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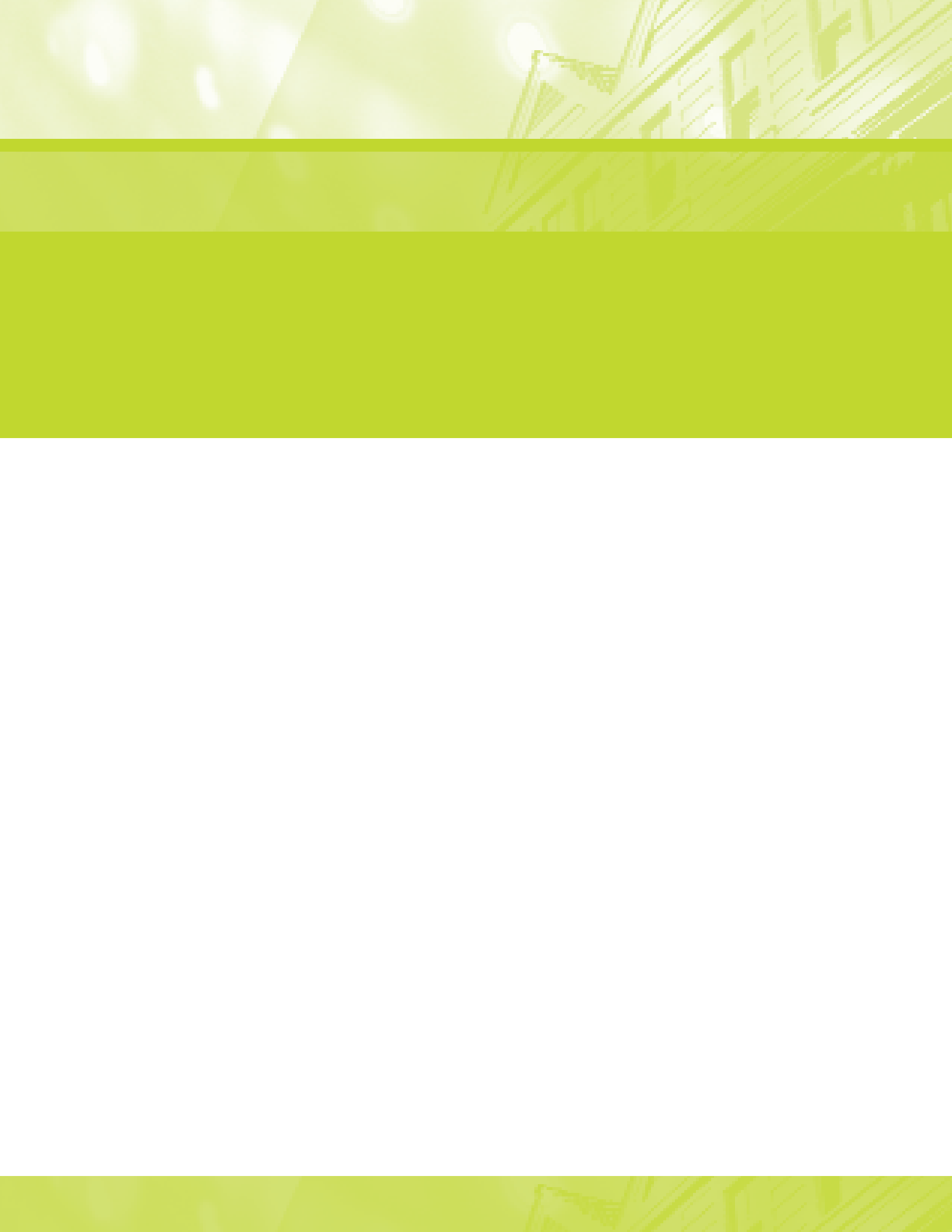
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In 1993, Statistics Canada conducted an extensive survey for Natural Resources Canada (NRCan) entitled *1993 Survey of Household Energy Use (SHEU-1993)*. This survey provided an opportunity to collect detailed data on the energy consumption habits of households in Canada to be used by what would become the Office of Energy Efficiency (OEE).

The OEE decided to periodically conduct additional Surveys of Household Energy Use in a continuing effort to assess the changing characteristics of household energy consumption across Canada. The second Survey of Household Energy Use collected data for 1997 (SHEU-1997), and the third collected data for 2003 (SHEU-2003).¹ These surveys tie in directly with the OEE's mandate to strengthen and expand Canada's commitment to energy efficiency in order to reduce greenhouse gas (GHG) emissions that contribute to climate change.

The primary objective of SHEU-2003 was to gather information on energy use and the factors affecting energy use in households residing in houses and residential buildings with fewer than five storeys. More precisely, the survey involved collecting information on

- dwelling characteristics
- usage of appliances and other energy-consuming products
- energy efficiency characteristics
- energy consumption

The purpose of this summary report is to provide an overview of the main findings of SHEU-2003. A more detailed report entitled *2003 Survey of Household Energy Use – Detailed Statistical Report* is also available.

Natural Resources Canada's Office of Energy Efficiency (OEE) offers a wide range of programs and services to improve energy efficiency in every sector of the Canadian economy, including the residential sector. The OEE's Equipment Program helps Canadians make energy-efficient choices when buying, selling or manufacturing energy-using equipment. The OEE's Housing Program offers resources to help Canadians keep their homes comfortable and well ventilated for healthy indoor air quality while reducing energy costs for home heating. For more information on these and other programs, as well as tools, financial incentives, free publications and other resources to help save energy and reduce GHG emissions, visit oeec.nrcan.gc.ca.

If you would like to learn more about this publication or the OEE's services, please contact us by e-mail at euc.cec@nrcan.gc.ca.

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¹ Statistics Canada conducted SHEU-2003 in 2004 and therefore refers to it as the 2004 Survey of Household Energy Use. However, the reference period for this survey is the calendar year 2003 (that is, all data presented are for households during the 2003 calendar year). Therefore, this report refers to the survey as the 2003 Survey of Household Energy Use (SHEU-2003).

Analytical Summary

- Data from SHEU-2003 found that the average heated area of a Canadian dwelling was 1321 square feet (sq. ft.) in 2003. The average heated area of a Canadian dwelling has increased with each Survey of Household Energy Use (SHEU).
- Dwellings constructed after 1979 were, on average, larger and more energy efficient than dwellings constructed before 1980.
- The energy source used by households for space and water heating was primarily based on the location of the household within the country. The majority of households located west of Quebec used natural gas, while the majority of households in Quebec used electricity. Most households in the Atlantic region used either electricity or oil.
- The penetration rate² for condensing (high-efficiency) furnaces was 62 percent among dwellings constructed during 1990–2003 that used a natural gas, propane or oil furnace.
- An increasing number of basements / crawl spaces, attics / crawl spaces and attached garages are being insulated.
- SHEU-2003 found that more households used both a main and a secondary refrigerator than did the previous SHEUs. These additional refrigerators were also increasing in capacity. These trends have also coincided with a decrease in the penetration rate for freezers.
- Nearly one quarter of Canadian households used three or more television sets in 2003.
- The penetration rate for both central and window/room air conditioners increased from SHEU-1997 to SHEU-2003. Also, Ontario households accounted for 60 percent of all air-conditioning systems used in Canada in 2003.
- Almost 25 percent of the light bulbs used by the average Canadian household were energy-efficient light bulbs, such as halogen light bulbs, fluorescent tubes and compact fluorescent lights.
- ENERGY STAR® qualified products, which are among the most energy-efficient products on the market, have had a high penetration since the inception of the ENERGY STAR Initiative in Canada. However, a significant number of households did not know if their products were ENERGY STAR qualified, which may have resulted in an underestimation of the penetration rate of ENERGY STAR qualified products.

² Penetration rate is the percentage of a sample population that used a given product during a specific time. For the purposes of this report, the sample population is Canadian households (unless otherwise stated) during 2003.

Scope of Survey

The third Survey of Household Energy Use (SHEU–2003) used 2003 as its reference year. The previous SHEUs used 1993 and 1997 as their respective reference years.

SHEU–2003 covers over 11 million households across Canada. The survey is representative of households in all 10 Canadian provinces that resided in single detached houses, double/row houses, duplexes,³ mobile homes and apartments in buildings with fewer than five storeys (low-rise apartments). Households in the territories were excluded in order to remain consistent with previous SHEUs.

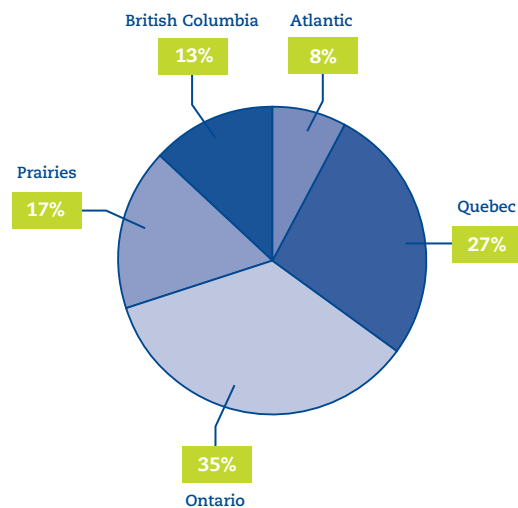
The survey data were collected through computer-assisted personal interviews with dwelling owners and renters. Also, landlords of rented dwellings and property managers of condominiums were interviewed in an attempt to obtain the most accurate responses possible. Landlords and property managers were asked questions only about the dwelling's heating and cooling equipment, features and conditions, energy use and energy consumption. Energy consumption data were obtained through either the energy supplier(s) of the household or the household providing the data from 2003 energy bills or statements.

SHEU–2003 found that, in 2003, the regional breakdown of households across Canada was as follows: Ontario, 35 percent; Quebec, 27 percent; the Prairies, 17 percent; British Columbia, 13 percent; and the Atlantic region, 8 percent (see Chart 1).

More detail about the methodology used for SHEU–2003 and a copy of the SHEU–2003 questionnaire can be found in the *2003 Survey of Household Energy Use – Detailed Statistical Report*.

Chart 1

Location of Households by Region



³ Duplexes will be included in the double/row houses category for comparison purposes throughout this report.

Trends in Household Energy Use

Although each Survey of Household Energy Use has evolved to incorporate the changing characteristics of household energy consumption, a few essential topics have continued to be covered by each survey (SHEU-1993, SHEU-1997 and SHEU-2003). This provides an opportunity to evaluate developments in the Canadian residential sector through a comparison of findings from 1993, 1997 and 2003.

For comparison purposes, this section refers only to elements that are common to all three surveys. Also, this section presents data only from single detached houses, double/row houses and mobile homes. Data from low-rise apartments are excluded because the sample population of SHEU-1997 did not include this type of dwelling.

Finally, since the methodology used for all of the surveys was not exactly the same,⁴ it should be noted that some of the discrepancies between the surveys might be partially attributable to methodological differences.

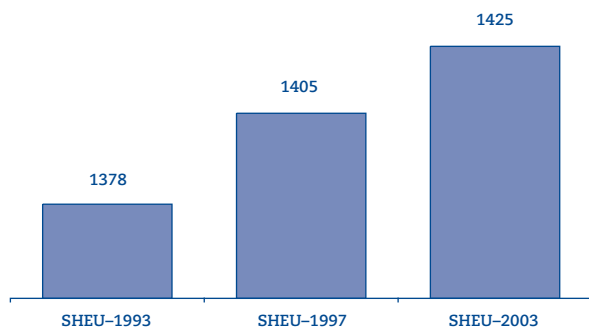
Changing Characteristics of Canadian Houses

Heated Area

The heated area of a house is defined as the total floor space of a house excluding the basement and the garage.

Chart 2

Average Heated Area of Houses (sq. ft.)



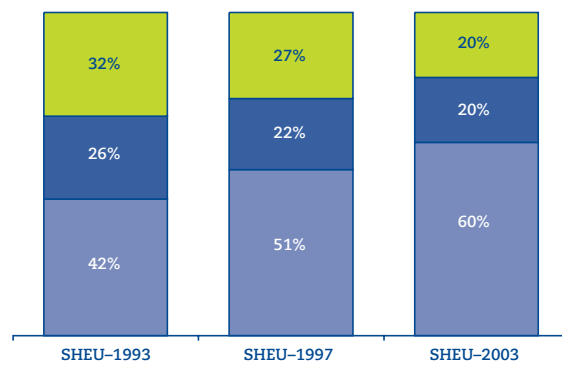
As shown in Chart 2, the average heated area of houses⁵ across Canada has increased with each version of SHEU. The 1993 version found that the average heated area of a house was 1378 sq. ft. Next, SHEU-1997 observed that the average heated area of a house had increased to 1405 sq. ft. Finally, SHEU-2003 data show that the average heated area of a house in Canada had once again increased, to reach 1425 sq. ft.

Basements

Basements can be a prime source of heat loss within a house. In fact, basements can account for 20 percent to 35 percent of a house's total heat loss.⁶ Canadian homeowners seem to have become more aware of this, as the percentage of fully insulated basements / crawl spaces has increased from 42 percent in SHEU-1993 to 51 percent in SHEU-1997 and to 60 percent in SHEU-2003 (see Chart 3).

Chart 3

Percentage of Basements / Crawl Spaces With Full, Partial and No Insulation on Inside Walls



⁴ For example, the wording of questions and possible responses may have been refined from one survey to the next.

⁵ Includes single detached houses, double/row houses and mobile homes.

⁶ Natural Resources Canada, *Keeping the Heat In – EnerGuide*, Gatineau, 2004, p. 74.

There has also been a corresponding decrease in the percentage of basements / crawl spaces that had no insulation at all. In 1993, nearly one out of every three basements had no insulation. This ratio has decreased to one out of every five basements in 2003.

Changing Characteristics of Residential Heating

Average Age of Main Heating System

The average age of the main heating system in Canadian dwellings has gradually increased with each SHEU, from 12 years in SHEU-1993 to 14 years in SHEU-1997 to 15 years in SHEU-2003 (see Chart 4). As for the average age of the prominent types of main heating systems, electric baseboards have seen the largest increase in average age, going from 11 years to 19 years over the course of the three surveys. Similarly, the average age of heat pumps has also increased, but at a slower rate, starting from 6 years in SHEU-1993 and reaching 10 years in SHEU-2003. Other types of heating systems, such as furnaces and heating stoves, had average ages that slightly increased from SHEU-1993 to SHEU-1997 and then remained constant from SHEU-1997 to SHEU-2003.

Fireplaces

Gas fireplaces have become a cleaner-burning and potentially more energy-efficient alternative to conventional wood fireplaces.⁷ Many homeowners are more attracted to gas fireplaces – because of their ease of use, cleanliness and environmental benefits – than conventional wood fireplaces. These factors

seem to have contributed to the increase in the popularity of gas fireplaces in Canadian homes. This increase can be seen by comparing the penetration rate of gas fireplaces in all three SHEUs.

The penetration rate for gas fireplaces has steadily increased, from 5 percent in SHEU-1993 to 19 percent in SHEU-2003 (see Chart 5). In contrast, the penetration rate for wood fireplaces declined slightly, from 31 percent to 27 percent, over the same period.

Chart 5

Penetration Rate of Fireplaces by Type of Fireplace

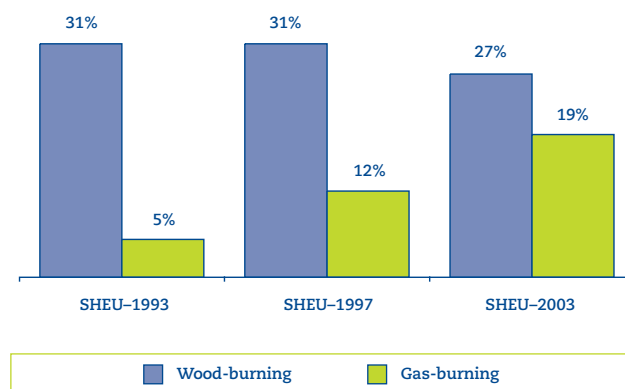


Chart 4

Average Age of Main Heating System (years)

	SHEU-1993	SHEU-1997	SHEU-2003
All heating systems	12	14	15
Electric baseboards	11	15	19
Hot-air furnace	13	14	14
Hot-water furnace	16	19	19
Heating stove	11	12	12
Heat pump	6	9	10
Other	15	11	14

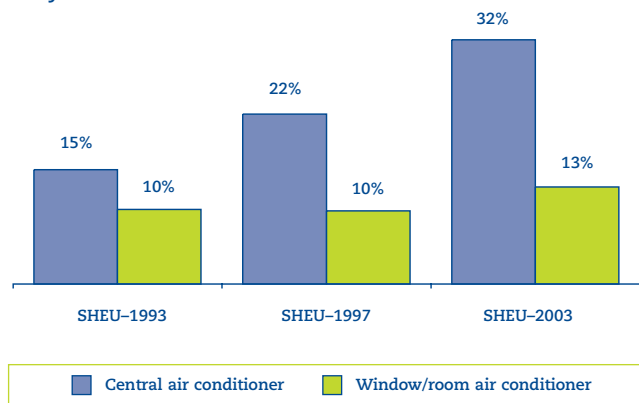
⁷ Natural Resources Canada, *All About Gas Fireplaces*, Gatineau, 2004, p. 2.

Changing Characteristics of Air Conditioning of Houses

From SHEU-1993 to SHEU-1997, the penetration rate for central air conditioners increased from 15 percent to 22 percent, while the penetration rate for window/room air conditioners remained stable at 10 percent (see Chart 6). Data from SHEU-2003 found that the penetration rates for central air conditioners and window/room air conditioners had increased to 32 percent and 13 percent respectively. These increases since SHEU-1997 have coincided with warmer-than-average Canadian summers since 1998, with the exception of the summer of 2000.⁸

Chart 6

Penetration Rate of Air-Conditioning Systems by Type of System



Changing Characteristics of Appliances

Main and Secondary Refrigerators

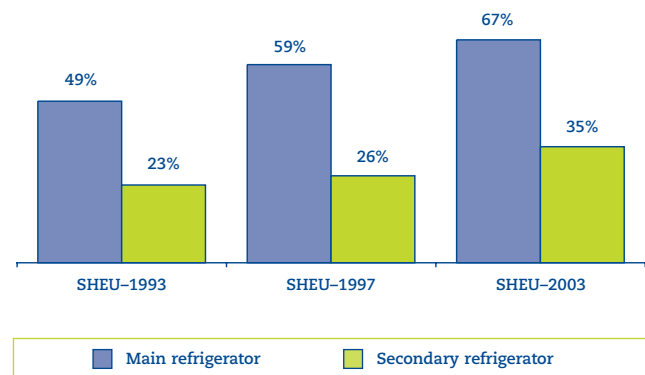
Refrigerators in general have become more energy efficient in recent years.⁹ Given this fact, it is not unexpected that an increasing proportion of main refrigerators used by houses had a capacity larger than 16.4 cubic feet (cu. ft.). These models consume the same amount of energy as older models that had less capacity. As with main refrigerators, an increasing proportion of secondary refrigerators had a capacity larger than 16.4 cu. ft.

When a refrigerator has a capacity greater than 16.4 cu. ft., it is classified in the large or very large refrigerator capacity category.

The proportion of main refrigerators with a large or very large capacity has steadily increased, from 49 percent in SHEU-1993 to 67 percent in SHEU-2003 (see Chart 7). In contrast, the proportion of secondary refrigerators with a large or very large capacity increased slightly, from 23 percent in SHEU-1993 to 26 percent in SHEU-1997, but then jumped in SHEU-2003 to 35 percent.

Chart 7

Percentage of Main and Secondary Refrigerators With a Capacity Greater Than 16.4 cu. ft.



Selected Appliances

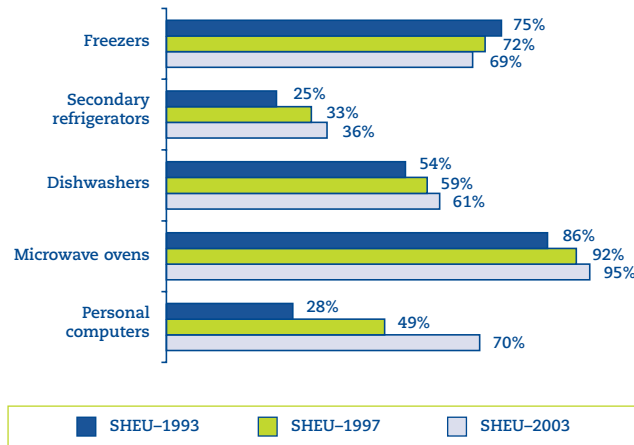
There has been a steady decline in the penetration rate for freezers, from 75 percent in SHEU-1993 to 69 percent in SHEU-2003 (see Chart 8 on page 7). This decline has coincided with an increase in the penetration rate of secondary refrigerators, from 25 percent in SHEU-1993 to 36 percent in SHEU-2003, and the previously discussed increase in the capacity of main and secondary refrigerators. Therefore, households seem to be slowly replacing freezers with additional and larger refrigerators, which include freezer sections.

⁸ Natural Resources Canada, *Energy Use Data Handbook – 1990 and 1997 to 2003*, Gatineau, 2005, p. 22.

⁹ Natural Resources Canada, *Energy Consumption of Major Household Appliances Shipped in Canada – Trends 1990-2003*, Gatineau, 2005, p. 9.

Chart 8

Penetration Rate of Selected Appliances



As was the case with secondary refrigerators, the penetration rates of many other appliances have increased over the 10 years since SHEU-1993. For example, the penetration rate of dishwashers in Canadian households has increased, from 54 percent to 61 percent. Also, the penetration rate for microwave ovens has increased, to the point where almost every household used a microwave oven in 2003. Additionally, there has been a dramatic increase in the penetration rate for personal computers, as it has risen from 28 percent to 70 percent.

Note: The results presented in this section excluded data from low-rise apartments. Unless otherwise stated, the analysis in the following sections covers the entire SHEU-2003 sample, which includes low-rise apartments.

The Stock of Dwellings in Canada

A dwelling is a living space that is structurally separate from others, with a private entry that permits access to the exterior of the building or to a stairwell or common corridor. There are many different types of dwellings across Canada with varying characteristics, such as size and year of construction. The interaction of these dwelling characteristics, along with other factors, influences the energy intensity level of a household.

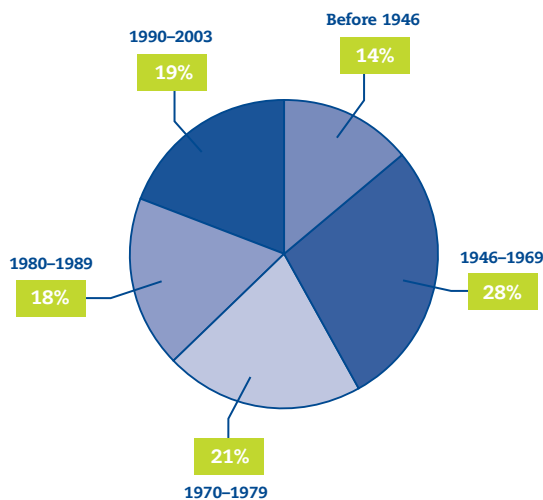
General Characteristics of Dwellings

Year of Construction

In 2003, almost 60 percent of Canadian residential dwellings were constructed after 1969 (see Chart 9). Among these dwellings, there was almost an equal proportion constructed in the seventies, in the eighties and from 1990 to 2003. As for dwellings built before 1970, only one third were built before 1946, while the remaining two thirds were built between 1946 and 1969.

Chart 9

Year of Construction of Dwellings



Year of construction is a determining factor in energy intensity analysis, which will be discussed later in this section of the report. Another determining factor in energy intensity analysis is the heated area of a dwelling.

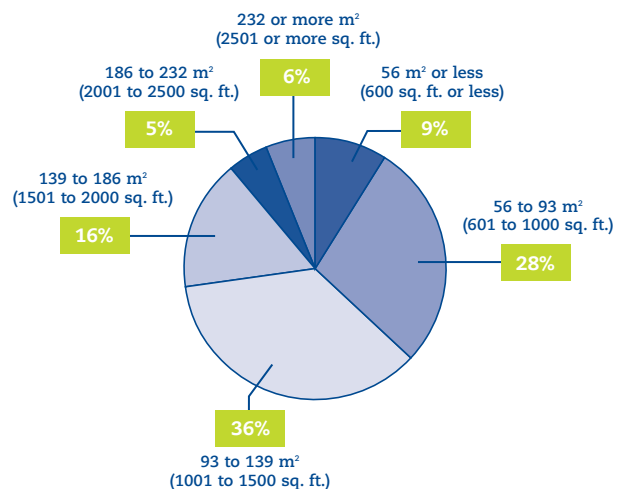
Heated Area

The heated area of a dwelling is defined as the total floor space of a dwelling excluding the basement and the garage.

SHEU-2003 found that 37 percent of dwellings had a heated area of less than 1001 sq. ft., and 36 percent had a heated area between 1001 and 1500 sq. ft. (see Chart 10). The remaining dwellings, which had a heated area larger than 1500 sq. ft., accounted for 27 percent of all dwellings. The average heated area of a Canadian dwelling was 1321 sq. ft.

Chart 10

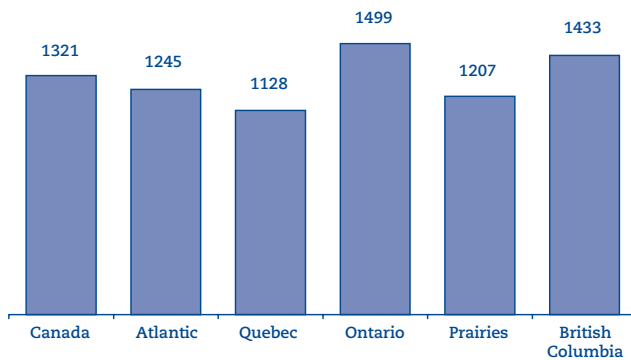
Heated Area of Dwellings



A regional analysis reveals that the average heated area of dwellings varied significantly by region in 2003 (see Chart 11).

Chart 11

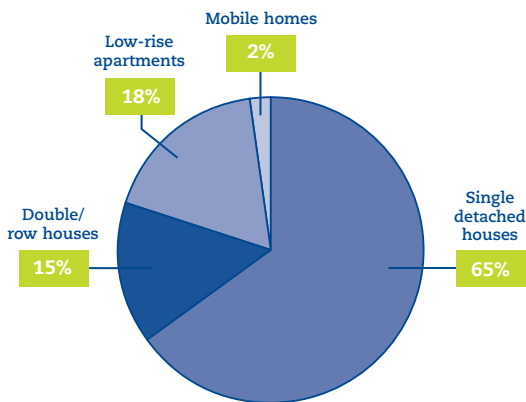
Heated Area by Region (sq. ft.)



Dwellings in Ontario had the largest average heated area at almost 1500 sq. ft. British Columbia dwellings had an average heated area of over 1400 sq. ft., while the average heated areas of dwellings in both the Atlantic region and the Prairies were over 1200 sq. ft. The only region where dwellings had an average heated area of less than 1200 sq. ft. was Quebec. This result was to be expected, given that the types of dwellings prevalent in Quebec differed greatly from those in the other regions in 2003. This will be discussed further in the following sub-section.

Chart 12

Dwelling Types of Households



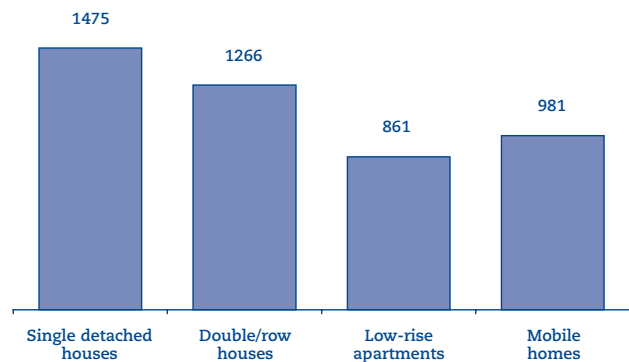
Dwelling Type

Across Canada in 2003, 65 percent of dwellings were single detached houses and 15 percent were double/row houses (see Chart 12). The remaining types of dwellings were low-rise apartments and mobile homes, which respectively accounted for 18 percent and 2 percent of all dwellings.

Typically, certain dwelling types have larger heated areas than other dwelling types. In 2003, the average heated area of a single detached house was 1475 sq. ft., and for a double/row house, it was 1266 sq. ft. (see Chart 13). These two types of dwellings were much larger than the average low-rise apartment (861 sq. ft.) and mobile home (981 sq. ft.).

Chart 13

Heated Area by Dwelling Type (sq. ft.)



Regionally, nearly half of all low-rise apartments across Canada were in Quebec. Since low-rise apartments were the dwelling type with the smallest average heated area, it was anticipated that Quebec would be the region with the smallest average heated area per dwelling.

Energy Intensity

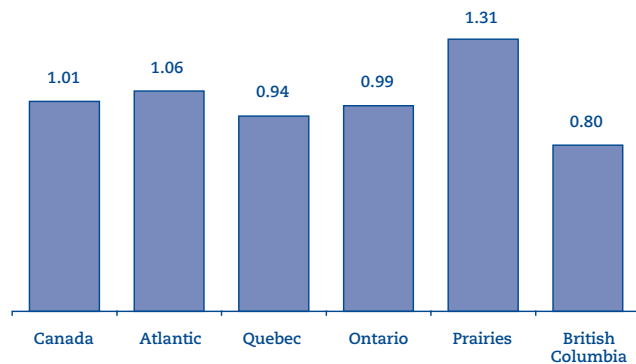
In this report, energy intensity is defined as the total amount of energy consumed per unit of heated area. It is expressed in gigajoules per square metre (GJ/m²). The energy intensity level of a household depends on the interaction of many factors. And although these factors are difficult to isolate and study individually, SHEU-2003 enables us to determine the main factors influencing energy consumption.

Regional Intensity

While the average household energy intensity levels of the Atlantic region (1.06 GJ/m²), Quebec (0.94 GJ/m²) and Ontario (0.99 GJ/m²) were relatively close to the Canadian average of 1.01 GJ/m², the same cannot be said for the Prairies and British Columbia (see Chart 14). The Prairies had the highest intensity of any region, with a ratio of 1.31 GJ/m². In contrast, the region with the lowest intensity was British Columbia, which had a ratio of 0.80 GJ/m².

Chart 14

Energy Intensity by Region (GJ/m²)



Many factors can be used to help explain these regional discrepancies, including differences in climate, types of energy used and general dwelling characteristics, such as year of construction, heated area and dwelling type.

Year of Construction

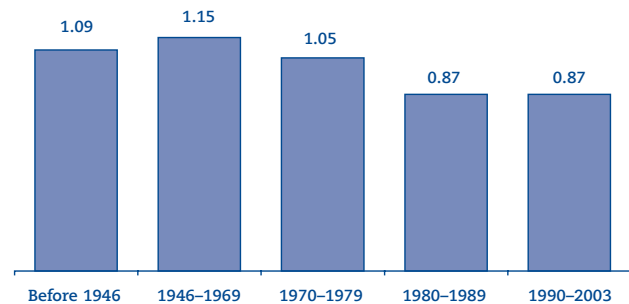
Construction standards, techniques and materials vary considerably over time and exert a direct impact on energy use. The influence of these construction factors on a dwelling’s energy use is evident when a comparison is made between the energy intensity ratios of dwellings built in different periods.

It is surprising to see in Chart 15 that dwellings built before 1946 had a lower energy intensity ratio (1.09 GJ/m²) than dwellings built during 1946–1969 (1.15 GJ/m²). A possible explanation is that dwellings

built before 1946 were at least 58 years old in 2003, so some of these dwellings have probably undergone some type of retrofit,¹⁰ which would have improved their energy efficiency.

Chart 15

Energy Intensity by Year of Construction (GJ/m²)



This unexpected outcome does not, however, hold true for dwellings built since 1945, as the more recently constructed dwellings had lower energy intensity ratios. This can be seen by observing the decline in the ratio, from 1.15 GJ/m² for dwellings built during 1946–1969 to 1.05 GJ/m² during 1970–1979 and to 0.87 GJ/m² during 1980–1989. The energy intensity ratio remained stable at the 1980–1989 level of 0.87 GJ/m² for dwellings constructed during 1990–2003. Therefore, dwellings constructed during 1980–1989 and 1990–2003 were, on average, the most energy-efficient dwellings built in Canada.

Heated Area

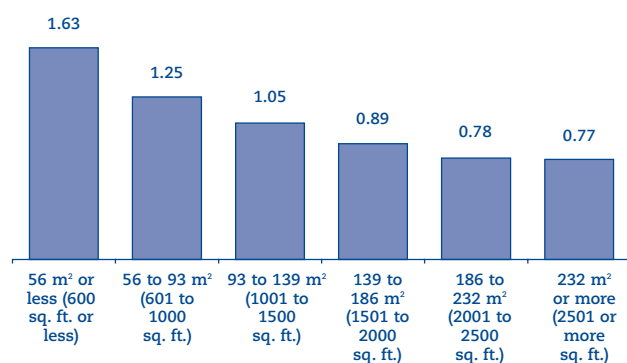
Based on SHEU–2003 data, the energy intensity of a dwelling decreases as its heated area increases. This negative relationship between heated area and intensity is evident when dwellings are divided into categories based on their heated area, and the average intensities of dwellings within each category are compared.

¹⁰ A retrofit is any type of improvement of efficiency of energy-consuming appliances or thermal characteristics of the dwelling.

Dwellings in the smallest heated area category (less than 56 m²) had the highest energy intensity, with a ratio of 1.63 GJ/m² (see Chart 16). If the heated area is increased to the next category (56 m² to 93 m²) the intensity declines to a ratio of 1.25 GJ/m². This trend of increasing heated area and declining intensity continues to the largest heated area category (more than 232 m²) which had the lowest intensity with a ratio of 0.77 GJ/m².

Chart 16

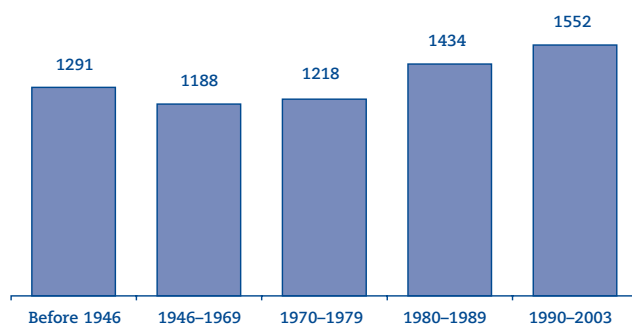
Energy Intensity by Heated Area (GJ/m²)



One reason for this negative relationship between the heated area of a dwelling and its energy intensity level is that many energy-consuming products, such as refrigerators, are considered necessities and are used by a high proportion of households regardless of their heated area. Obviously, these types of products have a greater impact on the energy intensity ratio of a smaller dwelling than a larger dwelling, since there is less heated area in a smaller dwelling.

Chart 17

Average Heated Area by Year of Construction (sq. ft.)



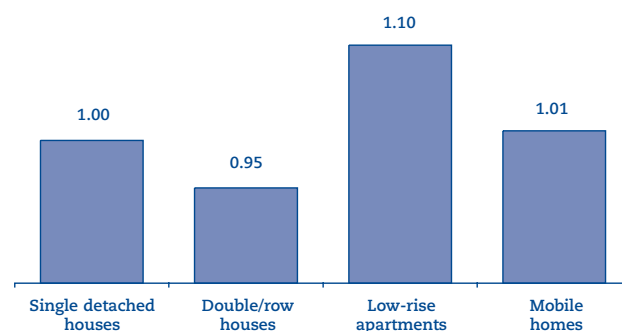
Another possible explanation for the decline in energy intensity ratios with an increase in heated area is the tendency for larger dwellings to have been constructed during the most recent periods, which were 1980–1989 or 1990–2003 (see Chart 17). And, as previously discussed in this section, dwellings constructed during these periods were, on average, the most energy-efficient dwellings built in Canada.

Dwelling Type

Since the average low-rise apartment and mobile home had smaller heated areas than the other dwelling types, and given that smaller dwellings generally had higher energy intensity ratios than larger dwellings, it is not surprising that low-rise apartments and mobile homes were the dwelling types with the highest intensity ratios, at 1.10 GJ/m² and 1.01 GJ/m² respectively (see Chart 18).

Chart 18

Energy Intensity by Dwelling Type (GJ/m²)



Also, as shown in Chart 18, it is not unexpected that double/row houses had a lower intensity ratio (0.95 GJ/m²) than single detached houses (1.00 GJ/m²). This is because a double/row house has at least one common wall with another house. A common wall reduces a dwelling's exposure to the exterior and enables a house to share heat with the adjacent house, therefore permitting a house to reduce its own energy consumption.

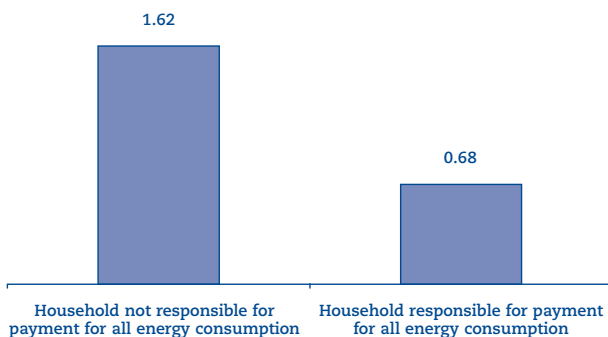
Given that low-rise apartments normally have at least two common walls, it could be considered surprising that this type of dwelling had the highest energy intensity ratio. However, other factors, such as the previously mentioned average heated area of low-rise apartments, may have diminished the influence of common walls on reducing the energy intensity level of low-rise apartments. Another factor may have been that only 32 percent of low-rise apartments were constructed since 1980, which was the lowest percentage among the dwelling categories.

It can be concluded that being responsible for paying for its energy consumption may also be a factor affecting a household’s energy intensity level. The interaction of this factor with the energy-efficient practices of a household and the other factors previously discussed – such as regional climate, energy sources used, dwelling type, year of construction and heated area of a dwelling – influence the energy intensity level of a household.

An additional factor that may have influenced the high energy intensity ratio of low-rise apartments in 2003 was payment for energy consumed (see Chart 19). Low-rise apartments where someone other than the occupant (e.g. a landlord) was responsible for paying for at least one of the dwelling’s energy sources had an energy intensity ratio of 1.62 GJ/m².¹¹ This was in stark contrast to the energy intensity ratio of 0.68 GJ/m² for low-rise apartments where the household was responsible for paying for all of its energy consumption. This suggests that a household may have been more conscious of its energy efficiency if it was responsible for paying for all of its energy consumption.

Chart 19

Energy Intensity Among Low-Rise Apartments by Responsibility for Payment for Energy Consumption (GJ/m²)



¹¹ In cases where a low-rise apartment used a central heating system, the energy consumed by the apartment was an estimate based on the total energy consumption of the entire apartment building. Please refer to the methodological section of the 2003 Survey of Household Energy Use – Detailed Statistical Report for more information.

The Thermal Envelope

The thermal envelope is the shell of a dwelling that protects us from the elements; it comprises the basement walls and floor, the above-grade walls, the roof and the windows and doors. To maintain our indoor environment, the envelope must control the flow of heat, air and moisture from the inside of the dwelling to the outdoors.

Insulation of the Thermal Envelope

Insulation wraps a dwelling in a layer of material that slows the rate at which heat is lost to the outdoors. And since heat flows from warmer to colder areas, it is important to insulate the entire thermal envelope. This includes the basement / crawl space, attic / crawl space and attached garage.

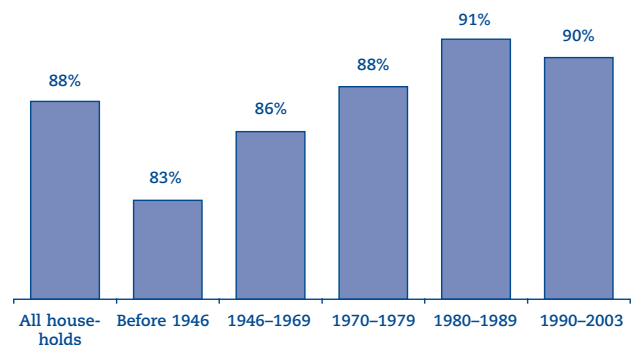
As reported in the “Trends in Household Energy Use” section of this report, each version of SHEU found fewer dwellings in Canada with no insulation in their basements / crawl spaces. Therefore, Canadian households’ awareness of the importance of insulating their basements seems to be increasing. The same type of awareness also appears to be increasing for attics / crawl spaces.

In 2003, nearly 90 percent of attics / crawl spaces across Canada were insulated (see Chart 20). This result does not vary greatly based on the year of construction of dwellings. Nevertheless, there is a noticeable upward trend from dwellings built before 1946 (83 percent of attics / crawl spaces were insulated) until 1980–1989 (91 percent of attics / crawl spaces were insulated). The proportion of attics / crawl spaces that were insulated then declined slightly to 90 percent for dwellings constructed during 1990–2003.

Although SHEU–2003 found that the vast majority of basements / crawl spaces and attics / crawl spaces were insulated, the same cannot be said for garages attached to dwellings. Only 54 percent of dwellings with an attached garage had an insulated garage in 2003.

Chart 20

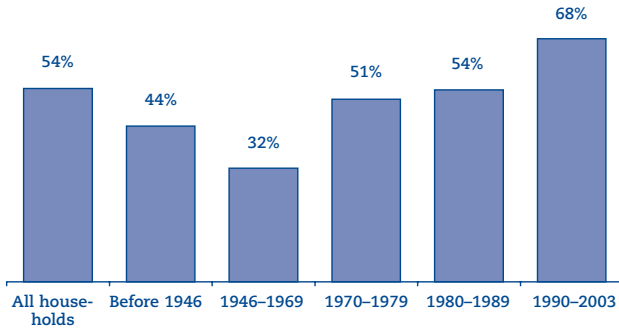
Proportion of Attics / Crawl Spaces That Were Insulated, by Year of Construction



It is important to insulate an attached garage because heat moves in any direction – up, down or sideways – as long as it is moving from a warm spot to a colder one. For example, a heated room over a garage will lose heat through the floor. Awareness of this fact seems to be increasing as dwellings with attached garages constructed during the most recent period, 1990–2003, were most apt to have an insulated garage (see Chart 21 on page 14). Moreover, the majority of dwellings with attached garages constructed after 1969 had insulated garages. Conversely, only 34 percent of dwellings with attached garages constructed before 1970 had insulated garages. The significance of these results is magnified by the increasing trend for dwellings to be constructed with attached garages instead of separate garages.

Chart 21

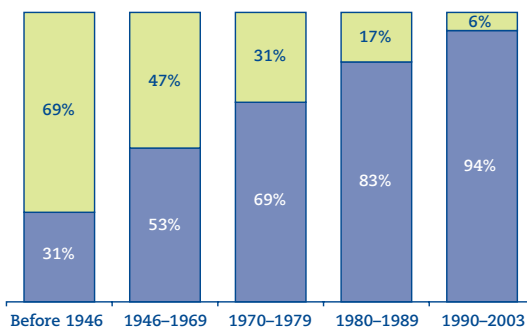
Proportion of Attached Garages That Were Insulated, by Year of Construction



Only 31 percent of dwellings with garages constructed before 1946 had an attached garage (see Chart 22). This percentage has dramatically increased in each successive period, peaking at 94 percent for dwellings constructed during 1990-2003. Therefore, with an increasing number of recently constructed dwellings having attached garages, it is imperative that the awareness of the importance of insulating attached garages also continues to grow.

Chart 22

Type of Garage Among Dwellings With a Garage, by Year of Construction



■ Attached ■ Not attached

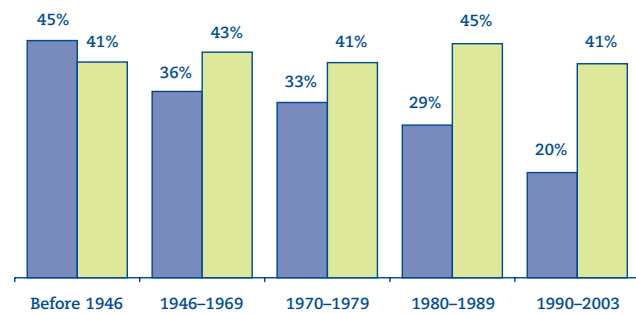
Windows

Windows can be responsible for unnecessary heat loss, high energy consumption and cold drafts and can be subject to condensation problems. SHEU-2003 data show that there is a link between a dwelling's

year of construction and air leaks or drafts around windows (see Chart 23). Older dwellings were more prone to have air leaks or drafts around windows than more recently constructed dwellings. The percentage of dwellings reporting air leaks or drafts around windows decreased in each successive period, from dwellings built before 1946 (45 percent) up until 1990-2003 (20 percent).

Chart 23

Percentage of Dwellings With Window Drafts and Condensation Problems, by Year of Construction



■ Air leaks or drafts around windows ■ Condensation on the inside surfaces of windows

Another problem associated with windows is condensation. Condensation problems on the inside surfaces of windows were reported by 42 percent of Canadian households. However, unlike air leaks and draft problems, condensation problems do not appear to be linked with the year of construction of the dwelling, as a comparable percentage of dwellings constructed in each period reported this problem.

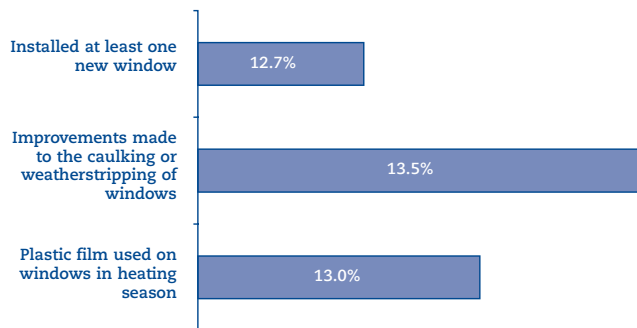
Condensation on the inside surfaces of windows can be the result of moisture problems and/or air leakage problems. Moisture problems can lead to window-frame damage and mould, while air leakage problems can lead to excessive heat loss and energy consumption. Moisture problems caused by excessive humidity levels can arise from poor ventilation within the dwelling. Ventilation can be improved with the use of an air exchanger, which will be discussed in the "Air Conditioning and Ventilation of Households" section of this report.¹² Air leakage problems can be addressed by installing new

¹² Natural Resources Canada, *Keeping the Heat In – EnerGuide*, p. 120.

windows or adding weatherstripping and caulking.¹³ In 2003, about 13 percent of households installed at least one new window, and about 14 percent made improvements to the weatherstripping or caulking on at least one of their windows (see Chart 24). These measures can help reduce air leakage and draft problems and reduce a household's energy consumption. Another way to improve the energy efficiency of a dwelling's windows is to put up plastic film on the windows during the heating season. This is an inexpensive and easy way to improve the heat retention of a dwelling and also reduce window condensation.¹⁴ SHEU-2003 found that 13 percent of Canadian households did this in 2003.

Chart 24

Percentage of Households That Made an Energy Efficiency Window Improvement in 2003, by Type of Improvement



Energy Efficiency Improvements

Homeowners and landlords / property managers were asked if they made any improvements to their dwelling that reduced energy consumption in 2003. Possible energy efficiency improvements included improvements to the following:

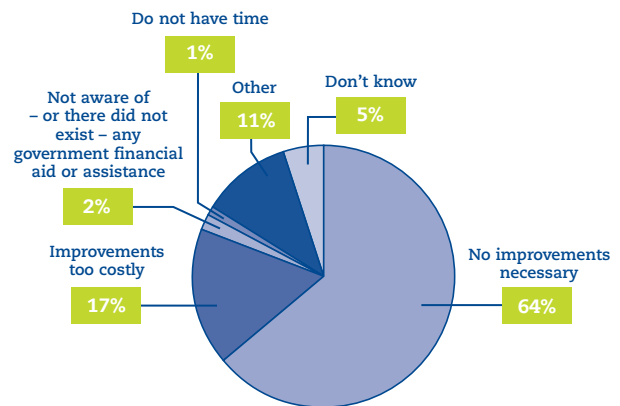
- the roof structure or surface
- the exterior wall siding
- the insulation of the roof or attic
- the insulation of the basement or crawl space walls
- the insulation of any exterior walls (excluding the basement)
- the foundation
- the heating equipment
- the ventilation or air-conditioning equipment

The survey found that 15 percent of dwellings underwent at least one of these energy efficiency improvements, and 40 percent of these dwellings underwent multiple improvements in 2003. Additionally, there were plans for 16 percent of Canadian dwellings to go through at least one of these improvements in 2004.

Among homeowners and landlords / property managers who did not make any improvements in 2003 and were not planning on making any improvements in 2004, the majority of them (64 percent) stated that improvements were not necessary (see Chart 25). Another 17 percent said that improvements were too costly, and 2 percent said they were not aware of – or there did not exist – any available government aid or assistance for the improvements.

Chart 25

Reasons for Not Making Any or Not Planning On Making Any Improvements in 2003 or 2004



¹³ Natural Resources Canada, *Improving Window Energy Efficiency (fact sheet) – EnerGuide for Houses*, Ottawa, 2004, p. 3.

¹⁴ Natural Resources Canada, *Keeping the Heat In – EnerGuide*, p. 109.

Residential Heating

Households use energy primarily for space and water heating, space cooling, the operation of appliances and lighting. Of these activities, space heating utilizes the most energy in the residential sector. It accounted for 60 percent of the total residential energy consumed in 2003.¹⁵

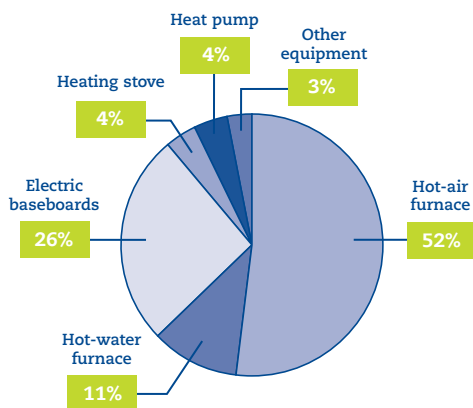
As a result, SHEU-2003 examined the types of heating equipment used by households, as well as the characteristics of the equipment, usage tendencies, supplementary heating equipment and prevalence of energy-saving heating equipment.

Main Heating Systems

In 2003, the majority of Canadian households, 63 percent, used a furnace as their main heating system (see Chart 26). Over 80 percent of these furnaces were hot-air systems, and the remaining furnaces were hot-water systems. Among the other types of heating systems used by Canadian households, electric baseboards were the most popular, with a penetration rate of 26 percent. The rest of the market was divided among heating stoves (4 percent), heat pumps (4 percent) and other equipment (3 percent).

Chart 26

Main Heating System of Households



A regional analysis reveals that each region, with the exception of the Atlantic region, had one type of

heating system that the majority of households used in 2003 (see Chart 27). In Quebec, electric baseboards were used by over 60 percent of households for their main heating system. In regions west of Quebec, the majority of households used hot-air furnaces. In contrast to these regions where the majority of households used one specific type of system, the Atlantic region had an almost equal proportion of households using electric baseboards (33 percent) or hot-air furnaces (31 percent) to heat their dwellings.

Chart 27

Main Heating System by Region

Region	Heating System	Penetration Rate
Atlantic	Electric baseboards	33%
	Hot-air furnace	31%
Quebec	Electric baseboards	61%
Ontario	Hot-air furnace	76%
Prairies	Hot-air furnace	82%
British Columbia	Hot-air furnace	50%

Energy Source for Heating

The regional differences observed with main heating systems are once again found with the energy source used by heating systems, as each region, again with the exception of the Atlantic region, had one energy source in particular that the majority of households used (see Chart 28 on page 17). In Quebec, electricity was used by almost 75 percent of households to power their main heating system. In regions west of Quebec, the majority of households used natural gas. And once again, in contrast to the other regions where the majority of households used one specific heating energy source, the Atlantic region had an almost equal proportion of households using oil (39 percent) or electricity (38 percent) as their main heating energy source.

¹⁵ Natural Resources Canada, *Energy Use Data Handbook – 1990 and 1997 to 2003*, p. 22.

Chart 28

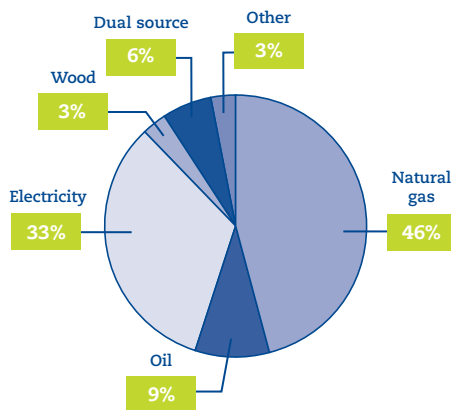
Main Heating System by Region

Region	Energy Source	Penetration Rate
Atlantic	Oil	39%
	Electricity	38%
Quebec	Electricity	73%
Ontario	Natural gas	68%
Prairies	Natural gas	78%
British Columbia	Natural gas	52%

For Canada as a whole, more households used natural gas to run their main heating system (46 percent) than any other energy source (see Chart 29). Other sources used by households for their main heating system were electricity, used by 33 percent of households; oil, used by 9 percent; and wood, used by 3 percent. Additionally, 6 percent of households used a combination of two sources of energy to power their main heating system. Over 50 percent of these dual-heating-source households used a combination of electricity and natural gas.

Chart 29

Main Energy Source for Household Heating



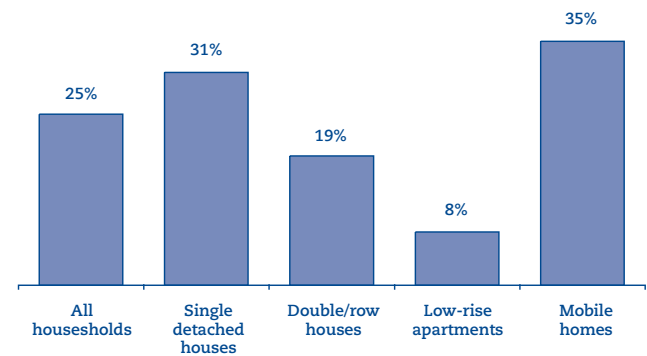
Supplementary Heating

One quarter of Canadian households used a secondary heating system to complement their main heating system during 2003 (see Chart 30). Interestingly, over 80 percent of these households which used a supplementary heating system did not have any common walls with another dwelling. As

was previously discussed in “The Stock of Dwellings in Canada” section, a common wall can reduce the demand on a household’s main heating system and, therefore, its need for supplementary heating. This relationship can be observed by comparing the penetration rates of supplementary heating systems for dwellings with and without common walls.

Chart 30

Penetration Rate of Supplementary Heating Systems by Dwelling Type

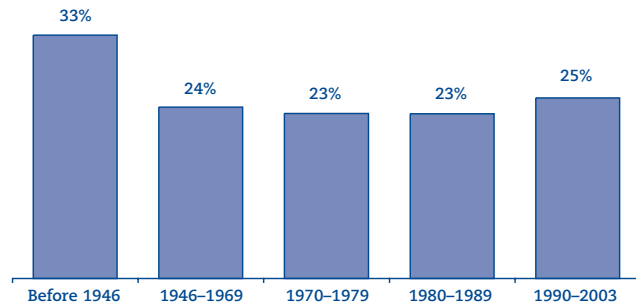


Dwellings without any common walls, such as single detached houses and mobile homes, had high penetration rates for supplementary heating systems (31 percent and 35 percent respectively). Double/row houses, which normally have at least one common wall, had a lower penetration rate (19 percent) and low-rise apartments, which normally have at least two common walls, had the lowest penetration rate (8 percent).

Another relationship that could be assumed is that the need for supplementary heating systems would diminish for more recently constructed dwellings since the quality of construction materials and practices, dwelling insulation and main heating systems have all improved over time. As shown in Chart 31 (on page 18), this assumption is accurate when the penetration rate of supplementary heating systems for dwellings built before 1946 (33 percent) is compared with the rate for dwellings constructed during 1946–1969 (24 percent). However, this assumption does not hold true for dwellings built since 1946, as their penetration rate has remained steady (around 25 percent).

Chart 31

Penetration Rate of Supplementary Heating Systems by Year of Construction



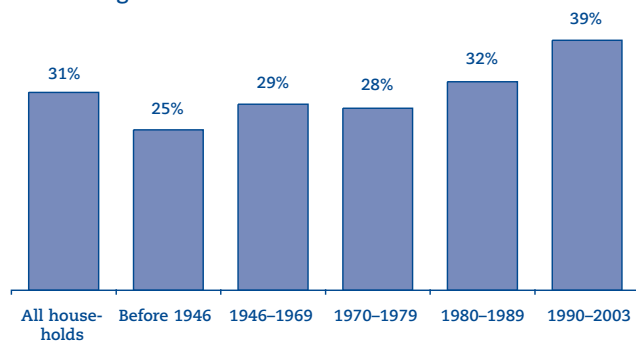
Energy-Conserving Heating Equipment

Programmable Thermostats

Programmable thermostats automatically adjust a dwelling’s temperature setting, allowing households to save energy while they are away or sleeping. This energy-saving technology has become more common among Canadian households that have control over their dwelling’s temperature (see Chart 32). The penetration rate for programmable thermostats has increased, from 28 percent for dwellings with temperature control that were constructed during 1970–1979 to 32 percent for those built during 1980–1989 and finally peaking at 39 percent for those built during 1990–2003. This emerging trend has resulted in 31 percent of all Canadian households with temperature control using this technology in 2003.

Chart 32

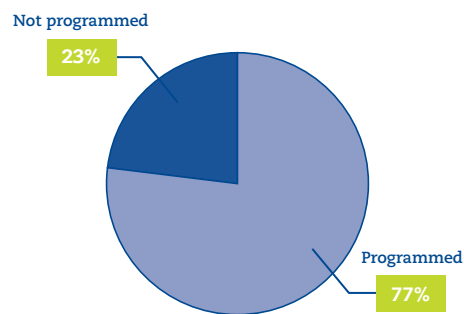
Penetration Rate of Programmable Thermostats Among Households With Temperature Control, by Year of Dwelling Construction



Even though this increasing penetration rate is beneficial towards reducing total residential energy consumption, its effects are somewhat diminished since nearly one out of every four programmable thermostats was not programmed in 2003 (see Chart 33). A programmable thermostat must be programmed in order to realize its full energy-saving potential.

Chart 33

Proportion of Programmable Thermostats That Were Programmed



Condensing Furnaces

Condensing furnaces are the most energy-efficient furnaces available on the market today. This is especially true if their energy source is natural gas or propane, as these furnaces can use 33 percent to 38 percent less energy than old furnaces and 10 percent less energy than a standard-efficiency furnace.¹⁶ Conversely, a condensing oil furnace has the potential to be only marginally more efficient than a well-designed mid-efficiency oil furnace.¹⁷ In 2003, condensing furnaces were used in 37 percent of all households that used a furnace fuelled by natural gas, propane or heating oil.

Since these high-efficiency furnaces are a relatively new technology – having appeared on the Canadian market over the last 20 years¹⁸ – it is not at all unexpected to see that the penetration rate for this technology was higher for recently built dwellings (see Chart 34 on page 19). The penetration rate among dwellings constructed during 1990–2003 that used a natural gas, propane or oil furnace was 62 percent. This was extremely high compared with

¹⁶ Natural Resources Canada, *Choose the Right Condensing Gas Furnace (fact sheet)* – EnerGuide, Ottawa, 2003, p. 1.

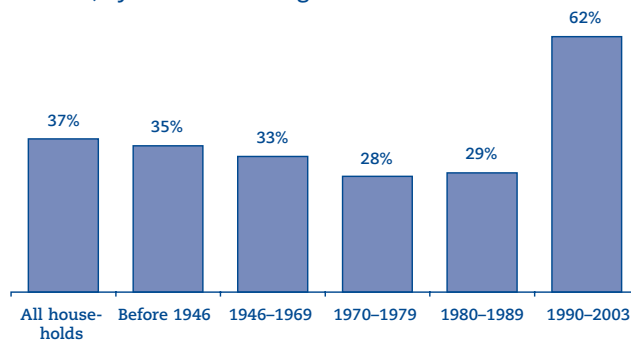
¹⁷ Natural Resources Canada, *Heating with Oil* – EnerGuide, Gatineau, 2004, p. 35.

¹⁸ Natural Resources Canada, *Heating with Gas* – EnerGuide, Ottawa, 2004, p. 32.

dwellings constructed during 1970–1979 and 1980–1989, which had penetration rates of 28 percent and 29 percent respectively. Given these results, it is interesting to note that dwellings constructed before 1946 and during 1946–1969 also had higher penetration rates (35 percent and 33 percent respectively) than those constructed during 1970–1979 and 1980–1989. A possible explanation for this finding is that furnaces in older dwellings have likely been replaced in recent years, and a condensing furnace can easily be installed as an energy-efficient replacement.

Chart 34

Penetration Rate of Condensing Furnaces Among Households That Used a Natural Gas, Propane or Oil Furnace, by Year of Dwelling Construction



Air Conditioning and Ventilation of Households

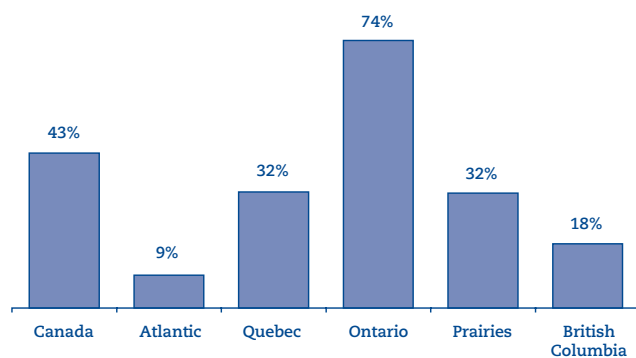
From 1993 to 2003, the energy consumed in the residential sector for space cooling has more than doubled.¹⁹ Furthermore, as previously reported in the “Trends in Household Energy Use” section of this report, there has been a noticeable increase in the penetration rate of air-conditioning systems in Canadian households over the same period. Because of these trends, SHEU-2003 collected information on the characteristics and usage tendencies of residential air-conditioning and ventilation systems.

Air-Conditioning Systems – Regional Analysis

Almost 45 percent of Canadian households were equipped with some type of air-conditioning system in 2003 (see Chart 35). Options available to consumers for air-conditioning their dwellings include window/room air conditioners, central air conditioners and heat pumps. Within Canada, there were significant regional differences in the penetration rates of air-conditioning systems. As expected, the regions with the warmest summers – Quebec, Ontario and the Prairies – also had the highest penetration rates for air-conditioning systems.

Chart 35

Penetration Rate of Air-Conditioning Systems by Region



Nearly three out of every four households in Ontario were equipped with an air-conditioning system in 2003. These systems accounted for 60 percent of all the residential air-conditioning systems in Canada.

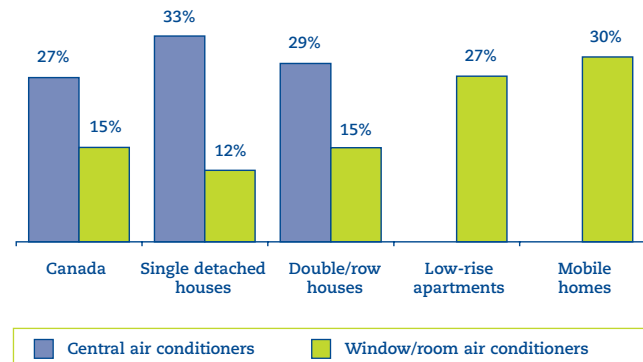
Other regions had much lower penetration rates. Both Quebec and the Prairies had rates of 32 percent, while 18 percent of households in British Columbia and 9 percent of households in the Atlantic region were equipped with an air-conditioning system.

Types of Air-Conditioning Systems

Central air-conditioning systems were the most prevalent type of air-conditioning system in Canadian households (see Chart 36). Over 25 percent of households were equipped with a central system in 2003. Window/room air conditioners were also commonly used in households, as 15 percent of households were equipped with this type of system. The third type of air-conditioning system – heat pumps – was not as prevalent across the country. Only 4 percent of households were equipped with one, and three quarters of these households were

Chart 36

Penetration Rate of Central and Window/Room Air-Conditioning Systems by Dwelling Type



¹⁹ Natural Resources Canada, *Energy Use Data Handbook – 1990 and 1997 to 2003*, p. 22.

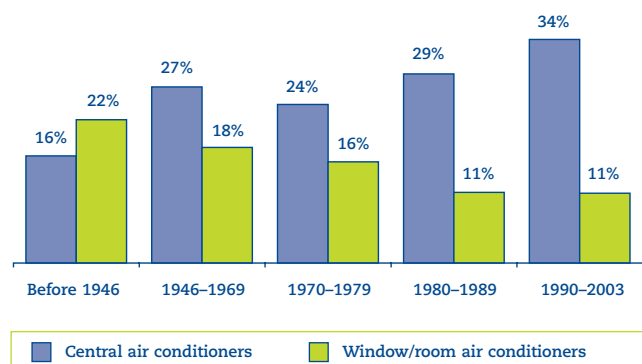
also equipped with either a central or window/room air conditioner. Given these findings, further analysis will deal only with central and window/room air-conditioning systems.

Usually, central air conditioners are used to cool an entire dwelling, while window/room air conditioners are used to cool a small space. SHEU-2003 found that this generality was valid, as central air conditioners were more prevalent in larger dwellings, such as single detached or double/row houses, while window/room air conditioners were more prevalent in smaller dwellings, such as low-rise apartments and mobile homes.

Additionally, the year of construction of a dwelling also appears to influence the type of air-conditioning system likely to be found within that dwelling (see Chart 37). The penetration rate for central air-conditioning systems has generally increased in dwellings constructed in each successive period, peaking at 34 percent for dwellings constructed during 1990–2003. In contrast, the penetration rate for window/room air conditioners has steadily decreased, from 22 percent for dwellings constructed before 1946 to 11 percent for dwellings constructed during 1980–1989. The rate remained stable at 11 percent for dwellings constructed during 1990–2003.

Chart 37

Penetration Rate of Central and Window/Room Air-Conditioning Systems by Year of Construction



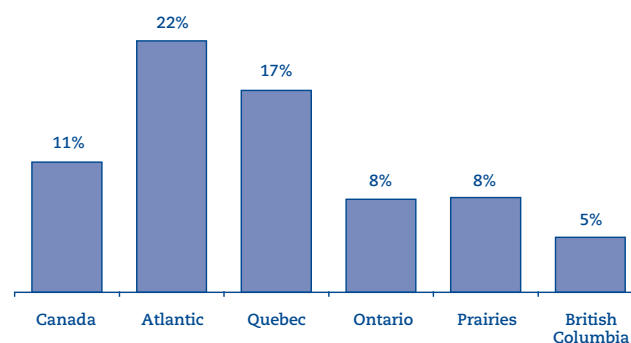
Central Ventilation Systems

Central ventilation systems, also known as air exchangers, can improve a dwelling's indoor air quality and reduce indoor humidity levels.²⁰ Despite these benefits, only 11 percent of dwellings were equipped with a central ventilation system in 2003.

A regional analysis found that the penetration rates for these systems were highest in regions east of Ontario, as 22 percent of dwellings in the Atlantic region and 17 percent of dwellings in Quebec were equipped with a system (see Chart 38). Conversely, Ontario, the Prairies and British Columbia had much lower penetration rates, at 8 percent, 8 percent and 5 percent respectively.

Chart 38

Penetration Rate of Central Ventilation Systems by Region



²⁰ Natural Resources Canada, *Moisture Problems (fact sheet) – EnerGuide for Houses*, Ottawa, 2003, p. 4.

Household Appliances

The operation of appliances is an important use of energy in the residential sector. As a result, SHEU-2003 examined the prevalence and characteristics of appliances in Canadian households during 2003.

Major Appliances

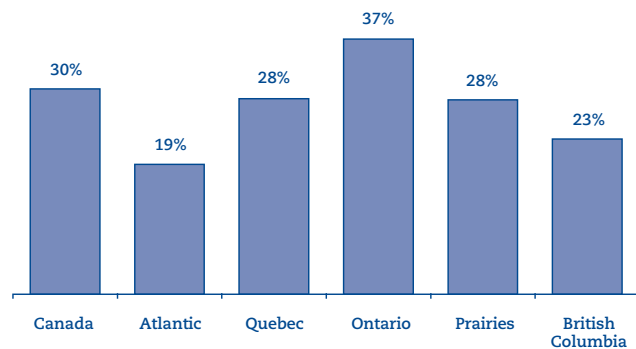
In 2003, major appliances²¹ accounted for 62 percent of all the energy used by appliances in the residential sector.²² Therefore, it was important that SHEU-2003 obtain information on the characteristics and usage of these appliances in Canadian households.

Refrigerators

Almost every household in Canada used a refrigerator in 2003, and 30 percent of all households used at least two refrigerators. A regional analysis shows that the percentage of households that used more than one refrigerator varied widely by region (see Chart 39). The results ranged from 19 percent of households in the Atlantic region to 37 percent of households in Ontario.

Chart 39

Percentage of Households That Used More Than One Refrigerator, by Region



The characteristics of the average main and secondary refrigerator also varied widely. A household's main refrigerator had an average age of 9.6 years, and the majority of these refrigerators (54 percent) had a capacity between 16.5 and 20 cu. ft. Secondary refrigerators had an average age of

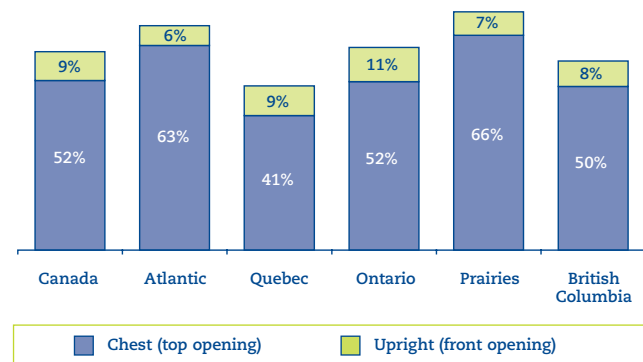
17.9 years and an equal probability of having a capacity between 16.5 and 20 cu. ft. (33 percent), 12.5 and 16.4 cu. ft. (34 percent) and less than 12.5 cu. ft. (31 percent).

Freezers

In 2003 the Atlantic region and the Prairies had penetration rates of freezers (69 percent and 73 percent respectively) well above the Canadian penetration rate of 61 percent (see Chart 40). These regions also had the highest penetration rates of chest freezers as the household's main freezer.

Chart 40

Penetration Rate of Freezers by Type, by Region



Chest freezers are generally more energy efficient than upright models. That is because lifting the door on a chest unit releases less cold air. Open the door to an upright freezer, however, and the cold air flows down and out.

Among households in the Atlantic and Prairie regions that used a freezer in 2003, over 90 percent used a chest freezer as their primary freezer.

²¹ "Major appliances" includes refrigerators, freezers, ranges, dishwashers, clothes washers and clothes dryers.

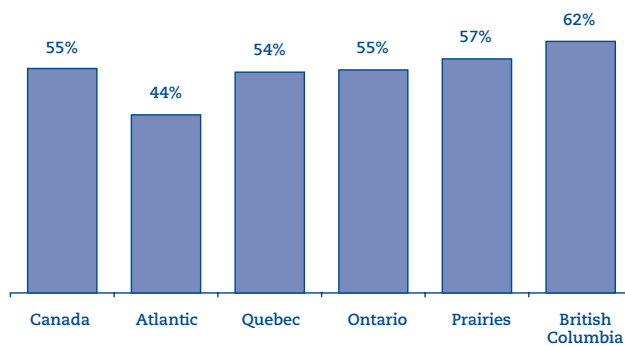
²² Natural Resources Canada, *Energy Use Data Handbook – 1990 and 1997 to 2003*, p. 22.

Dishwashers

SHEU-2003 data found that 55 percent of Canadian households used a dishwasher in 2003. A region-by-region analysis reveals that British Columbia had the highest penetration rate of dishwashers at 62 percent (see Chart 41). The Atlantic region had the lowest penetration rate at 44 percent, while the other regions had penetration rates that were close to the Canadian rate of 55 percent.

Chart 41

Penetration Rate of Dishwashers, by Region



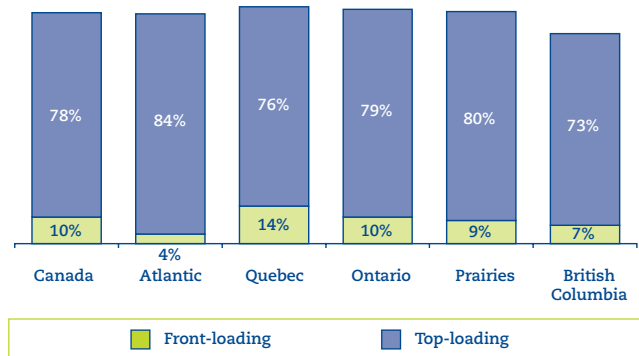
It is interesting to note that British Columbia was also the region with the highest penetration rate for compact dishwashers. A compact dishwasher is much smaller than a standard-size dishwasher as it only has a capacity of less than eight place settings and six serving pieces. Almost 8 percent of dishwashers used by households in British Columbia during 2003 were compact dishwashers. This high percentage of compact dishwashers in British Columbia may have contributed to the region also having the highest frequency of dishwasher use in Canada. Seventy percent of British Columbia households that used a dishwasher washed more than two loads of dishes in an average week.

Clothes Washers

Although the regional penetration rates of clothes washers did not diverge greatly from the Canadian rate of 88 percent (see Chart 42), the penetration rate of front-loading machines varied significantly from region to region, with a high of 14 percent in Quebec and a low of 4 percent in the Atlantic region.

Chart 42

Penetration Rate of Clothes Washers by Type, by Region



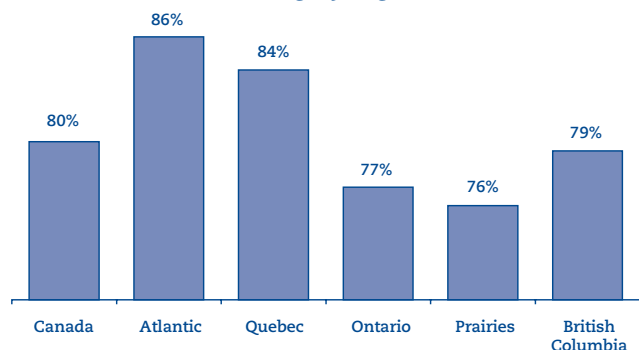
Both types of clothes washers – front-loading and top-loading – have about the same capacity; however, front-loading washers use about 40 percent less water per load and 50 percent less energy than top-loading washers. Front-loading machines also use less detergent.²³

Even though the penetration rates for energy-efficient clothes washers varied greatly between Quebec and the Atlantic region, the energy-efficient clothes washing habits of these regions were quite similar.

An energy-efficient way to use a clothes washer is to rinse with cold water, since clothes rinsed in cold water come out just as clean as those rinsed in warm.²⁴ The Atlantic region and Quebec were the regions where the highest percentage of households with a clothes washer rinsed with cold water, at 86 percent and 84 percent respectively (see Chart 43).

Chart 43

Percentage of Households With a Clothes Washer That Used Cold Water for Rinsing, by Region



²³ Natural Resources Canada, *EnerGuide Appliance Directory 2005*, Gatineau, 2005, p. 192.

²⁴ Natural Resources Canada, *EnerGuide Appliance Directory 2005*, p. 193.

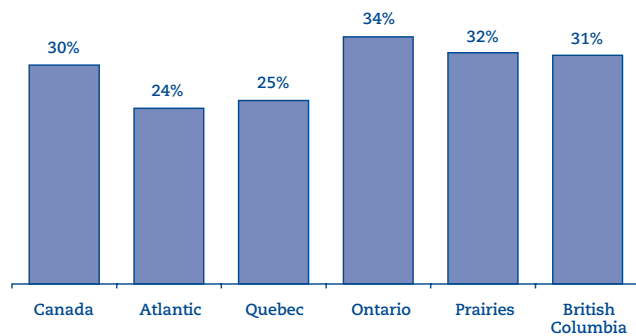
Clothes Dryers

Many new technologies are available in the Canadian market to help households reduce energy consumption. One such technology is a moisture detector, which is a sensor that automatically shuts off a clothes dryer as soon as the clothes are dry.

In 2003, 30 percent of households across Canada that used a clothes dryer within their household used a clothes dryer with a moisture detector (see Chart 44).

Chart 44

Penetration Rate of Moisture Detectors Among Households With a Clothes Dryer, by Region

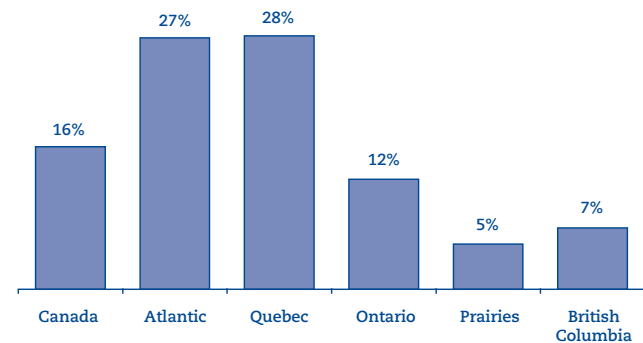


And while the Atlantic region and Quebec were the regions with the lowest penetration rates among households with a clothes dryer for this new energy-saving technology, 24 percent and 25 percent respectively, they were able to compensate for this lack of energy efficiency through a decrease in their seasonal clothes-drying energy consumption.

Over one quarter of households in the Atlantic and Quebec regions that used a clothes dryer within their dwelling in 2003 did not use their clothes dryer during an average week in the summer of 2003 (see Chart 45). Only 9 percent of households in other regions that used a clothes dryer in their dwelling in 2003 did not use their clothes dryer during an average week that summer.

Chart 45

Percentage of Households That Did Not Use Their Clothes Dryer During an Average Week in the Summer, by Region



Other Appliances

The energy used to power other appliances²⁵ in the residential sector increased by 63 percent from 1990 to 2003. This represents a large increase, especially when compared with the 12 percent decrease in energy used to power major appliances in the residential sector over the same period.²⁶ Since the energy used by other appliances increased at such a rapid rate in the residential sector in recent years, it is important to identify which of these other appliances were most prevalent in Canadian households in 2003.

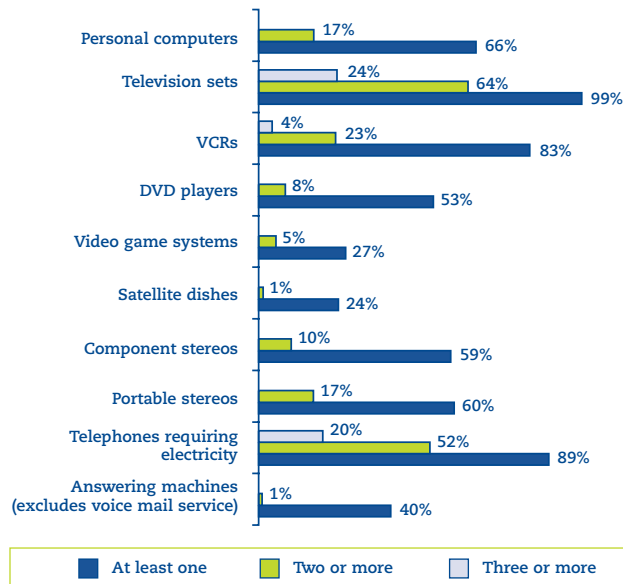
Television sets had the highest penetration rate of all appliances included in the other appliances category, as almost every Canadian household used at least one television set in 2003 (see Chart 46 on page 25). Furthermore, nearly 65 percent of households used a least two televisions sets, and almost one quarter of households used at least three sets in 2003. No other appliance covered by SHEU-2003 had a higher probability of a household using at least three of them in 2003.

²⁵ Other appliances” includes small appliances, such as television sets, VCRs, DVD players, stereos and personal computers.

²⁶ Natural Resources Canada, *Energy Use Data Handbook – 1990 and 1997 to 2003*, p. 22.

Chart 46

Penetration Rates of Selected Energy-Consuming Appliances



Not surprisingly, given the high penetration rate of television sets, appliances that operate in conjunction with a television set also had high penetration rates. More than 80 percent of households used at least one VCR, and more than a quarter of these households used at least two VCRs. Also, over 50 percent of households used at least one DVD player, and about a quarter of households used at least one satellite dish. Additionally, more than one quarter of households used at least one video game system in 2003, and 20 percent of these households used two or more of these systems.

Other appliances that are not associated with television sets also had high penetration rates in 2003. Telephones requiring electricity had a penetration rate in Canadian households of 89 percent in 2003, and nearly 60 percent of these households used at least two of these telephones. In addition, the penetration rate of answering machines, excluding voice mail services, was 40 percent for households. And stereos were also popular in 2003, as both component and portable stereos had penetration rates around 60 percent.

Hot Water

In a typical Canadian home, water heating is the second biggest energy user, after space heating. In fact, water heating accounted for more than 20 percent of residential energy usage in 2003.²⁷ Therefore, it was important for SHEU–2003 to examine the characteristics of water-heating equipment and the prevalence of water conservation devices within households.

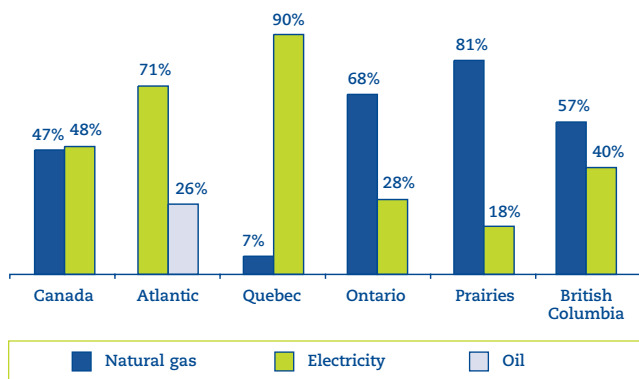
Water Heating

Almost an equal number of Canadian households used either electricity or natural gas to heat their water in 2003 (see Chart 47). Given this result, it is surprising to observe that there was no region in Canada where this same trend was observed. Each region actually had a clear majority of households using one of these energy sources over the other.

Households east of Ontario were most likely to have used electricity to heat their water, while households west of Quebec were more apt to have used natural gas. It is also interesting to note that the Atlantic region was the only region where a significant number of households used oil to heat their water.

Chart 47

Penetration Rate of the Two Most Popular Energy Sources for Heating Water, by Region



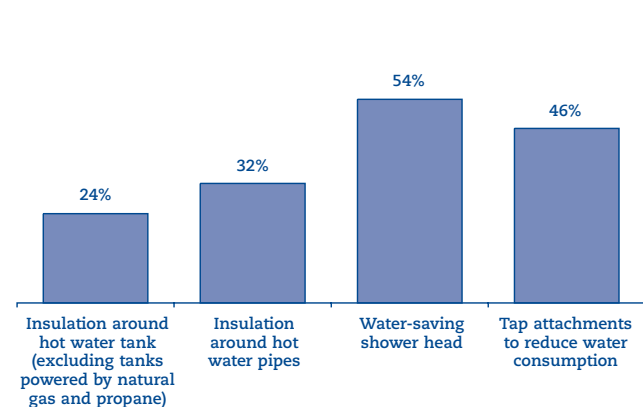
Hot Water Conservation Devices

While water is essential in a household, there are ways a household can conserve water and the energy used to heat it. Add-on insulation around the hot water tank and pipes ensures that energy used to heat water is not wasted. Also, water-saving shower heads and flow-reducing tap attachments conserve energy and water without changing water pressure.

In general, water-saving devices were more popular with Canadian households than add-on insulation products in 2003. This is apparent when the penetration rates for these devices are compared (see Chart 48). The penetration rates for water-saving shower heads and tap attachments were 54 percent and 46 percent respectively, while the rates for add-on insulation around the hot water tank and pipes were only 24 percent and 32 percent respectively.

Chart 48

Penetration Rate of Hot Water Conservation Devices



²⁷ Natural Resources Canada, *Energy Use Data Handbook – 1990 and 1997 to 2003*, p. 22.

Lighting

Lighting technology has changed dramatically in recent years, and this change is apparent in the increase in the variety of lighting products available to Canadian households. With this increase in variety, Canadian households have a growing opportunity to control the amount of lighting energy they consume.

Some of the lighting products available to households include ordinary (incandescent) light bulbs, halogen light bulbs, fluorescent tubes and compact fluorescent lights (CFLs). Each of these products has its advantages. Ordinary (incandescent) light bulbs have a low initial cost, but are not very energy efficient, as only 5 percent to 8 percent of the energy that goes into the fixture produces light, while the rest is dissipated as heat. Halogen light bulbs in some wattages can use 15 percent less energy and last two to four times longer than incandescent bulbs. Fluorescent tubes use 60 percent to 80 percent less energy and last 10 to 20 times longer than incandescent bulbs, but are not compatible with standard light sockets. CFLs, on the other hand, are compatible with standard light sockets, consume 67 percent to 75 percent less energy than incandescent bulbs and last up to 10 times longer.²⁸

Lighting Choices – Regional Analysis

In 2003, 99 percent of households in Canada used at least one ordinary (incandescent) light bulb. The same cannot be said, however, for the other types of bulbs on the Canadian market.

Almost half of all households in Canada used at least one halogen light bulb in 2003 (see Chart 49). A region-by-region analysis reveals that Quebec had the highest percentage of households that used at least one halogen light bulb (58 percent) and the Atlantic region had the lowest (30 percent).

More than half of Canadian households used at least one fluorescent tube in 2003 (see Chart 50). Regionally, the percentage of households that used at least one fluorescent tube appears to generally increase the further west a region is located.

Chart 49

Penetration Rate of Halogen Light Bulbs by Region

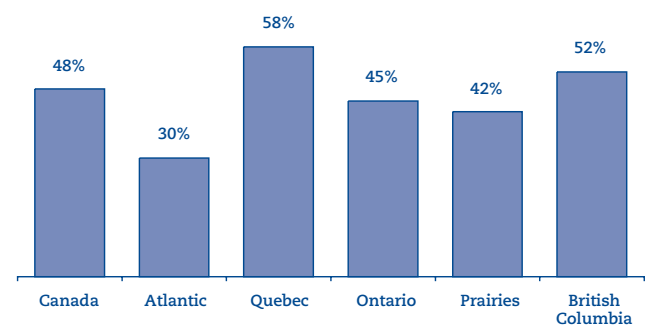
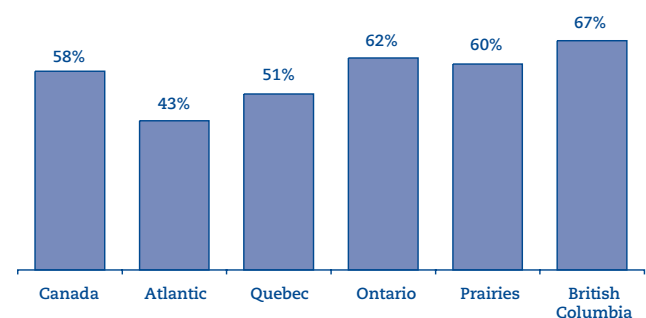


Chart 50

Penetration Rate of Fluorescent Tubes by Region



Consequently, British Columbia had the highest percentage of households that used at least one fluorescent tube (67 percent) and the Atlantic region had the lowest (43 percent).

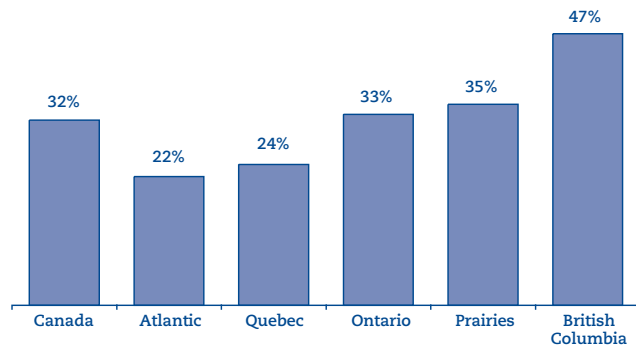
Unlike the case with halogen bulbs and fluorescent tubes, well less than half of Canadian households used a CFL in 2003 (see Chart 51 on page 28). In fact, only 32 percent of households used at least one CFL. However, as was the case with fluorescent tubes,

²⁸ Natural Resources Canada, *Household Lighting*, Ottawa, 1998, pp. 6–12.

the percentage of households that used at least one CFL in 2003 increases the further west the region is located. And once again, as was the case with fluorescent tubes, British Columbia had the highest percentage of households using at least one CFL (47 percent) and the Atlantic region had the lowest (22 percent).

Chart 51

Penetration Rate of CFLs by Region

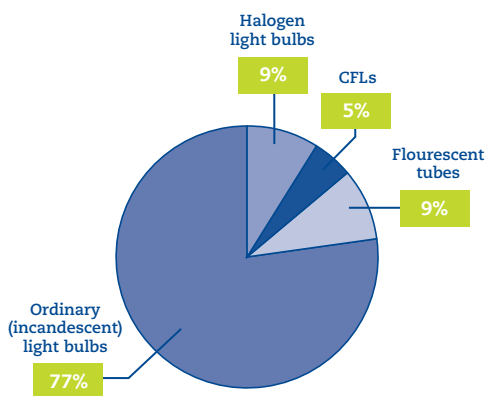


Number of Light Bulbs

SHEU-2003 found that the average Canadian household used 26.4 light bulbs. Over three quarters of the light bulbs used by the average household were ordinary (incandescent) light bulbs (see Chart 52). The remaining light bulbs used by the average household were comprised of halogen light bulbs (9 percent), fluorescent tubes (9 percent) and CFLs (5 percent).

Chart 52

Type of Light Bulbs Used by the Average Household

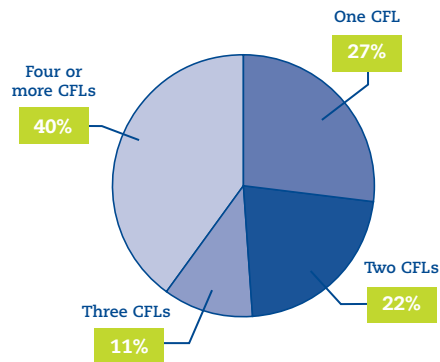


Even though energy-efficient light bulbs, such as halogen light bulbs, fluorescent tubes and CFLs, comprised nearly a quarter of the average household's light bulbs, the survey data shows that one out of every five households did not use any of these energy-efficient light bulbs in 2003. The reason 20 percent of households did not use any of these bulbs – yet these bulbs still accounted for nearly 25 percent of the average household's light bulbs – is that households that used one type of these energy-efficient light bulbs were likely to have used many of those particular bulbs.

Among households that used a halogen light bulb in 2003, only 28 percent used only one halogen light bulb, while 44 percent used four or more halogen light bulbs. Similar results were observed for fluorescent tubes and CFLs. Among households that used a fluorescent tube in 2003, only 26 percent used only one fluorescent tube, while 40 percent used four or more fluorescent tubes. And among households that used a CFL in 2003, only 27 percent used only one CFL, while 40 percent used four or more CFLs (see Chart 53).

Chart 53

Number of CFLs Used Among Households That Used at Least One CFL



ENERGY STAR®

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. It is estimated that products displaying the ENERGY STAR symbol can help reduce energy and operating costs by 30 percent to 50 percent.²⁹

In addition to helping save money, high-energy-efficiency household appliances and other everyday-use products help protect our environment by reducing GHG emissions that contribute to climate change. Their use also helps lower levels of other pollutants that cause urban smog and acid rain.

Since both SHEU-1993 and SHEU-1997 were performed before the ENERGY STAR Initiative officially entered the Canadian market in 2001, SHEU-2003 was the first Survey of Household Energy Use capable of asking questions about the initiative. However, given that in 2003 the ENERGY STAR Initiative in Canada was less than four years old and only covered certain product categories, not all households were asked if they used ENERGY STAR qualified products. A household was asked only if a particular product it used in 2003 was an ENERGY STAR qualified product, if the product in question was less than four years old and covered by the initiative.

Hence the following analysis represents only the penetration rates of ENERGY STAR qualified products among households that used products less than four years old. This was done in an effort to reveal the penetration rates of ENERGY STAR qualified products since the inception of the initiative.

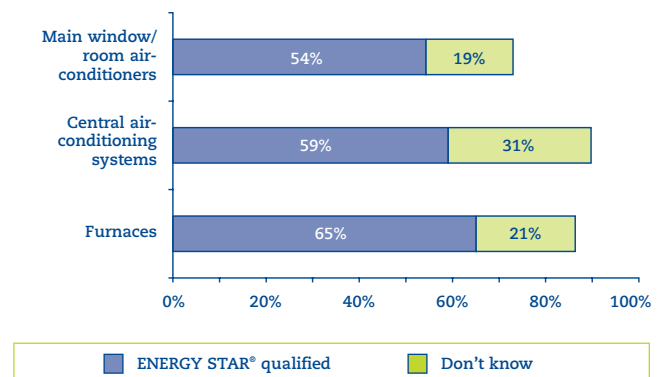
ENERGY STAR Heating and Air-Conditioning Systems

Among heating and air-conditioning systems, the ENERGY STAR Initiative covered furnaces, central air conditioners and window/room air conditioners in

2003. For each of these three system categories, among households that used a system less than four years old, the majority of households used an ENERGY STAR qualified system (see Chart 54).

Chart 54

Penetration Rate of ENERGY STAR Among Households With Systems Less Than Four Years Old in 2003



These results may underestimate the percentage of households that used ENERGY STAR qualified heating and air-conditioning systems, since a high percentage of households did not know if their systems were ENERGY STAR qualified. This could also reflect that many Canadian households were unaware of the ENERGY STAR Initiative or that the ENERGY STAR Initiative covers these system categories.

ENERGY STAR Major Appliances

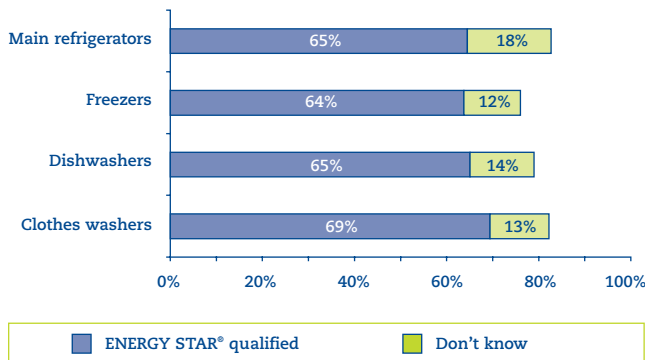
The major appliances covered by the ENERGY STAR Initiative in 2003 were refrigerators, freezers, dishwashers and clothes washers. For each of these

²⁹ Natural Resources Canada, *Look for ENERGY STAR*, Ottawa, 2003, p. 3.

appliance categories, among households that used an appliance less than four years old, well over 60 percent used an ENERGY STAR qualified appliance (see Chart 55).

Chart 55

Penetration Rate of ENERGY STAR Among Households With Major Appliances Less Than Four Years Old in 2003



As was the case with heating and air-conditioning systems, a high percentage of households did not know if their major appliances that were less than four years old were ENERGY STAR qualified. For example, nearly one out of five households with a main refrigerator less than four years old did not know if it was ENERGY STAR qualified. Therefore, the results may underestimate the percentage of households with ENERGY STAR qualified appliances.

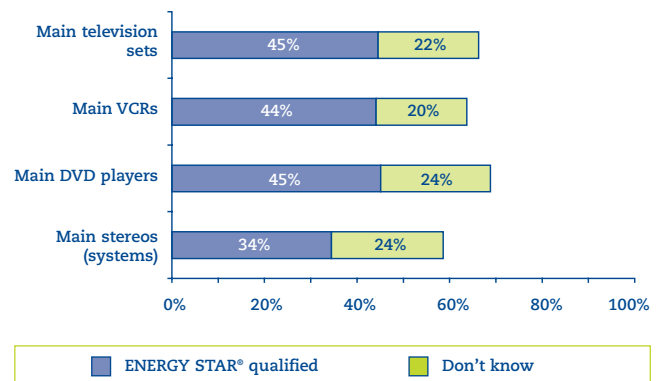
ENERGY STAR Other Appliances

In addition to the previously mentioned energy-consuming products, in 2003 the ENERGY STAR Initiative covered other appliances, such as televisions, VCRs, DVD players and stereos. For each of these product categories, with the exception of stereo systems, among households that used a product less than four years old, approximately 45 percent used an ENERGY STAR qualified product (see Chart 56). Nearly 35 percent of households whose main stereo (system) was less than four years old used an ENERGY STAR qualified stereo (system).

For each of these product categories, at least 20 percent of households that used a product less than four years old did not know if it was ENERGY STAR qualified. Once more, these results may underestimate the percentage of households that used ENERGY STAR qualified products in 2003. This could also reflect that many households were unaware of the ENERGY STAR® Initiative or that the ENERGY STAR Initiative covers these product categories.

Chart 56

Penetration Rate of ENERGY STAR Among Households With Other Appliances Less Than Four Years Old in 2003



ENERGY STAR Appliances – Regional Analysis

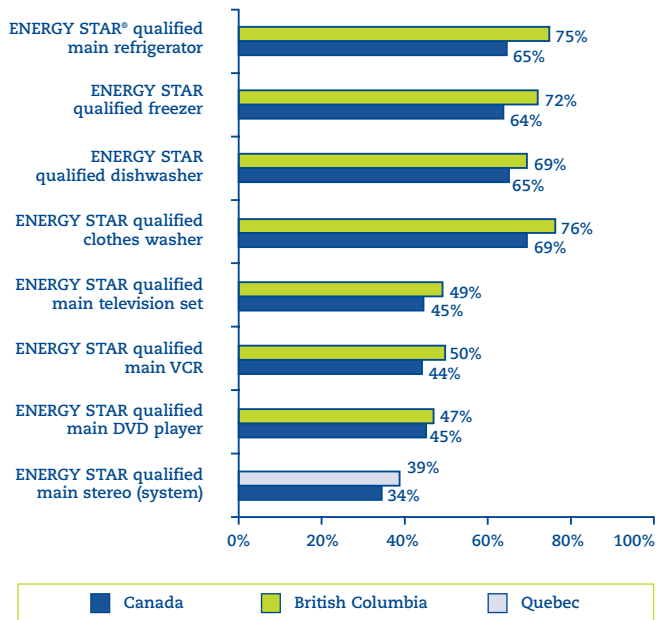
For each appliance category covered by the ENERGY STAR Initiative in 2003, with the exception of stereos, British Columbia had the highest proportion of households that used an appliance less than four years old that was an ENERGY STAR qualified appliance (see Chart 57). Quebec had the highest proportion of households that used a stereo less than four years old that was an ENERGY STAR qualified stereo.

Once again, these results only represent the penetration rates of ENERGY STAR qualified products among households that used products less than four years old. This was done in an effort to reveal the penetration rates of ENERGY STAR qualified products since the inception of the ENERGY STAR Initiative.

Please refer to the *2003 Survey of Household Energy Use – Detailed Statistical Report* to find data on the percentage of all households across Canada that used ENERGY STAR qualified products in 2003.

Chart 57

Penetration Rate of ENERGY STAR Among Households With Appliances Less Than Four Years Old in 2003, by Selected Regions





Glossary

Appliance: Device used in a house during the year. Appliances at the disposal of the head of the household for regular use are to be counted. Appliances that are owned by the household but are not used are not to be counted, except for air-conditioning units. An appliance that is temporarily inoperable, but which is generally used, is included if a serviceperson has been called or if it has been transported to a repair shop.

Caulking: Material used to seal spaces to make them airtight.

Central ventilation system (air exchanger): Device that takes stale air from inside a dwelling and exchanges it with fresh air from outside a dwelling.

Chest freezer: A freezer that is accessible from the top through a lid.

Compact dishwasher: Dishwasher with a capacity of less than eight place settings and six serving pieces.

Compact fluorescent light: General term applied to smaller-diameter fluorescent lights that are compatible with standard light sockets.

Condensing furnace (high-efficiency furnace): This type of furnace extracts most of the heat remaining in the combustion by-products through a condensing heat exchange process.

Condominium: Individual ownership of a dwelling in a multi-dwelling structure (such as an apartment building) or on land owned in common (such as a row house complex).

Crawl space: Ventilated open low space between the ground and the lowest storey of a dwelling, or a ventilated low space between the roof and highest storey of a dwelling.

Double/row house: House connected to at least one other dwelling, which together form a building. For SHEU-2003, duplexes (two dwellings one above the other, not attached to any other structure) are included in this category.

Dwelling: A living space that is structurally separate from others, with a private entry that permits access to the exterior of the building or to a stairwell or common corridor.

Energy intensity: Total energy consumption of a dwelling divided by the number of heated units of floor area. In this report, energy intensity is expressed in gigajoules per square metre (GJ/m²).

ENERGY STAR®: As an international symbol of energy efficiency, the ENERGY STAR mark helps consumers identify which appliances on the market are the most energy efficient in their class. Administered in Canada by Natural Resources Canada, the ENERGY STAR symbol is used mainly to identify products offering premium performance levels in energy efficiency. The ENERGY STAR symbol can be found on product packaging, literature and advertising and on the products themselves. In some cases, you may also find it on the EnerGuide label. The following criteria are used to determine if an appliance qualifies for the ENERGY STAR mark:

- A standard-size refrigerator must exceed the minimum energy performance standard established by the Government of Canada by at least 10 percent in 2003 and at least 15 percent in 2004. A standard-size freezer must, in 2003, exceed these standards by at least 10 percent. Compact refrigerators and freezers must exceed these same standards by at least 20 percent.
- A standard-size dishwasher must exceed the minimum energy performance standards established by the Government of Canada by at least 25 percent in 2003. Only standard-size dishwashers can qualify for the ENERGY STAR mark.

- A clothes washer must use from 35 percent to 50 percent less water and at least 50 percent less energy per load than conventional washers.
- A television must use 3 watts or less when turned off, i.e., use 75 percent less energy than conventional televisions, which consume up to 12 watts when turned off.
- A video cassette recorder must use 4 watts or less when turned off, i.e., use 70 percent less energy than conventional video cassette recorders, which consume up to 13 watts when turned off.
- A DVD player must use 3 watts or less when turned off, i.e., use 75 percent less energy than conventional DVD players, which consume up to 10 watts when turned off.
- A stereo system must use 2 watts or less when turned off, i.e., use 70 percent less energy than conventional stereo systems, which consume up to 7 watts when turned off.
- A room air conditioner must exceed the minimum energy performance standards established by the Government of Canada by at least 10 percent in 2003. A central air conditioner must exceed these standards by 20 percent.
- A forced-air furnace must have an annual fuel utilization efficiency (AFUE) rating of 90 or higher. A furnace (boiler) with hot water or steam radiators must have an AFUE rating of 85 or higher.

Fluorescent tube: A linear (long, straight tube) fluorescent light bulb (lamp).

Gigajoule (GJ): Unit of measure for energy consumption, equal to 1 billion joules.

Halogen light bulbs: Incandescent lights containing halogen gases, which burn very hot while providing an intense white light.

Heat pump: Heating and cooling unit that draws heat from an outdoor source and transports it to an indoor space for heating purposes, or the inverse for cooling purposes.

Heated area: The total floor space of a dwelling, excluding the basement and the garage.

Household: Person or group of persons who occupy a dwelling. The number of households, therefore, is equal to the number of dwellings occupied.

Low-rise apartment: Dwelling located within an apartment building with fewer than five storeys.

Mobile home: Mobile dwelling designed and built to be transported by road on its own frame to a location where it may be placed on a temporary foundation, such as concrete blocks, pillars or other specifically designed foundation. It must be able to be moved again to another location, as required.

Moisture detector: A moisture detector is a sensor in a clothes dryer used to check the amount of moisture in the clothes and to terminate the dryer cycle automatically when the clothes are dry.

Ordinary (incandescent) light bulb: The standard incandescent light bulb is the original and most common type of bulb used in the house.

Penetration rate: Percentage of a sample population that used a given product during a specific period of time.

Programmable thermostat: A temperature-sensitive device that lets an individual choose the temperature to be maintained in one or several rooms of a dwelling during different times of the day.

Retrofit: Improvement of efficiency of energy-consuming appliances or thermal characteristics of a building.

Single detached house: House containing a single dwelling unit entirely separate from any other building or structure; generally known as a single-family house.

Supplementary heating: Heating system which can be used in addition to a main heating system, as desired, and which is flexible enough to respond to rapid variations in heating needs.

Thermal envelope: The facing materials that form the shell of a building, including walls, ceilings, roof, basement walls, windows and doors.

Upright freezer: A freezer that is accessible from the front through a door.

Weatherstripping: A felt or foam band, usually self-adhesive, placed at the joints of doors and windows to seal against air leaks and reduce heat loss.

