Ontario

Ministry of Energy, Science and Technology

Ministry of the Environment

Measures to Address Climate Change in Ontario Government Operations

November, 1997

Submitted to the
Climate Change Voluntary Challenge
and Registry Program

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PIBS 3611E ISBN 0-7778-6931-4

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Science and Technology

Ministry of the
Environment

To the Honourable Ralph Goodale, Minister of Natural Resources Canada

We are pleased to present this update of the Ontario government's submission to the Voluntary Challenge and Registry Program.

Ontario remains committed to reducing emissions of greenhouse gases from government operations by 40 per cent by the year 2000, compared with 1990 levels.

Progress has continued on the initiatives identified in last year's report. This update covers previously identified activities, as Well as additional activities, such as training initiatives for facilities managers and employee awareness publications.

The Government is changing the Way it operates, With the aim of doing better for less, along more business-like lines. Initiatives to reduce operating costs and improve energy efficiency contribute to the goal of reducing greenhouse gas emissions. This approach is Working. The government's greenhouse gas emissions are down 32 per cent from the 1990 level.

We strongly support the Voluntary Challenge and Registry Program as a prudent and cost-effective component in the Wider program to address climate change. We are Working closely With our provincial utilities, the federal government, other provincial governments, and our private sector partners to make progress on this challenging issue.

Sincerely,

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Jim Wilson
Minister of Energy,
Science and Technology

_____

Norman W. Sterling
Minister of the Environment

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POLICY STATEMENT

Ontario supports the National Action Program on Climate Change and the national target of stabilizing greenhouse gas emissions at 1990 levels by the year 2000 and is committed to taking action to reduce our greenhouse gas emissions. Our target for government facilities and operations is to reduce greenhouse gas emissions by 40 per cent from 1990 levels by the year 2000.

The Voluntary Challenge and Registry lies at the heart of the national program. The Ontario Government supports the development of the VCR and will continue to participate actively in all program areas such as reporting and outreach initiatives.

The initiatives outlined in this VCR Action Plan contribute to the government's broader commitment to the Ontario public to make government smaller, simpler, less costly, more accountable and focussed on core businesses. The government will continue to pursue opportunities to reduce emissions of greenhouse gases that are sustainable over the long term and support our wider goals. The commitment behind the government's VCR activities is supported by the government's effort to achieve the goals of a smaller, simpler and more effective government.

SUMMARY

Greenhouse gas emissions from Ontario government operations result from a wide range of tasks and activities. The principal sources of emissions are from energy use in government buildings, which account for approximately 73 % of emissions, and vehicles, which account for about 24 % of emissions. There are also indirect emissions from landfills as a result of waste generated from government activity.

The Ontario government has already succeeded in reducing greenhouse gas emissions substantially. Emissions in 1996 were 32 per cent below the 1990 level. Initiatives such as energy conservation and waste reduction have been actively pursued in government buildings. The Ontario government will continue to build on this solid track record of initiatives. Greenhouse gas emissions from government operations are expected to be reduced by 40% from 1990 levels by the year 2000.

INTRODUCTION

Climate change poses the possibility of potentially severe environmental consequences for Ontario and the world. While uncertainty remains as to the extent and momentum of projected global climate change, the risks of inaction are too high to adopt a "wait and see" approach. Reducing the emissions of greenhouse gases will reduce the risk and extent of climate change and soften the environmental repercussions.

Ontario supports the national target of stabilizing greenhouse gas emissions at 1990 levels by the year 2000. Widespread participation in the Voluntary Challenge and Registry will play an important part in moving toward the national target.

Ontario Government Operations

The Ontario government provides a broad range of services, including inspection and enforcement of health, safety, labour and environmental regulations; information and support for industry, commerce and agriculture; administration, taxation, licensing and legislative functions; construction and maintenance of provincial roads and highways; social services, education, training, police, and health care; and management of natural resources such as Crown forests.

The government owns or leases a total of about 10,000 buildings and facilities across Ontario. Approximately 70,000 Ontario government employees work in more than 700 workplaces across Ontario. The government vehicle fleet consists of about 13,000 passenger cars, vans and trucks, police cruisers, ambulances and other vehicles.

In total, the Ontario government operations accounted for 612 kilotonnes of equivalent greenhouse gas emissions in 1996 - about 0.4% of Ontario's total emissions.

Approach to Climate Change

The Ontario government endorses a precautionary approach to managing greenhouse gas emissions through cost-effective measures and actions, particularly those that help in meeting other environmental, health or economic objectives, such as energy efficiency, pollution prevention or resource conservation. This approach encourages actions that can be taken now, which are consistent with our other priorities, and without waiting for final resolution of uncertainty.

Ontario will build on its solid track record of initiatives to address climate change. The government will actively continue its efforts to identify and pursue energy efficiency and waste reduction opportunities in its operations, where considerable progress has already

been made. Efforts to make government more efficient in general will also help in the reduction of greenhouse gas emissions.

This submission covers actions taken by the Ontario government to address greenhouse gas emissions within its own operations. The government also takes many actions that influence greenhouse gas emissions associated with the broader public sector, the private sector, and consumers. These actions and others are addressed in the December 12, 1996 report "Meeting the Challenge of Climate Change: An update on initiatives in Ontario to reduce greenhouse gas emissions".

MEASURES

One of the many steps the government is taking to operate in a more business-like manner occurred on April 1, 1997, when ministries began paying rent directly for their space. The new system makes ministry tenants fully accountable for the space and other resources, including energy, that they use. Previously, accommodation and energy costs incurred by ministries were accounted for and paid by the Management Board Secretariat's Ontario Realty Corporation. On April 1, these costs were transferred to ministries' budgets, although the actual management of the facilities and payment of utilities continues to be performed by the ORC.

The new system will encourage ministries to better align their space needs with the unique operating requirements of their programs, balanced with rental and other costs. Taking a more business-like approach to accommodation will foster efficient and effective use of the province's real estate portfolio. As a further incentive, the amounts transferred from the MBS/ORC budget were constrained to encourage ministries to rationalize occupied spaces and reduce costs. The impact of this change, in terms of reduced energy use and rationalization of facilities, is not known at this time, but will be monitored over time.

GOVERNMENT BUILDINGS

Energy use in buildings for heating, lighting, air conditioning, and equipment, is the leading source of greenhouse gas emissions by the government, accounting for 73 per cent of total emissions in 1996.

The Ontario Realty Corporation is working with government ministries to implement energy efficiency improvements in government-owned and operated buildings. In 1991, the Ontario Realty Corporation created The Green Workplace office to help Ontario government workplaces implement waste reduction, water and energy conservation, environmental purchasing and green transportation.

Energy Management

To assist Ministries and facility managers in tracking month-to-month variations in utility consumption and waste reduction efforts in government facilities, as well as the cost avoidance from energy efficiency projects, the Ontario Realty Corporation has upgraded its government-wide FASER (Fast Accounting System for Energy Reporting) program. The program is used to track utility usage and cost by fuel types for government-owned buildings managed by the ORC as well as leased facilities where the ORC receives the utility bills.[1]

Province-wide training of field office property staff is taking place along with updating building data. By the fall of 1997, complete building reporting will be available. This coincides with the Green Workplace's "Building Profile System" (described below) by incorporating consumption information with environmental building assessment that provides a complete performance picture of the government's building portfolio.

To illustrate the scope of this energy management project, the total electricity bill for ORC-operated buildings for the twelve month period ending March 31, 1997, was $16.2 million. The entire government's electricity bill is around $50 million per year (see Appendix 1).

Management Board Secretariat and the Ontario Realty Corporation have actively pursued an energy management program to retrofit government facilities with energy efficient lighting, heating and cooling systems, and motors.

Through the Government Energy Management (GEM) Program, government ministries have been offered, on a case-by-case basis, assistance in:

- auditing and monitoring the implications of energy use patterns;
- identifying cost savings, developing action plans, implementing new energy accounting systems and retrofitting existing buildings (including the demonstration of innovative design practices or technology); and
- providing energy management training for building operators and maintenance personnel.

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[1] The ORC manages slightly more than half of the government's portfolio of owned and leased buildings. The total floor area under management by the ORC was 45.9 million square feet on March 31, 1997. A significant portion of the remaining facilities are managed autonomously by just four ministries -- Solicitor General and Correctional Services, Transportation, Health, and Community and Social Services.

To minimize financial requirements for the government, the province has also looked for other sources of capital for energy efficiency initiatives. Arrangements such as financing by energy service companies and private sector leasing allow the government to implement projects without straining government financial resources and to proceed on a wider scale and more aggressive time frame. The most advanced example of this approach in government is described below.

Energy Efficiency Projects

The Rideau Regional Centre in Smiths Falls is the largest facility of its kind operated by the Ministry of Community and Social Services in the province. Its purpose is to provide services and support to people with developmental disabilities. The facility consists of an administrative and ward building and nine additional buildings totalling 75,065 m^2 (808,000 sq.ft) in area. The buildings comprise residential living areas, offices, laundry and trades services. The Centre employs 980 staff and provides care for 700 residents.

An energy services project being implemented at the Rideau Regional Centre by Rose Technology Group Ltd. of Willowdale, Ont., will generate significant cost savings, renew and improve many areas of the facility and generate employment through installation of the work by local contractors. Some highlights of the work at Rideau Regional Centre include:

- Replacement of the existing 45-year old heating plant with a completely new, decentralized, high-efficiency, hot water system using natural gas;
- Upgrading of laundry facility with new "continuous batch" washer system and replacement of outdated dryers with high efficiency gas-fired models;
- Retrofit of over 6,000 lighting fixtures with T8 fluorescent fixtures;
- Retrofit of energy efficient EXIT signs;
- Retrofits to heating, ventilation and AC controls to ensure they are operating to current codes and standards;
- Installation of a computer-based Energy Management Control System (EMCS) to improve performance and provide energy monitoring capability.

Improvements and repairs to the building envelope will provide energy savings and reduce air infiltration resulting in improved comfort levels. A number of refrigeration and air-conditioning condenser systems will be converted from water to air-cooled, thereby reducing water use at the facility by over 63 million litres (14 million gallons) each year, saving $32,000 annually.

The upgrades for the Rideau Regional Centre are being paid for by the savings in energy and operating costs. The total project value is $7.8 million, which will be recovered from the nearly $900,000 in annual savings. A complete training and occupant awareness program will be conducted to ensure all Rideau Regional Centre staff are informed and contribute to the success of the energy management project.

Estimates of the annual emissions reductions from the project are shown in Table 1. The total reduction in carbon dioxide emissions is estimated to be 5,466 metric tonnes annually. Ontario Hydro is investigating the possibility of purchasing credits for these emissions reductions from the Rideau Regional Centre under Ontario's Pilot Emissions Reduction Trading (PERT) program.

Table 1: Rideau Regional Centre Expected Emission Reductions

(Metric Tonnes)

Type of Action	Nitrogen Oxide (NOx)		Sulphur Dioxide (SO_2)	Carbon Dioxide (CO_2)
	Ozone season	Non-Ozone season		
Electricity Management	1.0	1.7	5.4	884
Fuel Management	0.9	3.6	1.1	3,361
New Low NOx Boilers	0.4	5.4	1.8	1,221
Total tonnes	2.3	10.7	8.3	5,466

Lighting retrofits are being implemented in six government buildings, including the head office of the Ministry of Environment, the Ontario Police College and the St. Catharines Courthouse (Table 2). When complete, the six projects will have replaced almost 10 thousand light fixtures, reducing electrical consumption by over 2 million kWh annually and associated carbon dioxide emissions by over 1,500 tonnes. The projects will also produce savings for the government of about $200,000 dollars annually, with a simple payback of less than 5 years.

In 1997, the Green Workplace implemented a **PowerSaver** installation program for computer monitors in all government facilities. The devices turn off the monitor when a computer hasn't been used for 10 minutes or more. A vibration sensor placed on the keyboard "tells" the monitor to turn on again when the keyboard or mouse is touched. There is no impact on any work or programs that may be running at the time.

Each device saves approximately 110 watts of energy when the monitors are operating, and 160 watts of energy from the building's cooling system which has to remove the 110 watts of heat given off by the idling computer. The estimated energy savings per computer is $40

to $60 per year. Over 5000 computer PowerSavers have already been installed, for a cost savings of at least $200,000.

Table 2: Energy Efficient Lighting Projects

Project	Location	Building Type	Total Fixtures Converted	Annual Kwh Saved	Annual Savings ($000)	Retrofit Cost ($000)	Payback (years}
135 St. Clair	Toronto	Office	2331	353517	27.3	120	4.4
Ontario Police College	Aylmer	Institutional-School	3715	802252	101	460	4.5
Courthouse & Registry	St. Catharines	Institutional-Court	1746	376370	25.9	124	4.8
Horticultural Research Station	Vineland	Institutional-Lab	1023	189792	14.3	65	4.5
1580 West Arthur St.	Thunder Bay	Warehouse	561	201652	14.9	78	5.2
1805 East Arthur St.	Thunder Bay	Institutional-Court	458	101666	7.9	29	3.6

New Building Standards

The Ontario government has developed Environmentally Conscious Design Guidelines for use in the construction of new government buildings. The guidelines provide generic design criteria to improve the environmental performance of government buildings, including energy efficiency, water conservation and waste reduction. Government construction specifications include the ASHRAE 90.1 standards, which result in a high level of energy efficiency and net cost savings over the life of the building.

Building Assessment

The Ontario government has in place one of the most comprehensive environmental assessment systems in the world. From the experience of applying the comprehensive Building Environmental Performance Assessment Criteria (BEPAC) in seven major government facilities, the Ontario Realty Corporation developed its Building Profile System to examine waste management, energy use, indoor air quality, water and resource conservation and transportation issues in government facilities.

The Green Workplace is expanding the assessments to 46 facilities, which should be completed by the end of 1997. In total, 287 facilities have been targeted for assessment.

The Green Workplace's on-line *Environmental Resource Centre* will act as a central clearinghouse containing practical "how-to" information for designers, facility managers and government tenants who wish to further improve the environmental performance of their facilities.

Training

The Energy Training Ontario Initiative, which provides building operators throughout Ontario with access to a high-quality, energy and environment issues centred training program: the Building Environmental Systems Certificate Program (BES). Developed in partnership with Seneca College of Applied Arts and Technology, the program is now attended by 3,800 building operators through 18 Ontario Colleges.

The 10-course program, and especially the Building Energy Efficiency Course (BES 710 - Energy Efficiency in Large Buildings, for which MOEE maintains the copyright) has been adopted by the Federal Government (NRCan) for use in its own buildings through the Federal Building Initiative (FBI). Ontario Government building operators have also attended the courses.

Waste Reduction

Reducing waste helps reduce greenhouse gas emissions. Every manufactured product requires energy for its production, so reducing the amounts of materials used in government operations reduces the greenhouse gases associated with the production of those materials. For the materials that are used, recycling can help reduce greenhouse gas emissions.

Products produced from recycled material, including paper, aluminum, steel and glass, typically require less energy than products produced from new feedstocks. Ontario government policy helps create a market for recycled products through environmental purchasing.

Diverting organic material such as paper from landfills reduces the production of methane gas in landfills. Composting also diverts organic material from landfills and reduces methane gas production.

Results of the **Green Workplace Initiative** on waste reduction include:

- About 70,000 public service staff in more than 700 workplaces are recycling at work, which is keeping 13,000 tonnes of wastes out of landfill sites annually, saving an

estimated $1.3 million in landfill disposal costs and 22,000 tonnes of carbon dioxide equivalent emissions;

- The goal of 50% waste diversion was achieved in 1992;

- Forty buildings, with 20,000 tenants, have progressed to an intensified waste reduction program called Maximum Green, with overall diversion rates of 75% to 90%;

- An electronic post office has been introduced in government workplaces across the province, which permits replacing paper documents with electronic documents;

- Fine paper purchased by the government must contain a minimum of 50% recycled and 10% post consumer waste;

- Government of Ontario Environmental Procurement Policy and Operational Guidelines promote reductions in the use of packaging materials.

- The world's first "in-vessel" composter, a mechanized, completely self-contained composting system, is in operation at the Ontario Science Centre. The composter handles about 220 tonnes of food waste a year , from seven government facilities throughout Toronto. Other "in-vessel" composters are located at government facilities in Kingston, London, Peterborough and Whitby.

- In total, approximately 15,000 tonnes of waste are currently diverted from landfills annually through the waste reduction efforts. This represents savings of about $1.5 million in waste disposal costs, and reductions in landfill site emissions of 22 kilotonnes of CO_2-equivalent greenhouse gases.

Water Conservation

Water conservation reduces energy use and associated greenhouse gas emissions from the pumping and heating of water. To ensure that water conservation is achieved in new and existing government facilities, both the Master Building Operations and Maintenance specification and the Environmentally-Conscious Design-Build specification have been amended to include water conservation measures.

VEHICLE FLEET

The Ontario government operates a fleet of approximately 13,000 cars and pick-up trucks, vans and heavy duty trucks, snowploughs, buses, ambulances and other vehicles throughout the province. In total, these vehicles consumed approximately 56 million litres of fuel in 1996, at a cost of more than $32 million, according to Ministry of Finance records. Vehicles were the source of 25 per cent of the government's total greenhouse gas emissions in 1996.

Historically, each ministry and agency has managed its vehicles independently. This has created the present situation of different methods of service and systems across the Ontario Public Service. Under the lead of the Ministry of Transportation, a review process has been initiated to examine service delivery options to improve service and reduce costs. The Fleet Management Project only deals with the 6,500 passenger vehicles the government owns.

It is expected that substantial costs savings will result from improvements in vehicle acquisition and distribution, vehicle operation and maintenance, vehicle remarketing and vehicle administration. It is difficult to make an estimate, but emissions from government vehicles are expected to be reduced substantially from changes in the composition of the passenger vehicle fleet toward newer technology, fewer numbers of vehicles, and better use of vehicles.

Government vehicles will be brought to testing centres as required under the province's DRIVE CLEAN vehicle inspection and maintenance program. This program, announced on August 22, 1997, applies to all cars and trucks, including government vehicles, in Southern Ontario beginning in the fall of 1998. The program is anticipated to reduce greenhouse gas emissions from government vehicles by more than 1,000 tonnes annually. This is equivalent to the emissions from about 200 cars. Actual results will be monitored by the contractor and reported in future progress reports.

OTHER INITIATIVES

Ministry of Environment and Energy 1997 Business Plan

At the December, 1996, joint meeting of Ministers of the Environment and Energy, Minister Sterling made a commitment to encourage Ontario-based companies, institutions and municipalities to voluntarily reduce their emissions of greenhouse gas emissions under the Voluntary Challenge and Registry program. In support of the Minister's commitment, a comprehensive strategy was developed to achieve this goal and the government has begun contacting potential participants.

Government staff will be involved *in* providing support to those interested in submitting action plans. The Ministry of Energy, Science and Technology will also continue working with the VCR Office, the federal government, industry, and other provinces to improve the quality of the Action Plans already submitted.

Employee Awareness

On the issue of climate change and its importance, the government is using the government newsletter, "Topical", which is delivered to all employees, to raise awareness.

Green transportation initiatives encourage employees to consider alternative transportation options such as public transit, bicycling and carpooling. These options reduce energy use and greenhouse gas emissions.

The Green Workplace program helped fund Green Transportation awareness initiatives such as Bike-to-Work Week, and support infrastructure such as bicycle lock-up facilities at government workplaces.

Provincial employees are encouraged to participate in Share-A-Ride, a phone activated computer system that matches people interested in carpooling to work. Through a partnership with the federal government, the program was developed and tested in government workplaces. Share-A-Ride is now publicly available on a province-wide basis through a toll-free number: 1-800-56SHARE.

The Green Workplace received an "Air Share Award" from the Clean Air Partnership in 1995 for the Share-A-Ride program, for "Clean Air Actions in the Greater Toronto Area". The Clean Air Partnership is a partnership of over 30 businesses, government agencies and community organizations committed to improving air quality in the Greater Toronto Area.

The Green Workplace/Ontario Realty Corporation received a "Clean Air Commute" award in 1996 for the highest employee participation. The Clean Air Commute is a week-long event designed to raise awareness of alternatives to commuting by car.

Forest Management

Ontario has a total area of approximately 106.8 million hectares, or over one million square kilometres (land + water). Of this, approximately 78.9 million hectares, or 74 per cent is forested.[2] Ontario's forests constitute about 17 per cent of Canada's forests and 1 per cent

[2] 78.9 million hectares is equivalent to 195 million acres or 312,000 square miles.

of the world's forest. Ontario's forested area is larger than the land masses of France, Switzerland and Austria combined.[3]

The Ontario Ministry of Natural Resources is responsible for the management of Crown forests in Ontario. A number of recent initiatives introduced in Ontario to ensure forest sustainability through good forest management will also indirectly support carbon sequestration:

- Ontario recently proclaimed the **Crown Forest Sustainability Act** for the purpose of providing for the sustainability (long term health) of Crown forests. Managing forests to ensure their sustainability is the first priority.

- The Ministry of Natural Resources is entering into new business relationships with the forest industry to ensure the regeneration of Crown forests. A **Forest Renewal Trust Fund** is in place to provide adequate funding for forest renewal.

Management units are areas of forest designated under the Crown Forest Sustainability Act and managed according to a forest management plan. In 1996, the Ministry of Natural Resources compiled a new overview of Ontario's forest resources, as it has done at least once every decade since 1922. The latest summary describes the 58 per cent of the province which was inventoried at the time (61.5 million hectares).[4] Table 3 presents a historical comparison of changes in land use between 1996 and 1986.

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[3] Source: "Forest Resources of Ontario - 1996", Ontario Ministry of Natural Resources (416) 314-2000.

[4] Within the inventoried area, 56% is boreal forest land, 30% Great Lakes/St. Lawrence and Deciduous, and 14% open water.

Table 3: Forest Resources of Ontario 1986-1996

Total Area by Land Class (thousands of hectares)

Land Classifications	All Crown Land	Parks and Recreation Reserves	Private & Federal Lands	Total
1996				
Forested Land	31761.7	2377.8	6163	40302.5
Non-Productive Forest	4519.7	273.0	700.6	5493.3
Non-Forested Land	284.8	14.0	6681.6	6980.3
Water	8405.8	259.1	11.2	8676.2
Grand Total:	44972	2923.9	13556.4	61452.3
1986				
Forested Land	32245.5	1400.7	6281.3	39927.5
Non-Productive Forest	4882.6	108.1	1190.3	6181.0
Non-Forested Land	196.4	15.7	6762.5	6974.5
Water	7951.2	113.9	418.4	8483.6
Grand Total:	45275.7	1638.4	14652.5	61566.7

Note: As new summaries are compiled, total area figures may change. This is due to improvements being made in the collection, interpretation and tabulation of data. The two most recent summaries, however, can be compared because they are similar in methodology and geographical coverage.

The total area forested (forested land + non-productive forest) is virtually the same in 1996 as 1986. The forested area held in parks and recreation reserves has gone up by 76 per cent, from 1.509 million hectares to 2.651 million hectares, while the area of crown, private and federal lands decreased.

Renewable Energy Installation

In 1996, the Ministry of Transportation installed a combined solar photovoltaic and thermo-electric (using propane) generation facility to provide the electricity for a remote radio repeater station at Grey Trout Lake, Ontario. The system replaced an existing diesel generating system and will substantially reduce the greenhouse gas emissions from the station.

The solar/thermo-electric system has performed well, reduced operating costs and improved reliability. The performance of the system is being monitored and the government will use the results to promote similar installations at other sites.

Wastewater Treatment

A demonstration Solar Aquatics System is in operation at the Ontario Science Centre for the treatment of wastewater. Solar Aquatics uses natural biological processes to deal with wastewater. This reduces emissions of methane and carbon dioxide to the atmosphere compared to regular treatment plants, as well as eliminating the use of chemicals.

In the demonstration project, 10% of the Science Centre's wastewater flows through the Solar Aquatics system for treatment. The process makes use of a variety of aquatic and non-aquatic plants, bacteria, zooplankton, algae, fish, mollusks, snails and clams, as well as filtering beds of sand and sphagnum. The water then flows into an adjoining aquarium populated by various species of fish.

The first year of operation of the plant is being monitored, to establish the system as a proven and viable technology for use in Ontario. The project was funded by the Green Workplace, the Ministry of Environment and Energy, Metro Toronto School Board, The Body Shop and Proctor and Redfern.

RESEARCH AND STUDIES

The Government of Ontario supports research and studies related to climate change through both internal and commissioned work. This work, as shown in the following examples, contributes to an improved understanding of the implications of climate change in Ontario and Canada, and the different ways in which we may address climate change.

Emissions Inventory and Ambient Monitoring Studies

The Ministry of Environment gathers emission and ambient monitoring data across the province and other sources to monitor trends, to investigate integrated air issues, and to contribute to studies on whether expected changes to forest, aquatic and biological ecosystems are, in fact, occurring in Ontario. Staff are also participating on climate change studies vis-à-vis involvement on the Climate Program Board and the Ontario Climate Advisory Committee.

Aquatic Ecosystems Research

We have been carrying out research on climate change effects on aquatic ecosystems. The work done by the ministry includes long-term meteorologic measurements at a network of sites, and detailed hydrologic, physical, chemical and biological measurements made over 20 years on 8 lakes, 30 streams and all of the associated watersheds.

The principal objectives of these studies are to evaluate the current measurable effects of changing climate on the Ontario environment, particularly on aquatic ecosystems; to develop models for prediction of future environmental effects based on realistic climate change scenarios; and to assess how climate change is altering ecosystem's responses to other environmental stresses such as changing acid rain levels.

Forest Ecosystem Research

Scientists at the Ontario Forest Research Institute of the Ministry of Natural Resources continue to research how forest ecosystems work, monitor the growth and health of forested ecosystems, and develop models to enable us to predict the future growth of Ontario's forests. This research will assist us in gaining a better understanding of the genetic adaptability of our forests and enable us to forecast the potential impacts of global warming on Ontario's forests.

Institute for Space and Terrestrial Studies (ISTS)

As part of a larger agenda to pursue opportunities in space and terrestrial science and engineering, the Institute for Space and Terrestrial Studies (http://www.ists.ca) develops and tests scientific instruments in conjunction with observations and modelling of the middle atmosphere, which is a critical zone for climate change research. One instrument, the LIDAR, an acronym for "light detection and ranging", is a laser system capable of studying those regions of the atmosphere that are too high for weather balloons and too low for satellites.

Under an agreement with the Ministry of Economic Development and Trade (MEDT) and its predecessor, the Ministry of Industry, Trade and Technology (MITT), ISTS conducts various research projects out of amounts received from MEDT. For the year ended March 31, 1996, ISTS received funding of $7.1 million from the Province of Ontario. Total expenditures by ISTS on Environmental Change research, including LIDAR development, were $1.89 million in 1996.[5]

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[5] Source: ISTS 1995-96 Annual Report.

COMMUNICATIONS & PARTNERSHIPS

The long-term challenge to the environment posed by climate change means that innovative ways must be sought to limit the growth in greenhouse gas emissions. In some areas, this may require fundamental changes in the way we produce and consume energy.

Publications

To better acquaint the general public and government employees with the issue of climate change, the Ontario government is preparing new materials that broaden understanding of the issues involved and the challenges we face, in partnership with other groups to raise awareness of climate change issues.

For example, the Ministry prepared a brochure on climate change and made it available to the public at the Public Information Centre located at the Ministry's head office in Toronto.

In addition, the Ministry of Environment is developing a series of Sector Specific Guidebooks on cost saving and resource conservation opportunities, which will allow companies in industrial and commercial sectors to save money, at the source, by implementing process and system modifications and improvements.

In particular, the Office Building Sector Guidebook, to be completed by October 1997, will have direct applications to Government facilities. The Guidebook will enable facility managers to compare their own operations with benchmark information and will provide guidance on evaluating opportunities to enhance energy and water conservation and minimize waste disposal.

Other publications targeted specifically at facilities managers include:

- Banking on Efficiency - Energy Reference Manual for Government and Institutional Facilities
- Energy Management for Buildings and Facilities - a Technical Manual
- How to Buy Energy Management Advice - A Guide to Developing a Request for Proposals for Utility Audits
- Heating and Cooling Guide

Partnership Activities

The Government of Ontario works in partnership with all sectors of the economy and all levels of government on issues related to climate change, providing information and assistance to help others take action, and working to expand participation in the Voluntary Challenge and Registry program generally and improve the quality of reports. Some examples of on-going Ontario government partnership activities are outlined in the box on

page 18. More details on these and other activities are described in the Ministry of Environment and Energy's December 1996 report "Meeting the Challenge of Climate Change".

Partnership Activities

Smog Plan

As part of the Ontario government's on-going effort to respond to Ontario's smog problem, a Smog Management Plan is being developed by a broad coalition of government, business and community representatives to reduce emissions of Nitrogen Oxides (NOx) and Volatile Organic Compounds (VOCs), both of which lead to the formation of ground-level ozone. One of the proposed goals is to reduce NOx and VOC emissions by 45 per cent of 1990 levels by 2015. The benefits of the Smog Plan from a climate change point of view is that actions to reduce nitrogen oxides through decreasing fossil fuel use will simultaneously reduce carbon dioxide emissions.

Ontario Government Industry programs

The Ontario Government will continue to use its resources strategically to reinforce key industry initiatives to enhance their environmental performance, and to encourage markets for technologies and clean production processes which reduce water, materials and energy usage. Reduced greenhouse gas emissions flow directly from reduced energy use.

Ontario's Green Industry Strategy

Ontario's Green Industry sector plays a key role in maintaining and improving environmental quality. It has become a world leader in finding solutions to environmental challenges with innovative technologies and processes.

Ontario's green industry strategy, through the Green Industry Office of the Ministry of Environment and Energy, is helping companies in this sector work together to build domestic markets and increase exports.

Energy Standards

The Ontario government continues to update regulations and standards under the **Energy Efficiency Act** to ensure that major energy-consuming products sold in Ontario are energy efficient.

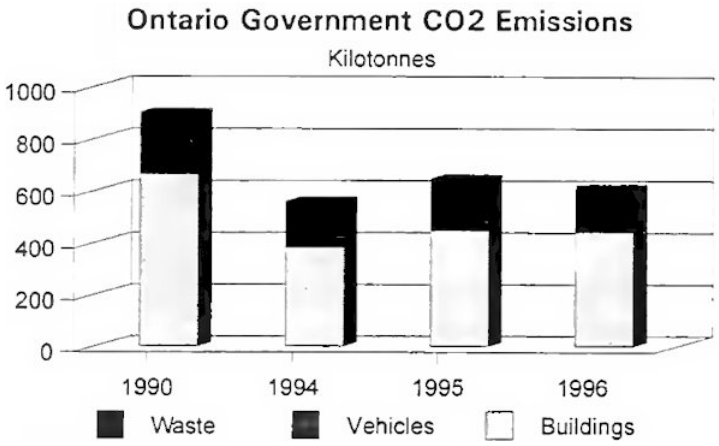
Staff from the Ministry of Environment and Energy worked with the Canadian Standards Association to develop 'CSA Plus 1140, A Voluntary Energy Management Guide' which has specific applications to facility operations. This information product is based on an MOEE-developed document: BES 710 - Energy Efficiency in Large Buildings.

EMISSIONS FROM GOVERNMENT OPERATIONS

BASELINE

In 1990, greenhouse gas emissions attributable to the Ontario government totalled about 903 kilotonnes of CO_2-equivalent emissions or about 0.5 per cent of Ontario's total greenhouse gas emissions (Figure 1).[6]

Figure 1



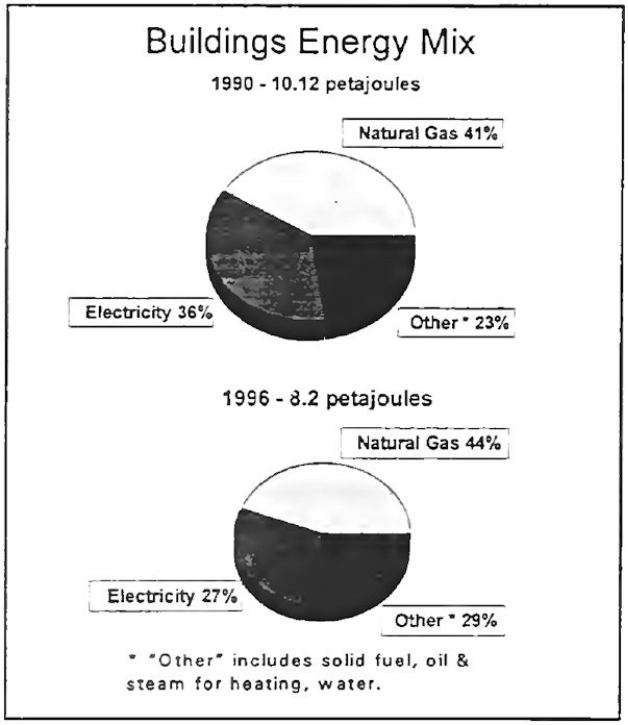
Sources of Emissions:

Buildings

Greenhouse gas emissions from government-owned and operated buildings are estimated to have been 665 kt of CO_2e in 1990. This calculation includes direct emissions of carbon dioxide, methane and nitrous oxides from government buildings and vehicles, as well as indirect emissions from electricity consumption (those in turn based on Hydro's 1990 average generation mix).

In 1990, Ontario government owned and leased buildings consumed a total of 10.1petajoules of energy in the form of natural gas, electricity and other energy fuels at a cost of $84.5million (figure 2).

Figure 2



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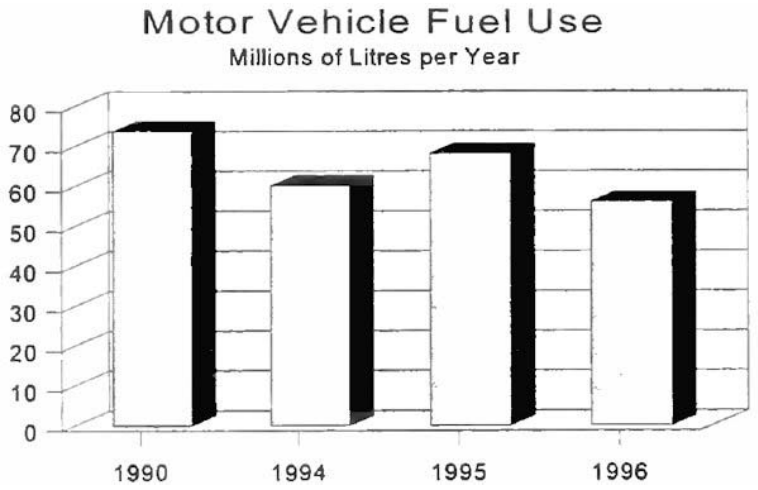
[6] Base year numbers in this report are different from those reported in the government's preliminary Action Plan submitted to the VCR in May, 1996. The baseline was recalculated incorporating greater detail about 1990 expenditures on energy than was available in 1996 and new Global Warming Potentials for methane and nitrous oxide from the fall 1996 VCR Bulletin (#2).

Ontario government buildings accounted for approximately 3.0 per cent of Ontario's commercial and institutional sector energy consumption in 1990.

Figure 3



Vehicles

Greenhouse gas emissions from the government vehicle fleet are estimated to have been 199 kilotonnes in 1990.

Expenditures by government on fuel for vehicles, including passenger vehicles, trucks, ambulances and other specialized equipment, totalled $41.3 million in 1990, for approximately 74 million litres of fuel (2.7 petajoules), based on an average cost of 56 cents per litre (Figure 3). Ontario government fuel use represents approximately 0.4 per cent of Ontario's total transportation sector energy consumption.

Landfilled Waste

Government operations are estimated to have produced 25,000 tonnes of waste sent to landfills in 1990, with associated landfill emissions of 38 kilotonnes of CO_2-equivalent greenhouse gases.

RESULTS ACHIEVED

During the fiscal year 1996-97, the Ontario government emitted approximately 612 kilotonnes of CO_2- equivalent greenhouse gas emissions in total, a reduction of about 32 per cent from 1990 levels. Emissions from energy use in government operations decreased to about 595 kilotonnes of CO_2e. (Figure 1). Non-energy emissions are estimated to have declined to about 16 kilotonnes, primarily as a result of waste reduction efforts.

In 1996, energy efficiency measures and reductions in government operations (buildings and vehicles) had reduced energy use in government-owned and operated buildings to 8.2 petajoules, with a reduction in total energy bills to about $106 million, down from approximately $114 million in 1995.

Sources of Reductions:

Three-quarters of the government's reduction of greenhouse gas emissions between 1990 and 1996 was as a result of improved energy efficiency, reduced government operations and waste reduction. One quarter of the reduction was attributable to the decrease in the carbon intensity of electricity production by Ontario Hydro over this period.

Government Buildings

Energy use in government buildings decreased by approximately 19 per cent between 1990 and 1996 (an average of 3.4% a year), from 10.1 PJ to 8.2 PJ. The specific sources of reductions are not known, but would have been the combined result of energy efficiency changes and the rationalization of facilities. The work on energy accounting systems noted previously will improve our ability to discern the impact of specific changes in more detail in the future.

A portion of the Ontario's reduction was the result of the decrease in carbon intensity of electricity produced by Ontario Hydro, from 0.28 kg CO_2 per kWh in 1990 to 0.14 kg CO_2 per kWh in 1996. Considering that electricity accounted for approximately one third of the Ontario Government's energy use in buildings in 1990, this factor had a fairly significant impact.

At the time of writing, just after Hydro announced the expected reductions in nuclear output to the year 2000, Hydro's revised carbon intensity forecast was not available. Prior to the announcement, Hydro had been forecasting that its carbon intensity could rise to 0.26 kg CO_2 per kWh by the year 2000. This was the figure used in the projections for government emissions that follow.

Government Vehicles

In 1996, government expenditures on motor vehicle fuel (including aviation fuel) totalled $32.03 million, for approximately 56 million litres of fuel, based on an average price of 57 cents per litre.

The amount of energy consumed was approximately 2.0 petajoules, down 24 per cent since 1990. This decline was the result of net reductions from reduced travel, fewer vehicles in the government fleet and improved vehicle efficiency, and to contracting out to the private sector of some operations, such as snow ploughing, which represents a transfer of emissions.

Table 4 shows that motor vehicle fuel expenditures in 1995 increased from the previous year's total, partly due to price increases (the average retail price of gasoline in Ontario

increased from 51 cents per litre in 1994 to 54¢/L in 1995), but mainly due to increased fire fighting activity by the Ministry of Natural Resources. Such events are unpredictable, but it is expected that the Fleet Management Project will restore the downward trend of these expenditures.

Table 4: Government Spending on Motor Vehicle Fuels (fiscal year).

($millions)

1990	1991	1992	1993	1994	1995	1996
41.3	42.1	37.5	31.9	30.7	36.8	32.0

Source: Ministry of Finance

Greenhouse gas emissions from the government vehicle fleet are estimated to have been 199 kilotonnes in 1990, and to have declined to 151 kilotonnes in 1996, a reduction of 24 per cent.

Other Activities

By 1995, waste reduction efforts and reductions in government operations had reduced waste going to landfills by an estimated 14,500 tonnes per year, for a reduction of associated landfill emissions of 22 kilotonnes of CO_2-equivalent greenhouse gases.

PROJECTIONS

The key factors in projecting emissions from Ontario government operations for the year 2000 are energy efficiency improvements, restructuring of government operations and the carbon intensity of electricity produced by Ontario Hydro. A 40 per cent reduction from 1990 emission levels translates to a target of 542 kilotonnes for the year 2000, a difference of 361,000 tonnes of carbon dioxide equivalent. Eighty-one per cent of the reduction has been achieved to date. The remaining reduction required is 70 kilotonnes.

Energy efficiency in government buildings is expected to continue to improve, and government operations are expected to be reduced. The combined effect of these two factors could be to reduce energy consumption from 8.2 PJ in 1996 to approximately 6.1 PJ in 2000, which is 40 per cent less than in 1990. The associated reduction in carbon dioxide equivalent emissions would be in the order of 112,000 tonnes by 2000.

Continued reductions are expected in vehicle emissions as a result of improvements in vehicle efficiency and operations, fleet downsizing, government restructuring, and from making needed repairs as identified by the government's DRIVE CLEAN inspection and maintenance program. Reductions in emissions from government vehicles may total 7,000

tonnes.

An estimated reduction for future recycling and composting efforts has not been included in this analysis. Efforts will continue on quantifying the impact of all the measures listed in this Action Plan, where possible.

Offsetting the above decreases in carbon emissions, Ontario Hydro has forecast that carbon dioxide emissions per unit of electricity will increase between 1996 and 2000, depending on the increase in demand for electricity in Ontario and the source of power. However, the risk of the government's greenhouse gas emissions increasing has been reduced by the government's shift away from electricity in the total energy mix (figure 2), at the same time that total energy use has also been declining.

Based on these factors, total emissions from Ontario government operations of CO_2-equivalent greenhouse gases are projected to be 40 per cent below 1990 levels by 2000.

FUTURE REPORTING AND REVIEWS

The Ontario government's actions to reduce greenhouse gas emissions will evolve over time. These actions will continue to support other government priorities and will recognize new opportunities and challenges.

The government's response to climate change in internal operations will continue to focus on areas where actions lead to multiple benefits for the government and for Ontario. Reduction of energy use, with the associated reduction in energy bills, continues to be a key area of focus. Similarly the reduction of solid and liquid waste from government operations, with the attendant savings in waste disposal, and reduction of emissions from the government vehicle fleet continues to be priorities.

The Ontario Government is working to improve the database used to track greenhouse gas emissions by bringing together information from several sources.

Appendix 1

Ontario Government Expenditures on Energy

$ millions

	fy 1990	1994	1995	1996
Natural Gas	16.20	15.32	14.86	15.21
Electricity	58.80	50.85	52.75	48.51
Other	8.90	9.59	9.94	9.80
Motor Vehicle Fuels	41.35	30.70	36.86	32.03
Total	125.25	106.46	114.41	105.55

Ontario Government Greenhouse Gas Emissions

Carbon Dioxide Equivalent KiloTonnes

	1990	1994	1995	1996
Buildings	665	384	448	444
Vehicles	199	162	184	151
Landfilled Waste	38	16	16	16
Total	903	562	648	612

Questions or feedback? Contact:

Eric Lawton
Energy Conservation and Liaison Branch
Ontario Ministry of Energy, Science & Technology
135 St. Clair Ave. W, 6th Floor
Toronto, Ontario M4V 1P5

telephone: (416) 323-5643
fax: (416) 323-5636
e-mail: