

A Comparison of Current Government Action on Climate Change in the U.S. and Canada

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Executive Summary

Governments in the U.S. have taken far more significant action to reduce GHG emissions than have governments in Canada

Prominent in the rhetoric of opponents of the Kyoto Protocol in Canada is the notion that ratifying the Protocol would damage Canada's economic competitiveness.¹ The Bush Administration has rejected Kyoto in favour of its own "Global Climate Change Initiative," which will have no impact on the current rising trend in U.S. greenhouse gas (GHG) emissions.² The Canadian economy is strongly linked to that of the U.S., so the argument goes, and if the U.S. is not acting then Canada cannot afford to either.

There is a major flaw in this argument. Although the White House has abandoned responsibility to reduce GHG emissions, the federal government still administers a substantial body of programs that recognize the opportunity presented by the development of GHG reduction technologies. More recently state and municipal governments have begun to take advantage of these opportunities. This report presents detailed evidence that governments in the U.S. have, in fact, taken far more significant action to reduce GHG emissions than have governments in Canada.

State governments in the U.S. are far ahead of provincial governments in Canada in implementing GHG-reducing measures. State actions, while still far from sufficient to reverse the rising trend in total U.S. emissions, are having real impacts now and are gathering pace. This, combined with clear public support for action on climate change, will ultimately make it impossible for the U.S. federal government not to take action.

In short, Canadians make a serious mistake if they look only at the current position of the Bush Administration to justify a decision not to ratify the Kyoto Protocol. Just as in Canada, where most major sources of GHGs fall at least partially under provincial jurisdiction, state governments in the U.S. play a key role. The argument that, since the U.S. isn't acting, Canada similarly can't afford to — or that the U.S. isn't acting so it's fine for Canada to also sit back — is faulty logic.

Other important flaws in the argument that Canada cannot afford to ratify the Kyoto Protocol because the Bush Administration has rejected it are provided in section 1.1 of the report.

Methodology

This report seeks to highlight the most significant measures impacting on GHG emissions implemented by federal and state governments in the U.S., and to compare them to the situation at federal and provincial levels in Canada. While the report deliberately limits itself to reporting on GHG-reducing measures that governments have actually implemented or, in a few cases, measures that are at an

¹ The Kyoto Protocol calls for Canada to reduce its emissions of greenhouse gases, net of (i) credits for forestry and agricultural "sinks" and (ii) purchases of international emissions units, to an average of 6% below the 1990 level during 2008–2012. By ratifying the Protocol, Canada would become legally bound by it.

² The Bush Initiative sets a voluntary target of reducing U.S. GHG emissions "intensity" from today's level of 183 tonnes of carbon equivalent per million dollars of gross domestic product to 151 metric tons by 2012 — a 17.5% reduction. Between 1990–2000, U.S. emissions intensity decreased by 17.4 percent but absolute emissions grew by 14% over the same period. See <http://www.nrdc.org/globalWarming/agwcon.asp> and section 11.

advanced stage of development, its conclusions are reinforced by the fact that, as of May 2001, fully 25 of the U.S. states had initiated processes to develop action plans to reduce GHG emissions, 19 of which were complete.

So as to make a fair comparison between the U.S. and Canada, the scope of the report is also limited to U.S. states with populations over one million, and the five Canadian provinces — Alberta, British Columbia, Ontario, Québec and Saskatchewan — that account for 89% of Canada’s GHG emissions.³ The report only considers substantial regulatory measures, financial incentives and direct investments implemented by federal and state/provincial governments, because of (i) the abundant evidence and broad acceptance that voluntary and educational measures are altogether insufficient to reverse rising trends in national GHG emissions;⁴ and (ii) the constitutional powers and financial muscle of these orders of government. This is not to ignore the fact many municipal governments have shown leadership in committing to, and implementing, GHG-reducing measures.⁵ Also, while a significant number of governments have made commendable progress towards reducing GHG emissions from their own operations, these “house in order” actions are not considered in this report as emissions from government operations represent only a very small proportion of national GHG emissions.

Measures impacting on GHG emissions implemented by federal and state governments in the U.S. and comparison to the situation in Canada

The leading U.S. measures at federal and state levels identified by this report are listed below. They are organized according to nine key categories of government measures needed to reduce GHG emissions,⁶ of which short descriptions are provided. In each category, a comparison is then made to the situation in Canada. All U.S. measures listed below have been implemented by governments except for those marked with an asterisk, which are at an advanced stage of development. Detailed descriptions of the measures are provided in sections 2 to 10 of the report.

Adoption of a reduction target or cap for total jurisdictional emissions

Adoption of a reduction target or cap for total jurisdictional emissions (i.e., national, state or provincial emissions) is a fundamental step for governments to take to frame and drive their strategies to address climate change. Such a target, if it is credible, creates “policy certainty” to allow major GHG emitters to plan long-term investments and manage the risk associated with their emissions. Leading U.S. measures include:

- New Jersey — GHG emission reduction to 3.5% below the 1990 level by 2005;
- *New York — statewide GHG emission target recommended by draft Energy Plan; and
- New England states — stabilization of GHG emissions at the 1990 level by 2010.

³ The population of Saskatchewan, the least populous of the five, was 1.02 million in 2000. Populations of all states and provinces mentioned in the report are given in the Appendix.

⁴ See, for example, Matthew Bramley (November 2001), *Contribution on climate change to the Canadian National Assessment for the World Summit on Sustainable Development*. Available at http://www.canada2002earthsummit.gc.ca/en/pdf/bramley_e.pdf.

⁵ See, for example, the Federation of Canadian Municipalities’ Partners for Climate Protection program (<http://www.fcm.ca>) and the International Council for Local Environmental Initiatives’ Cities for Climate Protection Program (http://www.iclei.org/us/us_ccp.html).

⁶ Reducing GHG emissions from agriculture is an important area for governments to address. It is, however, complex and beyond the scope of this report.

Comparison to Canada. No Canadian province has adopted a target to reduce its GHG emissions. The six New England states and five eastern Canadian provinces, including Québec, have adopted the collective goals of reducing total regional GHG emissions to the 1990 level by 2010, to “at least” 10% below the 1990 level by 2020, and, in the long term, “sufficiently to eliminate any dangerous threat to the climate; current science suggests this will require reductions of 75-85% below current levels.”

Measures to increase the share of low-impact renewable electricity

The electricity production sector exhibits a very large potential for achieving emission reductions at modest cost through measures to increase the share of low-impact renewable electricity. Leading U.S. measures include:

- Nevada, Connecticut, Massachusetts, Illinois, New Jersey, Texas, *California — renewables portfolio standard;
- *Federal — renewables portfolio standard approved by Senate;
- Federal — wind energy Production Tax Credit; and
- California, Illinois, Massachusetts, Connecticut, New Jersey, Michigan — government funding for renewable energy.

Comparison to Canada. Canada has a far weaker level of government support for low-impact renewables compared to the U.S. Canada’s provinces have only modest voluntary commitments made by government-owned utilities BC Hydro and Hydro-Québec. Financial incentives now being introduced by the government of Canada remain smaller than the U.S. wind energy Production Tax Credit. Only in Québec do incentives for wind power potentially rival levels in the U.S. The consequences can be seen in the widening gap between the two countries’ levels of operating capacity for wind energy.

Measures to increase electricity consumers’ energy efficiency

Another key approach to reducing GHG emissions from electricity production is to focus on wasteful electricity use by consumers. Electric utilities are uniquely well-placed to deliver “demand side management” measures to increase electricity consumers’ energy efficiency. Leading U.S. measures include:

- California, Massachusetts, New Jersey, Connecticut — demand side management charges.

Comparison to Canada. In Canada, British Columbia is the only province where electrical utilities are required to implement demand side management programs comparable to leading programs in the U.S.

Measures to cap GHG emissions from large emitters

The electricity production and industry sectors together account for over 50% of total GHG emissions in both the U.S. and Canada, with most of these emissions released by large point sources. One of the most promising approaches to reducing these emissions is to implement measures to cap GHG emissions from large emitters. Typically, these measures allow emitters to use emissions trading to meet the cap(s). Leading U.S. measures include:

- Oregon — carbon dioxide standard for energy facilities;
- Massachusetts and New Hampshire — four-pollutant legislation;
- New Jersey — carbon dioxide reductions for power plants; and
- *Federal — four-pollutant bills.

Comparison to Canada. In Canada, there is only just beginning to be some explicit GHG limitation activity through environmental approval or voluntary processes. Of the four most significant initiatives in Canada — the offset requirements on new coal-fired plants in Alberta, BC Hydro’s offset commitment, and, in Québec, the requirement to reduce SF₆ emissions from the Magnola facility and the voluntary covenants with the aluminum industry — the first two will result only in a slowing of emissions growth, not absolute emissions reductions. Both Massachusetts’ and New Hampshire’s legislation mandates absolute GHG reductions.

Measures to increase the share of alternative transportation modes

Within the transportation sector, cars and trucks are responsible for most of the GHG emissions. In the area of energy conservation, there is a need for measures to increase the share of alternative transportation modes, most notably via shifts from personal car use to public transit use and from road freight to rail freight. Leading U.S. measures include:

- Federal — funding for public transit;
- Federal — tax exemption for transit benefits;
- Large urban areas — investments in public transit;
- Oregon — programs to reduce car use; and
- Maryland — Commuter Choice program.

Comparison to Canada. The Canadian federal government has provided no funding for transit in recent years, and is only now just beginning to do so. Although Canada’s largest cities have higher transit ridership than many U.S. cities, capital investment per capita in public transit does not exceed US\$60 in Canada, less than half the recent level in Seattle, New York, Denver and San Francisco. Of Canada’s five highest GHG-emitting provinces, only Québec has taken significant action to ensure sustainable growth in urban areas, although it is unclear whether this will match the level of Oregon’s policies. Despite several years of lobbying, the Canadian federal government has still not emulated the U.S. federal tax exemption for employer-provided alternatives to single-occupancy commuting.

Measures to increase road vehicle fuel efficiency

In view of the decline in the average efficiency of personal vehicles in North America over the past fifteen years,⁷ there is also a very large potential for emission reductions from measures to increase road vehicle fuel efficiency. Leading U.S. measures include:

- Federal — Corporate Average Fuel Economy standards; and
- *California — bill to reduce GHG emissions from private vehicles.

Comparison to Canada. Canada mimics the U.S. Corporate Average Fuel Economy (CAFE) standards through its voluntary company average fuel consumption (CAFC) targets. While the government of Canada has the objective of negotiating with the U.S. government a “significant improvement” in new vehicle fuel efficiency by 2010, the likelihood of this objective being met is quite unclear. Among Canada’s five highest GHG-emitting provinces only British Columbia and Ontario provide some modest incentives in favour of fuel efficiency. In sum, Canada and the U.S. have made equally poor progress in implementing measures to improve vehicle fuel efficiency. Arguably, Canada lags behind the U.S. even here, as the U.S. CAFE standards have legal force, while the Canadian equivalents remain voluntary.

⁷ U.S. data is available in Office of Transportation and Air Quality (September 2001), *Light-Duty Automotive Technology and Fuel Economy Trends, 1975 Through 2001, Executive Summary*, U.S. Environmental Protection Agency. Available at <http://www.epa.gov/OMS/cert/mpg/fetrends/s01001.pdf>.

Measures to increase the use of less carbon-intensive automotive fuels

Use of alternative energy sources in the transportation sector can be encouraged through measures to increase the use of less carbon-intensive automotive fuels, including ethanol-blended gasoline and natural gas, as well as measures to increase the use of electric vehicles. Leading U.S. measures include:

- California — Zero Emission Vehicles Program;
- New York — incentives for buying alternatively fuelled vehicles;
- Minnesota — promotion of ethanol-blend gasoline; and
- Differential taxation of automotive fuels.

Comparison to Canada. Differential taxation of automotive fuels appears to provide roughly similar incentives for alternative fuels in the U.S. and Canada. The Canadian federal government has set an objective of quadrupling Canada's annual ethanol production capacity, although it is not clear whether the incentives implemented will be sufficient to achieve it. Natural Resources Canada provides significant incentives to purchase alternatively fuelled vehicles (AFVs), and Canada also has a few provincial incentive programs to encourage purchases of AFVs, but none are at the level of New York's. Canada has nothing comparable to California's Zero Emission Vehicle program. Saskatchewan has just announced a major strategy to promote ethanol-blend gasoline, ten years after Minnesota. In sum, Canada has a range of programs and incentives in place to encourage the use of less carbon-intensive automotive fuels, but it is far from clear whether, overall, they match the level of those in the U.S.

Measures to increase energy efficiency in buildings

While demand side management measures delivered by energy utilities (see above) are critical in helping residential, commercial and institutional building owners and renters reduce GHG emissions associated with electricity production, other measures to increase energy efficiency in buildings are also important. Leading U.S. measures include:

- California, Oregon, Florida, New York — building codes exceeding national standards;
- Federal — Weatherization Assistance Program;
- Oregon, New York, Maryland — tax credits for energy efficient new construction and retrofits;
- Texas and Indiana — financing for energy efficient retrofits;
- California, Massachusetts, Minnesota and *New York — equipment efficiency standards exceeding national standards; and
- *Federal — new energy efficiency tax credits and equipment standards approved by Senate.

Comparison to Canada. Canada has a distinctly lesser body of measures to increase building energy efficiency than have been implemented in the U.S., both at federal and provincial/state levels. None of Canada's five highest GHG-emitting provinces are going beyond national model building codes or equipment efficiency standards. In the area of energy efficient retrofits, Canada has nothing on the scale, for example, of the Weatherization Assistance Program at the federal level or the Texas Loan STAR revolving fund at the provincial level, even taking account of different populations. Only Canada's federal Energy Innovators Initiative appears to be comparable to the tax credits for energy efficient retrofits provided in the U.S.

Requirement to capture and burn landfill gas

Methane resulting from rotting processes in landfills is a relatively small contributor to total GHG emissions in the U.S. and Canada, but it is nonetheless a significant source that is relatively easy to reduce dramatically.⁸ The leading U.S. measure is:

- Federal — regulation requiring gas capture from large landfills.

Comparison to Canada. The Canadian federal government does not regulate landfill gas or provide any incentives to capture it, although some projects may potentially be funded under the Pilot Emission Reductions, Removals and Learnings (PERRL) Initiative. Among the five highest GHG-emitting provinces, only the governments of Ontario and Québec require landfill gas capture at all large MSW landfills, with the new Québec regulation capturing a higher proportion of landfill gas emissions than the U.S. federal regulations. Inconsistent policies at the provincial level once again place Canada behind the U.S. in this area. This may well explain why U.S. GHG emissions from landfills fell by 4.7% between 1990 and 2000 while in Canada they rose by 21%.

Conclusion

This report presents detailed and comprehensive evidence that governments in the U.S. have, to date, taken far more significant action to reduce GHG emissions than governments in Canada. In particular, state governments in the U.S. are far ahead of provincial governments in Canada in implementing GHG-reducing measures. There is not a single category of measures in which Canada is ahead of the U.S. Although the Bush Administration has abandoned leadership on climate change, the federal government still administers a much more substantial body of GHG-reducing measures than does Canada's federal government.

According to opponents of the Kyoto Protocol in Canada, ratifying the Protocol would damage Canada's economic competitiveness because the U.S. is not taking action to reduce its GHG emissions. The evidence assembled in this report shows that perhaps the biggest flaw in this argument is the erroneous assertion that the U.S. is not taking action to reduce GHG emissions. As has been shown here, Canada is actually substantially behind the U.S. in acting to address climate change.

It would be a grave mistake to conclude that, because the U.S. is acting outside the Kyoto framework, Canada doesn't need the Kyoto framework either. For one thing, as has been stressed in this report, U.S. action is far from sufficient. But it is also important to take account of Canada's very poor track record of action in the absence of a binding international commitment. Beginning in 1991, and throughout the 1990s, the government of Canada repeatedly stated its non-binding "Rio" commitment to stabilize its GHG emissions at the 1990 level by 2000. Federal and provincial governments endorsed a whole series of grandly titled strategies and plans purporting to address climate change. Yet very little of substance has been implemented and Canada missed its Rio commitment by 20%.

It is clear that Canadians can have no confidence that Canada will make an adequate contribution to addressing climate change if it follows the U.S. in rejecting the Kyoto Protocol. There is no alternative legally binding international agreement on the table. Canada must ratify the Protocol in order to assume its responsibility to participate in the global effort to curb climate change. Doing so will have the practical effect, for a number of years at least, of closing rather than widening the gap between the U.S. and Canada.

⁸ For example, the City of Toronto achieved a 67% reduction in GHG emissions from its corporate operations between 1990 and 1998, mainly by capturing landfill gas. See Enviro RIS, Torrie Smith Associates Ltd. (February 2002), *Moving Beyond Kyoto: Toronto's Emissions Reductions 1990-1998 and the Future Outlook*, Toronto Atmospheric Fund. Available at <http://www.city.toronto.on.ca/taf/reports.htm>.

1. Introduction

1.1 Kyoto and competitiveness

Prominent in the rhetoric of opponents of the Kyoto Protocol in Canada is the notion that ratifying the Protocol would damage Canada's economic competitiveness.⁹ The Bush Administration has rejected Kyoto in favour of its own "Global Climate Change Initiative," which will have no impact on the current rising trend in U.S. greenhouse gas (GHG) emissions.¹⁰ The Canadian economy is strongly linked to that of the U.S., so the argument goes, and if the U.S. is not acting then Canada cannot afford to either.

There is a major flaw in this argument. Although the White House has abandoned responsibility to reduce GHG emissions, the federal government still administers a substantial body of programs that recognize the opportunity presented by the development of GHG reduction technologies. More recently state and municipal governments have begun to take advantage of these opportunities. This report presents detailed evidence that governments in the U.S. have, in fact, taken far more significant action to reduce GHG emissions than have governments in Canada.

State governments in the U.S. are far ahead of provincial governments in Canada in implementing GHG-reducing measures. State actions, while still far from sufficient to reverse the rising trend in total U.S. emissions, are having real impacts now and are gathering pace. This, combined with clear public support for action on climate change, will ultimately make it impossible for the U.S. federal government not to take action. Already, several "four-pollutant"¹¹ bills have been tabled in Congress that would regulate carbon dioxide emissions from power plants. While it is unclear how long it will take for such measures to become law, the behaviour of U.S. corporations that have joined voluntary action programs like the Business Environmental Leadership Council of the Pew Center on Global Climate Change,¹² Climate Savers,¹³ and Climate Leaders¹⁴ makes it clear that they see GHG regulation on the horizon.

In short, Canadians make a serious mistake if they look only at the current position of the Bush Administration to justify a decision not to ratify the Kyoto Protocol. Just as in Canada, where most major sources of GHGs fall at least partially under provincial jurisdiction, state governments in the U.S. play a key role. The argument that, since the U.S. isn't acting, Canada similarly can't afford to — or that the U.S. isn't acting so it's fine for Canada to also sit back — is faulty logic.¹⁵

⁹ The Kyoto Protocol calls for Canada to reduce its emissions of greenhouse gases, net of (i) credits for forestry and agricultural "sinks" and (ii) purchases of international emissions units, to an average of 6% below the 1990 level during 2008–2012. By ratifying the Protocol, Canada would become legally bound by it.

¹⁰ The Bush Initiative sets a voluntary target of reducing U.S. GHG emissions "intensity" from today's level of 183 tonnes of carbon equivalent per million dollars of gross domestic product to 151 metric tons by 2012 — a 17.5% reduction. Between 1990–2000, U.S. emissions intensity decreased by 17.4 percent but absolute emissions grew by 14% over the same period. See <http://www.nrdc.org/globalWarming/agwcon.asp> and section 11.

¹¹ The four pollutants are sulphur dioxide, nitrogen oxides, mercury and carbon dioxide.

¹² See <http://www.pewclimate.org/belc/>.

¹³ See <http://www.panda.org/climate/savers.cfm>.

¹⁴ See <http://www.epa.gov/climateleaders/>.

¹⁵ It is worth also pointing out that fears of damage to Canada's competitiveness from Kyoto are currently amplified by the uncertainty about how governments in Canada will allocate responsibility to reduce emissions among different sectors and regions. Each sector or province naturally worries about worst-case scenarios. But federal and provincial governments have repeatedly and jointly affirmed the principle that no single region or sector should bear an unreasonable burden. Governments have at their disposal policy tools to implement this

There are several other flaws in the argument that Canada cannot afford to ratify the Kyoto Protocol because the Bush Administration has rejected it:

- When opponents of Kyoto talk about competitiveness, they give the term a very limited, short-term sense that ignores the importance of innovation and Canada's long-term positioning. Future technological innovation is poorly captured in economic models used to project the costs of Kyoto and ignored by those who claim Kyoto will inflict significant economic damage. Yet innovation will both be fundamental to Canada's future economic success and open up new ways to reduce GHG emissions at lower cost. A failure to ratify the Kyoto Protocol threatens to leave Canada behind the rest of the world in developing low-GHG technology.
- A number of international economic studies that suggest the Kyoto Protocol will represent an overall cost for Canada also indicate that the U.S. withdrawal from the Protocol has actually lowered that cost.¹⁶ A key reason for this is the removal of U.S. demand for international emissions units under the Protocol's emissions trading mechanisms (of which Canada expects to make significant use), causing a dramatic fall in the price that Canada can expect to pay for those units.
- Opponents of Kyoto exaggerate the significance of the modest increases in energy prices and other compliance costs that are expected if Canada implements the Protocol. For one thing, increases in energy prices can be offset and often overcome by increased efficiency, thereby reducing overall energy costs.¹⁷ Numerous other factors enter into firms' location and investment decisions, and suggestions of a rush of investment out of Canada smack of scaremongering.
- Regarding long-term positioning, currently Canada emits more than twice the amount of GHGs per person than the European Union or Japan.¹⁸ Climate scientists agree that a reduction in global emissions of over 50% will be needed to stabilize the levels of GHGs in the atmosphere.¹⁹ In light of this, international restrictions on GHG emissions — which will translate into dollar costs per tonne — must be continually tightened over the coming decades. If Canada fails to begin expanding the economic sectors and infrastructure needed to reduce emissions, it will put at risk its ability to compete in the future low-GHG global economy and at the same time acquire a potentially burdensome financial emissions liability. A decision to ratify the Kyoto Protocol would set Canada on a path towards reducing these long-term impacts on competitiveness.

The final point also applies to the U.S. So why is the U.S. not taking action to reduce its GHG emissions? As noted above, in actual fact it is. This report describes how.

principle. For example, the federal–provincial Tradeable Permits Working Group has suggested that sectors vulnerable to competitiveness impacts could be given free allocations of emission permits under a future domestic emissions trading system.

¹⁶ Environment Canada (March 2002), *Costs of Kyoto — What We Know*. Available at http://www.ec.gc.ca/minister/speeches/2002/020318_t_e.htm.

¹⁷ See, for example, Alison Baillie et al. (April 2002), *The Bottom Line on Kyoto: Economic Benefits of Canadian Action*, World Wildlife Fund and David Suzuki Foundation.

¹⁸ Hal Turton and Clive Hamilton (September 2001), *Comprehensive emissions per capita for industrialised countries*, The Australia Institute. Available at <http://www.tai.au.org>.

¹⁹ Intergovernmental Panel on Climate Change (2001), *Climate Change 2001: The Scientific Basis, Summary for Policymakers and Technical Summary of the Working Group I Report*, p.75-76. Available at <http://www.ipcc.ch>.

1.2 The approach taken in this report

There is abundant evidence and broad acceptance that voluntary and educational measures are altogether insufficient to reverse rising trends in national GHG emissions.²⁰ Instead, successful national and state/provincial strategies to address climate change must contain substantial regulatory measures, financial incentives and direct investments implemented by governments. Only these kinds of government measures will create the policy framework in which substantial changes in the behaviour of most emitters can be expected to occur.

While significant reductions in national GHG emissions demand action by all orders of government, the constitutional powers and financial muscle of federal and state/provincial governments make their role paramount. This is not to underplay the contribution of municipal governments: in both the U.S. and Canada, many municipal governments have shown leadership in committing to, and implementing, GHG-reducing measures.²¹

This report therefore seeks to highlight the most significant measures impacting on GHG emissions implemented by federal and state governments in the U.S., and to compare them to the situation at federal and provincial levels in Canada. The measures described are not all necessarily targeted primarily at reducing GHGs. Improving human health by reducing emissions of toxic, smog- and acid rain-forming pollutants was a prime motivator of some of the measures. Another motivator has been the desire to support the development of clean energy technologies and industries that are good for the economy. But differences in motivation are of little consequence if the end result is that GHG emissions are, in any case, reduced. Turning this argument around, many measures to reduce GHG emissions have important co-benefits for health and the economy.

The conclusions of this report are reinforced by the fact that, as of May 2001, fully 25 of the U.S. states had initiated processes to develop action plans to reduce GHG emissions, 19 of which were complete. More states have since followed suit. This report deliberately limits itself to reporting on GHG-reducing measures that governments have actually implemented or, in a few cases, measures that are at an advanced stage of development. The distinction between action plans that have been developed and measures that have been implemented is important, especially in light of the gap that has historically existed between good intentions and real action on climate change.

To concentrate on government measures that have the biggest impact on national GHG emission totals, and so as to make a fair comparison between the U.S. and Canada, the scope of the report is limited to U.S. states with populations over one million, and the five Canadian provinces — Alberta, British Columbia, Ontario, Québec and Saskatchewan — that account for 89% of Canada's GHG emissions.²² The author does not claim to have identified all leading climate-related government measures in these U.S. and Canadian jurisdictions, but has striven to capture as many as possible.

²⁰ See, for example, Matthew Bramley (November 2001), *Contribution on climate change to the Canadian National Assessment for the World Summit on Sustainable Development*. Available at http://www.canada2002earthsummit.gc.ca/en/pdf/bramley_e.pdf.

²¹ See, for example, the Federation of Canadian Municipalities' Partners for Climate Protection program (<http://www.fcm.ca>) and the International Council for Local Environmental Initiatives' Cities for Climate Protection Program (http://www.iclei.org/us/us_ccp.html).

²² The population of Saskatchewan, the least populous of the five, was 1.02 million in 2000. Populations of all states and provinces mentioned in the report are given in the Appendix.

1.3 Government measures to reduce greenhouse gas emissions

The leading sources of GHG emissions span a diverse range of sectors (see table 1). While some sectors have been more responsible than others for the growth in total emissions, the need for deep cuts in total emissions over the next few decades²³ dictates that governments implement substantial measures to reduce emissions for all these leading sources. (A comparison of the U.S. and Canada based on the data in table 1 is provided in section 11.)

Table 1. Major sources of GHG emissions^{24,25}

Source	U.S.		Canada	
	% of emissions (2000)	% growth (1990–2000)	% of emissions (2000)	% growth (1990–2000)
Electricity production	33.9	25.2	17.6	34.3
Industry	20.0	-4.7	35.0	18.8
Road vehicles	20.7	23.9	17.9	21.8
Buildings	8.9	12.5	10.6	10.2
Agriculture	7.6	8.2	8.3	1.7
Landfills	2.9	-4.7	3.2	21.1
Other	5.8	24.7	7.4	24.7
Total	100.0	14.2	100.0	19.6

As about three-quarters of total emissions come from combustion of fossil fuels for energy, the most important measures to reduce emissions are those that promote energy conservation, energy efficiency, and an increase in the share of renewable energy sources. However, a significant portion of industrial GHG emissions and the vast majority of emissions from agriculture and landfills are unrelated to energy use; emission reduction measures specific to these sectors are thus required.

The most important categories of government measures needed to reduce GHG emissions, organized by sector, are shown in table 2.

²³ Climate scientists agree that a reduction in global emissions of over 50% will be necessary to stabilize GHG concentrations in the atmosphere.

²⁴ U.S. Greenhouse Gas Inventory Program (April 2002), *Emissions by Economic Sector, Excerpt from the Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2000*, U.S. Environmental Protection Agency.

²⁵ Environment Canada (May 2002), *General Trends for Year 2000 Greenhouse Gas Emissions Data* (media backgrounder); Ken Olsen, Environment Canada (May 3, 2002), personal communication.

Table 2. Key categories of needed measures to reduce GHG emissions, by sector

Sectors	Categories of Measures
Overall	Adoption of a reduction target or cap for total jurisdictional emissions
Electricity production	Measures to increase the share of low-impact renewable electricity
	Measures to increase electricity consumers' energy efficiency
Electricity production / Industry	Measures to cap GHG emissions from large emitters
Transportation	Measures to increase the share of alternative transportation modes
	Measures to increase road vehicle fuel efficiency
	Measures to increase the use of less carbon-intensive automotive fuels
Buildings	Measures to increase energy efficiency in buildings
Agriculture	<i>see text below</i>
Landfills	Requirement to capture and burn landfill gas

Adoption of a reduction target or cap for total jurisdictional emissions (i.e., national, state or provincial emissions) is a fundamental step for governments to take to frame and drive their strategies to address climate change. A target reflects the overall environmental goal dictated by the science of climate change — reducing absolute levels of GHG emissions. Such a target, if it is credible, sends a clear signal of governments' overall goals, creating “policy certainty” to allow major GHG emitters to plan long-term investments and manage the risk associated with their emissions. A target is critical in allowing governments to gauge the adequacy of measures planned or implemented and to measure progress towards meeting the overall environmental objective.

The electricity production sector exhibits a uniquely wide range in the climate impact of competing technologies. Coal-fired electricity production, dominant in the U.S. and widespread in Canada, has very high GHG emissions per unit production. Electricity production from most renewable sources, on the other hand, has zero GHG emissions.²⁶ There is therefore a very large potential for achieving emission reductions at modest cost through **measures to increase the share of low-impact renewable electricity**. Key examples of such measures are renewable energy portfolio standards that set a required share of electricity to be produced from low-impact²⁷ renewable sources, and financial incentives to encourage producers and/or consumers to purchase low-impact renewable energy or install systems that generate it.

Another key approach to reducing GHG emissions from electricity production is to focus on wasteful electricity use by consumers. Electric utilities are uniquely well-placed to deliver **measures to increase electricity consumers' energy efficiency**. However, given electricity producers' desire to increase

²⁶ There is general recognition that hydro reservoirs can emit significant quantities of GHG emissions, but these are not yet accounted for in national GHG emission inventories. Energy from biomass can be a source of GHG emissions, although biomass projects can be designed to have no net GHG emissions if they sequester sufficient carbon during biomass growth.

²⁷ “Low impact” means that environmental and/or social impacts unrelated to GHGs are minimized. For example, large hydro reservoirs are generally not considered to be low-impact. For more information, see Marlo Reynolds and Andrew Pape (July 2000), *The Pembina Institute Green Power Guidelines for Canada*, Pembina Institute. Available at <http://www.pembina.org/pubs/greenpower.htm>.

profits through increased production, such “demand side management” measures are unlikely to be significant unless they are required by governments. The same logic applies to natural gas utilities.

The electricity production and industry sectors together account for over 50% of total GHG emissions in both the U.S. and Canada, with most of these emissions released by large point sources. One of the most promising approaches to reducing these emissions is to implement **measures to cap GHG emissions from large emitters**. Governments can impose GHG emissions caps that apply to individual large emitters, a whole industry sector, or large emitters as a group. The attraction of this approach is that corporations, who are better placed than governments to identify the most cost-effective means of reducing their own emissions, are able to choose how they wish to meet the environmental objective. Typically, these measures allow emitters to use emissions trading to meet the cap(s). If the system is well designed, emissions trading should only shift emissions from one place to another without undermining the effectiveness of the emissions cap(s).

Within the transportation sector, cars and trucks are responsible for most of the GHG emissions. Measures focused on energy conservation, energy efficiency and the use of alternative energy sources are all important. In the area of energy conservation, there is a need for **measures to increase the share of alternative transportation modes**, most notably via shifts from personal car use to public transit use and from road freight to rail freight. In addition, in view of the decline in the average efficiency of personal vehicles in North America over the past fifteen years,²⁸ there is also a very large potential for emission reductions from **measures to increase road vehicle fuel efficiency**. Alternative energy sources can be accessed through **measures to increase the use of less carbon-intensive automotive fuels**, including ethanol-blended gasoline and natural gas, as well as increasing the use of electric vehicles.

While demand side management measures delivered by energy utilities (see above) are critical in helping residential, commercial and institutional building owners and renters reduce GHG emissions associated with electricity production, other **measures to increase energy efficiency in buildings** are also important. These include building codes for new construction, financial incentives targeting the energy efficiency of both new construction and retrofits to existing buildings, and efficiency standards for major energy-using appliances.

GHG emissions from agriculture have diverse sources, notably digestion-related methane released by livestock and manure, and nitrous oxide emissions related to the use of nitrogen fertilizers. Each type of emissions source will likely require different, specific government measures. Although this is an important area for governments to address, it is complex and beyond the scope of this report.

Methane resulting from rotting processes in landfills is a relatively small contributor to total GHG emissions in the U.S. and Canada, but it is nonetheless a significant source that is relatively easy to reduce dramatically.²⁹ A **requirement to capture and burn landfill gas** should therefore be an uncontroversial component of governments’ strategies to address climate change. Burning captured landfill gas converts methane into carbon dioxide. This eliminates most of the climate impact since methane is considered to be 21 times more powerful a GHG than carbon dioxide. Producing usable

²⁸ U.S. data is available in Office of Transportation and Air Quality (September 2001), *Light-Duty Automotive Technology and Fuel Economy Trends, 1975 Through 2001, Executive Summary*, U.S. Environmental Protection Agency. Available at <http://www.epa.gov/OMS/cert/mpg/fetrends/s01001.pdf>.

²⁹ For example, the City of Toronto achieved a 67% reduction in GHG emissions from its corporate operations between 1990 and 1998, mainly by capturing landfill gas. See Enviro RIS, Torrie Smith Associates Ltd. (February 2002), *Moving Beyond Kyoto: Toronto’s Emissions Reductions 1990-1998 and the Future Outlook*, Toronto Atmospheric Fund. Available at <http://www.city.toronto.on.ca/taf/reports.htm>.

energy from this combustion can further displace GHG emissions associated with traditional energy sources.

Finally, a significant number of governments have set challenging targets for, and made considerable progress, towards reducing GHG emissions from their own operations (mainly buildings and vehicle fleets). In Canada, for example, this is the area in which provincial governments' performance in addressing climate change has been strongest. While these "house in order" actions are commendable and set an important example, they are not further considered in this report as emissions from government operations represent only a very small proportion of national GHG emissions.

1.4 Organization of this report and information sources

The following sections present measures taken by federal and state/provincial governments in the U.S. and Canada according to the nine key categories listed in table 2 (with the exception of agriculture) and described in section 1.3. As outlined in section 1.2, the approach taken is to highlight the most significant measures impacting on GHG emissions implemented federally and in states with populations over one million in the U.S., and to compare them with action in Canada by the federal government and the governments of the five provinces that account for 89% of Canada's GHG emissions.

A large number of information sources have been consulted in order to compile the information that follows, including Web sites, published reports, texts of legislation, leading independent experts in specific areas, and government officials. We have not attempted to provide detailed references. However, efforts have been made wherever possible to cross-check sources. Information on the situation in Canada has been drawn partly from the Pembina Institute's most recent assessment of provincial government performance on climate change,³⁰ updated with more recent information. Details of information sources are available from the author upon request.

Financial figures in this report are given in U.S. dollars when in sections describing U.S. programs, and Canadian dollars in sections describing Canadian programs, unless otherwise specified.

³⁰ Matthew Bramley and Leslie-Ann Robertson (September 2001), *Provincial Government Performance on Climate Change: 2001*, Pembina Institute. Available at <http://www.pembina.org/pubs/ReportCard2001.htm>.

2. Adoption of a reduction target or cap for total jurisdictional emissions

Adoption of a reduction target or cap for total national, state or provincial emissions is a fundamental step for governments to take to frame and drive their strategies to address climate change. The Bush Administration has abandoned the U.S. Kyoto target – a reduction of net U.S. emissions to an average of 7% below the 1990 level during 2008–2012. In its place, President Bush’s “Global Climate Change Initiative” contains only a weak target for emissions per unit of GDP, which will allow emissions to continue rising at the same rate as before (see section 1.1).

2.1 New Jersey: GHG emission reduction to 3.5% below the 1990 level by 2005

In contrast to President Bush’s proposal, the government of New Jersey has set a goal of reducing GHG emissions from the state to 3.5% below the 1990 level³¹ by 2005. The goal was established in March 1998 under an Administrative Order issued by the Commissioner of the Department of Environmental Protection. In 1999, New Jersey’s emissions of carbon dioxide from fuel combustion were 9% higher than in 1990.

The programs intended to achieve New Jersey’s goal are, for the moment, voluntary, but they include a range of incentives to encourage participation. The state’s Silver and Gold Track Program produces negotiated agreements between the government and industry for reducing GHGs and other pollutants. “Silver II Track” is a pilot phase and requires participating entities to commit to reductions in GHGs that equal or surpass the overall 3.5% reduction goal. After an evaluation of the Silver II Track pilot, the Department intends to address the need for any statutory or regulatory changes, and to implement a fuller program.

New Jersey is applying a similar negotiated agreement approach to other companies and sectors as part of its effort to achieve its GHG reduction goal. For example,

- a “consent decree” has been signed with Public Service Electric and Gas Power, one of the largest independent U.S. power producers, specifying a 15% reduction in GHG emissions intensity (emissions per unit production) from the company’s fossil fuelled power plants in New Jersey between 1990 and 2005 (see section 5.3); and
- a “sustainability covenant” was signed in February 2001 with all 56 colleges and universities in New Jersey, specifying a 3.5% reduction in absolute GHG emissions between 1990 and 2005.

2.2 New York: Statewide GHG emission target recommended by draft Energy Plan

Governor of New York George E. Pataki stated in June 2001 that he was “committed to positioning New York State as a national leader on the critically important issue of reducing greenhouse gases,” and urged the federal government to institute “a nationwide program that will result in major reductions” in sulfur dioxide, nitrogen oxides, mercury and carbon dioxide (the so-called “four-pollutant” approach).

³¹ Including emissions from the generation of imported electricity.

In its December 2001 draft of the New York State Energy Plan, scheduled to be finalized in 2002, the State Energy Planning Board included a number of recommendations pertaining to GHGs, notably recommending that the state commit to statewide GHG emission targets “with near-term (e.g., 2010), mid-term (e.g., 2020), and long-term (e.g., 2050) stages,” and develop a program to allow businesses to enter into voluntary agreements to reduce GHG emissions.

2.3 New England states: Stabilization of GHG emissions at the 1990 level by 2010

The governors of the states of Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island and Vermont (collective population: 14 million), together with the premiers of the provinces of Québec, New Brunswick, Nova Scotia, Prince Edward Island and Newfoundland (collective population: 9.8 million), adopted in August 2001 a Climate Change Action Plan that includes the goal of reducing total regional GHG emissions to the 1990 level by 2010, and to “at least” 10% below the 1990 level by 2020. There will be a review of the Plan every five years, beginning in 2005, when a new emissions target, “as aggressive as possible,” will be set for 2015. The Plan also sets the “long-term goal” of reducing regional GHG emissions “sufficiently to eliminate any dangerous threat to the climate; current science suggests this will require reductions of 75-85% below current levels.”

2.4 The situation in Canada

At the federal level, it can be argued that Canada is ahead of the U.S. in setting a reduction target for national GHG emissions, since Canada’s federal government has stated that it hopes to ratify the Kyoto Protocol. However, this will only be a meaningful target once Canada actually does ratify the Protocol, an action the federal government continues to delay.

None of the five most GHG-emitting provinces currently have reduction targets for provincial GHG emissions. The government of Québec did formally commit to the Rio target of stabilizing GHG emissions at the 1990 level in 2000, and by 1998 (the latest year for which a provincial breakdown of Canada’s GHG emissions inventory is available), its emissions were just 2% above the 1990 level. Québec is also part of the New England Governors’ / Eastern Canada Premiers’ goal to reduce total regional GHG emissions to the 1990 level by 2010, and to “at least” 10% below the 1990 level by 2020 (see section 2.3).

3. Measures to increase the share of low-impact renewable electricity

Key examples of measures to increase the share of low-impact³² renewable sources in total electricity production are renewable energy portfolio standards and financial incentives to producers and/or consumers. To date, 13 U.S. states have implemented renewables portfolio standards that require a specified share of electricity to be produced from low-impact renewable sources, and several more are considering doing so.

Nineteen states have also established “public benefits” funds, financed by charges levied on consumers, typically in the context of electricity sector restructuring in order to assure continued support for renewable energy, energy efficiency and programs for low-income households. The Union of Concerned Scientists expects that the combined effect of state-level renewables portfolio standards and funds will be to stimulate 12,700 megawatts (MW) of new low-impact renewable power by 2012 on top of the 6,900 MW already in place in 2000.³³

The federal wind energy Production Tax Credit has also had a major impact (see section 3.3).

3.1 Nevada, Connecticut, Massachusetts, Illinois, New Jersey, Texas, California: Renewables portfolio standards

Among the strongest renewables portfolio standards are those implemented by Nevada, Connecticut, Massachusetts, Illinois, New Jersey, and Texas, and that currently proposed in California.

Nevada

The Nevada legislature established a renewables portfolio standard as part of its 1997 electricity sector restructuring legislation, and then updated the standard in 2001. The updated standard requires Nevada utilities to derive 5% of their total electricity sales from renewable sources in 2003, rising by two percentage points every two years to 15% by 2013 and thereafter. Eligible sources are biomass, geothermal energy, wind and solar, with at least 5% of the renewable energy being solar. Renewable credit trading can be used to comply with the standard.

Connecticut

Connecticut’s 1998 electricity sector restructuring law created a renewables portfolio standard applying to investor-owned utilities, revised in 1999. Utilities must meet the following renewable energy portfolio targets:

- “Class I and II” sources: 5.5% in 2000, 6% in 2005, and 7% in 2009.

³² “Low impact” means that environmental and/or social impacts unrelated to GHGs are minimized. For example, large hydro reservoirs are generally not considered to be low-impact. For more information, see Marlo Reynolds and Andrew Pape (July 2000), *The Pembina Institute Green Power Guidelines for Canada*, Pembina Institute. Available at <http://www.pembina.org/pubs/greenpower.htm>.

³³ Union of Concerned Scientists (undated), *State Clean Energy Policy Maps and Graphs*. Available at <http://www.ucsusa.org/energy/statepolicy.ppt>.

- “Class I” only: 1% in 2002 increasing by one-half a percentage point each year to 3% by 2006, and then by one percentage point each year to 6% in 2009.

Class I sources include solar, wind, new sustainable biomass, landfill gas, and fuel cells. Class II sources include waste-to-energy facilities, biomass facilities not included in Class I, and certain approved hydro facilities.

Utilities can meet the requirements by participating in a renewable credit trading program. The 1999 revision allows the Public Utility Commission to delay the targets by up to two years if it finds that they cannot be reasonably met.

Massachusetts

Massachusetts’ renewables portfolio standard was finalized in February 2002. The regulation requires that retail electricity suppliers meet 1% of their sales with new renewable sources in 2003, rising by half a percentage point each year to 4% in 2009. After 2009, additional one percentage point annual increases may be imposed at the discretion of the Massachusetts Division of Energy Resources. A supplier can also fulfil its obligations by making an “alternative compliance payment” set at \$50 per megawatt-hour (MWh) in 2003, with any such funds directed to the Massachusetts Technology Park Corporation for use in the commercial development of new renewable energy generation.

The following are recognized as “new renewables”: solar photovoltaic, wind, ocean thermal, wave or tidal, and advanced biomass technologies. There is also a “vintage generation waiver” that allows electricity generated by qualifying older power plants in excess of historical production levels to qualify as renewable. Renewable certificate trading can be used to comply with the standard.

New Jersey

New Jersey’s electricity sector restructuring legislation requires all retail electricity suppliers to derive 0.5% of their energy from new “Class I” sources by September 1, 2001; 1% by January 1, 2006; and an additional 0.5% per year to reach 4% by 2012. “Class I” and “Class II” sources combined were subject to a 2.5% standard in 2000 and 5% in 2001. Class I includes wind, solar, fuel cells, ocean energy, landfill methane and sustainable biomass; Class II includes hydro and waste-to-energy facilities that meet the “highest environmental standards.”

Illinois

On June 22, 2001, Illinois Governor George H. Ryan signed into law the Illinois Resource Development and Energy Security Act. It specifies explicitly the goal that at least 5% of the State’s energy production and use be derived from renewable forms of energy by 2010 and at least 15% by 2020. Renewable energy, as defined by the Act, includes wind, solar thermal and photovoltaic, dedicated energy crops and organic waste biomass, hydropower that does not involve new construction or significant expansion of dams, “and other such alternative sources of environmentally preferable energy.” It excludes energy derived from waste wood, tires, garbage, or other waste.

Texas

On December 16, 1999, the Public Utility Commission of Texas issued the Renewable Energy Mandate Rule, which establishes the state's renewables portfolio standard, coupled with a renewable energy credits trading program, and defines the renewable energy purchase requirements for competitive electricity retailers in Texas. The standard calls for 2,000 MW of new renewables to be installed in Texas by 2009 in addition to the 880 MW of existing renewables generation, with intermediate annual targets beginning in 2002. Qualifying renewable energy sources include solar, wind, geothermal, hydroelectric (with no restrictions), wave or tidal energy, and biomass or biomass-based waste products, including landfill gas. Under the trading program, retailers that do not meet the renewables requirements will have to pay a penalty of \$50 per MWh or 200% of the average cost of credits traded during a given year, whichever is lower.

California

A bill (SB 532) has been tabled in the California Senate to create a California Renewables Portfolio Standard Program. In March 2002, Governor Gray Davis publicly expressed his support for the bill. Previously, in 2001, Governor Davis endorsed the California Energy Commission (CEC) Renewable Investment Plan, which sets a non-binding goal of increasing the state's renewable electricity consumption from 12% to 17% 2006. The CEC already administers a \$135 million per year Renewable Energy Program (see section 3.4).

The new bill would require the state's three investor-owned utilities to gradually increase the total percentage of electricity derived from eligible renewable sources to 20% by 2010, with at least half of this amount coming from new sources. The eligible sources are wind, solar, geothermal, or biomass technologies, or fuel cells using renewable fuels. Renewable energy credit trading could be used to comply with the standard.

3.2 U.S. Federal: Renewables portfolio standard approved by Senate

The Senate's energy bill passed on April 25, 2002, includes a renewables portfolio standard that would require that 1% of U.S. electricity production come from new renewable sources by 2005, increasing every two years and reaching 10% by 2020. Producers could comply with the standard using a credit trading system. However, if the price of credits reached 1.5 cents per kWh, additional credits would be made available at that price, potentially weakening the standard.

Eligible renewable energy sources are solar, wind, ocean, geothermal, biomass (excluding solid waste and paper that is commonly recycled), landfill gas or "incremental hydropower," and customer-generated renewable power. Incremental hydropower refers to additional generation achieved from increased efficiency or capacity additions at a pre-existing hydroelectric dam.

At the time of writing, differences between the Senate bill and the corresponding House energy bill (which does not include a renewables portfolio standard) remain to be resolved by the energy bill conference committee.

3.3 U.S. Federal: Wind energy Production Tax Credit

The U.S. has had a federal wind energy Production Tax Credit in place since the Energy Policy Act was signed into law in 1992. The Credit is described by the American Wind Energy Association as “an important factor in financing new wind power installations.” The Credit, worth 1.5 cents per kWh, adjusted annually for inflation, was extended until the end of 2003 in the economic stimulus bill signed into law by President Bush in March 2002. The Senate’s energy bill passed on April 25, 2002 would prolong the Credit until the end of 2006, as would the corresponding House bill. The Senate bill would also extend the Credit to geothermal, solar and biomass energy and create a new investment tax credit for small wind systems (up to 75 kW).

3.4 California, Illinois, Massachusetts, Connecticut, New Jersey, Michigan: Government funding for renewable energy

Among the states that have established funds for supporting renewable energy, California, Illinois, Massachusetts, Connecticut and New Jersey have committed the largest sums in absolute terms. The funds are generally financed by charges levied on consumers. The Union of Concerned Scientists has calculated the following levels of state funding for renewable energy between 1998 and 2012:³⁴

California: \$2,048 million
Illinois: \$627 million
Massachusetts: \$383 million
Connecticut: \$338 million
New Jersey: \$279 million

Adding in the contributions of ten further states with smaller funds, total funding from the fifteen states amounts to \$4.3 billion between 1998 and 2012.

Since these figures were calculated, Governor John Engler of Michigan has also announced major new plans to support renewable energy.

California

California set the bar for all other renewable energy funds with the creation of a four-year, \$540 million fund for renewables with its electricity sector restructuring legislation in 1996. The success of that program led to legislation passed in September 2000 to extend it at the same level for another ten years, creating an additional \$1.35 billion in renewables funding up to 2012. The money is collected from customers of the state’s three investor-owned utilities, which must pay specified amounts each year. The California Energy Commission (CEC) disburses the money through the following four accounts:

- existing technologies account: 45%
- new technologies account: 30%
- emerging technologies account: 10%
- consumer side account: customer production incentive 14%, education 1%

³⁴ Union of Concerned Scientists, *op. cit.*

The customer production incentive provides 1.5 cents per kWh to investor owned utility customers who install small solar photovoltaic and wind energy systems and/or who purchase certified green power from retailers.

In February 2002, another state agency, the California Power Authority (CPA), announced a Clean Growth strategy that aims to deliver 3,500 MW of new electricity generation capacity by 2006. The CPA proposes to achieve this goal by using its \$5 billion authority to issue bonds to finance bulk procurement, targeted project ownership and public broker services. The agency has already signed letters of intent with renewable energy developers for about 2,500 MW of new wind, biomass, geothermal and landfill gas capacity.

Illinois

Illinois' 2001 Resource Development and Energy Security Act provides for a total of \$500 million of low-interest financing for new renewable energy facilities including wind, solar, energy crops, organic waste biomass and run-of-river hydro.

Earlier, through its 1997 electricity sector restructuring law, the Illinois legislature created the Illinois Public Benefit Program, financed through charges to consumers. The program funds the Renewable Energy Resources Trust Fund, which supports renewables through grants for large projects and rebates for small ones. There is also an Alternative Energy Bond Fund Program that funds non-residential renewable energy capital projects. However, funding for these programs only amounts to \$50 million over ten years.

Massachusetts

Massachusetts also created public benefit funds for renewables, energy efficiency programs, and low-income assistance programs as part of its November 1997 electricity sector restructuring legislation. The Renewable Energy Trust Fund is supported through a charge levied on consumers creating total funding of roughly \$150 million over a five-year period.

The Fund is administered by the Massachusetts Technology Collaborative, whose 2001–2002 operating plan calls for efforts to focus on promoting

- the use of renewable energy technologies in highly energy-efficient buildings;
- increased energy generation from distributed power generation technologies, including fuel cells, biomass, low-impact hydroelectric, solar photoelectric and advanced storage devices; and,
- the development of, and expansion of consumer demand for, electric generators that use wind, biomass, landfill gas, photovoltaics and low-impact hydro.

Connecticut

The Connecticut public benefits program was enacted in April 1998, and began in earnest in January 2000. The Connecticut Clean Energy Fund will generate \$118 million over five years via a consumer charge that increases annually. There are few restrictions on use of the funds. The law specifies “grants, direct or equity investments, contracts or other actions which support research, development, manufacture, commercialization, deployment and installation of renewable energy technologies, and actions which expand the expertise of individuals, businesses and lending institutions with regard to renewable energy technologies.” Early investments have included funding to Connecticut Electric Cooperative to develop a green power marketing program and residential solar program; seed funding

for a joint venture to develop portable solar power systems; and funding for a wind energy study for the state.

New Jersey

New Jersey's 1999 electricity sector restructuring legislation provides for investments in energy efficiency and renewable energy over an eight-year period through the Societal Benefits Charge collected from all electric public utility customers.

On March 1, 2001, the New Jersey Board of Public Utilities approved a proposal to fund new energy efficiency and renewable energy programs with \$358 million over three years, 25% of which will be apportioned to Class I renewables (wind, solar, fuel cells, ocean energy, landfill methane and sustainable biomass). The Board has approved renewable energy programs that will provide rebates to customers who install their own systems, and is also developing and implementing larger-scale grid-supply renewable energy projects in conjunction with the Department of Environmental Protection. In 2001, funds were split 60/40 between customer-sited and grid-supply projects. From 2002 onwards, the split will be 50/50.

Michigan

On April 18, 2002, Michigan Governor John Engler unveiled NextEnergy, "a comprehensive economic development plan to make Michigan a world leader in the research, development, commercialization and manufacture of alternative energy technologies." The plan includes initiatives to

- exempt corporations "whose primary product or service is the research, development or manufacturing of alternative energy" from the Single Business Tax and personal property tax, until 2012;
- establish a NextEnergy Development fund to seed venture capital funds and provide working capital or finance for the construction of facilities for the research, development or manufacturing of alternative energy.

There is not a specific definition of alternative energy technologies, but eligible examples include fuel cells (stationary and mobile), alternative fuel internal combustion engines, battery and hybrid cars as well as wind and solar energy.

3.5 The situation in Canada

A number of provincial governments in Canada are buying varying amounts of low-impact renewable energy for government buildings, and the federal government has adopted the goal of purchasing 20% of its entire electricity needs from "emerging" renewable sources. However, these programs have a small impact compared to renewable portfolio standards or broad financial incentives and, as "house in order" measures, are beyond the scope of this report (see section 1.3).

The government of Canada is now in the process of introducing two new financial incentives: the Wind Power Production Incentive (WPPI) and the Market Incentive Program (MIP) for "emerging" (as yet undefined) renewable sources.

The WPPI was announced in the December 2001 federal budget. It aims to stimulate the establishment of 1000 MW of new wind energy capacity by providing incentive payments for ten years to owners of wind power projects commissioned between April 1, 2002 and March 31, 2007. Payments will begin at

1.2 cents per kWh, gradually declining to 0.8 cents per kWh by 2007.³⁵ The total cost of the fifteen-year program is estimated to be up to \$260 million.

Despite the significance of the WPPI, it represents nonetheless a substantially smaller incentive than that provided in the U.S. by the wind energy Production Tax Credit. With current exchange rates, the value of WPPI is 27% of that of the PTC.³⁶ The WPPI therefore appears unlikely to stimulate any incremental investment in wind power in Canada unless provinces complement it with additional incentives.

The MIP was announced in the federal government's October 2000 Action Plan 2000 on Climate Change. It is a much smaller program (total budget \$25 million up to March 31, 2006). According to the March 2002 consultation document, the MIP will provide short-term financial incentive to projects such as "the development and implementation of marketing and consumer awareness campaigns" or "innovative projects or measures intended to stimulate sales." Eligible renewable energy sources are "wind power, solar photovoltaic, bioenergy and innovative forms of hydroelectricity."

Since 1998, Natural Resources Canada's Renewable Energy Deployment Initiative has also provided a refund of 25% (40% in remote communities) of the purchase and installation costs of solar hot water, solar air heating and low-emission biomass combustion systems, up to a maximum refund of \$80,000. The program's budget is \$24 million over six years.

At the provincial level, the governments of Alberta and Saskatchewan provide no significant support for low-impact renewable energy beyond government procurement. Ontario is providing limited support for renewables (including large hydro if there is no increase in reservoir size) via the small portion of allowances reserved for renewable energy or conservation projects in the province's new emissions trading system for nitrogen oxides and sulphur dioxide.

In British Columbia, the government-owned generator BC Hydro has made a commitment that 10% of new (not total) electricity capacity constructed in the province will come from low-impact renewables. In addition, BC Hydro recently launched a "Customer-Based Generation Program," which will pay a price premium of \$5/MWh for green energy and \$3/MWh for projects with lower GHG emissions per unit production than a natural gas combined-cycle plant. However, in contrast to these initiatives, the province's Energy Policy Task Force, which was mandated to develop a new energy policy, was tentative in its Interim Report in its support for a continuation of BC Hydro's 10% standard, while calling for a stimulation of the coal mining industry by constructing the province's first coal-fired power plant.

Québec has some new support measures for low-impact renewables that position it as a leader alongside British Columbia. The government-owned generator Hydro-Québec has committed to buy 50 MW of wind power annually for five years, and the November 2001 provincial budget made wind power projects eligible for funding by the Fonds pour l'accroissement de l'investissement privé et la relance de l'emploi (FAIRE, fund for the stimulation of private investment and job creation), which provides loan guarantees and loans. It is estimated that this represents an incentive worth 1.5 cents per kWh over five years.

³⁵ The February 2002 consultation document for the WPPI proposes that the level of the incentive may be reduced or eliminated by an amount corresponding to the benefits provided by any GHG emissions trading system or similar broad-based measure that may be established

³⁶ This assumes a 40% marginal tax rate, an exchange rate of \$0.63 Canadian per U.S. dollar, and the current after-tax value of the U.S. Production Tax Credit of 1.7 U.S. cents per kWh.

Federal and provincial governments also announced in October 2000 a Pilot Emission Reductions, Removals and Learnings (PERRL) Initiative, under which the federal government will spend \$15 million on purchasing verifiable GHG emission reductions from projects falling into a number of categories including renewable energy. Provincial participation is currently unclear.

In sum, despite recent developments, Canada has a far weaker level of government support for low-impact renewables compared to the U.S. In particular, Canada has nothing that resembles a renewables portfolio standard aside from the modest commitments by BC Hydro and Hydro-Québec, and only one province has an incentive program for low-impact renewables. The consequences can be seen in the two countries' differing levels of operating capacity for wind energy, currently the most popular low-impact renewable technology. While the U.S. population is nine times larger than that of Canada, the U.S. had more than twenty times more wind capacity at the beginning of 2002 – an even larger gap than one year earlier, and before the various renewables portfolio standards implemented in the U.S. have realized their full effect.³⁷ Yet both countries have vast wind resources.

³⁷ At the beginning of 2002, the U.S. had 4245 MW of operating wind capacity compared to Canada's 207 MW. At the beginning of 2001, the corresponding figures were 2555 MW and 140 MW, respectively. See <http://www.windpower-monthly.com/windicat.htm>.

4. Measures to increase electricity consumers' energy efficiency

Electric utilities are uniquely well placed to deliver energy conservation and efficiency measures that reduce electricity consumption. However, electricity producers generally tend to focus on increasing production rather than on providing energy services such as energy efficiency.” Demand side management measures to increase consumers' energy efficiency are therefore unlikely to be widely implemented unless they are required by governments.

As noted in section 3, 19 states have established “public benefits” funds in the context of electricity sector restructuring, financed by charges levied on consumers. In most states with public benefits funds, a higher proportion of the funds go to energy efficiency than to renewable energy. Thus, while the Union of Concerned Scientists calculates that total funding from the fifteen state governments for renewables amounts to \$4.3 billion between 1998 and 2012 (see section 3.4), the comparable figure for energy efficiency is \$8.6 billion.³⁸

Other types of measures to improve energy efficiency in buildings are discussed in section 9.

4.1 California, Massachusetts, New Jersey, Connecticut: Demand side management charges

Among the states that have established funds for supporting consumer energy efficiency, California, Massachusetts, New Jersey and Connecticut have committed the largest sums in absolute terms.

California

Under California's 1996 utility restructuring law and more recent legislation, the California Public Utility Commission (CPUC) oversees energy efficiency programs funded by the Public Goods Charge (for electricity) and the natural gas Demand Side Management charge applied to each customer's bill. The component of the Public Goods Charge allocated to energy efficiency is 0.13 cents per kWh, which translates into \$228 million per year over fourteen years.

The CPUC oversees the allocation of these funds for program implementation to each of the four utilities in California, with some programs coordinated on a statewide basis. Programs are designed to provide a fair distribution of funds among residential and nonresidential customers, while maximizing energy savings. There are also special programs to provide energy efficiency services specifically for low-income households.

Massachusetts

Massachusetts' 1997 electricity sector restructuring law created an energy efficiency surcharge of 0.33 cents per kWh in 1998, declining to 0.25 cents per kWh over five years. This translates into \$125 million per year over five years. The Division of Energy Resources administers these funds through the

³⁸ Union of Concerned Scientists (October 2001), *State Public Benefits Funding for Energy Efficiency, Renewables, and R&D*. Available at http://www.ucsusa.org/energy/state_renewefunds.pdf.

utilities. Twenty percent of the amount spent in any year is for low-income weatherization and education programs.

New Jersey

As noted in section 3.4, New Jersey's 1999 electricity sector restructuring legislation provides for investments in energy efficiency and renewable energy over an eight-year period through the Societal Benefits Charge collected from all electric public utility customers. The Charge is set at 0.18 cents per kWh for the first four years, and 0.21 cents per kWh for the following four years, with 75% of the funds collected – about \$105 million per year – assigned to a range of coordinated statewide energy efficiency programs implemented by the utilities.

Connecticut

Connecticut's 1998 electricity sector restructuring legislation contains provisions for line charges to fund energy efficiency, renewable energy and services to low income households. The charge for energy efficiency is set at 0.3 cents per kWh, amounting to about \$87 million per year up to 2012. Electric distribution companies will collect and disperse these funds with oversight by the Department of Public Utility Control through its Energy Conservation Management Board. Funds can be spent on direct funding of equipment, rebates, sale price and loan subsidies, leases, and promotional and educational activities.

4.2 The situation in Canada

British Columbia has the most comprehensive energy efficiency requirements in Canada. Electrical and natural gas retailers regulated by the B.C. Utilities Commission are required to establish demand side management programs through incentive-based mechanisms, funded through consumer rates and the wholesale electrical transmission tariff. BC Hydro has recently expanded its "Power Smart" program to include targeted, community-level programs that are the most comprehensive in Canada. Similarly, Utilicorp Networks Canada (formerly West Kootenay Power) has a comprehensive "Powersense" program. These are the only electricity demand side management programs can be compared to leading programs in the U.S.

In Alberta's electricity and natural gas markets, both of which have been deregulated on the generation/supply side, no requirements to implement demand side management programs are in place. Ontario's electricity market was opened to competition May 1, 2002, but currently no requirement for demand side management is envisaged. (This is in contrast to the Ontario Energy Board's requirement for demand side management by natural gas utilities through a performance-based funding mechanism connected to consumer rates.)

The government-owned electric utilities in Québec and Saskatchewan are not required to implement demand side management programs, although they do undertake voluntary programs. (In the natural gas sector, Québec's Régie de l'Énergie will only allow a utility to increase its prices if it has implemented a demand side management program.)

5. Measures to cap GHG emissions from large emitters

Large point sources, all of them in the electricity production and industry sectors, account for about 35% of Canada's GHG emissions.³⁹ These sectors represent almost the same proportion (53–54%) of total emissions in the U.S. as in Canada (see table 1 in section 1.3). One of the most promising approaches to reducing these emissions is to implement measures that explicitly cap them, without limiting the freedom of the affected corporations to identify for themselves the most cost-effective emission reduction opportunities.

Costs can further be reduced by allowing emitters to trade emissions with one another; if the trading system is well designed overall GHG emissions should not be adversely affected. Indeed, caps on individual emitters or a whole industry sector can be seen as initial steps towards a “cap-and-trade” domestic GHG emissions trading system for all large emitters. In Canada, there is broad agreement between federal and provincial governments that such a system will be the main policy measure applied to the electricity production and industry sectors if Canada ratifies the Kyoto Protocol.

5.1 Oregon: Carbon dioxide standard for energy facilities

Oregon was the first U.S. state to explicitly regulate carbon dioxide (CO₂) emissions through a law passed in 1997. The law provides for standards for CO₂ emissions from new energy facilities, including power plants as well as “nongenerating facilities” such as power lines, pipelines and gas storage facilities. The current standards, set by the Oregon Energy Facility Siting Council, are as follows:

- base-load natural gas power plants: 0.675 pounds (0.306 kg) of CO₂ per kWh
- non-base-load power plants (all fuels): 0.675 pounds (0.306 kg) of CO₂ per kWh
- nongenerating facilities: 0.504 pounds CO₂ / horsepower-hour (0.306 kg CO₂ per kWh)

The base-load natural gas facility standard is 17% below the emissions intensity (emissions per unit production) of the best performing such plant currently operating in the U.S.; the law allows the Council to update the standard to preserve this 17% margin.

Plants can meet the standard either by reducing direct emissions, including increasing efficiency through co-generation, or through purchasing GHG offsets. Plant owners can invest in offset projects directly, through a third party or by paying an established price, currently \$0.85/short ton CO₂, into a Climate Trust that develops offsets. (This price may be adjusted in September 2003 but by no more than 50% in either direction.) There are no restrictions on the type or location of offset projects, but they must be new and satisfy other criteria set by the Council.

5.2 Massachusetts and New Hampshire: Four-pollutant legislation

Massachusetts was the first state to adopt “four-pollutant” legislation regulating emissions of sulphur dioxide (SO₂), nitrogen oxides (NO_x), mercury and carbon dioxide (CO₂) from power plants permitted prior to August 1977. The regulation, unveiled by the Governor on April 23, 2001, places absolute caps

³⁹ Tradeable Permits Working Group (April 2000), *Using Tradeable Emissions Permits To help achieve domestic greenhouse gas objectives*, National Climate Change Process, p. 7. Available at <http://www.nccp.ca>.

on CO₂ and mercury emissions and sets standards for average emissions intensities of SO₂, NO_x and CO₂.

The regulation caps absolute CO₂ emissions from affected plants at their average level during 1997–1999 while also setting an intensity standard of 1,800 pounds per MWh (0.816 kg per kWh), which is expected to result in a 10% total emissions reduction from the 1997–1999 average level. These requirements go into effect between 2004 and 2008. Compliance with both the cap and the intensity standard may be demonstrated by using offsets (emission reductions or sequestration) provided that the Department of Environmental Protection determines they are real, surplus, verifiable, permanent, and enforceable.

On May 9, 2002, New Hampshire Governor Shaheen signed into law the state's Clean Power Act, which caps SO₂, NO_x, mercury and CO₂ emissions from the state's three coal-fired power plants, all owned by the Public Service Company of New Hampshire (PSCNH).

The Act requires that total CO₂ emissions be limited to the 1990 level in 2010 and that a lower cap for post–2010 be set by 2005. Each source will be allocated emission allowances based on output, and will be able to use emissions trading to achieve compliance. If PSCNH makes expenditures on energy efficiency or new renewable energy projects that go beyond expenditures funded through the state's public benefits charge, it will receive additional emissions allowances.

5.3 New Jersey: carbon dioxide reductions for power plants

On January 24, 2002, the New Jersey Department of Environmental Protection announced that state and federal authorities had entered into a “consent decree” with Public Service Electric and Gas Power, one of the largest independent U.S. power producers, specifying reductions of a range of pollutants. These include a 15% reduction in the overall carbon dioxide (CO₂) emissions intensity of the company's fossil-fuelled power plants in New Jersey between 1990 and 2005. In case of non-compliance, there is a penalty of \$1 per tonne of CO₂ up to a maximum of \$1.5 million. The company will receive assistance of up to \$3.5 million toward the capital expenditures associated with meeting the goal.

The consent decree is a settlement reached following legal action brought by federal and state authorities alleging that the company's plants were in violation of the Clean Air Act and the New Jersey Air Pollution Control Act.

5.4 U.S. Federal: Four-pollutant bills

Several four-pollutant bills have been introduced in Congress that would regulate power plant emissions of carbon dioxide. Prominent among these bills is the Clean Power Act of 2001 introduced by Senator Jeffords, Chair of the Environment, Energy and Public Works Committee. It would require CO₂ emissions from the electricity sector to return to 1990 emissions levels by 2007 and allow for use of emissions trading to achieve compliance. A House version of the Jeffords bill has 123 sponsors (close to one-quarter of the House). None of these bills is expected to become law in 2002. However, they do signal a considerable and mounting appetite in Congress for legislating explicit caps on GHG emissions.

5.5 The situation in Canada

To date there have been no legislative measures in Canada to cap GHG emissions from large emitters. There is just beginning to be some explicit GHG limitation activity through environmental approval or voluntary processes.

In its December 2001 decision on EPCOR's 490 MW Genesee coal-fired power plant expansion, the Alberta Energy and Utilities Board (EUB) directed the company to acquire offsets to limit the GHG emissions intensity of the new units to the level of a natural gas combined cycle (NGCC) plant. The EUB also issued a similar direction in its February 2002 decision on TransAlta's 900 MW Keephills coal-fired power plant expansion. However, these directions merely formalized voluntary commitments that the companies had already made. The EUB has refused to impose GHG offset requirements on oil and gas projects — the other major cause of the province's rapid growth in GHG emissions.

Alberta Environment has also requested the province's government-stakeholder Clean Air Strategic Alliance to establish an Electricity Project Team with the mandate to develop an emissions management system including GHG management for the electricity generation sector. The Team must report by June 2003 and the government intends to have the system implemented for new plants approved "after 2005."

In its April 1998 approval of Noranda's new Magnola magnesium production facility, the Québec government required that the facility cut its use of sulphur hexafluoride (SF₆, one of the six GHGs covered by the Kyoto Protocol) per unit of production by half within 18 months, and stop using it altogether by the end of 2005. The Québec government also recently signed a framework agreement with the Aluminium Association of Canada that paves the way for voluntary covenants targeted at GHG emission reductions. Covenants are expected to be signed with individual aluminum companies in the near future, and similar negotiations are underway with other sectors.

In British Columbia, major projects going through the province's environmental assessment process are required to have GHG mitigation plans. The province's government-owned electricity generator, BC Hydro, has voluntarily committed to offsetting 50% of the increase in GHG emissions by 2010 at its two new natural gas-fired plants, equivalent to 5.5 million tonnes of CO₂ equivalent. In January 2002, BC Hydro issued a request for proposals for the necessary offsets, which may be located anywhere in the world and include landfill gas, renewable energy, energy efficiency, fuel switching, industrial process improvement, agricultural waste management and other unspecified types of projects.

The Saskatchewan government co-chairs the national Greenhouse Gas Emissions Reduction Trading (GERT) pilot project and the province's government-owned electricity generator, SaskPower, has purchased a significant quantity of GHG offsets, with plans to purchase more in the next few years.

The Ontario government has taken no significant action in this area, although the province's government-owned electricity generator prior to restructuring, Ontario Hydro, had a commitment to limit net GHG emissions in 2000 at the 1990 level, resulting in large purchases of GHG offsets. The government has suggested that its new cap-and-trade system for SO₂ and NO_x could be expanded in the future to include GHGs, but there is no commitment to do this.

In sum, Canada remains significantly behind the U.S. in introducing caps on GHG emissions from large emitters. It is important to note that of the four most significant initiatives in Canada — the offset requirements on new coal-fired plants in Alberta, BC Hydro's offset commitment, and, in Québec, the requirement to reduce SF₆ emissions from the Magnola facility and the voluntary covenants with the aluminum industry — the first two will result only in a slowing of emissions growth, not absolute emissions reductions. As noted in section 5.2, both Massachusetts' and New Hampshire's four-pollutant legislation mandates absolute GHG reductions.

6. Measures to increase the share of alternative transportation modes

Increasing the share of alternative transportation modes, notably via shifts from personal vehicle use to public transit use, is fundamental to reducing GHG emissions from the transportation sector. Investments in public transit, target setting and provision of meaningful financial incentives are all important.

6.1 U.S. Federal: Funding for public transit

The Transportation Equity Act for the 21st Century (TEA-21), enacted by Congress in 1997, authorizes \$218 billion of federal spending on transportation over six years (1998–2003). Most of this money is directed through state Departments of Transportation and Metropolitan Planning Organizations for cities with populations over 200,000. Out of the total sum, \$36 billion is guaranteed for public transit, compared to \$162.7 billion for highways.

There is also a direction under TEA-21 that communities take cyclists and pedestrians into account when planning most roads. Spending in this category rose from \$7 million in 1990 to \$222 million in 1999, although this remains a very small proportion of total federal transportation spending.

6.2 U.S. Federal: Tax exemption for transit benefits

TEA-21 (see section 6.1) also now exempts from federal tax up to \$100 of transit benefits per person per month. The benefits exempted by this program, known as Commuter Choice and administered by the Environmental Protection Agency (EPA) and the Department of Transportation, include transit or vanpool expenses as well as “guaranteed ride home” services and “cash in lieu of parking” (cash instead of a free parking space). The tax exemption is applied to employer-provided benefits, or, alternatively, allows employees to purchase transit or vanpool services using pre-tax income.

According to the Canadian Urban Transit Association, the U.S. Commuter Choice program “has become the single most important transportation demand action resulting in significant increases in new ridership.” In the past five years, total transit ridership in the U.S. has increased more than 20%.

6.3 Large U.S. urban areas: Investments in public transit

According to data collected by the Federal Transit Administration through its National Transit Database program, the following large U.S. urban areas made per-capita capital investments in public transit of over \$100 per area resident in 2000 (the latest year for which data is available). These funds originate from federal, state and local governments:

Transit Authority	Capital funds applied in 2000 (\$million)	Population (million, 1990)	Capital funds applied per capita (\$)
Central Puget Sound RTA (Seattle)	251	1.74	144
Regional Transportation District (Denver)	210	1.52	138
New York City Transit and New Jersey Transit	2124	16.04	132
Bay Area Rapid Transit (San Francisco)	443	3.63	122
Metro Atlanta RTA	243	2.16	113
Dallas Area RTA	362	3.20	113
Tri-County Metro District (Portland)	128	1.17	109
Mass Bay Transportation Authority (Boston)	300	2.78	108

6.4 Oregon: Programs to reduce car use

Oregon is a leader in promoting sustainable growth in urban areas. In 1991 the Oregon State Land Conservation and Development Commission adopted a Transport Planning Rule requiring jurisdictions in the Portland metro area to plan to cut per capita vehicle miles travelled by 20% over 30 years, cut the number of parking spaces per capita by 10% over 20 years and to adopt measurable goals to increase the modal share of bicycle and pedestrian travel.

The Regional Transport Plan (updated in 2000) for the Portland metro area recommends spending \$3.14 billion to double bus and light rail services (greater than the \$2.10 billion recommended for new highways). It also recommends \$406 million for bicycle lanes, sidewalks and other cycle and pedestrian infrastructure needs. The options under consideration by the Metro government for raising the necessary funds include increasing the gasoline tax and instituting a vehicle-miles-travelled charge.

In 2000, the Oregon Department of Environmental Quality (DEQ) initiated the voluntary Choices program in the Portland metro area, providing incentives to people to scrap their cars that fail the mandatory vehicle inspection test. Incentives are a free annual transit pass, a \$500 certificate toward the purchase of a bicycle or a \$500 certificate to join a car sharing program.

The DEQ has adopted an Employee Commute Option (ECO) Rule for the Portland metro area requiring employers with 50 or more employees at a work site to reduce single occupancy vehicle commuter trips by 10% over a three-year period. Portland currently has about ten city employee work sites subject to the Rule.

6.5 Maryland: Commuter Choice program

The Maryland Department of Transportation's Commuter Choice program further reinforces the federal tax exemption for transit benefits (see section 6.2) by providing tax credits of up to \$360 per year per employee to employers who pay for the same benefits covered by the federal program. It is the largest incentive of its kind in the U.S.

6.6 The situation in Canada

In contrast to the U.S., the Canadian federal government has provided no funding for public transit in recent years. In its interim report, issued on May 2, 2002, the Prime Minister's Caucus Task Force on Urban Issues, composed of Liberal MPs, noted that Canada is the only G8 country without a national urban transit investment program, and recommended the establishment of a "National Transportation Program that would provide long-term sustainable funding for public transportation systems."

Previously, in the 2001 Speech from the Throne, the federal government made a commitment to "co-operate with provincial and municipal partners to help improve public transit infrastructure." The 2000 federal budget committed \$2.65 billion over six years, including up to \$600 million over four years for highways, to the Canada Infrastructure Program, under which public transit is also eligible. The 2001 federal budget additionally created a Strategic Infrastructure Foundation with a minimum federal contribution of \$2 billion. The Foundation, operating at arm's length from government, will provide cost-shared assistance to large infrastructure projects, including urban transportation. The revolving \$200 million Green Municipal Investment Fund, administered by the Federation of Canadian Municipalities, is also open to public transit funding proposals, although none has yet been funded.

On June 11, 2001, the federal government announced the Urban Transportation Showcase Program. The \$40 million program will fund "community showcases to demonstrate and evaluate ways of reducing greenhouse gas emissions from transportation," potentially including infrastructure investments. On April 26, 2002, the federal government announced its first major public transit investment: a \$76 million investment in Toronto's transit system.

Although Canada's largest cities — Vancouver, Toronto and Montreal — have higher transit ridership than many U.S. cities, capital investment per capita in public transit does not exceed US\$60 in Canada, less than half the recent level in Seattle, New York, Denver and San Francisco (see section 6.3). The total capital investment in public transit in Canada in 2000 was just under CAN\$1 billion, compared with over US\$2 billion in New York City and the surrounding urban area alone.

Of Canada's five highest GHG-emitting provinces, only Québec has taken significant action to ensure sustainable growth in urban areas, although it is unclear whether this will be comparable to the action that Oregon has taken. In September 2001, the Québec government announced a mandatory 20-year urban planning framework for the Montreal area. The framework directs the Montreal Metropolitan Community to adopt targets for decreasing the use of cars and increasing the use of public transit, and to prioritize urban development that makes the most of the public transit infrastructure. Ontario's Smart Growth initiative is, in contrast, likely overall to encourage urban sprawl and car and truck use.

Despite several years of lobbying by the Canadian Urban Transit Association and others, the federal government has still not emulated the U.S. federal tax exemption (see section 6.2) for employer-provided alternatives to single-occupancy commuting. Among the provinces, the government of Québec again appears to be leading in the area of incentives for reduced car use with the establishment of employer-administered programs as part of its Climate Change Action Plan 2000–2002. But it is not clear whether these incentives will reach the level of those in place in U.S. locations such as Maryland.

7. Measures to increase road vehicle fuel efficiency

There is enormous potential for GHG emission reductions from measures to increase road vehicle fuel efficiency. A coalition of leading U.S. NGOs has described an increase in vehicle fuel efficiency standards as “the biggest single step our country can take to curb global warming”⁴⁰ — partly because of the major contribution of road vehicles to the national GHG emission total, and partly because personal vehicle fuel efficiency has actually been declining for 15 years while the availability of cost-effective technologies to improve efficiency has increased markedly.

7.1 U.S. Federal: Corporate Average Fuel Economy standards

Congress established the Corporate Average Fuel Economy (CAFE) standards in 1975, largely in response to the OPEC oil embargo of 1973. At the time, cars were averaging 13.5 miles per gallon (mpg) and trucks 11.6 mpg. Congress established a phase-in of new fuel economy standards that brought cars up to 27.5 mpg. Congress delegated to the Department of Transportation the responsibility for setting standards for light trucks (SUVs, minivans and pickups), currently set at 20.7 mpg. A powerful tool when first established, CAFE standards are now completely outdated, and, despite considerable bipartisan support, in the face of opposition from the auto industry Congress still refuses to update them. The result is that the average fuel efficiency of personal vehicles in the U.S. is at its lowest level since 1980 while the market share of light trucks has climbed to nearly 50%.

7.2 California: Bill to reduce GHG emissions from private vehicles

On May 1, 2002, the California State Senate passed AB 1058, a bill that explicitly aims to reduce GHG emissions from vehicles. The bill requires that the Air Resources Board adopt “regulations that achieve the maximum feasible reduction of greenhouse gases emitted by passenger vehicles and light-duty trucks and any other vehicles . . . whose primary use is non-commercial personal transportation.” The bill stipulates that such regulations be adopted by January 1, 2005, but only apply to vehicles manufactured in the 2009 model year or later. An earlier version of the bill was passed by the State Assembly; if the Assembly agrees to the amendments introduced in the Senate, it will go to Governor Gray Davis for signing into law. However, the Governor has not yet taken a position on the bill, which is fiercely opposed by automakers.

The bill provides for flexibility in the means of compliance with the associated GHG regulations. Obvious means of compliance include both improved fuel efficiency and use of less carbon-intensive fuel (see section 8).

7.3 The situation in Canada

Canada mimics the U.S. CAFE standards through Natural Resources Canada’s voluntary Motor Vehicle Fuel Efficiency Initiative, under which vehicle manufacturers agree to meet annual company average fuel consumption (CAFC) targets for the sale-weighted average fuel consumption of new cars. The CAFC targets, 8.6 litres (l) per 100 km for cars and 11.4 l per 100 km for light trucks, are identical to the U.S. CAFE standards.

⁴⁰ http://www.sierraclub.org/globalwarming/cleancars/cafe/briefing_book.pdf.

The Motor Vehicle Fuel Efficiency Initiative, which has a total budget of \$16 million, also includes public education efforts and aims to negotiate with the U.S. government and vehicle manufacturers a “significant improvement” in new vehicle fuel efficiency by 2010. The likelihood of this objective being met, and the willingness of the government of Canada to set vehicle fuel efficiency standards higher than those in the U.S. should the objective not be met, are both quite unclear.

Another promising approach to improving average vehicle fuel efficiency is the use of “feebates” — a combination of fees levied on low-efficiency vehicles and rebates offered for high-efficiency vehicles. While in the U.S. the states’ ability to implement feebate programs may meet with constitutional obstacles, there are no such obstacles for Canadian provinces. However, none of the provinces covered by this report have to date implemented feebates, although the Québec Ministry of Transport is currently studying the possibility. British Columbia imposes a surtax on passenger vehicles that cost more than \$47,000 (and which are likely to be less efficient than less expensive vehicles) and Ontario provides a sales tax rebate of up to \$1000 for hybrid cars and light trucks, although the program is not well advertised.

In sum, Canada and the U.S. have made equally poor progress in implementing measures to improve vehicle fuel efficiency. Arguably, Canada lags behind the U.S. even here, as the U.S. CAFE standards have legal force, while the Canadian equivalents remain voluntary.

8. Measures to increase the use of less carbon-intensive automotive fuels

A third approach to reducing GHG emissions from road vehicles is the implementation of measures to increase the use of alternative fuels that are less carbon-intensive than regular gasoline.

8.1 California: Zero Emission Vehicles Program

In 1990, in response to persistent air pollution problems, the California Air Resources Board adopted the zero emission vehicle (ZEV) program. The ZEV regulation required automakers to put small demonstration fleets of ZEVs – i.e., electric vehicles – on the road in the 1990s and then begin major ZEV marketing efforts no later than 2003. The original goals for the introduction of ZEVs were modified on January 25, 2001. The new schedule requires ZEVs to reach 10% of new car sales between 2003 and 2008, increasing to 16% by 2018; in 2007 SUVs, minivans and light trucks will be added to the baseline against which the percentage is assessed. The number of ZEVs can be further reduced by up to 50% if manufacturers produce very clean advanced technology vehicles (e.g., methanol fuel cell, hybrid electric or compressed natural gas). Partial credits that can be applied towards meeting ZEV percentages can also be obtained through advanced technologies, and credit multipliers can be used based on vehicle efficiency, among other factors.

The impact of electric vehicles on GHG emissions depends on the way the electricity used to charge the vehicles is generated. If the electricity is generated from low- or zero-GHG-intensity sources, such as natural gas combined cycle or renewable power plants, electric vehicles are equivalent in GHG terms to alternatively fuelled vehicles.

8.2 New York: Incentives for buying alternatively fuelled vehicles

The New York State Energy Research and Development Authority (NYSERDA) administers a broad range of significant incentives for buying alternatively fuelled vehicles (AFVs).

The **Alternative Fuel Vehicle Tax Incentive** applies to natural gas, liquefied petroleum gas, hydrogen, electricity, and other fuels that are at least 85% methanol, ethanol, any other alcohol or ether, or some combination. The incentive reduces the cost of a \$30,000 electric vehicle to \$23,000 (in conjunction with the Federal Electric Vehicle Tax Credit), the cost of a propane truck conversion from \$5,500 to \$2,200, and the cost of a \$28,100 natural gas vehicle to \$24,200.

The **Clean-Fuelled Bus Program** provides funds to state and local transit agencies, municipalities, and schools for up to 100% of the incremental cost of new alternatively fuelled buses. Twenty-five million dollars has been awarded for 538 buses including compressed natural gas, battery electric, and diesel hybrid-electric technology.

The **New York State Clean Cities Challenge** awards funds to municipal governments to acquire AFVs and/or build refuelling infrastructure. Funds can be used to cost-share up to 75% of proposed projects.

The **New York City Private Fleet Alternative-Fuel/Electric Vehicle Program** helps private companies operating vehicles in New York City to acquire AFVs. Funds are awarded on a competitive basis for up to 40% of the incremental cost of new light-duty natural gas or electric vehicles, and up to

70% of the incremental cost for new or converted medium- and heavy-duty natural gas, electric, or hybrid-electric vehicles.

The **New York City Clean Fuel Taxi Program** provides up to \$6,000 towards the purchase of new natural gas taxi cabs or the conversion of gasoline cabs.

8.3 Minnesota: Promotion of ethanol-blend gasoline

The Minnesota Ethanol Program, launched in 1992, has resulted in nearly 100% use of 10% ethanol-blend gasoline in the state today. Ten percent ethanol blend can be used readily in all gasoline-powered vehicles.

The program's objectives, both now met, were to build a new market for corn — Minnesota's largest crop, and to help the Twin City Area meet federal standards for carbon monoxide. Carbon dioxide produced by burning corn ethanol does not contribute towards net GHG emissions, as it is reabsorbed from the atmosphere by the following year's crop of corn. This results in overall GHG reductions as a result of displacing gasoline, although GHG emissions associated with energy and other inputs into cultivating the corn may significantly offset these reductions.⁴¹ Two of the state's 14 ethanol production facilities instead make ethanol as a byproduct of dairy residues.

The two main components of the Minnesota Ethanol Program are a 20 cent per gallon ethanol producer incentive and \$550 million in aid for ethanol plant construction and startup costs. According to the Minnesota Department of Agriculture, the industry will nonetheless contribute over \$350 million in net annual benefit to the state.

Minnesota also has more refuelling stations for 85% ethanol-blend gasoline than any other state. This is due in part to a loan program to station owners for conversion of one or more tanks and pumps to ethanol.

8.4 Differential taxation of automotive fuels in the U.S.

U.S. federal excise taxes on automotive fuels include the following rates: 18.30 cents per gallon for gasoline and liquified natural gas, 13 cents per gallon for 10% ethanol-blend gasoline and 13.6 cents per gallon for propane. Several states impose rates of state excise tax that are lower for ethanol, natural gas and propane than for gasoline.

8.5 The situation in Canada

The Canadian federal government currently exempts the ethanol component of blended gasoline from its 10 cent per litre gasoline excise tax. However, this provides a weaker incentive for ethanol-blend gasoline than do the U.S. federal differential tax rates.

The federal government has two other major programs to encourage the use of less carbon-intensive automotive fuels. In its Action Plan 2000 on Climate Change, the government set an objective of quadrupling Canada's annual ethanol production capacity, which, if achieved, could result in 25% penetration of 10% ethanol-blend gasoline nationwide. Natural Resources Canada's Future Fuels Program is intended to realize this objective through the provision of \$140 million in loan guarantees to

⁴¹ Use of ethanol produced from agricultural wastes results in much lower GHG emissions than corn ethanol.

encourage the financing of three to six new ethanol plants. The purpose of the guarantees is to compensate any future reversal of the current exemption of ethanol from the federal gasoline tax. However, it is not clear whether their provision will be sufficient to achieve the capacity-quadrupling objective.

Natural Resources Canada's Natural Gas for Vehicles Program contributes \$2,000 toward the purchase of a dedicated natural gas or bi-fuel light duty vehicle, \$3,000 toward the purchase of a dedicated natural gas or bi-fuel heavy-duty vehicle, \$500 per vehicle for after-market conversions to natural gas operation and \$500 to dealerships for each new natural gas vehicle sold. The program also supports the expansion of a natural gas vehicle fuelling infrastructure.

Canada also has a few provincial incentive programs to encourage purchases of AFVs, but none are at the level of New York's. British Columbia provides sales tax rebates for AFVs up to \$1000 for light vehicles and \$10,000 for buses, and a sales tax exemption for kits to convert conventionally fuelled vehicles to operate on propane. In Alberta, Climate Change Central (a government-stakeholder body) is a leading partner in the eMission Banff program, which will see more than 60 commercial vehicles that travel between Calgary and Banff converted to natural gas. The Ontario government provides a sales tax rebate of up to \$1000 for alternative fuel-powered automobiles and light trucks, but the program is not well advertised.

Canada has nothing comparable to California's Zero Emission Vehicle program.

All of Canada's five highest GHG-emitting provinces have differential taxation of automotive fuels that provides favourable treatment to alternative fuels. The incentives are roughly similar from one province to another and to those in place in several U.S. states.

On March 21, 2002, Saskatchewan became the first province in Canada to adopt a strategy to promote ethanol-blend gasoline along the lines of Minnesota's program that began ten years earlier. The Greenprint for Ethanol Production in Saskatchewan includes fully eliminating the provincial fuel tax on ethanol, approving legislation to provide for the mandating of ethanol-blend gasoline, and working with ethanol producers to encourage the establishment of ethanol facilities in the province. It is not clear, however, what level of incentives the government intends to provide to achieve the latter objective.

In sum, Canada has a range of programs and incentives in place to encourage the use of less carbon-intensive automotive fuels, but it is far from clear whether, overall, they match the level of those in the U.S.

9. Measures to increase energy efficiency in buildings

While demand side management measures delivered by energy utilities (see section 4) are critical in helping residential, commercial and institutional building owners and renters reduce GHG emissions associated with electricity production, other measures to increase energy efficiency in buildings are also important. These include building codes for new construction, financial incentives targeting the energy efficiency of both new construction and retrofits to existing buildings, and efficiency standards for major energy-using appliances.

9.1 California, Oregon, Florida, New York: Building codes exceeding national standards

The U.S. has national model building codes for both residential (the Department of Energy's 1995 Model Energy Code (MEC)) and other buildings (ASHRAE⁴² 90.1). But some states have developed their own codes that go beyond the national model codes. The governments of California, Oregon, Florida and New York have all recently updated (or are in process of updating) their codes for new residential and non-residential buildings.

California's mandatory Energy Efficiency Standards for Residential and Nonresidential Buildings were updated by the California Energy Commission in response to the state's electricity shortages, the new standards entering into effect in June 2001. The standards exceed the MEC and meet or exceed ASHRAE 90.1–1989. The Commission estimates that by 2011 the standards (along with standards for energy efficient appliances) will save \$57 billion in electricity and natural gas costs.

The most recent updates to Oregon's mandatory residential building codes came into effect in 2001 and updates to its commercial building codes in 2000. The former exceed the MEC code by 20–30%, and the commercial code exceeds ASHRAE 90.1–1989.

Florida's mandatory building codes also exceed both the MEC code and ASHRAE 90.1–1989 codes. Florida statutes now additionally require that all new educational facilities include passive solar design. The law mandates that schools with hot water demands exceeding 1,000 gallons per day must include a solar hot water heating system to provide at least 65% of hot water needs whenever economically feasible.

On March 6, 2002, the New York Code Council voted to adopt new advanced codes that are expected to come into effect in July 2002. The new codes, consistent with the most recent international codes, which are more advanced than MEC, improve some prescriptive areas relating to glazing and insulation by around 30% compared to 1991 state standards, and exempt renewable energy from calculations of total energy consumption.

⁴² American Society of Heating Refrigeration and Air-conditioning Engineers.

9.2 U.S. Federal: Weatherization Assistance Program

The Weatherization Assistance Program (WAP) is the largest residential energy efficiency program in the U.S. Administered by the Department of Energy (DOE) in cooperation with the states and about 1000 local agencies, the WAP aims to increase the energy efficiency of low-income residences in order to reduce their energy costs. According to the Department

- under the program, more than 60,000 low-income homes have been weatherized annually throughout the 1990s;
- the average reduction in energy bills is 15%, worth \$300 per year;
- for every \$1 of DOE investment the program leverages \$3.39 in federal, state, and private-sector investment in weatherization.

In the Interior Appropriations Bill signed by President Bush on November 5, 2001, WAP was allocated \$230 million for 2002 compared to \$153 million in 2001.

9.3 Oregon, New York, Maryland: Tax credits for energy efficient new construction and retrofits

Oregon

Oregon's Business Energy Tax Credit, enacted in 1980, provides a 35% tax credit (spread over five years) for investments made by any Oregon business in energy conservation, recycling, renewable energy, or alternative automotive fuels. Many projects address building energy efficiency. Any unused credit can be carried forward up to eight years. Under the "pass-through" option, utilities can claim the credit and give customers a lump-sum cash payment of about 28% (the net present value) of their project costs.

Lighting projects must improve energy efficiency by at least 25% to qualify. All rental property weatherization projects qualify for the credit if recommended by a utility or state energy auditor. Other conservation projects must reduce energy use by at least 10%. For new construction, measures are eligible if they reduce energy use by at least 10% compared to a similar building that meets the minimum requirements of the state energy code.

To date, more than 4,800 investments have qualified for the credit. It is estimated that those investments save or generate energy worth approximately \$90 million a year.

New York

New York legislation passed in 2000 established a Green Building Tax Credit to be allowable against various business and personal income taxes. The Credit can be claimed by owners and tenants of eligible buildings and tenant spaces that meet advanced energy efficiency standards and other green building characteristics. As of February 26, 2002, certain details of the Credit were still under review. The proposed rules would limit the Credit to new buildings with energy use no more than 65% of the level allowed under the state building code, and retrofit projects with energy use no more than 75% of the level allowed under the code.

According to the proposed rules, the Credit could be claimed for 7–8% of allowable costs related to a whole building, 5% for areas of a building not intended for occupancy, and 5–6% for tenant space, with caps of \$150 per square foot for the base building and \$75 per square foot for tenant space. The Credit could also be claimed for installation of fuel cells, solar panels and “green” refrigerants.

Maryland

Maryland’s Green Building Tax Credit, adopted in April 2001, will function in a similar manner to that of New York. The Credit will apply to investments made between 2003 and 2011 and will be allowable against corporate income tax or personal income tax.

9.4 Texas and Indiana: Financing for energy efficient retrofits

The Texas Loan STAR revolving fund, administered by the Texas Energy Conservation Office, has legislated minimum funding of \$95 million. The fund provides energy efficiency project financing for state agencies, institutions of higher education, school districts, and local governments. The fund’s revolving loan mechanism allows borrowers to repay loans through cost savings from retrofit projects. By January 2001, it is estimated that the program had saved taxpayers more than \$90 million, with projected cumulative savings of at least \$250 million by 2020.

The Indiana Public Facilities Energy Efficiency Program, administered by Indiana’s Energy Policy Division, provides loans to help public entities in the state identify and implement energy efficiency projects. Interest-free loans up to \$100,000 are available to schools, corporations, political subdivisions, and public libraries. The loans are awarded on a quarterly basis and do not require matching funds.

9.5 California, Massachusetts, Minnesota and New York: Equipment efficiency standards exceeding national standards

The U.S. federal government sets mandatory energy efficiency standards for energy-using equipment under the National Appliance Energy Conservation Act (1987) and the Energy Policy Act (1992). The Department of Energy is mandated to update standards whenever “new available technology makes higher standard levels economically justifiable.” Products covered by the standards include all the common major household appliances, air conditioners, furnaces, water heaters, electric motors, distribution transformers (used in many commercial and industrial buildings) and others.

Some states have adopted standards that go beyond those at the federal level. California is by far the leader in this area. In September 2000, in response to the state’s electricity shortages, the California Energy Commission was directed by the state legislature to “adopt and implement updated and cost-effective standards to ensure the maximum feasible reductions in wasteful, uneconomic, inefficient, or unnecessary consumption of electricity.” As a result of this directive, the Commission has proposed new efficiency standards for 20 appliances or other equipment (some of which are not within the scope of existing federal or state regulations), including all the common major household appliances, air conditioners, water heaters, food service equipment, commercial clothes washers, electric motors, distribution transformers and traffic signals. The proposed standards are intended to be finalized and adopted in July 2002, and most will become effective in July 2003.

New York, Massachusetts and Minnesota are also going beyond federal standards. Massachusetts and Minnesota have already adopted mandatory standards for distribution transformers and New York is preparing to do the same.

9.6 U.S. Federal: New energy efficiency tax credits and equipment standards approved by Senate

The Senate's energy bill passed on April 25, 2002 includes several new provisions to increase energy efficiency in buildings. The two with the largest projected impact are

- new tax credits for commercial buildings, fuel cells, homes and appliances; and
- new or improved equipment efficiency standards for nine types of equipment used in buildings including, for example, commercial refrigerators.

At the time of writing, differences between the Senate bill and the corresponding House energy bill remain to be resolved by the energy bill conference committee.

9.7 The situation in Canada

We have not attempted to compare the U.S. national model energy codes and Canada's Model National Energy Codes for Buildings and Houses. However, none of the five highest GHG-emitting provinces in Canada has adopted building codes that go beyond Canada's National Energy Codes. Alberta's building codes are less stringent than the National Energy Codes. The British Columbia Building Code includes some energy standards that are stronger than those in the National Energy Codes and others that are weaker. Ontario's building codes largely meet, but do not exceed, the standards of the National Energy Codes. Québec has now adopted the National Energy Code for Buildings and the energy efficiency requirements of its code for houses are relatively close to those of the National Energy Code. Saskatchewan has not adopted the National Energy Codes (although it is argued that most current construction practice in the commercial sector exceeds the National Energy Code for Buildings).

Canada's federal government provides no funding for residential energy efficient retrofits. The EnerGuide for Houses program does, however, offer subsidized home energy audits, valued at \$350, for \$150. For commercial or institutional buildings, Natural Resources Canada's Energy Innovators Initiative provides 50% of eligible costs for energy efficiency audits and feasibility studies to a maximum of \$25,000, and 25% of eligible costs for energy efficiency retrofits to a maximum of \$250,000.

The federal government also offers two relatively small programs to encourage the incorporation of energy efficiency features in new commercial and industrial buildings. The Commercial Building Incentive Program offers up to \$60,000 to building owners whose designs demonstrate a reduction in energy use of at least 25% when compared to the requirements of the Model National Energy Code for Buildings. The Industrial Building Incentive Program similarly offers an incentive of up to \$80,000 for new energy efficient industrial buildings. The combined budget of the two programs is \$6 million/year.

There is a major Federal Buildings Initiative to promote energy efficient retrofits of federal buildings, but, as a government "house in order" action, is beyond the scope of this report.

At the provincial level, there are a number of small programs that support energy efficient retrofits:

- the government of Alberta has provided a small number of municipalities with revolving funds to support energy efficiency retrofits;

- the governments of Alberta and British Columbia provide some funding assistance for energy efficiency retrofits of public buildings;
- British Columbia exempts from sales tax certain energy conservation materials for buildings;
- Québec's Agence de l'efficacité énergétique (energy efficiency agency) supports feasibility studies for retrofits of public buildings, and provides free advice and minor repairs to low-income households;
- Saskatchewan's government-owned utilities, SaskPower and SaskEnergy, have programs that facilitate financing of retrofits in commercial and residential buildings respectively.

The most significant initiative in Canada to date to provide financing for energy efficient building retrofits is the City of Toronto's Better Buildings Partnership. The Partnership's revolving fund has received \$7.1 million in provincial and federal funds under the Canada–Ontario Infrastructure Works Program. The revolving \$200 million Green Municipal Investment Fund (GMIF), administered by the Federation of Canadian Municipalities, is also open to retrofit projects. Among the projects funded to date by the GMIF is one to conduct energy efficiency retrofits of 49 facilities in the City of Ottawa.

The energy efficiency of energy-using equipment is regulated in Canada both at the federal and provincial levels. The federal standards generally follow the U.S. federal ones, with a time lag. The provincial standards generally follow either the federal standards or the U.S. ones. To our knowledge Canada has no equipment energy efficiency standards that exceed U.S. federal standards.

Overall, Canada has a distinctly lesser body of measures to increase building energy efficiency than have been implemented in the U.S., both at federal and provincial/state levels. Canada has nothing on the scale, for example, of the Weatherization Assistance Program at the federal level or the Texas Loan STAR revolving fund at the provincial level, even taking into account different populations. And, unlike some states in the U.S., none of Canada's five highest GHG-emitting provinces are going beyond national model building codes or equipment efficiency standards. Only Canada's federal Energy Innovators Initiative appears to be comparable to the tax credits for energy efficient retrofits provided in the U.S.

10. Requirement to capture and burn landfill gas

Methane in landfill gas is a significant GHG source that is relatively easy to reduce dramatically. A requirement to capture and burn landfill gas should therefore be an uncontroversial component of governments' strategies to address climate change. Burning captured landfill gas converts methane into carbon dioxide. This eliminates most of the climate impact since methane is considered to be 21 times more powerful a GHG than carbon dioxide. Producing usable energy from this combustion can further displace GHG emissions associated with traditional energy sources. Incentives to do this are commonly provided by measures to support low-impact renewable energy, which typically cover energy produced from landfill gas (see sections 3.1, 3.2 and 3.4).

10.1 U.S. Federal: Regulation requiring gas capture from large landfills

The U.S. EPA regulates landfill gas emissions from municipal solid waste (MSW) landfills through New Source Performance Standards and Emissions Guidelines adopted in 1996 under the Clean Air Act. These regulations require the capture of landfill gas at all MSW landfills that have accepted waste since November 1987 or have space to accept waste in the future, have a design capacity over 2.5 million tonnes, and emit non-methane organic compounds (NMOC) over a specified threshold. The design capacity threshold was estimated by EPA to result in the capture of about 40% of total methane emissions from U.S. MSW landfills, while limiting the number of landfills covered by the regulations to about 300 (compared to a total of over 7000). The NMOC threshold was not expected to exempt a significant number of these large landfills. Landfill operators can choose between flaring the landfill gas and collecting it for sale or use.

10.2 The situation in Canada

The Canadian federal government does not regulate landfill gas or provide any incentives to capture it. The revolving \$200 million Green Municipal Investment Fund, administered by the Federation of Canadian Municipalities, is open to solid waste management projects, although none has yet been funded. The only recent federal initiative in this area is a relatively modest investment of \$772,750 by the Climate Change Action Fund in a project to demonstrate the cost-effectiveness of turning landfill gas into liquefied natural gas.

Federal and provincial governments announced in October 2000 a Pilot Emission Reductions, Removals and Learnings (PERRL) Initiative, under which the federal government will spend \$15 million on purchasing verifiable GHG emission reductions from projects falling into a number of categories including landfill gas capture. Provincial participation is currently unclear.

Among the five highest GHG-emitting provinces, the government of Ontario already has in place a regulation requiring landfill gas capture at all large MSW landfills defined using the same size threshold as applied in the U.S. The government of Québec expects to promulgate in May or June 2002 a regulation that will require landfill gas capture at all MSW landfills that receive 50,000 tonnes or more of waste annually or that have a total capacity over 1.5 million cubic metres. This is a stricter size threshold than the one applied in the U.S. and Ontario, and is expected to result in the capture of 85% of Québec's landfill gas emissions. British Columbia requires landfill gas capture only at new landfills with a capacity over 100,000 tonnes and NMOC emissions over a specified threshold. Alberta and Saskatchewan have no landfill gas capture requirements in place.

In the absence of a federal requirement to capture landfill gas, inconsistent policies at the provincial level once again place Canada behind the U.S. in this area. This may well explain why U.S. GHG emissions from landfills fell by 4.7% between 1990 and 2000 while in Canada they rose by 21% (see table 1 in section 1.3).

11. Summary and conclusion

This report has examined measures implemented by governments in the U.S. and Canada in nine key categories covering all the major sources of GHG emissions except agriculture. The author has striven to capture the as many of the leading initiatives in these categories as possible implemented in the U.S. both at the federal level and by states with populations over one million. The report has sought to make a fair comparison to the situation in Canada at the federal level and in the five provinces that account for 89% of Canada's GHG emissions — Alberta, British Columbia, Ontario, Québec and Saskatchewan.

Sections 2 to 10 presented detailed and comprehensive evidence that governments in the U.S. have, to date, taken far more significant action to reduce GHG emissions than governments in Canada. In particular, state governments in the U.S. are far ahead of provincial governments in Canada in implementing GHG-reducing measures. There is not a single category of measures in which Canada is ahead of the U.S. Although the Bush Administration has abandoned leadership on climate change, the federal government still administers a much more substantial body of GHG-reducing measures than does Canada's federal government. The following paragraphs summarize the evidence assembled in this report.

Adoption of a reduction target or cap for total jurisdictional emissions. While New Jersey has adopted a reduction target and New York may be about to do so, no Canadian province has adopted a target to reduce its GHG emissions. The six New England states and five eastern Canadian provinces, including Québec, have adopted the collective goals of reducing total regional GHG emissions to the 1990 level by 2010, to “at least” 10% below the 1990 level by 2020, and, in the long term, “sufficiently to eliminate any dangerous threat to the climate; current science suggests this will require reductions of 75-85% below current levels.”

Measures to increase the share of low-impact renewable electricity. Canada has a far weaker level of government support for low-impact renewables compared to the U.S. While 13 states have implemented renewables portfolio standards, Congress is considering a national renewables portfolio standard, and several states have created major renewable energy funds, Canada's provinces have only modest voluntary commitments made by government-owned utilities BC Hydro and Hydro-Québec. Financial incentives now being introduced by the government of Canada remain smaller than the U.S. wind energy Production Tax Credit. Only in Québec do incentives for wind power potentially rival levels in the U.S. The consequences can be seen in the widening gap between the two countries' levels of operating capacity for wind energy.

Measures to increase electricity consumers' energy efficiency. Nineteen U.S. states have established “public benefits” funds, typically in the context of electricity sector restructuring, financed by charges levied on consumers. In several cases these funds provide major support for consumer energy efficiency (demand side management). In Canada, British Columbia is the only province where electrical utilities are required to implement demand side management programs comparable to leading programs in the U.S.

Measures to cap GHG emissions from large emitters. Oregon, Massachusetts and New Hampshire have now begun to explicitly regulate GHG emissions from large emitters. Both Massachusetts' and New Hampshire's legislation mandates absolute GHG reductions. In Canada, in contrast, there is only just beginning to be some explicit GHG limitation activity through environmental approval or voluntary processes. Of the four most significant initiatives in Canada — the offset requirements on new coal-fired plants in Alberta, BC Hydro's offset commitment, and, in Québec, the requirement to reduce SF₆

emissions from the Magnola facility and the voluntary covenants with the aluminum industry — the first two will result only in a slowing of emissions growth, not absolute emissions reductions.

Measures to increase the share of alternative transportation modes. In contrast to major long-term U.S. federal funding for public transit, the Canadian federal government has provided no funding for transit in recent years, and is only now just beginning to do so. Although Canada's largest cities have higher transit ridership than many U.S. cities, capital investment per capita in public transit does not exceed US\$60 in Canada, less than half the recent level in Seattle, New York, Denver and San Francisco. Of Canada's five highest GHG-emitting provinces, only Québec has taken significant action to ensure sustainable growth in urban areas, although it is unclear whether this will match the level of Oregon's policies. Despite several years of lobbying, the Canadian federal government has still not emulated the U.S. federal tax exemption for employer-provided alternatives to single-occupancy commuting.

Measures to increase road vehicle fuel efficiency. Canada mimics the U.S. Corporate Average Fuel Economy (CAFÉ) standards through its voluntary company average fuel consumption (CAFC) targets. While the government of Canada has the objective of negotiating with the U.S. government a "significant improvement" in new vehicle fuel efficiency by 2010, the likelihood of this objective being met is quite unclear. And while the California state legislature has passed a bill that explicitly aims to reduce GHG emissions from vehicles, among Canada's five highest GHG-emitting provinces only British Columbia and Ontario provide some modest incentives in favour of fuel efficiency. In sum, Canada and the U.S. have made equally poor progress in implementing measures to improve vehicle fuel efficiency. Arguably, Canada lags behind the U.S. even here, as the U.S. CAFE standards have legal force, while the Canadian equivalents remain voluntary.

Measures to increase the use of less carbon-intensive automotive fuels. Differential taxation of automotive fuels appears to provide roughly similar incentives for alternative fuels in the U.S. and Canada. The Canadian federal government has set an objective of quadrupling Canada's annual ethanol production capacity, although it is not clear whether the incentives implemented will be sufficient to achieve it. Natural Resources Canada provides significant incentives to purchase alternatively fuelled vehicles (AFVs), and Canada also has a few provincial incentive programs to encourage purchases of AFVs, but none are at the level of New York's. Canada has nothing comparable to California's Zero Emission Vehicle program. Saskatchewan has just announced a major strategy to promote ethanol-blend gasoline, ten years after Minnesota. In sum, Canada has a range of programs and incentives in place to encourage the use of less carbon-intensive automotive fuels, but it is far from clear whether, overall, they match the level of those in the U.S.

Measures to increase energy efficiency in buildings. Canada has a distinctly lesser body of measures to increase building energy efficiency than have been implemented in the U.S., both at federal and provincial/state levels. Unlike some states in the U.S., none of Canada's five highest GHG-emitting provinces are going beyond national model building codes or equipment efficiency standards. In the area of energy efficient retrofits, Canada has nothing on the scale, for example, of the Weatherization Assistance Program for residential retrofits at the federal level or the Texas Loan STAR revolving fund at the provincial level, even taking account of different populations. Only Canada's federal Energy Innovators Initiative appears to be comparable to the tax credits for energy efficient retrofits provided in the U.S.

Requirement to capture and burn landfill gas. While the U.S. federal government requires the capture of landfill gas at most large municipal solid waste (MSW) landfills, the Canadian federal government does not regulate landfill gas or provide any incentives to capture it, although some projects may potentially be funded under the Pilot Emission Reductions, Removals and Learnings (PERRL)

Initiative. Among the five highest GHG-emitting provinces, only the governments of Ontario and Québec require landfill gas capture at all large MSW landfills, with the new Québec regulation capturing a higher proportion of landfill gas emissions than the U.S. federal regulations. Inconsistent policies at the provincial level once again place Canada behind the U.S. in this area. This may well explain why U.S. GHG emissions from landfills fell by 4.7% between 1990 and 2000 while in Canada they rose by 21%.

As shown in table 1 (section 1.3), reproduced below as table 3, total U.S. GHG emissions rose by 14.2% between 1990 and 2000 while total Canadian GHG emissions rose by 19.6%. Over the same period, U.S. GDP grew by 38%⁴³ in real terms while Canada's GDP grew by 32.5%.⁴⁴ This means that the U.S. reduced its GHG intensity (GHG emissions per unit of GDP) by 17% while Canada reduced its GHG intensity by only 10%. In other words, the U.S. has been much more successful than Canada in decoupling economic growth from growth in GHG emissions. Among the reasons for this, no doubt geography and a continuation of Canada's historical emphasis on exploiting natural resources played significant roles. But while more analysis is needed to arrive at a firm conclusion, the figures may also be partially revealing the U.S. lead over Canada in implementing measures to reduce emissions. This may be most evident in the area of electricity production, where there are U.S. policies supporting renewable energy and consumer energy efficiency are markedly stronger than those in Canada.

Table 3. Emissions trends in the U.S. and Canada

Source	U.S.		Canada	
	% of emissions (2000)	% growth (1990–2000)	% of emissions (2000)	% growth (1990–2000)
Electricity production	33.9	25.2	17.6	34.3
Industry	20.0	-4.7	35.0	18.8
Road vehicles	20.7	23.9	17.9	21.8
Buildings	8.9	12.5	10.6	10.2
Agriculture	7.6	8.2	8.3	1.7
Landfills	2.9	-4.7	3.2	21.1
Other	5.8	24.7	7.4	24.7
Total	100.0	14.2	100.0	19.6

As was stated in section 1, government action in the U.S. is still far from sufficient to reverse the rising trend in total U.S. emissions, but state government action in particular is having real impacts now and is gathering pace. This, combined with clear public support for action on climate change, will ultimately make it impossible for the U.S. federal government not to take action.

According to opponents of the Kyoto Protocol in Canada, ratifying the Protocol would damage Canada's economic competitiveness because the U.S. is not taking action to reduce its GHG emissions. There are several flaws in this argument, not least the finding of a number of international economic studies that the U.S. withdrawal from the Protocol has actually lowered that cost of the Protocol for Canada because of the dramatic fall in the expected price of international emissions trading units.

⁴³ U.S. Environmental Protection Agency (April 2002), *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2000*, p.ES–8.

⁴⁴ Environment Canada (May 2002), *op. cit.*

But the evidence assembled in this report shows that perhaps the biggest flaw in the Kyoto-will-damage-competitiveness argument is the erroneous assertion that the U.S. is not taking action to reduce GHG emissions. As has been shown here, Canada is actually substantially behind the U.S. in acting to address climate change.

It would be a grave mistake to conclude that, because the U.S. is acting outside the Kyoto framework, Canada doesn't need the Kyoto framework either. For one thing, as has been stressed in this report, U.S. action is far from sufficient. But it is also important to take account of Canada's very poor track record of action in the absence of a binding international commitment. Beginning in 1991, and throughout the 1990s, the government of Canada repeatedly stated its "Rio" commitment (formalized, but not in legally binding form, in the United Nations Framework Convention on Climate Change) to stabilize its GHG emissions at the 1990 level by 2000. Federal and provincial governments endorsed a whole series of grandly titled strategies and plans purporting to address climate change. Canada has had a National Action Strategy on Global Warming (1990), an 18-month National Consultation Process that identified 88 potential measures to address climate change (1994–95), a National Action Program on Climate Change (1995), another 18-month National Consultation Process that identified more than 300 potential measures to address climate change (1998–2000), a National Implementation Strategy on Climate Change and a First National Climate Change Business Plan (2000). Yet very little of substance has been implemented and Canada missed its Rio commitment by 20%.

It is clear that Canadians can have no confidence that Canada will make an adequate contribution to addressing climate change if it follows the U.S. in rejecting the Kyoto Protocol. There is no alternative binding international agreement on the table. Canada must ratify the Protocol in order to assume its responsibility to participate in the global effort to curb climate change. Doing so will have the practical effect, for a number of years at least, of closing rather than widening the gap between the U.S. and Canada.

Appendix: Populations of all states and provinces mentioned in this report⁴⁵

State/province	Population (millions, in 2000)
Alberta	3.01
British Columbia	4.06
California	34.00
Connecticut	3.41
Florida	16.05
Illinois	12.44
Maryland	5.31
Massachusetts	6.36
Michigan	9.95
Minnesota	4.93
Nevada	2.02
New Hampshire	1.24
New Jersey	8.43
New York	18.99
Ontario	11.69
Oregon	3.43
Québec	7.38
Saskatchewan	1.02
Texas	20.95

⁴⁵ U.S. data is taken from <http://eire.census.gov/popest/data/states/populartables/table01.php> and Canadian data from <http://www.statcan.ca/english/Pgdb/People/Population/demo02.htm>.