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Survey of Household Energy Use 2007

Summary Report

Canada

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I. Introduction

In 1993, Statistics Canada conducted an extensive survey for Natural Resources Canada (NRCan) entitled the 1993 Survey of Household Energy Use (SHEU-1993). This survey collected detailed data on the energy consumption habits of households in Canada for what would eventually become NRCan's Office of Energy Efficiency (OEE).

The OEE has periodically conducted surveys 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); the third, for 2003 (SHEU-2003); and now the fourth, for 2007 (SHEU-2007).[1] These surveys support the OEE's mandate to strengthen and expand Canada's commitment to energy conservation and energy efficiency. Energy savings provide value to the consumer, help reduce greenhouse gas (GHG) emissions and contribute to a healthier environment.

The 2007 version of SHEU carries on the tradition by gathering information on energy consumption and the factors affecting energy use in households who reside in houses and residential buildings. SHEU's coverage of residential buildings has been expanded to include buildings greater than five storeys, referred to as high-rise apartments. This is the first time since 1993 that high-rise apartments have been included. More precisely, the survey collected information on the following:

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

This summary report provides an overview of the main findings of SHEU-2007. A more detailed report, entitled *2007 Survey of Household Energy Use – Detailed Statistical Report,* is also available (oee.nrcan.gc.ca/publications).

The OEE offers a wide range of programs and services to improve energy efficiency in every sector of the Canadian economy, including the commercial and institutional, industrial, transportation, and residential sectors. Key residential equipment programs (ENERGY STAR® and EnerGuide for Equipment) help Canadians make energy efficiency choices when buying, selling or manufacturing energy-using equipment. Housing programs (ecoENERGY for Buildings and Houses) offer resources to help Canadians keep their homes comfortable and well-ventilated for healthy indoor air quality while saving energy costs for home heating and cooling. For more information on these and other programs, as well as tools, financial incentives, free publications and other resources to help reduce energy consumption and GHG emissions, visit our Web site at oee.nrcan.gc.ca.

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[1]Statistics Canada refers to SHEU-2007 as the Households and the Environment Survey: Energy Use.

II. Survey findings

Analytical summary

- Data from SHEU-2007 found that the average heated area of a Canadian dwelling was 128 square metres (m^2) (1377 square feet [sq. ft.]) in 2007. The average heated area of a Canadian dwelling has increased with each Survey of Household Energy Use (SHEU).
- Dwellings built before 1946 tend to be larger than average and consume the most energy, while dwellings built from 1946 to 1969 tend to be the smallest and consume the least energy. After 1969, the trend is that newer dwellings have larger heated areas and higher energy consumption.
- Although the observed trend is that the larger the heated area of a dwelling, the more energy it consumed in 2007, we observe the inverse trend in energy consumption per square metre. However, dwellings sharing at least one common wall with another dwelling, such as low- and high-rise apartments and double/row houses, consumed less energy per square metre, regardless of size, than stand-alone dwellings, such as single detached and mobile homes.
- Dwellings sharing at least one common wall consumed less energy per dwelling and per square metre than stand-alone dwellings.
- The energy source used by households for space and water heating was primarily based on the household's location within the country. Most households located west of Quebec used natural gas, while most households in Quebec used electricity. Households in Atlantic Canada used either electricity or oil.
- The penetration rate[2] for condensing or high-efficiency furnaces was 33 percent among dwellings constructed from 2000 to 2007 that used a furnace.
- SHEU-2007 found that more than a quarter of households used a main and a secondary refrigerator.
- More than one quarter of Canadian households used three or more television sets in 2007.
- Personal computers, including laptops, were used in 80 percent of households.
- The penetration rate for an air conditioning system was 52 percent. Ontario households accounted for 57 percent of all air conditioning systems used in Canada in 2007.
- More than half 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 lamps.
- ENERGY STAR® qualified products, which are 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 the products they were using were ENERGY STAR qualified. This 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 2007.

II. Survey findings

Scope of the survey

The fourth Survey of Household Energy Use (SHEU-2007) uses 2007 as its reference year. The previous SHEUs used 1993, 1997 and 2003 as their respective reference years.

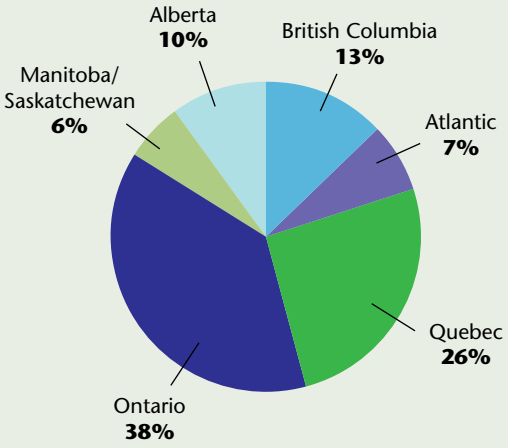
SHEU-2007 covers over 12.9 million households across Canada. The survey is representative of households in all 10 Canadian provinces that reside in single detached houses, double/row houses (including duplexes[3]), mobile homes and apartments located in buildings with fewer than five storeys (low-rise apartments) and those with five or more storeys (high-rise apartments). Households located in the territories were excluded to remain consistent with previous SHEUs.

The survey data were collected through a mail-back paper survey with dwelling owners and renters. Landlords of rented dwellings and property managers of condominiums were also surveyed 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, and energy use. Energy consumption data were obtained through direct contact with the energy supplier(s) or were reported by the household.

SHEU found that in 2007, the regional breakdown of households across Canada was as follows: Ontario, 38 percent; Quebec, 26 percent; British Columbia, 13 percent; Alberta, 10 percent; Atlantic Canada, 7 percent; and Manitoba/Saskatchewan, 6 percent (see Chart 1).

More detailed information about the methodology used for SHEU-2007 and a copy of the SHEU-2007 questionnaire can be found in the *2007 Survey of Household Energy Use – Detailed Statistical Report*.

Chart 1. Location of households by region, 2007



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

II. Survey findings

The stock of dwellings in Canada

A dwelling is any set of living quarters that is structurally separate from the living quarters of other dwellings and has a private entrance outside the building or a private entrance from a common hall or stairway inside the building. The private entrance must be one that can be used without passing through the living quarters of another dwelling.

There are many types of dwellings across Canada with varying characteristics, such as size and year of construction. The interaction of these dwelling characteristics, in addition to other factors, influences the energy intensity level of a household.

General characteristics of dwellings

Year of construction

In 2007, more than 60 percent of Canadian dwellings had been constructed in the previous 40 years (see Chart 2). Among these dwellings, an equal proportion, or 19 percent per decade, was constructed in the 1970s and 1980s, while the proportion decreased to 15 percent in the 1990s. The most active period of construction was from 1946 to 1969. The most recent (2000–2007) and the oldest (pre-1946) periods were the least active years of construction.

Year of construction reflects different building codes and is a determining factor in energy consumption and energy intensity analysis (which will be discussed later in this report). The heated area of a dwelling is also a major factor affecting a dwelling's energy consumption.

Heated area

The heated area of a dwelling is defined as all space within the exterior walls of a dwelling that is heated, excluding garages and basements.

Chart 2. Year of construction of dwellings, 2007

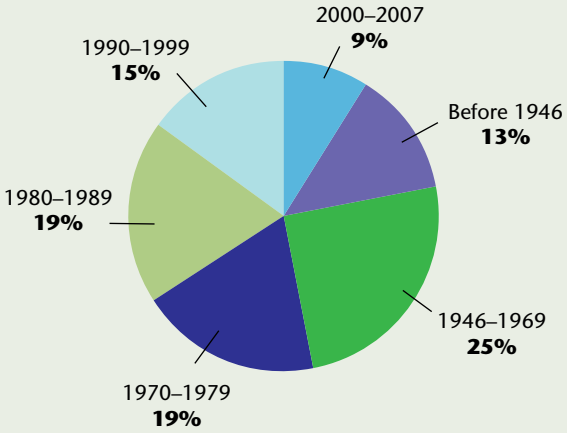
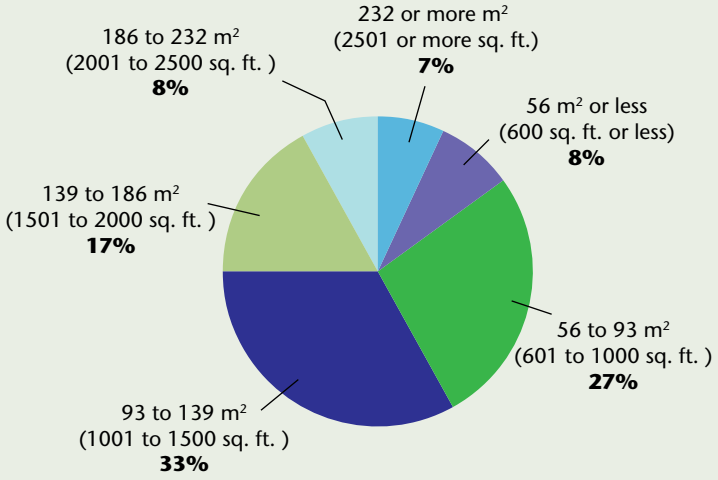


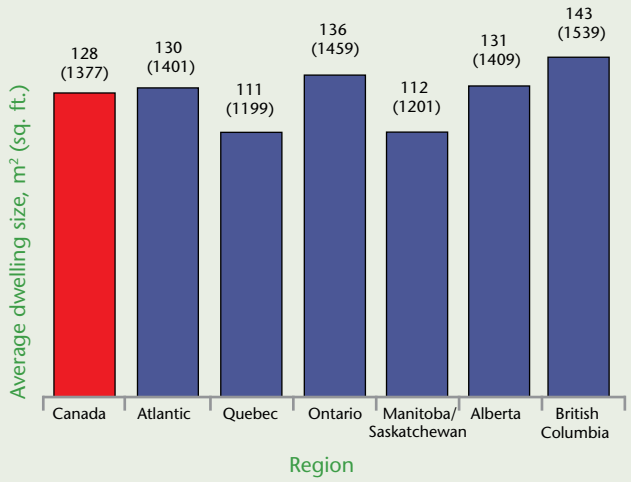
Chart 3. Heated area of dwellings, 2007



SHEU-2007 found that the average heated area of a Canadian dwelling was 128 square metres (m^2). However, 35 percent of the dwellings had a heated area of less than 93 m^2, and 31 percent had a heated area larger than 139 m^2 (see Chart 3).

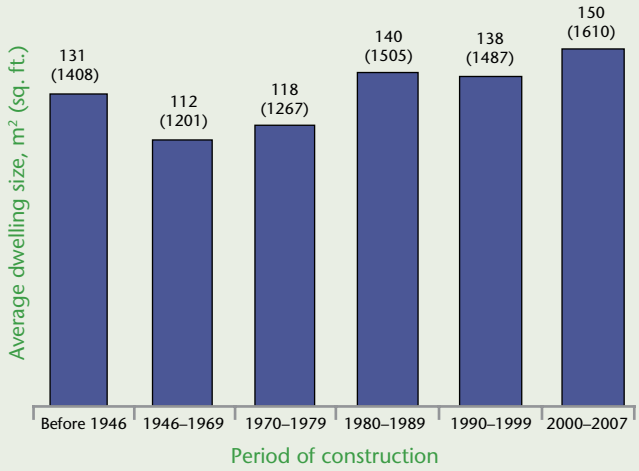
A regional analysis reveals that the average heated area of dwellings varied significantly by region in 2007. Dwellings in British Columbia had the largest average heated area, at 143 m^2, followed by Ontario dwellings, which had an average heated area of 136 m^2 (see Chart 4). The average heated area of dwellings in Atlantic Canada and Alberta was close to 130 m^2. The smallest dwellings in Canada were in Quebec and Manitoba/Saskatchewan, which were the only regions where dwellings had an average heated area of less than 130 m^2.

Chart 4. Heated area of dwellings by region, 2007 (m^2 [sq. ft.])



Dwelling size in Quebec was affected by the dwelling types that are prevalent there. In 2007, Quebec was the only region where single detached houses made up less than half of the dwellings. Quebec was also home to 46 percent of the country's low-rise apartments, which is the dwelling type with the smallest average heated area. Manitoba/Saskatchewan had the third largest proportion of single detached dwellings, at 70 percent, and the second largest proportion of low-rise apartments, at 17 percent.

Chart 5. Average size of dwelling by year of construction, 2007



An exploration of average dwelling size by year of construction found that the smallest dwellings were built between 1946 and 1969, at 112 m^2 (1201 sq. ft.). As shown in Chart 5, dwellings increased in size in the 1970s and 1980s and decreased slightly in the 1990s. The largest dwelling size occurred in the most recent period, the 2000s.

The average size of a dwelling in a given period is influenced by trends in the mix of dwelling types. Dwellings built before 1946 were larger on average than those built before 1980, partly because there were fewer apartments built during this period than any other. As the next section will show, apartments are the smallest dwelling type.

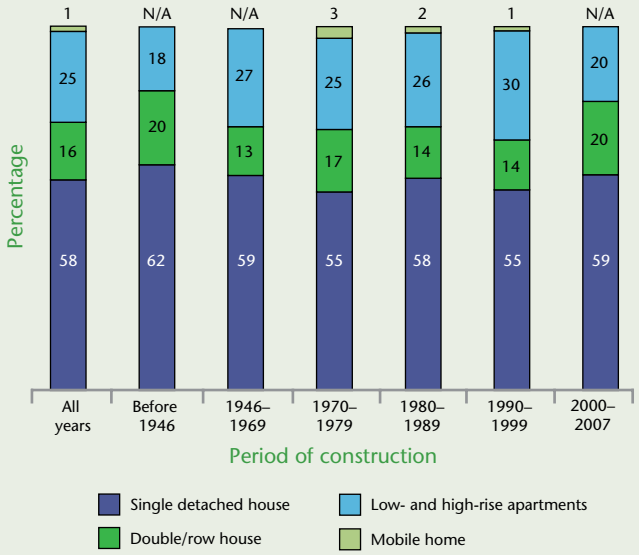
Dwelling type

Across Canada in 2007, 58 percent of dwellings were single detached homes, while double/row houses and low-rise apartments each accounted for 16 percent of dwellings. The remaining dwellings were high-rise apartments and mobile homes, which accounted for 8 percent and 1 percent of all dwellings, respectively.

SHEU-2007 found that the type of dwelling built during each period varied. The types of dwellings that varied the most in this regard were apartments and double/row houses. High-rise apartments were rare before 1946, but accounted for 9 percent of all dwelling types built between 1946 and 1969 (see Chart 6).

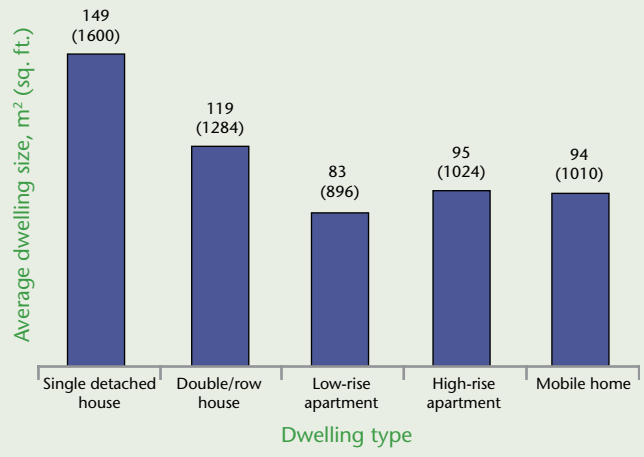
Double/row houses, on the other hand, were more commonly constructed than apartments before 1946, then became less common than apartments before rebounding in the most recent period.

Chart 6. Type of dwelling by year of construction, 2007



Typically, certain dwelling types have larger heated areas than others. In 2007, the average heated area of a single detached home, the largest dwelling type, was 149 m² (1600 sq. ft.), while that for double/row houses, the second largest dwelling type, was 119 m² (1284 sq. ft.), as shown in Chart 7. These two types of dwellings had much larger heated areas than the average low-rise apartment, which had a heated area of 83 m² (896 sq. ft.). High-rise apartments and mobile homes fell in between and were similar in size, at 95 m² (1024 sq. ft.) and 94 m² (1010 sq. ft.), respectively.

Chart 7. Heated area by dwelling type, 2007 (m² [sq. ft.])



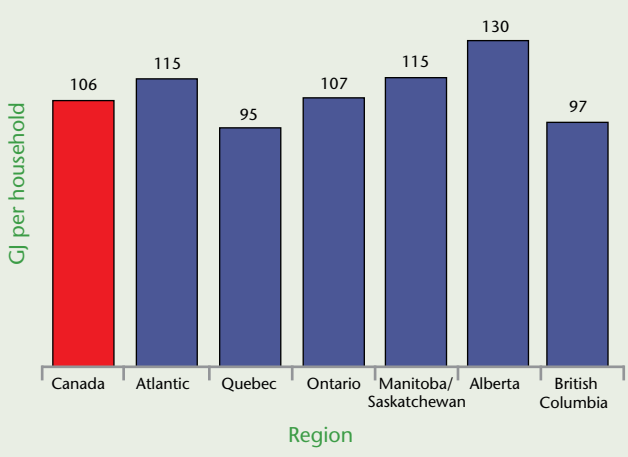
Energy consumption per household

Energy consumed[4] by a household is one measure of energy efficiency. This consumption is affected largely by the size and age of a dwelling occupied by a household, in addition to factors affecting climate and the energy consumed by appliances and electronics. Energy consumed per household is important because it demonstrates the household characteristics that change the net energy consumption. That is, it shows the factors that lead one household to use more energy than another. (Another measure of energy efficiency, consumption per square metre, will be presented later, in the section "Energy intensity.")

Regional energy consumption

The average Canadian household consumed 106 gigajoules (GJ) in 2007 (see Chart 8). Atlantic Canada, Manitoba/Saskatchewan and Alberta consumed significantly more energy per household than the national average, with Alberta consuming the most at 130 GJ per household. Ontario consumed 107 GJ per household, which was just above the national average. Quebec (95 GJ per household) and British Columbia (97 GJ per household) were the only

Chart 8. Energy consumption by region, 2007 (GJ per household)



[4]SHEU energy consumption is a summation of household electricity, natural gas, heating oil, propane and wood consumption in 2007. For this survey, household energy consumption excludes energy consumed for transportation and gas-powered equipment.

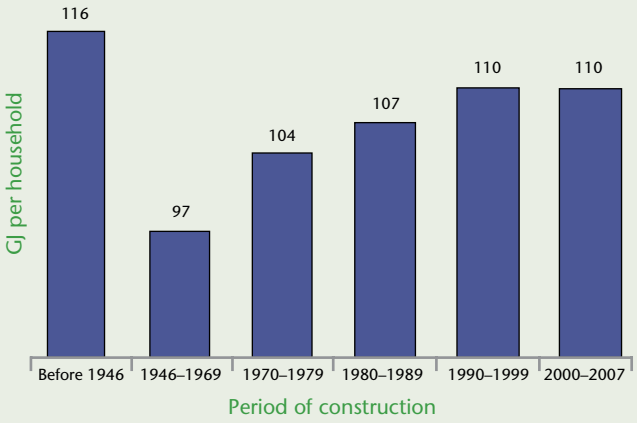
regions below the national average. British Columbia's low energy consumption per household is interesting because the region has the largest average dwelling size, which should lead to a high level of energy consumption.

British Columbia's mild climate, which in 2007 had the fewest heating degree-days (HDD),[5] partly explains the low energy consumption per household observed despite the average dwelling's relatively large heated area. Ontario had the second lowest HDD, while Manitoba, followed by Saskatchewan, had the highest.

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

Period of construction

Chart 9. Energy consumption by year of construction, 2007 (GJ per household)



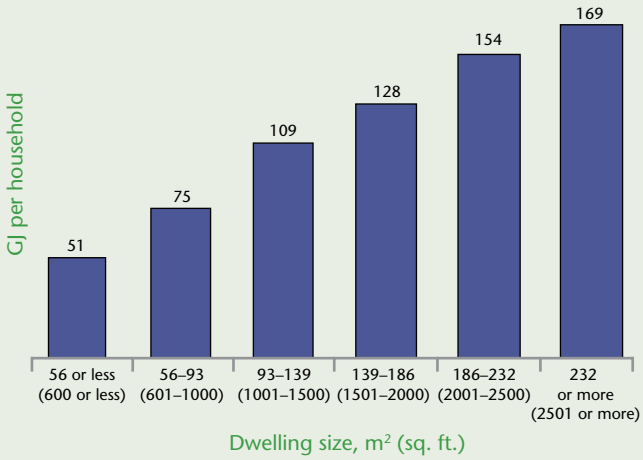
Trends in housing size, construction standards, techniques and materials vary considerably over time and exert a direct impact on energy use. The influence of these trends on a household's energy use is evident when the energy consumed per household is compared with the construction period.

Dwellings built between 1946 and 1969 had the lowest energy consumption per household in 2007, at 97 GJ per household (see Chart 9), but they also had the smallest heated area. This finding was unexpected because newer dwellings use the latest technologies. However, the older dwellings had the smallest heated area. Dwellings constructed during each decade from the 1970s until the 1990s consumed more energy than the previous decade until the current decade (2000s), which showed a slight decrease in energy consumption from the 1990s. One explanation is that dwellings have, in general, increased in size. Dwellings built before 1946 consumed the most energy in 2007. These dwellings were at least 61 years old in 2007 and were on average larger than the average dwelling built between 1946 and 1979.

Heated area

Based on SHEU-2007 data, the energy consumed per household increases as the dwelling's heated area increases. This relationship between heated area and energy consumption is evident when dwellings are divided into categories based on their heated area, and the average consumption per household within each category is compared.

Chart 10. Energy consumption by heated area, 2007 (GJ per household)



Dwellings in the category of smallest heated area, less than 56 m², had the lowest energy consumption at 51 GJ per household (see Chart 10). For a heated area from 56 m² to 93 m², the energy consumed average increases to 75 GJ per household. This trend of increasing heated area and increasing energy consumption continues for all heated area categories. Dwellings in the category of largest heated area, 232 m² or more, consumed 169 GJ per household. This is more than three times the energy consumption of the smallest dwelling size.

[5]Natural Resources Canada, Comprehensive Energy Use Database, 1978 to 2007, oee.nrcan.gc.ca/corporate/statistics/neud/dpa/comprehensive_tables/index.cfm?fuseaction=Selector.showTree.

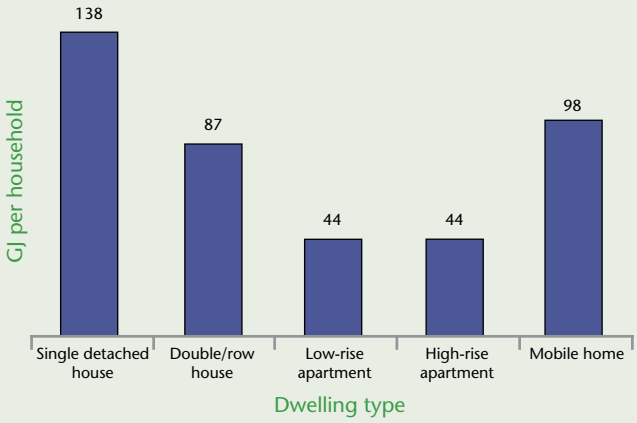
Dwelling type

Single detached homes consumed the most energy of all dwelling types, at 138 gigajoules (GJ) per household (see Chart 11). This consumption is not surprising given that it is also the largest dwelling type. Mobile homes were the next largest consumers of energy, despite being the second smallest dwelling type. This might be due to less insulation in mobile homes. The remaining dwelling types illustrate the benefit of shared walls because both apartment types and double/row houses had the lowest energy consumption.

A common or shared wall reduces a dwelling's exposure to the exterior and enables a dwelling to share heat with the adjacent dwelling, thus permitting a dwelling to reduce its energy consumption and improve energy efficiency. Apartments normally have at least two common walls and a common ceiling or floor, and double/row houses have at least one common wall.

Double/row houses were the third largest consumers of energy despite having the second largest heated area. Low- and high-rise apartments consumed the least amount of energy.

Chart 11. Energy consumption by type of dwelling, 2007 (GJ per household)



Energy intensity

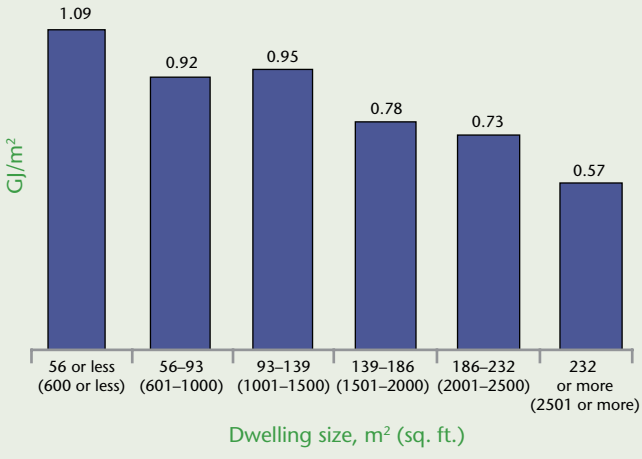
Another measure of efficiency is the total amount of energy consumed per unit of heated area, which is expressed in gigajoules per square metre (GJ/m^2). The energy intensity level of a household depends on the interaction of many factors, but it is known from past surveys of household energy use that GJ/m^2 generally decrease as the size of a dwelling increases. SHEU-2007 enables the isolation and study of some individual factors that influence energy consumption per square metre.

Heated area

Based on SHEU-2007 data, the inverse relationship between heated area and energy 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.

Households in the category of smallest heated area, less than 56 m^2, had the highest energy intensity, at 1.09 GJ/m^2 (see Chart 12). Households in the category of largest heated area, more than 232 m^2, had the lowest intensity, at 0.57 GJ/m^2. The only break in this trend occurred with the category of 93 m^2 to 139 m^2.

Chart 12. Energy intensity by heated area, 2007 (GJ/m^2)



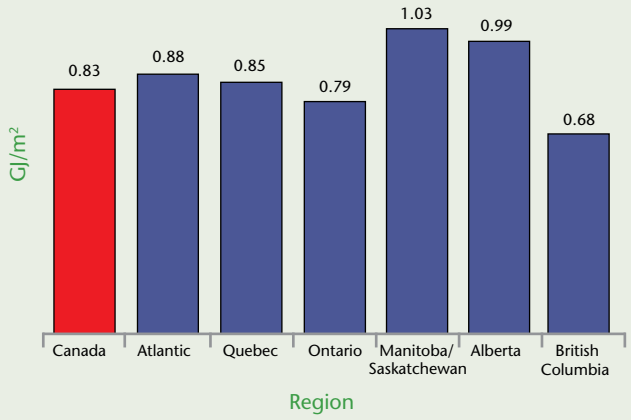
This inverse relationship between the heated area of a dwelling and its energy intensity level might be explained by the fact that many energy-consuming products, such as refrigerators, are considered necessities and are used by a high proportion of households regardless of their heated area. Obviously, these types of products have a greater impact on the energy intensity per square metre of a smaller dwelling than a larger dwelling, because the energy consumption of these appliances is distributed over a smaller space.

Another possible explanation for the decline in energy intensity per square metre as the heated area increases is the tendency for larger dwellings to have been constructed during the most recent periods, which are after 1980. As is discussed later in this section, dwellings constructed during these periods were, on average, the most energy-efficient dwellings built in Canada on a per-square-metre basis.

Regional energy intensity

The average household energy intensity per square metre in Atlantic Canada (0.88 GJ/m^2), Quebec (0.85 GJ/m^2) and Ontario (0.79 GJ/m^2) was relatively close to the Canadian average (0.83 GJ/m^2), as shown in Chart 13. The same can not be said for Manitoba/Saskatchewan and Alberta, which were well above the national average, and British Columbia, which was well below it. Manitoba/Saskatchewan's high energy consumption per square metre is due to its having a high percentage of single detached homes, the second smallest average dwelling size in the country and a cold climate. In contrast, British Columbia had the lowest energy intensity with a ratio of 0.68 GJ/m^2, which may be attributed to its having the largest average dwelling size and a more temperate climate.

Chart 13. Energy intensity by region, 2007 (GJ/m^2)



Year of construction

SHEU-2007 found that in general, the newer the dwelling, the lower the energy intensity ratio. This can be seen by observing the decline in the ratio: from 0.89 GJ/m^2 for dwellings built before 1946, to 0.77 GJ/m^2 during 1980–1989 and to 0.74 GJ/m^2 during 2000–2007 (see Chart 14). The break in the overall trend in the 1990s coincided with a decrease in the average size of the heated area between the 1980s and the 2000s. The 1970s break cannot be explained by average heated area because dwellings built during 1946–1969 were smaller. But the proportion of apartments, which are the least intensive dwelling type, decreased from the 1960s to the 1970s. Another possibility is that some of the dwellings built before 1970, which were at least 38 years old in 2007, underwent a retrofit,[6] which would have improved their energy efficiency.

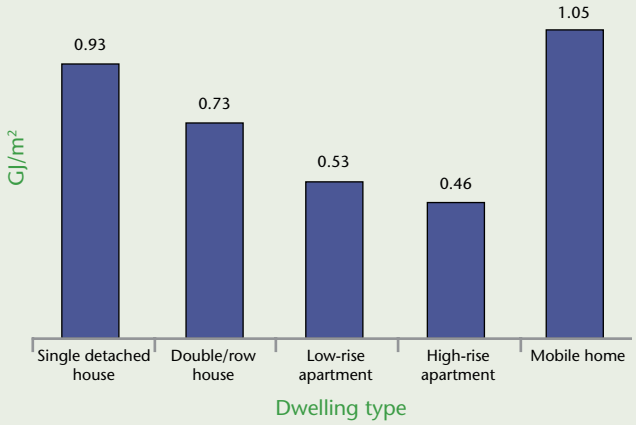
Chart 14. Energy intensity by year of construction, 2007 (GJ/m^2)

[6] A retrofit is any type of improvement of the efficiency of energy-consuming appliances or thermal characteristics of a dwelling.

Dwelling type

In 2007, the average mobile home, which has no common walls, had the second smallest heated area among dwelling types, and smaller dwellings generally had higher energy intensity ratios than larger dwellings. Thus it is not surprising to see that the dwelling type with the highest energy intensity ratio was mobile homes, at 1.05 GJ/m^2 (see Chart 15).

Chart 15. Energy intensity by dwelling type, 2007 (GJ/m^2)



Because of the inverse relationship between dwelling size and GJ/m^2, it might be somewhat unexpected to observe that double/row houses and low- and high-rise apartments had lower intensity ratios (0.73 GJ/m^2, 0.53 GJ/m^2 and 0.46 GJ/m^2, respectively) than single detached houses (0.93 GJ/m^2). These three more energy-efficient dwelling types all share at least one wall with another dwelling.

II. Survey findings

The thermal envelope

The thermal envelope is the shell of a dwelling that protects the interior from the elements. It includes the facing materials that form the shell of a building, including walls, ceilings, the roof, basement walls, windows and doors. To maintain the indoor environment, the envelope must control the flow of heat, air and moisture from the inside of the dwelling to the outdoors and from the outdoors to the inside.

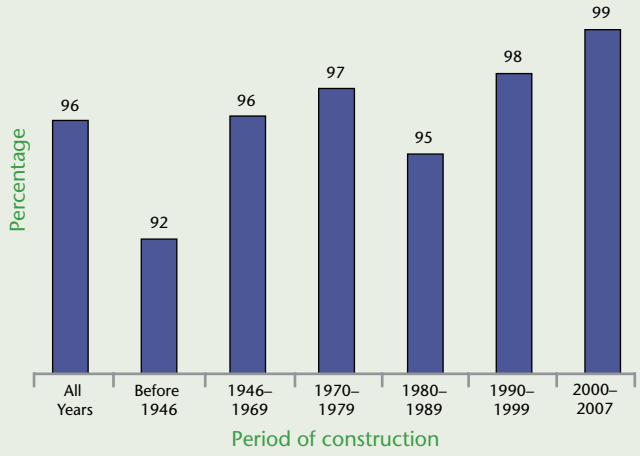
Insulation of the thermal envelope

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

Attics

In 2007, 96 percent of respondents who knew if their attics were insulated reported that they were insulated (see Chart 16). Over all the periods, there appears to be an upward trend for dwellings to have insulation, ranging from a low of 92 percent in the oldest dwellings to 99 percent in the newest.

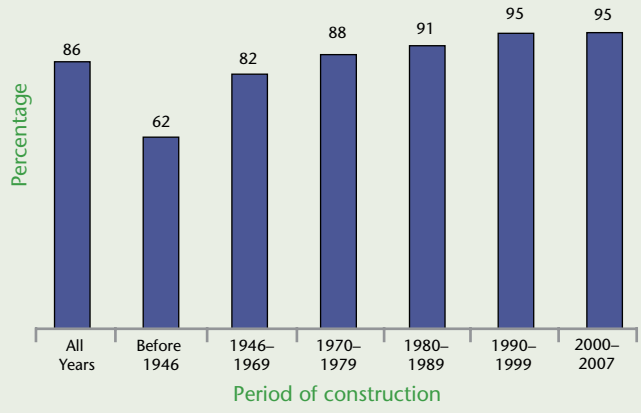
Chart 16. Proportion of attics that were insulated, by year of construction, 2007



Basements

SHEU-2007 found that the older the dwelling, the less likely it was to have some proportion of insulation on the basement / crawl space walls. The lowest penetration of insulation in the basement / crawl space is from the earliest period, before 1946, with only 62 percent of dwellings having insulation (see Chart 17).

Chart 17. Penetration rate of insulation in basement / crawl space, by year of construction, 2007

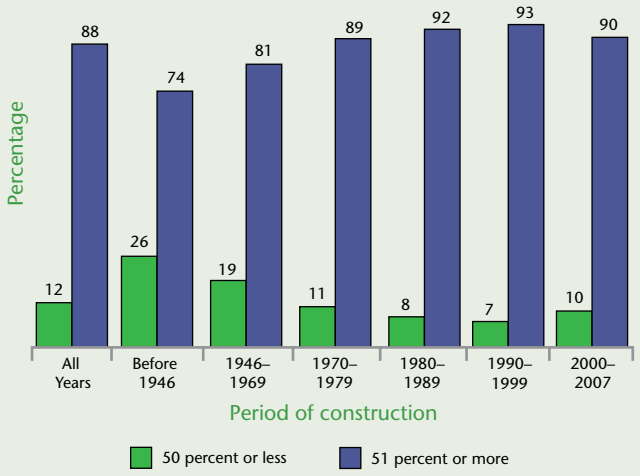


The highest percentage is in the most recent period, 2000–2007, with 95 percent of respondents reporting that their dwellings had insulation in their basement / crawl space.

In addition to asking respondents whether or not they had basement / crawl space insulation, SHEU-2007 also asked them to report the percentage of their basement/ crawl space that was insulated. SHEU found a trend, similar to that found for the age of the dwelling, in

the percentage of basement / crawl space insulated. In general, the newer the dwelling, the greater the percentage of the basement / crawl space insulated (see Chart 18). The increase in the percentage of basement / crawl space insulation is consistent across all the periods examined.

Chart 18. Percentage of basement / crawl space walls that were insulated, by year of construction, 2007



Garages

SHEU-2007 found that most respondents, 76 percent, with garages attached to dwellings had at least a partially insulated garage (see Table 1).

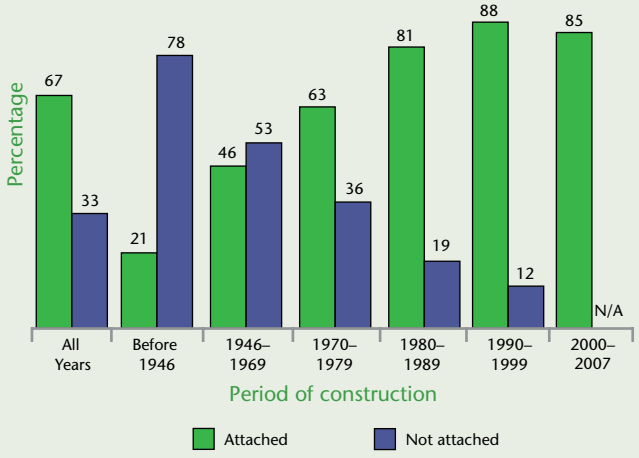
Table 1. Percentage of attached garages that were insulated, by year of construction, 2007

Attached garages that were insulated	All years	Before 1946	1946–1969	1970–1979	1980–1989	1990–1999	2000–2007
Full insulation – all walls and garage doors	24%	N/A	16%	20%	21%	32%	35%
Full insulation – all walls but not the garage doors	26%	N/A	16%	22%	28%	30%	28%
Partial insulation – some walls	26%	N/A	25%	31%	31%	20%	24%
Full or partial insulation	76%	53%	56%	73%	81%	82%	87%
No insulation	24%	47%	44%	27%	19%	18%	13%

It is beneficial 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. Dwellings seem to be increasingly looking to minimize this heat loss, because dwellings with attached garages constructed during the most recent period, 2000–2007, were most likely to have an insulated garage. The trend is for the percentage of dwellings with a fully or partially insulated attached garage to increase each period. The significance of these results is magnified by the trend for dwellings to be constructed with attached garages, instead of detached garages.

Only 21 percent of dwellings constructed before 1946 with a garage had an attached garage (see Chart 19). This percentage has dramatically increased over time, peaking at 88 percent for dwellings constructed during the 1990s. During the most recent period, 2000–2007, 85 percent of new dwellings had an attached garage. Therefore, with an increasing number of recently constructed dwellings having attached garages, it is important to raise homeowner awareness of the energy efficiency benefits of insulating attached garages.

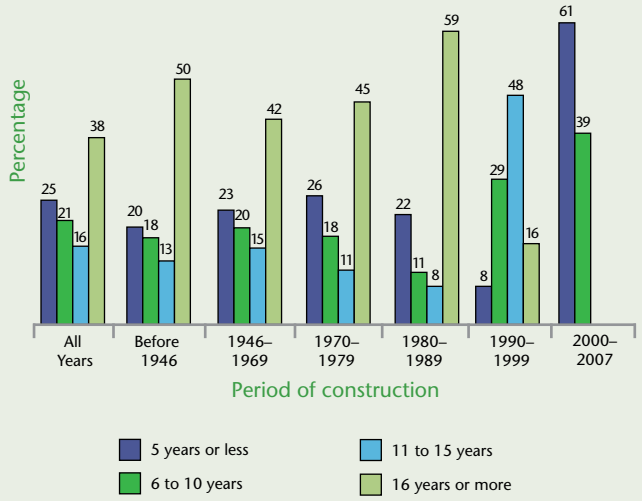
Chart 19. Type of garage among dwellings with a garage, by year of construction, 2007



Windows

SHEU-2007 has found that most windows in Canada are 11 years old or more (see Chart 20). The most common category is 16 years old or more, which is also the leading category for all dwellings built before 1990. It seems likely that most of the windows in dwellings built after 1980 have not been replaced yet.

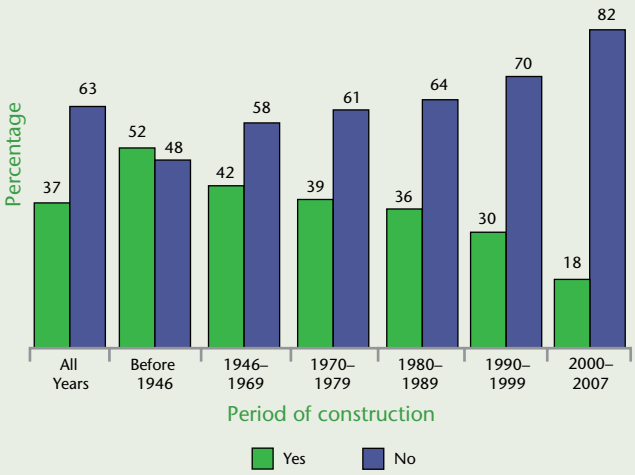
Chart 20. Age of windows, by year of construction, 2007



Windows can be responsible for unnecessary heat loss through cold drafts, leading to high energy consumption. Windows can also have condensation problems.

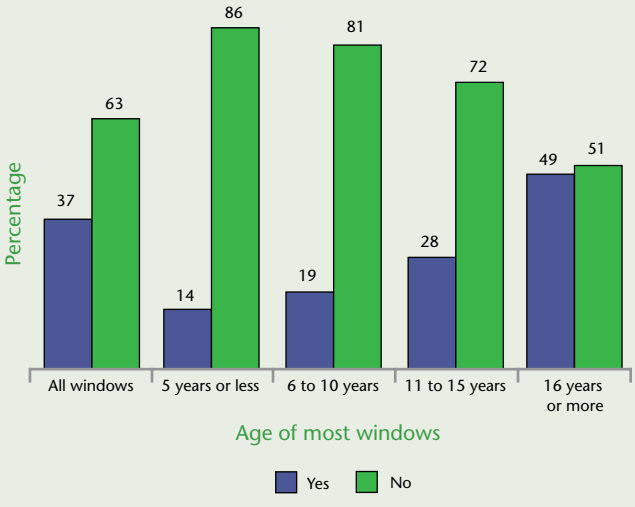
SHEU-2007 data show that there is a link between a dwelling's year of construction and air leaks or drafts around windows, with older dwellings being more prone to air leaks or drafts than more recently constructed dwellings. The percentage of dwellings reporting air leaks or drafts around windows decreased in each successive period, from dwellings built before 1946 (52 percent) to a low in 2000–2007 (18 percent), as shown in Chart 21.

Chart 21. Percentage of dwellings with drafts or leaks around the windows, by year of construction, 2007



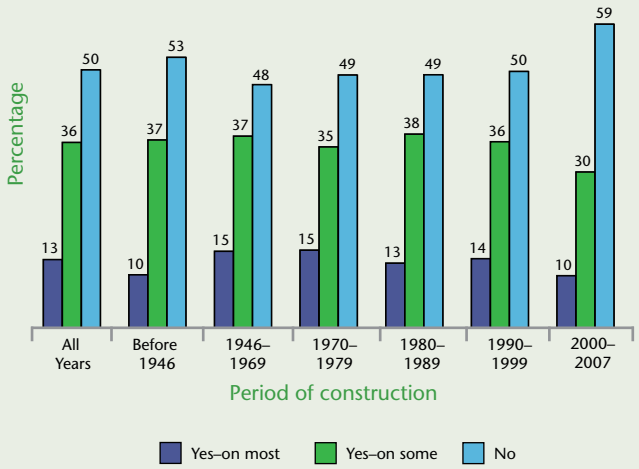
Among households who indicated the age of their windows, SHEU found that older windows tended to have drafts or air leaks around them. This increased from 14 percent for windows 5 years old or less to 49 percent for windows 16 years old or more (see Chart 22). The national average (which includes households who don't know or don't state the age of their windows) was 37 percent.

Chart 22. Percentage of dwellings with drafts or leaks around the windows, by age of window, 2007



Condensation problems on the inside surfaces of windows were reported by 50 percent of Canadian households. However, unlike air-leak and draft problems, condensation problems appear to have little correlation with the year of construction of the dwelling, because a comparable percentage of dwellings constructed in each period had condensation problems.

Chart 23. Percentage of dwellings with condensation on the inside of windows, by year of construction, 2007

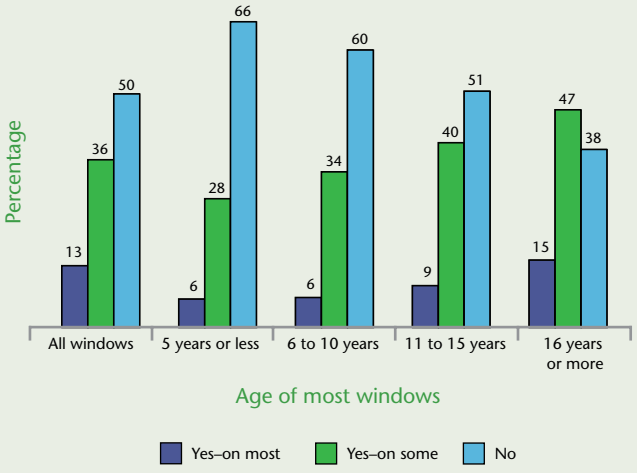


Condensation on the inside surfaces of windows can be the result of moisture and/or air leakage problems. Moisture problems can lead to window frame damage and mould, while air leakage problems can lead to excessive heat loss and energy consumption. Moisture problems caused by excessive humidity levels can arise from poor ventilation within the dwelling. Ventilation can be improved with the use of an air exchanger. Air leakage problems can be addressed through the installation of new windows or the addition of weatherstripping and caulking.[7]

SHEU-2007 data show that there is a weak link between year of construction and condensation on the inside of windows. Over the periods examined, there was little variation in the prevalence of condensation, increasing from 47 percent of dwellings built before 1946 experiencing condensation on some or most windows to a high of 52 percent in dwellings built between 1946 and 1969 (see Chart 23). In the following three periods, 1970–1979, 1980–1989 and 1990-1999, this remained constant before decreasing to a low of 41 percent in the latest period. One possible reason for this inverse U-shaped curve is that older dwellings are more likely to have updated windows.

Examining condensation by the window's age, rather than the dwelling's age, confirms the expectation that older windows are more prone to condensation. Over each age category examined, the older the window, the more likely the dwelling had condensation on some or all windows. Only 6 percent of dwellings with the newest windows, less than five years old, had condensation on most windows, while 28 percent had condensation on some windows (see Chart 24). In the oldest age category for windows, 16 or more years, these numbers increased, with15 percent of dwellings having condensation on most windows and 47 percent having it on some windows. For every category of window age, the percentage of dwellings that had windows with condensation decreased as the age of the windows decreased.

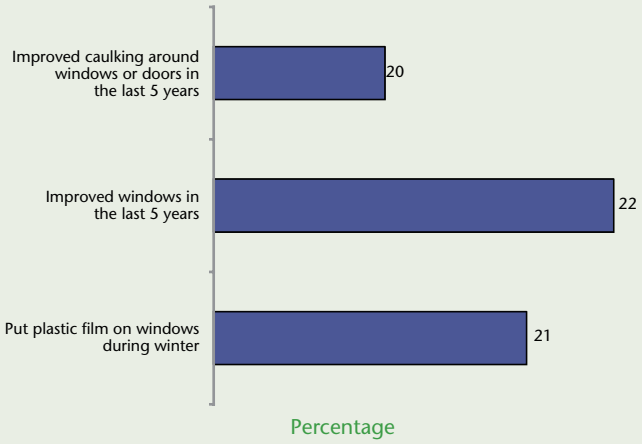
Chart 24. Percentage of dwellings with condensation on the inside of windows, by age of window, 2007



[7]Natural Resources Canada, *Improving Window Energy Efficiency* (fact sheet), Ottawa, 2004, p. 3.

In 2007, 20 percent of households had improved the weatherstripping or caulking on at least one of their windows in the last five years, and 22 percent had made energy savings improvements to windows in the last five years (see Chart 25). 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 reduce window condensation.[8] SHEU-2007 found that 21 percent of respondent households took this measure.

Chart 25. Percentage of households who made an energy efficiency window improvement, by type of improvement, 2007



Energy efficiency improvements

Homeowners and landlords / property managers were asked if they had made improvements to their dwelling that reduced energy consumption.

The survey found that 52 percent of dwellings underwent at least one energy efficiency improvement in the last five years (see Table 2).

[8]Natural Resources Canada, *Keeping the Heat In*, p. 109.

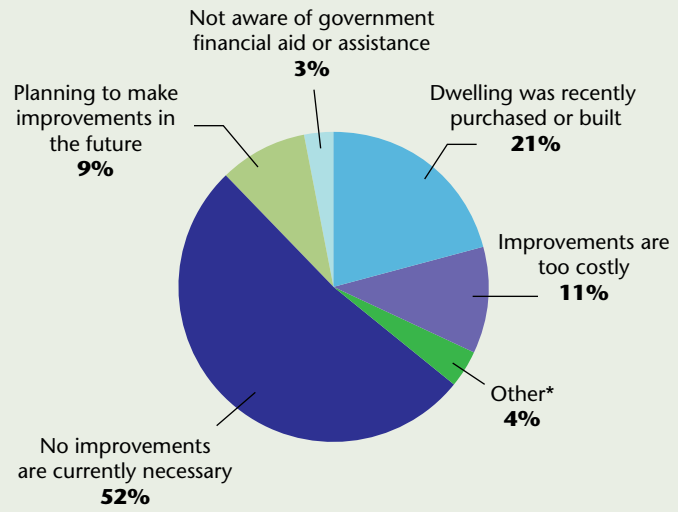
Table 2. Percentage of households making energy efficiency improvements in the last five years by type of improvement, 2007

Type of improvement made by household	Percent
To roof	17
To heating equipment	17
To windows	22
To caulking	20
To basement insulation	7
To exterior siding	5
To insulation of hot water pipes	6
To insulation of roof or attic	6
To insulation of exterior walls	4
To exterior doors	12
Installed a programmable thermostat	19
To ventilation / central air conditioning system	9
To foundation	2
Other improvements	3

The average dwelling underwent 1.3 different improvements in the last five years.

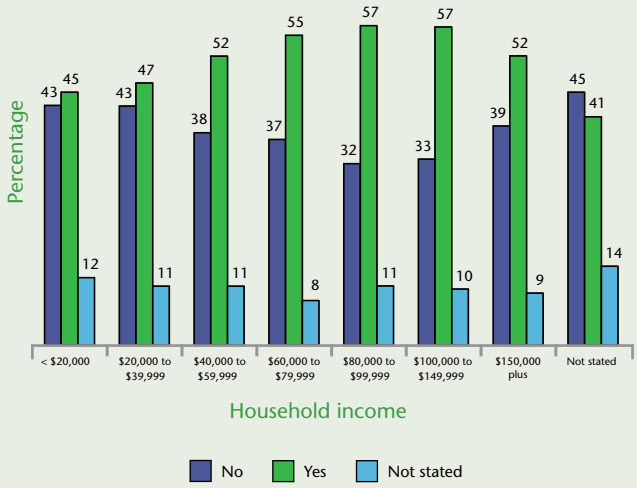
Among homeowners and landlords / property managers who had not made any energy efficiency improvements, the majority, 52 percent, stated that improvements were not necessary, while 21 percent said they had recently purchased or built the dwelling. The remaining significant reasons included respondents were planning to make improvements or had financial issues (see Chart 26).

Chart 26. Reason for not making any energy efficiency improvements to the dwelling, 2007



* "Other" includes no government financial aid, do not have the time and are planning to sell.

Chart 27. Percentage of households making energy efficiency improvements in the last five years, by dwelling income, 2007



The percentage of households making at least one energy efficiency improvement to their dwelling in the last five years increased with income (see Chart 27). The exception was households in the $150,000 or more category, which made fewer improvements than those in the $100,000 to $150,000 category. This overall trend indicates that income influences whether households make an energy efficiency improvement to their dwelling.

II. Survey findings

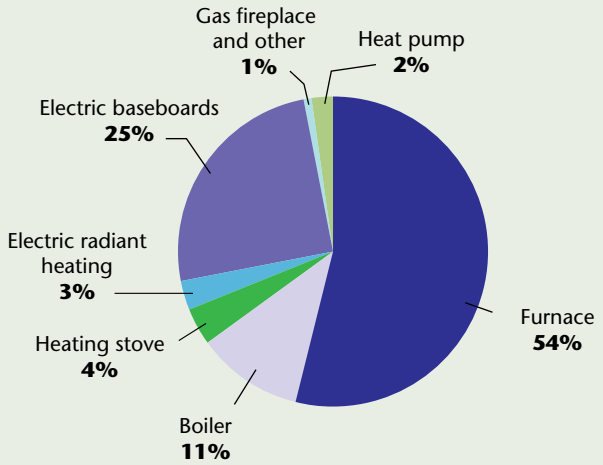
Space heating

Households use energy primarily for space and water heating, space cooling, the operation of appliances and lighting. Of these activities, space heating consumes the most energy in the residential sector. It accounted for 62.7 percent of the total residential energy consumed in 2007.[9] As a result, SHEU-2007 examined the types of heating equipment used by households, as well as the characteristics and use of the equipment, supplementary heating equipment and the prevalence of energy-saving heating equipment.

Main heating systems

In 2007, the majority of Canadian households, 54 percent, used a furnace as their main heating system (see Chart 28). The second most popular type of heating system was electric baseboards, with 25 percent of households reporting this to be their main heating equipment. The rest of the market was divided among boilers (11 percent), heating stoves (4 percent), electric radiant heating (3 percent), heat pumps (2 percent), and gas fireplaces and other equipment (1 percent), including "don't know" responses.

Chart 28. Penetration rate of main heating system of households, 2007



A regional analysis reveals that each region, with the exception of Atlantic Canada, had the majority of households using one type of heating system in 2007 (see Table 3). In Quebec, electric baseboards were used by 58 percent of households as their main heating system; in regions west of Quebec, furnaces were used by the majority of households. In four of the five regions with a dominant type of primary heating system, no other type of equipment was used by more than 20 percent of dwellings; British Columbia was the exception. Atlantic Canada, on the other hand, had three different types of heating systems used in at least 20 percent of the dwellings. The two most popular heating systems in Atlantic Canada were electric baseboards and furnaces, used in an almost equal proportion of households (30 percent). Boilers, the other primary heating system, was used in 20 percent of the dwellings.

Table 3. Principal heating system, by region, 2007

Region	Heating system	Penetration rate (percent)
Atlantic	Electric baseboards	30
	Furnace	30
	Boiler	20
Quebec	Electric baseboards	58
	Furnace	17
Ontario	Furnace	73
	Boiler	11
	Electric baseboards	10
Manitoba/ Saskatchewan	Furnace	73
	Electric baseboards	12
Alberta	Furnace	84
	Boiler	11
British Columbia	Furnace	52
	Electric baseboards	21
	Boiler	14

[9]Natural Resources Canada, Energy Use Data Handbook Tables, 1990 and 2001 to 2007, oee.nrcan.gc.ca/corporate/statistics/neud/dpa/tablestrends2/res_ca_2_e_3.cfm?attr=0.

Energy source for heating

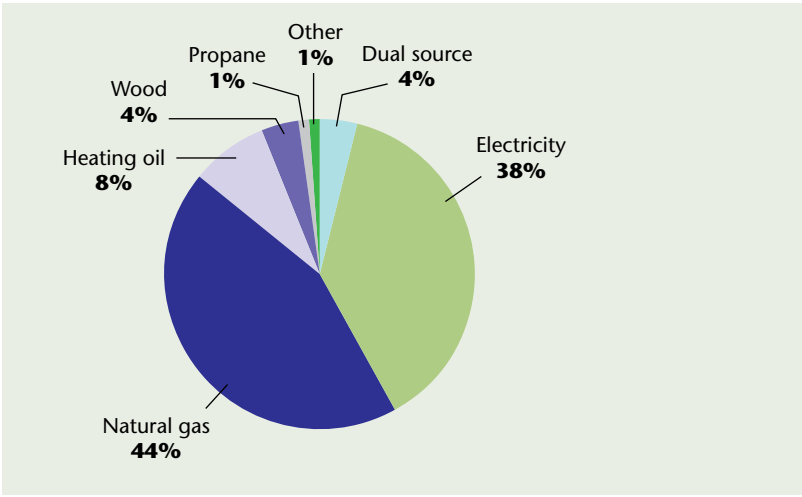
Regional differences were found for the energy source used by main heating systems. Each region, with the exception of Atlantic Canada, had one energy source that was used by the majority (50 percent or more) of households (see Table 4). This was expected, given the regional distribution of heating equipment and the link between heating equipment and fuel. In Quebec, 76 percent of households used electricity to power their main heating system; in regions west of Quebec, the majority of households used natural gas. In contrast to the other regions, Atlantic Canada had two energy sources that a large proportion of households used as their main heating energy source: electricity (42 percent) and heating oil (34 percent).

Table 4. Principal energy source for heating, by region, 2007

Region	Energy source	Penetration rate (percent)
Atlantic	Electricity	42
	Heating oil	34
	Wood	14
Quebec	Electricity	76
Ontario	Natural gas	66
	Electricity	20
Manitoba/ Saskatchewan	Natural gas	62
	Electricity	28
Alberta	Natural gas	81
	Electricity	12
British Columbia	Natural gas	53
	Electricity	34

Across Canada, more households used natural gas to run their main heating system (44 percent) than any other energy source (see Chart 29). Other energy sources used by households for their main heating system included electricity, oil and wood. Additionally, 4 percent of households used a combination of two sources of energy to power their main heating system.

Chart 29. Main energy source for household heating, 2007

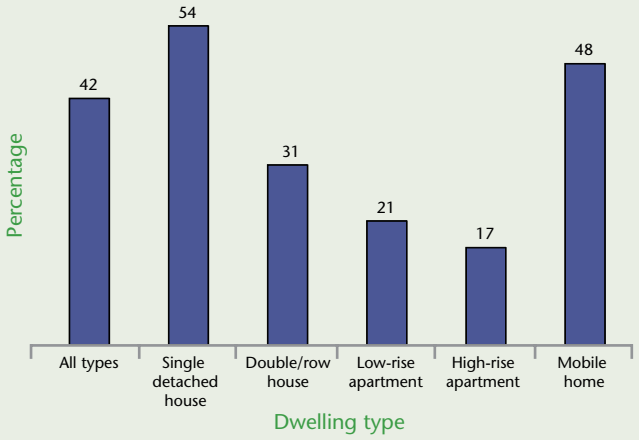


Supplementary heating

Canadian households' use of a secondary heating system to complement their main heating system during 2007 was commonplace (42 percent). Of note, 77 percent of these households, who 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 heating system. This relationship can be observed by comparing the penetration rates of supplementary heating systems for dwellings with and without common walls.

Dwellings without any common walls, such as single detached houses and mobile homes, had high penetration rates for supplementary heating systems (54 percent and 48 percent, respectively), as shown in Chart 30.

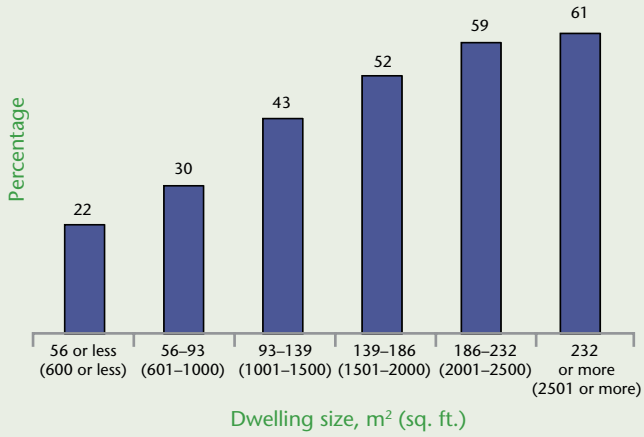
Chart 30. Penetration rate of supplementary heating systems, by dwelling type, 2007



Double/row houses, which normally have at least one common wall, had a lower penetration rate (31 percent). Still, this rate was significantly higher than those for low- and high-rise apartments, which normally have at least two common walls, which had the lowest penetration rates (21 and 17 percent, respectively).

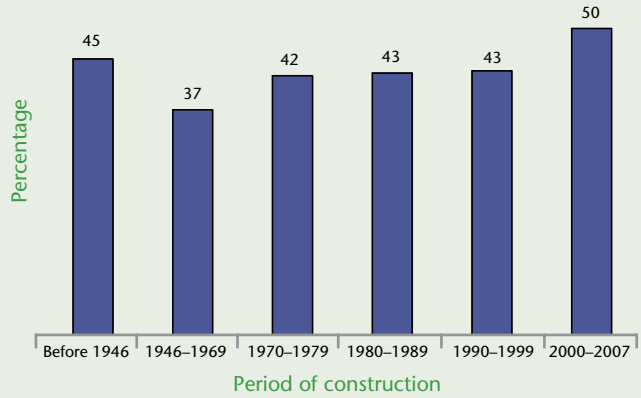
Examining the penetration rate of supplementary heating equipment by dwelling size reveals that there is a strong correlation with the size of the dwelling and the use of a supplementary heating system (see Chart 31).

Chart 31. Penetration rate of supplementary heating systems, by dwelling size, 2007



Another assumption worth testing was whether the need for supplementary heating systems would diminish in more recently constructed dwellings, because the quality of construction materials and practices, dwelling insulation and main heating systems has improved over time. This assumption appears inaccurate because the penetration rate of supplementary heating systems increased with each period for dwellings built after 1946 (see Chart 32).

Chart 32. Penetration rate of supplementary heating systems, by year of construction, 2007



This increase in the penetration rate can be attributed to gas fireplaces in new dwellings becoming commonplace. The use of gas fireplaces increased from 12 percent in dwellings built before 1946 to 52 percent in dwellings constructed between 2000 and 2007, among respondents with a supplementary heating system who specified the type of equipment they use.

Gas fireplace are also popular for aesthetic use, as opposed to heating. Of all gas fireplaces, 44 percent were reported to be neither the main heating equipment nor the primary supplementary heating system.

There are some trends among supplemental heating with newer homes containing a different mix of equipment than older dwellings. The major change, as mentioned above, is the occurrence of gas fireplaces among supplementary heating equipment, which has increased from 12 percent in dwellings built before 1946 to 52 percent in dwellings built between 2000 and 2007 (see Table 5).

Table 5. Types of primary supplementary heating systems, by year of construction, 2007

Primary heating systems	All years	Before 1946	1946–1969	1970–1979	1980–1989	1990–1999	2000–2007
Electric baseboards	19%	31%	19%	17%	21%	13%	8%
Portable electric heater	18%	21%	24%	19%	18%	12%	14%
Wood stove	14%	15%	15%	19%	14%	11%	N/A
Wood/electric fireplace	13%	11%	11%	16%	15%	14%	10%
Gas fireplace	25%	12%	17%	16%	22%	41%	52%
Furnace	7%	7%	8%	9%	6%	4%	N/A
Other	4%	N/A	4%	4%	4%	5%	N/A

This increase is contrasted with an overall decline in every other major type of supplemental heating equipment as the age of a home decreases.

The presence of electric baseboards, the most prevalent supplemental heating equipment in homes built before 1946, declined to an all-time low and were the fourth most common equipment in dwellings built between 2000 and 2007. Wood stoves, wood or electric fireplaces and furnaces have a similar trend – showing virtually no change among homes built in the first two periods, peaking in homes built in the 1970s and then declining in homes built in the 1980s and 1990s. Data for wood and electric fireplaces, which were available for homes built in the 2000s, show another period of decline.

Energy-conserving heating equipment

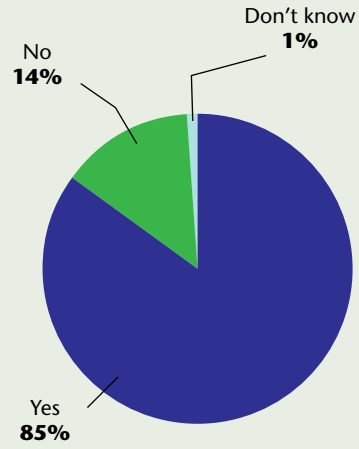
Programmable thermostats

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. The penetration rate for programmable thermostats increased from 32 percent of all dwellings with temperature control that were constructed before 1946, increasing every period and peaking at 58 percent for homes built during 2000–2007 (see Chart 33). This trend resulted in 39 percent of all Canadian households using this technology in 2007.

Chart 33. Penetration rate of programmable thermostats among households with temperature control, by year of construction, 2007

Even though this increasing penetration rate aids in reducing total residential energy consumption, its effects rely on households programming these thermostats. In 2007, 85 percent of households with a programmable thermostat had it programmed (see Chart 34). Still, 14 percent of dwellings have a programmable thermostat that must be programmed before it can realize its full energy-saving potential.

Chart 34. Proportion of programmable thermostats that were programmed, 2007

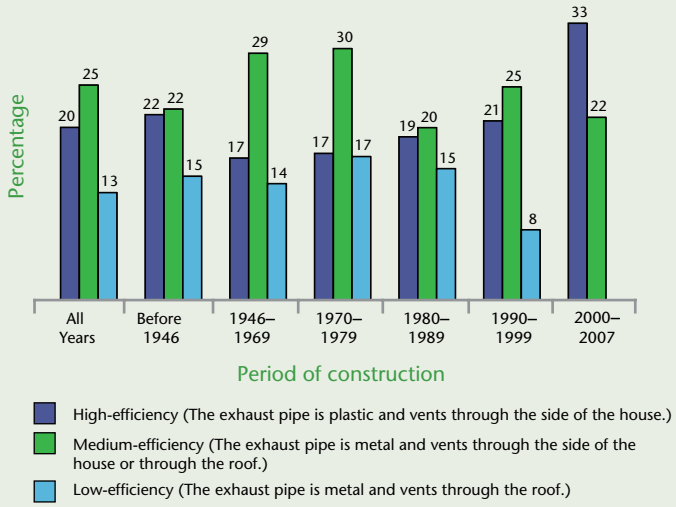


High-efficiency furnaces

Switching from a conventional furnace to a high-efficiency furnace, including a condensing furnace, will help conserve energy within a dwelling. This is especially true if its energy source is natural gas or propane, because these furnaces can use up to 38 percent less energy than conventional furnaces.[10] In 2007, high-efficiency furnaces were used in 20 percent of the households that used a furnace.

Since these high-efficiency furnaces are a relatively new technology – having appeared on the Canadian market over the last 25 years[11] – it is no surprise that the highest penetration rate for this technology was in the most recently built dwellings (see Chart 35).

Chart 35. Penetration rate of high, medium and low efficiency furnaces among households with a furnace, by year of construction, 2007

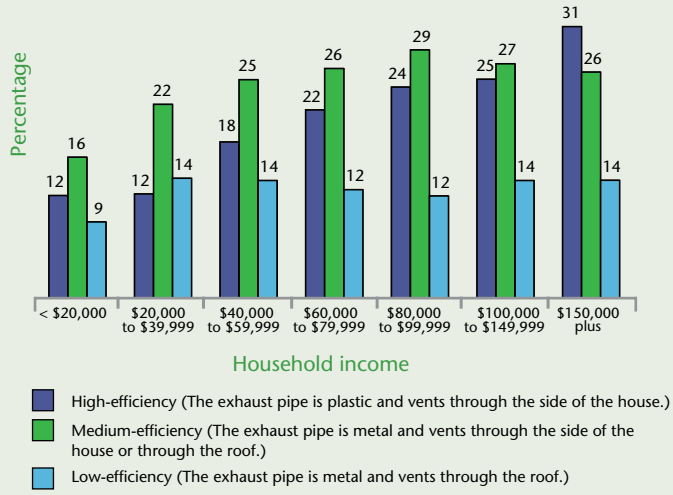


Of note, the second highest penetration rate was in the oldest dwelling period, those constructed before 1946. This reflects the need for these dwellings to occasionally replace their furnaces over time. A high-efficiency furnace can easily be installed as an energy-efficient replacement. Overall, with the exception of dwellings built in the most recent period, the penetration rates of high-efficiency furnaces varied by only 5 percentage points and were within 3 percentage points of the national average. The national rate of households that did not know if they had a high-efficiency furnace was 23 percent, which means that the actual penetration rate could have been under-reported.

[10] Natural Resources Canada, "Mid- and High-Efficiency Furnaces and Boilers," in *Heating With Gas*, oee.nrcan.gc.ca/publications/infosource/pub/home/Heating_With_Gas_Section4.cfm.
[11] Natural Resources Canada, *Heating With Gas*, Ottawa, 2004, p. 32.

The penetration of high-efficiency furnaces increased with reported household income for every income category[12] (see Chart 36).

Chart 36. Penetration rate of high, medium and low efficiency furnaces among households with a furnace, by reported household income, 2007



Among households with a reported income of less that $40,000, the penetration rate was 12 percent, rising to 31 percent among households with an income over $150,000.

[12]Just over 10 percent of surveyed households chose to not state their household income. These households are not included in the reported income categories.

II. Survey findings

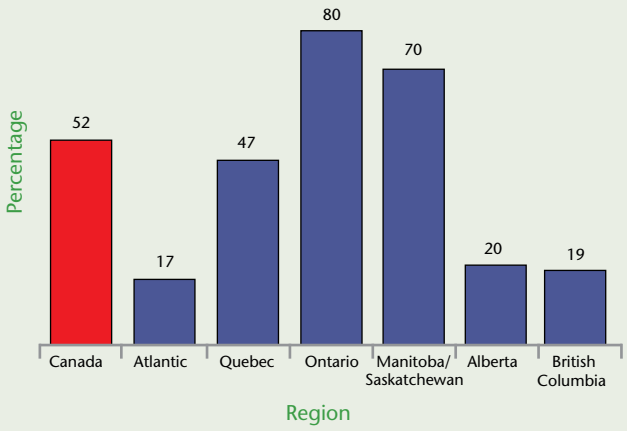
Air conditioning and other cooling methods

According to Natural Resources Canada's Energy Use Data Handbook Tables,[13] from 1990 to 2007, the energy consumed in the residential sector for space cooling almost tripled (increasing by 266 percent). Furthermore, there was a noticeable increase in the penetration rate of air conditioning systems in Canadian households. Because of this, SHEU-2007 collected information on the characteristics and use of residential air conditioning systems.

Air conditioning systems – Regional analysis

More than half (52 percent) of Canadian households were equipped with some type of air conditioning system in 2007. Options available to consumers for air conditioning their dwellings include window/room air conditioners (including portable), central air conditioners and heat pumps. Within Canada, there were significant regional differences in the penetration rates of air conditioning systems (see Chart 37).

Chart 37. Penetration rate of air conditioning systems, by region, 2007



As expected, the regions with the most cooling degree-days[14] – in order from most to least, Ontario, Quebec and Manitoba/Saskatchewan – also had the highest penetration rates for air conditioning systems. This resulted in three rough groupings of high, medium and low penetration rates for air conditioning systems.

Four out of every five households in Ontario were equipped with an air conditioning system in 2007. These households accounted for nearly 60 percent of all dwellings with a residential air conditioning system in Canada. Manitoba/Saskatchewan (70 percent) is the only other region in Canada that approaches the household penetration of Ontario. Other regions had much lower penetration rates. Quebec's penetration rate (47 percent) is roughly halfway between the high groupings of Ontario and Manitoba/Saskatchewan and the closely grouped low penetration rates of Alberta (20 percent), British Columbia (19 percent) and Atlantic Canada (17 percent).

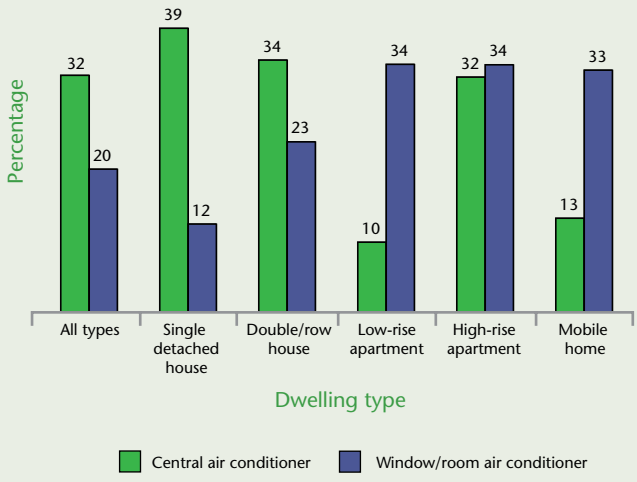
[13]Natural Resources Canada, Energy Use Data Handbook Tables, 1990 and 2001 to 2007, oee.nrcan.gc.ca/corporate/statistics/neud/dpa/tableshandbook2/res_00_1_e_3.cfm?attr=0.
[14]Natural Resources Canada, Comprehensive Energy Use Database, 1978 to 2007, oee.nrcan.gc.ca/corporate/statistics/neud/dpa/comprehensive_tables/index.cfm?fuseaction=Selector.showTree.

Types of air conditioning systems

A central air conditioning system was the most prevalent type of air conditioning system in Canadian households. Over 32 percent of households were equipped with a central system in 2007.

Usually, central air conditioners are used to cool an entire dwelling, while window/room air conditioners are used to cool a small space. SHEU-2007 found that this generality was valid, because central air conditioners were more popular than window/room air conditioners in single detached houses and double/row houses (see Chart 38).

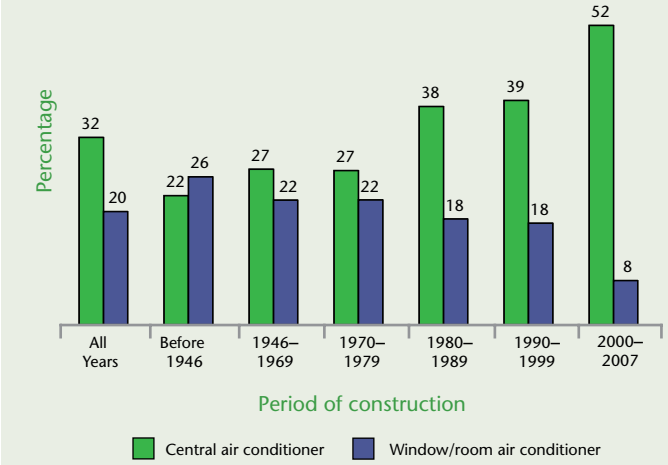
Chart 38. Penetration rate of central and window/room air conditioning systems, by dwelling type, 2007



Central air conditioning systems and window/room units were used in almost equal proportions in high-rise apartments. In low-rise apartments and mobile homes, window/room air conditioners were more popular than central air conditioning.

Additionally, the year a dwelling was built influences which type of air conditioning system is likely to be equipped in a dwelling. The penetration rate for central air conditioning systems has generally increased in dwellings constructed in each succesive period, peaking at 52 percent for dwellings constructed during 2000–2007 (see Chart 39).

Chart 39. Penetration rate of central and window/room air conditioning systems, by year of construction, 2007



In contrast, the pentration rate for window/room air conditioners decreased, from 26 percent for dwellings constructed before 1946 to an all-time low of 8 percent in 2000–2007.

Window/room air conditioner

Window or room air conditioners were commonly used in households, with 20 percent of households equipped with this type of system. There are various types of room air conditioners. The most popular type of room air conditioners in 2007 was window-mounted (louvered) units, with 73 percent of households that used a room air conditioner reporting it as their most used air conditioner (see Chart 40). Through-the-wall units were the next most popular primary room air conditioner (15 percent), followed by free-standing portable units (9 percent). Mini-split air conditioners and wall-mounted heat pump air conditioners were the remaining types of most-used room air conditioners.

Chart 40. Type of room air conditioner most used by dwelling, 2007

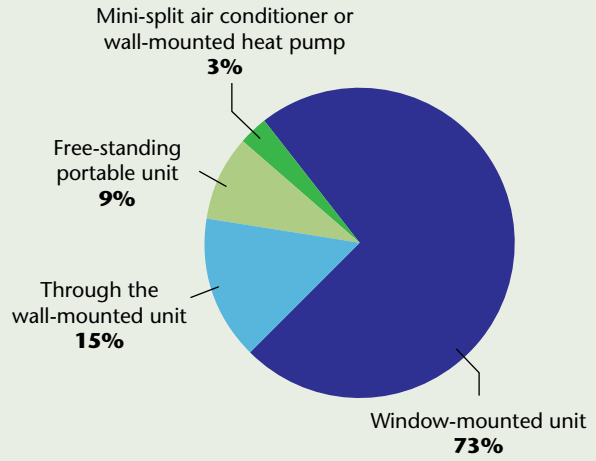
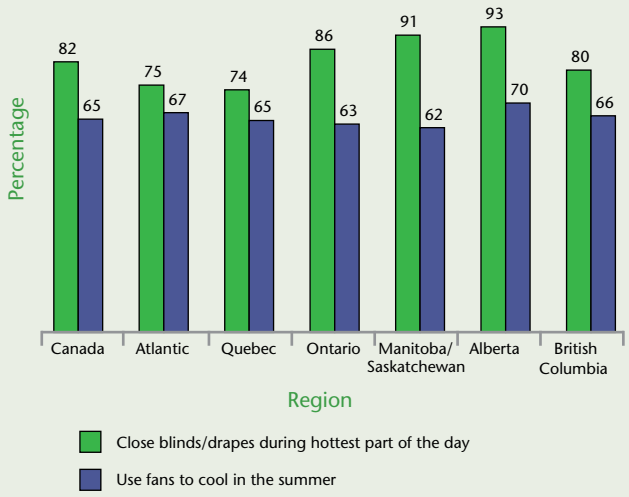


Chart 41. Penetration rates of house fans and the use of blinds/drapes during the hottest part of the day, by region, 2007



Other cooling methods

The use of fans and closing of window blinds are other methods of cooling a dwelling in the summer. Nearly two thirds of Canadian households reported using fans to assist in the cooling of their dwelling in 2007 – there are only slight regional variations in this use (see Chart 41). There appears to be an inverse relationship between the use of fans and the penetration rate of air conditioning systems. Ontario and Manitoba/ Saskatchewan, which have the highest penetration rates for air conditioning systems, also have the lowest penetration rates for fans. Atlantic Canada, British Columbia and Alberta, on the other hand, have the lowest penetration rates for air conditioning systems, while having the highest penetration rates for fans. Finally, Quebec is between the two highest and three lowest air conditioning penetration rates and is in the same position for the penetration rate of fans.

The use of blinds or drapes during the day can prevent a dwelling from absorbing passive solar heat. Regionally, there appears to be a significant variation. Regional climatic variations are a possible explanation, with households in regions that receive more sunshine during the summer being more likely to close their blinds. Using Environment Canada's hours of sunshine for June, July and August,[15] it is found that the provincial ranking for average hours of sunshine almost matches the provincial order of households that close their blinds. The ranking of provinces, from most sunshine hours to least, is as follows: Alberta, Saskatchewan, Manitoba, Ontario, British Columbia, Prince Edward Island, New Brunswick, Nova Scotia, Quebec, and Newfoundland and Labrador.

[15]Canadian Climate Normals or Averages, 1971–2000 www.climate.weatheroffice.ec.gc.ca/climate_normals/index_e.html.

II. Survey findings

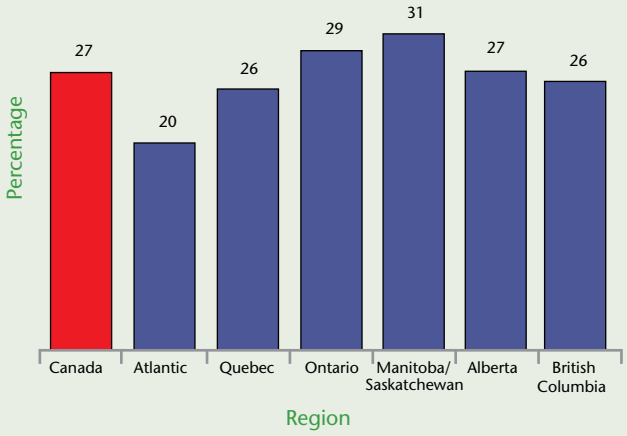
Major appliances

In 2007, major appliances[16] accounted for 66 percent of all the energy used by appliances in the residential sector.[17] Therefore, it was important for SHEU-2007 to obtain information on the characteristics and use of these appliances in Canadian households. For detailed information on the shipment of appliances, consult Energy Consumption of Major Household Appliances Shipped in Canada – Trends for 1990–2007, which can be found on the Office of Energy Efficiency's Web site.[18]

Refrigerators

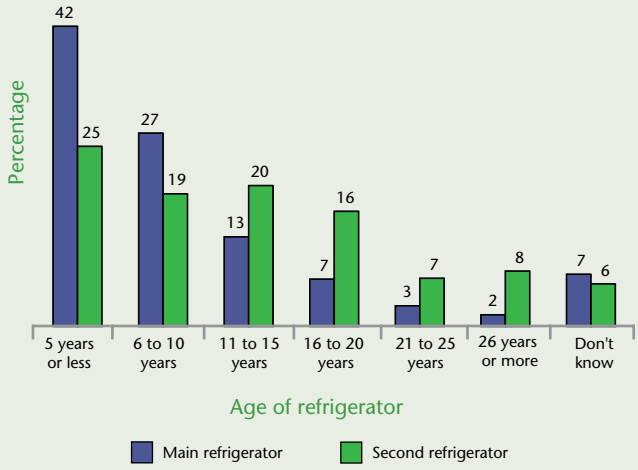
Almost every household in Canada used a refrigerator in 2007, and 27 percent of all households used at least two refrigerators. A regional analysis shows that the percentage of households that used more than one refrigerator varied widely by region (see Chart 42). The results ranged from a low of 20 percent of households in Atlantic Canada to a high of 31 percent of households in Manitoba/Saskatchewan.

Chart 42. Percentage of households who used more than one refrigerator, by region, 2007



The age of the average main and secondary refrigerators also varied, with 42 percent of respondents' main refrigerators and 25 percent of their secondary refrigerators being five years old or less (see Chart 43). The percentage of respondents with main refrigerators dropped off quickly with each increase in the refrigerator age category. The percentage of respondents with secondary refrigerators slowly declined with each increase in the refrigerator age category. These findings indicate that secondary refrigerators are older, on average, than main refrigerators.

Chart 43. Age of main and secondary refrigerators, 2007

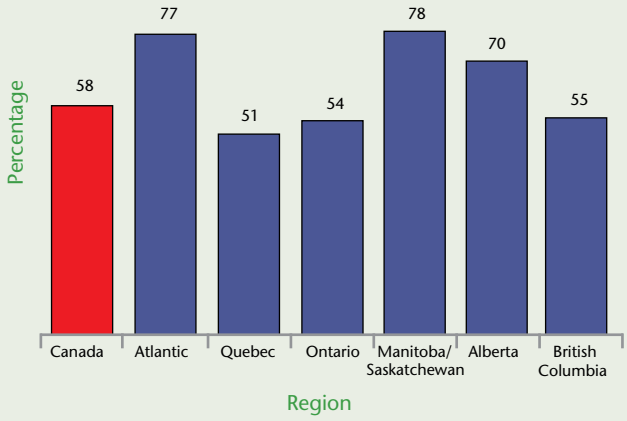


[16] "Major appliances" includes refrigerators, freezers, ranges, dishwashers, clothes washers and clothes dryers.
[17] Natural Resources Canada, Energy Use Data Handbook Tables – 1990 and 2001 to 2007, oee.nrcan.gc.ca/corporate/statistics/neud/dpa/tableshandbook2/res_00_1_e_3.cfm?attr=0.
[18] *Energy Consumption of Major Household Appliances Shipped in Canada – Trends for 1990–2006*, oee.nrcan.gc.ca/Publications/statistics/cama08/index.cfm?attr=0.

Freezers

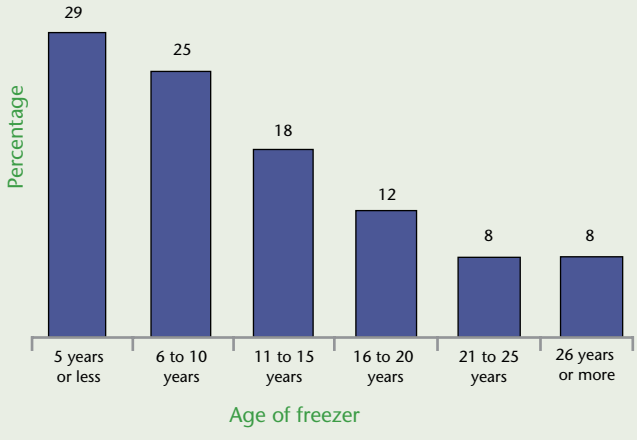
In 2007, Atlantic Canada, Manitoba/Saskatchewan and Alberta had penetration rates for freezers well above the Canadian penetration rate of 58 percent (see Chart 44). Quebec, Ontario and British Columbia were below the Canadian average.

Chart 44. Penetration rate of freezers, by region, 2007



As indicated by respondents, the majority of freezers (54 percent) were 10 years old or less (see Chart 45). Freezers aged five years old or less were the most common, accounting for 29 percent. The percentage of freezers declined for each successive age category until the oldest category, where there was a marginal increase.

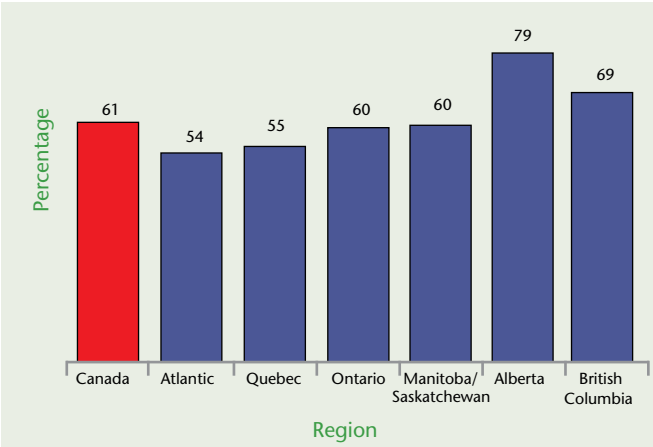
Chart 45. Age of freezers, 2007



Dishwashers

SHEU-2007 data found that 61 percent of Canadian households used a dishwasher. A region-by-region analysis reveals that Alberta had the highest penetration rate of dishwashers, at 79 percent, followed by British Columbia, at 69 percent (see Chart 46). Atlantic Canada had the lowest penetration rate, at 54 percent, with Quebec a close second, at 55 percent. The other regions, Ontario and Manitoba/ Saskatchewan, both had penetration rates of 60 percent.

Chart 46. Penetration rate of dishwashers, by region, 2007

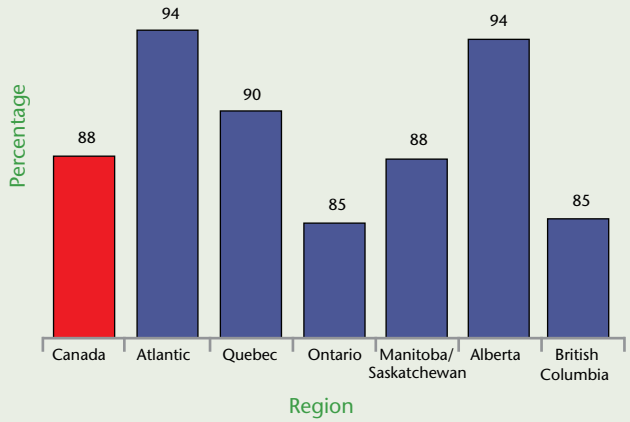


The two basic types of dishwashers are compact and standard. A compact dishwasher is much smaller than a standard-sized dishwasher and has a capacity of only eight place settings and six serving pieces or less. Nationally, of respondents that knew what type of dishwasher they had, 96 percent indicated that their dishwasher was a standard dishwasher.

Clothes washers

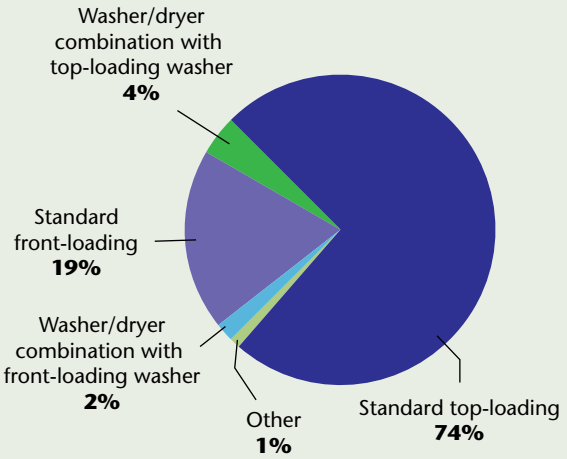
The regional penetration rates of clothes washers varied from 6 percentage points above to 3 percentage points below the Canadian rate of 88 percent (see Chart 47). Atlantic Canada and Alberta both had the highest penetration rate, with 94 percent of dwellings having a washer. Ontario and British Columbia both had the lowest penetration rate, with 85 percent of dwellings having a clothes washer.

Chart 47. Penetration rate of clothes washers, by region, 2007



The most popular type of clothes washer in Canada was a standard top-loading machine (see Chart 48). It comprises 74 percent of the clothes washers of respondents who knew what type of washer they used. The standard front-loading washer makes up 19 percent of the stock, while remaining washer types include top-loading and front-loading combination units.

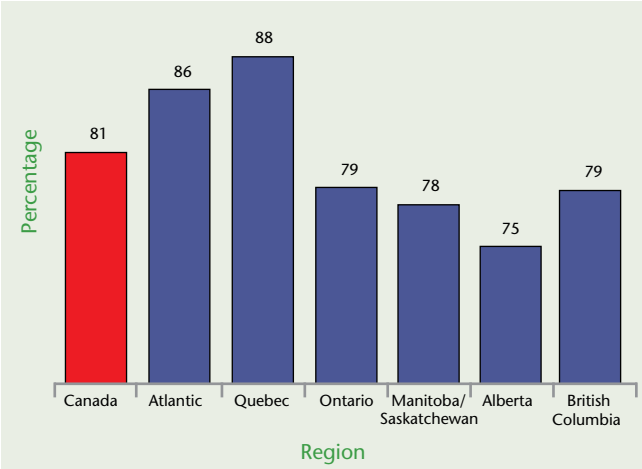
Chart 48. Penetration rate of clothes washers, by washer type, 2007



Front- and top-loading clothes washers may have about the same capacity. However, front-loading washers use less energy than top-loading washers. This is because front-loading washers have no agitator and instead use gravity to agitate the clothes. In addition, front-loading washers use less water. They also extract more water from the clothes, reducing drying time.[19]

An energy-efficient way to use a clothes washer is to rinse with cold water, because clothes rinsed in cold water come out just as clean as those rinsed in warm.[20] Of those households with a washer, Atlantic Canada and Quebec had the highest percentage of households that rinsed with cold water, at 86 percent and 88 percent, respectively (see Chart 49). Alberta had the lowest percentage, at 75 percent.

Chart 49. Percentage of respondents with a clothes washer who used cold water for rinsing, by region, 2007



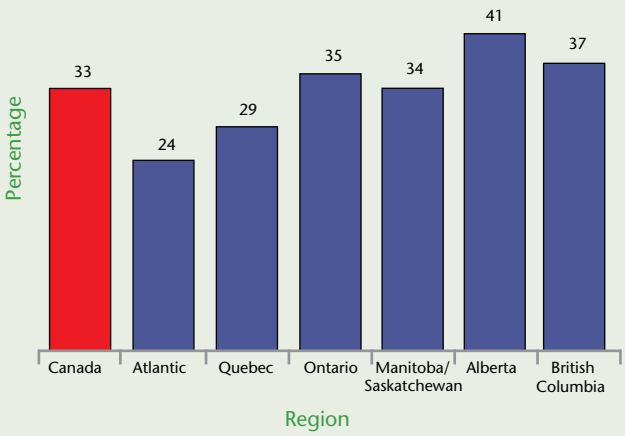
[19]Natural Resources Canada, *EnerGuide Appliance Directory 2009*, oee.nrcan.gc.ca/residential/personal/appliances/clothes-washers-tips.cfm?attr=4#categories.
[20]Natural Resources Canada, *EnerGuide Appliance Directory 2009*, oee.nrcan.gc.ca/residential/personal/appliances/clothes-washers-tips.cfm?attr=4#categories.

Clothes dryers

Many new technologies are available in the Canadian market to aid households in reducing energy consumption. One such technology is a moisture detector, which is an automatic sensor in a clothes dryer that checks the amount of moisture in the clothes and automatically stops the dryer when the clothes are at a predetermined level of dryness.

In 2007, 33 percent of households across Canada that used a clothes dryer used one with a moisture detector (see Chart 50).

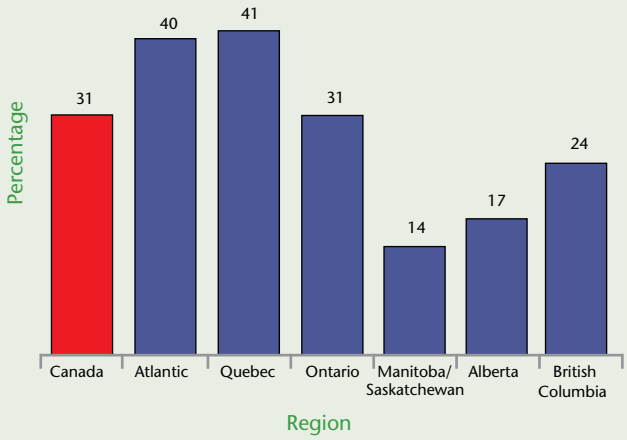
Chart 50. Percentage of respondents with a clothes dryer that had a moisture detector, by region, 2007



Atlantic Canada and Quebec had the lowest penetration rates among households with a clothes dryer with this energy-saving technology (24 percent and 29 percent, respectively).

However, these two regions compensated for the lack of this energy efficiency technology by drying the fewest loads with a dryer during the summer (see Chart 51).

Chart 51. Percentage of households using a clothes dryer who dried one load or less during an average week in the summer, by region, 2007



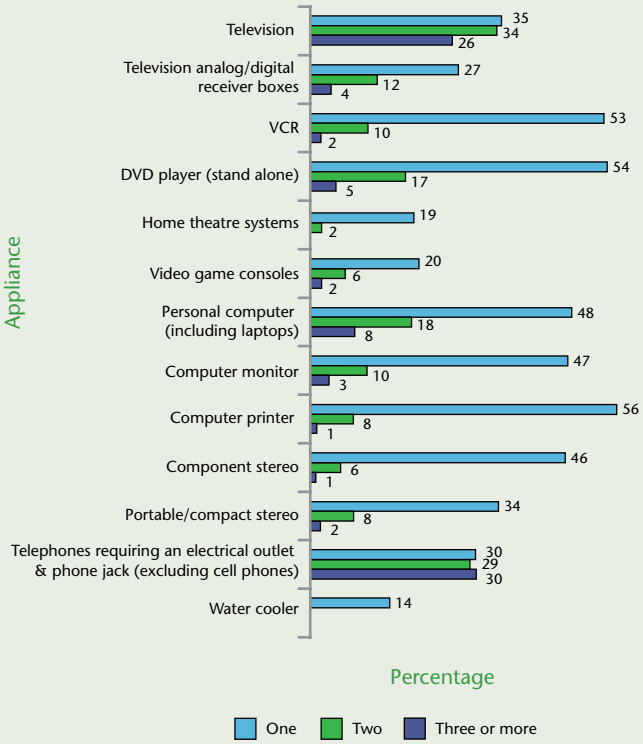
Drying one load or less of laundry per week during the summer indicates the use of air drying. Two fifths of households in Atlantic Canada (40 percent) and Quebec (41 percent) who used a clothes dryer within their dwelling in 2007 used their clothes dryer once per week or less during the summer of 2007. Ontario, which matched the Canadian average, was the only other region at or above the national average of 31 percent.

II. Survey findings

Home electronics

The amount of energy used to power home electronics[21] in the residential sector more than doubled between 1990 and 2007 (increasing by 124 percent). It increased by 19 percent between 2002 and 2007, the last five years for which data were available. This energy use represents an extremely large increase, especially when compared with the 4.6 percent increase in total residential energy use over the same period.[22] Since the energy used by home electronics in the residential sector has increased at such a rapid rate in recent years, it is important to identify which of these devices were most prevalent in Canadian households in 2007 (see Chart 52).

Chart 52. Penetration rates of selected electronic devices, 2007



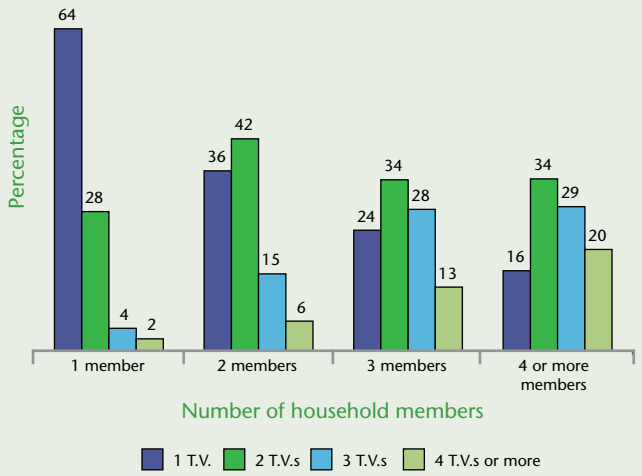
Televisions

Television sets had the highest penetration rate of all the appliances included in the home electronics category. Almost every Canadian household reported using at least one television set in 2007. Furthermore, 60 percent of households used a least two television sets and more than one quarter of households used at least three sets in 2007. Only one other appliance covered by SHEU-2007 had a higher occurrence of households using at least three of it in 2007. This appliance was a telephone that requires an electrical outlet and phone jack (excluding cellphones).

[21]Home electronics includes small appliances, such as television sets, VCRs, DVD players, stereos and personal computers.
[22]Natural Resources Canada, Energy Use Data Handbook Tables, 1990 and 2001 to 2007, oee.nrcan.gc.ca/corporate/statistics/neud/dpa/tableshandbook2/res_00_1_e_3.cfm?attr=0.

Among households who reported the number of people in their dwellings, there was a positive relationship between the number of members of a household and the number of televisions (Chart 53).

Chart 53. Penetration rate of number of televisions used by households, by number of household members, 2007



A ratio between members of a household and televisions was not calculated because the exact number of televisions used by households with four or more televisions was unknown.[23] There was a clear relationship, however, because the percentage of dwellings with one television declined rapidly with each additional household member.

Most households with one member had one television. As a dwelling with one member increased to two members in a dwelling, the largest increase was in the percentage of households with two televisions. The pattern continued, with the number of household members increasing to three, the largest increase appearing in the percentage of dwellings with three televisions. The relationship continued for households with four or more members and four or more televisions. This relationship suggests that there was a desire to have one television for every member of the household.

Devices that operate with televisions

Not surprisingly, given the high penetration rate of television sets, electronic devices that operate in conjunction with a television set also had high penetration rates. More than 75 percent of households used at least one DVD player, and more than a quarter of these households, 29 percent, used at least two DVD players. Also, two thirds of households used at least one VCR, and 21 percent of households used at least one home theatre system. Additionally, more than one quarter of households, 28 percent, used at least one video game system in 2007.

Computers

Computers and related products were prevalent in many Canadian homes in 2007. Personal computers, including laptops, were in 80 percent of dwellings, with just more than a quarter (26 percent) of the dwellings having two or more computers. Most personal computers were desktop computers (86 percent). Desktop computers require a computer monitor for use, and this requirement resulted in 72 percent of dwellings possessing a computer monitor. LCD flat panel screens were the most popular type of monitor (54 percent).

[23]Households were given the following possible responses for the number of televisions used: zero, one, two, three, and four or more.

II. Survey findings

Hot water

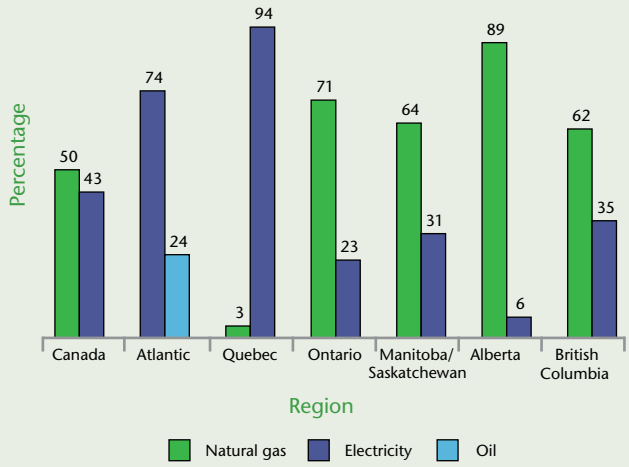
In a typical Canadian home, water heating is the second biggest energy user, after space heating. In fact, water heating alone accounted for 18 percent of residential energy use in 2007.[24] With less than 0.5 percent of respondents reporting that they did not have hot water, it was important for SHEU-2007 to examine the characteristics of water-heating equipment and the prevalence of water conservation devices within households.

Water heating

Almost all Canadian households used either natural gas or electricity, 50 percent versus 43 percent, to heat their water in 2007. Each region had one energy source fuelling a majority of its water heaters, a finding similar to that for space-heating systems (see Chart 54).

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 of note that Atlantic Canada was the only region where a significant number of households used oil to heat their water.

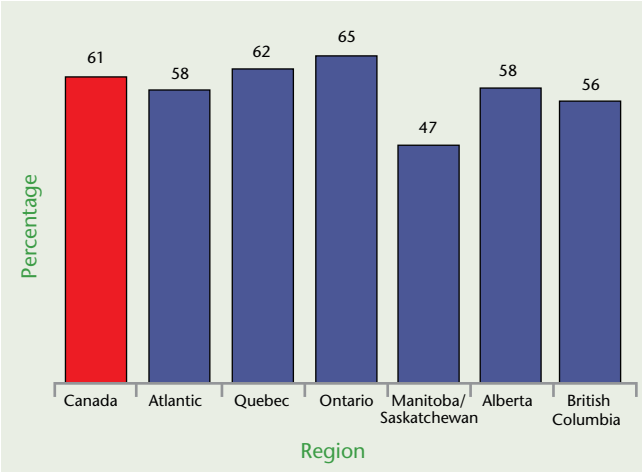
Chart 54. Penetration rate of the two most popular energy sources for heating water, by region, 2007



Hot water conservation devices

While water is viewed as essential in a household, there are ways a household can conserve water and the energy used to heat it. For example, water-saving showerheads conserve energy and water without changing water pressure. In general, water-saving showerheads were more popular in central Canadian households than in the rest of the country in 2007, with only Quebec and Ontario surpassing the Canadian average (see Chart 55). The penetration rates in Alberta, British Columbia and Atlantic Canada were similar, at 58 percent, 56 percent and 58 percent, respectively. Manitoba/Saskatchewan was lower than all other regions, with a 47 percent penetration rate.

Chart 55. Penetration rate of water-saving showerheads, by region, 2007



[24]Natural Resources Canada, Energy Use Data Handbook Tables, 1990 and 2001 to 2007, oee.nrcan.gc.ca/corporate/statistics/neud/dpa/tableshandbook2/res_00_1_e_3.cfm?attr=0.

II. Survey findings

Lighting

Lighting technology has changed dramatically in recent years, and this change is apparent in the increased variety of lighting products available to Canadian households. With this increase in variety, Canadian households have a growing opportunity to reduce the amount of energy they consume for lighting. This change promises to continue as energy efficiency regulations to phase out inefficient lighting products come into effect.

Lighting choices

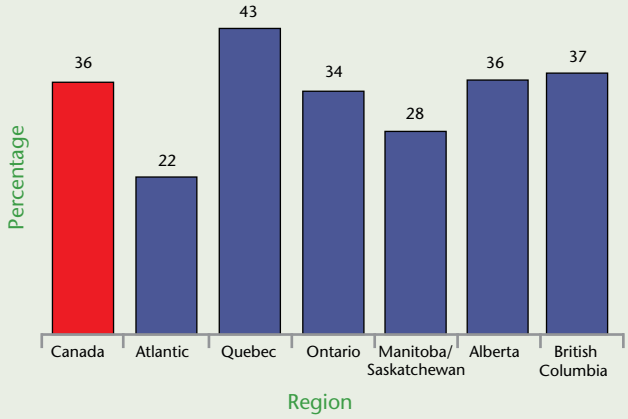
The most common lighting products available to households include incandescent bulbs, halogen bulbs, fluorescent tubes and compact fluorescent lamps (CFLs). Each of these products has its advantages:

- Incandescent light bulbs have a low initial cost, but are not energy-efficient. Only 4 percent to 6 percent of the energy that goes into the fixture produces light; the rest is dissipated as heat.
- Halogen light bulbs contain halogens, or chemicals that minimize filament wear, resulting in a longer lamp life.
- Fluorescent tubes are more efficient, but do not fit traditional sockets. They are not suitable for some specific applications because of their length.
- CFLs can fit traditional sockets and give off the same amount of light as a traditional incandescent light bulb. But they consume up to 75 percent less energy and last up to 10 times longer than traditional bulbs.[25]

Penetration by bulb type

In 2007, 89 percent of respondents used at least one incandescent light bulb – by far the greatest penetration rate of all bulb types on the Canadian market. Just over one third of all households in Canada used at least one halogen light bulb in 2007. A region-by-region analysis reveals that Quebec had the highest percentage of households that used at least one halogen light bulb, at 43 percent, and Atlantic Canada had the lowest percentage, at 22 percent (see Chart 56).

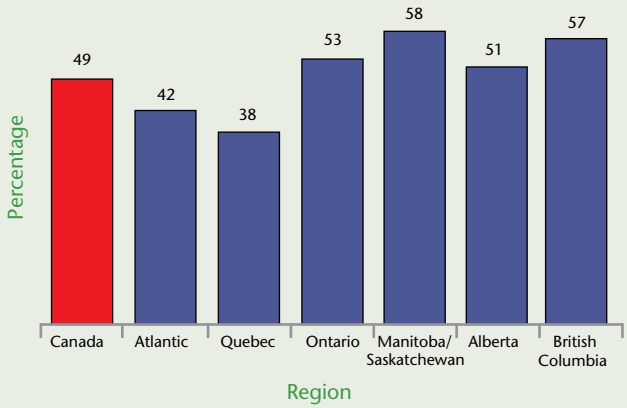
Chart 56. Penetration rate of halogen light bulbs, by region, 2007



[25]Natural Resources Canada, "Choosing Lighting Fixtures – Determine Your Needs," oee.nrcan.gc.ca/residential/personal/lighting/needs.cfm?attr=4.

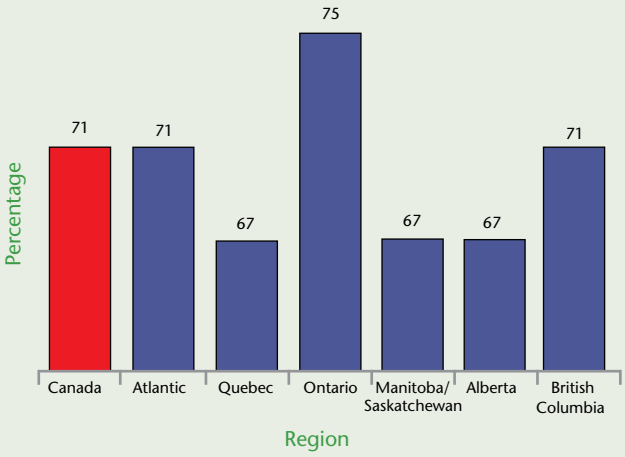
Almost half of Canadian households used at least one fluorescent tube in 2007. Regionally, the percentage of households who used at least one fluorescent tube was greater west of Quebec (see Chart 57). Consequently, Manitoba/Saskatchewan and British Columbia were the two regions with the highest percentage of households who used at least one fluorescent tube (58 percent and 57 percent, respectively). Quebec and Atlantic Canada had the two lowest percentages (38 percent and 42 percent, respectively).

Chart 57. Penetration rate of fluorescent tubes, by region, 2007



CFLs have the second highest penetration rate of any light bulb type in Canada, behind incandescent light bulbs. In 2007, nearly three out of every four dwellings had at least one CFL. This fraction was nearly twice the number of households with halogen light bulbs. Every region was within four percentage points of the national average, with Ontario leading the way (see Chart 58). In both British Columbia and Atlantic Canada, 71 percent of their households had at least one CFL. The other three regions each had 67 percent of their dwellings with at least one CFL.

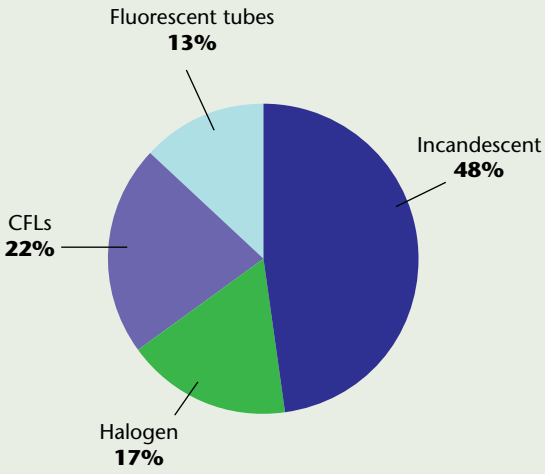
Chart 58. Penetration rate of CFLs, by region, 2007



Number of light bulbs

SHEU found that the average Canadian household used 24.2 light bulbs in 2007. Just fewer than 50 percent of the light bulbs used by Canadians were ordinary (incandescent) light bulbs (see Chart 59). The next most popular light bulb used by the average household was CFLs (22 percent), followed by halogen light bulbs (17 percent) and fluorescent tubes (13 percent).

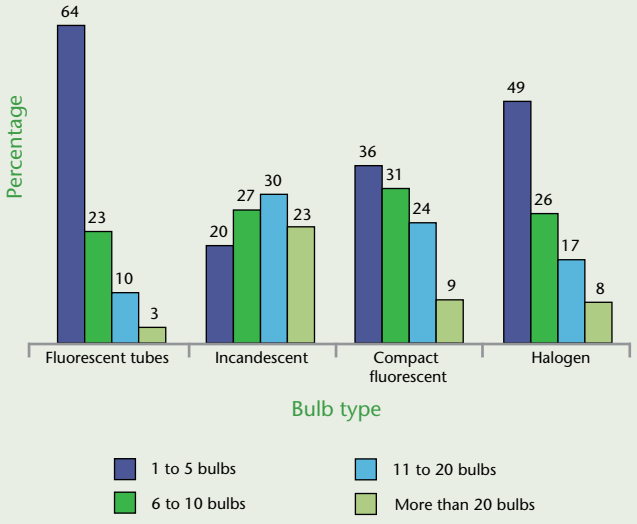
Chart 59. Type of light bulbs used by the average household, 2007



Energy-efficient light bulbs, such as halogen light bulbs, fluorescent tubes and CFLs, comprised over half of the average household's light bulbs. The survey data also show that only 1 out of every 20 households did not use any of these energy-efficient light bulbs in 2007.

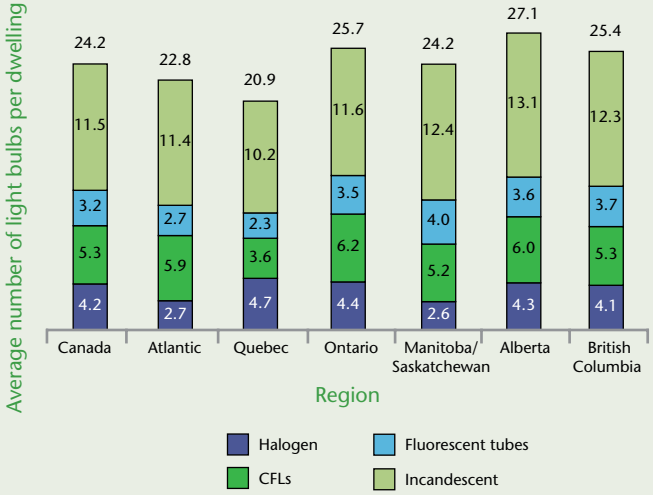
Among households that used a halogen light bulb in 2007, 49 percent used between one and five halogen light bulbs, while 51 percent used six or more halogen light bulbs (see Chart 60).

Chart 60. Number of light bulbs used among households with at least one of that specific bulb, by bulb type, 2007



Among respondents, the average dwelling had 24.2 light bulbs, with incandescent bulbs being the most popular type in all regions (see Chart 61). The average number of light bulbs by region varied by just over 6 bulbs, from a low of 20.9 in Quebec to 27.1 in Alberta. CFLs were the second most popular bulb in all regions except Quebec, where halogen light bulbs were the second most popular. Nationally, halogen light bulbs were the third most popular bulb, and fluorescent tubes were the least popular.

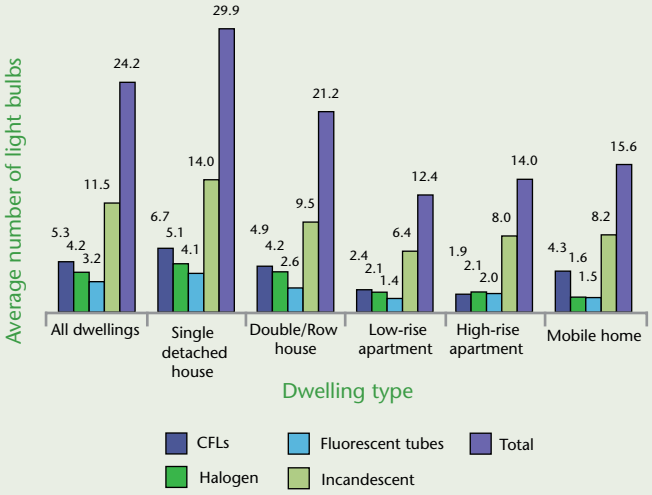
Chart 61. Average number of light bulbs, by bulb type and region, 2007



Among households with at least one CFL, 36 percent had between 1 and 5, 31 percent had between 6 and 10, and the remaining 33 percent used 11 or more. Among households who used a fluorescent tube in 2007, only 36 percent used more than five fluorescent tubes, while 64 percent used between one and five. Incandescent light bulbs had the smallest degree of variation, ranging from a low of 20 percent of dwellings with an incandescent bulb having between 1 and 5 of the bulbs to a high of 30 percent of dwellings having between 11 and 20 bulbs. Incandescent light bulbs were the only type of bulb that did not have the largest percentage of dwellings with that type of bulb using between 1 and 5 bulbs.

The number of light bulbs in a dwelling was linked with the type of dwelling (see Chart 62). Single detached houses, which are the largest of all dwelling types, had on average the most light bulbs per dwelling – eight more bulbs than the average double/row house. In all dwelling types, incandescent light bulbs were the most common, ranging from a low of 45 percent of light bulbs in double/row houses to a high of 57 percent in high-rise apartments. CFLs were the second most common bulb in all dwelling types except high-rise apartments. CFLs ranged from a high of 28 percent of the bulbs in mobile homes to a low of 13 percent of the bulbs in high-rise apartments. Halogen light bulbs were the third most popular choice, except in high-rise apartments. In most dwelling types, halogen light bulbs and fluorescent tubes were used in similar proportions.

Chart 62. Average number of light bulbs, by bulb type, by dwelling type, 2007



II. Survey findings

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. As of 2009, the symbol could be found on almost 40 types of products. 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 consume from 10 percent to 50 percent less energy and water than standard models.[26]

In addition to helping save money, energy-efficient household appliances help protect our environment by reducing greenhouse gas emissions that contribute to climate change. Using a more efficient model also helps lower other pollutants that cause urban smog and acid rain.

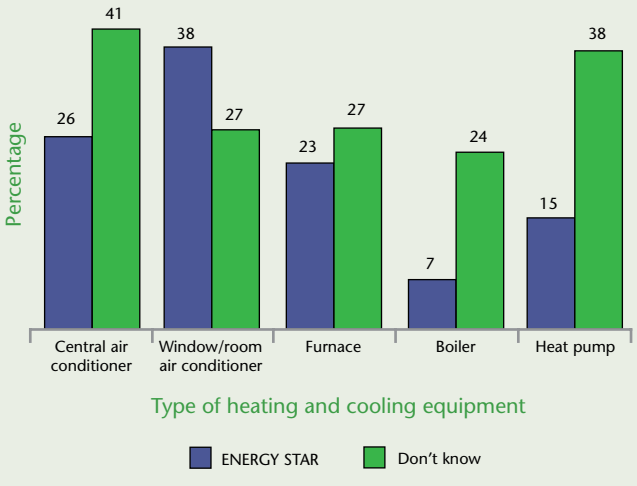
The ENERGY STAR Initiative in Canada officially entered the market in 2001, and it is possible that a product covered by SHEU-2007 was older than the initiative. Consequently, the following analysis represents the penetration rates of ENERGY STAR qualified products among households that used the product regardless of its age. This was done in an effort to reveal the penetration rates of ENERGY STAR qualified products among the total stock of all products in use by Canadians, because other publications track the shipment penetration rates.

ENERGY STAR qualified heating and air conditioning systems

Among ENERGY STAR qualified heating and air conditioning systems, SHEU-2007 covered furnaces, boilers, heat pumps, central air conditioners and window/room air conditioners. SHEU found that none of these ENERGY STAR qualified products had yet reached a 50 percent penetration rate in any category (see Chart 63). Window/room air conditioners had the highest penetration rate, at 38 percent. Boilers, on the other hand, had the lowest penetration rate, at 7 percent.

These results may underestimate the percentage of households that actually used ENERGY STAR qualified heating and air conditioning systems, because there was a high percentage of households who did not know if their systems were ENERGY STAR qualified. In addition, although not reported below, a significant percentage of households with a system did not answer the survey question. This could also reflect the fact that many Canadian households were unaware of the ENERGY STAR Initiative in Canada or that the initiative covers these system categories.

Chart 63. Penetration rate of ENERGY STAR qualified heating and cooling equipment, 2007

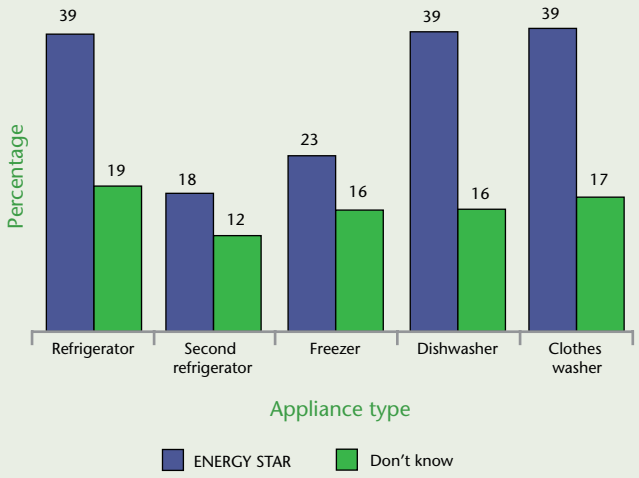


[26]Natural Resources Canada, "Improvements in Appliance Efficiency: By Product," oee.nrcan.gc.ca/residential/personal/appliances/improvements.cfm?attr=4.

ENERGY STAR qualified major appliances

SHEU-2007 covered the penetration rate of select ENERGY STAR qualified major appliances (refrigerators, freezers, dishwashers and clothes washers). For each of these appliance categories, among households who used the appliance, between 18 percent and 39 percent used an ENERGY STAR qualified appliance (see Chart 64).

Chart 64. Penetration rate of ENERGY STAR qualified major appliances, among households who used major appliances, 2007

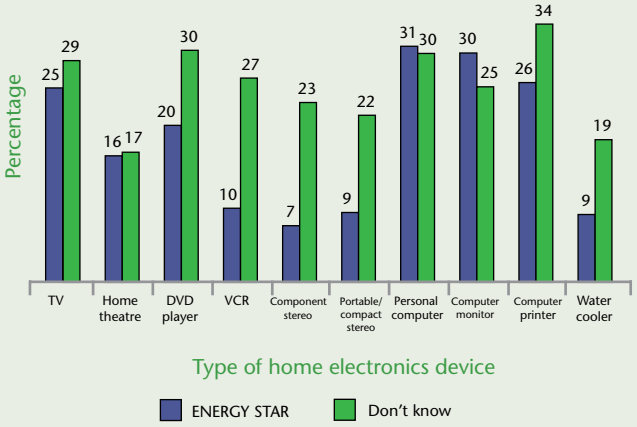


A smaller percentage of households did not know if their major appliances were ENERGY STAR qualified, when compared with knowing if their heating and cooling equipment was qualified. However, a significant percentage still did not know if their major appliance was ENERGY STAR qualified. For example, nearly one out of every five households with a main refrigerator 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 qualified home electronics

In addition to the previously mentioned energy-consuming products, SHEU-2007 covered ENERGY STAR qualified home electronics, such as televisions, home theatre systems, VCRs, DVD players, stereo systems, computers, computer accessories and water coolers. For each of these product categories, among households who used the product, between 7 percent and 31 percent used an ENERGY STAR qualified product (see Chart 65). Stereo equipment (component and portable/compact) and water coolers were at the low end, with 7 percent and 9 percent, respectively, of the households using an ENERGY STAR qualified product. Computers and computer equipment (monitors and printers) were at the high end, with 31 percent, 30 percent and 26 percent, respectively, of the households having an ENERGY STAR qualified product.

Chart 65. Penetration rate of ENERGY STAR qualified home electronics, among households who used home electronics, 2007

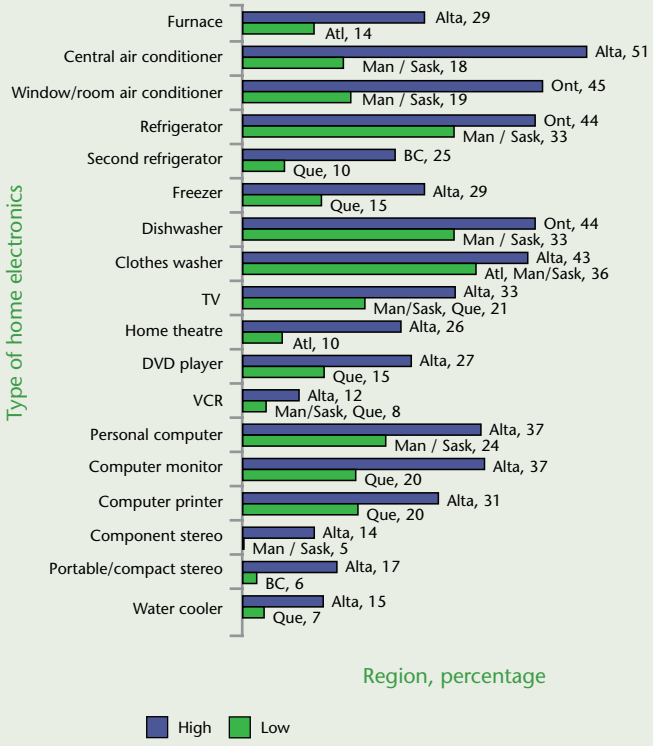


For each of these product categories, between 17 percent and 34 percent of households who used a product did not know if it was ENERGY STAR qualified. In all product categories except computers and computer monitors, a greater percentage of households did not know if they had an ENERGY STAR product, compared with those that reported having one. Once more, these results may cause an underestimation of households who used ENERGY STAR qualified products in 2007. This could reflect the fact that many households were unaware of the ENERGY STAR Initiative in Canada or that the initiative covers these product categories.

ENERGY STAR qualified appliances – regional analysis

Of the 18 ENERGY STAR qualified appliance categories covered by SHEU in 2007, Alberta had the highest proportion of households that reported using an ENERGY STAR qualified appliance in 14 categories (see Chart 66).

Chart 66. Highest and lowest penetration rates of ENERGY STAR qualified appliances, among households with appliances, by region, 2007



Manitoba/Saskatchewan had the lowest or was tied for the lowest penetration rate in nine categories, while Quebec had the lowest or tied for the lowest in eight categories.

Once again, these results represent only the penetration rates of ENERGY STAR qualified products among households that used the product regardless of the product's age. This was done to reveal the penetration rates of ENERGY STAR qualified products within the stock of products. Refer to the *Survey of Household Energy Use – Detailed Statistical Report* to find additional regional data on ENERGY STAR qualified products in 2007 (at oee.nrcan.gc.ca/statistics).

II. Survey findings

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 been covered by all surveys (SHEU-1993, SHEU-1997, SHEU-2003 and SHEU-2007). This provides an opportunity to evaluate developments in the Canadian residential sector through a comparison of findings from 1993, 1997, 2003 and now 2007.

For comparison purposes, this section refers only to elements that are common to all four surveys. Also, this section presents data only for single detached houses, double/row houses and mobile homes. Data for low-rise apartments are excluded because SHEU-1997 did not include this type of dwelling. In addition, SHEU-2007 included high-rise apartments, unlike SHEU-1997 and SHEU-2003. Consequently, this dwelling type is also excluded from the analysis. Therefore, data in this section differ from those in previous sections of this report.

Finally, discrepancies in the survey results may be attributed in part to methodological differences among the surveys. A major change between previous versions of SHEU and SHEU-2007 is that previous versions used a personal interview or telephone call to obtain information, while in the SHEU-2007 version, respondents were mailed a paper copy and asked to mail the survey back. It may be that people respond differently when asked a question face-to-face or by telephone than when they complete a survey on paper.

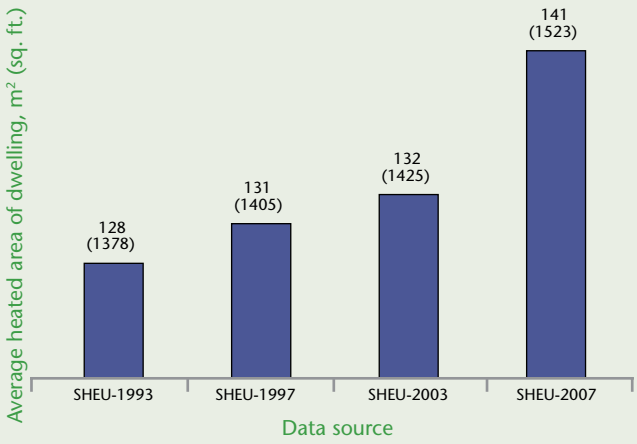
Changing characteristics of Canadian households

Heated area

The heated area of a dwelling is defined as all space within the exterior walls of a dwelling that is heated, excluding garages and basements.

The average heated area of dwellings[27] across Canada has increased with each version of SHEU (see Chart 67).

Chart 67. Average heated area of dwellings, SHEU-1993 to SHEU-2007 (m^2[sq.ft.])



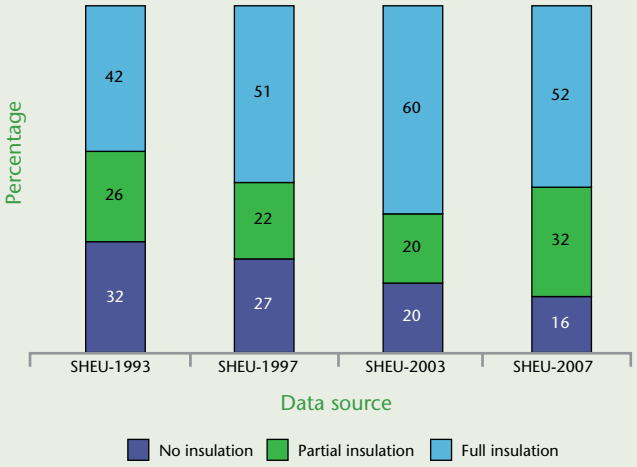
SHEU-1993 found that the average heated area of a dwelling was 128 square metres (m^2) (1378 square feet [sq. ft.]). The average size increased slightly in SHEU-1997 and SHEU-2003 to reach 132 m^2 (1425 sq. ft.). Finally, SHEU-2007 observed the largest increase, as the average dwelling size grew to 141 m^2 (1523 sq. ft.).

[27]Includes single detached houses, double / row houses and mobile homes.

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.[28] Canadian households seemed to become more aware of this fact, because the percentage of fully or partial insulated basements / crawl spaces increased, from 68 percent in SHEU-1993 to 84 percent in SHEU-2007 (see Chart 68). There appeared to be a drop in the percentage of basements with full insulation between SHEU-2003 and SHEU-2007, which may have been due to how the question was worded.[29]

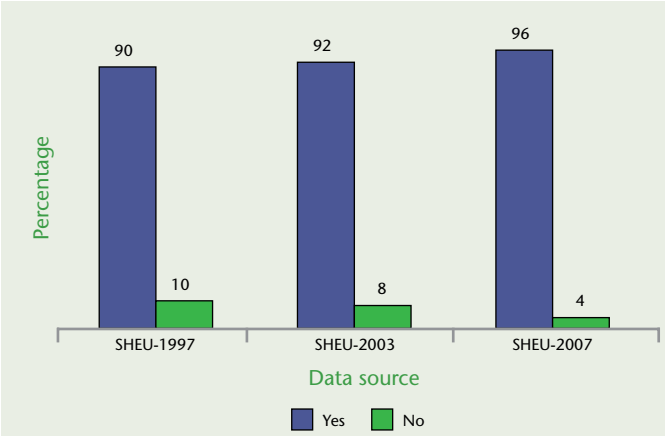
Chart 68. Percentage of basements / crawl spaces with full, partial and no insulation on inside walls, SHEU-1993 to SHEU-2007



Attics / crawl spaces

Despite the fact that most areas, such as basements and uninsulated walls, lose more heat than the typical attic, attics are easy to access when installing insulation. This access has made the attic a favourite insulation starting point for many homeowners.[30] The findings between SHEU-1997 and SHEU-2007 confirm that there was an increase in the percentage of dwellings with insulation among respondents who knew if they had insulation in their attics (see Chart 69).

Chart 69. Percentage of attics / crawl spaces with insulation, SHEU-1997 to SHEU-2007



Changing characteristics of residential heating

Fireplaces

Gas fireplaces have become a cleaner burning and potentially more energy-efficient alternative to conventional wood fireplaces.[31] Many homeowners are attracted to gas fireplaces because of their ease of use, cleanliness and environmental benefits, compared with 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 four SHEUs.

The penetration rate for gas fireplaces has steadily increased, from 5 percent in SHEU-1993 to 23 percent in SHEU-2007 (see Chart 70). In contrast, the penetration rate for wood fireplaces has declined slightly, from 31 percent to 23 percent over the same period.

[28]Natural Resources Canada, *Keeping the Heat In – EnerGuide*, Gatineau, oee.nrcan.gc.ca/residential/personal/new-home-improvement/choosing/insulation-sealing/basement/khi-basement.cfm?attr=4.
[29]SHEU-2007 asked for the percent of insulation coverage, unlike previous surveys, which only asked if the basement / crawl space had full insulation. For SHEU-2007, full insulation is considered 100 percent coverage; partial insulation, from 1 percent to 99 percent; and no insulation, 0 percent.
[30]Natural Resources Canada, "Roofs and Attics," oee.nrcan.gc.ca/residential/personal/new-home-improvement/choosing/insulation-sealing/roofs-attics/khi-atticleaks.cfm?attr=4.
[31]Natural Resources Canada, *All About Gas Fireplaces*, Ottawa, 2004, p. 3, oee.nrcan.gc.ca/Publications/infosource/Pub/home/all_about_gas_fireplaces.pdf.

Chart 70. Penetration rate of fireplaces, by type of fireplace, SHEU-1993 to SHEU-2007

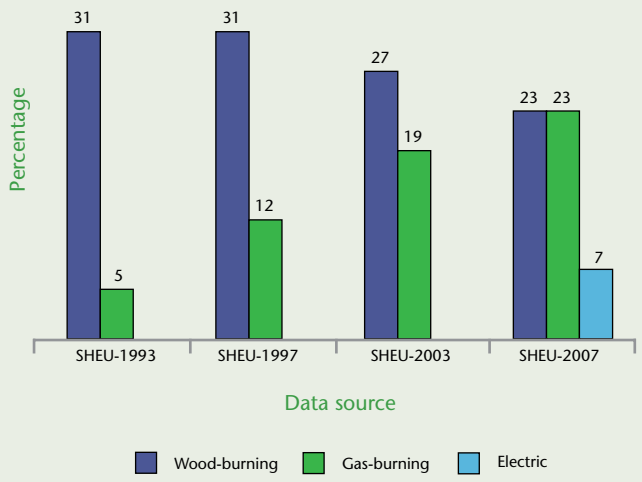
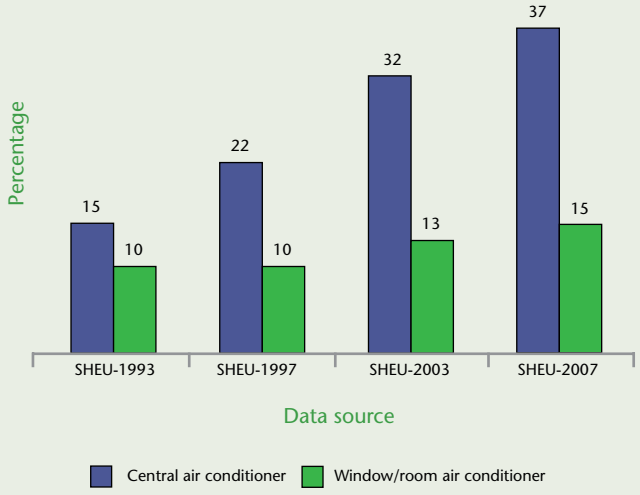


Chart 71. Penetration rate of air conditioning systems, by type of system, SHEU-1993 to SHEU-2007



For the first time, SHEU-2007 asked whether a dwelling had an electric fireplace. In 2007, 7 percent of single detached houses, double/row houses and mobile homes had an electric fireplace.

Changing characteristics of the air conditioning of households

From SHEU-1993 to SHEU-2007, the penetration rate for central air conditioners increased from 15 percent to 37 percent (see Chart 71). Over the same period, the penetration rate for window/room air conditioners increased, but not as quickly (from 10 percent to 15 percent). The increases since SHEU-2003 have coincided with warmer-than-average summers, including the 2006 summer, which was the second-warmest Canadian summer since 1948.[32]

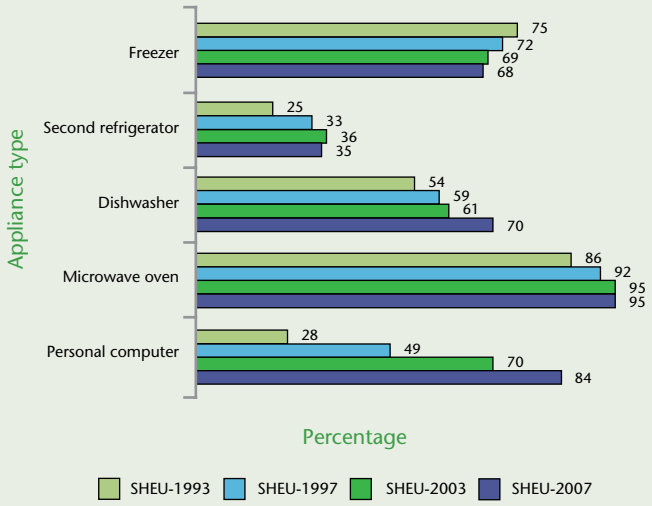
Changing characteristics of appliances

Selected appliances

There has been a steady decline in the penetration rate for freezers, from 75 percent in SHEU-1993 to 68 percent in SHEU-2007 (see Chart 72). 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, with a slight decline to 35 percent in SHEU-2007. Therefore, households seem to be slowly replacing freezers with additional refrigerators, which include freezer sections.

[32]Environment Canada, "Summer national temperature departures, warmest/coolest ten years in the period 1948–2009," www.msc-smc.ec.gc.ca/ccrm/bulletin/n10table_e.html?region=n&table=temperature&season=Summer&date=2009&rows=10.

Chart 72. Penetration rate of selected appliances, SHEU-1993 to SHEU-2007



As was the case with secondary refrigerators, the penetration rates of many other appliances have increased over the years since SHEU-1993. The penetration rate of dishwashers in Canadian households has increased, from 54 percent in SHEU-1993 to 70 percent in SHEU-2007. Also, the penetration rate of microwave ovens has increased over the past 10 years, to the point where almost every household used a microwave oven in 2003 and 2007. Additionally, there has been a dramatic increase in the penetration rate of personal computers, from 28 percent in SHEU-1993 to 84 percent in SHEU-2007.

Lighting choices

Since the first SHEU in 1993, lighting choices in the average household have dramatically changed, with much of that change taking place between 2003 and 2007. Lighting might represent the easiest path to energy efficiency gains for households, because light bulbs are frequently replaced and less expensive than other options, such as changing windows, adding insulation or installing new heating equipment.

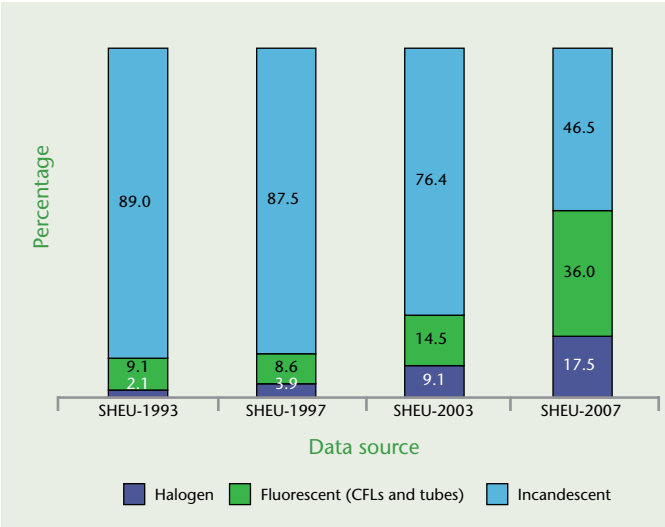
From SHEU-1993 to SHEU-1997, there was little change in the percentage of each light bulb type in the average household (see Chart 73). There was a slight decrease in the percentage of incandescent and fluorescent light bulbs (both tubes and CFLs). At the same time, the percentage of halogen light bulbs almost doubled, but they still represented only a small percentage of total lighting.

There appeared to be a move to switch from incandescent light bulbs to more energy-efficient lighting choices between SHEU-1997 and SHEU-2003. Not only did the percentage of halogen bulbs more than double, but also the declining trend of fluorescent bulbs reversed, increasing by almost 6 percentage points.

Between SHEU-2003 and SHEU-2007, the trend in declining incandescent lighting accelerated. The percentage of incandescent light bulbs dropped by 30 percentage points and dipped below 50 percent of all light bulbs for the first time. At the same time, energy-efficient lighting increased, with the penetration rate of halogen bulbs almost doubling and fluorescent bulbs more than doubling. And for the first time in the history of SHEU, energy-efficient lighting made up more than 50 percent of all light bulbs.

For the entire period, from SHEU-1993 to SHEU-2007, the percentage of incandescent bulbs almost halved, while the percentage of fluorescent bulbs increased almost fourfold, and the percentage of halogen bulbs increased more than eightfold.

Chart 73. Percentage of each light bulb type in the average household, SHEU-1993 to SHEU-2007



Note: The results presented in this section excluded data from low- and high-rise apartments. The numbers in this section of the analysis do not match those in the previous sections because the previous sections included the entire SHEU-2007 sample, which includes low- and high-rise apartments.

III. Appendix A

Glossary

Air conditioner: A device used to cool air within a dwelling.

Air leak: The unintended exchange of interior and exterior air around a window or door.

Apartment building: A building originally designed to contain multiple dwelling units (apartments) within it. Duplexes (two dwellings one above the other, not attached to any other structure) are not included in this definition.

Attic: The top storey of a dwelling, below the roof, used more often for storage purposes than for living purposes.

Bag of firewood: Equivalent to a stack of wood that measures 0.3 metres (m) long by 0.3 m wide by 0.6 m high (1 foot [ft.] long by 1 ft. wide by 2 ft. high).

Basement: A usable part of a building that is located partially or completely beneath the outside ground level.

Boiler (space heating): A space heating system with a pump that distributes heated water through a network of pipes to radiators in various rooms in the dwelling. The radiators are heat-emitting.

Boiler (water heating): A large hot water tank that is typically used in apartment buildings.

Caulking: Material used to make an air-tight seal by filling in cracks, such as those around windows and doors.

Central ventilation system (air exchanger): A 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.

Clothes dryer: An appliance used to dry clothing by evaporation accelerated by applying heat and rapid air movement. The air is usually heated by electricity or natural gas.

Clothes washer (washing machine): An appliance for washing laundry that has a washtub, an agitator (top loading machines) and a system for draining used water. An opening at the top or front of the appliance provides access to the washtub.

Combination boiler (typically a wall-hung unit): Typically, a small boiler used for domestic hot water in addition to space heating.

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

Compact fluorescent lamp (CFL): A general term for smaller-diameter fluorescent lights that are compatible with standard light sockets.

Compact stereo: A one-component stereo system that cannot be carried or moved easily because of its size or design (no built-in handles or carrying straps).

Component stereo: A stereo system with two or more separate components. Each component has its own electrical plug. The components and speakers operate together to produce sound. Components may include an amplifier, audio-video receiver, CD player, tape player, record player and radio tuner.

Computer monitor: An electrical device used to provide a visual display of images generated from the video output of a desktop computer. Laptop computers do not require an external computer monitor because a video display is built in to the laptop casing.

Computer printer: A peripheral computer device that produces a hard copy (usually on paper) of a graphic display relayed from a computer.

Condensation: A physical reaction in which water vapour molecules join to form water droplets that attach themselves to the interior surface of a window.

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

Condominium: A dwelling unit in a multidwelling structure (an apartment building) or on land owned in common (a townhouse complex) that is owned by an individual.

Condominium corporation: A corporation that administers the operation, maintenance and repair of the common elements and assets of a condominium.

Cooling degree-day: A measure of how hot a location was over a period, relative to a base temperature of 18.0°C. If the daily average temperature exceeds the base temperature, the number of cooling degree-days for that day is the difference between the two temperatures. However, if the daily average is equal to or less than the base temperature, the number of cooling degree-days for that day is zero. The number of cooling degree-days for a period is the sum of the daily cooling degree-days for the days in that period.

Crawl space: A narrow space between the bottom of the floor of the lowest building storey and the ground. The space may have an earth, gravel or paved floor. In dwellings that do not have basements, the space between the first floor and the surface of the ground is made large enough for a person to crawl through to access utilities.

Desktop computer: A personal computer in a form intended for regular use at a single location.

Dishwasher: An appliance designed to wash dishes automatically. Water is sprayed over dishes either by fixed jets aimed at a rotating basket or by rotating jets.

- **Compact dishwasher:** Categorized as a dishwasher that has a capacity of less than eight place settings and six serving pieces.
- **Standard dishwasher:** Categorized as a dishwasher that has a capacity equal to or greater than eight place settings and six serving pieces.

Door: A moveable barrier used to cover an opening. Doors are used widely and are found in walls or partitions of a building or space. Doors are nearly universal in buildings of all kinds, allowing passage between the inside and outside and between internal rooms. When open, they admit ventilation and light. Doors are used to control the physical atmosphere within a space by enclosing it, excluding air drafts, so interiors may be more effectively heated or cooled.

Double/row house: A house connected to at least one other dwelling, which together form a building. For SHEU-2007, duplexes (two dwellings one above the other, not attached to any other structure) are included in this category.

Drafts: The unintended exchange of interior and exterior air around windows or doors.

DVD player: A stand-alone device that plays DVDs (digital video disks). It contains a DVD drive and the electronics to decode the digital video. DVD players are cabled directly to a television or indirectly to a television through a home theatre system for audio/video display.

Dwelling: Any set of living quarters that is structurally separate from the living quarters of other dwellings and has a private entrance outside the building or a private entrance from a common hall or stairway inside the building. The private entrance must be one that can be used without passing through the living quarters of another dwelling.

Electric baseboard: An electric heat-emitting device located only at the baseboard level. It can be controlled at the unit itself or with a wall control.

Electric radiant heating: Radiant heat sources warm objects within their range without necessarily having to heat the surrounding space. Two types of electric radiant heating are portable infrared heaters and electric radiant heating cables installed in a floor or ceiling.

Electricity: Electric energy measured by a meter, distributed by a public utility company to a dwelling through overhead or underground power lines. This definition does not include electricity generated by non-public utility sources.

Energy consumption: For SHEU-2007, a summation of household electricity, natural gas, heating oil, propane and wood consumption in terms of energy (gigajoules) during 2007. Household energy consumption excludes energy consumed for transportation and gas-powered equipment.

Energy intensity: The total energy consumption of a dwelling divided by the heated units of floor area. For SHUE-2007, energy intensity is expressed in gigajoules per square metre (GJ/m^2).

Energy source(s): The type(s) of energy used by a household. For SHEU-2007, energy sources include electricity, natural gas, heating oil, propane, wood and other sources, such as solar and wind.

ENERGY STAR® qualified product: The ENERGY STAR mark helps consumers identify which energy-consuming products are the most energy-efficient in their class. The ENERGY STAR symbol is used to identify products that offer premium performance levels in energy efficiency. The ENERGY STAR symbol is displayed on product packaging, literature and advertising and on the products themselves.

Face or stove cord: Equivalent to a stack of wood that measures 2.4 m long by 0.4 m wide (one log) by 1.2 m high (8 ft. long by 16 inches wide by 4 ft. high).

Fireplace: A partially enclosed space for a contained fire within a dwelling. The energy source for a fireplace is typically wood, natural gas, propane or electricity. An electric fireplace does not house an actual fire within its enclosure. However, it may produce heat and a visual rendering of a fire when in use.

Fluorescent tube: A low-pressure electric-discharge lamp consisting of an elongated tube with one or more photo-luminescent (phosphor) coatings on the inside that transforms ultraviolet light into visible light.

Foundation: A structure that supports and immobilizes houses and buildings. It is designed to judiciously distribute all loads that are transmitted to it, either toward or under the ground.

Freezer: A stand-alone appliance that freezes food. It is built as either a vertical model (with a door that opens outward) or a chest model (with a lid). For SHEU-2007, a freezer compartment within a refrigerator is not included in the definition.

Full or brush cord: Equivalent to a pile of wood that measures 2.4 m long by 1.2 m wide by 1.2 m high (8 ft. long by 4 ft. wide by 4 ft. high). It is also equivalent to three face cords or 64 bags of wood.

Furnace: A heating system that distributes heat by using a motor-driven fan to circulate heated air through the duct system of a dwelling. The heated air is delivered to different rooms through air vents.

Furnace efficiency rating: A measurement of the amount of heat delivered to the dwelling compared with the amount of fuel supplied to the furnace. The efficiency rating is referred to as the annual fuel utilization efficiency (AFUE). A high-efficiency furnace has a higher AFUE than a low-efficiency furnace.

Garage: A space primarily designed to shelter personal vehicles that is usually enclosed or covered.

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

Halogen light bulb: An incandescent lamp with a tungsten filament that contains halogen gases that carry the tungsten particles back to the filament as they evaporate, thus preventing them from accumulating on the glass wall. The bulbs provide an intense white light and become very hot while in use.

Hardwood: A wood of higher density and hardness than softwood. It also produces more heat when burned than a softwood.

Heat pump: An electrical device that can be used to heat and cool a dwelling. It is typically located outdoors if it is an air-source heat pump and indoors if it is a ground-source (earth or water) heat pump.

Heated area: All space within the exterior walls of a dwelling that is heated, excluding garages and basements.

Heating degree-day (HDD): A measure of how cold a location was over a period, relative to a base temperature. For SHUE-2007 the base temperature is 18°C and the period is one year. If the daily average temperature is below the base temperature, the number of HDDs for that day is the difference between the two temperatures. However, if the daily average temperature is equal to or higher than the base temperature, the number of HDDs for that day is zero. The number of HDDs for a longer period is the sum of the daily HDDs for the days in that period.

Heating season: A general term for the time of the year when heating equipment is used to heat the interior of a dwelling.

Heating stove: An enclosed heating unit in which material such as wood, pellets and corn is burned.

High-rise apartment: A dwelling unit contained in an apartment building with five or more storeys.

Home theatre system: For SHEU-2007, a surround sound audio system typically used in conjunction with television viewing.

Hot water tank: A thermally insulated tank with automatic controls designed to produce and hold domestic hot water.

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

Household income: The total income of all members of the household in 2007 from all sources, before taxes and other deductions.

Improvements: For SHEU-2007, any enhancements to a dwelling that reduce energy consumption. They are commonly referred to as a retrofit.

Incandescent light bulb: A light bulb containing a tungsten filament that gives off light when an electric current flows through it. It is commonly referred to as an ordinary or regular light bulb.

Insulation: Material that reduces unwanted heat loss or gain and can decrease the energy demands of heating and cooling systems.

Insulation around hot water pipes: Add-on insulation placed around hot water pipes to conserve energy (keep heat in). The add-on insulation is not necessary for the normal operation of the pipes and includes, for example, snap-on insulation.

Joule (J): A unit of energy that is the energy exerted by a force of one newton acting to move an object a distance of one metre.

Landlord: The owner of a dwelling who rents that dwelling as housing to tenants.

Laptop computer: A personal computer designed for mobile use. A laptop computer is also referred to as a notebook computer.

Low-rise apartment: A dwelling unit contained in an apartment building with fewer than five storeys.

Microwave oven: An appliance that emits electromagnetic waves capable of agitating water molecules contained in food. The repeated friction of these molecules raises the temperature, enabling the food to cook rapidly.

Mobile home: A mobile dwelling 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 some other specifically designed structure. It must be able to be moved again to another location, as required.

Moisture detector: An automatic sensor in a clothes dryer that checks the amount of moisture in the clothes and automatically stops the dryer when the clothes are at a predetermined level of dryness. It is not a timed function.

Natural gas: An energy source consisting of a gaseous mixture of saturated hydrocarbons that is found in underground deposits, either alone or with petroleum. It is delivered directly to houses and buildings by pipelines.

Outside wall / exterior wall: Wall that is in contact with the outside of the dwelling. This excludes walls that are shared between double/row houses or apartments.

Penetration rate: Percentage of a sample population that used a given product during a specific period. For SHUE-2007, the sample population is Canadian households that were asked the question, unless otherwise stated.

Personal computer: Any general-purpose computer whose size and capabilities make it useful for individuals and that is intended to be operated directly by a user, with no intervening computer operator. Personal computers include desktop and laptop computers.

Plastic film on windows: Plastic film installed over window frames that reduces drafts and heat loss due to gaps in insulation. Typically, the film is temporary because it is installed during the heating season and then removed after the season is over.

Portable electric heater: A space heating unit that can be transported easily. The source of heat is electrical resistance.

Portable stereo: A stereo system that can be carried or moved easily (using built-in handles or carrying straps). Personal audio players, such as MP3 players, are not considered to be portable stereos.

Programmable lighting timer control: A device that automatically turns lights on and off according to its programmed time-of-day specifications.

Programmable thermostat: A thermostat that can be set to change the temperature at different times of the day. For example, at night you might set it at a lower temperature while you are sleeping and set it to come on automatically at higher daytime temperature an hour before you get up.

Propane: An energy source that is a saturated, aliphatic, linear-chain hydrocarbon found in natural gas and petroleum.

Property manager: A person who handles the day-to-day running of a condominium or rental property.

Refrigerator: A movable chest in which the temperature can be controlled to preserve perishable food. Most refrigerators are equipped with a second compartment for freezing food.

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

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

Supplementary heating: A heating system that can be used in addition to a main heating system, as required, and is flexible enough to respond to rapid variations in heating needs.

Telephone: For SHEU-2007, a phone that requires an electrical outlet and a phone jack. This does not include cellular phones.

Television: An electronic device that displays audio/video signals from television broadcasts and other audio / video equipment, such as DVD players and VCRs.

Television analog / digital receiver box: A device that converts a cable or satellite television signal for audio / visual display on an attached television. It is commonly referred to as a television set-top box or cable box.

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

Thermostat: A device that controls indoor dwelling temperature. It controls the operation of space heating and cooling devices by turning the device on or off when a specified temperature is reached.

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

VCR (video cassette recorder): An analog tape recording device that can record and play videocassettes through a television.

Video game console: A dedicated electronic device that plays video games on a television.

Water cooler: A device that cools and dispenses drinking water from large bottles that generally are delivered by or picked up from vendors.

Water heater: An apparatus that heats water to be used specifically as domestic hot water. Boilers used only for space heating are not included in this definition.

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.

Window: A construction unit set into a space within a wall or inclined roof to allow light, and possibly air, to enter. The space is typically closed by a transparent material, such as a pane of glass.

Window / room air conditioner: An air conditioner that typically distributes cooled and/or dehumidified air to a single room.

- **Minisplit air conditioner:** A quiet, compact air conditioner consisting of an outdoor compressor and up to three indoor diffusers installed high on the walls to ensure a uniform distribution of air. Unlike a heat pump, it can be used only for cooling.

- **Free-standing portable air conditioner:** An air conditioner that can be moved easily from location to location. Typically, the unit has wheels.

- **Through-the-wall-mounted (non-louvered) air conditioner:** An air conditioner that is installed in an exterior wall opening and has non-louvered sides.

- **Wall-mounted heat pump / air conditioner:** A compact heat pump consisting of an outdoor compressor and up to three indoor diffusers installed high on the walls to ensure a uniform distribution of air. It can be used for space heating as well as air conditioning.

- **Window-mounted unit (louvered unit) air conditioner:** An air conditioner that has an accordion pleat stretching from the air conditioner unit to the edge of the window frame. Louvered sides (accordion pleat) are used with window air conditioners to prevent drafts.