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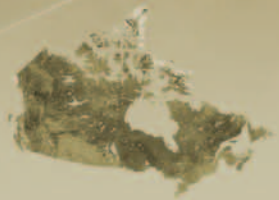
Energy Consumption of Major Household Appliances Shipped in Canada

Trends for 1990–2008



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Foreword

Since 1996, as part of the National Energy Use Database initiative, the Canadian Appliance Manufacturers Association (CAMA) has provided Natural Resources Canada's (NRCan's) Office of Energy Efficiency (OEE) with annual appliance shipment data for the six major household appliance categories – refrigerators, freezers, dishwashers, electric ranges, clothes washers and electric clothes dryers. According to CAMA, these manufacturers represent more than 90 percent of the Canadian market for five of the appliance groups.[1]

To keep the data confidential, appliance manufacturers suggested that a third party receive and prepare the database in a format in which no one (other than the third party) could determine the shipment data for an individual model or manufacturer. NRCan retained the services of Electro-Federation Canada, chosen by CAMA, as the third party.

Each model's shipments were matched to their associated unit energy consumption (UEC) ratings found in the *EnerGuide Appliance Directory* database.[2] The average annual shipment-weighted UEC was then calculated for each appliance category. This report analyzes these data for the six major household appliance categories shipped in Canada between 1990 and 2008.

The data gathered through this report provide important information about various aspects of energy consumption related to new appliances in Canada. The data also enable NRCan to improve its ecoENERGY programs, which are designed to support Canadians as they seek to achieve greater energy efficiency and further reduce greenhouse gas (GHG) emissions.

To further improve the quality and representation of energy efficiency data for new appliances in Canada, the OEE is exploring options to improve the coverage of the Canadian market through ongoing discussions with CAMA and other appliance manufacturers. The OEE thanks the participating manufacturers and CAMA for their co-operation in this project.

This report was prepared by Noel Melton of the Demand Policy and Analysis Division of the OEE. Diane Friendly provided assistance, while overall direction was provided by Andrew Kormylo.

For more information on programs and for the tools, financial incentives, free publications and other resources to help conserve energy and reduce GHG emissions, visit the OEE Web site at oee.nrcan.gc.ca.

[1] The market coverage of the freezers is not known.

[2] Available online at oee.nrcan.gc.ca/publications/infosource/pub/appliances/2009.

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Highlights

This report analyzes shipment data for major household appliances (refrigerators, freezers, dishwashers, electric ranges, clothes washers and electric clothes dryers) between 1990 and 2008. These data were collected through the co-operation of the Canadian Appliance Manufacturers Association and represent the majority of shipments to Canadian retailers and builders during this period.

Highlights of this report include

- The reduction in average annual unit energy consumption ranged from 7 percent (electric clothes dryers) to 79 percent (clothes washers) during the study period. These energy efficiency improvements can be attributed to a variety of factors, including
  - the research and development carried out by manufacturers
  - consumer demand for more energy-efficient products
  - standards that limit the amount of energy each appliance may consume (such as the minimum energy performance standards [MEPS])
  - information initiatives such as the EnerGuide for Equipment program and the ENERGY STAR® Initiative in Canada, which help consumers identify the most energy-efficient products on the market
  - the various incentives and rebates offered by the federal, provincial/territorial and municipal governments and utilities
- A household operating an average set of major household appliances purchased in 2008 might expect them to consume fewer than 2900 kilowatt hours per year (kWh/yr) of electricity – approximately half as much as a set purchased in 1990.
- To illustrate the significance of energy efficiency improvements on overall energy consumption, this report quantified energy savings from all shipped appliances in Canada between 1992 and 2008.[3] In 2008, the estimated energy savings exceeded 47 petajoules (or 13 billion kWh) – the equivalent of one year's energy for approximately 422 300 households.
- The share of ENERGY STAR qualified appliance shipments in Canada increased to 89 percent of dishwashers, 64 percent of clothes washers and 53 percent of refrigerators in 2008.
- The majority of appliances in Canada (between 79 and 94 percent) were shipped to retailers in 2008.

[3] Note that even though the MEPS did not come into effect until 1995, the baseline year used for all estimates of energy savings was 1992. This is because energy efficiency began to improve almost immediately after the *Energy Efficiency Act* came into force in 1992.

Contents

List of Tables

List of Figures

Introduction

The *Energy Consumption of Major Household Appliances Shipped in Canada, Trends for 1990–2008* outlines changes in the energy consumption and other characteristics of major household appliances shipped in Canada between 1990 and 2008.

The report is based on the shipments of the six major household appliance categories: refrigerators, freezers,[4] dishwashers, electric ranges, clothes washers and electric clothes dryers. The data are collected with the co-operation of the Canadian Appliance Manufacturers Association (CAMA). Throughout this report, the term "appliance" should be interpreted as "major household appliance."

Most retailers rely on a distribution strategy called just-in-time inventory, which responds quickly to consumer demand. In fact, retailers keep inventory as low as possible. For this reason, the Office of Energy Efficiency (OEE) at Natural Resources Canada (NRCan) believes that the shipment data in this report closely reflect the purchasing behaviour of consumers.

Note that these data show the region or province to which the appliances were originally shipped. It is possible that some appliances were eventually sold in a different province, and although the extent of this redistribution is unknown, the OEE believes it to be small.

While this report deals exclusively with shipment data, the OEE also has reports that provide additional information about appliances, such as the *Survey of Household Energy Use (SHEU)*. This national survey collects data on energy consumption and factors affecting energy consumption, such as the age of household appliances and their use. Some of the findings of SHEU are related to the analysis and discussions in this report. The latest SHEU–2007 can be downloaded free of charge from oee.nrcan.gc.ca/publications/statistics/sheu-summary07/sheu.cfm.

Contents of this report

This report is structured as follows:

- Chapter 1 provides background on the *Energy Efficiency Regulations*, the ENERGY STAR® Initiative in Canada and CAMA.
- Chapters 2 to 7 cover shipment data for each appliance category (refrigerators, freezers, dishwashers, electric ranges, clothes washers and electric clothes dryers).
- Chapter 8 compares the energy efficiency improvements among all appliance categories and quantifies the resulting energy savings, on both a household and national level.
- Chapter 9 provides conclusions about the analysis of the findings.
- Appendix A describes the database preparation process conducted by Electro-Federation Canada and the methodology used in this report.
- Appendix B is a glossary of key terms.
- Appendix C provides detailed tables to support the charts and figures.

[4] Because of restrictions in the market information available, the freezer shipment data are not as comprehensive as data for the other appliances and should be used with caution.

At the beginning of each chapter on one of the major household appliances (chapters 2 to 7), a box such as the one provided here summarizes key facts about the energy consumption and penetration of those appliances in Canadian households in 2007.[5] These data are taken from tables in NRCan's Comprehensive Energy Use Database and the *Energy Use Data Handbook, 1990 to 2007* and from the *2007 Survey of Household Energy Use Detailed Statistical Report*. Note that the data from these sources reflect ownership and energy consumption only in the residential sector, although some of the appliances contained in the data provided by CAMA are shipped to commercial customers.

Major household appliances in the residential sector

In 2007, major household appliances consumed 126 petajoules (PJ), down from 153 PJ in 1990 (a reduction of 18 percent).[6] The share of residential secondary energy consumption associated with major household appliances also decreased during this period, from 12 percent in 1990 to 9 percent in 2007.[7] The energy efficiency improvements in many appliances – the focus of this report – enabled these reductions to occur over this period.

[5] This is the last year for which data were available at the time of analysis for this report.

[6] Excluding hot water requirements for dishwashers and clothes washers.

[7] Natural Resources Canada, 2009, *Energy Use Data Handbook, 1990–2007*, Residential Sector, Table 15, oee.nrcan.gc.ca/corporate/statistics/neud/dpa/tableshandbook2/res_00_15_e_4.cfm.

Background

As is demonstrated throughout this report, many of the major household appliances have experienced significant improvements in energy efficiency during the past two decades. Changes in the energy efficiency of each appliance are based on standardized energy consumption ratings – labelled "average annual unit energy consumption (UEC)" and measured in kilowatt hours per year (kWh/yr). While these values are useful for comparison, they may not reflect the actual energy used by a given appliance because of the manner or frequency of use.

Generally, improvements in the energy efficiency of major household appliances can be attributed to one or more of the following:

- the minimum energy performance standards (MEPS) contained in the *Energy Efficiency Regulations* (the Regulations) and ongoing amendments
- information programs to help consumers identify energy-efficient products, such as the EnerGuide for Equipment program and the ENERGY STAR® Initiative in Canada (the initiative)
- the research and development carried out by the appliance manufacturers
- consumer demand for more energy-efficient products

This chapter provides some context to the rest of the report, describing the Regulations (Section 1.1), the initiative (Section 1.2) and the role of the members of the Canadian Appliance Manufacturers Association (CAMA) (Section 1.3).

1.1 *Energy Efficiency Regulations*

Natural Resources Canada's (NRCan's) wide range of energy efficiency initiatives includes standards, labelling programs and Canada's *Energy Efficiency Regulations*.[8] Through these initiatives, NRCan works with stakeholders to accelerate the market penetration of high-efficiency equipment.

The *Energy Efficiency Act* (the Act) of 1992 gives the Government of Canada the authority to make and enforce regulations on performance and labelling requirements for energy-using products, including major household appliances imported into Canada or shipped across provincial or territorial borders.

The Regulations came into effect in February 1995, following extensive consultation with provincial and territorial governments, industry, utilities and environmental groups. The Regulations refer to national consensus performance standards developed by accredited standards-writing organizations, such as the Canadian Standards Association. Such standards include testing procedures that must be used to determine a product's energy performance. Regulated products that fail to meet the MEPS identified by the Regulations cannot be imported into Canada or traded among provinces/territories.

[8] Natural Resources Canada, *Improving Energy Performance in Canada, Report to Parliament Under the Energy Efficiency Act for the Fiscal Year 2007–2008*, (Ottawa: 2008), p. 21, oee.nrcan.gc.ca/Publications/statistics/parliament07-08/pdf/parliament07-08.pdf.

Table 1 MEPS and ENERGY STAR® specifications for major household appliances

Appliance	Introduction of MEPS	Amendment to MEPS*	ENERGY STAR qualified models available in Canada	Revisions to ENERGY STAR specifications**
Refrigerators	Feb. 1995	Jul. 2001 Dec. 2002 Dec. 2005 (Type 5A) Dec. 2009 (Type 19 and Type 20)	Jan. 2001	Jan. 2004 Apr. 2008
Freezers	Feb. 1995	Jul. 2001 Dec. 2005 (Type 10A)	Jan. 2003	Jan. 2004
Dishwashers	Feb. 1995	Jan. 2004 (new test) Jan. 2010	Jan. 2001	Jan. 2007 Aug. 2009 Jul. 2011
Electric ranges	Feb. 1995	Oct. 2003 (new test)	N/A	N/A
Clothes washers	May 1995	Jan. 2004 Jan. 2007	Jan. 2001	Jan. 2007 Jul. 2009 Jan. 2011
Electric clothes dryers	May 1995	Dec. 1998 (compact)	N/A	N/A

*Note that some of the amendments reflect changes to testing or other elements of the standards and do not reflect changes to the stringency of the MEPS: the December 2005 amendment to freezers added a new freezer category; and the January 2004 amendment to dishwashers and the October 2003 amendment to electric ranges changed the testing procedures for these appliances. For more details, visit oee.nrcan.gc.ca/regulations/guide.cfm.

** Source: oee.nrcan.gc.ca/residential/business/manufacturers/requirements/index.cfm

Table 1 outlines the chronology of amendments to the MEPS and ENERGY STAR specifications for each major household appliance. For more information about the Regulations, visit oee.nrcan.gc.ca/regulations.

The Act and Regulations also support labelling initiatives. These initiatives require that an EnerGuide label be displayed on major electrical household appliances, showing the estimated annual UEC of the product in kilowatt hours and comparing the product with the most efficient and least efficient models of the same class and size. EnerGuide directories with energy ratings for appliances are published every year and distributed to consumers, retailers and appliance salespeople.[9]

[9] Up-to-date searchable lists of models are available at oee.nrcan.gc.ca/publications/infosource/pub/appliances/2009.

1.2 The ENERGY STAR® Initiative in Canada

The internationally recognized ENERGY STAR symbol is a simple way for consumers to identify products that are among the most energy-efficient on the market. The ENERGY STAR initiative began in the United States (U.S.) through the Environmental Protection Agency (EPA) and has expanded internationally. NRCan's Office of Energy Efficiency is the official custodian of the initiative for Canada.

In this section, the ENERGY STAR criteria are summarized by appliance. Then, the penetration of ENERGY STAR qualified shipments are examined over time and among regions in Canada. Lastly, the energy consumption of ENERGY STAR qualified shipments is compared with that of non-ENERGY STAR qualified shipments.

ENERGY STAR specifications

The ENERGY STAR specifications for each appliance are summarized in the following sections.[10] Note that ENERGY STAR specifications do not exist for ranges or clothes dryers because few energy savings are possible since most of these products consume similar amounts of energy.

Refrigerators

April 28, 2008, marked the introduction of a more stringent ENERGY STAR specification for standard-size refrigerators. After that date, the energy efficiency of standard refrigerators with a refrigerated volume of 7.75 cubic feet (cu. ft.) and greater must exceed Canada's minimum regulated standard by at least 20 percent.

The specification for compact refrigerators remains unchanged, requiring an efficiency level of at least 20 percent above Canada's minimum regulated standard.

Freezers

To be ENERGY STAR qualified, standard-size freezers must have energy efficiency levels that are at least 10 percent above Canada's minimum regulated standard. Compact freezers must exceed the standard by at least 20 percent.

Dishwashers

ENERGY STAR qualified dishwashers use 20 to 50 percent less energy and 35 to 50 percent less water than standard models. To qualify for the ENERGY STAR symbol, dishwashers must achieve energy efficiency levels that are at least 41 percent higher than Canada's minimum regulated standard.

Until August 10, 2009, the specification for the minimum ENERGY STAR energy factor (EF), or cycles per kilowatt hour, for standard dishwashers was 0.65. The minimum EF for compact dishwashers was 0.88.

As of August 11, 2009, ENERGY STAR qualified standard dishwashers must meet a maximum total annual energy consumption (TAEC) of 324 kWh/year (kWh/yr) and a maximum water factor (WF) of 21.96 litres/cycle (L/cycle) (5.8 gallons/cycle [gal./cycle]). Compact dishwashers now require a maximum TAEC of 234 kWh/yr and a maximum WF of 15.14 L/cycle (4.0 gal./cycle). The TAEC takes into consideration the annual energy use and standby energy.

[10] Source: Natural Resources Canada, *2009 EnerGuide Appliance Directory*, pp. 193 and 224.

Many ENERGY STAR dishwashers use "smart" sensors that match the wash cycle and the amount of water to each load. Some also have an internal heater to boost the temperature of incoming water.

Clothes Washers

To be ENERGY STAR qualified, clothes washers must be standard size – with a minimum tub capacity of 45 L (1.6 cu. ft.) – and at least 36 percent more efficient than Canada's minimum energy performance standard.

There is no ENERGY STAR specification for compact clothes washers.

To be ENERGY STAR qualified, a clothes washer must have advanced design features that use less energy and 35 to 50 percent less water than ENERGY STAR qualified washers made before January 1, 2007. Features include a spin cycle that extracts more water from clothes, thus shortening time in a clothes dryer and reducing the amount of energy needed for drying.

Until June 30, 2009, ENERGY STAR qualified residential clothes washers and residential-style commercial clothes washers needed a minimum modified energy factor (MEF) of 48.45 L/kWh per cycle (1.72 cu. ft./kWh per cycle). The MEF includes a calculation that takes into account the amount of energy used by an electric clothes dryer. As well, the clothes washers must have a maximum WF of 1.07 L/cycle per litre of tub capacity (8.0 gal./cycle per cu. ft.). The WF is the number of litres of water per cycle that the clothes washer uses per litre of tub capacity. The lower the WF, the more efficient the washer.

Effective July 1, 2009, ENERGY STAR qualified residential clothes washers and residential-style commercial clothes washers must have a minimum MEF of 50.97 L/kWh per cycle (1.8 cu. ft./kWh per cycle) and a maximum WF of 1.0 L/cycle per litre (7.5 gal./cycle per cu. ft.).

Penetration of ENERGY STAR qualified appliances over time

Figure 1 summarizes the penetration rate of ENERGY STAR qualified appliances since they began appearing on the market in early 1999 (influenced by U.S. activity spilling over into Canada). In 2001, Canada officially adopted the ENERGY STAR registered label to designate the most energy-efficient appliances. By 2008, 89 percent of dishwashers, 64 percent of clothes washers and 53 percent of refrigerators shipped in Canada were ENERGY STAR qualified.[11] Because the data for freezers is less representative of the Canadian market, their share of ENERGY STAR shipments is not shown.

Penetration of ENERGY STAR qualified appliances among regions

Figure 2 shows the breakdown by region/province for each appliance category covered by the ENERGY STAR initiative in 2008 (excluding freezers). The portion of ENERGY STAR qualified shipments was generally similar in Quebec, Ontario and the Prairies, while it was somewhat lower in the Atlantic provinces. In British Columbia, the penetration of ENERGY STAR clothes washers was higher than the Canadian average, while that of refrigerators was lower.

[11] Possible reasons for the higher penetration rate of ENERGY STAR qualified dishwashers are that many of them were made available to the consumer and that they were being offered at affordable prices. Dishwasher manufacturers met the specifications quickly, and the incremental cost to meet ENERGY STAR qualifying levels was decreasing. The increase in stringency of the ENERGY STAR specification for dishwashers introduced in January 2007 explains the slight decrease of their penetration rate shown in Figure 1. Similarly, the increase in stringency of the ENERGY STAR specification for refrigerators introduced in January 2004 explains the slight decrease of their penetration rate at that time.

Figure 1 Distribution of shipments of ENERGY STAR® qualified major household appliances, 1999–2008

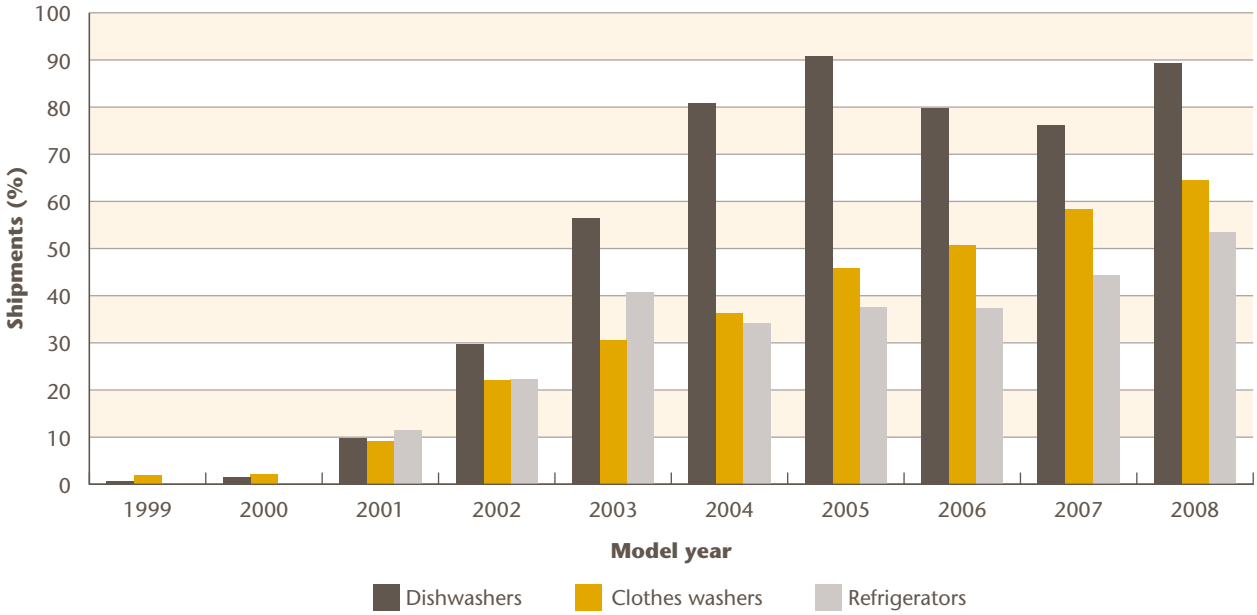
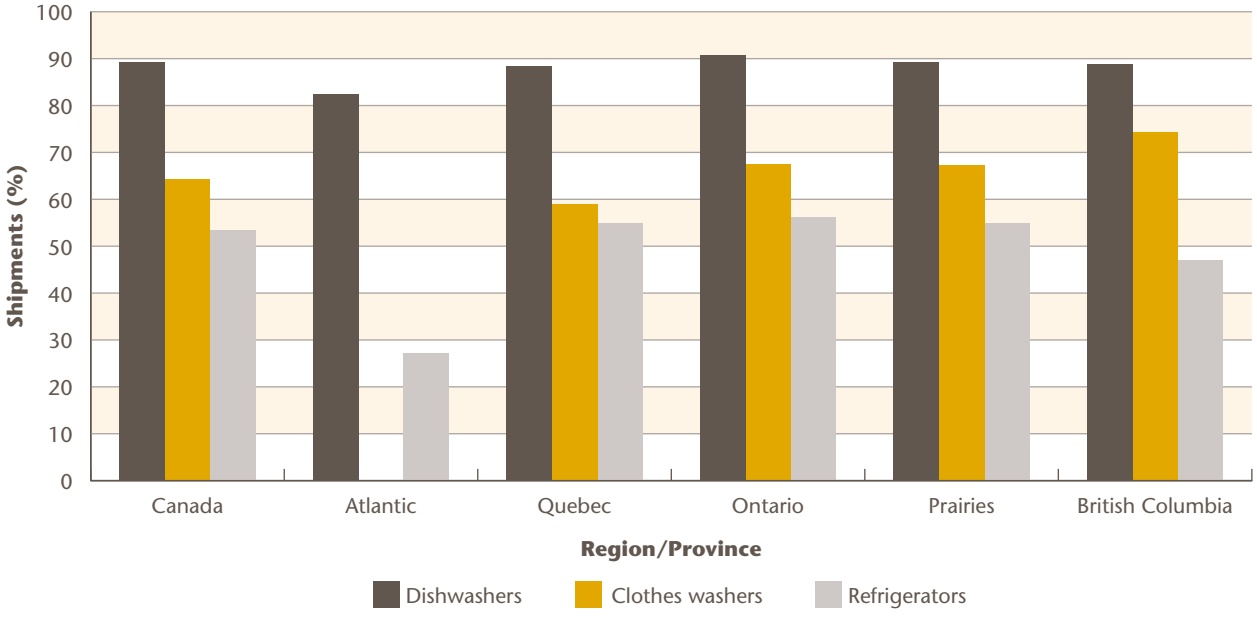


Figure 2 Distribution of shipments of ENERGY STAR qualified major household appliances by region/province, 2008



Note: Clothes washer data are not shown for the Atlantic provinces to protect confidentiality.

Energy consumption of ENERGY STAR qualified appliances

Table 2 shows the average annual UEC of ENERGY STAR qualified appliances from 2000 to 2008. In 2008, the average ENERGY STAR qualified refrigerator, dishwasher and clothes washer consumed 5 percent, 9 percent and 54 percent less energy than the average non-ENERGY STAR qualified appliance of each category, respectively. These differences have generally decreased over time, indicating that the energy consumption range for these appliances is diminishing.

Note that in 2002 and 2005, the average ENERGY STAR qualified refrigerator actually consumed more energy than the average non-ENERGY STAR refrigerator. This seemingly counterintuitive result most likely occurred because ENERGY STAR qualified refrigerators tended to be larger, on average, than non-ENERGY STAR refrigerators.[12]

Table 2 Average annual UEC of ENERGY STAR qualified major household appliances, 2000–2008

	2000	2001	2002	2003	2004	2005	2006	2007	2008
	(kWh/yr)								
Refrigerators									
Total refrigerators	639	559	506	487	478	469	481	483	467
Non-ENERGY STAR qualified refrigerators	–	567	505	491	482	469	485	486	479
ENERGY STAR qualified refrigerators	–	495	509	481	469	470	475	480	457
Dishwashers									
Total dishwashers	637	634	592	524	457	396	373	354	343
Non-ENERGY STAR qualified dishwashers	639	644	635	617	606	568	402	377	374
ENERGY STAR qualified dishwashers	553	534	492	452	422	378	365	347	339
Clothes washers									
Front-loading clothes washers	274	287	301	275	258	219	203	184	179
Non-ENERGY STAR qualified front-loading clothes washers	–	–	316	362	321	276	282	241	382*
ENERGY STAR qualified front-loading clothes washers	–	–	300	274	258	217	201	183	178
Top-loading clothes washers	923	905	871	827	702	609	555	415	387
Non-ENERGY STAR qualified top-loading clothes washers	–	–	916	892	746	636	581	425	399
ENERGY STAR qualified top-loading clothes washers	–	–	287	337	302	317	301	311	290
Total clothes washers	838	810	779	708	573	444	390	287	261
Non-ENERGY STAR qualified clothes washers	–	–	915	891	746	627	575	422	399
ENERGY STAR qualified clothes washers	–	–	299	294	267	228	211	191	185

*Non-ENERGY STAR qualified units accounted for less than 1 percent of shipments of front-loading clothes washers in 2008. Therefore, the average annual UEC is based on a very small number of shipments.

[12] Refrigerators meet the ENERGY STAR criteria by exceeding energy efficiency standards relative to other units of a given class or size. Thus, although a large ENERGY STAR qualified refrigerator would consume less energy than other refrigerators of its size, it may consume more energy than a smaller non-ENERGY STAR qualified unit.

1.3 Role of the members of the Canadian Appliance Manufacturers Association

CAMA members understand the important role they play in minimizing the effects that household appliances have on the environment. Developing, producing and marketing more energy-efficient products to help reduce consumer energy use and harmful greenhouse gas emissions is one of these roles.

Energy-efficient, ENERGY STAR qualified refrigerators, clothes washers, dishwashers and freezers are major drivers of reductions in Canadian energy use. CAMA members also acknowledge the importance of recycling and properly disposing of white goods and their packaging.

The recycling rate for end-of-life appliances in Canada is very high. A recent CAMA study on the recycling of appliances in the province of Ontario[13] found that between 95 percent and 99 percent of end-of-life appliances were collected for recycling and that between 83 percent and 89 percent of the component materials were diverted from landfills. These recycling rates make Canada one of the most successful countries in the world in diverting white goods.

The success of the appliance recycling system is due largely to the significant amount of valuable materials that comprise most household appliances, such as steel, aluminum, copper and zinc. This makes end-of-life appliances unique when compared with virtually all other waste electronic and electrical equipment (WEEE) in that the recycling of appliances is actually a profitable activity that does not require government or industry subsidy.

The value of the materials contained in appliances has enabled municipalities, retailers and private scrap metal dealers to profitably collect and sell end-of-life appliances into a market-driven appliance recycling industry where the metals are recovered for re-manufacturing into new metals-based products.

The significant reduction in appliance energy consumption over the years has resulted from the combined efforts of the appliance industry, governments, retailers and consumers. The minimum efficiency standards have contributed to a decrease in peak electricity demand and an increase in cost savings to consumers.

Appliance manufacturers have invested significantly in research and development to produce more energy- and water use-efficient appliances at more affordable prices. The benefit to society of more efficient appliances will increase as the existing stock of appliances in Canadian homes is replaced.

[13] This study was undertaken by SBR International on behalf of CAMA and was concluded in March 2009.

According to the *2007 Survey of Household Energy Use*, in 2007, approximately 911 000 Canadians did not dispose of their previous refrigerator when they acquired a new one. Because of this, appliance manufacturers continue to actively participate in the development, design and promotion of programs that encourage consumers to dispose of their previous refrigerator, removing it entirely from the grid when they acquire a more efficient replacement model.

CAMA and its member companies take environmental issues seriously. They have taken significant steps to minimize the impact household appliances have on the environment while still meeting consumer needs. Examples of improvements implemented by the appliance manufacturers, in conjunction with their material and component suppliers, are as follows:

- **refrigerators and freezers** – improved condensers, compressors, evaporators, fan motors, door seals and foam insulation
- **dishwashers** – better insulation, spray arms and filtering systems; and the availability of an air-dry cycle
- **electric ranges** – improvements in insulation and venting
- **clothes washers** – upgraded sensors, motors and mixing valves; the promotion of a cold water wash; the addition of front-loading clothes washers to manufacturers' product lines; and more effective water extraction, resulting in a shorter drying time
- **electric clothes dryers** – automatic termination controls eliminating excessive drying

Refrigerators

2.1 Overview

Refrigerators in the residential sector

Almost every household in Canada has a refrigerator, and approximately one quarter of households have two refrigerators.[14] In 2007, refrigerators in Canada's residential sector consumed 36.7 petajoules, representing 29 percent of the energy consumed by appliances (down from 40 percent in 1990).[15]

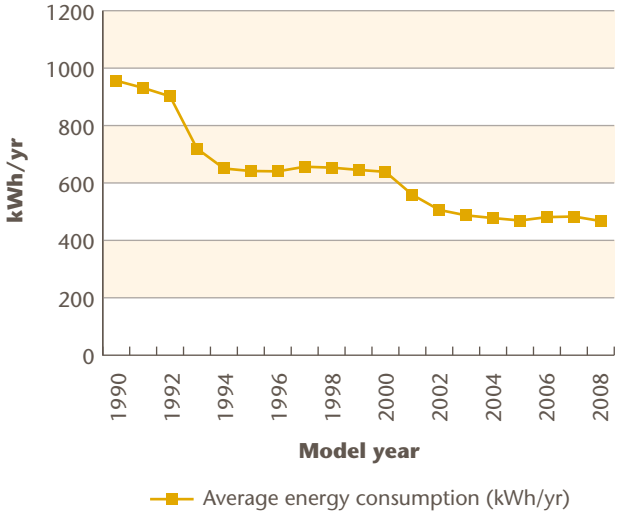
This chapter examines refrigerator shipment data in Canada from 1990 to 2008. Section 2.2 examines the improvement of unit energy consumption (UEC) over this period, and subsequent sections analyze specific characteristics of refrigerators and their influence on energy consumption. The shipment data is first examined by type (Section 2.3), then by volume (Section 2.4), energy consumption per volume (Section 2.5) and by channel (Section 2.6).

2.2 Average annual unit energy consumption by model year

As shown in Figure 3, a refrigerator shipped in 2008 consumed (on average) significantly less energy than one shipped in 1990; the average UEC decreased by more than half during this period, from 956 to 467 kilowatt hours per year (kWh/yr).

The most significant improvements in energy efficiency occurred between 1992 and 1994 (after the introduction of the minimum energy performance standards [MEPS]) and between 2000 and 2002 (coinciding with the 2001 amendment to the MEPS). Since 2003, energy consumption remained relatively stable.

Figure 3 Average annual UEC of refrigerators, 1990–2008



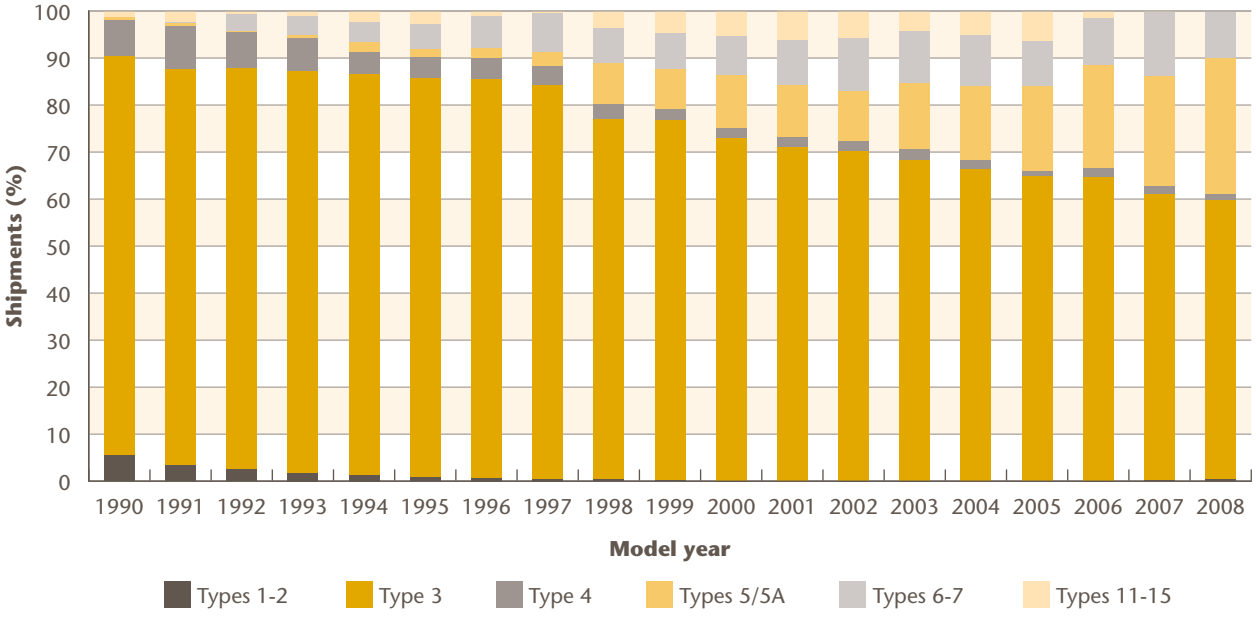
[14] Natural Resources Canada, 2010, *2007 Survey of Household Energy Use – Detailed Statistical Report*, Table 6.1, oee.nrcan.gc.ca/corporate/statistics/neud/dpa/data_e/sheu07/sheu_019_1.cfm.

[15] Natural Resources Canada, 2009, *Energy Use Data Handbook, 1990 to 2007*, Residential Sector, Table 15, oee.nrcan.gc.ca/corporate/statistics/neud/dpa/tableshandbook2/res_00_15_e_4.cfm.

Table 3 Distribution of refrigerators by type, 2008

	Type of refrigerator		Market share (%)
Without automatic defrost	1	Refrigerators and refrigerator-freezers with manual defrost	0.4
	2	Refrigerator-freezers with partial automatic defrost	0.0
With automatic defrost	3	Refrigerator-freezers with automatic defrost and top-mounted freezer, but without through-the-door ice service; also all-refrigerators with automatic defrost	59.4
	4	Refrigerator-freezers with automatic defrost and side-mounted freezer but without through-the-door ice service	1.2
	5	Refrigerator-freezers with automatic defrost and bottom-mounted freezer but without through-the-door ice service	26.5
	5A	Refrigerator-freezers with automatic defrost, bottom-mounted freezer and through-the-door ice service	2.4
	6	Refrigerator-freezers with automatic defrost, top-mounted freezer and through-the-door ice service	0.0
	7	Refrigerator-freezers with automatic defrost, side-mounted freezer and through-the-door ice service	10.0
Compact	11	Compact refrigerators and refrigerator-freezers with manual defrost	0.07
	12	Compact refrigerators and refrigerator-freezers with partial automatic defrost	0.0
	13	Compact refrigerator-freezers with automatic defrost and top-mounted freezer; also compact all-refrigerators with automatic defrost	0.04
	14	Compact refrigerator-freezers with automatic defrost and side-mounted freezer	0.0
	15	Compact refrigerator-freezers with automatic defrost and bottom-mounted freezer	0.0
Total			**100.0**

Figure 4 Distribution of refrigerators by type, 1990–2008



From 1990 to 2008, the increasing volume of refrigerators has tended to dampen improvements in UEC, although the difference in energy consumption between larger and smaller units has decreased substantially. These dynamics are discussed in more detail in the following sections of this chapter.

2.3 Distribution of shipments by type

Refrigerators are available in a range of sizes and with a variety of features, all of which affect energy consumption. Consequently, EnerGuide groups refrigerators according to both type and size, enabling the comparison of energy consumption among similar models.

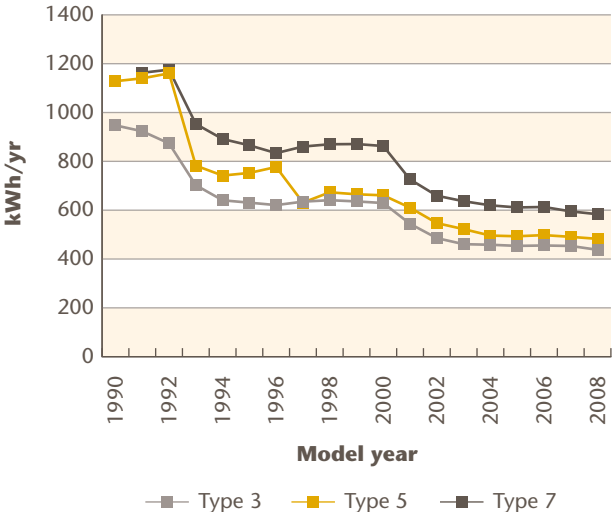
Refrigerators are categorized as those with and without automatic defrost and compact models.[16] Table 3 presents the market share of each refrigerator type in 2008, as well as a definition of each type. The refrigerator types with the greatest market share in 2008 were Type 3 (59 percent), Type 5 (27 percent) and Type 7 (10 percent). All of these types have automatic defrost.

Figure 4 shows the change in type of refrigerators shipped from 1990 to 2008. During this period, the share of Type 3 shipments decreased from 85 percent to 59 percent and was largely replaced by Type 5 and Type 7 refrigerators. Type 5 refrigerators – those with bottom-mounted freezers – grew increasingly popular over the period, reaching 26.5 percent of shipments in 2008 (up from 0.6 percent in 1990). Since the mid 1990s, the vast majority of shipped refrigerators have had automatic defrost (99.5 percent in 2008).

Little variation exists in the proportion of refrigerator types shipped to Ontario, the Prairies and British Columbia. However, Type 3 refrigerators were much more popular in the Atlantic provinces (representing close to 80 percent of shipments in 2008), and Type 7 refrigerators were somewhat less popular in Quebec. Table C.7 in Appendix C summarizes regional shipment data by type.

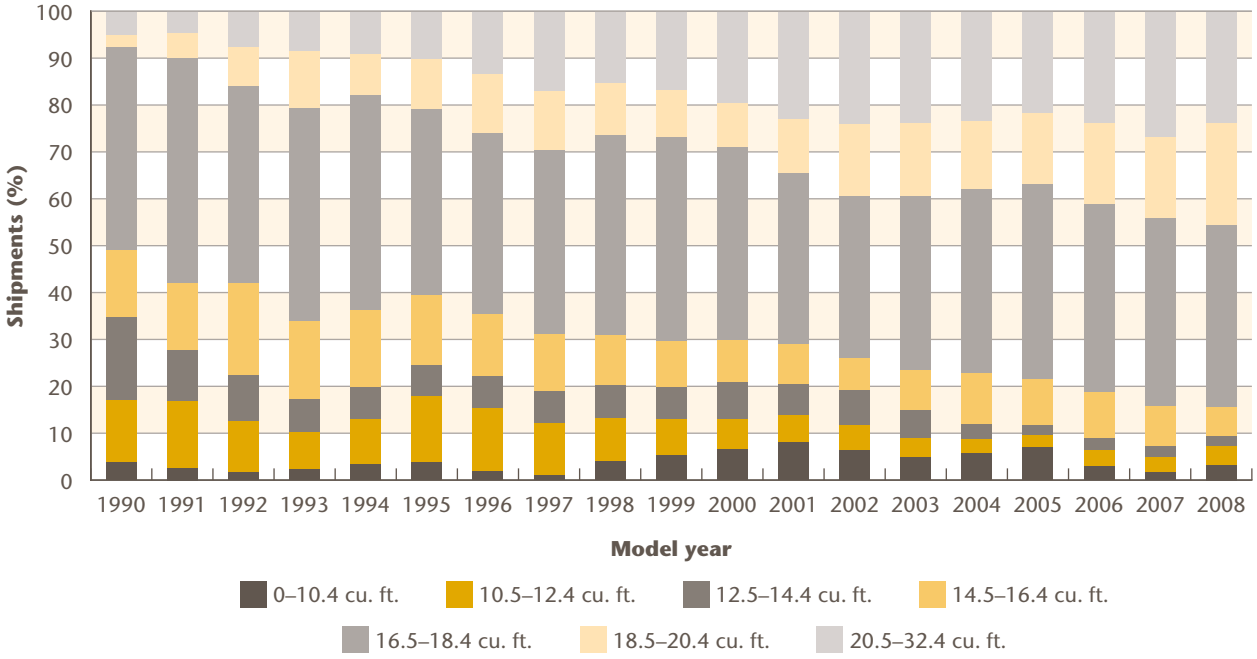
The popularity of different refrigerator types has implications for energy consumption. Figure 5 shows the average annual UEC for Type 3, Type 5 and Type 7 refrigerators (which were the most popular types in 2008). The energy consumption of all these types has decreased over time; in 2008, Type 3, Type 5 and Type 7 refrigerators consumed (on average) 438, 483 and 584 kWh/yr, respectively.

Figure 5 Average annual UEC of refrigerators by type, 1990–2008



[16] Compact refrigerators have a volume of less than 219.5 litres (7.75 cu. ft.) and a height of less than 91.4 centimetres (36 inches).

Figure 6 Distribution of refrigerators by volume, 1990–2008



2.4 Distribution of shipments by volume

The size of refrigerators shipped in Canada increased significantly from 1990 to 2008. Figure 6 shows that in 1990, almost half of shipped refrigerators had a volume of less than 16.5 cubic feet (cu. ft.). By 2008, this number had dropped to less than one fifth, and nearly half of refrigerators were 18.5 cu. ft. or larger.

In general, the average volume of refrigerators shipped to Ontario, the Prairies and British Columbia was similar. However, a much greater proportion of smaller refrigerators were shipped to the Atlantic provinces. Table C.9 in Appendix C summarizes regional shipment data by volume.

Figure 7 Average annual UEC of refrigerators by volume, 1990 and 2008

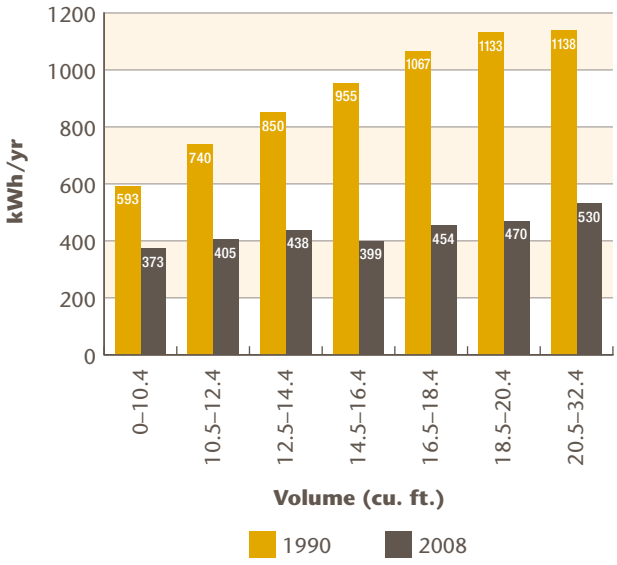
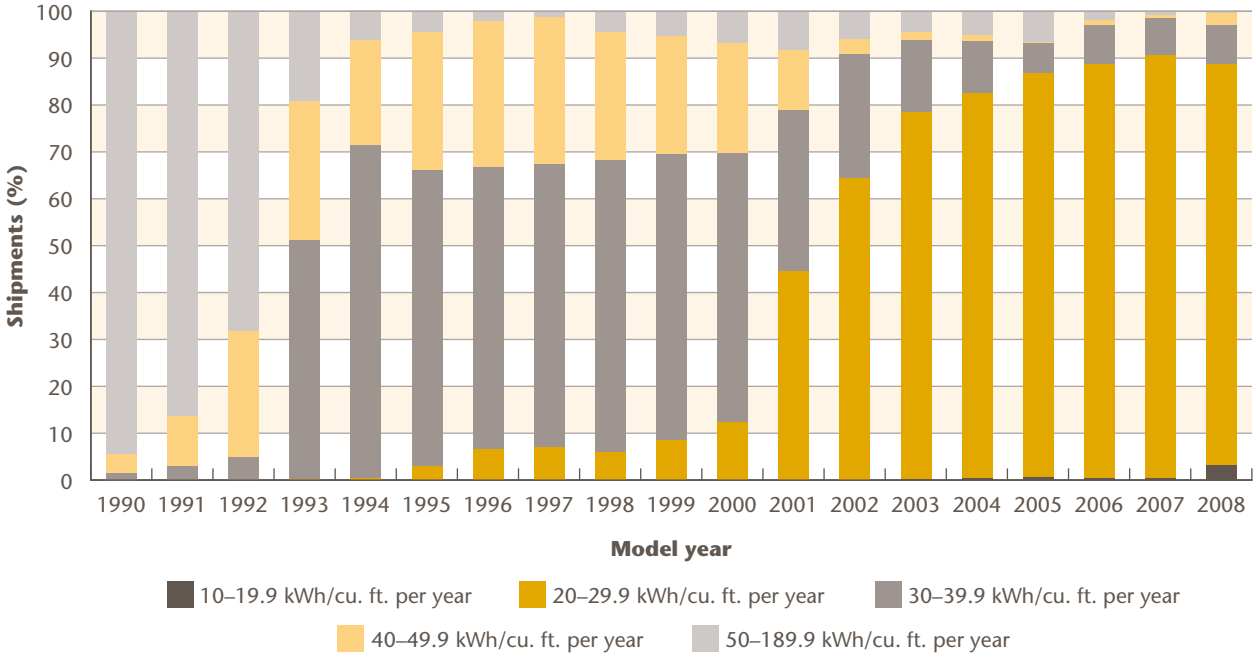


Figure 8 Distribution of refrigerators by average annual UEC per cubic foot, 1990–2008



Although refrigerators have been getting larger, the average annual UEC of refrigerators decreased significantly since 1990. This change was made possible by substantial improvements to the energy efficiency of larger refrigerators, which have decreased the difference in energy consumption between small and large units.

Figure 7 shows that in 1990, refrigerators in the largest category (those with a volume between 20.5 and 32.4 cu. ft.) consumed 1138 kWh/yr on average, almost twice as much as those in the smallest category. By 2008, this difference had decreased to 42 percent, with refrigerators in the largest category only consuming 157 kWh/yr more than those in the smallest category.

2.5 Distribution of shipments by unit energy consumption per volume

While the average annual UEC of refrigerators shipped between 1990 and 2008 decreased, the energy consumption per unit *volume* decreased even more because of the higher efficiency gains of larger refrigerators.

Figure 8 shows the distribution of shipped refrigerators by their average annual UEC per cubic foot of volume from 1990 to 2008.[17] In 1990, 95 percent of shipped refrigerators consumed more than 50 kWh/cu. ft. per year, whereas in 2008, close to 90 percent consumed less than 30 kWh/cu. ft. per year. Also in 2008, refrigerators of the lowest energy range (less than 20 kWh/cu. ft. per year) achieved a market penetration of 3 percent.

[17] Note that Natural Resources Canada does not have distribution data for UEC that is not divided by volume. Such data would show slightly more modest improvements in energy efficiency because average refrigerator size has increased throughout the study period.

Figure 9 Average annual UEC per cubic foot of refrigerators by volume, 1990 and 2008

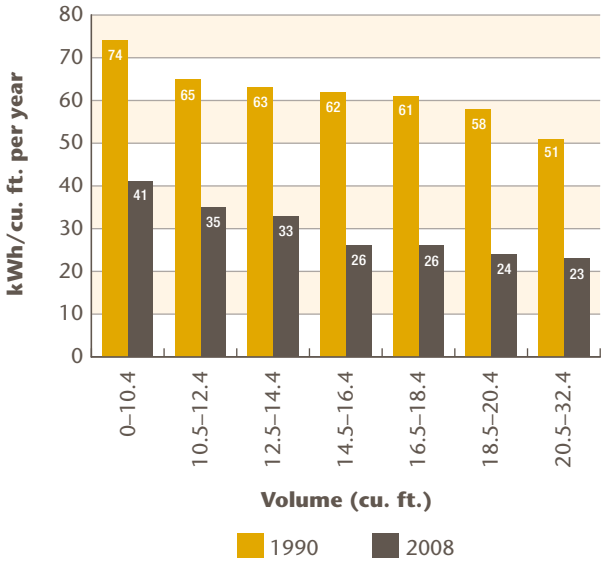


Figure 9 shows the average annual UEC per cubic foot for refrigerators shipped in 1990 and 2008, by volume of refrigerator. On both an absolute and proportional basis, energy efficiency improvements per cubic foot were greatest for refrigerators with a volume greater than 14.5 cu. ft. Larger refrigerators are able to consume less energy per unit volume because they have lower surface-to-volume ratios and can be insulated more easily than smaller units.

2.6 Distribution of shipments by channel

The majority of refrigerators in Canada were shipped to retailers (82 percent) in 2008 (see Table 4). This proportion has fluctuated modestly in recent years and varies among regions. Builder shipments were lowest in Quebec (7 percent) and the Atlantic provinces (12 percent) in 2008. In the Atlantic provinces, the ratio of builder shipments actually decreased between 2004 and 2008 (from 19 percent). In 2008, the proportion of builder shipments was the highest in British Columbia (41 percent, up from 36 percent in 2004). Table C.8 in Appendix C summarizes regional data by channel.

Table 4 Distribution of refrigerators by channel and region/province, 2008

Region/Province	Refrigerator shipments	
	Builder (%)	Retail (%)
Canada	17.7	82.3
Atlantic	11.6	88.4
Quebec	6.8	93.2
Ontario	18.1	81.9
Prairies	21.2	78.8
British Columbia	41.3	58.7

The proportion of builder and retail shipments has implications for energy consumption because refrigerators shipped to builders tend to be smaller (see Figure 10) and therefore consume less energy. However, larger refrigerators shipped to builders tended to consume more energy than refrigerators of the same size shipped to retailers. In 2008, more

than 50 percent of refrigerators shipped to retailers were 18.5 cu. ft. or larger, but less than one quarter of refrigerators shipped to builders was in this size range.

In 2008, the average annual UEC of refrigerators shipped to retailers was 472 kWh/yr, 5 percent higher than those shipped to builders (see Figure 11). The difference between the energy consumption of refrigerators shipped to retailers and those shipped to builders was greatest in Ontario (11 percent or 48 kWh/yr) and least in British Columbia (3 percent or 14 kWh/yr). Since 2004, the Canada-wide difference in energy consumption between builder- and retail-shipped refrigerators ranged from 3 to 6 percent.

Figure 10 Distribution of refrigerators by volume and channel, 2008

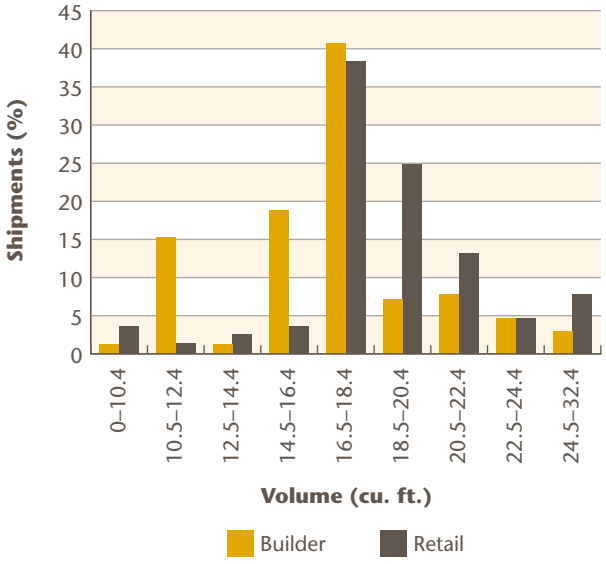
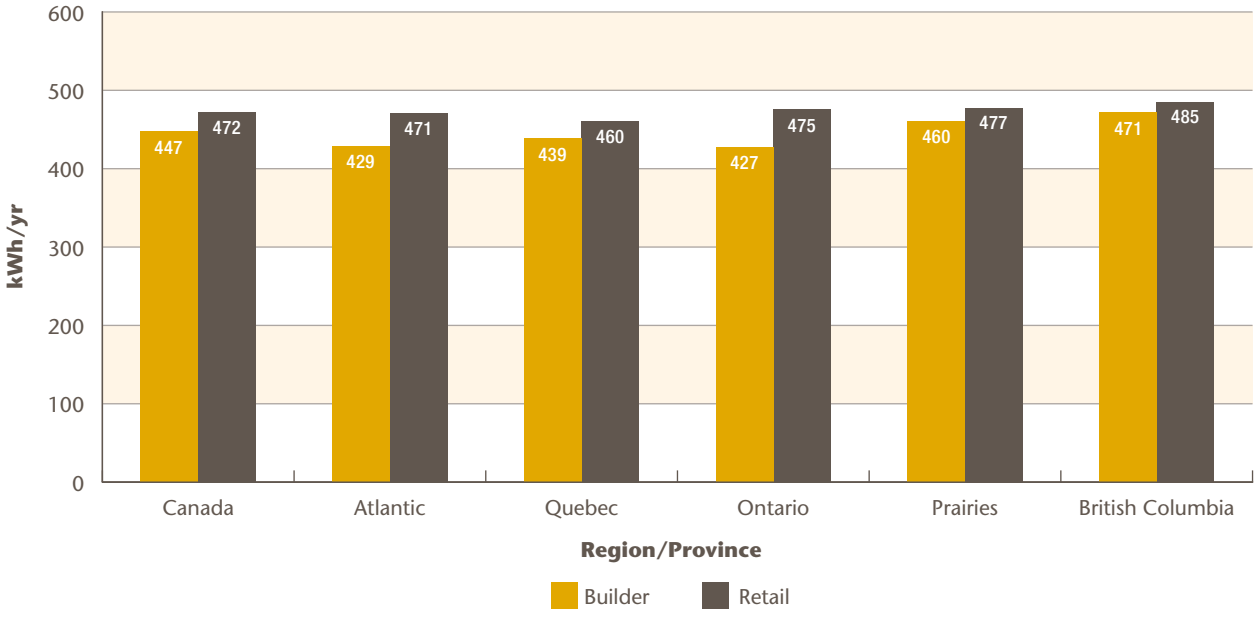


Figure 11 Average annual UEC of refrigerators by channel and region/province, 2008



Freezers

3.1 Overview

Freezers in the residential sector

Fifty-eight percent of Canadian households had a freezer in 2007.[18] Energy consumption of freezers in the residential sector was 11.8 petajoules in 2007, accounting for 9 percent of appliance energy use (down from 16 percent in 1990).[19]

This chapter examines freezer shipment data in Canada from 1991 to 2008. These data do not include freezers that are combined with refrigerators (which were assessed in the preceding chapter). In addition, the freezer data presented here should be treated cautiously because they may be less representative of the Canadian market than the data for other appliances. In particular, note that data for 1990 are not presented because they are based on a particularly small number of shipments.

Section 3.2 examines the improvement of unit energy consumption (UEC) of freezers over the study period. Subsequent sections analyze specific characteristics of freezers and their influence on energy consumption.

The shipment data are examined by type (Section 3.3), energy consumption per volume (Section 3.4) and channel (Section 3.5).

[18] Natural Resources Canada, 2010, *2007 Survey of Household Energy Use – Detailed Statistical Report*, Table 6.2, oee.nrcan.gc.ca/corporate/statistics/neud/dpa/data_e/sheu07/sheu_020_1.cfm.

[19] Natural Resources Canada, 2009, *Energy Use Data Handbook, 1990 to 2007*, Residential Sector, Table 15, oee.nrcan.gc.ca/corporate/statistics/neud/dpa/tableshandbook2/res_00_15_e_4.cfm.

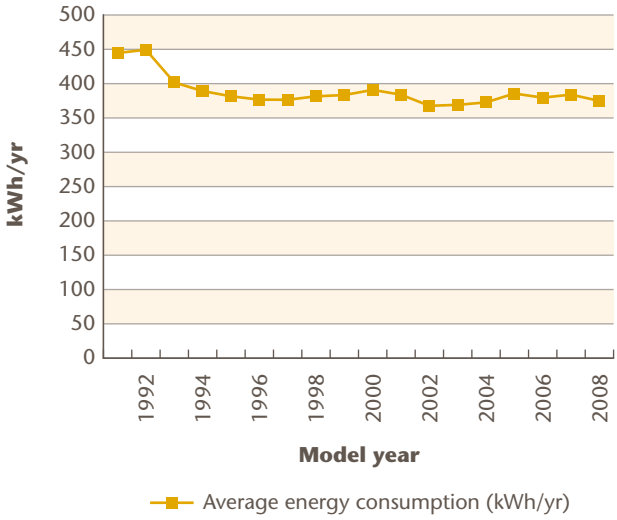
3.2 Average annual unit energy consumption by model year

Figure 12 shows the average annual UEC of freezers shipped in Canada between 1991 and 2008. Between 1991 and the mid 1990s, energy consumption decreased by about 15 percent. Energy consumption then fluctuated modestly throughout the rest of the period, reaching 375 kilowatt hours per year in 2008. However, the data prior to 1993 were significantly less comprehensive, so some of the observed change in UEC during this period may not reflect actual improvements in energy efficiency.

3.3 Distribution of shipments by type

Freezers come in a number of configurations, including upright, chest and compact (see Table 5). In 2008, chest, upright and compact freezers accounted for 43 percent, 32 percent and 26 percent of shipments, respectively.

Figure 12 Average annual UEC of freezers, 1991–2008

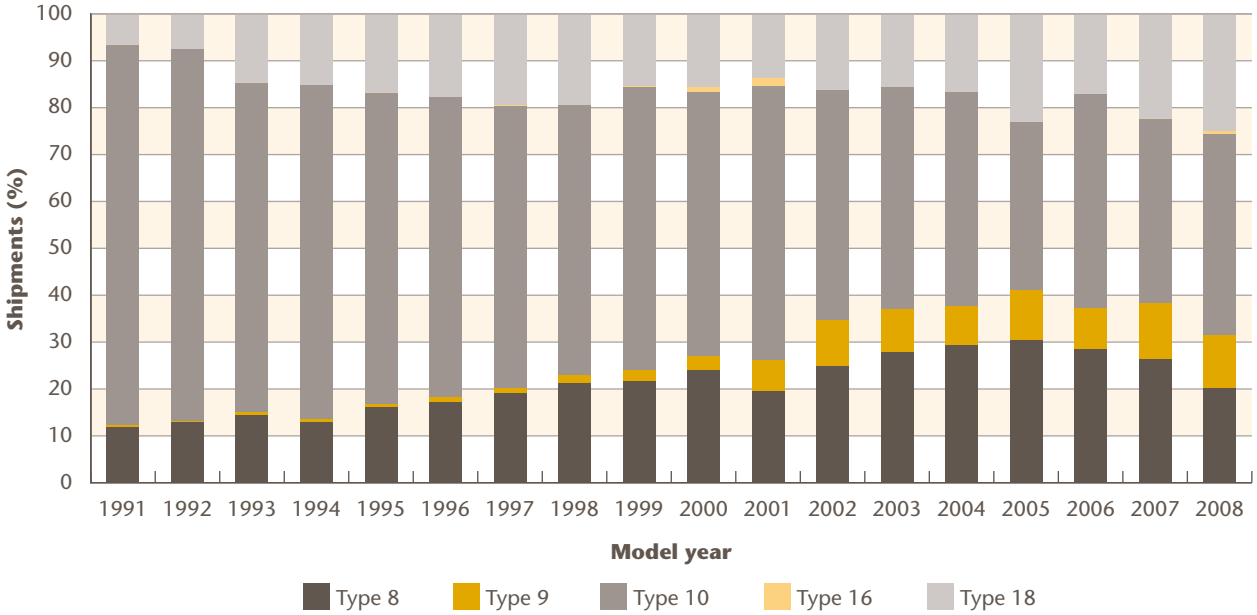


Note: The average annual UEC is not shown for 1990 because the data for this year are based on a small number of shipments and may be unrepresentative of the actual market.

Table 5 Distribution of freezers by type, 2008

	Type of freezer		Market share (%)
Upright	8	Upright freezers with manual defrost	20.1
	9	Upright freezers with automatic defrost	11.4
Chest	10	Chest freezers and all other freezers not defined as Type 8 or Type 9	42.9
Compact	16	Compact upright freezers with manual defrost	0.5
	17	Compact upright freezers with automatic defrost	0.0
	18	Compact chest freezers and all other compact freezers	25.1
Total			**100.0**

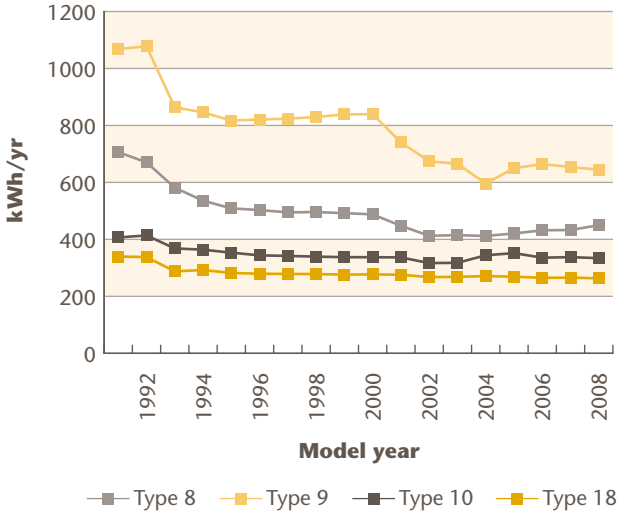
Figure 13 Distribution of freezers by type, 1991–2008



Note: The average annual UEC is not shown for 1990 because the data for this year are based on a small number of shipments and may be unrepresentative of the actual market.

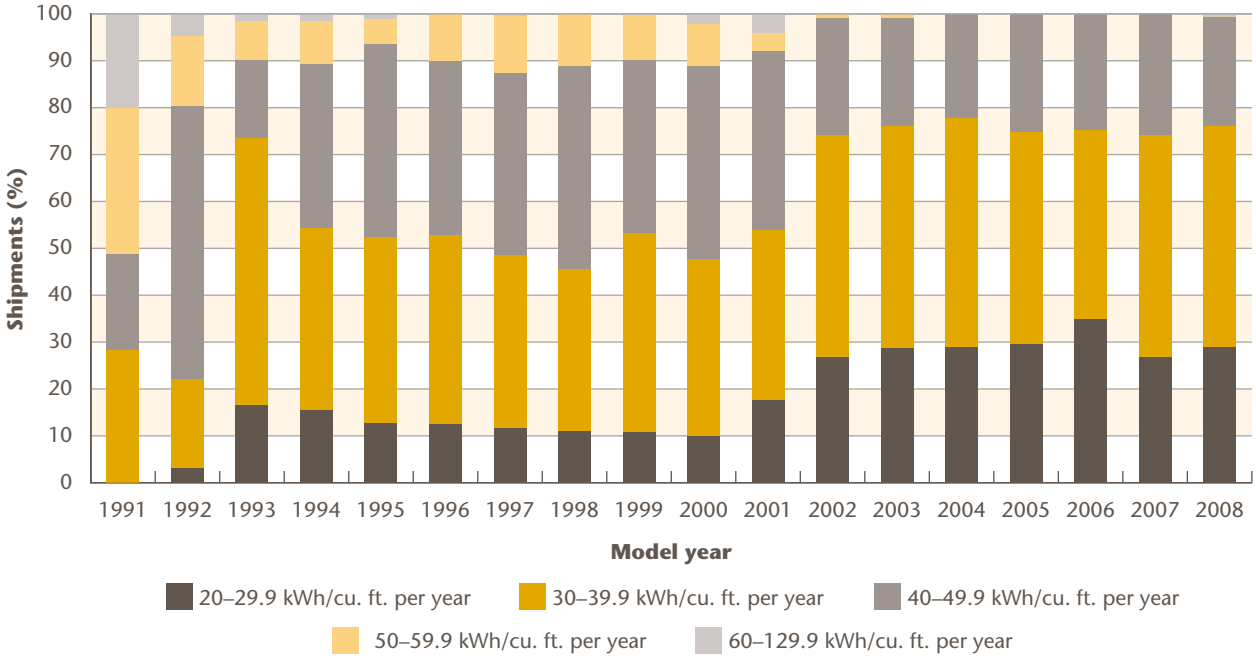
Figure 13 shows how the share of different types of freezers changed between 1991 and 2008. The popularity of chest freezers (Type 10) generally declined over the period (from 65 percent to 43 percent), while that of other types increased. Upright freezers, increasingly dominated by units with automatic defrost, increased from 12 percent of shipments in 1991 to 32 percent in 2008. Shipments of compact freezers (dominated by Type 18) fluctuated over the period, but generally accounted for an increasingly large share of total shipments. Table C.19 in Appendix C summarizes the type data by region/province.

Figure 14 Average annual UEC of freezers by type, 1991–2008



Note: The average annual UEC is not shown for 1990 because the data for this year are based on a small number of shipments and may be unrepresentative of the actual market.

Figure 15 Distribution of freezers by average annual UEC per cubic foot, 1991–2008



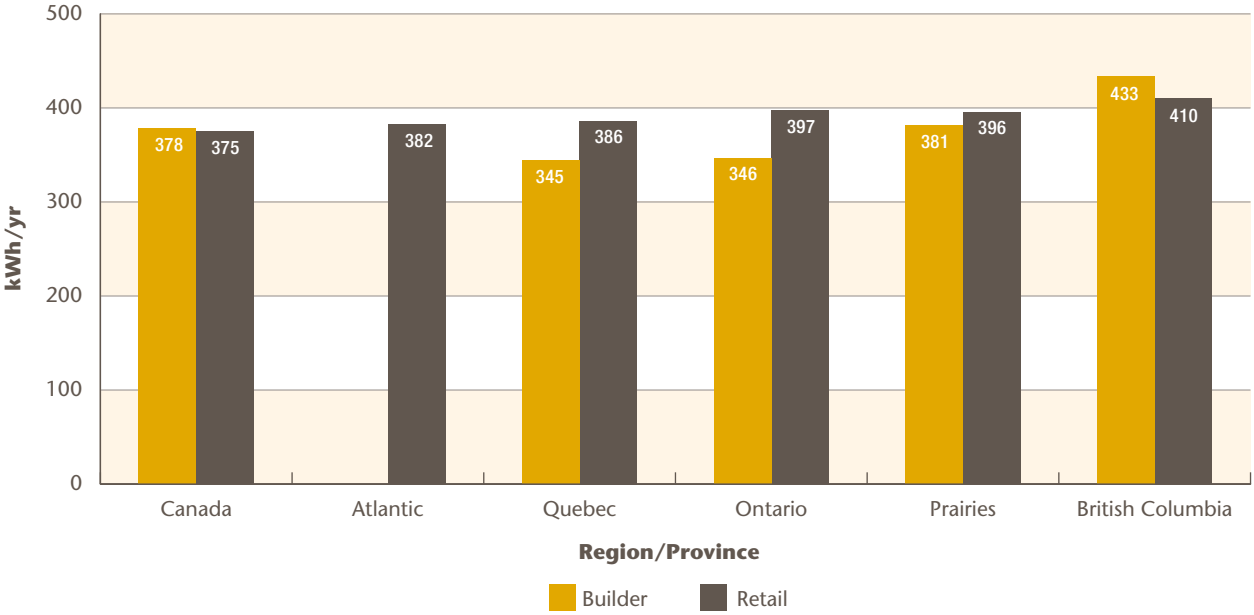
Note: The average annual UEC is not shown for 1990 because the data for this year are based on a small number of shipments and may be unrepresentative of the actual market.

The type of freezer has implications for energy consumption. Figure 14 shows how the average annual UEC of each type of freezer changed from 1991 to 2008. Upright freezers with automatic defrost (Type 9) consume the greatest amount of energy (and account for a growing segment of the freezer market). However, the average annual UEC of Type 9 freezers improved the most during this period. Meanwhile, compact chest freezers (Type 18) consume the smallest amount of energy.

3.4 Distribution of shipments by unit energy consumption per volume

Figure 15 shows the distribution of freezers by average annual UEC per cubic foot from 1991 to 2008. The data show that between 2000 and 2003, new freezers increasingly relied on a smaller amount of energy per volume to cool them. This improvement coincides with the 2001 amendment to the MEPS. However, the average annual UEC did not improve substantially during this period (see Figure 12), indicating perhaps that freezers grew in size. Table C.20 in Appendix C disaggregates these data by region/province.

Figure 16 Average annual UEC of freezers by channel and region/province, 2008



Note: UEC is not shown for builder shipments in the Atlantic provinces because of small sample size.

3.5 Distribution of shipments by channel

The majority of freezers in Canada were distributed to retailers (91 percent) in 2008 (see Table 6). The percentage of freezers shipped to builders was lowest in the Atlantic provinces (under 1 percent) and highest in British Columbia (28 percent). On a national level, the share of units shipped to builders increased rapidly in recent years, from under 2 percent in 2004 to close to 10 percent in 2008. Between 2007 and 2008, shipments to builders increased in all regions of Canada.

Figure 16 compares the average annual UEC of freezers by channel across Canada. In Quebec, Ontario and the Prairies, freezers shipped to retailers consumed, on average, more energy than those shipped to builders. In British Columbia, the reverse was true because a higher share of upright freezers were shipped to builders (which tend to consume more energy than chest freezers).

Table 6 Distribution of freezers by channel and region/province, 2008

Region/Province	Freezer shipments	
	Builder (%)	Retail (%)
Canada	9.3	90.7
Atlantic	0.6	99.4
Quebec	4.2	95.8
Ontario	8.1	91.9
Prairies	13.2	86.8
British Columbia	27.5	72.5

Dishwashers

4.1 Overview

Dishwashers in the residential sector

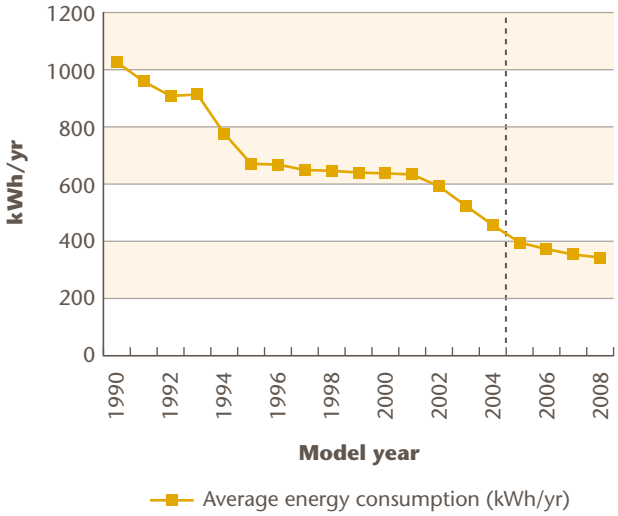
Sixty-one percent of Canadian households used a dishwasher in 2007.[20] In that year, dishwashers consumed 2.3 petajoules,[21] representing only 1.9 percent of appliance energy use in the residential sector (down from 2.6 percent in 1990).[22]

This chapter examines dishwasher shipment data in Canada from 1990 to 2008. Section 4.2 examines the improvement in unit energy consumption (UEC) of dishwashers over this period. Subsequent sections analyze specific characteristics of dishwashers and their influence on energy consumption. The shipment data is examined by UEC (Section 4.3) and channel (Section 4.4).

4.2 Average annual unit energy consumption by model year

The energy consumption of shipped dishwashers improved dramatically between 1990 and 2008. Figure 17 shows that during this period, the average annual UEC of shipped dishwashers decreased by 67 percent, from more than 1000 kilowatt hours per year (kWh/yr) to fewer than 400 kWh/yr. The most significant improvements in energy consumption occurred before the introduction of the minimum energy performance standards (MEPS) in 1995, and between 2001 and 2005, coinciding with the 2004 amendment to the MEPS.

Figure 17 Average annual UEC of dishwashers, 1990–2008



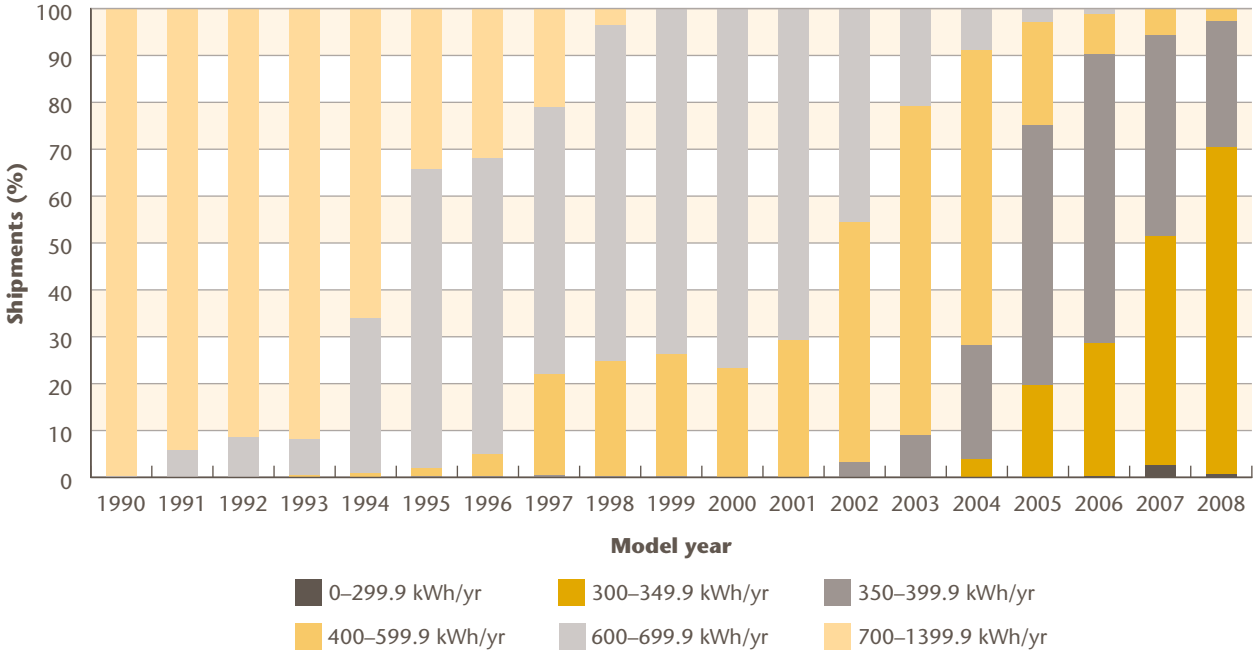
Note: Due to changes in the methodology for estimating average annual UEC, the data prior to 2004 are not directly comparable with those from 2004 to 2008.

[20] Natural Resources Canada, 2010, *2007 Survey of Household Energy Use – Detailed Statistical Report*, Table 6.4, oee.nrcan.gc.ca/corporate/statistics/neud/dpa/data_e/sheu07/sheu_022_1.cfm.

[21] Excluding hot water requirements.

[22] Natural Resources Canada, 2009, *Energy Use Data Handbook, 1990 to 2007*, Residential Sector, Table 15, oee.nrcan.gc.ca/corporate/statistics/neud/dpa/tableshandbook2/res_00_15_e_4.cfm.

Figure 18 Distribution of dishwashers by average annual UEC, 1990–2008



However, the more recent improvement in energy consumption does not entirely reflect an actual improvement in energy efficiency. In the 2004 amendment to the MEPS, the number of loads used to calculate average energy consumption was reduced from 264 to 215 per year. Therefore, the energy rating of any dishwasher would be lower according to the new standard, and data before and after 2004 are not directly comparable.[23] Using current assumptions about frequency of use would reduce the average annual UEC of dishwashers to 836 kWh/yr in 1990, resulting in a change of 59 percent over the period.

The new ratings also take into account standby power consumption (the energy used while the appliance is idle) and continue to include the energy required to heat water. Soil-sensing dishwashers are also subject to a new test procedure that reflects the average energy used when they are tested under light, medium and heavy soil loads.

4.3 Distribution of shipments by unit energy consumption

Figure 18 shows the distribution of shipped dishwashers by average annual UEC between 1990 and 2008. In 1990, all shipped dishwashers consumed at least 700 kWh/yr. By 2008, 97 percent of shipped dishwashers consumed fewer than 400 kWh/yr, and 70 percent consumed fewer than 350 kWh/yr.

Dishwashers consuming fewer than 300 kWh/yr also appeared in shipments for the first time in 2006, although they peaked at 2.6 percent of shipments in 2007 and subsequently declined to less than 1 percent in 2008.

The distribution of dishwasher shipments according to energy consumption varied little among regions, with the exception of the Atlantic provinces, where relatively more dishwashers were shipped with higher energy requirements.

[23] Natural Resources Canada, *EnerGuide Appliance Directory 2007*, p. 191.

Figure 19 Average annual UEC of dishwashers by channel and region/province, 2008

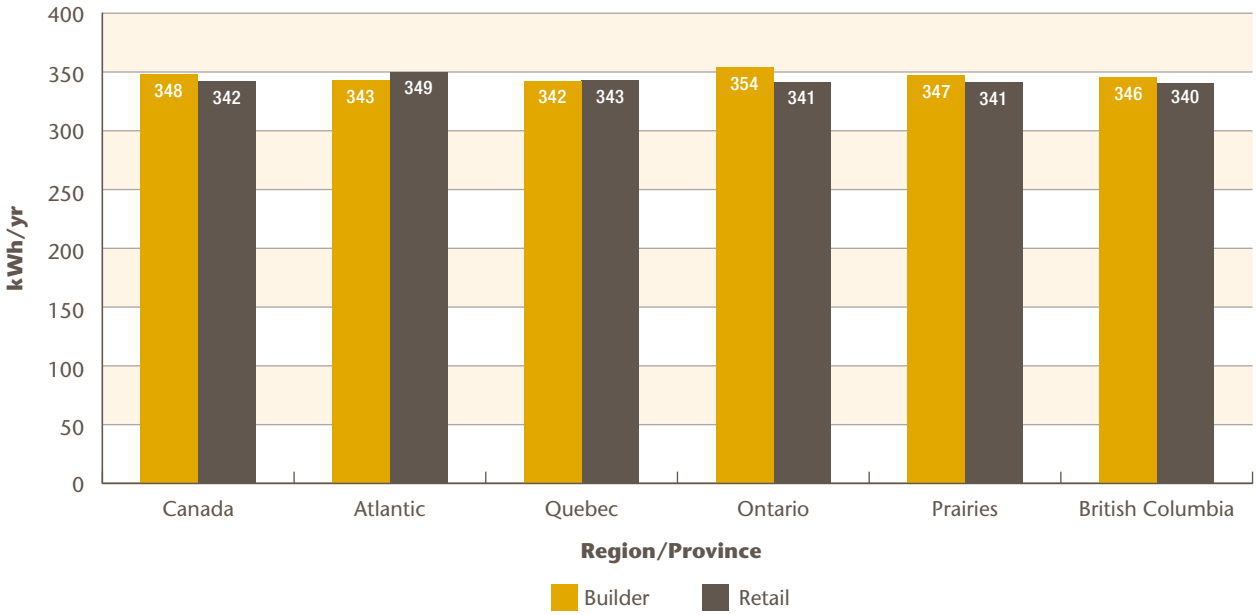


Table C.24 in Appendix C presents regionally disaggregated data on the distribution of shipments by UEC.

4.4 Distribution of shipments by channel

The majority of dishwashers in Canada were shipped to retailers (85 percent) in 2008 (see Table 7). This proportion has remained relatively constant nation-wide since 2006, although significant variation occurred among regions. Builder shipments were lowest in Quebec (3 percent in 2008), and have been decreasing in both the Atlantic provinces (11 percent in 2008, down from 15 percent in 2004) and Ontario (12 percent, down from 15 percent). Builder shipments have been highest in British Columbia (42 percent in 2008, up from 32 percent in 2004) and the Prairies (20 percent, up from 17 percent).

Figure 19 compares the average annual UEC of dishwashers shipped to builders with those shipped to retailers among regions in 2008. The differences are small overall, with dishwashers shipped to builders consuming slightly more energy than those shipped to retailers in Ontario, the Prairies and British Columbia (and the reverse occurring in the Atlantic provinces and Quebec).

Table 7 Distribution of dishwashers by channel and region/province, 2008

Region/Province	Dishwasher shipments	
	Builder (%)	Retail (%)
Canada	15.5	84.5
Atlantic	10.9	89.1
Quebec	3.0	97.0
Ontario	12.3	87.7
Prairies	20.3	79.7
British Columbia	41.8	58.2

Figure 20 Average annual UEC of dishwashers by channel, 2004–2008

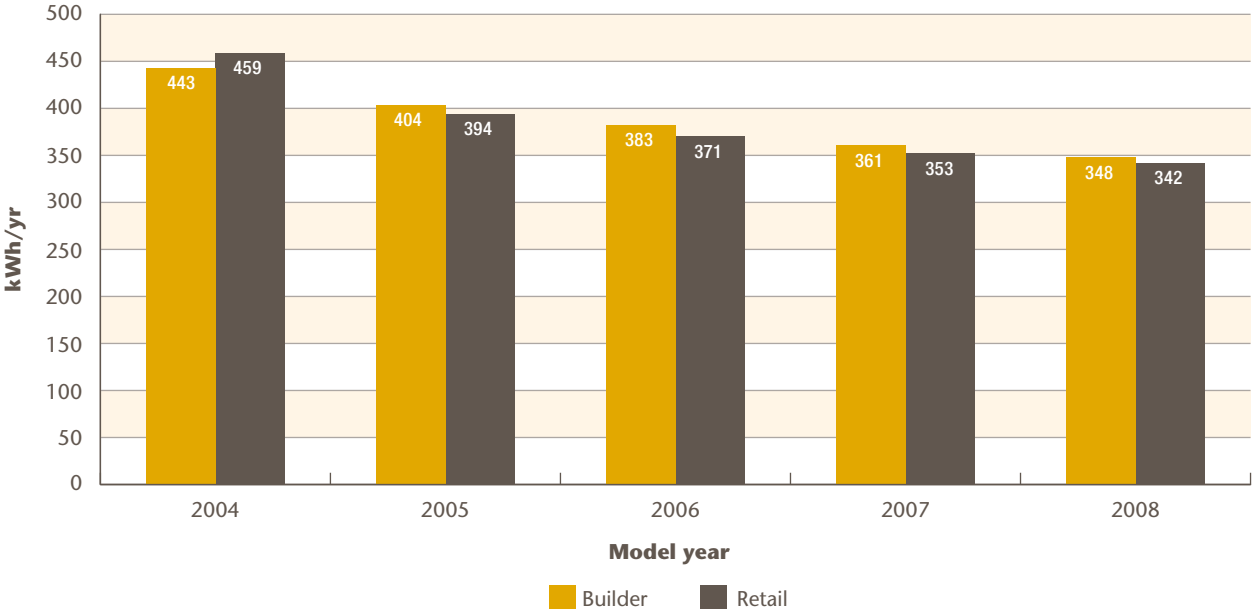


Figure 20 shows how the energy consumption of dishwashers shipped to both builders and retailers changed from 2004 to 2008. In 2004, dishwashers shipped to retailers consumed 16 kWh/yr more on average, while by 2008 those shipped to retailers consumed 6 kWh/yr fewer.

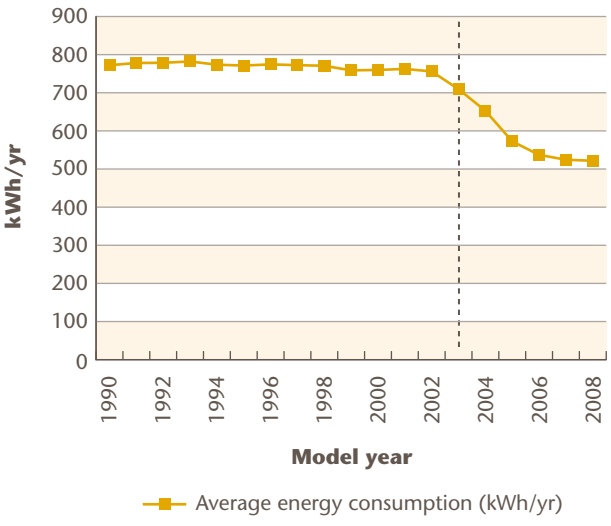
Electric Ranges

5.1 Overview

Ranges in the residential sector

In 2007, ranges in Canada's residential sector consumed 35.9 petajoules, representing 28 percent of major household appliance use (up from 18 percent in 1990).[24]

Figure 21 Average annual UEC of electric ranges, 1990–2008



Note: Due to changes in the methodology for estimating average annual UEC, the data prior to 2003 are not directly comparable with those from 2003 to 2008.

This chapter examines electric range shipment data in Canada from 1990 to 2008. Electric ranges represent the majority of the market for ranges (about 90 percent[25]), with gas ranges accounting for the remainder.

Section 5.2 examines the change in unit energy consumption (UEC) of electric ranges over the study period. Subsequent sections analyze specific characteristics of electric ranges and their influence on energy consumption. The shipment data is examined by type (Section 5.3), UEC (Section 5.4) and channel (Section 5.5).

5.2 Average annual unit energy consumption by model year

Figure 21 shows the average annual UEC of electric ranges shipped in Canada between 1990 and 2008. Until 2002, little change in energy consumption occurred. However, between 2002 and 2006, average annual UEC decreased from 756 to 537 kilowatt hours per year (kWh/yr), a drop of 29 percent. It also decreased more modestly between 2006 and 2008, finishing the period at 522 kWh/yr.

However, the improvement in energy consumption after 2002 does not entirely reflect an actual improvement in energy efficiency. In the 2003 amendment to the minimum energy performance standards (MEPS), several important changes were made to the calculation for the energy ratings. These changes included a reduction

[24] Natural Resources Canada, 2009, *Energy Use Data Handbook. 1990 to 2007*, Residential Sector, Table 15, oee.nrcan.gc.ca/corporate/statistics/neud/dpa/tableshandbook2/res_00_15_e_4.cfm.

[25] Canadian Appliance Manufacturers Association, *2008 Major Appliance Industry Trends & Forecast*, p. 35.

in the frequency of use of the self-cleaning cycle, from 11 to 4 times per year. These changes had the effect of reducing the overall average annual UEC of self-cleaning ranges by about 35 to 50 kWh/yr, meaning that data prior to 2003 are not directly comparable with data after.[26]

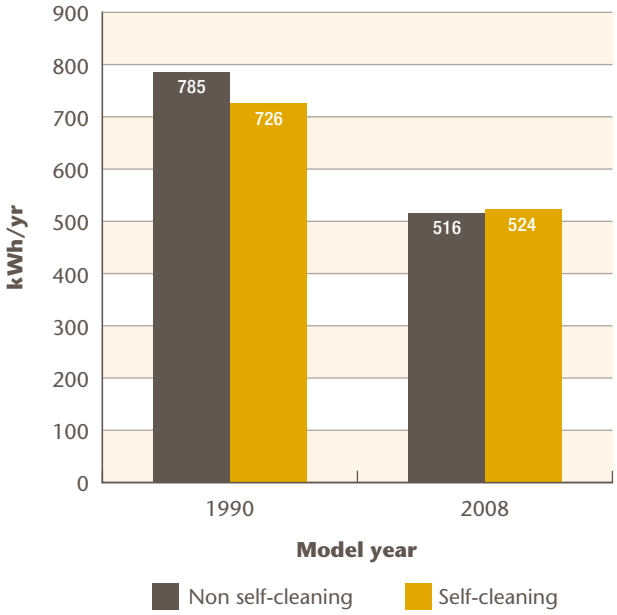
5.3 Distribution of shipments by type

Electric ranges can be self-cleaning or non-self-cleaning. In 1990, self-cleaning ranges accounted for less than 23 percent of electric range shipments (see Figure 22). However, by 2008, 70 percent of electric ranges were self-cleaning.

In 2008, the greatest proportion of self-cleaning ranges was shipped to Quebec (76 percent), and the least to Ontario (65 percent). Table C.30 in Appendix C lists the proportion of self-cleaning and non-self-cleaning ranges for each region/province.

Figure 22 Distribution of electric ranges by type, 1990 and 2008

Figure 23 Average annual UEC of electric ranges by type, 1990 and 2008

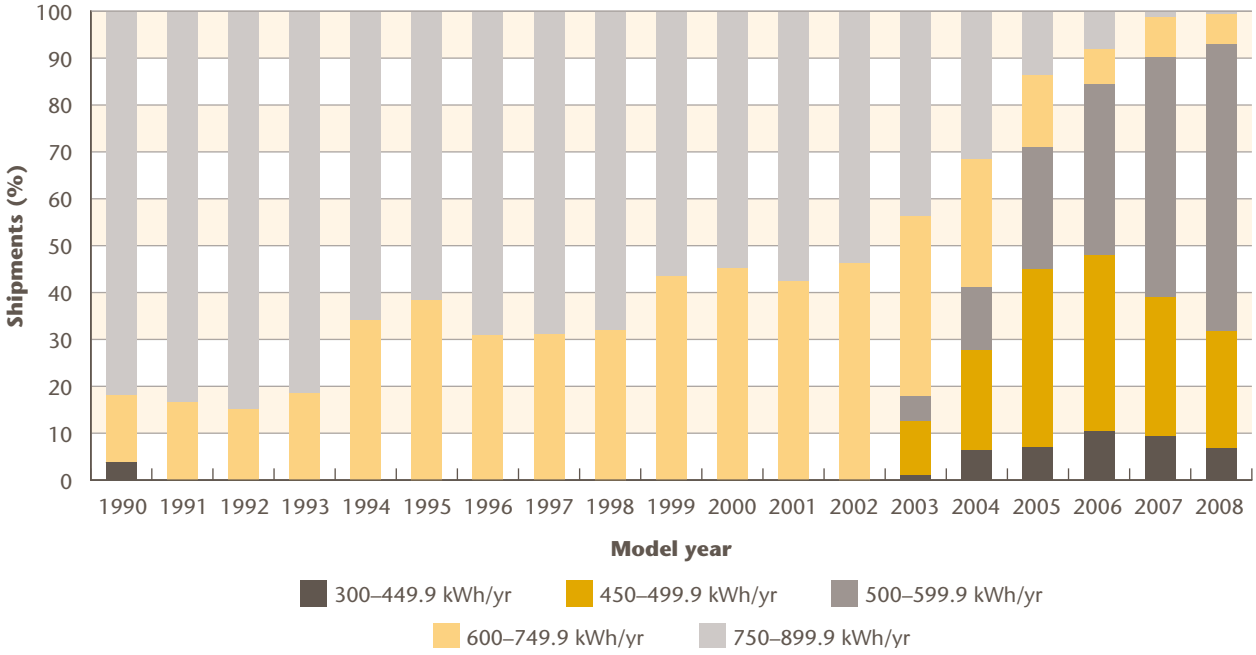


Self-cleaning ranges have typically been more energy-efficient than non-self-cleaning ranges because they tended to be better insulated. However, over time non-self-cleaning ranges have become increasingly efficient such that in 2008, they actually consumed less energy than self-cleaning ranges, on average (see Figure 23).

The magnitude of the change in energy efficiency between range types is actually greater than depicted in Figure 23 because of the 2003 amendment to the MEPS, which reduced the frequency of use of the self-cleaning cycle in its calculation of energy ratings. One of the reasons for the improved efficiency of non-self-cleaning ranges relative to self-cleaning ranges is, most likely, that the latter tend to have more energy-consuming options, such as baking drawers, true temperature systems that manage temperature, larger heating elements, bridge elements and warming zones.

[26] Natural Resources Canada, *EnerGuide Appliance Directory 2007*, p. 155.

Figure 24 Distribution of electric ranges by average annual UEC, 1990–2008



5.4 Distribution of shipments by unit energy consumption

Figure 24 shows the distribution of electric ranges by average annual UEC between 1990 and 2008. In 1990, 82 percent of ranges consumed at least 750 kWh/yr. By 2008, 93 percent of shipped ranges consumed fewer than 600 kWh/yr. As previously mentioned, some of this decrease is due to changes in how UEC ratings are now calculated for electric ranges.

5.5 Distribution of shipments by channel

Table 8 shows the distribution of electric ranges by channel and region/province in 2008: 19 percent of electric ranges were shipped to builders, representing a decline since it peaked at 27 percent in 2006. Across the country, the portion of electric ranges shipped to builders ranged from a low in Quebec (7 percent) to a high in British Columbia (43 percent).

Table 8 Distribution of electric ranges by channel and region/province, 2008

Region/Province	Electric range shipments	
	Builder (%)	Retail (%)
Canada	19.0	81.0
Atlantic	11.3	88.7
Quebec	6.6	93.4
Ontario	21.4	78.6
Prairies	23.2	76.8
British Columbia	43.4	56.6

Figure 25 Average annual UEC of electric ranges by channel and region/province, 2008

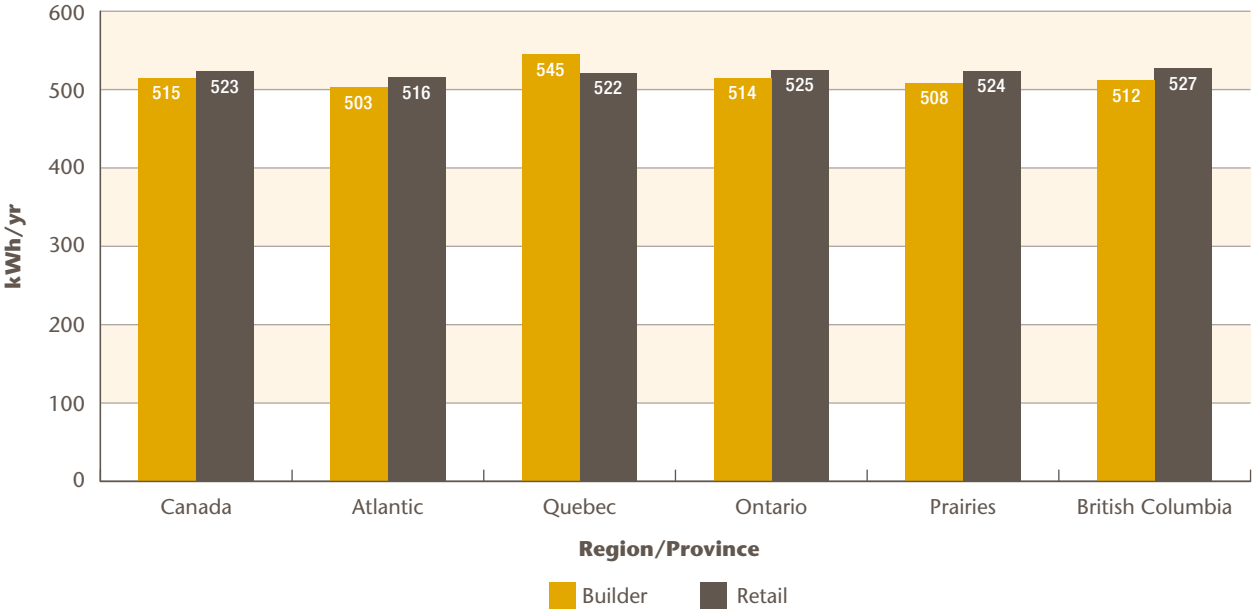


Figure 25 shows the variation in average annual UEC of electric ranges shipped to builders and retailers across the country in 2008. Variations were generally minor in most regions, with those units shipped to retailers consuming 2 to 3 percent more energy than those shipped to builders. This difference probably occurred because units shipped to retailers were more likely to be self-cleaning (which consumed slightly more energy in 2008). The one exception was in Quebec, where units shipped to builders consumed 6 percent more energy.

Figure 26 Average annual UEC of electric ranges by channel, 2004–2008

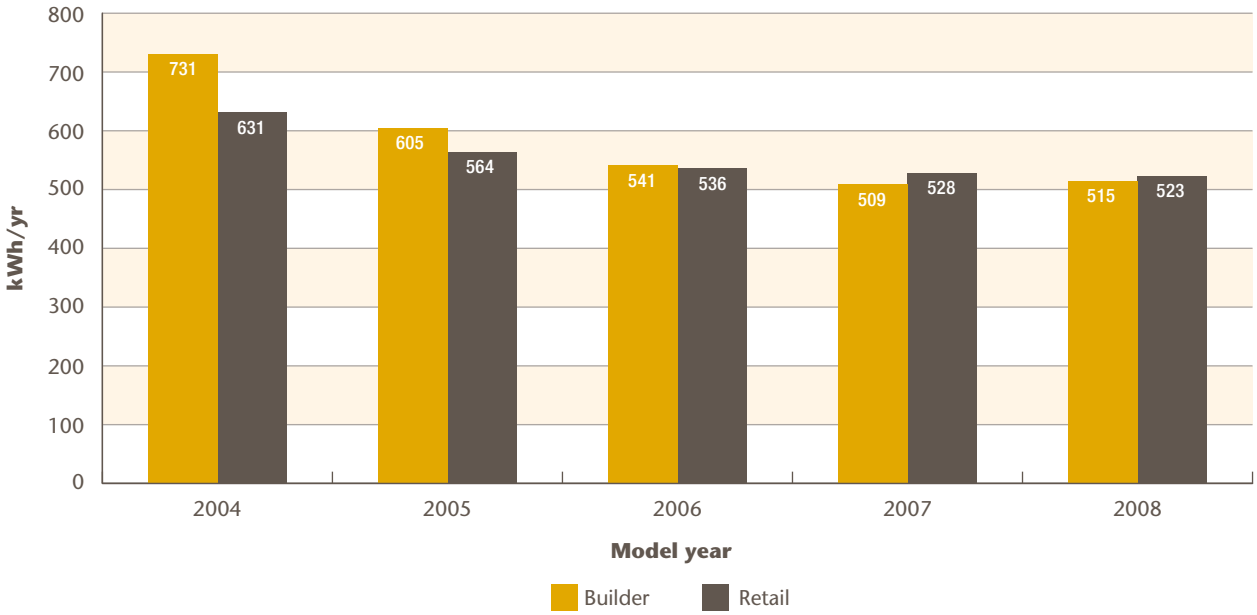


Figure 26 shows how the energy consumption of electric ranges shipped to builders and retailers changed between 2004 and 2008. In 2004, ranges shipped to builders consumed 100 kWh/yr more than those shipped to retailers, on average. This difference had reversed itself by 2007, and in 2008, ranges shipped to builders consumed 8 kWh/yr fewer than those shipped to retailers. As previously mentioned, units shipped to retailers are more likely to be self-cleaning than those shipped to builders. Therefore, the improvement in UEC of ranges shipped to builders (in Figure 26) can be largely attributed to the improvement in UEC of non-self-cleaning ranges.

Clothes Washers

6.1 Overview

Clothes washers in the residential sector

Eighty-eight percent of Canadian households had a clothes washer in 2007.[27] In that year, clothes washers consumed 2.3 petajoules in the residential sector,[28] representing 1.8 percent of major household appliance energy use (a proportion that is the least of all the appliances and has remained the same since 1990).[29]

This chapter examines clothes washer shipment data in Canada from 1990 to 2008. Section 6.2 examines the improvement of unit energy consumption (UEC) of clothes washers during this period. Subsequent sections analyze specific characteristics of clothes washers and their influence on energy consumption. The shipment data is examined by type (Section 6.3), UEC (Section 6.4) and channel (Section 6.5).

6.2 Average annual unit energy consumption by model year

The UEC of clothes washers decreased dramatically between 1990 and 2008 (see Figure 27). During this period, the average annual UEC fell by 79 percent, from 1218 to 261 kilowatt hours per year (kWh/yr). This decrease is due to both energy efficiency improvements across all types of clothes washer and the increasing popularity of front-loading units, which are more energy-efficient than top-loading units.

[27] Natural Resources Canada, 2010, *2007 Survey of Household Energy Use – Detailed Statistical Report*, Table 6.5, oee.nrcan.gc.ca/corporate/statistics/neud/dpa/data_e/sheu07/sheu_023_1.cfm.

[28] Excluding hot water requirements.

[29] Natural Resources Canada, 2009, *Energy Use Data Handbook, 1990 to 2007*, Residential Sector, Table 15, oee.nrcan.gc.ca/corporate/statistics/neud/dpa/tableshandbook2/res_00_15_e_4.cfm.

Figure 27 Average annual UEC of clothes washers, 1990–2008

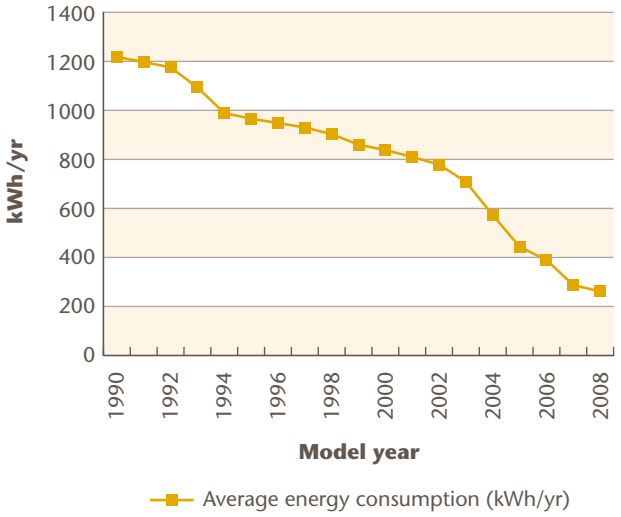
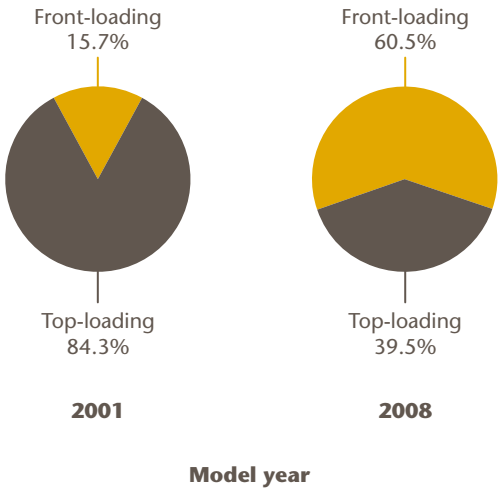


Figure 28 Distribution of clothes washers by type, 2001 and 2008



6.3 Distribution of shipments by type

Front-loading clothes washers became much more popular between 2001 and 2008 (see Figure 28). In 2001, these clothes washers only accounted for 16 percent of shipments in Canada.[30] However, by 2008 they accounted for 61 percent of shipments.

The popularity of front-loading clothes washers varies significantly by region (see Table 9). In 2008, front-loading clothes washers were most popular in British Columbia (where they accounted for 73 percent of shipments) and least popular in the Atlantic provinces and Quebec (where they accounted for 52 percent of shipments).[31]

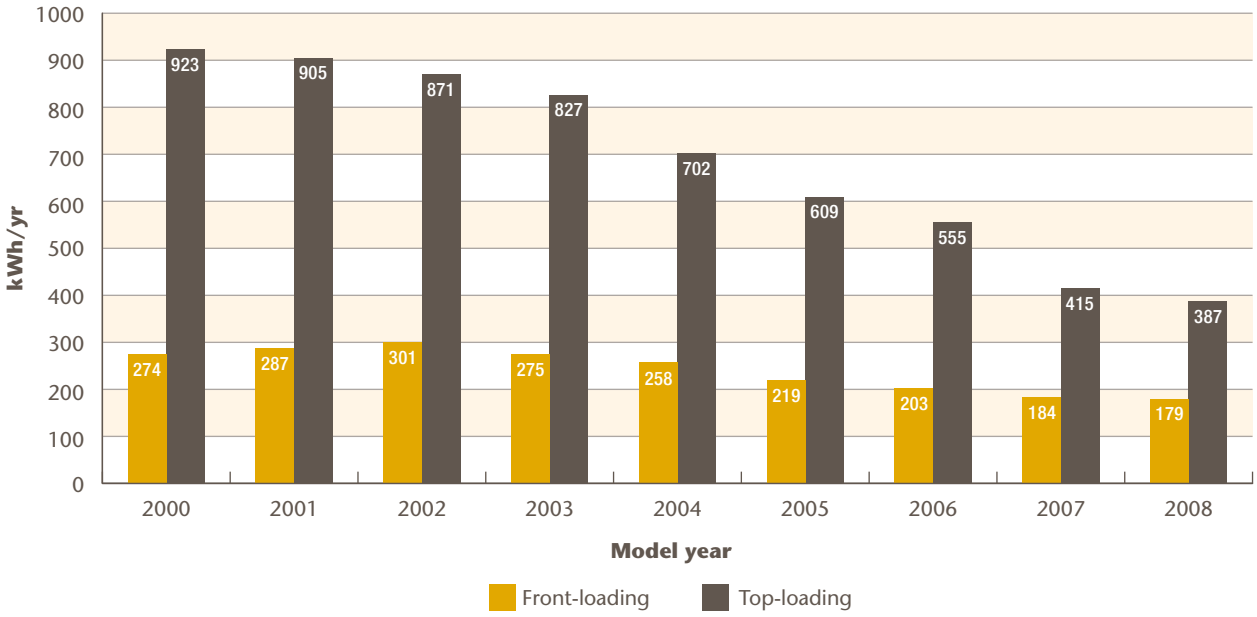
Table 9 Distribution of clothes washers by type and region/province, 2008

Region/Province	Clothes washer shipments	
	Front-loading (%)	Top-loading (%)
Canada	60.5	39.5
Atlantic and Quebec	51.6	48.4
Ontario	64.0	36.0
Prairies	63.7	36.3
British Columbia	72.7	27.3

[30] 2001 is the first year for which comprehensive data on distribution by clothes washer type exist.

[31] For confidentiality reasons, data for the Atlantic provinces and Quebec were grouped for this analysis.

Figure 29 Average annual UEC of clothes washers by type, 2000–2008

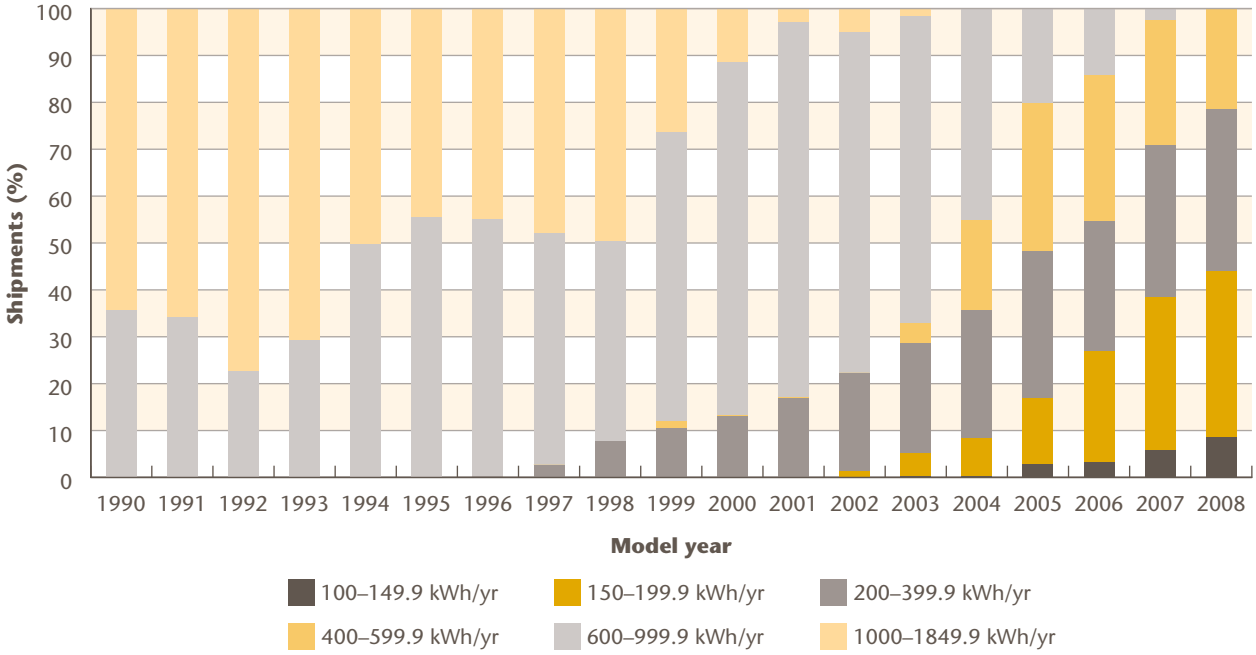


The popularity of front-loading clothes washers has implications for energy consumption because these washers tend to consume significantly less energy than do top-loading washers. Although the energy efficiency of top-loading clothes washers has improved substantially, they still consumed more than twice as much energy (on average) as front-loading washers in 2008 (see Figure 29).

6.4 Distribution of shipments by unit energy consumption

Figure 30 shows how the average annual UEC of shipped clothes washers changed between 1990 and 2008. In 1990, all clothes washers consumed at least 600 kWh/yr, and 64 percent consumed 1000 kWh/yr or more. By 2008, all shipped clothes washers consumed fewer than 600 kWh/yr, and almost 45 percent consumed fewer than 200 kWh/yr.

Figure 30 Distribution of clothes washers by average annual UEC, 1990–2008



The distribution of clothes washers by UEC showed little variation among regions in 2008, with the exception of the Atlantic provinces and Quebec. In these regions, a greater proportion of clothes washers that consumed at least 400 kWh/yr were shipped, due to a smaller penetration of front-loading units (see Tables C.37 and C.38 in Appendix C).

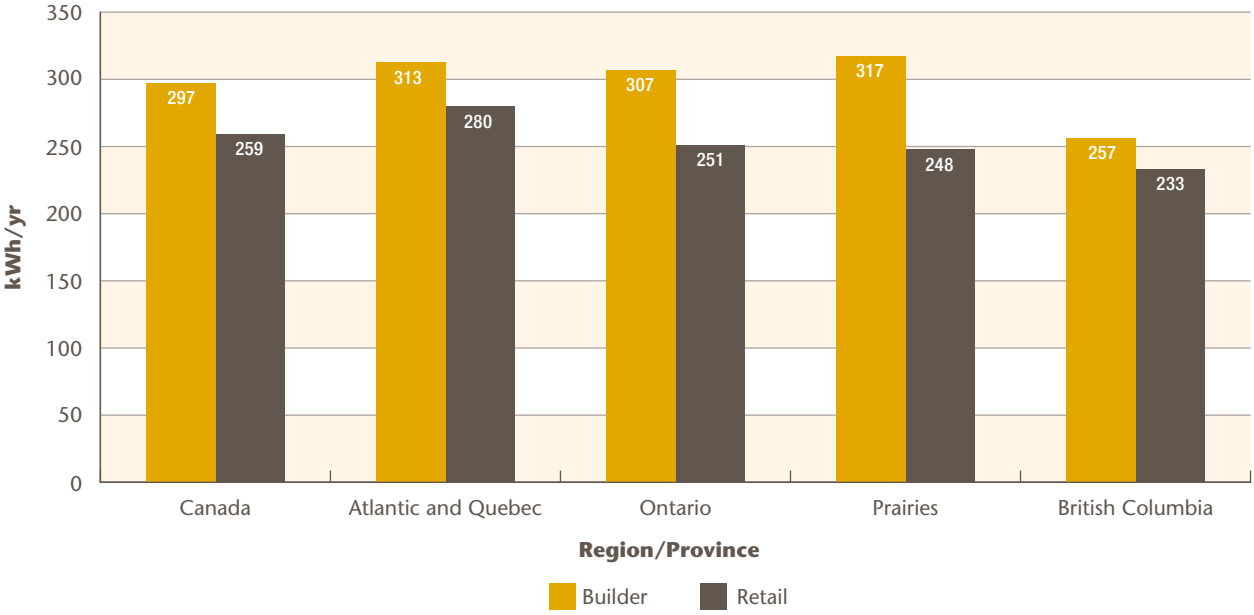
6.5 Distribution of shipments by channel

Ninety-four percent of clothes washers were shipped to retailers in 2008, a proportion that has remained relatively constant since 2004. In 2008, builder shipments ranged from a low of under 2 percent in the Atlantic provinces and Quebec to a high of 19 percent in British Columbia.

Table 10 Distribution of clothes washers by channel and region/province, 2008

Region/Province	Clothes washer shipments	
	Builder (%)	Retailer (%)
Canada	5.9	94.1
Atlantic and Quebec	1.6	98.4
Ontario	4.9	95.1
Prairies	8.4	91.6
British Columbia	19.1	80.9

Figure 31 Average annual UEC of clothes washers by channel and region/province, 2008



In 2008, clothes washers shipped to builders consumed significantly more energy than those shipped to retailers (see Figure 31). Nationally, the units sent to builders consumed 13 percent more energy on average. Part of the reason for this is that more front-loading units were sent to retailers than to builders (which consume less energy than top-loading units). The difference in UEC between builder- and retailer-shipped washers was greatest in the Prairies at 22 percent (69 kWh/yr) and least in British Columbia at 9 percent (23 kWh/yr). The average annual UEC of clothes washers generally decreased from east to west, with the exception of units sent to builders in the Prairies.

Electric Clothes Dryers

7.1 Overview

Clothes dryers in the residential sector

Eighty-eight percent of Canadian households had a clothes dryer in 2007.[32] In that year, clothes dryers consumed 37.4 petajoules in the residential sector, equivalent to 30 percent of major household appliance energy use (up from 22 percent in 1990).[33]

This chapter examines electric clothes dryer shipment data in Canada from 1990 to 2008. Electric clothes dryers typically account for approximately 97 percent of the clothes dryer market, with gas dryers accounting for the remainder.[34]

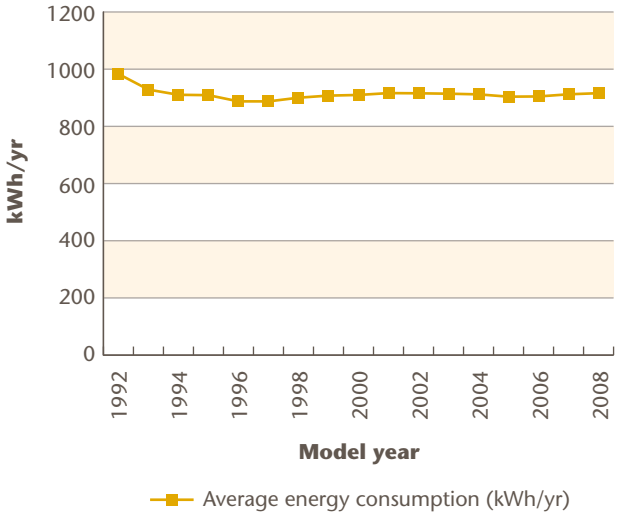
Section 7.2 examines the improvement of unit energy consumption (UEC) of electric clothes dryers over the period. Subsequent sections analyze specific characteristics of electric clothes dryers and their influence on energy consumption. The shipment data is examined by UEC (Section 7.3) and channel (Section 7.4).

Note that data for 1990 and 1991 are not presented because they are based on a small number of shipments and may not be representative of the Canadian market in those years.

7.2 Average annual unit energy consumption by model year

Figure 32 shows how the energy efficiency of electric clothes dryers changed from 1992 to 2008. Average UEC decreased by 10 percent between 1992 and 1996 and remained relatively stable since. However, the average annual UEC

Figure 32 Average annual UEC of electric clothes dryers, 1992–2008



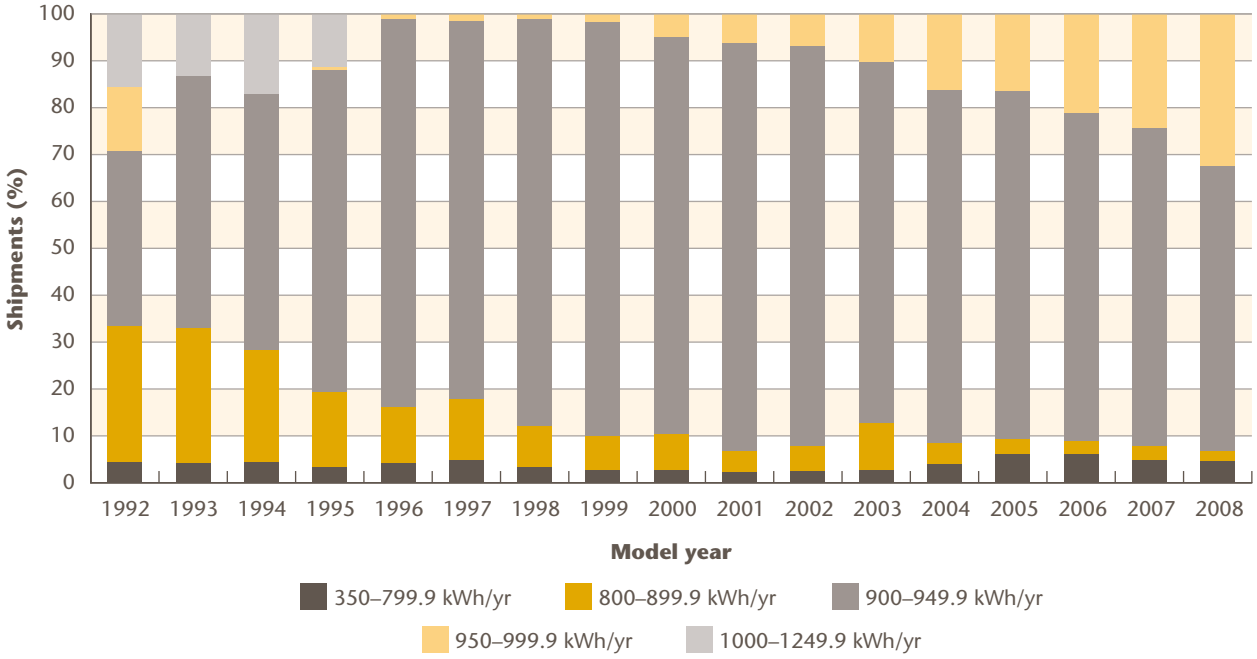
Note: The average annual UEC is not shown for 1990 and 1991 because the data for these years are based on a small number of shipments and may be unrepresentative of the actual market.

[32] Natural Resources Canada, 2010, *2007 Survey of Household Energy Use – Detailed Statistical Report*, Table 6.6, oee.nrcan.gc.ca/corporate/statistics/neud/dpa/data_e/sheu07/sheu_024_1.cfm.

[33] Natural Resources Canada, 2009, *Energy Use Data Handbook, 1990 to 2007*, Residential Sector, Table 15, oee.nrcan.gc.ca/corporate/statistics/neud/dpa/tableshandbook2/res_00_15_e_4.cfm.

[34] Canadian Appliance Manufacturers Association, *2008 Major Appliance Industry Trends & Forecast*, p. 57.

Figure 33 Distribution of electric clothes dryers by average annual UEC, 1992–2008



Note: The data are not shown for 1990 and 1991 because they are based on a small number of shipments and may be unrepresentative of the actual market.

increased slightly in each year since 2005, reaching 916 kilowatt hours per year (kWh/yr) in 2008. Overall, the average annual UEC was 7 percent lower in 2008 than in 1992.

Since the mid 1990s, the share of dryers in the highest energy consumption category has increased mostly due to the use of larger capacity units (see Section 7.3). Few opportunities exist to improve the energy efficiency of electric clothes dryers with current technology due to the nature of the appliance.

The increasing share of front-loading clothes washers (as described in Chapter 6) has helped reduce the energy consumption of clothes dryers by removing more moisture before clothes reach the dryer (although this is not reflected in the UEC data). In addition, moisture detectors in electric clothes dryers automatically shut off the unit when a load is sufficiently dry.

7.3 Distribution of shipments by unit energy consumption

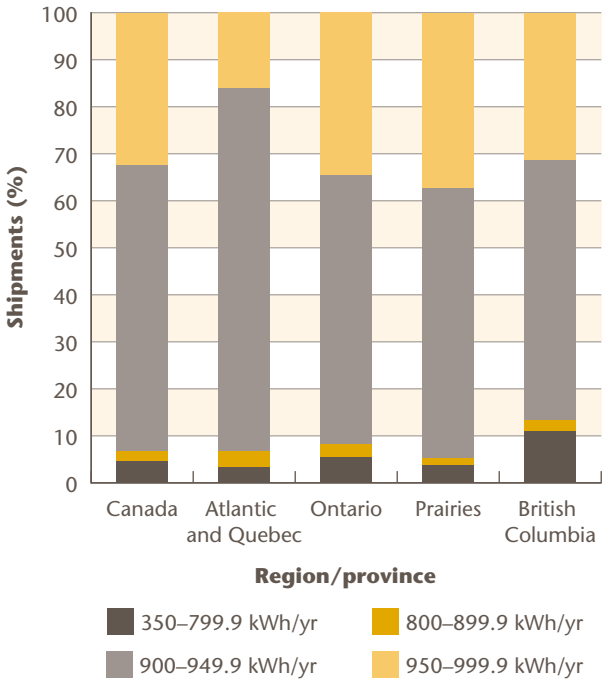
Figure 33 shows the distribution of electric clothes dryers shipped between 1992 and 2008, by average annual UEC. More than 30 percent of electric clothes dryers shipped in 1992 consumed fewer than 900 kWh/yr. By 2008, the majority of clothes dryers (68 percent) consumed less than 950 kWh/yr. Over the period, the share of dryers consuming less than 900 kWh/yr has decreased while the share of dryers consuming over 950 kWh/yr has increased.

Figure 34 shows how the UEC of clothes dryers varied across Canada in 2008. British Columbia received the highest proportion of dryers consuming fewer than 800 kWh/yr (11 percent), while the Prairies and Ontario received the highest proportion of dryers consuming 950 kWh/yr or more (37 percent and 35 percent, respectively).

7.4 Distribution of shipments by channel

Ninety-four percent of electric clothes dryers were shipped to retailers in 2008. Builders received the lowest proportion of shipments in the Atlantic provinces and Quebec (less than 2 percent) and the highest proportion in British Columbia (19 percent). The ratios have remained relatively constant since 2004, although the share of dryers shipped to builders in Ontario decreased by about 2 percent.

Figure 34 Distribution of electric clothes dryers by average annual UEC and region/province, 2008



Note: For confidentiality reasons, the Atlantic provinces and Quebec were grouped for this analysis.

Table 11 Distribution of electric clothes dryers by channel and region/province, 2008

Region/Province	Electric clothes dryer shipments	
	Builder (%)	Retail (%)
Canada	6.1	93.9
Atlantic and Quebec	1.6	98.4
Ontario	5.4	94.6
Prairies	8.9	91.1
British Columbia	18.8	81.2

Figure 35 Average annual UEC of electric clothes dryers by channel and region/province, 2008

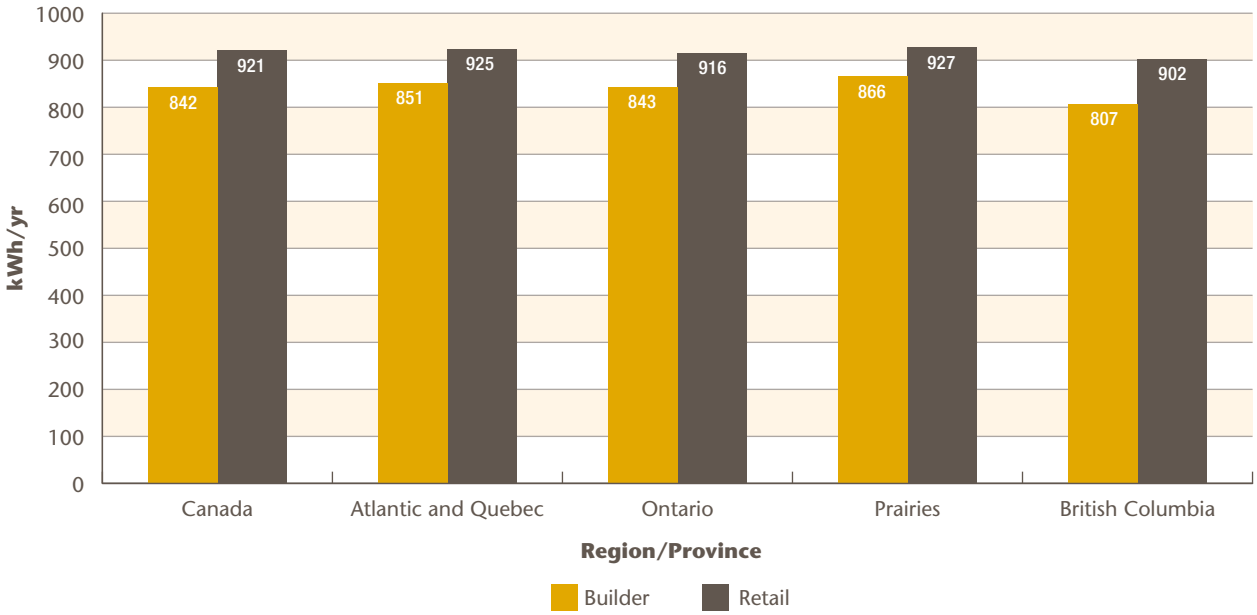


Figure 35 shows that electric clothes dryers shipped to retailers tended to consume more energy (921 kWh/yr) than those shipped to builders (842 kWh/yr) in 2008. Dryers shipped to builders tended to have a smaller drum capacity than those shipped for retail purposes. Electric clothes dryers shipped to Alberta consumed the most energy, and those shipped to British Columbia consumed the least.

Energy Consumption and Savings of All Major Household Appliances

The significant reduction of unit energy consumption (UEC) of many major household appliances has meant that less energy has been consumed by these appliances than if energy efficiency had not improved. In this chapter, energy consumption and savings are quantified to illustrate the significance of energy efficiency improvements over the past two decades, on both a household and national scale.

The chapter is divided in three sections:

- The improvement in UEC is compared across all appliances (Section 8.2).
- The energy cost savings are calculated for a household operating appliances purchased in 2008 relative to those purchased in 1990 (Section 8.3).
- The total energy consumption and savings are quantified for all appliances shipped in Canada between 1990 and 2008 (Section 8.4).[35]

8.1 Energy consumption of all appliances

The average annual UEC of new appliances decreased significantly between 1990 and 2008 (see Figure 36). A household operating a full suite of appliances purchased in 2008 might expect them to consume a little fewer than 2900 kilowatt hours per year (kWh/yr) of electricity on average, roughly half as much as a set of appliances purchased in 1990 (assuming similar operating patterns[36]).

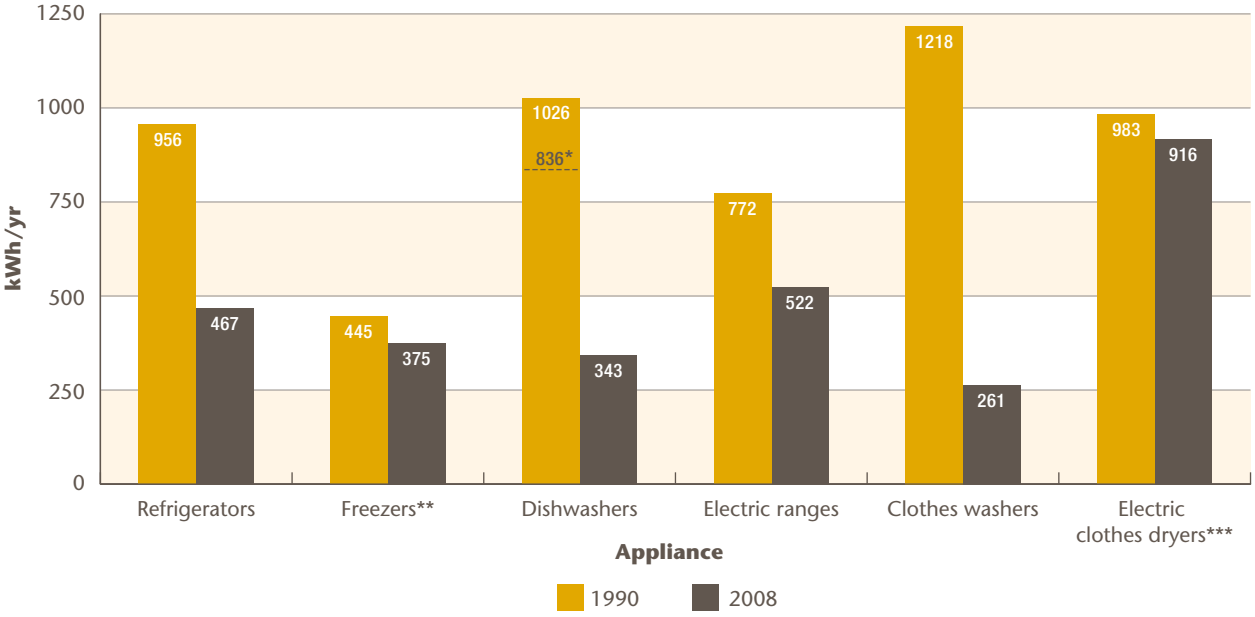
Between 1990 and 2008, the decrease in average annual UEC was most significant for clothes washers (957 kWh/yr or 79 percent). This decrease is due to both energy efficiency improvements across all types of clothes washers and the increasing popularity of front-loading units (which are more energy-efficient than top-loading units).

Dishwashers also experienced significant improvements in average annual UEC over the period (683 kWh/yr or 67 percent). However, part of this improvement is due to a change in how UEC is measured (the assumption about frequency of use was revised downward to more accurately reflect household usage patterns) and does not represent an actual improvement in energy efficiency. Using similar assumptions about frequency of use would reduce the average annual UEC of dishwashers to 836 kWh/yr in 1990, resulting in an energy efficiency improvement of 59 percent over the period (as opposed to 67 percent).

[35] Although this report deals with the trends in energy consumption and distribution of appliances from 1990 to 2008, energy savings are calculated as of 1992, with the implementation of the *Energy Efficiency Regulations* authorized under the 1992 *Energy Efficiency Act*.

[36] Except for dishwashers (whose rating is based on less frequent use after 2003) and self-cleaning electric ranges (whose rating is based on a lower number of cleaning cycles after 2002).

Figure 36 Average annual UEC of appliances, 1990 and 2008



* This figure represents the average annual UEC of dishwashers in 1990 if the frequency of use is assumed to be the same as in 2008.

** The average annual UEC for freezers is shown for 1991 because data for 1990 are based on a small number of shipments and may be unrepresentative of the actual market.

*** The average annual UEC for electric clothes dryers is shown for 1992 because data for 1990 and 1991 are based on a small number of shipments and may be unrepresentative of the actual market.

Meanwhile, the average annual UEC of refrigerators decreased by 489 kWh/yr (51 percent) between 1990 and 2008, due, in part, to more efficient compressors and better insulation. This reduction occurred despite an increase in shipments of larger refrigerators, because greater efficiency gains occurred for larger units over the period. Hence, even though the share of larger refrigerators increased, the average annual UEC of all refrigerators decreased.

Electric ranges experienced a reduction in average annual UEC of 250 kWh/yr (32 percent), and due to the nature of this appliance, few opportunities exist to further reduce energy consumption with current technology. In addition, a portion of the observed reduction in UEC was due to a change in how it is measured and does not represent an actual improvement in energy efficiency (the assumption about frequency of use of the self-cleaning cycle was revised downward to more accurately reflect household usage patterns). This change reduced the average annual UEC of self-cleaning ranges by about 35 kWh/yr to 50 kWh/yr.

Freezers experienced a relatively smaller reduction in UEC (70 kWh/yr or 16 percent), due in part to a switch away from chest freezers to less efficient upright units, as discussed in Chapter 3. However, as previously noted, the data for freezers are less comprehensive than for other appliances and may not be representative of the Canadian market.

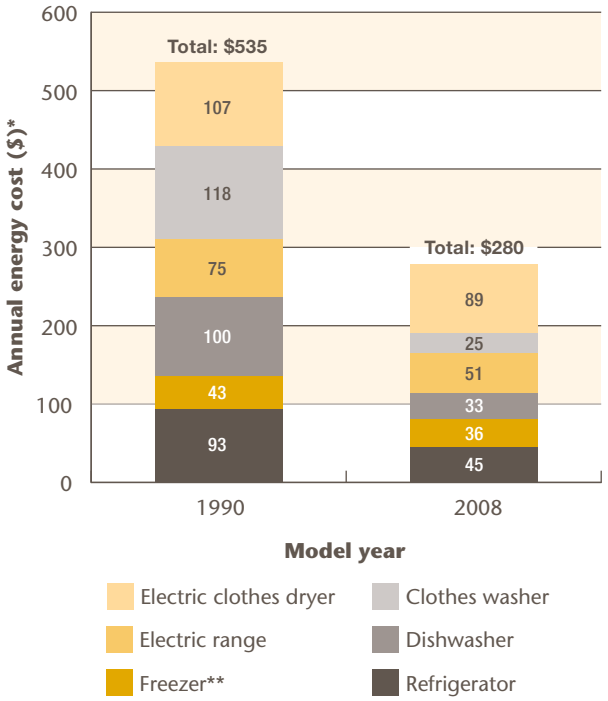
Like electric ranges, few opportunities exist to improve the energy efficiency of electric clothes dryers because of the nature of the appliance, although there has been a trend toward dryers with larger capacities. Between 1992 and 2008, the average annual UEC of electric clothes dryers decreased by 67 kWh/yr (7 percent). The increasing share of front-loading clothes washers helped reduce the energy consumption of clothes dryers by removing more moisture before clothes reach the dryer (although this change is not incorporated in the data). In addition, moisture detectors in electric clothes dryers automatically shut off the unit when a load is sufficiently dry.

8.2 Electricity cost savings per household

The increased energy efficiency of appliances should reduce energy costs for households, assuming usage patterns remain constant. Figure 37 shows the annual energy costs for an average set of appliances purchased in both 1990 and 2008. Assuming an electricity price of 9.7 cents/kWh,[37] annual electricity costs for a set of appliances purchased in 1990 would be approximately $535, while costs for a set of appliances purchased in 2008 would be reduced by almost half, to about $280.

The magnitude of the cost savings is directly proportional to the reduction in average UEC of each appliance. Annual energy costs decreased the most for clothes washers and dishwashers. Energy costs decreased the least for electric clothes dryers and freezers. Note that part of the reduction in energy costs for dishwashers and electric ranges is due to changes in usage patterns and methodology and not energy efficiency (as described in Section 8.1).

Figure 37 Average annual unit electricity costs for appliances purchased in 1990 and 2008

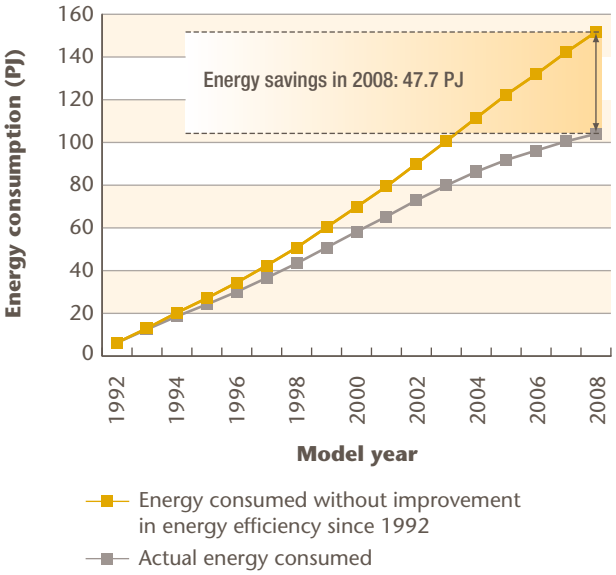


* Assuming a constant electricity price of 9.7 cents/kWh, which was the average Canadian residential price in 2008.

** The energy costs for freezers and electric clothes dryers are based on the average annual UEC in 1991 and 1992, respectively.

[37] This was the average Canadian residential price in 2008 (Natural Resources Canada, 2010, *Energy Use Data Handbook, 1990 to 2008*, Table 18, Residential Sector, oee.nrcan.gc.ca/corporate/statistics/neud/dpa/tableshandbook2/res_00_18_e_4.cfm.

Figure 38 Energy consumption of all shipped appliances, with and without improvements in energy efficiency, 1992–2008



8.3 Energy consumption and energy savings for all shipped appliances

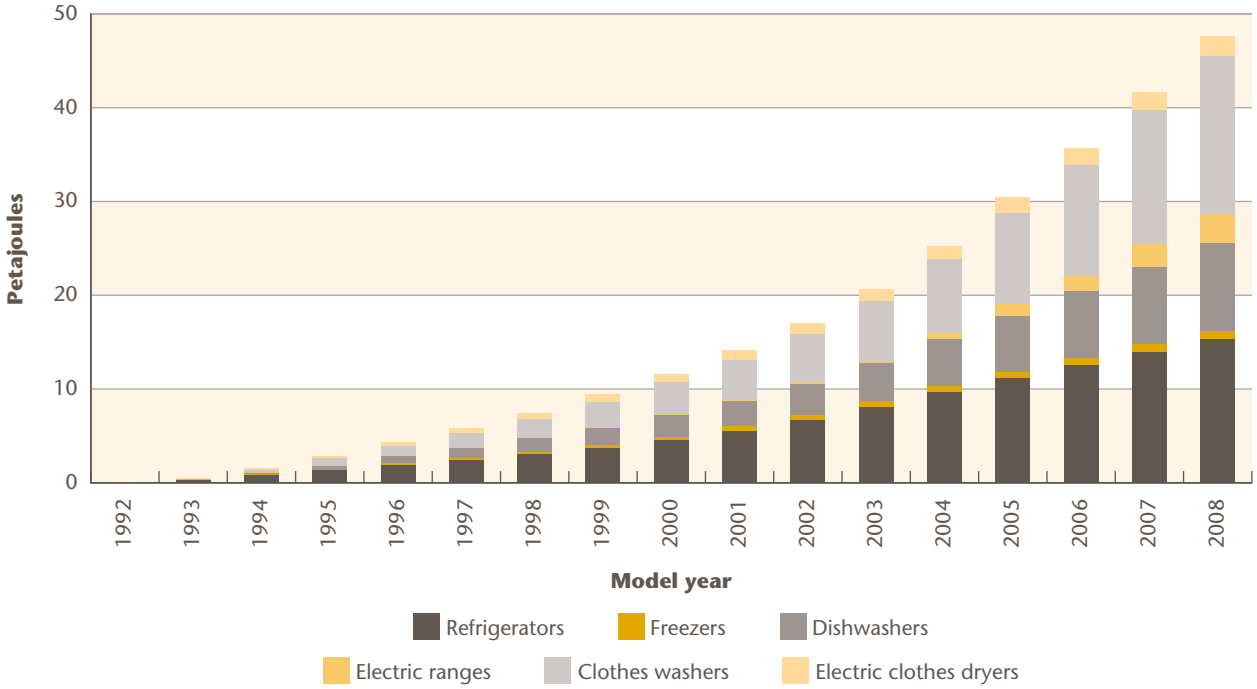
In this section, the total energy consumption and savings are quantified for all major household appliances shipped between 1990 and 2008. This analysis is not intended to be a comprehensive national assessment of energy use. Rather, it conveys a sense of the magnitude and relative importance of energy savings across the country for various appliances. A discussion on the limitations of this analysis is included at the end of the section.

Figure 38 quantifies the energy savings that have resulted from improvements in energy efficiency between 1992 and 2008, using the shipment data collected by Natural Resources Canada. The bottom line represents the total energy consumption of major household appliances shipped in Canada from 1992 to 2008, while the top line represents the total energy that would have been consumed if energy efficiency had not improved since 1992. The area between the two lines is, therefore, an estimate of the energy savings resulting from the improvement of energy efficiency of the appliances.

For example, energy consumption of shipped appliances in 2008 is estimated to be just slightly more than 100 petajoules (PJ) (or 28 billion kWh), representing the energy consumed in that year by all appliances shipped between 1992 and 2008, except for those that have reached the end of their service life. However, if energy efficiency had not improved since 1992, these appliances would have consumed more than 150 PJ. The difference is almost 50 PJ (the equivalent of one year's energy for more than 449 000 households) and represents the energy savings resulting from the improvement in energy efficiency of major household appliances during this period. For details of the assumptions used in these calculations, see Appendix A.2.

Figure 39 attributes the energy savings identified above (that is, the area between the two lines in Figure 38) to each appliance. Clothes washers, refrigerators and dishwashers account for much of the energy savings, due to significant improvements in the energy efficiency of these appliances. Electric clothes dryers and electric ranges accounted for much lower energy savings because of smaller energy efficiency improvements. However, freezers accounted for the least energy savings because of their low penetration rate and because the available shipment data accounts for a smaller portion of the market than it does for other appliances. The following section on limitations discusses market coverage of the data.

Figure 39 Energy savings by shipped appliance, 1992–2008



Limitations of the energy consumption and savings analysis

The energy consumption and savings analysis conveys a sense of the magnitude and relative importance of energy savings across the country for various appliances. However, it is not a comprehensive national assessment of energy use by all appliances, for at least two reasons. The first reason is that the shipment data do not reflect the entire Canadian market. According to the Canadian Appliance Manufacturers Association, the manufacturers represent more than 90 percent of the Canadian market for all appliances except freezers, for which the market share is unknown. The second reason is that we do not try to estimate the total Canadian stock for each appliance (although we do estimate stock directly associated with the shipment data from 1990 onward).

In addition, with respect to energy savings, several factors could affect the magnitude of the estimates presented here, including

- **appliance service life** – Continued use of appliances for longer than their assumed average service life would contribute to ongoing energy savings from that appliance. However, if that appliance were replaced by a newer and more energy-efficient model, an earlier replacement would contribute to greater energy savings.
- **secondary appliances** – If new appliances are purchased to complement rather than replace existing appliances, no energy savings would result from their purchase (unless a secondary appliance is being replaced).

Conclusions

This report analyzed shipment data for major household appliances (refrigerators, freezers, dishwashers, electric ranges, clothes washers and electric clothes dryers) between 1990 and 2008. These data represent the majority of shipments to Canadian retailers and builders during this period, and were collected through the co-operation of the Canadian Appliance Manufacturers Association.

Between 1990 and 2008, the average annual unit energy consumption (UEC) of most appliances decreased significantly. In fact, a household operating an average set of appliances purchased in 2008 might expect them to consume slightly fewer than 2900 kilowatt hours per year of electricity, roughly half as much as a set purchased in 1990. In addition to reducing energy demand and the associated impacts of electricity generation (such as greenhouse gas emissions), this decrease in energy consumption reduces household expenditures on electricity.

The reduction in average annual UEC ranged from 7 percent (electric clothes dryers) to 79 percent (clothes washers) during the study period. These energy efficiency improvements can be attributed to a variety of factors, including

- the research and development carried out by manufacturers
- consumer demand for more energy-efficient products
- standards that limit the amount of energy each appliance may consume (the minimum energy performance standards)
- information initiatives such as the EnerGuide for Equipment program and the ENERGY STAR® Initiative in Canada, which help consumers identify the most energy-efficient products on the market
- the various incentives and rebates offered by the federal, provincial/territorial and municipal governments and utilities

To illustrate the significance of energy efficiency improvements during this period, this report quantified energy savings from all shipped appliances in Canada between 1992 and 2008:

- Clothes washers, refrigerators and dishwashers accounted for the majority of energy savings, due to significant improvements in the energy efficiency of these appliances.
- Freezers accounted for the least energy savings because of their low penetration rate and because the available shipment data accounts for a smaller portion of the market than it does for other appliances.
- Electric clothes dryers and electric ranges also accounted for lower energy savings because of relatively minimal energy efficiency improvements.

Methodology

A.1 Data preparation

Introduction

To improve the monitoring of trends in Canadian energy use, Natural Resources Canada's (NRCan's) Office of Energy Efficiency proposed an annual data collection arrangement with the Canadian Appliance Manufacturers Association (CAMA) in 1996, as part of the National Energy Use Database (NEUD) initiative.

Under this agreement, CAMA members contributed their annual shipment data for six appliance categories – refrigerators, freezers, dishwashers, electric ranges, clothes washers and electric clothes dryers. To keep their data confidential, these appliance manufacturers suggested that a third party receive and prepare the database in a format in which no one (other than the third party) could determine the shipment data for an individual model or manufacturer. NRCan retained the services of Electro-Federation Canada (EFC), chosen by CAMA, as the third party to receive the data.

For 2008 (and for the previous four years), the manufacturers agreed to provide data on their shipments by region and province/territory and by distribution channel (builder versus retailer), where possible. These additional shipment data have allowed a more detailed analysis of the distribution and energy efficiency of the appliances.

Database preparation process

The data presented in this report combine shipment figures from the appliance manufacturers in Canada with the energy use information in NRCan's annual *EnerGuide Appliance Directory*. Analysts from EFC matched the model number from the manufacturer with the corresponding model in the *EnerGuide Appliance Directory*, allowing them to estimate the energy consumption of all shipments of that model within each year. The analysts then aggregated these figures by region and province/territory and by channel. They also produced separate aggregated data for ENERGY STAR® qualified models, where appropriate.

The analysts assembled the data using standard database and spreadsheet software and submitted it to NRCan for analysis and report generation. For the reporting stages, any information that could identify the manufacturer or model number was removed.

Manufacturers' data

NRCan requested annual shipment data from appliance manufacturers for each model of refrigerator, freezer, dishwasher, electric range, clothes washer and electric clothes dryer on the Canadian market from 1990 to 2008. When the project began in 1996, only three manufacturers provided shipment data. That number has since increased to nine, covering the majority of appliance models sold in Canada.

Manufacturers submitted the data in various electronic and printed formats. EFC converted the electronic data to a common database format and entered the data from the printed reports into the database.

The data include the appliance type, model number and number of shipments (by region/province and channel, where possible, for 2004 onward) for each year. Because each manufacturer provided data in a different format, the analysts amalgamated the files to produce a single file for all models subdivided by appliance type, region/province, channel and model year.

The nature of the freezer market prevented EFC from obtaining a model-by-model breakdown of shipments. Instead, the analysts received total shipments and average energy use by freezer type. NRCan used this information to generate the freezer reports.

EnerGuide data

The analysts used the size, type and unit energy information from NRCan's EnerGuide ratings for each appliance to calculate the shipment-weighted energy use of each appliance type. Also, the *EnerGuide Appliance Directory* was used to identify which models were listed as ENERGY STAR qualified.

Data matching

Analysts from EFC matched the manufacturer's data for each model with the corresponding energy consumption data from the *EnerGuide Appliance Directory* for that model. They then multiplied the manufacturer's shipments for each model by the corresponding EnerGuide model's energy rating. This result is the shipment-weighted total energy consumption for that model. Each appliance category (such as refrigerator or dishwasher) and type and size category (as defined in the EnerGuide directories, such as Type 7 refrigerators, self-cleaning ranges or front-loading clothes washers) was then subtotalled so that the average unit energy consumption (UEC) could be calculated.

The *EnerGuide Appliance Directory* shows the numbers for basic models of appliances available on the Canadian market. Many slight model variants have the same energy rating; therefore, the listings use symbols (such as * and #) to indicate model families. Because some model numbers have additional prefixes or suffixes to indicate features that do not affect energy use (such as colour and door-swing), there were relatively few one-to-one matches.

Analysts needed to manipulate the data to perform pattern matching. They wrote programs to compare the model numbers supplied by the manufacturers with those in the *EnerGuide Appliance Directory*. When a match was found, the corresponding energy consumption figure and the information about the type from the *EnerGuide Appliance Directory* were added to the record for the annual shipments of the model.

Because there were many combinations of character substitution, the analysts adopted a method to work from the closest matches to the least likely matches. Matches in which only one character differed were flagged and removed. Matches were then made with a difference of two characters, and so on.

The analysts developed reasonability tests to ensure the integrity of the data-matching process. For example, if the manufacturer's model number contained many characters but was matched by a model in the *EnerGuide Appliance Directory* that had considerably fewer characters, the model was flagged for manual checking. They also realized that manufacturers might re-use the same

numbers for different models after several years. For example, 128 models of refrigerators in the file containing 1980 to 1993 data from the *EnerGuide Appliance Directory* have the same model number as those in the 1997 file, but with different energy ratings. They flagged these models for special treatment.

During the matching process, analysts applied "reasonability" criteria. For example, a model would be checked manually if its shipments were reported more than three years after the last time the corresponding model appeared in the EnerGuide list or if the EnerGuide model number contained considerably fewer characters than that of the manufacturer.

Some difficulties occurred when the model number in NRCan's *EnerGuide Appliance Directory* differed from the model numbers used by the manufacturers in their internal shipment recording systems. For example, in some cases, manufacturers used special codes to denote models that were branded for other companies, such as department stores. The manufacturers helped resolve most of these cases.

Some models remained unmatched even after the automated processes were performed. When one of these models represented a substantial number of shipments for that appliance type, analysts handled it on an exceptional basis. Manufacturers were again helpful in identifying these models and verifying energy ratings and types.

The process continued until all but a few minor models were matched.

Data summary and transfer

After the matching process, analysts summarized the data. To calculate the annual energy consumption for each model, they multiplied the model's energy rating by the number of shipments for the year. This yielded the shipment-weighted total energy use of that model for that year.

For example, if model XYZ has annual shipments of 5238 and an annual energy consumption of 683 kilowatt hours (kWh), its shipment-weighted total energy use for the year is 5238×683 kWh = 3 577 554 kWh.

This aggregate figure and the shipment figures were added as necessary to provide totals for each appliance type and size category. Separate aggregated data were provided for ENERGY STAR qualified models. All these aggregate figures were given for region/province, channel and country.

For refrigerators, the volume of each model was available from the *EnerGuide Appliance Directory*. Therefore, it was possible to monitor the trend of changes in the size of refrigerators over the years. Furthermore, it was possible to determine the amount of energy used by each size category. Analysts summarized this information and added it to the database for NRCan.

The final database prepared by EFC contained information such as the appliance type, model year, total energy consumption and average UEC. Refrigerators were further categorized by type and size. The aggregated data were separated by ENERGY STAR qualified and non-ENERGY STAR qualified (as of 1999) and by region/province and channel (as of 2004). All the information was sent to NRCan for analysis and reporting.

A.2 Analysis

The shipment-weighted average annual UEC by category was calculated by dividing the total energy consumption of all refrigerators sold in Canada in that category by the number of shipments in that category.

The following is an example of the shipment-weighted average UEC for refrigerators:

$$\frac{\sum_{i=1}^{13} S\_type_i \times \overline{UEC\_type_i}}{\sum_{i=1}^{13} S\_type_i}$$

where S_type_i is the number of shipments of Type i refrigerators

and $\overline{UEC\_type_i}$ is the average UEC of Type i refrigerators

As mentioned in Section A.1, Data Preparation, data were obtained for some appliances by size category. Therefore, the UEC per cubic foot was calculated by dividing the UEC of a given size category by the midpoint volume of the category.

Energy consumption and savings for all shipped appliances

Calculating the energy consumption and savings for all shipped appliances types was a three-step process, as described below.

In the first step, baseline levels of energy consumption were estimated for each appliance type for each year between 1990 and 2008. For all appliances, baseline levels of energy consumption reflected NRCan's assumptions about how much energy each appliance type would have consumed without the energy efficiency improvements made by manufacturers and the minimum energy performance standards (MEPS).

To estimate baseline levels of energy consumption, it was assumed that without the implementation of Canada's *Energy Efficiency Regulations* (the Regulations) and general energy efficiency improvements made by manufacturers, the UEC for all appliance types would have remained constant at the 1992 levels.

Even though the MEPS were not introduced until 1995, the baseline year used for all estimates of energy savings was 1992. This is because energy efficiency began to improve almost immediately after the *Energy Efficiency Act* (the Act) came into force in 1992, thanks to market forces such as the regulations expected from the Act and United States regulations.

It was also assumed that the number of units shipped would have remained the same between 1990 and 2008 even in the absence of the general efficiency improvements made by manufacturers and the implementation of the Regulations.

In the second step, the "actual" or current levels of consumption for all appliances were calculated in a similar manner to the first step. However, the average annual UEC for each appliance type for each model year was used to determine the actual levels of energy consumption, instead of holding the UEC constant at 1992 levels.

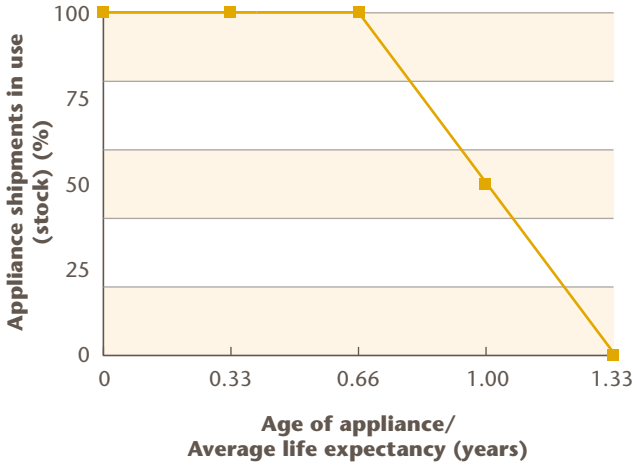
In the third step, energy savings for all appliances were calculated as the difference between baseline and actual levels of energy consumption.

Because 1992 was the baseline year used in the calculations, a retirement function was included to take into account the aging of appliances, based on the life expectancies set out in the *EnerGuide Appliance Directory 2009*:[38]

- refrigerators – 17 years
- freezers – 21 years
- dishwashers – 13 years
- electric ranges – 18 years
- clothes washers – 14 years
- electric clothes dryers – 18 years

The retirement function was applied to avoid overestimating the actual energy consumption (and savings) from appliance stock that has been retired. In a given year, the total energy consumed included energy consumption by appliances shipped in that year and energy consumption by appliances shipped previously that had not reached the end of their lifespan.

Figure 40 Retirement function for aging appliances



This retirement function is demonstrated in Figure 40. In this linear function, no appliances retire in the first two thirds (0.67) of their average life expectancy, and all units are retired by four thirds (1.33) of their average life expectancy. The ranges for the retirement function are:

- if age < {2/3 * (average life expectancy)}, 100 percent survive
- if age > {4/3 * (average life expectancy)}, 0 percent survive
- otherwise, {2 – age * 1.5/(average life expectancy)} survive

The rate of retirement was applied to the annual shipments of each appliance type to estimate the total stock of appliances in use for each year since the baseline year of 1992.

[38] Natural Resources Canada, *EnerGuide Appliance Directory 2009* (Ottawa: 2009), p. 13.

Glossary

Average annual unit energy consumption (UEC)	The annual energy consumption of all major household appliances shipped in Canada in a category, divided by the number of shipments in that category.
Channel	The categorization of shipments according to recipient: • Builder shipments are delivered to Canadian home builders, motels, governments, trailer manufacturers and property management. • Retail shipments are delivered from Canadian manufacturers and importers and/or their branches and distributors to Canadian retailers and other consumers, but do not include sales to branches or to other Canadian Appliance Manufacturers Association member companies.
Clothes washer	An appliance that cleans clothes using a water solution of soap or detergent or both and mechanical agitation or other movement. Canada's *Energy Efficiency Regulations* apply to standard or compact electrically operated household clothes washers that are top- or front-loading and that have an internal control system that regulates the water temperature without the need for user intervention after the machine starts.
Dishwasher	A cabinet-like appliance, either built-in or portable, that, with the aid of water and detergent, washes, rinses and dries (when a drying process is included) dishware, glassware, eating utensils and most cooking utensils by chemical, mechanical and electrical means and then discharges the water into the plumbing drainage system. The E*nergy Efficiency Regulations* apply to electrically operated automatic household dishwashers that are not commercial, industrial or institutional machines.
Electric clothes dryer	A cabinet-like appliance that dries clothes in a tumble-type drum with forced-air circulation. The heat source is electricity, and the drum and the blower(s) are driven by electric motor(s). The *EnerGuide Appliance Directory* groups electric clothes dryers into two categories: • compact – a clothes dryer with a drum volume of less than 125 litres (L) • standard – a clothes dryer with a drum volume of at least 125 L The *Energy Efficiency Regulations* apply to household tumble-type clothes dryers that are standard and compact size, electrically operated and electrically heated.

Electric range	A major household cooking appliance that uses electric resistance heating. The product may consist of a cook top, one or more ovens, or a combination of the two, and may be built-in or free-standing. The *Energy Efficiency Regulations* apply to the following styles of household ranges: • free-standing appliance equipped with one or more surface elements and one or more ovens • built-in appliance equipped with one or more surface elements and one or more ovens • built-in appliance equipped with one or more ovens and no surface elements • wall-mounted appliance equipped with one or more ovens and no surface elements • counter-mounted appliance equipped with one or more surface elements and no ovens but do not include the following appliances: • microwave cooking appliance • portable appliance that uses an electrical supply of 120 volts • household appliance with one or more tungsten-halogen heating elements
Electricity	Electric energy measured by a meter, typically distributed by a public utility company to a dwelling through overhead or underground power lines. In this report, electricity is measured in petajoules and/or kilowatt hours per year.
Energy consumption	In this report, energy consumption generally refers to electricity consumption and is measured in petajoules and/or kilowatt-hours per year.
Energy efficiency	Energy efficiency refers to how effectively energy is being used for a given purpose. For example, providing a similar (or better) level of service with less energy comsumption on a per-unit basis is considered to be an improvement in energy efficiency.
***Energy Efficiency Act* (1992)**	An act giving the Government of Canada the authority to make and enforce regulations on performance and labelling requirements for energy-using products (including major household appliances) imported into Canada or shipped across provincial or territorial borders.
Energy Efficiency Regulations	Regulations authorized under Canada's E*nergy Efficiency Act* that include minimum energy performance standards, the labelling of energy-using products and the collection of data on energy use. The *Energy Efficiency Regulations* came into effect in February 1995 and are amended on a regular basis to strengthen existing performance standards or to introduce standards for new products.
ENERGY STAR® qualified appliance	ENERGY STAR is the international symbol of premium energy efficiency. Appliances that are ENERGY STAR qualified have been tested according to prescribed procedures and meet or exceed higher energy efficiency levels without compromising performance.

Freezer	An appliance used for the extended storage of food frozen at an average temperature of –17.8°C (0°F) or lower that has a minimum freezing capability of two kilograms per 100 litres in 24 hours. In 2008, freezers were typically built as upright or chest models and grouped into the following types: • Type 8 – Upright freezers with manual defrost • Type 9 – Upright freezers with automatic defrost • Type 10 – Chest freezers and all other freezers not defined as Type 8 or Type 9 • Type 16 – Compact upright freezers with manual defrost • Type 17 – Compact upright freezers with automatic defrost • Type 18 – Compact chest freezers and all other compact freezers The *Energy Efficiency Regulations* apply to household freezers whose capacity does not exceed 850 litres (30 cubic feet).
Kilowatt hour (kWh)	The commercial unit of electricity equivalent to 1000 watt hours. A kilowatt hour is the amount of electricity consumed by ten 100-watt bulbs in one hour.
Major household appliance	Major household appliances include refrigerators, freezers, dishwashers, electric ranges, clothes washers and electric clothes dryers. In this report, "appliance" means "major household appliance."
Minimum energy performance standards (MEPS)	Standards in the *Energy Efficiency Regulations* that ensure new appliances imported into Canada, or manufactured in Canada and shipped from one province or territory to another, meet a minimum level of performance for energy efficiency.
Moisture detector	An automatic sensor in clothes dryers that detects the amount of moisture in clothing and automatically stops the dryer when the clothes are at a predetermined level of dryness. It is not a timed function.
Petajoule (PJ)	A unit of energy that is equal to 10^{15} joules, or 2.78×10^{8} kilowatt hours. One joule is the energy exerted by a force of one Newton acting to move an object a distance of one metre.
Refrigerator	An appliance that consists of one or more compartments, with at least one compartment for the refrigerated storage of food at temperatures above 0°C (32°F). If the model is a refrigerator-freezer, at least one of the compartments is for the freezing and storage of frozen foods at or below an average temperature of –15°C (5°F) and typically can be adjusted by the user to a temperature of ≤–17.8°C (0°F). A refrigerator with a freezer compartment can maintain simultaneously an average freezer temperature of ≤–15°C (5°F) and an average fresh food compartment temperature of between 0°C and 5°C (32°F and 41°F).

Refrigerator *(cont.)*	In 2008, the *EnerGuide Appliance Directory* grouped refrigerators under the following main categories: • Type 1 – Refrigerators and refrigerator-freezers with manual defrost • Type 2 – Refrigerator-freezers with partial automatic defrost • Type 3 – Refrigerator-freezers with automatic defrost and top-mounted freezer, but without through-the-door ice service; also all-refrigerators with automatic defrost • Type 4 – Refrigerator-freezers with automatic defrost and side-mounted freezer but without through-the-door ice service • Type 5 – Refrigerator-freezers with automatic defrost and bottom-mounted freezer but without through-the-door ice service • Type 5A – Refrigerator-freezers with automatic defrost, bottom-mounted freezer and through-the-door ice service • Type 6 – Refrigerator-freezers with automatic defrost, top-mounted freezer and through-the-door ice service • Type 7 – Refrigerator-freezers with automatic defrost, side-mounted freezer and through-the-door ice service • Type 11 – Compact refrigerators and refrigerator-freezers with manual defrost • Type 12 – Compact refrigerators and refrigerator-freezers with partial automatic defrost • Type 13 – Compact refrigerator-freezers with automatic defrost and top mounted freezer; also compact all-refrigerators[39] with automatic defrost • Type 14 – Compact refrigerator-freezers with automatic defrost and side-mounted freezer • Type 15 – Compact refrigerator-freezers with automatic defrost and bottom-mounted freezer The *Energy Efficiency Regulations* apply to household refrigerators or combination refrigerator-freezers whose capacity does not exceed 1100 litres (39 cubic feet), with the exception of refrigerators that employ an absorption refrigeration system.
Standby power consumption	The energy used while an appliance is idle.

[39] Natural Resources Canada, *EnerGuide Appliance Directory 2009* (Ottawa: 2009), p. 13.

Detailed Tables

Table C.1 ENERGY STAR® qualified appliances as a percentage of total shipments in Canada, 1999–2008

Appliance	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
						(%)				
Dishwashers	0.6	1.6	9.7	29.8	56.5	80.9	90.8	79.7	76.2	89.3
Clothes washers	1.9	2.2	9.2	22.1	30.6	36.2	45.9	50.8	58.4	64.4
Refrigerators	–	–	11.4	22.3	40.7	34.2	37.6	37.3	44.3	53.4

Table C.2 ENERGY STAR qualified appliances as a percentage of total shipments by region/province, 2004–2008

Region/Province	Dishwashers					Clothes washers*				
	2004	2005	2006	2007	2008	2004	2005	2006	2007	2008
			(%)					(%)		
Canada	81.0	90.8	79.7	76.2	89.3	36.2	45.9	50.8	58.4	64.4
Atlantic	75.4	88.4	79.6	66.4	82.4	–	–	–	–	–
Quebec	81.3	92.9	82.1	74.1	88.4	29.9	41.7	43.3	51.6	56.6
Ontario	83.3	90.8	80.4	77.9	90.7	37.6	50.1	54.6	60.7	67.6
Prairies	78.4	90.3	75.3	77.9	89.3	36.2	48.2	53.1	61.4	67.2
British Columbia and Territories	79.5	87.9	82.8	73.9	88.9	36.4	50.3	60.3	66.7	74.2

Region/Province	Refrigerators				
	2004	2005	2006	2007	2008
			(%)		
Canada	34.2	37.6	37.3	44.3	53.4
Atlantic	23.3	21.3	20.6	22.8	27.3
Quebec	36.9	37.2	38.6	43.1	55.0
Ontario	38.6	39.9	38.5	47.4	56.2
Prairies	33.0	40.6	39.8	48.8	55.0
British Columbia and Territories	29.3	30.4	31.3	34.5	47.1

* For confidentiality reasons, the Atlantic provinces and Quebec have been grouped for this analysis.

Table C.3 Distribution of refrigerators by type, 1990–2008

Model year	Standard size								Compact	
	Type 1	Type 2	Type 3	Type 4	Type 5	Type 5A	Type 6	Type 7	Type 11	Type 13
	(%)								(%)	
1990	3.5	2.0	84.9	7.6	0.6	0.0	0.0	0.0	0.1	1.2
1991	3.1	0.3	84.3	9.0	0.8	0.0	0.0	0.3	0.3	2.0
1992	2.1	0.4	85.4	7.5	0.3	0.0	0.0	3.5	0.1	0.6
1993	1.1	0.6	85.5	6.8	0.7	0.0	0.0	4.2	0.1	0.9
1994	0.6	0.7	85.1	4.9	2.0	0.0	0.1	4.3	1.3	1.0
1995	0.2	0.6	84.8	4.6	1.6	0.0	0.1	5.2	1.9	1.0
1996	0.2	0.5	84.8	4.4	2.2	0.0	0.1	6.6	0.8	0.4
1997	0.4	0.1	83.8	3.8	3.2	0.0	0.0	8.3	0.4	0.0
1998	0.4	0.0	76.5	3.3	8.5	0.0	0.3	7.3	3.6	0.0
1999	0.1	0.0	76.6	2.4	8.4	0.0	0.4	7.5	4.6	0.0
2000	0.0	0.0	72.9	2.2	11.1	0.0	0.5	7.9	5.3	0.0
2001	0.0	0.0	71.1	2.1	11.1	0.0	0.4	9.1	6.1	0.1
2002	0.0	0.0	70.2	2.2	10.6	0.0	0.2	11.0	5.8	0.1
2003	0.0	0.0	68.2	2.4	13.9	0.0	0.1	11.2	2.0	2.2
2004	0.0	0.0	66.4	1.9	15.5	0.0	0.1	11.0	4.5	0.5
2005	0.0	0.0	64.8	1.1	17.9	0.0	0.0	9.6	6.3	0.1
2006	0.1	0.0	64.5	1.9	21.2	0.6	0.0	10.1	1.5	0.0
2007	0.1	0.0	61.0	1.6	22.3	1.2	0.0	13.5	0.3	0.0
2008	0.4	0.0	59.4	1.2	26.5	2.4	0.0	10.0	0.1	0.0

Table C.4 Distribution of refrigerators by volume, 1990–2008

Model year	Volume (cu. ft.)						
	0–10.4	10.5–12.4	12.5–14.4	14.5–16.4	16.5–18.4	18.5–20.4	20.5–32.4
	(%)						
1990	3.8	13.2	17.8	14.1	43.3	2.6	5.1
1991	2.6	14.2	11.0	14.2	47.9	5.4	4.7
1992	1.6	10.9	10.0	19.6	42.0	8.3	7.6
1993	2.2	8.0	7.1	16.6	45.3	12.2	8.7
1994	3.4	9.5	6.9	16.5	45.8	8.7	9.3
1995	3.7	14.1	6.7	15.0	39.5	10.8	10.2
1996	1.9	13.5	6.7	13.4	38.6	12.5	13.4
1997	0.9	11.1	6.9	12.2	39.2	12.7	16.9
1998	4.0	9.3	7.0	10.6	42.7	11.1	15.2
1999	5.3	7.6	6.9	9.9	43.5	10.0	16.8
2000	6.5	6.6	7.7	9.0	41.2	9.3	19.7
2001	8.1	5.6	6.7	8.7	36.4	11.4	23.2
2002	6.3	5.5	7.4	6.8	34.6	15.3	24.2
2003	4.9	3.9	6.1	8.6	37.0	15.7	23.9
2004	5.6	3.0	3.3	11.0	39.2	14.3	23.5
2005	7.0	2.5	2.3	9.7	41.6	15.2	21.7
2006	2.9	3.6	2.5	9.7	40.1	17.3	23.9
2007	1.6	3.3	2.2	8.7	39.9	17.3	27.0
2008	3.2	3.9	2.2	6.3	38.8	21.7	23.8

Table C.5 Distribution of refrigerators by average annual UEC per cubic foot, 1990–2008

Model year	kWh/cu. ft. per year				
	10–19.9	20–29.9	30–39.9	40–49.9	50–189.9
			(%)		
1990	0.0	0.0	1.5	3.9	94.6
1991	0.0	0.0	2.9	10.7	86.4
1992	0.0	0.0	4.8	26.9	68.3
1993	0.0	0.1	51.0	29.7	19.2
1994	0.0	0.4	70.9	22.4	6.4
1995	0.0	2.8	63.3	29.3	4.6
1996	0.0	6.6	60.0	31.2	2.1
1997	0.0	6.9	60.4	31.4	1.3
1998	0.0	5.9	62.4	27.1	4.5
1999	0.0	8.4	61.2	25.0	5.4
2000	0.0	12.2	57.4	23.6	6.8
2001	0.0	44.5	34.5	12.7	8.3
2002	0.0	64.3	26.6	3.1	6.1
2003	0.1	78.3	15.5	1.6	4.5
2004	0.4	82.1	11.0	1.3	5.2
2005	0.5	86.2	6.5	0.2	6.6
2006	0.4	88.2	8.5	0.9	2.0
2007	0.4	90.2	7.9	0.6	0.9
2008	3.1	85.6	8.2	2.6	0.5

Table C.6 Average annual UEC of refrigerators by type, 1990–2008

Model year	Standard size							
	Type 1	Type 2	Type 3	Type 4	Type 5	Type 5A	Type 6	Type 7
	(kWh/yr)							
1990	706.2	720.0	947.4	1321.4	1128.4	–	–	–
1991	685.0	636.0	923.2	1218.8	1140.0	–	–	1162.9
1992	696.5	464.8	873.5	1215.1	1160.4	–	–	1175.5
1993	512.4	477.4	702.4	889.3	782.5	–	772.2	953.2
1994	461.8	465.0	640.5	764.0	741.8	–	763.4	891.5
1995	382.7	465.0	630.8	768.6	752.6	–	743.4	865.6
1996	378.4	465.0	620.8	767.7	776.9	–	781.2	833.7
1997	397.2	465.0	635.0	773.7	631.1	–	818.9	860.6
1998	422.3	478.2	640.9	792.3	673.2	–	839.9	870.0
1999	403.7	–	635.9	798.7	665.1	–	771.6	870.9
2000	413.2	–	629.3	781.1	660.9	–	742.9	862.8
2001	403.0	–	544.1	701.2	610.2	–	707.2	725.9
2002	323.5	–	485.6	646.9	547.0	–	604.1	659.2
2003	321.0	–	460.8	625.2	522.4	–	553.5	636.7
2004	–	–	458.4	582.6	496.0	–	554.0	619.8
2005	321.0	–	453.8	566.0	493.2	–	550.8	611.2
2006	319.1	–	455.4	548.4	497.9	580.1	–	613.1
2007	318.9	–	453.5	543.8	490.8	572.7	555.0	595.1
2008	334.4	–	437.7	520.6	482.6	545.4	–	583.5

Model year	Compact					Total
	Type 11	Type 12	Type 13	Type 14	Type 15	
			(kWh/yr)			(kWh/yr)
1990	337.0	–	370.0	–	–	**956.2**
1991	337.0	–	370.0	–	–	**931.2**
1992	337.0	–	370.0	507.0	–	**901.7**
1993	337.0	–	370.0	–	–	**719.6**
1994	328.7	–	370.0	–	–	**650.4**
1995	330.6	–	370.0	–	–	**641.6**
1996	318.1	–	370.0	–	–	**640.4**
1997	317.0	–	370.0	–	–	**656.5**
1998	320.8	419.0	432.1	–	–	**653.5**
1999	322.4	419.0	430.0	–	–	**645.5**
2000	323.4	419.0	430.0	–	–	**639.5**
2001	330.6	419.0	430.0	–	–	**559.4**
2002	331.1	419.0	405.0	–	–	**506.3**
2003	323.1	419.0	326.7	–	463.0	**487.1**
2004	321.3	419.0	356.7	–	–	**477.7**
2005	327.8	419.0	406.6	–	–	**469.2**
2006	328.6	–	339.1	–	–	**481.0**
2007	328.3	–	334.3	–	–	**483.1**
2008	338.1	–	332.2	–	–	**467.3**

Table C.7 Distribution of refrigerators by type and region/province, 2004–2008

Region/Province	Type 3					Type 5				
	2004	2005	2006 (%)	2007	2008	2004	2005	2006 (%)	2007	2008
Canada	66.4	64.9	64.2	60.8	59.3	15.5	17.9	21.2	22.3	26.5
Atlantic	83.2	81.3	80.9	78.0	77.2	6.4	8.0	8.2	9.2	10.2
Quebec	69.5	68.9	65.8	63.9	61.4	18.8	20.9	25.3	25.9	31.2
Ontario	64.5	62.6	64.2	60.9	58.4	14.6	17.7	19.9	21.6	25.2
Prairies	69.2	65.5	59.5	54.4	55.9	13.6	17.6	22.5	22.2	26.0
British Columbia and Territories	59.6	56.5	63.4	60.1	56.6	13.6	15.6	19.0	22.3	26.4

Region/Province	Type 5A					Type 7				
	2004	2005	2006 (%)	2007	2008	2004	2005	2006 (%)	2007	2008
Canada	–	–	0.6	1.2	2.4	11.0	9.6	10.1	13.5	10.0
Atlantic	–	–	0.1	0.2	0.7	8.0	7.6	7.4	8.7	9.3
Quebec	–	–	0.3	0.6	1.4	6.1	4.9	4.7	8.0	4.9
Ontario	–	–	0.7	1.3	2.6	13.8	11.2	10.9	13.9	11.6
Prairies	–	–	1.0	1.8	3.4	14.4	12.3	13.9	19.5	12.8
British Columbia and Territories	–	–	0.6	1.3	3.1	13.2	11.3	13.5	14.5	12.3

Region/Province	Types 1, 2, 4, 6, 11, 12, 13				
	2004	2005	2006 (%)	2007	2008
Canada	7.0	7.6	3.8	2.2	1.8
Atlantic	2.4	3.1	3.3	3.8	2.6
Quebec	5.7	5.4	3.9	1.7	1.1
Ontario	7.2	8.5	4.3	2.4	2.2
Prairies	2.8	4.5	3.1	2.1	1.9
British Columbia and Territories	13.7	16.6	3.5	1.8	1.5

Table C.8 Distribution of refrigerators by channel and region/province, 2004–2008

Region/Province	Builder					Retail				
	2004	2005	2006 (%)	2007	2008	2004	2005	2006 (%)	2007	2008
Canada	18.6	17.0	20.4	18.5	17.7	81.4	83.0	79.6	81.5	82.3
Atlantic	19.1	15.8	14.6	11.3	11.6	80.9	84.2	85.4	88.7	88.4
Quebec	6.3	5.6	6.7	5.2	6.8	93.7	94.4	93.3	94.8	93.2
Ontario	22.5	19.9	23.8	22.2	18.1	77.5	80.1	76.2	77.8	81.9
Prairies	20.8	19.1	23.4	19.1	21.2	79.2	80.9	76.6	80.9	78.8
British Columbia and Territories	36.1	32.3	37.1	38.0	41.0	63.9	67.7	62.9	62.0	59.0

Table C.9 Distribution of refrigerators by volume and region/province, 2004–2008

Region/Province	Volume (cu. ft.)									
	0–10.4					10.5–12.4				
	2004	2005	2006 (%)	2007	2008	2004	2005	2006 (%)	2007	2008
Canada	4.3	6.9	3.1	1.7	3.2	2.6	2.5	3.6	3.3	3.9
Atlantic	1.9	3.8	5.2	3.9	7.8	6.4	7.4	5.7	4.9	6.5
Quebec	4.3	4.8	3.3	1.9	2.7	2.0	1.8	2.1	1.8	2.7
Ontario	4.4	7.5	3.4	1.5	3.0	1.3	1.6	3.7	3.7	3.6
Prairies	0.6	3.7	1.4	1.1	2.9	2.8	2.4	3.1	2.3	3.7
British Columbia and Territories	12.7	17.3	4.0	2.5	3.6	7.6	6.2	7.1	6.9	7.5

Region/Province	Volume (cu. ft.)									
	12.5–14.4					14.5–16.4				
	2004	2005	2006 (%)	2007	2008	2004	2005	2006 (%)	2007	2008
Canada	3.6	2.3	2.5	2.2	2.2	11.7	9.7	9.7	8.7	6.3
Atlantic	7.8	7.9	8.1	8.4	7.4	21.4	13.9	12.2	10.2	7.8
Quebec	2.8	2.1	2.0	1.9	1.9	8.0	6.6	6.6	6.0	4.0
Ontario	4.7	2.7	2.8	2.2	2.2	14.8	12.8	13.2	12.0	9.1
Prairies	3.0	1.6	1.6	1.8	1.9	10.5	8.7	8.4	7.2	5.2
British Columbia and Territories	0.8	0.6	2.1	1.6	1.6	9.3	6.3	5.9	5.7	3.9

Region/Province	Volume (cu. ft.)									
	16.5–18.4					18.5–20.4				
	2004	2005	2006 (%)	2007	2008	2004	2005	2006 (%)	2007	2008
Canada	39.5	41.7	39.9	39.8	38.8	14.0	15.2	17.3	17.3	21.7
Atlantic	40.3	47.1	47.9	50.0	46.6	9.4	8.3	9.2	9.6	10.7
Quebec	48.9	49.6	45.8	45.6	43.5	17.3	19.3	22.6	23.3	29.3
Ontario	34.6	37.9	37.3	37.7	37.3	12.9	14.1	15.5	15.4	19.0
Prairies	40.8	42.1	36.6	35.6	36.0	12.7	13.9	16.6	15.4	19.3
British Columbia and Territories	29.1	32.4	38.6	38.1	34.8	13.8	13.7	15.9	17.4	21.3

Region/Province	Volume (cu. ft.)				
	20.5–32.4				
	2004	2005	2006 (%)	2007	2008
Canada	24.2	21.7	23.9	27.0	23.8
Atlantic	12.9	11.5	11.7	13.0	13.2
Quebec	16.7	15.7	17.7	19.5	15.9
Ontario	27.3	23.3	24.1	27.5	25.8
Prairies	29.6	27.7	32.3	36.6	31.0
British Columbia and Territories	26.7	23.5	26.4	27.8	27.3

Table C.10 Distribution of refrigerators for retail shipments by volume and region/province, 2004–2008

Region/Province	Volume (cu. ft.)									
	0–10.4					10.5–12.4				
	2004	2005	2006 (%)	2007	2008	2004	2005	2006 (%)	2007	2008
Canada	6.7	7.9	3.3	1.7	3.6	1.5	1.1	1.2	1.0	1.4
Atlantic	1.2	4.3	4.7	3.7	7.7	3.1	3.9	3.4	2.8	3.4
Quebec	4.5	4.7	3.2	1.8	2.7	0.6	0.7	0.6	0.7	0.8
Ontario	5.7	9.1	3.6	1.8	3.6	0.4	1.1	0.9	0.9	1.3
Prairies	0.7	4.1	1.7	1.1	3.3	0.9	0.7	1.1	0.7	1.3
British Columbia and Territories	19.4	24.7	5.2	1.8	5.2	2.8	3.0	3.1	2.4	3.8

Region/Province	Volume (cu. ft.)									
	12.5–14.4					14.5–16.4				
	2004	2005	2006 (%)	2007	2008	2004	2005	2006 (%)	2007	2008
Canada	2.2	1.4	2.2	2.3	2.5	8.2	6.6	6.4	5.7	3.6
Atlantic	6.5	5.4	6.9	8.3	7.6	22.0	14.3	11.2	8.9	6.9
Quebec	2.5	1.9	1.7	1.6	1.7	7.0	5.7	5.5	5.0	3.2
Ontario	1.8	0.9	2.0	2.4	2.6	9.1	6.7	6.5	5.8	3.7
Prairies	3.1	1.4	1.6	1.8	2.2	8.9	6.8	6.7	5.8	3.3
British Columbia and Territories	0.7	0.9	2.9	2.4	2.3	10.3	5.9	5.5	5.9	3.1

Region/Province	Volume (cu. ft.)									
	16.5–18.4					18.5–20.4				
	2004	2005	2006 (%)	2007	2008	2004	2005	2006 (%)	2007	2008
Canada	39.9	42.3	40.2	40.2	38.4	16.5	17.5	20.5	20.1	24.9
Atlantic	41.7	50.4	50.7	52.2	48.7	10.9	9.2	10.2	10.1	11.3
Quebec	49.5	50.4	46.2	46.2	43.4	18.4	20.4	24.1	24.5	31.4
Ontario	35.7	38.7	39.0	38.9	36.9	15.3	17.0	18.9	18.6	22.3
Prairies	39.7	41.4	32.7	33.4	33.4	15.4	16.6	21.0	18.2	23.1
British Columbia and Territories	24.2	28.2	37.1	37.0	33.2	17.2	15.6	19.6	22.2	24.7

Region/Province	Volume (cu. ft.)				
	20.5–32.4				
	2004	2005	2006 (%)	2007	2008
Canada	25.0	23.0	26.2	29.0	25.6
Atlantic	14.7	12.5	13.0	13.9	14.4
Quebec	17.5	16.4	18.6	20.3	16.8
Ontario	32.0	26.7	29.0	31.8	29.7
Prairies	31.2	29.0	35.2	39.0	33.4
British Columbia and Territories	25.4	21.7	26.5	28.2	27.8

Table C.11 Distribution of refrigerators for builder shipments by volume and region/province, 2004–2008

Region/Province	Volume (cu. ft.)									
	0–10.4					10.5–12.4				
	2004	2005	2006 (%)	2007	2008	2004	2005	2006 (%)	2007	2008
Canada	0.5	2.0	2.3	1.6	1.3	10.2	9.2	13.1	13.5	15.3
Atlantic	4.9	2.6	8.6	5.6	8.9	20.2	26.1	19.7	21.1	30.0
Quebec	0.3	7.2	4.1	3.3	2.3	23.4	21.1	21.8	22.7	28.2
Ontario	0.1	1.3	2.7	0.4	0.4	4.5	3.7	12.5	13.6	14.1
Prairies	0.3	1.8	0.4	1.3	1.2	9.9	9.7	9.8	9.3	12.4
British Columbia and Territories	0.8	1.7	2.0	3.6	1.2	16.2	12.9	13.9	14.1	12.9

Region/Province	Volume (cu. ft.)									
	12.5–14.4					14.5–16.4				
	2004	2005	2006 (%)	2007	2008	2004	2005	2006 (%)	2007	2008
Canada	8.7	6.5	3.9	1.9	1.2	23.8	24.4	22.6	22.2	18.8
Atlantic	13.2	21.1	15.2	8.7	5.2	18.9	11.8	17.7	20.4	14.8
Quebec	7.6	7.0	6.7	6.9	3.7	22.2	22.0	21.1	25.1	16.2
Ontario	14.7	10.1	5.2	1.5	0.7	34.5	37.5	34.6	34.0	33.1
Prairies	2.7	2.4	1.6	1.8	1.2	17.0	16.4	14.1	12.9	12.1
British Columbia and Territories	0.9	0.4	0.6	0.2	0.5	7.6	7.1	6.5	5.4	5.1

Region/Province	Volume (cu. ft.)									
	16.5–18.4					18.5–20.4				
	2004	2005	2006 (%)	2007	2008	2004	2005	2006 (%)	2007	2008
Canada	36.3	38.5	38.6	37.7	40.7	4.1	4.0	4.6	5.1	7.1
Atlantic	34.6	28.9	31.4	32.6	30.3	3.2	3.3	3.2	5.2	6.4
Quebec	40.2	37.1	40.0	35.3	45.0	0.7	1.1	1.1	1.5	0.9
Ontario	30.8	35.0	32.0	33.8	39.1	4.6	2.8	4.6	4.4	4.4
Prairies	44.8	45.1	49.5	44.7	45.6	1.9	2.6	2.1	3.8	5.2
British Columbia and Territories	37.9	41.2	41.2	39.9	37.2	7.6	9.7	9.6	9.6	16.4

Region/Province	Volume (cu. ft.)				
	20.5–32.4				
	2004	2005	2006 (%)	2007	2008
Canada	16.4	15.4	14.9	18.0	15.6
Atlantic	5.1	6.3	4.2	6.2	4.4
Quebec	5.5	4.7	5.3	5.1	3.7
Ontario	10.9	9.7	8.5	12.3	8.2
Prairies	23.4	21.9	22.6	26.2	22.3
British Columbia and Territories	29.0	27.1	26.3	27.2	26.6

Table C.12 Distribution of refrigerators by average annual UEC per cubic foot and region/province, 2004–2008

Region/Province	kWh/cu. ft. per year									
	10–29.9					30–39.9				
	2004	2005	2006 (%)	2007	2008	2004	2005	2006 (%)	2007	2008
Canada	82.6	86.7	88.6	90.7	88.7	11.0	6.5	8.5	7.9	8.2
Atlantic	83.3	80.5	79.4	80.4	74.6	11.9	16.1	17.6	17.7	17.8
Quebec	86.1	89.3	91.4	93.1	91.6	9.2	6.1	6.1	5.6	6.0
Ontario	84.1	87.1	87.9	90.7	89.2	10.7	5.4	8.6	8.1	7.7
Prairies	82.5	90.0	90.5	91.7	89.5	14.9	6.5	8.1	7.2	7.6
British Columbia and Territories	72.6	74.4	84.5	86.9	83.9	13.5	7.8	11.0	10.3	12.3

Region/Province	kWh/cu. ft. per year									
	40–49.9					50–59.9				
	2004	2005	2006 (%)	2007	2008	2004	2005	2006 (%)	2007	2008
Canada	1.3	0.2	0.9	0.6	2.6	0.2	0.2	0.3	0.4	0.3
Atlantic	3.7	0.3	1.6	1.0	7.2	0.0	0.3	0.2	0.3	0.2
Quebec	0.9	0.1	0.7	0.6	2.2	0.0	0.1	0.2	0.3	0.1
Ontario	0.8	0.1	1.1	0.4	2.4	0.0	0.2	0.4	0.4	0.4
Prairies	1.6	0.1	0.4	0.4	2.6	0.0	0.1	0.2	0.2	0.1
British Columbia and Territories	1.6	0.6	1.3	1.6	2.7	0.0	0.8	0.8	0.8	1.0

Region/Province	kWh/cu. ft. per year				
	60–179.9				
	2004	2005	2006 (%)	2007	2008
Canada	5.0	6.4	1.7	0.5	0.2
Atlantic	1.1	2.9	1.3	0.6	0.2
Quebec	3.7	4.3	1.5	0.4	0.1
Ontario	4.4	7.2	2.1	0.5	0.3
Prairies	1.1	3.3	0.8	0.4	0.1
British Columbia and Territories	12.3	16.4	2.4	0.4	0.3

Table C.13 Average annual UEC of refrigerators by volume, 1990–2008

Model year	Volume (cu. ft.)						
	0–10.4	10.5–12.4	12.5–14.4	14.5–16.4	16.5–18.4	18.5–20.4	20.5–32.4
	(kWh/yr)						
1990	593	740	850	955	1067	1133	1138
1991	401	727	877	915	1018	978	1080
1992	427	697	750	924	940	998	1124
1993	414	593	600	700	731	799	875
1994	378	563	547	627	665	720	817
1995	366	554	540	626	662	715	794
1996	375	547	570	631	646	680	762
1997	367	548	567	632	664	695	750
1998	329	564	562	629	675	703	755
1999	346	552	575	629	666	667	756
2000	359	550	583	625	667	637	730
2001	376	502	493	562	582	534	630
2002	339	433	428	480	521	489	586
2003	337	429	424	449	475	496	570
2004	335	432	420	455	465	487	551
2005	335	412	425	415	468	477	544
2006	357	417	434	423	467	489	551
2007	377	419	438	428	462	486	548
2008	373	405	438	399	454	470	530

Table C.14 Average annual UEC per cubic foot of refrigerators by volume, 1990–2008

Model year	Volume (cu. ft.)						
	0–10.4	10.5–12.4	12.5–14.4	14.5–16.4	16.5–18.4	18.5–20.4	20.5–32.4
	(kWh/cu. ft. per year)						
1990	74	65	63	62	61	58	51
1991	68	64	65	59	58	50	48
1992	59	61	56	60	54	51	50
1993	58	52	45	45	42	41	40
1994	70	49	41	41	38	37	38
1995	75	48	40	41	38	37	36
1996	74	48	42	41	37	35	35
1997	59	48	42	41	38	36	34
1998	85	49	42	41	39	36	34
1999	85	48	43	41	38	34	34
2000	83	48	43	40	38	33	33
2001	81	44	37	36	33	27	28
2002	88	38	32	31	30	25	26
2003	81	38	32	29	27	26	25
2004	85	38	31	29	27	25	24
2005	89	36	32	27	27	25	24
2006	60	36	32	27	27	25	24
2007	50	37	33	28	26	25	24
2008	41	35	33	26	26	24	23

Table C.15 Average annual UEC of refrigerators by channel and region/province, 2004–2008

Region/Province	Builder					Retail				
	2004	2005	2006	2007	2008	2004	2005	2006	2007	2008
			(kWh/yr)					(kWh/yr)		
Canada	464.3	457.2	458.2	459.2	447.2	480.7	471.7	486.9	488.6	471.6
Atlantic	463.8	436.8	437.6	439.2	428.5	477.8	468.4	471.9	475.2	470.5
Quebec	455.6	437.5	445.7	444.6	438.9	471.7	468.0	475.6	478.1	460.5
Ontario	451.9	444.1	442.0	443.0	426.9	489.0	475.0	490.6	490.9	475.1
Prairies	477.8	475.1	477.8	477.9	460.3	497.1	480.8	498.9	499.3	477.3
British Columbia and Territories	483.3	479.0	480.5	480.9	471.1	469.2	450.8	489.0	493.8	485.1

Table C.16 Distribution of refrigerators consuming fewer than 30 kWh/cu. ft. per year, by channel and region/province, 2004–2008

Region/Province	Builder					Retail				
	2004	2005	2006 (%)	2007	2008	2004	2005	2006 (%)	2007	2008
Canada	81.4	83.8	79.9	81.1	79.3	82.8	87.3	90.8	92.8	90.7
Atlantic	71.9	61.3	60.5	64.0	55.7	86.0	84.2	82.6	82.3	77.1
Quebec	69.3	63.4	66.0	65.6	64.3	87.2	90.8	93.2	94.5	93.6
Ontario	84.0	88.9	79.9	83.3	82.6	84.2	86.6	90.3	92.6	90.7
Prairies	84.8	85.4	86.9	85.1	82.7	85.7	91.1	91.6	93.2	91.3
British Columbia and Territories	78.8	83.7	80.5	78.6	80.0	69.1	70.0	86.8	91.8	86.6

Table C.17 Distribution of freezers by type, 1991–2008

Model year	Type 8	Type 9	Type 10 (%)	Type 16	Type 18
1991	11.8	0.4	81.2	0.0	6.7
1992	12.9	0.3	79.2	0.0	7.6
1993	14.4	0.6	70.3	0.0	14.8
1994	12.9	0.6	71.3	0.0	15.1
1995	16.0	0.7	66.5	0.0	16.7
1996	17.1	1.1	64.0	0.1	17.7
1997	19.1	1.0	60.2	0.3	19.4
1998	21.2	1.8	57.5	0.0	19.5
1999	21.6	2.5	60.3	0.1	15.5
2000	23.9	3.1	56.2	1.2	15.5
2001	19.5	6.7	58.3	1.8	13.8
2002	24.9	9.8	48.9	0.0	16.4
2003	27.8	9.2	47.4	0.0	15.6
2004	29.4	8.3	45.5	0.0	16.8
2005	30.4	10.7	35.7	0.0	23.2
2006	28.5	8.7	45.6	0.0	17.2
2007	26.4	11.8	39.4	0.0	22.4
2008	20.1	11.4	42.9	0.5	25.1

Table C.18 Distribution of freezers by average annual UEC per cubic foot, 1991–2008

Model year	kWh/cu. ft. per year				
	20–29.9	30–39.9	40–49.9	50–59.9	60–129.9
			(%)		
1991	0.0	28.3	20.3	31.2	20.3
1992	3.1	18.9	58.3	15.0	4.7
1993	16.5	57.0	16.5	8.4	1.5
1994	15.4	39.0	34.9	9.0	1.8
1995	12.7	39.6	41.2	5.4	1.1
1996	12.4	40.4	37.0	10.3	0.0
1997	11.7	36.7	39.0	12.0	0.6
1998	11.0	34.6	43.1	11.3	0.0
1999	10.8	42.3	37.0	9.6	0.3
2000	10.0	37.6	41.3	8.8	2.3
2001	17.5	36.3	38.2	3.9	4.0
2002	26.7	47.5	24.9	0.8	0.0
2003	28.6	47.4	23.2	0.8	0.0
2004	28.9	48.8	22.3	0.1	0.0
2005	29.5	45.2	25.3	0.0	0.0
2006	34.8	40.4	24.7	0.0	0.0
2007	26.7	47.5	25.9	0.0	0.0
2008	28.8	47.2	23.4	0.0	0.6

Table C.19 Distribution of freezers by type and region/province, 2004–2008

Region/Province	Type 8					Type 9				
	2004	2005	2006 (%)	2007	2008	2004	2005	2006 (%)	2007	2008
Canada	29.4	30.4	28.5	26.4	20.1	8.3	10.7	8.7	11.8	11.4
Atlantic	19.8	20.8	25.7	29.1	24.3	10.2	8.2	6.9	11.2	10.4
Quebec	41.3	41.1	44.9	39.9	31.9	5.6	6.0	3.5	8.2	8.6
Ontario	28.2	26.7	31.6	28.8	22.2	17.8	13.4	10.1	17.1	17.6
Prairies	31.7	27.9	31.9	26.8	17.8	12.6	12.1	9.6	16.0	16.4
British Columbia and Territories	30.0	28.8	30.0	31.6	22.0	15.0	14.6	14.3	16.6	16.3

Region/Province	Type 10					Type 18				
	2004	2005	2006 (%)	2007	2008	2004	2005	2006 (%)	2007	2008
Canada	45.5	35.7	45.6	39.4	42.9	16.8	23.2	17.2	22.4	25.1
Atlantic	38.0	37.0	29.0	27.3	28.2	32.0	34.1	38.4	32.4	37.1
Quebec	22.7	21.9	25.0	21.5	23.4	30.4	31.0	26.6	30.4	34.9
Ontario	18.9	19.9	22.6	21.6	23.3	35.1	39.8	35.7	32.4	36.4
Prairies	25.9	23.3	27.5	25.9	29.2	29.8	36.7	30.9	31.3	36.6
British Columbia and Territories	30.8	28.5	26.8	26.9	29.7	24.1	28.1	28.9	24.9	30.1

Table C.20 Distribution of freezers by average annual UEC per cubic foot by region/province, 2004–2008

Region/Province	kWh/cu. ft. per year									
	20–29.9					30–39.9				
	2004	2005	2006 (%)	2007	2008	2004	2005	2006 (%)	2007	2008
Canada	28.9	29.5	34.8	26.7	28.8	48.8	45.2	40.4	47.5	47.2
Atlantic	34.3	36.4	31.2	30.0	29.7	46.0	47.6	46.5	48.4	46.1
Quebec	27.9	29.9	36.6	26.8	31.0	51.3	48.7	45.7	50.3	48.6
Ontario	22.2	24.5	30.4	24.0	24.2	51.1	44.3	41.1	46.4	48.9
Prairies	33.2	31.9	40.2	26.6	29.4	47.3	45.6	36.1	49.9	46.6
British Columbia and Territories	36.7	37.5	38.0	37.7	37.5	40.6	35.4	32.6	32.6	36.4

Region/Province	kWh/cu. ft. per year									
	40–49.9					50–59.9				
	2004	2005	2006 (%)	2007	2008	2004	2005	2006 (%)	2007	2008
Canada	22.3	25.3	24.7	25.9	23.4	0.1	0.0	0.0	0.0	0.0
Atlantic	19.3	16.0	22.3	21.6	24.1	0.3	0.0	0.0	0.0	0.0
Quebec	20.7	21.4	17.6	23.0	19.1	0.1	0.0	0.0	0.0	0.0
Ontario	26.6	31.1	28.5	29.6	26.4	0.1	0.0	0.0	0.0	0.0
Prairies	19.5	22.5	23.8	23.5	24.0	0.0	0.0	0.0	0.0	0.0
British Columbia and Territories	22.6	27.0	29.4	29.7	24.3	0.1	0.0	0.0	0.0	0.0

Table C.21 Distribution of freezers by channel and region/province, 2004–2008

Region/Province	Builder					Retail				
	2004	2005	2006 (%)	2007	2008	2004	2005	2006 (%)	2007	2008
Canada	1.8	2.1	2.0	2.6	9.3	98.2	97.9	98.0	97.4	90.7
Atlantic	0.9	1.6	0.5	0.4	0.6	99.1	98.4	99.5	99.6	99.4
Quebec	0.9	0.7	0.4	0.2	4.2	99.1	99.3	99.6	99.8	95.8
Ontario	0.5	0.4	0.3	0.9	8.1	99.5	99.6	99.7	99.1	91.9
Prairies	5.0	4.4	7.2	4.1	13.2	95.0	95.6	92.8	95.9	86.8
British Columbia and Territories	15.5	18.6	16.0	13.2	27.3	84.5	81.4	84.0	86.8	72.7

Table C.22 Average annual UEC of freezers by type, 1991–2008

Model year	Type 8	Type 9 (kWh/yr)	Type 10 (kWh/yr)	Type 18 (kWh/yr)	Total (kWh/yr)
1991	706.4	1068.0	406.8	339.8	**444.7**
1992	670.4	1078.0	413.8	337.8	**449.3**
1993	581.3	863.3	368.2	287.8	**401.7**
1994	535.9	846.1	363.9	292.4	**389.2**
1995	508.9	817.1	353.2	282.0	**381.6**
1996	502.9	820.7	344.0	279.4	**376.7**
1997	494.8	823.7	341.9	278.7	**376.5**
1998	496.0	829.6	339.5	278.2	**381.5**
1999	492.1	838.6	337.5	276.3	**383.4**
2000	487.8	839.4	337.4	277.1	**390.9**
2001	447.6	740.5	336.7	275.7	**383.9**
2002	412.7	674.2	316.7	267.7	**367.7**
2003	414.8	665.4	317.8	268.3	**369.1**
2004	412.0	595.9	344.1	271.1	**372.7**
2005	420.8	650.1	351.8	269.1	**385.6**
2006	431.8	664.2	335.8	265.0	**379.6**
2007	432.9	654.1	337.6	265.7	**384.0**
2008	449.8	644.5	334.1	263.3	**374.8**

Table C.23 Distribution of dishwashers by average annual UEC, 1990–2008

Model year	kWh/yr					
	0–299.9	300–349.9	350–399.9	400–599.9	600–699.9	700–1399.9
	(%)					
1990	0.0	0.0	0.0	0.0	0.2	99.8
1991	0.0	0.0	0.0	0.0	5.8	94.2
1992	0.0	0.0	0.0	0.0	8.5	91.5
1993	0.0	0.0	0.0	0.4	7.7	91.9
1994	0.0	0.0	0.0	1.0	32.9	66.1
1995	0.0	0.0	0.2	1.9	63.7	34.2
1996	0.0	0.0	0.2	4.8	63.0	32.0
1997	0.0	0.0	0.4	21.6	56.9	21.2
1998	0.0	0.0	0.2	24.6	71.6	3.7
1999	0.0	0.0	0.2	26.2	73.6	0.0
2000	0.0	0.0	0.1	23.2	76.7	0.0
2001	0.0	0.0	0.0	29.4	70.6	0.0
2002	0.0	0.0	3.2	51.3	45.5	0.0
2003	0.0	0.0	9.1	70.1	20.7	0.0
2004	0.0	4.0	24.3	62.9	8.8	0.0
2005	0.0	19.6	55.5	21.9	3.0	0.0
2006	0.3	28.2	61.8	8.4	1.3	0.0
2007	2.6	48.9	42.7	5.6	0.3	0.0
2008	0.7	69.7	26.9	2.7	0.0	0.0

Table C.24 Distribution of dishwashers by average annual UEC and region/province, 2004–2008

Region/Province	kWh/yr									
	150–299.9					300–349.9				
	2004	2005	2006 (%)	2007	2008	2004	2005	2006 (%)	2007	2008
Canada	0.0	0.0	0.3	2.6	0.7	4.0	19.6	28.2	48.9	69.7
Atlantic	0.0	0.0	1.0	7.1	0.8	9.0	25.5	33.1	45.3	59.9
Quebec	0.0	0.0	1.1	4.9	0.7	4.0	21.9	26.3	46.9	70.3
Ontario	0.0	0.0	0.1	1.6	0.7	4.6	20.5	28.5	50.5	70.1
Prairies	0.0	0.0	0.0	1.3	0.6	2.7	15.2	25.8	47.6	70.5
British Columbia and Territories	0.0	0.0	0.1	2.3	0.7	3.4	20.0	35.5	51.8	68.6

Region/Province	kWh/yr									
	350–399.9					400–699.9				
	2004	2005	2006 (%)	2007	2008	2004	2005	2006 (%)	2007	2008
Canada	24.3	55.5	61.8	42.7	26.9	71.7	24.9	9.7	5.9	2.7
Atlantic	21.3	48.0	49.7	38.6	35.2	69.7	26.5	16.3	8.9	4.1
Quebec	28.0	59.7	66.8	43.8	26.9	68.1	18.4	5.9	4.3	2.1
Ontario	22.7	54.0	61.7	42.2	26.2	72.7	25.4	9.7	5.7	3.0
Prairies	23.5	59.2	64.2	45.5	26.6	73.8	25.7	10.0	5.6	2.4
British Columbia and Territories	24.1	44.7	50.0	36.8	27.3	72.6	35.3	14.4	9.2	3.4

Table C.25 Distribution of dishwashers by channel and region/province, 2004–2008

Region/Province	Builder					Retail				
	2004	2005	2006 (%)	2007	2008	2004	2005	2006 (%)	2007	2008
Canada	14.3	14.7	15.5	15.5	15.5	85.7	85.3	84.5	84.5	84.5
Atlantic	15.3	11.6	11.8	9.1	10.9	84.7	88.4	88.2	90.9	89.1
Quebec	3.0	2.9	3.3	3.2	3.0	97.0	97.1	96.7	96.8	97.0
Ontario	15.1	15.1	15.5	15.0	12.3	84.9	84.9	84.5	85.0	87.7
Prairies	16.7	16.8	18.8	18.5	20.3	83.3	83.2	81.2	81.5	79.7
British Columbia and Territories	32.3	35.9	33.9	36.3	41.8	67.7	64.1	66.1	63.7	58.2

Table C.26 Average annual UEC of dishwashers, 1990–2008

Model year	kWh/yr
1990	1025.7
1991	959.0
1992	908.0
1993	913.5
1994	776.7
1995	670.9
1996	668.2
1997	649.2
1998	646.7
1999	640.1
2000	637.4
2001	633.7
2002	592.0
2003	523.9
2004	456.8
2005	395.7
2006	372.6
2007	353.8
2008	342.9

Table C.28 Distribution of electric ranges by type, 1990–2008

Model year	Non-self-cleaning (%)	Self-cleaning (%)
1990	77.1	22.9
1991	71.3	28.7
1992	71.6	28.4
1993	70.1	29.9
1994	69.4	30.6
1995	68.3	31.7
1996	66.6	33.4
1997	64.1	35.9
1998	59.2	40.8
1999	59.4	40.6
2000	55.6	44.4
2001	47.8	52.2
2002	42.7	57.3
2003	44.9	55.1
2004	42.3	57.7
2005	41.2	58.8
2006	40.1	59.9
2007	34.2	65.8
2008	30.4	69.6

Table C.27 Average annual UEC of dishwashers by channel and region/province, 2004–2008

Region/Province	Builder					Retail				
	2004	2005	2006 (kWh/yr)	2007	2008	2004	2005	2006 (kWh/yr)	2007	2008
Canada	443.0	404.0	382.8	361.1	348.4	459.1	394.2	370.7	352.5	341.9
Atlantic	454.4	391.2	385.9	353.3	342.8	469.4	402.9	382.2	357.7	349.5
Quebec	449.2	417.0	386.8	363.7	342.2	454.3	386.5	367.3	350.0	342.9
Ontario	447.0	408.9	388.4	366.5	354.0	454.7	392.6	371.0	352.1	341.3
Prairies	442.1	396.4	381.2	359.4	347.0	465.2	399.3	371.8	354.6	341.1
British Columbia and Territories	434.6	404.2	376.3	356.3	345.6	472.6	408.4	372.6	352.7	340.4

Table C.29 Distribution of electric ranges by average annual UEC, 1990–2008

Model year	kWh/yr				
	300–449.9	450–499.9	500–599.9	600–749.9	750–899.9
			(%)		
1990	3.8	0.0	0.0	14.3	81.9
1991	0.0	0.0	0.0	16.6	83.4
1992	0.0	0.0	0.0	15.0	85.0
1993	0.0	0.0	0.0	18.4	81.6
1994	0.0	0.0	0.0	34.0	66.0
1995	0.0	0.0	0.0	38.4	61.6
1996	0.0	0.0	0.0	30.8	69.2
1997	0.0	0.0	0.0	31.1	68.9
1998	0.0	0.0	0.0	32.0	68.0
1999	0.0	0.0	0.0	43.5	56.5
2000	0.0	0.0	0.0	45.2	54.8
2001	0.0	0.0	0.0	42.3	57.7
2002	0.0	0.0	0.0	46.3	53.7
2003	0.9	11.6	5.4	38.3	43.8
2004	6.3	21.5	13.3	27.4	31.5
2005	7.0	37.9	26.2	15.3	13.6
2006	10.4	37.5	36.6	7.4	8.1
2007	9.3	29.7	51.2	8.5	1.3
2008	6.7	25.0	61.2	6.4	0.7

Table C.30 Distribution of electric ranges by type and region/province, 2004–2008

Region/Province	Non-self-cleaning					Self-cleaning				
	2004	2005	2006	2007	2008	2004	2005	2006	2007	2008
			(%)					(%)		
Canada	42.3	41.2	40.1	34.2	30.4	57.7	58.8	59.9	65.8	69.6
Atlantic	53.7	51.7	51.6	48.4	44.3	46.3	48.3	48.4	51.6	55.7
Quebec	40.4	37.6	31.8	28.0	23.7	59.6	62.4	68.2	72.0	76.3
Ontario	44.3	46.1	49.0	39.2	34.8	55.7	53.9	51.0	60.8	65.2
Prairies	39.7	36.5	32.7	31.1	29.3	60.3	63.5	67.3	68.9	70.7
British Columbia and Territories	40.7	38.6	35.5	33.8	31.7	59.3	61.4	64.5	66.2	68.3

Table C.31 Distribution of electric ranges by average annual UEC and region/province, 2004–2008

Region/Province	kWh/yr									
	<500					500–549.9				
	2004	2005	2006 (%)	2007	2008	2004	2005	2006 (%)	2007	2008
Canada	27.8	44.9	47.9	39.0	31.7	11.4	20.8	22.4	34.6	43.4
Atlantic	18.4	36.8	44.6	39.9	37.1	13.3	20.6	24.7	31.0	36.8
Quebec	30.9	43.7	47.5	41.0	33.7	13.0	21.3	19.9	30.8	41.3
Ontario	25.9	45.6	48.1	38.5	30.6	10.3	20.4	22.5	36.3	44.5
Prairies	32.3	48.4	45.7	36.8	28.5	12.9	21.9	25.9	38.1	48.7
British Columbia and Territories	19.3	42.6	53.6	41.2	34.8	5.8	17.9	20.2	32.0	36.0

Region/Province	kWh/yr									
	550–599.9					600–649.9				
	2004	2005	2006 (%)	2007	2008	2004	2005	2006 (%)	2007	2008
Canada	1.9	5.4	14.2	16.6	17.8	4.8	4.6	3.3	3.0	3.2
Atlantic	1.3	9.2	19.5	22.6	22.0	2.3	2.8	1.0	1.9	2.0
Quebec	2.0	4.8	15.0	15.0	16.9	4.1	6.1	5.3	4.2	3.4
Ontario	2.0	5.7	13.2	16.2	17.5	5.0	3.9	2.4	2.4	2.8
Prairies	1.8	5.1	14.9	16.4	17.1	5.0	3.7	3.0	2.5	3.0
British Columbia and Territories	1.4	4.6	12.2	19.3	21.4	6.8	5.4	3.3	3.5	4.6

Region/Province	kWh/yr									
	650–699.9					700–749.9				
	2004	2005	2006 (%)	2007	2008	2004	2005	2006 (%)	2007	2008
Canada	3.8	2.6	2.2	2.2	2.4	18.8	8.1	1.9	3.2	0.9
Atlantic	3.3	2.5	1.9	1.5	1.7	14.9	7.2	2.6	2.8	0.2
Quebec	4.1	3.0	2.6	2.9	3.0	18.1	8.5	1.6	3.6	0.8
Ontario	4.6	3.0	2.7	2.8	2.9	17.8	7.1	1.6	2.8	1.0
Prairies	2.3	1.4	1.1	1.1	1.0	18.8	7.3	2.5	4.2	1.2
British Columbia and Territories	3.0	2.2	1.9	1.7	2.2	28.6	13.3	2.6	1.4	0.4

Region/Province	kWh/yr									
	750–799.9					800–849.9				
	2004	2005	2006 (%)	2007	2008	2004	2005	2006 (%)	2007	2008
Canada	19.5	7.8	6.9	0.7	0.2	12.0	5.9	1.2	0.6	0.4
Atlantic	24.6	10.8	4.8	0.1	0.1	22.0	10.1	1.0	0.1	0.1
Quebec	16.0	4.5	6.8	1.8	0.3	11.8	8.0	1.3	0.8	0.6
Ontario	21.7	9.8	8.5	0.4	0.3	12.7	4.6	1.0	0.5	0.4
Prairies	17.8	7.6	5.7	0.4	0.2	9.1	4.6	1.3	0.4	0.3
British Columbia and Territories	23.6	9.0	5.2	0.3	0.2	11.6	5.0	1.1	0.6	0.4

Table C.32 Distribution of electric ranges by channel and region/province, 2004–2008

Region/Province	Builder					Retail				
	2004	2005	2006 (%)	2007	2008	2004	2005	2006 (%)	2007	2008
Canada	21.5	22.1	26.9	21.1	19.0	78.5	77.9	73.1	78.9	81.0
Atlantic	19.5	17.3	17.4	12.8	11.3	80.5	82.7	82.6	87.2	88.7
Quebec	6.6	6.5	8.7	6.0	6.6	93.4	93.5	91.3	94.0	93.4
Ontario	28.2	29.1	33.2	26.9	21.4	71.8	70.9	66.8	73.1	78.6
Prairies	22.6	23.6	31.0	22.9	23.2	77.4	76.4	69.0	77.1	76.8
British Columbia and Territories	42.8	43.5	43.9	41.7	43.1	57.2	56.5	56.1	58.3	56.9

Table C.33 Average annual UEC of electric ranges by type, 1990–2008

Model year	Non-self-cleaning (kWh/yr)	Self-cleaning (kWh/yr)	Total (kWh/yr)
1990	785.7	726.8	**772.2**
1991	787.4	755.1	**778.1**
1992	788.3	754.1	**778.6**
1993	795.2	751.5	**782.1**
1994	785.4	746.6	**773.6**
1995	778.3	756.4	**771.3**
1996	780.3	762.5	**774.4**
1997	780.2	758.5	**772.4**
1998	778.5	759.6	**770.8**
1999	770.3	741.8	**758.7**
2000	770.7	746.3	**759.9**
2001	785.7	741.2	**762.5**
2002	783.9	735.2	**756.0**
2003	732.1	691.0	**709.4**
2004	694.1	622.4	**652.7**
2005	593.2	558.0	**572.5**
2006	558.9	522.7	**537.2**
2007	522.4	525.2	**524.3**
2008	516.3	524.1	**521.7**

Table C.34 Average annual UEC of electric ranges by channel and region/province, 2004–2008

Region/Province	Builder					Retail				
	2004	2005	2006 (kWh/yr)	2007	2008	2004	2005	2006 (kWh/yr)	2007	2008
Canada	730.9	604.5	541.3	508.9	515.1	631.3	563.5	535.7	528.4	523.3
Atlantic	709.5	595.3	524.5	511.4	503.2	677.8	590.0	535.1	521.3	516.0
Quebec	714.3	620.3	562.1	534.1	545.2	625.9	563.8	537.4	529.2	521.6
Ontario	739.5	612.4	551.4	508.5	514.5	634.6	560.5	532.2	527.9	524.9
Prairies	724.1	586.1	532.7	503.6	508.4	610.2	553.3	538.2	528.6	523.9
British Columbia and Territories	728.7	600.3	518.2	501.3	512.1	684.2	587.8	538.7	531.2	527.4

Table C.35 Distribution of clothes washers by type, 2001–2008

Model year	Front-loading	Top-loading
	(%)	
2001	15.7	84.3
2002	16.8	83.2
2003	21.5	78.5
2004	29.2	70.8
2005	42.3	57.7
2006	46.9	53.1
2007	55.3	44.7
2008	60.5	39.5

Table C.36 Distribution of clothes washers by average annual UEC, 1990–2008

Model year	kWh/yr					
	100–149.9	150–199.9	200–399.9	400–599.9	600–999.9	1000–1849.9
	(%)					
1990	0.0	0.0	0.0	0.0	35.7	64.3
1991	0.0	0.0	0.0	0.0	34.3	65.7
1992	0.0	0.0	0.0	0.0	22.7	77.3
1993	0.0	0.0	0.0	0.0	29.4	70.6
1994	0.0	0.0	0.0	0.0	49.7	50.3
1995	0.0	0.0	0.0	0.0	55.6	44.4
1996	0.0	0.0	0.2	0.0	54.9	44.9
1997	0.0	0.0	2.7	0.0	49.4	47.9
1998	0.0	0.0	7.7	0.1	42.6	49.6
1999	0.0	0.0	10.6	1.3	61.7	26.4
2000	0.0	0.0	13.0	0.3	75.3	11.4
2001	0.0	0.0	17.0	0.1	79.9	3.0
2002	0.1	1.2	21.0	0.0	72.7	5.0
2003	0.3	4.7	23.5	4.3	65.6	1.6
2004	0.2	8.1	27.4	19.1	45.2	0.0
2005	2.8	14.0	31.4	31.7	20.1	0.0
2006	3.3	23.5	27.8	31.2	14.2	0.0
2007	5.9	32.6	32.4	26.6	2.5	0.0
2008	8.7	35.3	34.4	21.5	0.0	0.0

Table C.37 Distribution of clothes washers by type and region/province, 2004–2008

Region/Province	Front-loading					Top-loading				
	2004	2005	2006 (%)	2007	2008	2004	2005	2006 (%)	2007	2008
Canada	29.2	42.3	46.9	55.3	60.5	70.8	57.7	53.1	44.7	39.5
Atlantic and Quebec	22.8	36.2	39.0	46.9	51.6	77.2	63.8	61.0	53.1	48.4
Ontario	27.7	45.4	50.5	58.3	64.0	72.3	54.6	49.5	41.7	36.0
Prairies	28.9	44.9	49.2	58.7	63.7	71.1	55.1	50.8	41.3	36.3
British Columbia and Territories	30.2	48.6	59.1	66.2	72.6	69.8	51.4	40.9	33.8	27.4

Table C.38 Distribution of clothes washers by average annual UEC by region/province, 2004–2008

Region/Province	100–400 kWh/yr					400–499.9 kWh/yr				
	2004	2005	2006 (%)	2007	2008	2004	2005	2006 (%)	2007	2008
Canada	35.7	48.3	54.6	71.0	78.4	2.5	3.4	11.5	26.3	21.5
Atlantic and Quebec	27.7	41.8	47.2	66.3	73.4	1.5	3.0	15.0	31.8	26.6
Ontario	36.9	52.5	58.1	71.7	79.7	3.9	4.3	10.6	24.8	20.2
Prairies	35.9	50.0	57.2	74.4	81.6	2.2	2.9	8.8	23.3	18.4
British Columbia and Territories	35.6	53.0	62.9	76.1	83.8	3.2	2.8	8.2	19.9	16.1

Region/Province	500–599.9 kWh/yr					600–999.9 kWh/yr				
	2004	2005	2006 (%)	2007	2008	2004	2005	2006 (%)	2007	2008
Canada	16.6	28.3	19.8	0.3	0.0	45.2	20.1	14.2	2.5	0.0
Atlantic and Quebec	19.9	35.3	22.3	0.2	0.0	50.9	19.9	15.5	1.8	0.0
Ontario	16.5	23.5	17.9	0.3	0.0	42.8	19.7	13.3	3.2	0.1
Prairies	16.5	28.1	22.0	0.4	0.0	45.4	18.9	12.0	1.9	0.0
British Columbia and Territories	11.0	17.9	9.9	0.3	0.0	50.2	26.4	19.0	3.7	0.0

Table C.39 Distribution of clothes washers by channel and region/province, 2004–2008

Region/Province	Builder					Retail				
	2004	2005	2006 (%)	2007	2008	2004	2005	2006 (%)	2007	2008
Canada	5.8	5.7	5.7	5.8	5.9	94.2	94.3	94.3	94.2	94.1
Atlantic and Quebec	2.0	1.9	1.6	1.6	1.6	98.0	98.1	98.4	98.4	98.4
Ontario	6.4	5.6	6.0	5.9	4.9	93.6	94.4	94.0	94.1	95.1
Prairies	8.5	8.1	7.9	7.8	8.4	91.5	91.9	92.1	92.2	91.6
British Columbia and Territories	18.5	16.7	15.6	15.4	18.9	81.5	83.3	84.4	84.6	81.1

Table C.40 Average annual UEC of clothes washers by type, 1990–2008

Model year	Front-loading (kWh/yr)	Top-loading (kWh/yr)	Total (kWh/yr)
1990	–	–	**1218.0**
1991	–	–	**1197.4**
1992	–	–	**1175.5**
1993	–	–	**1094.1**
1994	–	–	**989.1**
1995	–	–	**965.9**
1996	–	–	**948.7**
1997	–	–	**930.1**
1998	–	–	**903.3**
1999	–	–	**859.9**
2000	274.2	922.7	**838.3**
2001	287.0	904.7	**810.1**
2002	300.6	871.1	**779.2**
2003	274.8	826.9	**708.4**
2004	258.4	702.3	**572.9**
2005	218.8	608.8	**443.6**
2006	202.7	555.0	**389.6**
2007	183.9	415.1	**287.2**
2008	179.4	387.2	**261.5**

Table C.41 Average annual UEC of clothes washers by channel and region/province, 2004–2008

Region/Province	Builder					Retail				
	2004	2005	2006 (kWh/yr)	2007	2008	2004	2005	2006 (kWh/yr)	2007	2008
Canada	653.0	529.9	499.9	319.5	297.1	568.0	438.4	382.9	285.2	259.2
Atlantic and Quebec	651.1	513.7	526.0	368.5	312.9	629.0	469.8	415.7	302.0	279.9
Ontario	641.0	510.4	475.6	321.6	306.7	550.7	420.7	369.1	281.3	251.3
Prairies	706.3	588.9	550.5	340.6	317.3	556.0	419.1	362.3	272.6	248.1
British Columbia and Territories	590.7	475.6	449.8	261.7	256.5	585.3	428.3	352.4	268.7	233.5

Table C.42 Distribution of electric clothes dryers by average annual UEC, 1990–2008

Model year	kWh/yr				
	350–799.9	800–899.9	900–949.9	950–999.9	1000–1249.9
			(%)		
1990	4.7	7.8	14.4	0.0	73.1
1991	5.3	0.2	30.0	22.6	41.8
1992	4.4	28.9	37.5	13.6	15.6
1993	4.1	28.9	53.6	0.1	13.2
1994	4.3	24.0	54.6	0.0	17.1
1995	3.2	16.2	68.5	0.8	11.3
1996	4.2	11.8	82.8	1.1	0.2
1997	4.9	12.9	80.7	1.4	0.0
1998	3.2	8.8	87.0	1.0	0.0
1999	2.7	7.2	88.3	1.8	0.0
2000	2.7	7.7	84.6	5.0	0.0
2001	2.3	4.3	87.1	6.3	0.0
2002	2.5	5.2	85.5	6.7	0.0
2003	2.7	10.0	77.0	10.3	0.0
2004	4.0	4.4	75.3	16.3	0.0
2005	6.1	3.2	74.1	16.6	0.0
2006	6.1	2.8	69.8	21.2	0.0
2007	4.9	2.9	67.8	24.4	0.0
2008	4.6	2.2	60.7	32.5	0.0

Table C.43 Distribution of electric clothes dryers by average annual UEC and region/province, 2004–2008

Region/Province	kWh/yr									
	350–799.9					800–899.9				
	2004	2005	2006	2007	2008	2004	2005	2006	2007	2008
			(%)					(%)		
Canada	4.0	6.1	6.1	4.9	4.6	4.4	3.2	2.8	2.9	2.2
Atlantic and Quebec	1.8	3.7	3.9	3.0	3.4	3.6	2.6	2.0	2.1	3.2
Ontario	5.9	7.9	7.2	5.7	5.4	6.3	4.7	4.2	4.3	2.9
Prairies	2.8	4.6	4.9	3.8	3.8	3.4	2.1	1.9	1.9	1.3
British Columbia and Territories	9.4	14.8	14.7	12.0	11.0	5.5	3.3	3.0	3.4	2.2

Region/Province	kWh/yr									
	900–949.9					950–999.9				
	2004	2005	2006	2007	2008	2004	2005	2006	2007	2008
			(%)					(%)		
Canada	75.3	74.1	69.8	67.8	60.7	16.3	16.6	21.2	24.4	32.5
Atlantic and Quebec	82.1	81.0	79.4	76.3	77.4	12.4	12.7	14.7	18.6	16.0
Ontario	69.7	69.9	66.4	64.4	57.2	18.1	17.5	22.1	25.6	34.5
Prairies	74.8	72.9	63.2	63.0	57.6	19.0	20.4	29.9	31.3	37.2
British Columbia and Territories	65.1	64.6	62.9	63.1	55.3	19.9	17.4	19.5	21.6	31.4

Table C.44 Distribution of electric clothes dryers by channel and region/province, 2004–2008

Region/Province	Builder					Retail				
	2004	2005	2006 (%)	2007	2008	2004	2005	2006 (%)	2007	2008
Canada	6.3	6.1	5.9	6.3	6.1	93.7	93.9	94.1	93.7	93.9
Atlantic and Quebec	2.0	1.9	1.5	1.6	1.6	98.0	98.1	98.5	98.4	98.4
Ontario	7.2	6.4	6.4	6.9	5.4	92.8	93.6	93.6	93.1	94.6
Prairies	8.9	8.5	8.1	8.2	8.9	91.1	91.5	91.9	91.8	91.1
British Columbia and Territories	18.9	17.3	15.4	15.7	18.6	81.1	82.7	84.6	84.3	81.4

Table C.45 Average annual UEC of electric clothes dryers, 1990–2008

Model year	kWh/yr
1990	1102.6
1991	1108.7
1992	983.3
1993	928.5
1994	910.4
1995	909.1
1996	887.4
1997	887.3
1998	900.2
1999	907.5
2000	909.8
2001	916.3
2002	915.6
2003	914.2
2004	911.9
2005	903.8
2006	904.6
2007	912.1
2008	916.0

Table C.46 Average annual UEC of electric clothes dryers by channel and region/province, 2004–2008

Region/Province	Builder					Retail				
	2004	2005	2006 (kWh/yr)	2007	2008	2004	2005	2006 (kWh/yr)	2007	2008
Canada	843.1	832.2	821.4	838.2	842.5	916.5	908.5	909.7	917.0	920.8
Atlantic and Quebec	836.2	827.3	868.6	883.9	851.4	924.1	917.0	915.6	920.3	924.7
Ontario	817.1	796.4	803.1	829.2	842.7	907.7	900.5	904.9	913.2	916.0
Prairies	870.1	865.3	853.7	876.1	866.2	923.6	918.0	918.7	924.0	927.0
British Columbia and Territories	851.3	838.9	783.7	776.3	807.3	892.1	865.2	877.2	896.4	902.4

Table C.47 Energy consumption of all shipped appliances, with and without improvements in energy efficiency, 1992–2008

Model year	Actual energy consumed (PJ)	Energy consumed without improvements in energy efficiency (PJ)
1992	6.3	6.3
1993	12.5	13.0
1994	18.6	20.3
1995	24.2	27.1
1996	30.1	34.4
1997	36.6	42.4
1998	43.4	50.8
1999	50.8	60.3
2000	58.2	69.8
2001	65.3	79.4
2002	72.9	90.0
2003	79.9	100.6
2004	86.3	111.5
2005	91.8	122.3
2006	96.2	131.9
2007	100.5	142.2
2008	104.0	151.7

Table C.48 Energy savings by shipped appliance, 1992–2008

Model year	Refrigerators	Freezers	Dishwashers	Electric ranges	Clothes washers	Electric clothes dryers	Total with retirement factor
				(PJ)			
1992	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
1993	0.3	0.0	0.0	0.0	0.1	0.1	**0.5**
1994	0.8	0.1	0.1	0.0	0.4	0.2	**1.7**
1995	1.3	0.1	0.4	0.0	0.8	0.3	**2.9**
1996	1.9	0.2	0.7	0.0	1.1	0.4	**4.3**
1997	2.4	0.2	1.1	0.0	1.6	0.5	**5.8**
1998	3.0	0.3	1.4	0.0	2.1	0.6	**7.5**
1999	3.7	0.3	1.8	0.1	2.7	0.8	**9.5**
2000	4.5	0.4	2.3	0.1	3.4	0.9	**11.6**
2001	5.5	0.5	2.7	0.1	4.3	1.0	**14.0**
2002	6.7	0.5	3.3	0.2	5.2	1.1	**17.1**
2003	8.1	0.6	4.0	0.3	6.3	1.3	**20.7**
2004	9.6	0.7	5.0	0.7	7.8	1.4	**25.2**
2005	11.1	0.7	6.0	1.2	9.8	1.6	**30.5**
2006	12.5	0.8	7.1	1.7	11.8	1.8	**35.7**
2007	13.9	0.9	8.2	2.4	14.3	2.0	**41.7**
2008	15.3	0.9	9.3	3.1	16.9	2.1	**47.7**