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Energy Consumption of **Major Household Appliances** Shipped in Canada

Trends for 1990–2006

December 2008

Canada

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Natural Resources Canada's Office of Energy Efficiency
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, Natural Resources Canada's (NRCan's) Office of Energy Efficiency (OEE) has been receiving from members of the Canadian Appliance Manufacturers Association (CAMA) their annual Canadian appliance shipment data, by model, for the six major household appliance categories – refrigerators, freezers, dishwashers, electric ranges, clothes washers and electric clothes dryers.

According to CAMA, the manufacturers represent more than 90 percent of the Canadian market for five of the appliance groups.[1] To keep each appliance manufacturer's data confidential, appliance manufacturers suggested that a third party receive and prepare the database in a format in which no one (other than the third party) could determine the shipment data for an individual model or manufacturer. NRCan retained the services of Electro-Federation Canada, chosen by CAMA, as the third party to receive the data.

Each model's shipments, provided by CAMA, were matched to their associated unit energy consumption (UEC) ratings found in the *EnerGuide Appliance Directory* database (oee.nrcan.gc.ca/publications/infosource/pub/appliances/2007). The shipment-weighted[2] average annual UEC was then calculated for each appliance category.

This report details the results of the analysis of the estimated shipment-weighted average UEC, in kilowatt hours per year, of the six major household appliance categories shipped in Canada between 1990 and 2006. It also provides data on the annual distribution of shipments by UEC range for the six types of appliances during the same period.

This is the seventh report of this type published by the OEE. Since 2004, participating manufacturers have provided their shipment data broken down by region/province and by channel (retail versus builder), allowing regional analysis, thereby assisting in monitoring the success of regional programs.

To further improve the quality and representation of new appliance energy efficiency data in Canada, the OEE is exploring options to improve the coverage of the Canadian market through ongoing discussions with CAMA and other appliance manufacturers.

The OEE would like to thank the participating manufacturers and CAMA for their co-operation in this project.

The data gathered through this report will increase your knowledge of the various aspects of energy consumption with respect to appliances. The data will also enable NRCan to develop and fine-tune its ecoENERGY programs, designed to support Canadians as they seek to achieve greater energy efficiency and reduce their greenhouse gas emissions.

This report was prepared by Diane Friendly of the Demand Policy and Analysis Division of the OEE. Glen Ewaschuk provided assistance and Andrew Kormylo provided project leadership.

If you would like to learn more about the OEE's services and programs, contact it by e-mail at euc.cec@nrcan.gc.ca.

[1] Information about market share for freezers is not available.

[2] The shipment-weighted average annual UEC of an appliance by category is calculated as total energy consumption of all the appliances sold in Canada in that category divided by total number of shipments in that category.

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Highlights

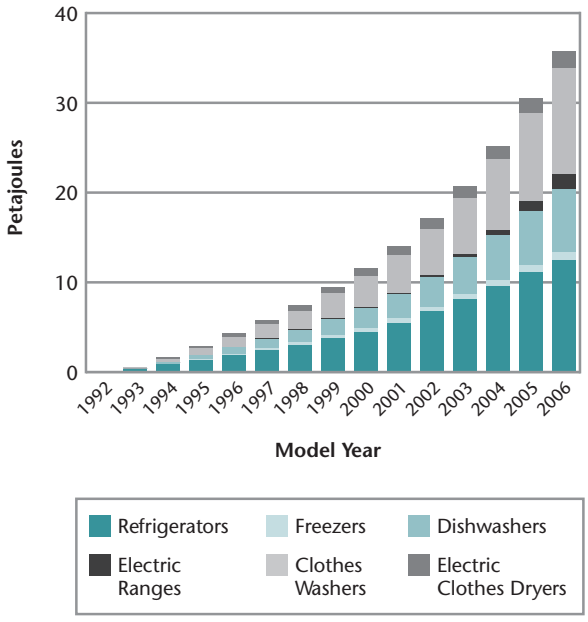
Appliances have become an increasingly fundamental part of modern lifestyles. The average Canadian household contains most of the six major appliances, which include a refrigerator, freezer, dishwasher, range, clothes washer and clothes dryer. The percentage of ownership of most appliances in Canada has steadily increased during the past 20 years.

Future energy demand of appliances is driven by the efficiency of the equipment, market penetrations, population growth, and changes in individual behaviour and usage patterns. Although the penetration of most "white goods"[3] is already relatively high in Canada, population growth and the shift to smaller, more numerous households will likely increase the appliance energy use over the coming decade.[4]

The energy efficiency of major household appliances on the market improved significantly between 1990 and 2006. Largely responsible for the improvement were the significant research and development activities carried out by appliance manufacturers and three initiatives authorized under the 1992 *Energy Efficiency Act*: the minimum energy performance standards (and amendments thereto) contained in the *Energy Efficiency Regulations*, the EnerGuide for Equipment program and the ENERGY STAR® Initiative in Canada. Also responsible for the improvement were an increase in consumer awareness and various incentives and rebates offered by the federal, provincial and municipal governments and utilities. Details of the latter can be found in the Directory of Energy Efficiency and Alternative Energy Programs in Canada (oee.nrcan.gc.ca/programs-directory) or on the ENERGY STAR Web site (oee.nrcan.gc.ca/energystar/english/consumers/rebate.cfm).

Figure 1 depicts the cumulative energy savings due to the above factors, measured in petajoules (PJ),[5] of the six major household appliances from 1992 to 2006.

Figure 1 Cumulative Energy Savings for All Major Household Appliances, 1992–2006



[3] Large, durable consumer goods usually finished in white, such as refrigerators, clothes washers and clothes dryers.

[4] Source: Natural Resources Canada, *Canada's Energy Outlook: The Reference Case 2006*, p. 20. Available: www.nrcan-rncan.gc.ca/com/resoress/publications/peo/peo-eng.php.

[5] One petajoule (PJ) (1 PJ = 1 × 10^{15} joules) is equivalent to the amount of energy consumed by approximately 9500 households in 1 year – assuming each household uses 105.6 gigajoules (GJ) (1 GJ = 1 × 10^{9} joules) annually (according to the *Energy Use Data Handbook Tables* (Canada), which can be found on the OEE Web site at oee.nrcan.gc.ca/corporate/statistics/neud/dpa/tableshandbook2/res_00_1_e_3.cfm.) A joule is the international unit of measure of energy – the energy produced by the power of one watt flowing for one second. There are 3.6 million joules in one kilowatt hour (kWh).

The following are some interesting findings as a result of the analysis of the shipment data:

- In 1990, a new set of the six major appliances for the home used an average of 5789 kilowatt hours (kWh) of energy. In 2006, that number dropped to an average of 3065 kWh – a 47 percent reduction.
- Total energy savings for the six major appliances shipped in 2006 were calculated at 5.61 PJ[6] (or 1.56 billion kWh[7]). Consumers saved an estimated $147 million in energy costs in 2006, based on an approximate national average of 9.4 cents/kWh.[8]
- The cumulative energy savings for all major household appliances between 1992 and 2006 were 35.67 PJ (or 9.91 billion kWh) – the equivalent of one year's energy for approximately 336 500 households.
- Among major appliances, refrigerators produced the largest cumulative energy savings, 12.48 PJ (or 3.47 billion kWh) from 1992 to 2006.
- This is the third year for which data were available to perform an analysis for retail versus builder shipments by region/province. From 2004 to 2006, it was found that, for all major household appliances, shipments to builders in British Columbia and the Territories were higher and shipments to builders in Quebec were lower than shipments to other regions.

Energy-efficient products will have a significant impact on consumers' energy bills and energy savings only upon the disposal of older appliances, such as the "old" second refrigerator in the basement.[9] According to the *2003 Survey of Household Energy Use*,[10] approximately 765 000 Canadian households did not dispose of their previous refrigerator when they acquired a new one in 2003. If consumers continue using the older models as a second appliance in the home, the maximum amount of energy savings and greenhouse gas emission reductions will not be realized.

[6] 1 petajoule (PJ) equals 277 777 777.78 kWh.

[7] The commercial unit of electricity energy equivalent to 1000 watt hours. A kilowatt hour is the amount of electricity consumed by ten 100-watt bulbs burning for 1 hour.

[8] Source: *Energy Use Data Handbook* table, which can be found on the OEE Web site at oee.nrcan.gc.ca/corporate/statistics/neud/dpa/tableshandbook2/res_00_18_e_3.cfm. Note that this is a national average.

[9] Be sure to choose an environmentally friendly option when disposing of an appliance. Appliance recycling programs are available in many Canadian communities. Consult your Yellow Pages or call your municipality to find out what programs exist and how appliances are collected in your area. Or consult the Metals and Minerals Recycling Database at www.recycle.nrcan.gc.ca to find Canadian companies involved in the recycling of appliances or "white goods."

[10] Natural Resources Canada, *2003 Survey of Household Energy Use (SHEU), Detailed Statistical Report* (Ottawa: 2006), p. 59. Available: oee.nrcan.gc.ca/Publications/statistics/sheu03/pdf/sheu03.pdf.

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Introduction

This report outlines changes in the energy use and distribution of major household appliances from 1990 to 2006. It is based on the shipments for that period of the six major household appliance categories in Canada: refrigerators, freezers, dishwashers, electric ranges, clothes washers and electric clothes dryers. The data are collected through the co-operation of the Canadian Appliance Manufacturers Association (CAMA).

Note that the quantity and profile of appliance shipments closely reflect Canadian purchases. 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) believes that the shipment data in this report closely reflect the purchasing behaviour of consumers.

While this report deals exclusively with shipment data, the OEE also has reports that provide additional information about appliances, such as the *Survey of Household Energy Use* (SHEU). This national survey collected data on energy consumption and factors affecting energy consumption, such as the age of household appliances and their use. Some of the findings of SHEU are related to the analysis and discussions in this report.

Each of the following chapters in this report covers a specific type of appliance:

- refrigerators (Chapter 1)
- freezers (Chapter 2)
- dishwashers (Chapter 3)
- electric ranges (Chapter 4)
- clothes washers (Chapter 5)
- electric clothes dryers (Chapter 6)

Chapter 1, "Refrigerators," contains more information than the other chapters. Although there is much diversity in the types and sizes of refrigerators, they have been grouped to calculate the average annual unit energy consumption (UEC) for all refrigerators by model year. However, because both size and energy consumption are so important in such analysis, further investigation of the analysis of refrigerators by UEC per cubic foot in Sections 1.2.4 and 1.2.6 is recommended.

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.

Chapter 7, "Summary of Major Household Appliances," discusses the overall energy savings achieved from improvements to these appliances.

Appendix A, "Methodology," describes the database preparation process conducted by Electro-Federation Canada and the methodology used by the analysts to summarize the data.

Appendix B, "Definitions," contains definitions of the types of appliances in this report.

Appendix C, "Questions and Answers About Changes to ENERGY STAR®," provides information about changes to the ENERGY STAR Initiative in Canada.

Appendix D, "Detailed Tables," provides detailed data supporting the various charts and figures in this report.

This report also provides regional/provincial shipment data, as well as "channel" data, which compares retail shipments and builder shipments described as follows:

- Retail shipments include shipments from Canadian manufacturers to Canadian retailers and other consumers.
- Builder shipments include shipments to Canadian home builders, motels, governments, trailer manufacturers and property management.

Note that these data show the region/province to which the appliances were originally shipped. It is possible that some appliances were eventually sold in a different province. The extent of this redistribution is unknown but believed to be small.

This trend analysis is associated with the implementation of the *Energy Efficiency Regulations* (the Regulations) authorized under the 1992 *Energy Efficiency Act*. The Regulations ensure that new appliances imported into Canada, or manufactured in Canada and shipped from one province or territory to another, comply with federal minimum energy performance standards (MEPS). For more information about the *Energy Efficiency Regulations*, consult the *Guide to Canada's Energy Efficiency Regulations* found on the Web site at oee.nrcan.gc.ca/regulations.

Additionally, this trend analysis is also associated with the ENERGY STAR Initiative in Canada, which was officially introduced in 2001. The international ENERGY STAR symbol is a simple way for consumers to identify products that are among the most energy efficient on the market. Only manufacturers and retailers whose products meet the ENERGY STAR criteria can label their products with this symbol. For more information about ENERGY STAR qualified products, visit energystar.gc.ca.

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

Because 1992 was the baseline year used in this report's calculations, and to ensure that cumulative energy savings were not over-estimated, a retirement factor was included in the past three years' analysis. This factor takes into account the aging of appliances based on their life expectancies, as set out in the *EnerGuide Appliance Directory*.[11] See Appendix A, "Methodology," for more information about this retirement factor.

As previously mentioned, the improvement in the energy efficiency of the major household appliances can be attributed to

- the significant research and development carried out by the members of CAMA
- the MEPS contained in the *Energy Efficiency Regulations* and amendments to the MEPS
- the initiatives authorized under the 1992 *Energy Efficiency Act*, namely, the EnerGuide for Equipment program
- the ENERGY STAR Initiative in Canada

"Market transformation" programs were designed to cause lasting change in the market by increasing the availability of and demand for high-efficiency appliances. The goal of these activities is to develop sustainable markets for more efficient products. For more information about the ecoENERGY Efficiency initiatives of the OEE, visit the Web site at oee.nrcan.gc.ca.

[11] Natural Resources Canada, *EnerGuide Appliance Directory 2006* (Ottawa: March 2006), p. 13.

How Appliances Work[12]

Refrigerators and Freezers

Refrigerators and freezers keep food cold by removing heat from the air in the refrigerator or freezer cabinet. This is accomplished by using a fluid – called the refrigerant – that absorbs heat as it circulates through coils in cabinet walls. The heat is pumped away and rejected outside the cabinet.

The cooling system in a refrigerator or freezer relies on the vapour compression cycle, in which the refrigerant changes from liquid to vapour and back to liquid again while circulating in a closed system, absorbing or discharging heat as it changes phase. In a typical refrigerator, the compressor circulates the refrigerant through two sets of coils in one continuous loop. One set, the evaporator coils, cools the refrigerator as the working fluid absorbs heat and vaporizes. The other set, the condenser coils, is typically located under or in back of the unit and gives off absorbed heat as the working fluid condenses.

An insulated cabinet with well-sealed doors is critical to maintaining the temperature difference between the cool refrigerator interior and ambient air.

Increases in energy efficiency mean less energy required per unit volume, but total energy use will also depend on other factors, particularly the size of the unit. All other things being equal, the bigger the refrigerator, the more energy it will use. Each cubic foot of additional refrigerated space adds approximately 20 to 30 kilowatt hours to annual energy use. Configuration of the refrigerator and the ratio of freezer to fresh food storage space are also important. For example, models with side-by-side refrigerator and freezer compartments generally use more energy than units with top freezers.

Other features or uses can also impact energy use. Making ice, either in trays in the freezer or with automatic ice makers, can increase energy use by 15 to 20 percent. Through-the-door ice and water dispensers can increase energy consumption by approximately 10 percent.

Antisweat heaters that prevent condensation on the outside of the refrigerator cabinet in humid weather boost consumption as well. However, in many models, a power-saver switch is available. This switch controls the warming coils that prevent condensation.

Installation can also play a role in energy use. An older refrigerator that is surrounded by cabinets or has little clearance will use more energy because there is less air flow to carry heat away from the condenser coils. Most newer models employ fan-cooled condensers, which are less affected by air circulation around the product. Installation next to a heat source may also cause the unit to use more energy.

The great strides in the energy efficiency of refrigerators have been accomplished by a combination of fairly straightforward technical improvements – primarily more efficient compressors, thicker insulation, better door seals, and improved condensers and evaporators – and more sophisticated technologies, including microprocessor controls and sensors. There are, however, many promising options for improving efficiency even further.

Several advanced insulation concepts are pushing the envelope beyond conventional levels. An additional benefit to these insulation materials is that they allow appliance manufacturers to reduce energy consumption without reducing internal volume or changing the outer dimensions of the appliance. In some cases, usable volume in the refrigerator or freezer compartments can be increased.

The use of separate compressors to cool the fresh food and freezer compartments may reduce overall compressor energy use because each compressor can be optimized to the conditions of the compartment it serves. While the compressor is the heart of a refrigeration system, it must be linked to other improvements in performance. The use of better insulation and door gaskets, for example, reduces the cooling load of the compressor.

[12] Source: Taken directly from *E Source Residential Appliances Atlas*, (E Source TA-RA-01: November 2001).

With respect to **stand-alone freezers**, smaller units use less energy, and chest freezers are more energy efficient than uprights because little cold air escapes when you open the top-mounted door. While chest freezers take up more floor space than uprights, experts say they are 10 to 25 percent more efficient because they are better insulated and air does not spill out when the door is opened. Also, the weight of the door helps seal the unit. Upright freezers are available in two types: manual-defrost and self-defrost. Manual-defrost freezers are slightly cheaper to buy and operate. However, self-defrost freezers eliminate the need for you to defrost them. Also, they contain interior shelves and shelves on the door.

Dishwashers

There are several design and technology options available to increase the efficiency of conventional **dishwashers**, including hot water conservation, motor efficiency improvements and drying efficiency improvements.

Close to 60 percent of all energy used by dishwashers is used to heat the water. Dishwashers require the highest temperature of any household appliance – an average recommended operating temperature of 60°C (140°F). For most dishwashers sold in North America, hot water supplied from the household water heater is heated an additional 15°C to 20°C by an electric booster heater of 500 to 1000 watts. Booster heaters help ensure wash quality and facilitate heated drying.

Dishwashers with advanced sensors and fuzzy-logic control can automatically select the type of cycle needed, the water level and the time required to get dishes clean, potentially reducing energy use.

Designing a dishwasher with a lower recommended water temperature is one way to reduce energy consumption. Another way is to reduce the amount of hot water used, which can be accomplished by reducing the level of fill and decreasing wash and rinse times.

Approximately 8 percent of the energy consumed by a typical dishwasher is used to run the motor in the pump. Typically, split-phase motors are used, which have an efficiency of approximately 50 percent. The heated drying mode in dishwashers uses an electric heating element and sometimes a fan to accelerate the drying of the load. This function consumes approximately 9 percent of the total energy used by an average dishwasher.

Much of the energy-conservation potential related to dishwashers relies on the user. No matter how efficiently a dishwasher is designed to function, its performance depends on proper installation and operation. For example, a dishwasher uses the same amount of water and energy whether it is empty or full. Using alternate wash cycles, such as energy-saving, low-temperature or shorter cycles, whenever appropriate, helps conserve energy.

Electric Ranges

Consumer behaviour has more impact on energy use in **cooking** than in most other areas of appliance use. Efficiency options are limited in most cooking technologies. Educating the consumer to choose wisely holds more potential for cooking efficiency improvements than do most technological advancements.

Consumer cooking habits can dramatically improve cooking efficiency – more than most technological advances can. Cooking energy can be reduced by using smaller appliances, by choosing cookware wisely and by heating the minimum amount necessary for the minimum time necessary. From the users' preferences for appliances to how often they peek in the oven, the users' actions do impact cooking energy.

Cookware choice also impacts energy use. Choosing flat-bottom cookware instead of warped-bottom cookware saves a significant amount of energy on electric elements. Further energy can be saved by using insulated cookware, while the most efficient choice is a pressure cooker.

Most of the trends in **electric ranges** are not being driven by energy efficiency. Instead, manufacturers are seeking to make their appliances easier to clean, more elegantly styled, and simpler and quicker to use.

Ovens are inherently inefficient because the heat takes a circuitous path from the heating element to the food. The coil or burner radiates energy, which is absorbed partly by the cooking vessel but mostly by the oven walls. The walls then conduct heat to the air, which finally cooks the food. Self-cleaning ovens generally have extra insulation built into the walls to resist the 450°C (850°F) temperatures generated during self cleaning.

Clothes Washers

Clothes washers clean clothes by using mechanical, chemical and thermal energy. When placed in water, soil is dislodged from fibres by motion and friction and is carried away by the water. Laundry detergent chemicals, many of which are activated by heat, help emulsify oil and grease and the dirt they bind. In some products, enzymes break down proteins and other materials so they can be removed by water.

The most significant improvement in the energy efficiency of clothes washers is occurring through a shift to horizontal-axis washers and advanced vertical-axis machines. Many of the advanced horizontal- and vertical-axis machines now use a high spin speed to reduce the remaining moisture content of laundry, thereby reducing the amount of dryer energy needed.

In horizontal-axis machines, clothes are tumbled in a rotating tub so that the clothes are plunged into a shallow pool of water and then pulled out again. Some machines recirculate water through the washer by pumping water to the top of the washer tub and spraying it over the clothes, thus reducing water consumption by 20 percent.

Washing-machine motors and controls account for only a small portion of the overall energy required to launder clothes. A larger portion of energy goes into heating the water used in the wash and rinse cycles and drying the washed clothes. Efficiency gains come from reducing the water needed to clean clothes effectively and increasing the speed of the spin cycle so that less energy is needed for drying.

Increasingly, clothes washers are equipped with automatic controls that determine water level and temperature based on electronic sensors located within the machine. Additional research will be needed to determine how these controls affect consumer behaviour and, as a result, water and energy consumption.

Electric Clothes Dryers

Most residential **electric clothes dryers** in North America are evaporative dryers. These dryers operate by circulating air, drawn from the household living space and heated by electricity, through a rotating drum containing wet clothes, then venting the moist exhaust air, usually to the outdoors. The level of heat is regulated by a thermostat – all dryers have a temperature sensor in the exhaust that cycles the heat off and on to prevent overheating. Dryer shut-off at the end of a cycle is controlled by a timer, temperature sensor or moisture sensor.

In conventional dryers, the most direct way to save energy is through shorter drying cycles – the less time the dryer is on, the less energy it uses.

How a dryer is operated and maintained makes a difference in how much energy it uses. For example, a dryer filled to one third of its capacity requires approximately 25 percent more energy than when fully loaded to dry each pound of clothes. With small loads, heated air can bypass the clothes and leave the drum without contributing to the drying process. Also, drying several loads consecutively prevents losing the heat. Most complaints concerning poor drying performance can be traced to clogged lint filters and exhaust systems.

Energy Efficiency Regulations and Minimum Energy Performance Standards

Natural Resources Canada's (NRCan's) wide range of energy efficiency initiatives includes standards, labelling programs and Canada's *Energy Efficiency Regulations*.[13]

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/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 interprovincially.

NRCan works with stakeholders to improve standards development and approval processes and to accelerate the market penetration of high-efficiency equipment.

Amendments to the Regulations also include labelling improvements so consumers have the latest information about the most energy-efficient products on the market. This way, Canadians can tap into huge potential savings in energy and money, and they will benefit from the improved air quality that results when emissions are reduced. In preparing amendments to the Regulations, NRCan analyses the impact of the proposed amendment on society, the economy and the environment. Table 7.1 in Chapter 7 lists the amendments made to the MEPS for the various appliances since they were introduced. For more information about the *Energy Efficiency Regulations*, visit the Web site at oee.nrcan.gc.ca/regulations.

Canada's *Energy Efficiency Act* and *Energy Efficiency Regulations* support several labelling initiatives. These initiatives require that an EnerGuide label be displayed on major electrical household appliances, showing the consumer the estimated annual unit energy consumption of the product in kilowatt hours and comparing it with the most efficient and least efficient models of the same class and size.

EnerGuide directories with energy ratings for major appliances are published each year and distributed to consumers, retailers and appliance salespeople. Up-to-date searchable lists of models are also available on the NRCan Web site at oee.nrcan.gc.ca/publications/infosource/pub/appliances/2007/.

As well, the Regulations are consistent with, and build on, 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 program began in the United States (U.S.), through the Environmental Protection Agency (EPA), and has expanded internationally. NRCan's OEE signed an administrative arrangement with the U.S. EPA and the U.S. Department of Energy to become the official custodian of the program for Canada. Canada became the fifth country to join the ENERGY STAR program, with Australia, New Zealand, Japan and Taiwan. The European Union is now also a signatory of ENERGY STAR.

[13] Source: Natural Resources Canada, *Improving Energy Performance in Canada, Report to Parliament Under the* Energy Efficiency Act *for the Fiscal Year 2006–2007* (Ottawa: 2008), p. 11. Available: oee.nrcan.gc.ca/Publications/statistics/parliament06-07/pdf/parliament06-07.pdf.

The ENERGY STAR® Initiative

Natural Resources Canada's Office of Energy Efficiency promotes the international ENERGY STAR symbol across Canada. Manufacturers and retailers of energy-efficient products; utilities and energy retailers; all levels of government; and industry groups recognize the benefits of ENERGY STAR to consumers and have joined in promoting the symbol. Only manufacturers and retailers whose products meet the ENERGY STAR criteria can label their products with this symbol. Choosing an ENERGY STAR-labelled product over a conventional model could save you hundreds of dollars in energy costs.

ENERGY STAR does not label electric ranges or electric clothes dryers because most of them use similar amounts of energy, which means there is little difference in energy consumption between models, and little potential to attain higher energy savings.

Refrigerators

To be ENERGY STAR qualified, standard-size refrigerators must exceed Government of Canada minimum energy efficiency levels by at least 15 percent. Compact refrigerators must achieve energy efficiency levels that are at least 20 percent higher than the minimum regulated standard in Canada. These eligibility criteria became more stringent on April 28, 2007.

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 uses to keep food fresh.

Freezers

To qualify, standard-size freezers must achieve energy efficiency levels that are at least 10 percent higher than the minimum regulated standard in Canada. Compact freezers must exceed the minimum regulated standard by 20 percent to qualify for ENERGY STAR.

Dishwashers

The best energy performers are ENERGY STAR qualified dishwashers, which must achieve energy efficiency levels that are at least 25 percent higher than the minimum regulated standard in Canada. This eligibility criterion became more stringent on January 1, 2007.

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

Clothes Washers

The best energy performers are ENERGY STAR qualified clothes washers, which use 35 to 50 percent less water and 20 to 50 percent less energy per load than other washers. Only standard-size clothes washers with minimum tub capacities of 45 litres (L) (1.6 cubic feet) qualify for the ENERGY STAR symbol. ENERGY STAR qualified clothes washers are available in both top- and front-loading models.

To be ENERGY STAR qualified, clothes washers must meet or exceed a modified energy factor (MEF) of 40.21 L per kilowatt hour per cycle. The MEF means that the calculation takes into account the amount of energy used by the dryer to remove moisture content. These eligibility criteria became more stringent on January 1, 2007.

The ENERGY STAR symbol is becoming increasingly recognized by the Canadian appliance purchaser. The next section analyses trends in ENERGY STAR shipments.

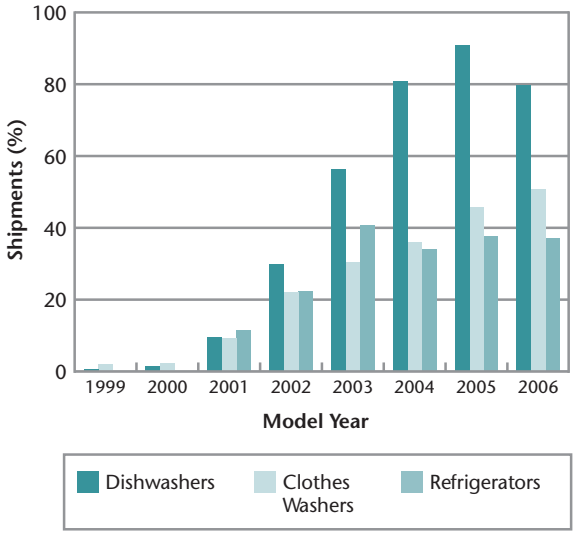
Penetration Rate of ENERGY STAR Qualified Appliances

Figure 2 illustrates the penetration rate[14] of ENERGY STAR qualified appliances since they began appearing on the market in early 1999 (influenced by their popularity in the United States). In 2001, Canada officially adopted the ENERGY STAR registered mark to designate the most energy-efficient appliances. By 2006, 80 percent of all dishwashers, 51 percent of all clothes washers and 37 percent of all refrigerators shipped in Canada were ENERGY STAR qualified products.[15]

Possible reasons for the higher penetration rate of ENERGY STAR qualified dishwashers – compared with those for clothes washers and refrigerators – are that many of them were made available to the consumer and they were being offered at affordable prices. Dishwasher manufacturers met the specifications quickly, and the incremental cost to meet ENERGY STAR qualifying levels was eventually eliminated.

Also, the dishwasher specifications had not changed in some time, whereas specifications for refrigerators and clothes washers had. A revision to increase the stringency of the ENERGY STAR specification for dishwashers came into effect in January 2007. Shipments of ENERGY STAR dishwashers decreased slightly in 2006, possibly because the manufacturers were preparing themselves for these upcoming, more stringent specifications.

Figure 2 ENERGY STAR Qualified Appliances as a Percentage of Total Shipments in Canada, 1999–2006*



* For more information, see Table D.A.1 in Appendix D, "Detailed Tables."

Figure 2 also shows that shipments of ENERGY STAR refrigerators decreased slightly between 2003 and 2004. This decrease coincides with the 2004 amendment to the ENERGY STAR refrigerator specifications. Table 7.1 in Chapter 7 lists the amendments made to the ENERGY STAR specifications for the various appliances since they were introduced in Canada.

Because the ENERGY STAR Initiative included freezers only recently, they have not been included in the analysis at this time.

[14] For each appliance, the penetration rate is the total number of ENERGY STAR qualified appliances shipped divided by the total number of appliances shipped of that particular appliance.

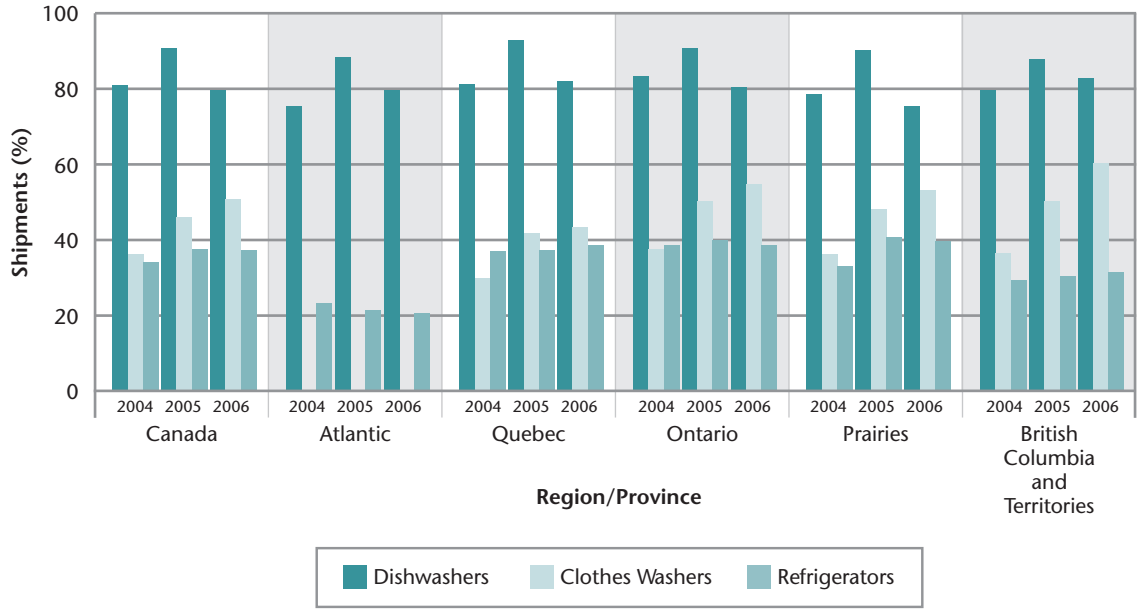
[15] These percentages are based on figures reported by the Canadian Appliance Manufacturers Association members to the third-party contractor referred to in Appendix A, "Methodology." They differ slightly from those reported in the *2007 Major Appliance Industry Trends & Forecast* statistical reference tool published by Electro-Federation Canada. Refer to the section entitled "Reporting Methodology – Expansion Factors" (page 11) in that publication for more details.

Penetration Rate by Region/Province, 2004–2006

Figure 3 shows the breakdown by region/province for each appliance category covered by the ENERGY STAR Initiative from 2004 to 2006 (excluding freezers). The tendencies remained somewhat constant throughout the country, with the penetration rate of ENERGY STAR clothes washers increasing slightly in all regions.

The figure also shows that shipments of ENERGY STAR dishwashers decreased slightly in all regions in 2006. Note that, for confidentiality reasons, the penetration rate for clothes washers in the Atlantic provinces is not shown.

Figure 3 ENERGY STAR Qualified Appliances as a Percentage of Total Shipments, by Region/Province, 2004–2006*



* For more information, see Table D.A.2 in Appendix D, "Detailed Tables."

The Role of the Members of the Canadian Appliance Manufacturers Association

Canadian Appliance Manufacturers Association (CAMA) members understand the important roles they must play in minimizing the effects that household appliances have on the environment.[16] Developing, producing and marketing more energy-efficient products to aid in reducing 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 considered to be high due to the number of municipal recycling initiatives and the significant level of valuable materials that comprise most household appliances, such as steel, aluminum, copper, zinc and plastics. However, it is difficult to put a number on overall national or regional recovery rates because there is no national mechanism for tracking the recovery and recycling of white goods.

As previously noted, according to the 2003 *Survey of Household Energy Use*,[17] in 2003, approximately 765 000 Canadians did not dispose of their previous refrigerator when they acquired a new one. As the issue is truly a North American concern, CAMA has formed a joint working group with the United States Association of Home Appliance Manufacturers to develop new solutions to a growing issue.

The significant reduction in appliance energy consumption over the years has resulted from the combined efforts of the appliance industry, governments, retailers and consumers. The minimum efficiency standards have contributed to a decrease in peak electricity demand and an increase in cost savings to consumers. The benefit to society of more efficient appliances will increase as the existing stock of major appliances in Canadian homes is replaced.

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

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

[16] Source: Canadian Appliance Manufacturers Association, a division of Electro-Federation Canada, 5800 Explorer Drive, Suite 200, Mississauga, Ontario L4W 5K9 (www.electrofed.com).

[17] Natural Resources Canada, *2003 Survey of Household Energy Use (SHEU), Detailed Statistical Report* (Ottawa: 2006), p. 59. Available: oee.nrcan.gc.ca/Publications/statistics/sheu03/pdf/sheu03.pdf.

Chapter 1 / **Refrigerators**

Refrigerators are available in various sizes and with a variety of features, all of which affect energy consumption. Consequently, EnerGuide groups refrigerators according to type and size, thereby enabling you to compare the energy consumption of similar models. Table 1.1 compares the market share of the various types of refrigerators in 2006.

The following are the definitions of the various types of refrigerators:

Refrigerators without automatic defrost

Type 1 Refrigerators and refrigerator-freezers with manual defrost

Type 2 Refrigerator-freezers with partial automatic defrost

Refrigerators with automatic defrost

Type 3 Refrigerator-freezers with automatic defrost and top-mounted freezer, but without through-the-door ice service; also all-refrigerators[18] with automatic defrost

Type 4 Refrigerator-freezers with automatic defrost and side-mounted freezer, but without through-the-door ice service

Type 5 Refrigerator-freezers with automatic defrost and bottom-mounted freezer, but without through-the-door ice service

Type 5A[19] Refrigerator-freezers with automatic defrost, with bottom-mounted freezer, with through-the-door ice service

Type 6 Refrigerator-freezers with automatic defrost, top-mounted freezer and through-the-door ice service

Type 7 Refrigerator-freezers with automatic defrost, side-mounted freezer and through-the-door ice service

Table 1.1 Refrigerator Market, 2006

Type of Refrigerator	Market Share (%)
1	0.1
2	0.0
3	64.5
4	1.9
5	21.2
5A	0.6
6	0.0
7	10.1
11	1.5
12	0.0
13	0.0
14	0.0
15	0.0
	100.0
Through-the-Door Ice Service	10.7
Type of Freezer*	
Top-mounted	64.5
Side-mounted	12.0
Bottom-mounted	21.8
Without freezer	1.7
	100.0

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

[18] The term "all-refrigerators" refers to models that have no freezer compartment.

[19] Type 5A is a new refrigerator type in 2006.

Refrigerators – compact[20]

Type 11 Compact refrigerators and refrigerator-freezers with manual defrost

Type 12 Compact refrigerators and refrigerator-freezers with partial automatic defrost

Type 13 Compact refrigerator-freezers with automatic defrost and top-mounted freezer; also compact all-refrigerators 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

1.1 2006 Market Snapshot

The shipment-weighted average annual unit energy consumption (UEC) of all refrigerators shipped in 2006 was 481 kilowatt hours (kWh). In 2006, as in all years studied since 1990, Type 3 refrigerators (those with a top-mounted freezer and automatic defrost) were the most popular type in Canada, accounting for 64.5 percent of all refrigerators shipped on the Canadian market.

The shipment-weighted average annual UEC of Type 3, and all other refrigerator types, is outlined in Table D.1 in Appendix D, "Detailed Tables."

The most popular size category, 16.5 to 18.4 cubic feet (cu. ft.), accounted for 40.1 percent of the market in 2006.

In 2006, 37.3 percent of the refrigerator models on the market qualified as ENERGY STAR® products, exceeding the minimum energy performance standards (MEPS) by at least 15 percent (see Table D.A.1 in Appendix D, "Detailed Tables").

There has been a substantial improvement in the energy efficiency of refrigerators since 1990. By 2006, 88.6 percent of refrigerators consumed less than 30 kWh/cu. ft. per year, even though a trend toward larger refrigerators had emerged.

- **In 2006, refrigerators with a volume between 16.5 and 18.4 cu. ft. remained the most popular, on average accounting for 40.1 percent of the market.**
- **From 1990 to 2006, the largest refrigerators (those with a volume of at least 20.5 cu. ft.) more than quadrupled in market share – rising from 5.1 to 23.9 percent.**
- **In 1990, refrigerators larger than 16.4 cu. ft. consumed on average more than 1000 kWh of electricity per year. By 2006, refrigerators that size consumed less than half as much energy, and some of the largest units (28.5 to 30.4 cu. ft.) consumed, on average, only 630 kWh of electricity per year.**

[20] Appliances with total refrigerated volumes of less than 7.75 cubic feet and overall heights of less than 36 inches.

1.2 Distribution of Shipments

1.2.1 Distribution by Type

Although Type 3 refrigerators were consistently the most shipped model between 1990 and 2006, their market share declined from 84.9 to 64.5 percent of all refrigerators shipped, as illustrated in Table 1.2 and Figure 1.1.

There seems to be an increasing trend toward refrigerators with a bottom-mounted freezer (Types 5 and 5A). These refrigerators did not have a significant market share in 1990; but with a steady increase in popularity, they accounted for 21.8 percent of the market in 2006. Also, refrigerators with a side-mounted freezer, automatic defrost and through-the-door ice service (Type 7) remained popular, accounting for 10.1 percent of the market in 2006.

Out of these three increasingly popular refrigerator types (5, 5A and 7), Type 5 is generally more energy efficient (see Figure 1.2 and Table D.1 in Appendix D, "Detailed Tables"). Types 1, 2, 4, 6, 11 and 13 had almost disappeared from the market by 2006. Data on Types 12, 14 and 15 refrigerators are available, but because the values are so low, they were not included in the analysis.

Table 1.2 Distribution of Refrigerators by Type

Model Year	Standard-Size								Compact	
	Type 1 (%)	Type 2 (%)	Type 3 (%)	Type 4 (%)	Type 5 (%)	Type 5A (%)	Type 6 (%)	Type 7 (%)	Type 11 (%)	Type 13 (%)
1990	3.5	2.0	**84.9**	7.6	0.6	0.0	0.0	0.0	0.1	1.2
1991	3.1	0.3	84.3	9.0	0.8	0.0	0.0	0.3	0.3	2.0
1992	2.1	0.4	85.4	7.5	0.3	0.0	0.0	3.5	0.1	0.6
1993	1.1	0.6	85.5	6.8	0.7	0.0	0.0	4.2	0.1	0.9
1994	0.6	0.7	85.1	4.9	2.0	0.0	0.1	4.3	1.3	1.0
1995	0.2	0.6	84.8	4.6	1.6	0.0	0.1	5.2	1.9	1.0
1996	0.2	0.5	84.8	4.4	2.2	0.0	0.1	6.6	0.8	0.4
1997	0.4	0.1	83.8	3.8	3.2	0.0	0.0	8.3	0.4	0.0
1998	0.4	0.0	76.5	3.3	8.5	0.0	0.3	7.3	3.6	0.0
1999	0.1	0.0	76.6	2.4	8.4	0.0	0.4	7.5	4.6	0.0
2000	0.0	0.0	72.9	2.2	11.1	0.0	0.5	7.9	5.3	0.0
2001	0.0	0.0	71.1	2.1	11.1	0.0	0.4	9.1	6.1	0.1
2002	0.0	0.0	70.2	2.2	10.6	0.0	0.2	11.0	5.8	0.1
2003	0.0	0.0	68.2	2.4	13.9	0.0	0.1	11.2	2.0	2.2
2004	0.0	0.0	66.4	1.9	15.5	0.0	0.1	11.0	4.5	0.5
2005	0.0	0.0	64.8	1.1	17.9	0.0	0.0	9.6	6.3	0.1
2006	0.1	0.0	**64.5**	1.9	**21.2**	**0.6**	0.0	**10.1**	1.5	0.0
Total Change	↓ 3.4	↓ 2.0	↓ 20.4	↓ 5.7	↑ 20.6	↑ 0.6	0.0	↑ 10.1	↑ 1.4	↓ 1.2

Figure 1.1 Distribution of Standard-Size Refrigerators by Type, 1990 and 2006

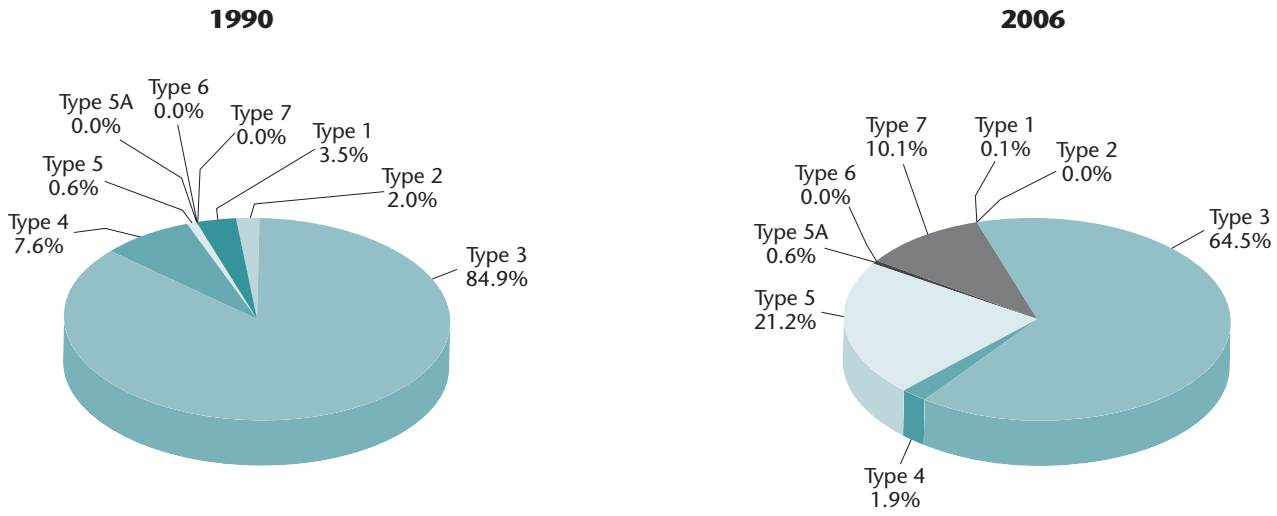
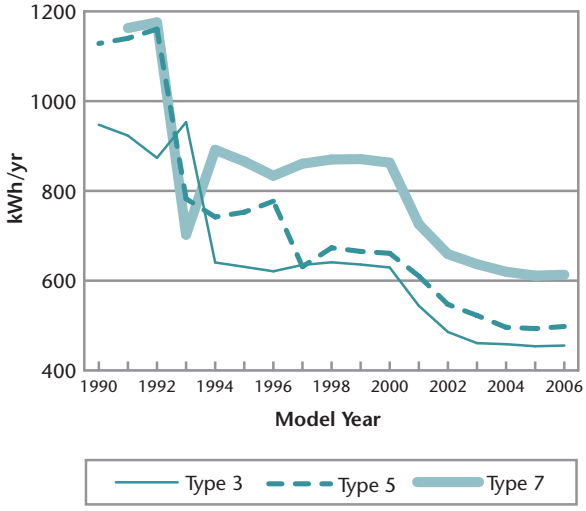


Figure 1.2 illustrates the average annual UEC of the three most popular refrigerator types during the study period. Type 3 refrigerators remained the most energy efficient, followed by Types 5 and 7.

Figure 1.2 Average Annual Unit Energy Consumption of Refrigerators by Type, by Model Year*



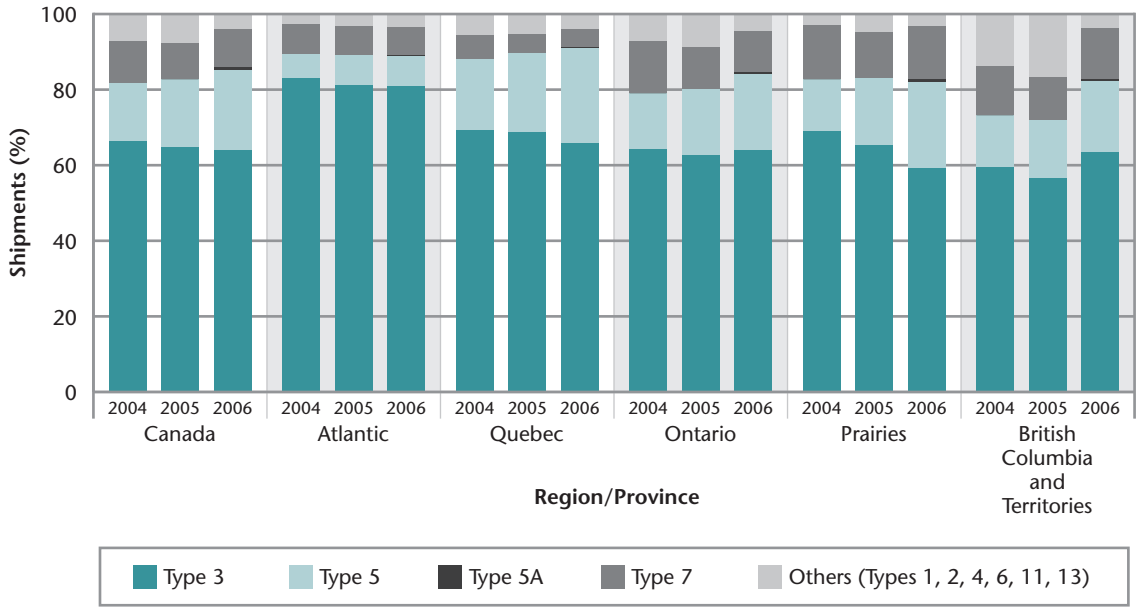
*For more information, see Table D.1 in Appendix D, "Detailed Tables."

1.2.2 Distribution by Type, by Region/Province

As previously mentioned, Type 3 refrigerators (those with a top-mounted freezer and automatic defrost) remained the most shipped model in 2006, with a national average of 64.5 percent. Figure 1.3 illustrates the distribution of the various types of refrigerators throughout the regions/provinces, from 2004 to 2006.

In 2006, Type 3 refrigerators remained the most popular in the Atlantic provinces, whereas Type 5 (those with a bottom-mounted freezer and automatic defrost) remained more popular in Quebec. Type 7 (those with a side-mounted freezer, automatic defrost and through-the-door ice service) were more popular in Ontario and the Western provinces.

Figure 1.3 Distribution of Refrigerators by Type, by Region/Province, 2004–2006*



*For more information, see Table D.2 in Appendix D, "Detailed Tables."

1.2.3 Distribution by Channel, by Region/Province

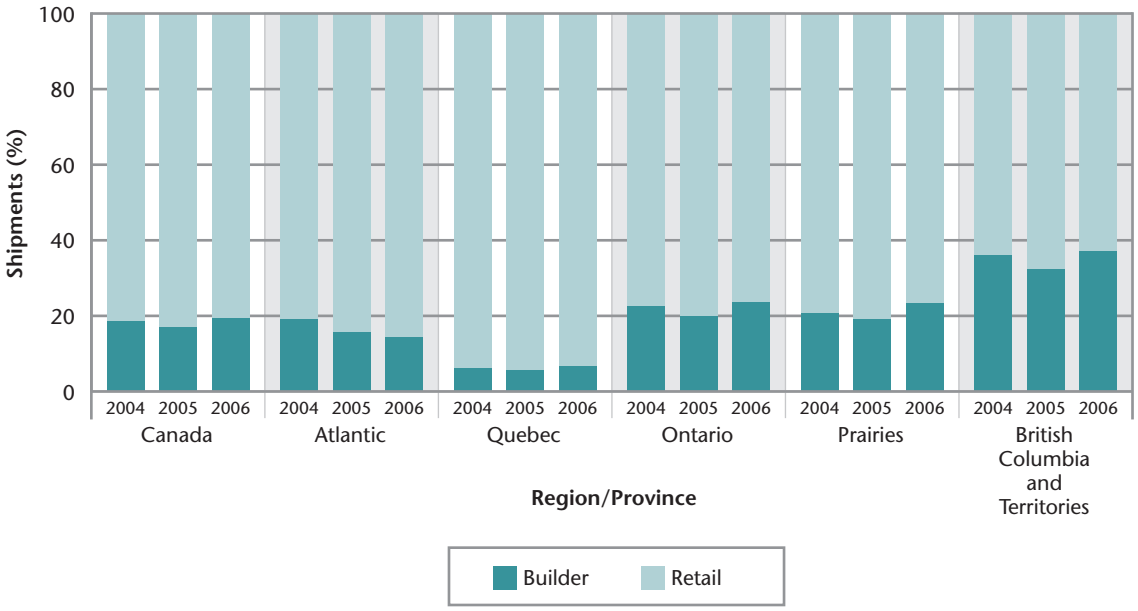
Figure 1.4 illustrates the proportion of refrigerators shipped for builder sales[21] versus those shipped for retail sales,[22] from 2004 to 2006. It shows minor fluctuations in builder/retail shipments for all regions of the country. Once agin, British Columbia and the Territories had a substantially larger builder representation than the other regions; shipments of refrigerators to builders in Quebec were again relatively low.

1.2.4 Distribution by Volume

Refrigerators with a volume between 16.5 and 18.4 cu. ft. remained the most popular, on average accounting for 40.1 percent of the market in 2006, as illustrated in Table 1.3 and Figure 1.5.

However, a trend toward larger refrigerators had emerged. This trend is also evidenced in the findings of the *2003 Survey of Household Energy Use*[23] where, in 2003, more than 61 percent of households surveyed possessed a main refrigerator larger than 16.5 cu. ft. The market share of refrigerators with a capacity greater than 18.5 cu. ft. increased steadily from 1990 to 2006 – rising from 7.7 percent to 41.2 percent.

Figure 1.4 Distribution of Refrigerators by Channel, by Region/Province, 2004–2006*



*For more information, see Table D.3 in Appendix D, "Detailed Tables."

[21] Builder sales include those to home, row house or apartment builders; motels; governments; trailer manufacturers; and property management.

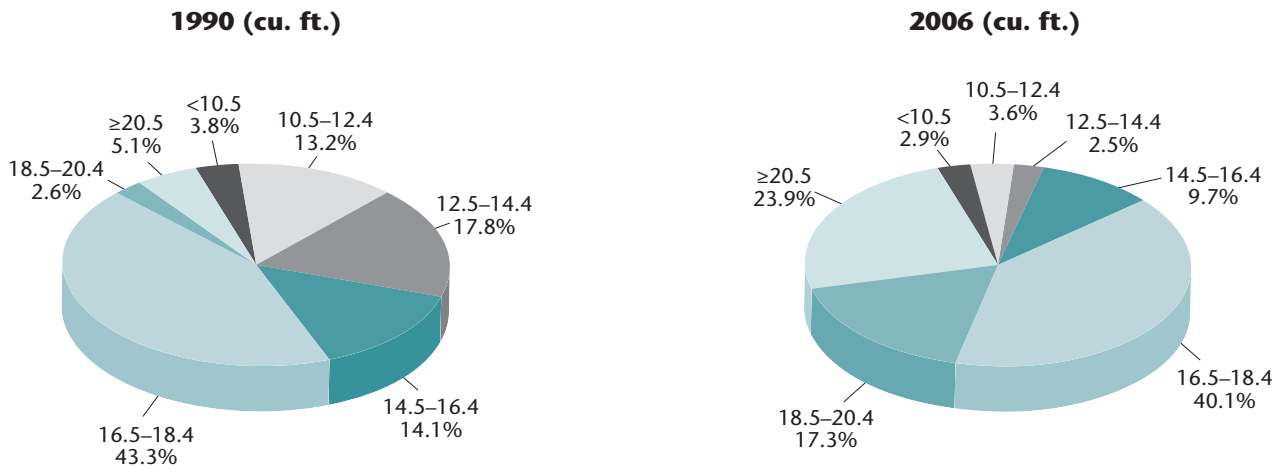
[22] Retail sales include those by Canadian manufacturers and importers and/or their branches and distributors to Canadian retailers and other consumers, but do not include sales to branches or to other Canadian Appliance Manufacturers Association member companies.

[23] Natural Resources Canada, *2003 Survey of Household Energy Use (SHEU), Detailed Statistical Report* (Ottawa: 2006), Table 5.1, p. 57. Available: oee.nrcan.gc.ca/Publications/statistics/sheu03/pdf/sheu03.pdf.

Table 1.3 Distribution of Refrigerators by Volume

Model Year	Volume (cu. ft.)						
	<10.5 (%)	10.5–12.4 (%)	12.5–14.4 (%)	14.5–16.4 (%)	16.5–18.4 (%)	18.5–20.4 (%)	≥20.5 (%)
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**
Total Change	↓ **0.9**	↓ **9.6**	↓ **15.3**	↓ **4.4**	↓ **3.2**	↑ **14.7**	↑ **18.8**

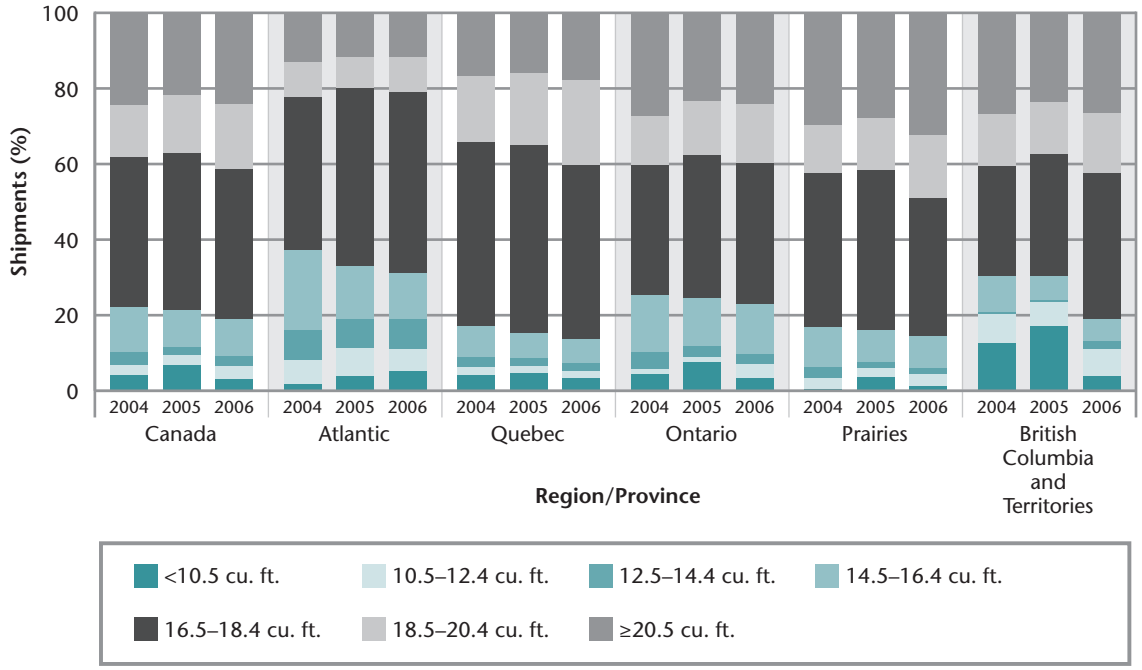
Figure 1.5 Distribution of Refrigerators by Volume, 1990 and 2006



1.2.5 Distribution by Volume, by Region/Province

Figure 1.6 illustrates that refrigerators between 16.5 and 18.4 cu. ft. were the most popular nationally from 2004 to 2006. This chart shows that consumers in the Atlantic provinces continued to purchase smaller refrigerators in 2006, compared to the national average. This chart also shows that, in 2006, the Prairies received more shipments of larger refrigerators (over 18.5 cu. ft.) than the rest of the country.

Figure 1.6 Distribution of Refrigerators by Volume, by Region/Province, 2004–2006*

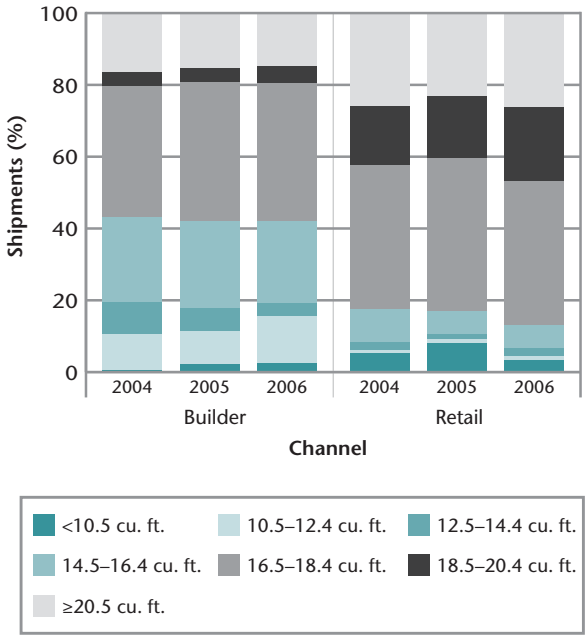


*For more information, see Table D.4 in Appendix D, "Detailed Tables."

Figure 1.7 compares the national breakdown of the distribution of refrigerators for builder sales and retail sales from 2004 to 2006. Although the most popular size of refrigerator in both cases for all years was between 16.5 and 18.4 cu. ft., retail shipments of refrigerators larger than 18.5 cu. ft. remained higher in 2006 than those shipped for the builder trade. This chart also shows that shipments of refrigerators between 14.5 and 16.4 cu. ft. to builders remained higher in 2006 than those shipped for retail sales.

The regional breakdown of builder and retail shipments by volume can be found in Tables D.5 and D.6 in Appendix D, "Detailed Tables." One trend that can be noted from these tables is that builder shipments of larger refrigerators (those over 16.5 cu. ft.) in British Columbia and the Territories remained substantially larger in 2006 than the rest of the country (77.1 percent compared to the national average of 58.1 percent). Another trend that can be observed is that retail shipments of refrigerators larger than 18.5 cu. ft. in the Atlantic provinces remained smaller in 2006 than the rest of the country (23.2 percent compared to the national average of 46.7 percent).

Figure 1.7 Distribution of Refrigerators by Volume, by Channel, 2004–2006*



*For more information, see Tables D.5 and D.6 in Appendix D, "Detailed Tables."

1.2.6 Distribution by Average Annual Unit Energy Consumption per Cubic Foot

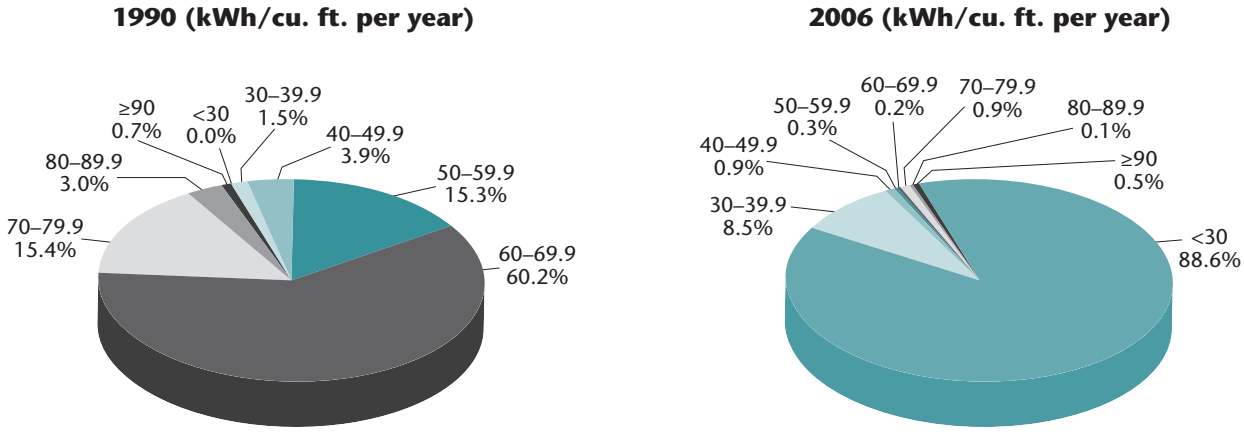
Refrigerators are becoming more efficient, thanks largely to the ongoing efforts of manufacturers, the MEPS and the amendment to the MEPS.[24] Note in Table 1.4 and Figure 1.8 that, since this 2001 amendment to the MEPS, there has been a substantial improvement in the energy efficiency of refrigerators. In 1990, no refrigerators consumed less than 30 kWh/cu. ft. per year. By 2006, 88.6 percent of refrigerators consumed less than 30 kWh per cu. ft. per year and 97.1 percent consumed less than 40 kWh per cu. ft., even though there was a definite trend toward larger ones, as illustrated in Table 1.3.

Table 1.4 Distribution of Refrigerators by Average Annual Unit Energy Consumption per Cubic Foot

Model Year	kWh/cu. ft. per year							
	<30 (%)	30–39.9 (%)	40–49.9 (%)	50–59.9 (%)	60–69.9 (%)	70–79.9 (%)	80–89.9 (%)	≥90 (%)
1990	0.0	1.5	3.9	**15.3**	**60.2**	**15.4**	**3.0**	**0.7**
1991	0.0	2.9	10.7	26.9	41.3	12.2	3.6	2.4
1992	0.0	4.8	26.9	33.2	16.0	10.4	4.0	4.8
1993	0.1	51.0	29.7	9.1	1.4	4.2	1.9	2.6
1994	0.4	70.9	22.4	4.0	0.0	0.0	1.7	0.6
1995	2.8	63.3	29.3	1.6	0.0	0.1	2.5	0.5
1996	6.6	60.0	31.2	0.9	0.1	0.0	0.7	0.4
1997	6.9	60.4	31.4	0.9	0.1	0.0	0.2	0.1
1998	5.9	62.4	27.1	0.8	0.0	0.6	2.9	0.2
1999	8.4	61.2	25.0	0.6	0.2	0.7	3.4	0.6
2000	12.2	57.4	23.6	0.9	0.4	0.7	3.6	1.2
2001	44.5	34.5	12.7	1.3	0.8	4.0	0.7	1.5
2002	64.3	26.6	3.1	0.2	0.0	3.9	0.2	1.7
2003	78.4	15.5	1.6	0.2	0.2	2.8	0.2	1.0
2004	82.6	11.0	1.3	0.2	0.2	1.2	3.0	0.7
2005	86.7	6.5	0.2	0.2	0.6	3.3	1.8	0.7
2006	**88.6**	8.5	0.9	0.3	0.2	0.9	0.1	0.5
Total Change	**88.6**	**7.0**	**3.0**	**15.0**	**60.0**	**14.5**	**2.9**	**0.2**

[24] For more information about the 2001 amendment to the MEPS for refrigerators, visit the following Web site: oee.nrcan.gc.ca/regulations/refrigerators.cfm.

Figure 1.8 Distribution of Refrigerators by Average Annual Unit Energy Consumption per Cubic Foot, 1990 and 2006

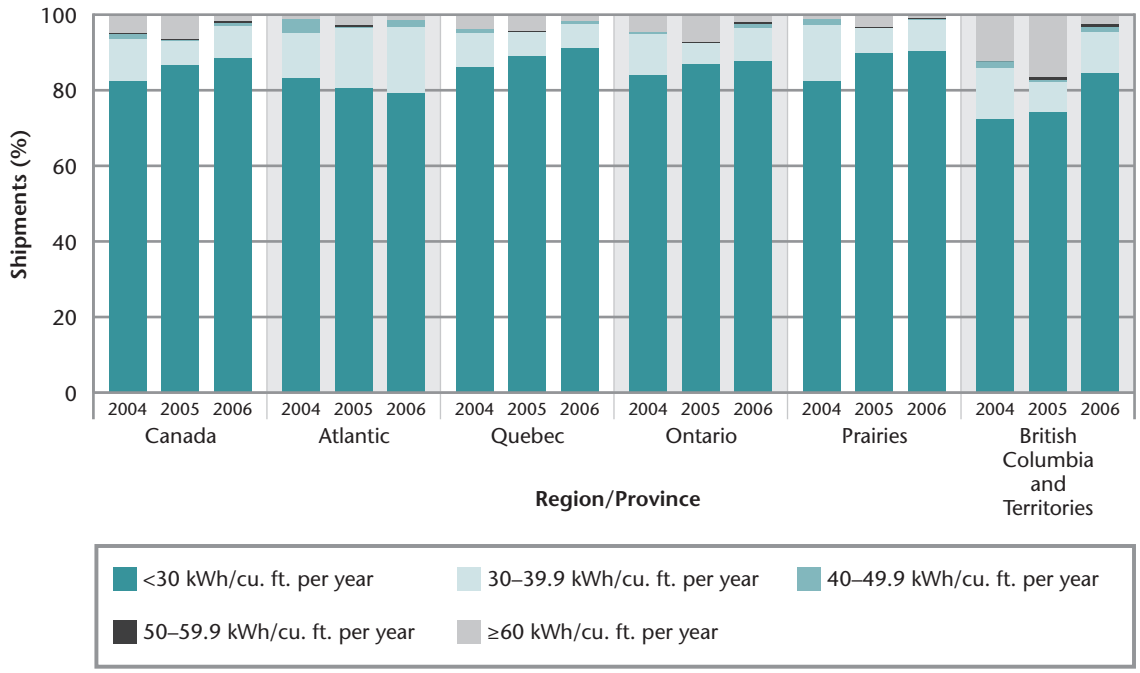


Also responsible for the trend toward the purchase of more energy-efficient refrigerators are the various initiatives and incentives offered by the federal, provincial and municipal governments and utilities.

1.2.7 Distribution by Average Annual Unit Energy Consumption per Cubic Foot, by Region/Province

In 2006, 88.6 percent of all refrigerators shipped in Canada consumed less than 30 kWh/cu. ft. Figure 1.9 illustrates the trends of energy consumption per cubic foot throughout the regions. British Columbia and the Territories had the largest increase in shipments of refrigerators consuming less than 30 kWh/cu. ft. from 2005 to 2006, compared with the rest of the country.

Figure 1.9 Distribution of Refrigerators by Average Annual Unit Energy Consumption per Cubic Foot, by Region/Province, 2004–2006*



*For more information, see Table D.7 in Appendix D, "Detailed Tables."

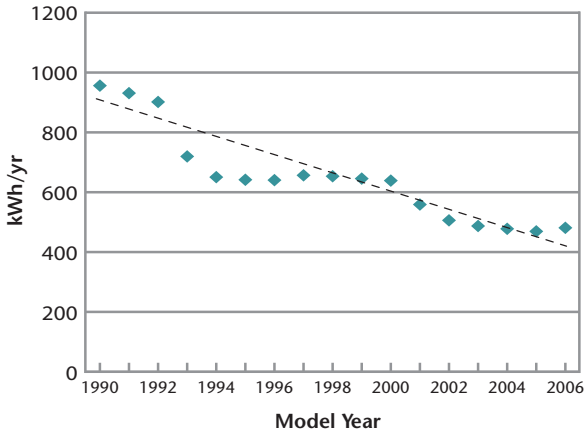
1.3 Energy Consumption

1.3.1 Average Annual Unit Energy Consumption by Model Year

As mentioned previously, even though there is diversity in types and sizes of refrigerators, they have been grouped to calculate the average annual UEC for all refrigerators by model year (see Figure 1.10). Overall, the average annual UEC decreased by 475 kWh during the study period. It showed a significant improvement from 2000 to 2002, which coincides with the 2001 amendment to the MEPS. From 2003 to 2005, the average annual UEC remained relatively stable, and in 2006, it increased slightly. We can conclude that some of the energy efficiency gains by refrigerators are being offset by the use of larger units, which consume more energy than smaller units.

For analysis of the distribution of refrigerators by average annual UEC by type, see Table D.1 in Appendix D, "Detailed Tables." Because the volume of the refrigerator is so important in such analysis, we recommend further examination of the distribution of refrigerators by average annual UEC per cubic foot by volume (Table D.9 in Appendix D, "Detailed Tables").

Figure 1.10 Average Annual Unit Energy Consumption of Refrigerators by Model Year*

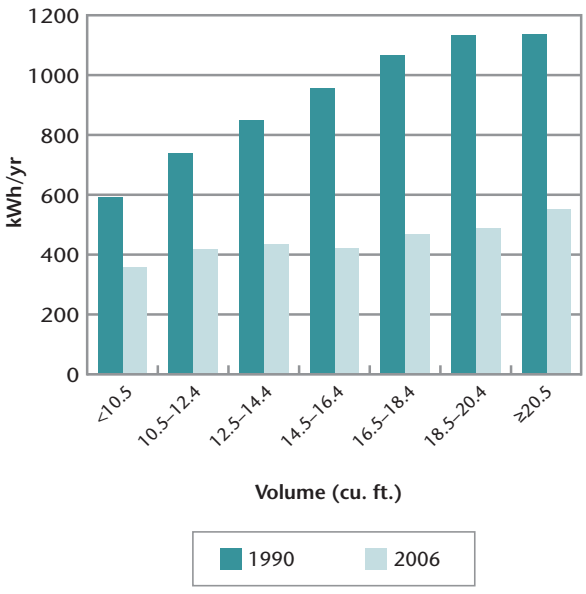


*For more information, see Table D.1 in Appendix D, "Detailed Tables."

1.3.2 Average Annual Unit Energy Consumption by Volume

The energy performance of refrigerators improved remarkably between 1990 and 2006. As illustrated in Figure 1.11, the larger the volume, the greater the decrease in average annual UEC. In 1990, refrigerators larger than 16.5 cu. ft. consumed on average more than 1000 kWh of electricity per year. By 2006, refrigerators that size consumed less than half as much energy. The gap between the average annual UEC of the largest and smallest units narrowed between 1990 and 2006. At the beginning of this period, the difference between the average annual UEC of the large and small units was 545 kWh. By 2006, with manufacturers improving the energy efficiency of larger models, the difference had decreased to approximately 200 kWh. This trend illustrates that there is less of a deterrent for purchasing larger units.

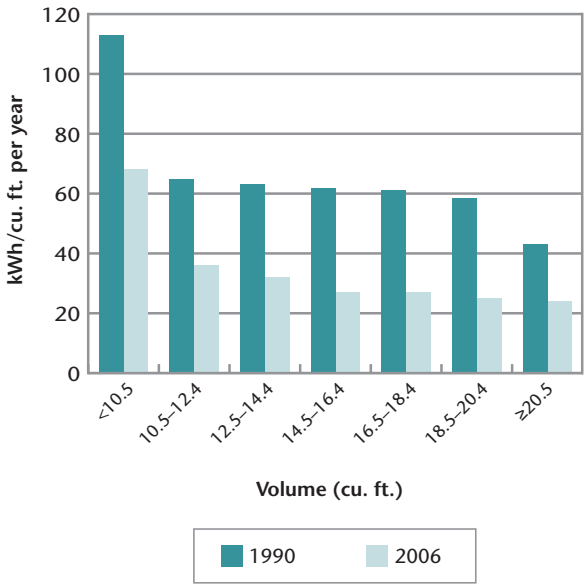
Figure 1.11 Average Annual Unit Energy Consumption of Refrigerators by Volume*



*For more information, see Table D.8 in Appendix D, "Detailed Tables."

The trend in the average annual UEC of refrigerators, on a per-cubic-foot basis, is consistent with the above findings. Figure 1.12 illustrates that larger models consumed less energy per cubic foot than smaller models.

Figure 1.12 Average Annual Unit Energy Consumption per Cubic Foot of Refrigerators by Volume*



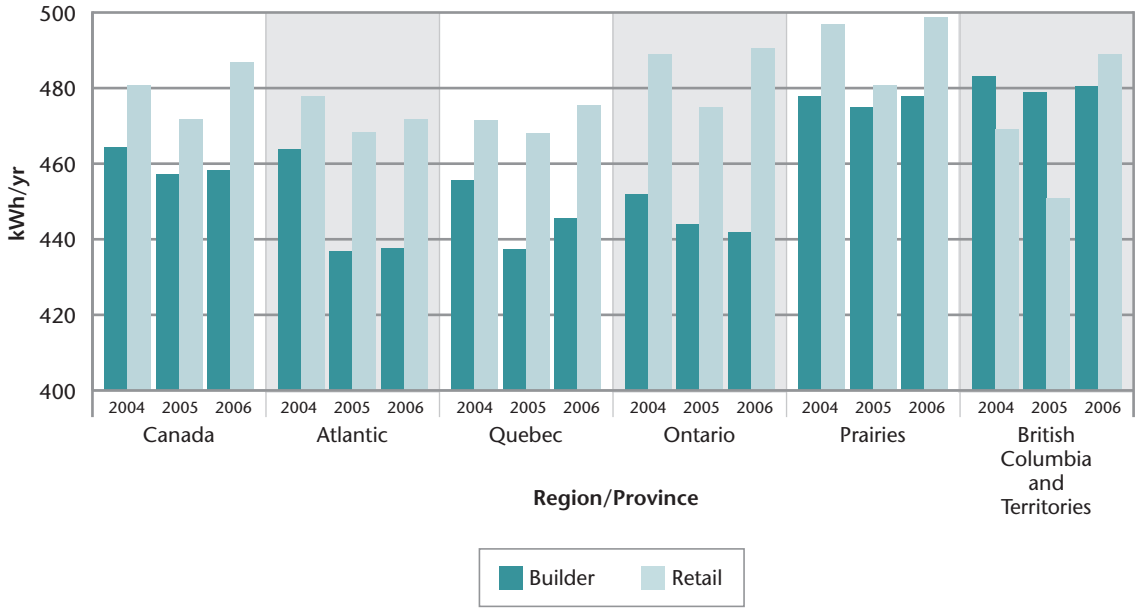
*For more information, see Table D.9 in Appendix D, "Detailed Tables."

1.3.3 Average Annual Unit Energy Consumption by Channel, by Region/Province

Figure 1.13 illustrates the breakdown of the average annual UEC of refrigerators by shipments for the builder trade and for retail purposes by region/province from 2004 to 2006. In most regions, the average annual UEC increased slightly in 2006 for builder and retail shipments, probably due to the fact that consumers were purchasing larger, more energy-consuming models.

Note also that, in British Columbia and the Territories, the average annual UEC for retail shipments increased significantly between 2004 and 2006. This is probably due to the fact that retail shipments of models over 16.5 cu. ft. in that region increased from 65.5 percent in 2005 to 83.2 percent in 2006.

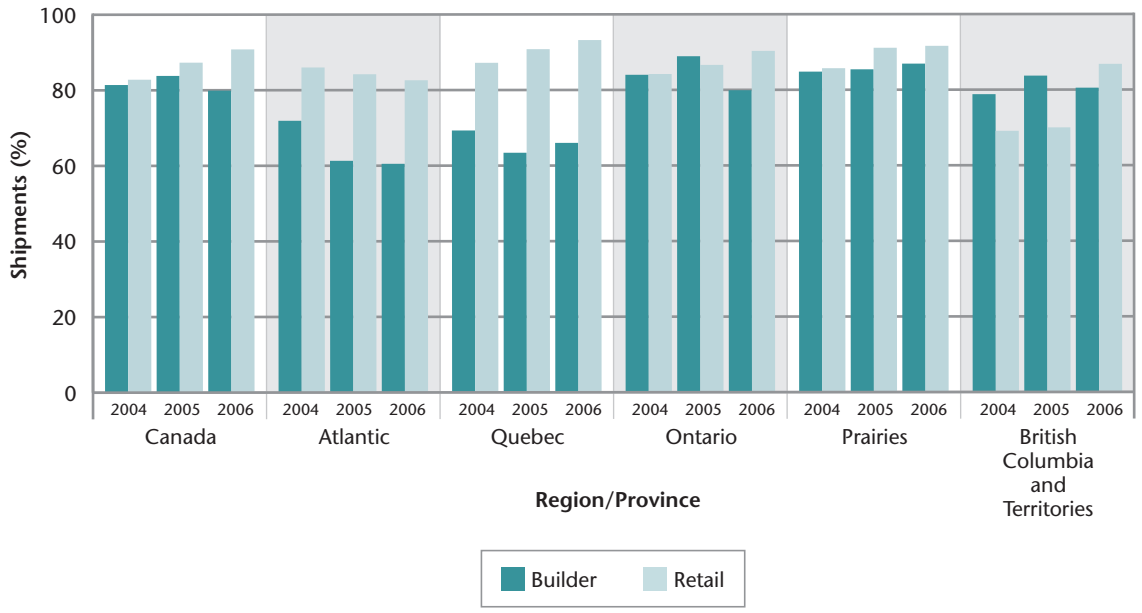
Figure 1.13 Average Annual Unit Energy Consumption of Refrigerators by Channel, by Region/Province, 2004–2006*



*For more information, see Table D.10 in Appendix D, "Detailed Tables."

Figure 1.14 illustrates national trends in shipments of refrigerators from 2004 to 2006. For refrigerators consuming less than 30 kWh/cu. ft. per year, builder shipments decreased and retail shipments increased slightly. Minor fluctuations of these proportions occurred throughout the regions/provinces, except that builder shipments in the Atlantic provinces and Quebec were somewhat more energy intensive than the national average from 2004 to 2006.

Figure 1.14 Distribution of Refrigerators Consuming Less Than 30 kWh/cu. ft. per Year, by Region/Province, 2004–2006*



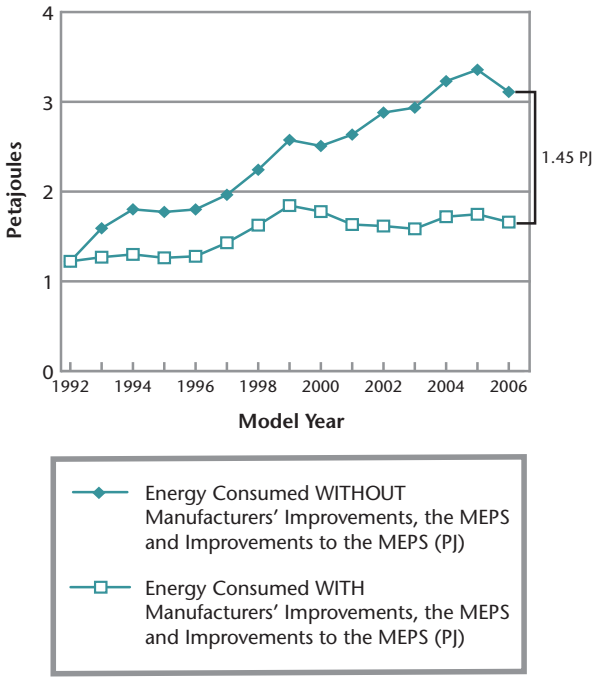
*For more information, see Table D.11 in Appendix D, "Detailed Tables."

1.4 Energy Savings

Figure 1.15 shows how much energy refrigerators might have consumed annually between 1992 and 2006 without the decrease in average annual UEC (*top line*) and how much energy refrigerators actually consumed during those years (*bottom line*).

The divergence of the two lines in Figure 1.15 represents incremental annual energy savings. Even though the MEPS did not come into effect until 1995, the calculation of energy savings is based on data from 1992 onward. This is because energy efficiency began to improve almost immediately after the *Energy Efficiency Act* (the Act) came into force in 1992.

Figure 1.15 Annual Energy Savings for Refrigerators, 1992–2006*

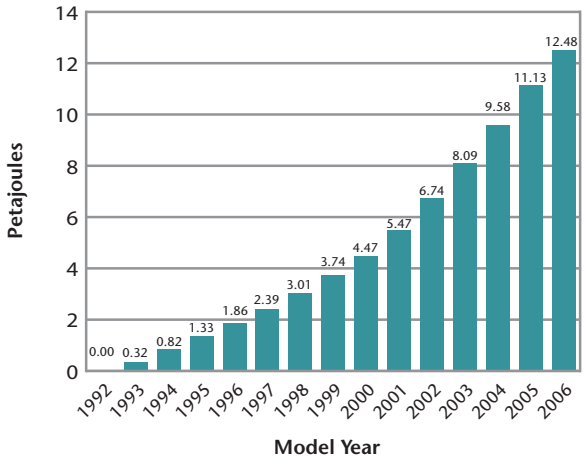


*For more information, see Table D.12 in Appendix D, "Detailed Tables."

The average annual energy savings for refrigerators were estimated to be 0.9 petajoules (PJ) between 1993 and 2006. (No savings were expected in 1992.) This indicates that, on average, refrigerators consumed 0.9 PJ less per year than they would have without the factors described above.

Cumulative energy savings for refrigerators are shown in Figure 1.16 and in Table D.12 in Appendix D, "Detailed Tables." In 2006, refrigerators consumed approximately 1.45 PJ less than they would have otherwise. They reached a total savings of 12.48 PJ in 2006 (the equivalent of one year's energy for approximately 118 000 households), taking into account the life expectancy factor of refrigerators. (This calculation is explained further in Appendix A, "Methodology.")

Figure 1.16 Cumulative Energy Savings for Refrigerators, 1992–2006*



*For more information, see Table D.12 in Appendix D, "Detailed Tables."

1.5 Refrigerators Summary

Type 3 refrigerators (refrigerator-freezers with a top-mounted freezer and automatic defrost) remained the most popular type in Canada (64.5 percent of the market in 2006). However, their market share had declined since 1990, when they represented 84.9 percent of the market. Refrigerators with a bottom-mounted freezer (Types 5 and 5A) continued to rise in popularity in 2006, and refrigerators with a side-mounted freezer and through-the-door ice service (Type 7) remained popular.

Of the refrigerators shipped in 2006, 37.3 percent were ENERGY STAR qualified, as outlined in Table D.A.1 in Appendix D, "Detailed Tables." In 2004, more stringent specifications for refrigerators to qualify for the ENERGY STAR registered mark were introduced.

In 2006, the most popular size category of refrigerators was 16.5 to 18.4 cu. ft., although there remained a continued trend for larger ones (those more than 18.5 cu. ft.). The average annual UEC of refrigerators increased slightly in 2006, due to this trend. However, refrigerators were becoming more efficient. From 2000 to 2006, the market share of refrigerators requiring less than 30 kWh per cu. ft. increased from 12.2 percent to 88.6 percent.

In 2006, 20.4 percent of all refrigerators were categorized as builder shipments, whereas 79.6 percent of them were tagged as retail shipments. British Columbia and the Territories continued to have a substantially larger share of builder shipments than the rest of the country, whereas Quebec continued to have a somewhat smaller builder share.

The average annual energy savings for refrigerators were estimated to be 0.9 PJ between 1992 and 2006, with total energy savings for that period reaching 12.48 PJ (3.47 billion kWh). Dollar savings for refrigerators for the study period were estimated to be $326 million (calculated at 9.4 cents/kWh).

Chapter 2 / **Freezers**

Freezers are available in various sizes and styles, all of which affect energy consumption. This is why EnerGuide groups freezers according to type, enabling you to compare the energy consumption of similar models. As previously noted, because of restrictions in the market information available, the freezer shipment data are not as comprehensive as for the other appliances and should be used with caution.

Upright freezers

Type 8 Upright freezers with manual defrost

Type 9 Upright freezers with automatic defrost

Chest freezers

Type 10 Chest freezers and all other freezers not defined as Type 8 or Type 9

Compact freezers[25]

Type 16 Compact upright freezers with manual defrost

Type 17 Compact upright freezers with automatic defrost

Type 18 Compact chest freezers and all other compact freezers

2.1 2006 Market Snapshot

Type 10 (chest) freezers were again the most popular type in 2006, accounting for 45.6 percent of all freezers shipped in Canada. Their shipment-weighted average annual unit energy consumption (UEC) was 336 kilowatt hours (kWh), as outlined in Table D.16 in Appendix D, "Detailed Tables."

Freezers were included in the ENERGY STAR® Initiative in 2003. More detailed data on qualified freezers will be included in future analyses, as they become available.

The energy efficiency of freezers improved between 1990 and 2006. In 1990, almost all freezers required more than 50 kWh per year to freeze each cubic foot of space. By 2006, no freezers required more than 50 kWh per year to freeze each cubic foot of space and 75.2 percent required less than 40 kWh per year.

[25] Those with total refrigerated volumes of less than 7.75 cubic feet and overall heights of less than 36 inches.

2.2 Distribution of Shipments

2.2.1 Distribution by Type

Type 10 freezers dominated the freezer market in Canada throughout the study period. However, as illustrated in Table 2.1 and Figure 2.1, the market share of chest freezers (Types 10 and 18) declined from 83.2 percent to 62.8 percent during those years. Conversely, upright freezers (Types 8 and 9) gained a 20.4 percentage point increase in market share between 1990 and 2006. They accounted for 37.2 percent of the market in 2006. (For more information, see Table D.16 in Appendix D, "Detailed Tables".) Unfortunately, Types 8 and 9 freezers are less energy efficient than Type 10 freezers. That is because lifting the door on a chest unit releases less cold air than opening the door to an upright freezer, where the cold air flows down and out.[26]

Table 2.1 Distribution of Freezers by Type

Model Year	Freezer Type				
	Type 8 (%)	Type 9 (%)	Type 10 (%)	Type 16 (%)	Type 18 (%)
1990	**16.8**	0.0	**64.9**	0.0	**18.3**
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**
Total Change	▲ 11.7	▲ 8.7	▼ 19.3	**0.0**	▼ 1.1

[26] Natural Resources Canada, *EnerGuide Appliance Directory 2006* (Ottawa: March 2006), p. 121.

Figure 2.1 Distribution of Freezers by Type, 1990 and 2006

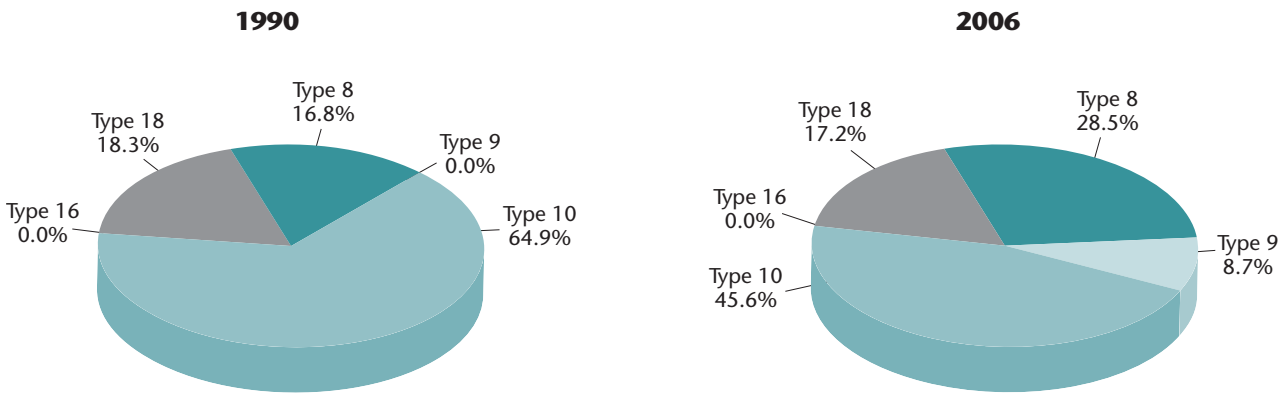
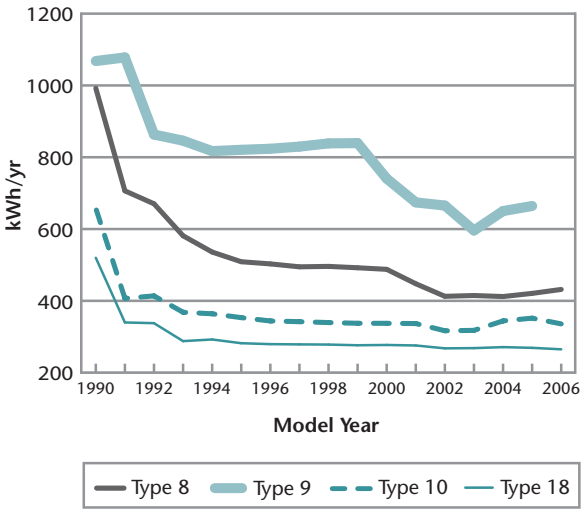


Figure 2.2 illustrates the average annual UEC of the various freezer types during the study period. Types 10 and 18 freezers remained the most energy-efficient ones on the market, followed by Types 8 and 9.

Figure 2.2 Average Annual Unit Energy Consumption of Freezers by Type, by Model Year*

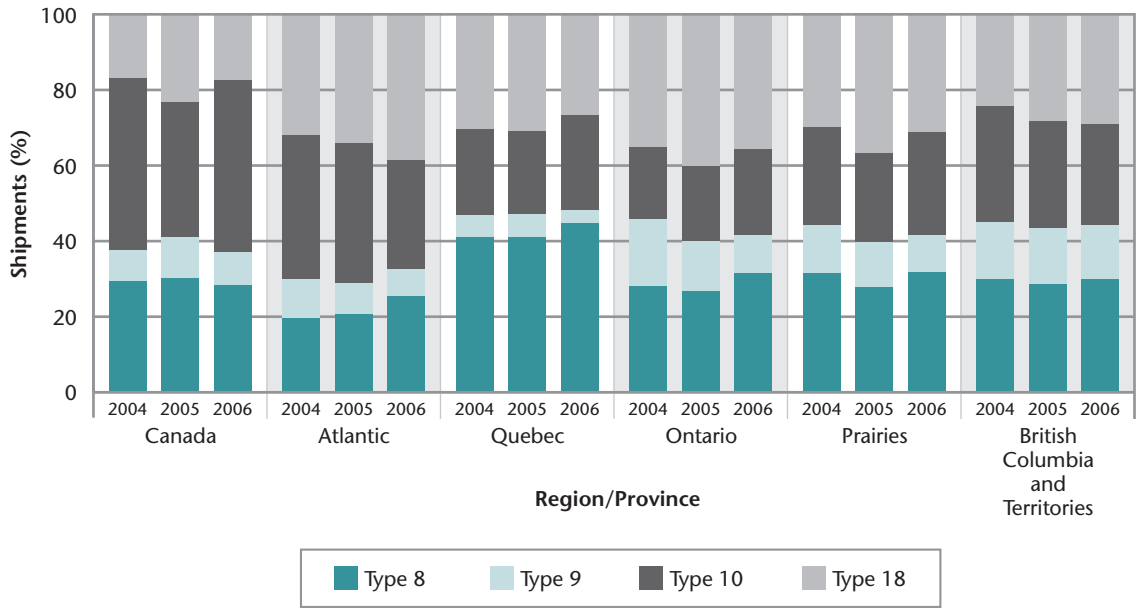


*For more information, see Table D.16 in Appendix D, "Detailed Tables."

2.2.2 Distribution by Type, by Region/Province

Figure 2.3 compares the shipment trends for various freezer types from 2004 to 2006. For example, Type 8 freezers continue to be more popular in Quebec than the national average. Note, however, that the freezer shipment data are not as comprehensive as data for the other appliances. In particular, the regional/provincial breakdown of shipments is not as detailed as the national level of data and, therefore, should be used with caution.

Figure 2.3 Distribution of Freezers by Type, by Region/Province, 2004–2006*



*For more information, see Table D.13 in Appendix D, "Detailed Tables."

2.2.3 Distribution by Average Annual Unit Energy Consumption per Cubic Foot

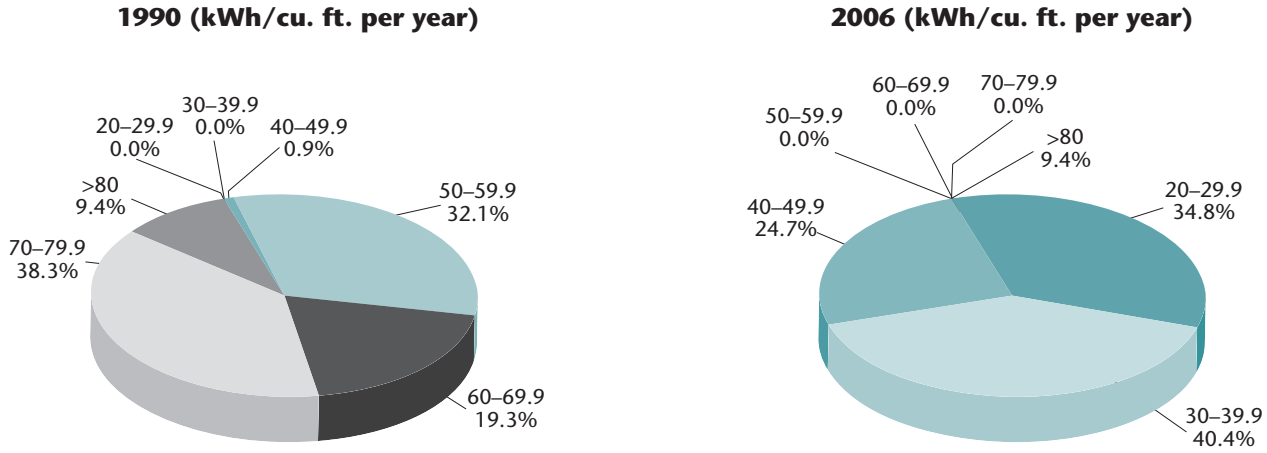
Table 2.2 and Figure 2.4 illustrate that in 1990, almost all freezers required more than 50 kWh per year to freeze each cubic foot of space.

By 2002 (shortly after the 2001 amendment to the MEPS), almost all freezers consumed less than 50 kWh per year, and in 2006, 75.2 percent of all freezers required less than 40 kWh per year to freeze each cubic foot of space.

Table 2.2 Distribution of Freezers by Average Annual Unit Energy Consumption per Cubic Foot

Model Year	kWh/cu. ft. per year						
	20–29.9 (%)	30–39.9 (%)	40–49.9 (%)	50–59.9 (%)	60–69.9 (%)	70–79.9 (%)	≥80 (%)
1990	0.0	0.0	0.9	**32.1**	**19.3**	**38.3**	**9.4**
1991	0.0	28.3	20.3	31.2	4.1	15.9	0.3
1992	3.1	18.9	58.3	15.0	4.5	0.3	0.0
1993	16.5	57.0	16.5	8.4	1.6	0.0	0.0
1994	15.4	39.0	34.9	9.0	1.9	0.0	0.0
1995	12.7	39.6	41.2	5.4	1.2	0.0	0.0
1996	12.4	40.4	37.0	10.3	0.0	0.0	0.0
1997	11.7	36.7	39.0	12.0	0.0	0.6	0.0
1998	11.0	34.6	43.1	11.3	0.0	0.0	0.0
1999	10.8	42.3	37.0	9.6	0.0	0.3	0.0
2000	10.0	37.6	41.3	8.8	0.0	2.3	0.0
2001	17.5	36.3	38.2	3.9	0.0	4.0	0.0
2002	26.7	47.5	24.9	0.8	0.0	0.0	0.0
2003	28.6	47.4	23.2	0.8	0.0	0.0	0.0
2004	28.9	48.8	22.3	0.1	0.0	0.0	0.0
2005	29.5	45.2	25.3	0.0	0.0	0.0	0.0
2006	**34.8**	**40.4**	24.7	0.0	0.0	0.0	0.0
Total Change	34.8	40.4	23.8	32.1	19.3	38.3	9.4

Figure 2.4 Distribution of Freezers by Average Annual Unit Energy Consumption per Cubic Foot, 1990 and 2006

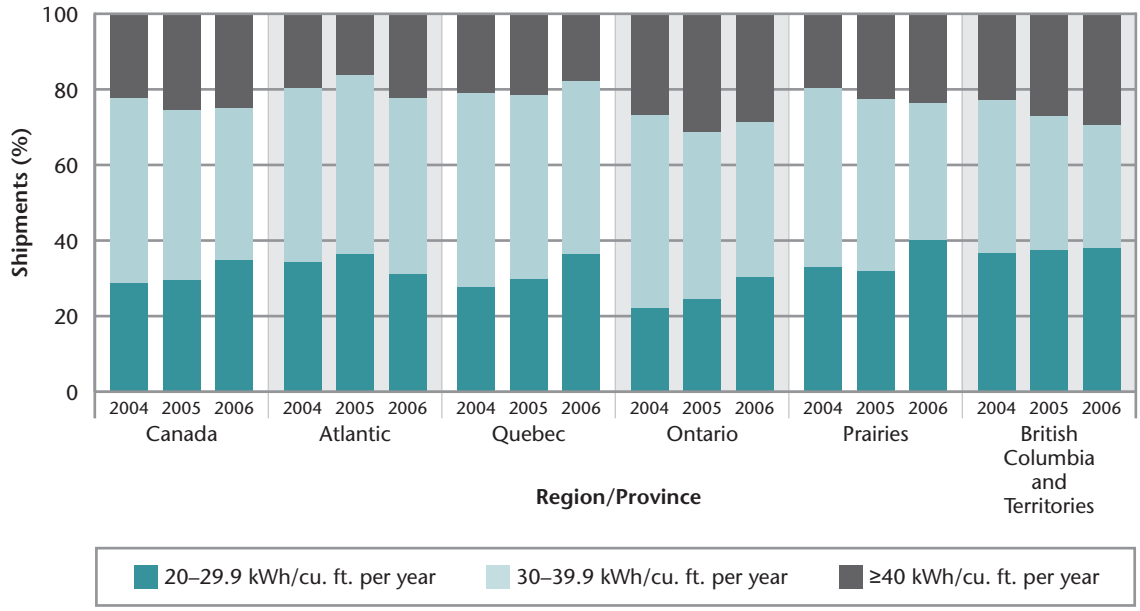


At the beginning of the study period, freezers with an average annual UEC between 70.0 and 79.9 kWh/cubic foot (cu. ft.) per year dominated the market, accounting for 38.3 percent of the market. By comparison, 40.4 percent of freezers in 2006 consumed between 30 and 39.9 kWh/cu. ft. per year and another 34.8 percent consumed between 20 and 29.9 kWh/cu. ft. per year.

2.2.4 Distribution by Average Annual Unit Energy Consumption per Cubic Foot, by Region/Province

Figure 2.5 illustrates a national improvement in energy efficiency in freezers from 2004 to 2006, with a 5.9 percentage point increase in those consuming between 20 and 29.9 kWh per cu. ft. This improvement is evidenced in most regions, except the Atlantic provinces.

Figure 2.5 Distribution of Freezers by Average Annual Unit Energy Consumption per Cubic Foot, by Region/Province, 2004–2006*

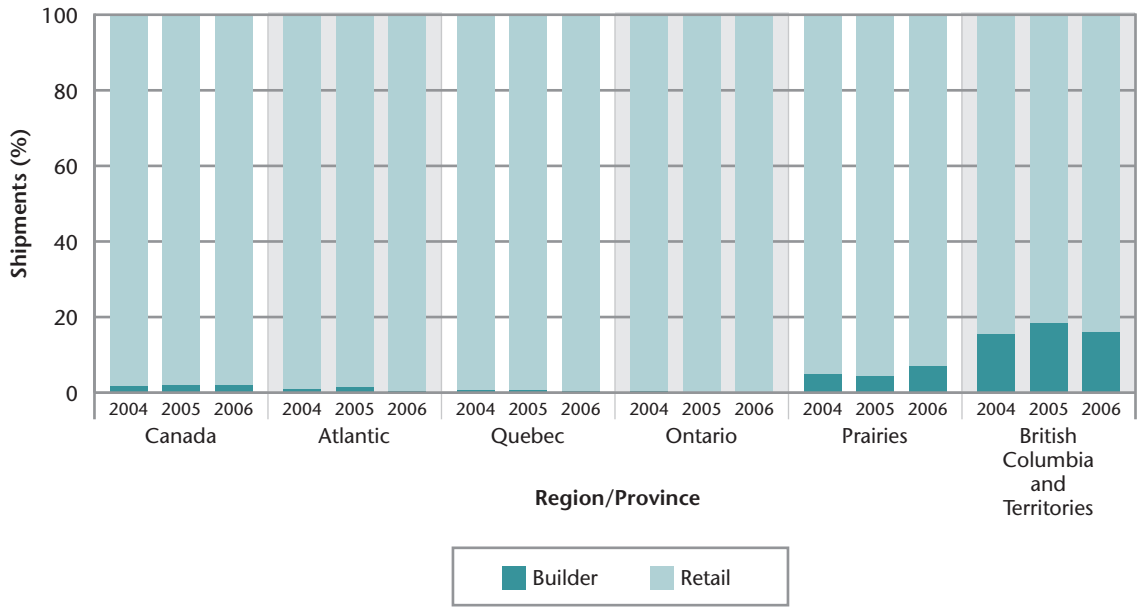


*For more information, see Table D.14 in Appendix D, "Detailed Tables."

2.2.5 Distribution by Channel, by Region/Province

Figure 2.6 illustrates the proportion of freezers shipped for the building trade versus those shipped for retail sales from 2004 to 2006. There were no major differences in this proportion in 2006 and, once again, builder shipments were higher than average in the western provinces.

Figure 2.6 Distribution of Freezers by Channel, by Region/Province, 2004–2006*



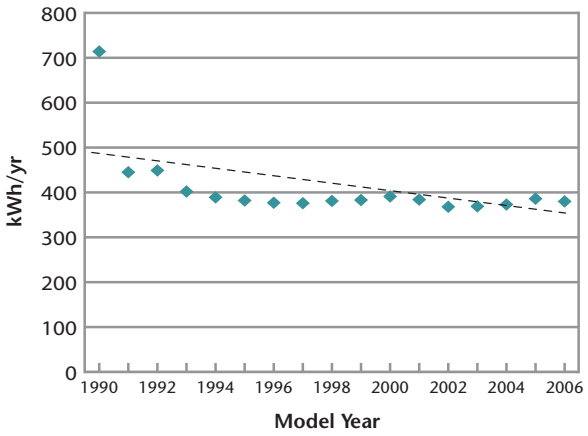
*For more information, see Table D.15 in Appendix D, "Detailed Tables."

2.3 Energy Consumption

2.3.1 Average Annual Unit Energy Consumption by Model Year

Freezers became more energy efficient between 1990 and 2006. As Figure 2.7 shows, the average annual UEC decreased significantly in 1991 and then decreased gradually until 1997. After 1997, the average annual UEC fluctuated only slightly.

Figure 2.7 Average Annual Unit Energy Consumption of Freezers by Model Year*



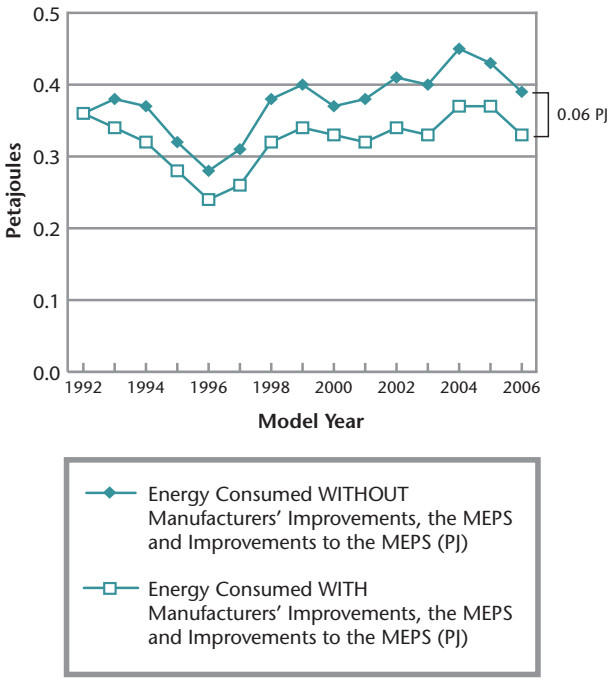
*For more information, see Table D.16 in Appendix D, "Detailed Tables."

2.4 Energy Savings

It is estimated that annual freezer energy consumption was slightly lower between 1993 and 2006 than it would have been without the minimum energy performance standards (MEPS), the 2001 amendment to the MEPS and the general improvements in energy efficiency.[27]

As with Figure 1.15 in Chapter 1, "Refrigerators," the difference between the two lines in Figure 2.8 represents the incremental annual energy savings.

Figure 2.8 Annual Energy Savings for Freezers, 1992–2006*



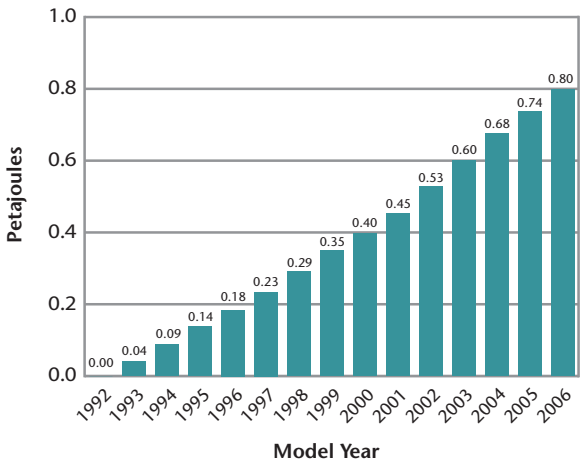
*For more information, see Table D.17 in Appendix D, "Detailed Tables."

[27] For more information about the 2001 amendment to the MEPS for freezers, visit the following Web site: oee.nrcan.gc.ca/regulations/refrigerators.cfm.

The average annual energy savings for freezers were estimated to be 0.06 petajoules (PJ) from 1993 to 2006. (No savings were expected for 1992.)

Cumulative energy savings grew steadily between 1992 and 2006 to reach 0.80 PJ in 2006 (the equivalent of one year's energy for approximately 7600 households), taking into account the life expectancy factor of freezers. (This calculation is explained in Appendix A, "Methodology.") These energy savings are shown in Figure 2.9.

Figure 2.9 Cumulative Energy Savings for Freezers, 1992–2006*



*For more information, see Table D.17 in Appendix D, "Detailed Tables."

2.5 Freezers Summary

Type 10 (chest freezers) continued to be the most popular type in 2006 (45.6 percent of the market). However, Types 8 and 9 (upright freezers with manual and automatic defrost) grew in popularity, accounting for 37.2 percent of the market (up from 16.8 percent in 1990).

The energy efficiency of freezers improved between 1990 and 2006. By 2006, all freezers required less than 50 kWh per year to freeze each cubic foot of space, whereas in 1990, almost all freezers (99.1 percent) required more than 50 kWh per year. The average annual energy savings for freezers were estimated to be 0.06 PJ between 1993 and 2006, with total energy savings for that period reaching 0.80 PJ (222.22 million kWh). Dollar savings for freezers for the study period were estimated to be $21 million (calculated at 9.4 cents/kWh).

Chapter 3 / **Dishwashers**

3.1 2006 Market Snapshot

The shipment-weighted average annual unit energy consumption (UEC) of dishwashers in 2006 was 373 kilowatt hours (kWh). Nearly 80 percent of the standard models on the market that year – that is, those with an exterior width of more than 56 centimetres – qualified as ENERGY STAR® products, exceeding the minimum energy performance standards (MEPS) by at least 25 percent. A revision to increase the stringency of the ENERGY STAR specification for dishwashers came into effect in January 2007. Shipments of ENERGY STAR dishwashers decreased slightly in 2006, which could be a result of manufacturers preparing themselves for these upcoming, more stringent specifications.

Between 1990 and 2006, the energy performance of dishwashers improved remarkably. The average annual UEC decreased by approximately 64 percent, or 653 kWh, during the period.

3.2 Distribution of Shipments

3.2.1 Distribution by Average Annual Unit Energy Consumption

Table 3.1 and Figure 3.1 illustrate that in 1990, dishwashers consuming more than 700 kWh annually represented 99.8 percent of the market. The majority (68.7 percent) of these dishwashers consumed at least 1000 kWh.

By 1999, these inefficient models were no longer produced and by 2006, 90.3 percent of all dishwashers consumed less than 400 kWh. Improvement in efficiency from 2003 to 2006 is probably attributable to the 2004 amendment to the MEPS.

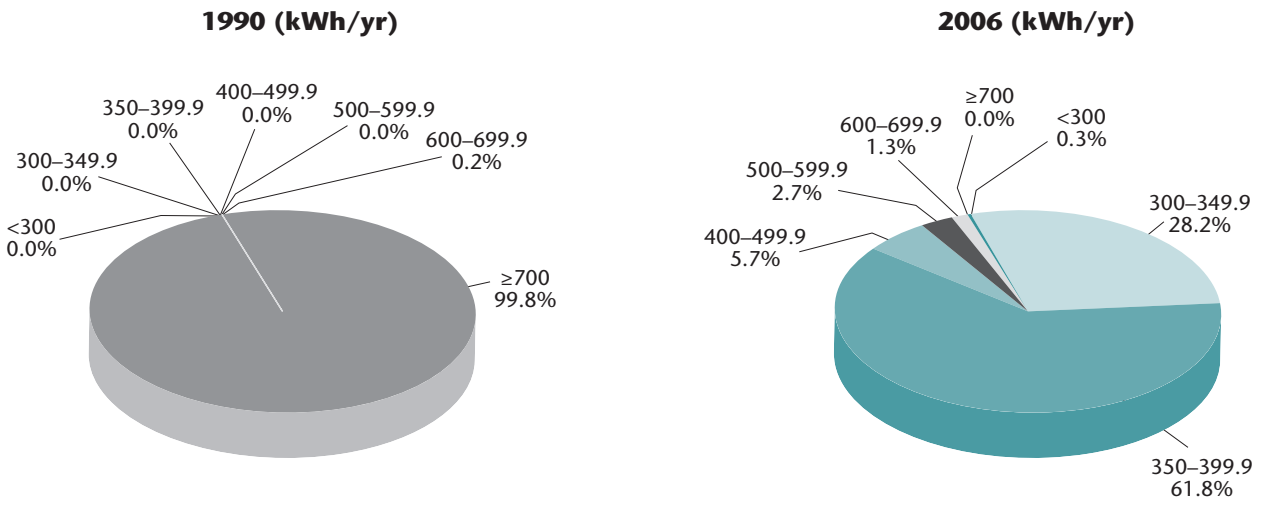
Dishwashers are now rated to a new energy-consumption standard, reducing the annual energy consumption for all models. However, this decrease may not accurately reflect an improvement in the energy efficiency of those models. Instead, this standard reduces the amount of energy these appliances might consume each year. Dishwashers are also subject to new energy-consumption testing procedures, also introduced in 2004. Previously, these appliances were rated according to an average of 264 loads per year. However, new data indicate that Canadians have reduced dishwasher use, so the test average is now 215 loads per year. The new ratings take into account standby power consumption (the energy used while the appliance is idle) and continue to include the energy required to heat the 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.[28]

[28] Natural Resources Canada, *EnerGuide Appliance Directory 2006* (Ottawa: March 2006), p. 173.

Table 3.1 Distribution of Dishwashers by Average Annual Unit Energy Consumption

Model Year	kWh/yr						
	<300 (%)	300–349.9 (%)	350–399.9 (%)	400–499.9 (%)	500–599.9 (%)	600–699.9 (%)	≥700 (%)
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
Total Change	↑ 0.3	↑ 28.2	↑ 61.8	↑ 5.7	↑ 2.7	↑ 1.1	↓ 99.8

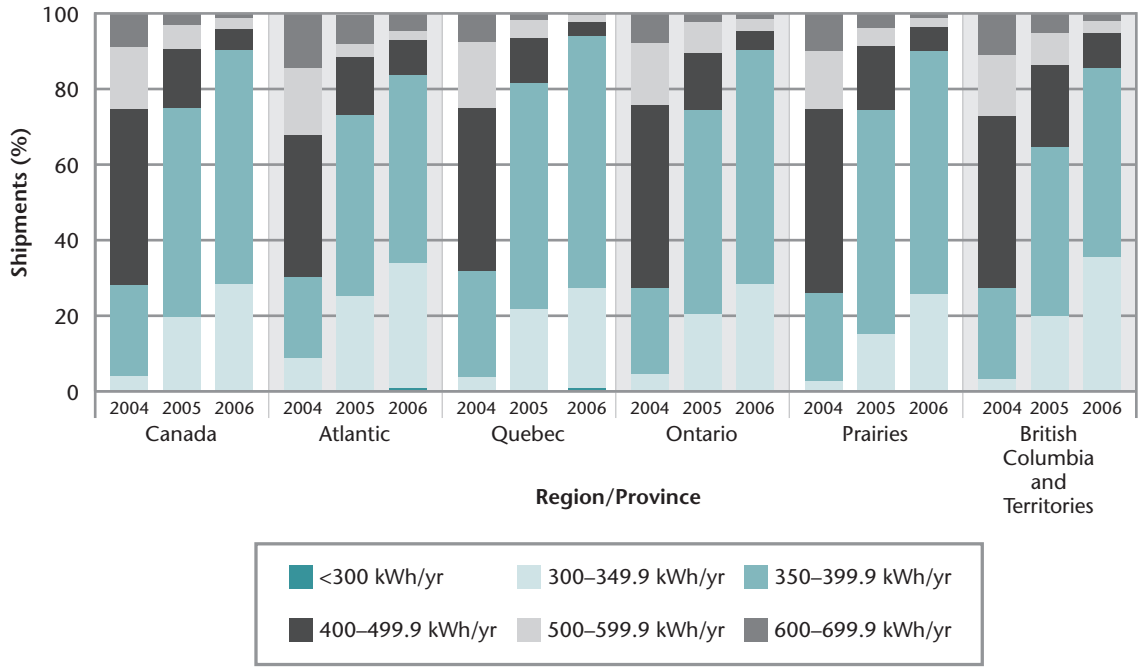
Figure 3.1 Distribution of Dishwashers by Average Annual Unit Energy Consumption, 1990 and 2006



3.2.2 Distribution by Average Annual Unit Energy Consumption, by Region/Province

Figure 3.2 shows that there were significant improvements in the average annual UEC of dishwashers throughout the country from 2004 to 2006.

Figure 3.2 Distribution of Dishwashers by Average Annual Unit Energy Consumption, by Region/Province, 2004–2006*

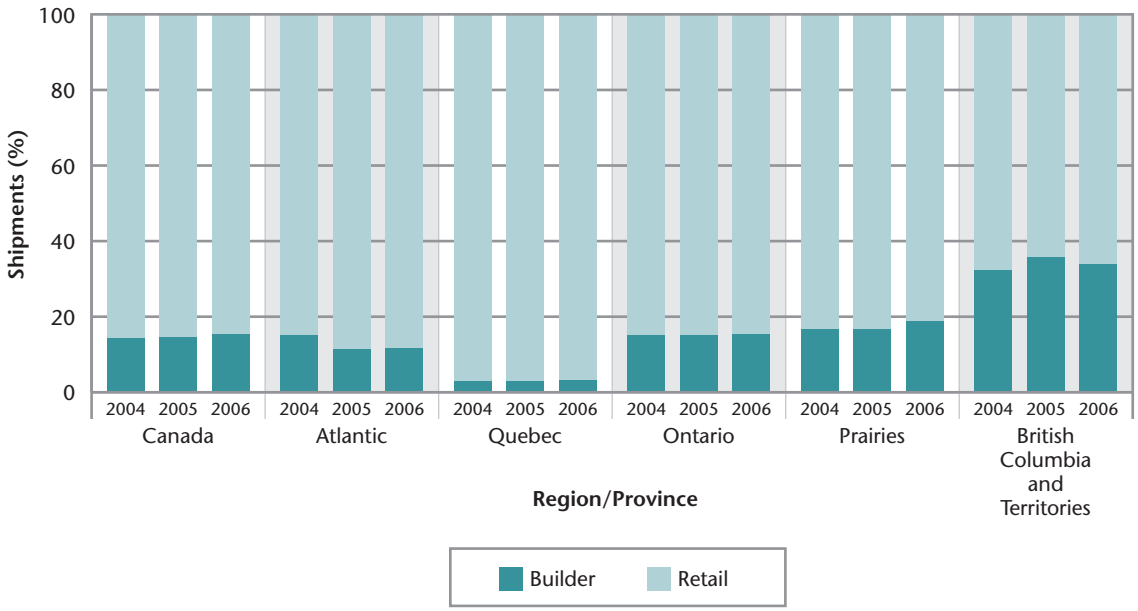


*For more information, see Table D.18 in Appendix D, "Detailed Tables."

3.2.3 Distribution by Channel, by Region/Province

Figure 3.3 illustrates the proportion of dishwashers shipped for the building trade versus those shipped for retail sales, between 2004 and 2006. There were only slight changes in the trends throughout the country. Builder shipments remained higher than average in British Columbia and the Territories.

Figure 3.3 Distribution of Dishwashers by Channel, by Region/Province, 2004–2006*



*For more information, see Table D.19 in Appendix D, "Detailed Tables."

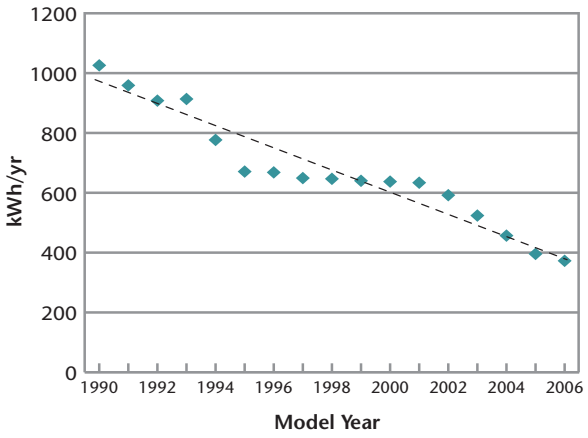
3.3 Energy Consumption

3.3.1 Average Annual Unit Energy Consumption by Model Year

Between 1990 and 2006, the energy performance of dishwashers improved substantially. As Figure 3.4 shows, the average annual UEC decreased by approximately 64 percent, or 653 kWh, during the period. A good part of the improvement occurred before 1995, when the average annual UEC decreased from 1026 to 671 kWh – a decrease of 355 kWh, or 35 percent.

After 1995, the decrease in the average annual UEC tapered off, but in 2001, a noticeable decrease began to re-emerge, probably partly due to the increase in availability of ENERGY STAR dishwashers and partly due to the announcement of the upcoming 2004 amendment to the MEPS. In 2006, the average annual UEC for dishwashers was 373 kWh, a decrease of 298 kWh, or 44 percent, from the 1995 level.

Figure 3.4 Average Annual Unit Energy Consumption of Dishwashers by Model Year*

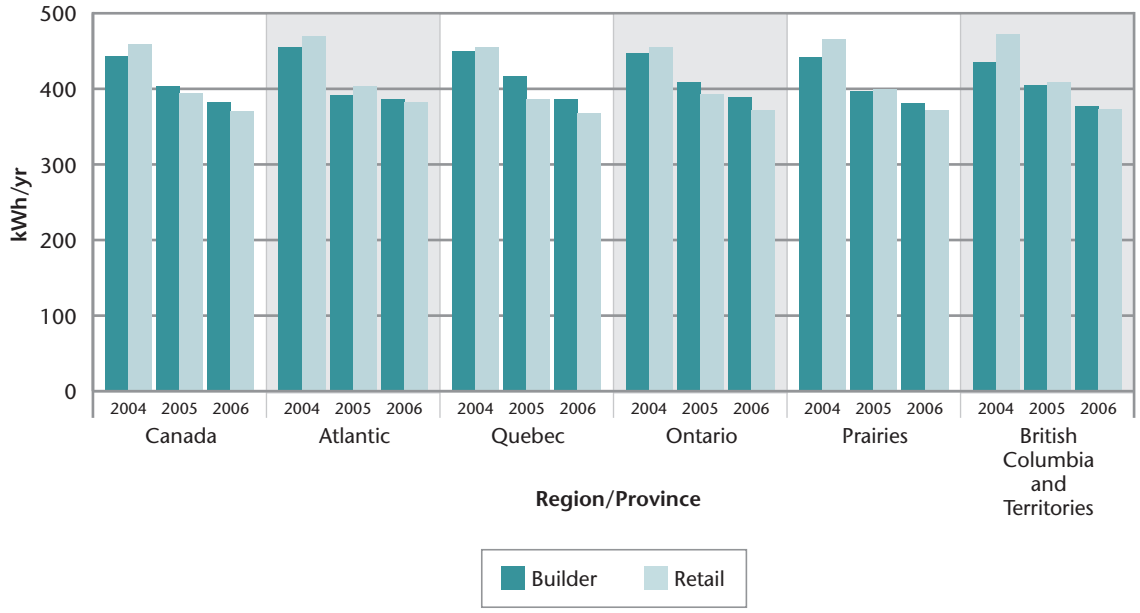


*For more information, see Table D.20 in Appendix D, "Detailed Tables."

3.3.2 Average Annual Unit Energy Consumption by Channel, by Region/Province

Figure 3.5 illustrates the breakdown of the average annual UEC of dishwashers by shipments for the builder trade and for retail purposes by region/province, for 2004 to 2006. It shows that throughout the country, in 2006, the gap between the average annual UEC for builder and retail shipments narrowed and reversed, compared with 2004 figures.

Figure 3.5 Average Annual Unit Energy Consumption of Dishwashers by Channel, by Region/Province, 2004–2006

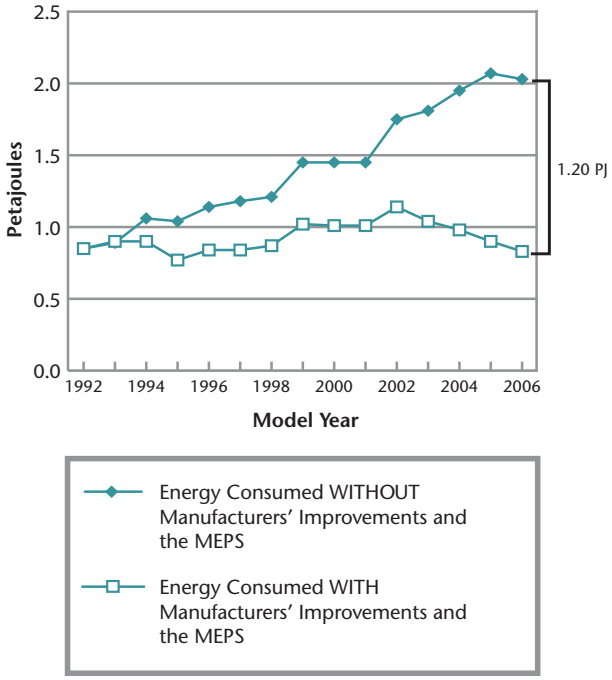


*For more information, see Table D.21 in Appendix D, "Detailed Tables."

3.4 Energy Savings

Figure 3.6 shows how much energy dishwashers might have consumed annually between 1992 and 2006 without the factors previously outlined (*top line*) and how much energy actually was consumed by refrigerators during those years (*bottom line*).

Figure 3.6 Annual Energy Savings for Dishwashers, 1992–2006*

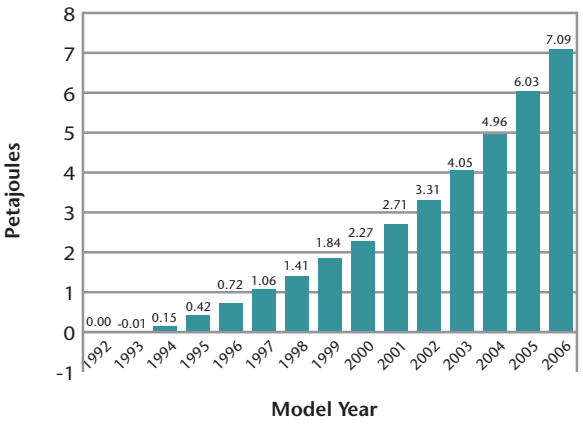


*For more information, see Table D.22 in Appendix D, "Detailed Tables."

The average annual energy savings for dishwashers were estimated to be 0.53 petajoules (PJ) from 1993 to 2006. (No energy savings were expected for 1992.) The largest annual energy savings occurred in 2006, when dishwashers consumed 1.20 PJ less than they might have otherwise. The substantial increase in energy savings beginning in 2003 is probably attributable to the upcoming 2004 amendment to the MEPS. Dishwashers are now rated to a new energy-consumption standard, reducing the annual energy consumption for all models.

The cumulative energy savings for dishwashers are shown in Figure 3.7. Cumulative energy savings for the study period reached 7.09 PJ in 2006 (the equivalent of one year's energy for approximately 67 000 households), taking into account the life expectancy factor of dishwashers (this calculation is explained further in Appendix A, "Methodology").

Figure 3.7 Cumulative Energy Savings for Dishwashers, 1992–2006*



*For more information, see Table D.22 in Appendix D, "Detailed Tables."

3.5 Dishwashers Summary

The energy efficiency of dishwashers improved significantly between 1990 and 2006. In 1990, almost all dishwashers (99.8 percent) consumed more than 700 kWh per year; whereas by 1999, all dishwashers consumed less than 700 kWh per year and in 2006, 90.3 percent of them consumed less than 400 kWh.

This improvement is probably attributable to the 2004 amendment to the MEPS. Dishwashers are now rated to a new energy-consumption standard, reducing the annual energy consumption for all models.

Dishwashers are also subject to new energy-consumption testing procedures, also introduced in 2004. Previously, these appliances were rated according to an average of 264 loads per year. However, new data indicate that Canadians have reduced dishwasher use, so the test average is now 215 loads per year. The new ratings take into account standby power consumption (the energy used while the appliance is idle) and continue to include the energy required to heat the water.

Of the dishwashers available in 2006, 79.7 percent were ENERGY STAR qualified. A revision to increase the stringency of the ENERGY STAR specification for dishwashers was introduced in January 2007 to address the high percentage of shipments meeting the standard.

Approximately 15.5 percent of all dishwashers were tagged for builder shipments, whereas 84.5 percent were shipped for retail sales. British Columbia and the Territories had a substantially larger share of builder shipments (33.9 percent) than the rest of the country, whereas Quebec had a substantially lower share (3.3 percent).

The average annual energy savings for dishwashers were estimated to be 0.53 PJ between 1993 and 2006, with total energy savings for that period reaching 7.09 PJ (1.97 billion kWh). Dollar savings for dishwashers for the study period were estimated to be $185 million (calculated at 9.4 cents/kWh).

Chapter 4 / **Electric Ranges**

4.1 2006 Market Snapshot

In 2006, 59.9 percent of the electric ranges shipped in Canada were self-cleaning units. The shipment-weighted average annual unit energy consumption (UEC) for self-cleaning ranges was 523 kilowatt hours (kWh), compared with 559 kWh for non-self-cleaning electric ranges.

Even though the energy consumption rating takes into account the energy used during the self-cleaning cycles (based originally on 11 cleanings per year but recently reduced to 4), these ranges use less energy than the non-self-cleaning electric ranges. That is because self-cleaning ovens are usually better insulated than standard ovens. As a result, every time you cook, you lose less heat, use less energy, save money and help protect the environment.[29]

Electric ranges typically made up 91 percent of the market; gas ranges constituted the remainder.

In 1990, the electric ranges that dominated the market (73.2 percent) consumed between 750 and 850 kWh per year. In 2006, the market share of electric ranges in this category fell to 8.1 percent.

[29] Natural Resources Canada, *EnerGuide Appliance Directory 2006* (Ottawa: March 2006), p. 139.

4.2 Distribution of Shipments

4.2.1 Distribution by Type

As illustrated in Table 4.1 and Figure 4.1, in 1990, self-cleaning electric ranges accounted for less than one quarter (22.9 percent) of all electric ranges available on the market. By 2006, self-cleaning ranges had increased in popularity, with market share increasing to 59.9 percent. This represents a 37 percentage point increase since 1990, or an annual growth rate of 2.3 percent.

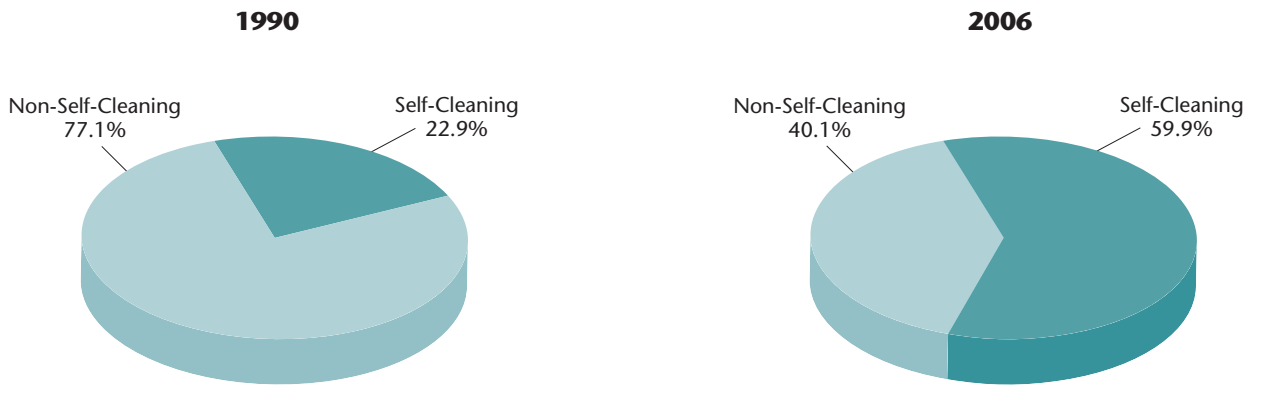
In contrast, the market share of electric ranges that were not self-cleaning decreased by 37 percentage points, dropping from 77.1 percent in 1990 to 40.1 percent in 2006.

As noted above, self-cleaning ovens are usually better insulated than non-self-cleaning ones, resulting in less heat loss and less energy consumption.

Table 4.1 Distribution of Electric Ranges by Type

Model Year	Electric Range Type	
	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**
Total Change	37.0	37.0

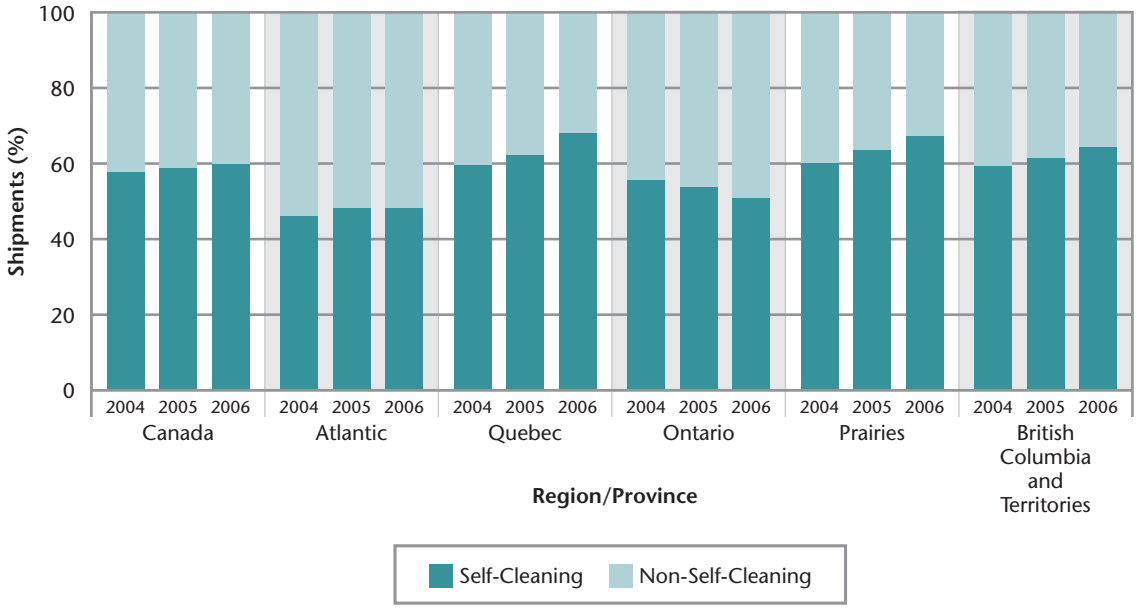
Figure 4.1 Distribution of Electric Ranges by Type, 1990 and 2006



4.2.2 Distribution by Type, by Region/Province

The market share of self-cleaning ranges increased substantially during the study period, with a national average of 59.9 percent in 2006. Figure 4.2 illustrates the proportion of self-cleaning versus non-self-cleaning ranges throughout the country from 2004 to 2006. It shows a slight increase in self-cleaning ranges between 2004 and 2006 throughout the regions, with the exception of Ontario, where shipments of self-cleaning ranges decreased slightly.

Figure 4.2 Distribution of Electric Ranges by Type, by Region/Province, 2004–2006*



*For more information, see Table D.23 in Appendix D, "Detailed Tables."

4.2.3 Distribution by Average Annual Unit Energy Consumption

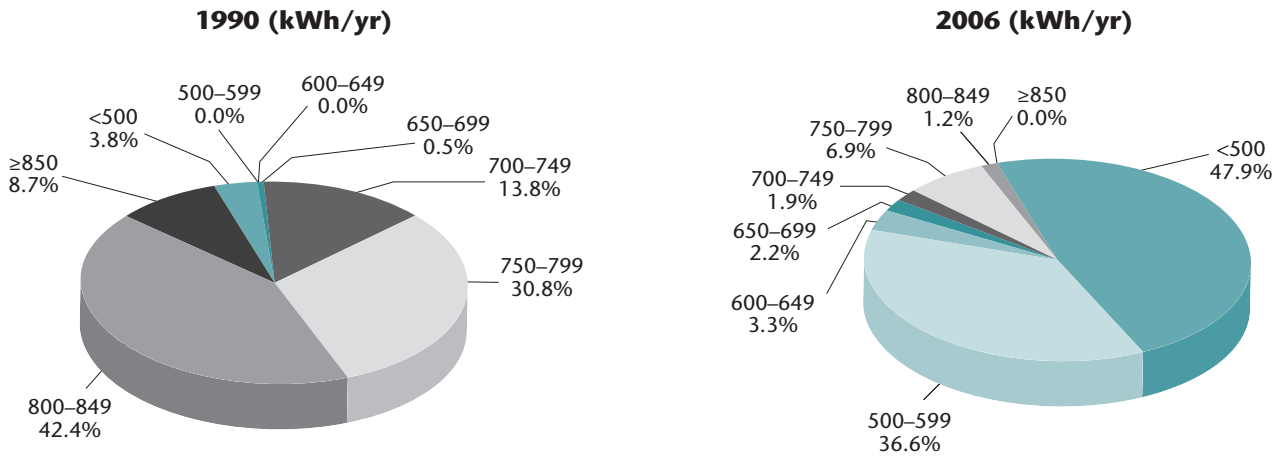
Table 4.2 and Figure 4.3 illustrate that in 1990, the electric ranges that dominated the market (73.2 percent) consumed between 750 and 850 kWh per year. In 2006, the market share of electric ranges in this category fell to 8.1 percent. By 2003, there was a considerable increase in the market share of electric ranges that consumed less than 600 kWh, reaching 84.5 percent in 2006. This is due to an energy-consumption standard introduced in October 2003.[30]

[30] Natural Resources Canada, *EnerGuide Appliance Directory, 2006* (Ottawa: March 2006), p. 139.

Table 4.2 Distribution of Electric Ranges by Average Annual Unit Energy Consumption

Model Year	kWh/yr							
	<500 (%)	500–599.9 (%)	600–649.9 (%)	650–699.9 (%)	700–749.9 (%)	750–799.9 (%)	800–849.9 (%)	≥850 (%)
1990	3.8	0.0	0.0	0.5	13.8	**30.8**	**42.4**	8.7
1991	0.0	0.0	0.0	0.8	15.9	27.6	54.0	1.8
1992	0.0	0.0	0.0	0.0	15.0	58.1	26.5	0.3
1993	0.0	0.0	0.0	0.1	18.4	42.8	38.5	0.2
1994	0.0	0.0	0.1	1.7	32.2	28.5	37.4	0.1
1995	0.0	0.0	0.1	3.3	35.0	22.5	39.2	0.0
1996	0.0	0.0	0.0	3.2	27.6	26.4	42.8	0.0
1997	0.0	0.0	0.0	3.6	27.6	29.0	39.8	0.0
1998	0.0	0.0	0.0	8.6	23.3	30.6	37.4	0.0
1999	0.0	0.0	0.0	15.3	28.2	31.6	24.9	0.0
2000	0.0	0.0	0.0	14.3	30.9	29.5	25.3	0.0
2001	0.0	0.0	0.0	15.0	27.3	29.2	28.5	0.0
2002	0.0	0.0	0.0	15.9	30.4	33.5	20.2	0.0
2003	12.5	5.4	0.4	7.9	30.0	27.3	16.5	0.0
2004	27.8	13.3	4.8	3.8	18.8	19.5	12.0	0.0
2005	44.9	26.2	4.6	2.6	8.1	7.8	5.9	0.0
2006	**47.9**	**36.6**	3.3	2.2	1.9	6.9	1.2	0.0
Total Change	↑ 44.1	↑ 36.6	↑ 3.3	↑ 1.7	↓ 11.9	↓ 23.9	↓ 41.2	↓ 8.7

Figure 4.3 Distribution of Electric Ranges by Average Annual Unit Energy Consumption, 1990 and 2006



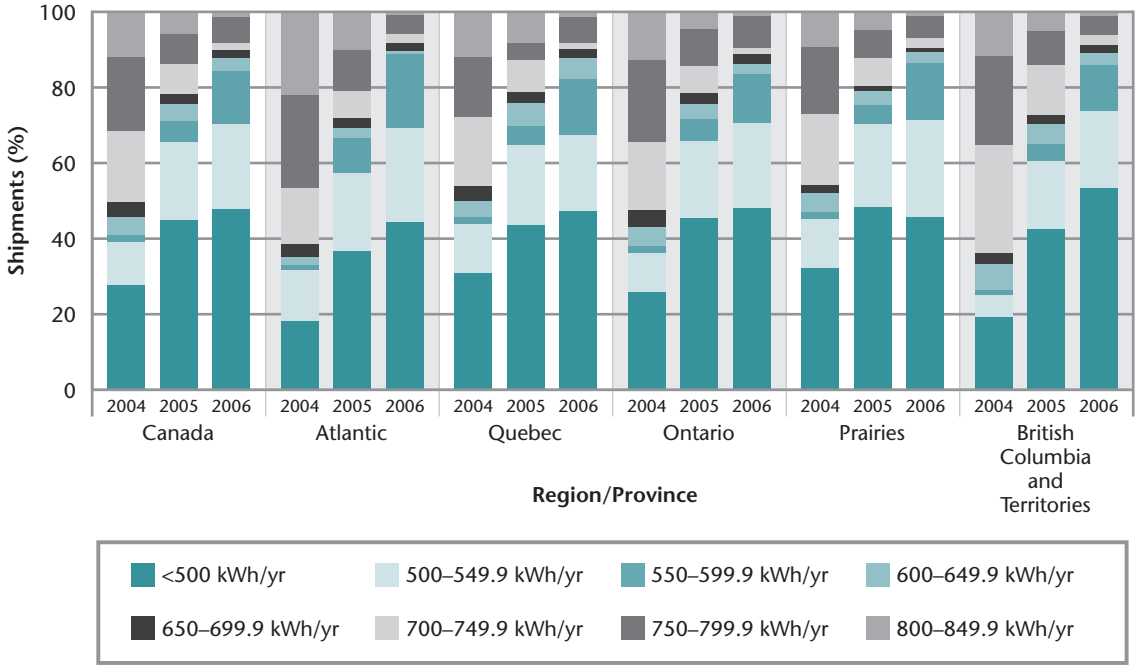
Testing to the new standard provided a new method for calculating energy consumption and resulted in a lower EnerGuide rating in kilowatt hours per year. Several important changes were made to the calculation for the rating, including the number of times the self-cleaning cycle is used. The frequency was lowered from 11 times per year to 4 because consumers were not using this feature as much as they did in the past. Because of these changes in testing procedures, data prior to 2003 are not directly comparable.

Even with the new testing procedures in place, there have been significant improvements in the energy efficiency of electric ranges. For example, in 2003, only 12.5 percent of electric ranges shipped consumed less than 500 kWh/yr, whereas only three years later, this figure increased to 47.9 percent. Conversely, in 2003, nearly three-quarters (73.8 percent) of electric ranges consumed more than 700 kWh/yr. In 2006, this percentage dropped to only 10 percent.

4.2.4 Distribution by Average Annual Unit Energy Consumption, by Region/Province

In 2006, 84.5 percent of all electric ranges shipped in Canada consumed less than 600 kWh per year, compared with 41.1 percent in 2004. Figure 4.4 shows that this was the trend throughout the regions. As mentioned previously, a new testing method and energy-consumption standard were introduced in October 2003. Many more of the electric ranges shipped in 2005 and 2006 were models newly listed in the EnerGuide appliance directories. Therefore, the proportion of models rated using this new testing standard was considerably higher than in 2004.

Figure 4.4 Distribution of Electric Ranges by Average Annual Unit Energy Consumption, by Region/Province, 2004–2006*

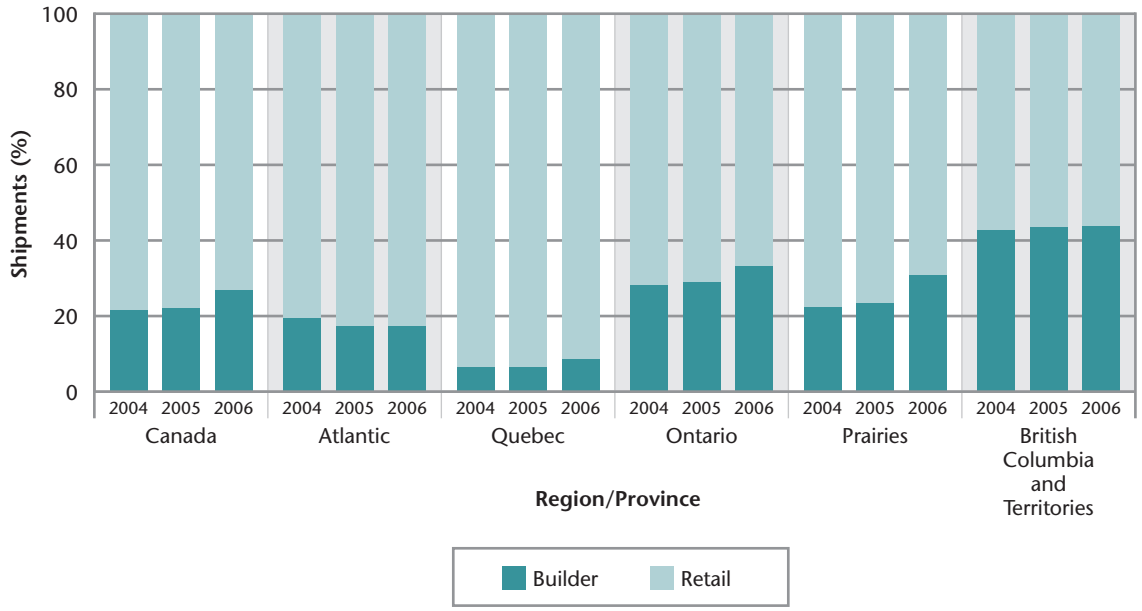


*For more information, see Table D.24 in Appendix D, "Detailed Tables."

4.2.5 Distribution by Channel, by Region/Province

Figure 4.5 illustrates the proportion of electric ranges shipped for the building trade versus those shipped for retail sales, from 2004 to 2006. There was a slight increase in builder share across the country in 2006. Once again, British Columbia and the Territories had a substantially larger builder shipment representation (43.9 percent) than the rest of the country, and Quebec had a significantly lower share (8.7 percent).

Figure 4.5 Distribution of Electric Ranges by Channel, by Region/Province, 2004–2006*



*For more information, see Table D.25 in Appendix D, "Detailed Tables."

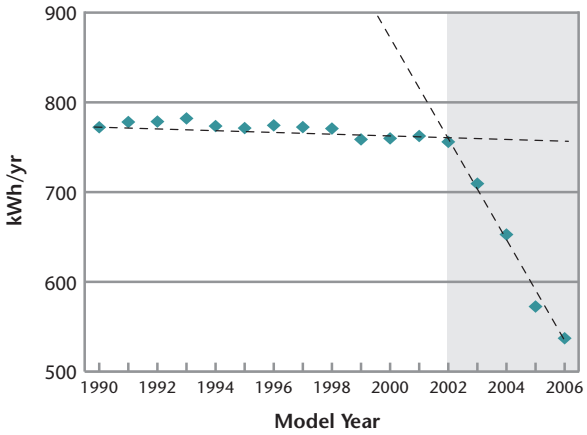
4.3 Energy Consumption

4.3.1 Average Annual Unit Energy Consumption by Model Year

Between 1990 and 2002, the energy consumption of electric ranges remained relatively unchanged. The decrease in average annual UEC, as illustrated in Figure 4.6, was approximately 2 percent, or 16 kWh. However, from 2003 to 2006, the average annual UEC decreased substantially, from 756 to 537 kWh, due to a 2003 amendment to the minimum energy performance standards (MEPS). The change to the MEPS is a change in the calculation rather than a change to the regulation. The change to the calculation is attributable to new testing procedures and a new reference standard for electric ranges having been put into place in 2003.

These changes resulted in the reduction of the average annual UEC for all models. However, this reduction may not reflect any improvement in the energy efficiency of those models.

Figure 4.6 Average Annual Unit Energy Consumption of Electric Ranges by Model Year*



*For more information, see Table D.26 in Appendix D, "Detailed Tables."

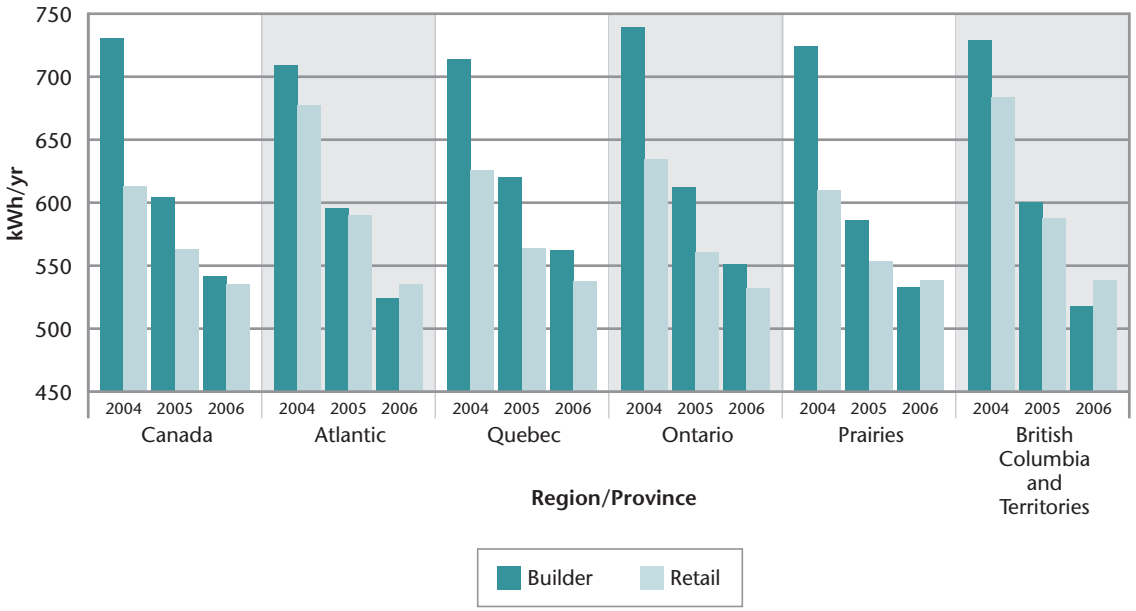
4.3.2 Average Annual Unit Energy Consumption by Channel, by Region/Province

Figure 4.7 illustrates the breakdown of the average annual UEC of electric ranges for retail shipments versus builder shipments, by region/province for 2004 to 2006.

The chart shows that, throughout the regions, not only did the average annual UEC of builder and retail models decrease once again in 2006, but the gap between the average annual UEC of the two channels also decreased. And in certain regions (i.e. the western provinces), the average annual UEC of models shipped to builders was lower than models shipped to retailers.

This change to the UEC levels can be attributed partly to the fact that, in 2006, although nationally, builder shipments of more energy efficient, self-cleaning ranges increased (38.4 percent), builder shipments of self-cleaning ranges were notably higher in the Prairies and British Columbia and the Territories (54.2 percent and 61.6 percent, respectively).

Figure 4.7 Average Annual Unit Energy Consumption of Electric Ranges by Channel, by Region/Province, 2004–2006*

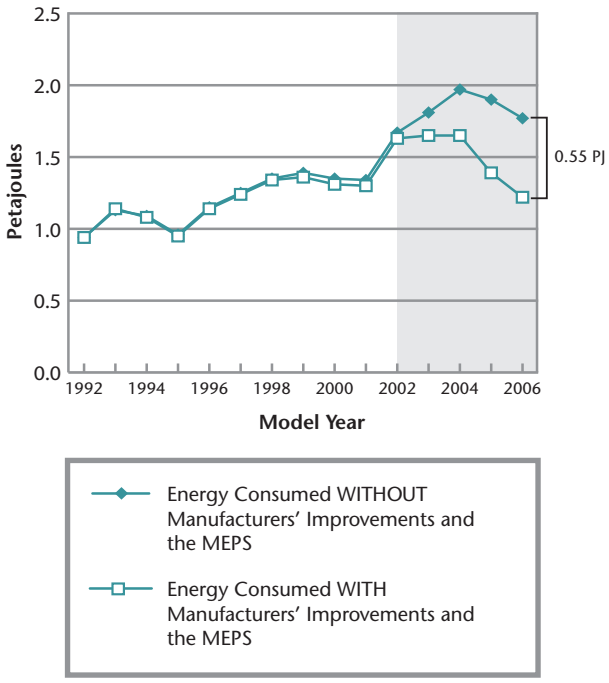


*For more information, see Table D.27 in Appendix D, "Detailed Tables."

4.4 Energy Savings

Figure 4.8 shows how much energy might have been consumed by electric ranges without the MEPS or general improvements in energy efficiency (*top line*) and how much energy they actually consumed (*bottom line*). The gap between the two lines represents annual energy savings – on average, 0.02 petajoules (PJ) per year for 1992 to 2002 and 0.32 PJ per year for 2003 to 2006.

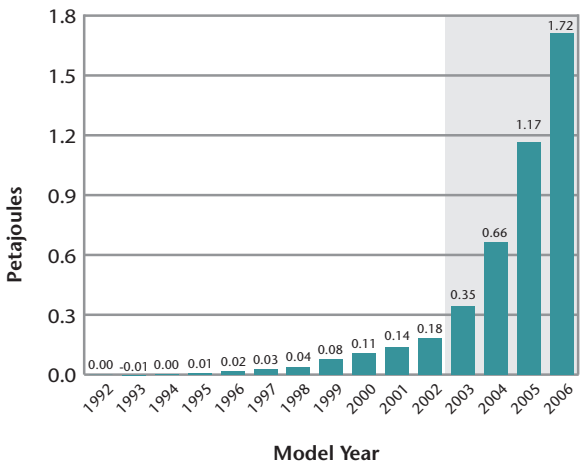
Figure 4.8 Annual Energy Savings for Electric Ranges, 1992–2006*



*For more information, see Table D.28 in Appendix D, "Detailed Tables."

The cumulative energy savings for electric ranges are shown in Figure 4.9. Cumulative energy savings grew slowly but steadily between 1994 and 2002, while annual energy savings began to accrue. The savings increased substantially from 2003 to 2006, due to a new testing method and energy consumption standard introduced in October 2003. Savings reached 1.72 PJ in 2006 (the equivalent of one year's energy for approximately 16 000 households), taking into account the life expectancy factor of electric ranges. (This calculation is explained further in Appendix A, "Methodology".)

Figure 4.9 Cumulative Energy Savings for Electric Ranges, 1992–2006*



*For more information, see Table D.28 in Appendix D, "Detailed Tables."

4.5 Electric Ranges Summary

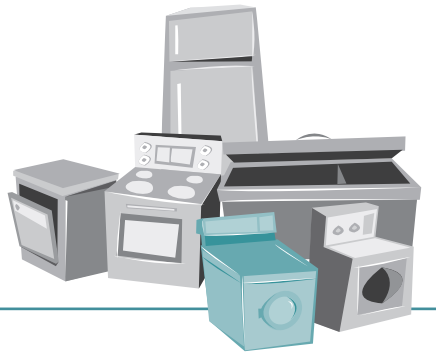
By 2006, self-cleaning ranges increased in popularity by 37 percentage points since 1990, and the market share increased to 59.9 percent. In 2006, the shipment-weighted average annual UEC for self-cleaning ranges was 522.7 kWh, compared with 558.9 kWh for non-self-cleaning electric ranges.

In 1990, the majority (42.4 percent) of electric ranges consumed between 800 and 849 kWh per year, whereas by 2006, 84.5 percent of them consumed less than 600 kWh per year. This decrease in average annual UEC in recent years is probably attributable to new testing procedures and a new reference standard for electric ranges having been put into place in 2003.

Approximately 26.9 percent of all electric ranges were tagged for builder shipments, whereas 73.1 percent were shipped for retail sales. British Columbia and the Territories had a substantially larger builder shipment representation (43.9 percent) than the rest of the country, whereas Quebec had a substantially lower share (8.7 percent).

Cumulative energy savings grew slowly but steadily between 1994 and 2002, as annual energy savings began to accrue. The savings increased substantially between 2003 and 2006 due to a new testing method and energy-consumption standard introduced in October 2003. Total energy savings for the study period reached 1.72 PJ (477.78 million kWh). Dollar savings for electric ranges for the study period were estimated to be $45 million (calculated at 9.4 cents/kWh).

Chapter 5 / **Clothes Washers**



5.1 2006 Market Snapshot

In 2006, 46.9 percent of the clothes washers shipped in Canada were front-loading units. The shipment-weighted average annual unit energy consumption (UEC) of front-loading clothes washers was 203 kilowatt hours (kWh), compared with 555 kWh for top-loading ones.

The ENERGY STAR® qualifying level for clothes washers increased in stringency in 2004. In 2006, 50.8 percent of clothes washers on the market (97.8 percent of front-loading models and 9.3 percent of top-loading models) qualified for the ENERGY STAR specification. The specification exceeds the minimum energy performance standards (MEPS) by at least 36 percent and has a modified energy factor of at least 40.21 litres per kWh per cycle. These criteria increased again in January 2007.

In 1990, 98.2 percent of the clothes washers shipped used more than 800 kWh per year. By 2006, 66.1 percent of all clothes washers consumed less than 500 kWh. This significant improvement is partly due to the 2004 amendment to the MEPS and the increased popularity of front-loading models.

5.2 Distribution of Shipments

5.2.1 Distribution by Type

Although front-loading washers have been used for many years – most often in commercial laundries – appliance manufacturers have more recently developed new models of front-loading washers for domestic use. Overall, front-loading clothes washers are more energy efficient.

Table 5.1 illustrates the increase in popularity of front-loading models versus top-loading ones since 2001 (the first year that shipment data for front-loading clothes washers were available). The market share increased to 46.9 percent in 2006, which represents a 31.2 percentage point increase since 2001, or an annual growth rate of 6.3 percent.

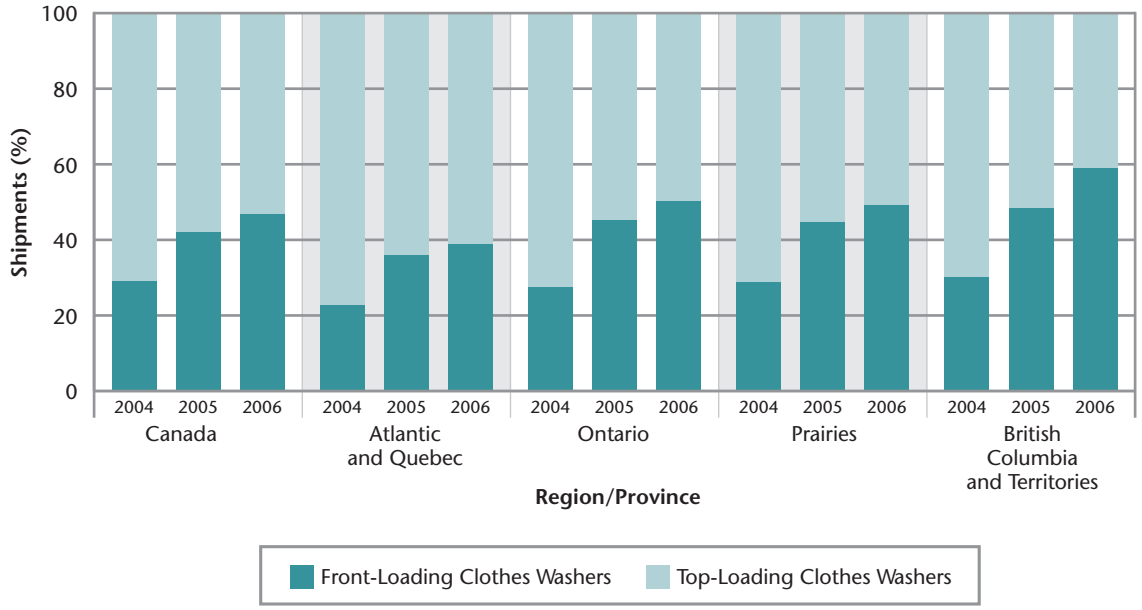
Table 5.1 Distribution of Clothes Washers by Type

Model Year	Clothes Washer Type	
	Front-Loading Clothes Washers (%)	Top-Loading Clothes Washers (%)
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
Total Change	▲ 31.2	▼ 31.2

5.2.2 Distribution by Type, by Region/Province

Figure 5.1 illustrates the increase in front-loading clothes washers both nationally and regionally between 2004 and 2006. British Columbia and the Territories received more shipments of front-loading models than the rest of the country. For confidentiality reasons, the Atlantic provinces and Quebec were grouped for this analysis.

Figure 5.1 Distribution of Clothes Washers by Type, by Region/Province, 2004–2006*



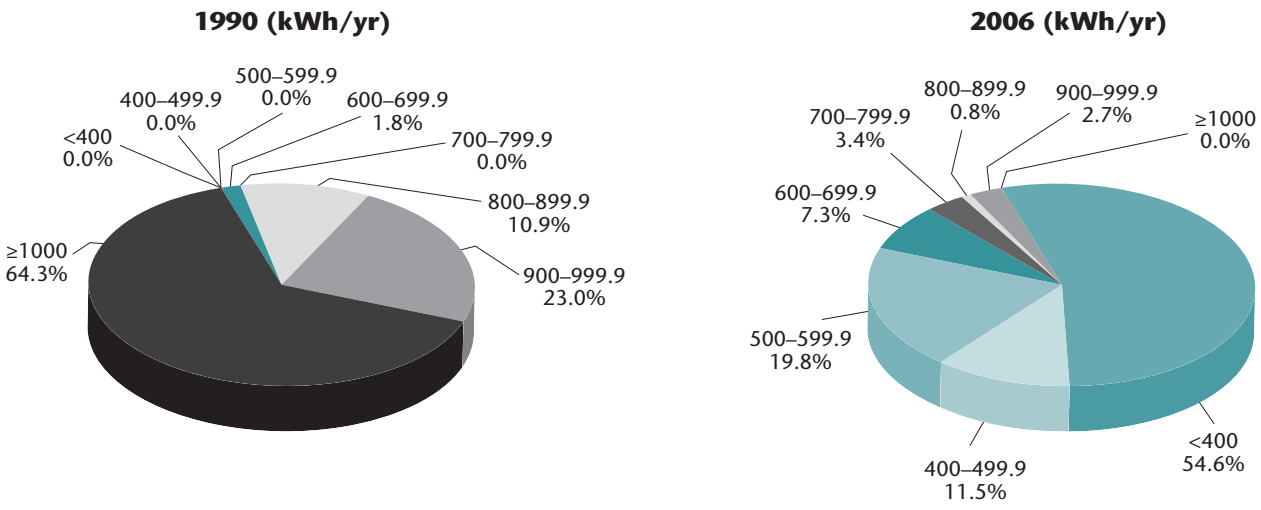
*For more information, see Table D.29 in Appendix D, "Detailed Tables."

5.2.3 Distribution by Average Annual Unit Energy Consumption

Table 5.2 Distribution of Clothes Washers by Average Annual Unit Energy Consumption

Model Year	kWh/yr							
	<400 (%)	400–499.9 (%)	500–599.9 (%)	600–699.9 (%)	700–799.9 (%)	800–899.9 (%)	900–999.9 (%)	≥1000 (%)
1990	0.0	0.0	0.0	1.8	0.0	**10.9**	**23.0**	**64.3**
1991	0.0	0.0	0.0	0.4	0.0	21.8	12.2	65.7
1992	0.0	0.0	0.0	0.1	0.0	10.4	12.2	77.3
1993	0.0	0.0	0.0	0.1	0.3	15.6	13.4	70.6
1994	0.0	0.0	0.0	0.2	0.5	23.5	25.5	50.3
1995	0.0	0.0	0.0	0.4	0.5	26.7	28.0	44.4
1996	0.2	0.0	0.0	1.5	0.6	34.9	17.9	44.9
1997	2.7	0.0	0.0	1.6	0.3	37.1	10.4	47.9
1998	7.7	0.1	0.0	1.1	1.8	28.5	11.1	49.6
1999	10.6	1.3	0.0	1.6	10.3	18.4	31.3	26.4
2000	13.0	0.3	0.0	0.8	12.9	15.7	45.9	11.4
2001	17.0	0.1	0.0	0.3	13.1	14.9	51.6	3.0
2002	22.3	0.0	0.0	0.1	12.5	14.5	45.5	5.0
2003	28.5	0.1	4.2	0.2	10.3	18.2	36.9	1.6
2004	35.7	2.5	16.6	10.0	8.3	10.2	16.7	0.0
2005	48.3	3.4	28.3	7.8	4.4	2.4	5.5	0.0
2006	**54.6**	**11.5**	19.8	7.3	3.4	0.8	2.7	0.0
Total Change	↑ 54.6	↑ 11.5	↑ 19.8	↑ 5.5	↑ 3.4	↓ 10.1	↓ 20.3	↓ 64.3

Figure 5.2 Distribution of Clothes Washers by Average Annual Unit Energy Consumption, 1990 and 2006



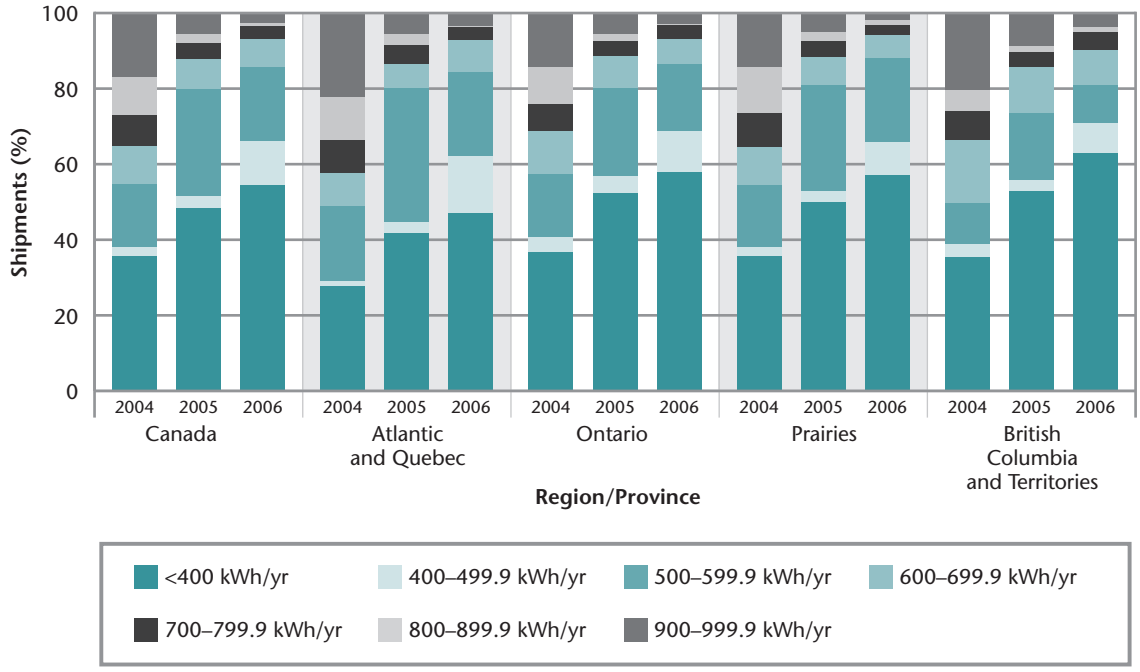
As shown in Table 5.2 and Figure 5.2, the energy consumption of clothes washers decreased significantly during the study period. In 1990, 98.2 percent of the clothes washers shipped used 800 kWh or more per year. By 2006, 66.1 percent all clothes washers shipped consumed less than 500 kWh per year.

The significant improvement in energy efficiency between 2003 and 2006, outlined in Table 5.2, is due partly to the 2004 amendment to the MEPS and the increased popularity of ENERGY STAR qualified clothes washers and front-loading models. This improvement will probably continue because, on January 1, 2007, the MEPS and the ENERGY STAR qualifying level for clothes washers were made more stringent, leading to increases in the efficiency of clothes washers.

5.2.4 Distribution by Average Annual Unit Energy Consumption, by Region/Province

In 2006, 54.6 percent of all clothes washers shipped in Canada consumed less than 400 kWh per year, compared with 35.7 percent in 2004. This improvement is probably due to the manufacturers preparing for the 2007 amendment to the MEPS. Figure 5.3 shows the distribution trends throughout the regions/provinces, from 2004 to 2006. This increase in shipments of clothes washers consuming less than 400 kWh is also evident throughout the regions.

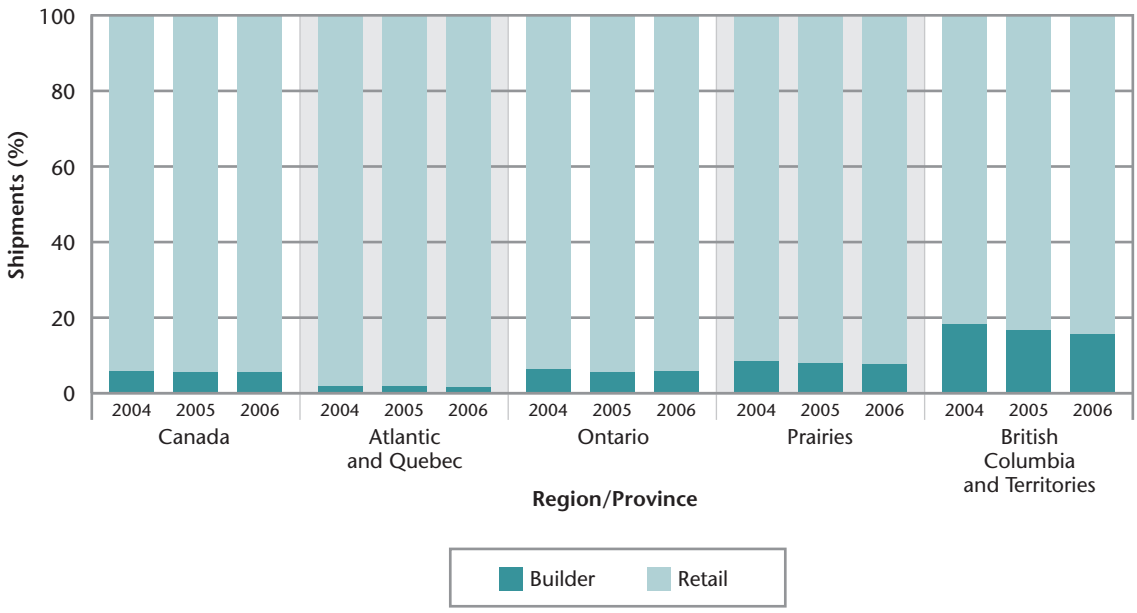
Figure 5.3 Distribution of Clothes Washers by Average Annual Unit Energy Consumption, by Region/Province, 2004–2006*



*For more information, see Table D.30 in Appendix D, "Detailed Tables."

5.2.5 Distribution by Channel, by Region/Province

Figure 5.4 Distribution of Clothes Washers by Channel, by Region/Province, 2004–2006*



*For more information, see Table D.31 in Appendix D, "Detailed Tables."

Figure 5.4 illustrates the breakdown of clothes washers shipped for the building trade versus those shipped for retail sales, from 2004 to 2006. Once again, the majority of clothes washers were shipped for retail sales. British Columbia and the Territories again had a slightly larger share of builder shipments than the rest of the country.

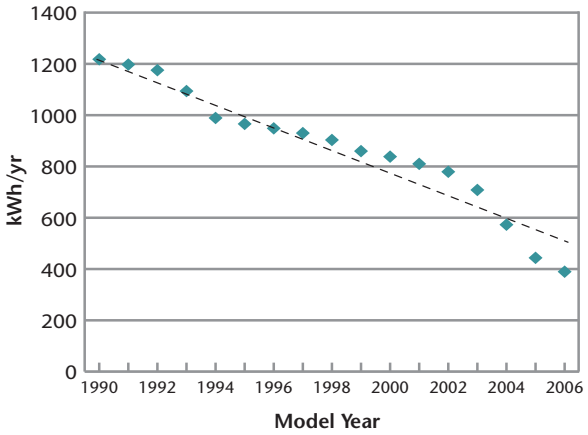
The data also show that, on average, 34.1 percent of builder shipments were front-loading clothes washers, which are more energy efficient than top-loading ones. In British Columbia and the Territories, however, this proportion was 59.1 percent.

5.3 Energy Consumption

5.3.1 Average Annual Unit Energy Consumption by Model Year

Between 1990 and 2006, the average annual UEC of clothes washers improved remarkably. As Figure 5.5 shows, the average annual UEC decreased by 828.4 kWh, or 68.0 percent. The significant decrease in average annual UEC from 2002 to 2006 (more than 389 kWh) coincided with the 2004 amendment to the MEPS. This trend is likely to continue because, on January 1, 2007, the MEPS and the ENERGY STAR qualifying level for clothes washers were strengthened, leading to greater increases in the efficiency of clothes washers.

Figure 5.5 Average Annual Unit Energy Consumption of Clothes Washers by Model Year*



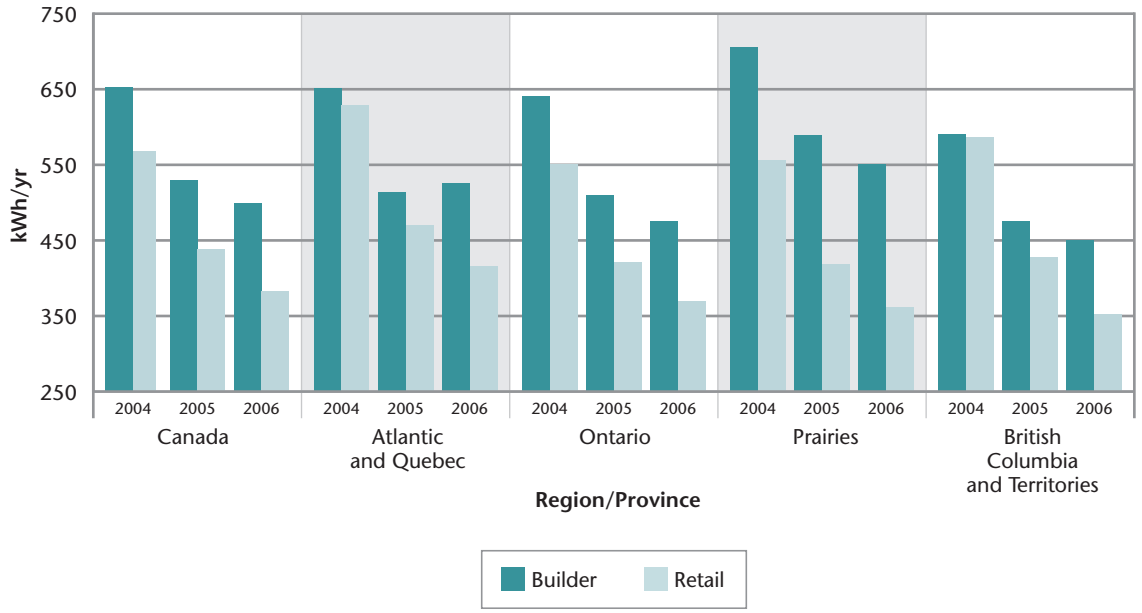
*For more information, see Table D.32 in Appendix D, "Detailed Tables."

5.3.2 Average Annual Unit Energy Consumption by Channel, by Region/Province

Figure 5.6 illustrates the breakdown of the average annual UEC of clothes washers by shipments for the builder trade and for retail purposes, by region/province, from 2004 to 2006. In all regions, the average annual UEC was once again lower for builder and retail shipments in 2006, except in the Atlantic provinces and Quebec, where the average annual UEC for builder shipments was slightly higher in 2006.

Builders in British Columbia and the Territories supplied their customers with significantly more energy-efficient clothes washers than did the rest of the country. As previously mentioned, builders in British Columbia and the Territories provided the largest percentage of front-loading clothes washers, which are more energy efficient than top-loading models. Retail shipments in the Atlantic provinces and Quebec were once again slightly less energy efficient than the national average.

Figure 5.6 Average Annual Unit Energy Consumption of Clothes Washers by Channel, by Region/Province, 2004–2006*



*For more information, see Table D.33 in Appendix D, "Detailed Tables."

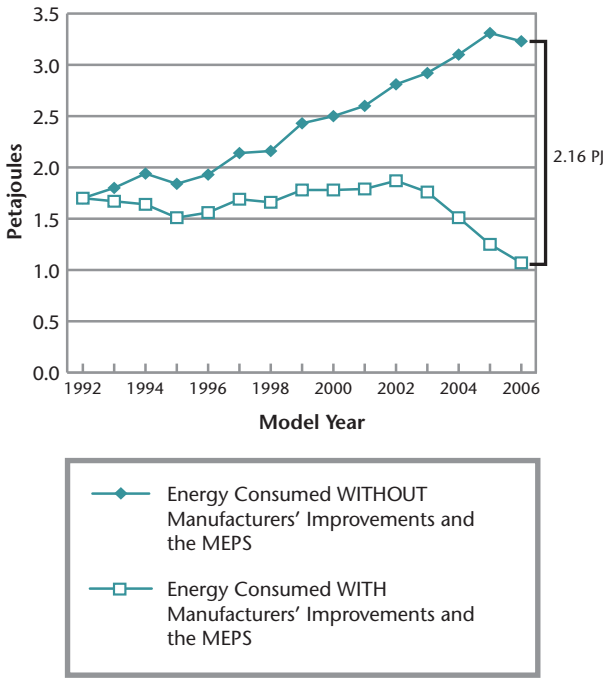
5.4 Energy Savings

It is estimated that the annual energy consumption for clothes washers was significantly less from 1993 to 2006 than it would have been without the contributing factors referred to in previous chapters. The annual savings have been increasing steadily since 1993.

Figure 5.7 illustrates the expected annual energy consumption for clothes washers if manufacturers had not met the MEPS and general improvements in energy efficiency (*top line*) and shows how much energy actually was consumed (*bottom line*).

The gap between the two lines in the figure represents incremental annual energy savings. On average, clothes washers would have consumed 0.87 petajoules (PJ) more per year. The largest annual energy savings occurred in 2006, when clothes washers consumed approximately 2.16 PJ less than they might have otherwise.

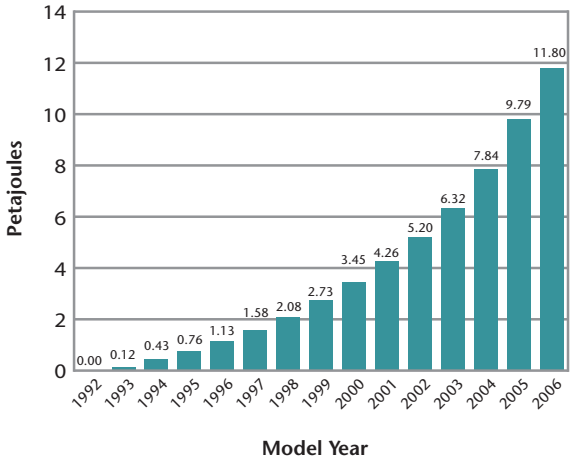
Figure 5.7 Annual Energy Savings for Clothes Washers, 1992–2006*



*For more information, see Table D.34 in Appendix D, "Detailed Tables."

The cumulative energy savings for clothes washers are shown in Figure 5.8. Accrued energy savings reached 11.80 PJ in 2006 (the equivalent of one year's energy for approximately 112 000 households), taking into account the life expectancy factor of clothes washers (this calculation is explained further in Appendix A, "Methodology"). The majority of savings occurred between 2000 and 2006. Energy savings amounted to 8.35 PJ, or 2.32 billion kWh.

Figure 5.8 Cumulative Energy Savings for Clothes Washers, 1992–2006*



*For more information, see Table D.34 in Appendix D, "Detailed Tables."

5.5 Clothes Washers Summary

The energy efficiency of clothes washers improved steadily between 1990 and 2006. By 2006, 66.1 percent of all clothes washers consumed less than 500 kWh per year, whereas in 1990, almost two thirds (64.3 percent) consumed 1000 kWh or more per year. Since 2001 – the first year that shipment data for front-loading clothes washers were available – there has been a substantial increase in popularity of the more energy-efficient front-loading models versus top-loading ones. Market share increased from 15.7 percent to 46.9 percent between 2001 and 2006.

Of the clothes washer models available in 2006, 50.8 percent were ENERGY STAR qualified.

Approximately 5.7 percent of all clothes washers were tagged for builder shipments, whereas 94.3 percent were shipped for retail sales. British Columbia and the Territories continued to have a substantially larger builder shipment representation (15.6 percent). The Atlantic provinces and Quebec had a somewhat smaller builder shipment representation (1.6 percent) than the rest of the country.

The average annual energy savings for clothes washers were estimated to be 0.87 PJ between 1993 and 2006, with total energy savings for that period reaching 11.80 PJ (3.28 billion kWh). Dollar savings for clothes washers for the study period were estimated to be $308 million (calculated at 9.4 cents/kWh).

Chapter 6 / Electric Clothes Dryers

6.1 2006 Market Snapshot

In 2006, the shipment-weighted average annual unit energy consumption (UEC) of all electric clothes dryers was 905 kilowatt hours (kWh) per year.

Electric clothes dryers typically make up 97 percent of the market; gas clothes dryers constitute the remainder.

There was a significant improvement in the energy efficiency of electric clothes dryers from 1991 to 1993, when the average annual UEC decreased from 1109 kWh to 929 kWh. After 1993, the average annual UEC remained relatively constant.

6.2 Distribution of Shipments

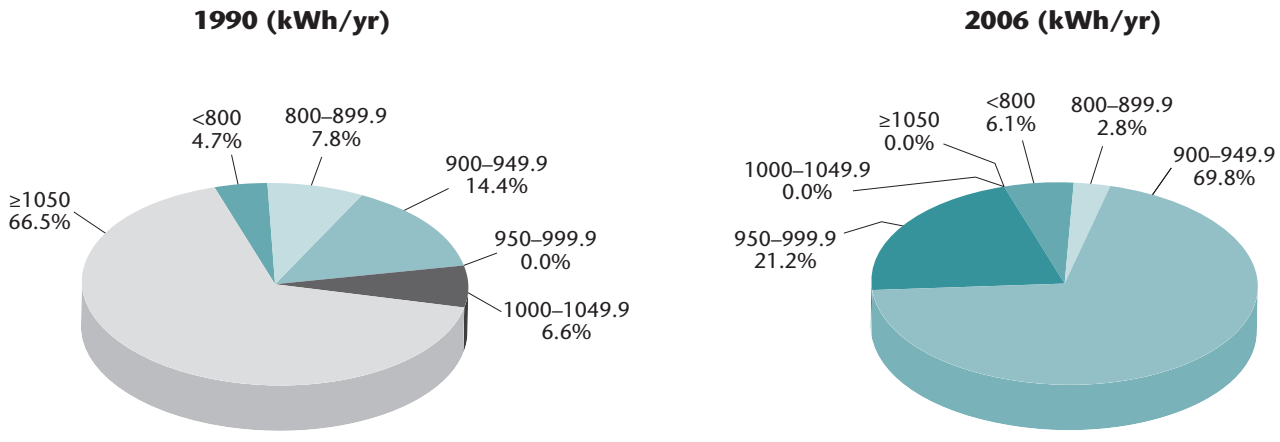
6.2.1 Distribution by Average Annual Unit Energy Consumption

Table 6.1 and Figure 6.1 illustrate that between 1990 and 2006, electric clothes dryers exhibited relatively minor improvements in energy efficiency. A consumption level of more than 1050 kWh per year had dominated the market (66.5 percent) in 1990. That consumption level had disappeared by 1996. In 2006, 69.8 percent of electric clothes dryers consumed between 900 and 949 kWh per year.

Table 6.1 Distribution of Electric Clothes Dryers by Average Annual Unit Energy Consumption

Model Year	kWh/yr					
	<800 (%)	800–899.9 (%)	900–949.9 (%)	950–999.9 (%)	1000–1049.9 (%)	≥1050 (%)
1990	4.7	7.8	14.4	0.0	6.6	**66.5**
1991	5.3	0.2	30.0	22.6	15.4	26.5
1992	4.4	28.9	37.5	13.6	4.6	11.0
1993	4.1	28.9	53.6	0.1	7.1	6.1
1994	4.3	24.0	54.6	0.0	14.9	2.2
1995	3.2	16.2	68.5	0.8	10.0	1.3
1996	4.2	11.8	82.8	1.1	0.2	0.0
1997	4.9	12.9	80.7	1.4	0.0	0.0
1998	3.2	8.8	87.0	1.0	0.0	0.0
1999	2.7	7.2	88.3	1.8	0.0	0.0
2000	2.7	7.7	84.6	5.0	0.0	0.0
2001	2.3	4.3	87.1	6.3	0.0	0.0
2002	2.5	5.2	85.5	6.7	0.0	0.0
2003	2.7	10.0	77.0	10.3	0.0	0.0
2004	4.0	4.4	75.3	16.3	0.0	0.0
2005	6.1	3.2	74.1	16.6	0.0	0.0
2006	6.1	2.8	**69.8**	21.2	0.0	0.0
Total Change	▲ 1.4	▼ 5.0	▲ 55.4	▲ 21.2	▼ 6.6	▼ 66.5

Figure 6.1 Distribution of Electric Clothes Dryers by Average Annual Unit Energy Consumption, 1990 and 2006



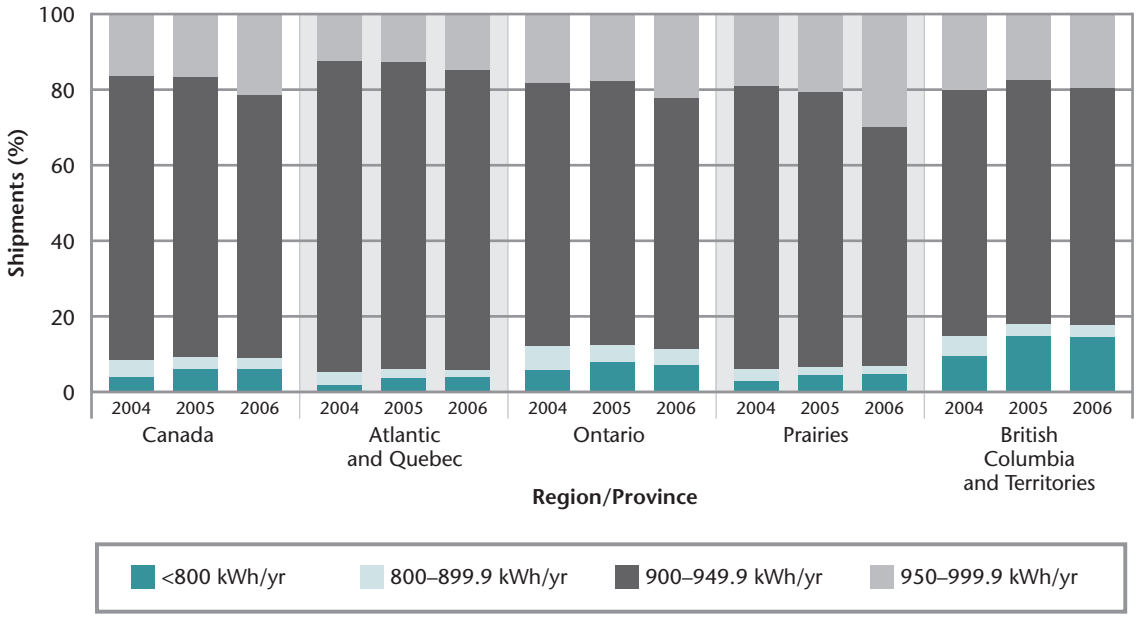
6.2.2 Distribution by Average Annual Unit Energy Consumption, by Region/Province

Figure 6.2 shows an increase in shipments of clothes dryers consuming between 950 and 999.9 kWh per year between 2004 and 2006, throughout the country. It also shows that British Columbia and the Territories had a slight tendency toward lower-energy-consuming dryers (less than 800 kWh per year), and the Prairies had a slight tendency toward higher-energy-consuming dryers (950–999.9 kWh/yr).

6.2.3 Distribution by Channel, by Region/Province

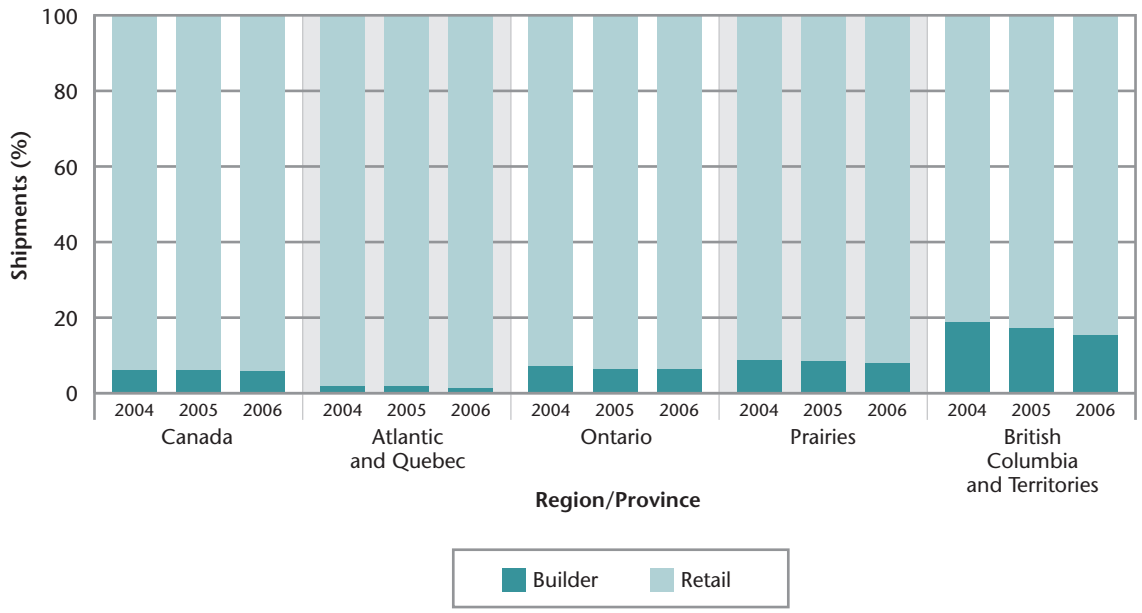
Figure 6.3 illustrates the proportion of electric clothes dryers shipped for the building trade versus those shipped for retail sales from 2004 to 2006. There was little change in the proportion of builder versus retail shipments throughout the country. British Columbia and the Territories still had a substantially larger builder shipment representation (15.4 percent) than the rest of the country, and Atlantic and Quebec had a somewhat lower share (1.5 percent).

Figure 6.2 Distribution of Electric Clothes Dryers by Average Annual Unit Energy Consumption, by Region/Province, 2004–2006*



*For more information, see Table D.35 in Appendix D, "Detailed Tables."

Figure 6.3 Distribution of Electric Clothes Dryers by Channel, by Region/Province, 2004–2006*



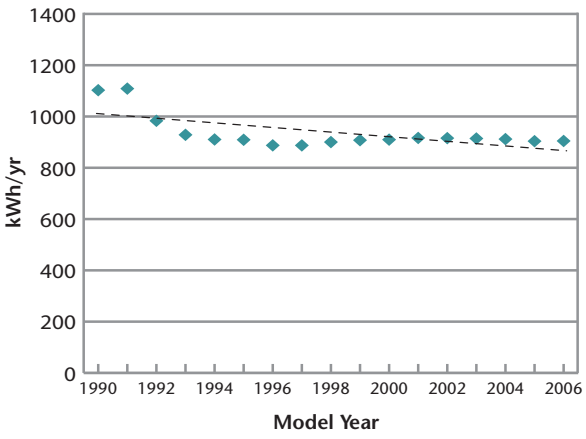
*For more information, see Table D.36 in Appendix D, "Detailed Tables."

6.3 Energy Consumption

6.3.1 Average Annual Unit Energy Consumption by Model Year

The improvement in energy efficiency for electric clothes dryers between 1990 and 2006 is illustrated in Figure 6.4. It shows a decrease in the average annual UEC of 198 kWh, or approximately 18 percent. Figure 6.4 and Table D.37 (in Appendix D, "Detailed Tables") show a significant improvement from 1991 to 1993, when the average annual UEC decreased from 1109 to 929 kWh (180 kWh or 16 percent). After 1993, the average annual UEC remained relatively constant.

Figure 6.4 Average Annual Unit Energy Consumption of Electric Clothes Dryers by Model Year*

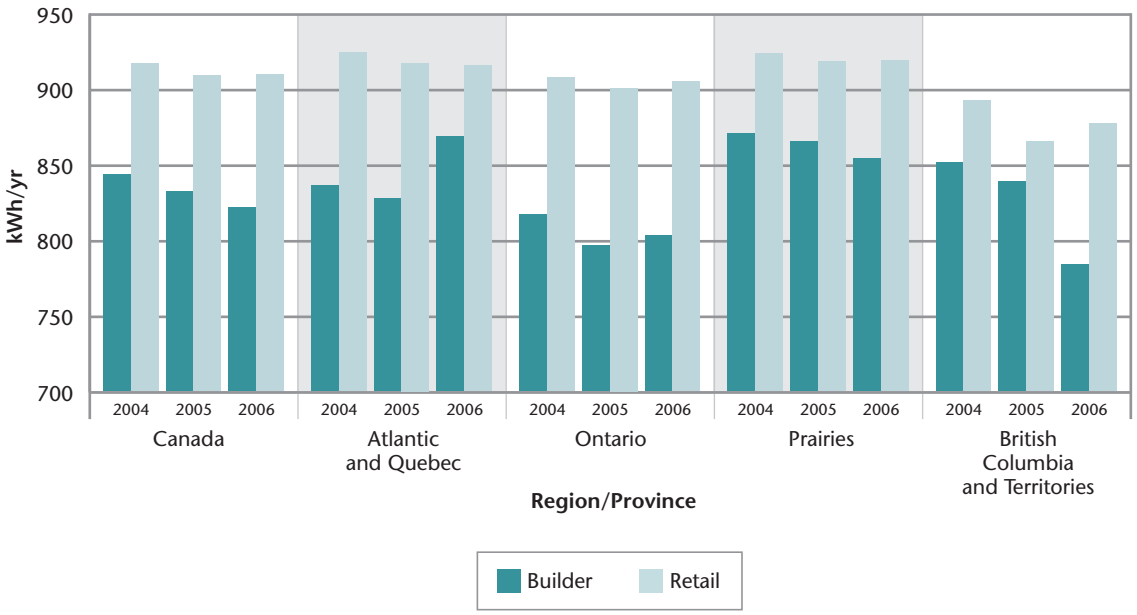


*For more information, see Table D.37 in Appendix D, "Detailed Tables."

6.3.2 Average Annual Unit Energy Consumption by Channel, by Region/Province

Figure 6.5 illustrates the breakdown of the average annual UEC of electric clothes dryers by shipments for the builder trade and for retail purposes, by region/province, from 2004 to 2006. In all regions, the average annual UEC remained higher for retail shipments than for builder ones. In 2006, the average annual UEC for builder shipments decreased the most in British Columbia and the Territories and increased the most in the Atlantic provinces and Quebec.

Figure 6.5 Average Annual Unit Energy Consumption of Electric Clothes Dryers by Channel, by Region/Province, 2004–2006*



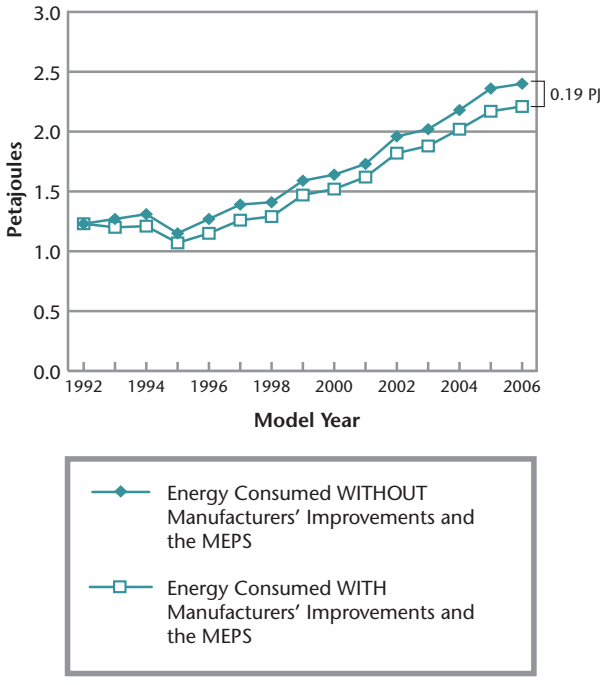
*For more information, see Table D.38 in Appendix D, "Detailed Tables."

6.4 Energy Savings

It is estimated that from 1993 to 2006, the annual energy consumption of electric clothes dryers was lower than it would have been had manufacturers not met the minimum energy performance standards (MEPS) or improved energy efficiency. Figure 6.6 shows how much energy might have been consumed annually by electric clothes dryers without the contributing factors (*top line*) and how much energy they actually consumed (*bottom line*).

The gap between the two lines represents incremental annual energy savings – on average, 0.13 petajoules (PJ) per year. The largest annual energy savings occurred in 2005 and 2006. In both years, electric clothes dryers consumed 0.19 PJ less than they might have otherwise.

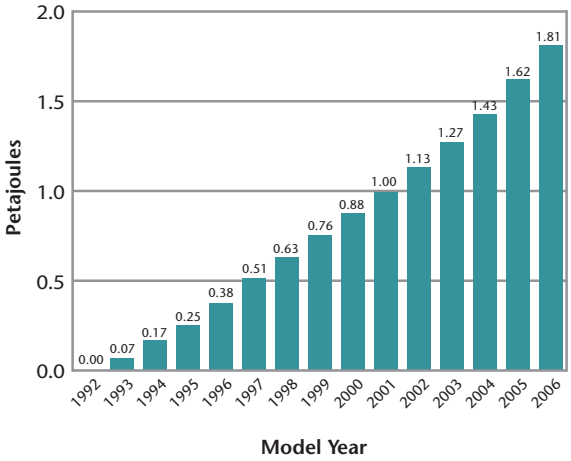
Figure 6.6 Annual Energy Savings for Electric Clothes Dryers, 1992–2006*



*For more information, see Table D.39 in Appendix D, "Detailed Tables."

The cumulative energy savings for electric clothes dryers are shown in Figure 6.7. Savings grew steadily between 1992 and 2006, as annual energy savings began to accrue. They reached 1.81 PJ in 2006 (the equivalent of one year's energy for approximately 17 000 households), taking into account the life expectancy factor of electric clothes dryers. (This calculation is explained further in Appendix A, "Methodology".)

Figure 6.7 Cumulative Energy Savings for Electric Clothes Dryers, 1992–2006*



*For more information, see Table D.39 in Appendix D, "Detailed Tables."

6.5 Electric Clothes Dryers Summary

The energy efficiency of clothes dryers improved between 1990 and 2006. By 2006, 69.8 percent of all clothes dryers consumed between 900 and 949.9 kWh per year, whereas in 1990, almost two thirds (66.5 percent) consumed more than 1050 kWh per year.

Approximately 5.9 percent of all electric clothes dryers were tagged for builder shipments, whereas 94.1 percent were shipped for retail sales. Once again, British Columbia and the Territories had a substantially larger builder shipment representation (15.4 percent) and the Atlantic provinces and Quebec had a somewhat smaller builder shipment representation (1.5 percent) than the rest of the country.

The average annual energy savings for clothes dryers were estimated to be 0.13 PJ between 1993 and 2006, with total energy savings for that period reaching 1.81 PJ (503 million kWh).

Dollar savings for electric clothes dryers for the study period were estimated to be $47 million (calculated at 9.4 cents/kWh).

Chapter 7 / **Summary of Major Household Appliances**

7.1 Total Energy Savings

Annual energy consumption for all major household appliances during the study period was significantly reduced, probably due to the following factors:

- the significant research and development activities carried out by appliance manufacturers
- improvements to the minimum energy performance standards (MEPS)
- the EnerGuide for Equipment program
- the ENERGY STAR® Initiative
- the various incentives and rebates offered by the federal, provincial and municipal governments and utilities

Table 7.1 lists the dates that the MEPS and ENERGY STAR Initiative came into effect, including their amendments.

Table 7.1 Dates of the Minimum Energy Performance Standards and ENERGY STAR Initiative

Appliance	MEPS Introduced	MEPS Amendments	ENERGY STAR Initiative	ENERGY STAR Amendments
Refrigerators	Feb. 1995	Jul. 2001	Jan. 2001	Jan. 2004 and Apr. 2008
Freezers	Feb. 1995	Jul. 2001	Jan. 2003	Jan. 2004
Dishwashers	Feb. 1995	Jan. 2004 and Jan. 2010	Jan. 2001	Jan. 2007
Electric Ranges	Feb. 1995	Oct. 2003	n/a	n/a
Clothes Washers	May 1995	Jan. 2004 and Jan. 2007	Jan. 2001	Jan. 2007
Electric Clothes Dryers	May 1995	n/a	n/a	n/a

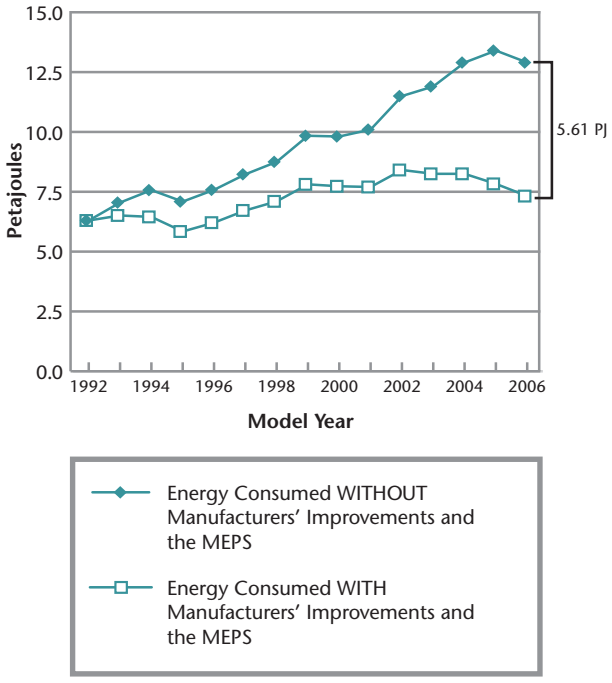
Figure 7.1 shows the estimated annual energy consumption of major appliances between 1992 and 2006 without these factors as well as how much energy was actually consumed by major appliances during this period.

The gap between the two lines in Figure 7.1 represents incremental annual energy savings. Energy efficiency began to improve almost immediately after the *Energy Efficiency Act* (the Act) came into force in 1992.

The average annual energy savings for major appliances were estimated to be 2.61 petajoules (PJ) between 1993 and 2006. (No energy savings had been expected in 1992.) This indicates that, on average, major appliances consumed approximately 2.61 PJ less per year than they would have without the contributing factors.

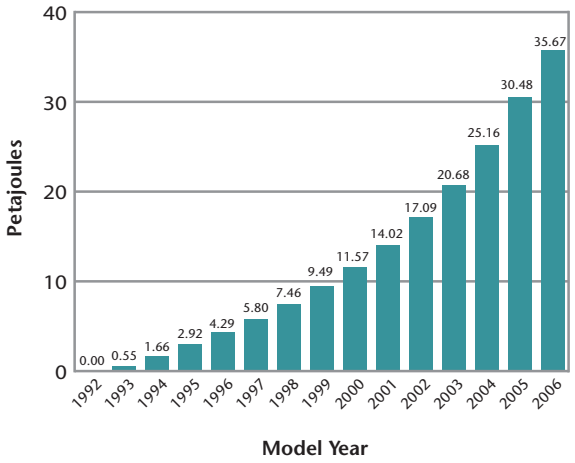
The largest annual energy savings occurred in 2006, when major appliances consumed approximately 5.61 PJ less than they would have otherwise. Cumulative energy savings for major appliances are shown in Figure 7.2 and Table D.40 (in Appendix D, "Detailed Tables"). Because the energy saved in any given year accrues over time, cumulative energy savings grew steadily between 1992 and 2006. They reached a total savings of 35.67 PJ (9.91 billion kilowatt hours [kWh]) in 2006 (taking into account the life expectancy factor of the various appliances). That is the equivalent of one year's energy for approximately 336 500 households. It is estimated that these energy savings resulted in consumers saving approximately $932 million (or $70 to $80 2006 dollars per household), calculated at 9.4 cents/kWh, over the 1992 to 2006 period.[31]

Figure 7.1 Annual Energy Savings for All Major Household Appliances, 1992–2006*



*For more information, see Table D.40 in Appendix D, "Detailed Tables."

Figure 7.2 Cumulative Energy Savings for All Major Household Appliances, 1992–2006*



*For more information, see Table D.40 in Appendix D, "Detailed Tables."

[31] Source: Natural Resources Canada, *Energy Use Data Handbook, 1990 to 2006*. Available: oee.nrcan.gc.ca/Publications/statistics/handbook08/chapter2.cfm

7.2 Average Annual Unit Energy Consumption of All Major Household Appliances

Table 7.2 provides an overview of the average annual unit energy consumption for the six major household appliances for seven years during the study period. It illustrates the significant improvement in energy efficiency as evidenced throughout this report.

Table 7.2 Average Annual Unit Energy Consumption of All Major Household Appliances, Selected Years

Appliance	kWh/yr						
	1990	1997	1999	2001	2003	2005	2006
Refrigerators							
Type 3 (16.5–18.4 cu. ft.) Refrigerators	947	635	636	544	461	454	455
Total Refrigerators	956	657	646	559	487	469	481
Freezers							
Total Freezers	714	377	383	384	369	386	380
Dishwashers							
Total Dishwashers	1026	649	640	634	524	396	373
Electric Ranges							
Self-Cleaning Electric Ranges	727	759	742	741	691	558	523
Non-Self-Cleaning Electric Ranges	786	780	770	786	732	593	559
Total Electric Ranges	772	772	759	763	709	573	537
Clothes Washers							
Total Front-Loading Clothes Washers	–	–	–	287	275	219	203
Total Top-Loading Clothes Washers	–	–	–	905	827	609	555
Total Clothes Washers	1218	930	860	810	708	444	390
Electric Clothes Dryers							
Total Electric Clothes Dryers	1103	887	908	916	914	904	905

Appendix A / **Methodology**

A.1 Data Preparation

A.1.1 Introduction

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

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

For 2006 (and for the previous two years), the manufacturers 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.

A.1.2 Database Preparation Process

The data presented in this report combine shipment figures from the major 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*. Thus they arrived at the energy consumption represented by all shipments of that model within each year. The analysts then aggregated these figures by region/province, by channel and for Canada to provide the data presented in this report. They produced separate aggregated data for ENERGY STAR® models, where appropriate.

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

A.1.3 Manufacturers' Data

NRCan sent a letter to each appliance manufacturer, requesting annual shipment data for each model of refrigerator, freezer, dishwasher, electric range, clothes washer and electric clothes dryer on the Canadian market from 1990 to 2006. When the project began in 1996, only three manufacturers provided shipment data. The number of data contributors has since increased to eight, covering the majority of appliance models sold in Canada. NRCan is approaching additional manufacturers to improve the coverage for future data collection.

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

The data included the appliance type, model number and number of shipments (by region/province and channel, where possible, for 2004 data 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.

A.1.4 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.

A.1.5 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, dishwasher) and type and size category (as defined in the EnerGuide directories, such as Type 7 refrigerators, self-cleaning ranges, front-loading clothes washers) was then subtotalled so that the average unit energy consumption 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. Attempts 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. In some cases, for example, 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. Whenever 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.

A.1.6 Data Summary and Transfer

After the matching process, analysts summarized the data. To calculate the total 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, 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 as appropriate. Separate aggregated data were provided for ENERGY STAR models. All these aggregate figures were given for region/province, channel and country.

For refrigerators, the actual 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 such information as the appliance type, model year, total energy consumption and average unit energy consumption (UEC). Refrigerators were further categorized by type and size. The aggregated data were broken down by ENERGY STAR versus non-ENERGY STAR (as of 1999) and region/province and channel (as of 2004). All the information was transferred to spreadsheets and sent to NRCan for analysis and reporting.

A.2 Analysis

The shipment-weighted average annual UEC by category was calculated as total energy consumption of all the refrigerators sold in Canada in that category divided by 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 = Number of Shipments of Type i refrigerators and

$\overline{UEC\_type_i}$ = Average Unit Energy Consumption of Type i refrigerators

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

A.2.1 Incremental Energy Savings

Calculating the incremental energy savings for each appliance type was a three-step process, as follows:

1. Baseline levels of energy consumption were estimated for each appliance type for each year between 1990 and 2006. 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, the following was assumed:

- Without the implementation of Canada's *Energy Efficiency Regulations* and general energy efficiency improvements made by manufacturers, the UEC for all appliance types would have remained constant at the 1992 levels.
- The number of units shipped would have remained the same between 1990 and 2006 even in the absence of the general efficiency improvements made by manufacturers and the implementation of the *Energy Efficiency Regulations*.

2. "Actual" or current levels of consumption for all appliances were calculated in an identical fashion. The average annual UEC for each appliance type for each model year was used, instead of holding it constant at 1992 levels, to determine the actual levels of energy consumption.
3. Incremental energy savings for all appliances were then 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 2006 *EnerGuide Appliance Directory*.[32] Applying this retirement function was done to avoid overestimating the actual energy savings from appliance stock that has been retired (or is no longer in use). The calculation involved using the average life expectancy, annual shipment data and annual incremental energy savings for each appliance type. Average life expectancy and annual shipment data for each appliance type were used to estimate the annual stock of each appliance type in use. This estimate was then applied to the annual incremental unit energy savings for each appliance type (shipment-weighted UEC for 1992 less the shipment-weighted UEC for each year) to calculate the cumulative energy savings.

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 came into force in 1992.

A.2.2 Cumulative Energy Savings

This calculation was a four-step process, as follows:

1. The average life expectancy of each appliance type was assumed to be the industry average reported in the 2006 *EnerGuide Appliance Directory:*
   a. refrigerators – 17 years
   b. freezers – 21 years
   c. dishwashers – 13 years
   d. electric ranges – 18 years
   e. clothes washers – 14 years
   f. electric clothes dryers – 18 years
2. A retirement function was used to estimate the retirement rate of each appliance type. 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 as follows:
   a. if age < {2/3 * (average life expectancy)}, 100 percent survive
   b. if age > {4/3 * (average life expectancy)}, 0 percent survive
   c. otherwise, {2 – age * 1.5/(average life expectancy)} survive

[32] Natural Resources Canada *EnerGuide Appliance Directory 2006* (Ottawa: March 2006), p. 13.

3. 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.
4. The total stock of appliances for each year since 1992 was separated into categories based on the year the appliances were shipped. Cumulative energy savings were then calculated by multiplying the annual shipments that made up the stock by the incremental unit energy savings for each corresponding year.

This retirement function is illustrated in Figures A.1 and A.2.

Figure A.1 Retirement Function for Aging Appliances

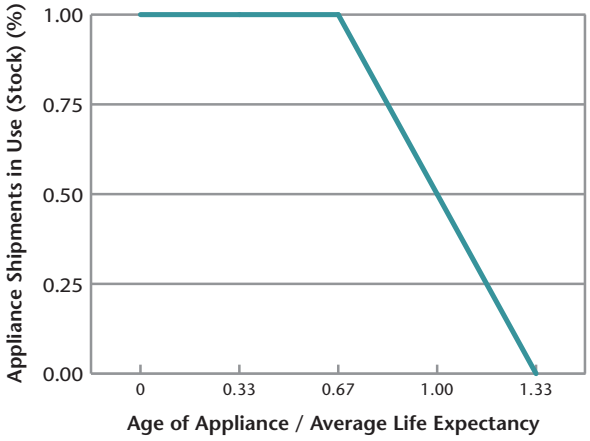


Figure A.2 Cumulative Energy Savings for All Major Household Appliances With and Without Retirement Factor, 1992–2006

Appendix B / **Definitions**

Clothes Washer

An appliance that is designed to clean clothes using a water solution of soap or detergent or both and mechanical agitation or other movement.

Canada's *Energy Efficiency Regulations* (the 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 Regulations apply to electrically operated automatic household dishwashers that are not commercial, industrial or institutional machines.

Electric Clothes Dryer

A cabinet-like appliance designed to dry fabrics 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 Size – a clothes dryer with drum volume of less than 125 litres
- Standard Size – a clothes dryer with drum volume of 125 litres

The Regulations apply to standard and compact electrically operated and electrically heated household tumble-type clothes dryers.

Electric Range

A consumer product using electric resistance heating and used as the major household cooking appliance. 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 Regulations apply to household ranges that are any of the following:

- free-standing appliances equipped with one or more surface elements and one or more ovens
- built-in appliances equipped with one or more surface elements and one or more ovens
- built-in appliances equipped with one or more ovens and no surface elements
- wall-mounted appliances equipped with one or more ovens and no surface elements
- counter-mounted appliances equipped with one or more surface elements and no ovens

but do *not* include the following:

- microwave cooking appliances
- portable appliances designed for an electrical supply of 120 volts
- household appliances with one or more tungsten-halogen heating elements

Freezer

An appliance designed

- for the extended storage of food frozen at an average temperature of –17.8°C (0°F) or lower
- with the inherent capability for freezing food
- with a minimum freezing capability of 2 kilograms /100 litres in 24 hours

The process of freezing involves removing heat from products to lower their temperatures to a point where most of the water contained therein is solidified.

In 2006, freezers were typically built as either vertical models or chest models and grouped into the following types:

Type 8
Upright freezers with manual defrost

Type 9
Upright freezers with automatic defrost

Type 10
Chest freezers and all other freezers not defined as Type 8 or Type 9

Type 16
Compact upright freezers with manual defrost

Type 17
Compact upright freezers with automatic defrost

Type 18
Compact chest freezers and all other compact freezers

The Regulations apply to household freezers that have a capacity of not more than 850 litres (30 cubic feet).

Refrigerator

An appliance that consists of one or more compartments, with at least one of the compartments designed for the refrigerated storage of foods at temperatures above 0°C (32°F) and, if the model is a refrigerator-freezer, with at least one of the compartments designed for the freezing and storage of frozen foods at or below an average temperature of –15°C (5°F) and typically capable of being adjusted by the user to a temperature of ≤ –17.8°C (0°F). The refrigerator with a freezer compartment is capable of maintaining simultaneously an average freezer temperature of ≤ –15°C (5°F) and an average fresh food compartment temperature of ≥ 0°C ≤ 5°C (≥ 32°F ≤ 41°F).

In 2006, refrigerators as per in the *EnerGuide Appliance Directory* were grouped under the following main categories:

Type 1
Refrigerators and refrigerator-freezers with manual defrost

Type 2
Refrigerator-freezers with partial automatic defrost

Type 3
Refrigerator-freezers with automatic defrost and top-mounted freezer, but without through-the-door ice service; also all-refrigerators[33] with automatic defrost

Type 4
Refrigerator-freezers with automatic defrost and side-mounted freezer but without through-the-door ice service

Type 5
Refrigerator-freezers with automatic defrost and bottom-mounted freezer, but without through-the-door ice service

[33] The term “all-refrigerators” refers to models that have no freezer compartment.

Type 5A
Refrigerator-freezers with automatic defrost, bottom-mounted freezer and through-the-door ice service

Type 6
Refrigerator-freezers with automatic defrost, top-mounted freezer and through-the-door ice service

Type 7
Refrigerator-freezers with automatic defrost, side-mounted freezer and through-the-door ice service

Type 11
Compact refrigerators and refrigerator-freezers with manual defrost

Type 12
Compact refrigerators and refrigerator-freezers with partial automatic defrost

Type 13
Compact refrigerator-freezers with automatic defrost and top mounted freezer; also compact all-refrigerators[33] with automatic defrost

Type 14
Compact refrigerator-freezers with automatic defrost and side-mounted freezer

Type 15
Compact refrigerator-freezers with automatic defrost and bottom-mounted freezer

The Regulations apply to household refrigerators or combination refrigerator-freezers that have a capacity of not more than 1100 litres (39 cubic feet), with the exception of refrigerators that employ an absorption refrigeration system.

Appendix C / **Questions and Answers About Changes to ENERGY STAR®**

Why does ENERGY STAR qualification matter to me?

Qualification matters in several ways. ENERGY STAR qualified products

- are the most energy-efficient products available – they cost less to run. As energy prices increase, consumers can count on appliances that are more efficient to provide ongoing savings.
- help protect the environment by reducing the amount of fossil fuels that utilities consume to provide energy. This reduction decreases greenhouse gas emissions and urban air pollution that contribute to climate change.
- help Canadian businesses and institutions by lowering operating costs

Why have the ENERGY STAR criteria changed for refrigerators, clothes washers and dishwashers?

To be ENERGY STAR qualified, a product must be 10 to 50 percent more energy efficient than products that meet the minimum standard.

For residential refrigerators, the last ENERGY STAR specification came into effect in 2004. Since then, new technologies have greatly increased the availability of energy-efficient refrigerators and transformed the market. As a result, approximately half the refrigerators for sale in North America in 2007 met the 2004 specification. The specification is changing to ensure that the ENERGY STAR symbol identifies only the top performers.

Note: The new specification applies only to standard-size refrigerators that have a volume of at least 219.5 litres (L) (7.75 cubic feet [cu. ft.]). It does not apply to commercial models, to models larger than 1104.4 L (39 cu. ft.) or to freezers larger than 849.5 L (30 cu. ft.). There is no change for compact refrigerators and compact and standard-size freezers.

For clothes washers, Canada and the United States introduced a minimum energy efficiency standard effective January 1, 2007. This standard keeps up-to-date with technology developments that enable manufacturers to design and build products that achieve higher levels of energy efficiency than in the past. The new standard will eliminate the least efficient models from the market. Consequently, the ENERGY STAR criteria must be strengthened so that only those products that are in the top 25 percent of energy performers can use this international symbol of energy efficiency.

For dishwashers, the ENERGY STAR criteria had not been updated for several years. Consequently, almost all products currently on the market can meet those criteria. The ENERGY STAR specification for dishwashers was strengthened on January 1, 2007 to achieve the ENERGY STAR objective to represent the top 25 percent of the market.

Why does Canada regulate energy efficiency standards?

Canada regulates energy efficiency standards for a wide range of energy-using products, with the objective of eliminating the least energy-efficient products from the Canadian market. Energy efficiency is an important way that all sectors of the economy and individual consumers can reduce emissions of greenhouse gases that contribute to climate change and other pollutants that contribute to urban smog. Energy efficiency is also good for the economy because it saves consumers money, reduces business operating costs and contributes to Canada's competitiveness in domestic and international markets.

What is the difference between a regulated energy performance standard and the ENERGY STAR criteria?

The standards referenced in Canada's *Energy Efficiency Regulations* define test procedures for determining a product's energy performance and establish minimum energy performance requirements that a product must meet to be sold in Canada. ENERGY STAR is a separate, voluntary, labelling initiative that uses an internationally recognized symbol to help consumers identify products that not only exceed the minimum energy performance requirements but also are among the most energy efficient on the market.

Will the new ENERGY STAR criteria affect product performance?

No. ENERGY STAR identifies products that meet a specified level of energy performance based on verified testing results. To qualify for ENERGY STAR, product features must not be compromised. ENERGY STAR qualified products deliver the same or better performance as comparable models while using less energy. Only those products whose energy performance under normal operating conditions puts them in the top 25 percent of products on the market are eligible to use the ENERGY STAR symbol.

How can I determine whether a product qualifies under the new criteria or the old criteria?

Natural Resources Canada (NRCan) maintains up-to-date lists of all products that qualify for ENERGY STAR in Canada. If you have a specific appliance model in mind, you can check these lists on the ENERGY STAR Web site to determine if it meets the new criteria.

NRCan has also posted lists of dishwashers and clothes washers that qualified under the pre-January 1, 2007, criteria – and may still be using the ENERGY STAR symbol – but do not meet the new requirements.

If the dishwasher or clothes washer you are considering purchasing was manufactured after January 1, 2007, and bears the ENERGY STAR symbol, you can be assured that it meets the new criteria. If it is an older model, it may still qualify for ENERGY STAR, but you should check the list on the ENERGY STAR Web site.

Similarly, NRCan has updated the refrigerator lists on its ENERGY STAR Web site at **www.energystar.gc.ca**. The updated list identifies models that meet the new specification. Units manufactured after April 28, 2008, must meet the new specification to be allowed to display the ENERGY STAR symbol.

If a product qualifies under the old criteria but does not meet the new requirements, does this mean the product is now considered a poor energy performer?

No – it could, for example, still be in the mid-range of products on the market. The best way to determine this is to check the scale on the EnerGuide label, which has an indicator arrow that shows how the product compares with similar models in terms of energy consumption. One thing is certain, however: if a product does not meet the new ENERGY STAR criteria, it is no longer considered to be among the most energy-efficient models available on the market. More energy-efficient models are available that will deliver lower operating costs and long-term savings.

Will rebate offers be honoured, regardless of whether the product qualifies under the new or old criteria?

Some provinces and utilities may pay rebates for products that qualify under the old ENERGY STAR criteria and were purchased after January 1, 2007, but others may not. The best strategy is to check directly with the organization offering the rebate to make sure a specific model is eligible for the rebate before you buy it.

Are the ENERGY STAR criteria for these products the same in Canada as in the United States?

Yes. The ENERGY STAR criteria are the same in Canada and the United States for these products. The ENERGY STAR name and the ENERGY STAR symbol are registered trademarks of the United States Environmental Protection Agency (EPA), which establishes the criteria for different products. ENERGY STAR in Canada is administered by NRCan through an agreement with the EPA. Due to the high level of integration in the North American equipment market, Canada and the United States also strive to harmonize their regulated minimum energy efficiency standards, which facilitates having the same ENERGY STAR criteria in both countries.

Can we expect more changes in the future?

Canada and the United States are continually updating their minimum energy efficiency standards for major household appliances to help transform the market to increased energy efficiency. As new standards are implemented from time to time, the criteria for ENERGY STAR qualification will also be updated.

For more information about ENERGY STAR qualified appliances, visit the Web site at energystar.gc.ca.

Appendix D / **Detailed Tables**

Table D.A.1 ENERGY STAR® Qualified Appliances as a Percentage of Total Shipments in Canada, 1999–2006

Appliance	1999 (%)	2000 (%)	2001 (%)	2002 (%)	2003 (%)	2004 (%)	2005 (%)	2006 (%)
Dishwashers	0.6	1.6	9.7	29.8	56.5	81.0	90.8	79.7
Clothes Washers	1.9	2.2	9.2	22.1	30.6	36.2	45.9	50.8
Refrigerators	–	–	11.4	22.3	40.7	34.2	37.6	37.3

Table D.A.2 ENERGY STAR Qualified Appliances as a Percentage of Total Shipments by Region/Province, 2004–2006

	Dishwashers			Clothes Washers*			Refrigerators		
Region/Province	2004	2005 (%)	2006	2004	2005 (%)	2006	2004	2005 (%)	2006
Canada	81.0	90.8	79.7	36.2	45.9	50.8	34.2	37.6	37.3
Atlantic	75.4	88.4	79.6	–	–	–	23.3	21.3	20.6
Quebec	81.3	92.9	82.1	29.9	41.7	43.3	36.9	37.2	38.6
Ontario	83.3	90.8	80.4	37.6	50.1	54.6	38.6	39.9	38.5
Prairies	78.4	90.3	75.3	36.2	48.2	53.1	33.0	40.6	39.8
British Columbia and Territories	79.5	87.9	82.8	36.4	50.3	60.3	29.3	30.4	31.3

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

Table D.1 Average Annual Unit Energy Consumption of Refrigerators by Model Year

Model Year	Standard-Size								Compact					Total
	Type 1	Type 2	Type 3	Type 4	Type 5	Type 5A	Type 6	Type 7	Type 11	Type 12	Type 13	Type 14	Type 15	
	(kWh/yr)								(kWh/yr)					(kWh/yr)
1990	706.2	720.0	947.4	1321.4	1128.4	–	–	–	337.0	–	370.0	–	–	956.2
1991	685.0	636.0	923.2	1218.8	1140.0	–	–	1162.9	337.0	–	370.0	–	–	931.2
1992	696.5	464.8	873.5	1215.1	1160.4	–	–	1175.5	337.0	–	370.0	507.0	–	901.7
1993	512.4	477.4	702.4	889.3	782.5	–	772.2	953.2	337.0	–	370.0	–	–	719.6
1994	461.8	465.0	640.5	764.0	741.8	–	763.4	891.5	328.7	–	370.0	–	–	650.4
1995	382.7	465.0	630.8	768.6	752.6	–	743.4	865.6	330.6	–	370.0	–	–	641.6
1996	378.4	465.0	620.8	767.7	776.9	–	781.2	833.7	318.1	–	370.0	–	–	640.4
1997	397.2	465.0	635.0	773.7	631.1	–	818.9	860.6	317.0	–	370.0	–	–	656.5
1998	422.3	478.2	640.9	792.3	673.2	–	839.9	870.0	320.8	419.0	432.1	–	–	653.5
1999	403.7	–	635.9	798.7	665.1	–	771.6	870.9	322.4	419.0	430.0	–	–	645.5
2000	413.2	–	629.3	781.1	660.9	–	742.9	862.8	323.4	419.0	430.0	–	–	639.5
2001	403.0	–	544.1	701.2	610.2	–	707.2	725.9	330.6	419.0	430.0	–	–	559.4
2002	323.5	–	485.6	646.9	547.0	–	604.1	659.2	331.1	419.0	405.0	–	–	506.3
2003	321.0	–	460.8	625.2	522.4	–	553.5	636.7	323.1	419.0	326.7	–	463.0	487.1
2004	–	–	458.4	582.6	496.0	–	554.0	619.8	321.3	419.0	356.7	–	–	477.7
2005	321.0	–	453.8	566.0	493.2	–	550.8	611.2	327.8	419.0	406.6	–	–	469.2
2006	319.1	–	455.4	548.4	497.9	580.1	–	613.1	328.6	–	339.1	–	–	481.0

Table D.2 Distribution of Refrigerators by Type, by Region/Province, 2004–2006

Region/ Province	Type 3			Type 5			Type 5A			Type 7			Types 1, 2, 4, 6,11,13		
	2004	2005	2006	2004	2005	2006	2004	2005	2006	2004	2005	2006	2004	2005	2006
	(%)			(%)			(%)			(%)			(%)		
Canada	66.4	64.9	64.2	15.5	17.9	21.2	–	–	0.6	11.0	9.6	10.1	7.0	7.6	3.8
Atlantic	83.2	81.3	80.9	6.4	8.0	8.2	–	–	0.1	8.0	7.6	7.4	2.4	3.1	3.3
Quebec	69.5	68.9	65.8	18.8	20.9	25.3	–	–	0.3	6.1	4.9	4.7	5.7	5.4	3.9
Ontario	64.5	62.6	64.2	14.6	17.7	19.9	–	–	0.7	13.8	11.2	10.9	7.2	8.5	4.3
Prairies	69.2	65.5	59.5	13.6	17.6	22.5	–	–	1.0	14.4	12.3	13.9	2.8	4.5	3.1
British Columbia and Territories	59.6	56.5	63.4	13.6	15.6	19.0	–	–	0.6	13.2	11.3	13.5	13.7	16.6	3.5

Table D.3 Distribution of Refrigerators by Channel, by Region/Province, 2004–2006

Region/Province	Builder			Retail		
	2004	2005 (%)	2006	2004	2005 (%)	2006
Canada	18.6	17.0	20.4	81.4	83.0	79.6
Atlantic	19.1	15.8	14.6	80.9	84.2	85.4
Quebec	6.3	5.6	6.7	93.7	94.4	93.3
Ontario	22.5	19.9	23.8	77.5	80.1	76.2
Prairies	20.8	19.1	23.4	79.2	80.9	76.6
British Columbia and Territories	36.1	32.3	37.1	63.9	67.7	62.9

Table D.4 Distribution of Refrigerators by Volume, by Region/Province, 2004–2006

Region/Province	Volume (cu. ft.)											
	<10.5			10.5–12.4			12.5–14.4			14.5–16.4		
	2004	2005 (%)	2006	2004	2005 (%)	2006	2004	2005 (%)	2006	2004	2005 (%)	2006
Canada	4.3	6.9	3.1	2.6	2.5	3.6	3.6	2.3	2.5	11.7	9.7	9.7
Atlantic	1.9	3.8	5.2	6.4	7.4	5.7	7.8	7.9	8.1	21.4	13.9	12.2
Quebec	4.3	4.8	3.3	2.0	1.8	2.1	2.8	2.1	2.0	8.0	6.6	6.6
Ontario	4.4	7.5	3.4	1.3	1.6	3.7	4.7	2.7	2.8	14.8	12.8	13.2
Prairies	0.6	3.7	1.4	2.8	2.4	3.1	3.0	1.6	1.6	10.5	8.7	8.4
British Columbia and Territories	12.7	17.3	4.0	7.6	6.2	7.1	0.8	0.6	2.1	9.3	6.3	5.9

Region/Province	Volume (cu. ft.)								
	16.5–18.4			18.5–20.4			≥20.5		
	2004	2005 (%)	2006	2004	2005 (%)	2006	2004	2005 (%)	2006
Canada	39.5	41.7	39.9	14.0	15.2	17.3	24.2	21.7	23.9
Atlantic	40.3	47.1	47.9	9.4	8.3	9.2	12.9	11.5	11.7
Quebec	48.9	49.6	45.8	17.3	19.3	22.6	16.7	15.7	17.7
Ontario	34.6	37.9	37.3	12.9	14.1	15.5	27.3	23.3	24.1
Prairies	40.8	42.1	36.6	12.7	13.9	16.6	29.6	27.7	32.3
British Columbia and Territories	29.1	32.4	38.6	13.8	13.7	15.9	26.7	23.5	26.4

Table D.5 Distribution of Refrigerators for Retail Shipments by Volume, by Region/Province, 2004–2006

Region/Province	Volume (cu. ft.)											
	<10.5			10.5–12.4			12.5–14.4			14.5–16.4		
	2004	2005 (%)	2006	2004	2005 (%)	2006	2004	2005 (%)	2006	2004	2005 (%)	2006
Canada	6.7	7.9	3.3	1.5	1.1	1.2	2.2	1.4	2.2	8.2	6.6	6.4
Atlantic	1.2	4.3	4.7	3.1	3.9	3.4	6.5	5.4	6.9	22.0	14.3	11.2
Quebec	4.5	4.7	3.2	0.6	0.7	0.6	2.5	1.9	1.7	7.0	5.7	5.5
Ontario	5.7	9.1	3.6	0.4	1.1	0.9	1.8	0.9	2.0	9.1	6.7	6.5
Prairies	0.7	4.1	1.7	0.9	0.7	1.1	3.1	1.4	1.6	8.9	6.8	6.7
British Columbia and Territories	19.4	24.7	5.2	2.8	3.0	3.1	0.7	0.9	2.9	10.3	5.9	5.5

Region/Province	Volume (cu. ft.)								
	16.5–18.4			18.5–20.4			≥20.5		
	2004	2005 (%)	2006	2004	2005 (%)	2006	2004	2005 (%)	2006
Canada	39.9	42.3	40.2	16.5	17.5	20.5	25.0	23.0	26.2
Atlantic	41.7	50.4	50.7	10.9	9.2	10.2	14.7	12.5	13.0
Quebec	49.5	50.4	46.2	18.4	20.4	24.1	17.5	16.4	18.6
Ontario	35.7	38.7	39.0	15.3	17.0	18.9	32.0	26.7	29.0
Prairies	39.7	41.4	32.7	15.4	16.6	21.0	31.2	29.0	35.2
British Columbia and Territories	24.2	28.2	37.1	17.2	15.6	19.6	25.4	21.7	26.5

Table D.6 Distribution of Refrigerators for Builder Shipments by Volume, by Region/Province, 2004–2006

Region/Province	Volume (cu. ft.)											
	<10.5			10.5–12.4			12.5–14.4			14.5–16.4		
	2004	2005	2006	2004	2005	2006	2004	2005	2006	2004	2005	2006
	(%)			(%)			(%)			(%)		
Canada	0.5	2.0	2.3	10.2	9.2	13.1	8.7	6.5	3.9	23.8	24.4	22.6
Atlantic	4.9	2.6	8.6	20.2	26.1	19.7	13.2	21.1	15.2	18.9	11.8	17.7
Quebec	0.3	7.2	4.1	23.4	21.1	21.8	7.6	7.0	6.7	22.2	22.0	21.1
Ontario	0.1	1.3	2.7	4.5	3.7	12.5	14.7	10.1	5.2	34.5	37.5	34.6
Prairies	0.3	1.8	0.4	9.9	9.7	9.8	2.7	2.4	1.6	17.0	16.4	14.1
British Columbia and Territories	0.8	1.7	2.0	16.2	12.9	13.9	0.9	0.4	0.6	7.6	7.1	6.5

Region/Province	Volume (cu. ft.)								
	16.5–18.4			18.5–20.4			≥20.5		
	2004	2005	2006	2004	2005	2006	2004	2005	2006
	(%)			(%)			(%)		
Canada	36.3	38.5	38.6	4.1	4.0	4.6	16.4	15.4	14.9
Atlantic	34.6	28.9	31.4	3.2	3.3	3.2	5.1	6.3	4.2
Quebec	40.2	37.1	40.0	0.7	1.1	1.1	5.5	4.7	5.3
Ontario	30.8	35.0	32.0	4.6	2.8	4.6	10.9	9.7	8.5
Prairies	44.8	45.1	49.5	1.9	2.6	2.1	23.4	21.9	22.6
British Columbia and Territories	37.9	41.2	41.2	7.6	9.7	9.6	29.0	27.1	26.3

Table D.7 Distribution of Refrigerators by Average Annual Unit Energy Consumption per Cubic Foot, by Region/Province, 2004–2006

Region/ Province	kWh/cu. ft. per year														
	<30			30–39.9			40–49.9			50–59.9			≥60		
	2004	2005 (%)	2006	2004	2005 (%)	2006	2004	2005 (%)	2006	2004	2005 (%)	2006	2004	2005 (%)	2006
Canada	82.6	86.7	88.6	11.0	6.5	8.5	1.3	0.2	0.9	0.2	0.2	0.3	5.0	6.4	1.7
Atlantic	83.3	80.5	79.4	11.9	16.1	17.6	3.7	0.3	1.6	0.0	0.3	0.2	1.1	2.9	1.3
Quebec	86.1	89.3	91.4	9.2	6.1	6.1	0.9	0.1	0.7	0.0	0.1	0.2	3.7	4.3	1.5
Ontario	84.1	87.1	87.9	10.7	5.4	8.6	0.8	0.1	1.1	0.0	0.2	0.4	4.4	7.2	2.1
Prairies	82.5	90.0	90.5	14.9	6.5	8.1	1.6	0.1	0.4	0.0	0.1	0.2	1.1	3.3	0.8
British Columbia and Territories	72.6	74.4	84.5	13.5	7.8	11.0	1.6	0.6	1.3	0.0	0.8	0.8	12.3	16.4	2.4

Table D.8 Average Annual Unit Energy Consumption of Refrigerators by Volume

Model Year	Volume (cu. ft.)						
	<10.5	10.5–12.4	12.5–14.4	14.5–16.4 (kWh/yr)	16.5–18.4	18.5–20.4	≥20.5
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

Table D.9 Average Annual Unit Energy Consumption per Cubic Foot of Refrigerators by Volume

Model Year	Volume (cu. ft.) <10.5	10.5–12.4	12.5–14.4	14.5–16.4	16.5–18.4	18.5–20.4	≥20.5
				(kWh/cu. ft. per year)			
1990	113	65	63	62	61	58	43
1991	76	64	65	59	58	50	41
1992	81	61	56	60	54	51	49
1993	79	52	45	45	42	41	40
1994	72	49	41	41	38	37	38
1995	70	48	40	41	38	37	36
1996	71	48	42	41	37	35	34
1997	70	48	42	41	38	36	33
1998	63	49	42	41	39	36	34
1999	66	48	43	41	38	34	34
2000	68	48	43	40	38	33	32
2001	72	44	37	36	33	27	28
2002	65	38	32	31	30	25	25
2003	64	38	32	29	27	26	25
2004	64	38	31	29	27	25	24
2005	64	36	32	27	27	25	24
2006	68	36	32	27	27	25	24

Table D.10 Average Annual Unit Energy Consumption of Refrigerators by Channel, by Region/Province, 2004–2006

Region/Province	Builder 2004	Builder 2005 (kWh/yr)	Builder 2006	Retail 2004	Retail 2005 (kWh/yr)	Retail 2006
Canada	464.3	457.2	458.2	480.7	471.7	486.9
Atlantic	463.8	436.8	437.6	477.8	468.4	471.9
Quebec	455.6	437.5	445.7	471.7	468.0	475.6
Ontario	451.9	444.1	442.0	489.0	475.0	490.6
Prairies	477.8	475.1	477.8	497.1	480.8	498.9
British Columbia and Territories	483.3	479.0	480.5	469.2	450.8	489.0

Table D.11 Distribution of Refrigerators Consuming Less Than 30 kWh/cu. ft. per Year, 2004–2006

Region/Province	Builder			Retail		
	2004	2005 (%)	2006	2004	2005 (%)	2006
Canada	81.4	83.8	79.9	82.8	87.3	90.8
Atlantic	71.9	61.3	60.5	86.0	84.2	82.6
Quebec	69.3	63.4	66.0	87.2	90.8	93.2
Ontario	84.0	88.9	79.9	84.2	86.6	90.3
Prairies	84.8	85.4	86.9	85.7	91.1	91.6
British Columbia and Territories	78.8	83.7	80.5	69.1	70.0	86.8

Table D.12 Annual Energy Savings for Refrigerators, 1992–2006

Model Year	Energy Consumed WITHOUT Manufacturers' Improvements, the MEPS and Improvements to the MEPS (PJ)	Energy Consumed WITH Manufacturers' Improvements, the MEPS and Improvements to the MEPS (PJ)	Annual Energy Savings (PJ)	Cumulative Energy Savings (with retirement factor) (PJ)
1992	1.22	1.22	0.00	0.00
1993	1.59	1.27	0.32	0.32
1994	1.80	1.30	0.50	0.82
1995	1.77	1.26	0.51	1.33
1996	1.80	1.28	0.52	1.86
1997	1.96	1.43	0.53	2.39
1998	2.24	1.63	0.62	3.01
1999	2.58	1.84	0.73	3.74
2000	2.51	1.78	0.73	4.47
2001	2.63	1.63	1.00	5.47
2002	2.88	1.62	1.26	6.74
2003	2.93	1.59	1.35	8.09
2004	3.23	1.72	1.51	9.58
2005	3.36	1.75	1.61	11.13
2006	3.11	1.66	1.45	12.48

Table D.13 Distribution of Freezers by Type, by Region/Province, 2004–2006

Region/Province	Type 8			Type 9			Type 10			Type 18		
	2004	2005	2006	2004	2005	2006	2004	2005	2006	2004	2005	2006
		(%)			(%)			(%)			(%)	
Canada	29.4	30.4	28.5	8.3	10.7	8.7	45.5	35.7	45.6	16.8	23.2	17.2
Atlantic	19.8	20.8	25.7	10.2	8.2	6.9	38.0	37.0	29.0	32.0	34.1	38.4
Quebec	41.3	41.1	44.9	5.6	6.0	3.5	22.7	21.9	25.0	30.4	31.0	26.6
Ontario	28.2	26.7	31.6	17.8	13.4	10.1	18.9	19.9	22.6	35.1	39.8	35.7
Prairies	31.7	27.9	31.9	12.6	12.1	9.6	25.9	23.3	27.5	29.8	36.7	30.9
British Columbia and Territories	30.0	28.8	30.0	15.0	14.6	14.3	30.8	28.5	26.8	24.1	28.1	28.9

Table D.14 Distribution of Freezers by Average Annual Unit Energy Consumption per Cubic Foot, by Region/Province, 2004–2006

Region/Province	kWh/cu. ft. per year											
	20–29.9			30–39.9			40–49.9			50–59.9		
	2004	2005	2006	2004	2005	2006	2004	2005	2006	2004	2005	2006
		(%)			(%)			(%)			(%)	
Canada	28.9	29.5	34.8	48.8	45.2	40.4	22.3	25.3	24.7	0.1	0.0	0.0
Atlantic	34.3	36.4	31.2	46.0	47.6	46.5	19.3	16.0	22.3	0.3	0.0	0.0
Quebec	27.9	29.9	36.6	51.3	48.7	45.7	20.7	21.4	17.6	0.1	0.0	0.0
Ontario	22.2	24.5	30.4	51.1	44.3	41.1	26.6	31.1	28.5	0.1	0.0	0.0
Prairies	33.2	31.9	40.2	47.3	45.6	36.1	19.5	22.5	23.8	0.0	0.0	0.0
British Columbia and Territories	36.7	37.5	38.0	40.6	35.4	32.6	22.6	27.0	29.4	0.1	0.0	0.0

Table D.15 Distribution of Freezers by Channel, by Region/Province, 2004–2006

Region/Province	Builder			Retail		
	2004	2005	2006	2004	2005	2006
	(%)			(%)		
Canada	1.8	2.1	2.0	98.2	97.9	98.0
Atlantic	0.9	1.6	0.5	99.1	98.4	99.5
Quebec	0.9	0.7	0.4	99.1	99.3	99.6
Ontario	0.5	0.4	0.3	99.5	99.6	99.7
Prairies	5.0	4.4	7.2	95.0	95.6	92.8
British Columbia and Territories	15.5	18.6	16.0	84.5	81.4	84.0

Table D.16 Average Annual Unit Energy Consumption of Freezers by Model Year

Model Year	Type 8	Type 9	Type 10	Type 18	Total
			(kWh/yr)		(kWh/yr)
1990	992.1	–	657.7	519.9	713.8
1991	706.4	1068.0	406.8	339.8	444.7
1992	670.4	1078.0	413.8	337.8	449.3
1993	581.3	863.3	368.2	287.8	401.7
1994	535.9	846.1	363.9	292.4	389.2
1995	508.9	817.1	353.2	282.0	381.6
1996	502.9	820.7	344.0	279.4	376.7
1997	494.8	823.7	341.9	278.7	376.5
1998	496.0	829.6	339.5	278.2	381.5
1999	492.1	838.6	337.5	276.3	383.4
2000	487.8	839.4	337.4	277.1	390.9
2001	447.6	740.5	336.7	275.7	383.9
2002	412.7	674.2	316.7	267.7	367.7
2003	414.8	665.4	317.8	268.3	369.1
2004	412.0	595.9	344.1	271.1	372.7
2005	420.8	650.1	351.8	269.1	385.6
2006	431.8	664.2	335.8	265.0	379.6

Table D.17 Annual Energy Savings for Freezers, 1992–2006

Model Year	Energy Consumed WITHOUT Manufacturers' Improvements, the MEPS and Improvements to the MEPS (PJ)	Energy Consumed WITH Manufacturers' Improvements, the MEPS and Improvements to the MEPS (PJ)	Annual Energy Savings (PJ)	Cumulative Energy Savings (with retirement factor) (PJ)
1992	0.36	0.36	0.00	0.00
1993	0.38	0.34	0.04	0.04
1994	0.37	0.32	0.05	0.09
1995	0.32	0.28	0.05	0.14
1996	0.28	0.24	0.05	0.18
1997	0.31	0.26	0.05	0.23
1998	0.38	0.32	0.06	0.29
1999	0.40	0.34	0.06	0.35
2000	0.37	0.33	0.05	0.40
2001	0.38	0.32	0.06	0.45
2002	0.41	0.34	0.07	0.53
2003	0.40	0.33	0.07	0.60
2004	0.45	0.37	0.08	0.68
2005	0.43	0.37	0.06	0.74
2006	0.39	0.33	0.06	0.80

Table D.18 Distribution of Dishwashers by Average Annual Unit Energy Consumption, by Region/Province, 2004–2006

Region/ Province	kWh/yr																	
	<300			300–349.9			350–399.9			400–499.9			500–599.9			600–699.9		
	2004	2005 (%)	2006	2004	2005 (%)	2006	2004	2005 (%)	2006	2004	2005 (%)	2006	2004	2005 (%)	2006	2004	2005 (%)	2006
Canada	0.0	0.0	0.3	4.0	19.6	28.2	24.3	55.5	61.8	46.4	15.5	5.7	16.5	6.4	2.7	8.8	3.0	1.3
Atlantic	0.0	0.0	1.0	9.0	25.5	33.1	21.3	48.0	49.7	37.6	15.3	9.2	17.6	3.6	2.4	14.5	7.5	4.7
Quebec	0.0	0.0	1.1	4.0	21.9	26.3	28.0	59.7	66.8	43.0	11.9	3.5	17.7	4.7	2.0	7.5	1.8	0.4
Ontario	0.0	0.0	0.1	4.6	20.5	28.5	22.7	54.0	61.7	48.5	15.2	5.1	16.4	8.0	3.1	7.8	2.2	1.4
Prairies	0.0	0.0	0.0	2.7	15.2	25.8	23.5	59.2	64.2	48.5	16.9	6.3	15.5	5.0	2.6	9.8	3.8	1.1
British Columbia and Territories	0.0	0.0	0.1	3.4	20.0	35.5	24.1	44.7	50.0	45.6	21.6	9.2	16.1	8.7	3.4	10.9	4.9	1.9

Table D.19 Distribution of Dishwashers by Channel, by Region/Province, 2004–2006

Region/Province	Builder 2004 (%)	Builder 2005 (%)	Builder 2006 (%)	Retail 2004 (%)	Retail 2005 (%)	Retail 2006 (%)
Canada	14.3	14.7	15.5	85.7	85.3	84.5
Atlantic	15.3	11.6	11.8	84.7	88.4	88.2
Quebec	3.0	2.9	3.3	97.0	97.1	96.7
Ontario	15.1	15.1	15.5	84.9	84.9	84.5
Prairies	16.7	16.8	18.8	83.3	83.2	81.2
British Columbia and Territories	32.3	35.9	33.9	67.7	64.1	66.1

Table D.20 Average Annual Unit Energy Consumption of Dishwashers by Model Year

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

Table D.21 Average Annual Unit Energy Consumption of Dishwashers by Channel, by Region/Province, 2004–2006

Region/Province	Builder 2004	Builder 2005	Builder 2006	Retail 2004	Retail 2005	Retail 2006
		(kWh/yr)			(kWh/yr)	
Canada	443.0	404.0	382.8	459.1	394.2	370.7
Atlantic	454.4	391.2	385.9	469.4	402.9	382.2
Quebec	449.2	417.0	386.8	454.3	386.5	367.3
Ontario	447.0	408.9	388.4	454.7	392.6	371.0
Prairies	442.1	396.4	381.2	465.2	399.3	371.8
British Columbia and Territories	434.6	404.2	376.3	472.6	408.4	372.6

Table D.22 Annual Energy Savings for Dishwashers, 1992–2006

Model Year	Energy Consumed WITHOUT Manufacturers' Improvements and the MEPS (PJ)	Energy Consumed WITH Manufacturers' Improvements and the MEPS (PJ)	Annual Energy Savings (PJ)	Cumulative Energy Savings (with retirement factor) (PJ)
1992	0.85	0.85	0.00	0.00
1993	0.89	0.90	-0.01	-0.01
1994	1.06	0.90	0.15	0.15
1995	1.04	0.77	0.27	0.42
1996	1.14	0.84	0.30	0.72
1997	1.18	0.84	0.34	1.06
1998	1.21	0.87	0.35	1.41
1999	1.45	1.02	0.43	1.84
2000	1.45	1.01	0.43	2.27
2001	1.45	1.01	0.44	2.71
2002	1.75	1.14	0.61	3.31
2003	1.81	1.04	0.77	4.05
2004	1.95	0.98	0.97	4.96
2005	2.07	0.90	1.17	6.03
2006	2.03	0.83	1.20	7.09

Table D.23 Distribution of Electric Ranges by Type, by Region/Province, 2004–2006

Region/Province	Non-Self-Cleaning			Self-Cleaning		
	2004	2005	2006	2004	2005	2006
	(%)			(%)		
Canada	42.3	41.2	40.1	57.7	58.8	59.9
Atlantic	53.7	51.7	51.6	46.3	48.3	48.4
Quebec	40.4	37.6	31.8	59.6	62.4	68.2
Ontario	44.3	46.1	49.0	55.7	53.9	51.0
Prairies	39.7	36.5	32.7	60.3	63.5	67.3
British Columbia and Territories	40.7	38.6	35.5	59.3	61.4	64.5

Table D.24 Distribution of Electric Ranges by Average Annual Unit Energy Consumption, by Region/Province, 2004–2006

Region/Province	kWh/yr											
	<500			500–549.9			550–599.9			600–649.9		
	2004	2005	2006	2004	2005	2006	2004	2005	2006	2004	2005	2006
	(%)			(%)			(%)			(%)		
Canada	27.8	44.9	47.9	11.4	20.8	22.4	1.9	5.4	14.2	4.8	4.6	3.3
Atlantic	18.4	36.8	44.6	13.3	20.6	24.7	1.3	9.2	19.5	2.3	2.8	1.0
Quebec	30.9	43.7	47.5	13.0	21.3	19.9	2.0	4.8	15.0	4.1	6.1	5.3
Ontario	25.9	45.6	48.1	10.3	20.4	22.5	2.0	5.7	13.2	5.0	3.9	2.4
Prairies	32.3	48.4	45.7	12.9	21.9	25.9	1.8	5.1	14.9	5.0	3.7	3.0
British Columbia and Territories	19.3	42.6	53.6	5.8	17.9	20.2	1.4	4.6	12.2	6.8	5.4	3.3

Region/Province	kWh/yr											
	650–699.9			700–749.9			750–799.9			800–849.9		
	2004	2005	2006	2004	2005	2006	2004	2005	2006	2004	2005	2006
	(%)			(%)			(%)			(%)		
Canada	3.8	2.6	2.2	18.8	8.1	1.9	19.5	7.8	6.9	12.0	5.9	1.2
Atlantic	3.3	2.5	1.9	14.9	7.2	2.6	24.6	10.8	4.8	22.0	10.1	1.0
Quebec	4.1	3.0	2.6	18.1	8.5	1.6	16.0	4.5	6.8	11.8	8.0	1.3
Ontario	4.6	3.0	2.7	17.8	7.1	1.6	21.7	9.8	8.5	12.7	4.6	1.0
Prairies	2.3	1.4	1.1	18.8	7.3	2.5	17.8	7.6	5.7	9.1	4.6	1.3
British Columbia and Territories	3.0	2.2	1.9	28.6	13.3	2.6	23.6	9.0	5.2	11.6	5.0	1.1

Table D.25 Distribution of Electric Ranges by Channel, by Region/Province, 2004–2006

Region/Province	Builder 2004 (%)	Builder 2005 (%)	Builder 2006 (%)	Retail 2004 (%)	Retail 2005 (%)	Retail 2006 (%)
Canada	21.5	22.1	26.9	78.5	77.9	73.1
Atlantic	19.5	17.3	17.4	80.5	82.7	82.6
Quebec	6.6	6.5	8.7	93.4	93.5	91.3
Ontario	28.2	29.1	33.2	71.8	70.9	66.8
Prairies	22.6	23.6	31.0	77.4	76.4	69.0
British Columbia and Territories	42.8	43.5	43.9	57.2	56.5	56.1

Table D.26 Average Annual Unit Energy Consumption of Electric Ranges by Model Year

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

Table D.27 Average Annual Unit Energy Consumption of Electric Ranges by Channel, by Region/Province, 2004–2006

Region/Province	Builder 2004 (kWh/yr)	Builder 2005 (kWh/yr)	Builder 2006 (kWh/yr)	Retail 2004 (kWh/yr)	Retail 2005 (kWh/yr)	Retail 2006 (kWh/yr)
Canada	730.9	604.5	541.3	631.3	563.5	535.7
Atlantic	709.5	595.3	524.5	677.8	590.0	535.1
Quebec	714.3	620.3	562.1	625.9	563.8	537.4
Ontario	739.5	612.4	551.4	634.6	560.5	532.2
Prairies	724.1	586.1	532.7	610.2	553.3	538.2
British Columbia and Territories	728.7	600.3	518.2	684.2	587.8	538.7

Table D.28 Annual Energy Savings for Electric Ranges, 1992–2006

Model Year	Energy Consumed WITHOUT Manufacturers' Improvements and the MEPS (PJ)	Energy Consumed WITH Manufacturers' Improvements and the MEPS (PJ)	Annual Energy Savings (PJ)	Cumulative Energy Savings (with retirement factor) (PJ)
1992	0.94	0.94	0.00	0.00
1993	1.13	1.14	-0.01	-0.01
1994	1.09	1.08	0.01	0.00
1995	0.96	0.95	0.01	0.01
1996	1.15	1.14	0.01	0.02
1997	1.25	1.24	0.01	0.03
1998	1.35	1.34	0.01	0.04
1999	1.39	1.36	0.04	0.08
2000	1.35	1.31	0.03	0.11
2001	1.34	1.32	0.03	0.14
2002	1.67	1.63	0.05	0.18
2003	1.81	1.65	0.16	0.35
2004	1.97	1.65	0.32	0.66
2005	1.90	1.39	0.50	1.17
2006	1.77	1.22	0.55	1.72

Table D.29 Distribution of Clothes Washers by Type, by Region/Province, 2004–2006

Region/Province	Front-Loading Clothes Washers			Top-Loading Clothes Washers		
	2004	2005	2006	2004	2005	2006
	(%)			(%)		
Canada	29.2	42.3	46.9	70.8	57.7	53.1
Atlantic and Quebec	22.8	36.2	39.0	77.2	63.8	61.0
Ontario	27.7	45.4	50.5	72.3	54.6	49.5
Prairies	28.9	44.9	49.2	71.1	55.1	50.8
British Columbia and Territories	30.2	48.6	59.1	69.8	51.4	40.9

Table D.30 Distribution of Clothes Washers by Average Annual Unit Energy Consumption, by Region/Province, 2004–2006

Region/Province	kWh/yr											
	<400			400–499.9			500–599.9			600–699.9		
	2004	2005	2006	2004	2005	2006	2004	2005	2006	2004	2005	2006
	(%)			(%)			(%)			(%)		
Canada	35.7	48.3	54.6	2.5	3.4	11.5	16.6	28.3	19.8	10.0	7.8	7.3
Atlantic and Quebec	27.7	41.8	47.2	1.5	3.0	15.0	19.9	35.3	22.3	8.5	6.6	8.4
Ontario	36.9	52.5	58.1	3.9	4.3	10.6	16.5	23.5	17.9	11.6	8.3	6.5
Prairies	35.9	50.0	57.2	2.2	2.9	8.8	16.5	28.1	22.0	10.0	7.4	6.3
British Columbia and Territories	35.6	53.0	62.9	3.2	2.8	8.2	11.0	17.9	9.9	16.8	12.1	9.2

Region/Province	kWh/yr								
	700–799.9			800–899.9			900–999.9		
	2004	2005	2006	2004	2005	2006	2004	2005	2006
	(%)			(%)			(%)		
Canada	8.3	4.4	3.4	10.2	2.4	0.8	16.7	5.5	2.7
Atlantic and Quebec	8.7	4.9	3.4	11.6	3.1	0.5	22.1	5.3	3.2
Ontario	6.9	4.1	3.7	9.9	1.9	0.4	14.3	5.5	2.8
Prairies	9.1	4.4	2.6	12.0	2.2	1.4	14.3	4.9	1.7
British Columbia and Territories	7.4	3.9	4.8	5.7	1.7	1.4	20.3	8.6	3.6

Table D.31 Distribution of Clothes Washers by Channel, by Region/Province, 2004–2006

Region/Province	Builder			Retail		
	2004	2005	2006	2004	2005	2006
	(%)			(%)		
Canada	5.8	5.7	5.7	94.2	94.3	94.3
Atlantic and Quebec	2.0	1.9	1.6	98.0	98.1	98.4
Ontario	6.4	5.6	6.0	93.6	94.4	94.0
Prairies	8.5	8.1	7.9	91.5	91.9	92.1
British Columbia and Territories	18.5	16.7	15.6	81.5	83.3	84.4

Table D.32 Average Annual Unit Energy Consumption of Clothes Washers by Model Year

Model Year	Front-Loading Clothes Washers	Top-Loading Clothes Washers	Total
	(kWh/yr)		(kWh/yr)
1990	–	–	1218.0
1991	–	–	1197.4
1992	–	–	1175.5
1993	–	–	1094.1
1994	–	–	989.1
1995	–	–	965.9
1996	–	–	948.7
1997	–	–	930.1
1998	–	–	903.3
1999	–	–	859.9
2000	274.2	922.7	838.3
2001	287.0	904.7	810.1
2002	300.6	871.1	779.2
2003	274.8	826.9	708.4
2004	258.4	702.3	572.9
2005	218.8	608.8	443.6
2006	202.7	555.0	389.6

Table D.33 Average Annual Unit Energy Consumption of Clothes Washers by Channel, by Region/Province, 2004–2006

Region/Province	Builder 2004 (kWh/yr)	Builder 2005 (kWh/yr)	Builder 2006 (kWh/yr)	Retail 2004 (kWh/yr)	Retail 2005 (kWh/yr)	Retail 2006 (kWh/yr)
Canada	653.0	529.9	499.9	568.0	438.4	382.9
Atlantic and Quebec	651.1	513.7	526.0	629.0	469.8	415.7
Ontario	641.0	510.4	475.6	550.7	420.7	369.1
Prairies	706.3	588.9	550.5	556.0	419.1	362.3
British Columbia and Territories	590.7	475.6	449.8	585.3	428.3	352.4

Table D.34 Annual Energy Savings for Clothes Washers, 1992–2006

Model Year	Energy Consumed WITHOUT Manufacturers' Improvements and the MEPS (PJ)	Energy Consumed WITH Manufacturers' Improvements and the MEPS (PJ)	Annual Energy Savings (PJ)	Cumulative Energy Savings (with retirement factor) (PJ)
1992	1.70	1.70	0.00	0.00
1993	1.80	1.67	0.12	0.12
1994	1.94	1.64	0.31	0.43
1995	1.84	1.51	0.33	0.76
1996	1.93	1.56	0.37	1.13
1997	2.14	1.69	0.45	1.58
1998	2.16	1.66	0.50	2.08
1999	2.43	1.78	0.65	2.73
2000	2.50	1.78	0.72	3.45
2001	2.60	1.79	0.81	4.26
2002	2.81	1.87	0.95	5.20
2003	2.92	1.76	1.16	6.32
2004	3.10	1.51	1.59	7.84
2005	3.31	1.25	2.06	9.79
2006	3.23	1.07	2.16	11.80

Table D.35 Distribution of Electric Clothes Dryers by Average Annual Unit Energy Consumption, by Region/Province, 2004–2006

Region/Province	kWh/yr											
	<800			800–899.9			900–949.9			950–999.9		
	2004	2005	2006	2004	2005	2006	2004	2005	2006	2004	2005	2006
	(%)			(%)			(%)			(%)		
Canada	4.0	6.1	6.1	4.4	3.2	2.8	75.3	74.1	69.8	16.3	16.6	21.2
Atlantic and Quebec	1.8	3.7	3.9	3.6	2.6	2.0	82.1	81.0	79.4	12.4	12.7	14.7
Ontario	5.9	7.9	7.2	6.3	4.7	4.2	69.7	69.9	66.4	18.1	17.5	22.1
Prairies	2.8	4.6	4.9	3.4	2.1	1.9	74.8	72.9	63.2	19.0	20.4	29.9
British Columbia and Territories	9.4	14.8	14.7	5.5	3.3	3.0	65.1	64.6	62.9	19.9	17.4	19.5

Table D.36 Distribution of Electric Clothes Dryers by Channel, by Region/Province, 2004–2006

Region/Province	Builder			Retail		
	2004	2005	2006	2004	2005	2006
	(%)			(%)		
Canada	6.3	6.1	5.9	93.7	93.9	94.1
Atlantic and Quebec	2.0	1.9	1.5	98.0	98.1	98.5
Ontario	7.2	6.4	6.4	92.8	93.6	93.6
Prairies	8.9	8.5	8.1	91.1	91.5	91.9
British Columbia and Territories	18.9	17.3	15.4	81.1	82.7	84.6

Table D.37 Average Annual Unit Energy Consumption of Electric Clothes Dryers by Model Year

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

Table D.38 Average Annual Unit Energy Consumption of Electric Clothes Dryers by Channel, by Region/Province, 2004–2006

	Builder			Retail		
	2004	2005	2006	2004	2005	2006
Region/Province		kWh/yr			kWh/yr	
Canada	843.1	832.2	821.4	916.5	908.5	909.7
Atlantic and Quebec	836.2	827.3	868.6	924.1	917.0	915.6
Ontario	817.1	796.4	803.1	907.7	900.5	904.9
Prairies	870.1	865.3	853.7	923.6	918.0	918.7
British Columbia and Territories	851.3	838.9	783.7	892.1	865.2	877.2

Table D.39 Annual Energy Savings for Electric Clothes Dryers, 1992–2006

Model Year	Energy Consumed WITHOUT Manufacturers' Improvements and the MEPS (PJ)	Energy Consumed WITH Manufacturers' Improvements and the MEPS (PJ)	Annual Energy Savings (PJ)	Cumulative Energy Savings (with retirement factor) (PJ)
1992	1.23	1.23	0.00	0.00
1993	1.27	1.20	0.07	0.07
1994	1.31	1.21	0.10	0.17
1995	1.15	1.07	0.09	0.25
1996	1.27	1.15	0.12	0.38
1997	1.39	1.26	0.14	0.51
1998	1.41	1.29	0.12	0.63
1999	1.59	1.47	0.12	0.76
2000	1.64	1.52	0.12	0.88
2001	1.73	1.62	0.12	1.00
2002	1.96	1.82	0.13	1.13
2003	2.02	1.88	0.14	1.27
2004	2.18	2.02	0.16	1.43
2005	2.36	2.17	0.19	1.62
2006	2.40	2.21	0.19	1.81

Table D.40 Annual Energy Savings for All Major Household Appliances, 1992–2006

Model Year	Energy Consumed WITHOUT Manufacturers' Improvements and the MEPS (PJ)	Energy Consumed WITH Manufacturers' Improvements and the MEPS (PJ)	Annual Energy Savings (PJ)	Cumulative Energy Savings (with retirement factor) (PJ)
1992	6.30	6.30	0.00	0.00
1993	7.05	6.51	0.55	0.55
1994	7.57	6.45	1.12	1.66
1995	7.09	5.84	1.26	2.92
1996	7.58	6.21	1.37	4.29
1997	8.23	6.72	1.51	5.80
1998	8.75	7.10	1.66	7.46
1999	9.84	7.81	2.03	9.49
2000	9.81	7.73	2.08	11.57
2001	10.15	7.70	2.45	14.02
2002	11.49	8.41	3.08	17.09
2003	11.90	8.25	3.65	20.68
2004	12.88	8.25	4.63	25.16
2005	13.43	7.83	5.60	30.48
2006	12.93	7.32	5.61	35.67