

Energy Use and Greenhouse Gas Emission Performance in Canadian Homes Since 1990

2006 Update

July 2009



Summary of Key Indicators:

- Between 1990 and 2006, energy use in Canada **increased by just over 21%**. Between 2005 and 2006, total energy use fell by slightly less than 1%.
- As a result of the increased use of energy, Canada's total greenhouse gas (GHG) emissions **increased by 21.7%** and, at the end of 2006, stood some **29% above** the target set in the Kyoto Accord.
- During the same period, total GHG emissions from Canada's residential sector **decreased by 8.5%**, despite 29% growth in the housing stock through the end of 2006. This reflects an average **19% decrease in energy use per home**.
- Overall, the net impact of energy efficiency gains in the residential sector **cut projected growth of energy use in homes by two-thirds** between 1990 and 2006.
- GHG emissions from energy consumed in homes varied regionally, but fell in all provinces on a per household basis by between **10% and 60%**.
- It should be noted that residential energy use is significantly affected by weather conditions. On a national basis, 2006 was a warmer year than the long-term average, and this contributed to the energy performance of the residential sector during that year.

Overview

This report provides an overview of the energy and greenhouse gas (GHG) emission performance of Canada's residential sector between 1990 and 2006. It shows that the sector continues to make significant energy efficiency gains, and that GHG emissions have been constrained as a result. During the period, the total area of residential housing in the country grew by 33.6%, while total residential energy use increased by only 4.8%. GHG emissions from Canadian homes decreased by 8.1% over the same period. As a result, the residential sector is one of very few areas where Canada has achieved the targets it agreed to when it signed the Kyoto Accord.

Overall, at the end of 2006, the residential sector had significantly outperformed the institutional and commercial building sector in terms of both increased energy efficiency and constrained emissions of GHGs. The residential sector also outperformed most other sectors of the economy.

All data cited comes from the *Comprehensive Energy Use Database* (CEUD), maintained by Natural Resources Canada. It should be noted that CEUD data is not weather-corrected, i.e., it has not been adjusted to factor out weather-induced variability. To provide some insight into how weather impacts energy and GHG emission performance in homes, data is presented on the relationship between annual heating degree days and space heating energy use in homes over the reporting period.

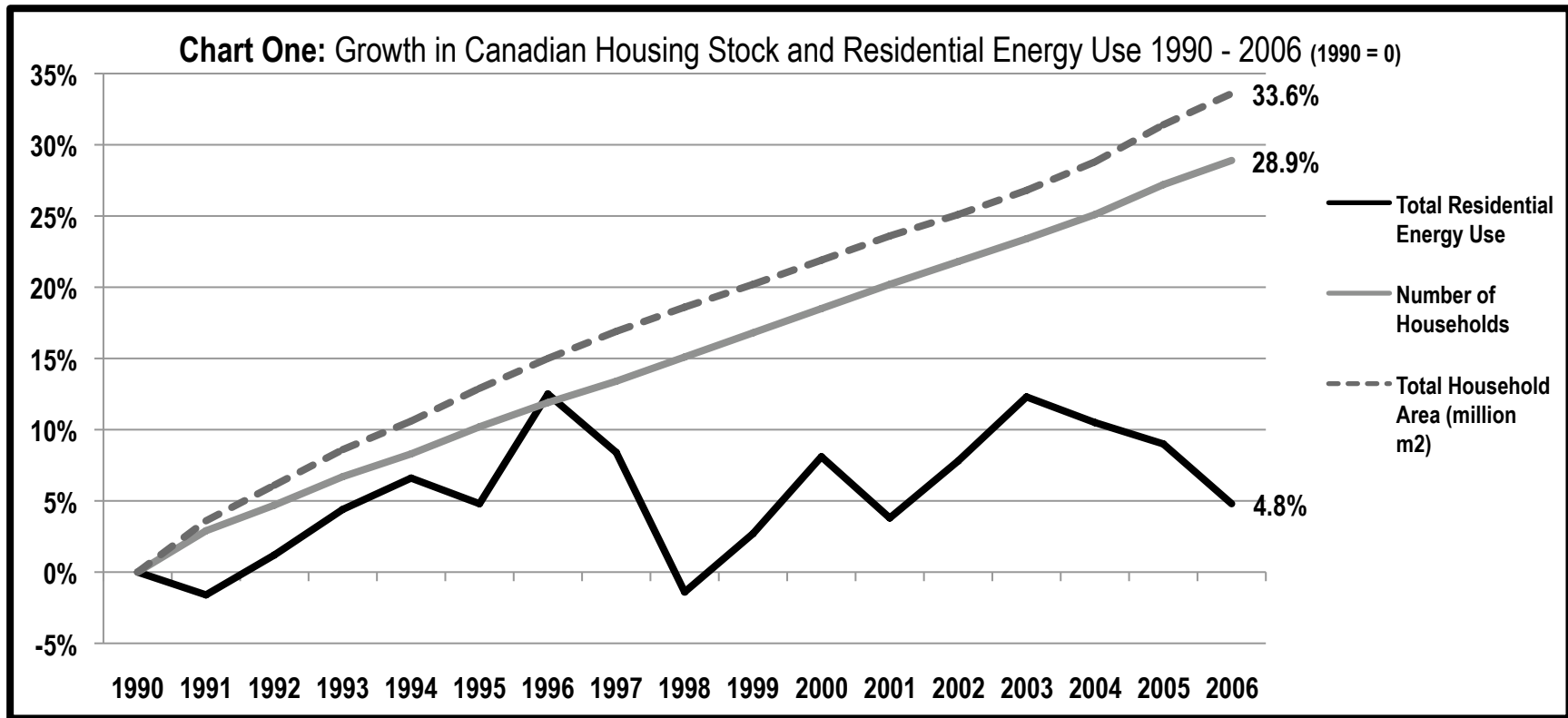
It should also be noted that the CEUD data is currently available only from 1990 through 2006, a period characterized by fairly low energy prices. Since 2006, energy prices have become much more volatile. As well, the residential sector has seen increased take-up of voluntary, market-driven energy efficiency initiatives in new housing. As additional data becomes available in future years, the growing impact of this market transformation will likely become apparent.

It is also noted that CEUD data tabulates GHG emissions in accordance with the methodology established under the Kyoto Accord Protocol, at the point of energy end-use. As such, emissions of GHGs related to electricity-generation are attributed to the generator, not the electricity end-user. This reflects the overarching importance of utility commitment to GHG emission reduction, notwithstanding the wisdom of consumers using electricity wisely.

While new home builders and consumers make decisions that determine how electricity is used in a home, neither party has input into how such electricity is generated. The “carbon-intensity” of electricity in Canada varies tremendously among provinces, and also within provinces as changes to the generation “mix” occur. For clarity, in this report national residential GHG emissions are presented based on energy at point of end-use, but data illustrating the national impact of electricity-related emissions linked to residential electricity consumption are also presented.

Growth in Housing and Residential Energy Use

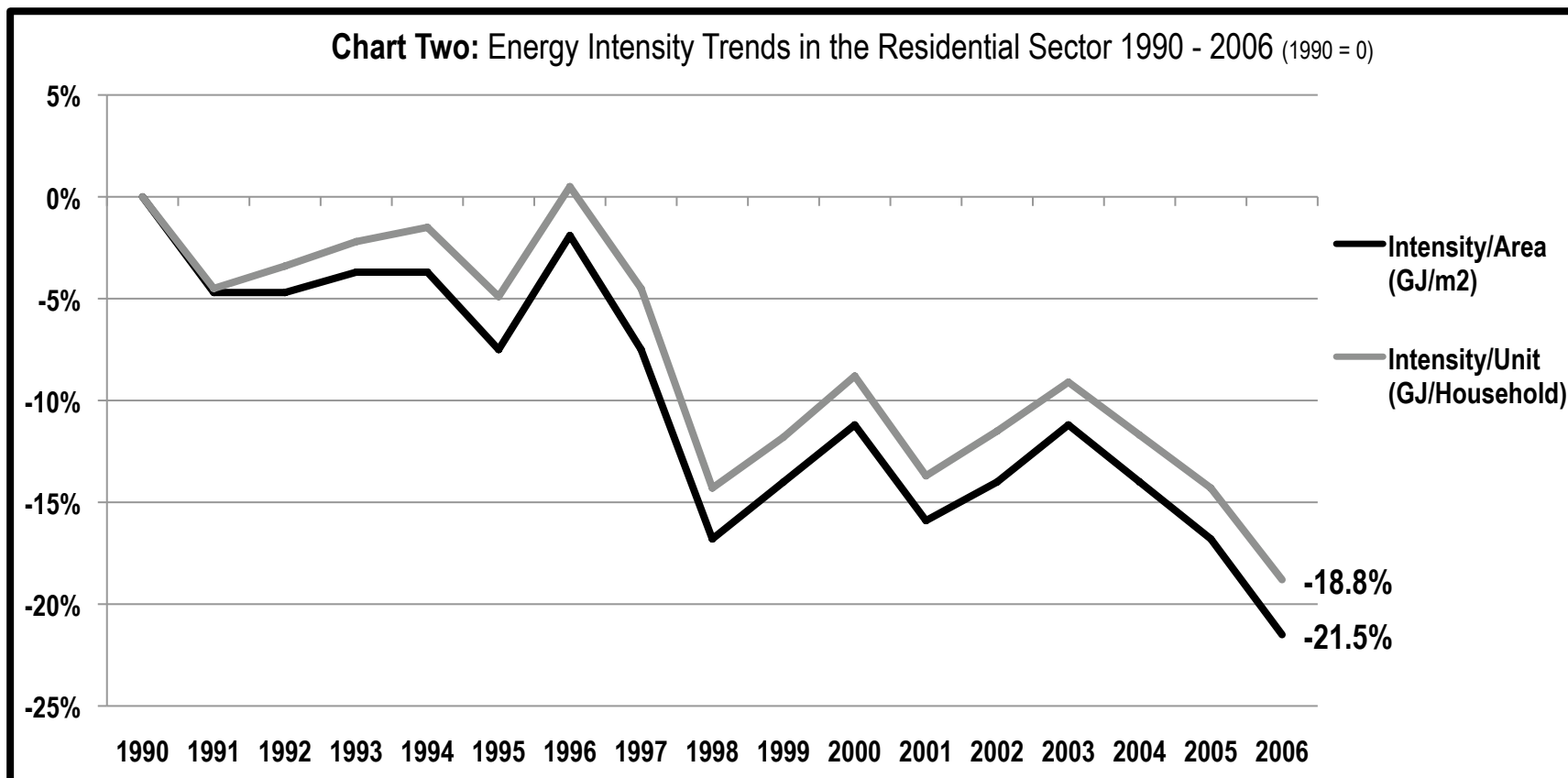
Chart One shows the growth in the number and total area of homes in Canada over the period, as well as total residential energy use. There has been a clear de-linking of growth in housing stock and the energy requirements of homes. The year-to-year “choppiness” of energy use reflects weather variability, but the overall trend is quite clear. Canada’s housing stock has been growing more than six times faster than the total amount of energy used in homes.



Source: *Comprehensive Energy Use Database*, Natural Resources Canada, 2008

Energy Intensity Trends

Chart Two illustrates trends in energy intensity on both a unit-area and household basis. The difference in intensity results between these two measures represents changes in the average size of homes. As the chart indicates, between 1990 and 2006, the residential sector saw a significant reduction in energy intensity (representing a corresponding improvement in energy efficiency). The residential sector remains far ahead of commercial and institutional buildings in terms of energy efficiency performance.

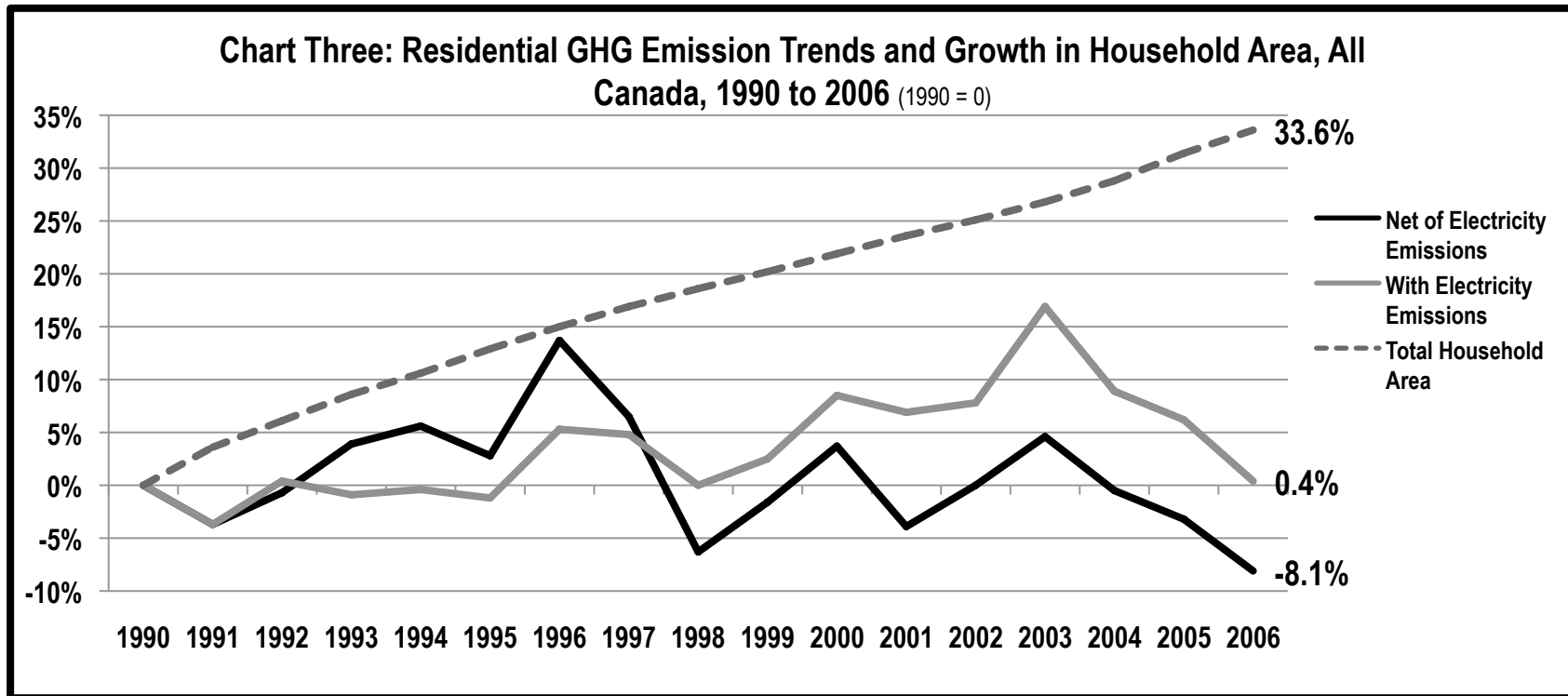


Source: Comprehensive Energy Use Database, Natural Resources Canada, 2008

Greenhouse Gas Emission Trends

Chart Three illustrates the GHG emission performance of the residential sector between 1990 and 2006, as well as the growth in household area that occurred during the same period. Results are presented for end-use emissions (the Kyoto methodology), as well as for end-use emissions combined with emissions resulting from the production of electricity used in homes. At the end of 2006, residential end-use emissions stood 8.1% below the level in 1990. If emissions related to the production of household electricity are included, the total increases to just .4% above the 1990 level. Note that, in a number of provinces, electricity production results in little or no GHG emissions, while in others electricity is a high-carbon energy source.

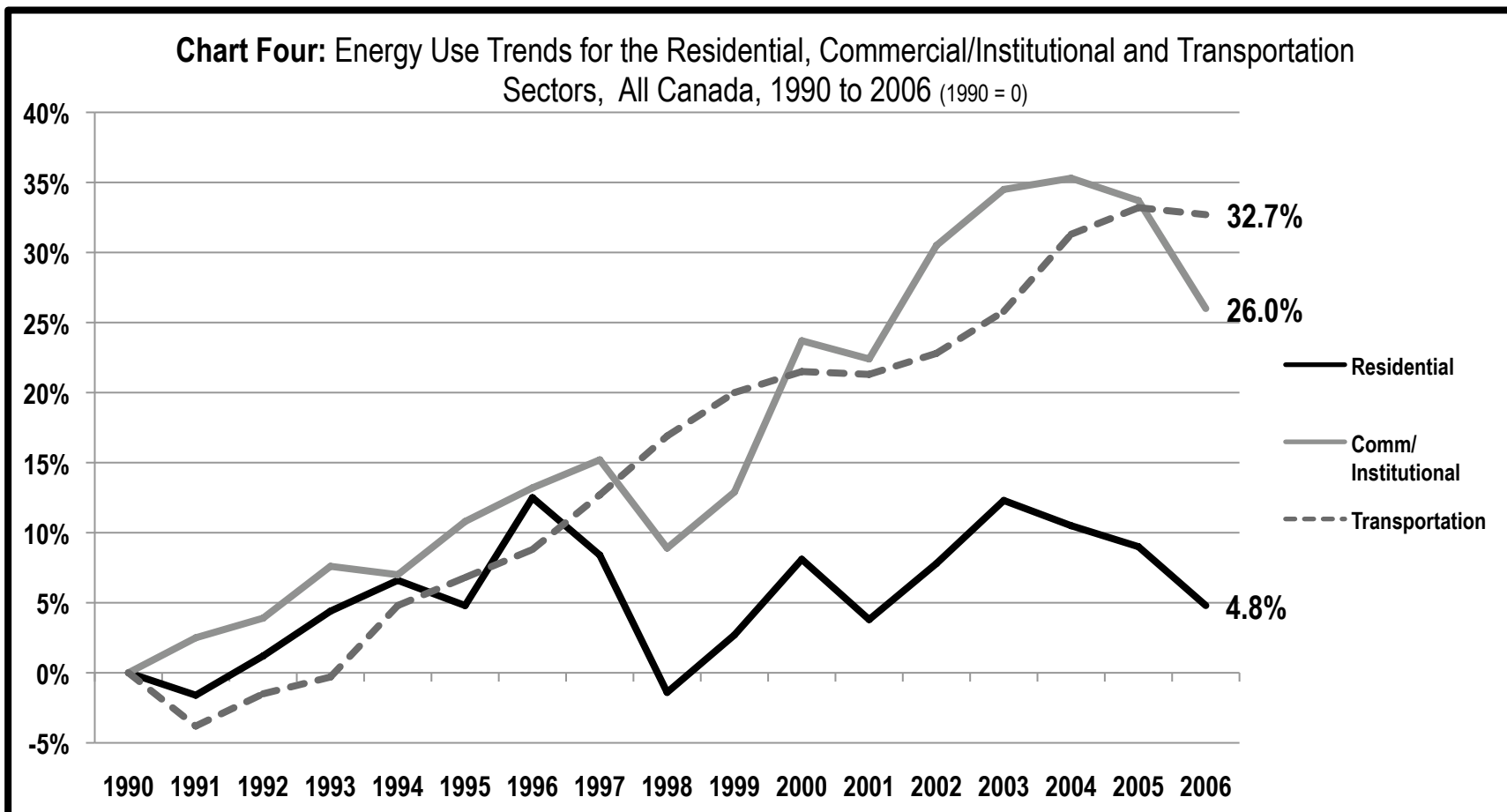
In addition to the effects of improved energy efficiency in homes, year-to-year variations in GHG emissions are linked to weather. The winter of 2006 was warmer than the long-term average, and this accounts for much of the 5% decrease in emissions between 2005 and 2006.



Source: *Comprehensive Energy Use Database*, Natural Resources Canada, 2008

Intra-Sector Energy Use Trends

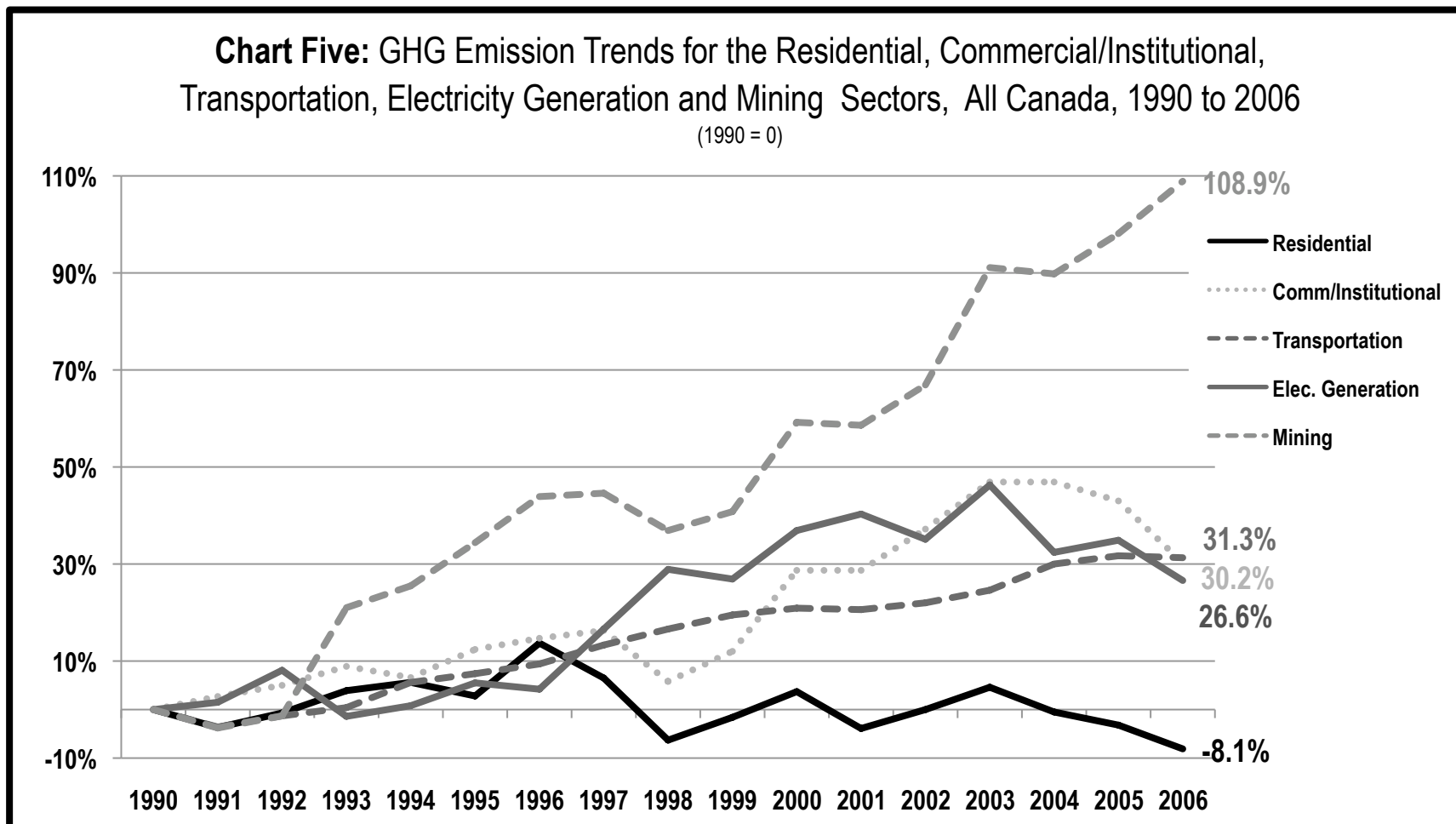
Chart Four provides some additional context, by comparing the total energy use of three sectors: residential, commercial/institutional buildings, and the transportation sector (which includes private cars). As illustrated, the residential sector has seen much more modest growth in energy use through the period.



Source: Comprehensive Energy Use Database, Natural Resources Canada, 2008

Intra-Sector GHG Emission Trends

Chart Five compares the total greenhouse gas emissions of five sectors: residential, commercial/institutional buildings, transportation, electricity generation and the mining sector (which includes Oil Sands production). All sectors are net of electricity-related emissions, which are represented by the generation sector. In terms of GHG emissions, the continued outperformance of the residential sector is very clear.

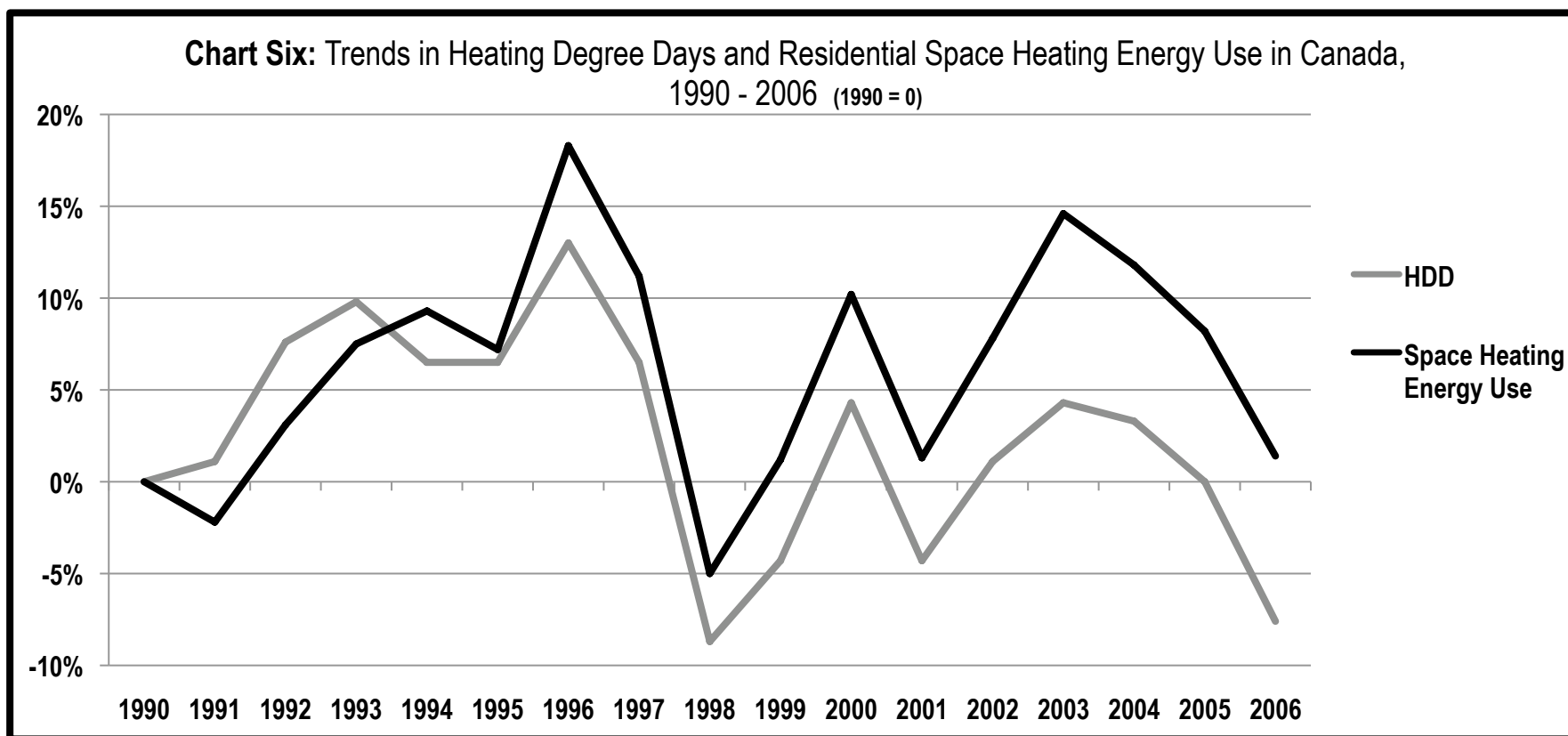


Source: Comprehensive Energy Use Database, Natural Resources Canada, 2008

Weather Impacts

The most significant end-use of energy in Canadian homes is for space heating. This accounted for 58.9% of total energy use in homes in 2006. Energy demand for space heating is influenced by weather, and can reflect significant weather-related variations, year to year. In considering the energy performance of the residential stock, weather effects need to be kept in mind.

Chart Six illustrates the yearly variation in Heating Degree Days (HDD) for Canada, and the corresponding change in residential space heating energy use. There is clearly a strong correlation between these two values. Over the period, winters were slightly colder than the long-term average, but the winter of 2006 was 7.6% warmer.



Source: *Comprehensive Energy Use Database*, Natural Resources Canada, 2008