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ENERGY CONSUMPTION
of Major Household Appliances Shipped in Canada

Trends for **1990–2010**

Canada

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Leading Canadians to Energy Efficiency at Home, at Work and on the Road

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Foreword

Since 1996, as part of the National Energy Use Database initiative, the Canadian Appliance Manufacturers Association (CAMA) has provided the Office of Energy Efficiency (OEE) of Natural Resources Canada (NRCan) with annual appliance shipment data for the six major household appliance categories: refrigerators, freezers, dishwashers, electric ranges, clothes washers and electric clothes dryers.

Through CAMA's considerable efforts, analysis for the past two years includes additional freezer and compact refrigerator data received from its members. These data reflect changes in the freezer marketplace and more comprehensive information on compact refrigerators.[1] The OEE thanks the participating manufacturers and CAMA for their co-operation in this project.

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 (EFC), chosen by CAMA, as the third party.

Each model's shipments were matched to their associated unit energy consumption (UEC) ratings found in the NRCan searchable product model listings.[2] The average annual shipment-weighted UEC was then calculated for each appliance category. This report analyses these data for the six major household appliance categories shipped in Canada between 1990 and 2010. Appendix A describes the database preparation process conducted by EFC and the methodology used in this report.

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

CAMA closes

On May 11, 2012, EFC announced that the CAMA council would close effective June 30, 2012. To continue to provide and/or enhance the quality and representation of the energy efficiency data on new appliances in Canada, the OEE is exploring options to maintain the coverage of the Canadian market.

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

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[1] The effects of this extra compact refrigerator and freezer data are discussed further in chapters 2 and 3 of this report.

[2] **oee.nrcan.gc.ca/publications/infosource/pub/appliances/2533**

Highlights

The *Energy Consumption of Major Household Appliances Shipped in Canada* contains an analysis of the shipment data for major household appliances (refrigerators, freezers, dishwashers, electric ranges, clothes washers and electric clothes dryers) between 1990 and 2010. These data were collected through the co-operation of the Canadian Appliance Manufacturers Association (CAMA) and represent approximately 90 percent of shipments to Canadian retailers and builders during this period.

Highlights of this report include the following:

- The reduction in average annual unit energy consumption (UEC) ranged from 6 percent (electric clothes dryers) to 82 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)
  - continual strengthening of ENERGY STAR® technical specifications
  - 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
  - various incentives and rebates offered by the provincial/territorial and municipal governments and utilities
- A household operating an average set of major household appliances purchased in 2010 might expect them to consume fewer than 2800 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[3] and 2010. In 2010, the estimated energy savings exceeded 60 petajoules[4] (or 16.7 billion kWh) – the equivalent of one year's energy for approximately 570 000 households.
- In 2010, 59 percent of refrigerators, 79 percent of dishwashers[5] and 66 percent of clothes washers were ENERGY STAR qualified.
- The majority of appliances in Canada (between 83 and 96 percent) were shipped to retailers in 2010. British Columbia had a larger share of appliances shipped to builders than did the rest of the jurisdictions.

[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.

[4] One petajoule (PJ) equals 277. 8 million kWh.

[5] The noticeable drop in the number of ENERGY STAR qualified dishwasher shipments (12 percent) reflects changes to the regulations for this appliance, effective August 20, 2009.

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Introduction

The *Energy Consumption of Major Household Appliances Shipped in Canada, Trends for 1990–2010* outlines changes in the energy consumption and other characteristics of major household appliances shipped in Canada between 1990 and 2010.

The report is based on the shipments of the six major household appliance categories: refrigerators, freezers,[6] 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 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.

Structure 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.
- 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 provides detailed tables to support the charts and figures.
- Appendix B includes definitions of the various types of refrigerators and freezers.
- Appendix C describes the database preparation process conducted by Electro-Federation Canada and the methodology used in this report.
- Appendix D is a glossary of key terms.

[6] 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.

Background

1

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). Although 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) required by the *Energy Efficiency Regulations* (the Regulations) and ongoing amendments
- continual strengthening of ENERGY STAR® technical specifications
- information programs to help consumers identify energy-efficient products, such as the EnerGuide for Equipment program and the ENERGY STAR® Initiative in Canada
- 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 ENERGY STAR Initiative in Canada (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 and labelling programs that are based on the requirements of Canada's *Energy Efficiency Regulations* (the Regulations).[7] 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 consultations with provincial and territorial governments, affected industries, utilities, environmental groups and others. 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.

NRCan regularly amends the Regulations to strengthen the minimum energy performance requirements for prescribed products when the market has achieved a higher level of efficiency.

[7] Natural Resources Canada, *Improving Energy Performance in Canada, Report to Parliament Under the* Energy Efficiency Act *for the Fiscal Year 2010–2011*, (Ottawa: 2012), p. 25, **oee.nrcan.gc.ca/parliament10-11**.

The Regulations are also amended to add new products, harmonize minimum energy performance requirements with those of other jurisdictions and update testing methodologies and labelling requirements.

Before amending the Regulations, NRCan conducts studies to determine how a proposed change will affect the market. A key criterion for amending the Regulations is that the change must have a significant positive impact on consumers and the environment. Stakeholders are consulted on all proposed changes to the Act and the Regulations, as well as on their practical application in the marketplace.

The Act and Regulations also support various labelling initiatives. These initiatives require that an EnerGuide label be displayed on major electrical household appliances. The label must show the estimated annual UEC of the product in kilowatt hours and compare it with the most efficient and least efficient models of the same class and size. EnerGuide directories that have energy ratings for major appliances are published each year and distributed to consumers, retailers and appliance salespeople.[8]

For a complete list of the chronology of amendments to the MEPS, see **http://laws-lois.justice.gc.ca/eng/regulations/SOR-94-651/page-10.html#h-13** and for major milestones concerning ENERGY STAR specifications, see **www.energystar.gov/index.cfm?c=about.ab_milestones**. For more information about the Regulations, visit **oee.nrcan.gc.ca/regulations/11239**.

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 (OEE) administers the initiative in 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.[9] Note that the ENERGY STAR specifications do not exist for electric ranges or electric clothes dryers because few energy savings are possible with most of these products consuming similar amounts of energy.

Refrigerators

Standard and compact refrigerators must be at least 20 percent more efficient than the federal MEPS in the Regulations to qualify for the ENERGY STAR mark.

ENERGY STAR qualified refrigerators typically have a more energy-efficient compressor and better insulation than conventional models. They may also have an "Energy Saver" switch that allows consumers to adjust how much energy the refrigerator use to keep food fresh.

Freezers

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

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[8] Searchable lists of models are available at **oee.nrcan.gc.ca/publications/infosource/pub/appliances/2533**.

[9] Source: Natural Resources Canada, *2011 EnerGuide Appliance Directory*, pp. 34, 156, 220 and 246.

Dishwashers

To qualify for the ENERGY STAR mark, dishwashers must achieve energy efficiency levels that are at least 17 percent higher than Canada's minimum regulated standard. Compact dishwashers must be at least 15 percent more efficient.

In 2010, ENERGY STAR qualified dishwashers used 20 to 50 percent less energy and 35 to 50 percent less water than standard models.

ENERGY STAR qualified standard dishwashers must meet a maximum total annual energy consumption (TAEC) of 295 kWh/year and a maximum water factor (WF) of 16.09 litre/cycle (L/cycle) (4.25 gallons/cycle [gal./cycle]). Compact dishwashers require a maximum TAEC of 222 kWh/year and a maximum WF of 13.25 L/cycle (3.5 gal./cycle). TAEC takes into consideration the annual energy use and stand-by energy.

Many ENERGY STAR dishwashers use "smart" sensors that match the wash cycle and the amount of water to each load. They may 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 cubic feet [cu. ft.]) – and at least 59 percent more efficient than Canada's MEPS.

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 energy needed for drying.

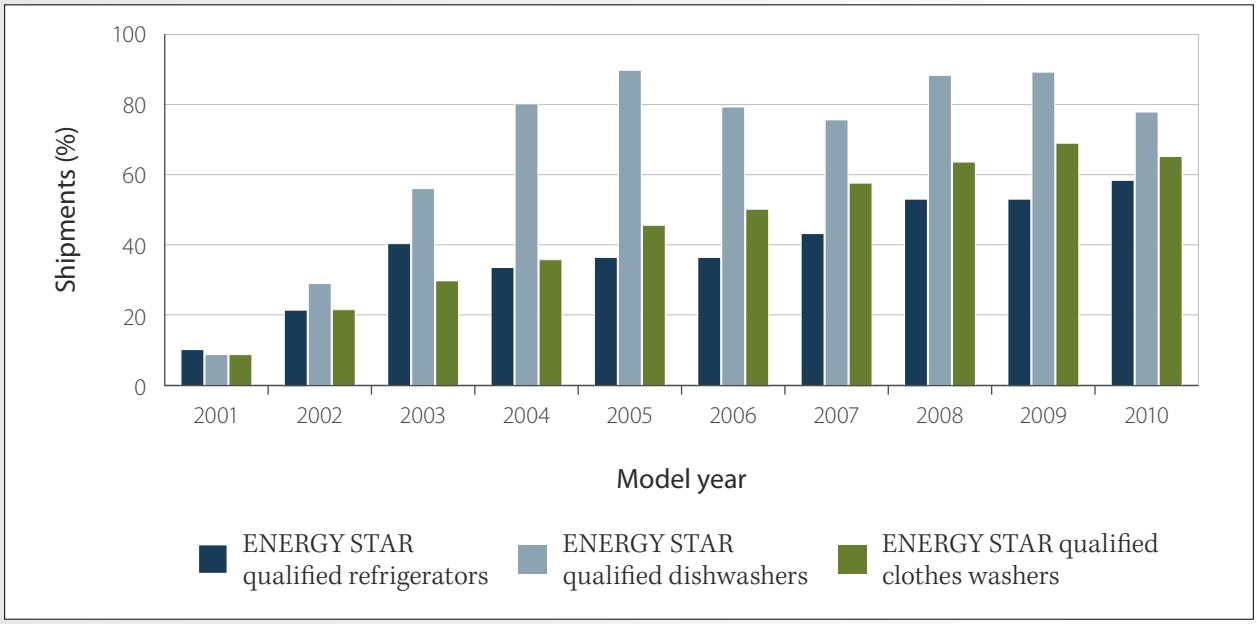
ENERGY STAR qualified residential clothes washers and residential-style commercial clothes washers must have a minimum modified energy factor (MEF) of 56.6 L/kWh per cycle (2.0 cu. ft./kWh per cycle) and a maximum WF of 0.8 L/cycle per litre (6.0 gal./cycle per cubic foot). The MEF includes a calculation that takes into account the amount of energy used by an electric clothes dryer. 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.

Penetration of ENERGY STAR qualified appliances over time

In 2001, Canada officially adopted the ENERGY STAR registered symbol to designate the most energy-efficient appliances. Figure 1 summarizes the penetration rate of ENERGY STAR qualified appliances since they began appearing on the market. By 2010, 59 percent of refrigerators, 79 percent of dishwashers[10] and 66 percent of clothes washers shipped in Canada were ENERGY STAR qualified. Because the data for freezers are less comprehensive and therefore less representative of the Canadian market, their share of ENERGY STAR shipments is not shown.

[10] The noticeable drop in the number of ENERGY STAR qualified dishwasher shipments (12 percent from 2009 to 2010) reflects changes in the Regulations for this appliance effective August 20, 2009.

Figure 1 – ENERGY STAR qualified appliances as a percentage of total shipments in Canada, 2001–2010

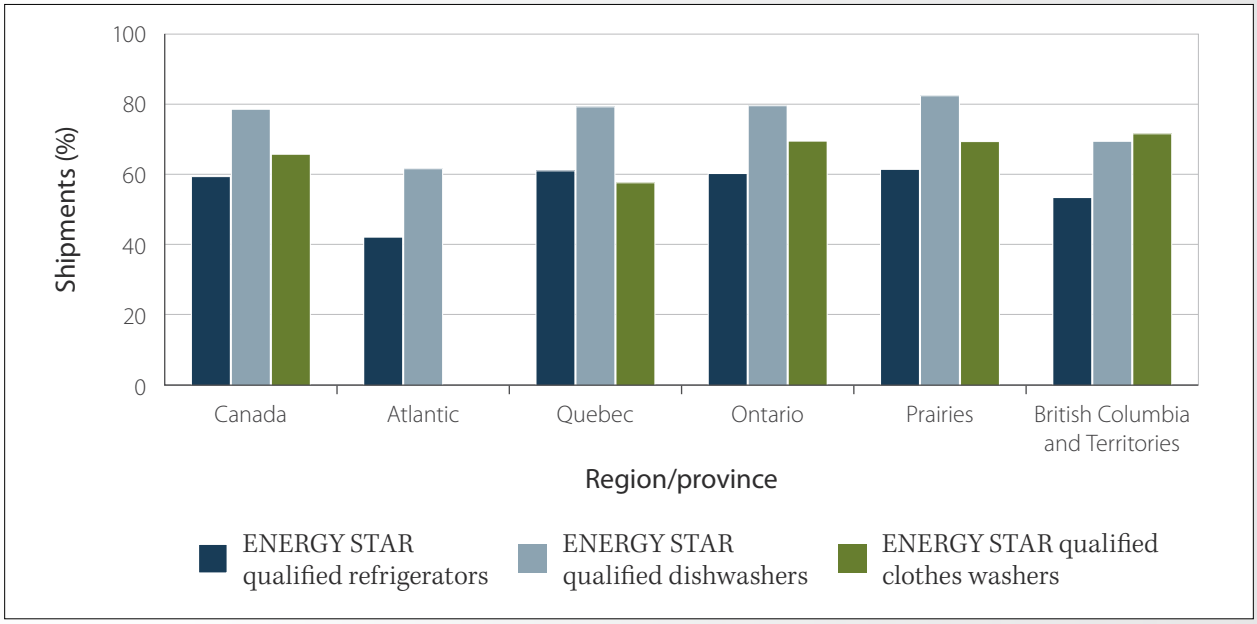


Penetration of ENERGY STAR qualified appliances among regions

Figure 2 shows the breakdown by region/province for each appliance category covered by the ENERGY STAR Initiative in 2010 (excluding freezers). The portion of ENERGY STAR qualified shipments was generally similar in Ontario and the Prairies to that of the national average, while it was somewhat lower in the Atlantic provinces.

Quebec's share of ENERGY STAR clothes washers was slightly lower, but that of refrigerators and dishwashers was in line with the rest of the country. In British Columbia, the penetration rate of ENERGY STAR clothes washers was higher than the Canadian average, while that of refrigerators and dishwashers was lower.

Figure 2 – ENERGY STAR qualified appliances as a percentage of total shipments by region/province, 2010



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

Energy consumption of ENERGY STAR qualified appliances

Table 1 shows the average annual UEC of ENERGY STAR qualified and non-ENERGY STAR qualified appliances from 2000 to 2010. In 2010, the average ENERGY STAR qualified clothes washer consumed 54 percent less energy than the average non-ENERGY STAR qualified one. This substantial difference was not evidenced for refrigerators or dishwashers.

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 occurred partly because ENERGY STAR qualified refrigerators were larger, on average, than non-ENERGY STAR qualified refrigerators. In addition, changes to the ENERGY STAR specifications occurred in December 2001 and January 2004, and the market needed time to adjust to these new specifications.

Table 1 – Average annual UEC of ENERGY STAR qualified and non-ENERGY STAR qualified major household appliances, 2000–2010 (kWh/yr)

Appliance	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Refrigerators											
Total refrigerators	**639**	**559**	**506**	**487**	**478**	**469**	**481**	**483**	**467**	**430**	**425**
Non-ENERGY STAR qualified refrigerators	..	567	505	491	482	469	485	486	479	442	432
ENERGY STAR qualified refrigerators	..	495	509	481	469	470	475	480	457	420	420
Dishwashers											
Total dishwashers	**637**	**634**	**592**	**524**	**457**	**396**	**373**	**354**	**343**	**325**	**310**
Non-ENERGY STAR qualified dishwashers	639	644	635	617	606	568	402	377	374	350	313
ENERGY STAR qualified dishwashers	553	534	492	452	422	378	365	347	339	322	309
Clothes washers											
Non-ENERGY STAR qualified front-loading clothes washers	n/a	n/a	316	362	321	276	282	241	382*	379*	192
ENERGY STAR qualified front-loading clothes washers	n/a	n/a	300	274	258	217	201	183	178	172	145
Non-ENERGY STAR qualified top-loading clothes washers	n/a	n/a	916	892	746	636	581	425	399	353	357
ENERGY STAR qualified top-loading clothes washers	n/a	n/a	287	337	302	317	301	311	290	251	205
Total clothes washers	**838**	**810**	**779**	**708**	**573**	**444**	**390**	**287**	**261**	**234**	**217**
Non-ENERGY STAR qualified clothes washers	n/a	n/a	915	891	746	627	575	422	399	353	338
ENERGY STAR qualified clothes washers	n/a	n/a	299	294	267	228	211	191	185	181	154

.. stands for not applicable

n/a stands for not available

* Non-ENERGY STAR qualified units accounted for less than 1 percent of shipments of front-loading washers in 2008 and 2009. Therefore, the average annual UEC is based on a very small number of shipments.

The higher penetration rate of ENERGY STAR qualified dishwashers may be due to availability and affordability. 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 specifications for dishwashers introduced in January 2007 and August 2009 explains the decreases of their penetration rate shown in Figure 1. Similarly, the increase in stringency of the ENERGY STAR specifications for refrigerators introduced in January 2004 explains the decrease of their penetration rate at that time.

1.3 Role of CAMA

The members of the Canadian Appliance Manufacturers Association (CAMA) 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 major appliances in Ontario[11] found that between 95 percent and 99 percent of end-of-life major appliances were collected for recycling and that between 83 percent and 89 percent of the component materials were diverted from landfills. These recycling rates place Canada among the most successful countries in the world for white goods diversion.

The major appliance recycling system is so successful largely because most household appliances comprise a significant amount of valuable materials such as steel, aluminum, copper and zinc. This content makes major appliances unique when compared to virtually all other waste electronic and electrical equipment (WEEE) in that recycling major appliances is actually a profitable activity that does not require government or industry subsidy. The value of the materials contained in major appliances has enabled municipalities, retailers and private scrap-metal dealers to profitably collect and sell end-of-life major appliances into a market-driven major appliance recycling industry in which the metals are recovered for manufacturing into new metals-based products.

The significant reduction in the energy consumption over the years is a result of 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.

Major appliance manufacturers have invested significantly in research and development to produce appliances that are more energy-efficient and water-use efficient at more affordable prices. The benefit to society will increase as the existing stock of major appliances in Canadian homes is replaced with newer versions.

In a tough economic climate, consumers continue to value the environment in their purchase decisions. Innovation combined with energy efficiency are drivers as the appliance sector continues to bring into the market design options that are easier to use, reduce average household energy consumption and are more effective than ever before. These options include new display technologies and smart appliances.

CAMA and its member companies take environmental issues seriously. They have taken significant steps to minimize the impact that household appliances have on the environment while meeting consumer needs. Improvements made by the appliance manufacturers, in conjunction with their material and component suppliers, include the following:

- **refrigerators and freezers** – improved condensers, compressors, evaporators, fan motors, door seals and foam insulation
- **dishwashers** – better insulation, spray arms and filtering systems; and the 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; and front-loading clothes washers
- **electric clothes dryers** – automatic termination controls that eliminate excessive drying and provide more effective water extraction in the washing machine, which results in a shorter drying time.

[11] The study undertaken by SBR International on behalf of CAMA concluded in March 2009.

Refrigerators

2

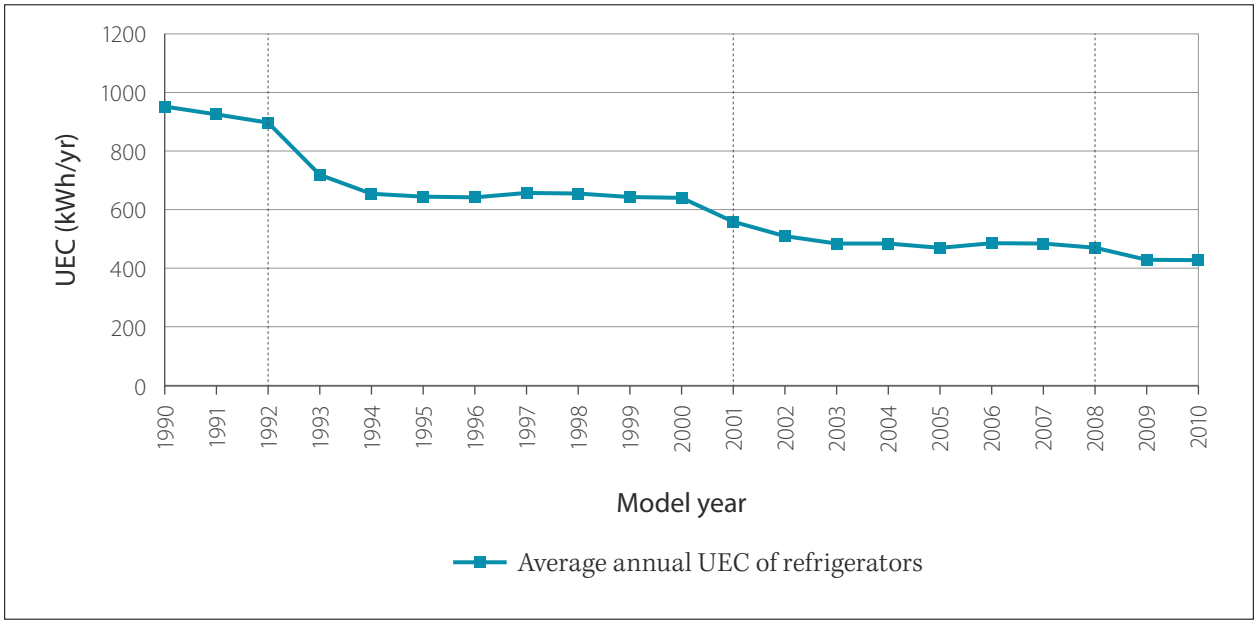
2.1 Overview

This chapter examines refrigerator shipment data in Canada from 1990 to 2010. Section 2.2 analyses the improvement of unit energy consumption (UEC) over this period, and subsequent sections study specific characteristics of refrigerators and their influence on energy consumption. The shipment data are first examined by type (Section 2.3), by volume (Section 2.4), by energy consumption per volume (Section 2.5) and by distribution channel (retail sales versus builder sales)[12] (Section 2.6).

2.2 Average annual unit energy consumption by model year

As shown in Figure 3, a refrigerator shipped in 2010 consumed (on average) significantly less energy than one shipped in 1990; the average UEC decreased by over half during this period, from 956 to 425 kilowatt hours per year (kWh/yr).

Figure 3 – Average annual UEC of refrigerators, 1990–2010



Note: The vertical lines shown in 1992, 2001 and 2008 refer to the introduction of and subsequent amendments to the MEPS for refrigerators.

[12] **Retail sales** include those by 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 CAMA member companies. **Builder sales** include those to home, row house or apartment builders; motels; governments; trailer manufacturers; and property managers.

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 to 2002 (coinciding with the 2001 amendment to the MEPS). From 2003 to 2007, energy consumption remained relatively stable; however, since 2007, it decreased from 483 to 425 kWh/yr (12 percent). This latest improvement in average annual UEC is most likely related to the ENERGY STAR® specification update in April 2008 because manufacturers implemented further improvements to this appliance to qualify for the new specification.

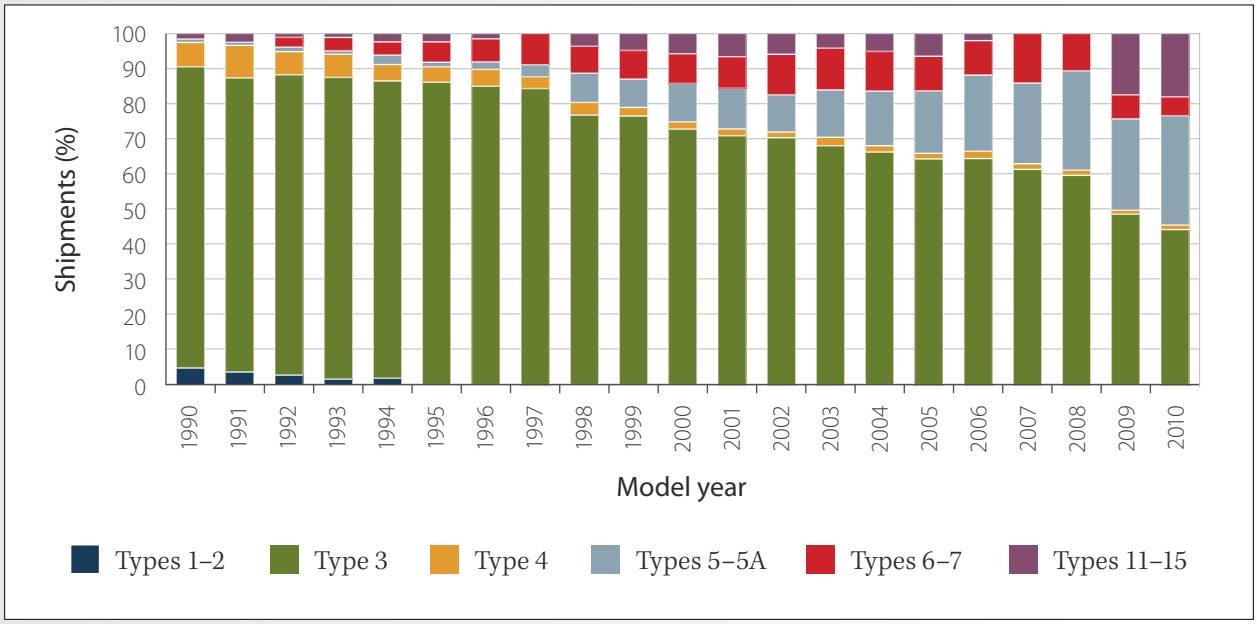
2.3 Distribution of shipments by type

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 standard (full-size) with and without automatic defrost (with and without through-the-door ice service) and compact models.[13] Table 2 presents the market share of each refrigerator type in 2010, as well as a definition of each type. The standard-size refrigerator types with the greatest market share in 2010 were Type 3 (45 percent), Type 5 (27 percent) and Type 7 (5 percent). Substantial supplementary data received from compact refrigerator manufacturers in 2010 show an 18 percent market share for compact models in that year (see Table A.4 in Appendix A).

Figure 4 shows the change in type of refrigerators (standard-size and compact) shipped from 1990 to 2010 (see also Table A.3 in Appendix A). During this period, the share of Type 3 (with top-mounted freezers) shipments decreased substantially (from 86 percent to 54 percent of standard-size refrigerators) and was largely replaced by Type 5 refrigerators. Type 5 refrigerators – those with bottom-mounted freezers – grew increasingly popular over the period, reaching 33 percent of shipments of standard-size refrigerators in 2010 (up from 1 percent in 1990).

Figure 4 – Distribution of refrigerators by type, 1990–2010



Note: The significant increase in 2009 and 2010 shipments of compact refrigerators (Types 11 to 15) is attributable to the recent supplementary compact refrigerator data provided by refrigerator manufacturers.

[13] Compact refrigerators have a volume of less than 219.5 litres (L) (7.75 cubic feet [cu. ft.]) and a height of less than 91.4 centimetres (cm) (36 inches [in.]).

Table 2 – Distribution of refrigerators by type, 2010

Refrigerator	Type		Market share (%)
Without automatic defrost	1	Refrigerators and refrigerator-freezers with semi-automatic or manual defrost	0.0
	2	Refrigerator-freezers with partial automatic defrost*	0.0
With automatic defrost	3	Refrigerator-freezers with automatic defrost, with top-mounted freezer, without through-the-door ice service and all-refrigerators (with no freezer) with automatic defrost	44.5
	4	Refrigerator-freezers with automatic defrost, with side-mounted freezer, without through-the-door ice service	0.6
	5	Refrigerator-freezers with automatic defrost, with bottom-mounted freezer, without through-the-door ice service	27.1
	5A	Refrigerator-freezers with automatic defrost, with bottom-mounted freezer, with through-the-door ice service	4.1
	6	Refrigerator-freezers with automatic defrost, with top-mounted freezer and through-the-door ice service	0.0
	7	Refrigerator-freezers with automatic defrost, with side-mounted freezer and through-the-door ice service	5.4
Compact	11	Compact refrigerators and refrigerator-freezers with semi-automatic or manual defrost	12.9
	12	Compact refrigerators and refrigerator-freezers with partial automatic defrost	0.6
	13	Compact refrigerator-freezers with automatic defrost and top-mounted freezer as well as compact all-refrigerators (with no freezer) with automatic defrost	4.7
	14	Compact refrigerator-freezers with automatic defrost and with side-mounted freezer	0.0
	15	Compact refrigerator-freezers with automatic defrost and with bottom-mounted freezer	0.0
Total			**100.0**

* Partial automatic defrost is a system in which only the refrigerator portion of the appliance defrosts automatically. The freezer compartment must be defrosted manually.

Slight variations exist in the proportion of refrigerator types shipped to the various regions/provinces, as outlined in Table A.8 in Appendix A. Type 3 refrigerators were slightly more popular in the Atlantic provinces in 2010 compared with the national average, while Type 5 refrigerators were significantly less popular in that region during that year. Also, a larger proportion of compact refrigerators were shipped to consumers in the Atlantic provinces in 2010.

The popularity of different refrigerator types has implications for energy consumption. Figure 5 shows the average annual UEC for Type 3 (standard-size), Type 5 (standard-size) and Type 11 (compact) refrigerators (which were the most popular types in 2010). The energy consumption of Type 3 and Type 5 refrigerators has decreased substantially over time; in 2010, they consumed (on average) 417 and 456 kWh/yr, a 56 percent and 60 percent decrease, respectively. The average annual UEC of Type 11 (compact) refrigerators remained stable from 1990 to 2010.

Figure 5 – Average annual UEC of refrigerators by type, 1990–2010

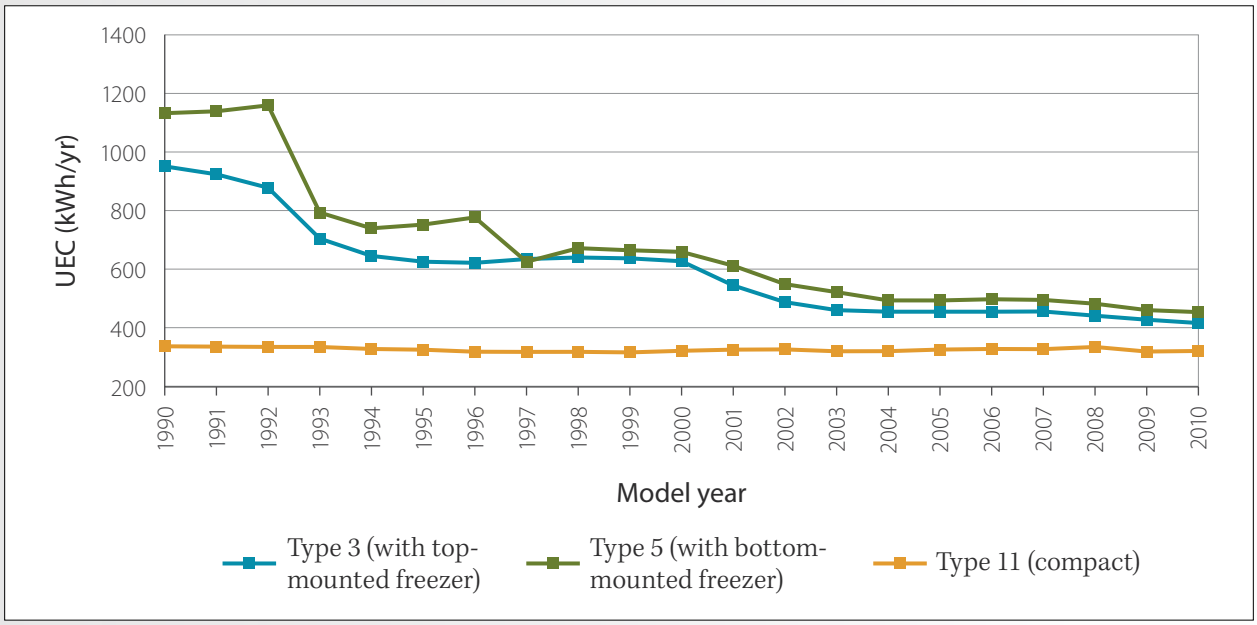
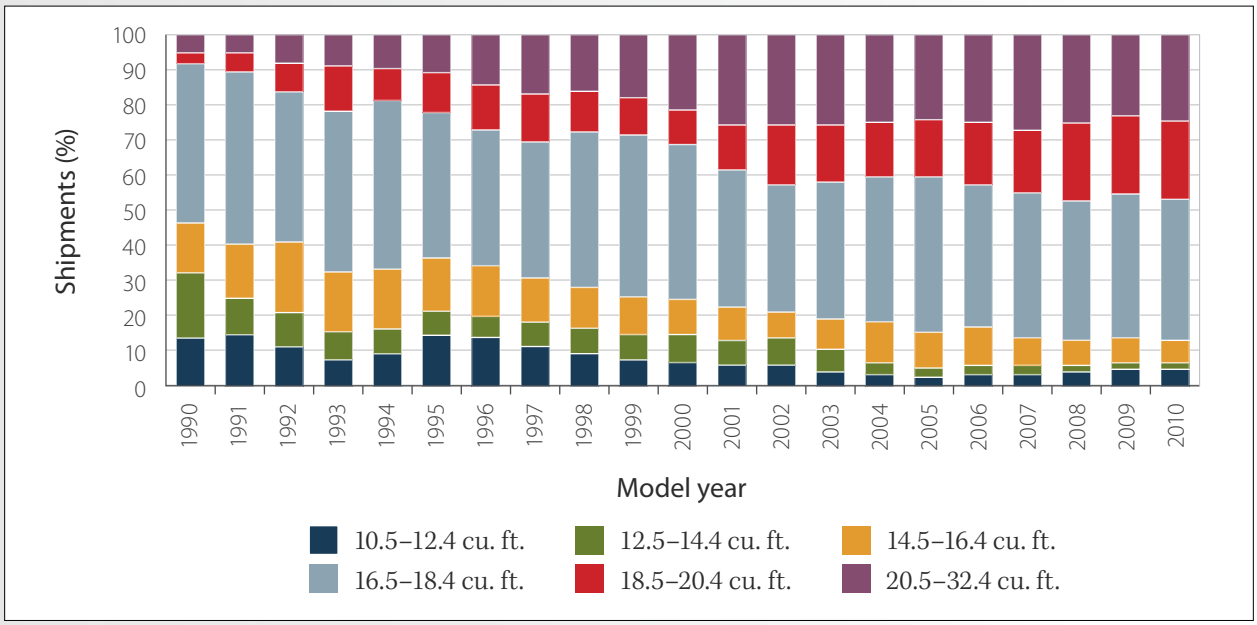


Figure 6 – Distribution of standard-size refrigerators by volume, 1990–2010



Note: Compact refrigerators (those with a volume of less than 10.5 cu. ft.) data are not included in this analysis, due to the supplementary compact refrigerator data received for 2009 and 2010 and their impact on data for previous years.

2.4 Distribution of shipments by volume

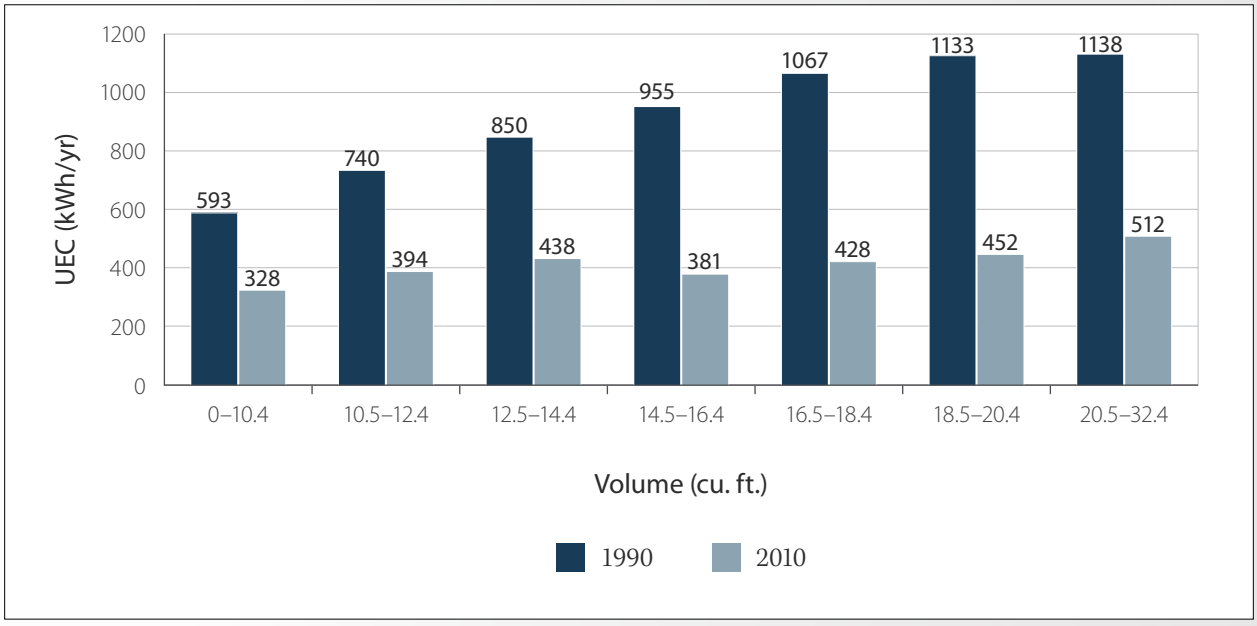
The size of refrigerators shipped in Canada increased significantly from 1990 to 2010. Figure 6 shows that in 1990, only 8 percent of standard-size refrigerators had a volume of 18.5 cubic feet (cu. ft.) or larger. By 2010, this number had increased to 47 percent, and 24 percent of them were 20.5 cu. 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 A.9 in Appendix A summarizes regional shipment data by volume.

Although refrigerators have been getting larger, the average annual UEC of refrigerators has 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 2010, this difference had decreased substantially, with refrigerators in the largest category consuming only 184 kWh/yr more than those in the smallest category.

Figure 7 – Average annual UEC of refrigerators by volume, 1990 and 2010

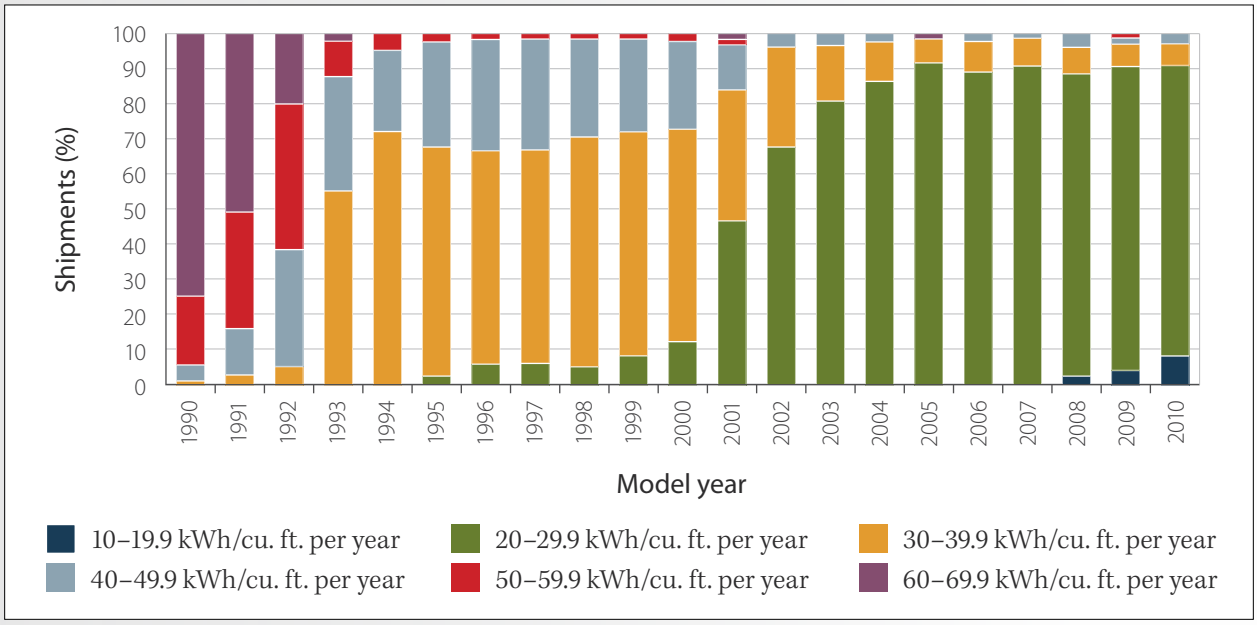


2.5 Distribution of shipments by unit energy consumption per volume

While the average annual UEC of refrigerators shipped between 1990 and 2010 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 standard-size refrigerators by their average annual UEC per cubic foot from 1990 to 2010. Two decades ago, 93 percent of shipped standard-size refrigerators consumed more than 50 kWh/cu. ft. per year, whereas in 2010, 91 percent of them consumed less than 30 kWh/cu. ft. per year. Also in 2010, refrigerators of the lowest energy range (less than 20 kWh/cu. ft. per year) achieved a market penetration of 9 percent. Figure 8 also demonstrates that significant improvements in energy efficiency occurred in 2001. That is when the market penetration of standard-size refrigerators consuming less than 30 kWh/cu. ft. per year increased by 35 percentage points over the previous year and continued to improve in subsequent years. This change corresponds directly with the amendment to the MEPS in July 2001.

Figure 8 – Distribution of standard-size refrigerators by average annual UEC per cubic foot, 1990–2010



Note: Compact refrigerators are not included in this analysis because of the supplementary compact refrigerator data received for 2009 and 2010 and their impact on data for previous years. Although compact refrigerators consume considerably more energy per unit of volume, overall they consume the smallest amount of energy of all refrigerators (see Tables A.13 and A.14 in Appendix A).

Figure 9 – Average annual UEC per cubic foot of standard-size refrigerators by volume, 1990 and 2010

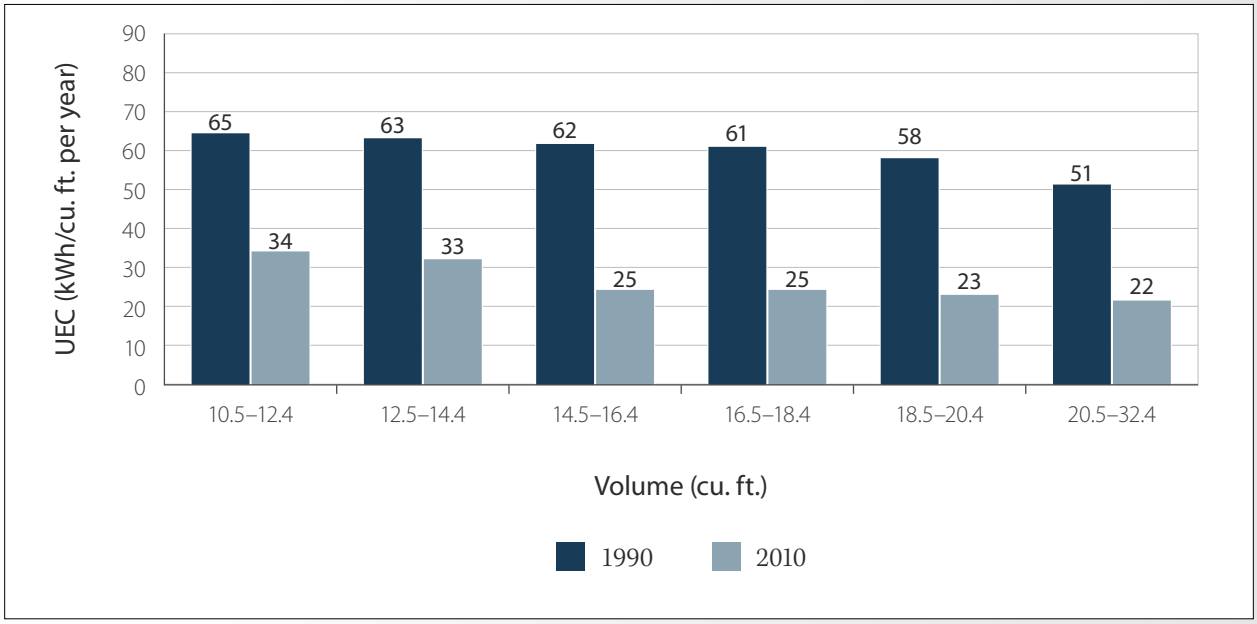


Figure 9 shows the average annual UEC per cubic foot for refrigerators shipped in 1990 and 2010, by volume of refrigerator (see Table A.14 in Appendix A for a complete breakdown by model year). On both an absolute and a proportional basis, energy efficiency improvements per cubic foot were greatest for 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

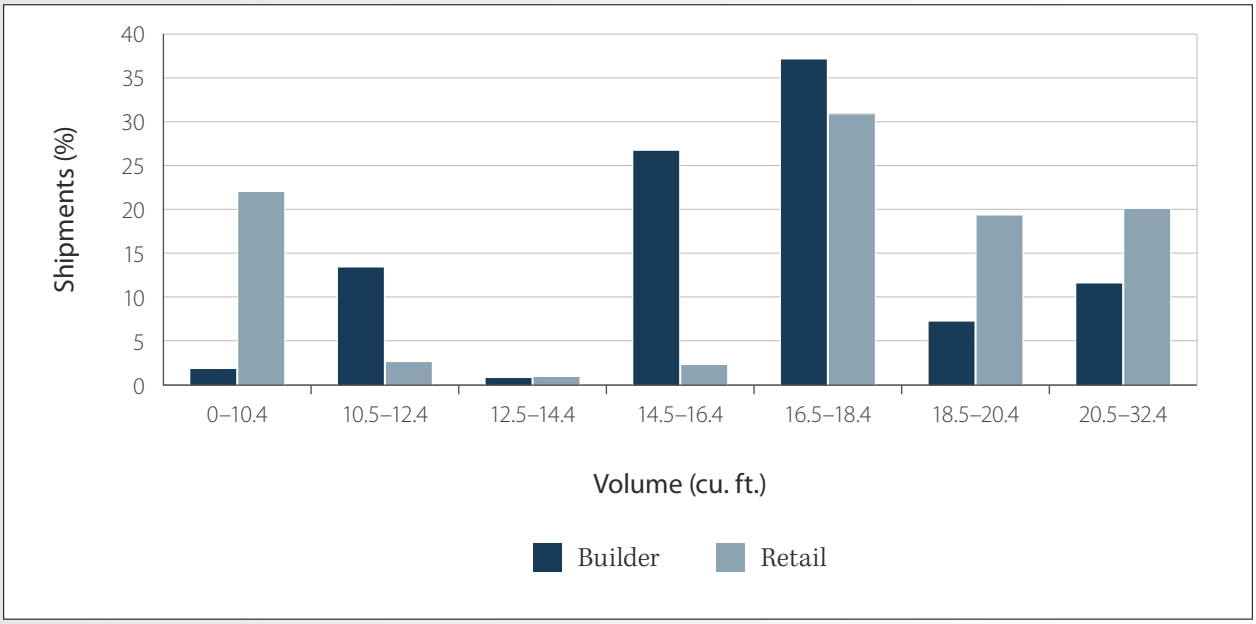
The majority of refrigerators in Canada were shipped to retailers (90 percent) in 2010 (see Table 3). This proportion has fluctuated modestly in recent years and varies among regions (see Table A.8 in Appendix A). Builder shipments were lowest in Quebec (4 percent) and the Atlantic provinces (5 percent) in 2010. That year, the proportion of builder shipments was the highest in British Columbia.

Table 3 – Distribution of refrigerators by channel and region/province, 2010

Region/province	Builder	Retail
	(%)	
Canada	10.2	89.8
Atlantic	5.4	94.6
Quebec	4.0	96.0
Ontario	14.2	85.8
Prairies	9.3	90.7
British Columbia and Territories	17.3	82.7

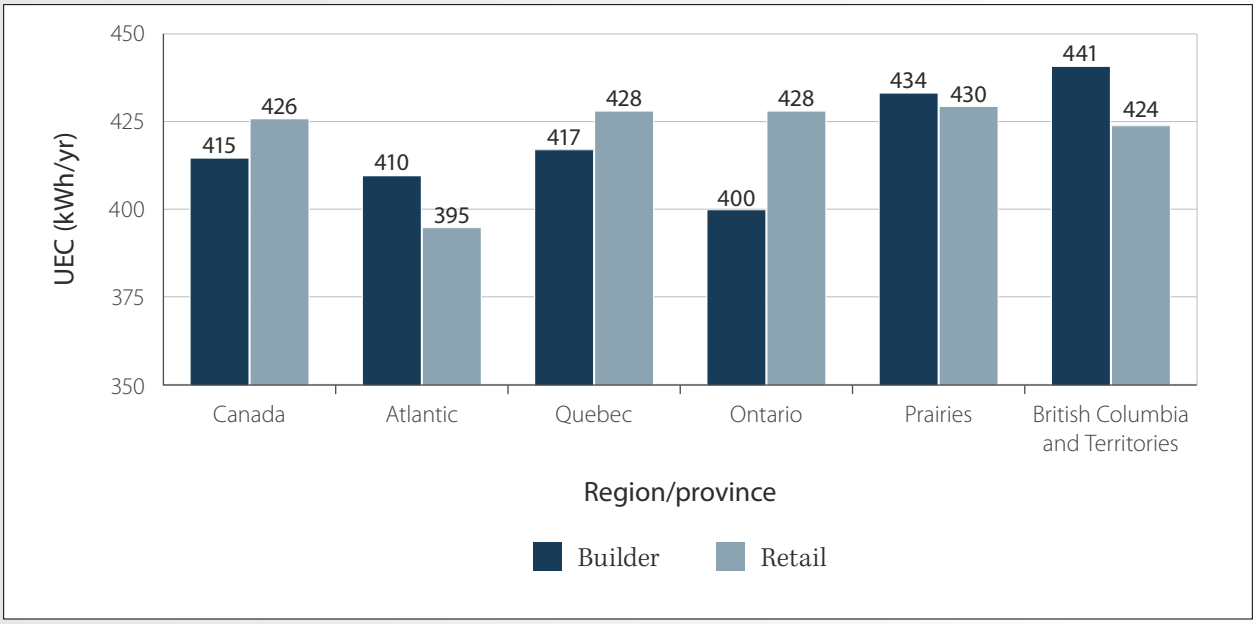
The proportion of builder and retail shipments has implications for energy consumption because refrigerators shipped to builders tend to be smaller (see Figure 10) and therefore consume less energy. In 2010, almost 40 percent of refrigerators shipped to retailers were 18.5 cu. ft. or larger, but less than 20 percent of refrigerators shipped to builders were in this size range.

Figure 10 – Distribution of refrigerators by volume and channel, 2010



In 2010, the average annual UEC of refrigerators shipped to retailers was 426 kWh/yr, whereas that of those shipped to builders was 415 kWh/yr (see Figure 11). The average annual UEC of retail shipments in Ontario and Quebec was higher than that for builder shipments, whereas the opposite was true for the other regions. The difference between the energy consumption of refrigerators shipped to retailers and those shipped to builders was greatest in Ontario (28 kWh/yr) and least in the Prairies (4 kWh/yr). Since 2004, the Canada-wide difference in energy consumption between builder and retail-shipped refrigerators ranged from 3 to 6 percent.

Figure 11 – Average annual UEC of refrigerators by channel and region/province, 2010



DID YOU KNOW?

When buying a refrigerator, top-freezer models are more energy-efficient than bottom-mounted or side-by-side models. Automatic icemakers and through-the-door and internal water dispensers use more energy.

Saving energy and money

- Be sure to read the owner's manual. It has helpful hints on how to operate refrigerators at optimum efficiency.
- Position the refrigerator at least 5 to 7 cm (2 to 3 in.) from the wall so air can move freely around it. Refrigerator motors and compressors generate heat, which requires sufficient space around your refrigerator for continuous airflow. If heat cannot escape, the refrigerator's cooling system has to work extra hard and use more energy.
- Clean the condenser coils regularly so air can circulate. When dust and pet hair build up on a refrigerator's coils, air does not circulate freely so the motor works harder and uses more electricity.
- Position refrigerators away from heat sources such as ovens, dishwashers, direct sunlight and heating vents.
- Set your refrigerator's temperature between 1.7° and 3.3°C (35° and 38°F) and the freezer at –18°C (0°F) for maximum efficiency.
- Do not hold the door open longer than necessary.
- Do not place warm food or containers in the refrigerator; wait until they cool.
- A full refrigerator is a fine thing, but do not overfill it. Restricted air circulation inside reduces energy efficiency.
- Make sure the door seals are clean and tight. They should hold a slip of paper snugly. If the paper slips out easily, replace the seals. Another way to check the seals is by performing the flashlight test: Place a lit flashlight inside the refrigerator and close the door. If you can see light around the door, the seals need to be replaced. Use the flashlight test for your freezers and ovens as well.
- Unplug an older, second refrigerator if you are not using it – it probably uses twice as much energy as your newer one.

Source: Natural Resources Canada, *2011 EnerGuide Appliance Directory*.

Freezers

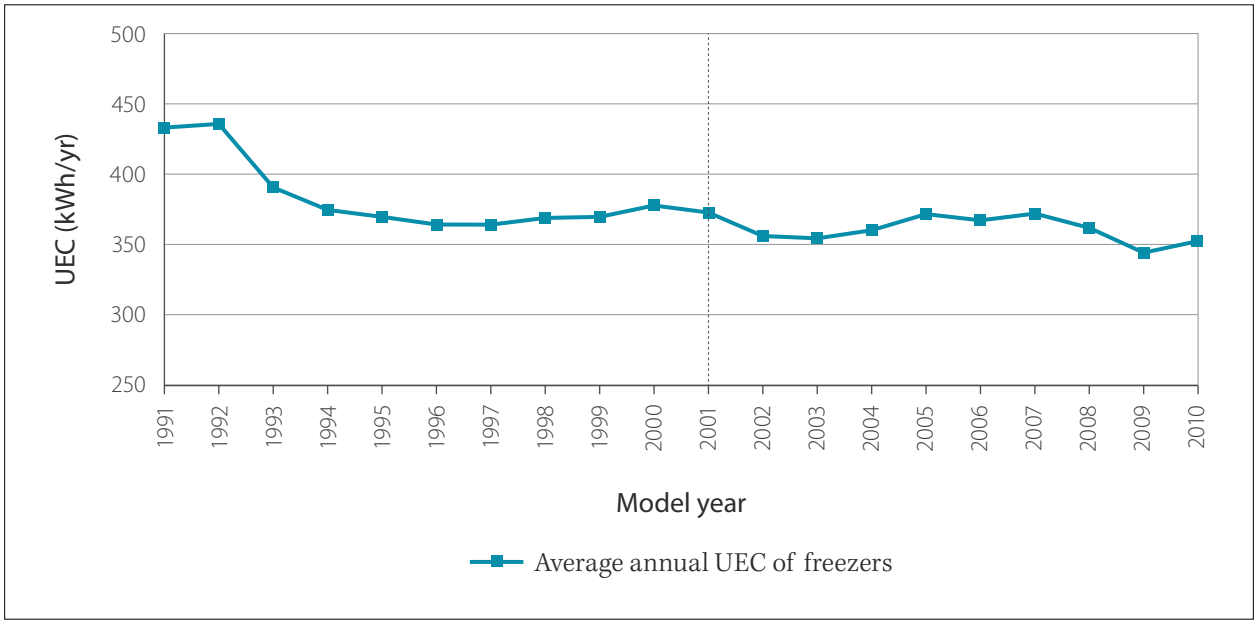
3

3.1 Overview

This chapter examines freezer shipment data in Canada from 1991 to 2010. 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 with caution because they are less comprehensive and 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. Also note that supplementary data received from freezer manufacturers in 2009 and 2010 will help provide a more complete analysis of this appliance over the coming years.

Section 3.2 examines the improvement of unit energy consumption (UEC) of freezers over the study period. Subsequent sections analyse specific characteristics of freezers and their influence on energy consumption. The shipment data are examined by type (Section 3.3), by energy consumption per volume (Section 3.4) and by distribution channel (Section 3.5).

Figure 12 – Average annual UEC of freezers, 1991–2010



Notes:

The vertical line shown in 2001 refers to the amendment to the minimum energy performance standards (MEPS) for freezers.

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.

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 2010. From 1991 to the mid-1990s, energy consumption decreased by about 15 percent. 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. Energy consumption then fluctuated modestly throughout the rest of the period, reaching 366 kilowatt hours per year (kWh/yr) in 2010.

3.3 Distribution of shipments by type

Freezers come in a number of configurations, including upright, chest and compact (see Table 4). In 2010, upright, chest and compact freezers accounted for 38 percent, 19 percent and 42 percent of shipments, respectively.

Figure 13 shows how the share of different types of freezers changed between 1991 and 2010.

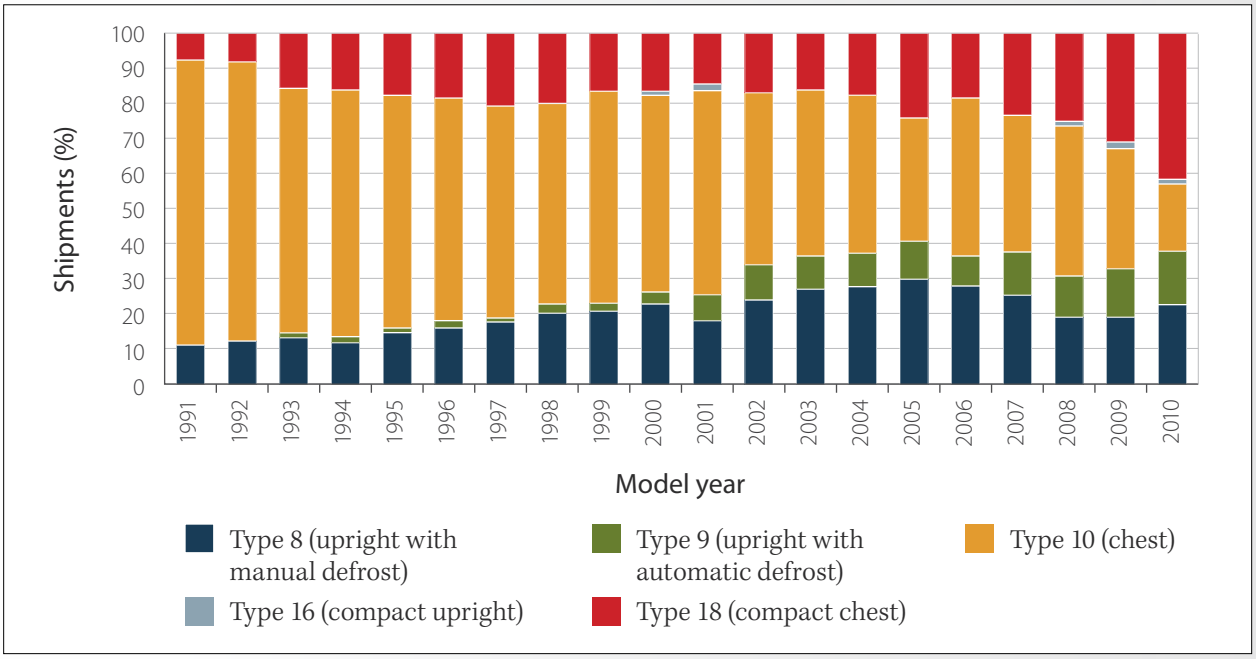
The popularity of full-size chest freezers (Type 10) declined substantially over the period, while that of other types increased. Upright freezers, both with and without automatic defrost, increased from 12 percent of shipments in 1991 to 38 percent in 2010. Shipments of compact freezers (dominated by Type 18) fluctuated over the period, but generally accounted for an increasingly large share of total shipments. Supplementary freezer data received from freezer manufacturers in 2009 and 2010 help provide a more accurate picture of the current freezer market. Table A.19 in Appendix A summarizes the type data by region/province.

The type of freezer affects energy consumption. Figure 14 shows how the average annual UEC of each type of freezer changed from 1991 to 2010. Upright freezers with automatic defrost (Type 9) and upright freezers with manual defrost (Type 8) consumed the greatest amount of energy and accounted for a growing segment of the freezer market. However, the average annual UEC of Type 9 and Type 8 freezers improved the most during this period, especially following the introduction of the MEPS in 1992 and its amendment in 2001. The MEPS had the largest impact on upright freezers. Meanwhile, compact chest freezers (Type 18) consumed the smallest amount of energy.

Table 4 – Distribution of freezers by type, 2010

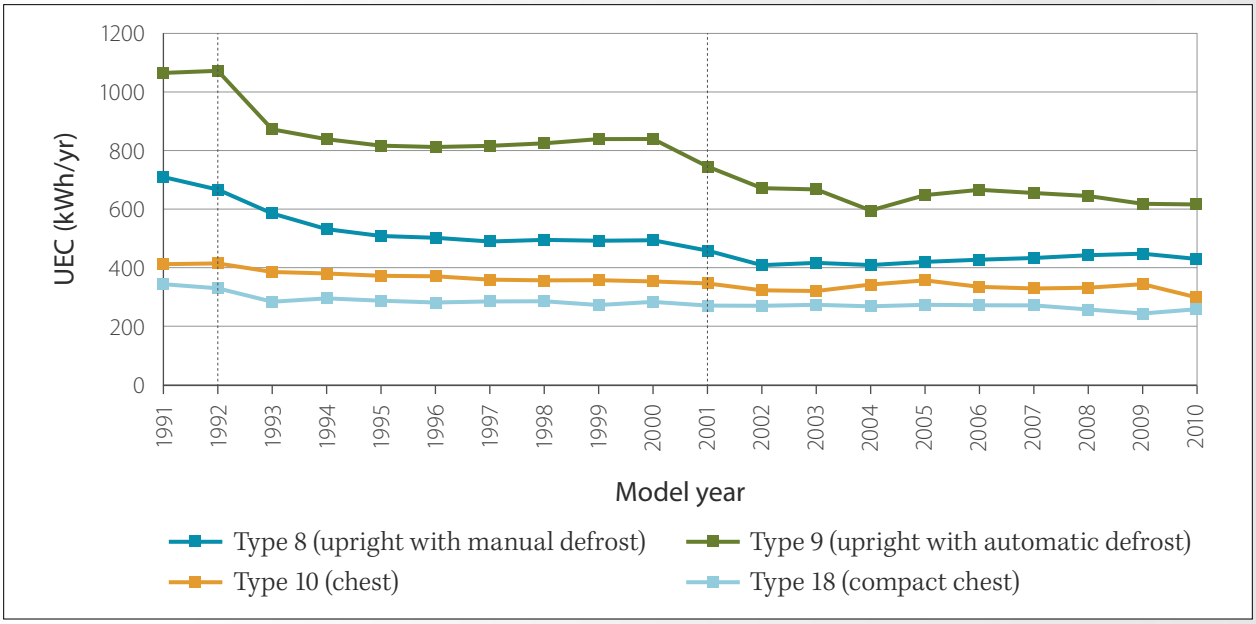
Freezer	Type		Market share (%)
Upright	8	Upright freezers with manual defrost	22.9
	9	Upright freezers with automatic defrost	15.4
Chest	10	Chest freezers and all other freezers not defined as Type 8 or Type 9	19.4
Compact	16	Compact upright freezers with manual defrost	1.0
	17	Compact upright freezers with automatic defrost	0.0
	18	Compact chest freezers and all other compact freezers	41.3
Total			**100.0**

Figure 13 – Distribution of freezers by type, 1991–2010



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 14 – Average annual UEC of freezers by type, 1991–2010

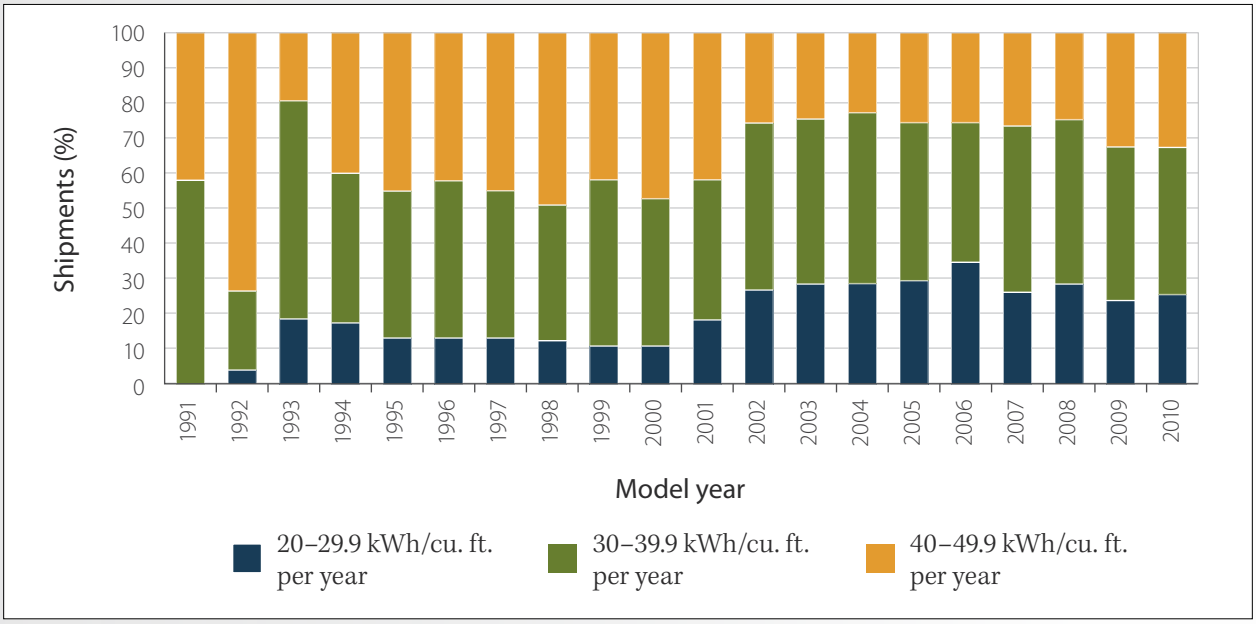


Notes:

The vertical line shown in 1992 and 2001 refers to the introduction of the MEPS and its amendment for freezers.

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 standard-size freezers by average annual UEC per cubic foot, 1991–2010



Notes:

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.

Compact freezers (those with a volume of less than 7.75 cubic feet (cu. ft.) data are not included in this analysis, due to the supplementary compact freezer data received for 2009 and 2010 and their impact on data for previous years.

3.4 Distribution of shipments by unit energy consumption per volume

Figure 15 shows the distribution of standard-size freezers by average annual UEC per cubic foot from 1991 to 2010. The data show that, beginning in 2002, standard-size freezers relied on a smaller amount of energy per volume for their cooling purposes. This improvement coincides with the 2001 amendment to the MEPS. However, the increased popularity of the more energy-consuming upright models caused a slight increase in the market penetration in 2009 and 2010 of those in the higher energy consumption category. Table A.20 in Appendix A disaggregates these data by region/province.

3.5 Distribution of shipments by channel

The majority of freezers in Canada were distributed to retailers (96 percent) in 2010 (see Table 5). The percentage of freezers shipped to builders was lowest in the Atlantic provinces and highest in British Columbia. For a regional breakdown of freezer shipments by channel, see Table A.22 in Appendix A.

Table 5 – Distribution of freezers by channel and region/province, 2010

Region/province	Builder	Retail
	(%)	
Canada	3.7	96.3
Atlantic	0.1	99.9
Quebec	2.8	97.2
Ontario	4.2	95.8
Prairies	4.3	95.7
British Columbia and Territories	6.8	93.2

DID YOU KNOW?

When buying a freezer, chest freezers are generally more energy-efficient than upright models because only a little amount of cold air flows out when you open them. Upright freezers lose cold air because it flows down and out of the freezer when the door is opened. Automatic defrost freezers use more energy than manual defrost models.

Saving energy and money

- Be sure to read the owner's manual. It has helpful hints on how to operate a freezer at optimum efficiency.
- Make sure the door seals are clean and tight. They should hold a slip of paper snugly. If the paper slips out easily, replace the seals. Another way to check the seals is by performing the flashlight test: Place a lit flashlight inside and close the door. If you can see light around the door, the seals need to be replaced. Use the flashlight test for your refrigerators and ovens as well.
- Set the freezer temperature at –18°C (0°F) for maximum efficiency.
- Do not place warm food or warm containers in the freezer; wait until they cool down.
- Position the freezer at least 5 to 7 centimetres (2 to 3 inches) from the wall so air can move freely around it. Freezer motors and compressors generate heat, which requires sufficient space around your freezer for continuous airflow. If heat cannot escape, the freezer's cooling system has to work extra hard and uses more energy.
- Position a freezer away from heat sources, such as ovens, dishwashers, direct sunlight and heating vents.
- Defrost and clean the food compartment at least once a year.
- Clean the condenser coils regularly so air can circulate. When dust and pet hair build up on the coils, air does not circulate freely so the freezer works harder and uses more electricity.

Source: Natural Resources Canada, *2011 EnerGuide Appliance Directory*.

Dishwashers

4

4.1 Overview

This chapter examines dishwasher shipment data in Canada from 1990 to 2010. Section 4.2 examines the improvement in unit energy consumption (UEC) of dishwashers over this period. Subsequent sections analyse specific characteristics of dishwashers and their influence on energy consumption. The shipment data are examined by UEC (Section 4.3) and by distribution 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 2010. Figure 16 shows that during this period, the average annual UEC of shipped dishwashers decreased by 70 percent, from 1026 to 310 kilowatt hours per year (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, a period coinciding with the 2004 amendment to the MEPS.

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.[14] 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 63 percent over the period.

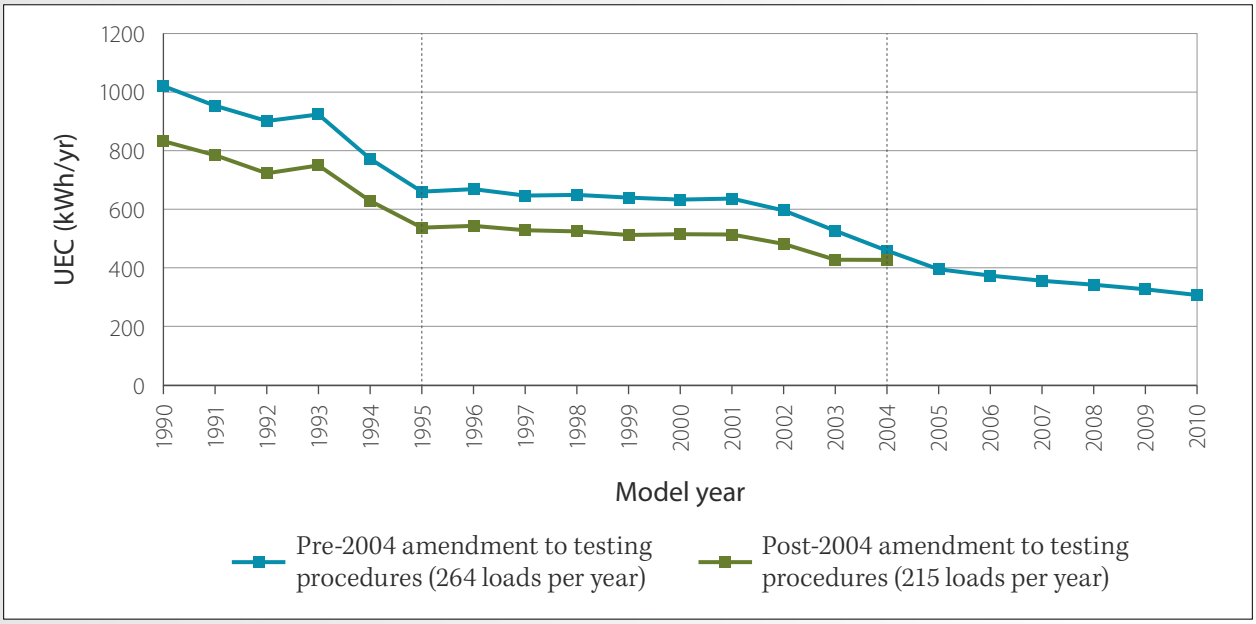
The new energy rating for dishwashers also takes into account standby power consumption (the energy used while the appliance is idle) and continues to include the energy required to heat water. Soil-sensing dishwashers are also subject to a new test procedure that reflects the average energy used when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

The industry has improved the overall water consumption of dishwashers over the years, which has an impact on both the energy consumption and the environment as a whole. Water and energy are closely linked. A clean, reliable water source consumes energy. Water conservation leads to energy conservation. Table 6 demonstrates how water use in dishwashers decreased from 1990 to 2010.[15]

[14] Source: Natural Resources Canada, *2011 EnerGuide Appliance Directory*, p. 220.

[15] Source: Electro-Federation Canada, Canadian Appliance Manufacturers Association, *2012 Major Appliance Industry Trends and Facts*, p. 8.

Figure 16 – Average annual UEC of dishwashers, 1990–2010

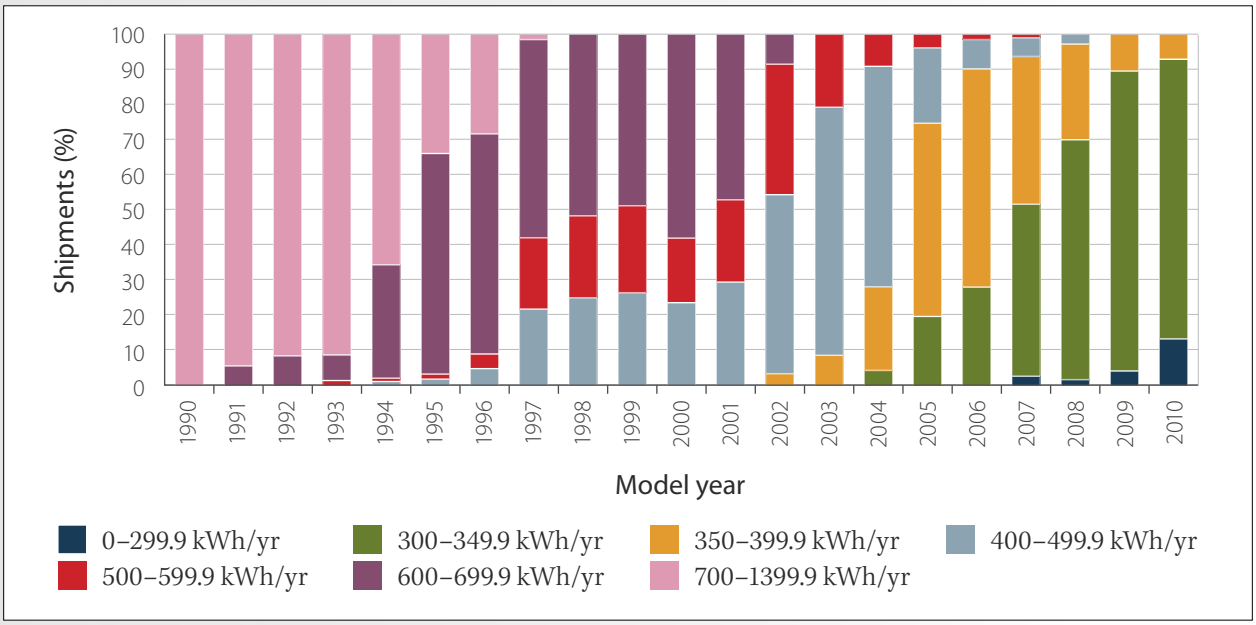


Note: The vertical lines shown in 1995 and 2004 refer to the introduction of and subsequent amendment to the MEPS for dishwashers. Due to changes in the methodology for estimating average annual UEC, the data prior to 2004 are not directly comparable with those from 2004 to 2010.

Table 6 – Reduction in water consumption in dishwashers shipped between 1990 and 2010

	1990	1995	2000	2005	2010	Change 1990–2010 (%)
Litres (per cycle)	29.51	31.22	26.76	22.16	17.90	-39.30

Figure 17 – Distribution of dishwashers by average annual UEC, 1990–2010



4.3 Distribution of shipments by unit energy consumption

Figure 17 shows the distribution of shipped dishwashers by average annual UEC between 1990 and 2010. In 1990, all shipped dishwashers consumed 700 kWh/yr or more. By 2010, 93 percent of them consumed fewer than 350 kWh/yr. Dishwashers consuming fewer than 300 kWh/yr also appeared in shipments for the first time in 2006 and attained a share of 14 percent in 2010.

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 slightly higher energy requirements. Table A.25 in Appendix A 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 (88 percent) in 2010 (see Table 7). This proportion has remained relatively constant nation-wide since 2006, although significant variation occurred among regions (see Table A.25 in Appendix A). Builder shipments were lowest in Quebec (3 percent in 2010) and have been decreasing in the Atlantic provinces (9 percent in 2010, down from 15 percent in 2004). Builder shipments have been highest in British Columbia (24 percent in 2010, although down from previous years).

Table 7 – Distribution of dishwashers by channel and region/province, 2010

Region/province	Builder	Retail
	(%)	
Canada	11.9	88.1
Atlantic	9.1	90.9
Quebec	3.3	96.7
Ontario	13.9	86.1
Prairies	13.5	86.5
British Columbia and Territories	23.7	76.3

Figure 18 compares the average annual UEC of dishwashers shipped to builders with those shipped to retailers among regions in 2010. The differences are small overall, with dishwashers shipped to builders consuming slightly less energy than those shipped to retailers in all regions except British Columbia.

Figure 19 shows how the energy consumption of dishwashers shipped to both builders and retailers changed from 2004 to 2010. In 2004, dishwashers shipped to retailers consumed 16 kWh/yr more on average, whereas from 2005 to 2008, those shipped to builders consumed slightly more. In 2009 and 2010, the average annual UEC of dishwashers shipped to retailers and builders were almost equal.

Figure 18 – Average annual UEC of dishwashers by channel and region/province, 2010

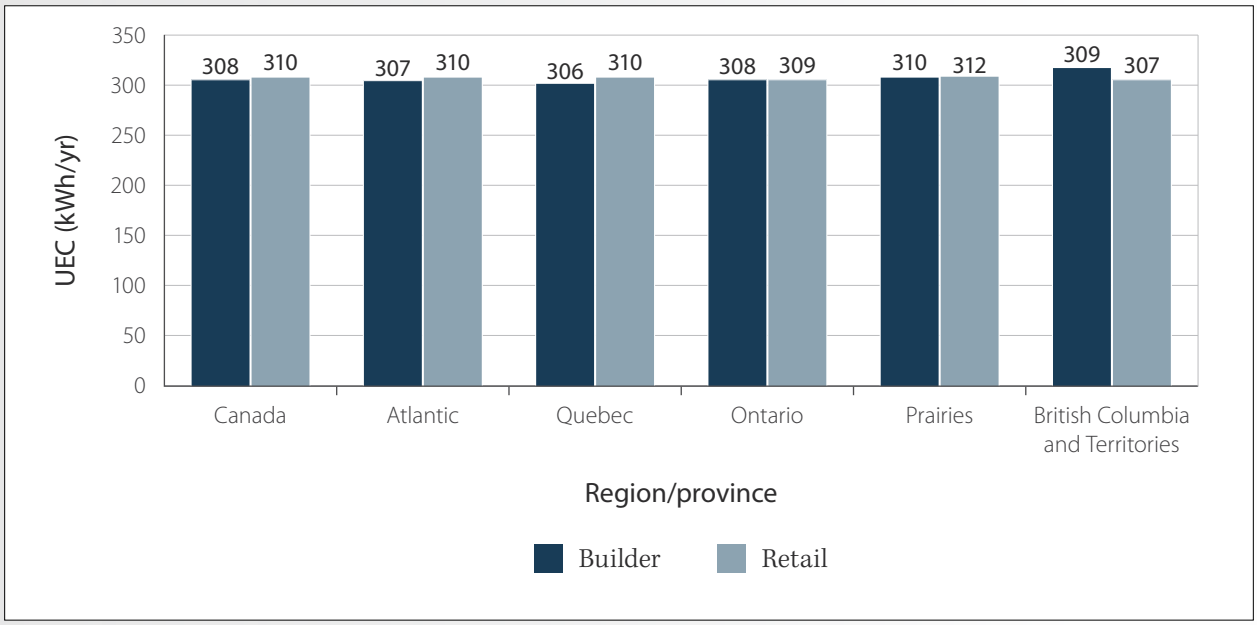


Figure 19 – Average annual UEC of dishwashers by channel, 2004–2010

DID YOU KNOW?

When buying a dishwasher, match size to your typical use. Compare standard, compact and larger models to minimize under- or over-use. Look for "energy-saver," "light" and "short-wash" cycles. More efficient cycles use less water and save energy. A no-heat drying option has also become common. Some models have sensors that measure the dirt on dishes and determine how much water is called for. There is no wasted water, no wasted energy.

Saving energy and money

- Read the owner's manual. It has helpful hints about operating the dishwasher at optimum efficiency.
- Regularly clean the filter.
- Run the dishwasher only when it is full, and use the setting that offers the best wash in the least amount of time. Check the manual to determine the most appropriate settings.
- Select the no-heat drying cycle (also called "air dry").
- Do not rinse dishes before putting them into the dishwasher! Rinsing, especially in hot water, wastes energy. Just scrape off the excess food and let the dishwasher do the job you bought it to do.

Source: Natural Resources Canada, *2011 EnerGuide Appliance Directory*.

Electric ranges

5

5.1 Overview

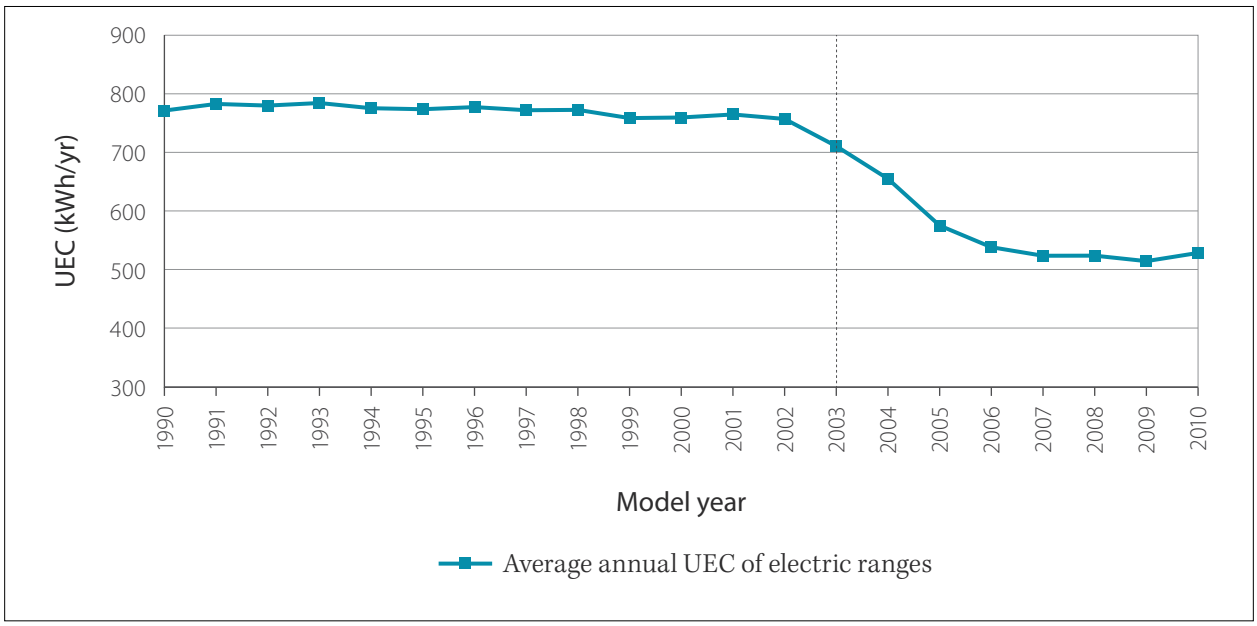
This chapter examines electric range shipment data in Canada from 1990 to 2010. Electric ranges represent about 90 percent[16] of the market for ranges, and gas ranges account for the remainder.

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

5.2 Average annual unit energy consumption by model year

Figure 20 shows the average annual UEC of electric ranges shipped in Canada between 1990 and 2010. 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 decreased more modestly between 2006 and 2009, increasing slightly in 2010.

Figure 20 – Average annual UEC of electric ranges, 1990–2010



Note: The vertical line shown in 2003 refers to the amendment to the MEPS for electric ranges. 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 2010.

[16] Canadian Appliance Manufacturers Association, *2011 Major Appliance Industry Trends & Facts*, p. 20.

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 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 2003.[17]

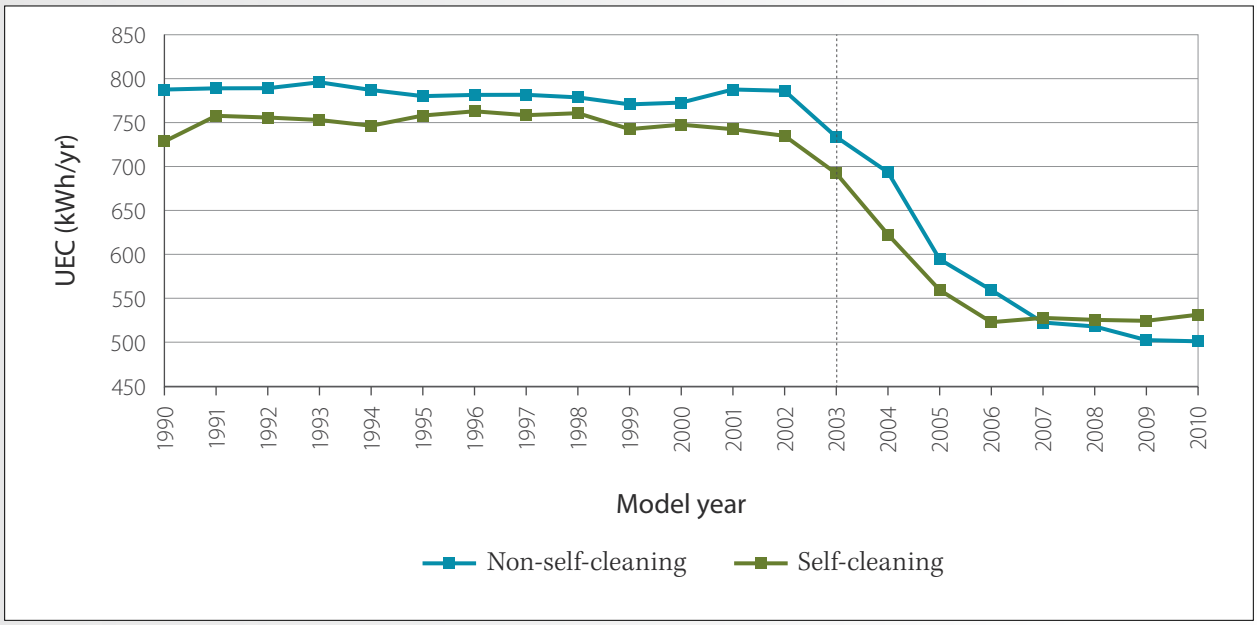
5.3 Distribution of shipments by type

Electric ranges are divided into two types: self-cleaning or non-self-cleaning. In 1990, self-cleaning ranges accounted for less than 23 percent of electric range shipments. However, by 2010, 74 percent of electric ranges were self-cleaning.

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 more efficient, such that in 2010, they actually (on average) consumed less energy than self-cleaning ranges (see Figure 21). One of the reasons for the improved efficiency of non-self-cleaning ranges relative to self-cleaning ranges is, most likely, that the latter now 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.

In 2010, the greatest proportion of self-cleaning ranges was shipped to Quebec (83 percent) and the least to the Atlantic provinces (63 percent). Table A.30 in Appendix A lists the proportion of self-cleaning and non-self-cleaning ranges for each region/province.

Figure 21 – Average annual UEC of electric ranges by type, 1990–2010



Note: The vertical line shown in 2003 refers to the amendment to the MEPS for electric ranges. 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 2010.

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

5.4 Distribution of shipments by unit energy consumption

Figure 22 shows the distribution of electric ranges by average annual UEC between 1990 and 2010. In 1990, 82 percent of electric ranges consumed 750 kWh/yr or more. By 2010, 94 percent of shipped electric ranges consumed fewer than 600 kWh/yr. Some of this decrease, however, 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 2010, 17 percent of electric ranges were shipped to builders, a decline since it peaked at 27 percent in 2006 (see Table A.32 in Appendix A). Across the country, the portion of electric ranges shipped to builders in 2010 ranged from a low in Quebec (6 percent) to a high in British Columbia (29 percent).

Table 8 – Distribution of electric ranges by channel and region/province, 2010

Region/province	Builder	Retail
	(%)	
Canada	17.0	83.0
Atlantic	10.5	89.5
Quebec	6.4	93.6
Ontario	24.8	75.2
Prairies	15.1	84.9
British Columbia and Territories	29.0	71.0

Figure 22 – Distribution of electric ranges by average annual UEC, 1990–2010

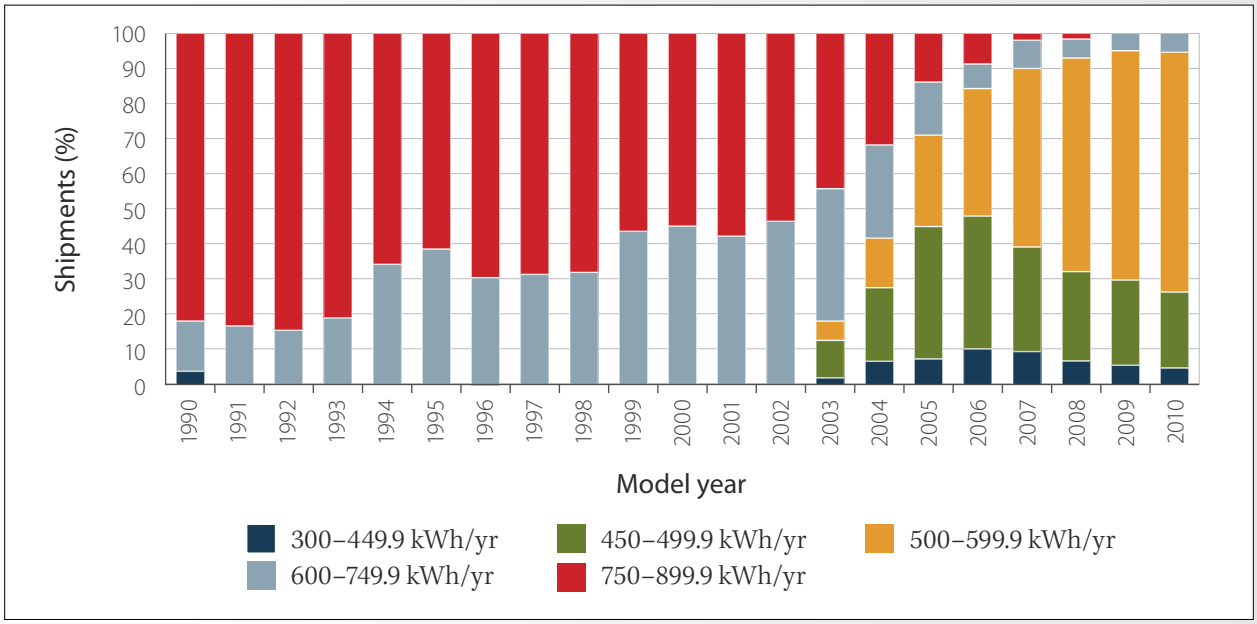


Figure 23 – Average annual UEC of electric ranges by channel and region/province, 2010

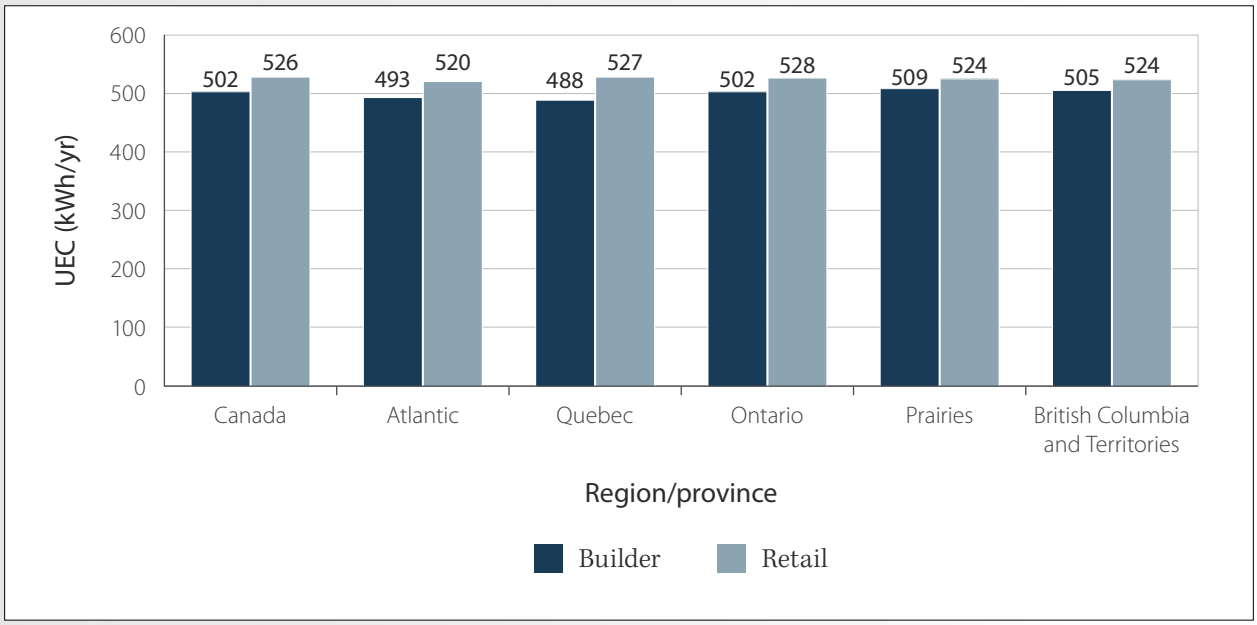


Figure 24 – Average annual UEC of electric ranges by channel, 2004–2010

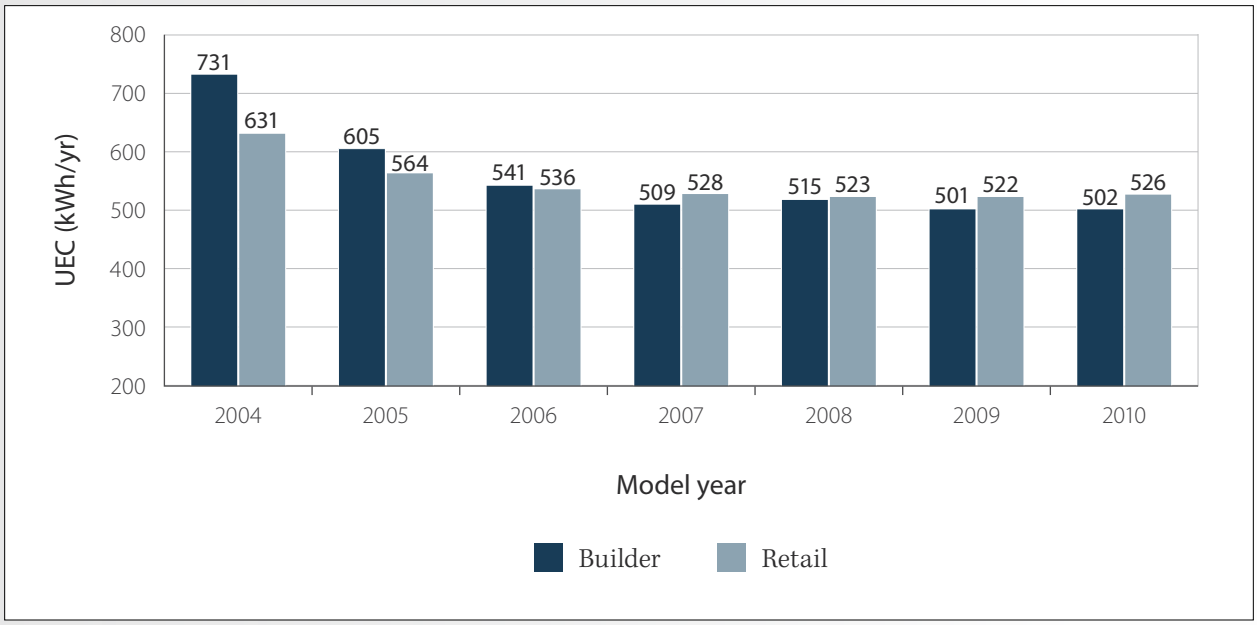


Figure 23 shows the variation in average annual UEC of electric ranges shipped to builders and retailers across the country. Variations were generally minor in most regions, with those units shipped to retailers consuming from 4 to 8 percent more energy than those shipped to builders. This difference occurred because units shipped to retailers tended to be self-cleaning (which consumed slightly more energy in 2010).

Figure 24 shows how the energy consumption of electric ranges shipped to builders and retailers changed between 2004 and 2010. In 2004, electric 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 2010, electric ranges shipped to builders consumed 24 kWh/yr fewer than those shipped to retailers. As previously mentioned, units shipped to retailers are more likely to be self-cleaning ones. Therefore, the improvement in UEC of electric ranges shipped to builders can be largely attributed to the improvement in UEC of non-self-cleaning electric ranges.

DID YOU KNOW?

When buying a range or oven, look for the lowest EnerGuide rating. Convection ovens cook more evenly and quickly and use less energy, because a fan moves heat around inside the oven throughout the cooking process. Buy an oven with a window so you do not have to open the door to check cooking progress. Every time the door is opened, at least 20 percent of the heat is lost.

Saving energy and money

- Be sure to read the owner's manual. It has helpful hints on how to operate ranges, cooktops and ovens at optimum efficiency.
- Match pots to the size of the cooking element. The bottom of a pot should just cover the cooking ring. When a pot is too small, energy will be lost around the outside.
- Use flat, smooth-bottomed pots that make full contact with the element so that most of the energy goes directly into the pot.
- Use the self-cleaning feature infrequently and only immediately after you use the oven – while it is still hot.
- Make sure the oven door seals are clean and tight. They should hold a slip of paper snugly. If the paper slips out easily, replace the seals. Another way to check the seals is by performing the flashlight test: Cover the oven window with opaque material. Place a lit flashlight inside the oven and close the door. If you can see light around the door, the seals need to be replaced. Use the flashlight test for refrigerators and freezers as well.
- Lower the heat! A fast boil is no hotter than a slow boil. Once boiling has begun, turn down the heat to the lowest setting for the job at hand.
- Minimize conventional oven preheating. Except for breads and pastries, most foods do not need a preheated oven.
- Turn off heating elements before the food is fully cooked – a few minutes, a minute or even just 30 seconds ahead. The heating element, the pot and the latent heat in the food will often finish cooking the food without using more electricity.
- Use lids on pots.
- Whenever possible, use the cooktop, toaster oven or microwave oven instead of the larger oven to cook or heat smaller quantities of food.

Source: Natural Resources Canada, *2011 EnerGuide Appliance Directory*.

Clothes washers

6

6.1 Overview

This chapter examines shipment data for clothes washers in Canada from 1990 to 2010. Section 6.2 examines the improvement of unit energy consumption (UEC) of clothes washers during this period. Subsequent sections analyse specific characteristics of clothes washers and their influence on energy consumption. The shipment data are examined by type (Section 6.3), by UEC (Section 6.4) and by distribution channel (Section 6.5).

6.2 Average annual unit energy consumption by model year

The UEC of clothes washers decreased dramatically between 1990 and 2010 (see Figure 25). During this period, the average annual UEC fell by 82 percent, from 1218 to 217 kilowatt hours per year (kWh/yr). This decrease is due to both energy efficiency improvements across all types of clothes washers, coinciding with the various amendments to the minimum energy performance standards (MEPS), and the increasing popularity of front-loading units, which are more energy-efficient than top-loading units.

As is the case for dishwashers, manufacturers have improved the overall water consumption of clothes washers over the years, which has an impact on energy use and leads to energy savings. Table 9 shows the average water consumption of every model listed in that year's *EnerGuide Appliance Directory*, from 2005 to 2010.[18]

6.3 Distribution of shipments by type

Front-loading clothes washers became increasingly popular between 2001[19] and 2010. In 2001, these clothes washers accounted for only 16 percent of shipments in Canada. However, by 2010, they accounted for 60 percent of shipments.

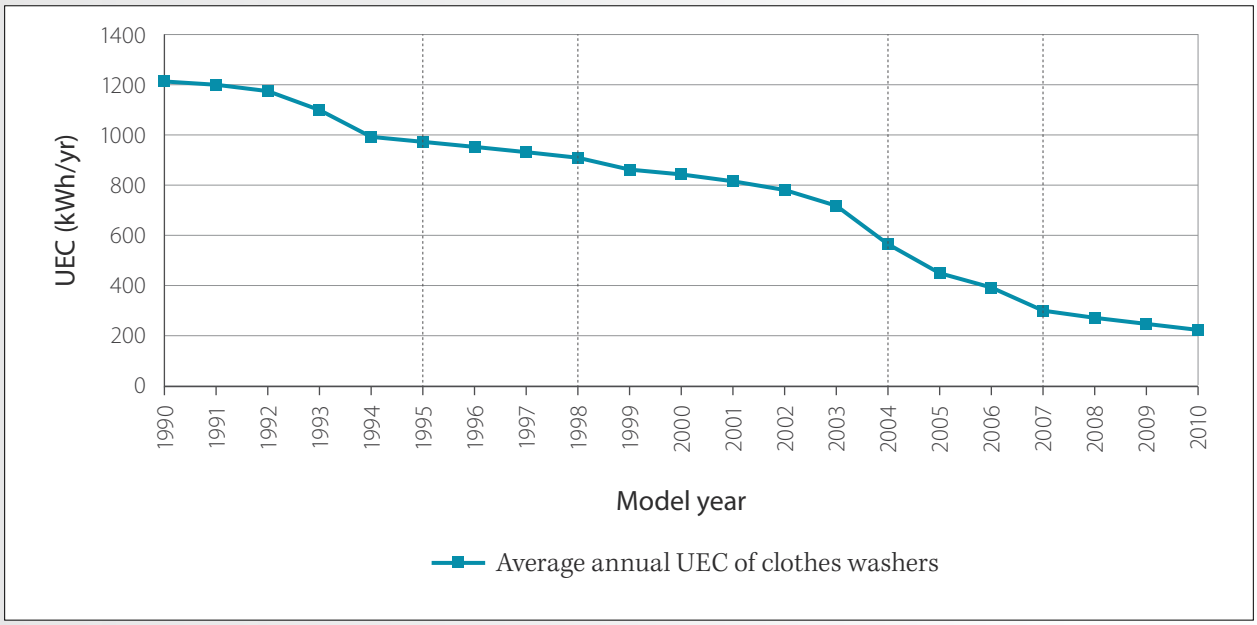
The popularity of front-loading clothes washers varied significantly by region (see Table 10). In 2010, front-loading clothes washers were most popular in British Columbia (where they accounted for 74 percent of shipments) and least popular in the Atlantic provinces and Quebec (where they accounted for 46 percent of shipments).[20]

[18] Source: Electro-Federation Canada, Canadian Appliance Manufacturers Association, *2011 Major Appliance Industry Trends and Facts*, p. 8.

[19] 2001 is the first year for which there are comprehensive data on distribution by clothes washer type.

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

Figure 25 – Average annual UEC of clothes washers, 1990–2010



Note: The vertical lines shown in 1995, 1998, 2004 and 2007 refer to the various amendments to the MEPS for clothes washers.

Table 9 – Average water consumption for clothes washer models listed in the *EnerGuide Appliance Directory* from 2005 to 2010

	2005	2006	2007	2008	2009	2010	Change 2005–2010 (%)
Litres (per cycle)	1.45	1.29	1.16	1.14	1.09	0.82	-43.40

Table 10 – Distribution of clothes washers by type and region/province, 2010

Region/province	Front-loading	Top-loading
	(%)	
Canada	59.8	40.2
Atlantic and Quebec	46.0	54.0
Ontario	65.8	34.2
Prairies	65.4	34.6
British Columbia and Territories	73.5	26.5

The trend toward front-loading clothes washers has implications for energy consumption because these washers tend to consume significantly less energy and water 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 2010 (see Figure 26).

6.4 Distribution of shipments by unit energy consumption

Figure 27 shows how the average annual UEC of shipped clothes washers changed between 1990 and 2010. In 1990, all clothes washers consumed at least 600 kWh/yr, and 64 percent consumed 1000 kWh/yr or more. By 2010, all shipped clothes washers consumed fewer than 600 kWh/yr, and more than 57 percent consumed fewer than 200 kWh/yr.

Figure 26 – Average annual UEC of clothes washers by type, 2000–2010

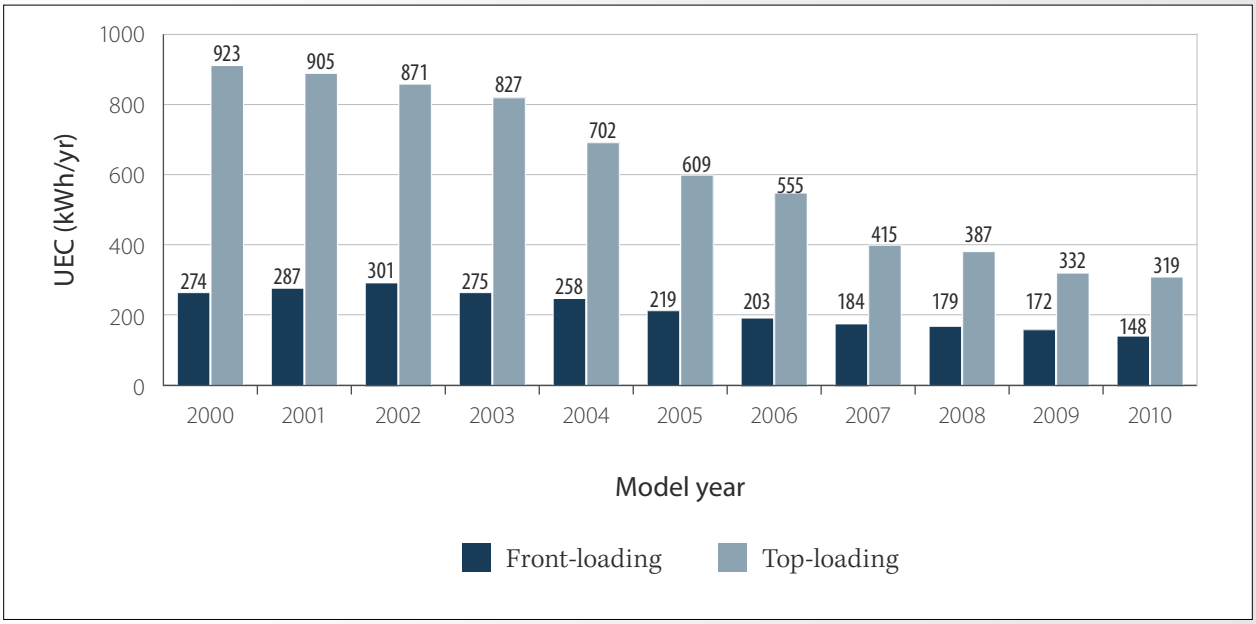
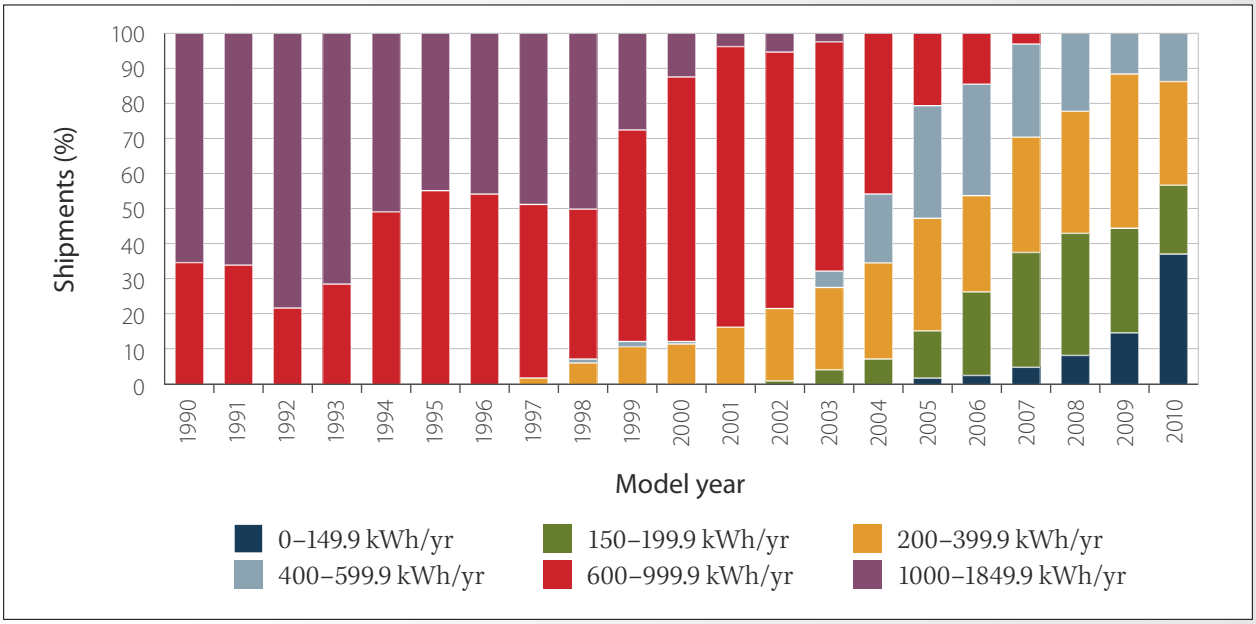


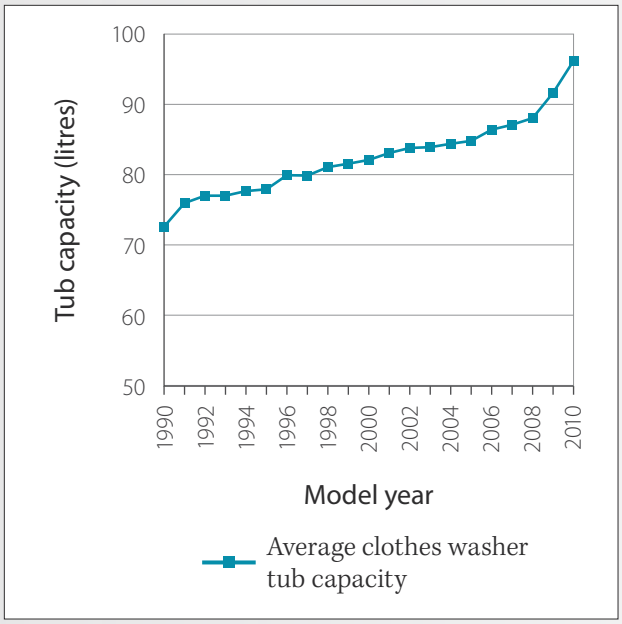
Figure 27 – Distribution of clothes washers by average annual UEC, 1990–2010



As shown in Figure 28, the average tub capacity of clothes washers increased substantially from 1990 to 2010, from 73 litres (L) to 96 L, or 32 percent. Conversely, the average energy consumption per tub litre decreased at a much faster rate during the same period (87 percent). It appears that consumers are washing substantially more clothes per load and using significantly less energy in doing so. The breakdown of tub capacity and average energy consumption of clothes washers by type is provided in Table A.42 in Appendix A.

The distribution of clothes washers by UEC showed little variation among regions in 2010, with the exception of the Atlantic provinces and Quebec. In these regions, a greater proportion of clothes washers were shipped that consumed 400 kWh/yr or more, due to a smaller penetration of front-loading units (see Tables A.37 and A.38 in Appendix A).

Figure 28 – Tub capacity and average energy consumption of clothes washers, 1990–2010



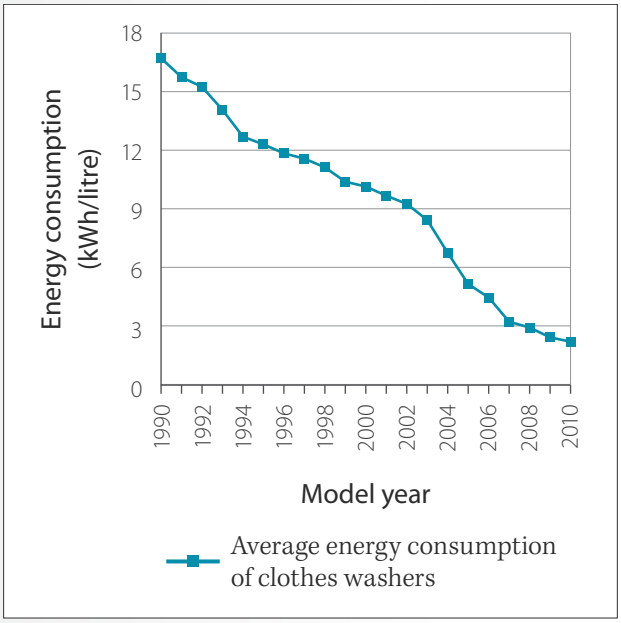
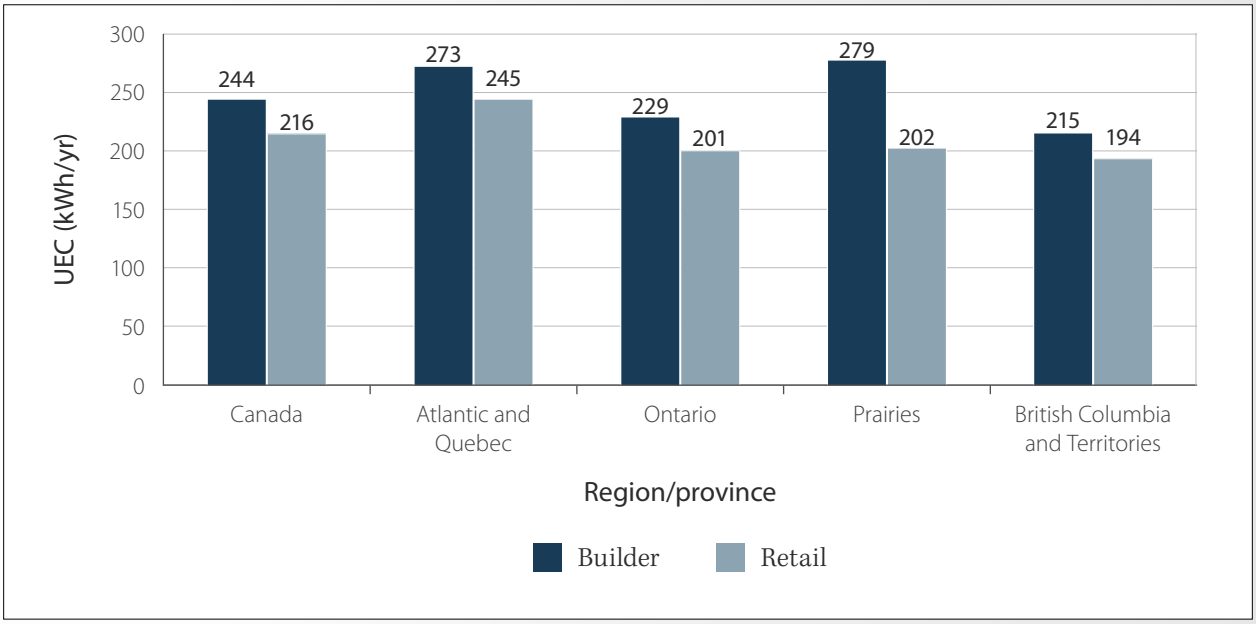


Figure 29 – Average annual UEC of clothes washers by channel and region/province, 2010



6.5 Distribution of shipments by channel

As outlined in Table 11, the vast majority of clothes washers (96 percent) were shipped to retailers in 2010, a proportion that has remained relatively constant since 2004 (see Table A.39 in Appendix A).

Table 11 – Distribution of clothes washers by channel and region/province, 2010

Region/province	Builder	Retail
	(%)	
Canada	4.2	95.8
Atlantic and Quebec	1.5	98.5
Ontario	5.5	94.5
Prairies	4.5	95.5
British Columbia and Territories	8.1	91.9

In 2010, clothes washers shipped to builders consumed significantly more energy than those shipped to retailers (see Figure 29). Nationally, the units sent to builders consumed 13 percent more energy on average (28 kWh/yr). Part of the reason for this was that more front-loading units (which consume less energy than top-loading units) were shipped to retailers than to builders. The difference in UEC between builder- and retailer-shipped washers was greatest in the Prairies at 27 percent (76 kWh/yr) and least in British Columbia at 11 percent (21 kWh/yr).

DID YOU KNOW?

When buying a clothes washer, ENERGY STAR® qualified front-loading and top-loading clothes washers use substantially less energy and water. Front-loading washers tumble clothes through a small amount of water instead of rubbing clothes against an agitator in a full tub. Advanced top-loading washers flip or spin clothes through a reduced stream of water. They also have high-efficiency motors that spin the drum at high speed to extract even more water in the final spin cycle, which reduces the demand on dryer energy.

Saving energy and money

- Be sure to read the owner's manual. It has helpful hints on operating the washer at optimum efficiency.
- Clothes washers are most energy-efficient when fully loaded. That is why it is important to choose a unit that is right for your household.
- Do not overload, because overloading can cause mechanical failure and reduce the effectiveness of the spin cycle.
- Go cold! Studies show that clothes rinsed in cold water come out just as clean as those rinsed in warm water. Your water-heating bill will drop considerably.
- When cold water will not do the job, wash in warm, rather than hot, water and rinse in cold water. You will use about 50 percent less energy.
- Extra-dirty clothes? Instead of washing twice, use the pre-soak option.
- If your machine does not have an automatic water-level selector, set the water level to suit each load.
- When possible, install your washer close to the water heater to reduce heat loss from the pipes. Even when the water heater is nearby, insulate exposed pipes, especially when they are close to cold walls.

Source: Natural Resources Canada, *2011 EnerGuide Appliance Directory*.

Electric clothes dryers 7

7.1 Overview

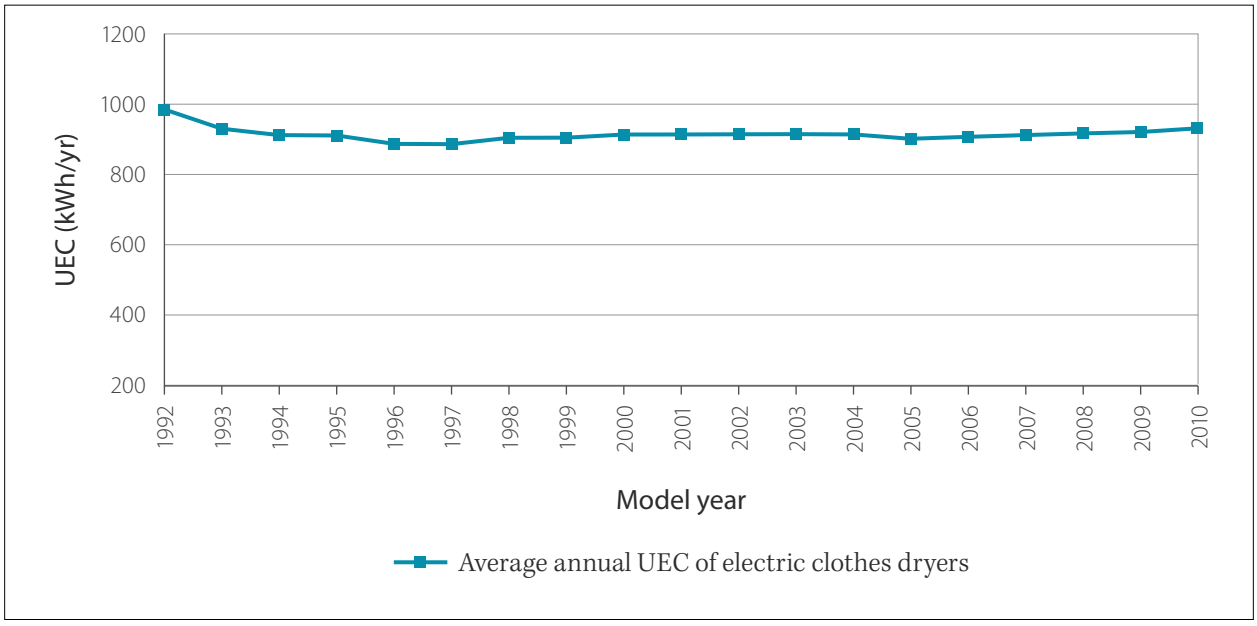
This chapter examines shipment data for electric clothes dryers in Canada from 1992 to 2010. Note that data for 1990 and 1991 are not presented because they are based on a small number of shipments and may not be representative of the Canadian market in those years. Electric clothes dryers typically account for approximately 97 percent of the clothes dryer market, with gas dryers accounting for the remainder.[21]

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

7.2 Average annual unit energy consumption by model year

Figure 30 shows how the energy efficiency of electric clothes dryers changed from 1992 to 2010. Average annual UEC decreased by 10 percent between 1992 and 1996 and has remained relatively stable since. However, the average annual UEC increased slightly in each year since 2005, reaching 928 kilowatt hours per year (kWh/yr) in 2010, mostly due to the use of larger capacity units (see Section 7.3). Overall, the average annual UEC was 6 percent lower in 2010 than in 1992.

Figure 30 – Average annual UEC of electric clothes dryers, 1992–2010



Note: The average annual UEC for electric clothes dryers 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.

[21] Canadian Appliance Manufacturers Association, *2011 Major Appliance Industry Trends & Facts*, p. 34.

Since the mid-1990s, the share of dryers in the higher energy consumption categories has increased mostly because of the use of larger capacity units (see the following section). Few opportunities exist to improve the energy efficiency of electric clothes dryers with current technology because of 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 because more moisture is removed before clothes even 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

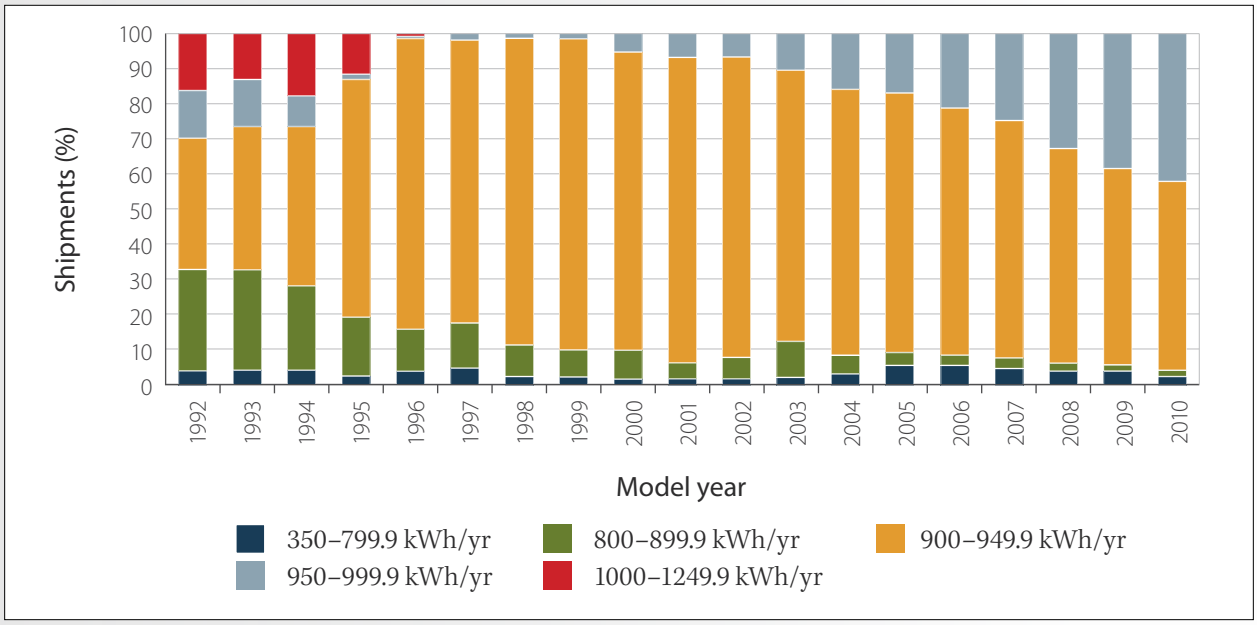
Figure 31 shows the distribution of electric clothes dryers shipped between 1992 and 2010 by average annual UEC. From 1992 to 2010, the share of electric clothes dryers consuming fewer than 900 kWh/yr decreased while the share of those consuming more than 950 kWh/yr increased.

The increase in shipments of more energy-consuming electric clothes dryers is mainly attributable to the popularity of larger capacity units over the period. As shown in Figure 32, the average drum capacity of electric clothes dryers increased substantially from 1992 to 2010, from 162 litres (L) to 195 L, or 21 percent. Conversely, the average energy consumption per drum litre decreased at an equal rate during the same period. As was the case for clothes washers, it seems that consumers are now drying substantially more clothes per load and that each load is consuming less energy.

The breakdown of drum capacity and average energy consumption of electric clothes dryers is provided in Table A.48 in Appendix A.

Figure 33 shows how the UEC of clothes dryers varied across Canada in 2010. British Columbia received the highest proportion of dryers consuming fewer than 800 kWh/yr (7 percent), while Ontario and the Prairies received the highest proportion of dryers consuming 950 kWh/yr or more (45 percent and 44 percent, respectively). For the complete breakdown of the distribution of electric clothes dryers by average annual UEC and region/province, see Table A.44 in Appendix A.

Figure 31 – Distribution of electric clothes dryers by average annual UEC, 1992–2010



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.

Figure 32 – Drum capacity and average energy consumption of electric clothes dryers, 1992–2010

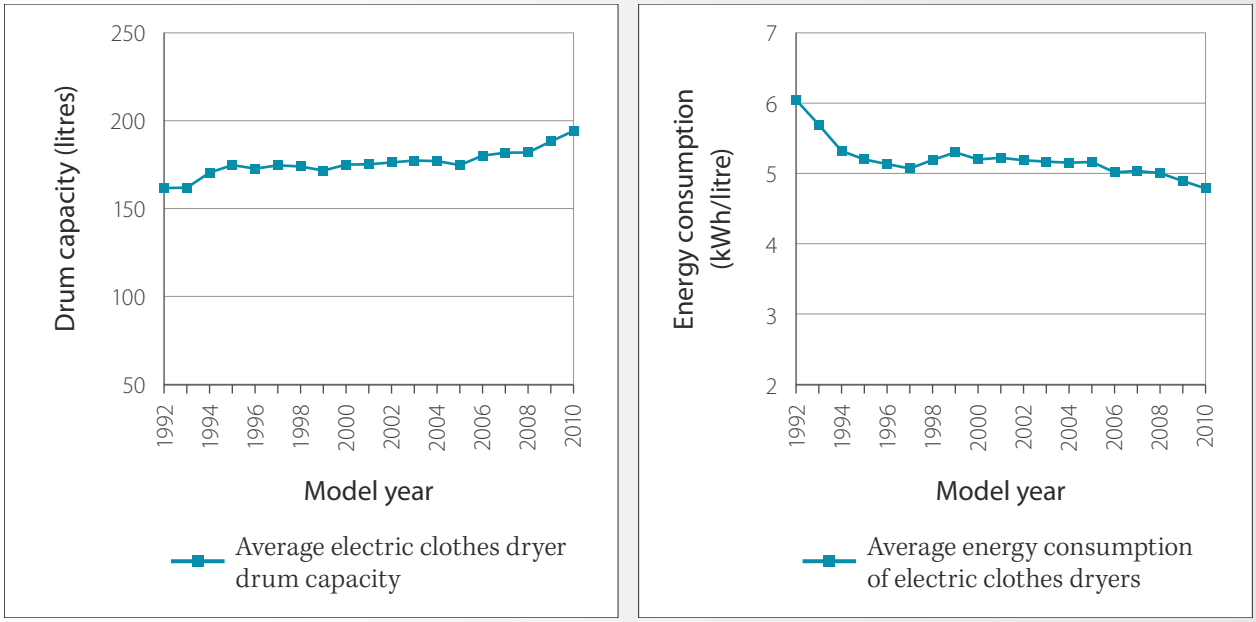
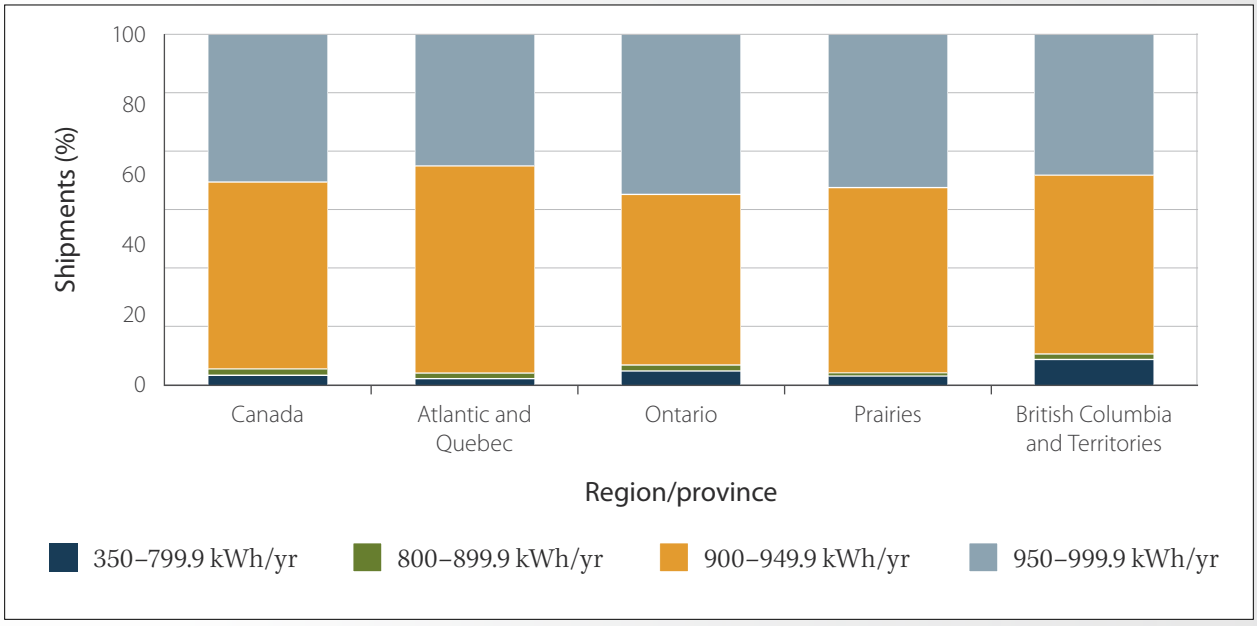
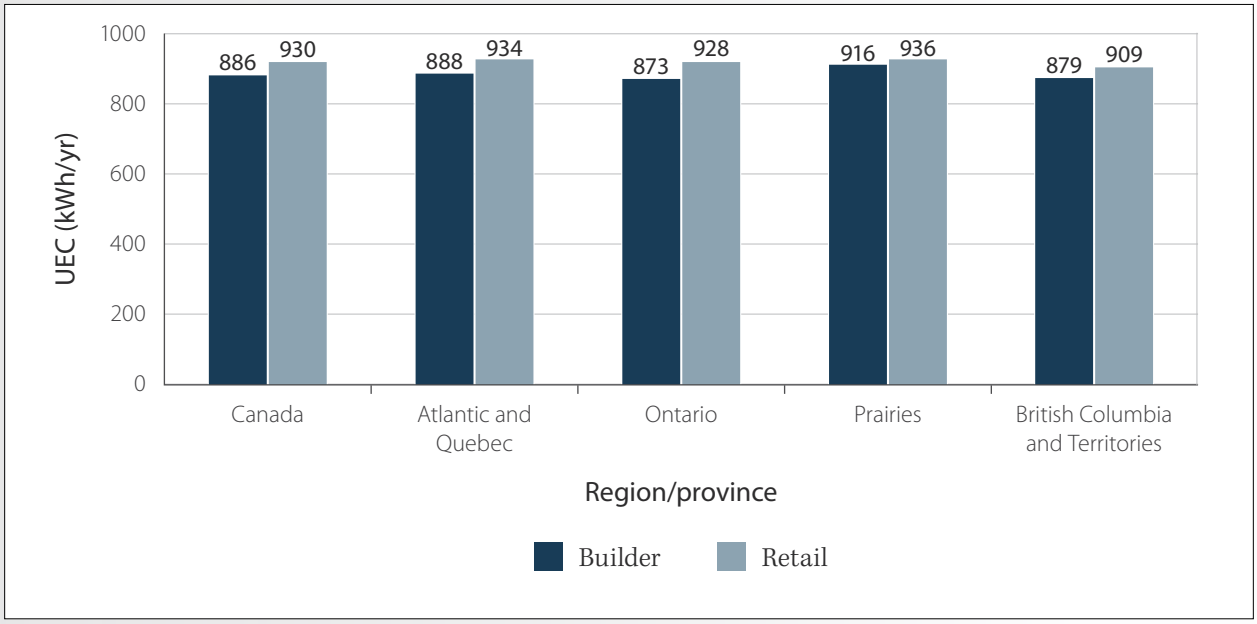


Figure 33 – Distribution of electric clothes dryers by average annual UEC and region/province, 2010



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

Figure 34 – Average annual UEC of electric clothes dryers by channel and region/ province, 2010



7.4 Distribution of shipments by channel

As shown in Table 12, the majority of electric clothes dryers were shipped to retailers in 2010 (96 percent). Builders received the lowest proportion of shipments in the Atlantic provinces and Quebec (less than 2 percent) and the highest proportion in British Columbia (8 percent).

Figure 34 shows that electric clothes dryers shipped to retailers tended to consume, on average, more energy (930 kWh/yr) than those shipped to builders (886 kWh/yr) in 2010. One explanation for this is that dryers shipped to builders tended to have a smaller drum capacity than those shipped for retail purposes.

Table 12 – Distribution of electric clothes dryers by channel and region/ province, 2010

Region/province	Builder	Retail
	(%)	
Canada	4.3	95.7
Atlantic and Quebec	1.5	98.5
Ontario	6.1	93.9
Prairies	4.5	95.5
British Columbia and Territories	8.1	91.9

DID YOU KNOW?

When buying a clothes dryer, many of them have sensors that shut the dryer off when the clothes are dry. This saves energy and wear and tear on clothes. Buy a clothes washer that does an exceptional job of spin drying. Clothes will be drier as you take them out of the washer, thereby reducing drying time.

Saving energy and money

- Be sure to read the owner's manual. It has helpful hints for operating your dryer at optimum efficiency.
- Do not put dripping wet clothes into your dryer; it will have to work extra hard and extra long and use more energy. Dryers are designed to handle damp, not wet, clothes. Wring out wet clothes or spin them in the washer first.
- Avoid drying partial loads.
- Fill but do not overfill, because too much clothing blocks airflow, lengthens drying time and overworks the machine.
- Sort clothes by thickness before washing. A shirt will dry much faster than a towel, especially if it is partly synthetic. Put thin, quick-drying items in one load and thicker items, such as towels, in another.
- Use the dryer continuously, one load right after another. This way, the dryer remains warm, does not have to re-heat and saves energy.
- Do not run the dryer too long. Overdrying not only uses more electricity but also increases shrinking, wrinkles and wear. Most loads dry in 40 to 60 minutes.
- Watch out for unintentional overdrying. It may mean that the humidity sensors are no longer accurate and the dryer needs servicing.
- To save money and reduce shrinking, use the "cool down" cycle, usually the "perma-press" setting. Here, the heat is off for the last few minutes and drying continues as cool air is blown through tumbling clothes.
- Clean the lint screen after or before each load. A full screen can cause your dryer to consume up to 30 percent more energy.
- Keep your dryer's outside exhaust vent clean. A clogged vent makes the blower work longer and harder, thereby increasing energy consumption.
- Lint build-up in the exhaust duct and outside vent is a potential fire hazard. Inspect and clean them at least once a year – mark it on your calendar and refer to your owner's manual for guidance.

Source: Natural Resources Canada, *2011 EnerGuide Appliance Directory*.

Energy consumption and savings for all major household appliances

8

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 into three sections:

- The improvement in UEC is compared across all appliances (Section 8.1).
- The energy cost savings are calculated for a household operating appliances purchased in 2010 relative to those purchased in 1990 (Section 8.2).
- The total energy consumption and savings are quantified for all appliances shipped in Canada between 1990 and 2010 (Section 8.3).[22]

8.1 Energy consumption of all appliances

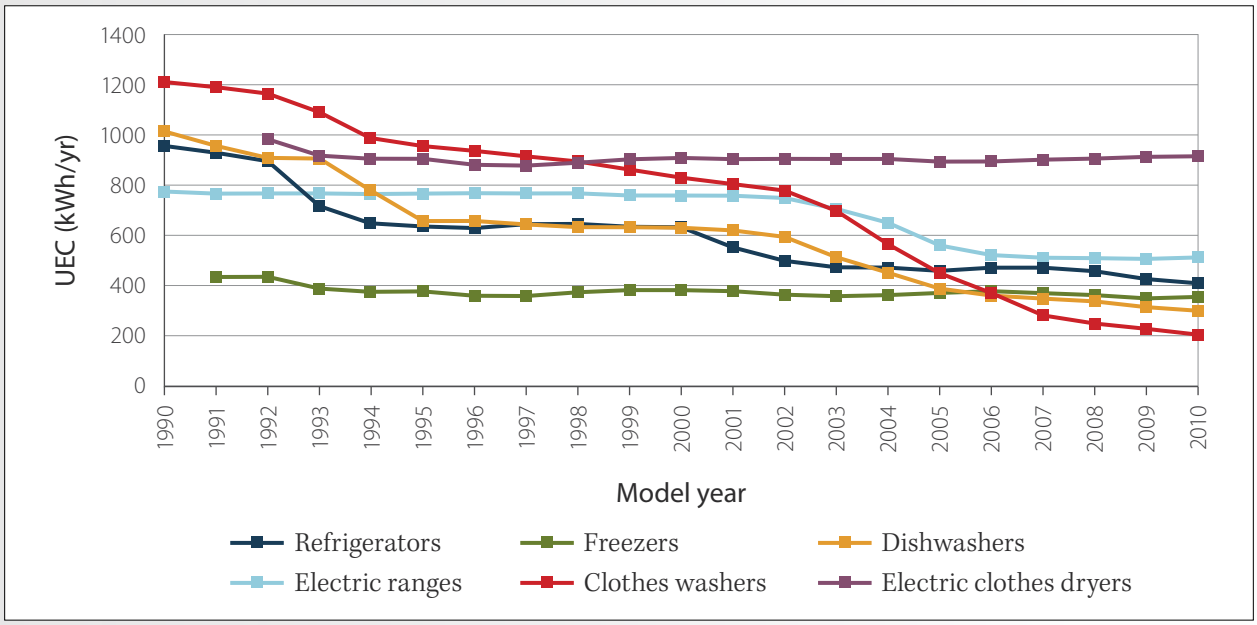
The average annual UEC of new shipped appliances decreased significantly between 1990 and 2010, as shown in Figure 35. Between 1990 and 2010, the decrease in average annual UEC was most significant for clothes washers (1001 kilowatt hours per year [kWh/yr], or 82 percent). This decrease is due both to 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).

There were also significant improvements in average annual UEC for dishwashers during this same period (716 kWh/yr, or 70 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 63 percent over the period (as opposed to 70 percent).

Meanwhile, the average annual UEC of refrigerators decreased by 531 kWh/yr (56 percent) between 1990 and 2010, partly because of more efficient compressors and better insulation. This reduction occurred despite an increase in the shipments' share of larger refrigerators during this period, because greater efficiency gains occurred for larger units over the period. Consequently, even though the share of larger refrigerators increased, the average annual UEC of all refrigerators decreased. However, supplementary data received from refrigerator manufacturers in 2009 and 2010 show an increase in their share of shipments of compact refrigerators (those with a volume of less than 10.4 cubic feet). The breakdown of refrigerators by volume is outlined in Table A.4 in Appendix A.

[22] Even though this report deals with the trends in energy consumption and distribution of appliances from 1990 to 2010, energy savings are calculated as of 1992, with the implementation of the *Energy Efficiency Regulations* authorized under the 1992 *Energy Efficiency Act*.

Figure 35 – Average annual UEC of appliances, 1990–2010



Notes:

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.

Electric ranges saw a reduction in average annual UEC of 250 kWh/yr (32 percent), but owing to the nature of this appliance, there is little potential to further reduce energy consumption with current technology. In addition, a portion of the 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.) The change reduced the average annual UEC of self-cleaning ranges by about 35 to 50 kWh/yr (5 to 10 percent).

The reduction in UEC for freezers was smaller than for other appliances (80 kWh/yr, or 18 percent), partly because of a switch away from chest freezers (Type 10) to less efficient upright units (Type 8 and Type 9). However, supplementary data received in 2009 and 2010 from freezer manufacturers also show a considerable market share for compact chest freezers in those years. As previously noted, the data for freezers are less comprehensive than the data for other appliances and may not be fully representative of the trends in the Canadian market. Because of the greater effort invested by the Canadian Appliance Manufacturers Association (CAMA), this recent supplementary shipment data will help create a truer picture of the freezer market in the years ahead.

As with electric ranges, there is little potential 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 2010, the average annual UEC of electric clothes dryers decreased by 55 kWh/yr (6 percent). The increasing share of front-loading clothes washers helped reduce the energy consumption of clothes dryers because more moisture is removed before clothes reach the dryer (although this change is not incorporated into the data). In addition, moisture detectors in electric clothes dryers automatically shut off the unit when a load is sufficiently dry.

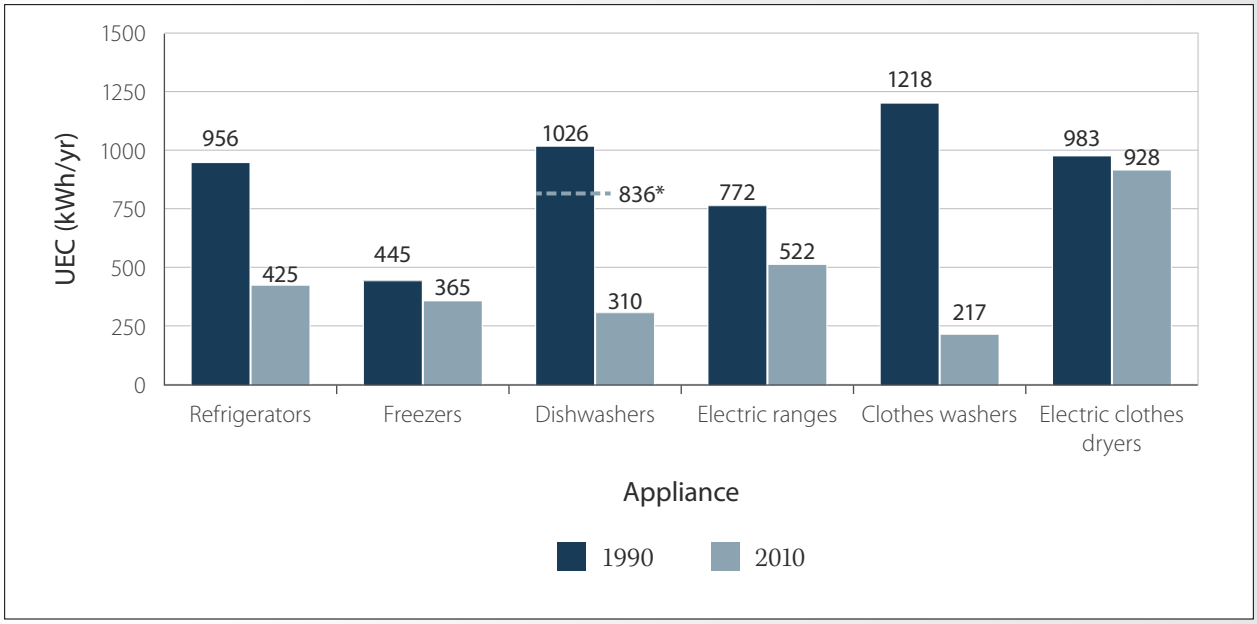
A household operating a full set of appliances purchased in 2010 might expect them to consume a little less than 2800 kWh/yr of electricity on average, roughly half as much as a set of appliances purchased in 1990 (assuming similar operating patterns[23]). This comparison of energy consumption for all appliances for 1990 and 2010 is outlined in Figure 36.

8.2 Electricity cost savings per household

The increased energy efficiency of major 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 2010. Assuming an electricity price of 9.7 cents/kWh,[24] annual electricity costs for a set of appliances purchased in 1990 would be approximately $535, while costs for a set of appliances purchased in 2010 would be reduced by half, to about $268.

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.

Figure 36 – Average annual UEC of appliances, 1990 and 2010



* This figure represents the average annual UEC of dishwashers in 1990 if the frequency of use is assumed to be the same as in 2010.

Notes:

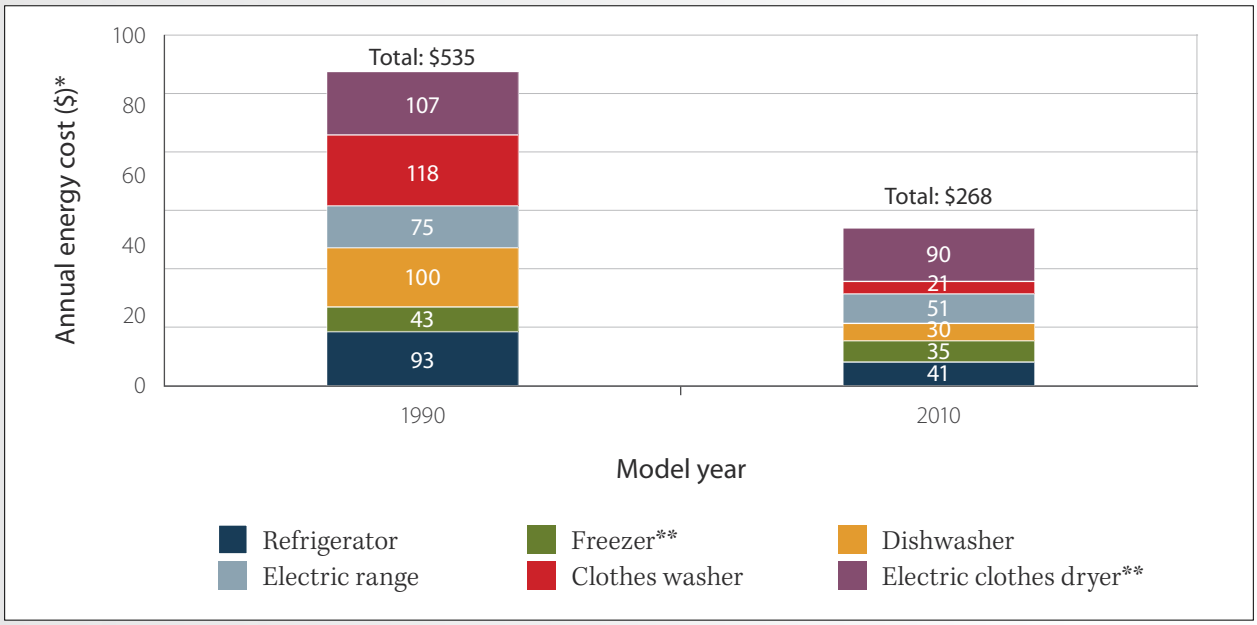
The average annual UEC for freezers is shown for 1991 because data for 1990 are based on a small number of shipments and may be unrepresentative of the actual market.

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.

[23] 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).

[24] This was the average Canadian residential price in 2009 (Natural Resources Canada, 2012, *Energy Use Data Handbook, 1990 to 2009*, Table 18, Residential Sector, **oee.nrcan.gc.ca/corporate/statistics/neud/dpa/tableshandbook2/res_00_18_e_5.cfm**.

Figure 37 – Average annual unit electricity cost for appliances purchased in 1990 and 2010



*Assuming a constant electricity price of 9.7¢/kWh, which was the average Canadian residential price in 2009.

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

8.3 Energy consumption and energy savings for all shipped appliances

In this section, total energy consumption and savings are quantified for all major household appliances shipped between 1990 and 2010. This analysis is not intended to be a comprehensive national assessment of energy use by all major household appliances. Rather, it conveys a sense of the magnitude and relative importance of energy savings obtained across the country from different appliances.

Figure 38 quantifies the energy savings that resulted from improvements in energy efficiency between 1992 and 2010, 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 2010, 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 increased energy efficiency of appliances shipped during this period.

For example, the energy consumption of shipped appliances in 2010 is estimated to be 143.7 petajoules (PJ) (or 39.9 billion kWh), representing the energy consumed in that year by all appliances shipped between 1992 and 2010, except for those that reached the end of their service life. However, if energy efficiency had not improved since 1992, these appliances would have consumed more than 204.3 PJ. The difference (60.6 PJ or the equivalent of one year's energy for more than 570 000 households) represents the energy savings resulting from the improvement in energy efficiency of major household appliances during the1992 to 2010 period. For details of the assumptions used in these calculations, see Appendix C.

Figure 39 attributes the energy savings identified in the previous paragraph (i.e. the area between the two lines in Figure 38) to each appliance. Clothes washers, refrigerators and dishwashers accounted for much of the energy savings because of significant improvements in the energy efficiency of these appliances. Electric clothes dryers and electric ranges accounted for a much lower energy saving because of smaller energy efficiency improvements. However, freezers accounted for the lowest energy saving because of their low penetration rate and the fact that the available shipment data account for a smaller portion of the market than they do for other appliances.

Figure 38 – Energy consumption of all shipped appliances, with and without improvements in energy efficiency, 1992–2010

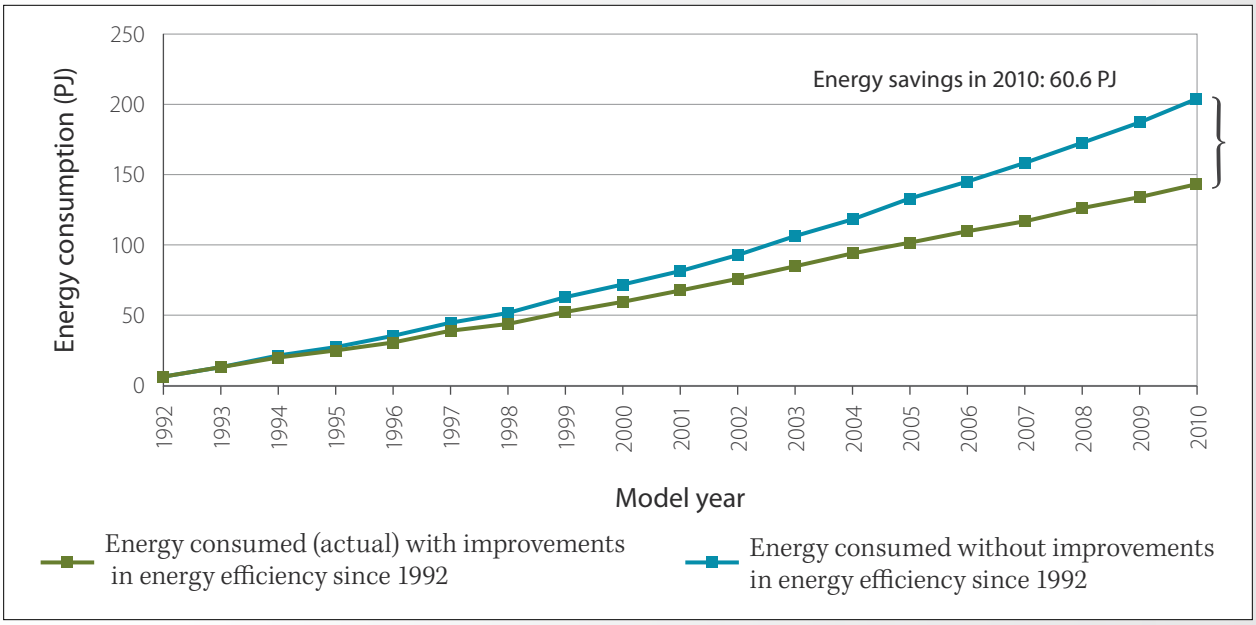
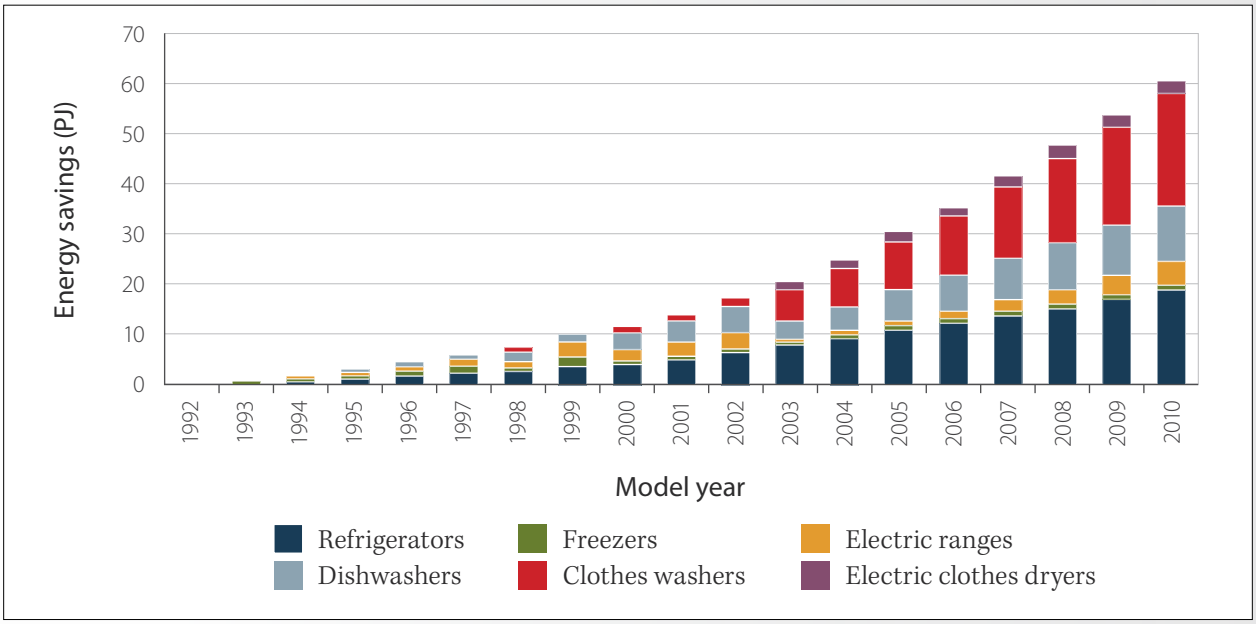


Figure 39 – Energy savings by shipped appliance, 1992–2010



Limitations of the energy consumption and savings analysis

This analysis conveys a sense of the magnitude and relative importance of energy savings obtained across the country from different appliances. However, it is not a comprehensive national assessment of energy use by all major appliances, for at least two reasons. First, the shipment data do not reflect the entire Canadian market. According to CAMA, the manufacturers represent more than 90 percent of the Canadian market for all appliances except freezers, for which the market share is unknown. Second, we do not attempt 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, including the following, could affect the magnitude of the estimates presented here:

- *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 actual energy savings would result from their purchase (unless a secondary appliance is being replaced).

Conclusions

9

This report analysed shipment data for major household appliances (refrigerators, freezers, dishwashers, electric ranges, clothes washers and electric clothes dryers) between 1990 and 2010. 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 2010, the average annual unit energy consumption (UEC) of most appliances decreased significantly. In fact, a household operating an average set of major appliances purchased in 2010 might expect them to consume 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 6 percent (electric clothes dryers) to 82 percent (clothes washers) during the study period. These energy efficiency improvements can be attributed to a variety of factors, including the following:

- research and development carried out by manufacturers
- consumer demand for more energy-efficient products
- standards that limit the amount of energy that each appliance may consume (minimum energy performance standards)
- continual strengthening of ENERGY STAR® technical specifications
- 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
- various incentives and rebates offered by the provincial/territorial and municipal governments and utilities

To illustrate the significance of energy efficiency improvements during this period, this report includes quantifications of the energy savings obtained from all shipped appliances in Canada between 1992 and 2010, as follows:

- Clothes washers, refrigerators and dishwashers accounted for the majority of energy savings because of significant improvements in the energy efficiency of these appliances.
- Freezers accounted for the lowest energy savings because of their low penetration rate and because the available shipment data account for a smaller portion of the market than they do for other appliances – although this changed considerably in 2009 and 2010 when supplementary data were obtained.
- Electric clothes dryers and electric ranges also accounted for lower energy savings because of more modest energy efficiency improvements.

In a tough economic climate, consumers continue to value the environment in their purchase decisions. Innovation combined with energy efficiency are drivers as the appliance sector continues bring to market new design options that are easier to use, reduce average household energy consumption and are more capable than ever before.

Appendix A

Detailed tables

A

Table A.1 – ENERGY STAR® qualified appliances as a percentage of total shipments in Canada, 2000–2010 (%)

Appliance	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Refrigerators	..	11.4	22.3	40.7	34.2	37.6	37.3	44.3	53.4	53.4	59.3
Dishwashers	1.6	9.7	29.8	56.5	80.9	90.8	79.7	76.2	89.3	89.5	78.7
Clothes washers	2.2	9.2	22.1	30.6	36.2	45.9	50.8	58.4	64.4	69.4	65.9

.. stands for not applicable

Table A.2 – ENERGY STAR qualified appliances as a percentage of total shipments by region/province, 2004–2010 (%)

Appliance	2004	2005	2006	2007	2008	2009	2010
Refrigerators							
Canada	32.4	37.6	37.3	44.3	53.4	53.4	59.3
Atlantic	23.3	21.3	20.6	22.8	27.3	33.5	42.2
Quebec	36.9	37.2	38.6	43.1	55.0	54.1	61.3
Ontario	38.6	39.9	38.5	47.4	56.2	56.3	60.4
Prairies	33.0	40.6	39.8	48.8	55.0	53.4	61.6
British Columbia and Territories	29.3	30.4	31.3	34.5	47.1	52.0	53.6
Dishwashers							
Canada	81.0	90.8	79.7	76.2	89.3	89.5	78.7
Atlantic	75.4	88.4	79.6	66.4	82.4	91.5	61.7
Quebec	81.3	92.9	82.1	74.1	88.4	91.3	79.3
Ontario	83.3	90.8	80.4	77.9	90.7	89.3	79.6
Prairies	78.4	90.3	75.3	77.9	89.3	88.9	82.6
British Columbia and Territories	79.5	87.9	82.8	73.9	88.9	86.4	69.5
Clothes washers							
Canada	36.2	45.9	50.8	58.4	64.4	69.4	65.9
Atlantic and Quebec*	29.9	41.7	43.3	51.6	56.6	60.5	57.8
Ontario	37.6	50.1	54.6	60.7	67.6	72.9	69.7
Prairies	36.2	48.2	53.1	61.4	67.2	72.2	69.6
British Columbia and Territories	36.4	50.3	60.3	66.7	74.2	80.3	71.8

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

Due to rounding, the numbers may not add up to 100.

Table A.3 – Distribution of refrigerators by type, 1990–2010 (%)

Model year	Type 1	Type 2	Type 3	Type 4	Type 5	Type 5A	Type 6	Type 7
Standard size								
1990	3.5	2.0	84.9	7.6	0.6	0.0	0.0	0.0
1991	3.1	0.3	84.3	9.0	0.8	0.0	0.0	0.3
1992	2.1	0.4	85.4	7.5	0.3	0.0	0.0	3.5
1993	1.1	0.6	85.5	6.8	0.7	0.0	0.0	4.2
1994	0.6	0.7	85.1	4.9	2.0	0.0	0.1	4.3
1995	0.2	0.6	84.8	4.6	1.6	0.0	0.1	5.2
1996	0.2	0.5	84.8	4.4	2.2	0.0	0.1	6.6
1997	0.4	0.1	83.8	3.8	3.2	0.0	0.0	8.3
1998	0.4	0.0	76.5	3.3	8.5	0.0	0.3	7.3
1999	0.1	0.0	76.6	2.4	8.4	0.0	0.4	7.5
2000	0.0	0.0	72.9	2.2	11.1	0.0	0.5	7.9
2001	0.0	0.0	71.1	2.1	11.1	0.0	0.4	9.1
2002	0.0	0.0	70.2	2.2	10.6	0.0	0.2	11.0
2003	0.0	0.0	68.2	2.4	13.9	0.0	0.1	11.2
2004	0.0	0.0	66.4	1.9	15.5	0.0	0.1	11.0
2005	0.0	0.0	64.8	1.1	17.9	0.0	0.0	9.6
2006	0.1	0.0	64.5	1.9	21.2	0.6	0.0	10.1
2007	0.1	0.0	61.0	1.6	22.3	1.2	0.0	13.5
2008	0.4	0.0	59.4	1.2	26.5	2.4	0.0	10.0
2009	0.1	0.0	48.9	0.8	23.8	2.5	0.0	7.1
2010	0.0	0.0	44.5	0.6	27.1	4.1	0.0	5.4

Continued

Table A.3 – Distribution of refrigerators by type, 1990–2010 (%) (continued)

Model year	Type 11	Type 12	Type 13	Type 14	Type 15
Compact					
1990	0.1	0.0	1.2	0.0	0.0
1991	0.3	0.0	2.0	0.0	0.0
1992	0.1	0.0	0.6	0.0	0.0
1993	0.1	0.0	0.9	0.0	0.0
1994	1.3	0.0	1.0	0.0	0.0
1995	1.9	0.0	1.0	0.0	0.0
1996	0.8	0.0	0.4	0.0	0.0
1997	0.4	0.0	0.0	0.0	0.0
1998	3.6	0.0	0.0	0.0	0.0
1999	4.6	0.0	0.0	0.0	0.0
2000	5.3	0.0	0.0	0.0	0.0
2001	6.1	0.0	0.1	0.0	0.0
2002	5.8	0.0	0.1	0.0	0.0
2003	2.0	0.0	2.2	0.0	0.0
2004	4.5	0.0	0.5	0.0	0.0
2005	6.3	0.0	0.1	0.0	0.0
2006	1.5	0.0	0.0	0.0	0.0
2007	0.3	0.0	0.0	0.0	0.0
2008	0.1	0.0	0.0	0.0	0.0
2009	13.6*	0.0	3.2	0.0	0.0
2010	12.9*	0.6	4.7	0.0	0.0

* This significant increase in 2009 and 2010 shipments in this category is attributable to the supplementary compact refrigerator data provided by refrigerator manufacturers.

Due to rounding, the numbers may not add up to 100.

The definitions of the various types of refrigerators can be found in Appendix B.

Table A.4 – Distribution of refrigerators by volume, 1990–2010 (%)

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
2009	19.1*	4.4	1.3	5.8	33.0	18.3	18.2
2010	20.1*	4.2	1.2	5.0	31.7	18.3	19.4

* This significant increase in 2009 and 2010 shipments in this category is attributable to the supplementary compact refrigerator data provided by refrigerator manufacturers.

Due to rounding, the numbers may not add up to 100.

Table A.5 – Distribution of refrigerators by average annual UEC per cubic foot, 1990–2010 (%)

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
2009	3.5	72.3	5.2	1.8	17.2*
2010	7.5	67.2	5.3	1.4	18.5*

* This significant increase in 2009 and 2010 shipments in this category is attributable to the supplementary compact refrigerator data provided by refrigerator manufacturers.

Due to rounding, the numbers may not add up to 100.

Table A.6 – Average annual UEC of refrigerators by type, 1990–2010 (kWh/yr)

Model year	Standard size							
	Type 1	Type 2	Type 3	Type 4	Type 5	Type 5A	Type 6	Type 7
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
2009	320.2	..	424.4	539.2	463.4	560.0	680.0	562.7
2010	306.0	..	417.0	560.3	456.3	564.3	555.0	557.4

Continued

Table A.6 – Average annual UEC of refrigerators by type, 1990–2010 (kWh/yr) (continued)

Model year	Compact					Total
	Type 11	Type 12	Type 13	Type 14	Type 15	
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**
2009	318.1	337.0	327.6	..	446.0	**430.1**
2010	322.2	337.0	323.4	..	446.0	**424.9**

Note: Numbers are not additive.

.. stands for not applicable

Table A.7 – Distribution of refrigerators by type and region/province, 2004–2010 (%)

Refrigerator type	2004	2005	2006	2007	2008	2009	2010
Type 3							
Canada	66.4	64.9	64.2	60.8	59.3	48.9	44.5
Atlantic	83.2	81.3	80.9	78.0	77.2	49.8	48.8
Quebec	69.5	68.9	65.8	63.9	61.4	53.2	44.8
Ontario	64.5	62.6	64.2	60.9	58.4	48.0	45.1
Prairies	69.2	65.5	59.5	54.4	55.9	47.1	43.6
British Columbia and Territories	59.6	56.5	63.4	60.1	56.6	45.1	41.2
Type 5							
Canada	15.5	17.9	21.2	22.3	26.5	23.6	27.1
Atlantic	6.4	8.0	8.2	9.2	10.2	8.7	10.5
Quebec	18.8	20.9	25.3	25.9	31.2	29.3	34.8
Ontario	14.6	17.7	19.9	21.6	25.2	22.6	25.3
Prairies	13.6	17.6	22.5	22.2	26.0	21.2	26.1
British Columbia and Territories	13.6	15.6	19.0	22.3	26.4	27.3	25.6
Type 5A							
Canada	..	..	0.6	1.2	2.4	2.7	4.1
Atlantic	..	..	0.1	0.2	0.7	0.7	1.0
Quebec	..	..	0.3	0.6	1.4	1.6	2.5
Ontario	..	..	0.7	1.3	2.6	3.0	4.5
Prairies	..	..	1.0	1.8	3.4	3.4	5.6
British Columbia and Territories	..	..	0.6	1.3	3.1	3.6	5.1
Type 7A							
Canada	11.0	9.6	10.1	13.5	10.0	7.1	5.4
Atlantic	8.0	7.6	7.4	8.7	9.3	5.3	4.2
Quebec	6.1	4.9	4.7	8.0	4.9	3.6	2.8
Ontario	13.8	11.2	10.9	13.9	11.6	8.3	6.2
Prairies	14.4	12.3	13.9	19.5	12.8	8.3	6.9
British Columbia and Territories	13.2	11.3	13.5	14.5	12.3	10.0	6.8
Types 1, 2, 4, 6, 11, 12, 13, 15							
Canada	7.0	7.6	3.8	2.2	1.8	17.7	18.9
Atlantic	2.4	3.1	3.3	3.8	2.6	35.5	35.4
Quebec	5.7	5.4	3.9	1.7	1.1	12.3	15.2
Ontario	7.2	8.5	4.3	2.4	2.2	18.1	19.0
Prairies	2.8	4.5	3.1	2.1	1.9	20.0	17.8
British Columbia and Territories	13.7	16.6	3.5	1.8	1.5	14.0	21.4

.. stands for not applicable

Due to rounding, the numbers may not add up to 100.

Table A.8 – Distribution of refrigerators by channel and region/province, 2004–2010 (%)

Channel	2004	2005	2006	2007	2008	2009	2010
Builder							
Canada	18.6	17.0	20.4	18.5	17.7	12.8	10.2
Atlantic	19.1	15.8	14.6	11.3	11.6	8.4	5.4
Quebec	6.3	5.6	6.7	5.2	6.8	4.5	4.0
Ontario	22.5	19.9	23.8	22.2	18.1	14.4	14.2
Prairies	20.8	19.1	23.4	19.1	21.2	13.6	9.3
British Columbia and Territories	36.1	32.3	37.1	38.0	41.0	29.8	17.3
Retail							
Canada	81.4	83.0	79.6	81.5	82.3	87.2	89.8
Atlantic	80.9	84.2	85.4	88.7	88.4	91.6	94.6
Quebec	93.7	94.4	93.3	94.8	93.2	95.5	96.0
Ontario	77.5	80.1	76.2	77.8	81.9	85.6	85.8
Prairies	79.2	80.9	76.6	80.9	78.8	86.4	90.7
British Columbia and Territories	63.9	67.7	62.9	62.0	59.0	70.2	82.7

Due to rounding, the numbers may not add up to 100.

Table A.9 – Distribution of refrigerators by volume and region/province, 2004–2010 (%)

Volume (cu. ft.)	2004	2005	2006	2007	2008	2009	2010
0–10.4*							
Canada	4.3	6.9	3.1	1.7	3.2	19.1	20.1
Atlantic	1.9	3.8	5.2	3.9	7.8	39.0	38.9
Quebec	4.3	4.8	3.3	1.9	2.7	13.6	16.1
Ontario	4.4	7.5	3.4	1.5	3.0	19.1	20.0
Prairies	0.6	3.7	1.4	1.1	2.9	20.8	18.9
British Columbia and Territories	12.7	17.3	4.0	2.5	3.6	17.3	23.6
10.5–12.4							
Canada	2.6	2.5	3.6	3.3	3.9	4.4	4.2
Atlantic	6.4	7.4	5.7	4.9	6.5	7.4	7.8
Quebec	2.0	1.8	2.1	1.8	2.7	2.7	3.0
Ontario	1.3	1.6	3.7	3.7	3.6	4.1	3.9
Prairies	2.8	2.4	3.1	2.3	3.7	4.5	4.1
British Columbia and Territories	7.6	6.2	7.1	6.9	7.5	7.7	6.5
12.5–14.4							
Canada	3.6	2.3	2.5	2.2	2.2	1.3	1.2
Atlantic	7.8	7.9	8.1	8.4	7.4	4.2	3.6
Quebec	2.8	2.1	2.0	1.9	1.9	1.2	1.0
Ontario	4.7	2.7	2.8	2.2	2.2	1.1	1.1
Prairies	3.0	1.6	1.6	1.8	1.9	1.1	1.2
British Columbia and Territories	0.8	0.6	2.1	1.6	1.6	1.1	0.8
14.5–16.4							
Canada	11.7	9.7	9.7	8.7	6.3	5.8	5.0
Atlantic	21.4	13.9	12.2	10.2	7.8	4.7	4.4
Quebec	8.0	6.6	6.6	6.0	4.0	4.3	3.2
Ontario	14.8	12.8	13.2	12.0	9.1	8.0	7.1
Prairies	10.5	8.7	8.4	7.2	5.2	5.1	4.4
British Columbia and Territories	9.3	6.3	5.9	5.7	3.9	3.3	3.3

Continued

Table A.9 – Distribution of refrigerators by volume and region/province, 2004–2010 (%) (continued)

Volume (cu. ft.)	2004	2005	2006	2007	2008	2009	2010
16.5–18.4							
Canada	39.5	41.7	39.9	39.8	38.8	33.0	31.7
Atlantic	40.3	47.1	47.9	50.0	46.6	28.7	29.5
Quebec	48.9	49.6	45.8	45.6	43.5	38.7	34.3
Ontario	34.6	37.9	37.3	37.7	37.3	31.6	31.6
Prairies	40.8	42.1	36.6	35.6	36.0	31.4	30.5
British Columbia and Territories	29.1	32.4	38.6	38.1	34.8	29.4	29.1
18.5–20.4							
Canada	14.0	15.2	17.3	17.3	21.7	18.3	18.3
Atlantic	9.4	8.3	9.2	9.6	10.7	7.6	7.5
Quebec	17.3	19.3	22.6	23.3	29.3	26.1	28.2
Ontario	12.9	14.1	15.5	15.4	19.0	16.0	15.1
Prairies	12.7	13.9	16.6	15.4	19.3	15.1	15.9
British Columbia and Territories	13.8	13.7	15.9	17.4	21.3	20.5	16.1
20.5–32.4							
Canada	24.2	21.7	23.9	27.0	23.8	18.2	19.4
Atlantic	12.9	11.5	11.7	13.0	13.2	8.5	8.3
Quebec	16.7	15.7	17.7	19.5	15.9	13.3	14.2
Ontario	27.3	23.3	24.1	27.5	25.8	20.0	21.2
Prairies	29.6	27.7	32.3	36.6	31.0	21.9	25.0
British Columbia and Territories	26.7	23.5	26.4	27.8	27.3	20.7	20.5

* The significant increase in 2009 and 2010 shipments in this category is attributable to the supplementary compact refrigerator data provided by refrigerator manufacturers.

Due to rounding, the numbers may not add up to 100.

Table A.10 – Distribution of refrigerators for retail shipments by volume and region/ province, 2004–2010 (%)

Volume (cu. ft.)	2004	2005	2006	2007	2008	2009	2010
0–10.4*							
Canada	6.7	7.9	3.3	1.7	3.6	21.5	22.2
Atlantic	1.2	4.3	4.7	3.7	7.7	42.0	40.9
Quebec	4.5	4.7	3.2	1.8	2.7	14.0	16.6
Ontario	5.7	9.1	3.6	1.8	3.6	22.1	23.3
Prairies	0.7	4.1	1.7	1.1	3.3	23.8	20.6
British Columbia and Territories	19.4	24.7	5.2	1.8	5.2	23.2	27.3
10.5–12.4							
Canada	1.5	1.1	1.2	1.0	1.4	3.4	3.1
Atlantic	3.1	3.9	3.4	2.8	3.4	6.0	6.7
Quebec	0.6	0.7	0.6	0.7	0.8	2.0	2.3
Ontario	0.4	1.1	0.9	0.9	1.3	3.4	3.0
Prairies	0.9	0.7	1.1	0.7	1.3	3.7	3.0
British Columbia and Territories	2.8	3.0	3.1	2.4	3.8	5.5	4.2
12.5–14.4							
Canada	2.2	1.4	2.2	2.3	2.5	1.3	1.2
Atlantic	6.5	5.4	6.9	8.3	7.6	2.9	3.5
Quebec	2.5	1.9	1.7	1.6	1.7	1.1	0.9
Ontario	1.8	0.9	2.0	2.4	2.6	1.2	1.3
Prairies	3.1	1.4	1.6	1.8	2.2	1.2	1.2
British Columbia and Territories	0.7	0.9	2.9	2.4	2.3	1.5	0.8
14.5–16.4							
Canada	8.2	6.6	6.4	5.7	3.6	3.2	2.5
Atlantic	22.0	14.3	11.2	8.9	6.9	3.6	3.7
Quebec	7.0	5.7	5.5	5.0	3.2	3.4	2.3
Ontario	9.1	6.7	6.5	5.8	3.7	2.9	2.1
Prairies	8.9	6.8	6.7	5.8	3.3	3.6	3.1
British Columbia and Territories	10.3	5.9	5.5	5.9	3.1	2.3	2.5

Continued

Table A.10 – Distribution of refrigerators for retail shipments by volume and region/province, 2004–2010 (%) (continued)

Volume (cu. ft.)	2004	2005	2006	2007	2008	2009	2010
16.5–18.4							
Canada	39.9	42.3	40.2	40.2	38.4	31.7	31.1
Atlantic	41.7	50.4	50.7	52.2	48.7	28.6	29.0
Quebec	49.5	50.4	46.2	46.2	43.4	38.3	34.1
Ontario	35.7	38.7	39.0	38.9	36.9	29.9	30.1
Prairies	39.7	41.4	32.7	33.4	33.4	29.5	30.5
British Columbia and Territories	24.2	28.2	37.1	37.0	33.2	25.3	28.2
18.5–20.4							
Canada	16.5	17.5	20.5	20.1	24.9	19.9	19.6
Atlantic	10.9	9.2	10.2	10.1	11.3	8.1	7.8
Quebec	18.4	20.4	24.1	24.5	31.4	27.3	29.2
Ontario	15.3	17.0	18.9	18.6	22.3	17.9	16.7
Prairies	15.4	16.6	21.0	18.2	23.1	16.2	16.5
British Columbia and Territories	17.2	15.6	19.6	22.2	24.7	21.9	16.1
20.5–32.4							
Canada	25.0	23.0	26.2	29.0	25.6	19.0	20.3
Atlantic	14.7	12.5	13.0	13.9	14.4	8.9	8.4
Quebec	17.5	16.4	18.6	20.3	16.8	13.7	14.7
Ontario	32.0	26.7	29.0	31.8	29.7	22.5	23.6
Prairies	31.2	29.0	35.2	39.0	33.4	22.0	25.0
British Columbia and Territories	25.4	21.7	26.5	28.2	27.8	20.4	20.8

* The significant increase in 2009 and 2010 shipments in this category is attributable to the supplementary compact refrigerator data provided by refrigerator manufacturers.

Due to rounding, the numbers may not add up to 100.

Table A.11 – Distribution of refrigerators for builder shipments by volume and region/ province, 2004–2010 (%)

Volume (cu. ft.)	2004	2005	2006	2007	2008	2009	2010
0–10.4							
Canada	0.5	2.0	2.3	1.6	1.3	2.3	2.1
Atlantic	4.9	2.6	8.6	5.6	8.9	6.5	4.1
Quebec	0.3	7.2	4.1	3.3	2.3	5.2	4.0
Ontario	0.1	1.3	2.7	0.4	0.4	1.0	0.5
Prairies	0.3	1.8	0.4	1.3	1.2	1.6	2.6
British Columbia and Territories	0.8	1.7	2.0	3.6	1.2	3.5	5.6
10.5–12.4							
Canada	10.2	9.2	13.1	13.5	15.3	10.9	13.6
Atlantic	20.2	26.1	19.7	21.1	30.0	22.3	28.1
Quebec	23.4	21.1	21.8	22.7	28.2	18.3	20.9
Ontario	4.5	3.7	12.5	13.6	14.1	8.1	9.7
Prairies	9.9	9.7	9.8	9.3	12.4	9.7	14.7
British Columbia and Territories	16.2	12.9	13.9	14.1	12.9	12.7	17.9
12.5–14.4							
Canada	8.7	6.5	3.9	1.9	1.2	1.6	1.0
Atlantic	13.2	21.1	15.2	8.7	5.2	17.9	6.0
Quebec	7.6	7.0	6.7	6.9	3.7	3.5	3.9
Ontario	14.7	10.1	5.2	1.5	0.7	0.6	0.4
Prairies	2.7	2.4	1.6	1.8	1.2	1.1	1.1
British Columbia and Territories	0.9	0.4	0.6	0.2	0.5	0.3	0.4
14.5–16.4							
Canada	23.8	24.4	22.6	22.2	18.8	23.4	26.7
Atlantic	18.9	11.8	17.7	20.4	14.8	17.3	16.8
Quebec	22.2	22.0	21.1	25.1	16.2	22.3	24.2
Ontario	34.5	37.5	34.6	34.0	33.1	38.7	36.7
Prairies	17.0	16.4	14.1	12.9	12.1	14.7	17.0
British Columbia and Territories	7.6	7.1	6.5	5.4	5.1	5.8	7.2

Continued

Table A.11 – Distribution of refrigerators for builder shipments by volume and region/province, 2004–2010 (%) (continued)

Volume (cu. ft.)	2004	2005	2006	2007	2008	2009	2010
16.5–18.4							
Canada	36.3	38.5	38.6	37.7	40.7	41.7	37.3
Atlantic	34.6	28.9	31.4	32.6	30.3	29.5	36.9
Quebec	40.2	37.1	40.0	35.3	45.0	46.5	39.6
Ontario	30.8	35.0	32.0	33.8	39.1	42.0	40.7
Prairies	44.8	45.1	49.5	44.7	45.6	43.5	30.0
British Columbia and Territories	37.9	41.2	41.2	39.9	37.2	39.1	33.6
18.5–20.4							
Canada	4.1	4.0	4.6	5.1	7.1	7.6	7.4
Atlantic	3.2	3.3	3.2	5.2	6.4	2.1	3.0
Quebec	0.7	1.1	1.1	1.5	0.9	1.2	3.5
Ontario	4.6	2.8	4.6	4.4	4.4	4.3	5.2
Prairies	1.9	2.6	2.1	3.8	5.2	7.7	9.5
British Columbia and Territories	7.6	9.7	9.6	9.6	16.4	17.2	16.3
20.5–32.4							
Canada	16.4	15.4	14.9	18.0	15.6	12.6	11.8
Atlantic	5.1	6.3	4.2	6.2	4.4	4.3	5.1
Quebec	5.5	4.7	5.3	5.1	3.7	2.9	3.9
Ontario	10.9	9.7	8.5	12.3	8.2	5.3	6.8
Prairies	23.4	21.9	22.6	26.2	22.3	21.8	25.0
British Columbia and Territories	29.0	27.1	26.3	27.2	26.6	21.4	19.0

Due to rounding, the numbers may not add up to 100.

Table A.12 – Distribution of refrigerators by average annual UEC per cubic foot and region/province, 2004–2010 (%)

Energy range (kWh/cu. ft. per year)	2004	2005	2006	2007	2008	2009	2010
10–19.9							
Canada	0.4	0.5	0.4	0.4	3.1	3.5	7.5
Atlantic	0.0	0.1	0.1	0.2	0.8	0.9	6.6
Quebec	0.3	0.4	0.3	0.2	2.1	2.8	4.4
Ontario	0.3	0.6	0.4	0.4	3.4	3.7	8.5
Prairies	0.0	0.7	0.5	0.5	4.4	4.7	9.3
British Columbia and Territories	0.0	0.4	0.3	0.5	3.0	3.6	8.7
20–29.9							
Canada	82.1	86.2	88.2	90.2	85.6	72.3	67.2
Atlantic	83.3	80.3	79.3	80.1	73.8	49.3	44.1
Quebec	85.8	88.9	91.1	92.7	89.5	80.5	75.6
Ontario	83.8	86.5	87.4	90.1	85.8	72.5	66.7
Prairies	80.1	89.3	90.0	91.2	85.1	69.0	66.6
British Columbia and Territories	80.8	74.0	84.2	86.3	80.8	71.4	60.8
30–39.9							
Canada	11.0	6.5	8.5	7.9	8.2	5.2	5.3
Atlantic	11.9	16.1	17.6	17.7	17.8	10.7	11.1
Quebec	9.2	6.1	6.1	5.6	6.0	3.6	3.9
Ontario	10.7	5.4	8.6	8.1	7.7	4.6	5.0
Prairies	17.9	6.5	8.1	7.2	7.6	5.4	5.5
British Columbia and Territories	14.5	7.8	11.0	10.3	12.3	7.8	6.6
40–49.9							
Canada	1.3	0.2	0.9	0.6	2.6	1.8	1.4
Atlantic	3.7	0.3	1.6	1.0	7.2	3.8	2.8
Quebec	0.9	0.1	0.7	0.6	2.2	1.2	1.2
Ontario	0.8	0.1	1.1	0.4	2.4	1.7	1.2
Prairies	0.8	0.1	0.4	0.4	2.6	1.8	1.5
British Columbia and Territories	3.1	0.6	1.3	1.6	2.7	2.4	2.0
50–189.9*							
Canada	5.2	6.6	2.0	0.8	0.5	17.2	18.5
Atlantic	1.1	3.2	1.4	0.9	0.4	35.2	35.3
Quebec	3.7	4.5	1.8	0.7	0.2	11.9	14.9
Ontario	4.4	7.4	2.5	0.9	0.7	17.5	18.6
Prairies	1.2	3.4	1.0	0.6	0.2	19.0	17.1
British Columbia and Territories	1.6	17.2	3.2	1.2	1.2	14.8	21.8

* The significant increase in 2009 and 2010 shipments in this category is attributable to the supplementary compact refrigerator data provided by refrigerator manufacturers.

Due to rounding, the numbers may not add up to 100.

Table A.13 – Average annual UEC of refrigerators by volume, 1990–2010 (kWh/yr)

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	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
2009	326	396	438	383	440	456	520
2010	328	394	438	381	428	452	512

Table A.14 – Average annual UEC per cubic foot of refrigerators by volume, 1990–2010 (kWh/cu. ft. per year)

	Volume (cu. ft.)						
Model year	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	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
2009	85*	35	33	25	25	23	22
2010	87*	34	33	25	25	23	22

*This substantial increase in average annual UEC per cu. ft. of volume in 2009 and 2010 of refrigerators in the 0–10.4 cu. ft. category is mainly due to a shift toward (more energy-intensive) compact refrigerators with a volume less than 4.4 cu. ft., as evidenced by the supplementary compact refrigerator data received in 2009 and 2010.

Table A.15 – Average annual UEC of refrigerators by channel and region/province, 2004–2010 (kWh/yr)

Channel	2004	2005	2006	2007	2008	2009	2010
Builder							
Canada	464.3	457.2	458.2	459.2	447.2	430.8	414.8
Atlantic	463.8	436.8	437.6	439.2	428.5	433.3	409.9
Quebec	455.6	437.5	445.7	444.6	438.9	424.5	417.2
Ontario	451.9	444.1	442.0	443.0	426.9	408.6	400.4
Prairies	477.8	475.1	477.8	477.9	460.3	449.4	433.8
British Columbia and Territories	483.3	479.0	480.5	480.9	471.1	454.3	441.1
Retail							
Canada	480.7	471.7	486.9	488.6	471.6	430.1	426.1
Atlantic	477.8	468.4	471.9	475.2	470.5	404.0	395.1
Quebec	471.7	468.0	475.6	478.1	460.5	432.7	428.1
Ontario	489.0	475.0	490.6	490.9	475.1	432.5	428.1
Prairies	497.1	480.8	498.9	499.3	477.3	427.9	429.6
British Columbia and Territories	469.2	450.8	489.0	493.8	485.1	435.6	424.0

Table A.16 – Distribution of refrigerators consuming less than 30 kWh/cu. ft. per year, by channel and region/province, 2004–2010 (%)

Channel	2004	2005	2006	2007	2008	2009	2010
Builder							
Canada	81.4	83.8	79.9	81.1	79.3	84.4	83.2
Atlantic	71.9	61.3	60.5	64.0	55.7	52.9	61.8
Quebec	69.3	63.4	66.0	65.6	64.3	72.8	71.2
Ontario	84.0	88.9	79.9	83.3	82.6	89.9	89.4
Prairies	84.8	85.4	86.9	85.1	82.7	86.8	81.6
British Columbia and Territories	78.8	83.7	80.5	78.6	80.0	81.4	76.0
Retail							
Canada	82.8	87.3	90.8	92.8	90.7	74.6	73.8
Atlantic	86.0	84.2	82.6	82.3	77.1	50.0	50.1
Quebec	87.2	90.8	93.2	94.5	93.6	83.7	80.4
Ontario	84.2	86.6	90.3	92.6	90.7	73.9	72.8
Prairies	85.7	91.1	91.6	93.2	91.3	71.6	75.4
British Columbia and Territories	69.1	70.0	86.8	91.8	86.6	72.2	68.2

Table A.17 – Distribution of freezers by type, 1991–2010 (%)

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
2009	19.5	14.0	34.5	1.7	30.3*
2010	22.9	15.4	19.4	1.0	41.3*

* This significant increase in 2009 and 2010 shipments in this category is attributable to the supplementary compact freezer data provided by freezer manufacturers.

Due to rounding, the numbers may not add up to 100.

The definitions of the various types of freezers can be found in Appendix B.

Table A.18 – Distribution of freezers by average annual UEC per cubic foot, 1990–2010 (%)

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
2009	18.6	37.7	26.4	15.5*	1.7*
2010	21.6	36.0	27.1	14.4*	1.0*

* These significant increases in 2009 and 2010 shipments in these categories are attributable to the supplementary compact freezer data provided by freezer manufacturers.

Due to rounding, the numbers may not add up to 100.

Table A.19 – Distribution of freezers by type* and region/province, 2004–2010 (%)

Freezer type	2004	2005	2006	2007	2008	2009	2010
Type 8							
Canada	29.4	30.4	28.5	26.4	20.1	19.5	22.9
Atlantic	19.8	20.8	25.7	29.1	24.3	19.2	22.7
Quebec	41.3	41.1	44.9	39.9	31.9	28.5	30.4
Ontario	28.2	26.7	31.6	28.8	22.2	17.2	20.0
Prairies	31.7	27.9	31.9	26.8	17.8	14.6	18.4
British Columbia and Territories	30.0	28.8	30.0	31.6	22.0	18.1	24.3
Type 9							
Canada	8.3	10.7	8.7	11.8	11.4	14.0	15.4
Atlantic	10.2	8.2	6.9	11.2	10.4	4.9	7.1
Quebec	5.6	6.0	3.5	8.2	8.6	11.5	12.5
Ontario	17.8	13.4	10.1	17.1	17.6	16.0	18.1
Prairies	12.6	12.1	9.6	16.0	16.4	17.4	18.6
British Columbia and Territories	15.0	14.6	14.3	16.6	16.3	9.6	11.8
Type 10							
Canada	45.5	35.7	45.6	39.4	42.9	34.5	32.4
Atlantic	38.0	37.0	29.0	27.3	28.2	38.0	35.0
Quebec	22.7	21.9	25.0	21.5	23.4	30.4	30.1
Ontario	18.9	19.9	22.6	21.6	23.3	34.3	31.4
Prairies	25.9	23.3	27.5	25.9	29.2	36.3	34.2
British Columbia and Territories	30.8	28.5	26.8	26.9	29.7	39.7	37.0
Type 18							
Canada	16.8	23.2	17.2	22.4	25.1	30.3	28.3
Atlantic	32.0	34.1	38.4	32.4	37.1	35.2	33.7
Quebec	30.4	31.0	26.6	30.4	34.9	28.4	26.1
Ontario	35.1	39.8	35.7	32.4	36.4	30.6	29.4
Prairies	29.8	36.7	30.9	31.3	36.6	30.2	28.0
British Columbia and Territories	24.1	28.1	28.9	24.9	30.1	30.6	25.6

* Breakdown does not include slight market share for Type 16 freezers now evident in supplementary freezer data for 2009 and 2010.

Due to rounding, the numbers may not add up to 100.

Table A.20 – Distribution of freezers by average annual UEC per cubic foot and region/ province, 2004–2010 (%)

Energy range (kWh/cu. ft. per year)	2004	2005	2006	2007	2008	2009	2010
20–29.9							
Canada	28.9	29.5	34.8	26.7	28.8	18.6	21.6
Atlantic	34.3	36.4	31.2	30.0	29.7	14.8	17.7
Quebec	27.9	29.9	36.6	26.8	31.0	22.2	23.8
Ontario	22.2	24.5	30.4	24.0	24.2	15.4	17.5
Prairies	33.2	31.9	40.2	26.6	29.4	19.0	24.3
British Columbia and Territories	36.7	37.5	38.0	37.7	37.5	25.0	27.1
30–39.9							
Canada	48.8	45.2	40.4	47.5	47.2	37.7	36.0
Atlantic	46.0	47.6	46.5	48.4	46.1	27.8	32.1
Quebec	51.3	48.7	45.7	50.3	48.6	44.4	39.0
Ontario	51.1	44.3	41.1	46.4	48.9	36.2	35.5
Prairies	47.3	45.6	36.1	49.9	46.6	38.2	35.8
British Columbia and Territories	40.6	35.4	32.6	32.6	36.4	28.4	31.2
40–49.9							
Canada	22.3	25.3	24.7	25.9	23.4	26.4	27.1
Atlantic	19.3	16.0	22.3	21.6	24.1	29.5	28.2
Quebec	20.7	21.4	17.6	23.0	19.1	21.3	24.1
Ontario	26.6	31.1	28.5	29.6	26.4	29.6	30.1
Prairies	19.5	22.5	23.8	23.5	24.0	26.6	27.0
British Columbia and Territories	22.6	27.0	29.4	29.7	24.3	25.3	22.7
50–59.9*							
Canada	0.1	0.0	0.0	0.0	0.0	15.5	14.4
Atlantic	0.3	0.0	0.0	0.0	0.0	25.2	20.5
Quebec	0.1	0.0	0.0	0.0	0.0	10.9	12.2
Ontario	0.1	0.0	0.0	0.0	0.0	16.9	15.7
Prairies	0.0	0.0	0.0	0.0	0.0	14.6	12.0
British Columbia and Territories	0.1	0.0	0.0	0.0	0.0	19.3	17.8
60–129.9*							
Canada	0.0	0.0	0.0	0.0	0.6	1.7	1.0
Atlantic	0.0	0.0	0.0	0.0	0.0	2.7	1.4
Quebec	0.0	0.0	0.0	0.0	1.2	1.2	0.9
Ontario	0.0	0.0	0.0	0.0	0.5	1.9	1.1
Prairies	0.0	0.0	0.0	0.0	0.0	1.6	0.8
British Columbia and Territories	0.0	0.0	0.0	0.0	1.9	2.1	1.2

* The significant increases in 2009 and 2010 shipments in the categories over 50 kWh/cu. ft. per year are attributable to the supplementary compact freezer data provided by freezer manufacturers.

Due to rounding, the numbers may not add up to 100.

Table A.21 – Distribution of freezers by channel and region/province, 2004–2010 (%)

Channel	2004	2005	2006	2007	2008	2009	2010
Builder							
Canada	1.8	2.1	2.0	2.6	9.3	4.4	3.7
Atlantic	0.9	1.6	0.5	0.4	0.6	0.1	0.1
Quebec	0.9	0.7	0.4	0.2	4.2	2.5	2.8
Ontario	0.5	0.4	0.3	0.9	8.1	3.2	4.2
Prairies	5.0	4.4	7.2	4.1	13.2	5.8	4.3
British Columbia and Territories	15.5	18.6	16.0	13.2	27.3	17.8	6.8
Retail							
Canada	98.2	97.9	98.0	97.4	90.7	95.6	96.3
Atlantic	99.1	98.4	99.5	99.6	99.4	99.9	99.9
Quebec	99.1	99.3	99.6	99.8	95.8	97.5	97.2
Ontario	99.5	99.6	99.7	99.1	91.9	96.8	95.8
Prairies	95.0	95.6	92.8	95.9	86.8	94.2	95.7
British Columbia and Territories	84.5	81.4	84.0	86.8	72.7	82.2	93.2

Due to rounding, the numbers may not add up to 100.

Table A.22 – Average annual UEC of freezers by model year, 1991–2010 (kWh/yr)

Model year	Type 8	Type 9	Type 10	Type 18	Total
1991	706.4	1068.0	412.4	339.8	**444.7**
1992	670.4	1078.0	421.1	337.8	**449.3**
1993	581.3	863.3	385.1	287.8	**401.7**
1994	535.9	846.1	379.1	292.4	**389.2**
1995	508.9	817.1	371.1	282.0	**381.6**
1996	502.9	820.7	368.1	279.4	**376.7**
1997	494.8	823.7	362.4	278.7	**376.5**
1998	496.0	829.6	360.2	278.2	**381.5**
1999	493.1	838.6	353.2	276.3	**383.4**
2000	494.8	839.4	354.0	277.1	**390.9**
2001	456.9	740.5	345.1	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**
2009	438.9	622.7	348.4	243.7	**356.3**
2010	432.8	621.7	294.6	256.6	**365.5**

Note: Numbers are not additive.

Table A.23 – Distribution of dishwashers by average annual UEC, 1990–2010 (%)

Model year	kWh/yr						
	0–299.9	300–349.9	350–399.9	400–499.9	500–599.9	600–699.9	700–1399.9
1990	0.0	0.0	0.0	0.0	0.0	0.2	99.8
1991	0.0	0.0	0.0	0.0	0.0	5.8	94.2
1992	0.0	0.0	0.0	0.0	0.0	8.5	91.5
1993	0.0	0.0	0.0	0.0	0.4	7.7	91.9
1994	0.0	0.0	0.0	0.5	0.5	32.9	66.1
1995	0.0	0.0	0.2	0.9	0.9	63.7	34.2
1996	0.0	0.0	0.2	0.9	3.9	63.0	32.0
1997	0.0	0.0	0.4	1.1	20.5	56.9	21.2
1998	0.0	0.0	0.2	1.2	23.4	71.6	3.7
1999	0.0	0.0	0.2	1.4	24.9	73.6	0.0
2000	0.0	0.0	0.1	3.9	19.3	76.7	0.0
2001	0.0	0.0	0.0	5.5	23.9	70.6	0.0
2002	0.0	0.0	3.2	13.6	37.8	45.5	0.0
2003	0.0	0.0	9.1	33.6	36.5	20.7	0.0
2004	0.0	4.0	24.3	46.4	16.5	8.8	0.0
2005	0.0	19.6	55.5	15.5	6.4	3.0	0.0
2006	0.3	28.2	61.8	5.7	2.7	1.3	0.0
2007	2.6	48.9	42.7	5.0	0.6	0.3	0.0
2008	0.7	69.7	26.9	2.7	0.0	0.0	0.0
2009	4.2	85.3	10.1	0.4	0.0	0.0	0.0
2010	13.7	79.6	6.6	0.1	0.0	0.0	0.0

Due to rounding, the numbers may not add up to 100.

Table A.24 – Distribution of dishwashers by average annual UEC and region/province, 2004–2010 (%)

Energy range (kWh/yr)	2004	2005	2006	2007	2008	2009	2010
0–299.9							
Canada	0.0	0.0	0.3	2.6	0.7	4.2	13.7
Atlantic	0.0	0.0	1.0	7.1	0.8	2.6	7.6
Quebec	0.0	0.0	1.1	4.9	0.7	3.2	12.7
Ontario	0.0	0.0	0.1	1.6	0.7	5.2	15.3
Prairies	0.0	0.0	0.0	1.3	0.6	3.4	12.6
British Columbia and Territories	0.0	0.0	0.1	2.3	0.7	5.7	15.4
300–349.9							
Canada	4.0	19.6	28.2	48.9	69.7	85.3	79.6
Atlantic	9.0	25.5	33.1	45.3	59.9	89.0	89.7
Quebec	4.0	21.9	26.3	46.9	70.3	85.6	77.9
Ontario	4.6	20.5	28.5	50.5	70.1	85.0	78.5
Prairies	2.7	15.2	25.8	47.6	70.5	85.3	82.3
British Columbia and Territories	3.4	20.0	35.5	51.8	68.6	84.5	77.2
350–399.9							
Canada	24.3	55.5	61.8	42.7	26.9	10.1	6.6
Atlantic	21.3	48.0	49.7	38.6	35.2	8.3	2.7
Quebec	28.0	59.7	66.8	43.8	26.9	10.9	9.2
Ontario	22.7	54.0	61.7	42.2	26.2	9.2	6.1
Prairies	23.5	59.2	64.2	45.5	26.6	10.9	5.0
British Columbia and Territories	24.1	44.7	50.0	36.8	27.3	9.7	7.4
400–699.9							
Canada	71.7	24.9	9.7	5.9	2.7	0.4	0.1
Atlantic	69.7	26.5	16.3	8.9	4.1	0.1	0.0
Quebec	68.1	18.4	5.9	4.3	2.1	0.3	0.2
Ontario	72.7	25.4	9.7	5.7	3.0	0.5	0.1
Prairies	73.8	25.7	10.0	5.6	2.4	0.4	0.2
British Columbia and Territories	72.6	35.3	14.4	9.2	3.4	0.1	0.0

Due to rounding, the numbers may not add up to 100.

Table A.25 – Distribution of dishwashers by channel and region/province, 2004–2010 (%)

Channel	2004	2005	2006	2007	2008	2009	2010
Builder							
Canada	14.3	14.7	15.5	15.5	15.5	15.2	11.9
Atlantic	15.3	11.6	11.8	9.1	10.9	10.9	9.1
Quebec	3.0	2.9	3.3	3.2	3.0	3.1	3.3
Ontario	15.1	15.1	15.5	15.0	12.3	13.4	13.9
Prairies	16.7	16.8	18.8	18.5	20.3	18.1	13.5
British Columbia and Territories	32.3	35.9	33.9	36.3	41.8	42.2	23.7
Retail							
Canada	85.7	85.3	84.5	84.5	84.5	84.8	88.1
Atlantic	84.7	88.4	88.2	90.9	89.1	89.1	90.9
Quebec	97.0	97.1	96.7	96.8	97.0	96.9	96.7
Ontario	84.9	84.9	84.5	85.0	87.7	86.6	86.1
Prairies	83.3	83.2	81.2	81.5	79.7	81.9	86.5
British Columbia and Territories	67.7	64.1	66.1	63.7	58.2	57.8	76.3

Due to rounding, the numbers may not add up to 100.

Table A.26 – Average annual UEC of dishwashers, 1990–2010

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
2009	324.7
2010	309.6

Table A.27 – Average annual UEC of dishwashers by channel and region/province, 2004–2010 (kWh/yr)

Channel	2004	2005	2006	2007	2008	2009	2010
Builder							
Canada	443.0	404.0	382.8	361.1	348.4	323.9	308.4
Atlantic	454.4	391.2	385.9	353.3	342.8	329.5	306.7
Quebec	449.2	417.0	386.8	363.7	342.2	328.0	305.7
Ontario	447.0	408.9	388.4	366.5	354.0	322.9	307.9
Prairies	442.1	396.4	381.2	359.4	347.0	325.0	309.6
British Columbia and Territories	434.6	404.2	376.3	356.3	345.6	322.8	309.3
Retail							
Canada	459.1	394.2	370.7	352.5	341.9	324.9	309.8
Atlantic	469.4	402.9	382.2	357.7	349.5	326.0	310.1
Quebec	454.3	386.5	367.3	350.0	342.9	325.6	310.0
Ontario	454.7	392.6	371.0	352.1	341.3	323.8	308.9
Prairies	465.2	399.3	371.8	354.6	341.1	325.8	311.6
British Columbia and Territories	472.6	408.4	372.6	352.7	340.4	323.2	306.8

Table A.28 – Distribution of electric ranges by type, 1990–2010 (%)

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
2009	31.8	68.2
2010	26.3	73.7

Due to rounding, the numbers may not add up to 100.

Table A.29 – Distribution of electric ranges by average annual UEC, 1990–2010 (%)

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
2009	4.7	25.2	65.9	4.2	0.1
2010	4.3	22.1	68.0	5.6	0.0

Due to rounding, the numbers may not add up to 100.

Table A.30 – Distribution of electric ranges by type and region/province, 2004–2010 (%)

Electric range type	2004	2005	2006	2007	2008	2009	2010
Non-self-cleaning							
Canada	42.3	41.2	40.1	34.2	30.4	27.8	26.3
Atlantic	53.7	51.7	51.6	48.4	44.3	43.8	36.9
Quebec	40.4	37.6	31.8	28.0	23.7	19.0	16.9
Ontario	44.3	46.1	49.0	39.2	34.8	32.2	31.4
Prairies	39.7	36.5	32.7	31.1	29.3	27.5	25.6
British Columbia and Territories	40.7	38.6	35.5	33.8	31.7	30.9	32.4
Self-cleaning							
Canada	57.7	58.8	59.9	65.8	69.6	72.2	73.7
Atlantic	46.3	48.3	48.4	51.6	55.7	56.2	63.1
Quebec	59.6	62.4	68.2	72.0	76.3	81.0	83.1
Ontario	55.7	53.9	51.0	60.8	65.2	67.8	68.6
Prairies	60.3	63.5	67.3	68.9	70.7	72.5	74.4
British Columbia and Territories	59.3	61.4	64.5	66.2	68.3	69.1	67.6

Due to rounding, the numbers may not add up to 100.

Table A.31 – Distribution of electric ranges by average annual UEC and region/province, 2004–2010 (%)

Energy range (kWh/yr)	2004	2005	2006	2007	2008	2009	2010
300–449.9							
Canada	6.3	7.0	10.4	9.3	6.7	4.7	4.3
Atlantic	1.5	4.3	9.3	11.8	8.4	4.7	4.4
Quebec	9.5	9.0	12.3	10.5	7.5	4.7	3.6
Ontario	5.0	6.2	9.6	8.8	6.7	5.5	5.3
Prairies	7.1	7.5	10.7	8.6	5.9	3.5	3.5
British Columbia and Territories	1.5	4.0	8.6	8.4	5.5	4.3	4.4
450–499.9							
Canada	21.5	37.9	37.5	29.7	25.0	25.2	22.1
Atlantic	16.8	32.5	35.3	28.1	28.7	28.9	26.7
Quebec	21.4	34.7	35.2	30.4	26.2	26.9	22.0
Ontario	20.8	39.4	38.5	29.6	23.9	23.8	21.2
Prairies	25.2	40.8	35.0	28.1	22.6	23.0	21.2
British Columbia and Territories	17.8	38.6	45.0	32.8	29.2	29.1	25.9
500–599.9							
Canada	13.3	26.2	36.6	51.2	61.2	65.9	68.0
Atlantic	14.6	29.8	44.2	53.6	58.8	64.9	64.0
Quebec	15.0	26.1	34.9	45.8	58.2	64.2	68.0
Ontario	12.3	26.1	35.7	52.6	62.0	67.0	68.5
Prairies	14.7	27.1	40.8	54.5	65.8	67.5	68.5
British Columbia and Territories	7.2	22.6	32.4	51.3	57.4	62.8	67.0
600–749.9							
Canada	27.4	15.3	7.4	8.5	6.4	4.2	5.6
Atlantic	20.5	12.4	5.4	6.2	3.8	1.3	4.9
Quebec	26.3	17.6	9.5	10.7	7.2	4.0	6.4
Ontario	27.4	14.0	6.7	8.0	6.7	3.6	5.0
Prairies	26.1	12.4	6.6	7.9	5.3	6.1	6.8
British Columbia and Territories	38.4	20.9	7.8	6.6	7.2	3.7	2.7
750–899.9							
Canada	31.5	13.6	8.1	1.3	0.7	0.1	0.0
Atlantic	46.6	20.9	5.8	0.2	0.2	0.1	0.0
Quebec	27.8	12.6	8.1	2.6	0.9	0.2	0.0
Ontario	34.4	14.4	9.5	0.9	0.7	0.0	0.0
Prairies	26.9	12.1	7.0	0.8	0.4	0.0	0.0
British Columbia and Territories	35.2	13.9	6.3	0.9	0.6	0.0	0.0

Due to rounding, the numbers may not add up to 100.

Table A.32 – Distribution of electric ranges by channel and region/province, 2004–2010 (%)

Channel	2004	2005	2006	2007	2008	2009	2010
Builder							
Canada	21.5	22.1	26.9	21.1	19.0	18.7	17.0
Atlantic	19.5	17.3	17.4	12.8	11.3	14.7	10.5
Quebec	6.6	6.5	8.7	6.0	6.6	6.1	6.4
Ontario	28.2	29.1	33.2	26.9	21.4	23.0	24.8
Prairies	22.6	23.6	31.0	22.9	23.2	19.9	15.1
British Columbia and Territories	42.8	43.5	43.9	41.7	43.1	41.4	29.0
Retail							
Canada	78.5	77.9	73.1	78.9	81.0	81.3	83.0
Atlantic	80.5	82.7	82.6	87.2	88.7	85.3	89.5
Quebec	93.4	93.5	91.3	94.0	93.4	93.9	93.6
Ontario	71.8	70.9	66.8	73.1	78.6	77.0	75.2
Prairies	77.4	76.4	69.0	77.1	76.8	80.1	84.9
British Columbia and Territories	57.2	56.5	56.1	58.3	56.9	58.6	71.0

Due to rounding, the numbers may not add up to 100.

Table A.33 – Average annual UEC of electric ranges by type, 1990–2010 (kWh/yr)

Model year	Non-self-cleaning	Self-cleaning	Total
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**
2009	502.6	523.5	**517.7**
2010	499.3	529.7	**521.7**

Note: Numbers are not additive.

Table A.34 – Average annual UEC of electric ranges by channel and region/province, 2004–2010 (kWh/yr)

Channel	2004	2005	2006	2007	2008	2009	2010
Builder							
Canada	730.9	604.5	541.3	508.9	515.1	501.0	501.5
Atlantic	709.5	595.3	524.5	511.4	503.2	499.8	492.5
Quebec	714.3	620.3	562.1	534.1	545.2	478.6	487.7
Ontario	739.5	612.4	551.4	508.5	514.5	497.9	501.5
Prairies	724.1	586.1	532.7	503.6	508.4	509.7	508.5
British Columbia and Territories	728.7	600.3	518.2	501.3	512.1	507.0	504.5
Retail							
Canada	631.3	563.5	535.7	528.4	523.3	521.5	525.8
Atlantic	677.8	590.0	535.1	521.3	516.0	515.6	520.0
Quebec	625.9	563.8	537.4	529.2	521.6	521.9	526.6
Ontario	634.6	560.5	532.2	527.9	524.9	521.9	527.5
Prairies	610.2	553.3	538.2	528.6	523.9	520.9	524.0
British Columbia and Territories	684.2	587.8	538.7	531.2	527.4	524.0	524.3

Table A.35 – Distribution of clothes washers by type, 2001–2010 (%)

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
2009	61.4	38.6
2010	59.8	40.2

Due to rounding, the numbers may not add up to 100.

Table A.36 – Distribution of clothes washers by average annual UEC, 1990–2010 (%)

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
2009	15.9	29.1	44.3	10.5	0.2	0.0
2010	37.4	20.0	29.8	12.6	0.2	0.0

Due to rounding, the numbers may not add up to 100.

Table A.37 – Distribution of clothes washers by type and region/province, 2004–2010 (%)

Clothes washer type	2004	2005	2006	2007	2008	2009	2010
Front-loading							
Canada	29.2	42.3	46.9	55.3	60.5	61.4	59.8
Atlantic and Quebec	22.8	36.2	39.0	46.9	51.6	49.3	46.0
Ontario	27.7	45.4	50.5	58.3	64.0	65.3	65.8
Prairies	28.9	44.9	49.2	58.7	63.7	66.0	65.4
British Columbia and Territories	30.2	48.6	59.1	66.2	72.6	76.7	73.5
Top-loading							
Canada	70.8	57.7	53.1	44.7	39.5	38.6	40.2
Atlantic and Quebec	77.2	63.8	61.0	53.1	48.4	50.7	54.0
Ontario	72.3	54.6	49.5	41.7	36.0	34.7	34.2
Prairies	71.1	55.1	50.8	41.3	36.3	34.0	34.6
British Columbia and Territories	69.8	51.4	40.9	33.8	27.4	23.3	26.5

Due to rounding, the numbers may not add up to 100.

Table A.38 – Distribution of clothes washers by average annual UEC and region/province, 2004–2010 (%)

Energy range (kWh/yr)	2004	2005	2006	2007	2008	2009	2010
100–149.9							
Canada	0.2	2.8	3.3	5.9	8.7	15.9	36.9
Atlantic and Quebec	0.0	2.4	3.0	5.3	7.6	12.9	22.8
Ontario	0.0	3.2	3.5	6.5	9.5	17.0	30.2
Prairies	0.0	2.0	2.3	4.1	7.9	16.7	39.6
British Columbia and Territories	0.0	5.9	6.7	11.7	12.5	20.5	42.3
150–199.9							
Canada	8.1	14.0	23.5	32.6	35.3	29.1	20.0
Atlantic and Quebec	5.8	10.3	16.6	27.1	29.7	22.4	16.8
Ontario	7.9	16.1	25.8	33.3	37.0	31.7	16.3
Prairies	10.0	15.7	29.5	39.0	40.6	32.9	22.1
British Columbia and Territories	3.8	16.8	25.4	32.4	35.6	32.8	19.6
200–399.9							
Canada	27.4	31.4	27.8	32.4	34.4	44.4	29.8
Atlantic and Quebec	21.9	29.1	27.7	34.0	36.1	50.9	25.8
Ontario	29.0	33.2	28.8	31.9	33.3	41.6	36.8
Prairies	25.9	32.4	25.4	31.3	33.1	41.5	27.9
British Columbia and Territories	31.8	30.3	30.8	31.9	35.8	39.3	26.9
400–499.9							
Canada	2.5	3.4	11.5	26.3	21.5	10.5	12.6
Atlantic and Quebec	1.5	3.0	15.0	31.8	26.6	13.5	33.0
Ontario	3.9	4.3	10.6	24.8	20.2	9.5	16.1
Prairies	2.2	2.9	8.8	23.3	18.4	8.9	9.5
British Columbia and Territories	3.2	2.8	8.2	19.9	16.1	7.5	10.8
500–599.9							
Canada	16.6	28.3	19.8	0.3	0.0	0.0	0.6
Atlantic and Quebec	19.9	35.3	22.3	0.2	0.0	0.0	1.5
Ontario	16.5	23.5	17.9	0.3	0.0	0.0	0.3
Prairies	16.5	28.1	22.0	0.4	0.0	0.0	0.8
British Columbia and Territories	11.0	17.9	9.9	0.3	0.0	0.0	0.3
600–999.9							
Canada	45.2	20.1	14.2	2.5	0.0	0.2	0.2
Atlantic and Quebec	50.9	19.9	15.5	1.8	0.0	0.3	0.1
Ontario	42.8	19.7	13.3	3.2	0.1	0.2	0.4
Prairies	45.4	18.9	12.0	1.9	0.0	0.1	0.2
British Columbia and Territories	50.2	26.4	19.0	3.7	0.0	0.0	0.1

Due to rounding, the numbers may not add up to 100.

Table A.39 – Distribution of clothes washers by channel and region/province, 2004–2010 (%)

Channel	2004	2005	2006	2007	2008	2009	2010
Builder							
Canada	5.8	5.7	5.7	5.8	5.9	5.5	4.2
Atlantic and Quebec	2.0	1.9	1.6	1.6	1.6	1.8	1.5
Ontario	6.4	5.6	6.0	5.9	4.9	5.0	5.5
Prairies	8.5	8.1	7.9	7.8	8.4	7.6	4.5
British Columbia and Territories	18.5	16.7	15.6	15.4	18.9	14.0	8.1
Retail							
Canada	94.2	94.3	94.3	94.2	94.1	94.5	95.8
Atlantic and Quebec	98.0	98.1	98.4	98.4	98.4	98.2	98.5
Ontario	93.6	94.4	94.0	94.1	95.1	95.0	94.5
Prairies	91.5	91.9	92.1	92.2	91.6	92.4	95.5
British Columbia and Territories	81.5	83.3	84.4	84.6	81.1	86.0	91.9

Due to rounding, the numbers may not add up to 100.

Table A.40 – Average annual UEC of clothes washers by type, 1990–2010 (kWh/yr)

Model year	Front-loading	Top-loading	Total
1990	n/a	n/a	**1218.0**
1991	n/a	n/a	**1197.4**
1992	n/a	n/a	**1175.5**
1993	n/a	n/a	**1094.1**
1994	n/a	n/a	**989.1**
1995	n/a	n/a	**965.9**
1996	n/a	n/a	**948.7**
1997	n/a	n/a	**930.1**
1998	n/a	n/a	**903.3**
1999	n/a	n/a	**859.9**
2000	n/a	n/a	**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**
2009	172.0	331.9	**233.8**
2010	148.3	318.7	**216.8**

Note: Numbers are not additive.

n/a stands for not available

Table A.41 – Average annual UEC of clothes washers by channel and region/province, 2004–2010 (kWh/yr)

Channel	2004	2005	2006	2007	2008	2009	2010
Builder							
Canada	653.0	529.9	499.9	319.5	297.1	270.5	244.2
Atlantic and Quebec	651.1	513.7	526.0	368.5	312.9	303.0	273.4
Ontario	641.0	510.4	475.6	321.6	306.7	272.1	229.1
Prairies	706.3	588.9	550.5	340.6	317.3	287.4	278.5
British Columbia and Territories	590.7	475.6	449.8	261.7	256.5	230.8	215.3
Retail							
Canada	568.0	438.4	382.9	285.2	259.2	231.6	215.6
Atlantic and Quebec	629.0	469.8	415.7	302.0	279.9	254.2	244.6
Ontario	550.7	420.7	369.1	281.3	251.3	223.5	201.2
Prairies	556.0	419.1	362.3	272.6	248.1	219.7	202.3
British Columbia and Territories	585.3	428.3	352.4	268.7	233.5	208.2	194.1

Table A.42 – Tub capacity and average energy consumption of clothes washers by type, 1990–2010

Model year	Front-loading	Top-loading	Total
Average clothes washer tub capacity (litres)			
1990	n/a	n/a	**72.72**
1991	n/a	n/a	**76.08**
1992	n/a	n/a	**77.03**
1993	n/a	n/a	**77.13**
1994	n/a	n/a	**77.75**
1995	n/a	n/a	**78.02**
1996	n/a	n/a	**80.17**
1997	n/a	n/a	**79.63**
1998	n/a	n/a	**81.16**
1999	80.07	81.90	**81.68**
2000	76.60	83.26	**82.23**
2001	76.01	84.49	**83.13**
2002	75.78	85.50	**83.85**
2003	77.46	85.94	**84.07**
2004	79.42	86.50	**84.42**
2005	82.00	87.18	**84.98**
2006	84.21	88.54	**86.51**
2007	85.07	89.65	**87.12**
2008	86.79	90.26	**88.16**
2009	89.31	95.45	**91.68**
2010	94.83	98.40	**96.27**

Model year	Front-loading	Top-loading	Total
Average energy consumption (kWh/litre)			
1990	n/a	n/a	**16.75**
1991	n/a	n/a	**15.74**
1992	n/a	n/a	**15.26**
1993	n/a	n/a	**14.18**
1994	n/a	n/a	**12.72**
1995	n/a	n/a	**12.38**
1996	n/a	n/a	**11.83**
1997	n/a	n/a	**11.68**
1998	n/a	n/a	**11.13**
1999	3.60	11.15	**10.53**
2000	3.58	11.08	**10.19**
2001	3.78	10.71	**9.75**
2002	3.97	10.19	**9.29**
2003	3.55	9.62	**8.43**
2004	3.25	8.12	**6.79**
2005	2.67	6.98	**5.22**
2006	2.41	6.27	**4.50**
2007	2.16	4.63	**3.30**
2008	2.07	4.29	**2.97**
2009	1.93	3.48	**2.55**
2010	1.56	3.24	**2.25**

Note: Numbers are not additive.

n/a stands for not available

Table A.43 – Distribution of electric clothes dryers by average annual UEC, 1992–2010 (%)

Model year	kWh/yr				
	350–799.9	800–899.9	900–949.9	950–999.9	1000–1249.9
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
2009	4.2	1.7	56.1	38.1	0.0
2010	3.0	1.7	53.4	41.9	0.0

Due to rounding, the numbers may not add up to 100.

Table A.44 – Distribution of electric clothes dryers by average annual UEC and region/ province, 2004–2010 (%)

Energy range (kWh/yr)	2004	2005	2006	2007	2008	2009	2010
350–799.9							
Canada	4.0	6.1	6.1	4.9	4.6	4.2	3.0
Atlantic	1.8	3.7	3.9	3.0	3.4	2.4	1.7
Ontario	5.9	7.9	7.2	5.7	5.4	4.6	3.9
Prairies	2.8	4.6	4.9	3.8	3.8	3.5	2.0
British Columbia and Territories	9.4	14.8	14.7	12.0	11.0	9.0	7.3
800–899.9							
Canada	4.4	3.2	2.8	2.9	2.2	1.7	1.7
Atlantic	3.6	2.6	2.0	2.1	3.2	2.5	1.9
Ontario	6.3	4.7	4.2	4.3	2.9	1.7	2.0
Prairies	3.4	2.1	1.9	1.9	1.3	1.0	1.1
British Columbia and Territories	5.5	3.3	3.0	3.4	2.2	1.5	1.9
900–949.9							
Canada	75.3	74.1	69.8	67.8	60.7	56.1	53.4
Atlantic	82.1	81.0	79.4	76.3	77.4	73.7	58.8
Ontario	69.7	69.9	66.4	64.4	57.2	54.0	48.9
Prairies	74.8	72.9	63.2	63.0	57.6	54.0	53.3
British Columbia and Territories	65.1	64.6	62.9	63.1	55.3	48.6	50.8
950–999.9							
Canada	16.3	16.6	21.2	24.4	32.5	38.1	41.9
Atlantic	12.4	12.7	14.7	18.6	16.0	21.4	37.6
Ontario	18.1	17.5	22.1	25.6	34.5	39.7	45.3
Prairies	19.0	20.4	29.9	31.3	37.2	41.6	43.6
British Columbia and Territories	19.9	17.4	19.5	21.6	31.4	40.9	40.1

Due to rounding, the numbers may not add up to 100.

Table A.45 – Distribution of electric clothes dryers by channel and region/province, 2004–2010 (%)

Channel	2004	2005	2006	2007	2008	2009	2010
Builder							
Canada	6.3	6.1	5.9	6.3	6.1	5.3	4.3
Atlantic and Quebec	2.0	1.9	1.5	1.6	1.6	1.8	1.5
Ontario	7.2	6.4	6.4	6.9	5.4	5.0	6.1
Prairies	8.9	8.5	8.1	8.2	8.9	7.2	4.5
British Columbia and Territories	18.9	17.3	15.4	15.7	18.6	13.8	8.1
Retail							
Canada	93.7	93.9	94.1	93.7	93.9	94.7	95.7
Atlantic and Quebec	98.0	98.1	98.5	98.4	98.4	98.2	98.5
Ontario	92.8	93.6	93.6	93.1	94.6	95.0	93.9
Prairies	91.1	91.5	91.9	91.8	91.1	92.8	95.5
British Columbia and Territories	81.1	82.7	84.6	84.3	81.4	86.2	91.9

Due to rounding, the numbers may not add up to 100.

Table A.46 – Average annual UEC of electric clothes dryers, 1992–2010

Model year	kWh/yr
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
2009	921.4
2010	928.0

Table A.47 – Average annual UEC of electric clothes dryers by channel and region/province, 2004–2010 (kWh/yr)

Channel	2004	2005	2006	2007	2008	2009	2010
Builder							
Canada	843.1	832.2	821.4	838.2	842.5	876.7	886.1
Atlantic and Quebec	836.2	827.3	868.6	883.9	851.4	906.8	888.2
Ontario	817.1	796.4	803.1	829.2	842.7	893.4	872.5
Prairies	870.1	865.3	853.7	876.1	866.2	905.7	916.3
British Columbia and Territories	851.3	838.9	783.7	776.3	807.3	807.3	879.2
Retail							
Canada	916.5	908.5	909.7	917.0	920.8	876.7	929.9
Atlantic and Quebec	924.1	917.0	915.6	920.3	924.7	926.9	933.6
Ontario	907.7	900.5	904.9	913.2	916.0	921.0	927.8
Prairies	923.6	918.0	918.7	924.0	927.0	927.7	935.8
British Columbia and Territories	892.1	865.2	877.2	896.4	902.4	914.1	908.6

Table A.48 – Electric clothes dryers' drum capacity and average energy consumption, 1992–2010

Model year	Average electric clothes dryer drum capacity (litres)	Average energy consumption (kWh/litre)
1992	161.6	6.08
1993	162.8	5.70
1994	171.2	5.32
1995	174.6	5.21
1996	172.7	5.14
1997	174.7	5.08
1998	174.0	5.17
1999	171.8	5.28
2000	174.7	5.21
2001	175.3	5.23
2002	176.3	5.19
2003	177.1	5.16
2004	176.8	5.16
2005	175.4	5.15
2006	179.7	5.03
2007	181.4	5.03
2008	182.8	5.01
2009	188.3	4.89
2010	194.8	4.78

Table A.49 – Energy consumption of all shipped appliances, with and without improvements in energy efficiency, 1992–2010 (PJ)

Model year	Energy consumed (actual) with improvements in energy efficiency since 1992	Energy consumed without improvements in energy efficiency since 1992
1992	6.3	6.3
1993	12.8	13.4
1994	19.3	20.9
1995	25.1	28.0
1996	31.3	35.6
1997	38.0	43.8
1998	45.1	52.6
1999	52.9	62.4
2000	60.7	72.2
2001	68.4	82.4
2002	76.8	93.9
2003	85.1	105.8
2004	93.4	118.7
2005	101.4	132.1
2006	108.9	145.0
2007	117.1	159.4
2008	126.1	173.8
2009	134.5	188.4
2010	143.7	204.3

Table A.50 – Energy savings by shipped appliance, 1992–2010 (PJ)

Model year	Refrigerators	Freezers	Dishwashers	Electric ranges	Clothes washers	Electric clothes dryers	Total with retirement factor*
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**
2009	17.1	1.0	10.3	3.8	19.5	2.2	**54.0**
2010	19.2	1.1	11.3	4.5	22.2	2.3	**60.6**

* 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 2011*. This retirement function is explained further in Appendix C of this report.

Due to rounding, the numbers may not add up.

Appendix B

Definitions of refrigerator and freezer types

B

Refrigerator

In 2010, refrigerators were grouped under the following main categories.[25]

Refrigerators without automatic defrost

- Type 1 – Refrigerators and refrigerator-freezers with semi-automatic or manual defrost
- Type 2 – Refrigerator-freezers with partial automatic defrost. (Partial automatic defrost is a system in which only the refrigerator portion of the appliance defrosts automatically. The freezer compartment must be defrosted manually.)

Refrigerators with automatic defrost

- Type 3 – Refrigerator-freezers with automatic defrost, with top-mounted freezer, without through-the-door ice service and all-refrigerators (with no freezer) with automatic defrost
- Type 4 – Refrigerator-freezers with automatic defrost, with side-mounted freezer, without through-the-door ice service
- Type 5 – Refrigerator-freezers with automatic defrost, with bottom-mounted freezer, without through-the-door ice service
- Type 5A – Refrigerator-freezers with automatic defrost, with bottom-mounted freezer, with through-the-door ice service
- Type 6 – Refrigerator-freezers with automatic defrost, with top-mounted freezer and through-the-door ice service
- Type 7 – Refrigerator-freezers with automatic defrost, with side-mounted freezer and through-the-door ice service

Refrigerators – compact

(those with compartment volumes of less than 219.5 litres [L][7.75 cubic feet {cu. ft.}] and overall heights of less than 91.4 centimetres [cm] [36 inches {in.}])

- Type 11 – Compact refrigerators and refrigerator-freezers with semi-automatic or manual defrost
- Type 12 – Compact refrigerators and refrigerator-freezers with partial automatic defrost
- Type 13 – Compact refrigerator-freezers with automatic defrost and with top-mounted freezer as well as compact all-refrigerators (with no freezer) 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

[25] Natural Resources Canada, *2011 EnerGuide Appliance Directory*, p.36.

Freezer

In 2010, freezers were typically built as either upright models or chest models and grouped into the following types.[26]

Freezers – upright

- Type 8 – Upright with manual defrost
- Type 9 – Upright with automatic defrost

Freezers – chest

- Type 10 – All chest freezers and all other freezers (not defined as Type 8 or Type 9)

Freezers – compact

(those with compartment volumes of less than 219.5 L [7.75 cu. ft.] and overall heights of less than 91.4 cm [36 in.])

- Type 16 – Compact upright with manual defrost
- Type 17 – Compact upright with automatic defrost
- Type 18 – Compact chest and all other compact freezers (not defined as Type 16 or Type 17)

[26] Natural Resources Canada, *2011 EnerGuide Appliance Directory*, p.157.

Appendix C

Methodology

C

C.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 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.

Since 2004, the manufacturers have agreed to provide data on their shipments by region/province 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/province 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 them 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 2010. 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. In 2009 and 2010, NRCan obtained additional freezer and compact refrigerator data from CAMA members.

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 onwards) 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 basic model numbers for 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 actual 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 consisted of 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 versus 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.

C.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 total number of shipments in that category.

The following gives 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 = the number of shipments of Type *i* refrigerators and

UEC_type_i = the average UEC of Type *i* refrigerators

As mentioned in Section C.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 2010. 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 2010 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 2009 *EnerGuide Appliance Directory*:[27]

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

This 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 both energy consumption by appliances shipped in that year and energy consumption by appliances shipped previously that had not reached the end of their lifespan.

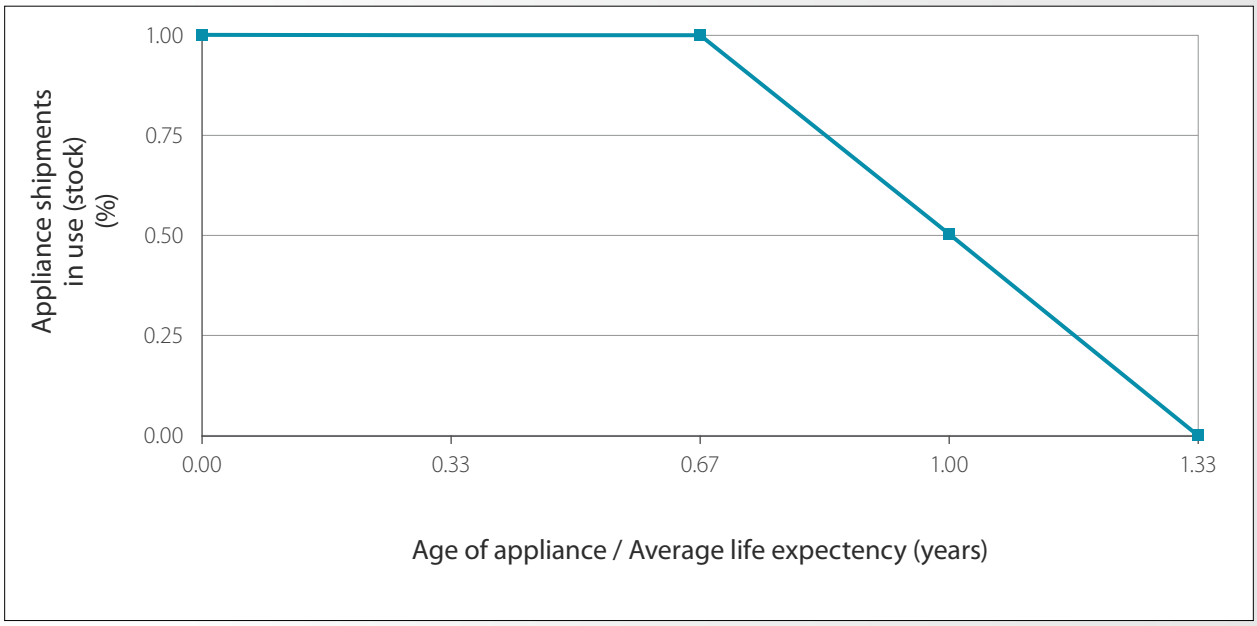
The retirement function is demonstrated in Figure 40. In this linear function, no appliances retire in the first two thirds (0.67) of their average life expectancy, and all units are retired by four thirds (1.33) of their average life expectancy. The ranges for the retirement function are:

- if age < {⅔ * (average life expectancy)}, 100 percent survive
- if age > {⅔ * (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.

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

Figure 40 – Retirement function for aging appliances



Appendix D

Glossary

D

Average annual unit energy consumption	The annual energy consumption of all major household appliances shipped in Canada in a category, divided by the number of shipments in that category.
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 *Energy Efficiency Regulations* apply to electrically operated automatic household dishwashers that are not commercial, industrial or institutional machines.
Distribution channel	A categorization of shipments according to recipient: • 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. • Builder shipments are delivered to Canadian home builders, motels, governments, trailer manufacturers and property management.

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 drum volume of less than 125 litres • standard – a clothes dryer with drum volume of at least 125 litres 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 consumption 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 *Energy 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. 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). 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.