

## **Space Heating Trends in Prince Edward Island and Nova Scotia<sup>1</sup>**

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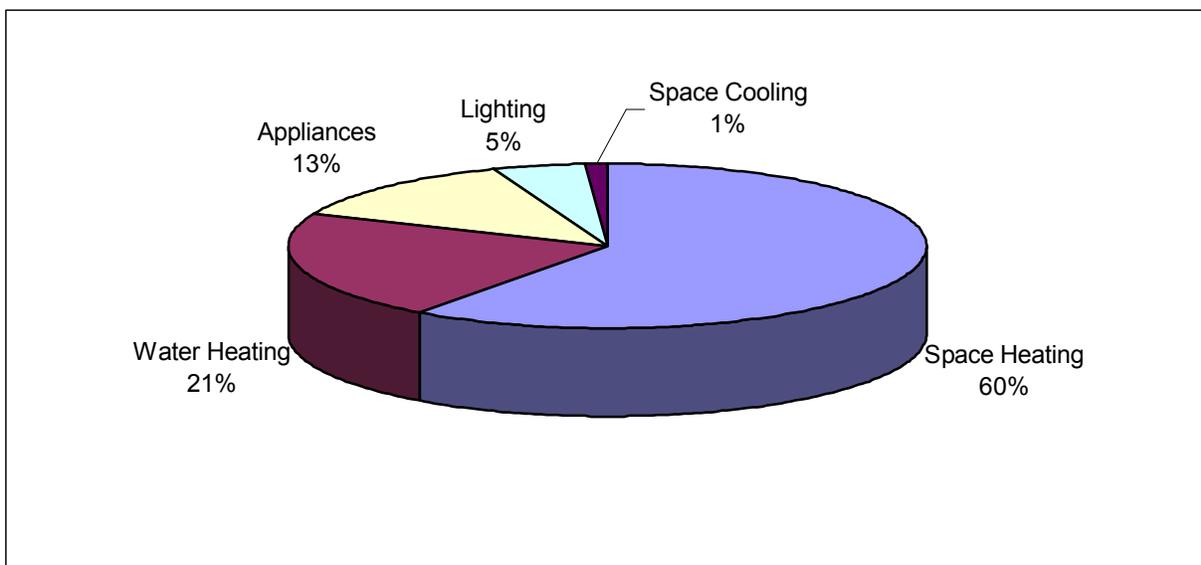
## Abstract

Space heating is central to any residential dwelling in a northern country such as Canada. Residential space heating is of particular interest in Prince Edward Island and Nova Scotia, where the housing stock is older than the national average, is less well insulated, and there is a reliance on fuel oil for space heating. Furthermore, there are a higher percentage of people living on low-income in these provinces. An examination of data from Natural Resources Canada (NRCan) suggests that despite their similarities, the space heating requirements for Prince Edward Island's residential sector appears to be improving, whereas that of Nova Scotia shows no improvement. This paper attempts to explain the differences by comparing government policies and considering anecdotal information.

## 1 Introduction

Worldwide, economies are facing the problem of higher energy costs. This, coupled with increasing demand and possible shortages in supply is causing concern among home owners and policy makers alike. Because of this, there is an urgent need to check the performance of every sector of the economy to reduce its energy intensity.

One such sector is the residential sector, which though consumed only 17 percent of Canada's total secondary end use in 2003 (NRCan, 2006), has a large potential for reduction in energy intensity. The residential sector uses energy for space heating, water heating, appliances, lighting, and space cooling. Figure 1 shows the breakdown of residential energy end use in each of the above. It can be seen that 60 percent of the energy in residential sector is used for space heating. Therefore, space heating trends need to be examined for the formulation of a better energy strategy.



**Figure 1: Residential Sector Energy End Use in 2003 (NRCan, 2006)**

## 2 Space Heating Trends in Prince Edward Island and Nova Scotia

As can be seen from Table 1, both Prince Edward Island and Nova Scotia have about the same fuel mix, although there are some differences in the use of electricity and heating oil. At present, the residential electricity rate in Nova Scotia is 9.22 cents per kWh (NSPI, 2005), whereas in Prince Edward Island it is 10.33 cents per kWh (MECL, n.d.). While both provinces rely heavily on heating oil to meet their space heating requirements (as compared to other Canadian provinces), the higher cost of electricity in Prince Edward Island could explain its greater dependency on heating oil, which is almost 80 percent.

**Table 1: Energy sources for space heating in residential sector in 2003 (NRCan, 2005a)**

<i>Fuel</i>	<i>Canada</i>	<i>Nova Scotia</i>	<i>Prince Edward Island</i>
Electricity	18.6%	13.3%	1.7%
Natural Gas	55.1%	n/a	n/a
Heating Oil	12.6%	67.5%	79.9%
Other	1.3%	2.5%	4.3%
Wood	12.5%	16.7%	14.2%

There are a number of factors which influence the space heating requirements of a house, including:

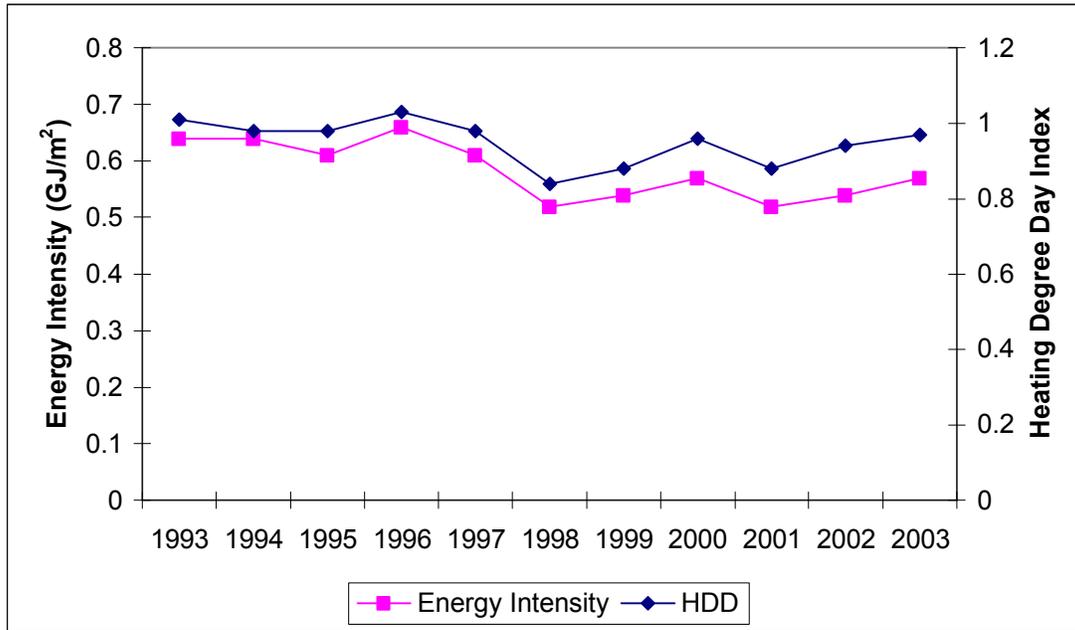
1. Weather
2. Number of persons
3. Household income and shelter costs
4. Size and condition of the house
5. Fuel prices
6. Administration policy

The following sections discuss the effect of some of these factors on residential space heating demand in both provinces.

### 2.1 Weather

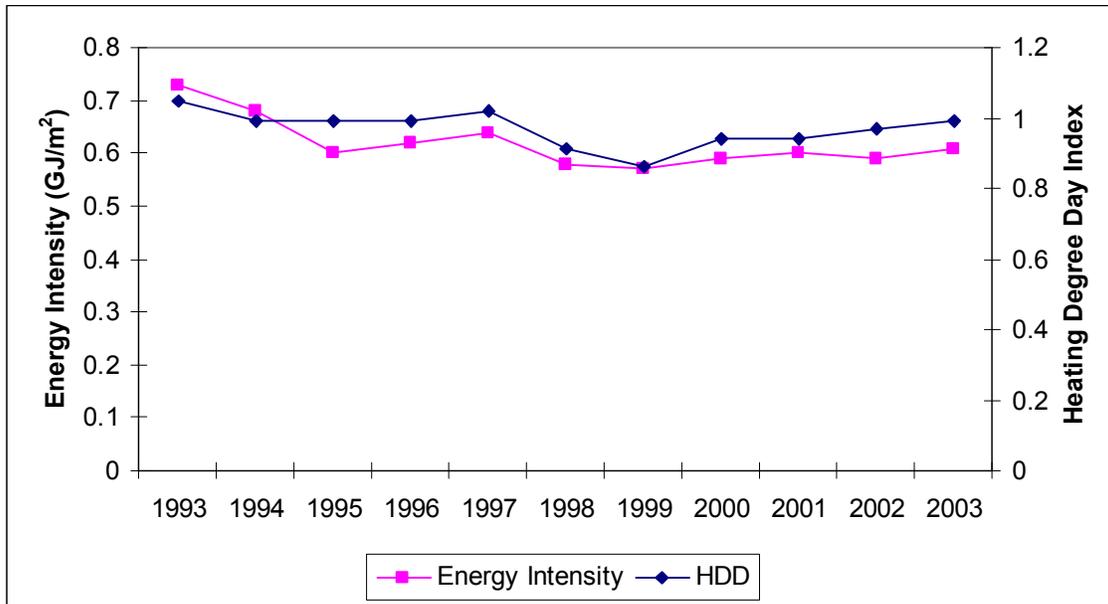
It can be seen in Figure 2 that, in general, Canadian energy intensity ( $\text{GJ}/\text{m}^2$ ) for residential space heating more or less follows the Heating Degree Day Index. In this case, the energy intensity is the amount of energy used to heat a house per unit of floor area, while the heating degree day (HDD) is used to measure the relative coldness of a place with respect to the base temperature ( $18^\circ\text{C}$ ) over a period of time (typically a year). If the daily mean temperature is below the base temperature, then the HDD is the difference of two temperatures. On the other hand, if the daily mean temperature is

above the base temperature, then the HDD is taken as zero. The daily heating degree days are summed to obtain the heating degree days over a year. The Heating Degree Day Index is then calculated by comparing the HDD of a year with the HDD average. A HDD index greater than 1 implies that the temperature is hotter than normal, while a HDD lower than 1 implies that the temperature is colder than normal.



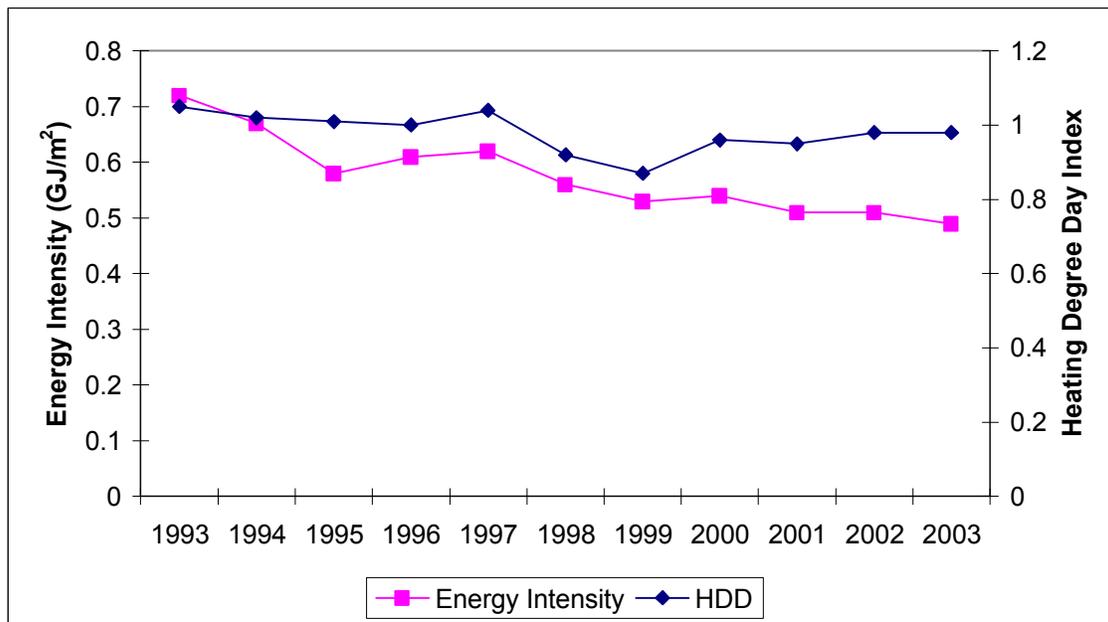
**Figure 2: Space heating energy intensity and Heating Degree Day Index for Canada (NRCan, 2005a)**

Figure 3 shows the effect of weather on the energy intensity in Nova Scotia. It can be seen that the residential energy intensity improved in the early 1990s, a trend seen in all Atlantic Provinces. However, since then, the energy intensity has remained relatively stable, tracking the heating degree day index.



**Figure 3: Space heating energy intensity and Heating Degree Day Index for Nova Scotia (NRCan, 2005a)**

However, Prince Edward Island appears to be an anomaly, as its energy intensity for space heating has been steadily decreasing over the past decade. Figure 4 shows that, similar to Nova Scotia, there was a significant decrease in the energy intensity in 1993-94, but since then the energy intensity has continued to diverge from the heating degree day index.



**Figure 4: Space heating energy intensity and Heating Degree Day Index for Prince Edward Island (NRCan, 2005a)**

## 2.2 Number of persons and size of household

The average size of a house on Prince Edward Island is about 118.11 square meters, whereas in Nova Scotia the size is about 122.21 square meters, with on average, 2.5 and 2.6 persons residing in a house, respectively (see Table 2 **Error! Reference source not found.**). In Prince Edward Island, a larger number of people live in smaller homes when compared to Nova Scotia.

**Table 2: Average household size and floor space area per household, 2001**

	<i>Average number of persons in household (StatCan, 2005a)</i>	<i>Total households (StatCan, 2005a)</i>	<i>Total floor space area (million m<sup>2</sup>) (NRCan, 2005a)</i>	<i>Average floor area (m<sup>2</sup>)</i>
Canada	2.6	11,562,975	1,498	129.55
Nova Scotia	2.5	360,025	44	122.21
Prince Edward Island	2.6	50,800	6	118.11

## 2.3 Household income and shelter costs

Household income influences the heating choices and the condition of housing stock. The annual average income in both provinces is much lower than the Canadian average, with Prince Edward Island's average income being even lower than that of Nova Scotia. However, when compared to the shelter costs in each province, Prince Edward Island's STIR (Shelter-costs to income-costs) is lower than that of Nova Scotia (see Table 3). STIR is the measure of the "acceptable housing", that is, an uncrowded housing in good repair (CMHC, 2005); the lower the STIR value, the better the affordability of a house.

**Table 3 Housing income and shelter costs for all households, 2001 (CMHC, 2005)**

	<i>Average Annual Income</i>	<i>Average Monthly Shelter Costs</i>	<i>Average STIR</i>
Canada	\$60,976	\$764	21%
Nova Scotia	\$50,585	\$610	20%
Prince Edward Island	\$49,082	\$572	19%

## 2.4 Condition of the house

As shown above, even though the average annual income in Prince Edward Island is less than in Nova Scotia, the STIR is lower as well, making housing more affordable in Prince Edward Island than in Nova Scotia. Moreover, from Table 4 it can be seen that a homeowner spends, on average, more on repairs and renovations in Prince Edward Island than in Nova Scotia. Although no

comprehensive study has been performed to determine how much is actually spent on improving insulation, envelope, and windows, it can be assumed that the average housing condition in Prince Edward Island is better than in Nova Scotia.

**Table 4: Average homeowner expenditure (\$) on repairs and renovations, 2002  
(StatCan, 2005b)**

	<i>Canada</i>	<i>Nova Scotia</i>	<i>Prince Edward Island</i>
Repairs and maintenance	1,072	807	1,028
Replacement of equipment	340	323	440
Additions	569	528	302
Renovations and alterations	711	563	518
New installations	219	113	195
Total repairs and renovations	2,910	2,334	2,484

## 2.5 Fuel prices

Over the past decade, fuel prices have been increasing steadily worldwide. This has affected Nova Scotia and Prince Edward Island since residential space heating in these provinces is done primarily with heating fuel. Higher fuel costs, along with constrained budgets, are forcing some people on low-income to choose between “eating and heating” (McNeil, 2005). Historically, it can be seen that heating oil prices in Prince Edward Island have been somewhat lower than those in Nova Scotia (see Figure 5). However, since the overall average household expenditure on fuel in Prince Edward Island is higher than in Nova Scotia (see Figure 6), the effect of higher household heating fuel expenses in Prince Edward Island is greater. According to Steve Szabo of Environment Canada, “The price of heating oil has increased dramatically over the past few years (doubled or nearly tripled in cost) -- it is now close to the cost of electric baseboard heat. This has caused financial hardship for many families on Prince Edward Island” (Szabo, 2006). There is now a general awareness of the cost of heating fuel among the residents of Prince Edward Island and “people are cutting wherever they can” (Larter, 2006).

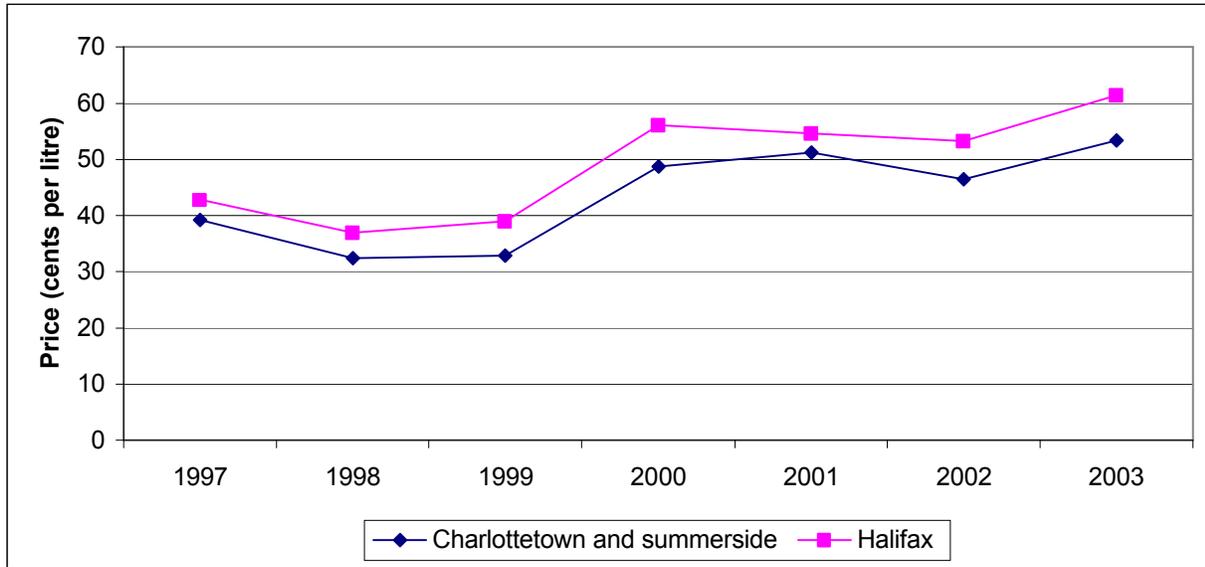


Figure 5: Average retail price of home heating oil including taxes (StatCan, 2005c)

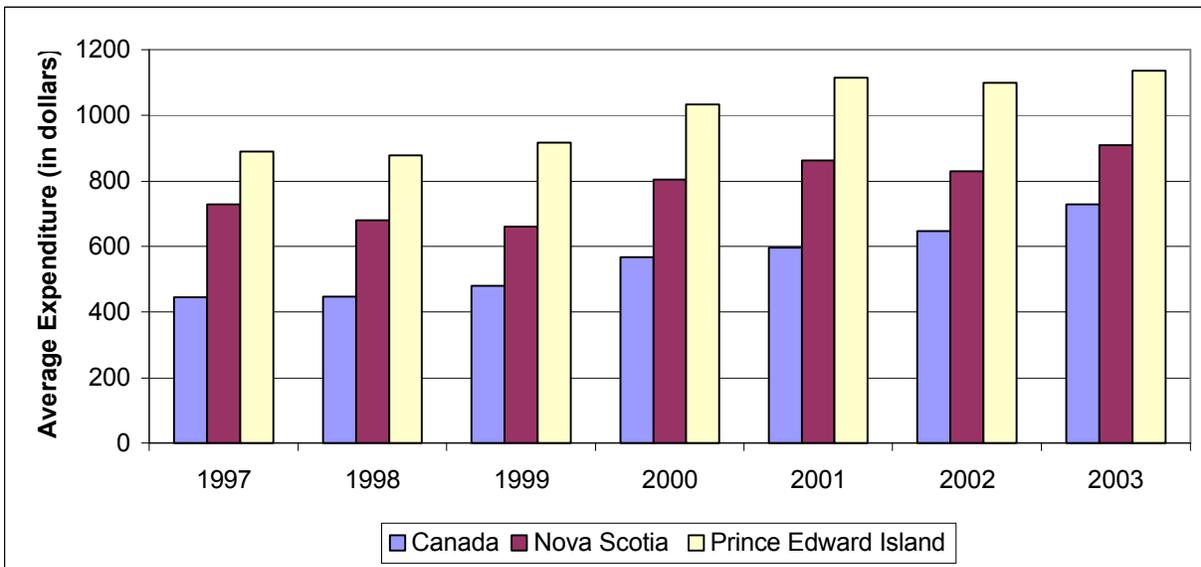


Figure 6: Average household expenditures for fuel for principal accommodation (StatCan, 2005d)

## 2.6 Administration policy

Prince Edward Island’s energy policy encourages the adoption of the National Building Code and the Model National Energy Code for new buildings (PEI, 2004), whereas Nova Scotia’s energy policy goes one step further and supports R-2000 and Energuide for new houses (NSDOE, 2005), which are said to have requirements about 40 percent above the building codes (NRCan, 2005b).

Nova Scotia also matches the federal grant under the EnerGuide program, up to the maximum of \$1,000. Prince Edward Island, on other hand, started its Residential Energy Assistance Program (REAP) in November 2005, providing \$200 for basic energy upgrades. Under REAP, unlike the EnerGuide program, an eligible person does not have to pay the upfront costs of audit renovations. The upfront costs of the audit and renovations can be daunting for the households with an already restricted cash flow (Takerer, 2006). With REAP to resume again in September 2006 (Larter, 2006), it is hoped that this program will further improve the energy efficiency of especially low-income households.

### 3 Conclusions

Overall, it can be seen that over the last decade, Prince Edward Island has made considerable progress in reducing its space heating energy intensity as compared to Nova Scotia. This has been despite a lack of provincial government policy focused towards houses heated with furnace oil. Since there are multiple factors affecting space heating, it is difficult to pinpoint the exact reasons for this reduction in energy intensity. Some possible reasons include, the average floor space area per house being smaller in Prince Edward Island and more persons per household. Also the STIR is lower and, on average, a homeowner in Prince Edward Island spends more on residential repairs and renovations than a homeowner in Nova Scotia. These reasons, as well as a general awareness among people about the need for energy conservation and a broad push for energy efficiency on part of the Prince Edward Island government appears to explain the decoupling of energy intensity and heating degree day index.

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