Please note that in order to better reflect the intent of actions implemented in some measures, the following changes have been made to Appendix B of the Commercial/Institutional Options Report.

- For measures C7, C8, AE1 and AE9, the first bullet under Indoor and Ambient Quality in the Health Impact category has been removed and replaced by "Reduced exposure to indoor air contaminants (VOCs particulates, etc.) due to improved ventilation in buildings - leading to decreased incidence of eye irritation, headaches, fatigue, respiratory diseases, and cancer".

- In all measures, the word "Potentially" has been added to the word "Increased" for all negative impacts listed under the Environment and Health Impact categories .

- Furthermore, these negative impacts have been marked by an asterisk leading to this note: "When this measure is properly implemented, potential negative impacts will be marginal or eliminated".

Buildings Issue Table
Commercial/Institutional Sector Options Report

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LIST OF ACRONYMS

ACH	Air changes per hour
AMG	Analysis and Modelling Group
BAU	Business as Usual
CMHC	Canadian Mortgage and Housing Corporation
COP	Coefficient of Performance
DHW	Domestic Hot Water
EE Products	Energy Efficient Products
ESCO	Energy Services Company
GHG	Greenhouse Gas
GST	Goods and Services Tax
HST	Harmonized Tax
HVAC	Heating, Ventilating and Air Conditioning
IRC	Institute for Research in Construction
LCC	Lifecycle costs
MNECB	Model National Energy Code for Buildings
MNECH	Model National Energy Code for Houses
NRCan	Natural Resources Canada
OTC	Outdoor Temperature Control
PST	Provincial Sales Tax
PV	Photovoltaic
PWGSC	Public Works Government Services Canada

PART 1: EXECUTIVE SUMMARY

i. Introduction

The Buildings Table was created to develop, analyse and propose options to reduce GHG emissions associated with commercial, institutional and residential buildings. The Commercial/Institutional Buildings Sector was separated from the Residential Sector for ease of analysis and is the focus of this report.

The Commercial/Institutional Buildings Table achieved its objective through a series of meetings and studies that included:

- The preparation of a Foundation Paper dealing with the physical characteristics of the sector, the decision making processes, the barriers that inhibit adoption of energy efficiency and measures to overcome such barriers.
- Preparing a list of specific technological, behavioural or performance Actions that will reduce green house gas emissions.
- Estimating the GHG emission reduction potential and associated costs of a wide range of Actions.
- Preparing a list of Measures, which are programs or policies that achieve one or more of the Actions.
- Estimating the "stand-alone" GHG emission reduction and cost impact of each of the Measures
- Preparing two Options Packages of Measures - The Comprehensive Package and The Targeted Package.
- Determining the "integrated" GHG emission reduction and cost impact of the two packages of Measures.

ii Results of the Options Package Analysis

The GHG emission reduction impacts of the two Options Packages were estimated to be the following:

	2010 Emissions megatonnes	**2010 Emissions Compared to 1990 in percentage**
Business-As-Usual Scenario	60.7	+16.7
Comprehensive Options Package	47.8	-8%
Targeted Options Package	49.3	-5%
Kyoto Target	48.9	-6%

The **Targeted Options Package** contains 10 of the Measures selected on the following basis:

- Low public expenditure
- High GHG emission reduction
- Positive cash flow
- Capacity building
- Ease of implementation

The Table expressed the following concerns with the Targeted Options Package:

- The Targeted Package has a short term GHG emission reduction perspective and is weak in capacity building for the longer term;
- The Targeted Package leaves gaps in coverage. Omitting AE-7, for example, eliminates an opportunity for the federal government to demonstrate leadership;
- Some of the programs omitted by the Targeted Package are already in place and achieving the desired results.

Attempts were made to improve the Targeted Package by adding Measures that don't qualify under the selection criteria but which could have beneficial impact beyond 2010. However, the additions soon approached the total list of 19 Measures.

As the result, the Commercial/Institutional Buildings Table recommends the **Comprehensive Options Package** which contains all 19 of the Measures. This Package was preferred for the following reasons:

- The Comprehensive Package has the potential to achieve -8% reductions in GHG emissions which exceeds the Kyoto target of -6%.
- The Comprehensive Options package covers all areas of concern expressed by the Table - new and existing buildings, appliances and renewable energy sources.
- The Table believes that a mix of Measures including those that inform/persuade, codes and standards, incentives and demonstrations are the most effective way to achieve GHG reductions before and after 2010.
- The Table has high confidence that the Comprehensive Package can achieve its projected GHG reduction goal.

The Buildings Table is aware that the effectiveness of many of the Measures is based on assumptions concerning program design and implementation and therefore offers the following caveat to its recommendation of the Comprehensive Options Package:

- The Table recognized that the 19 Measures bundled into the Comprehensive Options Package will strain the capacity of governments and industry to design and implement the programs required in the short time frame.
- There is also the need to achieve intergovernmental agreement on issues that have been problems in the past such as implementation of a Model National Energy Code for Buildings.

However, the Table feels that these concerns are surmountable if there is sufficient commitment and resolve on the part of stakeholders.

iii Observations Concerning the Results

The stand-alone analysis found that 16 out of 19 Measures produce net savings. This means that the present value of energy savings from Actions stimulated by the Measure is greater than the present value of the capital costs of these Actions. In business, a positive net present value is the measure of an attractive capital investment so why is there not more investment in energy efficiency by the private sector? The answer goes back to the barriers of awareness, confidence, split responsibility, payback expectations, etc, referenced in section 6 of the Options Report. These are the barriers that the Comprehensive Options Package is intended to address.

The saving (cost) per tonne is an indication of the cost effectiveness of each stand-alone Measure. It is not wise to draw conclusions from the stand-alone impacts of Measures but there is overwhelming evidence that the most cost effective Measure is AE-9 - Window Market Transformation Program (see Figure 4.1).

The data sheets for the two Options Packages (see Appendix D) indicate that the greatest opportunities for GHG reductions occur in schools, strip malls and large office buildings mainly in Ontario and Quebec.

It is noteworthy that the Residential Options Packages have an average cost per tonne of GHG reduction of $30. compared to an average savings per tonne of GHG reduction of $7. for the Commercial Comprehensive Options Package. This indicates that the residential sector is further ahead in energy efficiency than the commercial/institutional sector and it costs more to squeeze out additional GHG reductions. It also indicates that the greatest return on investment will be achieved in the commercial/institutional sector.

In accordance with the guidelines from the Climate Change Secretariat's Analysis and Modelling Group (AMG), the analysis of Measures assumed natural gas as the marginal fuel. Additional analysis was conducted with regional fuel mix (eg. hydro as displaced fuel in Nfld., Quebec and Manitoba) and it was found that, in the commercial/institutional sector, the GHG emission reductions with a regional generation mix average less than 5% below those based on natural gas. Thus, there is little difference in basing the analysis of the impact of the Measures on natural gas generation of marginal electricity

iv Follow-up Work

The following are areas for further development or study arising from the work of the Commercial/Institutional Buildings Table:

- Program design and implementation of the Measures contained in the Comprehensive Options Package will be an area of significant further work if the impacts of the Measures are to be realized.

- Commercial floor space, which is the current activity indicator, is established utilizing a number of unrelated studies and assumptions. There currently is little or no data available to link the energy requirements of the different types and the activity measured by the floor space. It is recommended that a study be established to establish the correlation between the activity in the sector and the energy requirement of the different building types, different fuel types and end-use intensities.

- Federal government leadership is essential in GHG reduction and there is a need to study public programs underway in other jurisdictions for effective leadership examples. For example, US government agencies only purchase Energy Star Equipment.

- There is a need to further clarify linkages between the Measures proposed by the Buildings Table and those proposed by other Tables, for example, liaison may be needed with the Industry Table to clarify Measures they may want to use for buildings within their mandate.

- Embodied energy in construction materials was not considered by the Buildings Table but this is a GHG emission issue that needs to be addressed.

- The Buildings Table sought expert advice on certain Measures that require an understanding of the tax and financial environment building owners currently operate under. A study[1] was commissioned to review whether existing financial structures, leasing arrangements and methods of taxation lend themselves to investment in energy improvements in the commercial/institutional sector or whether they create barriers. The recommendations included in the study have not been specifically endorsed by Buildings Table members. Nonetheless, the Table believes the findings and recommendations constitute a valuable resource for use at a later stage for facilitating the detailed design of Measures that are presented in broad terms in this Options Report.

v. Conclusions

The Issue Table for the Commercial/Institutional Buildings Sector has effectively completed its assigned task. The Comprehensive Options Package of Measures recommended by the Table will result in Green House Gas emission reductions in 2010 that exceed the Kyoto

[1]Report dated August 24, 1999 by Hamilton, Thomas & Associates Ltd. titled: *"Financial Structures, Leasing Arrangements and Taxation as They Affect Energy Efficiency Improvements Within the Commercial/Institutional Sector".*

target of -6% below 1990. This Package also provides for reductions beyond 2010 by including a mix of Measures that address the barriers to adoption of energy efficiency in the Commercial/Institutional Sector.

Part II: OVERVIEW OF THE TABLE'S WORK

1. INTRODUCTION

In December 1997, Canada and more than 150 countries negotiated the Kyoto Protocol, which sets greenhouse gas (GHG) reduction targets for the post-2000 period. If ratified, the Protocol will commit Canada to reduce emissions of GHG to 6% below 1990 levels by the years 2008 to 2012.

Following the Kyoto Conference, a national process was established to examine the impact, cost and benefits of Canada's commitment under the Kyoto Protocol. A meeting of federal, provincial and territorial Energy and Environment Ministers in April 1998, agreed on the creation of fifteen Issue Tables to support the development of a national implementation strategy. The Tables provide expert and detailed input concerning GHG reduction options that will form part of the National Climate Change Strategy to address the Kyoto commitment.

The Buildings Table was created to develop, analyse and propose options to reduce GHG emissions associated with commercial, institutional and residential buildings. The Table provided a venue for stakeholder input and dialogue. Members were drawn from a wide range of backgrounds and expertise including government, not-for-profit and the private sector. The members of the Table are listed in Appendix E.

The Buildings Issue Table achieved its mandate through a series of meetings and research projects leading to Options Reports for the Commercial/Institutional and Residential Sectors. Liaison was also established with other Tables where linkages in mandates exist in order to avoid duplication of work.

Background information on the Commercial/Institutional Sector used in PART III of this report was obtained from the foundation paper on the sector prepared by Applied Research Consultants and Green House Gas emission projections prepared by Natural Resources Canada.

The Buildings Table sought expert advice on certain Measure that require an understanding of the tax and financial environment building owners currently operate under. A study was commissioned to review whether existing financial structures, leasing arrangements and methods of taxation lend themselves to investment in energy improvements in the commercial/institutional sector or whether they create barriers.

It was decided early in the project to include Multi-Use Residential (MUR) buildings in the same category as Commercial/Institution buildings since there are close structural and equipment similarities. The Residential Sector Options Report deals with new and existing low-rise residential buildings.[2]

[2]Prepared by Marbek Resource Consultants in association with Sheltair Scientific and SAR Engineering

2. ANALYTICAL APPROACH

2.1 Overview

Consistent with the approach taken by other Tables, the Buildings Table followed a multi-step work plan to achieve its objectives.

- Two Foundation Papers (residential and commercial/institutional) were prepared to investigate existing stock, energy sources and use characteristics and trends.

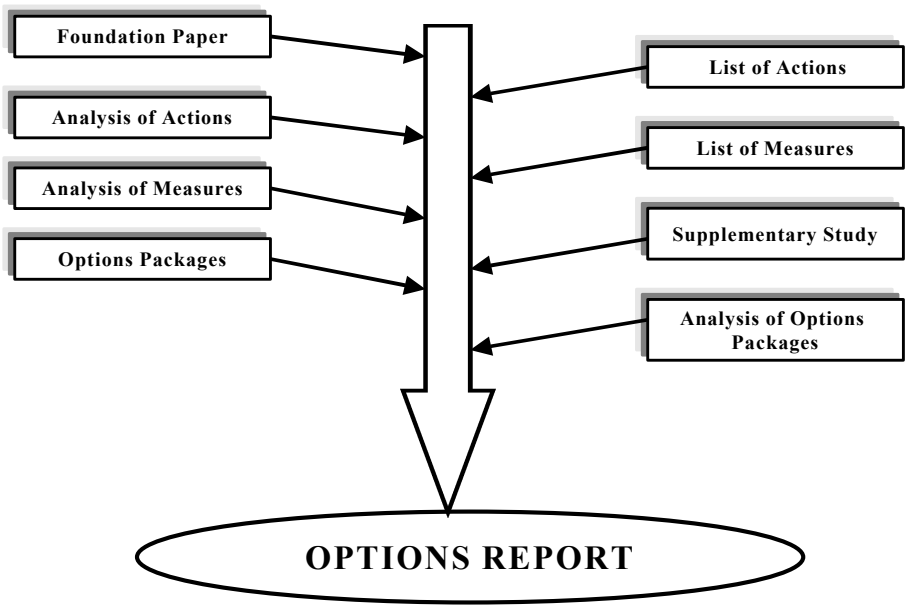
- Contact was established with other Tables where linkages in mandates exist in order to avoid duplication.

- Research was conducted into the tax and financial environment faced by building owners

- An Options Report was developed through a process that included:

  < modelling of 24 stand-alone Actions to provide the Commercial/Institutional Sector of the Buildings Table with a foundation from which GHG emissions reduction Measures could be developed.
  < modelling of 19 integrated Measures to assess their costs, benefits and impacts.
  < modelling of two integrated options packages to assess their costs, benefits and impacts . All three modelling exercises were carried out by Marbek Resource Consultants in association with Sheltair Scientific and SAR Engineering

Work Plan - Commercial/Institutional Sector Table



The Foundation Paper was prepared during the Fall of 1998 to provide the Buildings Table members with the information base they needed to develop and analyse options to address reductions in green house gas emissions in the commercial/institutional sector.

In the course of its first two meetings, the Table generated and refined a list of "Opportunities" or specific technological, behavioural or performance "Actions" that will reduce greenhouse gas emissions - such as window replacement or operating staff energy management training.

Commercial/Institutional Sector Actions were analysed using cost curve analysis in accordance with the guideline provided by the National Climate Change Secretariat. The output from this study is a comprehensive set of cost curves profiling the potential GHG emissions reduction impact and associated cost for a wide range of energy management Actions.

The Third Table meeting was devoted to preparing a list of "Measures" which are applications of policy to achieve one or more Actions, e.g. the Action might be to eliminate standard efficiency motors and the corresponding Measure could be to regulate motors under the Energy Efficiency Act. The Table generated a list of 35 Measures applicable to the sector.

In the course of the Fourth Table meeting, Measures were reviewed and consolidated to 19. The reduced list was subjected to a broader analysis which includes costs, benefits and impacts of the selected Measures. The results of this analysis helped to determine which Measures to bundle into Options Packages.

The Fifth Table meeting reviewed the analysis of the Measures and categorized them in accordance with guidelines provided by the National Climate Change Secretariat. Measures were then grouped into two Option Packages - The Comprehensive Package and The Targeted Package and subjected to an integrated analysis to determine costs, benefits and impacts of the two Options Packages.

The Sixth Table meeting determined which Options Package the Table recommends for adoption by the National Climate Change Secretariat.

2.2 Key Areas of Focus

The Commercial/Institutional segment of the Buildings Table concentrated on the design, construction and operations of buildings that must comply with Parts 3 to 6 of the National Building Code.

The Buildings Table also examined the following non-energy impacts that could influence the overall ranking or attractiveness of a specific Measure:

- Economic - cost to tenants, construction costs, competitive impacts, employment impacts and regional inequalities.
- Environmental - atmospheric effects, aquatic effects, and terrestrial effects
- Health - Air quality, noise and risk of accidents
- Social - workplace environment

The results of this indirect impact analysis are included with the Measures information contained in Appendix B to the Options Report.

Embodied energy in construction materials was not considered by the Buildings Table but this is a GHG emission issue that needs to be addressed at some stage of the impact analysis.

As will be discussed in the following section, the Measures selected by the Buildings Table are presented in broad terms and the impact analysis is based on a number of key assumptions some of which are discussed in Appendix B. There has been no attempt to develop detailed program designs, as this will come following approval and funding of Measures. It has been assumed that barriers to implementation and funding will be overcome through cooperation and commitment to GHG emission reduction by the many stakeholders.

2.3 Methodological Issues

To overcome limitations in terms of data availability and quality, the analysis of the costs and impacts of Measures to reduce GHG emissions from buildings in the commercial/institutional sector involves many assumptions, estimates and predictions. Many of these approximations become evident during the modelling of the Actions and Measures. Some of these issues are discussed below:

- There is a wide range of Actions that can be taken to reduce GHG emissions in the commercial/institutional sector. It is not practical to model all of these Actions and the Actions modelled within a particular Measure may not include all Actions that could in principle be stimulated by the Measure.

- Assumptions must be made concerning the scope of a particular Action since the definition has a major impact on GHG and cost.

- The modelling methodology employed requires the definition of a "business-as-usual" scenario that projects GHG emissions to the year 2010, assuming the absence of new measures to reduce emissions. Information on the BAU was supplied by NRCan.

- The penetration rates for Actions stimulated by a Measure are important variables in the impact analysis but there is not much empirical data available and significant assumptions were necessary.

- The costs of a Measure (program costs, and costs of incentives if applicable) must be estimated but in many cases Measures interact with and influence the expected penetration.

- The GHG impact and life-cycle cost of any Measure that involves electricity will be heavily influenced by assumptions concerning marginal generation. A kWh of electricity saved will have different GHG implications if the avoided generation was based on natural gas, compared to avoided generation based on coal, hydro, or some other source.

- In accordance with the guidelines from the Climate Change Secretariat's Analysis and

Modelling Group (AMG), the analysis of Measures presented in Section IV assumes natural gas as the marginal fuel. Additional analysis was conducted with regional fuel mix (eg. hydro as displaced fuel in Nfld., Quebec and Manitoba) as the Table felt the results might be different than with the AMG guidelines.

- The individual Measures presented in Part IV of this document were initially modelled on a "stand-alone" basis. When combined into Options Packages the impacts of these Measures cannot be simply added together. Certain are independent of the others while others overlap because they target the same Actions. The integration of the Measures to determine the impacts of the Options Packages had the following steps:

    - Select Measures that stand alone or are unaffected by others
    - Compare the major Measures that overlap, adjust penetration rates and remodel
    - Derate Enabling Measures as necessary
    - Total the costs and impacts of the unaffected, remodelled and enabling Measures to arrive at costs and impacts of the Options Package.

    The Measures are integrated in the analysis of the Options Packages and yield a composite estimate of the GHG emission reduction and cost impacts with a high confidence factor.

- The Measures proposed by the Buildings Table are based on existing technologies and current conditions. Long term issues such as the projected need for increased cooling degree days are beyond the Table's time frame.

- The cost per tonne of GHG reduction can be calculated and presented in different ways. In the earlier work of the Buildings Table, this data was presented as cost per tonne of GHG reduction ***in 2010.*** In this final version of the *Options Report*, the data is presented as cost per tonne of ***total*** GHG reduction (i.e. total reduction over the life of various actions simulated by the measure). This alternative presentation is based on guidance from the Climate Change Secretariat (AMG), and does not involve any change in the underlying data. It should also be noted, that the cost elements considered in the cost per tonne calculation include the capital cost of the actions taken as a result of a Measure, and the resulting energy cost savings. Other factors such as possible resale value of the building, are excluded from this calculation.

PART III: BACKGROUND INFORMATION ON THE COMMERCIAL/INSTITUTIONAL SECTOR

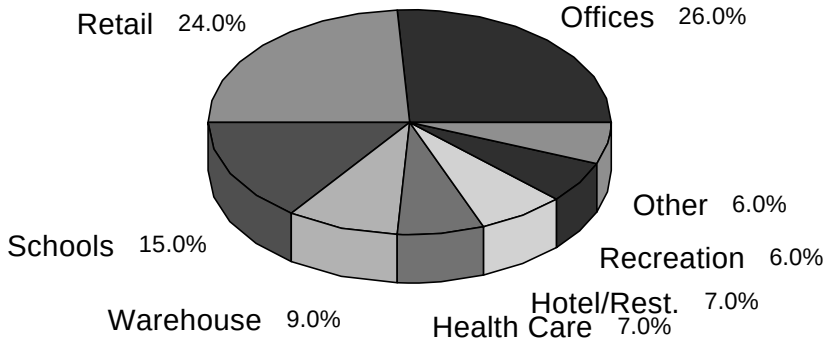
4. OVERVIEW OF THE SECTOR

4.1 Current Stock

In 1996, the total number of commercial/institutional buildings in Canada (excluding MUR) was estimated to be 430,000 with approximately 517 million sq. meters of space. The MUR market consisted of approximately 970,000 suites with 77.4 million sq. meters of space.

Figure 3.1 presents the distribution of commercial/institutional buildings by type (excluding MUR). Figure 3.2a presents the distribution of Commercial/Institutional floor space by region while Figure 3.2b presents the distribution of MUR floor space by region.[3].

Fig. 3.1- 1996 Distribution of Commercial/Institutional Floor Space
By Building Type



[3] Applied Research Consultants, *Foundation Paper on the Commercial/Institutional Sector in Canada*

Fig. 3.2a - 1996 Distribution of Commercial/Institutional Floor Space
By Region

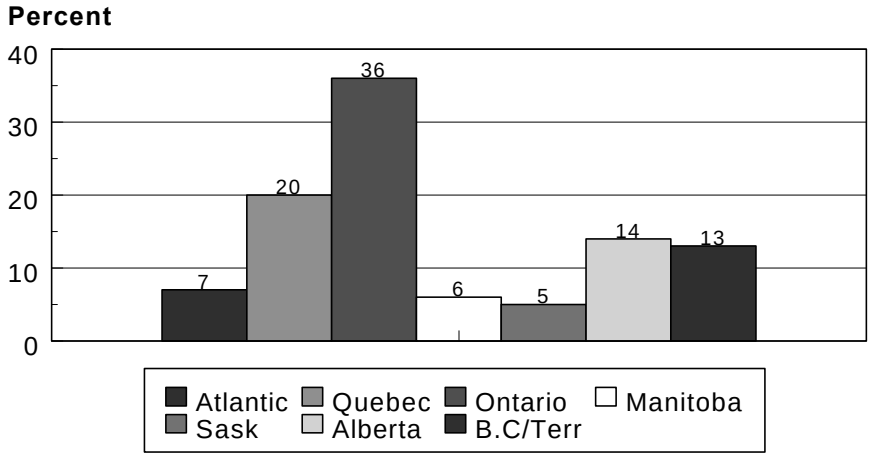
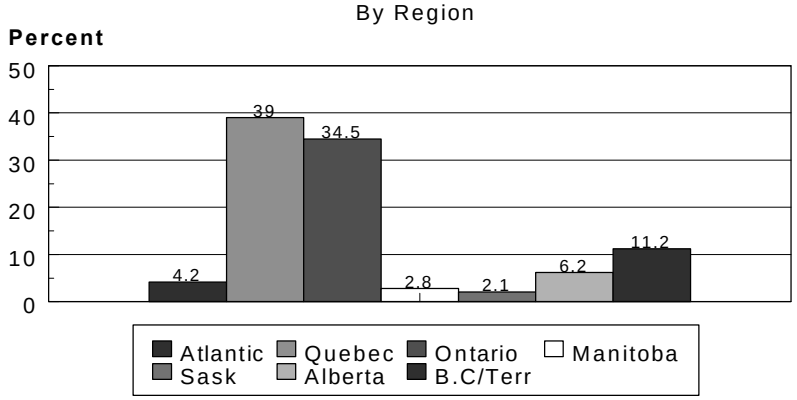


Fig. 3.2b - 1996 Distribution of MUR Floor Space
By Region



4.2 Life-Cycle of Commercial/Institutional Buildings

Buildings in this sector generally last a long time and may undergo several changes in ownership and occupants and related renovations while the basic structure remains unchanged.

During the lifetime of a building, there is an ongoing need to invest in components such as windows, roofs, boilers, HVAC equipment, lights, etc, as they wear out or become obsolete. A study conducted by CMHC indicates that once a building reaches 20 years of age it requires an annual investment of 1-3% of its original cost for the balance of its useful life.

Decisions regarding renovation and retrofit are less dependant on the age of the building and more on the age of the components that are housed inside.

4.3 Energy Use in the Commercial/Institutional Sector

The total energy consumption in the Commercial/Institutional sector (excluding MUR) in 1996 was 1,000 petajoules. The MUR sector had energy use that was estimated at 84 petajoules.

Distribution of energy use in the sector by building type is shown in Figure 3.3. Energy use by end use for the Commercial/Institutional sector is shown in Figure 3.4a, while that for the MUR sector is shown in Figure 3.4b.

Fig. 3.3 - 1996 Commercial/Institutional Sector Total Energy Use

By Building Type

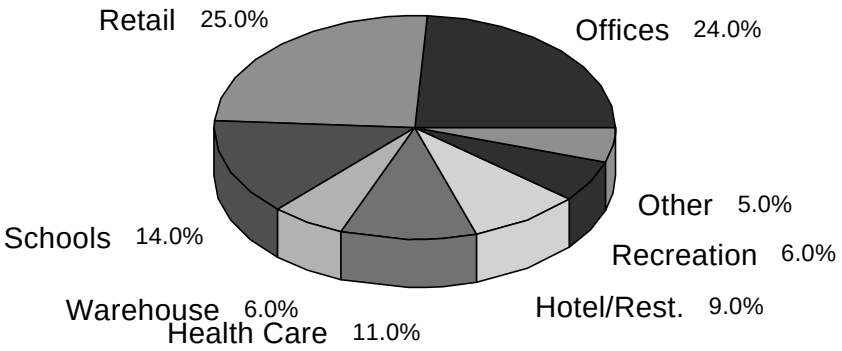


Fig. 3.4a - 1996 Commercial/Institutional Sector Total Energy Use
By End Use

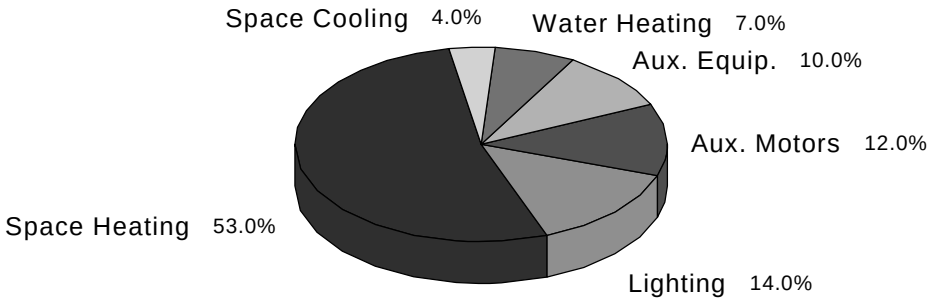
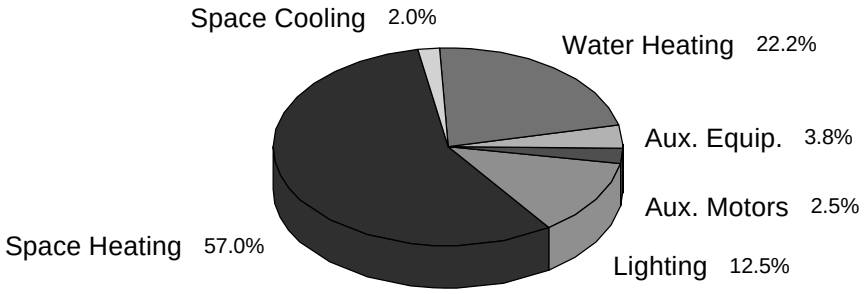


Fig. 3.4b - 1996 MUR Total Energy Use
By End Use



According to NRCan's, *Energy Efficiency Trends in Canada*, energy use in the commercial/institutional sector increased by 12.2% between 1990 and 1996. The growth in this sector was influenced by two offsetting factors - increased economic activity and decreased energy intensity.

- During the period 1990 to 1996 commercial/institutional sector activities, as measured by floor area, increased by 11%.

- Over the same period, aggregate energy intensity increased by 1.1%, however, energy intensity adjusted for weather and structure declined by more than 3.7% mainly as the result of improvements in energy efficiency. Such as:
  - < Space heating uses approximately 53.3% of the energy consumed in commercial buildings. Over the past ten years average heating plant efficiencies have increased by more than 10%.
  - < Lighting uses 14% of the energy in the sector and has been an area of major improvement in efficiency due to better electronic ballasts, the introduction of electronic ballasts and the replacement of standard fluorescent lamps with more energy efficient units.
  - < Space cooling in commercial buildings has improved dramatically in recent years as the result of energy efficient compressors and fan motors and the increased use of economizers to pre-cool return air.
  - < Building environment control systems are being used increasingly to monitor and control heating and cooling systems.
  - < Over the past decade occupants have become more aware of energy conservation and this has had a significant impact on energy use in commercial buildings. E.g., the employee awareness program at CFB Halifax generates a $20,000/ year energy saving.

4.4 Green House Gas Emissions in the Sector

There is a close relationship between changes in energy use and changes in GHG emissions. The emissions from a particular building depend on several factors such as building use, choice of fuels and geographical location to mention only three of the variables.

Emissions are the result of burning fossil fuels such as coal, oil and natural gas. It also depends on which fossil fuel is used since they do not produce the same level of GHG emissions.

In 1996, the commercial/institutional sector accounted for 12.4% of GHG emissions from total secondary use-related emissions. During the period 1990 to 1996, CO2 emissions increased by 4.9% compared with a 12% increase in energy use. The main reason for the difference is a 6.5% decrease in intensity due mainly to a reduction in the CO2 intensity of electricity generation.

Multi-unit residential buildings (mid/hi rise apartments) are part of the Residential Sector but are closer to commercial buildings in structure and equipment. For this reason GHG emissions from MUR buildings have been added to those from commercial/institutional sector.

Exhibit 3.1
Commercial/Institutional GHG Emissions (mT CO_2 equivalent)
Including Multi-Unit Residential[4]

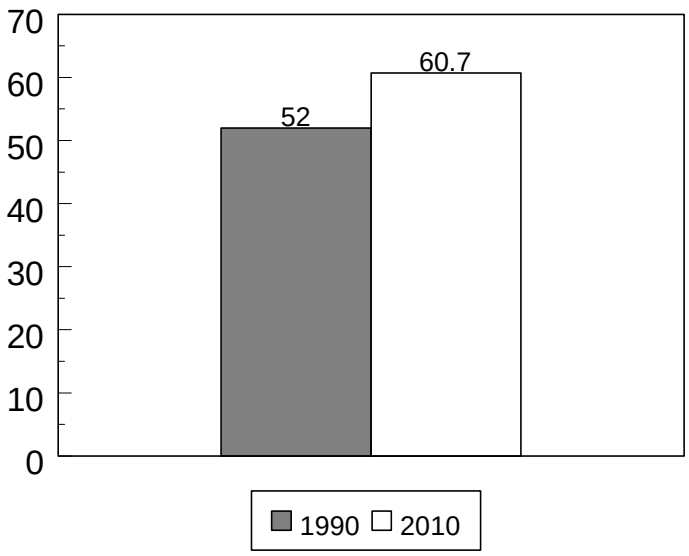
	Business-As-Usual		
	1990	**2000**	**2010**
Commercial/Institutional	47.8	49.5	55.6
Multi-Unit Residential	4.2	4.6	5.1
Total Emissions	52	54.1	60.7

Exhibit 3.1 illustrates GHG emissions from commercial/institutional energy use in 1990 and as projected for 2000 and 2010 based on a business-as-usual scenario. Emissions from Multi-Unit Residential buildings have been added as shown

This analysis suggests that emissions in the commercial/institutional sector will increase by approximately 9.0 mega tonnes CO2 equivalent or 17% above 1990 levels by 2010, in the absence of measures to reverse this trend.

This information is presented graphically in Figure 3.5.

Fig. 3.5 - GHG Emission Comparison 1990 & 2010
Commercial/Institutional with Multi-Unit Residential



[4] Source is NRCan's, *Canada's Emission Outlook, An Events-Based Update for 2010*

5. OPPORTUNITIES TO REDUCE GHG EMISSIONS

5.1 Emission Reduction Opportunities

Essentially there are four opportunities to reduce energy consumption in the commercial/institutional sector:

- **When the building is first constructed -** Original design and construction is the best time to incorporate energy efficiency into a building. Once the decision is made concerning major equipments they are unlikely to be replaced until they wear out.
- **In the course of regular operations and maintenance -** O & M is carried out throughout the life of the building and can generate Low-Cost or even No-Cost energy savings. These savings usually require a trained operator and cooperative tenants.
- **During building renovation -** Buildings undergo renovations for various reasons usually related to appearance or usage but renovations often create an opportunity to install energy efficient components. Redesigned lighting systems are a common part of renovations and it may also present a rare opportunity to modify the building envelope.
- **As the result of a retrofit program -** Replacement of equipment usually occurs at the end of its useful life and replacement offers an opportunity to introduce components with a higher energy efficiency.

Taking advantage of the above opportunities in the commercial/institutional sector is complicated by the diversity of the building stock and by behavioural and systemic obstacles.

There are many stakeholders in the commercial/institutional sector and almost every one (owner, developer, designer, contractor, operator, property manager, tenant, supplier and even government officials) plays a role in the energy efficiency of a building. The following table list some of the stakeholders in the decision process.

Federal Government	*Municipal Government*	*Utility Companies*
· Natural Resources Canada	· Planning	· Electricity
· National Energy Board	· Engineering	· Natural Gas
· National Research Council	· Permits	· Oil
· PWGSC		
· Revenue Canada	*Private Companies*	*Building Occupants*
· Industry Canada		
· CMHC	· Developers	· Building Owners
	· Designers (Architects, Engineers)	· Tenants
Provincial Government	· Product Manufacturers	· Building Managers
	· Standards Organizations	
· Energy & Environment Ministries	· Product Distributors	*Advocacy Groups*
	· Performance Contractors	
· Municipal Affairs and Housing	· Financial Institutions	· Industry Associations
· Utilities Commissions	· Builders	· Builders Associations
	· Code Inspectors	· Environmental Groups
	· Building Owners	

Buildings in the commercial/institutional sector often have layers of ownership, management and occupants that make decisive action difficult. Many of the buildings in the sector are owned and managed by public agencies (e.g., schools & hospitals) while others are owned, managed and occupied by unrelated private sector companies (e.g., shopping malls). These participants often don't have a complete view of the impact of their actions on life-cycle energy use.

Building owners typically have separate Operations & Maintenance (O&M) and Capital budgets. O&M costs increase incrementally and are seen as a cost of doing business. As a result, building owners often sustain high O&M costs rather than drawing from the capital budget to reduce these costs.

Domestic and International experience indicates that the most cost-effective mechanism available to change behaviour in a market economy is to create a shift in market demand. The main impediment to the widespread adoption of energy efficiency in commercial buildings is the lack of demand for such performance by the main formulators of demand in buildings, namely: investors and tenants who are a building's customers.

If the building customer group demands green buildings, developers, designers and builders will be motivated to provide such buildings. Developers will instruct their designers and builders to produce buildings that meet the demand and higher performance will become the norm.

Experience has shown that changes in attitude and behaviour of this nature is a process with several steps.

- create public awareness of the issue
- transfer knowledge and skills to building owners and designer/builders
- develop community support programs
- make related changes in policy

The public awareness issue has been studied by the Public Education and Outreach Table while the Buildings Table has concentrated on developing a list of actions that address the later steps.

The following section lists the Actions defined by the Buildings Table that are expected to reduce energy consumption in commercial/institutional buildings.

5.2 Commercial/Institutional Sector GHG Emission Reduction "Actions"

A series of 24 Actions were identified for detailed analysis using the cost-curve technique. The output from this analysis was a comprehensive set of cost curves profiling the potential GHG emissions reduction impact and associated cost for a wide range of energy management Actions. For more information on energy measurement Actions, refer to the final cost curve report: "*Commercial/Institutional and Residential Sector Action/Opportunity Cost Curves - Buildings Table"*, prepared by Marbek Resources Consultants, dated April, 1999.

The energy management Actions are concrete energy saving steps and are important building blocks for the GHG emission reduction Measures that will be defined in section 7.

5. LESSONS LEARNED FROM ENERGY EFFICIENCY PROGRAMS

6.1 Overview of Lessons

Programs aimed at improving energy efficiency in commercial buildings have been underway in Canada for many years sponsored by governments, utilities and the private sector. Programs tend to fall into four categories:

- Codes and Standards
- Incentives/Financing Programs
- Awareness/Education Programs
- Research and Development

Each of the four program categories has a role in achieving energy efficiency in buildings. Based on experience in Canada and elsewhere, the following observations can be made:

- Codes and standards are necessary to achieve EE where market forces are not strong enough or public safety is an issue. Federal and provincial applications of the codes and standards must be complementary if equitable results are to be achieved. Harmonization of standards with other NAFTA countries is also a requirement.

- Awareness and Suasion programs are necessary but can be expensive unless they fall on fertile ground. This sector may need *Champions* (organizations with the funding and resources to initiate programs, e.g., governments) and *Influencers* (organizations who can easily carry a message to groups of decision makers, e.g., trade associations) to create awareness and provide the suasion.

- Research and Development is essential but can be slow to commercialize. The introduction of new technology equipment tends to follow the demand for the product. Demonstration programs that overcome stakeholders caution concerning new technology can help to accelerate its widespread adoption.

- Fiscal and other incentive measures can be effective but need to impact decision makers directly.

Experience has shown that effective programs must, above all, be **targeted.** In the case of the commercial/institutional buildings sector the targets may include:

- Building type - office, strip mall, shopping centre, school, high-rise residential, etc.
- Building size - large or small
- Energy end use - lighting, heating, cooling, etc

- Influencers - trade associations, contractors, material suppliers, etc.
- Stakeholders - owners, designers, property managers, tenants, etc
- Barriers - the program should aim to overcome a known barrier to the adoption of energy efficiency in the specific end use by the target stakeholders. Barriers may include cost, lack of knowledge, past practice, lack of incentive, etc.

Thus, to be effective, an energy efficiency program must be aimed at a clear set of targets and provide services that hit these targets. This has been the basis for the Measures developed by the Buildings Table and described in detail in Appendix B.

The following are examples of the types of Measures proposed by the Table that fall into the four categories listed previously:

- continuing education programs at the designer/builder level
- building operator training programs
- demonstration projects that highlight private sector technical expertise
- energy efficiency standards for equipment found in buildings
- building performance codes and standards
- innovative Financial Incentive programs that target new buildings
- innovative programs that target existing building retrofit opportunities
- procurement programs that reward high performance equipment and commercialized technology
- building performance rating and labeling systems
- programs that foster the use of renewable energy sources

The following subsection considers some of the financial and taxation barriers faced by stakeholders in the Commercial/Institutional Buildings Sector.

6.2 Financial and Taxation Barriers

The Buildings Table sought expert advice on certain Measures that require an understanding of the tax and financial environment building owners currently operate under. A study[5] was commissioned to review whether existing financial structures, leasing arrangements and methods of taxation lend themselves to investment in energy improvements in the commercial/institutional sector or whether they create barriers. The recommendations included in the study have not been specifically endorsed by Buildings Table members. Nonetheless, the Table believes the findings and recommendations constitute a valuable resource for use at a later stage for facilitating the detailed design of the Measures that are presented in broad terms in this Options Report.

[5]Report dated August 24, 1999 by Hamilton, Thomas & Associates Ltd. titled: *"Financial Structures, Leasing Arrangements and Taxation as They Affect Energy Efficiency Improvements Within the Commercial/Institutional Sector".*

PART IV: ASSESSMENT OF THE MEASURES

7. OVERVIEW OF MEASURES

7.1 Introduction

This section presents the Measures defined by the Buildings Table to be included in the Options Packages. A Master List of Measures for Further Analysis was prepared at the Vancouver meeting and is attached as Appendix A to this Options Report. The Master List contains 36 Measures applicable to the Commercial/Institutional Sector but these were consolidated into 19 in later meetings.

The 19 Commercial/Institutional Measures are listed below and are then categorized in accordance with guidelines provided by the Climate Change Secretariat. The stand-alone analysis of the Measures is discussed and comments made on assumptions made in the course of the analysis. Finally, comments are made concerning the implications of the Measures.

Actions that improve the energy efficiency of buildings could make them more attractive to rent and thus generate a larger return to investors at resale. This additional benefit has not been considered in the analysis of the Measures.

It should be noted that Multi-Unit Residential (MUR) buildings Measures are included with Commercial Measures. Measure C-8A is strictly MUR related, and MUR is also considered as part of Measures such as AE-1, AE-9, AE-7, C-4, etc.

A description package is provided in Appendix B for each Measure which includes:

- **Measure profiles** that provide a description. Summary of GHG impact, costs and other information related to the Measure.
- **Data sheet** showing the GHG and cost impacts of the Measure as determined by the analysis
- **Socio-Economic impacts** of the Measure

The program implementation cost assumptions made in modelling each Measure are contained in Appendix C

The following subsection lists the Measures and provides a brief description of each.

7.2 List of Measures

The following are the final 19 Measures selected by the Commercial/Institutional Sector of the Buildings Table for analysis and consideration as part of the Options Packages.

C-1 **National Commercial Building Labeling & Rating System**
Application: New and existing buildings

Description: Development and promulgation of a multi-part rating and labeling system to assist in comparing actual operating costs with benchmarks and goals.

C-2B **Improved Model National Energy Code for Buildings (MNECB +)**

Application: All new buildings and additions to existing buildings

Description: Increase the provincial minimum energy efficiency regulations for new construction.

C-3 **Advanced Building and Equipment Demonstration Initiative**

Application: New and existing buildings

Description: Enabling Measure for long-term improvements in energy efficiency

C-4 **Commercial New Building Incentive Program (CBIP II)**

Application: New Buildings

Description: Extend and expand current CBIP Program

C-5 **Commercial Building Design Guidelines/Greenprints**

Application: Commercial buildings, including multi-unit residential buildings

Description: Enabling Measure tied to Green Building/Climate Change Information Services and commercial building programs

C-6 **Professional Continuing Education Program**

Application: Professional designers and builders

Description: Expansion of provincial association-led programs and university/college continuing education programs for designers & builders

C-7 **Public Buildings Initiative**

Application: Provincial and municipality-owned or funded existing buildings, including schools, health care facilities, etc.

Description: Refocusing, enhancement, and expansion of a public building targeted program along the lines of the Federal Buildings Initiative and spin-off for municipal buildings and the New Brunswick Building Initiative

C-8 **Commercial Building Retrofit Program**

Application: Privately-owned existing buildings in the retail, office, hospitality, and warehouse sub-sectors, especially buildings under 5,000 square feet

Description: Refocusing, enhancement, and expansion of private sector building targeted program along the lines of the Toronto Better Buildings Partnership, Energy Innovators Plus and the Voluntary Challenge Registry.

C-8A **Multi-Residential Retrofit Program**

Application: Privately-owned existing high rise residential buildings

Description: Refocusing, enhancement, and expansion of private sector building program modeled along the lines of the Toronto Better Buildings Partnership, Energy Innovators Plus and the Voluntary Challenge Registry.

C-9 **National Building Operator Training Program**
Application: Building facility managers and operators
Description: Expansion of Seneca/SAIT community college program to national level with access to both full-time and continuing education programs

C-11 **EE Equipment Tax Measure**
Application: New and existing buildings
Description: Faster tax write-offs for capital costs of EE equipment, construction, and renovations and/or exemption from GST/PST/HST

C-13 **National Commercial Building Checkup Program**
Application: Existing commercial buildings
Description: Technical and monetary support to buildings owners and facility managers to verify the operation of the buildings.

AE-1 **National Standards Program for Equipment and Appliances**
Application: Energy-using equipment
Description: Regulate additional equipment under the Energy Efficiency Act and/or increase the efficiency levels of currently regulated equipment.

AE-4 **Technology Commercialization Program**
Application: Residential & Commercial/Institutional buildings
Description: New program to promote technologies such as integrated systems/heat pumps; solar & instantaneous domestic and service water hot water heating systems; lighting with dimmable ballasts; ground source heat pumps; and other proven technologies that have not yet developed a market.

AE-5 **Energy Star Labelling Program**
Application: Commercial energy-using equipment
Description: Consumer-oriented labelling of high performance lighting products and other equipment.

AE-7 **Government Procurement Program for High Efficiency Products**
Application: High efficiency equipment for new and retrofit applications
Description: Public agencies and their partners commit to purchasing only equipment that meets qualifying level of energy efficiency

AE-9 **Window Market Transformation Program**:
Application: Commercial new and existing buildings
Description: Five year program to eliminate non-low E double glazing from the Canadian market.

RT-1 **Expanded the Renewable Energy Deployment Initiative**
Application: General
Description: Expand coverage under REDI to include other renewable energy systems and

applications and increase maximum grant level and feasibility funding.

RT-2 **Market Development Program for On-site Renewables**

Application: On-site power & heat

Description: Promotion and financing packages for on-site renewable energy technology and fuel cells. Financing would be provided through utility energy bills (including net billing for electricity generating systems), monthly rental/leasing programs, and/or government assistance through innovative mortgage financing, interest-free loans, etc.

7.3 Categories of Measures

In accordance with the Climate Change Secretariat Guidelines, the Measures identified in the commercial sector were classified into four categories as follows:

- **Category 1: Short Term Measures** (suitable for immediate implementation by the year 2002)
- **Category 2: Prospective Measures** (should play a role in Canada's strategy, but may require additional analysis, broader consultation, or are conditional on international developments)
- **Category 3: Measures that Merit Consideration** (insufficient information to form a judgement)
- **Category 4: Measures that do not Merit Further Consideration**.

The Buildings Table decided not to consider Measures that fall into Category 4. Thus, by definition, all 19 Measures considered by the Table fall into Categories 1, 2, or 3.

The distribution of Measures into the three categories is based on the characteristics of the Measure relative to the identified criteria and the decisions made by the Buildings Table at the June 21/22 meetings. The criteria are not absolute, but reflect the range of considerations made by the Buildings Table to arrive at the appropriate category.

It is clear to the Buildings Table that some of the stand-alone Measures will require agreements, funding and other resources that may not be currently in place. It was assumed however that these barriers would be overcome in all but the most complex situations. As a result only three Measures are not category 1 and they are the following:

- C-11 - concerns federal taxes and amendments to the Tax Act are known to be difficult and time consuming to consult, get agreement, design and implement.
- C-2B - the Model National Energy Code for Buildings is a national code and will take a long time to amend and to obtain consensus approval as well as acceptance by the provinces.
- RT-2 - concerns the commercialization of renewable energy equipment and the means to achieve this requires further study.

Exhibit 4.1 lists the 19 Measures by category and also provides more details of the criteria used to place Measures into the three categories.

Exhibit 4.1
Measures by Category

Category	Criteria	Measures
Category 1: Short Term Measures (suitable for immediate implementation by 2002)	• Significant GHG impact, and/or low life cycle cost • Other impacts of Measure expected to be neutral or positive overall • Program experience available to guide implementation • Achievable implementation requirements • No major unanswered questions regarding the Measure	C-8 Commercial Building Retrofit Program AE-1 National Standards for equipment and Appliances C-7 Public Buildings Initiative AE-9 Window Market Transformation AE-7 Government Procurement AE-5 Energy Star Labelling C-4 Commercial New Building Incentive Program (CBIP II) C-6 Continuing Education C-9 National Building Operator Training C-3 Advanced Building & Equipment Demonstration Initiative C-1 National Building System Labelling/rating AE-4 Technology Commercialization Program C-8A A Multi-Residential Retrofit Program RT-1 Expanded REDI Program C-5 Commercial Building Design Guidelines/Green prints C-13 National Commercial Checkup
Category 2: Prospective Measures	• Measure meets most of the Category 1 criteria, but • Significant unanswered questions remain, or • Measure requires a number of conditions (e.g. other Measures) to be well established prior to implementation	C-11 EE Equipment Tax Measure C-2B Improved MNECB
Category 3: Measures that Merit Consideration	• Measure meets some of the Category 1 criteria • Significant additional research and analysis are required, or • The Measure may not be required to meet GHG targets	RT-2 Market Development for Onsite Renewables

7.4 Comments on the Analysis of the Measures

The Measures presented above build on a "business-as-usual"scenario that includes changes that are expected to occur in the marketplace, even in the absence of the proposed Measures. The BAU case

is the basis for determining the impact of Measures.

The Measures have been analysed on a "stand alone" basis. This means that the analysis identifies what would be achieved by each Measure on its own. It cannot be assumed that the combined impact of a group of Measures will be the sum of the impacts of the individual Measures since the various Measures may be targeting some of the same efficiency gains.

The impacts of some Measures will in fact be additive. For instance, the impacts of Measures that target different segments of the market can be added. Also, some Measures are complementary. For instance, AE-7 (Government Procurement) adds to the gains made through AE-1 (National Standards for Equipment and Appliances).

Some Measures are enabling in nature and achieve their impact by amplifying the impact of other Measures. Thus, a technology demonstration program will increase the effect of any retrofit assistance programs that are contemplated.

7.5 Costing Assumptions

Assumptions concerning the costs of program implementation are contained in Appendix D and are based on the following:

- The cost of each action and the savings, accrue over the period 2000 to 2010
- Program duration ranges from 3 to 10 years but is mainly 5 years
- Incentives are applied at a level expected to reduce bundled pay backs to 5 years
- Implementation costs are estimated as a percentage of total costs and range from 2% to 7% where subsidies are not in place and from 8% to 14% where they are in place
- Life Cycle Costs are based on:
  - < not discounting capital costs
  - < energy savings discounted at 10%
  - < operating or maintenance costs discounted at 10%

7.6 Penetration Assumptions

Potential penetration rates were established for each action within a Measure. Penetration rates are a function of many factors, including the detailed design of the specific Measure, the nature and cost of the actions, and the size of the eligible stock. In addition, the type of Measure also has an important effect. This is illustrated by the following percentages, which indicate the possible impact of different types of Measure relative to the eligible stock. These ranges provided an initial and very approximate guide that assisted in determining penetration rates:

Codes and Standards	70 to 100% of the eligible stock
Incentive/Financing Programs	5 to 30% of the eligible stock
Awareness/Education programs	5 to 25% of the eligible stock
Demonstration Programs	5% of the eligible stock

The specific penetration rates selected for each Measure are included in the Data Sheets presented in Appendix B.

Typically the ramp-up for the Measures would require 2-3 years for peak penetration. A Measure with high opportunity uptake (3% per year) would, over the ten years of implementation, achieve 25% penetration.

Financial Incentive programs are particularly sensitive to snap-back if a good exit strategy is not applied and peak year energy savings will decline unless there is a market factor, such as a regulation, that continues to channel decision making to the more efficient choice. This was experienced in the mid 1990s when high efficiency motor incentives were eliminated by some sponsoring utilities.

7.7 National Impact of the Measures

Data sheets showing the national impact of each Measure in 2010 are contained in Appendix B. Some features of the data sheets are discussed below:

< The data sheets list the Actions that form part of the Measure and indicate building stock affected and penetration rates assumed.
< Capital costs, energy cost savings, program implementation costs and subsidies (where applicable) are provided in tabular form.
< Total GHG reductions in 2010 in kilotonnes is estimated and used to calculate the (cost) or savings per tonne
• Direct and indirect national GHG reduction and cost/tonne by building segment are shown graphically. Retail strip malls are often the most cost effective targets because significant energy efficiency improvement can be obtained at a relatively low cost.
• Direct and indirect national GHG reduction and cost/tonne by region of Canada are also shown graphically. The national impact by region shows the major impact to be in Ontario and Quebec as might be expected from population distribution. The savings vary by region based on the size, type and age of building stock, labour rates, etc.

7.8 Measure Implementation Issues

The implementation method selected for a given Measure will have a significant impact on the cost incurred and the impact achieved. For example, changes will have to be made to funding protocols in order for some institutions to take advantage of subsidies that are available to commercial buildings. In this case the penetration rate, take-up rate of the Financial Incentive and the impact of the Measure depends on the nature of the implementation process.

Comments on Measures where the nature of implementation is an issue are made in the description package found in Appendix B.

7.9 Socio-Economic Impacts

Results of analysis of economic, environmental, health and social impacts of each Measure is included in the Measure description package contained in Appendix B. This is a qualitative analysis based on advice from the Table members. Time did not permit more intensive research, however, the following comments can be made:

Economic Impact: 16 of the Measures show a positive or neutral economic impact characterized by:

- < cost savings that exceed expenditures
- < increased construction activity and skills development
- < increased employment in the construction industry
- < no significant effect on competitiveness

Three Measures have slightly negative economic impacts but all three are enabling Measures with positive returns in the longer term.

Some Measures may cause Canadian-based manufacturers to cease production of certain equipment and materials and this could result in loss of employment.

Environmental Impact: All the Measures improve ambient air quality due to reduced SOx and NOx emissions from electricity generating facilities. Reduced emissions in cities will improve local air quality particularly in areas where air quality is a problem such as Quebec City to Windsor, Calgary and Vancouver.

Health Impact: Health impacts are mainly beneficial due to cleaner outside air and water. Measures that promote a tighter building envelope such as C-8 and AE-9, can be implemented without increased exposure to indoor air contaminants.

Social Impacts: None of the Measures has a significant impact on the working environment.

7.10 Divergence

The Measures proposed by the Commercial/Institutional Buildings Table represent a consensus of the views of the members. Differences in points of view were expressed at the meetings and were generally concerned with the definition and contents of the Measures.

One recurring objection on the part of a number of members concerned opposition to the use of financial incentives or subsidies in certain Measures. Most members felt that financial incentives were needed while a few members felt that information and suasion programs would be sufficient. One example concerned C-8 Commercial Building Retrofit Program where it was argued that penetration would be much quicker with a financial incentive. The counter argument was that modelling of C-8 had shown that money will be saved by retrofitting existing buildings and owners would take action without the need for a financial incentive if they were aware of this situation.

Although not clearly expressed by Table members, there was a concern on the acceptability of new codes and regulations by industry in general.

8. PRESENTATION OF THE MEASURES

8.1 Summary of Projected GHG Emission Reduction and Financial Implications

Exhibit 4.2 summarizes the GHG reductions identified for each of the Measures shown by category with the largest GHG contributor shown first. The net savings, savings per tonne and program costs are also shown for each Measure. Most Measures are classified as category 1 but the three Measures at the bottom of the table have been classified category 2 and 3 as can be seen in Exhibit 4.1

Exhibit 4.2

Measures and their Projected GHG Emission Based on Total Reductions to 2010

Measures		GHG Reductions in kilotonnes of CO_2	Net Savings (Costs) $ million	Dollar Savings (Costs) /tonne	Program Costs $ million
C-8	Commercial Building Retrofit Program	3.820321028e+49	970	18	3.73226e+21
AE-1	National Standards for equipment and Appliances		150	4	
C-7	Public Buildings Initiative		130	3	
C-8A	A Multi-Residential Retrofit Program		230	20	
AE-9	Window Market Transformation		465	31	
AE-7	Government Procurement		(160)	(15)	
C-13	National Commercial Checkup		133	13	
AE-5	Energy Star Labelling		18	4	
C-4	Commercial New Building Incentive Program (CBIP II)		7	1	
C-6	Continuing Education		65	12	
C-9	National Building Operator Training		70	13	
C-5	Commercial Building Design Guidelines/Green prints		50 54	10 12	
C-3	Advanced Building & Equipment Demonstration Initiative		54	12	
AE-4	Technology Commercialization Program		57	16	
C-1	National Building System Labelling/rating		(32)	(28)	
RT-1	Expanded REDI Program				
C-11	EE Equipment Tax Measure	1820520	13540	76	1358
C-2B	Improved MNECB				

Measures	GHG Reductions in kilotonnes of CO_2	Net Savings (Costs) $ million	Dollar Savings (Costs) /tonne	Program Costs $ million
RT-2 Market Development for Onsite Renewables	57	-2	-2	2

The following observations can be made concerning the stand-alone Measures from the data in Exhibit 4.2:

< All of the selected Measures make a positive contribution to the reduction of GHG emissions

< Certain Measures make a substantial contribution to GHG emission reduction such as:
  - < C-8 & C-8A - Commercial & Multi-Residential Building Retrofit Program
  - < AE-1 - National Standards for Equipment and Appliances
  - < C-7 - Public Buildings Initiative
  - < C-11 - Energy Efficient Equipment Tax Measure

- The net cost is actually a saving for 16 of the Measures. This means that the present value of energy savings from Actions stimulated by the Measure over the life of the Actions is greater than the present value of the capital costs of the Actions stimulated by the Measure cumulative to 2010.

- In the case of three of the Measures the difference between present values of savings and net cost is negative. All three Measures are government-sponsored programs and two are related to renewable energy sources:
  - < AE-7 - government provides leadership by purchasing only EE equipment at higher cost.
  - < RT -1 & 2 - improve REDI and on-site renewable energy sources. Both involve incentives to foster the use of renewable energy sources and have a long term impact.

- The saving (cost) per tonne is an indication of the cost effectiveness of each stand-alone Measure. It can be seen that AE-9 - Window Market Transformation Program, is by far the most cost effective Measure yielding substantial GHG emission reductions as well as a substantial net savings.

8.2 Impacts of Commercial/Institutional Measures - National Level

Figures 4.1 and 4.2 summarize the greenhouse gas impact, and life-cycle cost per tonne of emissions reduction, for all Measures. Figure 4.1 shows results assuming all marginal electricity generation is derived from natural gas, and thus reflects the data presented Measure-by-Measure above in Exhibit 4.2. Figure 4.2, on the other hand, assumes a regional mix for the marginal generation.

It can be seen that Figures 4.1 and 4.2 are very similar both in values and shape. With the exception of C-8A - a Multi-Residential Retrofit Program, the GHG emission reductions with a regional generation mix average less than 5% below those based on natural gas. Thus, there is little error in basing the analysis of the impact of the Measures on natural gas generation of marginal electricity.

C-8A experiences a 44% drop in GHG emission reduction with regional mix indicating that the bulk of high rise apartments are located in regions with clean fuel sources such as nuclear power or hydroelectricity.

Figure 4.1 - Impacts of Commercial Measures - National Level
(marginal electricity based on natural gas)

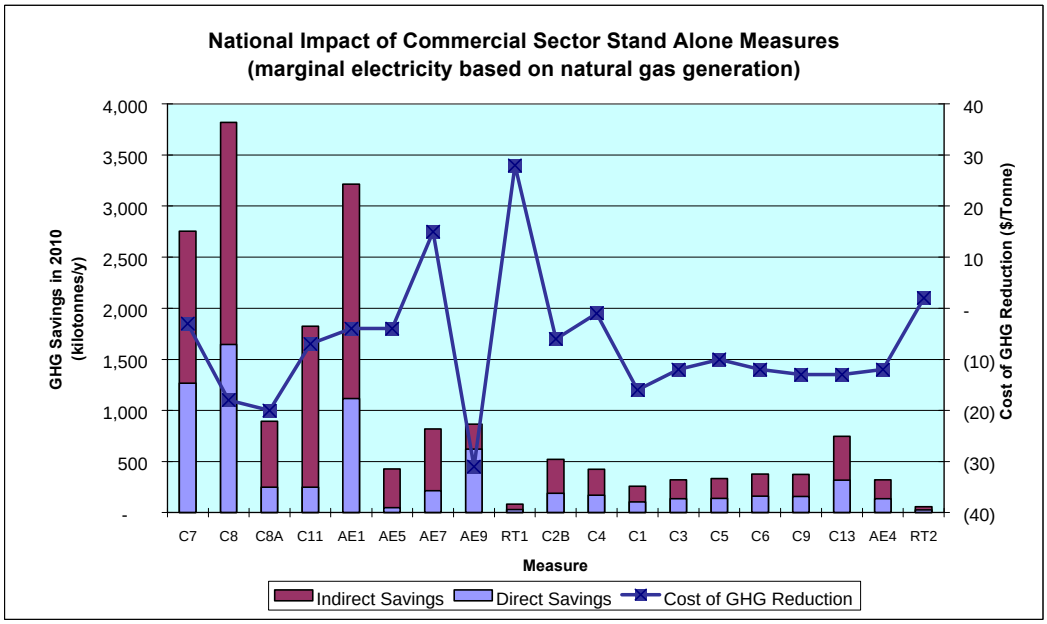
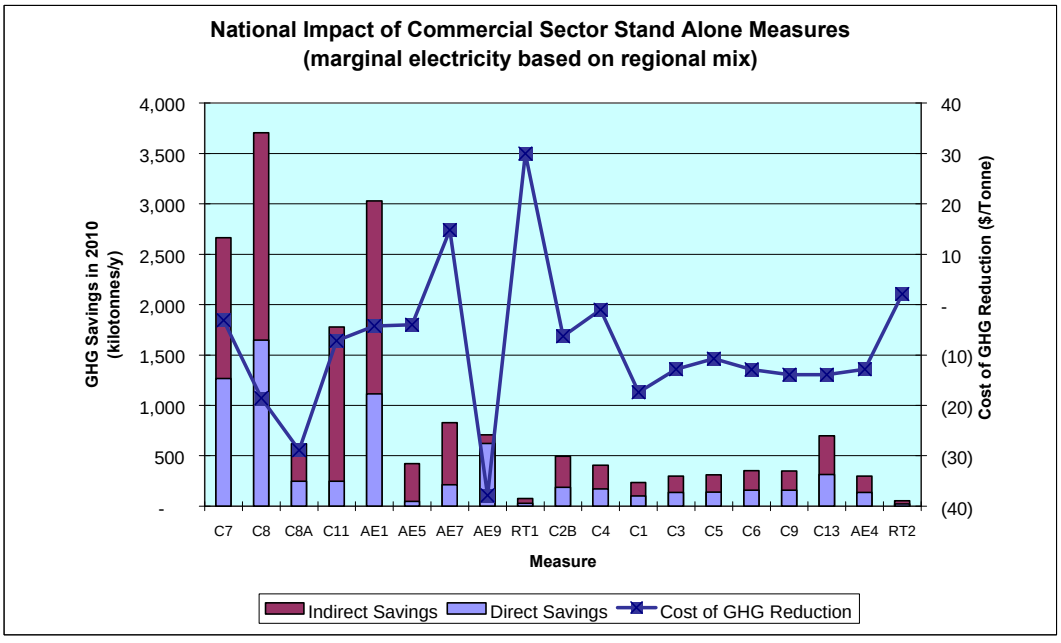


Figure 4.2 - Impacts of Commercial Measures - National Level
(marginal electricity based on regional mix)



8.3 Alternative Presentation of Cost per Tonne

In the previous figures and commentary, the data concerning cost per tonne for GHG reductions is ***based on total GHG reductions*** (i.e. total reductions over the life of the various actions simulated by the measure). Alternatively, and during much of the Table discussions, the cost per tonne could be presented ***based on GHG reductions in the year 2010.*** For information purposes, this alternative presentation of cost per tonne is shown in Exhibit 4.3 for each of the measures.

Exhibit 4.3

Alternative Presentation of the Measures and their Projected Savings (Cost) per tonne GHG Emission Reductions Based on Total Reductions and Reductions in 2010

Measures		Dollar Savings (Costs) /tonne	
		Based on total reductions	Based on reductions in 2010
C-8	Commercial Building Retrofit Program	18	255
AE-1	National Standards for equipment and Appliances	4	48
C-7	Public Buildings Initiative	3	48
C-8A	A Multi-Residential Retrofit Program	20	250
AE-9	Window Market Transformation	31	540
AE-7	Government Procurement	(15)	(190)
C-13	National Commercial Checkup	13	180
AE-5	Energy Star Labelling	4	40
C-4	Commercial New Building Incentive Program (CBIP II)	1	16
C-6	Continuing Education	12	170
C-9	National Building Operator Training	13	180
C-5	Commercial Building Design Guidelines/Green prints	10	150
C-3	Advanced Building & Equipment Demonstration Initiative	12	170
AE-4	Technology Commercialization Program	12	170
C-1	National Building System Labelling/rating	16	220
RT-1	Expanded REDI Program	(28)	(390)
C-11 C-2B	EE Equipment Tax Measure Improved MNECB	76	7580
RT-2	Market Development for Onsite Renewables	(2)	(26)

PART V: OVERVIEW OF TABLES FINDINGS

9. SELECTION OF THE OPTIONS PACKAGES

9.1 Introduction

The Commercial/Institutional Sector of the Buildings Table reviewed the Measures discussed in Part IV and decided to generate two options packages.

The **Comprehensive Options Package** contains all 19 of the Measures and is intended to cover all areas of concern - new and existing buildings, related equipment, renewable energy sources, geographic areas, range of stakeholders and types of measures.

The Table recognized that the Measures bundled into the Comprehensive Options Package, while possible to implement individually by 2002 (with the exception of C-11, C-2B and RT-2), will tax the capacity of governments and industry to design and implement the programs required by the 19 Measures in a short time frame. C-11 drew particular attention because it involves federal taxes. However, the Table felt that if there was a will to achieve the Kyoto commitments a way would be found to overcome these difficulties.

The **Targeted Options Package** contains 10 of the Measures selected on the following basis:

- Low public expenditure
- High GHG emission reduction
- Positive cash flow
- Capacity building
- Ease of implementation

The Targeted Options Package is not merely the top ten Measures from the Comprehensive Options Package. The following omissions and inclusions are significant:

- C-11 has good GHG emission reduction and positive cash flow but was omitted because it was deemed to be difficult to implement (Category 2)
- AE-7 was omitted because it does not have a positive cash flow and results in a negative savings of $190/tonne.
- C-6 and C-9 were included as capacity building Measures that also yield good GHG emission reduction and savings per tonne.

The contents of the two Options Packages are listed below and discussed in section 10.

Exhibit 5.1 lists the Measures that make up the Comprehensive Options Package in order of descending GHG reduction capability, and indicates whether they impact New or Existing Buildings or Equipment and Appliances.

Exhibit 5.2 list the Measures selected for the Targeted Options Package.

9.2 Exhibit 5.1-The Comprehensive Options Package -contains all 19 of the Measures and therefore covers all areas of concern - new and existing buildings, related equipment and renewable energy sources.

Comprehensive Package			
	Existing buildings	**New buildings**	**Equipment and Appliances**
C-8	Commercial Building Retrofit Program		
AE-1			National Standards for Equipment/Appliances
C-7	Public Building Program		
C-11			EE Equipment Tax Measure
C-8A	Multi-Residential Retrofit Program.		
AE-9	Window Market Transformation		
C-13	National Commercial Checkup		
AE-7	Government Procurement		
C-2B	Adoption of improved MNECB by Provinces		
AE-5			Energy Star Labelling
C-4		Commercial New Building Incentive Program	
C-6	Continuing Education		
C-9	National Building Operator Training		
C-5	Commercial Building Design Guidelines/Green prints		
C-3	Advanced Building & Equipment Demonstration Initiative		
AE-4	Technology Commercialization Program		
C-1	National Building System Labelling/Rating		
RT-1	Expanded REDI Program		
RT-2	Market Development for Onsite Renewables		

9.3 Exhibit 5.2 - The Targeted Options Package

The Targeted Options Package consists of ten selected measures that involve low public expenditure, yield high GHG emission reduction and feature positive cash flow, capacity building and ease of implementation.

Targeted Package			
	Existing buildings	**New buildings**	**Equipment and Appliances**
C-8	Commercial Building Retrofit Program		
AE-1			National Standards for Equipment/Appliances
C-7	Public Building Program		
C-8A	Multi-Residential Retrofit Program		
AE-9	Window Market Transformation		
C-13	National Commercial Checkup		
C-2B	Adoption of improved MNECB by Provinces		
AE-5			Energy Star Labelling
C-6	Continuing Education		
C-9	National Building Operator Training		

10 ANALYSIS OF THE OPTIONS PACKAGES

10.1 Introduction

As stated earlier, the individual Measures were initially modelled on a "stand- alone" basis. When combined into Options Packages the impacts of these Measures cannot be simply added together. Certain Measures are independent while others overlap and have reduced impact since they target the same actions. Thus the total impact of the Comprehensive Options Package is less than the sum of the impacts of the stand-alone Measures.

The integration of the Measures to determine the impacts of the Options Packages had the following steps:

- Select Measures that stand alone or are unaffected by others
- Compare the major Measures that overlap, adjust penetration rates and remodel
- Derate Enabling Measures as necessary
- Total the costs and impacts of the unaffected, remodelled and enabling Measures to arrive at costs and impacts of the Options Package.

This integration method yields a composite estimate of the GHG emission reduction and cost impacts that has a higher confidence factor than the individual Measures. It is not possible to add or remove Measures from the Packages and to expect changes in impact comparable to the impacts of the stand-alone Measure.

Data sheets for the two Options Packages are contained in Appendix D, where it can be seen that the greatest opportunities for GHG reductions occur in schools, strip malls and large office buildings mainly in Ontario and Quebec.

10.2 Impact of the Comprehensive Options Package

The Comprehensive Options Package contains all 19 of the Measures selected by the Table and therefore covers all areas of concern - new and existing buildings, related equipment and renewable energy sources. GHG reduction and cost impact of the Comprehensive Options Package are given in the following table.

Emission Reductions in megaTonnes of CO_2		**Costs in current $millions**	
Direct Reductions	3.7	**Capital Costs**	6658
Indirect Reductions	7.8	**Savings**	7733
Total Reductions	11.5	**Net Savings**	1075
		Program Costs	373

Net savings in achieving total reductions to 2010	$7 per Tonne

10.3 Impact of the Targeted Options Package

The Targeted Options Package contains 10 of the Measures selected on the following basis:

- Low public expenditure
- High GHG emission reduction
- Positive cash flow
- Capacity building
- Ease of implementation

GHG reduction and cost impact of the Targeted Options Package are given in the following table.

Emission Reductions in megaTonnes of CO_2		**Costs in current $millions**	
Direct Reductions	3.2	**Capital Costs**	6282
Indirect Reductions	7	**Savings**	6800
Total Reductions	10.1	**Net Savings**	518
		Program Costs	140

Net savings in achieving total reductions to 2010	$4 per Tonne

Note that the Targeted Options Package achieves 88% of the GHG emission reduction of the Comprehensive Options Package but results in a net savings per tonne which is 46% lower.

The Table felt that the Targeted Options Package would be easier to implement than the Comprehensive Package but voiced the following concerns:

- The Targeted Package has a short term perspective without the capacity building features of the Comprehensive package
- The Targeted Package leaves gaps in coverage. Omitting AE-7 eliminates an opportunity for the federal government to demonstrate leadership
- Some of the programs omitted by the Targeted Package are already in place and achieving the desired results.

The Table tried to add some of the Measures that would not qualify under the selection criteria but which could have beneficial impacts beyond 2010. However, it quickly became apparent that there were good reasons to include most of the remaining Measures and the Targeted Package soon approached the Comprehensive Package.

The following sub-section makes an adjustment to the GHG emission reduction impact of the two Options Packages to account for the fact that not all Commercial/Institutional Buildings were modelled .

10.4 Impact of Other Commercial Buildings

Approximately 80% of the commercial/institutional buildings sector was modelled as part of the Measure impact analysis. However, certain types of buildings were difficult to model such as hospitals and their impact has been estimated.

The following table gives an indication of the magnitude of the GHG reduction impact of other commercial buildings as additions to the modelled segments of the commercial/institutional sector. Adding this approximation gives a more accurate estimate of the GHG reductions available from the Options Packages.

	Options Packages	
	Comprehensive megatonnes	Targeted megatonnes
GHG Savings of modelled segments	11.5	10.1
GHG Savings attributed to "other commercial"	1.4	1.2
Total GHG Savings	12.9	11.4

10.5 Impact of the Options Packages on the Business-As-Usual Case including Other Commercial Buildings

The following table shows the GHG emission reduction impact of the two Options Packages on the Business-As-Usual case for the Commercial/Institutional Building Sector including the adjustment for other Commercial Buildings.

Case	**2010 Emissions Compared to 1990 in megatonnes**	**2010 Emissions Compared to BAU in megatonnes**
Business-As-Usual (BAU)	8.7	---
Comprehensive Options Package	-4.2	-12.9
Targeted Options Package	-2.7	-11.4
Kyoto	-3.1	-11.8

The following observations can be made:

- By 2010 emissions in the Business-As-Usual case for the Commercial Sector will be 11.8 megaTonnes greater than the Kyoto target.
- The Comprehensive Options Package reduces the 2010 GHG emissions to 47.8 mT CO_2 equivalent which is 12.9 megaTonnes below the BAU and better than the Kyoto target
- The Targeted Options Package reduces the 2010 GHG emissions to 49.3 mT CO_2 equivalent

which is 11.4 mT below the BAU but does not achieve the the Kyoto target.

The impacts of the options packages are further illustrated in figure 5.1 and 5.2.

Fig.5.1 Option Package Impacts on Business -As-Usual Case

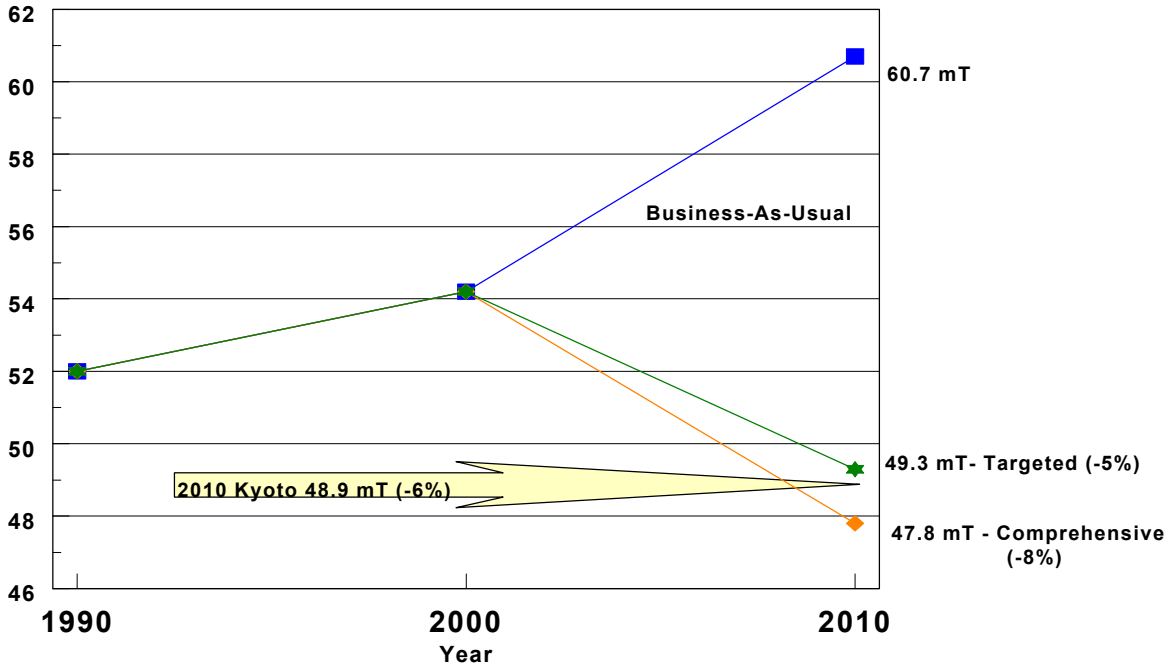
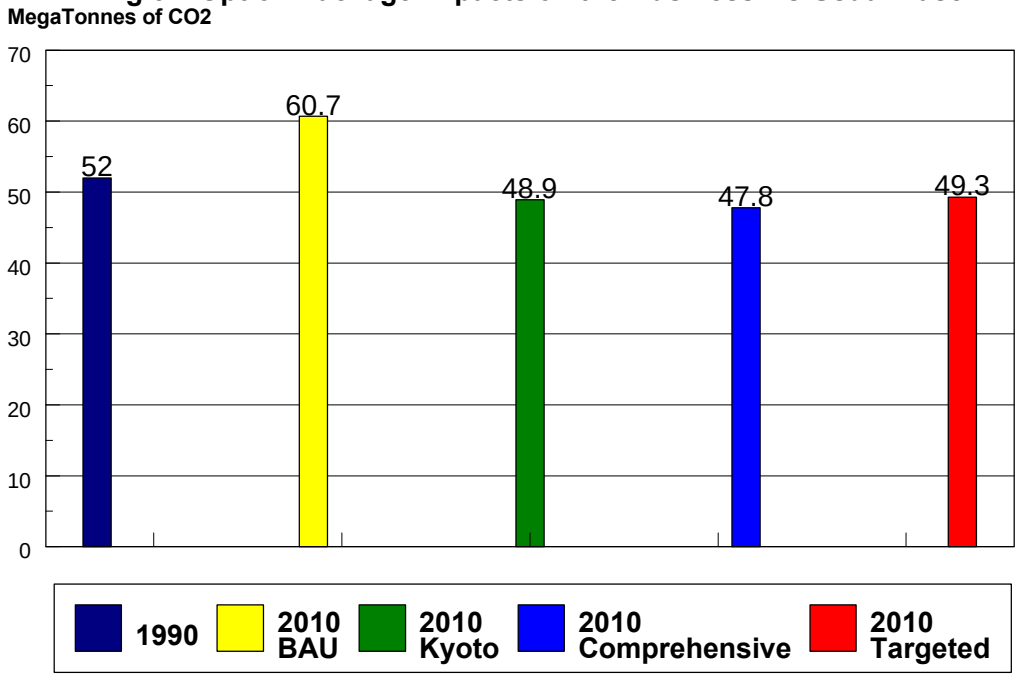


Fig.5.2 Option Package Impacts on the Business-As-Usual Case



10.6 Recommended Options Package

The Commercial/Institutional Buildings Table recommends the Comprehensive Options Package for the following reasons:

- Comprehensive Options package covers all areas of concern expressed by the Table - new and existing buildings, appliances and renewable energy sources.
- The Table believes that a mix of Measures including those that inform/persuade, codes and standards, incentives and demonstrations are the most effective way to achieve GHG reductions in the short term and beyond 2010.
- The Comprehensive Package has the potential to achieve -8% reduction in GHG emissions which exceeds the Kyoto target of -6%.
- The Table has high confidence that the Comprehensive Package can achieve its projected GHG reduction goal.

The Buildings Table is aware that the effectiveness of many of the Measures is based on assumptions concerning program design and implementation and therefore offers the following caveat to its recommendation of the Comprehensive Options Package:

- The Table recognized that the 19 Measures bundled into the Comprehensive Options Package will strain the capacity of governments and industry to design and implement the programs required in the short time frame.
- The Table is particularly concerned about C-11 which relates to federal and provincial tax reductions and it is felt that implementation will be a slow process.
- There is also the need to achieve intergovernmental agreement on issues that have been problems in the past such as implementation of a Model National Energy Code for Buildings.

However, the Table feels that these concerns are surmountable if there is commitment and resolve on the part of stakeholders.

10.7 Responsibility for Implementation

Most of the Measures that are contained in the two Options Packages will form the basis for new or revised GHG emission reduction programs. The design and implementation of these programs is a major issue that will influence the costs and GHG impact of each Measures and the Options.

The following two tables list the Comprehensive and Targeted Options Packages with the Capital and Program Costs of each Measure. The right hand column lists stakeholders in the particular Measure. Uppercase letters are used to designate the agencies responsible for implementing the Measure. Lowercase letters designate agencies who have a role to play to assist those responsible.
In accordance with the following code:

F: Federal Government	P: Provincial Government	I: Energy Management Industry
M: Municipal Government	U: Utilities	

Utilities were the leaders in energy efficiency programs in the period 1980 to 1994 but have reduced their involvement significantly in recent years. However, utilities are in the front line of GHG emission reduction and must be involved in future programs if the desirable objectives are to be achieved. For example, they have a significant role to play in education and outreach to the public and to small and medium enterprises.

The role of industry in achieving GHG emission reductions will be defined by the Industry Table but, some of the Measures need energy management industry input if the resulting programs are to achieve their objectives. For example, Energy Management Firms (EMF) provide a comprehensive turnkey service for energy efficiency improvements including - capital investment, engineering and design, project management, energy maintenance, employee training, etc.

Exhibit 5.3 -Commercial/Institutional Measures - Proposed Responsibilities for Implementation

Measures (in descending order of potential GHG emission reduction)	Capital Cost	Cost to Implement	Financial Incentive	Respons-ibility
C-8 Commercial Building Retrofit Program	1640	34	3	FPMi
AE-1 National Standards Program: Equipment & Appliances	1800	3	0	Fpi
C-7 Public Building Initiative	1755	22	0	Pm
C-11 EE Equipment Tax Measure	1080	12	123	Fp
C-8 A Multi-Residential Retrofit Program	455	38	22	FPMi
AE-9 Window Market Transformation	115	2	20	Fi
AE-7 Government Procurement	740	6	0	FP
C-13 National Commercial Checkup	385	4	0	Fp
C-2 B Improve MNECB	260	8	0	FPMi
AE-5 Energy Star Labelling	245	9	0	Fp
C-4 Commercial New Building Initiative Program (CBIP II)	270	7	39	F
C-6 Continuing Education	195	2	0	Fp
C-9 National Building Operator Training	190	5	0	Fpu
C-5 Commercial Building Design Guidelines/Greenprints	180	5	0	Fpmi
C-3 Advanced Building & Equipment Demonstration Initiative	168	6	0	Fi

Measures (in descending order of potential GHG emission reduction)	Capital Cost	Cost to Implement	Financial Incentive	Respons-ibility
AE-4 Technology Commercialization Program	168	2	0	Fi
C-1 National Building System Labelling/Rating	112	8	0	Fpm
RT-1 Expanded REDI Program	89	4	29	Fi
RT-2 Market Development for Onsite Renewables	40	2	0	Fi

11. LINKAGES TO OTHER TABLES

11.1 Introduction

There are linkages between the scope of the Buildings Table and those of other Tables. The following are areas where overlap occurs:

- **Industry Table** - The Buildings Table analysis covers industrial headquarters housed in commercial office buildings. They do not cover the buildings that house industrial processes. However, some building Table measures (e.g. AE-1 National Standards, Equipment & appliances) will apply in industrial applications. Others (e.g. C-9 Building Operator Training; C-6 Continuing Education etc) could be readily applied to the industrial sector. The Buildings Table has referred these measures to the Industry Table for their consideration. In addition, the upstream oil and gas subgroup of the Industry Table will be provided with the estimated 2010 demand from the Buildings Table for consideration in their production numbers.
- **Municipalities Table** - The Municipalities Table concerns itself with areas of control or influence of municipal government over GHG emissions which are outside the scope of the Buildings Table. However, the Municipalities Table may wish to include some of the Buildings Table Measures.
- **Technology Table** - The Buildings Table has focused on increasing the adoption of commercially available technologies while the Technology Table looks at technologies that have yet to be commercialized.
- **Public Education and Outreach Table** - The PEO Table mandate links with Building Table Measures that relate to education such as C-6 and C-9 and the promotion of renewable energy sources.
- **Enhanced Voluntary Action Table** - Recommendations of the EVA Table impact on the Buildings Table and further study of the EVA Paper is needed to ensure symbiosis.
- **Electricity Table** - need the estimated 2010 demand numbers from the Buildings Table in order to run production numbers.

11.2 Measures for Consideration by Other Tables

A number of Measures identified by the Buildings Table have not been developed further, in recognition that these Measures are better dealt with by other Issue Tables. These Measures are listed below, along with the brief description prepared by the Table:

Measure	Recommendation
RT-4 **Promotion of Green Power Purchases** Application: Electricity supply Description: Modification of existing utility rate structures to allow consumers to purchase a percentage of their electricity generated by renewable energies (at a premium). Also, the wheeling of green power would be accepted in all provinces.	Refer to Electricity Table
O-1 **Environmental Costing of all Energy Supply Sources** Application: General Description: Government-mandated energy pricing adders to account for environmental costs of energy sources	Refer to AMG or appropriate table
O-2 **Level Playing Field for all Energy Sources** Application: General Description: This Measure would ensure that the tax treatment of all energy sources was equalized.	Refer to AMG or appropriate table
O-3 **National Climate Change Loan Fund** Application: General Description: This Measure is essentially a revolving fund(s) designed to provide financing for community level projects that result in significant reduction of GHG emissions. Activities include energy efficiency retrofits and renewable energy installations. The money could be accessed by municipalities and other groups to implement community level activities.	Refer to Municipalities table
O-4A **Climate Change Information Services** Application: Public and private sector individuals and organizations looking for sustainable development, construction, renovation, and technology information Description: "One-stop shopping" at the national level linked to either the community or provincial level for information on residential and commercial EE information, guidelines, and programs	Refer to Public Education and Outreach Table
RT-3 **Promotion of Renewable Energy and Green Power** Application: General Description: Comprehensive promotion and information program. Promotion could include, among other things, a web site to list suppliers, products, resource database, etc. General promotion and information using all media could be provided. Marketing support for the industry could also be included.	Refer to Public Education and Outreach Table

In addition to the measures identified above referred to other Tables, the Buildings Table agreed that transportation-related impacts due to a building's location (e.g. urban versus suburban) can have a

major impact on energy use. It was felt that this matter should be referred to the Municipalities Table since they were better able to address the issue of land use or urban planning.

12. OTHER RECOMMENDATIONS

12.1 Recommendations for Further Work

The following are areas for further development or study arising from the work of the Commercial/Institutional Buildings Table:

- Program design and implementation of the Measures contained in the Comprehensive Options Package will be an area of significant further work if the impacts of the Measures are to be realized.

- Commercial floor space, which is the current activity indicator, is established utilizing a number of unrelated studies and assumptions. There currently is little or no data available to link the energy requirements of the different types and the activity measured by the floor space. It is recommended that a study be established to establish the correlation between the activity in the sector and the energy requirement of the different building types, different fuel types and end-use intensities.

- A mechanism must be put in place to track and report on GHG emission reductions achieved in the Buildings Sector from implementing the Measures.

- Federal government leadership is essential in GHG reduction and there is a need to study public programs underway in other jurisdictions for effective leadership examples. For example, US government agencies only purchase Energy Star Equipment.

- There is a need to further clarify linkages between the Measures proposed by the Buildings Table and those proposed by other Tables, for example, liaison may be needed with the Industry Table to clarify Measures they may want to use for buildings within their mandate. Liaison will also be required with the PEO Table concerning implementation of some of the Buildings Measures such as C-6 Continuing Education, C-9 Building Operator Training, AE-5 Energy Star Labelling and others .

- Embodied energy in construction materials was not considered by the Buildings Table but this is a GHG emission issue that should also be addressed.

PART VI: SUMMARY AND CONCLUSIONS

The Buildings Table was created to develop, analyse and propose options to reduce GHG emissions associated with commercial, institutional and residential buildings. The Commercial/Institutional Buildings Sector was separated from the Residential Sector for ease of analysis and is the focus of this report.

The Commercial/Institutional Buildings Table achieved its objective through a series of meetings and studies that resulted in two packages of Measures known as the Options Packages:

- The Targeted Options Package which includes 10 selected Measures
- The Comprehensive Options Package which includes all 19 of the Measures

The **Targeted Options Package** contains 10 of the Measures selected on the following basis:

- Low public expenditure
- High GHG emission reduction
- Positive cash flow
- Capacity building
- Ease of implementation

The Table expressed the following concerns with the Targeted Options Package:

- The Targeted Package has a short term GHG emission reduction perspective and is weak on capacity building.
- The Targeted Package leaves gaps in coverage. Omitting AE-7 eliminates an opportunity for the federal government to demonstrate leadership
- Some of the programs omitted by the Targeted Package are already in place and achieving the desired results.

Attempts were made to improve the Targeted Package by adding Measures that don't qualify under the selection criteria but which could have beneficial impact beyond 2010. However, the additions soon approached the total list of 19 Measures.

As the result, the Commercial/Institutional Buildings Table recommends the **Comprehensive Options Package** which contains all 19 of the Measures for the following reasons:

- The Comprehensive Package has the potential to achieve -8% reduction in GHG emissions which exceeds the Kyoto target of -6%.
- The Comprehensive Options package covers all areas of concern expressed by the Table - new and existing buildings, appliances and renewable energy sources.
- The Table believes that a mix of Measures including those that inform/persuade, codes and standards, incentives and demonstrations are the most effective way to achieve GHG reductions before and after 2010.

- The Table has high confidence that the Comprehensive Package can achieve its projected GHG reduction goal.

The Buildings Table is aware that the effectiveness of many of the Measures is based on assumptions concerning program design and implementation and therefore offers the following caveat to its recommendation of the Comprehensive Options Package:

- The Table recognized that the 19 Measures bundled into the Comprehensive Options Package will strain the capacity of governments and industry to design and implement the programs required in the short time frame.
- The Table is particularly concerned about C-11 which relates to federal and provincial tax reductions as it is felt that implementation will be a slow process.
- There is also the need to achieve intergovernmental agreement on issues that have been problems in the past such as implementation of a Model National Energy Code for Buildings.

However, the Table feels that these concerns are surmountable if there is sufficient commitment and resolve on the part of stakeholders.

The two Options Packages were analysed and the GHG emission reduction impacts were estimated to be the following:

	2010 Emissions megatonnes	**2010 Emissions Compared to 1990 in percentage**
Business-As-Usual Scenario	60.7	16.7%
Comprehensive Options Package	47.8	-8%
Targeted Options Package	49.3	-5%
Kyoto Target	48.9	-6%

This table shows that in a business-as-usual scenario, the GHG emissions in 2010 from the Commercial Sector will increase 16.7% above the 1990 level (or an unimpressive 22.7% above the Kyoto target). If the Comprehensive Options Package is adopted, it is estimated that a reduction in GHG emissions of 8% below 1990 levels is achievable.

Thus, it can be concluded that the Issue Table for the Commercial/Institutional Buildings Sector has effectively completed its assigned task. The Comprehensive Options Package of Measures recommended by the Table will result in Green House Gas emission reductions in 2010 that exceed the Kyoto target. This Package also provides for reductions beyond 2010 by including a mix of Measures that address many of the barriers to adoption of energy efficiency in buildings of the Commercial/Institutional Sector.

Commercial/Institutional Sector Measures

Note: This Appendix was developed at the Buildings Table meeting held in Vancouver. Later some of the measures were collapsed and/or expanded to the final selection. This list provides the most detail on the original thinking of the Buildings Table.

C-1 National Commercial Building Labeling & Rating System

Application: All existing buildings

Description: Development and promulgation of a multipart rating and labeling system. Provides options to the owner of rating various aspects of performance at different levels of detail. This, for example, would allow users to compare actual operating energy costs per square foot with benchmarks and goals, or to use the system to rate a full range of green criteria.

Sponsor: NRCan

Includes development of:

-Regional Databases
-Benchmarks
-Modular structure for broader acceptance (can use operating costs only for comparison, or add other aspects of sustainable design to the benchmarked criteria at owner/manager=s discretion)
-possibility of integrating with U.S. approach (?)

C-2A Adoption of Model National Energy Code for Buildings by Provinces

Application: All new buildings

Description: Sets in place provincial minimum energy efficiency regulations for new housing construction in provinces that have not yet adopted the MNECB

Sponsor: All provinces except Ontario

Includes:

-Building Official training and/or certification of designers/builders (Vancouver model)
-Reference in the National Building Code reinstated to facilitate adoption
-Renewable technologies included in Code

C-2B Ratchetting Up of Model National Energy Code for Buildings

Application: All new buildings

Description: Increases provincial minimum energy efficiency regulations for new housing construction.

Sponsor: Provinces

Includes: -Post-adoption Aratchetting up@ of code requirements using environmental multiplier
-Updated life-cycle costing analysis to generate requirements (stale assumptions and costing necessitate this)
-Latest technology, including renewables

C-3 Advanced Building and Equipment Demonstration Initiative

Application: New and existing buildings
Description: Enabling measure for long-term improvements in EE
Sponsors: NRCan (CANMET), NRC, Industry partners
Includes: - AAdopt EE@, and C-2000 approaches
-Design assistance/facilitation
-Demonstrations of high performance buildings and use of renewable and EE technology in both new and existing buildings
-Development of guidelines for use of the technology
-Case studies and information dissemination
-Links to other programs for financial assistance

C-4 Commercial New Building Incentive Program (CBIP II)

Application: New Buildings
Description: Extend and expand current CBIP Program
Sponsor: NRCan (OEE)
Includes:
-Extend current program 5 additional years
-Increase incentives and add access to other national and regional financing mechanisms (e.g. green loans/mortgages, National Green Loan Fund, provincial/municipal revolving funds)
-Expand information dissemination/prepare case studies
-Add reward/recognition/profile component

C-5 Commercial Building Design Guidelines/Greenprints

Application: Commercial buildings, including multi-unit residential buildings
Description: Enabling measure tied to Green Building/Climate Change Information Services and commercial building programs
Sponsor: NRCan
Includes compiling (where they exist) or development of:
-Performance-based fee structure info and guidelines
-Retrofit guidelines
-Daylighting, passive solar, landscaping design guidelines (e.g., Illuminating Engineering Society=s Recommended Practice of Daylighting)
-Guidelines for the use of renewable technologies (including GSHPs)
-Guidelines for the use of high performance control systems
-Materials for adding to college and university curriculums (e.g., Vital Signs instructional packages) etc.

C-6 Professional Continuing Education Program

Application: Professional designers and builders
Description: Expansion of provincial association-led programs and university/college continuing education programs for designers & builders
Sponsors: federal & provincial governments, professional associations & educational institutions

Includes:

-Link to Royal Architectural Institute of Canada=s development of a National Practice Program for continuing education
-Sustainable design principles
-Systems design (including controls)
-Equipment selection & sizing
-Renewable energy design (use of renewable technologies)
etc.

C-7 Public Buildings Initiative

Application: Provincial and municipality-owned or funded existing buildings, including schools, health care facilities, etc.

Description: Refocusing, enhancement, and expansion of a public building targeted program along the lines of the Federal Buildings Initiative spin-off for municipal buildings, Energy Innovators - Public, and the New Brunswick Building Initiative

Sponsor: NRCan in conjunction with provincial partners

Includes: -Assessment of barriers to take-up of retrofit initiatives, and development of measures to address them (e.g. decouple operating budgets from capital budgets)
-Use of life-cycle costing to specify and procure EE equipment (e.g. golden carrot program)
-Access to broader range of financing mechanisms (ESCO=s, provincial or regional revolving funds)
-Mandated solar thermal evaluations

C-8 Commercial Building Retrofit Program

Application: Privately-owned existing buildings in the retail, office, hospitality, multi-unit rental residential, and warehouse subsectors, especially buildings under 5,000 square feet

Description: Refocusing, enhancement, and expansion of private sector building targeted program along the lines of the Toronto Better Buildings Partnership, Energy Innovators Plus and the Voluntary Challenge Registry

Sponsor: NRCan (OEE) and provincial partners

Includes: -***Policy*** development and templates for top level - owners/managers (including policies on procurement, training, performance goals)
-***Quantifiable Goal/Target for Improvement*** (based on comparison with operating costs per square foot benchmarks) and include in property managers= performance objectives
-***Financing***: access to broader range of financing mechanisms (ESCO=s, revolving funds, green loans, incentives)
-***Tax Incentives***: faster write-offs for EE equipment and renovation expenditures (Note: tax rules regarding capitalization of renovation expenses need to be clarified)
-***Streamlined application and processing***
-***Operating Cost Tracking*** with software tools (minimum 3 year data

capability) and distribute energy costs to responsibility centres to create awareness. Individual unit metering for tenants should be promoted.
-***Retrofit Options Analysis/Scenario Modeling*** with software tools
-***Case Studies and Information/Website*** (keep messages understandable)
-***Regional Databases*** of operating costs for various buildings archtypes for benchmarking
-***Training/Awareness*** for owners, facility managers, operators, suppliers
-***Rewards/Recognition/Profile*** (e.g. BOMA Earth Award, AInsite@ operator reward program)

C-9 ***National Building Operator Training Program***

Application: Building facility managers and operators
Description: Expansion of Seneca/SAIT community college program nationally with access to both full-time and continuing education applicants
Sponsor: Community colleges and Industry partners
Includes development of:
-Building operation simulation software
-Best Practice guidelines for building operation and management training
-Operator certification
-Procurement practices - promotion of life-cycle costing in equipment selection
-Renewable energy design and evaluation

C-10 ***National or Provincial Green Loan Funds*** **(see also O-3)**

Application: Municipalities, Health Care Facility owners, School Boards, and other owner/managers of publically-owned buildings
Description: Revolving funds modeled after Toronto=s Atmospheric Fund and Saskatchewan Energy Management Program, for the purpose of loans to do EE upgrades and renewables installations for new and existing buildings
Sponsor: Federal and provincial governments
Includes: - Source of funding where capital is not available, but energy savings will cover loan payments
-Eligibility for loan is not tied to building performance
-Is an alternative to the use of ESCOs

C-11 ***EE Equipment Tax Measure***

Application: New and existing buildings
Description: Faster tax write-offs for capital costs of EE equipment, construction, and renovations and/or exemption from GST/PST/HST
Sponsor: Federal government
Includes: -Possible link with equipment covered under a federal and provincial government Agolden carrot@ procurement program
-companion renewable energy measure

C-12 ***Measure to Limit CFC-R11 and CFC-R22***

Application: Coolants regulated under the Montreal Protocol
Description: Accelerate removal of CFCs in existing equipment
Sponsor: Federal (provincial?) Government
Includes: -Regulation or other measures to recover, reuse, and recycle existing refrigerant, to fine-tune equipment and modify it to prevent losses of gas, and to improve compliance with the Montreal Protocol
-Includes development of information/curriculum for operators and managers.

C-13 ***National Commercial Building Checkup Program***

Application: Existing commercial buildings
Description: Technical and monetary support to buildings owners/managers to verify the operation of the buildings (this is not an audit).
Sponsor: Federal and provincial governments
Includes: -Review of operations through existing energy management system (if any)
-Recommendations for operational savings leading to improved comfort and lower energy costs.

C-14 ***Building Permit Feebates****

Application: New commercial buildings
Description: Base building permit fees on the level of energy efficiency of a new building as determined at the plans review state.
Sponsor: Municipal governments
Includes: -Revenue-neutral approach
(a building built to average levels of energy efficiency would pay the same fee as the current level; those which were more energy efficient would pay less; those which were less energy efficient would pay more. The amount of the additional fee or rebate would depend on how far a building was below or above the average, so that the least efficient would pay the greatest fee and the most efficient would have the largest rebate. The "average" would be set each year, based upon the previous year.)

* This needs to be coordinated with the Municipalities Table

Appliance & Equipment Measures

AE-1 ***National Standards Program for Equipment and Appliances***
(To be split into measure for new regulated products vs measure for updates of existing regulations.)

Application: Energy-using equipment and windows
Description: Potentially newly regulated products or higher efficiency levels for currently federally regulated products (minimum EE Levels Based on Life Cycle Costing analysis)
Sponsor: NRCan
Includes: Products listed below

The list represents a preliminary attempt to identify suitable products for minimum efficiency requirements for the period up to 2010.

NB. Items marked with an asterisk (*) indicate the product is currently covered by federal energy efficiency regulations.
Residential:

a). Windows: Implement standard at ER - 13: saves approximately 1PJ per year, accumulating as half of the stock turns over reporting period. Windows represent 15% of sector end use. (Assuming residential energy use is 1300 PJ per year, space heating is 65% or 845 PJ, and heat loss attributed to windows is about 15% or 126PJ, and 5% of windows per year are replaced)
Effective date: 2004

b) Clothes Washers* : 40% improvement over current Unit Energy Consumption (UEC). Sector end use: second biggest demand**.** Effective date: 2004.

c) Refrigerators*: 25 % improvement over current UEC. Appliances represent 15% of sector end use or 210PJ, and refrigerators are the largest energy users in that category. Effective date: 2004.

d) Domestic Hot Water Heaters*: 10-15% improvement for gas fired; gas heaters have10% sector end-use or 159PJ. 20% of residential energy use is for DHW. Gas has 50% of that which can be improved by 10-15%. Effective Date: 2004.

e) Gas Furnaces*: 10% improvement over standard furnace (@ 83% efficiency), which now has approx. 70% of market. Sector End Use (gas heating) is 50% of national space heating, or 434PJ per year, that could be improved by 10%, for a gain of about 30PJ. Effective date: 2005.

f) Air Handling Systems: Reduce ventilation losses by 10%.

Commercial/Institutional:

(g) Architectural Windows: Implement standard of U-value=2.1: saves 0.65PJ annually (based on the number of architectural windows that are sold per year for retrofit and new construction). Effective Date: 2005.

(h) Distribution Transformers: approximately 0.6PJ annually. Auxiliary category (transformers office equipment, electric motors, etc.) comprises 13% of total sector end use.

(i) Certain IR bulbs: 50% of savings previously attributed to incandescent reflector (IR) bulbs. Effective Date: 2000.

(j) Commercial Space Heating, gas-fired: 10% improvement; gas-fired space heating comprises 60% of commercial sector end use . (60% of commercial sector send use is space heating. Approximately 70% of that is gas, that can be improved by 10% or so.) Effective Date: 2003.

(k) Commercial Service Water Boilers: Boilers comprise 7% of commercial sector end use. Possible to obtain an 18% improvement in gas, and 10-20% improvement in electricity run boilers. Effective Date: 2003.

(l) Fluorescent Ballasts*: 20% improvement over current standard. Lighting 15% of commercial sector use, predominantly fluorescent. Effective Date: 2003.

(m) Fluorescent Lamps: Improvement: T8; Effective Date: 2010.

(n) Road Way Lighting. ????

(m) Electric Baseboards: 10% improvement per year possible from better controls. Effective Date: 2008.

(n) Refrigeration Equipment: 10% improvement per year. Effective date: 2008.

(o) Chillers: 10% improvement per year. Effective Date: 2008.

(p) Commercial Washers, Refrigeration, Cooking: To be determined

(q) Large air conditioners: To be determined

AE-2 ***Heat-Pump Combined System***

Application: All new buildings
Description: New measure to promote heat-pump combined systems and/or a code requirement for combined systems in certain jurisdictions
Sponsor: NRCan
Includes: Study to assess the Impact of Resistance Heating Ban Except when Combined with

System of Overall COP of 1.25 (or to be determined)

AE-3 ***Changeout Air-conditioning Programs for Heat Pumps***

Application: Residential air conditioning market (initially)
Description: Measure to convert air conditioning industry over to production of heat pumps
Sponsor: Industry/NRCan/utilities
Includes: -Study to identify regional costs and carbon impacts
-Homeowner awareness program, case studies, sales force training, computational aids, subsidies, etc.

AE-4 ***Technology Commercialization Program (also see C-3 Advanced Building and Equipment Demonstration Program)***

Application: Residential & Commercial/Institutional buildings
Description: New measure to promote technologies such as integrated systems/heat pumps; solar & instantaneous domestic and service water hot water heating systems; lighting(e.g., residential luminaires for residential and 347 volt dimmable ballasts); ground source heat pumps; and other proven technology that have not yet developed a market in Canada.
Sponsor: NRCan, Industry
Includes:
-technology development aimed at reducing production costs
-development of market infrastructure such as quality assurance, distribution channels, service industries
-assessment of market potential

AE-5 ***Energy Star Labelling Program***

Application: Residential and Commercial energy-using equipment
Description: Consumer-oriented labelling of high performance lighting and equipment products.
Sponsor: NRCan and manufacturers
Includes:
-Expansion of US Energy Star Program into Canada.
- E-Star Green Lighting Programs
-Development of electronic and Internet-based efficiency choice tools

AE-6 ***Modify Consumption Taxes to Encourage Purchase of EE Products***

Application: High performance windows and equipment
Description: Remove GST/PST/HST from Energy-Saving Equipment
Sponsor: Federal and provincial governments
Includes:
-Tax relief for qualifying products (would be geared to high performers)
-Information dissemination to explain levels

AE-7 ***Government Procurement Program with Golden Carrot Component***

Application: High efficiency equipment for new and retrofit applications
Description: Public agencies and their partners commit to purchasing only equipment at meets qualifying level of energy efficiency
Sponsor: NRCan, provincial governments, municipal governments, utilities, affiliates (e.g. VCR registrants)
Includes: -Policy
-Specifications
-Information to procurement community
-Outreach marketing to private sector
-Technology development assistance for leading edge products
-Compliance component

AE-8 ***Equipment Leasing Facilitation Program***

Application: Retrofit and new construction (residential and commercial)
Description: Program to facilitate uptake of new technology through leasing arrangements, removing risk factors for owners
Sponsor: Manufacturers or other agent, ESCOs
Includes:
-Study to assess impact on tax system

AE-9 ***Phased Window Market Transformation Program***:

Application: Residential and Commercial new and existing buildings
Description: Five year program to eliminate non-low E double glazing from the Canadian market.
Sponsor: NRCan, provincial governments, industry (manufacturer, supply and installers)
Includes: (a) Revision to CWDMA Certification
(b) High Performance Window Labelling
(c) Financial Incentives (time limited)
(d) Minimum Performance Regulation
(e) Marketing & Public Relations
(f) Distributor spin-off (SPIFF)
(g) Window Sales Force Training
(h) Window Contractor/Installer Training

AE-10 ***Accelerated Equipment Replacement Program*** **- Residential**

Application: Energy-using space and water heating equipment in owner-occupied and rental residential units.
Description: Replace older inefficient equipment with efficient or renewable technologies
Sponsors: Utilities, Manufacturers, ESCOs

AE-11 ***Accelerated Equipment Replacement Program*** **- Commercial/Institutional**

Application: Energy-using space and water heating equipment in commercial buildings, especially those under 5000 sq ft.

Description: Replace older inefficient equipment with efficient or renewable technologies

Sponsors: Utilities, Manufacturers, ESCOs

Renewables Measures

RT-1 Expanded REDI Program.

Currently, the Renewable Energy Deployment Initiative (REDI) program provides a 25% grant up to a maximum $50,000 to eligible businesses and corporations for certain types of solar and biomass heating systems (air and water heating and high efficiency biomass combustion systems of 75 kw or more).

Application: General

Description: Expanded coverage under REDI to include other renewable energy systems and applications (possibly including residential systems such as SDHW, swimming pool heaters and localized photovoltaics) and increased maximum grant level up to, say, $250,000, to provide coverage for large-scale projects (by utilities and others such as a utility SDHW leasing program) costing as much as $1,000,000. The scope would also be expanded to include feasibility funding.

Sponsor: NRCan

Includes:
- Feasibility funding
- Extend duration of current program
- Increase incentives
- Extend scope to other renewable energy systems, including both small-scale and large-scale projects

RT-2 Market Development Program for On-site Renewables

Application: On-site power & heat

Description: Promotion and financing packages for on-site renewable energy technology and fuel cells. Included are roof-top PV grid-connected systems, on-site wind turbines, SDHW, solar make-up air and ventilation systems, etc. Financing would be provided through utility energy bills (including net billing for electricity generating systems), monthly rental/leasing programs, and/or government assistance through innovative mortgage financing, interest-free loans, etc.

Sponsor: Provinces & provincial utilities, federal government

Includes:
- Technology targets, for example, 100,000 residential and 100,000 commercial roof-top PV systems over 3 years
- Promotion through various media

- Utility/homeowner partnerships
- Innovative financing packages including establishment of a ›solar= bank and cooperatives for bulk purchases.

RT-3 **Promotion of Renewable Energy and Green Power**

Application: General
Description: Comprehensive promotion and information program. Promotion could include, among other things, a web site to list suppliers, products, etc. General promotion and information using all media could be provided. Marketing support for the industry could also be included.
Sponsor: NRCan
Includes: -Various renewable technologies, including EE wood fireplaces
- Promotion through various media
- Marketing support for renewables industry
- Renewable resource database, for example, regional windpower potential

RT-4 **Promotion of Green Power Purchases**

Application: Electricity supply
Description: Modification of existing utility rate structures to allow consumers to purchase a percentage of their electricity generated by renewable energies (at a premium). Also, the wheeling of green power would be accepted in all provinces.
Sponsor: Provinces & utilities
Includes: - Utility rate design to permit green power purchases in provinces where generation is normally from non-renewable resources

RT-5 **Faster Write-offs for Renewable Energy Systems.**

Application: General
Description: This is a measure to expand the accelerated tax write-off allowances to cover more renewable energy systems. Currently only a limited number are covered under Class 43.1.
Sponsor: NRCan, Revenue Canada
Includes: - Capital cost allowance for some portion to the installed cost of renewable energy systems
- Development of guidelines for applicants
- Promotion through various media

RT-6 Include Renewable Energy in the Model National Energy Codes and the Canadian Electrical Code

Application: General
Description: This measure would include expansion of the MNEC and the electrical code to explicitly include references to use of renewables. It is believed that more explicit mention in these codes will foster increased use of these technologies.
Sponsor: Federal and provincial governments
Includes:

RT-7 Solar Thermal Evaluations Under Federal/Public Buildings Initiative

Application: All government/public buildings
Description: This measure could be applied under the Federal Buildings Initiative (FBI) and under a similar Public Buildings Initiative (identified as a separate measure in the Commercial sector) and would apply to all government and public buildings. The measure would be a mandated solar-thermal evaluation for the construction of new public buildings and renovations to existing ones. It is expected that new buildings that use a renewable energy supply would contribute 20-30% fewer GHG emissions.
Sponsor: All governments
Includes: - Development of solar thermal design and evaluation criteria
- Promotion of solar evaluation as feature of these initiatives

RT-8 Include Solar Thermal in C-2000 and R-2000 Programs

Application: New high performance commercial and residential buildings
Description: This measure would require that a solar-thermal evaluation be a feature of all C2000 and R2000 projects.
Sponsor: NRCan
Includes: - Development of solar thermal design and evaluation criteria
- Promotion of solar evaluation as feature of these initiatives

RT-9 Public Building Procurement Program

Application: All government/public buildings
Description: This measure would be an extension to the solar thermal evaluations as a means of developing a market for on-site photovoltaic (PV) and fuel cells (grid-connected). Similar procurement programs could be developed at the provincial and municipal levels. Such programs would encourage companies to develop and market products at a commercial scale.
Sponsor:Federal and provincial governments
Includes: - Individual departments to comply with program procurement requirements, eg., a portion of new building energy supply must be by on-site renewable.

RT-10 **Training Program for Use of Renewable Energy Technology**

Application:	General
Description:	This measure would include renewables as part of the course content of training programs provided by the Residential and Commercial sectors. For example, renewable energy courses could be incorporated into existing training programs, such as Seneca College=s Building environmental systems program.
Sponsor:	NRCan and Community colleges and other training providers and their associations for building operators, architects, engineers, and others
Includes:	- Financial support by NRCan - In-kind support (development of training materials) by training organizations - Renewable energy mandatory for professional programs such as mechanical engineering and architecture

Commercial/Institutional Buildings Sector
Appendix B
Table of Contents

Acknowledgments:

We wish to acknowledge at this time that this material is developed from the following sources:

- The “Profile sheets were prepared by Bay Consulting Group utilizing the inputs listed below as well as the minutes and discussions from the various Table meetings.
- The “Data” sheets were prepared by Marbek Resource Consultants Inc. in conjunction with SAR & Sheltair and under Contract to NRCan.
- The “Impact” sheets were prepared by Marbek Resource Consultants Inc. in conjunction with SAR & Sheltair and under contract to NRCan.

Note: The Data sheets are not included in the electronic transmission. They are sent in hard copy and should replace the blank pages in each measure package.

Profile C-8 Commercial Building Retrofit Program

Description	Refocusing, enhancement and expansion of a private sector building program modeled after more successful programs such as the Toronto Better Buildings Partnership (BBP), the Energy innovators plus and the Voluntary Change Registry.
Type of Measure	This is technical assistance, training and includes financial and other supports
Target Stakeholder Group	Building owners, lenders, engineers, equipment manufacturers, property managers & through organizations such as BOMA and CAESCO.
Target Market	Privately owned existing buildings in the retail, office, hospitality, multi-unit residential and warehouse sub-sectors and including large and small buildings.
Time Frame	Should be implemented in a short time frame with provincial and industry support.
Responsibility	NRCan, provinces & municipalities.
Relationship to Other Measures	This is linked to C-1 Labeling & Rating System, RT-1 Expanded REDI, C-9 Operator Training, C-11 EE equipment Tax Measures & C-6 Continuing Education

GHG EMISSION & COST IMPACTS

Emission Reductions in k tonnes of CO_2		**Costs in current $ millions**	
Direct Reductions	1,650	**Capital Costs**	1,640
Indirect Reductions	2,170	**Savings**	2,620
Total Reductions	3,820	**Net Savings**	970
		Program Costs	37

Net savings in achieving reductions ($ per tonne)	18

This measure was modeled for the existing market only and the major contributors to reductions are HE AC equipment, HE DHW equipment and Lighting upgrades. The major segment affected is retail strip malls followed by large offices and Hotels.

There are major cost savings to the user community to offset their investment. There is a relatively low investment in administrative and subsidy costs to ensure the measure meets its penetration targets.

OTHER IMPACTS and IMPLICATIONS

There are no specific regional or international implications identified. In addition the socio-economic study that was carried out, did not identify any major issues.

CONVERGENCE /DIVERGENCE OF STAKEHOLDER'S VIEWS ON THIS MEASURE

The table members are in complete concurrence that this measure is extremely important in this process.

RECOMMENDATIONS

It is recommended by the table that this measure be acted upon in a reasonable period of time.

IMPACTS:	C-8	Commercial Building Retrofit Program	
Impact Category	**IMPACT**		
	Identification	**Characterization**	**Assessment & Comment**
Economic	Affordability for tenants/owners	Net impact on occupancy cost. (Change in capital cost vs net change in utility costs)	• Overall, the data for this Measure show that cost savings exceed expenditures. Therefore, net impacts on affordability are expected to be positive.
	Construction Industry Impacts	Change in demand for related products, equipment and services	• Increased demand for related EE products would increase total industry sales.
		Implications on required industry skill levels	• Continued encouragement of skills improvement. No dramatic changes foreseen.
	Competitive	Increase/decrease in Canadian market share	• No significant effects anticipated.
		Export opportunities	• No significant effects anticipated
	Employment	Jobs created	• Increased direct and indirect jobs in construction and EE equipment supply sectors. Previous employment studies have estimated direct and indirect employment creation from this type of Measure to be in the range of 12 to 15 person years per $million (1999) of expenditure.
	Distribution Effects	Disproportionate effects within a region,"sub sector or social group	All segments and regions benefit; in general, benefits are greatest in central and eastern Canada.
Environ-ment	Atmospheric Effects	Related impacts on other pollutants affecting ambient exterior air quality (e.g., SO2, NO_x, VOC etc.)	• Improved ambient air quality due to reduced emissions of SO_2, NO_x, and particulates released from combustion of fossil fuels on site for space heating and DHW and in electrical generation facilities.
		Related impacts on ozone depleting substances	• Potentially increased emissions of ozone depleting substances from increased use of heat pumps and early retirement of air conditioning and refrigeration equipment.*
	Aquatic Effects	Related impacts on water consumption	• Reduced groundwater and watershed impacts from reduced water consumption.
		Related impacts on amount and toxicity of waste water production/disposal	• Reduced impacts on aquatic environments due to reduced discharge of wastewater flows. • Potentially increased impacts on aquatic environments from discharge of acidic boiler condensate.*
	Terrestrial Effects	Related effects on levels of material consumption	• Potentially increased building material consumption from increased rate of envelope and equipment retrofits, leading to negative ambient air quality, aquatic and terrestrial impacts.*
		Related effects on disposal of toxic materials	• Potentially increased disposal of building materials leading to landfill impacts.* • Potentially increased disposal of toxic materials due to production and disposal of PV panels and transformers.*
		Other	• Decreased damage to crops, forests, other plants and buildings from reduced emission of air pollutants from combustion of fossil fuels for space heating and DHW and in electrical generation facilities.
Health	Indoor and ambient air quality	Related effects on human exposure to indoor and ambient air pollutants	• Reduced exposure to indoor air contaminants (VOC's, particulates, etc.) due to improved ventilation in buildings – leading to decreased incidence of eye irritation, headaches, fatigue, respiratory diseases, and cancer. • Reduced exposure to combustion gases from the increased use of sealed combustion appliances. • Reduced exposure to ambient air contaminants such as ground level ozone, NO_x, SO_2, particulates etc leading to decreased incidence of respiratory symptoms, chronic respiratory disease, and reduced respiratory function.
	Noise	Related effects on human exposure to excessive noise or vibrations	Decreased outside noise from improvements to building envelope

"	" Accidents	" Related effects on human exposure to potential accidents associated with the use and maintenance of the EE equipment etc.	• Potentially increased risk of falling accidents from maintenance of solar DHW and PV systems.*
" S ocial	" Workplace Environment	" Related effects leading to changes in aesthetics of the working environment.	No significant effects expected.

"

***** When this measure is properly implemented, potential negative impacts will be marginal or eliminated.

P r o f i l e A E - 1

National Standards Program: Equipment and Appliances

Description	Regulate additional equipment under the Energy Efficiency Act and/or increase the efficiency levels of currently regulated equipment.
Type of Measure	Regulatory
Target Stakeholder Group	Equipment manufacturers/distributors
Target Market	New and existing buildings both commercial and med/high rise
Time Frame	Slow to implement new regulations and to amend current so plan on 4 years before program is in place then normal replacement for penetration.
Responsibility	NRCan, provinces and equipment manufacturers
Relationship to Other Measures	There was no relationship to other measures identified.

G H G E M I S S I O N & C O S T I M P A C T S

Emission Reductions in k tonnes of CO_2		**Costs in current $ millions**	
Direct Reductions	1,110	**Capital Costs**	1,800
Indirect Reductions	2,100	**Savings**	1,950
Total Reductions	3,210	**Net Savings**	150
		Program Costs	3

Net savings in achieving reductions ($ per tonne)	4

This measure is one of the largest contributors to GHG reductions of the measures selected and has a reasonable savings for the investor.

This measure was modeled for both the new and the existing commercial and med-high rise residential markets. The major contributors to reductions are Plug Loads, Transformers, Lighting upgrades, HE AC Equipment, HE DHW and Windows followed by Boiler Controls . The major segment affected is retail strip malls followed by schools and hotels.

OTHER IMPACTS and IMPLICATIONS

There are no specific regional implications identified. There is need to that standards harmonize with the US & meet other trade laws. In addition the socio-economic study that was carried out, did not identify any major issues.

CONVERGENCE /DIVERGENCE OF STAKEHOLDER'S VIEWS ON THIS MEASURE

The table members are in complete concurrence that this measure is extremely important in this process.

RECOMMENDATIONS

It is recommended by the table that this measure be acted upon in a reasonable period of time.

IMPACTS:	AE-1 National Standards - Equipment & Appliances		
Impact Category	**IMPACT**		
	Identification	**Characterization**	**Assessment & Comment**
Economic	Affordability for tenants/owners	Net impact on occupancy cost. (Change in capital cost vs net change in utility costs)	• Overall, the data for this Measure show that cost savings exceed expenditures. Therefore, net impacts on affordability are expected to be positive.
	Construction Industry Impacts	Change in demand for related products, equipment and services	Increased demand for related EE products would increase total industry sales.
"	"	" Implications on required industry skill levels	" • Continued encouragement of skills improvement. No dramatic changes foreseen.
"	" Competitive	Increase/decrease in Canadian market share	No significant effects expected.
"	"	" Export opportunities	Could provide small boost to export opportunities.
"	" Employment	" Jobs created "	Increased jobs in EE products sector, but overall, no significant effect expected on direct or indirect jobs creation. Given that savings exceed expenditures, job creation through respending effect would be expected.
"	" Distribution Effects	" Disproportionate effects within a region, sub sector or social group "	Positive costs of Measures in offices and shopping centres are offset by negative costs in other segments. Cost of Measure is most beneficial in central and eastern Canada; minor positive cost in Alberta and Manitoba.
" Environ- " ment "	Atmospheric Effects	Related impacts on other pollutants affecting ambient exterior air quality (e.g., SO_2, NO_x, VOC etc.)	• Improved ambient air quality due to reduced emissions of SO_2, NO_x, and particulates released from combustion of fossil fuels on site for space heating and DHW and in electrical generation facilities.
		Related impacts on ozone depleting substances	• Potentially increased emissions of ozone depleting substances from increased use of heat pumps and early retirement of air conditioning and refrigeration equipment.*
	Aquatic Effects	Related impacts on amount and toxicity of waste water production/disposal	• Potentially increased impacts on aquatic environments from discharge of acidic boiler condensate.*
		Other	• Decreased damage to crops, forests, other plants and buildings from reduced emission of air pollutants from combustion of fossil fuels for space heating and DHW and in electrical generation facilities
Health	Indoor and ambient air quality	Related effects on human exposure to indoor and ambient air pollutants	• Reduced exposure to indoor air contaminants (VOC's, particulates, etc.) due to improved ventilation in buildings – leading to decreased incidence of eye irritation, headaches, fatigue, respiratory diseases, and cancer. • Reduced exposure to combustion gases from the increased use of sealed combustion appliances. • Reduced exposure to ambient air contaminants such as ground level ozone, NO_x, SO_2, particulates etc leading to decreased incidence of respiratory symptoms, chronic respiratory disease, and reduced respiratory function.
	Noise	Related effects on human exposure to excessive noise or vibrations	• Decreased outside noise from window improvements.
Social	Workplace Environment	Related effects leading to changes in aesthetics of the working environment.	No significant effects expected.

* When this measure is properly implemented, potential negative impacts will be marginal or eliminated.

Profile

C-7
Public Buildings Initiative

Description	Refocusing, enhancement and expansion of a public building initiative targeted along the lines of Federal Buildings Initiative and the spin-off for municipal buildings and the New Brunswick Building Initiative.
Type of Measure	Includes technical assistance, training & financing measures.
Target Stakeholder Group	Building owners, lenders, developers, engineering, property management
Target Market	Existing non-federal government, institutional buildings
Time Frame	Can be implemented in a short time frame.
Responsibility	NRCan, provinces, municipalities
Relationship to Other Measures	This measure is linked to AE-7 Government procurement and RT-1 Expanded REDI measures.

GHG EMISSION & COST IMPACTS

Emission Reductions in k tonnes of CO_2		**Costs in current $ millions**	
Direct Reductions	1,270	**Capital Costs**	1,755
Indirect Reductions	1,490	**Savings**	1,855
Total Reductions	2,760	**Net Savings**	130
		Program Costs	22

Net savings in achieving reductions ($ per tonne)	3

This measure was modeled for the existing market only and the major contributors to reductions are lighting and HE A/C equipment. By far the largest segment affected is schools with a small impact on large & small offices.

There is only a small positive financial contribution per tonne of GHG but the Administrative and incentive costs are relatively low for the amount of GHG savings.

OTHER IMPACTS and IMPLICATIONS

There are no specific regional or international implications identified.

Other socio-economic impacts are considered to be minor

CONVERGENCE /DIVERGENCE OF STAKEHOLDER'S VIEWS ON THIS MEASURE

The table members are in complete concurrence that this measure is extremely important in this process.

RECOMMENDATIONS

It is recommended by the table that this measure be acted upon in a reasonable period of time.

IMPACTS: C-7 Public Building Initiative			
Impact Category	**IMPACT**		
	Identification	**Characterization**	**Assessment & Comment**
Economic	Affordability for tenants/owners	Net impact on occupancy cost. (Change in capital cost vs net change in utility costs)	• Overall, the data for this Measure show that cost savings exceed expenditures. Therefore, net impacts on affordability are expected to be positive.
	Construction Industry Impacts	Change in demand for related products, equipment and services	• Increased demand for related EE products would increase total industry sales. This Measure is similar to the FBI program which reports annual leveraged private sector expenditures of $75m for each $1m of program expenditure. Related annual energy savings reported by FBI are approximately $10m.
		Implications on required industry skill levels	• Continued encouragement of skills improvement. No dramatic changes foreseen.
	Competitive	Increase/decrease in Canadian market share	• No significant effects anticipated.
		Export opportunities	• No significant effects anticipated
	Employment	Jobs created	• Increased direct and indirect jobs in construction and EE equipment supply sectors. Previous employment studies have estimated direct and indirect employment creation from this type of Measure to be in the range of 12 to 15 person years per $million (1999) of expenditure.
	Distribution Effects	Disproportionate effects within a region, sub sector or social group "	Positive costs of Measures in schools are offset by negative costs in other segments. Positive costs of Measures in western Canada are offset by negative costs in central and eastern Canada.
Environ-ment	Atmospheric Effects	Related impacts on other pollutants affecting ambient exterior air quality (e.g., SO_2, NO_x, VOC etc.)	• Improved ambient air quality due to reduced emissions of SO_2, NO_x, and particulates released from combustion of fossil fuels on site for space heating and DHW and in electrical generation facilities.
		Related impacts on ozone depleting substances	• Potentially increased emissions of ozone depleting substances from increased use of heat pumps and early retirement of air conditioning and refrigeration equipment.*
	Aquatic Effects	Related impacts on water consumption	• Reduced groundwater and watershed impacts from reduced water consumption.
		Related impacts on amount and toxicity of waste water production/disposal	• Reduced impacts on aquatic environments due to reduced discharge of wastewater flows. • Potentially increased impacts on aquatic environments from discharge of acidic boiler condensate.*
	Terrestrial Effects	Related effects on levels of material consumption	• Potentially increased building material consumption from increased rate of envelope and equipment retrofits, leading to negative ambient air quality, aquatic and terrestrial impacts.*
		Related effects on disposal of toxic materials	• Potentially increased disposal of building materials leading to landfill impacts.* • Potentially increased disposal of toxic materials due to production and disposal of PV panels and transformers.*

		Other	• Decreased damage to crops, forests, other plants and buildings from reduced emission of air pollutants from combustion of fossil fuels for space heating and DHW and in electrical generation facilities.

Health	Indoor and ambient air quality	Related effects on human exposure to indoor and ambient air pollutants	• Reduced exposure to indoor air contaminants (VOC's, particulates, etc.) due to improved ventilation in buildings – leading to decreased incidence of eye irritation, headaches, fatigue, respiratory diseases, and cancer. • Reduced exposure to combustion gases from the increased use of sealed combustion appliances. • Reduced exposure to ambient air contaminants such as ground level ozone, NO_x, SO_2, particulates etc leading to decreased incidence of respiratory symptoms, chronic respiratory disease, and reduced respiratory function.
	Noise	Related effects on human exposure to excessive noise or vibrations	• Decreased outside noise from improvements to building envelope.
	Accidents	Related effects on human exposure to potential accidents associated with the use and maintenance of the EE equipment etc.	• Potentially increased risk of falling accidents from maintenance of solar DHW and PV systems.*
Social	Workplace Environment	Related effects leading to changes in aesthetics of the working environment.	• No significant effects expected.

*** When this measure is properly implemented, potential negative impacts will be marginal or eliminated.**

Profile C-8A
Multi-Residential Retrofit Program

Description	Refocusing, enhancement and expansion of a private sector building program modeled after the Toronto Better Buildings Partnership (BBP)
Type of Measure	This is technical assistance, training and financial support
Target Stakeholder Group	Lenders, engineers, property managers, BOMA
Target Market	Existing mid/high rise residential buildings
Time Frame	This should be implemented in a relatively short time frame
Responsibility	NRCan, CMHC, provinces, municipalities.
Relationship to Other Measures	This is linked to C-1 Labeling & Rating System, RT-1 Expanded REDI & C-9 Operator Training

GHG EMISSION & COST IMPACTS

Emission Reductions in k tonnes of CO_2		**Costs in current $ millions**	
Direct Reductions	250	**Capital Costs**	465
Indirect Reductions	650	**Savings**	685
Total Reductions	900	**Net Savings**	230
		Program Costs	60

Net savings in achieving reductions ($ per tonne)	20

GREENHOUSE GAS IMPACT

This measure is one of the mid size contributors to GHG reductions of the measures selected but it has a very positive savings per tonne of GHGs reductions.

This measure was modeled for existing multi unit residential buildings only. The major contributors are HE A/C and HE DHW equipment with contributions from plug loads, transformers, lighting and mid-efficiency boilers.

OTHER IMPACTS and IMPLICATIONS

There are no specific regional or international implications identified. Other socio-economic impacts are considered to be minor

CONVERGENCE /DIVERGENCE OF STAKEHOLDER'S VIEWS ON THIS MEASURE

The table members are in complete concurrence that this measure is extremely important in this process and has a direct connection to measure C-8.

RECOMMENDATIONS

It is recommended by the table that this measure be acted upon in a reasonable period of time.

IMPACTS: C-8A MUR Retrofit			
Impact Category	**IMPACT**		
	Identification	**Characterization**	**Assessment & Comment**
Economic	Affordability for tenants/owners	Net impact on occupancy cost. (Change in capital cost vs net change in utility costs)	• Overall, the data for this Measure show that cost savings exceed expenditures. Therefore, net impacts on affordability are expected to be positive.
	Construction Industry Impacts	Change in demand for related products, equipment and services	• Increased demand for related EE products would increase total industry sales.
		Implications on required industry skill levels	• Continued encouragement of skills improvement. No dramatic changes foreseen.
	Competitive	Increase/decrease in Canadian market share	• No significant effects anticipated.
		Export opportunities	• No significant effects anticipated
	Employment	Jobs created	• Increased direct and indirect jobs in construction and EE equipment supply sectors. Previous employment studies have estimated direct and indirect employment creation from this type of Measure to be in the range of 12 to 15 person years per $million (1999) of expenditure.
	Distribution Effects	Disproportionate effects within a region, sub sector or social group	No significant effects anticipated. Cost of Measure is negative in Atlantic and central Canada and Saskatchewan; positive cost in Manitoba, Alberta and B.C.
Environ-ment	Atmospheric Effects	Related impacts on other pollutants affecting ambient exterior air quality (e.g., SO_2, NO_x, VOC etc.)	• Improved ambient air quality due to reduced emissions of SO_2, NO_x, and particulates released from combustion of fossil fuels on site for space heating and DHW and in electrical generation facilities.
		Related impacts on ozone depleting substances	• Potentially increased emissions of ozone depleting substances from increased use of heat pumps and early retirement of air conditioning and refrigeration equipment*.
	Aquatic Effects	Related impacts on water consumption	• Reduced groundwater and watershed impacts from reduced water consumption.
		Related impacts on amount and toxicity of waste water production/disposal	• Reduced impacts on aquatic environments due to reduced discharge of wastewater flows. • Potentially increased impacts on aquatic environments from discharge of acidic boiler condensate*.
	Terrestrial Effects	Related effects on levels of material consumption	• Potentially increased building material consumption from increased rate of envelope and equipment retrofits, leading to negative ambient air quality, aquatic and terrestrial impacts*.
		Related effects on disposal of toxic materials	• Potentially increased disposal of building materials leading to landfill impacts*. • Potentially increased disposal of toxic materials due to production and disposal of PV panels and transformers*.

		Other	• Decreased damage to crops, forests, other plants and buildings from reduced emission of air pollutants from combustion of fossil fuels for space heating and DHW and in electrical generation facilities.

Health	Indoor and ambient air quality	Related effects on human exposure to indoor and ambient air pollutants	• Reduced exposure to indoor air contaminants (VOC's, particulates, etc.) due to improved ventilation and use of HRV's in buildings – leading to decreased incidence of eye irritation, headaches, fatigue, respiratory diseases, and cancer. • Reduced exposure to combustion gases from the increased use of sealed combustion appliances. • Reduced exposure to ambient air contaminants such as ground level ozone, NO_x, SO_2, particulates etc leading to decreased incidence of respiratory symptoms, chronic respiratory disease, and reduced respiratory function.
	Noise	Related effects on human exposure to excessive noise or vibrations	• Decreased outside noise from improvements to building envelope.
	Accidents	Related effects on human exposure to potential occupational accidents	• Potentially increased risk of falling accidents from maintenance of solar DHW and PV systems*.
Social	Workplace Environment	Related effects leading to changes in aesthetics of the working environment.	• No significant effects anticipated.

***When this measure is properly implemented, potential negative impacts will be marginal or eliminated.**

Profile AE-9
Window Market Transformation Program

Description	This is a five year program to eliminate non-low E double glazing from the Canadian market. .
Type of Measure	The measure is classified as mainly information and promotional with elements of training and financial support. Regulations and incentives could also play a role.
Target Stakeholder Group	window manufacturers, building owners & managers, specifiers & governments.
Target Market	New and existing Commercial & Residential Buildings
Time Frame	This could start very shortly and be fully implemented in a five to eight year time frame.
Responsibility	Will rest with NRCan with support from the provinces and municipalities.
Relationship to Other Measures	C-7 Public Building Initiative C-8 Commercial Building Retrofit Measures

GHG EMISSION & COST IMPACTS

Emission Reductions in k tonnes of CO_2		**Costs in current $ millions**	
Direct Reductions	650	**Capital Costs**	115
Indirect Reductions	250	**Savings**	580
Total Reductions	900	**Net Savings**	465
		Program Costs	22

Net savings in achieving reductions ($ per tonne)	31

This measure, although considered important, is a lesser contributor to reductions of GHG's, on the other hand it has an extremely positive financial contribution per tonne of GHG.

This measure was modeled for the new and existing markets and the linkages to the other measures is important. This measure affects all of the identified segments except shopping centers.

OTHER IMPACTS and IMPLICATIONS

There are no specific regional or international implications identified. In addition the socio-economic study that was carried out, did not identify any major issues.

CONVERGENCE /DIVERGENCE OF STAKEHOLDER'S VIEWS ON THIS MEASURE

The table members are in concurrence that this measure is very important in this process due to the high savings per tonne.

RECOMMENDATIONS

It is recommended by the table that this measure be acted upon in a reasonable period of time.

IMPACTS: AE-9 Window Market Transformation			
Impact Category	**IMPACT**		
	Identification	**Characterization**	**Assessment & Comment**
Economic	Affordability for tenants/owners	Net impact on occupancy cost. (Change in capital cost vs net change in utility costs)	• Overall, the data for this Measure show that cost savings significantly exceed expenditures. Therefore, net impacts on affordability are expected to be very positive.
	Construction Industry Impacts	Change in demand for related products, equipment and services	Potential for very significant boost to Canadian window industry sales.
"	"	" Implications on required industry skill levels	" • Continued encouragement of skills improvement. No dramatic changes foreseen.
"	" Competitive	" Increase/decrease in Canadian market share	Potential for positive spin-offs for Canadian window industry
"	"	" Export opportunities "	Potential for positive spin-offs for Canadian window industry
"	" Employment	" Jobs created "	Increased direct and indirect jobs in construction and window sectors; due to net energy cost savings additional jobs are also expected from respending effect.
"	" Distribution Effects	" Disproportionate effects within a region, sub sector or social group "	Strongly beneficial effect in all regions and building types.
Environ-ment	Atmospheric Effects	Related impacts on other pollutants affecting ambient exterior air quality (e.g., SO_2, NO_x, VOC etc.)	• Improved ambient air quality due to reduced emissions of SO_2, NO_x, and particulates released from combustion of fossil fuels on site for space heating and DHW and in electrical generation facilities.
		Other	• Decreased damage to crops, forests, other plants and buildings from reduced emission of air pollutants from combustion of fossil fuels for space heating and DHW and in electrical generation facilities.
Health	Indoor and ambient air quality	Related effects on human exposure to indoor and ambient air pollutants	• Reduced exposure to indoor air contaminants (VOC's, particulates, etc.) due to improved ventilation in buildings – leading to decreased incidence of eye irritation, headaches, fatigue, respiratory diseases, and cancer. • Reduced exposure to ambient air contaminants such as ground level ozone, NO_x, SO_2, particulates etc leading to decreased incidence of respiratory symptoms, chronic respiratory disease, and reduced respiratory function.
	Noise	Related effects on human exposure to excessive noise or vibrations	• Decreased outside noise from window improvements.
Social	Workplace Environment	Related effects leading to changes in aesthetics of the working environment.	• No significant effects expected.

P r o f i l e A E - 7

Government Procurement Program for High Efficiency Products

Description	Public agencies and their partners commit to purchasing only equipment that meets a qualifying level of energy efficiency. This will ensure that energy efficient products are available and cost effective in the market place.
Type of Measure	Procurement
Target Stakeholder Group	Equipment manufacturers/distributors, building owners and facility managers
Target Market	New and existing commercial buildings.
Time Frame	Could be quick to implement with federal- provincial agreement.
Responsibility	Federal and provincial governments.
Relationship to Other Measures	AE-5 Energy Star Labeling Program, RT-1 Expanded REDI Program & RT-2 Market Deployment of Onsite Renewable.

G H G E M I S S I O N & C O S T I M P A C T S

Emission Reductions in k tonnes of CO_2		**Costs in current $ millions**	
Direct Reductions	215	**Capital Costs**	740
Indirect Reductions	605	**Savings**	580
Total Reductions	820	**Net Savings**	(160)
		Program Costs	6

Net savings in achieving reductions ($ per tonne)	(15)

This measure is one of the lesser contributors to reductions of the measures selected and has a negative contribution to costs and therefore will be difficult to implement.

This measure was modeled for the new and existing market and the major contributors to reductions are Lighting Controls, Condensing Boilers, HE AC equipment and HE DHW equipment. By far the largest segment affected is schools. This is followed by large & small offices.

OTHER IMPACTS and IMPLICATIONS

There are no specific regional or international implications identified. In addition the socio-economic study that was carried out, did not identify any major issues.

CONVERGENCE /DIVERGENCE OF STAKEHOLDER'S VIEWS ON THIS MEASURE

The table members are in concurrence that this measure be carried even with the negative contribution per tonne and the risk of not achieving the predicted participation. .

RECOMMENDATIONS

It is recommended that this measure be acted upon and that the means to achieve more positive savings, be investigated.

IMPACTS: AE-7 Government Procurement for HE Products

Impact Category	IMPACT		
	Identification	**Characterization**	**Assessment & Comment**
Economic	Affordability for tenants/owners	Net impact on occupancy cost. (Change in capital cost vs net change in utility costs)	Overall, the data for this Measure show that expenditures exceed cost savings by about 25%. Therefore, net impacts on affordability are expected to be moderately negative.
"	" Construction Industry Impacts	" Change in demand for related products, equipment and services	Increased demand for related EE products would increase total industry sales.
"	"	" Implications on required industry skill levels	" • Continued encouragement of skills improvement. No dramatic changes foreseen.
"	" Competitive	" Increase/decrease in Canadian market share	No significant effects expected.
"	"	" Export opportunities	Could provide small boost to export opportunities.
"	" Employment	" Jobs created "	Increased jobs in construction and EE equipment sectors; due to costs exceeding savings, reduced disposable income leads to offsetting job loss from respending effect.

"	" Distribution Effects	" Disproportionate effects within a region, sub sector or social group	Effects are limited to offices and schools; costs savings in large offices are offset by increased costs in small offices and schools.
Environ-ment	Atmospheric Effects	Related impacts on other pollutants affecting ambient exterior air quality (e.g., SO2, NO_x, VOC etc.)	• Improved ambient air quality due to reduced emissions of SO_2, NO_x, and particulates released from combustion of fossil fuels on site for space heating and DHW and in electrical generation facilities.
		Relatd impacts on ozone depleting substances	• Potentially increased emissions of ozone depleting substances from increased use of heat pumps and early retirement of air conditioning and refrigeration equipment*.
	Aquatic Effects	Related impacts on amount and toxicity of waste water production/disposal	• Potentially increased impacts on aquatic environments from discharge of acidic boiler condensate*.
		Other	• Decreased damage to crops, forests, other plants and buildings from reduced emission of air pollutants from combustion of fossil fuels for space heating and DHW and in electrical generation facilities.
Health	Indoor and ambient air quality	Related effects on human exposure to indoor and ambient air pollutants	• Reduced exposure to ambient air contaminants such as ground level ozone, NO_x, SO_2, particulates etc leading to decreased incidence of respiratory symptoms, chronic respiratory disease, and reduced respiratory function.
	Accidents	Related effects on human exposure to potential accidents associated with the use and maintenance of the EE equipment etc.	• Potentially increased risk of falling accidents from maintenance of solar DHW and PV systems*.
Social	Workplace Environment	Related effects leading to changes in aesthetics of the working environment.	No significant effects expected.

* When this measure is properly implemented, potential negative impacts will be marginal or eliminated.

Profile

C-13
National Commercial Building Checkup Program

Description	Technical and monetary support to building owners and facility managers to verify the operation of the building
Type of Measure	This is technical assistance, training & includes financial and other supports.
Target Stakeholder Group	Developers, building owners, facility managers & organizations such as BOMA, CHES, etc
Target Market	Existing buildings both commercial and med/high rise
Time Frame	To be determined
Responsibility	NRCan, CMHC & provinces,
Relationship to Other Measures	C-7 Public Building Incentive Program, C-8 Commercial Building Retrofit Program, C-8A MUR Retrofit Program, C-6 Continuing Education & C-9 Building Operator Training.

GHG EMISSION & COST IMPACTS

Emission Reductions in k tonnes of CO_2		**Costs in current $ millions**	
Direct Reductions	320	**Capital Costs**	385
Indirect Reductions	430	**Savings**	518
Total Reductions	750	**Net Savings**	133
		Program Costs	4

Net savings in achieving reductions ($ per tonne)	13

This measure is one of the mid size contributors to GHG reductions of the measures selected and has a positive contribution for the user.

This measure was developed as a multiplier of the measures identified above. The largest segment affected is schools followed by large and small office buildings and retail strip malls.

OTHER IMPACTS and IMPLICATIONS

There are no specific regional or international implications identified.
Other socio-economic impacts are considered to be minor

CONVERGENCE /DIVERGENCE OF STAKEHOLDER'S VIEWS ON THIS MEASURE

The table members are in concurrence that this measure is important in this process.

RECOMMENDATIONS

It is recommended by the table that this measure be acted upon in a reasonable period of time.

IMPACTS:	C-13	National Commercial Check Up	
Impact Category	**IMPACT**		
	Identification	**Characterization**	**Assessment & Comment**
Economic	Affordability for tenants	Net impact on occupancy cost. (Change in capital cost vs net change in utility costs)	• This is an enabling measure designed to increase market penetration of Actions included within Measures C7, C8 and C8A; as such, its impacts are tied to those core Measures. • Overall, the data for this Measure show that the cost savings exceed expenditures. Therefore, net impacts on affordability are expected to be positive.
	Construction Industry Impacts	Change in demand for related products, equipment and services	• As in Measures C7, C8 and C8A, increased demand for related EE products would increase total industry sales.
		Implications on required industry skill levels	• As in Measures C7, C8 and C8A Continued encouragement of skills improvement. No dramatic changes foreseen.
	Competitive	Increase/decrease in Canadian market share	• No significant effects anticipated.
		Export opportunities	• No significant effects anticipated
	Employment	Jobs created	• As in Measures C7, C8 and C8A and RT1 this Measure contributes positively to direct and indirect job creation. Due to cost savings, respending effects would be expected to lead to additional job creation, particularly in the service sectors.
	Distribution Effects	Disproportionate effects within a region, "sub sector or social group	As in Measures C7, C8 and C8A, all segments and regions participate.
Environ-ment	Atmospheric Effects	Related impacts on other pollutants affecting ambient exterior air quality (e.g., SO2, NO_x, VOC etc.)	• Improved ambient air quality due to reduced emissions of SO_2, NO_x, and particulates released from combustion of fossil fuels on site for space heating and DHW and in electrical generation facilities.
		Related impacts on ozone depleting substances	• Potentially increased emissions of ozone depleting substances from increased use of heat pumps and early retirement of air conditioning and refrigeration equipment*.
	Aquatic Effects	Related impacts on water consumption	• Reduced groundwater and watershed impacts from reduced water consumption.
		Related impacts on amount and toxicity of waste water production/disposal	• Reduced impacts on aquatic environments due to reduced discharge of wastewater flows. • Potentially increased impacts on aquatic environments from discharge of acidic boiler condensate*.
	Terrestrial Effects	Related effects on levels of material consumption	• Potentially increased building material consumption from increased rate of envelope and equipment retrofits, leading to negative ambient air quality, aquatic and terrestrial impacts*.
		Related effects on disposal of toxic materials	• Potentially increased disposal of building materials leading to landfill impacts*. • Potentially increased disposal of toxic materials due to production and disposal of PV panels and transformers*.
		• Other	• Decreased damage to crops, forests, other plants and buildings from reduced emission of air pollutants from combustion of fossil fuels for space heating and DHW and in electrical generation facilities.

Health	Indoor and ambient air quality	Related effects on human exposure to indoor and ambient air pollutants	• Reduced exposure to indoor air contaminants (VOC's, particulates, etc.) due to improved ventilation and use of HRV's in buildings – leading to decreased incidence of eye irritation, headaches, fatigue, respiratory diseases, and cancer. • Reduced exposure to combustion gases from the increased use of sealed combustion appliances. • Reduced exposure to ambient air contaminants such as ground level ozone, NO_x, SO_2, particulates etc leading to decreased incidence of respiratory symptoms, chronic respiratory disease, and reduced respiratory function.
	Noise	Related effects on human exposure to excessive noise or vibrations	• Decreased outside noise from improvements to building envelope.
	Accidents	Related effects on human exposure to potential accidents associated with the use and maintenance of the EE equipment etc.	• Potentially increased risk of falling accidents from maintenance of solar DHW and PV systems*.
Social	Workplace Environment	Related effects leading to changes in aesthetics of the working environment.	• No significant effects expected.

* When this measure is properly implemented, potential negative impacts will be marginal or eliminated.

Profile

AE-5
Energy Star Labeling **Program**

Description	Consumer oriented labeling of high performance lighting products and other equipment
Type of Measure	Information, product commercialization
Target Stakeholder Group	Equipment manufacturers/distributors, building owners, engineering/contracting, facility managers and tenants
Target Market	New and existing buildings both commercial and med/high rise
Time Frame	Quick to introduce and should become the norm as with similar EPA program in the USA.
Responsibility	NRCan to introduce the program with support from the provinces and equipment manufacturers to respond.
Relationship to Other Measures	AE-7 Government Procurement Program for Energy Efficient Products C-11 Equipment Tax Measure

GHG EMISSION & COST IMPACTS

Emission Reductions in k tonnes of CO_2		**Costs in current $ millions**	
Direct Reductions	50	**Capital Costs**	245
Indirect Reductions	380	**Savings**	263
Total Reductions	430	**Net Savings**	18
		Program Costs	9

Net savings in achieving reductions ($ per tonne)	4

This measure is one of the smaller contributors to GHG reductions of the measures selected and has a low savings rate for the investment.

This measure was modeled for the new and existing buildings markets and the major contributors to reductions are HE DHW equipment and plug loads. The main segment of the market affected is retail strip malls.

OTHER IMPACTS and IMPLICATIONS

There are no specific regional or international implications identified.
In addition the socio-economic study that was carried out, did not identify any major issues.

CONVERGENCE /DIVERGENCE OF STAKEHOLDER'S VIEWS ON THIS MEASURE

The table members are in concurrence that this measure is important in this process even with low reductions of GHGs.

RECOMMENDATIONS

It is recommended by the table that this measure be acted upon in a reasonable period of time.

IMPACTS: AE- 5 Energy Star Labelling			
Impact Category	**IMPACT**		
	Identification	**Characterization**	**Assessment & Comment**
Economic	Affordability for tenants/owners	Net impact on occupancy cost. (Change in capital cost vs net change in utility costs)	• Overall, the data for this Measure show that cost savings exceed expenditures. Therefore, net impacts on affordability are also expected to be positive.
	Construction Industry Impacts	Change in demand for related products, equipment and services "	Increased demand for related EE products would increase total industry sales.
"	"	" Implications on required industry skill levels	" • Continued encouragement of skills improvement. No dramatic changes foreseen.
"	" Competitive	" Increase/decrease in Canadian market share "	No significant effects expected.
"	"	" Export opportunities "	Could provide small boost to export opportunities.
"	" Employment	" Jobs created "	No significant overall effect expected on direct or indirect jobs creation. Given that savings exceed expenditures, job creation through respending effect would be expected.
"	" Distribution Effects	" Disproportionate effects within a region, sub sector or social group "	Negative cost of Measures in strip malls and hotels offset positive costs in other segments. Cost of Measure is negative in Atlantic, Ontario and Saskatchewan; positive cost in other regions..
Environ-ment	Atmospheric Effects	Related impacts on other pollutants affecting ambient exterior air quality (e.g., SO_2, NO_x, VOC etc.)	• Improved ambient air quality due to reduced emissions of SO_2, NO_x, and particulates released from combustion of fossil fuels on site for space heating and DHW and in electrical generation facilities.
		Related impacts on ozone depleting substances	• Potentially increased emissions of ozone depleting substances from increased use of heat pumps and early retirement of air conditioning and refrigeration equipment*.
	Aquatic Effects	Related impacts on amount and toxicity of waste water production/disposal	• Potentially increased impacts on aquatic environments from discharge of acidic boiler condensate*.
	Terrestrial Effects	Related effects on disposal of toxic materials	• Potentially increased disposal of toxic materials due to production and disposal of PV panels and transformers*.
		Other	• Decreased damage to crops, forests, other plants and buildings from reduced emission of air pollutants from combustion of fossil fuels for space heating and DHW and in electrical generation facilities.

Health	Indoor and ambiant air quality	Related effects on human exposure to indoor and ambient air pollutants	• Reduced exposure to ambient air contaminants such as ground level ozone, NO_x, SO_2, particulates etc leading to decreased incidence of respiratory symptoms, chronic respiratory disease, and reduced respiratory function.
	Accidents	Related effects on human exposure to potential accidents associated with the use and maintenance of the EE equipment etc.	• Potentially increased risk of falling accidents from maintenance of solar DHW and PV systems*.
Social	Workplace Environment	Related effects leading to changes in aesthetics of the working environment.	No significant effects expected.

* When this measure is properly implemented, potential negative impacts will be marginal or eliminated.

Profile

C-4
Commercial New Building Incentive Program (CBIP II)

Description	This measure will extend and expand the current CBIP Program
Type of Measure	Incentive and technical assistance
Target Stakeholder Group	Owners, developers, engineers, contractors
Target Market	New Commercial & med/high rise residential buildings
Time Frame	This could be implemented reasonably quickly especially with the cooperation of the provinces. It may need the MNECB+ in place as a performance yardstick.
Responsibility	NRCan, provinces
Relationship to Other Measures	RT-1 Expanded REDI Program, C-2B Improved Model National Energy Building Code & RT-2 Market Deployment for Onsite Renewables.

GHG EMISSION & COST IMPACTS

Emission Reductions in k tonnes of CO_2		Costs in current $ millions	
Direct Reductions	170	**Capital Costs**	270
Indirect Reductions	250	**Savings**	277
Total Reductions	420	**Net Savings**	7
		Program Costs	46

Net savings in achieving reductions ($ per tonne)	1

This measure is one of the smaller contributors to GHG reductions of the measures selected and has a slightly positive net savings for the investor.

This measure was modeled for the new Commercial and the med/high rise residential markets only and the major contributors to reductions are lighting and HE A/C equipment. All segments of the market are affected with the largest segments affected being retail strip malls, schools and hotels. This measure builds on measure C-2B Improved Model National Energy Building Code.

OTHER IMPACTS and IMPLICATIONS

There are no specific regional or international implications identified. In addition the socio-economic study that was carried out, did not identify any major issues.

CONVERGENCE /DIVERGENCE OF STAKEHOLDER'S VIEWS ON THIS MEASURE

The table members are in concurrence that this measure should proceed.

RECOMMENDATIONS

It is recommended by the table that this measure be acted upon in a reasonable period of time.

IMPACTS: C-4 Commercial New Building Incentive Program (CBIB II)			
Impact Category	**IMPACT**		
	Identification	**Characterization**	**Assessment & Comment**
Economic	Affordability for tenants/owners	Net impact on occupancy cost. (Change in capital cost vs net change in utility costs) "	This is a voluntary, incentive based program; therefore, affordability impacts are expected to be neutral. Overall, the data for this Measure show that expenditures exceed cost savings by about 33%..
"	Construction Industry Impacts	Change in demand for related products, equipment and services"	Increased demand for related EE products would increase total industry sales.
"	"	" Implications on required industry skill levels	" • Continued encouragement of skills improvement.
"	Competitive	Increase/decrease in Canadian market share "	No significant effects expected.
"	"	" Export opportunities "	Could provide small boost to export opportunities.
"	" Employment	" Jobs created " "	Increased jobs in the construction and equipment supply sectors. Decreased jobs (expected to be concentrated in service sectors) due to reduced disposable incomes (assuming incentives are funded through general taxes).

"	" Distribution Effects	" Disproportionate effects within a region, sub' sector or social group	No significant effects beyond those noted for employment.
Environ-ment	Atmospheric Effects	Related impacts on other pollutants affecting ambient exterior air quality (e.g., SO_2, NO_x, VOC etc.)	• Improved ambient air quality due to reduced emissions of SO_2, NO_x, and particulates released from combustion of fossil fuels on site for space heating and DHW and in electrical generation facilities.
	Terrestrial Effects	Other	• Decreased damage to crops, forests, other plants and buildings from reduced emission of air pollutants from combustion of fossil fuels for space heating and DHW and in electrical generation facilities.
Health	Indoor and ambient air quality	Related effects on human exposure to indoor and ambient air pollutants	• Decreased exposure to indoor air contaminants (VOC's, particulates, etc.) due to minimum ventilation rate design requirements - leading to decreased incidence of eye irritation, headaches, fatigue, respiratory diseases, and cancer. • Reduced exposure to ambient air contaminants such as ground level ozone, NO_x, SO_2, particulates etc leading to decreased incidence of respiratory symptoms, chronic respiratory disease, and reduced respiratory function.
	Noise	Related effects on human exposure to excessive noise or vibrations	• Decreased outside noise from improvements to building envelope.
Social	Workplace Environment	Related effects leading to changes in aesthetics of the working environment.	

Profile C - 6

Professional Continuing Education Program

Description	This is an expansion of provincial association led programs and university/college continuing education programs for designers & builders
Type of Measure	Training, education
Target Stakeholder Group	Building owners, property managers, tenants, BOMA & Building engineers and contractors
Target Market	Mainly existing buildings (large & small) in the commercial/institutional and mid high rise residential.
Time Frame	This could start very shortly and be fully implemented in a five to eight year time frame.
Responsibility	NRCan, Provinces supported by Associations & Educational Institutions
Relationship to Other Measures	C-7 Public Buildings Incentive Program, C-8 Commercial Building Retrofit, C-8A Multi Res Retrofit, RT -1 Expanded REDI Program & C-9 Operator Training.

GHG EMISSION & COST IMPACTS

Emission Reductions in k tonnes of CO_2		Costs in current $ millions	
Direct Reductions	160	**Capital Costs**	195
Indirect Reductions	220	**Savings**	265
Total Reductions	380	**Net Savings**	70
		Program Costs	2

Net savings in achieving reductions ($ per tonne)	12

This measure is one of the smaller contributors to GHG reductions of the measures selected but it has a reasonably positive contribution to reductions/tonne.

This measure was developed as a multiplier of the measures identified above. All segments of the market are affected with the largest segments affected being schools, offices and retail strip malls.

OTHER IMPACTS and IMPLICATIONS

There are no specific regional or international implications identified. In addition the socio-economic study that was carried out, did not identify any major issues.

CONVERGENCE /DIVERGENCE OF STAKEHOLDER'S VIEWS ON THIS MEASURE

The table members are in concurrence that this measure is important in this process.

RECOMMENDATIONS

It is recommended by the table that this measure be acted upon in a reasonable period of time.

IMPACTS:	C-6	Continuing Education	
Impact Category	**IMPACT**		
	Identification	**Characterization**	**Assessment & Comment**
Economic	Affordability for tenants	Net impact on occupancy cost. (Change in capital cost vs net change in utility costs)	• This is an enabling measure designed to increase market penetration of Actions included within Measures C7, C8, C8A and RT1 ; as such, its impacts are tied to those core measures. • Overall, the data for this Measure show that the cost savings exceed expenditures. Therefore, net impacts on affordability are expected to be positive.
	Construction Industry Impacts	Change in demand for related products, equipment and services	• As in Measures C7, C8 and C8A and RT1, increased demand for related EE and solar products would increase total industry sales.
		Implications on required industry skill levels	• As in Measures C7, C8 and C8A and RT1, continued skills improvement would be promoted. No dramatic changes foreseen.
	Competitive	Increase/decrease in Canadian market share	• No significant effects anticipated.
		Export opportunities	• No significant effects anticipated
	Employment	Jobs created	• As in Measures C7, C8 and C8A and RT1 this Measure contributes positively to direct and indirect job creation. Due to cost savings, respending effects would be expected to lead to additional job creation, particularly in the service sectors.

	Distribution Effects	Disproportionate effects within a region, sub sector or social group	As in Measures C7, C8, C8A and RT1, all segments and regions benefit.
Environment	Atmospheric Effects	Related impacts on other pollutants affecting ambient exterior air quality (e.g., SO_2, NO_x, VOC etc.)	• Improved ambient air quality due to reduced emissions of SO_2, NO_x, and particulates released from combustion of fossil fuels on site for space heating and DHW and in electrical generation facilities.
		Related impacts on ozone depleting substances	• Potentially increased emissions of ozone depleting substances from increased use of heat pumps and early retirement of air conditioning and refrigeration equipment*.
	Aquatic Effects	Related impacts on water consumption	• Reduced groundwater and watershed impacts from reduced water consumption.
		Related impacts on amount and toxicity of waste water production/disposal	• Reduced impacts on aquatic environments due to reduced discharge of wastewater flows. • Potentially increased impacts on aquatic environments from discharge of acidic boiler condensate*.
	Terrestrial Effects	Related effects on levels of material consumption	• Potentially increased building material consumption from increased rate of envelope and equipment retrofits, leading to negative ambient air quality, aquatic and terrestrial impacts*.
		Related effects on disposal of toxic materials	• Potentially increased disposal of building materials leading to landfill impacts*. • Potentially increased disposal of toxic materials due to production and disposal of PV panels and transformers*.
		Other	• Decreased damage to crops, forests, other plants and buildings from reduced emission of air pollutants from combustion of fossil fuels for space heating and DHW and in electrical generation facilities.

Health	Indoor air quality	Related effects on human exposure to indoor air pollutants	• Reduced exposure to indoor air contaminants (VOC's, particulates, etc.) due to improved ventilation and use of HRV's in buildings – leading to decreased incidence of eye irritation, headaches, fatigue, respiratory diseases, and cancer. • Reduced exposure to combustion gases from the increased use of sealed combustion appliances. • Reduced exposure to ambient air contaminants such as ground level ozone, NO_x, SO_2, particulates etc leading to decreased incidence of respiratory symptoms, chronic respiratory disease, and reduced respiratory function.
	Noise	Related effects on human exposure to excessive noise or vibrations	• Decreased outside noise from improvements to building envelope
	Accidents	Related effects on human exposure to potential occupational accidents	• Potentially increased risk of falling accidents from maintenance of solar DHW and PV systems*.
Social	Workplace Environment	Related effects leading to changes in aesthetics of the working environment.	• No significant effects expected.

* When this measure is properly implemented, potential negative impacts will be marginal or eliminated.

Profile **C-9** **National Building Operator Training Program**

Description	Expansion of Seneca/SAIT community college program to the national level with access to both full-time and continuing education programs
Type of Measure	Training and certification
Target Stakeholder Group	Facility managers, operators & tenants of existing buildings.
Target Market	Existing commercial/institutional and multi-unit residential buildings
Time Frame	Be guided by the response to other Seneca/SAIT programs
Responsibility for realization	Federal government. CMHC, Provinces and community colleges
Relationship to Other Measures	C-7 Public Building Incentive Program, C-8 Commercial Building Retrofit Program and C- 8A Multi Unit Residential Program

GHG EMISSION & COST IMPACTS

Emission Reductions in k tonnes of CO_2		**Costs in current $ millions**	
Direct Reductions	155	**Capital Costs**	190
Indirect Reductions	215	**Savings**	260
Total Reductions	370	**Net Savings**	70
		Program Costs	5

Net savings in achieving reductions ($ per tonne)	13

This measure is one of the smaller contributors to GHG reductions of the measures selected but it has a reasonable contribution to savings per tonne.

This measure was developed as a multiplier of the measures identified above. All segments of the market are affected with the largest segments affected being schools, large offices and strip malls.

OTHER IMPACTS and IMPLICATIONS

There are no specific regional or international implications identified. In addition the socio-economic study that was carried out, did not identify any major issues.

CONVERGENCE /DIVERGENCE OF STAKEHOLDER'S VIEWS ON THIS MEASURE

The table members are in concurrence that this measure is important in this process.

RECOMMENDATIONS

It is recommended by the table that this measure be acted upon in a reasonable period of time.

IMPACTS:	C-9	National Building Operator Training	
Impact Category	**IMPACT**		
	Identification	**Characterization**	**Assessment & Comment**
Economic	Affordability for tenants	Net impact on occupancy cost. (Change in capital cost vs net change in utility costs)	• This is an enabling measure designed to increase market penetration of Actions included within Measures C7, C8 and C8A ; as such, its impacts are tied t those core measures. • Overall, the data for this Measure show that the cost savings exceed expenditures. Therefore, net impacts on affordability are expected to be positive.
	Construction Industry Impacts	Change in demand for related products, equipment and services	• As in Measures C7, C8 and C8A increased demand for related EE products would increase total industry sales.
		Implications on required industry skill levels	• As in Measures C7, C8 and C8A continued skills improvement would be promoted. No dramatic changes foreseen.
	Competitive	Increase/decrease in Canadian market share	• No significant effects anticipated.
		Export opportunities	• No significant effects anticipated
	Employment	Jobs created	• As in Measures C7, C8 and C8A this Measure contributes positively to direct and indirect job creation. Due to cost savings, respending effects would be expected to lead to additional job creation, particularly in the service sectors.
	Distribution Effects	Disproportionate effects within a regiðn, sub sector or social group	As in Measures C7, C8, and C8A , all segments and regions benefit.
Environ-ment	Atmospheric Effects	Related impacts on other pollutants affecting ambient exterior air quality (e.g., SO_2, NO_x, VOC etc.)	• Improved ambient air quality due to reduced emissions of SO_2, NO_x, and particulates released from combustion of fossil fuels on site for space heating and DHW and in electrical generation facilities.
		Related impacts on ozone depleting substances	• Potentially increased emissions of ozone depleting substances from increased use of heat pumps and early retirement of air conditioning and refrigeration equipment*.
	Aquatic Effects	Related impacts on water consumption	• Reduced groundwater and watershed impacts from reduced water consumption.
		Related impacts on amount and toxicity of waste water production/disposal	• Reduced impacts on aquatic environments due to reduced discharge of wastewater flows. • Potentially increased impacts on aquatic environments from discharge of acidic boiler condensate*.
	Terrestrial Effects	Related effects on levels of material consumption	• Potentially increased building material consumption from increased rate of envelope and equipment retrofits, leading to negative ambient air quality, aquatic and terrestrial impacts*.
		Related effects on disposal of toxic materials	• Potentially increased disposal of building materials leading to landfill impacts*. • Potentially increased disposal of toxic materials due to production and disposal of PV panels and transformers*.
		Other	• Decreased damage to crops, forests, other plants and buildings from reduced emission of air pollutants from combustion of fossil fuels for space heating and DHW and in electrical generation facilities.

Health	Indoor and ambient air quality	Related effects on human exposure to indoor and ambient air pollutants	• Reduced exposure to indoor air contaminants (VOC's, particulates, etc.) due to improved ventilation and use of HRV's in buildings – leading to decreased incidence of eye irritation, headaches, fatigue, respiratory diseases, and cancer. • Reduced exposure to combustion gases from the increased use of sealed combustion appliances. • Reduced exposure to ambient air contaminants such as ground level ozone, NO_x, SO_2, particulates etc leading to decreased incidence of respiratory symptoms, chronic respiratory disease, and reduced respiratory function.
	Noise	Related effects on human exposure to excessive noise or vibrations	• Decreased outside noise from improvements to building envelope.
	Accidents	Related effects on human exposure to potential occupational accidents	• Potentially increased risk of falling accidents from maintenance of solar DHW and PV systems*.
Social	Workplace Environment	Related effects leading to changes in aesthetics of the working environment.	• No significant effects anticipated.

* When this measure is properly implemented, potential negative impacts will be marginal or eliminated.

Profile

C-5
Commercial Building Design Guidelines/Green Prints

Description	This is an enabling measure tied to Green Building/Climate change information services and commercial building programs.
Type of Measure	Technical assistance, finance and information
Target Stakeholder Group	Building owners, developers, property managers & engineers and associations such as BOMA
Target Market	New and existing Commercial & med/high rise residential buildings
Time Frame	This measure can be implemented in a relatively short time frame.
Responsibility	NRCan, CMHC, provinces & municipalities
Relationship to Other Measures	C-7 Public Building Incentive Program, C-8 Commercial Building Retrofit Program, C-8A MUR Retrofit Program, RT-1 Expanded REDI Program & C-4 Commercial New Buildings Incentive Program (CBIP II)

GHG EMISSION & COST IMPACTS

Emission Reductions in k tonnes of CO_2		**Costs in current $ millions**	
Direct Reductions	140	**Capital Costs**	180
Indirect Reductions	190	**Savings**	230
Total Reductions	330	**Net Savings**	50
		Program Costs	5

Net savings in achieving reductions ($ per tonne)	10

This measure is one of the smaller contributors to GHG reductions of the measures selected, but it has a good savings per tonne.

This measure was developed as a multiplier of the measures identified above. The largest segment affected is schools followed by large and small office buildings and strip malls.

OTHER IMPACTS and IMPLICATIONS

There are no specific regional or international implications identified.
Other socio-economic impacts are considered to be minor

CONVERGENCE /DIVERGENCE OF STAKEHOLDER'S VIEWS ON THIS MEASURE

The table members are in concurrence that this measure is important in this process.

RECOMMENDATIONS

It is recommended by the table that this measure be acted upon in a reasonable period of time.

IMPACTS:	C-5	Building Design Guidelines/Greenprints	
Impact Category	**IMPACT**		
	Identification	**Characterization**	**Assessment & Comment**
Economic	Affordability for tenants	Net impact on occupancy cost. (Change in capital cost vs net change in utility costs)	• This is an enabling measure designed to increase market penetration of Actions included within Measures C4, C7, C8, C8A and RT1; as such, its impacts are tied to those core measures. • Overall, the data for this Measure show that cost savings exceed expenditures. Therefore, net impacts on affordability are expected to be positive.
	Construction Industry Impacts	Change in demand for related products, equipment and services	• As in Measures C4, C7, C8 and C8A and RT1, increased demand for related EE and solar products would increase total industry sales.
		Implications on required industry skill levels	• As in Measures C4, C7, C8 and C8A and RT1, continued skills improvement would be promoted. No dramatic changes foreseen.
	Competitive	Increase/decrease in Canadian market share	• No significant effects anticipated.
		Export opportunities	• No significant effects anticipated
	Employment	Jobs created	• As in Measures C4, C7, C8 and C8A and RT1 this Measure contributes positively to direct and indirect job creation. Due to cost savings, respending effects would be expected to lead to additional job creation, particularly in the service sectors.
	Distribution Effects	Disproportionate effects within a region, sub sector or social group	As in Measures C7, C8, C8A and RT1, all segments and regions benefit.
Environ-ment	Atmospheric Effects	Related impacts on other pollutants affecting ambient exterior air quality (e.g., SO_2, NO_x, VOC etc.)	• Improved ambient air quality due to reduced emissions of SO_2, NO_x, and particulates released from combustion of fossil fuels on site for space heating and DHW and in electrical generation facilities.
		Related impacts on ozone depleting substances	• Potentially increased emissions of ozone depleting substances from increased use of heat pumps and early retirement of air conditioning and refrigeration equipment*.
	Aquatic Effects	Related impacts on water consumption	• Reduced groundwater and watershed impacts from reduced water consumption.
		Related impacts on amount and toxicity of waste water production/disposal	• Reduced impacts on aquatic environments due to reduced discharge of wastewater flows. • Potentially increased impacts on aquatic environments from discharge of acidic boiler condensate*.
	Terrestrial Effects	Related effects on levels of material consumption	• Potentially increased building material consumption from increased rate of envelope and equipment retrofits, leading to negative ambient air quality, aquatic and terrestrial impacts*.
		Related effects on disposal of toxic materials	• Potentially increased disposal of building materials leading to landfill impacts*. • Potentially increased disposal of toxic materials due to production and disposal of PV panels and transformers*.
		Other	• Decreased damage to crops, forests, other plants and buildings from reduced emission of air pollutants from combustion of fossil fuels for space heating and DHW and in electrical generation facilities.

Health	Indoor and ambient air quality	Related effects on human exposure to indoor and ambient air pollutants	• Reduced exposure to indoor air contaminants (VOC's, particulates, etc.) due to improved ventilation and use of HRV's in buildings – leading to decreased incidence of eye irritation, headaches, fatigue, respiratory diseases, and cancer. • Reduced exposure to combustion gases from the increased use of sealed combustion appliances. • Reduced exposure to ambient air contaminants such as ground level ozone, NO_x, SO_2, particulates etc leading to decreased incidence of respiratory symptoms, chronic respiratory disease, and reduced respiratory function.
	Noise	Related effects on human exposure to excessive noise or vibrations	• Decreased outside noise from improvements to building envelope.
	Accidents	Related effects on human exposure to potential accidents associated with the use and maintenance of the EE equipment etc.	• Potentially increased risk of falling accidents from maintenance of solar DHW and PV systems*.
Social	Workplace Environment	Related effects leading to changes in aesthetics of the working environment.	• No significant effects anticipated.

* When this measure is properly implemented, potential negative impacts will be marginal or eliminated.

Profile

C-3
Advanced Building & Equipment Demonstration Initiative

Description	This is an enabling measure for long term improvements in energy efficiency
Type of Measure	Demonstration
Target Stakeholder Group	Building owners, developers, engineering, contracting, manufacturers
Target Market	New and existing Commercial & med/high rise residential buildings
Time Frame	This will take time to establish, implement and then to affect change in established habits.
Responsibility	NRCan, CMHC, Provinces,
Relationship to Other Measures	C 7 Public Building Incentive Program, C 8 Commercial Building Retrofit Program, C 8A MUR Retrofit Program and C 4 CBIP II, AE-1 Standards for Equipment & Appliances.

GHG EMISSION & COST IMPACTS

Emission Reductions in k tonnes of CO_2		Costs in current $ millions	
Direct Reductions	135	**Capital Costs**	168
Indirect Reductions	185	**Savings**	222
Total Reductions	320	**Net Savings**	54
		Program Costs	6

Net savings in achieving reductions ($ per tonne)	12

This measure is one of the smaller contributors to GHG reductions of the measures selected and has a reasonably positive contribution to reductions/tonne.

This measure was developed as a multiplier of the measures identified above. All segments of the market are affected with the largest segments affected being schools, large offices and strip malls.

OTHER IMPACTS and IMPLICATIONS

There are no specific regional implications identified. There is need for standards to harmonize with the US & meet other trade laws. In addition the socio-economic study that was carried out, did not identify any major issues.

CONVERGENCE /DIVERGENCE OF STAKEHOLDER'S VIEWS ON THIS MEASURE

The table members are in concurrence that this measure is important in this process.

RECOMMENDATIONS

It is recommended by the table that this measure be acted upon in a reasonable period of time.

IMPACTS: C-3 Advanced Building & Equipment Demonstration Initiative			
Impact Category	**IMPACT**		
	Identification	**Characterization**	**Assessment & Comment**
Economic	Affordability for tenants/owners	Net impact on occupancy cost. (Change in capital cost vs net change in utility costs)	• This is an enabling measure designed to increase market penetration of Actions included within Measures C4, C7, C8 and C8A; as such its impacts are tied to those core measures • Overall, the data for this Measure show that the cost savings exceed expenditures. Therefore, net impacts on affordability are expected to be positive.
	Construction Industry Impacts	Change in demand for related products, equipment and services	See Measures C4, C7, C8 and C8A
"	"	" Implications on required industry skill levels	See Measures C4, C7, C8 and C8A
"	" Competitive	" Increase/decrease in Canadian market share	See Measures C4, C7, C8 and C8A
"	"	" Export opportunities	See Measures C4, C7, C8 and C8A
"	" Employment	" Jobs created "	No significant effects expected.
"	" Distribution Effects	" Disproportionate effects within a region, sub sector or social group	No significant effects expected.
Environ-ment	Atmospheric Effects	Related impacts on other pollutants affecting ambient exterior air quality (e.g., SO2, NO_x, VOC etc.)	• Improved ambient air quality due to reduced emissions of SO_2, NO_x, and particulates released from combustion of fossil fuels on site for space heating and DHW and in electrical generation facilities.
		Related impacts on ozone depleting substances	• Potentially increased emissions of ozone depleting substances from increased use of heat pumps and early retirement of air conditioning and refrigeration equipment*.
	Aquatic Effects	Related impacts on water consumption	• Reduced groundwater and watershed impacts from reduced water consumption.
		Related impacts on amount and toxicity of waste water production/disposal	• Reduced impacts on aquatic environments due to reduced discharge of wastewater flows. • Potentially increased impacts on aquatic environments from discharge of acidic boiler condensate*.
	Terrestrial Effects	Related effects on levels of material consumption	• Potentially increased building material consumption from increased rate of envelope and equipment retrofits, leading to negative ambient air quality, aquatic and terrestrial impacts*.
		Related effects on disposal of toxic materials	• Potentially increased disposal of building materials leading to landfill impacts*. • Potentially increased disposal of toxic materials due to production and disposal of PV panels and transformers*.
		Other	• Decreased damage to crops, forests, other plants and buildings from reduced emission of air pollutants from combustion of fossil fuels for space heating and DHW and in electrical generation facilities.

Health	Indoor and ambient air quality	Related effects on human exposure to indoor and ambient air pollutants	• Reduced exposure to indoor air contaminants (VOC's, particulates, etc.) due to improved ventilation and use of HRV's in buildings – leading to decreased incidence of eye irritation, headaches, fatigue, respiratory diseases, and cancer. • Reduced exposure to combustion gases from the increased use of sealed combustion appliances. • Reduced exposure to ambient air contaminants such as ground level ozone, NO_x, SO_2, particulates etc leading to decreased incidence of respiratory symptoms, chronic respiratory disease, and reduced respiratory function.
	Noise	Related effects on human exposure to excessive noise or vibrations	• Decreased outside noise from improvements to building envelope
	Accidents	Related effects on human exposure to potential occupational accidents	• Potentially increased risk of falling accidents from maintenance of solar DHW and PV systems*.
Social	Workplace Environment	Related effects leading"to changes in aesthetics of the working environment.	No significant effects expected.

* When this measure is properly implemented, potential negative impacts will be marginal or eliminated.

Profile

AE-4
Technology Commercialization Program

Description	New program to promote the use of technologies such as integrated systems/heat pumps, solar and instantaneous domestic and service hot water heating systems, lighting with dimmable ballasts, ground source heat pumps, and other proven technologies that need help to develop a market
Type of Measure	Product commercialization
Target Stakeholder Group	Equipment manufacturers/distributors and engineering and contracting organizations
Target Market	New and existing buildings both commercial and med/high rise
Time Frame	To be determined
Responsibility	NRCan, NRC & provinces.
Relationship to Other Measures	C-7 Public Building Incentive Program, C-8 Commercial Building Retrofit Program, C-8A MUR Retrofit Program and C-4 CBIP II

GHG EMISSION & COST IMPACTS

Emission Reductions in k tonnes of CO_2		Costs in current $ millions	
Direct Reductions	130	**Capital Costs**	168
Indirect Reductions	190	**Savings**	222
Total Reductions	320	**Net Savings**	54
		Program Costs	2

Net savings in achieving reductions ($ per tonne)	12

This measure is one of the very small contributors to GHG reductions of the measures selected but still is a positive contributor to savings.

This measure was developed as a multiplier of the measures identified above. All segments of the market are affected with the largest segments affected being schools, large offices and strip malls.

OTHER IMPACTS and IMPLICATIONS

There are no specific regional or international implications identified.
Other socio-economic impacts are considered to be minor

CONVERGENCE /DIVERGENCE OF STAKEHOLDER'S VIEWS ON THIS MEASURE

The table members are in complete concurrence that this measure is important in this process.

RECOMMENDATIONS

It is recommended by the table that this measure be acted upon in a reasonable period of time.

IMPACTS: AE-4 Technology Commercialization Program			
Impact Category	**IMPACT**		
	Identification	**Characterization**	**Assessment & Comment**
Economic	Affordability for tenants	Net impact on occupancy cost. (Change in capital cost vs net change in utility costs)	• This is an enabling measure designed to increase market penetration of Actions included within Measures C4, C7, C8 and C8A; as such, its impacts are tied to those core measures. • Overall, the data for this Measure show that the cost savings exceed expenditures. Therefore, net impacts on affordability are expected to be positive.
	Construction Industry Impacts	Change in demand for related products, equipment and services	• As in Measures C4, C7, C8 and C8A, increased demand for related EE products would increase total industry sales.
		Implications on required industry skill levels	• As in Measures C4, C7, C8 and C8A Continued encouragement of skills improvement. No dramatic changes foreseen.
	Competitive	Increase/decrease in Canadian market share	• No significant effects anticipated.
		Export opportunities	• No significant effects anticipated
	Employment	Net jobs created	• As in Measures C4, C7, C8 and C8A and RT1 this Measure contributes positively to direct and indirect job creation. Due to cost savings, respending effects would be expected to lead to additional job creation, particularly in the service sectors.
	Distribution Effects	Disproportionate effects in a particular region or among particular social groups	As in Measures C4, C7, C8 and C8A, all segments and regions benefit.
Environ-ment	Atmospheric Effects	Related impacts on other pollutants affecting ambient exterior air quality (e.g., SO_2, NO_x, VOC etc.)	• Improved ambient air quality due to reduced emissions of SO_2, NO_x, and particulates released from combustion of fossil fuels on site for space heating and DHW and in electrical generation facilities.
		Related impacts on ozone depleting substances	• Potentially increased emissions of ozone depleting substances from increased use of heat pumps and early retirement of air conditioning and refrigeration equipment*.
	Aquatic Effects	Related impacts on water consumption	• Reduced groundwater and watershed impacts from reduced water consumption.
		Related impacts on amount and toxicity of waste water production/disposal	• Reduced impacts on aquatic environments due to reduced discharge of wastewater flows. • Potentaily increased impacts on aquatic environments from discharge of acidic boiler condensate*.
	Terrestrial Effects	Related effects on levels of material consumption	• Potentially increased building material consumption from increased rate of envelope and equipment retrofits, leading to negative ambient air quality, aquatic and terrestrial impacts*.
		Related effects on disposal of toxic materials	• Potentially increased disposal of building materials leading to landfill impacts*. • Potentially increased disposal of toxic materials due to production and disposal of PV panels and transformers*.
		Other	• Decreased damage to crops, forests, other plants and buildings from reduced emission of air pollutants from combustion of fossil fuels for space heating and DHW and in electrical generation facilities.

Health	Indoor and ambient air quality	Related effects on human exposure to indoor and ambient air pollutants	• Reduced exposure to indoor air contaminants (VOC's, particulates, etc.) due to improved ventilation and use of HRV's in buildings – leading to decreased incidence of eye irritation, headaches, fatigue, respiratory diseases, and cancer. • Reduced exposure to combustion gases from the increased use of sealed combustion appliances. • Reduced exposure to ambient air contaminants such as ground level ozone, NO_x, SO_2, particulates etc leading to decreased incidence of respiratory symptoms, chronic respiratory disease, and reduced respiratory function.
	Noise	Related effects on human exposure to excessive noise or vibrations	• Decreased outside noise from improvements to building envelope.
	Accidents	Related effects on human exposure to potential accidents associated with the use and maintenance of the EE equipment etc.	• Potentially increased risk of falling accidents from maintenance of solar DHW and PV systems*.
Social	Workplace Environment	Related effects leading to changes in aesthetics of the working environment.	• No significant effects anticipated.

* When this measure is properly implemented, potential negative impacts will be marginal or eliminated.

Profile **C-1** **National Building System Labeling/Rating System**

Description	The development and promulgation of multi-part rating & labeling system to assist in comparing actual operating costs with benchmarks and goals including energy measurement & heat reduction.
Type of Measure	Information
Target Stakeholder Group	BOMA, building owners, property managers, tenants
Target Market	New and existing Commercial & med/high rise residential buildings
Time Frame	As is the case in most informational programs the market penetration would be gradual and over many years.
Responsibility	NRCan, Provinces, Municipalities
Relationship to Other Measures	C-8 Commercial Building Retrofit Program, C-8A Multi-Residential Retrofit Program, C-4 CBIP II.

GHG EMISSION & COST IMPACTS

Emission Reductions in k tonnes of CO_2		**Costs in current $ millions**	
Direct Reductions	105	**Capital Costs**	112
Indirect Reductions	155	**Savings**	169
Total Reductions	260	**Net Savings**	57
		Program Costs	8

Net savings in achieving reductions ($ per tonne)	16

This measure is one of the smaller contributors to GHG reductions of the measures selected but it has a positive savings per tonne of GHGs

This measure was developed as a multiplier of the measures identified above. All segments of the market are affected except Schools. The largest segments affected are large offices, hotels and retail strip malls.

OTHER IMPACTS and IMPLICATIONS

There are no specific regional or international implications identified.

Other socio-economic impacts are considered to be minor

CONVERGENCE /DIVERGENCE OF STAKEHOLDER'S VIEWS ON THIS MEASURE

The table members are in complete concurrence that this measure is extremely important in this process.

RECOMMENDATIONS

It is recommended by the table that this measure be acted upon in a reasonable period of time.

IMPACTS:	C-1	National Building System Labelling/Rating	
Impact Category	**IMPACT**		
	Identification	**Characterization**	**Assessment & Comment**
Economic	Affordability for tenants/owners	Net impact on occupancy cost. (Change in capital cost vs net change in utility costs)	• This is an enabling measure designed to increase market penetration of Actions included within Measures C8, C8A and C4; as such, its impacts are tied to those core measures. • Overall, the data for this Measure show that the cost savings exceed expenditures. Therefore, net impacts on affordability are expected to be positive.
	Construction Industry Impacts	Change in demand for related products, equipment and services	• As in Measures C8, C8A and C4, increased demand for related EE products would increase total industry sales.
		Implications on required industry skill levels	• As in Measures C8, C8A and C4, continued encouragement of skills improvement. No dramatic changes foreseen.
	Competitive	Increase/decrease in Canadian market share	• No significant effects anticipated.
		Export opportunities	• No significant effects anticipated
	Employment	Jobs created	• As in Measures C8, C8A and C4, this Measure contributes positively to direct and indirect job creation. Due to cost savings, respending effects would be expected to lead to additional job creation, particularly in the service sectors.
	Distribution Effects	Disproportionate effects within a region, sub sector or social group	As in Measures C8, C8A and C4, all segments and regions participate.
Environ-ment	Atmospheric Effects	Related impacts on other pollutants affecting ambient exterior air quality (e.g., SO_2, NO_x, VOC etc.)	• Improved ambient air quality due to reduced emissions of SO_2, NO_x, and particulates released from combustion of fossil fuels on site for space heating and DHW and in electrical generation facilities.
		Related impacts on ozone depleting substances	• Potentially increased emissions of ozone depleting substances from increased use of heat pumps and early retirement of air conditioning and refrigeration equipment*.
	Aquatic Effects	Related impacts on water consumption	• Reduced groundwater and watershed impacts from reduced water consumption.
		Related impacts on amount and toxicity of waste water production/disposal	• Reduced impacts on aquatic environments due to reduced discharge of wastewater flows. • Potentially increased impacts on aquatic environments from discharge of acidic boiler condensate*.
	Terrestrial Effects	Related effects on levels of material consumption	• Potentially increased building material consumption from increased rate of envelope and equipment retrofits, leading to negative ambient air quality, aquatic and terrestrial impacts*.
		Related effects on disposal of toxic materials	• Potentially increased disposal of building materials leading to landfill impacts*. •Potentially increased disposal of toxic materials due to production and disposal of PV panels and transformers*.
		Other	• Decreased damage to crops, forests, other plants and buildings from reduced emission of air pollutants from combustion of fossil fuels for space heating and DHW and in electrical generation facilities.

Health	Indoor and ambient air quality	Related effects on human exposure to ambient and indoor air pollutants	• Reduced exposure to combustion gases from the increased use of sealed combustion appliances. • Reduced exposure to ambient air contaminants such as ground level ozone, NO_x, SO_2, particulates etc leading to decreased incidence of respiratory symptoms, chronic respiratory disease, and reduced respiratory function.
	Noise	Related effects on human exposure to excessive noise or vibrations	• Decreased outside noise from improvements to building envelope.
	Accidents	Related effects on human exposure to potential occupational accidents	• Potentially increased risk of falling accidents from maintenance of solar DHW and PV systems*.
Social	Workplace Environment	Related effects leading''to changes in aesthetics of the working environment.	No significant effects expected.

* When this measure is properly implemented, potential negative impacts will be marginal or eliminated.

Profile RT-1 Expand the Renewable Energy Deployment Initiative (REDI)

Description	Expand coverage under REDI to include other renewable energy systems and applications, increased maximum grant level and feasibility funding.
Type of Measure	Financial support
Target Stakeholder Group	Equipment manufacturers/distributors, engineering/contracting firms and developers
Target Market	New and existing buildings both commercial and mid rise residential
Time Frame	This measure can be implemented in a relatively short time frame and will have longer term effects.
Responsibility	NRCan
Relationship to Other Measures	C-7 Public Building Initiative, C-8 Commercial Building Retrofit, RT-2 Market Development of Onsite Renewables.

GHG EMISSION & COST IMPACTS

Emission Reductions in k tonnes of CO_2		Costs in current $ millions	
Direct Reductions	30	**Capital Costs**	89
Indirect Reductions	50	**Savings**	57
Total Reductions	80	**Net Savings**	(32)
		Program Costs	33

Net savings in achieving reductions ($ per tonne)	(28)

This measure is one of the smaller contributors to GHG reductions of the measures selected and has a negative savings level over the projected life.

This measure was modeled for both new and existing buildings. The major contributors are PV Systems, Solar Heating and Solar DHW. The largest segment affected are schools.

OTHER IMPACTS and IMPLICATIONS

There are no specific regional or international implications identified. Other socio-economic impacts are considered to be minor

CONVERGENCE /DIVERGENCE OF STAKEHOLDER'S VIEWS ON THIS MEASURE

The table members agree that this measure is important for the longer term savings in GHGs even with negative savings for the user.

RECOMMENDATIONS

It is recommended by the table that this measure be acted upon in a reasonable period of time and that steps be taken to improve the payback to the user.

IMPACTS: RT-1 Expanded REDI Program			
Impact Category	**IMPACT**		
	Identification	**Characterization**	**Assessment & Comment**
Economic	Affordability for tenants/owners	Net impact on occupancy cost. (Change in capital cost vs net change in utility costs)	Overall, the data for this Measure show that expenditures exceed cost savings by about 20%. However, the assumed penetration rate for this Measures is very small; consequently overall impacts are expected to be negligible.
"	" Construction Industry Impacts	" Change in demand for related products, equipment and services	Increased demand for related solar products would increase total industry sales.
"	"	" Implications on required industry skill levels	" • Continued encouragement of skills improvement. No dramatic changes foreseen.
"	" Competitive	" Increase/decrease in Canadian market share	No significant effects expected.
"	"	" Export opportunities	Could provide boost to export opportunities.
"	" Employment	" Jobs created "	Increased jobs with in the solar industry sector; Given relatively limited scope of Measure, no significant overall effects on the general economy are expected
"	" Distribution Effects	" Disproportionate effects within a region, sub sector or social group	Costs savings in schools are offset by increased costs other sectors.
Environment	Atmospheric Effects	Related impacts on other pollutants affecting ambient exterior air quality (e.g., SO_2, NO_x, VOC etc.)	• Improved ambient air quality due to reduced emissions of SO_2, NO_x, and particulates released from combustion of fossil fuels on site for space heating and DHW and in electrical generation facilities.
	Terrestrial Effects	Related effects on disposal of materials	• Potentially increased disposal of toxic materials due to production and disposal of PV panels and transformers*.
		Other	• Decreased damage to crops, forests, other plants and buildings from reduced emission of air pollutants from combustion of fossil fuels for space heating and DHW and in electrical generation facilities.
Health	Indoor and ambient air quality	Related effects on human exposure to indoor and ambient air pollutants	• Decreased exposure to indoor air contaminants (VOC's, particulates, etc.) due to potentially increased ventilation rates associated with use of solar ventilation air preheat systems -leading to decreased incidence of eye irritation, headaches, fatigue, respiratory diseases, and cancer. • Reduced exposure to ambient air contaminants such as ground level ozone, NO_x, SO_2, particulates etc leading to decreased incidence of respiratory symptoms, chronic respiratory disease, and reduced respiratory function.
	Accidents	Related effects on human exposure to potential accidents associated with the use and maintenance of the EE equipment etc.	• Potentially increased risk of falling accidents from maintenance of solar DHW and PV systems*.
Social	Workplace Environment	Related effects leading to changes in aesthetics of the working environment.	No significant effects expected.

* When this measure is properly implemented, potential negative impacts will be marginal or eliminated.

Profile C-11 Energy Efficient Equipment Tax Measures

Description	Faster tax write-offs for the capital cost of EE equipment, construction and renovations and/or exemption from GST/HST/PST
Type of Measure	Fiscal/tax
Target Stakeholder Group	Equipment manufacturers/distributors, building owners, engineering/contracting and facility managers
Target Market	New and existing buildings both commercial and med/high rise
Time Frame	This measure may take a little longer to implement due to the complexities and politics of tax changes.
Responsibility	NRCan & Dept. of Finance.
Relationship to Other Measures	AE-1 National Standards Program, AE-5 Energy Star Labeling & C-8 Commercial Building Retrofit Program.

GHG EMISSION & COST IMPACTS

Emission Reductions in k tonnes of CO_2		Costs in current $ millions	
Direct Reductions	250	**Capital Costs**	1,080
Indirect Reductions	1,570	**Savings**	1,215
Total Reductions	1,820	**Net Savings**	135
		Program Costs	135

Net savings in achieving reductions ($ per tonne)	7

This measure is one of the larger contributors to reductions of the measures selected and there are small savings for the user after their investment is made.

This measure was modeled for both new and existing buildings. The major contributors are Plug Loads & Transformers with all other equipment contributing. The largest segments affected are retail strip malls & hotels.

OTHER IMPACTS and IMPLICATIONS

There are no specific regional or international implications identified. Other socio-economic impacts are considered to be minor

CONVERGENCE /DIVERGENCE OF STAKEHOLDER'S VIEWS ON THIS MEASURE

The table members are in complete concurrence that this measure is extremely important in this process but that it will take time to implement.

RECOMMENDATIONS

It is recommended by the table that this measure be acted upon in a reasonable period of time.

IMPACTS: C-11 EE Equipment Tax Measure			
Impact Category	**IMPACT**		
	Identification	**Characterization**	**Assessment & Comment**
Economic	Affordability for tenants	Net impact on occupancy cost. (Change in capital cost vs net change in utility costs)	• Overall, the data for this Measure show that expenditures marginally exceed savings. However, this Measure is voluntary and increased capital costs are offset by a reduced tax burden on participants; therefore no significant impacts on affordability are expected.
	Construction Industry Impacts	Change in demand for related productŝ, equipment and services	Increased demand for related EE products would increase total industry sales.
"	"	" Implications on required industry skill levels	" • Continued encouragement of skills improvement.
"	" Competitive	" Increase/decrease ĩh Canadian market share	No significant effects expected. Most product categories are currently dominated by US based manufacturers.

"	"	" Export opportunitiës	No significant effects expected
"	" Employment	" Net jobs created "	Positive effect expected on direct and indirect jobs creation within the equipment supply sector. Given that costs exceed savings, overall disposable incomes/revenues would be marginally reduced with corresponding minor reduction of jobs within the overall economy.
"	" Distribution Effects	" Disproportionate effects within a region, sub sector or social group	No significant effects expected
Environ-ment	Atmospheric Effects	Related impacts on other pollutants affecting ambient exterior air quality (e.g., SO2, NO_x, VOC etc.)	• Improved ambient air quality due to reduced emissions of SO_2, NO_x, and particulates released from combustion of fossil fuels on site for space heating and DHW and in electrical generation facilities.
		Related impacts on ozone depleting substances	• Potentially increased emissions of ozone depleting substances from increased use of heat pumps and early retirement of air conditioning and refrigeration equipment*.
	Aquatic Effects	Related impacts on amount and toxicity of waste water production/disposal	• Potentially increased impacts on aquatic environments from discharge of acidic boiler condensate*.
	Terrestrial Effects	Related effects on levels of material consumption	• Potentially increased disposal of toxic materials due to production and disposal of PV panels and transformers*.
		Other	• Decreased damage to crops, forests, other plants and buildings from reduced emission of air pollutants from combustion of fossil fuels for space heating and DHW and in electrical generation facilities.
Health	Indoor and ambient air quality	Related effects on human exposure to indoor and ambient air pollutants	• Reduced exposure to ambient air contaminants such as ground level ozone, NO_x, SO_2, particulates etc leading to decreased incidence of respiratory symptoms, chronic respiratory disease, and reduced respiratory function.
	Accidents	Related effects on human exposure to potential accidents associated with the use and maintenance of the EE equipment etc.	• Potentially increased risk of falling accidents from maintenance of solar DHW and PV systems*.
Social	Workplace Environment	Related effects leading''to changes in aesthetics of the working environment.	No significant effects expected

* When this measure is properly implemented, potential negative impacts will be marginal or eliminated.

Profile **C-2B Improved Model National Energy Code for Buildings (MNECB+)**

Description	Increase the provincial minimum energy efficiency regulations for new construction to 15 % above MNECB.
Type of Measure	Regulatory, suasion
Target Stakeholder Group	Building owners, developers, engineering, contracting
Target Market	New Commercial and Mid/high rise Residential buildings
Time Frame	It may require some time to write the MNECB+ and longer to have it accepted by the provinces
Responsibility	NRCan, provincial/territorial governments & municipalities
Relationship to Other Measures	C-4, Commercial New Building Incentive Program(CBIP II), C-5 Commercial Building Design Guidelines/Green prints.

GHG EMISSION & COST IMPACTS

Emission Reductions in k tonnes of CO_2		**Costs in current $ millions**	
Direct Reductions	190	**Capital Costs**	260
Indirect Reductions	330	**Savings**	300
Total Reductions	520	**Net Savings**	40
		Program Costs	8

Net savings in achieving reductions ($ per tonne)	6

This measure is one of the smaller contributors to GHG reductions of the measures selected and has a reasonably positive contribution in savings/tonne

This measure was modeled for the new buildings market only and the major contributors to reductions are lighting and HE A/C equipment. All segments of the market are affected with the largest segments affected being schools, hotels and retail strip malls.

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OTHER IMPACTS and IMPLICATIONS

There are no specific regional or international implications identified. In addition the socio-economic study that was carried out, did not identify any major issues.

CONVERGENCE /DIVERGENCE OF STAKEHOLDER'S VIEWS ON THIS MEASURE

The table members are in concurrence that this measure is important in this process.

RECOMMENDATIONS

It is recommended by the table that this measure be acted upon in a reasonable period of time.

IMPACTS: C-2B Improved MNECB			
Impact Category	**IMPACT**		
	Identification	**Characterization**	**Assessment & Comment**
Economic	Affordability for tenants/owners	Net impact on occupancy cost. (Change in capital cost vs net change in utility costs)	• Overall, the data for this Measure show that cost savings exceed expenditures. Therefore, net impacts on affordability are expected to be positive.
	Construction Industry Impacts	Change in demand for related products, equipment and services	• Increased demand for related EE products would increase total industry sales.
		Implications on required industry skill levels	• Continued encouragement of skills improvement. No dramatic changes foreseen.
	Competitive	Increase/decrease in Canadian market share	• No significant effects anticipated.
		Export opportunities	• No significant effects anticipated
	Employment	Jobs created	• Increased direct and indirect jobs in construction and EE equipment supply sectors. Previous employment studies have estimated direct and indirect employment creation from this type of Measure to be in the range of 12 to 15 person years per $million (1999) of expenditure.
	Distribution Effects	Disproportionate effects within a region, sub sector or social group	• No significant effects anticipated
Environ-ment	Atmospheric Effects	Related impacts on other pollutants affecting ambient exterior air quality (e.g., SO_2, NO_x, VOC etc.)	• Improved ambient air quality due to reduced emissions of SO_2, NO_x, and particulates released from combustion of fossil fuels on site for space heating and DHW and in electrical generation facilities.
	Terrestrial Effects	Other	• Decreased damage to crops, forests, other plants and buildings from reduced emission of air pollutants from combustion of fossil fuels for space heating and DHW and in electrical generation facilities.
Health	Indoor and ambient air quality	Related effects on human exposure to indoor and ambient air pollutants	• Decreased exposure to indoor air contaminants (VOC's, particulates, etc.) due to minimum ventilation rate design requirements - leading to decreased incidence of eye irritation, headaches, fatigue, respiratory diseases, and cancer. • Reduced exposure to ambient air contaminants such as ground level ozone, NO_x, SO_2, particulates etc leading to decreased incidence of respiratory symptoms, chronic respiratory disease, and reduced respiratory function.
	Noise	Related effects on human exposure to excessive noise or vibrations	• Decreased outside noise from improvements to building envelope
Social	Workplace Environment	Related effects leading'to changes in aesthetics of the working environment.	No significant effects expected.

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Profile **RT-2 Market Deployment of Onsite Renewables**

Description	Promotion and financing packages for on-site renewable energy technologies. Financing to be provided through utility bills (including net billing for electricity generation systems), monthly rental/leasing programs, and/or government assistance through innovative mortgage financing, interest-free loans, etc.
Type of Measure	Product commercialization, technical assistance, financial assistance.
Target Stakeholder Group	Building owners, developers, facility managers and related associations.
Target Market	New and existing buildings in the commercial and mid/high rise categories
Time Frame	Gradual introduction as equipment becomes available at competitive prices and operates to expectations
Responsible	NRCan
Relationship to Other Measures	C-7 Public Building Incentive Program, RT-1 Expanded REDI Program and C-4 CBIP II

GHG EMISSION & COST IMPACTS

Emission Reductions in k tonnes of CO_2		**Costs in current $ millions**	
Direct Reductions	24	**Capital Costs**	40
Indirect Reductions	33	**Savings**	39
Total Reductions	57	**Net Savings**	(1)
		Program Costs	2

Net savings in achieving reductions ($ per tonne)	(2)

This measure is one of the smallest contributors to GHG reductions of the measures selected, and savings per tonne is in a negative position.

This measure was developed as a multiplier of the measures identified above. The largest segment affected is schools followed at a much lower level by large and small office buildings.

OTHER IMPACTS and IMPLICATIONS

There are no specific regional or international implications identified. Other socio-economic impacts are considered to be minor

CONVERGENCE /DIVERGENCE OF STAKEHOLDER'S VIEWS ON THIS MEASURE

The table members are in concurrence that this measure is important in the longer term.

RECOMMENDATIONS

It is recommended by the table that this measure be acted upon in a reasonable period of time.

IMPACTS: RT-2 Market Development for On-site Renewables			
Impact Category	**IMPACT**		
	Identification	**Characterization**	**Assessment & Comment**
Economic	Affordability for tenants	Net impact on occupancy cost. (Change in capital cost vs net change in utility costs)	• This is an enabling measure designed to increase market penetration of Actions included within Measures C4, C7 and RT1; as such, its impacts are tied to those core measures. • Capital costs exceed energy savings by about 20%. However, participation in this Measure is voluntary and, as such, affordability is unlikely to be affected.
	Construction Industry Impacts	Change in demand for related products, equipment and services	• As in Measures C4, C7 and RT1, increased demand for related EE and solar products would increase total industry sales.
		Implications on required industry skill levels	• As in Measures C4, C7 and RT1, continued skills improvement would be promoted. No dramatic changes foreseen.
	Competitive	Increase/decrease in Canadian market share	• No significant effects anticipated.
		Export opportunities	• No significant effects anticipated
	Employment	Jobs created	• Overall magnitude of this Measure is small and participation is voluntary; therefore, employment impacts would also likely be minor.
	Distribution Effects	Disproportionate effects within a region, sub sector or social group	As in Measures C4, C7 and RT1, all segments and regions participate.
Environ-ment	Atmospheric Effects	Related impacts on other pollutants affecting ambient exterior air quality (e.g., SO2, NO_x, VOC etc.)	• Improved ambient air quality due to reduced emissions of SO_2, NO_x, and particulates released from combustion of fossil fuels on site for space heating and DHW and in electrical generation facilities.
		Related impacts on ozone depleting substances	• Potentially increased emissions of ozone depleting substances from increased use of heat pumps and early retirement of air conditioning and refrigeration equipment*.
	Aquatic Effects	Related impacts on water consumption	• Reduced groundwater and watershed impacts from reduced water consumption.
		Related impacts on amount and toxicity of waste water production/disposal	• Reduced impacts on aquatic environments due to reduced discharge of wastewater flows. • Increased impacts on aquatic environments from discharge of acidic boiler condensate.
	Terrestrial Effects	Related effects on levels of material consumption	• Potentially increased building material consumption from increased rate of envelope and equipment retrofits, leading to negative ambient air quality, aquatic and terrestrial impacts*.
		Related effects on disposal of toxic materials	• Potentially increased disposal of building materials leading to landfill impacts*. • Potentially increased disposal of toxic materials due to production and disposal of PV panels and transformers*.
		Other	• Decreased damage to crops, forests, other plants and buildings from reduced emission of air pollutants from combustion of fossil fuels for space heating and DHW and in electrical generation facilities.

Health	Indoor and ambient air quality	Related effects on human exposure to indoor and ambient air pollutants	• Reduced exposure to indoor air contaminants (VOC's, particulates, etc.) due to improved ventilation and use of HRV's in buildings – leading to decreased incidence of eye irritation, headaches, fatigue, respiratory diseases, and cancer. • Reduced exposure to combustion gases from the increased use of sealed combustion appliances. • Reduced exposure to ambient air contaminants such as ground level ozone, NO_x, SO_2, particulates etc leading to decreased incidence of respiratory symptoms, chronic respiratory disease, and reduced respiratory function.
	Noise	Related effects on human exposure to excessive noise or vibrations	• Decreased outside noise from improvements to building envelope
	Accidents	Related effects on human exposure to potential accidents associated with the use and maintenance of the EE equipment etc.	• Potentially increased risk of falling accidents from maintenance of solar DHW and PV systems*.
Social	Workplace Environment	Related effects leading to changes in aesthetics of the working environment.	• No significant effects anticipated.

* When this measure is properly implemented, potential negative impacts will be marginal or eliminated.

APPENDIX C
PROGRAM IMPLEMENTATION COST ASSUMPTIONS
COMMERCIAL/INSTITUTIONAL SECTOR

Note 1. The costs provided in the Measure Profiles represent the net present value of the estimates presented below.

Note 2. All Measures are assumed to stimulate GHG reduction actions from the time of program start until 2010. However, during this time, many Measures are intended to achieve market transformation, after which program spending for the Measure itself will no longer be required. For such Measures, it is assumed that the administrative and subsidy costs would be incurred for the program duration indicated below, rather than for the full period to 2010.

Measure	Assumptions Concerning Costs of Program Implementation
C-8 Commercial Building Retrofit Program	*Reference source*: NRCan data show a considerable range of leverage possibilities; for instance Energy Innovators and FBI programs where current program cost leverage is $1:$7.5 for Innovator/Innovator Plus and $1:$75 for the FBI program. *Administrative costs:* $1 of program costs to $30 action costs leveraged which amounts to $44.6 million *Cost of subsidy*: Assume that government will finance about 10% of the amount needed to reduce payback to an acceptable level, which amounts to a subsidy of $4.4 million. *Total action costs*: $2.67 billion. *Program start and duration*: 5 years starting in 2001.
AE-1 National Standards for Equipment and Appliances	*Reference source*: NRCan OEE-provided administrative and related costs, for the Canadian program and the U.S. Energy Star Labelling program, for program development, operation, compliance. *Administrative costs:* The current NRCan standards development/management costs are about $ 1 million/annum for all equipment types. We assume the cost for new standards development in the commercial sector will be at the same level initially but levelling out over time for an average annual cost of $ 750 thousand or $ 5.3 million total. *Total action costs:* $ 3.42 billion. *Program start and duration*: 7 years starting in 2004
C-7 Public Building Initiative	*Reference source*: NRCan data show a considerable range of leverage possibilities; for instance Energy Innovators and FBI programs where current program cost leverage is $1:$7.5 for Innovator/Innovator Plus and $1:$75 for the FBI program. *Administrative costs:* Assume $1 of program costs to $50 action costs leveraged which amounts to administrative cost of $28.6 million. *Total action costs*: $2.86 billion. *Program start and duration*: 5 years starting in 2001.

Measure	Assumptions Concerning Costs of Program Implementation
AE-9 Window Market Transformation	*Reference source*: NRCan *Administrative costs:* Estimated at about $500 K per year amounting to a total of $2.5 million (of which about 60% is government funding.) *Cost of subsidy:* Assume subsidy required to reduce 7 year payback to 5 years, which amounts to $27.1 million. *Total action costs*: $ 189.9 million. *Program start and duration:* 5 years starting in 2001
AE-7 Government Procurement with Golden Carrot	*Reference source*: NRCan data show a considerable range of leverage possibilities; for instance Energy Innovators and FBI programs where current program cost leverage is $1:$7.5 for Innovator/Innovator Plus and $1:$75 for the FBI program. *Administrative costs*: Assume $1 of program costs to about $80 action costs leveraged. Program costs support "greenprinting" federal government specifications, developing case studies and internal measure promotion and building industry market awareness and training. The total administrative cost is $7.4 million. *Total action costs:* $ 1.2 billion *Program start and duration*: 5 years starting in 2001
C-2B Improved MNECB	*Reference source*: NRCan provided cost estimates. *Administrative costs:* Assume cost of $ 2 million per year for the provinces, and $700,000 for the federal government, for a total of $13.5 million over 5 years. Additional costs (e.g. municipal) are assumed to be $1.5 million total for five year duration, for a total of $15 million. *Total action costs*: $ 529.6 million. *Program start and duration*: 5 years starting in 2005
AE-5 Energy Star Labelling	*Reference source*: NRCan OEE provided administrative and related costs, for the Canadian program and the U.S. Energy Star Labelling program, for program development, operation, compliance. *Administrative costs:* The Energy Star cost of $50 million/yr is proportioned to Canada and slightly reduced for an amount of $4 million/year. Total cost is assumed to be divided evenly with residential, so total cost for commercial is $16 million over 8 years. *Total action costs:* $ 445.5 million. *Program start and duration*: 8 years starting in 2003
C-4 Commercial New Building Incentive Program (CBIP II)	*Reference source*: NRCan *Administrative costs*: Total cost is estimated at $1.8 million per year, for a total cost of $9.0 million. *Cost of subsidy:* Based upon reducing the payback from 6 to 5 years, which amounts to $51.5 million. *Total action costs*: $441.3 million. *Program start and duration*: 5 years starting in 2001

Measure	Assumptions Concerning Costs of Program Implementation
C-6 Continuing Education	*Reference source*: NRCan. *Administrative costs:* Cost estimates ranged from $170/participant to $420/participant, depending whether or not there was cost recovery. We assume the high end of this range for the program period plus curriculum development and train-the-trainer sessions. Therefore, the cost is assumed to be $500 thousand per year (at $500 per participant) for five years, amounting to $2.5 million. Once operating and accredited courses are available costs will be borne by the students. *Total action costs:* $320.8 million *Program start and duration*: 5 years starting in 2001.
C-9 National Building Operator Training	*Reference source*: Bill Humber of Seneca College *Administrative costs*: Program set up and work with training groups such as BOMI, SAIT and other post secondary institutions will comprise the majority of measure cost. Cost recovery on the courses is assumed. Assume program development cost of $100 thousand, amounting to a total cost of $6 million over 5 years. *Total action costs*: $ 313 million. *Program start and duration*: 5 years starting in 2001
C-3 Advanced Building & Equipment Demonstration Initiative	*Reference source:* NRCan *Administrative costs*: Approx. $400,000/year for staffing and $6,000,000 to develop and support 20 (regional representation) advanced building demos @ $320,000 per demonstration including promotional activities. This is a total of $8 million over five years. These costs are assumed to be shared between government and private sector on a 20:80 basis using NRCan ratios. *Total action costs*: $272.9 million. *Program start and duration*: 5 years starting in 2001
AE-4 Technology Commercialisation Program	*Reference source:* NRCan and Marbek *Administrative costs:* Based on two staff years ($200,000) an annual budget of $500,000 is available to develop promotional and tech transfer material directed at marketing benefits of technology and demonstration sites. This is a total of $ 2.5 million over five years. These costs are assumed to be shared between government and private sector on a 20:80 basis. *Total action costs:* $272.9 million *Program start and duration:* 5 years starting in 2001
C-1 National Building System Labelling/rating	*Reference source*: NRCan R-2000 program evaluation and Energuide delivery costs *Administrative costs*: $1,500,000 per year to provide the technical and administrative requirements for a "whole building" rating system. This amounts to total of $13.5 million to 2010. *Total action costs:* $192.9 million *Program start and duration*: 9 years starting in 2002

Measure	Assumptions Concerning Costs of Program Implementation
C-11 **EE Equipment Tax Measure**	*Reference source:* Marbek *Administrative costs*: Based on 1% of the action cost which amounts to $19.6 million to design, communicate & implement tax system *Cost of subsidy:* Assume that a proxy for the cost to the government of foregone tax revenue is equivalent to an incentive level required to reduce the payback from 5 to 4 years. This amounts to approximately $196 million. *Total action costs:* $1.96 billion *Program start and duration*: 5 years starting in 2003
C-8A **Multi-Residential Retrofit Program**	*Reference source*: NRCan data show a considerable range of leverage possibilities; for instance Energy Innovators and FBI programs where current program cost leverage is $1:$7.5 for Innovator/Innovator Plus and $1:$75 for the FBI program. *Administrative costs*: $1 of program costs to $7.5 action costs leveraged which amounts to $49.4 million *Cost of subsidy*: Assume that government will provide 40% of subsidy required to reduce payback to acceptable level, which amounts to a total of $29.6 million. *Total action costs:* $0.74 billion. *Program start and duration*: 5 years starting in 2001
RT-1 **Expanded REDI Program**	*Reference source:* NRCan *Administrative costs:* Estimated to be $750,000 per year, for a total of $5.3 million. *Cost of subsidy:* Assumed that financial subsidy required to reduce bundled payback from 12 to 7 years which amounts to $42.2 million. *Total action costs:* $ 144.7 million. *Program start and duration*: 7 years starting in 2001
C-5 **Commercial Building Design Guidelines/ Green Prints**	*Reference source:* NRCan, Marbek *Administrative costs*: Staffing (3) persons $300,000/year. $1.1M per year is available to provide development and technology transfer activities within the professional community. Therefore, total costs amount to $ 7 million over a five year period. These costs are assumed to be shared between government and private sector on a 20:80 basis. *Total action costs:* $294.6 million *Program start and duration*: 5 years starting in 2001
C-13 **National Commercial Check-up**	*Reference source:* NRCan and Marbek *Administrative costs*: $1.1M/year. $400,000/year in staffing and $700,000 for technology transfer initiatives such as internet-based building performance analysis capabilities. The total cost for a five year period is $5.5 million. *Total action costs:* $627.2 million *Program start and duration*: 5 years starting in 2001.
RT-2 **Market Development for Onsite Renewable**	*Reference source:* NRCan, Marbek *Administrative costs:* $300,000 per year for staffing, plus $400,000 promotional and financial option administration/development. This amounts to a total of $1.9 million. *Total action costs:* $65.1 million *Program start and duration*: 5 years starting in 2001.

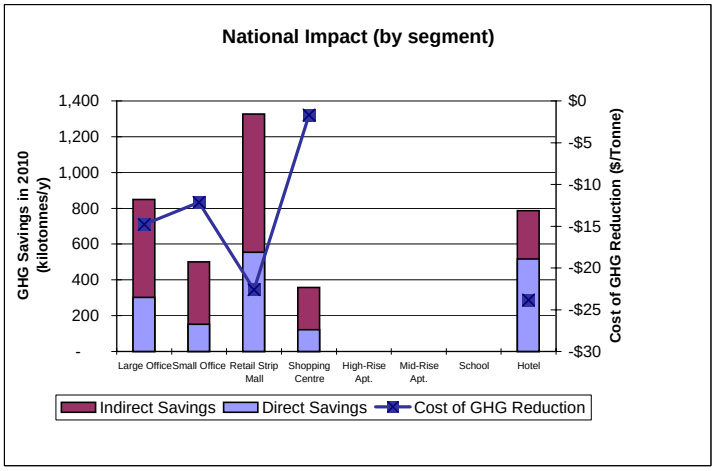
MEASURE DATA SHEET -- C8-- Commercial Building Retrofit Program

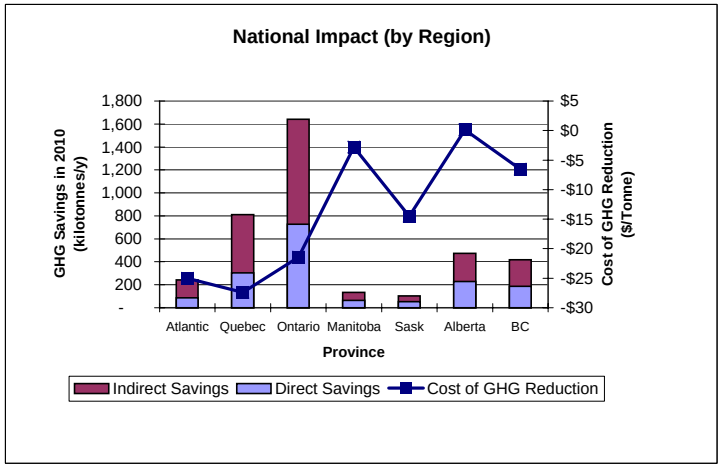
(data does not include "Other Commercial " segment)

Summary of Market Penetration			
Actions	**Affected Stock**	**Market Penetration in Affected Stock**	
		Existing	**New**
E1 Roof Insulation Incremental	existing stock	18 - 20%	N/A
E3 Wall Insulation Full	existing stock	3 - 5%	N/A
E4 Wall Insulation Incremental	existing stock	3	N/A
E5 HE Windows Incremental	existing stock	19 - 21%	N/A
E 7 Temperature Setback	existing stock	28 - 30%	N/A
E8 Boiler Controls	existing buildings with hydronic heating	10%	N/A
E9 BAS/FMS/EMCS	existing stock	5 - 15%	N/A
E10 O&M Recommissioning	existing stock	18 - 28%	N/A
E11 Lighting Upgrade	existing stock	15 - 20%	N/A
E12 Lighting redesign	existing stock	5 - 15%	N/A
E13 Mid-Eff. Boiler Incremental	existing buildings with hydronic heating	21 - 23%	N/A
E15 Condensing Boiler Incremental	existing buildings with hydronic heating	9 - 11%	N/A
E17 HE A/C Equip. Incremental	existing stock that has A/C equipment	31 - 45%	N/A
E19 CAV to VAV Conversion	existing stock with CAV systems retrofitable to VAV	7 - 12%	N/A
E20 DHW Load Reduction	existing stock	10 - 28%	N/A
E21 HE DHW Equip. Incremental	existing stock	15 - 30%	N/A
E22 PV Systems	low rise buildings (small office and shopping centres)	1 %	N/A
E23 Cogeneration	existing stock	1%	N/A
E24 GSHP	existing buildings with WLHP (large offices only)	2%	N/A
E30 Transformers	existing stock	25%	N/A
E31 VSD?VFD	existing stock	3 - 28%	N/A

Capital Costs, Energy Savings, and GHG Reductions	**(millions)**
Capital cost of actions stimulated by this Measure cumulative to 2010 (net present value)	$1,643.6
Participant energy savings from actions stimulated by this Measure, over the life of the actions (net present value)	$2,616.8
Total GHG reductions in 2010	3,821 kt/y
Cost of total GHG reductions stimulated by this Measure ($ per tonne)	(18) $/tonne

Costs of Program Implementation (cumulative to 2010)	**(millions)**
Administrative and related costs (net present value)	$33.8
Cost of subsidy, if applicable (net present value)	$3.3
Total cost of program implementation (net present value)	$ 37.1





MEASURE DATA SHEET -- AE1-- National Standards (Equipment & Appliances)

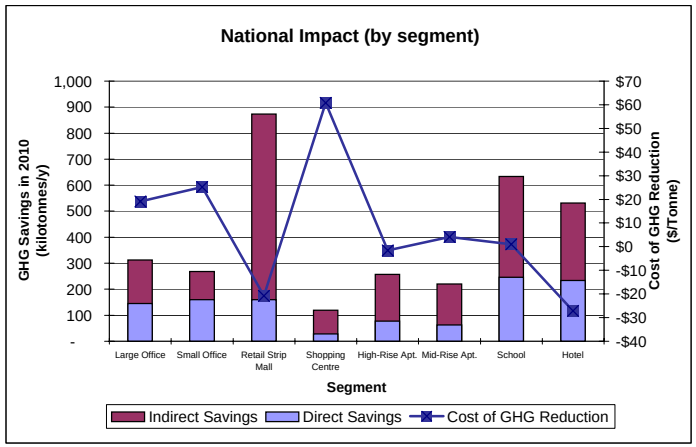
(data does not include "Other Commercial " segment)

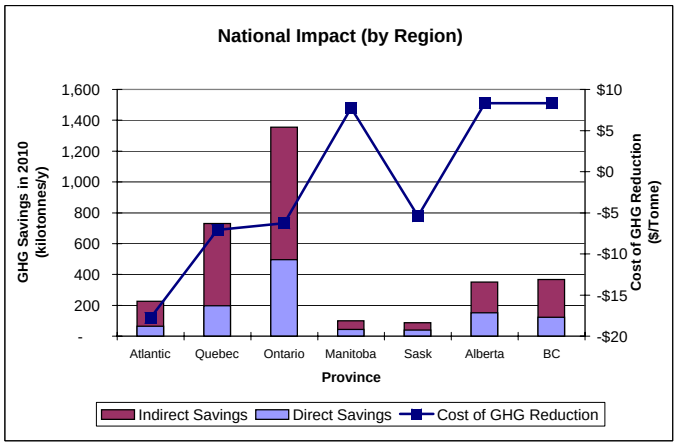
Summary of Market Penetration

Actions	Affected Stock	Market Penetration in Affected Stock	
		Existing	New
E5 HE Windows Incremental	existing and new buildings	12%	33%
E11 Lighting Upgrade	existing and new buildings	8%	33%
E13 Mid-Eff. Boiler Incremental	existing and new buildings with hydronic heating	12%	33%
E17 HE A/C Equip. Incremental	existing and new buildings that have A/C equipment	12%	33%
E21 HE DHW Equip. Incremental	existing and new buildings	13%	33%
E24 GSHP	existing large office and all new buildings	1%	8%
E29 Plug Loads	existing and new stock high connected UPD values	17%	33%
E30 Transformers	existing and new stock	7%	33%

Capital Costs, Energy Savings, and GHG Reductions	(millions)
Capital cost of actions stimulated by this Measure cumulative to 2010 (net present value)	$1,789.1
Participant energy savings from actions stimulated by this Measure, over the life of the actions (net present value)	$1,942.9
Total GHG reductions in 2010	3,215 kt/y
Cost of total GHG reductions stimulated by this Measure ($ per tonne)	(4) $/tonne

Costs of Program Implementation (cumulative to 2010)	(millions)
Administrative and related costs (net present value)	$2.8
Cost of subsidy, if applicable (net present value)	$0.0
Total cost of program implementation (net present value)	$ 2.8





Segment	GHG Savings in 2010		Cost of GHG Reduction
	Kilotonnes eCO_2		$/tonne
	Direct	Indirect	
Large Office	146	166	$19
Small Office	159	109	$25
Retail Strip Mall	160	714	-$21
Shopping Centre	29	90	$61
High-Rise Apt.	78	179	-$2
Mid-Rise Apt.	63	158	$4
School	246	388	$1
Hotel	234	297	-$27
Total	1,115	2,101	

Region	GHG Savings in 2010		Cost of GHG Reduction
	Kilotonnes eCO_2		$/tonne
	Direct	Indirect	
Atlantic	64	163	-$18
Quebec	198	532	-$7
Ontario	496	859	-$6
Manitoba	44	56	$8
Saskatchewan	39	47	-$5
Alberta	152	199	$8
British Columbia	121	245	$8
Total	1,115	2,101	

Segment	GHG Savings in 2010		Cost of GHG Reduction
	Kilotonnes eCO_2		$/tonne
	Direct	Indirect	
Large Office	232	419	-$14
Small Office	117	267	-$26
Retail Strip Mall	-	-	n/a
Shopping Centre	-	-	n/a
High-Rise Apt.	-	-	n/a
Mid-Rise Apt.	-	-	n/a
School	918	801	$6
Hotel	-	-	n/a
Total	1,268	1,488	

Region	GHG Savings in 2010		Cost of GHG Reduction
	Kilotonnes eCO_2		$/tonne
	Direct	Indirect	
Atlantic	94	130	-$11
Quebec	214	376	-$10
Ontario	519	602	-$8
Manitoba	77	61	$6
Saskatchewan	59	34	-$2
Alberta	197	159	$13
British Columbia	108	126	$15
Total	1,268	1,488	

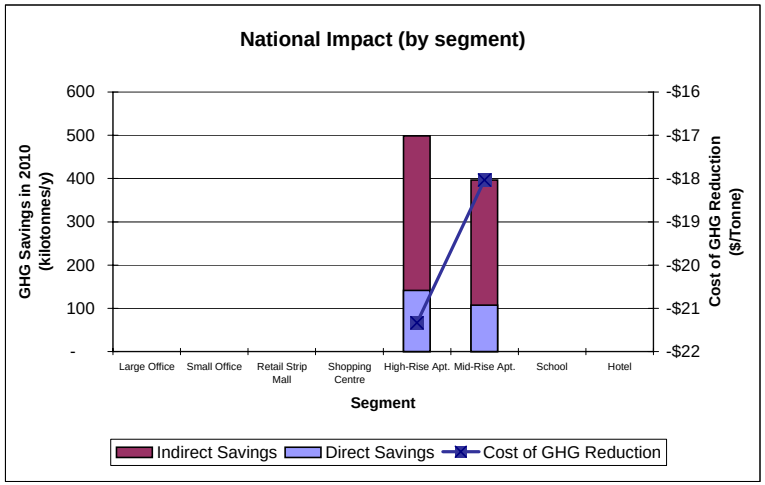
MEASURE DATA SHEET -- C8A-- MUR Retrofit Program

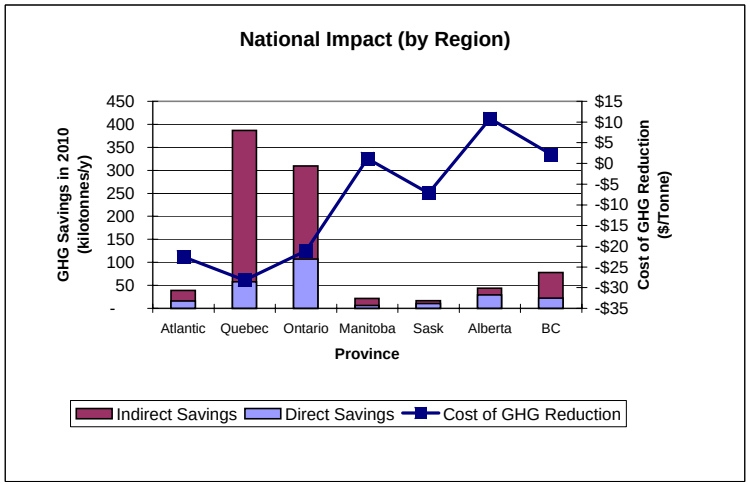
(data does not include "Other Commercial " segment)

Summary of Market Penetration			
Actions	**Affected Stock**	**Range of Market Penetration**	
		Existing	**New**
E1 Roof Insulation Incremental	existing stock	18 - 20%	N/A
E3 Wall Insulation Full	existing stock	3 - 5%	N/A
E4 Wall Insulation Incremental	existing stock	3	N/A
E5 HE Windows Incremental	existing stock	19 - 21%	N/A
E8 Boiler Controls	existing buildings with hydronic heating	10%	N/A
E10 O&M Recommissioning	existing stock	18 - 28%	N/A
E11 Lighting Upgrade	existing stock	15 - 20%	N/A
E13 Mid-Eff. Boiler Incremental	existing buildings with hydronic heating	21 - 23%	N/A
E15 Condensing Boiler Incremental	existing buildings with hydronic heating	9 - 11%	N/A
E17 HE A/C Equip. Incremental	existing stock that has A/C equipment	31 - 45%	N/A
E20 DHW Load Reduction	existing stock	10 - 28%	N/A
E21 HE DHW Equip. Incremental	existing stock	15 - 30%	N/A
E22 PV Systems	mid rise apartments only	1 %	N/A
E23 Cogeneration	existing stock	1%	N/A
E28 HRV system	e xisting stock	2%	N/A
E30 Transformers	existing stock	25%	N/A
E31 VSD?VFD	existing stock	3 - 28%	N/A

Capital Costs, Energy Savings, and GHG Reductions	**(millions)**
Capital cost of actions stimulated by this Measure cumulative to 2010 (net present value)	$455.2
Participant energy savings from actions stimulated by this Measure, over the life of the actions (net present value)	$682.6
Total GHG reductions in 2010	895 kt/y
Cost of total GHG reductions stimulated by this Measure ($ per tonne)	(20) $/tonne

Costs of Program Implementation (cumulative to 2010)	**(millions)**
Administrative and related costs (net present value)	$37.4
Cost of subsidy, if applicable (net present value)	$22.4
Total cost of program implementation (net present value)	$ 59.9





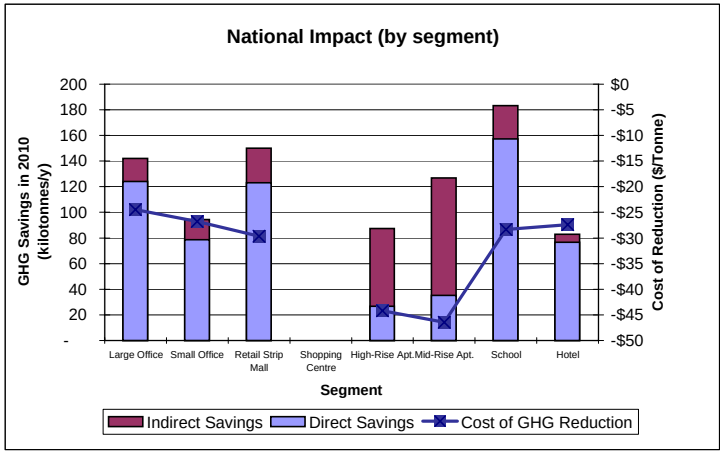
MEASURE DATA SHEET -- AE9-- Window Market Transformation

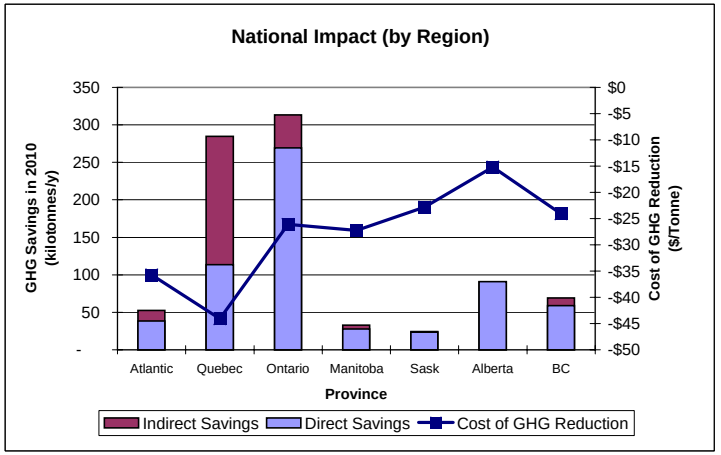
(data does not include "Other Commercial " segment)

Summary of Market Penetration			
Actions	**Affected Stock**	**Market Penetration in Affected Stock**	
		Existing	**New**
E5 HE Windows Incremental	existing and new buildings	1-2%	55%

Capital Costs, Energy Savings, and GHG Reductions	**(millions)**
Capital cost of actions stimulated by this Measure cumulative to 2010 (net present value)	$116.7
Participant energy savings from actions stimulated by this Measure, over the life of the actions (net present value)	$582.0
Total GHG reductions in 2010	867 kt/y
Cost of total GHG reductions stimulated by this Measure ($ per tonne)	(31) $/tonne

Costs of Program Implementation (cumulative to 2010)	**(millions)**
Administrative and related costs (net present value)	$1.9
Cost of subsidy, if applicable (net present value)	$20.5
Total cost of program implementation (net present value)	$ 22.4





Segment	**GHG Savings in 2010**		**Cost of GHG Reduction**
	Kilotonnes eCO_2		**$/tonne**
	Direct	**Indirect**	
Large Office	124	18	-$24
Small Office	79	16	-$27
Retail Strip Mall	123	27	-$30
Shopping Centre	-	-	n/a
High-Rise Apt.	27	61	-$44
Mid-Rise Apt.	35	91	-$46
School	157	26	-$28
Hotel	77	6	-$27
Total	622	245	

Region	**GHG Savings in 2010**		**Cost of GHG Reduction**
	Kilotonnes eCO_2		**$/tonne**
	Direct	**Indirect**	
Atlantic	38	14	-$36
Quebec	114	171	-$44
Ontario	269	44	-$26
Manitoba	28	5	-$27
Saskatchewan	23	1	-$23
Alberta	91	(1)	-$15
British Columbia	59	10	-$24
Total	622	245	

MEASURE DATA SHEET -- AE7-- Government Procurement Program for HE Products

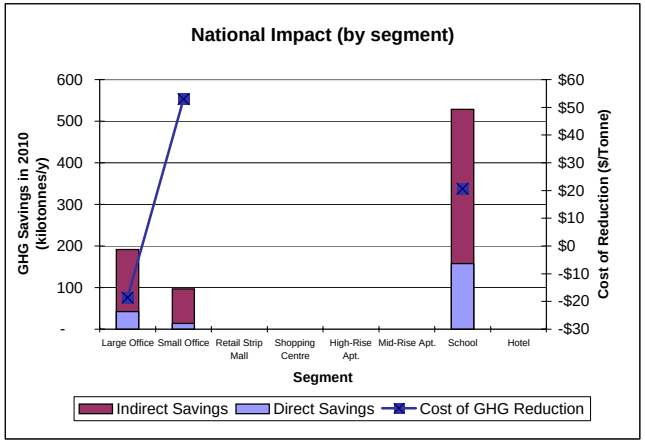
(data does not include "Other Commercial " segment)

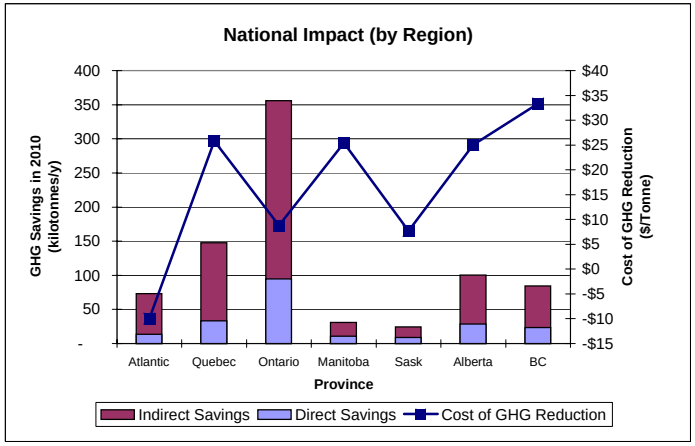
Summary of Market Penetration

Actions	Affected Stock	Market Penetration in Affected Stock	
		Existing	New
E8 Boiler Controls	existing buildings with hydronic heating	20 - 30%	N/A
E11 Lighting Upgrade	existing and new buildings	10 - 25%	100%
E15 Condensing Boiler Incremental	existing and new buildings with hydronic heating	10 - 20%	100%
E17 HE A/C Equip. Incremental	existing and new buildings that have A/C equipment	20 - 30%	100%
E21 HE DHW Equip. Incremental	existing and new buildings	25%	100%
E22 PV Systems	existing and new buildings	1%	5%
E24 GSHP	existing and new buildings	4%	25%

Capital Costs, Energy Savings, and GHG Reductions	(millions)
Capital cost of actions stimulated by this Measure cumulative to 2010 (net present value)	$736.0
Participant energy savings from actions stimulated by this Measure, over the life of the actions (net present value)	$578.3
Total GHG reductions in 2010	817 kt/y
Cost of total GHG reductions stimulated by this Measure ($ per tonne)	15 $/tonne

Costs of Program Implementation (cumulative to 2010)	(millions)
Administrative and related costs (net present value)	$5.6
Cost of subsidy, if applicable (net present value)	$0.0
Total cost of program implementation (net present value)	$ 5.6





Segment	GHG Savings in 2010 Kilotonnes eCO_2		Cost of GHG $/tonne
	Direct	Indirect	
Large Office	42	150	-$19
Small Office	14	83	$53
Retail Strip Mall	-	-	n/a
Shopping Centre	-	-	n/a
High-Rise Apt.	-	-	n/a
Mid-Rise Apt.	-	-	n/a
School	157	371	$21
Hotel	-	-	n/a
Total	213	604	

Region	GHG Savings in 2010 Kilotonnes eCO_2		Cost of GHG $/tonne
	Direct	Indirect	
Atlantic	14	60	-$10
Quebec	33	114	$26
Ontario	95	261	$9
Manitoba	11	20	$25
Saskatchewan	9	16	$8
Alberta	28	72	$25
British Columbia	24	61	$33
Total	213	604	

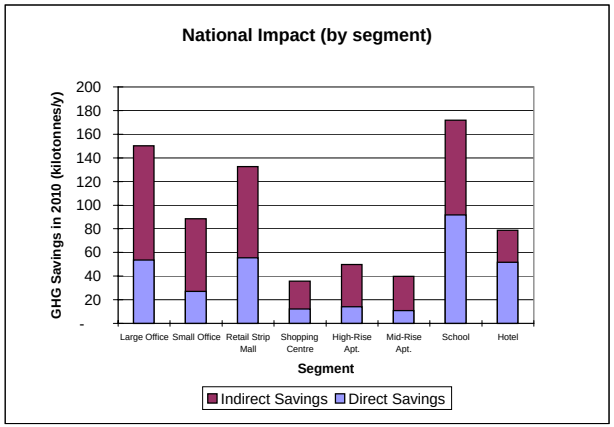
MEASURE DATA SHEET -- C13-- National Commercial Checkup

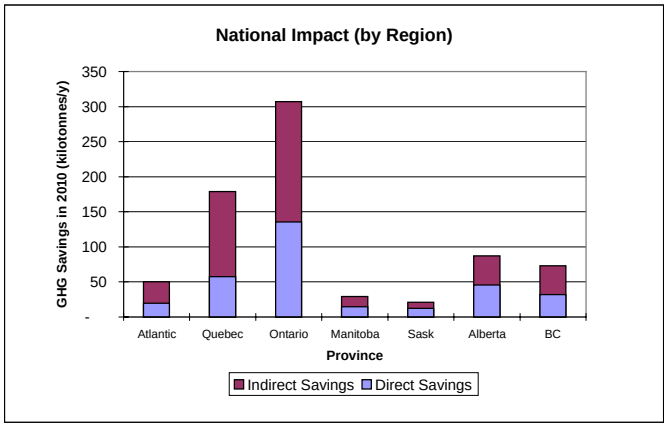
(data does not include "Other Commercial " segment)

Summary of Affected Measures & Multipliers	
Other Measures Affected by this Measure	**Multiplier**
C7 Public Building Incentive Program	10%
C8 Commercial Building Retrofit Program	10%
C8A MUR Retrofit Program	10%

Capital Costs, Energy Savings, and GHG Reductions	(millions)
Capital cost of actions stimulated by this Measure cumulative to 2010 (net present value)	$385.4
Participant energy savings from actions stimulated by this Measure, over the life of the actions (net present value)	$518.7
Total GHG reductions in 2010	747 kt/y
Cost of total GHG reductions stimulated by this Measure ($ per tonne)	(13) $/tonne

Costs of Program Implementation (cumulative to 2010)	(millions)
Administrative and related costs (net present value)	$4.2
Cost of subsidy, if applicable (net present value)	$0.0
Total cost of program implementation (net present value)	$ 4.2





Note:

Segment	GHG Savings in 2010 Kilotonnes eCO_2	
	Direct	**Indirect**
Large Office	54	97
Small Office	27	61
Retail Strip Mall	55	77
Shopping Centre	12	24
High-Rise Apt.	14	36
Mid-Rise Apt.	11	29
School	92	80
Hotel	52	27
Total	316	431

Region	GHG Savings in 2010 Kilotonnes eCO_2	
	Direct	**Indirect**
Atlantic	20	31
Quebec	57	121
Ontario	135	172
Manitoba	15	15
Saskatchewan	12	9
Alberta	45	42
British Columbia	32	41
Total	316	431

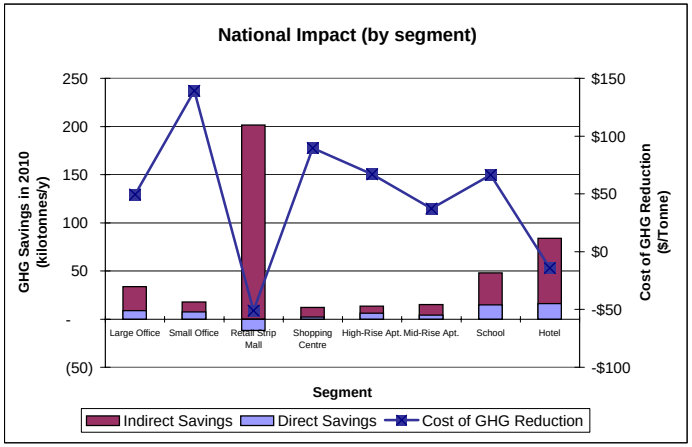
MEASURE DATA SHEET -- AE5-- Energy Star Labelling

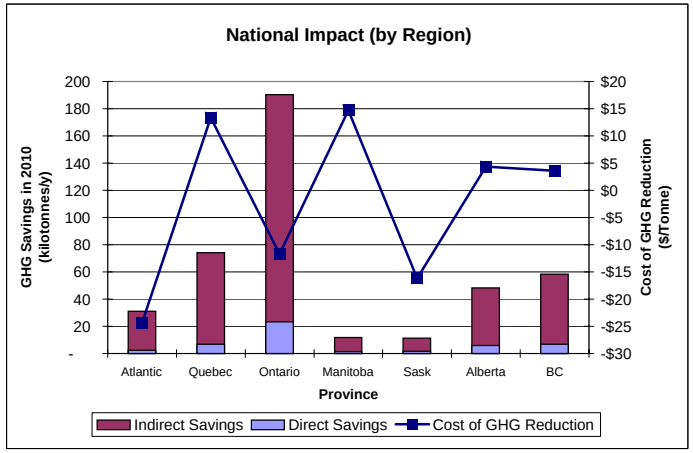
(data does not include "Other Commercial " segment)

Summary of Market Penetration			
Actions	**Affected Stock**	**Market Penetration in Affected Stock**	
		Existing	**New**
E8 Boiler Controls	existing buildings with hydronic heating	1 - 6%	N/A
E11 Lighting Upgrade	existing and new buildings	2 - 10%	10 - 20%
E15 Condensing Boiler Incremental	existing and new buildings with hydronic heating	1 - 2%	2 - 20%
E17 HE A/C Equip. Incremental	existing and new buildings that have A/C equipment	1 - 2%	10 - 20%
E21 HE DHW Equip. Incremental	existing and new buildings	2 - 20%	2 - 25%
E29 Plug Loads	existing and new stock high connected UPD values	20%	25 - 75%
E30 Transformers	existing and new stock	5%	10 - 50%

Capital Costs, Energy Savings, and GHG Reductions	**(millions)**
Capital cost of actions stimulated by this Measure cumulative to 2010 (net present value)	$245.5
Participant energy savings from actions stimulated by this Measure, over the life of the actions (net present value)	$263.2
Total GHG reductions in 2010	426 kt/y
Cost of total GHG reductions stimulated by this Measure ($ per tonne)	(4) $/tonne

Costs of Program Implementation (cumulative to 2010)	**(millions)**
Administrative and related costs (net present value)	$8.8
Cost of subsidy, if applicable (net present value)	$0.0
Total cost of program implementation (net present value)	$ 8.8





Segment	**GHG Savings in 2010**		**Cost of GHG Reduction**
	Kilotonnes eCO_2		**$/tonne**
	Direct	**Indirect**	
Large Office	9	25	$49
Small Office	7	10	$139
Retail Strip Mall	(12)	213	-$51
Shopping Centre	2	10	$90
High-Rise Apt.	6	7	$67
Mid-Rise Apt.	4	11	$37
School	15	33	$66
Hotel	16	68	-$14
Total	48	378	

Region	**GHG Savings in 2010**		**Cost of GHG Reduction**
	Kilotonnes eCO_2		**$/tonne**
	Direct	**Indirect**	
Atlantic	2	29	-$24
Quebec	7	67	$13
Ontario	23	167	-$12
Manitoba	1	10	$15
Saskatchewan	2	10	-$16
Alberta	6	42	$4
British Columbia	7	52	$4
Total	48	378	

MEASURE DATA SHEET -- C4-- CBIP II

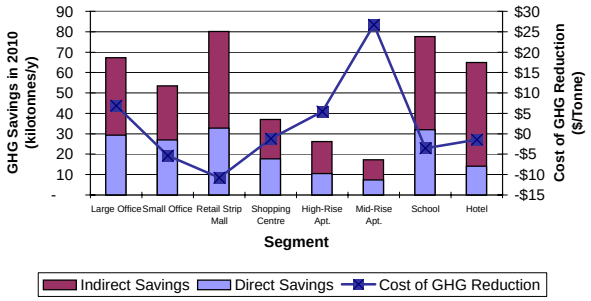
(data does not include "Other Commercial " segment)

Summary of Performance Improvement & Market Penetration		
Performance Improvement	**Affected Stock**	**Market Penetration in Affected Stock**
35% above MNECB	new stock only	20%

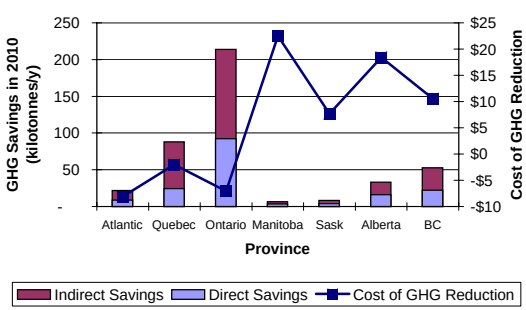
Capital Costs, Energy Savings, and GHG Reductions	**(millions)**
Capital cost of actions stimulated by this Measure cumulative to 2010 (net present value)	$271.2
Participant energy savings from actions stimulated by this Measure, over the life of the actions (net present value)	$278.1
Total GHG reductions in 2010	424 kt/y
Cost of total GHG reductions stimulated by this Measure ($ per tonne)	(1) $/tonne

Costs of Program Implementation (cumulative to 2010)	**(millions)**
Administrative and related costs (net present value)	$6.8
Cost of subsidy, if applicable (net present value)	$39.0
Total cost of program implementation (net present value)	$ 45.9

National Impact (by segment)



National Impact (by Region)



Segment	**GHG Savings in 2010**		**Cost of GHG Reduction**
	Kilotonnes eCO_2		**$/tonne**
	Direct	**Indirect**	
Large Office	29	38	$7
Small Office	27	26	-$5
Retail Strip Mall	33	47	-$11
Shopping Centre	18	19	-$1
High-Rise Apt.	11	16	$5
Mid-Rise Apt.	7	10	$27
School	32	46	-$4
Hotel	14	51	-$1
Total	171	253	

Region	**GHG Savings in 2010**		**Cost of GHG Reduction**
	Kilotonnes eCO_2		**$/tonne**
	Direct	**Indirect**	
Atlantic	9	13	-$8
Quebec	24	63	-$2
Ontario	92	122	-$7
Manitoba	3	3	$23
Saskatchewan	4	4	$8
Alberta	16	17	$18
British Columbia	22	31	$11
Total	171	253	

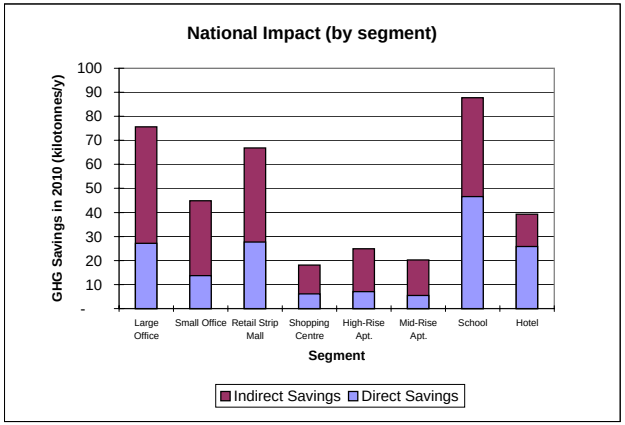
MEASURE DATA SHEET -- C6-- Continuing Education

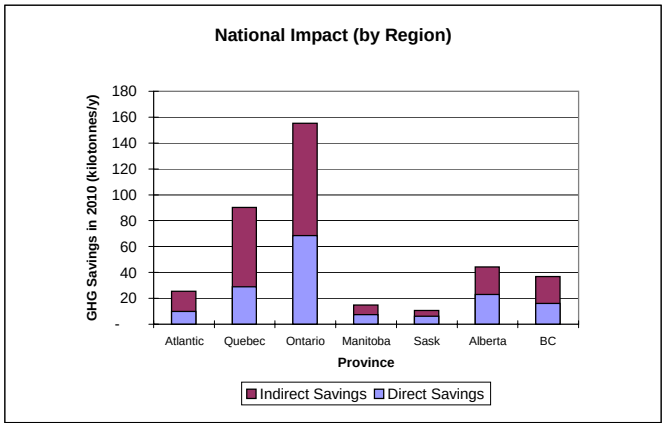
(data does not include "Other Commercial " segment)

Summary of Affected Measures & Multipliers	
Other Measures Affected by this Measure	**Multiplier**
C7 Public Building Incentive Program	5%
C8 Commercial Building Retrofit Program	5%
C8A MUR Retrofit Program	5%
RT1 Expanded REDI Program	5%

Capital Costs, Energy Savings, and GHG Reductions	**(millions)**
Capital cost of actions stimulated by this Measure cumulative to 2010 (net present value)	$197.1
Participant energy savings from actions stimulated by this Measure, over the life of the actions (net present value)	$262.2
Total GHG reductions in 2010	378 kt/y
Cost of total GHG reductions stimulated by this Measure ($ per tonne)	(12) $/tonne

Costs of Program Implementation (cumulative to 2010)	**(millions)**
Administrative and related costs (net present value)	$1.9
Cost of subsidy, if applicable (net present value)	$0.0
Total cost of program implementation (net present value)	$ 1.9





Segment	**GHG Savings in 2010 Kilotonnes eCO_2**	
	Direct	**Indirect**
Large Office	27	48
Small Office	14	31
Retail Strip Mall	28	39
Shopping Centre	6	12
High-Rise Apt.	7	18
Mid-Rise Apt.	5	15
School	47	41
Hotel	26	13
Total	160	218

Region	**GHG Savings in 2010 Kilotonnes eCO_2**	
	Direct	**Indirect**
Atlantic	10	16
Quebec	29	61
Ontario	68	87
Manitoba	7	7
Saskatchewan	6	5
Alberta	23	21
British Columbia	16	21
Total	160	218

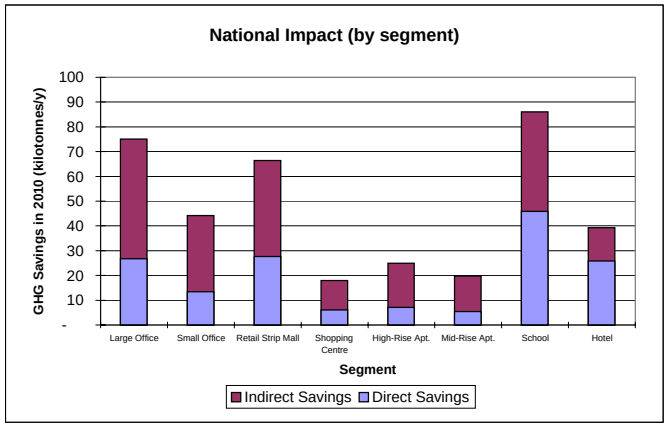
MEASURE DATA SHEET -- C9-- National Building Operator Training

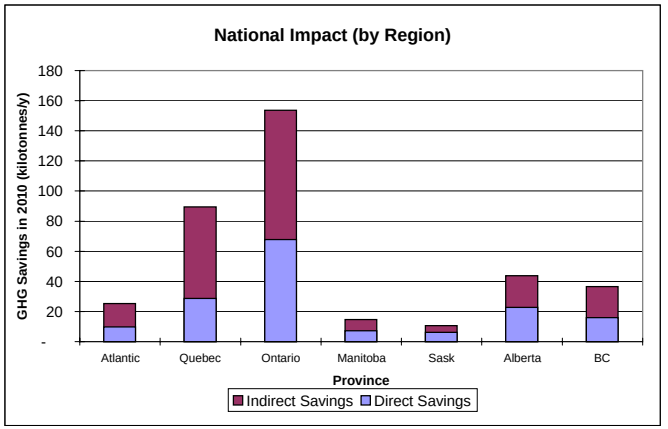
(data does not include "Other Commercial " segment)

Summary of Affected Measures & Multipliers	
Other Measures Affected by this Measure	**Multiplier**
C7 Public Building Incentive Program	5%
C8 Commercial Building Retrofit Program	5%
C8A MUR Retrofit Program	5%

Capital Costs, Energy Savings, and GHG Reductions	**(millions)**
Capital cost of actions stimulated by this Measure cumulative to 2010 (net present value)	$192.7
Participant energy savings from actions stimulated by this Measure, over the life of the actions (net present value)	$259.3
Total GHG reductions in 2010	374 kt/y
Cost of total GHG reductions stimulated by this Measure ($ per tonne)	(13) $/tonne

Costs of Program Implementation (cumulative to 2010)	**(millions)**
Administrative and related costs (net present value)	$4.5
Cost of subsidy, if applicable (net present value)	$0.0
Total cost of program implementation (net present value)	$ 4.5





Note:

Segment	**GHG Savings in 2010 Kilotonnes eCO_2**	
	Direct	**Indirect**
Large Office	27	48
Small Office	13	31
Retail Strip Mall	28	39
Shopping Centre	6	12
High-Rise Apt.	7	18
Mid-Rise Apt.	5	14
School	46	40
Hotel	26	13
Total	158	215

Region	**GHG Savings in 2010 Kilotonnes eCO_2**	
	Direct	**Indirect**
Atlantic	10	15
Quebec	29	61
Ontario	68	86
Manitoba	7	7
Saskatchewan	6	4
Alberta	23	21
British Columbia	16	21
Total	158	215

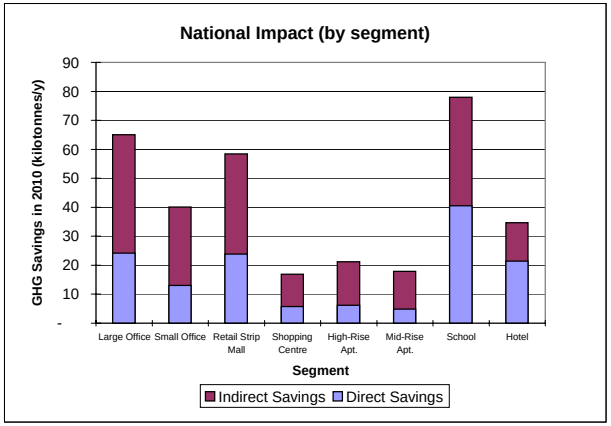
MEASURE DATA SHEET -- C5-- Building Design Guidelines/Greenprints

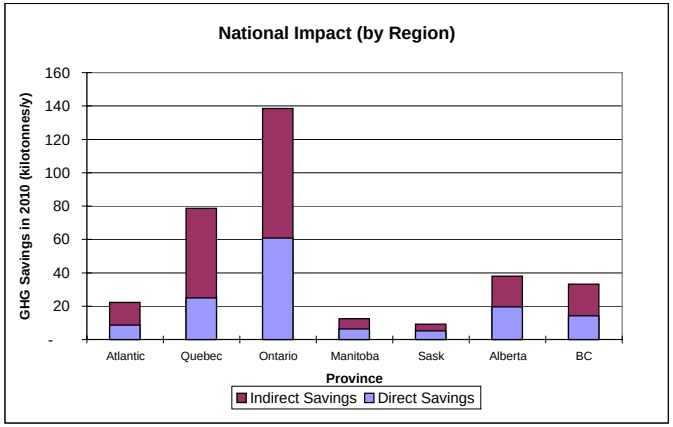
(data does not include "Other Commercial " segment)

Summary of Affected Measures & Multipliers	
Other Measures Affected by this Measure	**Multiplier**
C7 Public Building Incentive Program	4%
C8 Commercial Building Retrofit Program	4%
C8A MUR Retrofit Program	4%
RT1 Expanded REDI Program	15%
C4 CBIP II	5%

Capital Costs, Energy Savings, and GHG Reductions	**(millions)**
Capital cost of actions stimulated by this Measure cumulative to 2010 (net present value)	$181.0
Participant energy savings from actions stimulated by this Measure, over the life of the actions (net present value)	$230.0
Total GHG reductions in 2010	332 kt/y
Cost of total GHG reductions stimulated by this Measure ($ per tonne)	(10) $/tonne

Costs of Program Implementation (cumulative to 2010)	**(millions)**
Administrative and related costs (net present value)	$5.3
Cost of subsidy, if applicable (net present value)	$0.0
Total cost of program implementation (net present value)	$ 5.3





Segment	**GHG Savings in 2010 Kilotonnes eCO_2**	
	Direct	**Indirect**
Large Office	24	41
Small Office	13	27
Retail Strip Mall	24	35
Shopping Centre	6	11
High-Rise Apt.	6	15
Mid-Rise Apt.	5	13
School	40	38
Hotel	21	13
Total	140	193

Region	**GHG Savings in 2010 Kilotonnes eCO_2**	
	Direct	**Indirect**
Atlantic	9	14
Quebec	25	54
Ontario	61	78
Manitoba	6	6
Saskatchewan	5	4
Alberta	20	18
British Columbia	14	19
Total	140	193

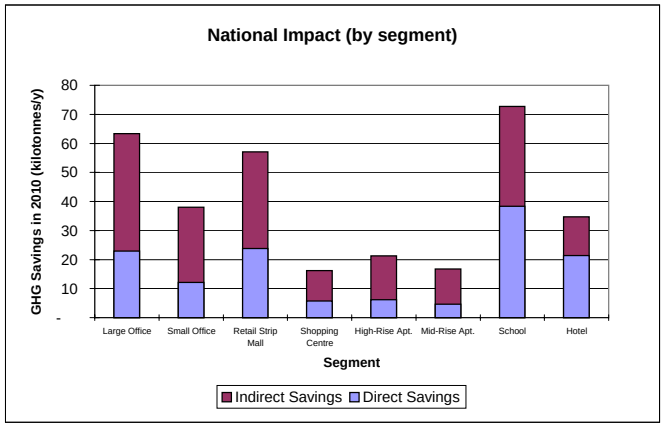
MEASURE DATA SHEET -- C3-- Advanced Building and Equipment Demo. Initiative

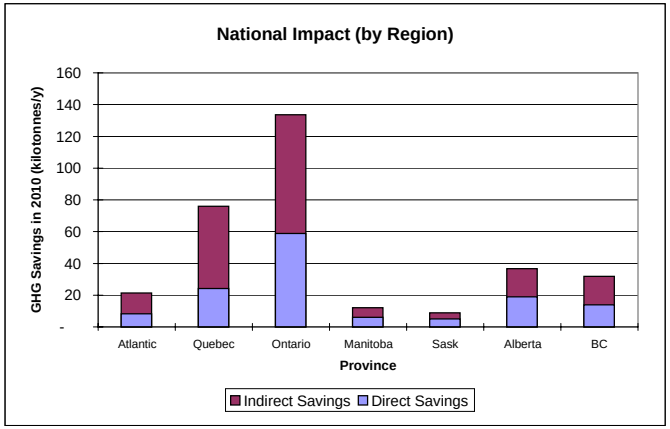
(data does not include "Other Commercial " segment)

Summary of Affected Measures & Multipliers	
Other Measures Affected by this Measure	**Multiplier**
C7 Public Building Incentive Program	4%
C8 Commercial Building Retrofit Program	4%
C8A MUR Retrofit Program	4%
C4 CBIP II	5%

Capital Costs, Energy Savings, and GHG Reductions	**(millions)**
Capital cost of actions stimulated by this Measure cumulative to 2010 (net present value)	$167.7
Participant energy savings from actions stimulated by this Measure, over the life of the actions (net present value)	$221.4
Total GHG reductions in 2010	320 kt/y
Cost of total GHG reductions stimulated by this Measure ($ per tonne)	(12) $/tonne

Costs of Program Implementation (cumulative to 2010)	**(millions)**
Administrative and related costs (net present value)	$6.1
Cost of subsidy, if applicable (net present value)	$0.0
Total cost of program implementation (net present value)	$ 6.1





Segment	**GHG Savings in 2010 Kilotonnes eCO_2**	
	Direct	**Indirect**
Large Office	23	41
Small Office	12	26
Retail Strip Mall	24	33
Shopping Centre	6	10
High-Rise Apt.	6	15
Mid-Rise Apt.	5	12
School	38	34
Hotel	21	13
Total	135	185

Region	**GHG Savings in 2010 Kilotonnes eCO_2**	
	Direct	**Indirect**
Atlantic	8	13
Quebec	24	52
Ontario	59	75
Manitoba	6	6
Saskatchewan	5	4
Alberta	19	18
British Columbia	14	18
Total	135	185

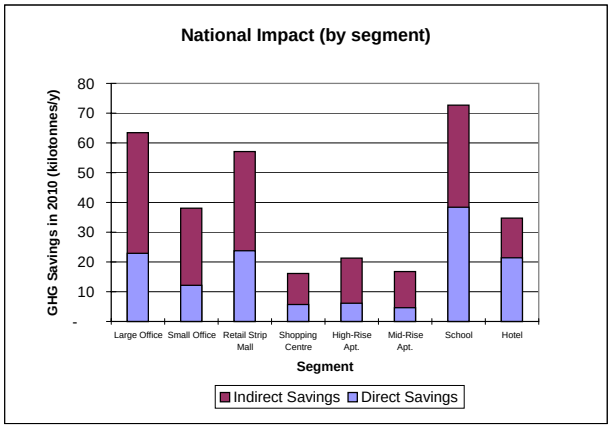
MEASURE DATA SHEET -- AE4-- Technology Commercialization Program

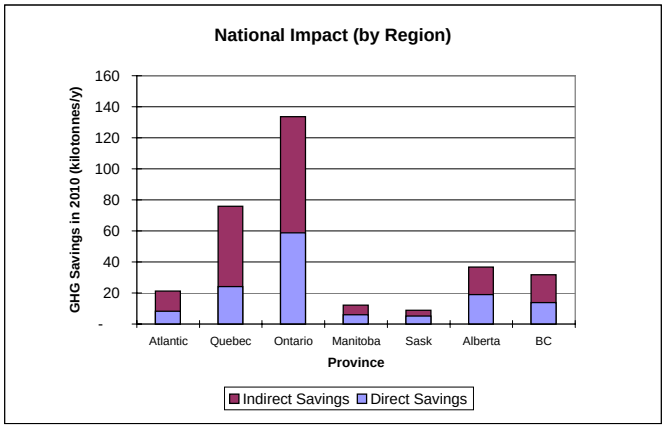
(data does not include "Other Commercial " segment)

Summary of Affected Measures & Multipliers	
Other Measures Affected by this Measure	**Multiplier**
C7 Public Building Incentive Program	4%
C8 Commercial Building Retrofit Program	4%
C8A MUR Retrofit Program	4%
C4 CBIP II	5%

Capital Costs, Energy Savings, and GHG Reductions	**(millions)**
Capital cost of actions stimulated by this Measure cumulative to 2010 (net present value)	$167.7
Participant energy savings from actions stimulated by this Measure, over the life of the actions (net present value)	$221.4
Total GHG reductions in 2010	320 kt/y
Cost of total GHG reductions stimulated by this Measure ($ per tonne)	(12) $/tonne

Costs of Program Implementation (cumulative to 2010)	**(millions)**
Administrative and related costs (net present value)	$1.9
Cost of subsidy, if applicable (net present value)	$0.0
Total cost of program implementation (net present value)	$ 1.9





Note:

Segment	**GHG Savings in 2010 Kilotonnes eCO_2**	
	Direct	**Indirect**
Large Office	23	41
Small Office	12	26
Retail Strip Mall	24	33
Shopping Centre	6	10
High-Rise Apt.	6	15
Mid-Rise Apt.	5	12
School	38	34
Hotel	21	13
Total	135	185

Region	**GHG Savings in 2010 Kilotonnes eCO_2**	
	Direct	**Indirect**
Atlantic	8	13
Quebec	24	52
Ontario	59	75
Manitoba	6	6
Saskatchewan	5	4
Alberta	19	18
British Columbia	14	18
Total	135	185

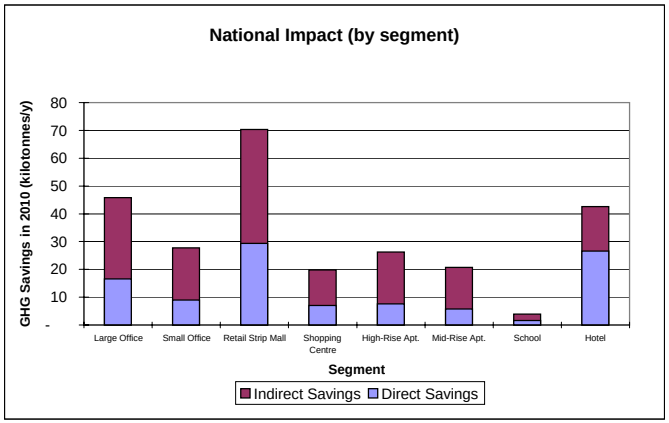
MEASURE DATA SHEET -- C1-- National Building System Labelling/Rating

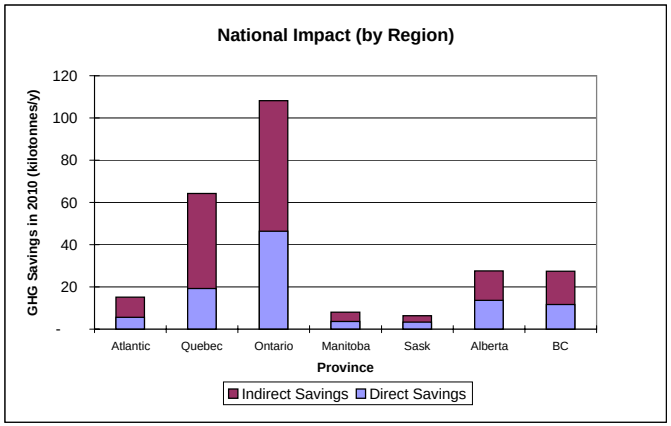
(data does not include "Other Commercial " segment)

Summary of Affected Measures & Multipliers	
Other Measures Affected by this Measure	**Multiplier**
C8 Commercial Building Retrofit Program	5%
C8A MUR Retrofit Program	5%
C4 CBIP II	5%

Capital Costs, Energy Savings, and GHG Reductions	**(millions)**
Capital cost of actions stimulated by this Measure cumulative to 2010 (net present value)	$112.2
Participant energy savings from actions stimulated by this Measure, over the life of the actions (net present value)	$169.3
Total GHG reductions in 2010	257 kt/y
Cost of total GHG reductions stimulated by this Measure ($ per tonne)	(16) $/tonne

Costs of Program Implementation (cumulative to 2010)	**(millions)**
Administrative and related costs (net present value)	$7.9
Cost of subsidy, if applicable (net present value)	$0.0
Total cost of program implementation (net present value)	$ 7.9





Segment	**GHG Savings in 2010 Kilotonnes eCO2**	
	Direct	**Indirect**
Large Office	17	29
Small Office	9	19
Retail Strip Mall	29	41
Shopping Centre	7	13
High-Rise Apt.	8	19
Mid-Rise Apt.	6	15
School	2	2
Hotel	27	16
Total	103	154

Region	**GHG Savings in 2010 Kilotonnes eCO_2**	
	Direct	**Indirect**
Atlantic	6	10
Quebec	19	45
Ontario	46	62
Manitoba	4	4
Saskatchewan	3	3
Alberta	14	14
British Columbia	12	16
Total	103	154

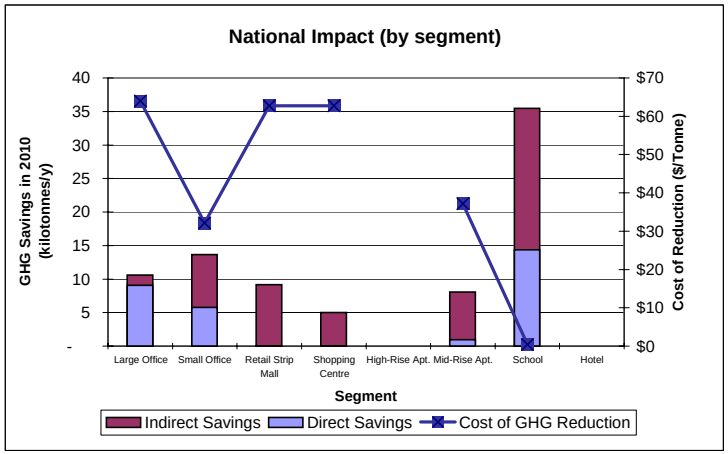
MEASURE DATA SHEET -- RT1-- Expanded REDI Program

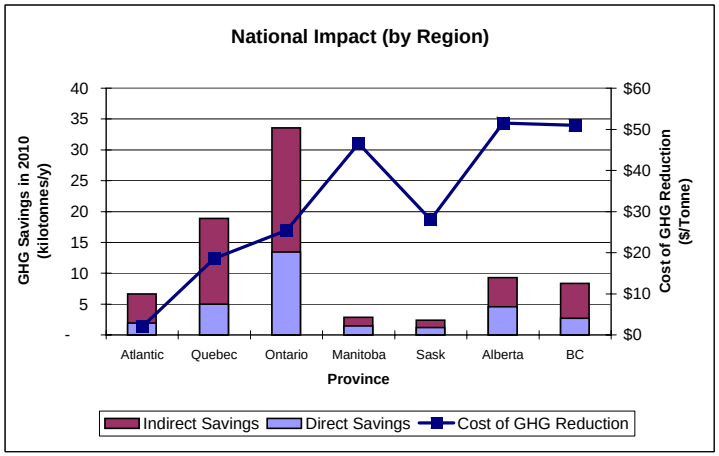
(data does not include "Other Commercial " segment)

Summary of Market Penetration			
Actions	**Affected Stock**	**Market Penetration in Affected Stock**	
		Existing	**New**
E22 PV Systems	existing and new buildings	0.5%	0.5%
E26 Solar Heating	existing and new buildings	1-3%	1-3%
E27 Solar DHW	existing and new buildings	3%	3%

Capital Costs, Energy Savings, and GHG Reductions	**(millions)**
Capital cost of actions stimulated by this Measure cumulative to 2010 (net present value)	$88.9
Participant energy savings from actions stimulated by this Measure, over the life of the actions (net present value)	$57.1
Total GHG reductions in 2010	82 kt/y
Cost of total GHG reductions stimulated by this Measure ($ per tonne)	28 $/tonne

Costs of Program Implementation (cumulative to 2010)	**(millions)**
Administrative and related costs (net present value)	$3.7
Cost of subsidy, if applicable (net present value)	$29.3
Total cost of program implementation (net present value)	$ 33.0





Segment	**GHG Savings in 2010**		**Cost of GHG Reduction**
	Kilotonnes eCO_2		**$/tonne**
	Direct	**Indirect**	
Large Office	9	2	$64
Small Office	6	8	$32
Retail Strip Mall	0	9	$63
Shopping Centre	0	5	$63
High-Rise Apt.	-	-	n/a
Mid-Rise Apt.	1	7	$37
School	14	21	$0
Hotel	-	-	n/a
Total	30	52	

Region	**GHG Savings in 2010**		**Cost of GHG Reduction**
	Kilotonnes eCO_2		**$/tonne**
	Direct	**Indirect**	
Atlantic	2	5	$2
Quebec	5	14	$19
Ontario	13	20	$25
Manitoba	1	1	$47
Saskatchewan	1	1	$28
Alberta	5	5	$52
British Columbia	3	6	$51
Total	30	52	

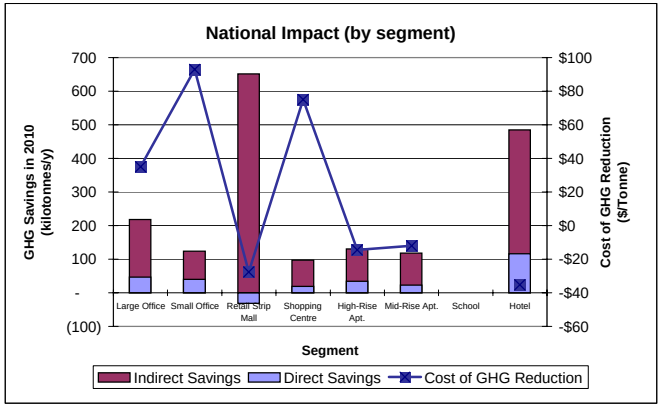
MEASURE DATA SHEET -- C11-- EE Equipment Tax Measure

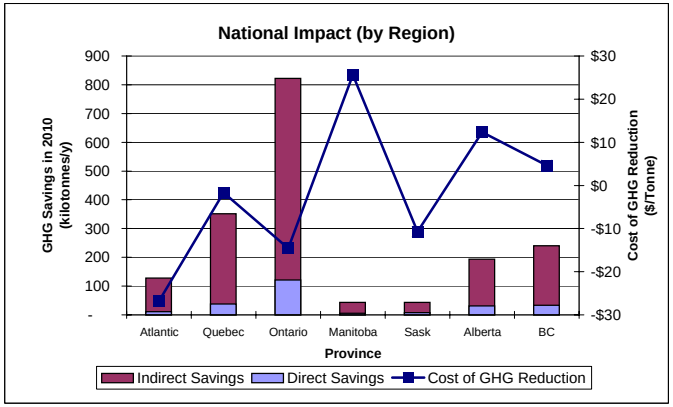
(data does not include "Other Commercial " segment)

Summary of Market Penetration			
Actions	**Affected Stock**	**Market Penetration in Affected Stock**	
		Existing	**New**
E8 Boiler Controls	existing buildings with hydronic heating	2 - 10%	N/A
E11 Lighting Upgrade	existing and new buildings	3 - 8%	100%
E15 Condensing Boiler Incremental	existing and new buildings with hydronic heating	3 - 7%	100%
E17 HE A/C Equip. Incremental	existing and new buildings that have A/C equipment	7 - 10%	100%
E21 HE DHW Equip. Incremental	existing and new buildings	8%	100%
E22 PV Systems	existing and new low rise buildings only	1%	5%
E23 Cogeneration	existing and new buildings	1%	5%
E24 GSHP	existing large office and all new buildings	4%	25%
E29 Plug Loads	existing and new stock high connected UPD values	50%	100%
E30 Transformers	existing and new stock	20%	100%

Capital Costs, Energy Savings, and GHG Reductions	**(millions)**
Capital cost of actions stimulated by this Measure cumulative to 2010 (net present value)	$1,080.8
Participant energy savings from actions stimulated by this Measure, over the life of the actions (net present value)	$1,215.5
Total GHG reductions in 2010	1,823 kt/y
Cost of total GHG reductions stimulated by this Measure ($ per tonne)	(7) $/tonne

Costs of Program Implementation (cumulative to 2010)	**(millions)**
Administrative and related costs (net present value)	$12.3
Cost of subsidy, if applicable (net present value)	$122.9
Total cost of program implementation (net present value)	$ 135.2





Segment	**GHG Savings in 2010**		**Cost of GHG Reduction**
	Kilotonnes eCO_2		**$/tonne**
	Direct	**Indirect**	
Large Office	47	172	$35
Small Office	40	83	$93
Retail Strip Mall	(31)	682	-$28
Shopping Centre	19	77	$75
High-Rise Apt.	34	97	-$14
Mid-Rise Apt.	23	96	-$12
School	-	-	n/a
Hotel	116	368	-$35
Total	248	1,575	

Region	**GHG Savings in 2010**		**Cost of GHG Reduction**
	Kilotonnes eCO_2		**$/tonne**
	Direct	**Indirect**	
Atlantic	12	116	-$27
Quebec	38	314	-$2
Ontario	121	701	-$15
Manitoba	6	38	$26
Saskatchewan	7	37	-$11
Alberta	31	163	$12
British Columbia	34	207	$5
Total	248	1,575	

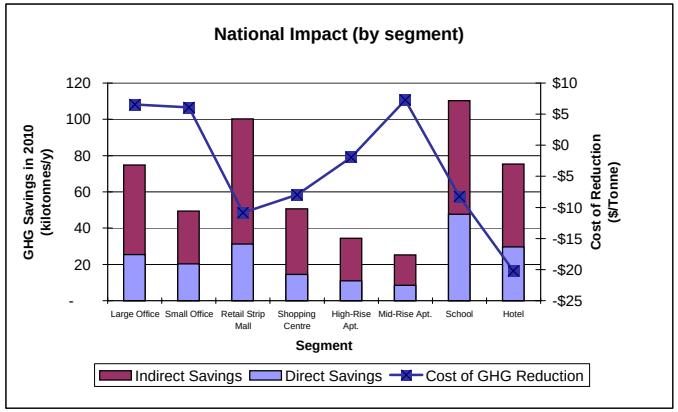
MEASURE DATA SHEET -- C2B-- IMPROVED MNECB

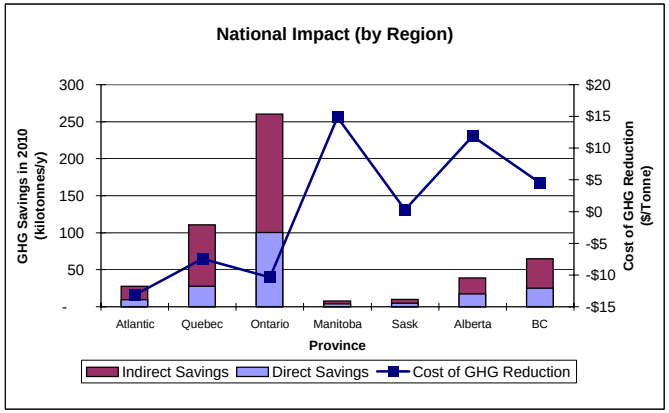
(data does not include "Other Commercial " segment)

Summary of Performance Improvement & Market Penetration		
Performance Improvement	**Affected Stock**	**Market Penetration in Affected Stock**
15 - 20% above MNECB	new stock only	80% starting in 2005

Capital Costs, Energy Savings, and GHG Reductions	**(millions)**
Capital cost of actions stimulated by this Measure cumulative to 2010 (net present value)	$262.6
Participant energy savings from actions stimulated by this Measure, over the life of the actions (net present value)	$303.5
Total GHG reductions in 2010	520 kt/y
Cost of total GHG reductions stimulated by this Measure ($ per tonne)	(6) $/tonne

Costs of Program Implementation (cumulative to 2010)	**(millions)**
Administrative and related costs (net present value)	$7.8
Cost of subsidy, if applicable (net present value)	
Total cost of program implementation (net present value)	$ 7.8





Segment	**GHG Savings in 2010**		**Cost of GHG Reduction**
	Kilotonnes eCO_2		**$/tonne**
	Direct	**Indirect**	
Large Office	25	49	$7
Small Office	20	29	$6
Retail Strip Mall	31	69	-$11
Shopping Centre	14	36	-$8
High-Rise Apt.	11	23	-$2
Mid-Rise Apt.	8	17	$7
School	48	63	-$8
Hotel	30	46	-$20
Total	188	332	

Region	**GHG Savings in 2010**		**Cost of GHG Reduction**
	Kilotonnes eCO_2		**$/tonne**
	Direct	**Indirect**	
Atlantic	10	18	-$13
Quebec	28	83	-$7
Ontario	100	160	-$10
Manitoba	4	4	$15
Saskatchewan	5	5	$0
Alberta	17	22	$12
British Columbia	25	40	$5
Total	188	332	

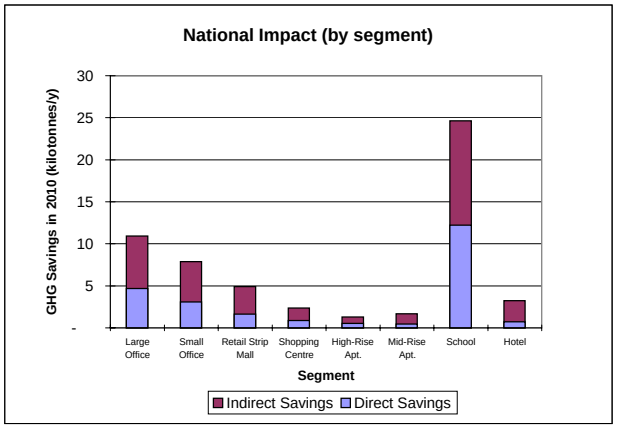
MEASURE DATA SHEET -- RT2-- Market Development for Onsite Renewables

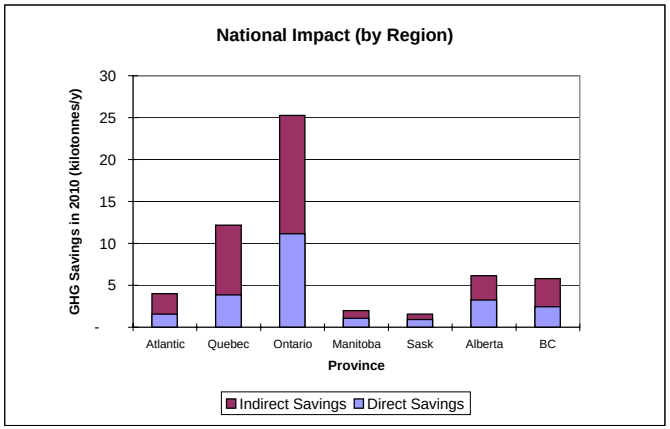
(data does not include "Other Commercial " segment)

Summary of Affected Measures & Multipliers	
Other Measures Affected by this Measure	**Multiplier**
C7 Public Building Incentive Program	1%
RT1 Expanded REDI Program	10%
C4 CBIP II	5%

Capital Costs, Energy Savings, and GHG Reductions	**(millions)**
Capital cost of actions stimulated by this Measure cumulative to 2010 (net present value)	$40.0
Participant energy savings from actions stimulated by this Measure, over the life of the actions (net present value)	$38.5
Total GHG reductions in 2010	57 kt/y
Cost of total GHG reductions stimulated by this Measure ($ per tonne)	2 $/tonne

Costs of Program Implementation (cumulative to 2010)	**(millions)**
Administrative and related costs (net present value)	$1.4
Cost of subsidy, if applicable (net present value)	$0.0
Total cost of program implementation (net present value)	$ 1.4





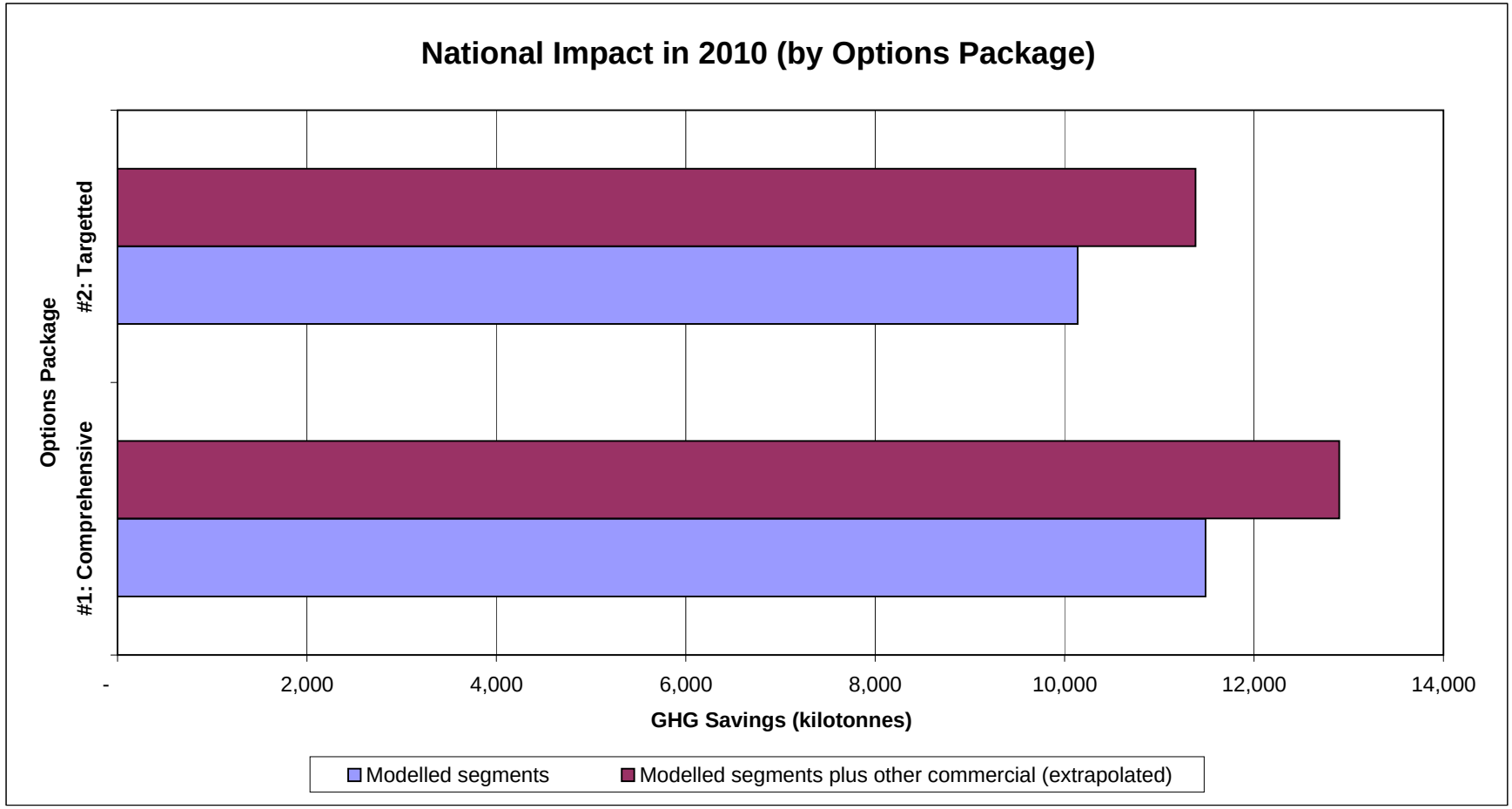
Note:

Segment	**GHG Savings in 2010 Kilotonnes eCO_2**	
	Direct	**Indirect**
Large Office	5	6
Small Office	3	5
Retail Strip Mall	2	3
Shopping Centre	1	1
High-Rise Apt.	1	1
Mid-Rise Apt.	0	1
School	12	12
Hotel	1	3
Total	24	33

Region	**GHG Savings in 2010 Kilotonnes eCO_2**	
	Direct	**Indirect**
Atlantic	2	2
Quebec	4	8
Ontario	11	14
Manitoba	1	1
Saskatchewan	1	1
Alberta	3	3
British Columbia	2	3
Total	24	33

OPTION PACKAGE GHG SAVINGS

	Options Package	
	#1: Comprehensive	**#2: Targetted**
GHG Savings of modelled segments	11,489	10,138
GHG Savings of "other commercial" (extrapolated)	1,410	1,244
Total GHG Savings	**12,899**	**11,382**



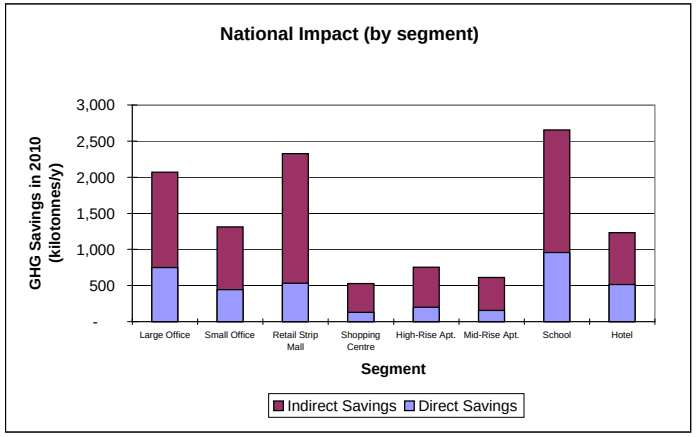
OPTIONS PACKAGE # 1: COMPREHENSIVE SCENARIO (ALL MEASURES)

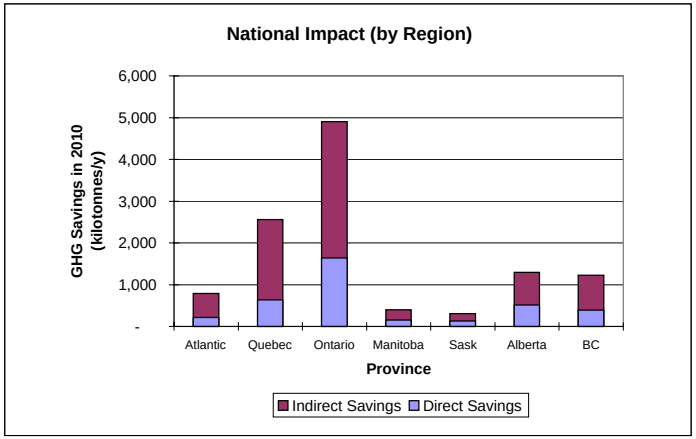
(data does not include "Other Commercial " segment)

Measures included in Options Package	
Code	**Description**
C-7	Public Building Initiative
C-8	Commercial Building Retrofit Program
C-8A	Multi-Residential Retrofit Program
C-11	EE Equipment Tax Measure
AE-1	National Standards for Equipment and Appliances
AE-5	Energy Star Labelling
AE-7	Government Procurement with Golden Carrot
AE-9	Window Market Transformation
RT-1	Expanded REDI Program
C-2B	Improved MNECB
C-4	CBIP II
C-1	National Building System Labelling / rating
C-3	Advanced Building and Equipment Demo. Initiative
C-5	Building Design Guidelines/Greenprints
C-6	Continuing Education
C-9	National Building Operator Training
C-13	National Commercial Checkup
AE-4	Technology Commercialization Program
RT-2	Market Development for Onsite Renewables

Capital Costs, Energy Savings, and GHG Reductions	**(millions)**
Capital cost of Measures cumulative to 2010 (net present value)	$6,657.8
Participant energy savings from Measures, over the life of the actions (net present value)	$7,732.8
Total GHG reductions in 2010	11,489 kt/y
Cost of total GHG reductions for Options Package ($ per tonne)	(7) $/tonne

Costs of Program Implementation (cumulative to 2010)	**(millions)**
Administrative and related costs (net present value)	$155.9
Cost of subsidy, if applicable (net present value)	$217.0
Total cost of program implementation (net present value)	$ 373





Segment	GHG Savings in 2010 Kilotonnes eCO2	
	Direct	**Indirect**
Large Office	751	1,320
Small Office	444	867
Retail Strip Mall	533	1,793
Shopping Centre	127	399
High-Rise Apt.	199	555
Mid-Rise Apt.	155	455
School	955	1,700
Hotel	513	721
Total	3,678	7,811

Region	GHG Savings in 2010 Kilotonnes eCO_2	
	Direct	**Indirect**
Atlantic	214	578
Quebec	639	1,921
Ontario	1,642	3,265
Manitoba	152	245
Saskatchewan	131	174
Alberta	510	788
British Columbia	390	839
Total	3,678	7,811

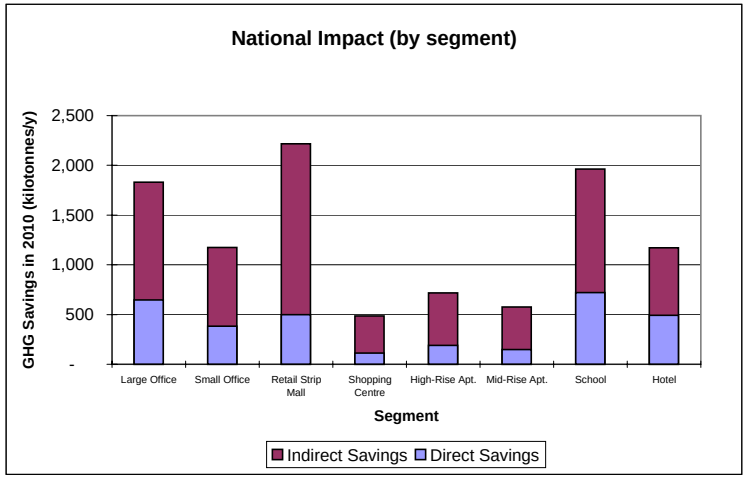
OPTIONS PACKAGE # 2: TARGETTED SCENARIO

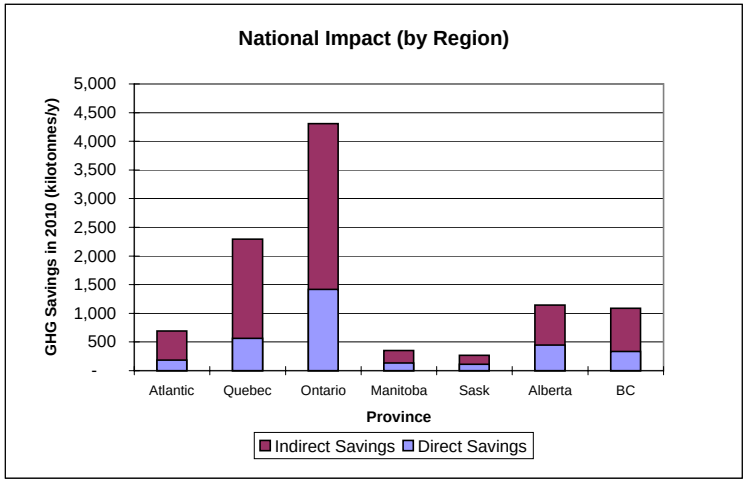
(data does not include "Other Commercial " segment)

Measures Included in Options Package	
Code	**Description**
C-7	Public Building Initiative
C-8	Commercial Building Retrofit Program
C-8A	Multi-Residential Retrofit Program
AE-1	National Standards for Equipment and Appliances
AE-5	Energy Star Labelling
AE-9	Window Market Transformation
C-2B	Improved MNECB
C-6	Continuing Education
C-9	National Building Operator Training
C-13	National Commercial Checkup

Capital Costs, Energy Savings, and GHG Reductions	**(millions)**
Capital cost of Measures cumulative to 2010 (net present value)	$6,281.9
Participant energy savings from Measures, over the life of the actions (net present value)	$6,800.3
Total GHG reductions in 2010	10,138 kt/y
Cost of total GHG reductions for Options Package ($ per tonne)	(4) $/tonne

Costs of Program Implementation (cumulative to 2010)	**(millions)**
Administrative and related costs (net present value)	$114.5
Cost of subsidy, if applicable (net present value)	$25.8
Total cost of program implementation (net present value)	$ 140





Segment	**GHG Savings in 2010** Kilotonnes eCO2	
	Direct	**Indirect**
Large Office	646	1,185
Small Office	382	793
Retail Strip Mall	499	1,717
Shopping Centre	114	371
High-Rise Apt.	189	530
Mid-Rise Apt.	147	429
School	720	1,244
Hotel	493	679
Total	3,189	6,949

Region	**GHG Savings in 2010** Kilotonnes eCO_2	
	Direct	**Indirect**
Atlantic	185	507
Quebec	561	1,729
Ontario	1,416	2,892
Manitoba	131	218
Saskatchewan	113	154
Alberta	445	700
British Columbia	337	748
Total	3,189	6,949

Climate Change: Buildings Table
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Brent Barnes	Canadian Plastics Industry Association
Bruno Carella	Canadian Gas Association
Chris Morris	Industry Canada
Alan Levy	Canadian Association of Energy Services Companies

Jean-Francois Tremblay	AdESEQ alternate for Canadian Association of Energy Services Companies
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