The
British Columbia
Public Interest
Advocacy Centre
208–1090 West Pender Street
Vancouver, BC V6E 2N7
Tel: (604) 687-3063 Fax: (604) 682-7896
email: bcpiac@bcpiac.com
http://www.bcpiac.com

Sarah Khan 687-4134
James L. Quail 687-3034
Ros Salvador 488-1315
Leigha Worth 687-3044
Barristers & Solicitors

Eugene Kung
Articled Student

File No. 7636

May 27, 2008

Erica Hamilton
Commission Secretary
BC Utilities Commission
Sixth Floor - 900 Howe Street
Vancouver, BC V6Z 2N3

VIA EMAIL

Dear Mesdames/Sirs:

Re: BC Hydro Residential Inclining Block Rate Application

Attached please find a "clean" copy of Attachment 3 to Exhibit C10-2 (BCOAPO IR 1), unobstructed by the "CONFIDENTIAL" watermark.

Yours truly,

BC PUBLIC INTEREST ADVOCACY CENTRE

Jim Quail
Executive Director

JQ:pm
Enclosure

cc: interested parties

P:\MSOFFICE\JIM\7376 BC Hydro Residential Block Rates 2008\IRs\L T Commission with legible Attachment 3 to IR #1 doc

AFFORDABLE ENERGY

DIVERSIFYING DSM PROGRAMS IN BC: A DISCUSSION PAPER

CONTENTS

"The BC Energy Plan will ensure secure, reliable and affordable energy for all British Columbians for years to come."
Premier Gordon Campbell, BC Energy Plan, February 2007

1. EXECUTIVE SUMMARY

'Affordable Energy' can be defined as the ability for families in BC to achieve adequate indoor temperatures and air quality needed to maintain standards of health and comfort, at a reasonable cost. For most families in BC, energy costs typically represent 5% of after tax income. Conversely, families that can not afford to adequately heat their homes are faced with a disproportionate energy burden.

Despite low energy prices, around 18% of homes in BC spend an average of 17% of after tax income on energy bills, over 3 times more than the average family. As a result, these families are often faced with difficult choices between competing basic necessities such as shelter, food and clothing.

This discussion paper sits within the context of the 2007 Energy Plan for British Columbia, with its focus on affordable energy and a recent publication by the BC Progress Board, the Social Condition of British Columbia which highlights that 1 in 10 British Columbians live in low-income for extended periods of time. The paper explores the potential for diversification and development of socially equitable demand side management (DSM) programs as one solution that can make a significant contribution towards addressing the costs of economic and social marginalization experienced by many families in BC. Such programs can create affordable energy for all homes and at the same time, can provide the means to make significant contributions to the Province's Great Goals, the 2010 targets within the Energy Efficient Buildings Strategy and to the delivery of many of policies within the new BC Energy Plan.

Within BC approximately $29 million per year is spent on DSM programs. Historically, programs have been aimed at single family homes and home-owners already in the market for home improvements. Incentives are provided to off-set the incremental costs of upgrading to clean or energy efficient technologies and they assume the consumer is already making some level of investment. Within this market, there is significant chance that energy efficient choices have already been made, enabling the consumer to "free-ride" the incentives. In stark contrast, DSM expenditure on lower income homes is close to zero and many families simply can not afford to invest in home upgrades.

Encouraging the implementation of energy efficiency policies and DSM programs to alleviate the energy burden faced by many families across BC, will amongst other things, lower energy bills, improve the availability of affordable, healthy homes and decrease the risks of homelessness. In addition, this market sector has not traditionally been targeted by DSM, presenting a significant opportunity to generate previously un-tapped and cost effective energy savings.

Although this concept is relatively new to BC, many other jurisdictions in Europe, USA and Canada have invested DSM dollars to alleviate the energy burden and have successful, established programs in place that make affordable energy attainable for all homes. Brief details of these programs are provided in Section 4.

Within BC, recent pilot projects supported by MEMPR under the Opportunities Envelope program in partnership with BC Housing and Non-Profit Housing Associations, have explored the potential to re-dress the balance, by providing incentives specifically designed to help families living in the social housing sector. An overwhelming response has been received and these pilots have become one of the success stories of the Opportunities Envelope program. Further details of the emerging results are provided in section 5. The main purpose of this paper is to raise awareness of this innovative work and to explore the potential to build upon and expand the scope in order that more families can benefit.

Sections 6 and 7 of the paper briefly explain 'the energy burden' and the benefits that energy efficient housing can bring towards the creation of affordable energy for all. A baseline of scale of energy poverty within BC is established, by exploring in detail some typical indicators as follows:

- Expenditure on energy – statistical analysis reveals that around 270,000 homes within BC are likely to be spending 10% or more of their family income on energy. This is the level accepted in many other jurisdictions as a measure of unreasonable energy costs and energy poverty. The installation of cost effective renewable and energy efficient technologies can reduce the energy demand and costs for a home, even in a situation of rising energy prices. Ensuring lower income homes minimise energy use is one path to affordable energy.
- Health – Within the UK, North America and Europe, there is growing recognition that poor quality, inefficient housing conditions can have a negative impact on people's quality of life and health. One extreme impact of poorly insulated, difficult to heat, inefficient homes, when combined with changes in temperatures, is a marked fluctuation in seasonal mortality rates. Excess Winter Mortality (EWM) rates have long been studied in Canada. Cardiovascular diseases, flu and pneumonia have been identified as the main causes of EWM and it is recognised that this phenomena is seasonal, predictable and therefore preventable. The World Health Organisation recommends intervention to improve thermal comfort and reduce energy consumption, as a means of providing affordable energy necessary for families to heat their homes. Approximately 10,000 winter deaths occur in Canada each year; 16% of these are in BC.
- Utility Disconnections - The strong correlation between utility disconnections and homelessness has been proven. Disconnections have been attributed as the second biggest cause of homelessness, behind rent or mortgage default. During 2005 over 50,000 gas and electricity disconnections occurred in BC. Proactive energy efficiency programs targeted at homes experiencing difficulties with affording the costs of energy can help to avoid the need for disconnections in the first place, along with all the associated costs of debt and debt recovery borne by the consumer and the utility companies.

Section 8 presents a scenario in which the Province could realistically set a target to eradicate energy poverty in British Columbia by 2050. A province wide, "Affordable Energy" program to assist the estimated 270,000 homes that are likely to be faced with an energy burden in BC should be established. At a cost of around $6 million per year (only 20% of DSM expenditure in BC), a program could be designed to target 6,000 homes and generate annual energy savings of around 300,000 Giga-joules per year, every year. This initial investment would achieve a cost effectiveness of approximately $18/Gigajoule in the first year, reducing to $2/Gigajoule over the lifetime of the savings and would generate approximately 9,000 person years of employment within BC.

In support of this action, the following policy recommendations are made:

- Clear targets including interim targets and continual measurement of typical indicators;
- Long term target of 2050 target to provide continuity, send the right signal to the industry, encourage investment and in turn sustainability;
- Support funding to ensure that all ratepayers can attain affordable energy and can access the many benefits of DSM;
- Implementation of highly efficient equipment to ensure savings are maximised. This mechanism can also be used to prepare markets for future regulation;
- Professional training, quality assurance and education to raise industry standards and consumer awareness;
- Ease of access through co-ordinated delivery to represent the needs of vulnerable families and
- 'Joined-up' approach to align policies between government departments, particularly in the areas of energy efficiency, health and housing.

Finally, the paper recommends next steps required to advance an Affordable Energy Program in British Columbia.

2. CONTEXT

This discussion paper sits within the context of the 2007 Energy Plan for British Columbia. The new Energy Plan has a clear focus on the provision of affordable energy. Scope is provided to focus on the development of a diversified portfolio of innovative DSM programs to ensure that ratepayers across all income levels can access the benefits of energy efficiency programs and that all cost effective energy saving opportunities are pursued.

The paper also sits within the context of a recent publication by the BC Progress Board [1]which focuses on the social condition of British Columbia. The report highlights that "the most troubling social indicator is the proportion of British Columbians living below Statistic Canada's low income threshold", with one in ten living in low income for extended periods. The report makes recommendations for changes in social policy that can have a positive impact on economic marginalization and the associated collective costs borne by government and society as a whole.

The diversification and development of socially equitable DSM programs is one solution that can address economic and social marginalization and the many associated issues faced by vulnerable households. Aside from the obvious environmental benefits, targeted DSM programs provide a cost effective solution for improvements in quality of life, health and housing and also generate training and quality employment opportunities. For example, a study carried out by the Pembina Institute[2] on behalf of Environment Canada reports that "on average, energy efficiency investments (e.g. building retrofits) create over 35 person years of employment per million dollars invested", between 4 – 5 times more than investments in energy supply.

[1] BC Progress Board, The Social Condition in British Columbia, December 15th 2006.
[2] Pembina Institute, Comparative Analysis of Employment from Air Emission Reduction Measures, January 1997.

In addition, such programs can assist the Province of British Columbia in delivering against the following goals and targets:

Contribution to Great Goals:

- Make BC the best educated – by educating industry and reaching all ratepayers
- Lead the way for healthy living – improved healthy housing conditions and indoor air quality
- Support for vulnerable groups – increasing quality of life and lowering energy costs
- Sustainable environmental management – producing substantial reductions in greenhouse gas emissions and local air pollutants by lowering energy use in the most inefficient homes
- More jobs per capita than rest of Canada – economic growth for trades and industry, energy efficiency one of the most cost effective employment policies in terms of $/job.

Contribution to Energy Efficient Buildings 2010 Targets:

- Reduce energy consumption in 12% of existing single family homes;
- Reduce energy consumption in 16% of existing multi-unit residential homes;
- All new homes to achieve EnerGuide for New Homes rating of 80; and
- All new low rise multi-unit residential homes to achieve 25% better than MNECB.

Contribution to the 2007 Energy Plan Policies:

- Acquire 50 per cent of BC Hydro's incremental resource needs through conservation by 2020;
- Ensure a co-ordinated approach to conservation is actively pursued;
- Pursue cost effective and competitive DSM opportunities across all income levels;
- Increase the participation of local government through the CAEE program;
- Ensure publicly funded buildings achieve the highest standards for GHG emissions reductions to support the goal of a carbon neutral government by 2010;
- Implement energy efficiency standards for buildings by 2010;
- Implement a pilot program for energy performance labelling of homes; and
- Establishing the Innovative Clean Energy Fund to support the development of clean energy and energy efficiency technologies.

3. BACKGROUND

Historically in BC, residential DSM has consisted of financial incentive based and educational programs aimed at encouraging customers to reduce energy demand in the home. Residential DSM programs are largely funded by utility companies. The Ministry of Energy, Mines and Petroleum Resources (MEMPR) is currently supporting these activities with limited short term funding, approximately 50% of an $11 million contribution agreement with the Federal Opportunities Envelope. In addition, the Provincial Government provides considerable DSM dollars in the form of PST exemptions on energy efficient products. During 2005, the Federal government EnerGuide for Houses (EGH) program was active in BC but was discontinued in May 2006. The estimated total DSM expenditure in BC for 2005 and 2006 is $27.2 million and $29.5 million respectively. A breakdown of DSM dollars by each main funding source is provided in the Table 1.

	Residential DSM Expenditure	
Funding Source	**2005**	**2006**
BC Hydro	$5,581	$5,581
Terasen Gas	$1,688	$3,334
Fortis BC	$3,307	$2,286
Pacific Northern Gas	$25	$25
Provincial PST Exemptions	$9,150	$9,150
MEMPR OE Funding	$1,600	$5,260
EnerGuide for Houses	$5,823	$3,907
Total	**$27,174**	**$29,543**

Table 1: Data Source - Opportunities Envelope Budgets: **Dollar amounts in $000's**

A proportion of the DSM dollars available in BC are passed on to consumers through rate increases. For customers who are able to take part in programs, this additional cost can be more than offset by the benefits that improved energy efficiency can bring. However, for many customers, participation in energy efficiency upgrades is beyond their means as the upfront capital required to invest is not available. Some of the opposition to DSM programs comes from organisations, such as PIAC, that represent the interests of lower income families who may be excluded from participation due to affordability issues, yet they incur the cost of DSM through their energy bills.

To illustrate this point, it is fair to say that DSM dollars in BC are largely targeted at homeowners who may already be upgrading their homes or developers building new homes and usually take the form of rebates that represent a small fraction of the total cost of the upgrade or build. As residential homeowners and builders invest capital to improve the standards of homes, DSM incentives encourage the purchase of energy efficient products and offset the incremental costs of doing so.

In stark contrast, DSM expenditure targeted at other housing sectors, such as social, rented or First Nations housing is close to zero. Notable exceptions are pilot programs currently supported by MEMPR; the Energy Savings Plan low income program ($800k) and a BC Housing program (approx. $150K). These programs are discussed in more detail in Section 5. The Federal government's EnerGuide for Low Income Homes (EGLIH) would have provided vulnerable homes in BC access to $39.8 million towards the direct costs of energy efficiency improvements over a 5 year period. However, the program was discontinued in May 2006 and very few families have benefited. Details of the limited activity that has been carried out under the EGLIH program during 2006 is also provided in Section 5.

In terms of the traditional home-owner audience for DSM programs, a number of research papers and academic studies emerging within BC and Canada have explored the potential challenges in reducing overall energy demand. A recent publication by the Pembina Institute and Pollution Probe[3], reports that despite the strong presence of DSM programs in British Columbia, per capita demand for electricity has remained fairly stable for the last 15 years and overall energy consumption has actually increased at a steady rate of 1.5% per annum. The report focuses on the significant potential for increased, up-tapped DSM activity as identified in the Conservation Potential Reviews of BC Hydro, with an economic potential of 12,000 GWh/year by 2015 and of Terasen Gas, with an economic potential of just over 10,000 GWh/year by 2015. Amongst many

[3] Pollution Probe & Pembina Institute, Maximising Energy Efficiency and Renewable Energy in BC, October 2006

recommendations for realising this potential, the report calls for a particular focus on lower income homes.

Additional studies[4] have identified unpredictable human behaviour as one of the main challenges faced by DSM programs in effectively reducing energy demand. In measuring potential energy savings, it has been suggested that methodologies have not necessarily considered the true impact of free-rider and rebound factors, resulting in over-estimated success compared to the reality of the market place.

The term 'free-rider' refers to customers who have independently made the purchasing decision to improve the energy efficiency of home. They subsequently receive DSM incentives for equipment they would have purchased anyway. The incentives do not impact changes in decision making or bring about market transformation and the net effect is status quo.

The term 'rebound' refers to customers who experience a net increase in energy use following an energy efficient upgrade. In reality, studies suggest the average person is likely to spend a large proportion of the money they save reducing energy bills consuming more energy, either through increased comfort or the purchase of more energy consuming products and appliances with newly realised disposable income.

A good example of the rebound impact is our addiction to appliances and gadgets and the relatively new phenomenon of 'stand-by power'. A report by the International Energy Agency[5] states that the impact of appliances drawing stand-by power is large, representing a whopping 10% of total electricity used in most homes. A typical European, Japanese, Australian, or North American home contains upwards of twenty appliances constantly drawing stand-by power. These include all devices with remote controls, illuminated digital displays and many new larger appliances, such as washing machines and air conditioners.

So, are there ways we can address these issues through different approaches to traditional DSM programs? In tackling this question, this paper focuses on the results of recent pilot projects and explores the opportunity to shift some DSM activity towards previously un-tapped housing stock. In lower income homes, both free-rider and rebound factors are immediately minimised due to one major barrier, affordability.

According to Natural Resources Canada[6], many lower-income households live in substandard housing with aging energy-consuming equipment. Data reveals that the lowest Canadian income quintile has a far greater proportion of households that are rented, older homes, with electric water heating and with substandard windows and insulation in walls, crawl spaces and attics. In addition, these homes are more likely to have electric space heating and principal heating equipment of which 76 percent is more than 10 years old. In summary, there is great potential to save energy and make energy cost more affordable.

---

[4] Mark Jaccard, Sustainable Fossil Fuels, Cambridge University Press 2005;
Mark Jaccard, Nic Rivers, Christopher Bataille et al, Burning Our Money to Warm the Planet, CD Howe Institute, May 2006

[5] Things that go Blip in the Night: Stand-by Power and How to Limit it; IEA, 2001.

[6] DSM Working Group paper prepared by NRCan, Energy Efficiency Programs for Low Income Households, July 2005.

However, with the notable exceptions of social landlords such as BC Housing, many lower income homes simply can not afford to invest in the capital costs of energy efficient equipment to improve this picture. The reality is that without assistance, little action will be taken to reduce energy demand; hence the probability of a free-rider is very small.

In addition, vulnerable homes are faced with many difficult demands and pressures on limited family finances. The need to spend money on energy competes with other basic life essentials such as food and shelter. Any 'spare' disposable income achieved through energy efficient upgrades is less likely to be spent on the purchase of new energy consuming goods than in the average home; hence the probability of a rebound effect is also reduced.

A recent study of 420 households in Kitchener, Ontario[7] illustrates this point. Participants were provided with a simple, low cost evaluation and energy plan for their homes. The study arrived at similar conclusions:

> *"The conservers (30% of households) had higher initial energy consumption levels and achieved two-thirds of the potential savings identified by the energy evaluation. Consumers (12% of households) had higher ownership rates of high-efficiency furnaces and water heaters and demonstrated the rebound effect of increased demand for energy services following the evaluation. Low-income groups were the most likely to behave as conservers (42%) while high-income groups were the least likely to be conservers (13%) and the most likely to be consumers."*

These points alone suggest it is worth focusing at least a proportion of the DSM incentive dollars available in BC towards lower income housing sectors, to tap into cost effective energy savings and to provide affordable energy for all.

There are additional factors to consider such as the long term climate of increasing residential energy costs, which will only serve to aggravate the energy burden experienced by many. In addition, more immediate issues at the top of political, social and economic agendas in BC, relate specifically to the diminishing availability of affordable housing and increased risk of homelessness faced by many people. In considering these broader issues, the case for DSM to provide real solutions to the many issues faced by vulnerable families, becomes even more compelling.

The remainder of this paper explores the potential for energy efficiency programs targeted at lower income homes in BC. In doing so the paper aims to answer the following questions:

- What is an energy burden and how is it addressed?
- What is BC doing?
- How can we measure energy poverty? – some typical indicators
- What is the potential for action in BC?
- What are the benefits of addressing the energy burden?
- Recommended policy actions?
- What next?

[7] Parker, Rowlands, Scott, Comparing Residential Energy Conservers and Consumers? University of Waterloo, April 2005

4. WHAT IS THE ENERGY BURDEN?

A recent study by the Public Interest Advocacy Centre[8] (PIAC) argues that all Canadians need to participate in DSM activities to avoid facing the economic burden created through excess energy use. In doing so, the report recognises that "not all Canadians may have the ability to reduce household energy consumption because of barriers to participation. These barriers may include the inability to finance changes to heating equipment or household features that would reduce energy bills."

The term 'affordable energy' means that families can achieve the indoor temperatures needed to maintain health and comfort at a reasonable cost. Conversely, the term "energy poverty" is used to describe families that can not afford to keep their homes warm at an acceptable cost. A disproportionate energy burden is experienced compared to the average home and families are often faced with difficult decisions over competing essentials such as shelter, food and clothing. The World Health Organisation recommends adequate thermal temperatures for healthy living of 21oC in the living areas and 18oC in the rest of the home and states the importance of "reducing the dependence of adequate thermal comfort on financial resources in order to avoid indoor temperature-related health effects."[9]

There are three main causal factors that create an energy burden on a family; the energy efficiency of the home, energy costs of the home and the family income. Low energy prices can help vulnerable homes, but when combined with lower income and poor standards of energy efficiency, the essential need to provide energy and fuel for family well-being becomes a burden and energy poverty is often is inevitable. Even small changes in any one of these three factors can have dramatic effects on a family's ability to maintain the most basic standards of health and comfort in the home. Poor energy performance of homes results in higher than average energy consumption. Consequently, the costs of energy to maintain adequate indoor temperature starts to represent an unreasonable amount of the family income. Added to this, the living patterns and day-to-day needs of vulnerable families can often be very different. For example more time spent in the home or larger families place increased demands on energy systems which can in turn intensify the energy burden.

For the purposes of the UK Fuel Poverty Strategy[10], the generally accepted definition of a household faced with an unreasonable energy burden is one that needs to spend 10% or more of after tax income on meeting the energy needs of their home. Average expenditure on residential energy costs for the majority of people is between 3 - 4% of after tax income. Approximately 20% of the UK population are faced with an energy burden on their family at any one time, depending upon the movement of any one of the three energy burden factors described above. Industry experts have estimated[11] that in England alone, just a 1% increase in energy rates places an additional 30,000 homes into energy poverty.

---

[8] PIAC, Letting Everyone Help, Removing Barriers to Consumer Participation, February 2006.
[9] World Health Organisation; http://www.euro.who.int/eprise/main/WHO/Progs/HOH/Activities/20041013_6#Thermal
[10] Fuel Poverty in England, The Government's Action Plan, DEFRA Publications, November 2004.
[11] Andrew Warren, A Windfall to Eradicate Fuel Poverty, December 2004.

Energy poverty has received public attention in the UK for many years and substantial energy efficiency programs are in place to help provide assistance. The UK Government's target to eradicate fuel poverty in England by 2010 is delivered through the Warm Front program with a budget of approx. $630 million/year. Warm Front covers the costs of common sense energy efficient measures such as insulation, draft-proofing, high efficiency heating and lighting. Improvements are reinforced with energy advice, tailored to the specific needs of each participant. To complement this, the utility regulator, the Office of Gas and Electricity Markets (OFGEM), oversees the Energy Efficiency Commitment (EEC) program with a budget of approx. $700 million/year. Under this program, funded via a levy on consumer energy bills, OFGEM requires of utilities that 55% of expenditures on DSM be directed towards vulnerable homes. To achieve cost effective energy savings, many utilities integrate with the Government delivery infrastructure. Costs are reduced and energy efficiency opportunities for vulnerable homes are maximised. Under this regime, the energy performance of over 5 million homes has been improved since 1990.

In the United States, the Weatherization Assistance Program (WAP) has improved the energy efficiency of over 5.5 million vulnerable homes over the past three decades. In addition, the Low Income Home Energy Assistance Program (LIHEAP) provides assistance with fuel bills and energy efficient upgrades. According to LIHEAP[12], in 2003 the average US household spent 6% of income on energy costs compared to 14% for all low income households and 19% for LIHEAP recipients, an energy burden three times greater than the average home. Also in the US, many state driven initiatives are coming to the forefront. For example, the California Solar Initiative will create 3,000 megawatts of new, solar produced electricity by 2017 with $3 billon US dollars of funding collected through utility distribution rates. An allocation of 10% of program funds will be directed towards solar installations in lower income and affordable housing.

In Ontario, the Low Income Energy Network (LIEN) has used the word 'energy poverty' to describe families who spend a disproportionate amount of income on energy costs. A report by the Canadian Housing and Renewal Association[13] notes that one in five homes in Ontario spends an average of 12% of their pre-tax income on utilities compared to most homes with utility costs at 4%. The Ontario Conservation Bureau's Low-Income and Social Housing conservation and demand management programs (LI-CDM) are province-wide energy conservation initiatives directed at lower income households. Their goal is to reduce electricity consumption in this sector by 100 megawatts (MW), the amount used by about 33,000 homes. Programs target 750,000 homes across the province including social housing, privately rented, owned and First Nations lower income homes.

In November 2006, the Department of Families and Community Services in the province of New Brunswick partnered with Energy Efficiency New Brunswick to initiate a $5.3 million, province wide energy efficiency program aimed at lower income families. The program provides no cost energy audits and non refundable grants of up to $4,500 for basic energy efficiency measures. New Brunswick has recently been provided with $34 million in funding from the Canada ecoTrust for Clean Air and Climate Change, a proportion of which will be used to expand and enhance energy efficiency programs for low income homes.

---

[12] LIHEAP Home Energy Notebook for FY 2003.
[13] CHRA, Affordable and Efficient, February 2005.

Also in November 2006, Manitoba announced their program to unite job training, environmental leadership and reduced energy bills in the Centennial neighbourhood, one of Winnipeg's lowest income areas. The project is a partnership between the Ministry of Science, Technology, Energy and Mines, Manitoba Hydro, United Way and Building Urban Industries for Local Development (BUILD). Local residents from within the community are trained to carry out the work and Manitoba Hydro is providing the energy efficiency materials for the program. They give recognition to the fact that participation in their Power Smart programs is low in areas of rental and lower income housing. Manitoba will receive $53.8 million as part of the new Canada ecoTrust for Clean Air and Climate Change, a proportion of which will be used to expand their low income program into more communities to re-dress this imbalance.

There are many examples of successful programs in other jurisdictions. Avoiding the need to go into further detail here, the PIAC report[14] provides in-depth and detailed descriptions of the wealth of policies and programs within Canada, the UK and the US, that have demonstrated success in overcoming barriers by providing adequate support to ensure that ***all*** homes have the opportunity to access the benefits of DSM programs.

5. HOW IS IT BEING ADDRESSED IN BC?

As mentioned in section 3, a number of pilot projects aimed at addressing the energy burden in rented housing, are supported by MEMPR with Opportunities Envelope funding currently available through a partnership agreement with Natural Resources Canada. This section will focus on the progress and achievements of these projects to date, plus the achievements of the EnerGuide for Low Income Families program which was discontinued in May 2006.

5.1 Energy Savings Plan - Low Income Component.

The Energy Savings Plan (ESP) pilot project commenced activity in April 2006 and will be completed by March 2007 or before if available funding is fully utilized. Designed to make participation easy, the ESP provides a 'first-shop' window for consumers to take action to reduce their energy demand. One element of the program provides incentives specifically designed for social landlords and lower income families living in rented housing.

The incentive dollars allocated to this element of the ESP pilot were originally intended to complement and enhance the federal government's EGLIH program by providing additional dollars to maximise the potential for energy efficient improvements in participating homes. However, the discontinuation of this program in May 2006, forced a rethink in the scope of the project. In order to maximise the potential of the pilot with limited funding available, the decision was taken to focus upon multi-unit residential buildings (MURB) and rooming houses in rented housing sectors.

The main driver behind this decision is that rented housing sectors and MURB buildings in particular, are un-tapped in terms of energy efficiency improvements. The potential to achieve high energy savings makes this type of low-rise building low hanging fruit in terms of cost effective DSM programs. The focus on MURBs also meant a greater number of individual

[14] Ibid, footnote 6.

families could be assisted with the limited funding available. Another factor that effected the decision to focus on this housing sector was the ability to market the program through a partnership approach. Working closely with various social housing providers has provided ease of access to a greater number of buildings with limited marketing expenditure.

In order to include as many buildings as possible within the program, incentive dollars were limited to $20/GJ of energy saved up, to a maximum of $23,000 per building. One of the main goals of the program is to partner with existing social housing providers that may already have capital improvement programs in place. The incentive dollars are used to cover the costs of energy efficiency audits and to offset the incremental costs of installing energy efficient equipment during the upgrade of a building. The total budget available to the program was $800,000.

The pilot enjoyed an overwhelmingly successful response. A total of 60 buildings registered, representing over 8 different social housing providers, including organisations such as BC Housing, BC Non Profit Housing Association, Habitat for Humanity and the Victoria Women's Transition Housing Society. Of the 60 buildings registered, 34 have received full energy evaluations including estimated savings and estimated incentive levels. These 34 buildings are shown in Table 2.

PARTNER ORGANISATIONS	No of Buildings	GJ Savings	Incentive Value	Cost Effectiveness $/GJ saved
BC Housing Buildings	13	19,444	$300,000	$15.43
Greater Vancouver Housing Corp	1	660	$11,917	$18.06
BC Non Profit Housing Association Members	14	4,460	$69,917	$15.68
Co-operative Housing Federation of BC	6	13,889	$25,000	$1.80
Grand Total	**34**	**38,453**	**$406,834**	$10.58

Table 2 Data Source Energy Savings Plan 2006

As shown, the pilot is reporting extremely cost effective energy savings in its progress so far, with a total of $406,834 allocated, representing an estimated annual energy savings of over 38,000 Gigajoules or $10.58 per Gigajoule saved. A detailed picture of the total capital expenditure, value of incentives, types of measures, the potential and actual achievements for each project within this pilot will emerge after March 31st 2007, when all work has been completed.

Throughout the initial stages of the program, the need for a complementary energy education, awareness and advice program has been repeatedly identified, not only for tenants, but for social housing providers, especially facilities and building maintenance staff. In all participating buildings, there are significant behavioural change opportunities that need to be realised and reinforced through a basic level, but comprehensive educational program.

Should this pilot project prove successful, as early indicators are showing, there is significant potential to roll out a comprehensive program within rented housing sectors of BC. In order to realize this, financial support would be needed to assist social and private landlords with energy efficient evaluations, upgrades and education.

5.2 BC Housing

BC Housing is a provincial crown agency under the Ministry of Forests and Range and Minister Responsible for Housing. The organisation provides subsidized housing to serve the needs of lower income and vulnerable families across the province, with a housing portfolio including 8,000 directly managed units and approximately 33,000 managed by Non-Profit Housing (NPH) Associations.

Energy costs for the directly managed portfolio are in the region of $5m / year. BC Housing also subsidises the NPH portfolio with a contribution of approx. $30m / year towards operating costs, which include energy. In addition, BC Housing provides a 'heating-subsidy' of approximately $3.5m / year for an estimated 6,500 tenants who have metered homes and pay their fuel bills directly.

In the summer of 2004, BC Housing embarked on a pilot program with the initiation of a number of feasibility studies to test the potential for energy efficiency improvements throughout their housing portfolio. A small number of buildings were selected for inclusion in the feasibility studies and have subsequently moved to the implementation stages of energy efficiency upgrades. These buildings are included in the Energy Savings Plan pilot detailed in section 5.1.

In addition to the feasibility phase described above and included in the Energy Savings Plan pilot, a number of additional initiatives have been implemented and are supported under an Agreement with MEMPR as follows:

- A dedicated Energy Manager was appointed in January 2005, with specific responsibility for improving the energy efficiency of BC Housing's directly managed and non-profit sector managed portfolios. A co-op student has now also been appointed to assist the Energy Manager with energy retrofit feasibility studies and with assessing energy efficient equipment options. Included in this work is benchmarking the energy performance of 8000 units of directly managed housing and 33,000 units of non-profit housing.
- An engineering consultant has developed a revised set of prescriptive standards for all new homes to achieve or exceed the energy performance target of 25% less than the Model National Energy Code for Buildings (MNECB) or an EnerGuide for New Home rating of 80. Design and construction standards have been modified to incorporate a simplified method for verifying performance to MNECB minus 25% using the new CBIP MURB wizard.
- In addition, 10 recently completed Independent Living BC (ILBC) projects have been 3 to determine the level of energy performance achieved under the new standard. Revised "ILBC Design and Construction Standards" for new assisted living apartment buildings under Phase 2 of the ILBC initiative have now been completed and are being rolled out to BC Housing technical and field staff.
- The construction of three group home buildings, in Chilliwack (12 homes), Langley (25 homes) and Victoria (5 homes) with an EnerGuide for New Homes energy performance rating of 80 have now been completed. These homes have been through the final testing and verification of energy savings stages, so more detailed results will emerge over the coming weeks.

- Finally, recent analysis and modelling of the new Woodlands Assisted Living & Community Health Centre in New Westminster has demonstrated that the building will achieve 34% better than MNECB and a 26% energy cost savings compared to standard MNECB.

BC Housing has reported that the MEMPR support and partnership in this project has had a significant impact on their ability to implementation energy efficiency measures into the BC Housing Portfolio. The pilot programs have saved an estimated $750,000 in energy costs for an investment of approximately $700,000. The position of Energy Manager will now be sustained full time within the organisation, which has enabled the production of a 5-year sustainability policy and action plan for all units, including educational programs for tenants. The Purchasing Department within BC Housing is also fully engaged in the program and has committed to the purchase of Energy Star standards when replacing equipment such as fridges and washing machines. In addition, a ban on incandescent lighting is to be implemented. In order to realize this, further support is likely to be needed to assist with incremental costs associated with achieving the new energy efficient standards in all homes.

5.3 EnerGuide for Low Income Homes (EGLIH)

Although the EGLIH program was discontinued in May 2006, applications made to the program before that date are being honoured. In total, 248 homes within BC have received an EGLIH evaluation of their home to identify the potential for energy savings. As shown in the Table 3, initial evaluations have revealed the potential to increase energy performance by an average of 15 points per home on the EGLIH rating scale. This equates to average savings of 63 Gigajoules and 3.5 tonnes of Co2 per year.

POTENTIAL EGLIH ENERGY SAVINGS BY YEAR BUILT - BRITISH COLUMBIA								
	No of Houses	Avg A Rating	Potential B Rating	Rating Increase	Avg Energy Consumption (GJ / House)	Avg Energy Saving (GJ / House)	Avg Co2 Reduction (t/yr/house)	Co2 Reduction All Houses (t/yr)
Pre 1945	23	54	74	20	188	87	4.7	108
1945 - 1959	45	57	74	17	180	76	4.5	202
1960 - 1969	44	64	76	11	145	50	2.6	113
1970 - 1979	131	63	76	13	149	58	3.3	433
1980 - 1989	5	65	79	14	148	63	3.2	16
TOTAL	**248**	**61**	**76**	**15**	**157**	**63**	**3.5**	**872**

Table 3: Data Source NRCan EGLIH Program 2006

The potential energy savings shown align very closely with the EnerGuide for Houses Program which completed just over 40,000 evaluations in homes across BC. This could largely be related to the fact that the participating homes in both programs are single family homes and relatively similar in profile.

Of the 248 participating homes, 136 have installed energy efficient equipment and have completed a second evaluation of their home to measure the improvements in energy performance. The actual results achieved in the 136 homes showed an average rating increase of 7 points equating to average energy savings of 30 Gigajoules per year and Co2 reductions of 1.7 tonnes per year.

Only 60% of the potential energy savings were realised in participating homes, largely due to the grant limit of $3,500 for each home. Had the program been maintained, there would have been

significant opportunity for other funding providers, such as utility companies, to integrate with the EGLIH delivery infrastructure and maximise the energy savings potential within each home.

6. TYPICAL INDICATORS OF THE ENERGY BURDEN IN BC

The following section looks at how energy poverty can be measured by exploring in detail some typical indicators, including general levels of expenditure on energy as a proportion of household after tax income, health and utility debt. The indicators have been applied to data available from Statistics Canada to establish the scale of energy poverty in British Columbia.

6.1 Expenditure on energy and energy prices

If the generally accepted energy expenditure patterns that place an energy burden on a home outlined in section 4 are applied to homes in British Columbia, data from Statistics Canada[15] reveals that as many as 18% of families could be faced with an disproportionate energy burden.

British Columbia data on major payments as a % of household income are represented graphically in Figure 4 below. As household expenditure on basic essential reaches 40% and above, the graph shows that the number of applicable homes starts to increase against the general trend, in both rented (orange line) and homeowner (blue line) sectors. According to the data, approximately 31% of tenants spend more than 40% of their household income on major payments[16], whilst 12% of homeowners find themselves in the same situation. These figures represent the potential number of families faced with a disproportionate energy burden and represent approximately 150,000 rented homes and 120,000 owner-occupied homes, which equates to 18% or almost one in five of all homes in British Columbia. Data for the whole of Canada reveals a similar picture with approximately 15% of all Canadian families potentially living in fuel poverty.

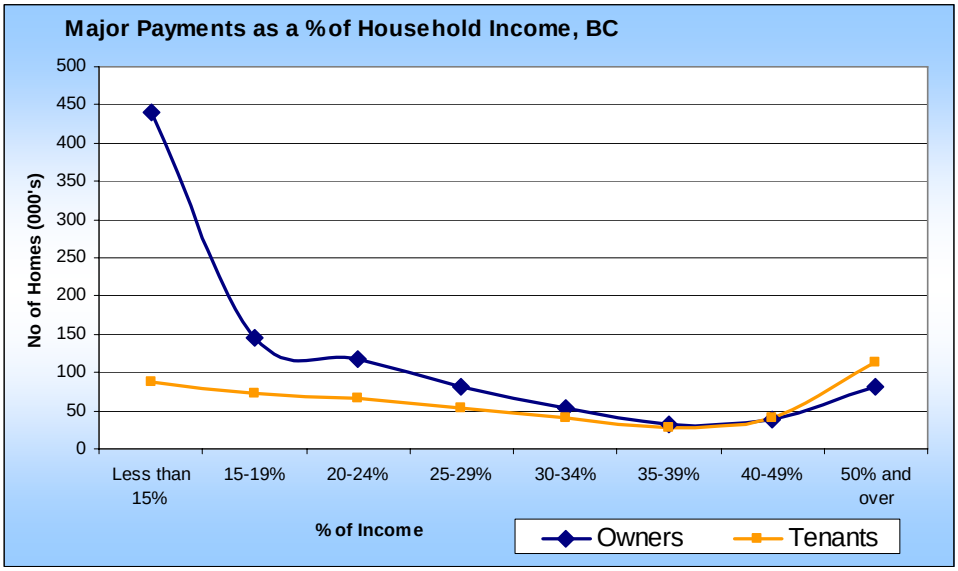

Figure 4: Data Source -Stats Canada: Major Payments as a % of Household Income

15 Stats Canada 2002 data: Major Payments as a % of Household income: include payments for electricity, oil, gas, wood or other fuels, water and other municipal services, monthly mortgage payments, property taxes and rental fees.
[16] Major Payments: include payments for electricity, oil, gas, wood or other fuels, water and other municipal services, monthly rental and mortgage payments, property taxes, and condo fees.

These figures provide a high level indication of the number of households that are struggling to cover the costs of basic necessities required to achieve a credible standard of living. A more detailed focus on two of the causal factors of an energy burden, as described in section 4, namely expenditure on energy and income, presents a clearer picture of the scale of energy poverty in British Columbia.

Table 5 provides an analysis of average expenditure on energy as a proportion of average after-tax income, by the 5 income quintiles for BC. If the UK definition of energy poverty, spending 10% or more of after-tax income on energy, is applied to BC the data reveals that most of the lowest income quintile within BC is faced with an unreasonable energy burden. In this group, an average of 17.6% of income is needed to cover the costs of electricity, gas and other fuels, which is almost 6.5 times more than the highest income quintile, where average energy costs represents only 2.7% of after-tax income. The figure for the lowest quintile is 3.5 times more than all homes in BC where average energy costs represent about 5% of after-tax income.

The lowest quintile in BC fairs slightly better than the whole of Canada, which could reflect the lower hydro cost in the province. However, the gap between the lowest and highest quintiles is greater in BC than in the whole of Canada. The analysis for the whole of Canada reveals average spend on energy is over 20% of after-tax income for the lowest quintile, almost 6 times higher than the highest quintile and 3 times more than all homes in Canada.

	BRITISH COLUMBIA AVERAGE					
INCOME QUINTILE	Income After Tax	Electricity	Gas	Other Fuel	Energy Bill	% of Disposable Income
All	$53,342	$894	$1,366	$427	$2,687	5.04%
Lowest	**$14,064**	**$652**	**$1,208**	**$617**	**$2,477**	**17.61%**
2nd	$30,839	$763	$1,274	$507	$2,544	8.25%
3rd	$48,126	$875	$1,225	$485	$2,585	5.37%
4th	$67,833	$1,015	$1,333	$338	$2,686	3.96%
Highest	$110,540	$1,101	$1,596	$327	$3,024	2.74%

	CANADA AVERAGE					
INCOME QUINTILE	Income After Tax	Electricity	Gas	Other Fuel	Energy Bill	% of Disposable Income
All	$53,326	$1,285	$1,509	$749	$3,543	6.64%
Lowest	**$15,476**	**$942**	**$1,250**	**$962**	**$3,154**	**20.38%**
2nd	$30,661	$1,128	$1,396	$857	$3,381	11.03%
3rd	$46,315	$1,292	$1,403	$795	$3,490	7.54%
4th	$65,513	$1,362	$1,507	$648	$3,517	5.37%
Highest	$113,446	$1,594	$1,709	$646	$3,949	3.48%

Table 5 Average energy costs as a % of after-tax income in BC and Canada.
Source: Stats Canada Survey of Household Spending, custom tabulation

The average expenditure on energy for the 2nd quintile is 8% in British Columbia and 11% in Canada. This suggests that a significant proportion of families in this group are also faced by a disproportionate energy burden.

Median data for BC shows that typical energy costs in the lowest quintile are $2,122 per year, or 14% of after-tax income for typical families in this group. A conservative estimate of 60% to represent 'typical families', indicates that around 195,000 families in this group are living in energy poverty. For the 2nd income quintile, median energy costs are $2,135 or 7% of after-tax income. It is reasonable to assume that approximately 30% of this group, or 97,000 families, could be spending 10% or more of their income on energy. This correlates closely with the data relating to major payments as a % of income, shown in Table 4 which indicates that approximately 270,000 homes are struggling with major payments.

Table 6 reveals some interesting information about the typical characteristics of each income quintile in BC. In the lowest quintile, 88% of homes have no full-time earner, 44% of the group are over 65 and 63% are living in rented property. This type of information should be taken into account when considering audiences that could benefit from a targeted energy efficiency program.

Of the estimated 195,000 households in the lowest quintile and 97,000 families in the 2nd quintiles that are likely to be living in energy poverty, it follows from the household characteristics, that approximately 160,000 are within the rented housing sector and 128,000 are home owners.

	HOUSE HOLD CHARACTERISTICS			
INCOME QUINTILE	No Full Time Earner	Over 65	Home Owner	Avg Persons per Home
All	38%	20%	69%	2.51
Lowest	88%	44%	37%	1.45
2nd	55%	30%	58%	2.11
3rd	28%	15%	70%	2.56
4th	14%	8%	85%	2.99
Highest	7%	4%	94%	3.41

Table 6 Household Characteristics by Income Quintile for British Columbia.

Statistics Canada's Low Income Cut-off (LICO) measurements identify families that are substantially worse off than the average family when it comes to paying for basic necessities such as food and shelter.

Analysis in the discussion paper to this point has estimated approximately 270,000 families (18%) in BC could be living in energy poverty. This compares to an analysis carried out in 2003 by Stats Canada which identified 16% (258,000) of BC families are below the LICO's[17]. This seems to indicate that there could be families above LICO's that are living in energy poverty. In order to explore this further, Table 7 applies the average energy bill across all homes in BC ($2,687) to each of the Stats Canada after-tax LICO groups to establish the potential energy burden in each group.

As can be seen, homes across all communities with a family size of up to 3 persons are experiencing an energy burden in their home. The most extreme cases of energy poverty appear to be experienced by LICO groups in small communities and rural areas with the least extreme

[17] Applied Research Branch, HRDC; Understanding the 2000 Low Income Statistics; May 2003

cases experienced by very larger families living in urban areas. The fact that the energy burden is so high for single and 2 person households, ranging between 13 – 24%, indicates that there could be many families with income just above the LICO thresholds who are also experiencing a disproportionate energy burden.

	Community Size				
Family Size	> 500,000	100,000 - 499,999	30,000 - 99,999	< 30,000	Rural Areas
1	$17,219	$14,562	$14,380	$12,890	$11,264
2	$20,956	$17,723	$17,502	$15,690	$13,709
3	$26,095	$22,069	$21,794	$19,535	$17,071
4	$32,556	$27,532	$27,190	$24,373	$21,296
5	$37,071	$31,351	$30,962	$27,754	$24,251
6	$41,113	$34,769	$34,338	$30,780	$26,895
7+	$45,155	$38,187	$37,713	$33,806	$29,539

	Average BC Energy Costs			**$2,687**	
1	16%	18%	19%	21%	24%
2	13%	15%	15%	17%	20%
3	10%	12%	12%	14%	16%
4	8%	10%	10%	11%	13%
5	7%	9%	9%	10%	11%
6	7%	8%	8%	9%	10%
7	6%	7%	7%	8%	9%

Table 7 Average BC Energy Costs as a % of Stats Canadas After Tax Low Income Cut-Offs

It is worth noting that Statistics Canada has repeatedly emphasised that LICO's are not representative of the poverty line in Canada, as no official definition of poverty exists. In the same vein, although there is a strong correlation, energy poverty does not necessarily equate to low income, as is shown by the bottom left hand portion of Table 7. A combination of factors is responsible for placing a family into energy poverty, including the energy efficiency of the home and fuel prices. However, LICO's are an interesting measurement as they are broken down into family size and community size, which could prove to be a useful tool in helping to identify the homes in BC that are most vulnerable to an energy burden.

6.2 Health

Within the UK, North America and Europe, there is growing recognition that poor quality, inefficient housing conditions can have a negative impact on people's quality of life and health. In particular, older people, families with children and people with a disability or suffering from long term illness are most vulnerable to temperature related illnesses, such as influenza and cardiovascular risks such as heart disease and strokes. Many of these illnesses are seasonal, predictable and therefore preventable. Housing intervention to improve standards of living conditions is one solution that can help to minimise risk for the most vulnerable families.

As shown in Table 8, produced by the West Midlands Public Health Observatory in the UK, even relatively minor reductions of in-door temperatures can cause dramatic, negative impacts on a person's comfort and health with the most common effects being strokes and heart attacks.

TEMP	EFFECT
> 28° C	Deaths through heat stress increase
24° C	Top of range for comfort
21° C	Recommended living room temperature
< 20° C	Mortality rate increases below 20°C
18° C	Recommended temperature for rooms other than living room
16° C	Resistance to respiratory disease falls
12° C	> 2 hours at 12°C increases blood presure and cardiovascular risk
5° C	Significant risk of hypothermia.

Table 8: Temperature effects on comfort and health[18]

One extreme impact of poorly insulated, difficult to heat, inefficient homes, when combined with decreasing temperatures, is a marked fluctuation in seasonal mortality rates. Whilst not one of the coldest countries in Europe, the UK has one of the largest Excess Winter Mortality (EWM) rates, with approx. 30,000 deaths each year, representing approx. 0.04% of the population.

Consequently, the UK has pioneered research into the EWM phenomenon. Studies have demonstrated a credible chain of causation between excess winter deaths and older homes with poor energy efficiency ratings and low indoor temperatures. For example, a recent study carried out by researchers from the London School of Hygiene and Tropical Medicine[19] concluded that greater investment in home insulation and greater help with heating costs could help to prevent thousands of unnecessary winter deaths each year.

Dr Paul Wilkinson, who led the research team, reports that "taken as a whole, the results suggest a chain of causation that links older, poorly insulated, poorly heated housing and poverty to low indoor temperatures and cold-related deaths. Hence, it is likely that substantial health benefits could be achieved by measures aimed at improving the thermal efficiency of homes and the affordability of heating them."

Another study focused on 25,000 residents in the London Borough of Newham to explore the relationship between EWM and energy poverty. Results indicated “supporting evidence of a relationship between energy inefficient housing and winter respiratory disease among older people, with public health implications for increasing health-driven energy efficiency housing interventions.”[20]

UK Government has for many years recognised energy poverty as a major cause of EWM and other health related problems. Families who can not afford to heat their homes properly and who are living in cold, damp, thermally inefficiency housing have been identified as those at greatest risk and grant funded energy efficiency programs targeted towards such groups have long been viewed as a solution for many health related problems.

The positive impact of these programs has been evident with annual winter death rates falling by about one third, as program funding for energy efficiency programs increased dramatically from 2000.[21] Industry experts[22] [23] have recently noted that spiralling energy prices are threatening to

[18] West Midlands Public Health Observatory; Fuel Poverty and Older People
[19] Joseph Rowntree Foundation, The impact of Housing Conditions on Excess Winter Deaths, 2001
[20] Janet Rudge and Robert Gilchrist, Journal of Public Health, EWM among older people at risk of cold homes, 2005
[21] UK Government National Statistics, Health, Excess Winter Mortality Rates 1996 – 2006, www.statistics.gov.uk.
[22] Ibid, footnote 11; National Energy Action, Work to reduce fuel poverty undone by rising energy prices, Jan 2005.

reverse achievements to date, estimating that every 1% increase in energy rates places an additional 30,000 families into fuel poverty. In response, the UK Government continues to step up and increase the availability of funding for energy efficiency, with the most recent announcement in December 2006 of "an extension to the Warm Front program, targeting 300,000 of the most vulnerable pensioner and other households, community by community"[24].

The issue of EWM and the positive impact of energy efficient housing on improved health, has recently received greater attention on a global scale. Notably, the World Health Organisation (WHO) is currently collecting data from countries across Central and Eastern Europe with similar climates to the UK. As well as the causal link between temperature and mortality, WHO notes that "seasonal variations are related to indoor rather than outdoor temperature and that this annual variation could be reduced by helping residents to protect themselves from cold weather conditions."[25]

The initial review for the WHO research[26] concluded that "without housing interventions, the number of excess winter deaths will increase, as will the number of individuals suffering adverse effects on health caused by low indoor temperatures. Housing interventions are suitable means to

1. Reduce excess winter deaths, and provide better health generally.
2. Reduce the demands made on health services.
3. Reduce the contribution to climate change from domestic energy use."

One of the main recommendations made is that action should "be directed at improving the energy efficiency of the existing housing stock, particularly of older housing which will be the most energy inefficient. This could involve improving and making more efficient the heating system as well as the ventilation options, improving the thermal insulation of the dwelling, or (ideally) both."

The first results from the WHO research state "it is clear adequate housing standards with functional ventilation and heating systems and with efficient thermal insulation protecting the dwelling from both cold and heat, represent one prevention measure to reduce the impact of temperature events on mortality".

Similarly, the results from a study in New Zealand on the effects of improved energy efficiency on health were recently published. The study focused on the installation of basic retrofit measures into over 1,300 homes in 6 low income communities and concludes that "insulating existing houses led to a significantly warmer, drier indoor environment and resulted in improved self rated health, self reported wheezing, days off school and work, and visits to general practitioners as well as a trend for fewer hospital admissions for respiratory conditions"[27]. In addition the editorial for the research notes "Heating and energy efficiency measures can improve the indoor environment and also alleviate fuel poverty (when a household spends more

---

[23] OFGEM, Rising Prices Threaten Progress on Tackling Fuel Poverty, June 2005.
[24] HM Treasury, Pre-Budget Report, Investing in Britain's Potential, December 2006
[25] WHO, http://www.euro.who.int/Housing/Activities
[26] WHO, Housing, Energy and Thermal Comfort, 2007.
27 The Effect of insulating existing houses on health inequality, He Kainga Oranga Housing and Health Research Program of the University of Otago, Wellington, New Zealand, 2007.

than 10% of its income on fuel). The combination of greater warmth and reduced household expenditure may be a key mechanism through which health effects occur."[28]

To turn the focus of the discussion to Canada and more specifically British Columbia, its worth noting that very little research exists in the area of energy efficiency and the effects on health. A high level analysis of data from Statistics Canada was carried out to establish if an EWM rate exists. Figure 9 below shows the latest data available, for 2003 and reveals the same pattern as other counties, with higher deaths in the winter months than the summer averages.

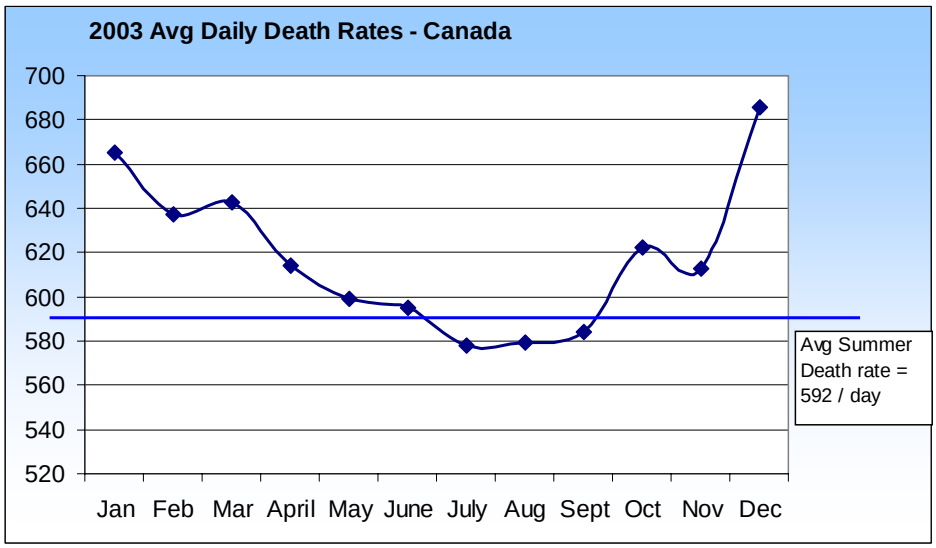

Figure 9: Data source: Stats Canada – Monthly Death Rates 2003

The dark blue line in graph above represents the average number of people per day who died in Canada during 2003. Almost 10,000 excess deaths occurred during the winter months over and above the average monthly death rate during the summer months (light blue line). The figures represent an average increase in deaths of 10% during the winter months and when isolated, December alone witnessed a 17% increase above the summer average. The excess seasonal mortality in Canada represents 0.03% of the population, which despite colder climates, is slightly lower than the UK.

An article by Richard Trudeau from a 1997 Statistics Canada Health Report[29], reports a detailed analysis of mortality statistics from the Canadian Vital Statistics Database and in particular notes with curiosity that "some seasons of the year bring more deaths than do others, and deaths attributable to a number of specific causes tend to follow a [predictable] yearly cycle." In particular, Trudeau notes that EWM in Canada has long been observed and that it is related to variations in temperature and the fact that people spend more time indoors during the winter. He reports that the major causes are pneumonia, flu and cardiovascular diseases: "During the 1974 to 1994 period, the average daily number of deaths from cardiovascular diseases was usually highest in January and lowest in August. The seasonal peaks were about 13% above the average daily number, and the seasonal troughs, 10% below it."

[28] Housing and Health, Editorial, MJ Ref 2007;334:434-435 (3 March), doi:10.1136/bmj.39133.558380.BE.
[29] Mortality and Daily Patterns of Death, Richard Trudeau, Stats Canada Health Reports, Summer 1997, Vol 9 #1.

Whilst there is no specific reference to healthy, energy efficient housing as a potential solution, Trudeau does focus on the fact that the phenomenon of EWD is predictable in terms of both timing and causes and concludes that "preventive health and safety measures may be able to reduce the toll."

The EWD data from British Columbia reveals similar patterns. The actual numbers for 2003 seem low, with approximately 1,600 excess seasonal deaths during the winter months. However, this represents 16% of all excess seasonal deaths in Canada and 0.04% of the population in BC, which is the same as the UK in relative terms. The data for BC revealed an average increase of 12% during the winter months and December 2003 alone witnessed an increase of 24% above the summer average. In all cases, the EWM rate in BC is higher than the rest of Canada.

The BC data for each December from 1991 to 2003 as shown in Figure 10 reveals a steady increase in seasonal mortality. Most notably, in recent years the gap between mortality rates in December (the blue line) compared to the summer average (the red line) has also grown wider.

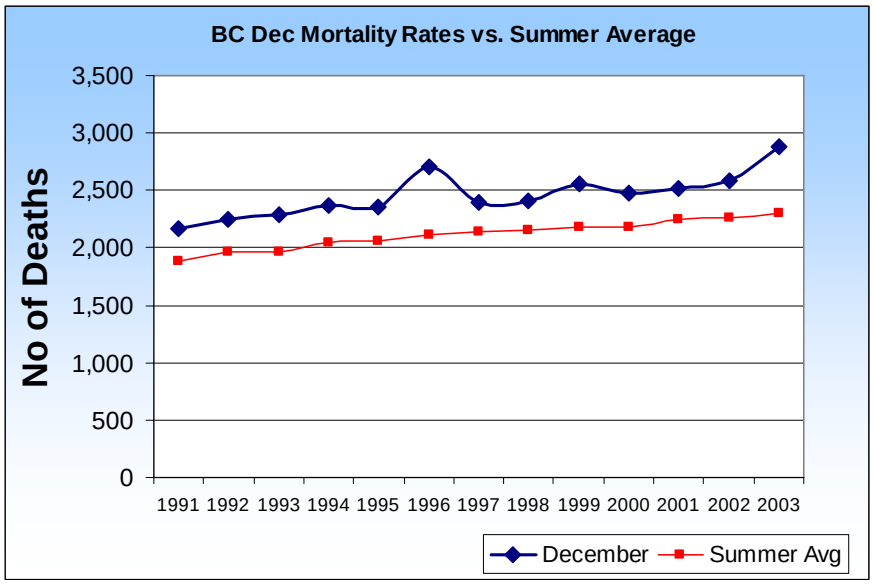

Figure 10: Data source: Stats Canada Monthly Death Rates 1991 - 2003

One of the reasons behind BC's disproportionately high numbers could relate to increasing levels of homelessness within the province. However, levels of homelessness are inherently connected back to energy poverty issues as demonstrated in the next section which explores another indicator of energy poverty, that of utility debt and disconnections.

6.3 Utility Debt

The strong correlation between utility disconnections and homelessness has been proven. A study by the National Consumer Law Centre (NCLC) in the US reveals that utility disconnections were among the primary causes of homelessness,[30] and concludes that "DSM programs contribute to the prevention of homelessness and housing abandonment by enhancing

[30] Howatt and Openhiem, Low Income Benefits in Determining Cost Effectiveness of Energy Efficiency Programs, National Consumer Law Centre, 1999.

energy service affordability and by reducing the number of service terminations that lead to loss of residency." The study sites a number of surveys carried out in the US that have focused in this issue including:

- Survey by The Energy Coordinating Agency of Philadelphia which revealed that 32 percent of electric disconnection cases and 24 percent of gas disconnection cases led to homelessness within one year; and
- A survey of homelessness in Northern Kentucky indicated that utility shutoffs were among the primary causes of homelessness in that region

There is also widely available evidence to show that targeted DSM programs can have a positive impact on utility company's costs for bad debt, debt collection and other costs associated with termination and reconnection, administration, regulatory responses and complaint resolution. For example, a report from the North West Energy Coalition[31] provides details of the impacts of a $2m (US) low income energy efficiency program implemented by the Eugene Water and Electric Board (EWEB) in Oregon. An audit of the program revealed that every dollar spent on low-income – from home weatherization to bill-paying assistance – returned $1.48 to the utility by reducing customer debt.

In light of this information, it is useful to look further at utility disconnections within British Columbia. Research with the help of representatives within BC Hydro and Terasen Gas revealed the following information for each utility company.

6.3.1 BC Hydro

In the fiscal year 2005, a total of 17,630 BC Hydro services were disconnected for non-payment or non-signing for service. Of these it is estimated that 80% (14,104 homes) were for non payment by residential customers[32]. BC Hydro's estimated residential debt for the past 4 years is as follows:

- 2002 - $4.0M
- 2003 - $5.2M
- 2004 - $5.3M
- 2005 - $3.7M

On top of the residential debt shown, consumers are subject to a late payment charge of 1.5%. There are also reconnection charges ranging from $64 to $127. Assuming the lower end of the reconnection scale and that all 14,104 homes will reconnect, the total estimation of consumer debt for 2005 alone is in the region of $4.7M

In Fiscal 2005 BC Hydro's business costs for disconnection and reconnection services was estimated at $3.0M. This included direct fees paid to BC Hydro's outsource collection agency ABSU, costs incurred by BC Hydro field staff and overhead loadings. Of this it is estimated that 80% ($2.4M) related to residential customers.

[31] Low Income Assistance Pays Off for EWEB, North West Energy Coalition Report, Dec 2003.
[32] Source: BC Hydro

Following collection efforts by ABSU, if the debt remains uncollected the accounts are referred to collection agencies who continue collection action for up to 6 years.

6.3.2 Terasen Gas

In fiscal year 2005, a total of 32,000 of Terasen Gas services were disconnected due to non-payment. Of these it is estimated that 90% (28,800) are residential[33]. The estimated residential debt of Terasen Gas for the past 3 years associated with disconnections is as follows:

- 2003 - $5.7M – 45,000 residential
- 2004 - $4.9M – 36,000 residential
- 2005 - $3.3M – 28,800 residential
- 2006 - $4.5M (forecast) – estimated 35,000

On top of this debt, customers must pay a reconnection fee once the debt has been paid off, plus a refundable security deposit, the value of both is unknown at this time.

Terasen Gas out sources the debt recovery to a collection agency who receive between 25 and 30% of the debt they recover. The majority of these business costs are recovered through the reconnection fees.

Energy Efficiency programs aimed at residential customers before the point of disconnection, when combined with agreements to pay down debt with the resulting energy savings, can reverse these trends by reducing the overall energy burden to the consumer and the costs of bad debt and debt recovery to the utility. At the same time, more affordable and healthy homes are placed into the housing stock and less people are at risk of homelessness, ill health or worse.

The NCLC study[34] shows that the non-energy, non-environmental benefits realized by utility companies that invest in energy efficiency programs targeted at vulnerable customers are quite substantial. Benefits include lower utility costs for accounts collection, emergency services, debt collection and reconnections. The study estimates that these benefits alone should equal approximately 50% of the program costs for the utility.

7. THE BENEFITS OF ENERGY EFFICIENCY PROGRAMS

The substantial social and economic benefits of a targeted DSM program for rented housing sectors have been well documented. Some examples are listed below:

- Lower heating bills, increased disposable income; the reduction of energy costs through the provision of basic energy efficiency measures increases the amount of income available for other needs such as food and shelter.
- Income generated from energy savings is more likely to be directed back into the local economy vs ‘rebound’ expenditure on more energy consuming goods.
- Improved quality of life, health and comfort within the home; energy efficiency can help maintain minimum temperature levels identified by WHO as a requirement for healthy living arrangements.

[33] Source: Terasen Gas
[34] Ibid footnote 30.

- Reduced debt and disconnection costs and reduced risk of homelessness; utility disconnections are the second largest cause of homelessness, behind eviction due to unpaid rent.
- Increased affordable housing; the reduction of energy costs through the provision of basic energy efficiency measures helps to improve housing affordability.
- Reduced public expenditures in the areas of healthcare, public safety, housing, homelessness and social services.
- Increased property values; Landlords in particular will benefit from improving the value of a building and will also reduce the risk of default on rent and reduce tenant turnover rates.
- Reduced utility costs related to bad payments and disconnections.
- Greatly reduced free-rider issues; low income housing has not previously been targeted by DSM programs which potentially means greater un-tapped energy savings and more cost effective programs.
- Job creation and increased stability and investment within the industry; and
- Greater energy savings, cost effectiveness and shorter payback periods.

The NCLC[35] paper provides a comprehensive and detailed evaluation the benefits that energy efficiency programs aimed at lower income homes can bring. In particular, the report sites benefits to utilities and energy systems and also focuses on non-energy, societal benefits such as economic development, relief for public spending in areas such as health, housing, social services and public safety, as well as the immediate benefits for participating households. The report concludes that "an adder of more than triple avoided costs can be justified for all low-income DSM programs - more for technology-specific measures such as gas-related, space-heating measures, and new construction."

8. PROGRAM POTENTIAL IN BC

This section presents a potential scenario for a province wide energy efficiency program aimed at lower income housing sectors and attempts to quantify the costs and energy related benefits only. This high level analysis does not take into account any external, non-energy benefits such as reduced expenditure in other areas, specifically public health care costs and utility debt along with reduced costs of consumer debt.

The estimated 260,000 homes in BC identified in section 5, that are likely to be facing a disproportionate energy burden, are assumed to be the recipient audience for a targeted DSM program. To service these families by 2050, approximately 6000 homes per year would need assistance. If these activity levels were sustained, the Province could realistically set a policy target to eradicate energy poverty in BC by the year 2050.

Using intelligence gathered from the NRCan's EnerGuide for Houses activity within BC to date, Table 11 provides an indication of what this scenario might look like in terms of annual and lifetime energy savings for the province. The life time saving assumes an average of 8 years for each renovated home and applies a 20% discount to take into account the net present value of the savings and to incorporate a minimal free-rider estimate.

[35] Ibid footnote 30.

	Low Income 2050 Target				EGH AVG ENERGY Stats			
	All BC Homes	Rented Homes	Home Owners	Annual Target	Used (GJ / House / Year)	Saved (GJ / House/year)	Total Saved (GJ/yr)	Total Life Time
1945 or before	135,990	14,755	10,607	**590**	248	124	73,137	468,079
1946-1960	179,310	19,455	13,986	**778**	198	84	65,327	418,094
1961-1970	222,170	24,105	17,329	**964**	198	78	75,161	481,028
1971-1980	355,125	38,531	27,700	**1,540**	193	72	110,898	709,748
1981-1985	150,240	16,301	11,719	**652**	185	60	39,097	250,223
1986-1990	152,735	16,572	11,913	**662**	185	60	39,747	254,378
1991-1995	195,605	21,223	15,257	**848**	170	38	32,238	206,326
TOTAL	1,391,175	150,942	108,512	**6,034**			324,523	2,787,876

Table 11: Potential un-tapped energy savings from lower income housing sector
Avg energy savings based upon NRCan data - 40,000 BC homes in the EGH Program to date.

A program designed to target 6,000 homes per year would generate annual energy savings of over 300,000 Giga-joules per year, every year.

In terms of costs to implement such a program, it is useful to provide a benchmark. In both the UK and the US programs, the cost of an energy efficient upgrade for a family living in energy poverty, is on average $3,000 Canadian equivalent per home. In comparison, the EGLIH program limited grant funding to $3,500 per home. The average cost of energy efficient upgrade for participants in the EGH program was in the region of $5,000 per single family home with NRCan incentives providing on average $750 contribution towards this cost. It seems reasonable to assume a funding level of $3,500 would be required to provide a comprehensive program targets at providing basic measures to low income homes.

As BC's pilot programs described in section 5 are completed, a fuller understanding of the average total costs and average incentive costs per home will emerge. In the meantime, using the benchmark figures as indicators, a conservative contribution incentive of **$1,000 per home**, a budget of **$6m** per year would be needed to provide assistance to **6000 homes per year.** This represents approximately 20% of the annual DSM dollars currently available within BC.

In order to fully realise the estimated potential of the energy savings, it is assumed that this incentive figure will represent a 30% contribution towards the total costs of the work ($3,500), with the remaining capital costs contributed by a combination of the new Federal ecoTrust renovation program (details still to be released), utility companies and social housing providers as part of their business as usual building improvement programs.

As shown in Figure 11, a program of this nature could potentially result in annual energy savings in the region of just over 300,000 Gigajoules every year with a budget of approximately $6m / year. This initial investment would achieve a cost effectiveness of approximately $18/Gigajoule in the first year, reducing to $2/Gigajoule over the lifetime of the savings. This level of annual funding up to 2050 would generate approximately 8,600 person years of employment within BC.

9. RECOMMENDED POLICY ACTIONS

This paper explores the potential to re-think traditional approaches to DSM programs within British Columbia. There is a wealth of evidence from many other jurisdictions within Canada, the UK, the US and other areas, to demonstrate the need to address the energy burden faced families, with targeted DSM programs to ensure customers across all income levels can benefit.

Support policies can play a major role in transforming markets and in the context of this paper it is appropriate to recommend that political support is provided to homes in BC that are faced with an energy burden and that can least afford to change. An estimated 18% of homes in BC fall into this category. Activity on this scale can help to create enough critical mass for the industry to self sustain. It is recommended that policies and strategies to address the energy burden in British Columbia contain the following:

- Clear Targets: This paper has presented a realistic scenario in which energy poverty could be eradicated in British Columbia by 2050. This high level target need to be accompanied by a comprehensive set of interim targets and requires continual measurement of indicators such as those outlined in section 6.
- Longer term continuity: Long term policies sends the right signals to major players in the market such as designers, manufacturers, suppliers, installers and contractors and they set the scene for investment and sustained market transformation. Traditional short term 'stop-start' approaches do not create confidence in the market, discourage investment and hinder market development.
- Support funding: Approximately $29 million dollars are invested into DSM programs in BC each year. Single family homes and home owners who may already be investing in home improvements are the main targets of DSM programs in BC. In this market, there is potentially high free-rider and rebound issues which calls into question the true cost-effectiveness of the investments. A proportion of funding should be directed towards a previously un-tapped market to support families who can not afford to make investments to improve their homes.
- Improved standards and regulations: Guidelines and best practice measures should be selected for any program aimed at lower income homes, to ensure high standards of work and value for money. Such investment means that programs can demand compliance and be used to prepare the market for change in advance of regulation.
- Professional training and education: Training and education should be an integral part of an affordable energy program, aimed at both industry and individual homes to encourage increased standards, awareness and levels of participation.
- Ease of access: DSM programs are complex affair, even for those within the industry. They are fragmented, time-consuming, tend to be technical in nature and are rarely designed from the customer's perspective. To ensure maximum participation and cost effective delivery a single, co-ordinated approach should be established to represent vulnerable families and their interests, to ease the process, to educate and to provide outreach to lower income networks.
- Joined-up approach: To ensure maximum impact of a province wide Affordable Energy Program, it will be critical to align energy efficiency actions with the policies, goals and aims of other government departments, in particular housing and health.

In addition to these recommendations, it is critical to recognise that an affordable energy program targeted towards lower income homes can play a significant role in delivering against many of the policies outlined in the new Energy Plan, as follows:

- Acquire 50 per cent of BC Hydro's incremental resource needs through conservation by 2020: This target represents 10,000 GWh of currently forecast needs that must be met through DSM programs. A targeted program aimed at the 18% of households faced by an energy burden in BC would exceed this target.
- Ensure a co-ordinated approach to conservation is actively pursued: With incentive funding to contribute towards the cost of implementing basic energy efficiency measures in lower income homes, the Province could take a leadership role to leverage Federal Government and Utilities support to ensure a streamlined, co-ordinated approach to this market sector.
- Pursue cost effective and competitive DSM opportunities across all income levels: A targeted program will ensure that all rate payers are included and have the opportunity to participate in DSM programs. This innovative, new approach minimises free-riders ensuring that every dollar spent is creating maximum energy savings. In addition, a co-ordinated approach will help to reduce delivery costs and increase the cost effectiveness of the program. Section 9 shows initial estimates of approximately $18/GJ saved.
- Increase the participation of local government through the CAEE program: Many CAEE participants have expressed an interest in improving housing and affordability for lower income families within their communities. CAEE participants can play a huge role in promoting programs of this nature at the community level.
- Ensure publicly funded buildings achieve the highest standards for GHG emissions reductions to support the goal of a carbon neutral government by 2010: BC Housing represents a portfolio of over 40,000 homes for lower income families across the province. The BC Housing portfolio presents an ideal opportunity for the Province to take a leadership role in the area of low income housing. In addition, reduced operating costs could be used to assist other lower income homes in the province.
- Implement energy efficiency standards for buildings by 2010: The energy market has often been sighted as one of the most obvious market failures in terms of traditional economic rules of supply and demand. Investing in a long term program for lower income homes will provide the Province with an avenue to actively transform market and engage industry infrastructure to achieve improved energy efficiency standards. Such a program can demand high standards of equipment in exchange for industry participation, enabling the industry to actively engage in a relatively risk-free, long term environment.
- Implement a pilot program for energy performance labelling of homes: Through investment in the lower income housing sector, the Province can actively invest in an energy performance labelling program that will reach 18% of existing homes in BC. This will encourage increased energy performance for the housing sectors most in need of assistance and improvement.
- Establishing the Innovative Clean Energy Fund: A proportion of the funding available could be directed towards lower income homes in British Columbia to facilitate the implementation of an innovative affordable energy program including energy efficiency and clean energy technologies such as solar hot water.

10. NEXT STEPS.

The current pilot projects supported by MEMPR have been one of the major success stories of the Opportunities Envelope Program. There is every reason to actively encourage and support policy makers, utility companies, associations and industry stakeholders to learn more about the achievements to date and to explore the potential to build upon the scope of this important work to ensure that the benefits can be fully realized within British Columbia.

The following list identifies some simple steps in order to move this work forward over the next 6 months:

1. Detailed review of pilot achievements to date;
2. Engagement and co-ordination of other Government departments;
3. Utility engagement to examine the pilot results data and apply standard cost effectiveness tests (TRC, RIM, etc);
4. Design and develop expanded pilot programs beyond March 2007;
5. Identification of existing affordable housing capital expenditure programs;
6. Explore potential for government and regulator intervention to set targets for utility companies;
7. Assess potential for funding support from other government areas;
8. Stakeholder engagement and consultation process through organised forums. Effective DSM programs for lower income families will involve many stakeholders, all with varying interests and contributions to make in addressing the issues. An initial list of potential stakeholders is provided below:
    - Natural Resources Canada
    - Utility Companies and Regulator
    - Ministry of Energy, Mines and Petroleum Resources
    - Ministry responsible for Housing (Housing Policy Branch)
    - Ministry of Health
    - Ministry of Children and Families
    - Ministry of Aboriginal Relations and Reconciliation
    - Ministry of Employment and Income Assistance
    - Ministry of Environment
    - Ministry of Community Services
    - Human Resources Development Canada
    - CMHC
    - Municipalities and Regional District Councils
    - Social Housing Providers, Private Landlords and Non-Profit Agencies
    - British Columbia Public Interest Advisory Committee
    - Industry Associations, Non Profit Organisations and the Private Sector.

"By building on the strong successes of Energy Plan 2002,
this energy plan will provide secure, affordable energy for British Columbia"
Honourable Richard Neufeld, BC Energy Plan 2007