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Our winters of discontent: Addressing the problem of rising home-heating costs[1]

Larry Hughes
Energy Research Group
Department of Electrical and Computer Engineering
Dalhousie University, Halifax, Nova Scotia, B3J 2X4

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Abstract

Residential space heating is a necessity in northern countries such as Canada. With over 70 percent of the energy required for residential space heating in Canada provided by fossil fuels, many Canadians are vulnerable to increases in the cost of natural gas, fuel oil, and electricity generated from fossil fuels. Politicians at both the federal and provincial levels face the question of how best to help those Canadians with limited household energy budgets deal with these costs. To date, solutions have been restricted to offering financial assistance in the form of a lump-sum payment, or lowering all or part of the taxes applied to the purchase of residential heating fuels.

This paper questions the efficacy of fuel assistance programs based on lump-sum payments or lowered fuel taxes at a time of rising energy prices; these policies may be of no benefit to those with limited household energy budgets since these people may be required to pay more for their heating fuel. Instead, the paper proposes the introduction of a policy that guarantees a set price for heating fuel for those in need, covering the difference between the amount paid by the consumer and the guaranteed price. The paper uses Nova Scotia as a case study to show how such a program could cost less than a lump-sum payment or the elimination of the provincial government's tax on home-heating fuel.

As space heating energy costs continue to rise, government fuel assistance programs run the risk of becoming larger and more costly: first, to offset the cost of fuel; and second, to support a growing number of consumers unable to adequately meet their space heating requirements. These are long-term issues that must be handled by federal or provincial energy security programs. This paper proposes a three-part energy security strategy for residential space heating, reducing Canada's dependence on fossil fuels by using solar energy, reducing residential energy demand, and promoting district heating.

1. Introduction

As the cost of space heating increases, many Canadians will face "winters of discontent" caused by rising fuel prices in international energy markets and the absence of federal and provincial energy security policies. The effect of these price increases will appear in a number of different ways, including:

- The cost of motive fuels (gasoline and diesel), electricity, and energy for home space heating will all increase.
- Any goods or services reliant on energy for production, transportation, or distribution will also see price rises. This will be most apparent in food products (especially those imported by transport truck) and transportation services (such as airlines, buses, and taxis).

- Commercial and industrial companies, as well as public institutions such as schools, universities, and hospitals, will be forced to make changes in the way they operate. This may range from lowering the thermostat, to using less lighting, to operating for fewer hours, to the complete closure of the enterprise.

The original focus of the public's attention was the steadily rising cost of motive fuels over the past year. However, by mid-August 2005 this had shifted to the upcoming winter. There were two reasons for this: the threat of a rapid rise in home heating fuel prices; and, in some provinces (such as Nova Scotia and New Brunswick), the prospect of significant electricity price increases in early 2006. While rising fuel costs will affect everyone who relies on fossil fuels for home heating, those with limited household energy budgets may face significant challenges, perhaps being forced to choose between "heating or eating" (McNeil, 2005).

Broadly speaking, there have been two approaches to assisting those with limited household energy budgets meet their heating requirements:

- Offering financial assistance to those in need, typically as a one-time payment during the heating season.[2] Such programs, often called Low Income Fuel Assistance (LIFA), are common in many jurisdictions across Canada. For example, in anticipation of rising residential heating costs, the federal government announced a $1.5 billion fuel assistance program for the 2005-6 winter (Cordon, 2005).
- Home heating fuels are subject to one or more taxes (i.e., federal and provincial) in most jurisdictions in Canada. Given the importance of winter space heating, many social activists and politicians are calling for the reduction or elimination of these taxes.

This report examines how these two solutions affect the cost of home heating fuels, and their impact on consumers and governments. The paper then proposes an alternative way of addressing the problem. Nova Scotia is presented as a case study, given its reliance on imported fuels for both space heating and electrical generation.

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[2] The "heating season" is defined as those months when the average outdoor temperature is below 18°C.

The absence of federal or provincial energy security policies means that as fuel prices continue to increase, the number of Canadians requiring assistance will also grow.[3] Since budgets for fuel assistance programs cannot be expected to grow indefinitely, the issue of energy security must be addressed now. In recognition of this, the report describes a proposal for an energy security policy that will ensure that Canadians can meet their residential space heating needs.

2. Background

Nova Scotia differs from most other Canadian provinces in its use of light fuel oil (typically #2) for home heating, with almost 60 percent of Nova Scotian households using fuel oil, compared to 12.5 percent in the rest of the country (see Table 1). Thus Nova Scotians who use fuel oil (refined from crude oil imported primarily from the North Sea (PPP, 2004)) are particularly vulnerable to the vagaries of world oil prices and supply. Furthermore, since over 89 percent of Nova Scotia's electricity is generated from foreign coal and oil (Emera, 2005), people heating their homes electrically will also be affected by increases in world energy prices.

Table 1: Principal heating fuels used by Canada and Nova Scotia in 2002 (Nova Scotia Finance, 2005)

Fuel	Canada (percent)	Nova Scotia (percent)
Oil or other Liquid Fuel	12.5	59.9
Natural Gas	49.1	n/a
Propane	1.1	n/a
Electricity	31.6	25.5
Wood	5.2	12.4
Other	0.4	n/a

Between 1999 and 2003, sales of light fuel oil in Nova Scotia increased by over 13.75 percent, with the largest share consumed by the residential sector (see Table 2).

[3] Energy security is defined as government actions that ensure that the members of a community have access to reliable and uninterrupted sources of energy at a reasonable price. Governments in most industrialized countries attempt to offer their citizens some degree of energy security.

Table 2: Sales of light fuel oil in Nova Scotia (cubic metres ×1,000) (Statistics Canada, 2005a)

	1999	2000	2001	2002	2003	Growth (1999-2003)
Manufacturing	23.3	26.7	22.8	21.7	22.2	-4.72%
Residential	538.3	544.7	565.6	555.2	583.1	8.32%
Public administration	47.7	50.7	51.4	52.1	60.6	27.04%
Commercial and other institutional	154.5	159.7	190.7	191.1	203.2	31.52%
Total	763.8	781.8	830.5	820.1	869.1	13.79%

For most of the 1990s, energy prices in Nova Scotia and throughout Canada remained below the cost of living; while in Halifax the cost of heating fuel was lower than the average cost of energy. Figure 1 shows the percentage price increases from 1992 to 2005. This changed in the early part of the new century when oil prices began to climb, causing the cost of energy to rise in tandem. From this point on, the price of fuel oil generally exceeded the average cost of energy in Nova Scotia. The rapid decline in energy prices late in 2001 reflects the aftermath of the attacks on New York. Subsequently, prices began to rise again, peaking early in 2003 at the start of the second Gulf War. The steady increase in the price of oil since mid-2003 coincides with China becoming the world's second largest user of petroleum products.

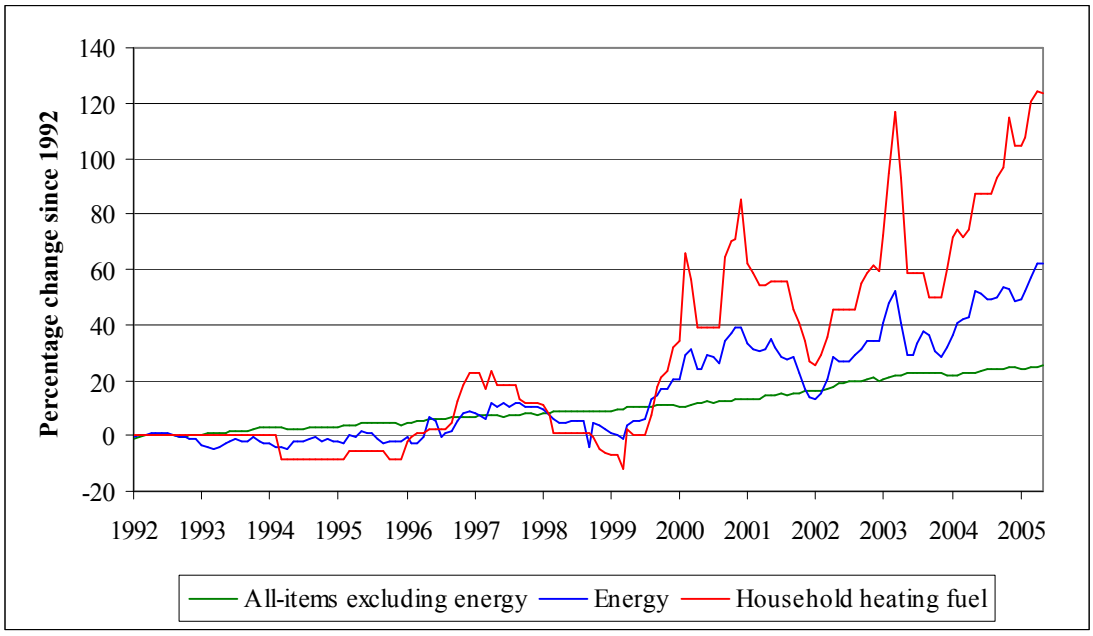

Figure 1: Selected price increases in Halifax and Nova Scotia (1992 to 2005)
(Statistics Canada, 2005b, 2005c)

Between January 1992 and May 2005 the Consumer Price Index rose 25 percent, and the cost of energy increased by 62 percent; however, the cost of home heating fuel (including taxes) climbed by a staggering 123 percent.

3. Fuel assistance program

A fuel assistance (or rebate) program is intended to help people meet some of the cost of heating their homes. These programs are typically run by government departments or agencies and are funded by tax revenues. The cost of such a program is determined by the number of possible recipients multiplied by the amount given to each recipient, plus any administration costs.

Such programs must be carefully administered to ensure that support goes only to those in need. In 2000, the Canadian government ran its Heating Fuel Rebate program, issuing heating assistance cheques to anyone who qualified as "low-income"; this included students living at home, prison inmates, and deceased Canadians (Cordon, 2005).

Fuel assistance programs are also open to political abuse; a government might try to boost its standing by announcing such an initiative prior to a winter election.

3.1. Nova Scotia's fuel assistance program

In November 2004, the Nova Scotia government introduced its "Keep the Heat" program.[4] Keep the Heat offered a $200 rebate to households with an annual income below $22,200 (or individuals with an income of less than $13,400) to supplement the purchase of heating fuel or propane (but not electric heating) during the 2004-05 heating season.[5] In addition to the $200 cheque, qualifying Nova Scotians could also receive a furnace tune-up coupon worth $80.50 (SNS, 2004). Anyone receiving a cheque would also be entered in a draw for one of 6,000 energy saving kits. The total number of participants was estimated to be 25,000 (Dobbelsteyn, 2005).[6] The program cost about $5 million: rebates, approximately $3.9 million; furnace tune-up coupons, approximately $800,000; energy saving kits, $300,000 (Barnable, 2005).

In October 2005, the provincial government announced the 2005-06 Keep the Heat program would have a budget of $25 million (Nova Scotia Energy, 2005b). This covered rebates, energy saving kits, oil furnace tune-ups, and a pilot electric thermostat replacement program.

The level of assistance was raised to $250 for those using fuel oil and, in contrast to the previous year, households heating with electricity, wood, or natural gas became eligible for a $100 assistance cheque. Eligibility criteria are based on income: families with incomes under $25,000 and single people with incomes under $15,000 qualify for the program (Nova Scotia Energy, 2005b).

The number of households eligible to receive assistance tripled, from 25,000 in 2004-05 to 73,000 for 2005-06 (Nova Scotia Energy, 2005b); this is about 20 percent of Nova Scotian households.

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[4] Despite its name, the "Keep the Heat" program did nothing to address the issue of heat loss from homes (Hughes, 2005).

[5] In Nova Scotia, the heating season is eight months long, from October to May inclusive.

[6] This was an increase from the previous year's 17,000 participants (SNS, 2004). This increase may reflect the value of the fuel assistance cheque, which rose from $50 in 2003-04 to $200 in 2004-05.

3.2. Discussion

Fuel assistance programs, such as the one administered by the government of Nova Scotia, exhibit a number of shortcomings.

First, the single level of assistance may be insufficient for some recipients. If the year-over-year increase in fuel costs exceeds the level of assistance, then the recipient will still face the prospect of being unable to meet the cost of space-heating. For example, in 2004-05, Keep the Heat offered qualifying Nova Scotians a rebate of $200; in 2005-06, this increased by $50. If the $200 in assistance in 2004-05 meant that the recipient's budget for space-heating was met, then, assuming the same budget for space-heating in 2005-06, any fuel price rise over 2004-05 levels exceeding $50 would have to be borne by the recipient (for someone purchasing 2,500 litres this would mean an increase greater than $0.02 per litre).

Second, some recipients may make financial gains from the assistance program. If the amount of fuel purchased by the recipient can be met by the recipient's fuel budget, then the assistance is unnecessary and could be better spent on those who are unable to meet their space heating requirements. It is unhelpful to say that paying these extra funds to those who do not need them is acceptable as the money could be used for rent or groceries; other programs should be available to cover these expenses.

Finally, as illustrated above, fuel assistance programs are static and do not take into account the fact that fuel price rises may be more or less than anticipated. Similarly, they do not recognize that conditions can vary from one winter to another: some milder, some colder.

4. Removing the tax on heating fuels

Most energy products used for residential space heating in Canada (notably, natural gas, electricity, fuel oil, and wood) are subject to federal and provincial taxes. In New Brunswick, Newfoundland and Labrador, and Nova Scotia, the Harmonized Sales Tax (HST) is applied to the sale of energy at a rate of 15 percent; with a seven percent federal component and an eight percent Nova Scotia component (further details can be found in

Appendix I).[7] Since the federal government has refused to consider removing its component from the sale of energy products in Canada, this section considers the effect of eliminating the Nova Scotia component of the HST in Nova Scotia.

Table 3 shows the components that contribute to the price of a litre of fuel oil for various fuel prices. For example, if the cost of a litre of fuel oil (including HST) is $0.95, the base cost (without HST) is $0.826 per litre; the federal and Nova Scotia components are $0.058 and $0.066, respectively.

Table 3: Components contributing to the price of a litre of fuel

Cost per litre (including HST)	Cost per litre (excluding HST)	Federal component	Nova Scotia component
$0.75	$0.652	$0.046	$0.052
$0.80	$0.696	$0.049	$0.056
$0.85	$0.739	$0.052	$0.059
$0.90	$0.783	$0.055	$0.063
$0.95	$0.826	$0.058	$0.066
$1.00	$0.870	$0.061	$0.070
$1.05	$0.913	$0.064	$0.073
$1.10	$0.957	$0.067	$0.077
$1.15	$1.000	$0.070	$0.080
$1.20	$1.043	$0.073	$0.083
$1.25	$1.087	$0.076	$0.087
$1.30	$1.130	$0.079	$0.090

4.1. Impact on consumers

With the exception of people who heat their homes with wood from their own woodlots, or home-owners who purchase wood or coal from a small-volume dealer who does not charge HST, all home heating fuel sales in Nova Scotia are subject to HST.

The effect on individual consumers of removing the Nova Scotia component of the HST from fuel sales would depend on the cost of the fuel and the volume of fuel used by the consumer.

Table 8 shows the effect of removing the Nova Scotia component from a variety of fuel

[7] Unless otherwise indicated, in this report all fuel costs include the HST. This is in keeping with the way Statistics Canada reports fuel costs.

purchases and the consumer's associated savings. For example, if the fuel cost (including HST) is $0.85 per litre and the consumer purchases 2,500 litres, the total cost including HST would be $2,125. The cost is reduced to $1,977.17 if the Nova Scotia component of the HST is removed, giving the consumer a savings of $147.83.

4.2. Impact on the provincial government

The impact on the provincial government of removing the Nova Scotia component from the HST on fuel oil sales would depend on the volume of fuel sold, the price of a litre of fuel oil at the time of purchase, and the number of consumers qualifying for the rebate.

In it simplest implementation such a program would be universal, removing the Nova Scotia component of the HST on all fuel oil for all residential consumers. As an example, consider the application of such a program using total provincial residential fuel oil sales in 2003 of 583,100 cubic metres (583,100,000 litres)[8] (Nova Scotia Finance, 2005). The cost to the province would depend on the cost of the fuel, as shown in Table 4. For example, at an average price of $1.00 per litre, the province would lose over $40 million in fuel tax revenues.

Table 4: Average cost per litre and associated provincial revenue losses

Cost per litre (with HST)	Cost per litre (Nova Scotia component removed)	Nova Scotia component	Lost revenue from removal of Nova Scotia component
$0.75	$0.698	$0.052	$30,422,609
$0.80	$0.744	$0.056	$32,450,783
$0.85	$0.791	$0.059	$34,478,957
$0.90	$0.837	$0.063	$36,507,130
$0.95	$0.884	$0.066	$38,535,304
$1.00	$0.930	$0.070	$40,563,478
$1.05	$0.977	$0.073	$42,591,652
$1.10	$1.023	$0.077	$44,619,826
$1.15	$1.070	$0.080	$46,648,000

If the Nova Scotia component of the HST were removed from the sale of all energy sources used for home heating, notably electricity, coal, and wood, the loss in fuel tax

[8] A cubic metre contains 1,000 litres (one kilolitre).

revenues would be even greater. Although well over 25 percent of Nova Scotians use electricity for home heating, it becomes problematic when attempting to isolate the percentage of electricity a consumer uses for home heating, as this varies from consumer to consumer. However, studies have shown that in an electrically heated home in Nova Scotia, about 60 percent of the electricity consumed is used for space heating (Fung, 2003).

Table 5 shows the electricity and coal usage in the residential sector between 1999 and 2003. Residential electricity is subject to the HST. Given the limited amount of coal consumed, and that no firm price for it is available, it is reasonable to assume that any rebates associated with the Nova Scotia component of the HST would be negligible. The situation is similar for wood; although over 12 percent of Nova Scotians claim to heat with wood, exact sales figures are hard to obtain, given the nature of wood sales.

Table 5: Other energy sources used in the residential sector (Statistics Canada, 2005a)

	1999	2000	2001	2002	2003
Electricity (Gigawatt-hours)	3,561.6	3,698.5	3,698.5	4,104.5	4,017.6
Coal (kilotonnes)[9]	12.7	13.3	n/a	n/a	n/a

It is possible to obtain a reasonable estimate of the HST collected from the sale of electricity, since the vast majority of residential electricity consumers fall under the Domestic Service Tariff (fewer than one percent of these consumers use the Domestic Service Time-of-Day Tariff). For example, using 2003 data, and assuming that all electricity consumed is billed at the proposed Domestic Service Tariff energy charge of $0.1089 per kilowatt-hour (NSPI, 2005), the total HST to be collected would be:

$$0.1089\ \$/kWh \times 4{,}017.6 \times 10^6\ kWh \times 0.15$$

or about $65.6 million; the Nova Scotia component of this would be about $35 million. Assuming that 60 percent of the electricity is used for heating and that only the heating

[9] Because of the limited number of suppliers and the small volumes of indigenous coal sold in Nova Scotia, Statistics Canada suppresses coal data to meet the confidentiality requirements of the Statistics Act.

portion would be refunded, the province would stand to lose about $21 million.[10]

The total cost to the province of rescinding its component of the HST on home heating this winter depends on the number of consumers qualifying for the rebate, the cost of fuel oil, and whether electricity is included (wood and coal, if included, would simply increase the total). At the low end, with fuel oil at an average cost of $0.75/litre, the loss in revenues obtained from the Nova Scotia component of the HST would be about $30 million. At the high end, with an average price of $1.00 per litre ($40.5 million in lost revenues), and including the removal of the 60 percent of the Nova Scotia component on the sales of electricity ($21 million), the loss to the province would be over $61 million.

4.3. Discussion

The benefits of removing fuel taxes during a time of rising fuel prices may not be as great as the individual yearly savings would suggest. In order to determine the actual benefits to the consumer, it is necessary to consider the effect of the yearly price increases.

Table 6 shows how the benefits of fuel tax reduction can be misleading if considered on an annual basis only. This example shows the apparent benefits of a consumer purchasing 2,500 litres at $0.75 per litre in Year 1 and 2,500 litres at $0.85 per litre in Year 2. In Year 1, the consumer makes a savings of $130.43 ($1,875.00 - $1,977.17) with the Nova Scotia component of the HST removed, while in Year 2, the savings are $147.83 ($2,125.00 - $1,977.17).

[10] Since not every residential consumer uses electricity for space heating and not all electricity is used for space heating, determining the "right" level of HST reduction for electricity is problematic. Rather than a blanket removal of the Nova Scotia component of the HST on all residential electricity sales (which would cost the province $35 million), it was decided to remove only 60 percent, as this is the average percentage of energy used for space heating in the Nova Scotian residential sector. Note that this benefits those consumers who do not use electricity for space heating.

Table 6: Effect of year-over-year fuel price increases

	Cost per litre	**Cost with HST**	**Cost with Nova Scotia component removed**	**Annual savings**
Year 1	$0.75	$1,875.00	$1,744.57	$130.43
Year 2	$0.85	$2,125.00	$1,977.17	$147.83
Increase	*$0.10*	*$250.00*	*$232.60*	

The fuel price increase from Year 1 to Year 2 is $0.10 per litre or $250. With the Nova Scotia component of the HST removed, the price increase is $232.60. In Year 2, the consumer has a savings of $147.83, but the total cost to the consumer has increased by $232.60; thus the consumer must spend an additional $84.77 ($232.60 - $147.83) in Year 2's heating season. Although the cost to the consumer is less than if the complete HST had been charged, if the consumer's fuel budget has not increased by $84.77, then the consumer is forced either to reduce fuel consumption or to pay the increase from some other part of the household budget.

The blanket removal of a space-heating fuel tax has other effects:

- Those members of society with large homes and high energy costs, who are not affected by high energy prices, stand to gain an unnecessary windfall.
- Landlords would also make windfall profits from the removal of the fuel tax if the savings were not passed on to tenants.
- Local shortages of heating energy (typically fuel or electricity) could occur if fuel consumption increased because of the reduction in fuel tax.
- Similarly, greenhouse gas emissions would increase if the reduction in fuel tax encouraged increased consumption. The volume of additional fuel that could be purchased by a consumer using all the funds from the reduction in fuel tax is obtained by multiplying the original volume purchased by the ratio 0.08/1.07 (in the case of the HST). The volume and additional greenhouse gases emitted are shown in Table 7.

Table 7: Effect of additional purchases on greenhouse gas emissions[11]

Original purchase volume (litres)	Possible additional purchase (litres)	CO_2 emissions from additional purchase (kilograms)
1,000	74.8	211.6
1,500	112.1	317.4
2,000	149.5	423.2
2,500	186.9	529.0
3,000	224.3	634.8

- If the difference between the cost of home heating fuel and diesel fuel becomes significant, unscrupulous consumers could take advantage of this by fueling their diesel vehicles with less expensive home heating fuel.

If fuel taxes are removed from all purchases of energy for residential space-heating, the benefits to most consumers would be modest at best. However, the impact on the finances of the province would be immense, given the volume of fuel sold during the heating season. Regardless of the ultimate cost to the province, the fact remains that foregoing the tax on home energy sales will mean a shortfall in government revenues. The precarious state of Nova Scotia's finances, the province's mounting debt, and the need to address other issues such as health care and education, means that something would have to be sacrificed. Failing that, it would be necessary to raise taxes to meet these additional expenses, something the government claims runs counter to its beliefs.

5. An alternative assistance scheme

Until national or provincial energy security strategies to reduce reliance on fossil fuels (discussed in section 7, below) are established, assistance may be needed for anyone who pays for space heating and has a limited household energy budget. Neither fuel assistance programs (discussed in section 3) nor the removal of fuel taxes (discussed in section 4) adequately address this issue.

[11] The emission factor for light fuel oil in the Canadian residential sector is estimated to be 2.83 kg/L (Jaques, 1992).

5.1. Method

There are other approaches to assisting Canadians with limited household energy budgets; this section discusses one such alternative, taking Nova Scotia as an example.

In this approach, consumers in need of assistance would be guaranteed a price per litre by the provincial government. If the price per litre paid by the consumer exceeded the guaranteed price, the provincial government would refund the difference to the consumer. The consumer would be responsible for submitting each purchase's receipt to claim the assistance. The assistance to the consumer would be determined from the following equation:

(price paid per litre - guaranteed price per litre) × number of litres purchased

For example, if the guaranteed price is $0.75 per litre and a consumer purchases 1,000 litres of fuel at $0.90 per litre (including HST), the assistance would be ($0.90 - $0.75) or $0.15 × 1,000 or $150.

In order to encourage conservation and to discourage the purchase of fuel for other consumers, there would be an upper limit on the number of litres that would be subsidized. If the consumer's consumption exceeded this limit, they would be expected to pay the full cost of the fuel.

There are a number of ways in which the consumer could be reimbursed:

- A lump sum at the beginning of the heating season. This method is problematic as it requires the province to anticipate an average fuel cost for the heating season and the amount of fuel to be used by the consumer (either or both of which could be incorrect). It is also open to abuse, since the consumer could spend the sum on goods or services other than heating fuel.
- A lump sum at the end of the heating season. This method, although more accurate if based upon the actual payments the consumer made, addresses the limitations of the first approach. However, it requires the consumer to have sufficient funds to meet all fuel costs during the heating season, something that may not be possible for those with limited household energy budgets.
- On a fuel-purchase basis. This method avoids the problems associated with the two

previous approaches, since the consumer purchases the fuel for the full amount and then requests a refund from the province. The consumer is assisted almost immediately (the waiting period is the time taken for the refund to be returned) and the refund is based upon a known amount. This approach ensures that eligible consumers are guaranteed a fair price, regardless of the cost of fuel.

There are a number of possible variations to this approach. For example, an automated system could be employed, allowing eligible consumers to inform the province of their purchase by telephone or Internet. To reduce the waiting period, cheques could be deposited directly to the consumer's bank account.

Regardless of the approach taken, there is a potential for abuse; for example, a fuel supplier could inflate the price and split the difference with the consumer. Such a program would have to monitor fuel supplier companies: first, by requiring these firms to inform the province of changes in the price of their home heating fuel; and second, by ensuring that their revenues corresponded to the amount of fuel sold.

Similarly, to reduce the likelihood of fraud, it would be necessary that all invoices be numbered and kept for inspection by both the consumer and the fuel supplier.

5.2. Other fuel sources

Other fuel sources, such as electricity or wood, could be included in such a program. In these cases, qualifying consumers would be offered a similar rebate, based on the energy content of the fuel source; a litre of fuel oil has an energy content of about 38.68 megajoules (MJ) per litre, while a kilowatt-hour of electricity has an energy content of about 3.6 MJ. Since about 60 percent of the electricity consumed in an electrically heated home is used for space heating (Fung, 2003), consumers living in electrically heated homes would be permitted to claim 60 percent of their electricity bill for assistance during the heating season.

Ignoring any fuel-oil furnace efficiency issues, one kilowatt-hour of electricity has the energy equivalent of 0.0931 litres of fuel oil. Thus the level of assistance for a consumer using electricity would be 0.0931 times the level of assistance per litre of fuel oil. Accordingly, an assistance level of $0.75 per litre of fuel oil is equivalent to an assistance

level of $0.0698 per kilowatt-hour of electricity. Assuming a consumer used 3,000 kilowatt-hours for a billing period during the heating season, the electricity used for space-heating would be 1,800 kilowatt-hours. At NSPI's Domestic Service Tariff energy charge of $0.1089 per kilowatt-hour, the assistance would be 1,800 × ($0.1089 - $0.0698) or $70.38.

Similar calculations can be made for wood and natural gas.

5.3. Determining the level of assistance

The level of assistance made available to each qualifying consumer is obtained from the guaranteed price and the annual number of litres purchased.

The guaranteed price should be determined in a clear and meaningful manner. Allowing a price to be selected arbitrarily runs the risk of political interference (e.g., lowering the guaranteed price to maximize assistance prior to a winter election). A more transparent approach is to base the guaranteed price on the average fuel price from one or more previous heating seasons. For example, the 2004-05 eight-month (October to May) heating season average for Halifax was $0.774 per litre; the monthly average fuel cost increased from $0.719 in October 2004 to peak at $0.819 in April 2005 (Statistics Canada, 2005b).

Determining this upper limit is somewhat more problematic:

- Taking the average volume of fuel used by all consumers and applying it to all those in need of assistance means that:
  - Those well under the average could increase their consumption to the average, potentially defeating the goal of conservation and opening the program to abuse.
  - Those over the average would be unjustifiably penalized for consuming fuel they required.
- Taking the previous year's level of a consumer's consumption and using it as this year's level may fail to help some consumers meet their minimal heating needs.
- Inspecting each qualifying recipient's home for square footage, air infiltration, and heat loss would be the ideal approach, as it would give an accurate picture of the

home's energy requirements. However, given the time needed to complete such an inspection, it is unlikely that all qualifying recipients could have their homes inspected before each heating season.

Another approach would be to base the level of assistance on the previous heating season's level of consumption. If the consumer exceeded the level of consumption, this would become the new level of consumption and would be assisted; however, the consumer's residence would be targeted for an energy retrofit before the next heating season. This approach would identify and upgrade the most energy inefficient residences, thereby reducing their need for assistance and lowering the cost of the program. Methods of funding such a program are discussed in section 7.

6. Comparison and Discussion

Four different fuel assistance programs are now compared:

- A LIFA of $250 per qualified consumer.
- Removal of the Nova Scotia component of the HST on fuel oil for qualified consumers.
- A combination of LIFA and the provincial HST component for qualified consumers.
- The alternative proposed in section 5.

6.1. Impact on consumers

Table 9 shows the cost to an individual consumer of purchasing a given volume of fuel oil (2,000; 2,500; and 3,000 litres) at different prices ($0.80; $0.90; $1.00; and $1.10 per litre), and five different pricing alternatives (i.e., the full price, including HST, and the four fuel assistance schemes listed above). The total cost for each pricing method is compared with an equivalent volume sold at $0.77 per litre (the average cost of a litre of heating fuel, including HST, purchased during the 2004-05 heating season).

For example, a consumer purchasing 2,500 litres of fuel oil (or the equivalent in other energy sources) would have paid $1925 during the 2004-05 heating season. If the cost increased to $1.00 per litre in a given heating season, the consumer would pay $2,500; an additional expense (over the 2004-05 cost per litre) of $575. The results of the different

fuel assistance schemes for purchasing an average of 2,500 litres are as follows:

- The $250 LIFA rebate brings the season's heating cost down to $2,250; however, the consumer still has an additional expense (over 2004-05) of $325.
- Removing the Nova Scotia component of the HST reduces this season's cost to $2,326.09, resulting in an additional expense to the consumer of $401.09 over the 2004-05 heating season.
- Removing the Nova Scotia component of the HST and then applying the $250 LIFA results in a cost of $2,076.09 this season, with an additional expense to the consumer of $151.09.
- The proposed alternative reduces the total cost of the fuel to $1,925 (the price paid by the consumer during the 2004-05 heating season), and the consumer has no additional expenses this season.

The proposed alternative ensures that Nova Scotians with limited household energy budgets are protected against major price increases. Furthermore, the consumer is not expected to make up the difference between the full price and shortfalls associated with the assistance scheme.

Whether a consumer is protected from price increases depends upon the quantity of fuel purchased, the average fuel price paid by the consumer, and the guaranteed price. The following equation can be used to compare the proposed alternative with a guaranteed price:

$$(AveragePricePerLitre - GuaranteedPricePerLitre) > \frac{LIFA}{VolumePurchased}$$

The value of the LIFA, divided by the quantity of fuel purchased, is the savings per litre available to the consumer; for example, a consumer purchasing 2,500 litres with a LIFA of $250, would have a savings of $0.10 per litre.

When the difference between the average price per litre and the guaranteed price exceed the value of the savings, the proposed alternative helps the consumer more than does the LIFA. However, if the difference is less than the savings, the consumer benefits more from the LIFA (this may include a windfall, which is discussed in the next section).

During times of rapidly increasing fuel prices (causing the difference between the seasonal average price and the guaranteed price to exceed any savings offered by the LIFA), the proposed alternative will be of greater benefit to those in need. For example, a consumer with a savings of $0.10 per litre and a guaranteed price of $0.65 per litre would benefit from the proposed alternative when the average price exceeded $0.75 per litre.

6.2. Unintended consequences

Table 9 also illustrates some potential unintended consequences of fuel assistance rebates and the widespread removal of taxes. Consumers who can afford the cost of energy but are still eligible for rebates or tax reductions may obtain a windfall from the rebates or tax reductions.

Consider the situation in which the average cost per litre rises from $0.77 to $0.80 and the consumer could afford to pay $0.77 per litre for 2,500 litres ($1,925). At $0.80 per litre, the cost to the consumer would rise by $75 to $2,000; in three of the four programs, the consumer would gain a windfall:

- The LIFA of $250 would lower the cost from $2,000 to $1,750, meaning the consumer would gain $175, when compared to the previous heating season ($1,925 - $1,750).
- The removal of the Nova Scotia component of the HST would lower the cost of the heating fuel from $2,000 to $1,860.87; this would be a gain of $64.14 ($1,925.00 - $1,860.87).
- The most extreme case occurs when the LIFA is combined with the removal of the Nova Scotia component of the HST; in this instance the consumer's gain is $314.13.
- Only with the guaranteed price does the consumer not gain from increases in the cost of heating fuel. In this case, the cost of 2,500 litres of fuel remains constant at $1,925.

These policy-induced gains can cause a "rebound effect" in which some consumers purchase and use more fuel with the additional funds obtained from the program (Sauter, 2005). The rebound effect can precipitate a number of other problems. For example, if local fuel oil supplies run low, additional purchases could lead to shortages or price increases, or both. Furthermore, these additional purchases could lead to increased

greenhouse gas emissions. These social and environmental problems are best addressed by first, using the guaranteed price for fuel, and second, developing policies that reduce residential energy consumption through energy security programs (see section 7).

Whatever fuel assistance program is instituted for residential consumers, other sectors of the economy, such as commercial, institutional, public administration, and industrial, may well demand similar levels of assistance in order to defray their space heating costs. As fuel prices rise, and without some form of assistance, these organizations may be forced to operate for shorter hours, lay off employees, or even cease operations altogether. In September 2005, Nova Scotia Premier John Hamm stated that hospitals and school boards were to operate within their budgets, regardless of the cost of fuel (CBC, 2005).

6.3. Impact on the provincial government

Each of the four assistance schemes described above impose a cost on the provincial government; the amount will depend on the number of qualified recipients, the average cost of fuel during the heating season, and the average volume of fuel consumed per recipient.

Figure 2 shows the cost to the province of different average fuel prices and assumes that assistance is paid to 50,000 recipients who use an average of 2,500 litres each. The guaranteed fuel price is $0.77 per litre.

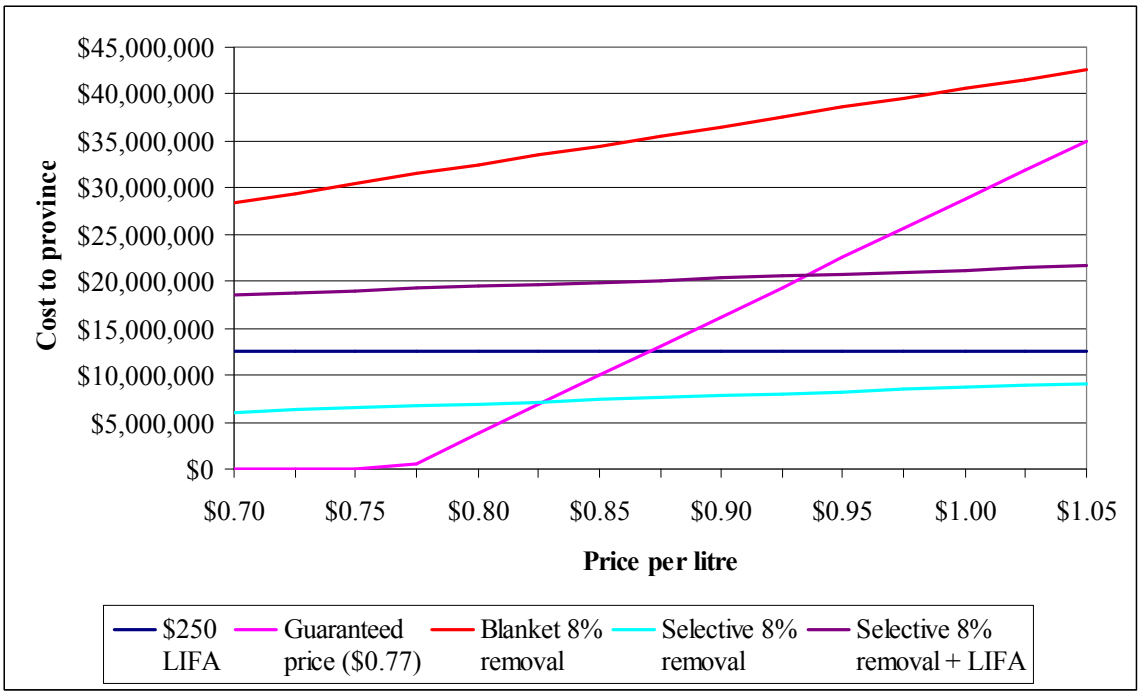

Figure 2: Program costs for 50,000 recipients purchasing an average 2,500 litres

The cost of each program to the government is summarized as follows:

- The blanket removal of the eight percent Nova Scotia component of the HST from all fuel oil sales is the most expensive approach, varying from $28.3 million at $0.70 per litre to $42.6 million at $1.05 per litre. This program is the most costly over the range of prices shown because all Nova Scotians would benefit from the removal of the Nova Scotia component of the HST. In this example, the cost to the government per recipient ranges from $568 to $852.
- The total cost of the $250 LIFA program is simply $250 times the number of qualifying recipients, regardless of the cost of heating fuel. The cost for 50,000 recipients is a constant $12.5 million.
- If the Nova Scotia component of the HST could be removed for qualifying recipients only (selective removal), the cost to the government would range from $6 million to $9.1 million. In this example, the cost per recipient ranges from $121 to $181.
- Combining the LIFA and the removal of the Nova Scotia component would cost the government the sum of the total cost of each program. At $0.70 per litre, the cost would be $18.5 million, while at $1.05 per litre, the cost would be $21.6 million. The

minimum cost per recipient is $372 at $0.70 per litre, reaching a maximum of $433 at $1.05 per litre.

- The cost to the provincial government of the guaranteed price of $0.77 per litre would depend upon the price per litre, costing the provincial government nothing while the price was below the guaranteed price. In this example, the cost to the provincial government ranges from nothing (if prices are below $0.77 per litre) to $35 million when the price reaches $1.05 per litre. The maximum cost to the government would be $700 per recipient at $1.05 per litre.

The point at which the guaranteed price per litre becomes more costly than the LIFA of $250 can be obtained from the following equation:

$$\frac{\$250}{TotalLitresPurchased} + GuanteedPrice$$

where *TotalLitresPurchased* is the volume of heating fuel purchased during the heating season.

Figure 3 is a graphical representation of the above equation. The line represents those points where the cost per consumer of the guaranteed assistance program ($0.77 per litre) equals the cost of the fuel assistance program ($250). For example, a consumer purchasing 2,500 litres at $0.87 per litre would cost the government $250. If the average purchase price per litre for a given number of litres is above this line, the cost per consumer of the guaranteed program exceeds that of the LIFA program. On the other hand, if the average price per litre for a given number of litres is below the line, the per consumer cost to the government is less than that of the LIFA program.

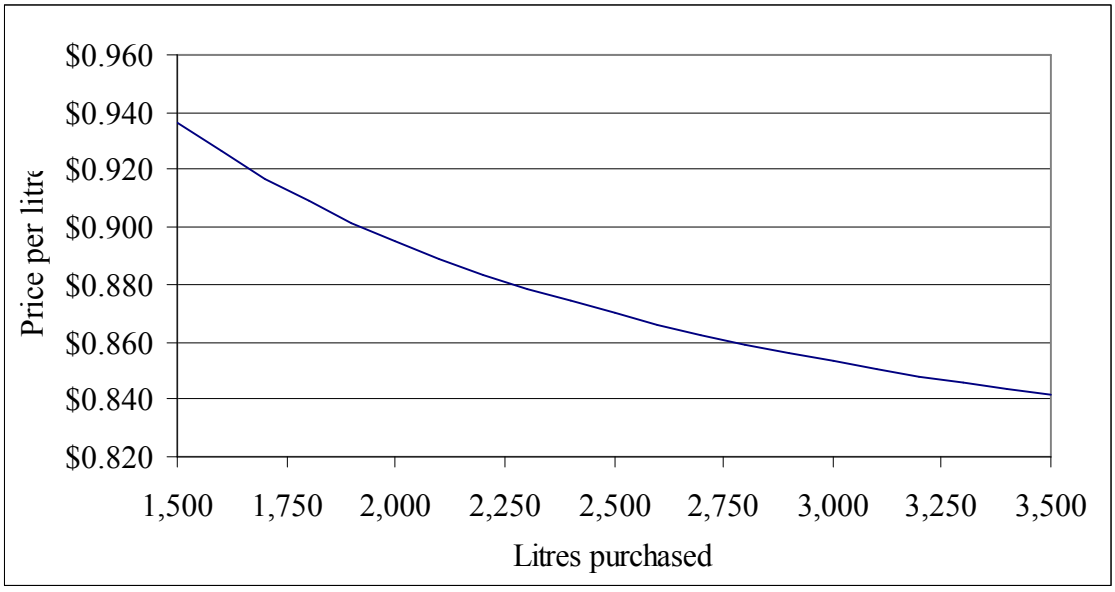

Figure 3: $250 LIFA vs. $0.77 guaranteed price per litre

As will be shown in the next section, if qualifying customers can reduce their home heating requirements, their reliance on assistance will, not surprisingly, also be reduced.

7. The components of an energy security strategy

Successive Canadian governments, at both the federal and provincial levels, have failed to develop energy security strategies. As a result, Canadians are almost entirely dependent upon energy sources that are increasing in price because of production limitations, rising world demand, and declining supplies. What politicians of all political stripes apparently fail to understand is that addressing the issue of energy security is a long-term structural problem that will take years, if not decades, to solve. One season's fuel assistance rebate or a reduction in fuel taxes will not improve Canada's energy security; if anything, it may lead to Canada becoming less energy secure.

Over the short term, assistance must be given to Canadians with limited household energy budgets; however, these programs all face the same problem: increasing fuel prices and increasing demand for support. This is illustrated by Nova Scotia's Keep the Heat program, which has seen an increase both in the level of support (from $50 in 2003-04 to $200 in 2004-05, and $250 in 2005-06) and in the number of participants (from 17,000 in 2003-04 to 25,000 in 2004-05, and 73,000 in 2005-06). Even the guaranteed price program proposed in section 5 will eventually reach a point where it is

unsustainable.

Achieving energy security in the residential sector requires three distinct but related actions:

1. *Reduce energy requirements for space heating.*

   Space heating requirements can be reduced through:

   – Conservation, which implies cutting back on energy use, possibly through lowering room temperatures. However, given Nova Scotia's ageing population, reducing room temperatures may not be a realistic option. The heating and cooling comfort level charts of the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) show that elderly people require higher than average heating levels (ASHRAE, 1997), which can result in higher energy demands.

   – Energy efficiency, which means using energy more wisely. For example, retrofitting a building with new windows and doors, adding vapour barriers, and increasing the levels of insulation can reduce the amount of energy required to maintain a given temperature.

2. *Reduce reliance on foreign sources of energy for space heating by increasing the use of indigenous sources of energy.*

   Energy security requires energy sources that are reliable, uninterrupted, and reasonably priced; something that Nova Scotia has yet to achieve because of its overwhelming reliance on foreign energy supplies. Reliable indigenous sources of energy such as biomass, geothermal, solar, and wind should all be considered and employed before turning to foreign sources of energy. Indigenous sources of fossil fuels should be used in conjunction with renewables or when there are no other alternatives.

3. *Maximize the efficiency of energy use.*

   All available energy in Nova Scotia should be used as efficiently as possible. This means that high energy content fuels such as oil or natural gas should not be

consumed in home heating unless there is no alternative. Instead, low energy sources, such as waste heat from industrial processes, should be used.

These actions can be achieved by (in order of least to most expensive):

- Changing building codes to ensure that all new construction takes advantage of solar energy (either active or passive); this means aligning individual buildings and entire subdivisions on an east-west axis. Nova Scotia has sufficient solar energy to allow properly constructed homes to meet up to 60 percent of their space heating requirements from the sun through passive solar means (Nova Scotia Energy, 2005a).
- The thermal insulation of existing homes must be upgraded to reduce heat loss (and hence reduce energy demand). Assistance is available from the federal government's EnerGuide for Houses program, which will pay for much of the insulation upgrade to homes. An average reduction of 34 percent on space-heating energy requirements has been achieved with this program (Dodge, 2005). This program requires homeowners to pay $150 for the initial energy audit and cover the cost of any retrofitting; the homeowner is reimbursed only after a second audit determines the level of energy improvements in the building. However, many Canadians, especially those with limited household energy budgets, do not have these funds readily available and thus cannot benefit from this program.[12] In early October 2005, the federal government announced its EnerGuide for Low-Income Households program, which is to be administered by the Canada Mortgage and Housing Corporation. At the time of writing no details of the program had been released, other than that it is "to provide direct financial assistance of between $3,500 and $5,000 to low-income households to defray the cost of items such as draft-proofing, heating system upgrades and window replacement" (Finance Canada, 2005).

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[12] Part of the Nova Scotia government's recently announced $10 million "Smart Energy Choices for Nova Scotians" (separate from the $25 million Keep the Heat program) includes $2 million for any "modest-income senior" whose house is retrofitted (Nova Scotia Energy, 2005d). In this program the province covers the $150 audit fee, matches any federal rebate up to $1,000, and includes an additional $400 grant. This is an excellent idea as far as it goes, but it only helps modest-income seniors. Other Nova Scotians who live in buildings that need energy audits and retrofitting, and are unable to cover these costs, cannot benefit from this program.

The existing federal energy audit program is time consuming and, in Nova Scotia, inspects only a few hundred houses per year. In order to maximize the number of houses being audited, funds will be required to employ more auditors and to purchase additional auditing equipment.

- Many industrial processes, most notably the thermal generation of electricity, create products using high-grade sources of energy (such as coal, oil, and natural gas). One of the by-products of these processes is low-grade thermal heat (often between 50°C and 100°C), which is ideal for space heating purposes. This low-grade heat can be shipped from the heat source to homes within communities in underground, insulated piping.

  A heat source that produces two products from a single energy source (i.e., electricity and heating water from coal) is referred to as a cogeneration plant. The entire system (cogeneration plant, piping, and connected buildings) is referred to as a district heating system. District heating systems are very efficient, typically over 70 percent and approaching 90 percent in some cases (Nijjar, 2005), in part because a single fuel source, rather than several, is used for a number of applications.

  District heating systems work best where there are high thermal densities (i.e., a large number of buildings in a small area all requiring space heating). These can be compact developments such as are found in the downtown sectors of older communities. In Nova Scotia, this would include peninsular Halifax, downtown Dartmouth, and towns such as Berwick, Antigonish, and Kentville. There is sufficient low-grade heat from Nova Scotia Power's Tufts Cove power station in Dartmouth to heat peninsular Halifax or downtown Dartmouth (Hughes, 1999).

  The most expensive component of a district heating system is the installation cost of the underground piping, at about $1 million per kilometre (Nijjar, 2005). Such expenses can be recouped over time, but would require government backing to be viable.

How the above programs are funded will clearly be an issue for any level of government. However, as section 6.3 shows, there are large differences in the cost of the various assistance schemes; so, for example, rather than implementing a universal HST reduction

program costing $34 million, a forward thinking provincial government could opt to collect the HST, support 50,000 consumers for $13 million, and use the remaining $21 million to implement a provincial energy security strategy. Alternatively, the Nova Scotia government could implement the guaranteed price program and use the difference between it and the Keep the Heat program to support energy improvements for those with limited household energy budgets.

8. Concluding Remarks

With increased consumption in Asian countries and the United States, global oil supply is barely able to meet world oil demand. As the events in the late summer of 2005 on the US Gulf Coast showed, supply interruptions can have devastating effects, causing the price of refined petroleum products to jump to unprecedented levels. Other energy sources are not immune from price increases: as crude oil prices fluctuate, so do those of natural gas; similarly, changes in the price of fossil fuels influence the price of electricity.

These energy price increases have an impact on all sectors of the economy, from manufacturing to transportation and, of course, residential. The need for residential space heating, coupled with energy price increases, means that a growing number of Canadians will face "winters of discontent."

Energy security, the responsibility of a government to ensure that the members of a community have access to reliable and uninterrupted sources of energy at a reasonable price, has been overlooked by successive federal and provincial governments, due, in part, to years of low energy costs. As a result, the vast majority of Canadians have no choice but to heat their homes with increasingly expensive fossil fuels, or electricity generated from fossil fuels.

The typical political reaction, at both the federal and provincial levels, is to offer a fuel assistance payment to those with limited household energy budgets. Governments seldom suggest removing the tax on home heating fuels as that could mean a lost revenue stream. Although fuel assistance programs and removing fuel taxes can offer some degree of assistance to those in need, they both have shortcomings:

- Removing the tax on home heating fuel can result in seemingly large savings; but

when compared from year to year, the savings may be minor or non-existent. Since the savings can be used to purchase more fuel, removing the tax on heating fuel may benefit those who need it the least, notably well-to-do, inefficient users of energy. If the reduction in tax causes demand to increase, the result can be shortages and increased prices; this offers little benefit to those for whom removing the tax was intended. Furthermore, the resulting increase in demand can result in increased emissions of carbon dioxide.

- Lump-sum fuel assistance payments are a simple solution that suffer from a number of drawbacks; for example:
  - The sum, combined with the recipient's funds, may be insufficient to meet the cost of energy required to heat the home.
  - If the program is not properly managed, some recipients who do not need funds may receive them (e.g., someone living in an apartment with heating included in the rent or someone who heats their home with wood from their woodlot).
  - If fuel prices fall, the recipient may not need the funds, but they still will be paid. Funds can also be spent unnecessarily if the winter is mild and fuel consumption is less than expected.
  - There is no guarantee that the recipient will spend the fuel assistance payment on fuel.

Typically such programs are politically expedient actions that make for good optics but do not necessarily address the fuel needs of those Canadians in need of assistance. Instead of tax reductions or lump-sum payments, this paper has proposed that those in need of fuel assistance be offered a guaranteed price for their fuel purchases. Such a program is dynamic in nature, adjusting to price changes throughout the heating season as well as ensuring that the funds are spent on fuel purchases. Depending on the average price of heating fuel during the heating season, the number of litres of fuel consumed by those receiving assistance, and the guaranteed price, the proposed program can assist those in real need while costing less than the lump-sum payment option. With rapidly rising world energy prices, the guaranteed price offers consumers a level of protection not

available with the other approaches.

Ultimately, all fuel assistance programs suffer from the same problem: as fuel prices continue to rise, the number of consumers requiring assistance increases as well, raising the cost of the program. This cycle is unsustainable; residential space-heating demand must be reduced. To achieve this, both federal and provincial governments must develop truly universal policies that:

- Reduce energy requirements for space heating by improving the way energy is used for this purpose.
- Increase the use of indigenous sources of energy for space heating, such as biomass, geothermal, and solar.
- Maximize the efficiency of energy production through the implementation of district heating programs.

Residential space-heating is an essential fact of life for anyone living in Canada. Rising energy prices are making space heating an issue of concern for many Canadians. Addressing the residential space-heating problem is a two-step process: first, those who cannot afford to heat their homes adequately must be given the assistance to do so; second, existing infrastructure must be modified and future infrastructure must be developed to reduce energy consumption. This two-step process requires energy security policies at the national and provincial levels. At present, government solutions are failing to achieve either.

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Table 8: Effect of removing Nova Scotia component from fuel sales for various fuel purchases

Cost per litre (with HST)	**Cost per litre (Nova Scotia component removed)**	**2,000 litre purchase**			**2,500 litre purchase**			**3,000 litre purchase**		
		Cost with HST	Cost with Nova Scotia component removed	Savings	Cost with HST	Cost with Nova Scotia component removed	Savings	Cost with HST	Cost with Nova Scotia component removed	Savings
$0.600	$0.558	$1,200.00	$1,116.52	$83.48	$1,500.00	$1,395.65	$104.35	$1,800.00	$1,674.78	$125.22
$0.650	$0.605	$1,300.00	$1,209.57	$90.43	$1,625.00	$1,511.96	$113.04	$1,950.00	$1,814.35	$135.65
$0.700	$0.651	$1,400.00	$1,302.61	$97.39	$1,750.00	$1,628.26	$121.74	$2,100.00	$1,953.91	$146.09
$0.750	$0.698	$1,500.00	$1,395.65	$104.35	$1,875.00	$1,744.57	$130.43	$2,250.00	$2,093.48	$156.52
$0.800	$0.744	$1,600.00	$1,488.70	$111.30	$2,000.00	$1,860.87	$139.13	$2,400.00	$2,233.04	$166.96
$0.850	$0.791	$1,700.00	$1,581.74	$118.26	$2,125.00	$1,977.17	$147.83	$2,550.00	$2,372.61	$177.39
$0.900	$0.837	$1,800.00	$1,674.78	$125.22	$2,250.00	$2,093.48	$156.52	$2,700.00	$2,512.17	$187.83
$0.950	$0.884	$1,900.00	$1,767.83	$132.17	$2,375.00	$2,209.78	$165.22	$2,850.00	$2,651.74	$198.26
$1.000	$0.930	$2,000.00	$1,860.87	$139.13	$2,500.00	$2,326.09	$173.91	$3,000.00	$2,791.30	$208.70
$1.050	$0.977	$2,100.00	$1,953.91	$146.09	$2,625.00	$2,442.39	$182.61	$3,150.00	$2,930.87	$219.13
$1.100	$1.023	$2,200.00	$2,046.96	$153.04	$2,750.00	$2,558.70	$191.30	$3,300.00	$3,070.43	$229.57
$1.150	$1.070	$2,300.00	$2,140.00	$160.00	$2,875.00	$2,675.00	$200.00	$3,450.00	$3,210.00	$240.00
$1.200	$1.117	$2,400.00	$2,233.04	$166.96	$3,000.00	$2,791.30	$208.70	$3,600.00	$3,349.57	$250.43
$1.250	$1.163	$2,500.00	$2,326.09	$173.91	$3,125.00	$2,907.61	$217.39	$3,750.00	$3,489.13	$260.87
$1.300	$1.210	$2,600.00	$2,419.13	$180.87	$3,250.00	$3,023.91	$226.09	$3,900.00	$3,628.70	$271.30
$1.350	$1.256	$2,700.00	$2,512.17	$187.83	$3,375.00	$3,140.22	$234.78	$4,050.00	$3,768.26	$281.74

Table 9: Comparison of different fuel purchase schemes

Five different purchasing schemes are compared at four different average costs per litre ($0.80, $0.90, $1.00, and $1.10). In each case, the total cost associated with purchasing a given number of litres (2,000, 2,500, and 3,000) is presented. The additional expense (to the consumer) associated with purchasing this amount of fuel is compared with the average cost of a litre of fuel during the 2004-05 heating season in Halifax ($0.77 per litre); the 2004-05 costs were: 2,000 litres: $1,540; 2,500 litres: $1,925; and 3,000 litres: $2,310.

Fuel purchase scheme	**Total litres purchased**	**$0.80 per litre (including HST)**		**$0.90 per litre (including HST)**		**$1.00 per litre (including HST)**		**$1.10 per litre (including HST)**	
		Total cost	Additional expense	Total cost	Additional expense	Total cost	Additional expense	Total cost	Additional expense
Full price (including HST)	2,000	$1,600.00	$60.00	$1,800.00	$260.00	$2,000.00	$460.00	$2,200.00	$660.00
	2,500	$2,000.00	$75.00	$2,250.00	$325.00	$2,500.00	$575.00	$2,750.00	$825.00
	3,000	$2,400.00	$90.00	$2,700.00	$390.00	$3,000.00	$690.00	$3,300.00	$990.00
LIFA $250 rebate only	2,000	$1,350.00	-$190.00	$1,550.00	$10.00	$1,750.00	$210.00	$1,950.00	$410.00
	2,500	$1,750.00	-$175.00	$2,000.00	$75.00	$2,250.00	$325.00	$2,500.00	$575.00
	3,000	$2,150.00	-$160.00	$2,450.00	$140.00	$2,750.00	$440.00	$3,050.00	$740.00
Nova Scotia component removed	2,000	$1,488.70	-$51.30	$1,674.78	$134.78	$1,860.87	$320.87	$2,046.96	$506.96
	2,500	$1,860.87	-$64.13	$2,093.48	$168.48	$2,326.09	$401.09	$2,558.70	$633.70
	3,000	$2,233.04	-$76.96	$2,512.17	$202.17	$2,791.30	$481.30	$3,070.43	$760.43
Combined LIFA and removed Nova Scotia component	2,000	$1,238.70	-$301.30	$1,424.78	-$115.22	$1,610.87	$70.87	$1,796.96	$256.96
	2,500	$1,610.87	-$314.13	$1,843.48	-$81.52	$2,076.09	$151.09	$2,308.70	$383.70
	3,000	$1,983.04	-$326.96	$2,262.17	-$47.83	$2,541.30	$231.30	$2,820.43	$510.43
Guaranteed price of $0.77 per litre	2,000	$1,540.00	$0.00	$1,540.00	$0.00	$1,540.00	$0.00	$1,540.00	$0.00
	2,500	$1,925.00	$0.00	$1,925.00	$0.00	$1,925.00	$0.00	$1,925.00	$0.00
	3,000	$2,325.00	$15.00	$2,375.00	$65.00	$2,425.00	$115.00	$2,475.00	$165.00

Appendix I: Calculating the Harmonized Sales Tax

To obtain the HST on a particular good or service, the pre-tax price is multiplied by 0.15. The total cost of the good or service plus the HST can be obtained by multiplying the original price by 1.15. For example, a service costing $100 has an HST of $15 ($100 × 0.15) and a total price (including the HST) of $115 ($100 × 1.15).

The original price of a good or service that includes the HST can be obtained by dividing the total price by 1.15. For example, a good with a total price (including HST) of $57.50 has a price of $50 ($57.50 ÷ 1.15).

The value of the HST and its federal and Nova Scotia components can be obtained in a number of different ways; for example, multiplying the pre-tax price of the good or service by 0.15 to obtain the HST, by 0.07 to obtain the federal component, and by 0.08 to obtain the Nova Scotia component. Alternatively, the HST can be multiplied by 7/15 to obtain the federal component or 8/15 to obtain the Nova Scotia component. As an example, if a good has a price of $75, the HST is $11.25 ($75 × 0.15), the federal component is $5.25 ($75 × 0.07 or $11.15 × 7/15), and the Nova Scotia component is $6 ($75 × 0.08 or $11.15 × 8/15).

Rebate misconception

There is a misconception that if the provincial government refunds its component of the HST on the purchase of a taxable good or service, it will subsequently recoup the same amount when the refund is subsequently spent on another good or service.

Consider the purchase of a good with a price of $1,000. The HST is $150, with a Nova Scotia component of $80. If the provincial government refunds the $80 to the consumer, the consumer will have $80 to spend on another good or service, while the government is $80 out-of-pocket. If the consumer spends the $80 on a taxable good or service, the HST will be $10.44 and the Nova Scotia component will be $5.57.

The consumer has spent a total of $1,080 and the provincial government has collected $5.57 in the Nova Scotia component of the HST, and that only from the $80. The $80 originally refunded by the provincial government is therefore lost.