

Feasibility Assessment of a Change-out / Education Program for Residential Wood Combustion

A Step-by-Step Approach to a National Program Aimed at Reducing Emissions from Residential Wood Combustion

FINAL REPORT

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1.0 Executive Summary

Communities across Canada have participated in various ways to reduce emissions from residential wood burning appliances. Based on these experiences, the funders for this study recognized the need to evaluate whether change-out programs or education campaigns alone or in combination would be more effective in achieving reductions in fine particulate matter from the residential wood combustion sector. The results of this study were used to evaluate the feasibility of a national woodstove change-out/education campaign along with a proposed strategic framework.

This report is the product of that research. It involved the in-depth study of twelve change-out/education campaigns from across Canada supported by interviews with industry, government staff, program managers and other people working in the field. The impact of the various incentive-based and educational approaches was evaluated using as many means as possible, both quantitative and qualitative. These included change-out data, information dissemination data and surveys to measure attitudinal and behavioural changes associated with the installation, operation and maintenance of wood burning appliances.

Findings

In order to achieve significant reductions in emissions generated from residential wood combustion an education campaign must go beyond the initial step of generating awareness into a realm that involves stimulating behavioural changes such as adopting new technologies and ensuring that those technologies are properly installed, operated and maintained.

There are significant barriers that have been observed in the change-out programs delivered to-date that limit the number of change-outs achieved. The most significant barriers are cost, limited timeframe and long service life of conventional woodstoves. If a national program can be designed to overcome the above barriers, then the results of a change-out program would accelerate, leading to a significant step in achieving substantial reductions in PM emissions. Successful strategies to promote behaviour change combine tactics that target individual motivations, remove barriers to and provide incentives for behaviour change, and involve people in activities that demonstrate the desired behaviours. The change-out program must be supported by an education campaign to ensure that EPA certified woodstoves are properly installed, operated and maintained in order to achieve the lowest possible emission rates. Changing behaviour through participatory methods in combination with incentives would form a sound basis for a national woodstove change-out and education campaign.

Due to the nature of wood as a fuel, the air quality impacts of wood burning can never be totally eliminated. **Regulation appears to be the most effective approach to stopping the retail sales of conventional woodstoves** by ensuring that only EPA certified wood-burning technology is available to purchase. This measure is also supported by the Feasibility of Developing and Piloting a Woodstove Exchange Program— a study done in 2003 to assess the feasibility of an Ontario change-out/education campaign. **Without a regulation, a national change-out program should not be undertaken.**

Homeowners with conventional woodstoves should have the option to choose anything that is cleaner in terms of air quality. The following provides a scope of the change-out options that can be offered as part of a national program:

- Conventional woodstove to EPA woodstove change-out

- Fuel neutral change-out to other fuel stove¹ (i.e. pellet, oil, gas, electric, woodstove)
- Stove change-out to an alternative heat source (i.e. ground source heat pump, wind, solar)

To-date, change-out programs in Canada have offered few fuel neutral change-outs. Only in some cases were the change-out expanded to include other fuel stoves (pellet, oil, gas, electric). These other fuel stoves should formulate the basis of the change-out program. The feasibility of alternative heat sources (ground source heat pump, wind, solar) are uncertain at this time and it is suggested that opportunities within complimentary government activities such as Natural Resources Canada's Renewable Energy Strategy be explored.

¹ This would be limited to the best available technology in terms of reduced emissions.

2.0 Introduction

2.1 Purpose

The purpose of this study is to evaluate whether change-out programs or education campaigns alone or in combination would be more effective in achieving reductions in fine particulate matter emissions from the residential wood sector. Building on this initial evaluation, a second objective of the project is to assess the feasibility of a national wood stove change-out / education campaign. Should the feasibility assessment seem positive, a third objective would be to develop a business plan for a national and Ontario-specific wood stove change-out / education program.

2.2 Background

Air pollution affects the health of all Canadians especially those with respiratory and cardiac conditions. Particulate matter less than or equal to 10 microns (PM₁₀) is a key component of smog, along with ground-level ozone. Of greatest health concern are fine particulate matter (PM_{2.5}) that interfere with the proper functioning of the respiratory system. These fine particulates attribute to increases in asthma symptoms, hospital admissions and premature mortality. PM₁₀ has been declared toxic under the Canadian Environmental Protection Act, 1999 (CEPA 1999). PM also serves as carrier for many toxics produced by wood burning.

The residential wood combustion sector contributes to particulate matter that directly impacts the air quality of all Canadians. The Canadian Council of Ministers of the Environment has adopted a Canada-wide Standard for particulate matter and ozone that commits governments to significantly reduce particulate matter and ground-level ozone by 2010. This standard is an important step towards the long-term goal of minimizing the risks of these pollutants to human health and the environment. The standard represents a balance between achieving the best health and environmental protection possible and the feasibility and costs of reducing the pollutant emissions that contribute to particulate matter and ground-level ozone in ambient air. In June 2000, one of the seven joint initial actions agreed to by the Ministers was to participate in new initiatives to reduce emissions from residential wood burning appliances. The Intergovernmental Working Group on Residential Wood Combustion (IGWGRWC), with representatives from all level of government, has been coordinating actions on the sustainable development of wood combustion.

Over the past 15 years, various change-out programs provided incentives for the replacement of conventional wood stoves for advanced technology, EPA certified wood stoves. In 2002-2003, Natural Resources Canada (NRCan), in partnership with Health Canada and Environment Canada, launched a national public education campaign on a new initiative to reduce emissions from residential wood burning appliances. The Burn it Smart Region Campaign enabled proponents to prepare and deliver public workshops on better wood burning practices, cleaner (in the sense of reduced wood smoke), safer, more efficient residential wood heating.

2.3 Methodology

This study evaluated whether change-out programs or education campaigns alone or in combination would be more effective in achieving reductions in PM emissions from the residential wood sector. As a first step, the study identified key lessons learned from various equipment exchange or change-out programs that have occurred around the world. The study then assessed the relative effectiveness of woodstove change-out/education campaigns used across Canada. The effectiveness of each campaign was evaluated, where information was available,

based on the number of citizens reached, the amount of emissions reduced from the residential wood sector due to change-outs and the amount of behavior change towards better burning practices.

Research other Global Equipment or Change-out Programs

This study first identified and determined the applicability of various global equipment exchange or change-out programs. These programs were deemed to have a similar magnitude, scope and relevance to the Canadian woodstove change out program. Interviews were conducted with those program proponents with the greatest applicability to determine lessons learned and critical success factors.

Develop Evaluation Template

The Burn it Smart evaluation template (2002) was used as a starting point for developing a new evaluation template. A series of screening criteria was developed for evaluating the effectiveness of woodstove change-out programs versus education campaigns. Screening criteria included:

- Reliability of findings (e.g. whether changes were measured prior to and following the change-out or education activity, whether random sampling was used); and
- Metrics used to measure impact (soft data vs. actual measurements)
- Degree of behaviour change

Feedback was sought from the Project Authority and the IGWGRWC and incorporated into the evaluation template.

Evaluation and Program Impacts

The evaluation template was used to evaluate the success of Canadian woodstove change-out programs and education campaigns. Information was collected from interviews with program managers and experts across Canada. Research findings from both the interviews and previous reports were used to complete the evaluation template for each of the Canadian woodstove change-out programs and education campaigns.

An analysis was then conducted across change-out program and education campaigns, in order to identify promising models that are most effective. The estimates of air emission reductions achieved were derived from quantitative information based on the number of change-outs achieved where available.

Pollution from wood stoves is measured in “grams per hour”, which represents the particles in the smoke released up the chimney. Older stoves and fireplaces release from 40 to 80 grams per hour of smoke. The new EPA/CSA approved stoves produce from two to seven grams per hour². Here is an example of how the impact of a change-out is measured in terms of pollutants reduced³:

- In the New Brunswick 1997 exchange, a total of 112 woodstoves were exchanged for EPA woodstoves or pellet stoves. The program resulted in particulates released into the air from approximately 6 720 grams per hour (60 grams * 112 stoves) to 560 grams per hour (5 grams * 112 stoves), for an overall reduction of 6 160 grams of particulates per hour.

² The CSA standard is allowing 4g/hr (catalytic) and 7g/hr (non catalytic) for woodstoves to be certified. There are few catalytic stoves sold in Canada. It is assumed that pellet stoves produce two to five grams per hour of particulates.

³ This calculation is performed under the assumption that only dry wood and good burning practices are used.

Another way to measure the impact of a change-out is by estimating the amount of wood fuel that is saved as a result of using more efficient technology. Here is an example of how the impact of a change-out is measured in terms of wood fuel economized:

- The Burn it Smart campaign assumed new woodstove owners use 1/3 less wood of an average 4 cords⁴ used in a typical burning season. An exchange of 100 conventional stoves for 100 EPA certified stoves, would result in a savings of 133 cords.

The potential for behaviour change as a result of an education campaign was derived from qualitative information based on the number of people reached as representing those whom could potentially reduce their woodstove emissions by practicing better wood burning habits. Here are some examples of how the potential for behaviour change is measured:

- The Great Woodstove Change-out and Education Program of Georgian Bay held 12 public workshops, reaching a total of 1210 participants.
- Nova Scotia's Healthy Woodstove Campaign received 1 000 requests for information on the 1-800 number provided. Based on the requests, a total of 1 000 people were reached.

Feasibility Assessment

In order to determine the feasibility of a national woodstove change-out / education campaign, the research findings were first summarized as the following key program design considerations: Target Audience; Timing of Program Delivery; Change-out Options and Financial Incentives; and, Logistics of Woodstove Collection and Metal Recycling. The project team then established a set of threshold requirements. The requirements were then applied to the research findings as part of the feasibility assessment.

Framework of a National and Ontario Program

The project team conducted a brainstorming session on ideas for a national woodstove change-out program. The key steps and components were documented in the form of a business plan, taking into account provincial, territorial and cultural differences. The business plan also highlights how a change-out / education program would work in the Province of Ontario.

2.4 Limitations of Data

Noted below are the limitations of data associated with in-kind budget figures, number of woodstove change-outs and the number of people reach during an education campaign.

There are limitations with comparing in-kind budget figures associated with change-out and education campaigns. The ways in which in-kind contributions are calculated vary from project to project and are often based on best recollection or estimations. It is important to note the extent of in-kind contributions, but dollar-to-dollar comparisons cannot be made.

Many program managers have indicated that the number of exchanges made during a change-out program does not fully reveal the impact of these programs. The main reason for this being that the purchase and professional installation of a new EPA certified stove is a significant investment. The decision to make this investment often takes a few burning seasons. Another

⁴ One cord = 4' x4' x8'

hindrance to making the decision to exchange is that the service life of a woodstove appliance is often 25-30 years.

Alternatively, it has been suggested that the number of people reached during a public education campaign can be considered as having an impact. For instance the number of people reached represent those who could potentially reduce their wood stove emissions by practicing better wood burning habits.

Participant surveys have been done to determine whether those who attended a workshop heard the key messages that were conveyed. These surveys provide an idea of the participant's intentions in the minutes that follow the workshop. Presently, no follow-up surveys have been conducted to see if participants of education campaigns actually carried out their intentions and to find out what changes were made to their wood burning practices.

3.0 Research Findings

3.1 Lessons Learned from Global Change-out Programs

A number of equipment change-out programs have occurred. Many of the global change-out programs examined have a similar magnitude, scope and relevance to Canadian woodstove change-out programs. In the majority, a financial incentive, whether through a rebate or subsidy, was an essential component of the program. Another common factor to many of the programs is the strong partnership between various levels of government and industry players –retailers, distributors or manufacturers (see Appendix 6.4 for more details).

3.2 Overview of Canadian Woodstove Change-out / Education Campaigns

Over the past 15 years, various programs have provided incentives for the replacement of conventional woodstoves for EPA certified wood stoves and in some cases other cleaner fuel stoves. In 2002-2003, Natural Resources Canada (NRCan), in partnership with Health Canada and Environment Canada, launched a national public education campaign on a new initiative to reduce emissions from residential wood burning appliances. The Burn it Smart Regional campaign enabled proponents to prepare and deliver public workshops on better wood burning practices; cleaner (in the sense of reduced wood smoke), safer, more efficient residential wood heating.

A total of 12 woodstove change-out/education campaigns were examined as part of this study. Seven took the approach of change-out supported by education. The 1995 B.C. Change-out was the only change-out program that was conducted without education. Three took the approach of education on its own to generate awareness on the environmental and health concerns surrounding residential wood burning. It was found that the Whitehorse Efficient Wood Heat Demonstration was conducted as a scientific study rather than as a change-out/education campaign. As a result, the findings from this study were not included in the analysis.

For purposes of comparing the results achieved by the various campaigns table 1 was created to summarize the approach, budget per community, duration, financial incentives offered and program impacts.

Where possible, budgets are presented on a community basis indicating which portion is cash and which portion is in-kind. The range of budgets for change-out/education campaigns per community is as follows:

- Change-out alone: \$ 7 463 (cash) ⁵
- Change-out with education: \$ 10 000 to \$ 33 725 (cash) and \$5 000 to \$81 000 (in-kind)
- Education alone: \$9 588 (cash) on average and 39% in-kind ⁶

So far, woodstove change-out programs and education campaigns have been delivered within a timeline that is limited to the winter-spring season or the fall season. The majority of change-out programs offered trade-in rebates that ranged from \$125 - \$300. The change-out programs examined in British Columbia offered higher trade-in allowances of 15%, which amounted to a range of \$100-\$500. In British Columbia the cost of the trade-in allowance is shared 50% by the

⁵ Please note, based only on 1995 B.C. Change-out, the total budget was divided by four communities (Vancouver Island area, Lower Mainland, Interior B.C. and Northern B.C.)

⁶ Figures based on National Burn it Smart Regional Workshop Series 2002-2003.

retailer and 50% by the manufacturer and distributor. In Ontario and Nova Scotia, retailers funded rebates, with some manufacturers and distributors providing funding. In Quebec, all funds were shared between federal and provincial government.

The estimates of air emission reductions achieved were derived from quantitative information based on the number of change-outs made. Here, pollution from wood stoves is measured in “grams of particulates per hour”, which represents the particles in the smoke released up the chimney. A summary of these calculations is as follows:

- The 1995 B.C. Change-out stood out as the highest with 11 230 grams of particulates per hour reduced.
- The remaining change-out programs achieved in the range of 715 to 7725 grams of particulates per hour reduced.

None of the education campaigns undertook a follow-up survey 1-3 years after the campaign to gauge lasting behaviour change or intentions of changing behaviour. Given this data gap, the potential for behaviour change as a result of an education campaign was derived from qualitative information based on the number of people reached as representing those whom could potentially reduce their woodstove emissions by practicing better wood burning habits.

There have been two main approaches to the way in which communities conduct education campaigns. One approach involves a heavy reliance on the distribution of information materials such as brochures, posters, and user guides. The methods in which these materials are distributed vary from 1-800 information request line, mass distribution and point-of-purchase. Below is a summary of the number of people reached through this approach:

- The use of 1-800 information request lines ranges from 200 to 1 000 responses over a limited period of time during a campaign (i.e. six weeks)
- Mass distribution of materials via volunteers and targeted mailing reaches thousands. For instance, in a recent campaign in Quebec, over 175 flyers, 2 600 posters and 2 000 user guides were distributed.
- In 1999, point-of-purchase materials were distributed to 157 Hearth Products Association of Canada retailers, 65 members of Association des Professionels du Chauffage and 31 members of Wood Energy Technical Transfer. There were data available on the number of consumers reached.

The other approach used as part of an education campaign targets changing behaviour through more participatory venues such as workshops, moisture clinics and home visits. The majority of woodstove education campaigns have involved the use of public and professional sector workshops delivered by community experts. Below is a summary of the number of people reached through this approach:

- Of those communities hosting public workshops, the average number of participants reached per workshop⁷ is 38, with lows of zero reached versus highs of over 200 reached. A key factor attributable to high turnout is the effective promotion of the benefits of attending a workshop through various forms of media.
- Of the moisture clinics hosted, the average number of participants reached per clinic is 20.
- Of the community offering home visits, the number of participants reached is 180.

Based purely on the number of people reached, education campaigns that distribute information materials have reached more people. This is the most cost-effective approach if the intent is to solely raise awareness. Evidence put forward by behaviour change experts indicates that information campaigns do raise awareness, however they are not sufficient in fostering a change in behaviour. This will be explored further in section 3.4.

⁷ This figure was calculated using the data provided in Table 1.

| Table 1: Overview of Canadian Woodstove Change-out/Education Campaigns | | | | | | |
|---|-----------------------------------|--|---|--|--|--|
| | Approach | Duration | Budget per Community | Incentives Offered | Program Impacts Qualitative / Quantitative | |
| BC Change-out (1995) | Change-out | One season: April 1 st - May 15th | \$29 850 (cash) / 4 communities ⁸ = \$7 463 (cash) per community | \$50 to \$200 cash discounts EnviroLoan program | 208 responses to the 1-800 number | 196 exchanges (105 gas, 106 wood, 2 pellet) Particulates released into the air from approximately 11 760 grams per hour (60 grams * 196 stoves) to 540 grams per hour (5 grams * 108 stoves), for an overall reduction of 11 220 grams of particulates per hour. 569 cords of wood saved annually |
| Nova Scotia (1997) | Change-out supported by education | One season: Sept. 3 rd to 10th | \$21 950 (cash) \$27 635 (in kind) Program covers all communities in Nova Scotia (approximately 100 000 households) | \$150 | 1 000 requests for information received on 1-800 number. Based on the requests, a total of 1000 consumers potentially reduced their woodstove emissions by practicing better wood burning habits. | 120 stoves traded in for EPA woodstoves, 72 recycled. It is assumed that the remaining 48 were resold by dealers. Particulates released into the air from approximately 4 320 grams per hour (60 grams * 72 stoves) to 360 grams per hour (5 grams * 72 stoves), for an overall reduction of 3 960 grams of particulates per hour. 96 cords of wood saved annually |
| New Brunswick (1997) | Change-out supported by education | One season: Sept. 3 rd to Oct. 15 | Budget unknown 5 communities | Under \$250 | 20 people attended each of the eleven moisture testing clinics, for a total of 220 participants. Plus over 900 people phoned the 1-800 line. A total of 1 120 consumers potentially reduced their wood stove emissions by practicing better wood burning habits. | 112 woodstoves were exchanged for EPA stoves or pellet stoves. Particulates released into the air from approximately 6 720 grams per hour (60 grams * 112 stoves) to 560 grams per hour (5 grams * 112 stoves), for an overall reduction of 6 160 grams of particulates per hour. 149 cords of wood saved annually |

⁸ Please note, the total budget was divided by four communities (Vancouver Island area, Lower Mainland, Interior B.C. and Northern B.C.)

| | Approach | Duration | Budget per Community | Incentives Offered | Program Impacts | |
|---|-----------------------------------|---|---|--|--|---|
| | | | | | Qualitative / Quantitative | |
| ALAP Project Québec (2001) | Change-out supported by education | One season change-out: Over three weeks in Autumn 2001 Education Fall 2001 and Winter 2002 | \$223 712 including in-kind / 204 communities =\$ 1097 per community | Rebate: \$210-\$300 | 175 000 flyers 2 600 posters 2 000 user guides Residents of 204 communities with the help of the firefighters, drugstores, medical clinics and environmental NGO. In Lanaudière and 7 other regions | 68 woodstoves changed out (7 oil, 16 gas and 45 EPA woodstoves) Particulates released into the air from approximately 4080 grams per hour (60 grams * 68 stoves) to 225 grams per hour (5 grams * 45 stoves), for an overall reduction of 3 855 grams of particulates per hour. 143 cords of wood saved annually (estimation made by JF Banville-Env. Canada) |
| Great Eastern Ontario Woodstove Change-out (1999) | Change-out supported by education | One season: Start in January for eight weeks | \$87 000 (cash) / 8 communities = \$10 875 (cash) per community | Trade-in rebate of \$150 on average | 8 public workshops with a total of 500 attendees reached | 83 wood-wood 28 fireplace insert 1 fireplace 1 pellet stove Particulates released into the air from approximately 6780 grams per hour (60 grams * 113 stoves) to 415 grams per hour (5 grams * 83 stoves), for an overall reduction of 6 365 grams of particulates per hour. 231 cords of wood saved annually |
| Renewing an Old Flame Campaign (2000) | Education campaign | One season: Start in fall | \$65 750 (cash) This was an across Canada initiative | None | Point-of-sale purchase materials distributed to 157 HPAC retailers, 65 APC retailers and 31 WETT members | Unknown |
| Great Woodstove Change-out and Education Program of Georgian Bay (2001) | Change-out supported by education | One season: Late February for nine weeks | \$99 800 (cash) / 3 regions = \$ 33 267 (cash) per region | Trade-in rebates of \$125 on average when old stove disabled by retailer | 12 workshops with a total of 1210 participants A user profile was done of those purchasing change-out appliances during the change-out. The majority of purchasers learned about the program in the store, while 13.8% of purchasers attended a wood heat workshop. | 85 EPA woodstoves Particulates released into the air from approximately 5 100 grams per hour (60 grams * 85 stoves) to 425 grams per hour (5 grams * 85 stoves), for an overall reduction of 4675 grams of particulates per hour. 113 cords of wood saved annually |

| | Approach | Duration | Budget per Community | Incentives Offered | Program Impacts Qualitative / Quantitative | |
|---|--|---|--|--|---|---|
| First Nation Communities in Ontario (2002-2003) | Education campaign | | Unknown | N/A | 8 professional workshops with a total of 133 attendees 6 public workshops with a total of 38 attendees | |
| 2003 Great Okanagan Woodstove Exchange Program | Change-out supported by education | Early February for six weeks As of 2004, in fourth season | \$13 000 (cash) \$5 000 (in-kind) | 15% trade-in allowance available (up to \$500) when appliance was traded-in and recycled. Cost of rebate shared 50% by manufacturer and distributor. | 3 public workshops with a total of 214 attendees | 109 EPA woodstoves 2 pellet 26 gas 1 electric insert Particulates released into the air from approximately 8 280 grams per hour (60 grams * 138 stoves) to 555 grams per hour (5 grams * 111 stoves), for an overall reduction of 7 725 grams of particulates per hour. 184 cords of wood saved annually |
| Whitehorse Efficient Wood Heat Demonstration | Demonstration of the performance of new residential woodheat technologies. | Nine one-week particulate emissions sampling periods during one wood burning season | Budget unknown One community | none | 14 homeowners reduced their emissions by adopting better burning practices. | 14 homes participated and 8 stoves were changed-out for EPA stoves Particulates released into the air from approximately 480 grams per hour (60 grams * 8 stoves) to 40 grams per hour (5 grams * 8 stoves), for an overall reduction of 440 grams of particulates per hour. 11 cords of wood saved annually |

| | Approach | Duration | Budget per Community | Incentives Offered | Program Impacts Qualitative / Quantitative | |
|--|-----------------------------------|----------------------|---|---|--|--|
| Burn it Smart Pilot Projects (January – March 2002) | | | | | | |
| Overall | Change-out supported by education | January – March 2002 | NRCan (estimated): \$161 548 In-kind: (estimated): \$381 627 | Varied | The campaign is estimated to have reached a total of 6 940 participants, of which 1 230 attended workshops or were visited at home by a wood heating expert. | This campaign, changed-out and destroyed 221 units and professionally installed 223 EPA certified units. The estimated amount of CORDS SAVED THROUGHOUT THE CAMPAIGN WORKS OUT TO 279.8. |
| Sackville (NS) | Change-out supported by education | January – March 2002 | NRCan: \$20 674 In-kind: \$48 240 Total: \$68 914 | \$50 rebate for old stove return | 7 English 1 French workshops total of 273 attendees at workshops | 13 EPA woodstoves 2 New EPA woodstoves installed Particulates released into the air from approximately 780 grams per hour (60 grams * 13 stoves) to 75 grams per hour (5 grams * 15 stoves), for a reduction of 705 grams of particulates per hour. 20 cords of wood saved annually |
| Annapolis Valley (NS) | Change-out supported by education | January – March 2002 | NRCan: \$29 999 In-kind: \$71 072 Total: \$101 071 | \$35 rebate for new stove Also dedicated approximately 400 hours to EnerGuide audits for homeowners. | 6 English workshops Total of 262 attendees at workshops | 50 EPA woodstoves Particulates released into the air from approximately 3 000 grams per hour (60 grams * 50 stoves) to 250 grams per hour (5 grams * 50 stoves), for a reduction of 2 750 grams of particulates per hour. 60 cords of wood saved annually |
| Okanagan Valley (BC) | Change-out supported by education | January – March 2002 | NRCan: \$28 118 In-kind: \$65 607 Total: \$93 725 | 15% trade-in allowance available when appliance was traded-in and recycled. | Number of workshops: unknown Total of 279 attendees at workshops | 111 EPA woodstoves Particulates released into the air from approximately 6 660 grams per hour (60 grams * 111 stoves) to 555 grams per hour (5 grams * 111 stoves), for a reduction of 6105 grams of particulates per hour. 140 cords of wood saved annually |
| Whitehorse (YK) | Change-out supported by education | January – March 2002 | NRCan: \$33 725 In-kind: \$44 174 Total: \$77 899 | \$50 rebate for new stove | 2 workshops 180 home visits Total of 60 attendees at workshops | 5 EPA woodstoves Particulates released into the air from approximately 300 grams per hour (60 grams * 5 stoves) to 25 grams per hour (5 grams * 5 stoves), for a reduction of 275 grams of particulates per hour. 7 cords of wood saved annually |
| Moncton (NB) | Change-out supported by education | January – March 2002 | NRCan: \$15 000 | \$100 rebate for new stove | 4 (bilingual) workshops Total of 3 | 16 EPA woodstoves Particulates released into the air from approximately |

| | | | | | | |
|--|-----------------------------------|----------------------|--|----------------------------|---|--|
| | | | In-kind: \$81 000 Total: \$96 000 | | attendees at workshops | 960 grams per hour (60 grams * 16 stoves) to 80 grams per hour (5 * 16 stoves), for a reduction of 880 grams of particulates per hour. 21.2 cords of wood saved annually |
| | Approach | Duration | Budget per Community | Incentives Offered | Program Impacts Qualitative / Quantitative | |
| Burn it Smart Pilot Projects (January – March 2002) | | | | | | |
| Fredericton (NB) | Change-out supported by education | January – March 2002 | NRCan: \$15 000 In-kind: \$81 000 Total: \$96 000 | \$100 rebate for new stove | 4 (bilingual) workshops Total of 27 attendees at workshops | 26 EPA woodstoves Particulates released into the air from approximately 1560 grams per hour (60 grams * 26 stoves) to 130 grams per hour (5 * 26 stoves), for an overall reduction of 1430 grams of particulates per hour. 31.68 cords of wood saved annually |
| Burn it Smart National Campaign (September 2002-March 2003) | | | | | | |
| BIS National Campaign | Education campaign | Sept.2002-March 2003 | Average budget of \$9 588 per public outreach project. In-kind contributions represented up to 39% of total budget. \$15 000 budget for twelve workshops per region | none | 7399 people were reached by 339 workshops in approximately 200 communities. | The BIS National Campaign did not provide funding to deliver change-outs. In some cases local organizers on their own initiative, engaged retailers to become involved in change-outs. For instance, Annapolis Valley Home Builders Association (NS) changed-out 42 conventional stoves and Atlantic Wood Energy Technicians Association (NS) changed-out 14 conventional stoves in conjunction with delivering a series of regional public education workshops. |

3.3 *Summaries of Canadian Woodstove Change-out / Education Campaigns*

Below are brief summaries of the Canadian woodstove change-out and education campaigns that were studied. For more detailed information, please refer to section 5.2 of the Appendices.

Province-wide New Brunswick

The overall goal of New Brunswick's Healthy Wood Stove Campaign (1997) was to help reduce the pollutants from domestic woodstoves via a woodstove exchange program and through public education highlighting proper wood burning techniques. Five communities were targeted: Fredericton, Saint John, Moncton, Bathurst and Edmundston. The education campaign included: moisture testing clinics, wood burning demonstrations, industry training seminars and brochures. The Campaign took place over September 3 to October 15, 1997. To promote and publicize the Campaign, an intensive media campaign was designed. The number of stoves exchanged was 112 (70 in Moncton, 9 in Fredericton, 6 in Saint John, 12 in Bathurst area and 15 in the Edmundston area). Suggestions on future campaigns include making the financial incentive larger so to encourage people to exchange their conventional stoves, rather than sell them; and having future campaigns look at "first-time" purchasers by having an incentive program geared to these consumers, to make EPA certified stoves more attractive than conventional stoves.

The New Brunswick Lung Association (NBLA) ran province-wide Burn-it-Smart campaigns during the falls of 2002 and 2003. NBLA preferred this timing because that is when people get ready for the winter and think of wood burning. However, industry partners preferred the winter - their slow season. NBLA engaged local Fire Marshall's offices (focus on wood burning safety), Departments of Environment and Health (focus on environmental and health benefits), and woodstove retailers (focus on selling more stoves). A passive educational approach was used for professionals: mail outs were directed to fire departments, and workshops were offered to newly trained professionals (although the ones for employees at big box stores were poorly attended.) A more active approach was used with the general public. To attract participants, people who came to their workshops could get their wood tested for moisture. TV and radio interviews also worked well, especially call-in shows. Of their various messages, the most compelling was to save money on the purchase of a new stove. Other key messages were to: reduce your emissions, increase safety and save energy. One hundred and twelve units were taken out and it is assumed they were all recycled. Key lessons learned included (1) ensure that stoves are actually recycled and not re-sold; and (2) put an equal emphasis on better burning for those who can't afford to switch - most can't.

Province-wide Nova Scotia

The Atlantic Wood Energy Technicians Association delivered the Healthy Woodstove Campaign, a public education campaign during the fall of 1997 in Nova Scotia. The first objective was to raise awareness on the importance of efficient, safe woodburning and was achieved through a public relations media campaign. Activities included moisture meter testing, a 1-800 number of tips and literature, public service announcements, workshops for installers, brochures, newspaper articles, etc. The second objective was to encourage Nova Scotians to take action to improve their ability to burn wood more efficiently and safety by offering information and financial incentives for change. The financial incentive was funded through contributions from stove dealers, manufacturers and distributors to encourage purchasers of new EPA-certified stoves to trade-in old units, which were scrapped to prevent future usage. Thirty-eight dealers throughout Nova Scotia participated in the change-out. Approximately 120 stoves were traded in, 72 of these were recycled. It is assumed that the units that weren't recycled were resold by dealers as they were worth considerably more than \$150. Numbers were tracked for the amount of

information distributed, however there were no measurements taken on how this information influenced changes in burning practices.

Natural Resources Canada, in collaboration with the Province of Nova Scotia, ran a Burn it Smart pilot in 2001, then implemented a project in the winter of 2002/2003 covering much of the province. Participants who bought a new stove and had the old one delivered for destruction received a \$250 rebate in the mail. Seventy-seven units were taken out and recycled. Firefighters and local retailers were the primary means of motivating other community members to participate. In addition, about 100,000 flyers were distributed which, along with radio PSAs, attracted people to the public workshops. At the workshops, key points were highlighted vividly using two stoves side by side - one that was an EPA certified stove and one that was not. There were over 1,000 entries in a drawing contest for elementary school students, but an essay contest for older students drew much less participation. Their most successful messages had to do with creating a cleaner/safer place to live. A key lesson learned was that it is hard to attract people to attend public workshops in urban areas; an alternative is to get placed as a guest speaker in already planned events.

BC Change-outs

A number of local change-out programs have operated in British Columbia. The province has a provincial regulation since 1994 that prohibits non-EPA compliant stoves from being sold. This study focused on a province-wide program run in 1995 and a project in the Caribou region during the summer of 2002/2003.

The BC Great Stove Change-out in 1995 was done to support the new Provincial Legislation which no longer allowed the manufacturing of conventional wood burning appliances within the province of British Columbia. There were 196 exchanges made for EPA/CSA certified wood appliances, gas appliances or pellet appliances. Cash discounts were offered by participating manufacturers and distributors ranging from \$50 to \$200 between April 1, 1995 to May 15, 1995. Canada Trust supported the program by allowing consumers to take advantage of the EnviroLoan program (up to \$10,000 at prime for up to 10 years), to assist consumers with financing. Newspaper advertising was the major media used to promote the program.

Concerns about local airshed quality and poor visibility were key drivers for the Caribou project. The project reached professionals through WETT certification workshops, Burn it Smart workshops (how to burn properly, and how to reduce the amount of wood required), and personal relationships (development of an Air Quality Round Table Committee). A 15% incentive was offered on the purchase of new stoves, split between retailer, manufacturers and distributors. Participating retailers also paid a \$75 registration fee in order to benefit from advertising, referrals, pamphlets, and banners that were hung in their stores. Community health (local air quality concerns) proved to be the primary motivation for citizen participation; there is a need for good case studies demonstrating the health benefits other communities have achieved. Another key motivation was reducing the need to chop or buy less wood. A key message was "burn cleaner, more efficient fires."

2003 Great Okanagan Woodstove Exchange Program

The Central Okanagan Regional District Air Quality Program with the help of staff from the North Okanagan and Okanagan Similkameen Regional Districts managed the Great Okanagan Wood Stove Exchange Program. Approximately 21% of Okanagan homes (21,654 residences) have a burning appliance; 89% are inefficient conventional wood stoves or masonry fireplaces. Partnerships with all levels of wood heating industry, fire departments, WETT, Industry association, gas utility, BC Lung Association, provincial and local governments have helped the Program continue into its fourth year in 2004. The Great Okanagan Wood Stove Exchange

Program continues to focus on public education through media outreach activities like public service announcements. The financial incentive of 15% discount offered by retailers in peak season is attractive to wood appliance users.

The main lessons learned include the necessity to have support of Local Air Quality Committee (consists of politicians, experts and staff), carefully integrating incentive-based changeouts with education and continuing with the exchange and education program annually to emphasize the importance of the issue to the community. The importance of a funding source to support the exchange and education program is vital especially as more communities get involved in delivering their own programs.

Lanaudière – Québec (2001)

The *Association de Lanaudière pour l'air pur (ALAP)*, an environmental NGO dedicated to improve air quality in their region has identified wood burning as their main target. In collaboration with many retailers, local media and municipalities, ALAP conducted a pilot project from October to December 2001. There were two types of activities: change-out and outreach.

The change-out was done with close collaboration with retailers. The retailers did most of promotion, mostly through local newspaper, using standardized messages approved by ALAP. It works quite simply: for their old stove people received a rebate of \$150 from ALAP, plus an extra \$60 to \$150 depending on the type of the new stove (i.e.: \$60 for a EPA woodstove, \$125 for an oil stove and \$150 for a gas stove). The less pollution the more of a rebate offered. To make sure that the old stove would never be used again, ALAP collected the doors. In total, 68 stove were changed-out. Promotion said "program available until all funds given". It took only around 4 weeks for that to happen and many people mentioned that the possibility of coming too late accelerated their decision to buy.

Outreach was done at the regional level with ALAP staff and also volunteers. It mostly consisting of using flyers, a video created by ALAP, posters, user's guide and some clinics. As a result, there was a growing concern on the issue of health and wood burning. ALAP also spread provincially its message through environmental NGOs. That also helped to raise attention to many people.

Great Eastern Ontario Wood Stove Change-out (1999)

The scale of this initiative encompassed communities within Eastern Ontario (i.e. Napanee, Bancroft, Cornwall) and included the delivery of eight public workshops along with the offering of change-out rebates. The rebates were available for people upgrading from conventional woodstoves and fireplaces to certified EPA or Canadian Standards Association (CSA) appliances. Over 25 participating Eastern Ontario woodstove retailers offered special trade-in rebates. Incentives of \$150 on average were used to encourage people to "change-out" their conventional units. Dealers were asked for money up front in exchange for a dealer kit to help them promote the program. The main lesson learned was that those dealers who became actively involved in the program by assisting with woodstove workshops, donating installations for the media events and running ³co-op² ads were able to generate substantial numbers of change-outs. They were also the ones most satisfied with the program. Not surprisingly, dealers that chose to not get actively involved and assist in promoting the program saw little or no change-out activity.

Renewing an Old Flame Campaign (2000)

The focus of this project was on designing and distributing point-of-purchase materials to encourage shoppers to opt for cleaner burning appliances when shopping for woodstoves. The rationale was that woodstoves are not impulse purchases. As a strategy, point-of-purchase materials acknowledges that there is no legislation in place to require stoves in Canada to be

cleaner-burning (except in B.C.). The cleaner-burning message was delivered right at the place where people were making their purchase decision. Free kits were distributed to all 157 Hearth Products Association of Canada retailers across Canada and 65 members of Association des Professionnels du Chauffage. Wood Energy Technical Transfer members were sent a letter asking them to call if they would like a free kit, and 31 replied and were sent their kit. There was no reliable way to quantify how successful the program had been, in terms of how many people upgraded from conventional to cleaner-burning because of the point-of-purchase materials. This is because the sales process and customer decision-making process is a complicated mix of product features, sales pitch, sales materials (including the *Renewing an Old Flame* materials) and other external factors (e.g. growing environmental concerns). However, there was every indication that the project was successful, in that it was well-regarded by the initial target audience, the retailers.

Woodstove Change-out and Education Program of Georgian Bay (2001)

This initiative's primary emphasis was on education; the change-out was complementary and served to attract people to the workshops. A series of 12 workshops were held within the Georgian Bay Watershed (i.e. Sault Ste. Marie, Sudbury, Timmins, North Bay, Parry Sound, Huntsville, Bracebridge, Penetang, Barrie, Schomberg, Shelburne, Owen Sound). The area was picked as a pilot project as it is a strong wood burning area with a good mix of rural and small to medium sized communities as well as a large number of specialized retailers. The educational component of the change-out program was used to promote proper firing techniques and fuel preparation, fundamental to cleaner (emitting less wood smoke), efficient wood burning, together with a fundamental understanding of the linkage between emissions, health and the environment. These are important messages to communicate to everyone who burns wood; especially to those wood burners that may not be in a financial position to purchase a new appliance but need to hear this important message that in turn might prompt them in future buying decisions. Twenty dealers from the area signed up and paid their fees to HPAC to participate in the program. Upon signing, each received a Retailer Change-out Kit specifically designed to assist them in organizing local workshops, arranging publicity and to provide background information on the change-out program. Trade-in rebates on purchases of EPA certified wood stoves were provided by wood heating retailers and manufacturers.

Activities in First Nation Communities

Environment Canada-Ontario Region and the Canada Mortgage Housing Corporation (Aboriginal Capacity Development)-Ontario Region ran the Burn it Smart (BIS) workshop series in First Nation Communities in Northwestern and Southwestern Ontario. The professional seminars were offered in the afternoons for fire, building and housing professionals and the public seminars were delivered in the evening. Professionals received more detail on building and fire codes together with information on the WETT program. In 2003, the Ontario First Nations Technical Services issued a requirement to have WETT training become mandatory for building inspectors. There are virtually no WETT trained First Nations personnel in other provinces⁹. WETT certification opens the door for eventual BIS workshop delivery, ensures better support for wood burning in communities and furthermore assists First Nation building inspectors to meet their requirements for certification.

The emphasis for the public workshops was placed on how to use existing woodstoves more effectively. The reason for this was based on the facts that limited resources are available to purchase new appliances plus the average community member has very little say in the

⁹ Some workshops have also been conducted in British Columbia (i.e. Snxw'ow'hamel – Hope First Nations) and in First Nations communities surrounding Whitehorse, Yukon. In March 2004, some workshops will be delivered to First Nations in Thompson, Manitoba.

appliance selection. Housing Coordinators and Band Managers buy the woodstoves and they often buy the least expensive units. The participation at the evening public sessions was somewhat disappointing but understandable given that few home occupants actually make the purchase decisions on their stoves / systems.

Whitehorse Efficient Wood Heat Demonstration (1987)

A general goal of this demonstration was to reach meaningful conclusions regarding the effectiveness of new wood heat technologies at: reducing the impact of residential wood heat emissions on ambient air quality; reducing the risk associated with chimney fires and safety of operation in the home; and improving the energy efficiency of residential wood heating. This demonstration consisted of nine one-week particulate emission-sampling periods that were conducted in fourteen Whitehorse homes that used wood as a primary source of heat. The first four one-week sampling periods were completed using the homeowner's existing conventional technology woodstoves. New wood heat technology appliances were installed in each of the study homes and monitored for an additional five one-week sampling period. The study revealed that proper installation and good operating practices (i.e. using dry wood) increased the probability of achieving the lowest possible emission rates. The main lesson learned was that there is a need for improved education programs for both consumers and dealers to ensure that new technology woodstoves are properly installed, operated and maintained. Sponsorship of these programs should be both from the public, e.g. regulatory agencies, and the private sector, e.g. manufacturers of woodstoves and trade organizations.

Burn it Smart Pilot Projects (2002)

This was an education and change-out project that took place in seven different communities¹⁰ across Canada from October 2001 to March 2002. Natural Resources Canada provided funding for most of the campaign. Other partners made contributions through sponsorship or in-kind such as providing space for workshops, donating time to plan, free advertising and marketing. The main objectives of the pilot projects were to help Canadians who heat with wood or burn wood recreationally to improve their practices and for homeowners to replace their conventional wood heating appliances that are inefficient with EPA certified appliances. Of the six reports submitted, all six project managers chose to use a passive approach to social marketing to encourage people to participate in their workshops or information sessions. One project manager combined a passive approach with an active one by offering home visits. The campaign is estimated to have reached a total of 6 940 participants, of which 1 230 attended workshops or were visited at home by a wood heating expert. The remaining 5 710 participants were partially exposed to the campaign, as they did not attend a formal 2-hour workshop. Four of the six projects that submitted reports delivered some form of training to professionals. In terms of change-outs, the project manager for each community had to build partnerships with local retailers to develop the change-out portion of the project. This campaign, changed-out and destroyed 221 units and professionally installed 223 EPA certified units. Assuming that the new owners of EPA certified wood stove use 1/3 less wood of a typical four cord winter, the total estimated number of cords saved throughout the campaign works out to 279.8. As autumn is a very busy season for the industry, it has been suggested that the campaign be played out in two parts, an educational campaign in winter or early spring and the actual change-out campaign in the fall.

National Burn it Smart Campaign (2003)

¹⁰ The six of the seven communities involved submitted reports, they were: Sackville (NS), Moncton (NB), Fredericton (NB), Annapolis Valley (NS), Okanagan (BC), and Whitehorse (YK). The seventh community was Thunder Bay and it did not submit a report. There was an eighth pilot originally planned for Montreal, but it never got started.

The National Burn It Smart (BIS) Campaign ran from September 2002 to March 2003. Natural Resources Canada and various partners developed the campaign. The campaign was designed for wood burners and aimed at modifying their wood burning practices towards better practices to improve air quality, security and health while heating with wood. More than 300 professional and public workshops were held across Canada that involved approximately 200 communities and the participation of over 7000 Canadians.

Workshop participants were given surveys to fill out on their present and future wood burning habits. During this period, 7 399 people were directly reached by the campaign and a total of 3 232 surveys were completed. The surveys provide an idea of the participant's intentions in the minutes that follow the workshop. 62% of respondents planned to make changes as a result of the information they obtained through the BIS campaign. The responses varied from 47% of respondents who planned to make changes in New Brunswick to 81% in the Yukon. When comments were provided, people who said that yes, they would make changes often referred to burning smaller, hotter fires with dry wood only, consider getting an EPA appliance, won't burn garbage anymore and having stove/chimney checked by a professional more often. When asked when it is time to replace their current stove, fireplace or insert, 81.5% ranked efficiency/EPA certification as the most important factor that will be considered, while health or environmental impacts (48.5%) and long-term savings (45%) completed the top three factors. A follow-up survey is needed to see if participants actually carried out their intentions and to find out what changes were made to their wood burning practices.

3.4 *Evaluation of the Effectiveness of Change-out Programs and Education Campaigns*

The intent of this research is to evaluate the effectiveness of woodstove change-out programs versus education campaigns in achieving substantial reductions in PM emissions. The Canadian Council for Ministers of the Environment has adopted a Canada-wide Standard for particulate matter and ozone that commits governments to significantly reduce particulate matter and ozone by 2010. Given the commitment to substantially reduce PM emissions from the residential wood combustion sector, it is important to evaluate how effective change-out programs and education campaigns alone or in combination are significant enough in achieving substantial reductions in PM emissions.

This section will evaluate the impact of three scenarios on achieving substantial reductions in PM emissions. The three scenarios examined are: woodstove change-out programs, education campaigns, and the combination of education campaigns with change-out programs.

3.4.1 Woodstove Change-out Programs

a. *Research Question:* Will the impact of replacing conventional woodstoves with EPA certified or CSA approved stoves (installed by a professional) or other fuel sources (i.e. gas, pellet) be significant enough to achieve substantial reductions in PM emissions?

b. *Research Findings:*

According to a cooperative study done between Environment Canada and the Hearth Products Association of Canada in 2000, the impact of replacing conventional woodstoves with EPA certified or CSA approved stoves in a controlled setting is high. The study compared an EPA certified stove with a non-EPA certified stove with the following results: 94 % less particulate matter; 80 % less volatile organic compounds; and, 85 % less polycyclic aromatic hydrocarbons.

It is important to highlight that these are lab results achieved from controlled conditions. The reduction of emissions is easier to obtain in a controlled environment where all the steps of combustion are carefully followed, i.e. where the wood is sampled for dryness and where combustion is checked every 5 minutes.

In 1987, the Whitehorse Efficient Wood Heat Demonstration revealed that proper installation and good operating practices (i.e. using dry wood) increased the probability of achieving the lowest possible emission rates. This finding is also applicable to stoves that run other types of fuel.

When examining the effectiveness of change-out programs, the main conclusion derived from these studies is that there is a role for education campaigns targeted at both consumers and dealers to ensure that EPA certified woodstoves are properly installed, operated and maintained. The objective of a change-out is to reduce emissions by removing conventional wood burning appliances while at the same time helping wood burners improve their wood burning practices thereby economizing wood fuel and increasing safety and efficiency. The education component of the change-out assists wood heating appliance users in identifying EPA certified appliances and in identifying the differences between advanced and conventional technology.

c. *Evaluation and Recommendation:*

There are significant barriers that have been observed in the change-out programs delivered to-date that limit the number of change-outs achieved per community to range from 5 to 196. The most significant barriers are as follows:

- Cost of a new appliance (EPA certified woodstove or other fuel stoves) and installation by certified professional ranges from \$1800 to \$5000. For instance, an EPA certified woodstove costs between \$700-\$1500, while professional installation cost between approximately \$1 000-\$3 500.
- Consumers perceive financial incentives on the lower end of the \$100 to \$500 range as too low.
- Retail interest in participating in a change-out program is higher and often limited to the slow sales period.
- Having a limited timeframe for change-outs limits the consumer's ability to take part in the change-out program.
- The service life of a woodstove appliance is often 25-30 years, resulting in a small portion of woodstove appliances that are "due for a change" each year.

If a national program can be designed to overcome the above barriers, then the results of a change-out program would accelerate, leading to a significant step in achieving substantial reductions in PM emissions. The change-out program must be supported by an education campaign to ensure that EPA certified woodstoves are properly installed, operated and maintained in order to achieve the lowest possible emission rates.

3.4.2 Education Campaigns

a. *Research Question:* Will the impact of education campaigns alone be significant enough to achieve substantial reductions in PM emissions?

b. *Research Findings:*

The objective to-date of a woodstove education campaign is to reduce emissions by helping wood heating appliances users improve their wood burning practices, thereby reducing emissions and economizing wood fuel while increasing safety and efficiency. The actual campaign assists wood heating appliance users in identifying EPA certified wood appliances and the differences between EPA certified appliances and conventional appliances.

The majority of woodstove education campaigns have involved the use of public workshops delivered by community experts such as fire safety officials, health officials, WETT certified professionals etc. Other woodstove education campaigns, such as Association de Lanaudière pour l'air pur and Renewing an Old Flame Campaign relied more heavily on education materials and did not host public workshops.

It has been suggested that the number of people reached during a public education campaign can be considered as having an impact. For instance the number of people reached represents those who could potentially reduce their wood stove emissions by practicing better wood burning habits.

Participant surveys have been done to determine whether those who attended a workshop heard the key messages that were conveyed. These surveys provide an idea of the participant's intentions in the minutes that follow the workshop, but do not reflect the long-term impacts.

Presently, no follow-up surveys have been conducted to see if participants of education campaigns actually carried out their intentions and to find out what changes were made to their wood burning practices. There have been indications that public workshops lead to change-outs. For instance, a Perth woodstove retailer experienced customer interest in changing-out older wood burning appliances as a result of attending a public workshop in February 2004. This may have occurred at other locations as well, but presently there does not exist a system in place to account for this. To determine the long-term impacts of woodstove education campaigns, more

primary research would be required which falls outside the resources of this study. Addressing this need for data should be a component of any proposed education program.

c. Evaluation and Recommendation:

Given the lack of data to assess the long-term impacts of woodstove education campaigns, it is unknown at this time whether an education campaign alone would be more or less effective than a change-out program in a manner that would be significant enough to achieve substantial reductions in PM emissions. It is suggested that a broader perspective be taken on this issue by examining the role of education in generating changes in behaviour.

Environmental education has been pursued by many governmental agencies and ministries in the past decades, i.e. recycling, energy efficiency, household hazardous waste. Environmental education serves first to raise awareness. For instance, in many cases people do not even know they are polluting the environment when heating with wood and when they first encounter the information they do not believe it. When a lack of knowledge is present, an education campaign based on providing information will serve to generate awareness, which is an important first step.

In order to achieve significant reductions in emissions generated from residential wood combustion an education campaign must go beyond the initial step of generating awareness into a realm that involves stimulating behavioural changes such as adopting better burning practices which involves burning appropriate fuel as well as adopting other technology (EPA certified stove, pellet, gas, oil or electric stove) and ensuring that those technologies are properly installed, operated and maintained. It is recommended that a community-based social marketing approach be taken to advance the acceleration of behavioural change. This approach will be elaborated upon further when examining the effectiveness of combining education campaigns with change-out programs.

3.4.3 Combining Education Campaigns with Change-out Programs

a. *Research Question:* Will the impact of education campaigns in conjunction with change-out program be significant enough to achieve substantial reductions in PM emissions?

b. Research Findings:

In the case of all change-out programs, with the exception of the B.C. Change-out, there are complementary education campaigns. In general, the change-out serves to attract people to public workshops. All change-out programs recognize the need to educate the public on three key issues: importance of what to burn, operating the stove efficiently and ensuring that the stove is installed by a certified professional for safety and efficiency purposes.

c. Evaluation and Recommendation:

Successful strategies to promote behaviour change combine tactics that target individual motivations, remove barriers to and provide incentives for behaviour change, and involve people in activities that demonstrate the desired behaviours. McKenzie-Mohr's model for fostering pro-environmental behaviour change, commonly known as community-based social marketing, identifies motivations that lead to current behaviour and assesses how these behaviours may be changed by removing barriers and providing incentives. This implies that focusing on changing behaviour through participatory methods in combination with incentives would form a sound basis for a national woodstove change-out and education campaign.

As suggested earlier, if a national program can be designed to overcome the barriers to behaviour change, then the results of a change-out program would accelerate, leading to a significant step in achieving substantial reductions in PM emissions. The change-out program must be supported by an education campaign to ensure that emission reduction is reached as much as possible through the proper installation, operation and maintenance of the appliance as well as through the replacement of conventional woodstoves by other types of home heating system (EPA certified woodstoves, another fuel stove, alternative heating system).

3.5 Feasibility Assessment of a National Program

Due to the multi-faceted issues and diversity of stakeholders involved in the residential wood combustion sector, there are several design factors to take into consideration when assessing the feasibility of a national program. Below is an overview of the key program design considerations.

3.5.1 Target Audience

When designing an education campaign / change-out program for the residential wood combustion sector, one must identify the target audience. The more closely the campaign matches the audience, the better the chance of success. Key to identifying the target audience is answering who needs to be reached in order to accomplish the campaign objectives. Based on the experiences of past education campaigns the target audiences are:

- **Public:** For those audiences where wood smoke is not a known pollutant, an education campaign focused on the distribution of information is a necessary first step in raising awareness. Once awareness is raised, the next step is behaviour change, as mentioned in section 3.4.3.

Another important consideration when targeting the public is to recognize that there are three main audiences: frequent wood burners, infrequent wood burners and those who have never burned wood but may consider it. For periodic users of woodstoves, the main messages conveyed entail best practices with respect to burning and stove maintenance. Frequent users of woodstoves are more likely candidates for change-out provided financial barriers are addressed. In circumstances where wood burning is of economic necessity (i.e. common amongst First Nation and Northern communities), the messages should be on best practices with respect to burning and stove maintenance.

For those whom have never burned with wood, a different approach is needed. Here, the main message should focus on providing a cost/benefit comparison of the various heating options.

- **Professionals, Business and Industry:** This group is also a target audience because of the leadership role they can play in demonstrating action to the public and in communicating to target audiences (including employees, suppliers, and consumers). Consumers' purchasing decisions can be influenced by the technical and safety information that sales staff provide. This group will serve as key partners in the delivery of an education campaign, for instance:
 - WETT¹¹ trained sales people, installers and chimney sweeps have a sound understanding of the efficiency, health and environmental issues that surround woodstoves and as a result are experienced in the delivery of education workshops and committed to participating in future campaigns.
 - Big box stores are an important partner, particularly in communities where specialty home heating stores do not exist.¹² Typically "cash and carry", big box stores create the perception that home heating installation is a "weekend project".

¹¹ WETT is the acronym for Wood Energy Technology Transfer Inc., the national training agency for wood energy professionals. Its certificate holders represent the core of well-informed and trained retailers, technicians and sweeps in Canada. Through professional training and public education, WETT Inc. promotes the safe and effective use of wood burning systems in Canada. In Quebec the organization is referred to as Association Professionels du Chauffage (APC Inc.).

¹² Smaller communities within Manitoba, Saskatchewan and to some extent Alberta do not have specialty home heating stores.

This needs to change. As a start, big box stores can provide information that will assist the consumer in making a well-informed decision regarding the proper installation, operation and maintenance of home heating options. This can be done using the following tactics: provision of point-of-purchase materials, provision of certified installation services, in-store certified specialist¹³, and in the absence of in-store assistance/installation services, have sales people refer consumers to local accredited installers.

- Distributors:¹⁴ serve as coaches for small woodstove retailers. For instance, distributors keep informed of the latest technical information and provide sales support to retailers.
- Communities: are an important audience and partner. Communities vary with respect to the level of awareness regarding air quality issues, much of it is attributed to the degree to which local air quality has an impact on its citizens. Those wood burning communities with air shed protection programs are best positioned to deliver an education campaign / change-out program.

Unique circumstances must be given important consideration when engaging First Nations communities on the issue of residential wood burning. In many First Nations communities, the housing is owned by the band council and is rented out to residents, therefore the woodstoves used are not owned by the resident. Given this common circumstance, key messages to residents should focus on best operating practices, emphasizing safety and efficiency while building managers should be trained on the best practices associated with installation and maintenance. In general, First Nations listen to members of their own community that they view as credible. In some First Nations communities, alternative approaches to communicating messages are more effective such as the use of nonverbal communication (i.e. pictures).

- Media: is a key audience because of their ability to make the public more aware of an issue and generate support for required changes.

Recommendations for National Program Design:

- There are three main segments of the public that need to be reached in order to accomplish the objectives of a national program: frequent wood burners, infrequent wood burners and those who have never burned wood but may consider it.
- Retailers of all sizes can provide information that will assist the consumer in making a well-informed decision regarding the proper installation, operation and maintenance of home heating options. This can be done using the following tactics: provision of point-of-purchase materials, provision of certified installation services, in-store certified specialist, and in the absence of in-store assistance/installation services, have sales people refer consumers to local accredited installers.
- Reduction of residential wood combustion should be communicated as part of a broader set of objectives for indoor and outdoor air quality.
- There is an ongoing need to have certified professionals across Canada and in particular within First Nations communities. First Nations listen to members of their own community that they see as credible. Training opens the door for eventual workshop delivery and ensures better support for wood burning in communities.

¹³ Home Hardware is one big box store providing certified professionals within their store to help consumers with their choice. Efforts should be made to understand why they made the investment to determine whether similar initiatives can be done with other big box stores.

¹⁴ Distributors function as a warehouse for the woodstove retailers.

3.5.2 Timing of Program Delivery

There are two key factors that influence the timing of program delivery:

- Specialty retailers are motivated to participate in a woodstove change-out program during the winter/spring months, a slower time of year for woodstove sales.
- The purchase a new EPA certified woodstove is a significant investment. The decision to make this investment is often made prior to the onset of the winter season and made more often by frequent users of woodstoves.

It has been suggested that, an education campaign in the fall would not be as effective, as people are too busy with the upcoming holiday season to be attending a public workshop and their memories of frustration with operating their existing woodstove aren't as fresh in their minds as they are in February. From this standpoint, the best timeframe for a public education campaign is mid-January to end of February. The main reason is that this time of year people are frustrated with the performance of their woodstoves. The decision is made at this time of year whether an investment in newer technology is worthwhile. The actual purchase however, may not take place until September/October.

So far, woodstove change-out programs and education campaigns have been delivered within a timeline that is limited to the winter-spring season or the fall season. At this point, neither approach has stood out as having more success. The main reason being that the decision to switch older technology happens over a longer period then the timeline of a change-out program.

Besides the timing of program delivery, there is the issue of long-term commitment and its benefits in terms of generating momentum. For instance, over the course of the last three years of the Great Okanagan Woodstove Exchange, retailers have been increasing their efforts on promotion. The main benefit to having a repeated annual campaign such as this is that citizens continually hear the same messages year after year, reinforcing the importance of taking action.

Industry has indicated that the timing of a national change-out program would be best served with the implementation of national legislation. This legislation would require that retailers would no longer be able to carry non-EPA certified stoves. Given the long service life of wood burning appliances, it makes sense that only new technology appliances are introduced into the marketplace.

Recommendations for National Program Design:

- There needs to be an action plan with long-term commitment. Right now activities are happening at a micro scale within limited budgets. A timeline of several years is needed in order to have an impact on behaviour. This amount of commitment also elevates the profile of the issue.
- The timing of the discounts is inconsistent with when consumers buy woodstoves. Perhaps participating retailers can issue a certificate for a rebate to those whom attend public workshops and that certificate will maintain its value for up to a one-year period upon being issued.

3.5.3 Change-out Options and Financial Incentives

The decision to burn wood is made on an individual basis and in some cases, out of economic necessity. If individuals are "thinking about moving away from wood" or have never burned with wood, then they need a framework on which to make decisions. Homeowners should be

presented with a decision-making framework that provides the pros and cons of each home heating option. Due to the nature of wood as a fuel, the air quality impacts of wood burning can never be totally eliminated. Homeowners with conventional woodstoves should have the option to choose anything that is cleaner in terms of air quality. The following provides a scope of the change-out options that can be offered as part of a national program:

- Conventional woodstove to EPA woodstove change-out
- Fuel neutral change-out to other fuel stove¹⁵ (i.e. pellet, oil, gas, electric, woodstove)
- Stove change-out to an alternative heat source (i.e. ground source heat pump, wind, solar)

To-date, change-out programs in Canada have offered few fuel neutral change-outs. Only in some cases were the change-out expanded to include other fuel stoves (pellet, oil, gas, electric). These other fuel stoves should formulate the basis of the change-out program. The feasibility of alternative heat sources (ground source heat pump, wind, solar) are uncertain at this time and it is suggested that opportunities within complimentary government activities such as Natural Resources Canada's Renewable Energy Strategy be explored.

The decision that leads an individual to take action on changing out their old stove consists of multiple steps, as it is a significant investment to make. With increased awareness in combination with financial incentives, the consumer may be motivated to purchase a new home heating appliance.

The final purchasing decision is influenced by the following factors:

- Conventional woodstoves continue to be available for purchase
- Conventional woodstoves are less expensive than EPA certified stoves
- Cost and perceived benefits of the other home heating options
- The decision to burn wood in some cases, is out of economic necessity.

Regulation appears to be the most cost effective approach to stopping the retail sales of conventional woodstoves by ensuring that only EPA certified wood-burning technology is available to purchase. This measure is also supported by the *Feasibility of Developing and Piloting a Woodstove Exchange Program*— a study done in 2003 to assess the feasibility of an Ontario change-out/education campaign.

Beyond regulation, federal and provincial governments may use policy tools like taxation, tax exemptions, tax rebates, direct expenditure, and program expenditure to influence individual behaviour in directions more consistent with the public good. Environmental tax shifting, a type of policy tool, involves charging environmental taxes and "recycling" the revenue from the environmental taxes. The revenue can be recycled in numerous ways, including funding reductions in existing taxes, new credit or subsidy programs, or refunds.¹⁶ An application for woodstove change-out may involve levying a "clean air" tax on conventional woodstoves and recycling the revenue back as subsidies to homeowners who purchase EPA certified stoves, other fuel stoves or alternatively to homeowners who purchase and install renewable energy systems (i.e. solar, etc).

A caution has been noted regarding the provision of government rebates. Home heating options when improperly installed or operated pose a safety hazard. By offering rebates, the government becomes a target for taking responsibility when things go wrong.

So far, woodstove change-out programs have been delivered with a financial incentive that is offered through the retailer and/or manufacturer. Based on this experience, financial incentives of

¹⁵ This would be limited to the best available technology in terms of reduced emissions.

¹⁶ Taylor A. and Jackard M. (1999) Environmental Tax Shifting for British Columbians. Accessed Feb 22, 2004 from <http://www.emrg.sfu.ca/articles/EnvTaxShift5.pdf> .

\$75-\$200 are not enough when you factor in the cost of the new stove and the installation costs associated with it. Cost of new technology (EPA certified woodstove or other fuel stoves) and installation by a certified professional ranges from \$1800 to \$5000. For instance, an EPA certified woodstove costs between \$700-\$1500, while professional installation cost between approximately \$1 000-\$3 500.

If financial incentives are higher, then the results of a change-out program would accelerate, leading to a significant step in achieving substantial reductions in PM emissions. Due to the cost of new stoves and tight profit margins¹⁷ in the woodstove manufacturing/sales industry, the provision of manufacturer/retailer incentives in isolation is both insufficient and financially unsustainable in the long-term. One possibility is to offer discounts on installation. Installers vary from those that work full-time for woodstove specialty stores to general contractors. Given this, it will be challenging to coordinate or get collective agreement on offering a discount on installation. It is recommended that this opportunity be further investigated.

Besides government policy tools, other realistic options for making financial incentives more substantial involve exploring nation-wide partnerships with the insurance, financial and utilities industry.

The Hearth Products Association of Canada, WETT and Environment Canada have been in discussions with the Insurance Bureau of Canada (IBC). Presently, IBC's level of reception to providing insurance rebates for properly installed EPA-certified stoves is low. This is due to the fact that woodstoves represent such a small segment of the home insurance market. There is a feeling that the IBC would be more receptive to providing resources towards the safety concerns regarding woodstove installation and operation. It is recommended that the federal government in partnership with the industry and IBC explore the opportunities to have the insurance industry engaged at a national scale.

At the local and regional scale in British Columbia, partnerships with the utilities and financial industry are in place to help overcome the financial barriers to investing in a new stove (i.e. providing loans at prime or rebates on alternative fuel appliances). Again, it would be beneficial to extend these partnerships to a national scale by the federal government engaging nation-wide representatives of the utilities and financial industry.

Recommendations for National Program Design:

- **Regulation is needed to eliminate the retail sales of conventional woodstoves. Industry is also supportive of national regulation as it creates a level playing field.**
- Homeowners should be provided with all the options to change-out along with a decision-making framework that provides the pros and cons of each choice.
- Environmental tax shifting should be considered as a way of influencing individual behaviour and as a source of additional revenue.
- Financial incentives offered by retailers/manufacturers play a key part in reducing the financial barriers to investing in a new stove.
- Nation-wide partnerships with the insurance, financial and utilities industry need to be established to help individuals overcome the financial barriers to investing in a new stove.
- Financial incentives should at least be in the order of \$300.

3.5.4 Logistics of Woodstove Scrappage (Collection and Recycling)

¹⁷ Between manufacturers and retailers, there is a profit margin of 25%-30%.

As part of conducting woodstove exchanges, it is important that the woodstoves are dismantled beyond hope of repair to prevent future use. Discarded woodstoves can be managed as scrap metal. There are four main challenges that impact the logistics of collecting and recycling woodstoves:

- In general, there seems to be a mentality amongst wood burners in rural communities that their old woodstoves have aesthetic value and in some instances wood burners believe that their old stoves increase in value over time.
- Infrequent users tend to hold onto conventional woodstoves as an emergency source of heat, i.e. ice storms, power outages.
- There presently does not exist a national infrastructure to handle the collection and recycling of woodstoves on a large scale.
- There are no known municipal programs that target woodstoves for collection and given their weight, they cannot be set out for curbside collection.

Without a proper tracking mechanism, not all installers/retailers can be relied upon to dismantle older woodstoves. In some cases, older woodstoves can end up being re-sold. A proper tracking mechanism rests with tying the incentive to the consumer, being the one who receives the rebate once the old woodstove has been dismantled. The rebate is issued only when a certificate is provided which has signatures from the retailer and metal recycler. An accredited installer would issue a certificate to the consumer who would then submit the certificate to the administrative body responsible for the rebate.

In British Columbia, the change-out programs have an arrangement between participating retailers and the local metal wreckers. The retailers take care of the collection part of the program. They have to make sure the stove being traded in is dismantled in some way. This can mean either taking out the stove for the customer and taking it to the recycling yard or accepting the wood stove doors from the customer at their store. The later option makes the customer responsible for recycling the stove because it is rendered useless without its doors.

There is a role for woodstove manufacturers to lead and support an industry stewardship program that would involve retailers recycling old woodstoves. An industry stewardship program would engage manufacturers in taking financial responsibility for getting older wood burning appliances out of circulation.

Recommendations for National Program Design:

- The public education campaign should include messages that encourage the retirement of old woodstove technology.
- Technicians and installers of new stoves can best handle the collection of old stoves.
- An industry stewardship program could provide funding for the collection, and recycling of conventional appliances.
- In order to engage woodstove manufacturers, a change-out/education program must be of a significant regional or provincial scale as a minimum.
- A process is needed in which old wood burning technology is retired in a way that is easy to do for the customer, the retailer and the change-out coordinator.

4.0 Recommended Framework of a National Program

4.1 Strategic Context

Clean air has become a growing public health concern in recent years. New scientific information about ground-level ozone and fine particulate matter suggests that even low levels of exposure to these pollutants can be harmful to human health, particularly among vulnerable populations such as children and the elderly.

Design Considerations

The recommended framework of a national program reflects a number of design considerations drawn from a best practices review of other non-woodstove and woodstove change-out as well as public awareness campaigns. These design considerations are relevant across Canada. Lessons learned from other woodstove change-out and public awareness campaigns include:

- A national program should be launched in conjunction with national legislation.
- Reduction of residential wood combustion should be communicated as part of a broader set of objectives for indoor and outdoor air quality.
- The decision to burn wood is made on an individual basis and in some cases, out of economic necessity.
- Homeowners should be presented with a decision-making framework that provides the pros and cons of each home heating option. Homeowners with conventional woodstoves should have the option to choose anything that is cleaner in terms of air quality.
- Trained certified professionals have the expertise regarding installation that will maximize efficiency and reduce the health and environmental issues that surround woodstoves.
- Financial incentives offered by retailers/manufacturers in combination with nation-wide partnerships with the insurance, financial and utilities industry will help individuals overcome the financial barriers to investing in a new heating system.
- Financial incentive-base change-outs go hand in hand with education.
- Wood-stove change-out programs are best suited to small-scale undertakings at the local level where local retailers and local leaders such as the fire safety community can get involved.
- In general, rural communities were more receptive to education workshops.
- Infrequent users more likely to hold onto their stoves.
- Woodstove manufacturers and retailers need to lead and support an industry stewardship program that would involve metal recycling of conventional woodstoves and education material on better burning practices (this could include wood heating guide, video, factsheet(s) distributed at point of sale with new stoves.
- Governments need to support an industry stewardship program. This could be done by creating a bounty program where conventional wood heating appliances are worth a certain dollar amount. This could be done in partnership with municipalities in poor air quality air sheds to help finance, administer market and operate the program.
- There is an ongoing need to have trained certified professionals across Canada. Training opens the door for eventual workshop delivery and ensures better support for wood burning in communities.
- First Nations are in need of certified professionals. First Nations listen to members of their own community that they see as credible.
- A long-term program is needed to have an impact of behaviour.

Key Lessons Learned include:

- National regulation necessary for a national program
- National program be based on a broader set of objectives related to indoor and outdoor air quality
- Delivery of education and change-out program suited to local level
- Need for long-term program

- Program should allow for some flexibility for regional or provincial differences, for example implementation of new regulations at provincial or municipal level.
- Longer-term surveys would be particularly useful to assess the effectiveness of education programs in permanently changing wood burning practices.

Principles

The proposed framework of a national program is built on a core set of principles. These include:

- Learning from and building on existing woodstove change-out and public education campaigns;
- Multiplying the impacts of existing initiatives and organizations;
- Fostering enhanced coordination and collaboration within communities;
- Enhancing consistency in messages, including the integration of clean air and climate change messaging where possible (i.e. make linkages to EnerGuide¹⁸ for houses and the value of having a good building envelope as a means of being more energy efficient);
- Reflecting regional variability;
- Adopting a flexible and phased approach, to enable the program to evolve over time; and
- Offering alternatives to wood burning which includes articulating a decision making framework for the consumer that presents the environmental costs and benefits of other home heating options

Objectives of a National Program

Public education and outreach will be critical to addressing the impacts of residential wood combustion effectively. Individual Canadians and their communities have a significant role to play in reducing their emissions of air pollutants and protecting themselves from the health impacts of residential wood combustion. **However, greater communication of residential wood combustion, its effects, and its relationship to air pollution will be needed before Canadians will be prepared to make changes.**

The key objectives of this program are:

- To build awareness and understanding among Canadians about the potential health impacts of residential wood combustion and associated environmental issues;
- To engage community leaders and the wood heat industry in public outreach initiatives on residential wood combustion aimed at the general public, with particular emphasis on communities where wood burning is a significant contributor to air pollution.
- To encourage the integration of residential wood combustion issues into other clean air related public education and outreach campaigns such as local air shed plans; and
- To encourage and motivate community-level action in burning less (i.e. support for local bylaws that ban wood burning days when weather conditions cause stagnant air) and burning better by adopting cleaner technologies (i.e. municipal bylaw regulating all new woodstove installations meet the EPA/CSA emission requirement, or as a condition on the sale of a house that the conventional woodstove be removed) and better burning practices.

Purpose and Outcomes of a Program

¹⁸ As part of the Burn it Smart pilot project, Annapolis Valley (NS) dedicated approximately 400 hours to EnerGuide audits for homeowners.

The purpose of this program is to build awareness and understanding among Canadians regarding the health and environmental effects of residential wood combustion, in order, ultimately, to engage Canadians and their communities in taking action to mitigate the impacts of residential wood combustion.

Key outcomes from this program will include:

- Clear, consistent core messages about the potential health effects of residential wood combustion, and possible actions to reduce the emissions that stem from wood burning;
- An active and engaged core of community leaders and professionals to deliver public education and outreach initiatives to the general public with particular emphasis on communities where wood burning is a significant contributor to air pollution;
- Mechanisms for ongoing collaboration among partners (industry, health and environmental organizations), with linkages to other key sectors active in public education and outreach; and,
- Enhanced engagement at the community level in preventative and mitigative actions.

This program is designed to be consistent and supportive of other residential wood burning initiatives, while remaining carefully focused on its approach.

4.2 Overview

- Communities will be provided with incentives and support for launching local change-out programs. These local programs will be implemented by 'champions', which could include municipal government staff (e.g. Fire Marshals), local retailers, community groups, or groups of concerned citizens. The national program will be extremely flexible, adapting to community needs and allowing for delivery by a number of different agents.
- Financial support will be provided to participating communities to help defray the costs of a local program coordinator and support local promotion and marketing.
- Financial incentives offered by retailers/manufacturers will be topped up with funding from nation-wide partnerships with the insurance, financial and utilities industry.
- A request for expressions of interest / mini-proposal will be used to interest and engage individual communities in taking part in the program. Selection criteria and filters will ensure a broad geographic spread and difference of approaches used by those communities selected to participate
- The first participating communities will then be invited to a workshop, where they will help to co-design the parameters, resources, tools and support they feel is required to make the national program a success. .
- The national program will, in collaboration with its national program delivery partners, provide the local programs with training, national media support and template communications materials

4.3 Audiences and Activities

Priority audiences have been targeted because of their relative lack of engagement to date, or because of their ability to reach and raise awareness among others. As part of the national program, it is recommended that the following activities be undertaken as priorities. These activities derive from the woodstove change-out and education campaigns that were studied. Activities from these campaigns were identified as having the greatest potential for success in reaching and influencing the behaviour of various target audiences.

- **Public:** The general public is the overall target audience for the national program. Activities focus primarily on a branded national advertising campaign, media relations activities, and national events, using credible spokespeople to deliver clear, consistent

messages that address the information needs of the 3 main audiences: frequent wood burners, infrequent wood burners and those who have never burned wood but may consider it.

- **Communities:** Communities represent both key target audiences and important partners in the implementation of the national program. The implementation of a national program needs to be delivered locally, with municipalities, local organizations and community networks playing a key role in generating awareness and influencing behaviour change.

The amount of resources needed to engage First Nations communities is substantially larger relative to other communities. A long-term investment is needed. There are two avenues in which to engage First Nations communities. The first avenue is the technical network. Here efforts can be placed on training community leaders such as building inspectors and then having them implement an awareness program. The second avenue is the political network. Here efforts can be placed on training First Nations Chiefs, whom then use their political influence to support and promote an awareness program.

- **Professionals, Business and Industry:** There is an ongoing need to have certified professionals across Canada and in particular in First Nations communities. Professional training opens the door for education campaign delivery and ensures better support for wood burning communities. This can be done using the following tactics: provision of point-of-purchase materials, provision of certified installation services, in-store certified specialist, and in the absence of in-store assistance/installation services, have sales people refer consumers to local accredited installers.
- **Media:** The media are a key audience because of their ability to make the public more aware of, an issue and generate support for required changes. It is recommended that a national program consist of:
 - Producing a feature to air on specialty channels (i.e. Weather Network) focusing on the role communities could play in improving ambient air quality
 - Providing regional hubs with media outreach kits to assist them in creating news opportunities with community media;
 - Documenting detailed success stories on community achievements in reducing the impacts of residential wood combustion;
 - Working with the Federation of Canadian Municipalities and others to identify examples of excellence to promote to community media; and
 - Creating an award of excellence in woodstove change-out /education campaigns.

4.4 Implementation

Consistent with the principles of building on and multiplying the effectiveness of existing initiatives and organizations, the National program will emphasize the indirect delivery of change-out and public awareness campaigns on residential wood combustion. A national, multi-sector advisory committee would guide the overall administration of the national program. It would serve to link regions to each other and to the national efforts. The lead coordinator of the committee, a national organization, would be responsible for coordinating and providing funding support to appropriate local awareness and community-based social marketing activities. The national organization would also be primarily responsible for broad-scale national advertising, media relations and special events. The national organization would provide national recognition for participating initiatives, institute a framework for integrating and coordinating action at the community level, and provide core resources for overall planning and monitoring. It would also act as a clearinghouse for information and research on residential wood combustion, compiling and sharing lessons learned from regional activities.

While local initiatives are emphasized, broad-based national activities are designed to create an integrating backdrop to support activities across the country. At the national level, the program focuses primarily on approaches that promote understanding and awareness about residential wood combustion, and engage the Canadian public, using advertising, media relations, and national events. It is recommended that approximately 20 per cent of the resources be allocated for national activities.

At the community level, the primary focus would be to equip, encourage and motivate people to take action to reduce emissions from residential wood combustion. This requires a strong effort in building awareness and understanding of the residential wood combustion issue through educational activities, as well as promoting action and behaviour change. It is recommended that approximately 80 per cent of the resources be targeted at this level.

Community organizations interested in participating would be required to meet specific criteria so that a credible, integrated and successful approach resulted.

Financial incentives offered by retailers/manufacturers will be topped up with funding from nationwide partnerships with the insurance, financial and utilities industry. Community organizations in partnership with local retailers will commit to providing financial incentives. Upon receipt of this commitment, local change-out programs will be eligible for additional funding to go towards the provision of higher financial incentives to help individuals overcome the financial barriers to investing in a new stove.

Phased Approach

A phased approach will enable the program to evolve over time and benefit from lessons learned in the early stages of the program. Phasing also reflects the reality that building awareness and changing behaviour is a long-term investment.

The first phase (2005-2006), focuses on building a base for support and understanding around residential wood combustion in a single province. Partnerships should also be established with municipalities. Activities enhance and support successful existing initiatives and pilot new and promising approaches. It is recommended that stakeholders are active in developing and advising on woodstove change-out and education campaigns. For example, an external advisory committee is put in place to manage education projects being funded by the national program. The main steps of this phase include:

- Government leadership through the creation of an external national advisory committee of multi-sector leaders (e.g. federal government, provincial/territorial governments, municipal, private sector, community, and non-governmental involvement);
- Funding provided by federal government, through the national program mechanisms, and leveraged through contributions from provincial/territorial governments, communities, industry, and non-governmental organizations; and,
- Establishment of a clearinghouse of information and research on residential wood combustion, compiling and sharing lessons learned from regional activities.

The second phase (2007 and beyond) and full roll-out involves the realization of independent, arms-length management of public education and outreach by all stakeholders throughout Canada. The main steps include:

- Implementation of national regulation as soon as possible, i.e. 2008-2009
- Full operational capacity across Canada
- Funding to come from multiple sources (i.e. nation-wide partnerships with the insurance, financial and utilities industry)
- Movement of various groups from being target audiences to becoming key players in designing and delivering woodstove change-out / public education campaigns.

- Multi-stakeholder involvement and shared leadership—governments together with business and industry, communities, and non-governmental organizations.

Throughout all the two phases and full roll-out, ongoing evaluation and monitoring underpins all activities to continually build on success, learn from past experience, and adapt to evolving attitudes, awareness, and activity around residential wood burning.

4.5 Estimated Budget

Woodstove change-out programs are highly variable in design and implementation. To complicate the issue, the wood stove change out could involve switching from conventional to an EPA certified woodstove or gas, oil, electric or pellet stove in the early years of the program and latter adapted to another fuel heating technology, i.e. solar, ground source heat pump or wind as the program evolves. Therefore, various assumptions are required to be made in order to arrive at an estimated budget for a step-wise approach to a national program aimed at reducing emissions from residential wood combustion.

- Data from previous change-out programs indicates that the cost per change-out (excluding in-kind support) ranges from \$ 130-350 per change-out. The average was \$ 250/woodstove exchanged..
- Capture rates of old woodstoves will be set annually.
- In-kind support will equal cash support received from the various funding agencies.
- Further detailed direction will be required as to how the federal funds can be allocated.
- Wood change out incentives have been slotted at \$ 320/stove recognizing that this may be considered insufficient in some instances
- Negotiation with industry (retailers, manufacturers) and nation-wide partnerships with the insurance, financial and utilities industries will be needed to reach and exceed a financial incentive of \$320.
- Phase I and II would not target change-outs in major urban markets
- Other fuel heating technologies may become economically viable as the national program evolves which will require the budget to be revisited

The following estimated pro-forma income statement reflects the expenses for each phase of a potential national program. This is an estimate for wood to wood change out that has the potential to be altered to address other fuel heating technologies as they become available.

| | Phase I | Phase II | Full Roll-out |
|--|--------------|--------------|---------------|
| | 2005-2006 | 2006-2007 | 2007-2008 |
| <i>Expected Number of Woodstoves Exchanged</i> | 1 000 stoves | 2 000 stoves | 2 900 stoves |
| <i>Expenses</i> | \$ | \$ | \$ |
| Outreach-flyers - mall displays - workshops - promotion | 140 000 | 240 000 | 406 000 |
| Advertising | 80 000 | 100 000 | 232 000 |
| Wood change out incentives | 320 000 | 640 000 | 928 000 |
| Wood change out logistics | 15 000 | 30 000 | 43 500 |
| Educational workshops | 60 000 | 120 000 | 174 000 |
| Program coordination | 45 000 | 90 000 | 130 500 |
| Total expenses | 660 000 | 1 220 000 | 1 914 000 |

4.6 *Measurement and Evaluation*

The program will evolve over time in response to changing internal and external circumstances. Regular monitoring of progress, and of factors that could affect implementation or direction of the program, will be important for its success.

Two areas of results and performance measurement are anticipated – information collected from individual community change-out activities, and higher-level indicators measuring the success of the national Change-out program overall.

Indicators could include:

- Number of older stoves destroyed / recycled
- Changes in knowledge and attitudes regarding the health, safety, efficiency and environmental issues related to older wood stoves
- Number of Canadian communities actively involved in the change out program
- Number of other partners/leverage contributing to these initiatives
- Incremental number of stakeholders trained as a result of the program and/or other measures of building capacity at the community level to (1) retire older wood stoves and (2) address local air quality issues
- Amount of earned media generated as a result
- Stakeholder satisfaction with the process of participating in the program

5.0 Summary

This research evaluated the effectiveness of woodstove change-out programs versus education campaigns in achieving substantial reductions in PM emissions. The three scenarios examined are: woodstove change-out programs, education campaigns, and the combination of education campaigns with change-out programs.

For those communities where wood smoke is not a known pollutant, an education campaign focused on the distribution of information is a necessary first step in raising awareness. Greater communication of residential wood combustion, its effects, and its relationship to ambient air quality/air pollution will be needed before Canadians will be prepared to make changes.

In order to achieve significant reductions in emissions generated from residential wood combustion an education campaign must go beyond the initial step of generating awareness into a realm that involves stimulating behavioural changes such as adopting new technologies and ensuring that those technologies are properly installed, operated and maintained.

There are significant barriers that have been observed in the change-out programs delivered to-date that limit the number of change-outs achieved. The most significant barriers are cost, limited timeframe and long service life of conventional woodstoves. If a national program can be designed to overcome the above barriers, then the results of a change-out program would accelerate, leading to a significant step in achieving substantial reductions in PM emissions. Successful strategies to promote behaviour change combine tactics that target individual motivations, remove barriers to and provide incentives for behaviour change, and involve people in activities that demonstrate the desired behaviours. The change-out program must be supported by an education campaign to ensure that EPA certified woodstoves are properly installed, operated and maintained in order to achieve the lowest possible emission rates. Changing behaviour through participatory methods in combination with incentives would form a sound basis for a national woodstove change-out and education campaign.

Due to the nature of wood as a fuel, the air quality impacts of wood burning can never be totally eliminated. Regulation appears to be the most cost effective approach to stopping the retail sales of conventional woodstoves by ensuring that only EPA certified wood-burning technology is available to purchase. This measure is also supported by the *Feasibility of Developing and Piloting a Woodstove Exchange Program*— a study done in 2003 to assess the feasibility of an Ontario change-out/education campaign. Without a regulation, a national change-out program should not be undertaken.

Homeowners with conventional woodstoves should have the option to choose anything that is cleaner in terms of air quality. The following provides a scope of the change-out options that can be offered as part of a national program:

- Conventional woodstove to EPA woodstove change-out
- Fuel neutral change-out to other fuel stove¹⁹ (i.e. pellet, oil, gas, electric, woodstove)
- Stove change-out to an alternative heat source (i.e. ground source heat pump, wind, solar)

To-date, change-out programs in Canada have offered few fuel neutral change-outs. Only in some cases were the change-out expanded to include other fuel stoves (pellet, oil, gas, electric). These other fuel stoves should formulate the basis of the change-out program. The feasibility of alternative heat sources (ground source heat pump, wind, solar) are uncertain at this time and it

¹⁹ This would be limited to the best available technology in terms of reduced emissions.

is suggested that opportunities within complimentary government activities such as Natural Resources Canada's Renewable Energy Strategy be explored.

In terms of implementation, a phased approach will enable the program to evolve over time and benefit from lessons learned in the early stages of the program. Phasing also reflects the reality that building awareness and changing behaviour is a long-term investment.

The first phase (2005-2006), focuses on building a base for support and understanding around residential wood combustion in a single province. Activities enhance and support successful existing initiatives and pilot new and promising approaches. The main steps of this phase include:

- Government leadership through the creation of an external national advisory committee of multi-sector leaders (e.g. federal government, provincial/territorial governments, municipal, private sector, community, and non-governmental involvement);
- Funding provided by federal government, through the national program mechanisms, and leveraged through contributions from provincial/territorial governments, communities, industry, and non-governmental organizations; and,
- Establishment of a clearinghouse of information and research on residential wood combustion, compiling and sharing lessons learned from regional activities.

The second phase (2007 and beyond) involves the realization of independent, arms-length management of public education and outreach by all stakeholders throughout Canada. The main steps of this phase include:

- Implementation of national regulation as soon as possible, i.e. 2008-2009
- Full operational capacity across Canada
- Funding to come from multiple sources (i.e. nation-wide partnerships with the insurance, financial and utilities industry)
- Movement of various groups from being target audiences to becoming key players in designing and delivering woodstove change-out / public education campaigns.
- Multi-stakeholder involvement and shared leadership—governments together with business and industry, communities, and non-governmental organizations.

Throughout all the two phases, ongoing evaluation and monitoring underpins all activities to continually build on success, learn from past experience, and adapt to evolving attitudes, awareness, and activity around residential wood burning.