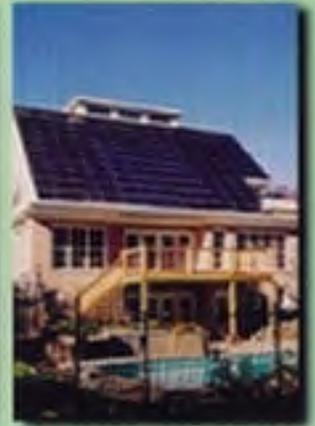
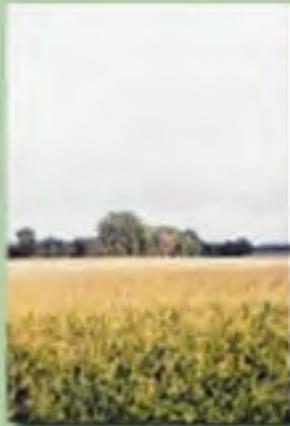


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of Ontario



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de l'Ontario

SELECT COMMITTEE ON ALTERNATIVE FUEL SOURCES



FINAL REPORT

3rd Session, 37th Parliament
51 Elizabeth II

The Honourable Gary Carr, M.P.P.,
Speaker of the Legislative Assembly.

Sir,

Your Select Committee on Alternative Fuel Sources has the honour to present its Final Report
and commends it to the House.

Doug Galt, M.P.P.,
Chair.

Queen's Park
June 2002

SELECT COMMITTEE ON ALTERNATIVE FUEL SOURCES

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EXECUTIVE SUMMARY

The Select Committee on Alternative Fuel Sources, an all-party Committee of the Ontario Legislature, was appointed on June 28, 2001 with a broad mandate “to investigate, report and recommend ways of supporting the development and application of environmentally sustainable alternatives to our existing fossil [carbon-based] fuel sources.” Through extensive public hearings, site visits, attendance at relevant conferences, background research and other deliberations the Committee canvassed a broad range of alternative fuel and energy sources with potential application within Ontario.

In November 2001, the Committee issued an *Interim Report* as a discussion paper. It now presents its *Final Report* with 141 specific recommendations on 20 topic areas to the Legislature. With this report, the Committee seeks to establish an overall policy framework to support the development of alternative fuels/energy, and outline policy and programs to support specific alternative fuel/energy sources and technologies. Based on an extensive review and assessment of experience and policies in other jurisdictions, the Committee sets out a framework to make Ontario a leader in North America in the support and use of alternative fuels/energy.

Part A discusses and makes recommendations on policy issues including: the formulation of an Ontario alternative fuel and energy strategy; the establishment of an Ontario Energy Research Institute; specific funding and comprehensive tax provisions to assist alternative fuels/energy; establishment of an aggressive renewable portfolio standard for the supply of new renewable power sources across Ontario; the establishment of a systems benefits charge to fund renewable energy programs; provisions to require net metering; the long-term elimination of traditional carbon-based generation by 2015 with a recommendation to close the Atikokan and Thunder Bay coal-fired stations in northwestern Ontario by 2005; new aggressive energy conservation and efficiency standards, aggressive government and municipal procurement incentives and targets to utilize alternative fuels and energy; and consumer awareness and education programs to promote alternative fuels/energy.

Part B sets out recommendations on specific alternative fuel/energy sources to: further water power including designating the Beck 3 Niagara River development as a priority for development; advance wind and solar power as sources of renewable power, including a rebate program for the installation of solar panels on 100,000 homes within Ontario; establish aggressive targets and standards for the use of alternative fuels and vehicles, including a commitment by the Ontario government to the full ‘hydrogenization’ of GO Transit’s rail and bus services by the end of 2006; and utilize biomass sources of energy. In most cases recommendations contain specific timelines for action.

The Committee believes that aggressive action on alternative fuels and energy can serve to substantially reduce Ontario’s dependence upon traditional petroleum-based fuel and energy sources. Progress in this area will provide significant long-term environmental (particularly, air quality), social, and economic benefits to Ontario.

INTRODUCTION

Establishment and Purpose of the Committee

The Select Committee on Alternative Fuel Sources was appointed by motion of the Ontario Legislature on June 28, 2001 with a broad mandate “to investigate, report and recommend ways of supporting the development and application of environmentally friendly sustainable alternatives to our existing fossil [carbon-based] fuel sources.” The Committee was required to submit its Final Report to the Legislature before the end of May 2002.

The Committee recognizes that, in association with its mandate, one of the purposes of the *Energy Competition Act, 1998* is “to facilitate energy efficiency and the use of cleaner, more environmentally benign energy sources in a manner consistent with the policies of the Government of Ontario.”

At its inaugural meeting on August 2, 2001, the Committee unanimously agreed that its deliberations and report would canvass a broad range of alternative fuel and energy sources with potential for use in Ontario.

The two major areas of focus within the Committee report are:

- an effective overall policy framework to support the development of alternative fuels/energy; and
- appropriate policies and programs to support specific alternative fuels/energy sources and technologies.

The Committee believes its recommendations will lay the groundwork for the shift to more renewable and sustainable fuel and energy options for Ontario. Most of the Committee’s recommendations are designed as provincial scale proposals to lead the province toward a practical renewable energy future.

The Committee understands that Ontario has never had an overall strategy for the promotion and use of alternative fuels and energy. The report proposes that such a provincial strategy be developed to set a framework for action. Ontario can become a leader in the support for and use of alternative fuels and energy.

Leadership on alternative fuels and energy can provide Ontario with significant social, economic and environmental benefits. Most obviously, the province can act to reduce its dependence on non-renewable, imported petroleum-based fuels and energy sources. The Committee has focussed on recommendations to set Ontario on a path towards increasing the use of renewable fuel and energy. Development of alternative energy sources and the promotion of energy conservation and efficiency also present the province with significant economic growth opportunities and benefits.

Key Committee Activities

The Committee established a website to better engage the public in its deliberations (accessible from the Legislative Assembly of Ontario website at www.ontla.on.ca). The site contains information on the mandate and membership of the Committee, provides access to *Hansard* of Committee meetings, the *Interim Report* and other key documents. Some members of the public responded to the Committee's deliberations electronically.

An initial set of public hearings in Toronto, Ottawa and London was conducted during August 2001. At the outset of these hearings, the Committee sought background input from seven Ontario ministries, select federal departments, and related public agencies. Other stakeholders including energy industry representatives, umbrella groups, environmental organizations, and private citizens made oral and written submissions to the Committee.

In November 2001, the Committee tabled its *Interim Report* in the Legislature. The report is in the form of a discussion paper reflecting what the Committee heard during its first round of hearings and deliberations. The *Interim Report* identified six policy objectives:

- Increase the use of renewable energy and fuel sources within Ontario in both the immediate and long-term.

- Reduce Ontario's reliance upon traditional carbon-based fuel sources.

- Reduce adverse impacts on the environment compared to traditional energy/fuel sources and uses.

- Ensure that the policy framework developed for alternative fuels and energy takes into account the relative cost of the different energy sources, fiscal implications of any policy or program change, energy security, impact on job creation, export development and the provincial economy.

- Support innovative research and development in alternative energy fields that will yield long-term economic, environmental and social benefits.

- Ensure that energy conservation and efficiency are improved for both traditional and alternative fuels and energy sources.

Based upon subsequent deliberations, the Committee believes these objectives remain vital for the future formulation of alternative fuel/energy policy in Ontario.

The *Interim Report* contained a set of 65 public policy questions on various alternative fuel and energy matters. These topics and questions formed the focus of subsequent input to the Committee.

In November and December 2001, the Committee held supplementary hearings, where it received additional information from Ontario ministries, and municipal and transit representatives.

In mid-January 2001, Navigant Consulting Ltd., an Ontario-based energy consulting firm engaged by the Committee, completed its *Review of Policies for the Promotion of Alternative Fuels and Technologies*. This report provided an independent assessment of the opportunities and constraints associated with the key fuel and energy alternatives. The main premise of the study was to “reduce Ontario’s primary demand for fossil [carbon-based] fuels.” It also reviewed alternative energy policies and programs in North American and other jurisdictions. The various fuel/energy alternatives were assessed based on their environmental, technical, economic and incremental policy impacts.

In January and February of 2002, the Committee held its second major round of public hearings and site visits designed to hear responses to its *Interim Report*, and obtain additional information on fuel/energy alternatives. Hearings were held in Toronto, Ottawa, Thunder Bay and Windsor. The Committee also visited fuel and energy sites in Ottawa, Thunder Bay, Windsor and Dearborn, Michigan. In February, the Committee travelled to western North America where it held meetings and site visits with fuel and energy stakeholders, and public officials in: Calgary and Pincher Creek, Alberta (focussing on wind energy) Vancouver, British Columbia (focussing on fuel cells) and Sacramento, California (focussing on policy regulation and wind and solar power). In total, the Committee held 11 additional days of hearings, meetings and site visits.

Responses to the *Interim Report* received during public hearings, site visits, and in written submissions were summarized in a Summary Report (April 2002). A separate Summary (March 2002) was also prepared on the Committee’s western trip to highlight meetings, presentations, and additional site visits in Ontario and Michigan.

Individual Committee Members attended a variety of fuel and energy conferences and visited sites in North America and elsewhere. This provided Members with further opportunities to discuss and assess alternative fuel/energy policies in other jurisdictions. These experiences were shared with the full Committee and directly influenced many of the recommendations contained herein. Detailed reports on these conferences and visits were presented to the Committee (available in *Hansard*) and were also filed as Committee exhibits.

The Committee reviewed the experience of many other jurisdictions in North America and internationally on alternative energy matters. Goals and timelines expressed in the recommendations of this report reflect the Committee’s extensive research on best practices in leading jurisdictions.

In total, the Committee held 29 days of public hearings, meetings, and site visits. It met with and received oral or written submissions from some 218 individuals and organizations. All of these meetings, written and oral submissions, review of appropriate databases and associated materials aided the Committee in drafting the *Final Report*.

The entire process served as a valuable learning experience for Committee Members on the rapidly developing field of alternative fuels and energy. The

Committee expresses its sincere gratitude for the interest, commitment and dedication of all witnesses, companies, organizations and individuals who provided input to this report.

Organization of the Report

The *Final Report* follows a similar organizational structure to that in the *Interim Report*. Each section contains a commentary section highlighting key Committee observations and findings, followed in most cases by specific recommendations. However, in some cases representations were made in the second round of hearings on topics that were not addressed in the first round. In these cases, new sections have been added, and others modified.

The first part of the *Final Report*, Part A, focuses on policy and regulatory proposals to facilitate a provincial policy framework for alternative fuels and energy. Specific topics include: Ontario government policy; principles for financial assistance to alternative fuels/energy; renewable portfolio standard; role of Ontario energy regulators and utilities; net metering; transmission and powerline connections; emissions trading program; operation of carbon-based fuel generating stations; energy conservation and efficiency measures; government procurement programs; relationship to federal energy policies; the municipal sector; relationship to federal policies; and consumer awareness and education.

The second part, Part B, deals with specific alternative fuel/energy sources and technologies and their potential importance in Ontario. Topics include: water, wind and solar power; transportation fuels and vehicles; fuel cells and hydrogen; biomass fuel/energy; and energy-from-waste. A final section deals with overall commitment and funding.

A glossary of key terms appears at the end of the report together with the list of committee recommendations.

CONTEXT

To set our analysis and recommendations in context, the Report briefly reviews current energy use, the potential for alternative fuels and energy sources in Ontario and key policy developments in other countries.

Fuel/Energy Sources in Ontario

In 1999, Ontario satisfied the majority of its end-use energy demand (that is, energy used not only for electricity production, but for manufacturing goods and supporting industrial processes) through the use of oil (41%) and natural gas (29%), as shown in Table A.

Table A: Ontario's End-Use Energy Consumption by Major Type, 1999

	Amount of energy (petajoules)	Amount of energy (kWh)	Percentage of Total (%)
Oil	1105	3.061×10^{11}	41
Natural Gas	782	2.555×10^{11}	29
Electricity	485	1.343×10^{11}	18
Other (wood and wood waste, liquefied petroleum gas, ethane and steam)	189	6.174×10^{10}	7
Coal, coke, oven gas	135	4.410×10^{10}	5

Source: National Energy Board, 2001.

Major fuel sources for electricity generation in Ontario (1999) are nuclear (44%) and hydraulic power (27%), as shown in Table B below. Energy generation figures for nuclear power could increase significantly with the licensing and coming on line of Ontario's total rated nuclear capacity of 13,760 MW at the Pickering, Bruce, and Darlington nuclear generating stations.

Table B: Ontario Electricity Generation by Fuel, 1999

	Amount of Energy (petajoules)	Amount of Energy (kWh)	Percentage of Total (%)
Nuclear	238	6.593×10^{10}	44
Hydraulic	146	4.044×10^{10}	27
Coal	113	3.130×10^{10}	21
Natural Gas	35	9.695×10^9	6.5
Oil	5	1.385×10^9	1.0
Other	4	1.108×10^9	0.7

Source: Ontario Energy Board, 2001.

Based on the Committee's deliberations, the alternative or renewable fuel and energy sources listed below are believed to have potential in Ontario. Some of these sources, such as water power and landfill gas, have existing and additional potential. Others, such as wind and solar power, have potential for utilization, but have not been significantly developed yet. The Committee understands that there are costs associated in making the transition from *status quo* carbon-based generation to cleaner technologies. The Committee recognizes that any requirements to change the fuelling of existing carbon-based stations could impact upon the long-term financial and debt obligations associated with the former Ontario Hydro.

The Potential of Alternative Energy

The Committee reached the following broad conclusions on the major alternative or renewable fuel/energy sources for Ontario:

Water power

Water power is an established renewable power source that has significant additional potential in Ontario. In its recommendations, the Committee emphasizes the refurbishment of existing hydraulic facilities and water control structures (dams) to generate electricity. In some cases there may also be potential for the development of new hydraulic sites, while respecting the interests of other watershed users and natural processes.

Wind power

Due to technological advances in wind turbine technology, the Committee believes that wind power has significant immediate potential within Ontario. According to the International Energy Agency, Canada lags behind other countries in installed wind capacity. In 2000, installed wind capacity was 137 MW in Canada, whereas Germany had 6,095 MW, Denmark 2,338 MW and 2,554 MW were installed in the United States. Recommendations are put forward to expedite the utilization of this alternative and renewable power source.

Biomass fuel/energy

The Committee believes that there is significant additional potential for the use of biomass materials from landfill, agricultural and forestry operations to generate power. The enhanced collection and use of fuel gases from landfill and agricultural operations, including the possible cultivation of energy crops such as switchgrass, a native grass which does not constitute a food crop, form the basis of Committee recommendations.

Solar power

Advances in solar power and heating technology require renewed attention for smaller scale energy applications. In 1999, Canada had only 1,356 kW of installed photovoltaic power, compared to 100 MW in Germany in 2000, and 2000 MW in Japan in the same year. There is also significant potential for passive solar design in new construction and major renovation of buildings. Solar power also has the potential to meet energy needs in urban and remote locations.

Transportation fuels

The Committee focused on renewable and alternative fuel sources such as ethanol and biodiesel to reduce dependence upon traditional carbon-based fuels. Alternative transportation fuels have potential for use in 'on road' and 'off road' applications and offer substantial emissions benefits compared to traditional petroleum-based fuels. The greater use of these fuels depends upon adequate production, supply and distribution. There is also potential for the use of new fuels such as hythane which is a mixture of hydrogen and natural gas/methane.

Various presenters to the Committee also outlined promising options and a range of complimentary products to moderate the adverse effects of traditional carbon-based fuels. These techniques can involve modified refining of traditional fuels, or the use of various additive packages to enhance performance and emission

characteristics. These alternative approaches are recognized within the *Report*. In addition, the Committee proposes a renewable fuel standard for Ontario.

Fuel cells

Fuel cells that use hydrogen as a fuel and oxygen as an oxidant to produce electricity present the greatest possible air emissions benefits. At present, the hydrogen fuel is normally ‘stripped’ from other carbon-based fuels, but may in future be economically produced by hydrolysis – the passing of an electric current through water. Fuel cells may serve as an alternative to the internal combustion engine for motor vehicles, railway locomotives, and as a stationary power source. Recommendations are made for Ontario to be involved in research, development, testing, and promotion of fuel cells as this market continues to evolve. The Committee also sees the potential merits of using Ontario’s established supply of off-peak power (from nuclear and hydraulic sources) to produce hydrogen for fuel cells through electrolysis.

Other

The Committee was also introduced to new energy storage technologies developed in Ontario and to the International Thermonuclear Experimental Reactor (ITER) nuclear fusion project, which may be located adjacent to the Darlington nuclear generating station. There is also potential for earth energy (heat pumps) and lake water cooling applications for both on and off-grid power sources. Energy storage, nuclear fusion, and geothermal energy have potential to assist in meeting Ontario’s future energy needs.

Policy Developments in Other Jurisdictions

The Report of the World Commission on Environment and Development (1987), widely known as the Bruntland Report, foresaw a key role for renewables:

Renewable energy systems are still in a relatively primitive state of development. But they offer the world potentially huge primary energy sources, sustainable in perpetuity and available in one form or another to every nation on Earth.... The need for a steady transition to a broader and more sustainable mix of energy sources is beginning to be accepted. Renewable energy sources can contribute substantially to this.... The Commission believes that every effort should be made to develop the potential for renewable energy, which should form the foundation of the global energy structure for the 21st century.

Since the Bruntland Report, many countries have implemented policies and programs to promote renewable energy. Market reforms in the electricity sector are often the driver of renewable energy policies. In many cases, policy

interventions aim to balance environmental and energy security objectives in the context of market liberalisation.

Table C below illustrates the status of renewable policy application for select jurisdictions that were of interest to the Committee. Information was gathered from reports by international bodies, government websites, and academic literature. The chart is meant to be a snapshot of policies to promote renewable energy around the world, and should not be seen as a definitive review.

The renewable fuel/energy policies contained in the recommendations of this report are also profiled. Each of the major policy recommendations for action in Ontario put forward in the *Final Report* are already in place in other major jurisdictions around the world. The Committee believes that Ontario should become a leader in providing a supportive policy environment for renewable fuels and energy.

Table C: Renewables Policy Comparison for Select Jurisdictions

	European Union	Germany	United Kingdom	Denmark	Italy	Iceland	Australia	Brazil	United States	Michigan	Massachusetts	New York	California	Texas	Canada	British Columbia	Alberta	Ontario	Committee Recommendations
1. Renewable Portfolio Standard	X ¹		X	X	X	X	X				X			X		X ²			X
2. Net Metering		X		X							X	X	X	X				X ³	X
3. Emissions Trading			X	X	X		X		X	X	X	X	X	X		X		X	X
5. Energy Conservation and Efficiency Measures	X		X				X	X					X	X	X	X		X	X
6. Consumer Awareness and Education	X	X	X	X			X		X	X	X		X	X		X			X
7. Renewables Production Incentives		X	X	X	X		X	X	X	X	X	X	X	X	X	X		X	X
8. Renewables Manufacturing Incentives		X					X		X				X		X	X			X
9. Renewables Purchasing Incentives		X		X	X		X	X	X			X	X		X	X		X	X
10. Research and Development	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				X
11. Coordinating Agency		X	X	X	X		X			X					X		X		X
13. Systems Benefit Charge			X	X	X						X	X	X	X					X
14. Power Labelling Requirement		X	X	X	X	X	X				X	X	X	X		X		X	X

¹ The European Union has a proposed Renewable Fuel Standard that would establish a minimum level of biofuels as a proportion of fuels sold from 2005, starting with 2% and reaching 5.75% in 2010.

² Renewable Portfolio Standard is for B.C. Hydro.

³ Net metering is offered by Toronto Hydro.

Renewable energy creates jobs in direct manufacturing of related technologies (wind turbines, photovoltaics, solar hot water systems, and biogas plants), research and development, system design, installation and maintenance, education and training, energy auditing and management, and consulting. Select statistics on employment impacts of renewable power include:

One MW of installed wind power-generating capacity creates jobs for 15-19 people (European Commission, 1997).

Developing the 500,000 MWs of potential wind power in the United States is estimated to create approximately 1 million short term construction jobs and employ over 33,000 operations and maintenance workers. This excludes manufacturing jobs associated with building wind turbines (U.S. Department of Energy, 1999).

Many European countries and the United States have developed wind and solar power industries that provide employment and generate economic activity.

Denmark, a small nation with 5.3 million population (2000), had more than 50% of the global market for wind turbines in the late 1990s. Approximately 9000 people were employed directly or indirectly in the wind energy industry in 1995 (OECD, 2001).

Solar thermal power plants yield twice as much tax revenue per square foot as conventional gas-fired plants (California Energy Commission, 1998).

The Committee is putting forth firm policy recommendations and timetables to guide the development of a comprehensive Ontario alternative fuels and energy plan. Major initiatives covered include: the development of an alternative fuel and energy strategy; the establishment of an Ontario Energy Research Institute; amendment of pertinent Ministry business plans; review and amendment of provincial legislation; establishment of a renewable portfolio standard; a system benefits charge; net metering; the long-term elimination of traditional carbon-based generation; aggressive energy conservation and efficiency standards; aggressive government procurement programs; incentives and targets for municipal and transit operations; cooperation with federal energy programs; and active consumer awareness and education programs.

With respect to alternative and renewable fuel/energy sources, aggressive policy recommendations are made to further water, wind, and solar power; transportation fuels and vehicles; and biomass. In most cases, recommendations also contain a specific deadline or timetable for action.

A. POLICY FRAMEWORK FOR ALTERNATIVE FUELS/ENERGY

A.1 Ontario Government Policy

Commentary

The Committee believes that alternative fuels and energy will be a significant public policy issue as alternative energy sources gain the attention of the public, government and the private sector. New renewable energy sources should be utilized to improve air quality in Ontario and across North America, and to replace traditional sources of generation. The recommendations below establish a broad framework for the formulation of Ontario government policy on alternative fuels and energy, carefully designed to make Ontario a leader in this field.

The Committee also believes that the Task Force approach, as used by the Ontario Waterpower and Wind Energy Task Forces, has merit to give direction in some cases in the formulation of policy on alternative fuel/energy matters. The Committee was impressed by the thoroughness of these Task Forces and the fact that they brought together key public and private stakeholders to develop policy proposals in a timely and efficient manner.

Recommendations

1. The Ontario government shall develop an alternative fuel and energy strategy to establish a framework for a coordinated approach to: (a) increase the use of renewable energy and fuel sources in both the immediate and long-term; (b) reduce Ontario's reliance upon carbon-based fuel sources; (c) reduce adverse impacts upon the environment; (d) ensure that the relative cost of different energy sources, fiscal implications, energy security, impact on job creation, export development and the provincial economy are all considered; (e) support innovative research and development in alternative energy fields that yield long-term economic, environmental and social benefits; (f) and ensure that energy conservation and efficiency are improved.
2. The Ministry of Environment and Energy shall be the lead in formulating an Ontario Alternative Fuel/Energy Strategy. Other pertinent ministries and agencies shall be consulted including: Enterprise, Opportunity and Innovation; Agriculture and Food; Training, Colleges, and Universities; Education; Finance; Management Board; Municipal Affairs and Housing; Natural Resources; Native Affairs; Northern Development and Mines; Transportation; Ontario Power Generation; Hydro One and/or successor companies; Ontario Energy Board; Independent Electricity Market Operator; and Natural Resources Canada. A coordinating Branch shall be established within the Ministry of Environment and Energy to deal with alternative fuel/energy policy and programs. An independent Technical Advisory Group reporting to the Minister of Environment and Energy shall be appointed to advise on alternative fuel/energy technologies and levels of assistance to individual technologies.
3. An Ontario Energy Research Institute shall be established by March 1, 2003 to advance the manufacture and use of alternative fuel and energy products in

Ontario. The Institute should have responsibility for oversight of all alternative fuel/energy projects and be a Schedule 3 Agency reporting to the Ministry of Environment and Energy. It should have an annual budget of \$40 million and a guaranteed minimum 10-year lifespan. Its functions should include: policy development and implementation, including product specifications and standards in conjunction with the Technical Standards and Safety Authority; development of partnerships with the private sector and post-secondary institutions; testing of technologies at a demonstration site, with a \$10 million funding commitment over 3 years; development of an educational program, including a comprehensive website and alternative fuels/energy component within the elementary and secondary educational science curriculum, in cooperation with Ministry of Education; securing of matching federal and private sector funding; funding programs to promote alternative fuels/energy installations at Ontario universities, community colleges; working with municipalities on energy planning; and monitoring and assessment of worldwide developments in alternative fuels/energy.

4. The Ontario government shall undertake a comprehensive legislative and regulatory review to consider amendments to legislation/regulations regarding alternative fuels/energy, including energy efficiency and conservation by June 30, 2003.
5. The Ontario government's 'Core Business' and related 'Core Activities' within all relevant Ontario ministry and agency Business Plans shall be revised to establish priorities for alternative fuel and energy, including energy efficiency and conservation. Performance measures shall be developed for the increased use of alternative fuels/energy in Ontario ministry/agency operations.
6. The Committee supports the development of a registry for airborne contaminants by the Ministry of the Environment and Energy that includes annual reporting of greenhouse gas emissions and other smog forming pollutants by large and small emitting sectors. Relevant work of Environment Canada, the U.S. Environmental Protection Agency, and the North American Commission for Environmental Cooperation should also be consulted.
7. The Ontario government shall use a 'Life Cycle Costing' approach to assess costs and impacts of new fuel/energy technologies. In assessing the costs of new alternative fuel/energy sources, comparisons should be made with the costs of new conventional sources of fuel/energy.
8. With respect to fuels: propane, natural gas, methanol, biofuels, ethanol, hydrogen, hythane (hydrogen and natural gas/methane mixture) and electricity are generally considered alternative fuels. With respect to energy sources: hydraulic, wind, solar, biomass, hydrogen/fuel cells, earth energy and co-generation are generally considered renewable. Where suitable federal definitions exist for alternative and renewable fuels/energy, and related terms, they shall be adopted by the Ontario government for use in appropriate legislation/regulations, standards, policies and programs. Environment Canada's national *Ecologo* certification program should be used as a basis. Where a suitable definition does

not exist, Ontario shall develop its own. Definitions shall be used consistently for all aspects of Ontario legislation/regulations and alternative fuels/energy policy and programs. Any alternative fuel/energy certification program should be 'self-sustaining' through the levying of appropriate certification fees upon proponents.

A.2 Principles and Provisions for Financial Assistance to Alternative Fuels/Energy

Commentary

Through the course of its deliberations the Committee heard a range of testimony about and received information on a variety of programs in other jurisdictions that provide financial assistance or favourable tax treatment to alternative fuel/energy. The Committee establishes some general principles for the formulation of provincial financial assistance policies below, but understands that the program details may be set by the responsible Ministry.

Recommendations

9. The Ministry of Finance shall offer flexible and effective tax incentives for investment in alternative fuel/energy technology. This will include a tax deduction called the Ontario Renewable and Sustainable Energy Development Tax Incentive whereby companies investing in equipment relating to renewable and alternative fuels will be permitted to deduct from taxable income 25% of the capital cost in each of the three years following the purchase of such equipment. A similar tax incentive will apply to capital investments made by manufacturers of renewable and alternative fuels.

10. Ontario government financial programs and incentives for alternative fuels/energy should be structured to not interfere with the operation of the competitive commercial market and should not favour one technology over the other. Wherever possible, programs should serve only as bridge incentives and only offer assistance for a specified time period.

11. The Ontario government shall establish a dedicated alternative energy/technology demonstration fund to support results-oriented outcomes associated with proven technologies. The purpose of the fund shall be to assist alternative technologies to gain public acceptance and achieve significant market share, but should not favour a specific technology. Such a fund should include appropriate cost sharing by private or other public sector partners.

12. The Ministry of Finance shall issue specific bonds to finance alternative fuel/energy investments by the province.

13. The Ministry of Finance shall review the *Assessment Act* and give consideration to full or partial exemptions under the Act for alternative fuel/energy installations, equipment, or improvements to buildings, other structures or property. Specific provisions should be developed to deal with wind, solar, biomass and earth energy installations and related modifications and equipment. Consideration should be given to full or partial provincial

compensation for such exemptions within municipalities, where there is a significant concentration of alternative/fuel energy installations.

14. The Ministry of Finance, in consultation with the wind industry, shall establish a standardized property assessment method for windfarms and wind turbine equipment and report by December 31, 2002. Consideration should be given to the impact of wind installations on adjacent property values. The Ministry of Finance should consider a property tax holiday for new windfarms, similar to the 10 year tax holiday offered for new, rebuilt or expanded hydraulic stations.

15. The Ministry of Finance should examine other tax incentives or exemptions to encourage the production and installation of new alternative fuel/energy equipment in Ontario.

A.3 Renewable Portfolio Standard and Related Measures

Commentary

A renewable portfolio standard (RPS) requires that a certain percentage of electricity produced within a jurisdiction, such as Ontario, come from renewable energy sources. The standard may also stipulate the type(s) of alternative fuels, or power sources, necessary to meet the RPS requirement. There may also be processes to certify credits, monitor compliance and impose penalties if the specified standard is not met. As of early 2002, ten U.S. States including Texas, New Jersey, Massachusetts, and Pennsylvania had enacted a form of renewable energy purchase requirements.

The Committee supports an RPS for Ontario to apply to new renewable power, and believes that the opening of the electricity market to competition and a clear commitment to an RPS for Ontario will cause a range of renewable power producers to come forward to meet market demand. The Committee also thinks that emerging wind power proposals can play a significant role within an RPS for Ontario.

An RPS for Ontario should be structured to maximize reliance upon the market, and also to reflect standards in neighbouring provinces or states, especially those jurisdictions that have transmission links with Ontario. An RPS should be subject to periodic review to assess performance and the need for revision of the standard.

The Committee also believes that the establishment in Ontario of a systems benefit charge, consisting of a nominal charge on customers' electricity bills to support renewable energy programs, would positively complement the establishment of an RPS. Such a charge, as in Massachusetts, could be used to directly support an Ontario renewable energy trust fund. The creation of such a charge should follow the establishment of an RPS.

Recommendations

16. The Ontario Government shall convene a Task Force with representation from all relevant stakeholder groups to determine a Renewable Portfolio Standard (RPS) for Ontario. The Task Force shall report its findings by March 1, 2003, and the RPS shall be in place by June 30, 2003, for all new renewable power sources. The RPS shall be amongst the most aggressive in North America and shall include provisions to eliminate carbon-based electricity generation in Ontario by 2015. The RPS shall include a renewable energy accreditation system, and an aggressive timetable and targets for the contribution of renewables. The operation and targets for the RPS shall be reviewed by the Ministry of Environment and Energy every four years. All local electricity distribution companies shall be required to develop compatible local renewable portfolio plans.

17. The Ontario government shall mandate the Ontario Energy Board to establish a Systems Benefit Charge for Ontario, as a nominal charge of 0.1 cent per kWh to be applied to electricity bills, to fund an Ontario renewable energy trust to support renewable electrical energy programs and projects. Funds may be allocated as subsidies to manufacturers, utilities and customers.

18. The Ontario government shall commit to developing a carbon tax (a tax based on the carbon content of the fuel consumed) in conjunction with an RPS, with a target implementation date of July 1, 2005.

A.4 Role of Ontario Energy Regulators and Utilities

Commentary

The Ontario Energy Board (OEB), established by the *Ontario Energy Board Act*, is a regulatory agency with oversight of both the electricity and natural gas sectors. With respect to electricity, the Board seeks to provide generators, retailers and consumers with non-discriminatory access to transmission and distribution systems and to facilitate energy efficiency and the use of cleaner, more environmentally benign energy services in a manner consistent with government policy.

The Independent Electricity Market Operator (IMO), established by the *Electricity Act* (1998), is a non-profit regulated corporation that controls the safe and reliable operation of the bulk electrical power system in Ontario. This agency also regulates the immediate dispatch of power across Ontario from suppliers to users.

The Committee appreciates that both of these bodies can play important roles in facilitating the development and supply of alternative energy. Based on the Committee's hearings and deliberations, recommendations are put forward to enhance the provision of alternative power and reduce regulatory barriers to the greater provision of renewable power. The role of these regulatory agencies should be strengthened to integrate renewable energy supply, energy efficiency and environmental concerns.

Recommendations

19. The Ontario Energy Board and Independent Electricity Market Operator shall develop non-discriminatory interconnection standards for independent alternative electricity generators by July 1, 2003. Interconnection priority shall be given to renewable power.

20. The Ontario government, in conjunction with the Ontario Energy Board, shall act to remove barriers and restrictions on the use of district energy systems by local electrical distribution companies.

21. The Ontario government shall expand electricity labelling to include the requirement for mandatory disclosure by electricity retailers of the fuel/energy source(s) used to generate power, including disclosure of pollution emissions from generation sources. This information shall be provided on electricity bills by July 1, 2003.

A.5 Net Metering

Commentary

Net metering is a policy that allows smaller producers of power (such as a residence, farm or industrial/commercial enterprise with a wind turbine or solar installation) to connect to the electrical power grid. Independent power producers are able to sell surplus locally-produced power into the grid, and at other times, utilize grid-supplied power. The independent power producer is only billed for the net amount of power used. Net metering also requires appropriate electrical metering equipment and safety standards. Grid connection avoids the requirement for small power producers to have costly back-up power sources such as diesel generators or batteries.

The Committee believes that support of net metering in Ontario can actively promote the development of localized alternative power sources. Such small-scale power sources in aggregate can also serve to lessen the need for new centralized sources of generation.

Recommendations

22. The Ontario government shall require the Ontario Energy Board, Independent Electricity Market Operator and local electricity distribution companies to develop supportive policies, practices and appropriate technical/safety standards, including CSA or UL rated-meters, to permit net metering across Ontario by December 31, 2002. All meters sold in Ontario before December 31, 2006, shall be exempt from provincial sales tax. Net metering should be available for all applications up to 60kW, including community energy co-ops. The Ontario government shall require that all electrical distribution companies offer net metering, consistent with safety and operational requirements within their service areas, by July 1, 2004. Net metered power purchases shall also be recognized as part of an RPS.

A.6 Transmission and Powerline Connections

Commentary

The ready connection of renewable generation facilities to the transmission grid is essential for the reliable supply of renewable power. The Committee heard extensive testimony regarding regulatory, economic, and physical limitations for such connections. In some locations in Northern Ontario, inadequate, or unavailable, transmission capacity serves as a barrier to the development of new renewable power.

New transmission policies need to be developed to accommodate geographically scattered renewable power sites, such as wind installations. In some isolated locations grid extension may not be practical or economic. Renewable power should be developed to serve isolated communities and to displace costly diesel generation. In northern communities distributed sources of generation may also meet a portion of local power needs and reduce the requirement for additional new long distance transmission.

With the opening of the electricity market to competition and possible sale of the transmission network, transmission ties with neighbouring provinces and states may be upgraded. These links may provide enhanced opportunities for the inter-jurisdictional production and purchase of renewable power.

Recommendations

23. The Ontario government shall review and revise policies to facilitate non-discriminatory connection to the transmission grid by alternative energy generators and local distributed generation, including conservation and co-generation projects.
24. In place of new high voltage power lines or major extensions in the north, on Crown land, and in non-urban settings, the Ontario government shall establish a policy that electricity needs, where technically feasible, shall be met by alternative supply such as wind, solar, local small hydraulic, fuel cells, or distributed power sources.
25. Transmission inter-connections with neighbouring provinces or states should be utilized for the sale/purchase of renewable sources of power.

A.7 Emissions Trading and Renewables 'Set Aside'

Commentary

The Committee accepts some form of emissions trading as a means of improving air quality. While appropriate to address global warming, this may have more limited ability to tackle localized sources of smog. Ontario's policy, under *Regulation 397/01* of the *Environmental Protection Act*, initially applies to the thermal generating stations of Ontario Power Generation, and successor owners. Air emission caps are placed on two pollutants: nitric oxide (NO) and sulphur dioxide (SO₂).

The policy makes provision for a NO and SO₂ ‘set aside’ for new conservation and renewable energy projects that displace electricity produced from the thermal generating stations. This provision has the potential to encourage new investment in the development of alternative power generation in Ontario.

Recommendations

26. The Ministry of Environment and Energy shall monitor and assess NO and SO₂ take-up under the renewable ‘set aside’ component of the emissions trading regulation. The ‘set aside’ shall be adjusted where appropriate to reflect actual activity. Measures shall be put in place to prevent parties from being credited multiple times for the same renewable transaction.

27. The Ministry of Environment and Energy should consider increasing the renewable ‘set aside’ provisions under the Emissions Trading Regulation to further encourage conservation and renewable energy. The operation of the emissions trading system shall be amended to be compatible with any future renewable portfolio standard adopted for Ontario. The Ministry of Environment and Energy shall develop a carbon trading system in conjunction with an RPS, with a target implementation date of July 1, 2005.

28. The definition of renewable energy project in the *Ontario Emissions Trading Code* (December 2001) shall be expanded to include new power generated from the use of biomass, such as methane from landfill and/or anaerobic composting, use of agricultural or wood wastes, and stacked fuel cells connected to the power grid.

29. The Ontario system of emissions trading shall be revised to ensure that pollution cannot be increased in certain geographical areas on the strength of reductions in other areas. There must also be an enhanced ability to verify that “traded” reductions in other jurisdictions actually occur and that the reductions are real and not changes that would have happened even without the emissions trade.

A.8 Operation of Traditional Carbon-Based Fuel Generating Stations

Commentary

The operation of Ontario Power Generation’s (OPG) traditional carbon-based fuel generating stations was a major issue raised before the Committee, primarily due to the adverse air emission impacts of these facilities.

The Nanticoke, Lambton and Lakeview generating stations are among the largest sources of air emissions of the top 15 thermal electric generating facilities in Canada, according to national figures compiled by the North American Commission for Environmental Cooperation (2001 report; 1998 data). The Committee believes that Ontario should work to eliminate its reliance upon coal-based power generation, unless future technological advances result in dramatically reduced air emissions that are equivalent to or lower than emissions

from natural gas generation. At the same time, Ontario should continue to adopt aggressive air pollution requirements to promote clean energy options. Traditional carbon-based fuel generation constitutes only 19% of Ontario's electricity generation by fuel type. In some Canadian provinces, such as Alberta, coal-fired generation provides 81% of electricity generation (1999 figures).

Proposals were put forward to convert Ontario's existing coal fired generating stations to natural gas. The Ministry of Environment and Energy has mandated the Lakeview Generating Station in Mississauga to stop burning coal by April 2005. Concerns were raised regarding the re-powering of these stations in the event of their sale or lease, as part of the requirement for OPG to reduce its share of generation. It was suggested that one option might be to replace these stations with new combined-cycle natural gas plants. The Committee was also concerned that a future re-powering of these stations with natural gas could cause a major increase in demand for this fuel, and a resulting increase in price. This could affect the long-term supply and price of natural gas within Ontario.

In addition, the Committee reviewed an Ontario-designed battery/capacitor (passive electronic component that stores energy) technology that could store off-peak and intermittent power. If proven, this technology has the potential to obviate the need for traditional carbon-based fuel generation.

The Committee heard that the coal industry believes that it can perfect 'clean coal' technology by 2007. The Alberta Energy Research Institute is currently conducting research into clean power generation from coal. However, based on current technology, Ontario should work to first eliminate coal-fired generation. Oil and natural gas-fired generation should also be phased out.

Recommendations

30. The Ontario government shall complete, within 12 months, an assessment of the feasibility and cost of converting all Ontario Power Generation coal and oil-fired generating stations to natural gas.

31. The Ontario government shall set stringent emissions limits that are no greater than the emissions limits for natural gas-fired generating stations for the operation of all current coal and oil-fired generating stations.

32. The Ontario government shall mandate the closure of the Ontario Power Generation Atikokan and Thunder Bay coal-fired generating stations no later than July 1, 2005. This capacity shall be replaced with a windfarm(s), possibly on the plateau adjacent to Thunder Bay. Consistent with recommendation 16, the Ontario government shall mandate the closure of all remaining coal or oil-fired generating stations by 2015.

33. Any requirement(s) to convert/replace current carbon-based fuel generation shall responsibly manage debt obligations associated with the original construction of these stations.

34. The preferred long-term goal is to eliminate traditional carbon-based fuel generation and, wherever possible, all new renewable power sources in Ontario shall be used to displace traditional carbon-based fuel generation.
35. The Independent Electricity Market Operator shall give preference to the sourcing of economic renewable power in the bulk dispatch of power. Coal-fired generation shall be given the lowest dispatch priority.
36. The Independent Electricity Market Operator shall take into account power dispatch policies in neighbouring states and provinces to ensure that Ontario does not import/export unwarranted amounts of non-renewable power.
37. The Ministry of Environment and Energy should work with Environment Canada to ensure that air quality impacts of traditional carbon-based fuel generated power in other provinces and states are equitably mitigated.

A.9 Energy Conservation and Efficiency Measures

Commentary

The Committee has concluded that conservation and efficiency measures can contribute to meeting Ontario's fuel and energy requirements and is of the view that the reduction of energy demand is more important than new supply. Such measures can serve to reduce, or partly eliminate, the need for additional fuel consumption and/or power generation capacity. Energy efficiency and conservation leading to reduced fuel use serves to lessen air emissions. Conservation measures and related technologies can also positively impact upon employment, technology and manufacturing capacity in Ontario. The Systems Benefit Charge as proposed earlier can also support conservation measures.

Recommendations

38. The Ontario Energy Board shall require all local electrical distribution companies to operate demand-side management programs in their own operations and for their customers by July 1, 2003. A system of incentives and penalties identical to those for the natural gas industry shall be put in place. A specified portion of their revenues shall be allocated to demand-side management programs.
39. The Ontario government shall require that all electrical utilities commit to spend a set percentage of their gross revenue (0.2%) to promote energy conservation. A partnership with the proposed Ontario Energy Research Institute shall be considered to include conservation as part of an overall education strategy.
40. Local electrical distribution companies shall aggressively pursue programs to promote the use of alternative fuel/energy sources. Such measures are particularly attractive within urban service areas.

41. Local electrical distributors shall undertake programs to establish 'time-of-use' rates for their customers by December 31, 2002 as a way to encourage energy conservation.
42. Management Board shall implement a 'house-in-order' energy conservation and efficiency program for its properties and operations. Specific targets and efficiency measures shall be developed within 12 months.
43. The Ministry of Environment and Energy shall review, update and expand the application of the Ontario *Energy Efficiency Act* to a broader range of electrical appliances and equipment within 12 months.
44. Within the Ontario government and Broader Public Sector, actual energy and efficiency savings from conservation shall be measured. These savings should be directed to defray the costs of conservation and efficiency measures.
45. The Ministry of Environment and Energy shall consult with local distribution and generation companies and major power consumers to assess and recommend solutions to conservation and efficiency program barriers in Ontario within six months.
46. The Ministry of Municipal Affairs and Housing shall work with stakeholders to assess opportunities for energy conservation and efficiency measures in the development, construction, and renovation industries.
47. The Ontario government shall commence a review of the *Ontario Building Code* to incorporate the most advanced science with respect to energy generation and conservation, mandate the use of co-generation units, and establish an objective for energy self-sufficiency in all residential and commercial construction. Technologies such as solar wall cladding heating applications, or equivalent, for commercial and multi-residential buildings will be mandatory, wherever feasible. Renewable energy audits using the Natural Resources Canada RETScreen (Renewable Energy Technology Screen pre-feasibility analysis software for renewable energy projects) or similar software, where feasible, will also be mandatory.
48. The Ontario government under the "Ontario Clean Development Program" shall establish aggressive targets for energy conservation, for fixed and mobile applications, that are the toughest in North America.
49. There should be a mandatory evaluation of energy efficiency and conservation measures prior to approval of major new generation projects.

A.10 Government Procurement Programs

Commentary

The Committee believes that public purchasing and use of alternative fuels/energy and related machinery and equipment can serve to increase the supply and reduce the cost of alternative fuel/energy and related technologies in the general market.

The Committee believes that there is significant potential to promote and utilize these energy technologies within the operations of the Ontario government, its ministries and agencies and in the Broader Public Sector (municipalities, universities and community colleges, schools, hospitals and related institutions). Recommendations are put forward with respect to government property management, vehicle acquisition and operations in particular. A separate section on the municipal sector immediately follows.

Recommendations

50. The Ontario government shall establish commitments and targets for alternative fuel/energy, including energy efficiency and conservation for universities/community colleges, public and separate schools, and the hospital/health care sector. Energy plans for individual institutions shall be prepared and shall include targets for alternative fuel/energy use and/or energy efficiency and conservation measures by December 31, 2003.
51. The Ontario government shall conduct a complete assessment of all government buildings, vehicles/equipment ('on and off-road' vehicles, boats, airplanes and stationary generators) to determine the extent and potential for alternative fuel/energy utilization by December 31, 2002.
52. The Ontario government shall undertake alternative fuel/energy 'pilot' projects within its operations, and the Broader Public Sector. Wherever possible, private or transfer partner financial participation shall be encouraged. The practical results of these applications shall be assessed and applied.
53. Provincial operating and capital funding programs to the Broader Public Sector shall be revised to require the use of alternative fuel and energy applications and technologies, including efficiency and conservation measures. Programs should encourage assessments of the broader environmental, social and economic benefits of such applications. The Broader Public Sector should consider public private partnerships to bring alternative fuel/energy applications on stream.
54. Effective immediately, all new Ontario government/agency buildings, all 'SuperBuild' projects, and all buildings constructed by the Broader Public Sector must conduct an alternative fuels/energy audit to make provision for the application of such technologies, including co-generation systems. Wherever possible, Life-Cycle Costing shall be employed in such evaluations. An objective shall be: to make every government building, and government funded building, energy self-sufficient (see glossary).

55. Management Board shall establish a retrofit program to convert all government buildings to alternative fuels/energy use by July 1, 2015.
56. Management Board shall establish an immediate program for the use of low-level ethanol and biodiesel-based fuels by the government fleet. Fuelling depots should be established to support this policy as public-private partnerships.
57. Management Board shall mandate that 10 % of the government vehicle fleet, and 30% of the Ministry of Environment and Energy fleet, shall be electric or fuel cell/hythane-powered by July 1, 2005.
58. GO Transit and the Ontario Northland Transportation Commission shall be required to utilize low sulphur fuels (gasoline and diesel) in their operations by July 1, 2003.
59. The Ministry of Natural Resources shall undertake to make all provincial parks, preserves and conservation areas energy self-sufficient by July 1, 2006.
60. The Ontario government shall establish an objective, and work in cooperation with affected stakeholders, to convert petroleum-based electricity generation, where technically feasible, on all Crown lands and lands that fall within provincial jurisdiction north of the 52nd parallel of latitude to renewable electricity generation by July 1, 2007.

A.11 The Municipal Sector

Commentary

The 447 local municipalities in the province (as of January 2002) can play a significant role in promoting the use of alternative fuels/energy and related technologies. The Ontario government also plays a key role in defining the functions and assisting in the funding of many municipal programs. The following recommendations deal with legislation, programs, building management and operation, vehicles and transit services that impact the municipal sector.

Recommendations

61. All municipalities in Ontario shall be mandated to develop policies and programs to increase the utilization of alternative fuel/energy in their operations by December 31, 2003. These policies should include conservation and efficiency measures.
62. All provincial funding programs, cost-sharing arrangements and grants to municipalities shall be reviewed to establish incentives for the use of alternative fuel/energy sources and technologies.

Vehicle purchases

63. The Ontario government shall provide a 25% provincial contribution toward the purchase of alternative-fuelled municipal vehicles (except garbage trucks, which must compete on an even basis with the private sector).

64. The Ontario government, boards of education and school bus operators shall establish a program to utilize alternative fuels, including ethanol-based gasoline and biodiesel fuels for their fleets, with all vehicles to be converted to use these or other alternative fuels no later than July 1, 2007. An accelerated depreciation allowance shall be made available for the purchase of new school buses powered by non-diesel alternative fuel.

65. The Ontario government shall mandate that public vehicles be converted to 100% clean fuel technologies according to the following timetable: all airport equipment by July 1, 2007; all municipal heavy vehicles (sweepers, garbage trucks, fire engines, etc.) by July 1, 2008; and all other municipal cars and light trucks by July 1, 2012. All new vehicles in these categories purchased after January 1, 2005 must be alternative fuel powered with standards equivalent to or tougher than the leading jurisdiction in North America.

Land use planning and development

66. The Ministry of Municipal Affairs and Housing shall review the 'healthy environment component' of the municipal Smart Growth initiative to include measures to promote the use of alternative fuels/energy, including efficiency and conservation measures.

67. The Ministry of Municipal Affairs and Housing shall review the *Building Code Act*, *Municipal Act*, *Planning Act*, *Social Housing Reform Act*, and other pertinent legislation, to make provision for alternative fuel/energy and application of the most advanced technology, including efficiency and conservation measures. Where appropriate, Ontario should specify the Natural Resources Canada R-2000 (residential) and C-2000 (advanced commercial buildings program) standards in the *Building Code* and other acts and regulations.

68. Effective immediately, energy self-sufficient newly built homes will be eligible for a maximum of \$4000 land transfer tax refund (double the current provision).

69. The Ministry of Municipal Affairs and Housing shall seek to amend the *Planning Act* by July 1, 2003 to include the requirement of sustainable development.

70. The Ministry of Municipal Affairs and Housing shall incorporate alternative fuel/energy standards and applications in its five-year review of the *Provincial Policy Statement*, issued under the *Planning Act*.

71. All municipalities in Ontario shall incorporate policies within their Official Plans, zoning by-laws and other land use control documents to make provision for alternative fuel/energy.

Public Transit

72. Effective immediately, provincial operating and capital funding to municipal and regional transit (GO Transit) services shall be restricted to the acquisition and operation of alternative fuel/energy technologies, including the use of alternative-fuelled vehicles. The Ontario government, municipalities, transit and ferry operators shall establish and fund a program to expand alternative fuel use including ethanol-based and biodiesel fuels for the transit fleet across Ontario.

73. Effective immediately, all future provincial support to municipal transit systems must be applied to alternative-fuelled vehicles. No municipal transit system will be allowed to purchase non-alternative fuelled vehicles after January 1, 2005, and 100% of municipal bus fleets must be converted to 'clean' technologies (preferably hydrogen) by January 1, 2015. All municipal electrically-powered transit services (subways, light rail transit services, streetcars and trolley buses) must be 100% 'green' electrically powered by July 1, 2004.

74. The Ontario government shall commit to the full 'hydrogenization' of the GO Transit rail and bus fleets by December 31, 2006.

75. Local municipal transit and ferry operators shall be required to utilize low sulphur fuels (gasoline and diesel) in their operations by July 1, 2003.

A.12 Relationship to Federal Energy Policies

Commentary

The Federal government has developed a range of policies and programs to enhance the supply and use of alternative fuel and renewable energy sources. The Committee supports the principle of effective cooperation between the Ontario and federal governments as well as with municipalities and other key transfer partners. In the development of alternative fuels/energy policy, the Ontario and federal governments need to coordinate tax treatment, economic incentives, public education and energy efficiency measures, in particular. Such cooperation serves to ensure the most efficient use of limited public sector resources.

Recommendations

76. The Ontario government, led by the Ministry of Environment and Energy, shall actively participate in, and where appropriate augment, federal alternative fuel/energy initiatives.

77. The Ministry of Enterprise, Opportunity and Innovation shall consider participation in Industry Canada's Technology Partnerships program where these investments augment an enduring renewables industry.

78. The Ministry of Environment and Energy shall work with Environment Canada to accelerate the requirement for the use of low sulphur ‘on-road’ and ‘off road’ gasoline and diesel fuel for all uses, including railway locomotives.

79. The Ministry of Environment and Energy should encourage the Federal Government to apply the same air emissions and sulphur content standards to railway diesel fuel and locomotives as for ‘on road’ diesel fuel and engines.

80. The Ontario and federal governments, and relevant stakeholders, shall develop codes and standards for alternative fuel/energy technical applications including fuel cells.

81. The Ministry of Environment and Energy shall work with federal departments to better disseminate public information on viable alternative fuel and energy options, including conservation and energy efficiency.

A.13 Consumer Awareness and Education

Commentary

The Committee recognizes that there is considerable scope for improved public education and awareness on alternative fuels and energy. In recent years, for example, the cost competitiveness of wind power has improved substantially. Consumers will also be able to choose from alternative electricity production options with the opening of the electricity market. Consumers may not be aware of all their options.

Ontario’s colleges and universities should emphasize research and training in alternative fuels and energy. For example, the Committee understands that wind energy and the development and application of fuel cells are two significant emerging areas in the alternative energy field with important implications for Ontario’s economy. Research and training could support such developments.

Recommendations

82. The Ministry of Enterprise, Opportunity and Innovation and the Ministry of Environment and Energy shall establish a program with Ontario-based manufacturers and distributors of alternative fuel/energy products to increase public awareness of technologies and applications.

83. Government and industry shall launch energy efficiency and conservation information programs directed at specific sectors of the economy. Performance evaluations should be employed to measure the effectiveness of these programs.

84. The Ontario government, in partnership with the federal government and key stakeholders, shall prepare public information on assistance available to purchasers of alternative fuelled vehicles, and in concert with manufacturers, actively promote these programs. Enhanced consumer and public awareness about the potential and uses of clean energy sources, including wind and solar power, should be encouraged.

85. The Ontario government shall update the elementary and secondary educational curriculum to include relevant content on alternative fuel and energy. Opportunities shall be pursued to establish coverage of alternative fuel/energy and related technologies in university, community college programs and in the trades, in cooperation with industry. Training on installation and repair services shall also be covered. Appropriate use should be made of online educational resource and instructional methods.

86. The Ministry of Municipal Affairs and Housing, in cooperation with the Ontario Energy Research Institute, shall develop a curriculum and training program on a complete range of environmentally sustainable subjects relating to residential and commercial construction, with particular emphasis on new building regulations and environmental technologies.

87. Educational and research partnerships on alternative fuels/energy shall be established involving government, industry and post-secondary educational institutions.

88. The Ontario government shall fund centre(s) of excellence within the public post-secondary system for all aspects of alternative fuels/energy research and development, including manufacturing, and sales and service. Wind energy, solar energy, biomass and hydrogen/fuel cells are considered to be promising areas for research and potential partnerships between the education sector, government and industry.

B. SPECIFIC ALTERNATIVE FUEL/ENERGY SOURCES AND TECHNOLOGIES

B.1 Water Power

Commentary

The Committee accepts that water power is an established source of renewable energy in the province. The largest number of Ontario water power installations are run-of-the river operations, as opposed to projects involving dams with extensive waterway diversions. With the opening of the electricity market and greater focus on renewable energy, there are substantial opportunities to further utilize Ontario's water power resources. The Ministry of Natural Resources conservatively estimates that there is 2,000MW of additional waterpower potential in Ontario.

New water power projects that augment or better utilize the capacity of existing sites or other water control structures should be emphasized. In the development of new water power sites, run-of-the river hydraulic designs should be used in conjunction with a watershed approach to power planning.

The Committee does not believe that every water power site in the province should be developed for energy purposes. Some more remote undeveloped water power sites may not be economically feasible to develop. In addition, some viable sites should remain undeveloped to meet environmental, natural resource, wilderness, and recreational requirements.

Wind and water may be used together to provide power. Wind-generated power may be used to pump water into reservoirs where the water is stored for later release into hydraulic turbines.

The Committee recognizes that the untapped water power potential at the Niagara River Beck 3 site constitutes a significant renewable resource. The site is adjacent to available transmission links, and close to major power markets in southern Ontario and New York State.

Recommendations

89. The Ministry of Natural Resources, along with pertinent stakeholder groups, shall undertake an assessment of the available waterpower potential in Ontario within 12 months. The analysis should assess potential upgrades of existing hydraulic stations, as well as the potential of undeveloped water power sites.

90. Using a watershed-based planning approach, priority shall be given to hydraulic upgrades and modifications that increase the waterpower potential of existing generating facilities or other water control structures. Hydraulic power upgrades should conform with run-of-the river hydraulic design principles. Requests for proposals should be issued by the Ministries of Environment and

Energy and Natural Resources for the development of priority undeveloped waterpower sites within 12 months.

91. Hydro One and/or successor transmission company(ies) shall investigate transmission grid extensions or upgrades to enable the connection of existing or new hydraulic generating stations and report back within 12 months.

92. The Ontario government shall assess incentives to encourage upgrading of existing hydraulic generation sites or other existing water control structures with undeveloped water power potential. All feasible upgrades and renovations shall receive accelerated approval by July 1, 2004. Such upgrades shall receive complete property tax relief for five years.

93. New hydraulic power capacity in Ontario shall be recognized by the Ontario government as new renewable power. All of this new capacity should be assigned to displace existing coal-fired generation.

94. The Ministry of Natural Resources shall assess wind energy potential in the vicinity of hydraulic generation sites at remote locations to determine whether windfarms may be developed at these locations to power pump storage facilities.

95. The Ministries of Environment and Energy and Natural Resources shall designate the Beck 3 generating site as a priority for development. The output of the Beck 3 project shall be recognized as renewable power.

96. The Ministry of Northern Development and Mines, in conjunction with stakeholders, shall expand capital support for small-scale hydraulic developments in remote communities.

B.2 Wind Power

Commentary

Wind turbine technology has improved and production costs have declined, making wind power an increasingly viable renewable energy source. Advances in technology help to accurately predict the power output from existing windfarms.

The Committee gained first hand exposure to operating wind farms in southern Alberta and California. Other countries such as Denmark, Germany and Spain have ambitious wind energy programs.

The Federal Budget (December 2001) made provision for a Wind Power Production Incentive to support the installation of 1000MW of new wind energy capacity in Canada over a 5 year period. Eligible wind energy producers will receive a payment of up to 1.2 cents per kWh, and declining thereafter, for new eligible wind energy projects to be commissioned between March 31, 2002 and April 1, 2007.

There is substantial untapped potential for the utilization of Ontario's wind resources, though wind power production is currently only in the early stages of assessment. Commercially viable wind resource sites are generally located along the northern shoreline of the Great Lakes, and in other inland locations. There may also be significant wind resource potential in the Hudson and James Bay lowlands. Wind power may be able to augment, or partly displace, diesel power sources in remote northern communities.

Windfarms may be located on Crown lands or on private lands. Wind resource revenues from turbines located on Crown land could provide additional revenue for the province. When located on private land, turbine lease revenue could provide a supplementary source of income to rural and agricultural landowners.

Public attitudes will have to adjust to this emerging technology. Visual impact, effect on birds and wildlife, and zoning and planning issues would have to be addressed in assessing wind turbine siting and proposals. The Committee was concerned that the only significant proposal to date for a private windfarm in Ontario was blocked by local planning and zoning concerns.

Recommendations

97. The Ontario government shall respond to the recommendations of the Ontario Wind Power Task Force by December 31, 2002.

98. The Ministry of Natural Resources, in conjunction with stakeholder groups, shall assess priority sites for wind power development on Crown land. Proposals for development should then be considered by December 31, 2002.

99. The Ministries of Environment and Energy and Natural Resources shall develop a standardized policy for wind energy development sites on Crown land by December 31, 2002.

100. The Ministries of Finance and Natural Resources shall develop a resource revenue policy for new wind farm developments on Crown land by December 31, 2002.

101. The Ministry of Finance shall match the Federal wind power production incentive for new wind power projects. Consideration shall also be given to expanding this incentive to a similar incentive for new solar, biomass and small hydraulic projects within Ontario.

102. The Ministry of Municipal Affairs and Housing shall amend the *Planning Act* by December 31, 2002 to apply a provincial standard to zoning for windfarms/wind turbines and solar energy systems to make them immune from local municipal prohibition, and thereby allowed across Ontario 'as of right.' Municipalities shall be allowed to specify reasonable conditions, such as spacing of turbine units or siting of solar panels, as part of site plan approval.

103. The Ontario government, in cooperation with their federal counterparts, First Nations and remote communities, shall assess the renewable energy potential, including wind, solar and biomass in the vicinity of remote communities by July 1, 2003.

104. The Ministry of Environment and Energy, under the *Environmental Assessment Act*, shall develop a standardized environmental assessment process for windfarm proposals, and other emerging renewable energy sources by December 31, 2002.

105. The Ontario government, in association with the federal government, shall compile and make available comprehensive GIS (geographic information systems) data on a cost recovery basis to wind power developers, and other stakeholders by December 31, 2002.

106. The Ontario government and the wind industry shall prepare a public information package on wind turbine technology and its applications by December 31, 2002.

B.3 Solar Power

Commentary

Solar energy can be used in a variety of ways: photovoltaic cells (PV) on solar panels capture the energy of the sun to produce electricity; solar energy can also be used to produce heat (solar thermal). Photovoltaics and passive solar design can be used in new building construction or major renovations. Solar PV installations may be able to augment diesel generation in remote communities.

Advances in solar technology, and the renewable nature of this resource, merit its specialized application in Ontario. However, power produced from solar energy is still substantially more expensive than other power sources, and its potential may be limited due to our latitude. The Committee was impressed with the solar photovoltaic installations of the Sacramento Municipal Utility District during its visit to California.

The promotion of solar energy may require incentives to compensate for the high initial capital costs of this technology and to achieve economies of scale. Solar power or heating sources may serve to augment, or partly displace, other more traditional power sources. The principles and provisions for financial assistance to alternative fuel/energy, the availability of net metering and the existence of a renewable portfolio standard, as addressed earlier, all have implications for promoting solar power.

Recommendations

107. The Ontario government shall establish a 3-year program to provide a rebate of up to 25% of the purchase price, up to a set maximum, for the installation of solar panels on up to 100,000 homes including new, existing and multi-family

dwellings, across Ontario. The program will be monitored by the Ontario government to ensure that solar panels continue to be offered at competitive rates.

108. The Ontario government, in association with the federal government, shall compile and make available comprehensive GIS (geographic information systems) insolation data on a cost recovery basis to solar power developers, and other stakeholders by December 31, 2002.

109. Local electricity distribution companies across Ontario should consider 'pilot' programs to promote solar PV installations. Photovoltaic installations should be considered at electricity distribution facilities and on private, commercial, institutional, industrial, and residential dwellings.

B.4 Transportation Fuels, Vehicles and Engines

Commentary

Transportation is responsible for approximately 25 % of Ontario's total energy consumption. Gasoline and diesel fuel account for 97 % of the transportation fuel consumed. Alternative transportation fuels used today, such as propane, natural gas, electricity and ethanol make up the remaining 3% of Ontario's total energy consumption for transportation.

The transportation sector is a major source of air emissions along highways and in major urban centres. There is considerable public interest in reducing air emissions and growing interest on the part of motor vehicle manufacturers to utilize alternative fuels to respond to these concerns.

Substantial progress has been made to ensure that each car today emits less pollution than in the past. However, there are now more vehicles on the road and this has led to an increase in total emissions. There is significant potential to improve air quality by accelerating the introduction of cleaner gasoline and diesel fuel and using various fuel additives. Tax incentives could accelerate the introduction of cleaner fuels and could be offered for the purchase and use of alternative-fuelled vehicles. The earlier sections on government procurement and the municipal sector include recommendations to provide strong incentives and mandates for the introduction of alternative-fuelled vehicles in Ontario.

The automotive and related parts industries are major components of Ontario's industrial base. The Committee believes that it is critical that these industries remain in the forefront of technological developments related to alternative fuel and associated technologies.

Ethanol, a liquid alcohol made from renewable biomass (see glossary) may have immediate promise as an additive to existing 'on road' fuels. Low concentration ethanol mixtures added to gasoline can be used in existing internal combustion engines. Ethanol gasoline is supplied by some Ontario gasoline retailers. Measures to increase ethanol production and availability may benefit the agricultural community in Ontario. Saskatchewan, in its recent 'Greenprint for

Ethanol Production,' intends to create an environment for private sector development of a provincial ethanol industry. The Committee supports the expanded use of ethanol-based motor fuels, but recognizes that the capacity to produce and distribute such fuel within Ontario still has to be established. There is also the potential to use waste agricultural products or other biomass material to produce ethanol.

Biodiesel fuel (see glossary) may be produced from plant or animal fats that can be blended in various concentrations with petroleum diesel. To use low concentration biodiesel, engine modifications are not required. The production of biodiesel may benefit Ontario's agricultural economy and may promote the utilization of oil products that are currently disposed of as waste. Biodiesel presents immediate promise as a low level additive to petroleum-based diesel fuel. Toronto Hydro-Electric Systems Ltd. is testing a B20 (20% vegetable oil and 80% diesel fuel) mixture for the operation of its vehicles. However, the capacity to produce and distribute this fuel within Ontario has not yet been established. The Committee proposes a renewable fuel standard for Ontario similar to the proposed European Union requirement that at least 5.75% of fuel sold be from renewable sources by 2010.

Recommendations

110. The Ontario government shall work with stakeholders including agricultural producers, the petroleum industry and federal representatives, to assess the potential to expand ethanol and biodiesel production and availability in Ontario by July 1, 2003.

111. The Ministries of Environment and Energy; Enterprise, Opportunity and Innovation, and their federal counterparts, shall work with the renewable fuels and petroleum industries to establish a low-level ethanol content requirements for 'on road' gasoline in Ontario.

112. The Ontario government, in cooperation with industry, shall work to establish a province-wide network of ethanol-based fuelling stations along major provincial highways as soon as possible. For general usage, E10 (10%) ethanol mixture gasoline should be readily available, fleet uses require E85 (85%) ethanol mixture gasoline.

113. Ontario shall adopt the Auto Makers' Choice Gasoline specification by December 31, 2003. As an incentive, the provincial gasoline tax shall be reduced by two cents per litre on all 'clean' gas sold, defined to include gasoline meeting the Auto Makers' Choice or equivalent specification, and gasoline with at least 10% ethanol content. Any retailer not vending gasoline which meets the defined specifications by that date will be required to pay an additional five cents per litre "pollution tax," thereby creating a considerable price spread between the "dirtiest" and "cleanest" grades of gasoline.

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114. By July 1, 2006, all diesel sold in Ontario must either be biodiesel, contain ethanol or an additive package, or a combination thereof, and be formulated to meet the toughest fuel standards in North America.
115. Ontario shall adopt a renewable fuel standard specifying that 6% by volume of all transportation fuels should be from renewable sources by July 1, 2010.
116. The Ministry of Finance shall exempt biodiesel, hydrogen as a fuel, and hydrogen fuel cells for use in Ontario from provincial fuel, sales, and retail taxes. The Ministry shall also assess the cost of exempting other fuel additives that enhance fuel efficiency and emissions performance by December 31, 2002.
117. The Ministry of Environment and Energy, through the Drive Clean program and in cooperation with Environment Canada, should assess the emissions associated with expanded ethanol based fuel and biofuels use in Ontario. A data base on the emissions characteristics of alternative fuels use should be developed.
118. The Ministry of Environment and Energy shall not require hybrid vehicles to undergo Drive Clean inspections for six years, and electric and hydrogen/fuel cell vehicles shall be exempt from Drive Clean.
119. Provincial sales and fuel tax incentives should be equitably applied to all alternative-fuelled vehicles, whether original equipment manufactured, or converted to alternative fuel use.
120. The Ontario government shall expand retail sales tax incentives for selected alternative-fuelled vehicles including all motorized two-wheeled and four-wheeled (or more) vehicles, for 'on road' or 'off road' use, as follows: natural gas vehicles will have the sales tax reduced to 6%; hybrid vehicles reduced to 4%; and all electric vehicles and fuel cell vehicles reduced to 2% for a period of no less than five years. There shall be an additional \$2000 grant for pure hydrogen cars/trucks/off-road vehicles up to 25% of the value of the vehicle.
121. Ontario retail, fuel, and sales tax policy shall be coordinated with taxation policies of the federal government to encourage alternative fuel and vehicle use. Due to changes in motor vehicle aerodynamics, the Ontario government, in cooperation with the federal government, shall assess the removal of the \$100 tax on air conditioners in motor vehicles imposed under the federal *Excise Tax Act*.
122. The Ontario government shall require all railroads operating in Ontario to utilize "clean" diesel according to the following schedule: 'road grade' diesel by January 1, 2004 and diesel-ethanol (or diesel with similar technical specifications) by January 1, 2005. The Ontario government shall offer significant assessment relief (set at a fixed rate per kilometre below the current average rate) for any rail system that completely converts to hydrogen fuel cell motive power. All locomotives must be converted to hydrogen by January 1, 2015.
123. Due to the high air emission characteristics of older 2-cycle engines, only the latest technology (fuel injected, catalytic converter equipped or equivalent) 2-

cycle engines shall be offered for sale in new mobile applications (snowmobiles, all-terrain vehicles, propelled mowers, etc.) within Ontario effective July 1, 2004; and marine engines by July 1, 2006; and in new portable equipment (mowers, trimmers, blowers and other landscaping equipment, chainsaws and cutters, etc.) effective July 1, 2007. The Ministry of Environment and Energy shall monitor pertinent air emission and technical requirements developed by the U.S. Environmental Protection Agency, California Environmental Protection Agency, and other leading North American jurisdictions to ensure that Ontario's requirements match, or exceed, these standards. The Ministry of Environment and Energy, in cooperation with manufacturers, major retailers, marinas, dealers and other stakeholders, shall develop financial and other incentive programs to encourage the retirement of older engines, as well as an outreach, education, and labelling program to promote this transition to clean technologies.

124. The Ontario government shall establish a program that matches, up to a maximum of \$500, financial incentives provided by motor vehicle manufacturers or retailers to encourage the retirement of 1987 model year and older automobiles and light trucks.

125. In the formulation of Ontario alternative fuels and vehicle policy, provision shall be made for appropriate exemptions to accommodate major classes of vehicles, equipment, or engines that cannot operate on mandated alternative fuels. Consideration should be given to phasing-in the introduction of alternative fuels/engine requirements for new vehicles, equipment and engines used in Ontario in these cases.

B.5 Fuel Cells and Hydrogen

Commentary

A fuel cell is a highly efficient electrochemical energy conversion device that can generate electricity and produce heat, with the help of catalysts. The most common fuel used in a fuel cell is hydrogen, and in the future, hydrogen fuel cells may replace the internal combustion engine as a source of motor vehicle motive power. Fuel cells may also serve as a stationary electrical power source when stacked together.

Canadian companies and motor vehicle manufacturers with production facilities in Ontario are involved in fuel cell research and development work. The Committee gained an overview of this work from presentations by Fuel Cells Canada in Vancouver, the Canadian Motor Vehicle Manufacturers' Association in Windsor and visits to motor vehicle research facilities in Ontario and Michigan. Fuel cell vehicle demonstration programs also exist in California and Europe.

At present, however, it appears that extensive research and development work is still required for the more widespread introduction and use of this technology in motor vehicles. Cost, safety, reliability, performance, production capacity, available fuelling and ready repair and maintenance comparable to the current fleet of motor vehicles would all have to be addressed for this technology to be

gain widespread acceptance. At present, fuel cells may only be practical in high mileage bus, truck or railway applications. There are also unresolved technical and development issues related to the source, availability and distribution of hydrogen for fuel cells.

Nonetheless, Ontario, with its key automotive and parts industries, should take advantage of opportunities related to fuel cell research and development. Fuel cell technology shows promise of providing high-tech, knowledge-based jobs in the future. Government procurement programs and proposals to apply to the municipal sector including transit operators have been put forward earlier to provide incentives for the introduction of fuel cells into Ontario.

Recommendations

126. The Ontario government shall join and actively participate in the Canadian Fuel Cell Alliance.

127. The Ontario government shall, under the auspices of the Ontario Energy Research Institute (proposed in recommendation #3), take an active role in public-private partnerships to promote research in the application of fuel cell technology in motor vehicles, including railway locomotives, and in stationary applications within Ontario by July 1, 2003.

128. The Ontario government shall undertake a public-private partnership in conjunction with bus and fuel cell manufacturers, and transit and motor coach operators, to operate fuel cell powered buses in Ontario. As part of the requirement to move to 100% clean technologies outlined in recommendation 73, a 25% capital grant for the term of five years shall be offered to municipalities for the purchase of hydrogen-powered buses.

129. The Ontario government shall establish a program to rapidly acquire and test a number of hydrogen powered light and heavy-duty vehicles for the government fleet. Provisions should be made for government to share in any commercially viable modifications that result from such tests.

130. Management Board shall establish a program to install and test stationary fuel cells in public institutions and buildings. Provision should be made for government to share in any commercially viable modifications that result from such tests.

131. The Ontario Energy Board and Independent Electricity Market Operator shall ensure that there are no barriers to the connection of stacked fuel cells to the power grid as outlined in recommendations 19 and 23.

132. The Ontario government shall ensure that commercially available fuel cell vehicles and power sources are offered appropriate incentives or exemptions under the Ontario *Retail Sales Tax Act*.

133. The Ontario government shall undertake an assessment of the long-term potential of using off-peak nuclear power for the production of hydrogen in Ontario and report its findings by December 31, 2002.

B.6 Biomass Fuel/Energy

Commentary

Biomass from renewable plant and animal materials can be used to produce heat or power. Burning biomass to produce power results in substantially fewer harmful emissions when compared to traditional sources of power generation. Within Ontario there are extensive opportunities to make use of biomass materials from landfill sites, agricultural and livestock operations, and the forest industry.

The Committee understands that there are numerous active and inactive landfill sites where landfill gas may be collected and used. *Ontario Regulation 232/98* under the *Environmental Protection Act* requires the collection of landfill gas for new or expanding landfill sites larger than three million cubic metres or 2.5 million tonnes. The production of energy from methane derived from animal manure wastes could serve to mitigate other disposal and surface or groundwater contamination concerns. Promising technological developments related to these fuel/energy technologies, such as anaerobic digestion technology (see glossary) could also have positive environmental and economic spin-offs for Ontario.

Recommendations

Landfill Gas Utilization

134. The Ontario government, in conjunction with stakeholders, shall examine opportunities for increased landfill gas collection and use from existing or abandoned landfill sites.

Biomass-derived Power

135. The Ontario government, in association with the agricultural industry including livestock producers, shall commit to a demonstration program for the collection and use of livestock-derived biogas as a power source by December 31, 2002.

136. The Ontario government, in conjunction with the agricultural industry, shall assess opportunities to make use of energy crops, such as switchgrass and crop wastes, for fuel or power generation in Ontario.

137. The Ontario government, in cooperation with the forest industry, shall assess opportunities to make greater use of wood wastes for heat or power production.

138. The Ministry of Environment and Energy, the Ontario Energy Board and the Independent Electricity Market Operator shall review policies to facilitate the connection and supply of biomass-derived power sources into the transmission grid.

139. The Ministry of Finance shall establish a financial incentive program that provides tax benefits to producers who install and utilize technologies that enhance the use of biomass fuel/energy in industrial operations by December 31, 2002.

Other Energy Sources

140. The Ministry of Environment and Energy in conjunction with affected municipalities, shall investigate the technical merits of deep lake water cooling for Thunder Bay and other Lake Superior communities. The Ministry and other lakefront municipalities across Ontario should assess other opportunities to utilize deep lake water cooling technology.

B.7 Energy-from-Waste

Commentary

The Committee recognizes that generating energy from waste is a complex and much debated issue, and fundamentally supports the principles of the ‘3Rs’ (reduce, reuse, and recycle) as the basis for waste management in Ontario. It should be expressly stated that no materials used in existing or potential recycling streams should be considered in energy-from-waste projects in Ontario. However, many municipalities are facing difficulties expanding or securing approvals for landfill sites. In some cases, municipal waste from larger urban centres is being transported long distances by truck outside of the host municipality and the province. Traditional landfill sites also face long-term environmental and land use management concerns with respect to location, impact upon neighbouring landowners, odours and rodents, methane gas formation and escape, leachate collection and long-term impact upon groundwater.

The Committee accepts that on a case-by-case basis, and subject to the requirements of the *Environmental Protection Act* for “maximum achievable control technology,” modern energy-from-waste installations may be considered in the treatment of municipal waste. Modern energy-from-waste installations can minimize air emissions, generate power and substantially reduce the volume of waste going to landfill. The Committee supports installations that generate heat and power for associated uses. At the same time, these installations shall not mitigate the diversion of recyclables through local recycling programs or biomass materials through composting.

There are other emerging high temperature technologies that may be applicable for use in industrial and energy applications. The Committee heard from the cement industry regarding the viability of using scrap tires to fuel cement kilns. The Committee believes that such applications may be assessed in Ontario in an environmentally responsible manner.

The Committee could not reach consensus on energy-from-waste; therefore no recommendations are included.

B.8 Commitment and Funding

Commentary

The Committee looks forward to a serious assessment and commitment by the Ontario government to the recommendations put forward in this Report. This commitment should be accompanied by appropriate funding from the Ontario government which may be augmented by commitments from the federal government, municipalities, other transfer partners and the private sector.

Recommendation

141. The Ontario government should establish an appropriate commitment to and funding support for the recommendations of the *Final Report* of the Select Committee on Alternative Fuel Sources within the time frames put forward in the *Report*.

LIST OF RECOMMENDATIONS

The following is a complete list of recommendations, organized under the heading titles as they appear in the text of the report.

A. POLICY FRAMEWORK FOR ALTERNATIVE FUELS/ENERGY

A.1 Ontario Government Policy

1. The Ontario government shall develop an alternative fuel and energy strategy to establish a framework for a coordinated approach to: (a) increase the use of renewable energy and fuel sources in both the immediate and long-term; (b) reduce Ontario's reliance upon carbon-based fuel sources; (c) reduce adverse impacts upon the environment; (d) ensure that the relative cost of different energy sources, fiscal implications, energy security, impact on job creation, export development and the provincial economy are all considered; (e) support innovative research and development in alternative energy fields that yield long-term economic, environmental and social benefits; (f) and ensure that energy conservation and efficiency are improved.
2. The Ministry of Environment and Energy shall be the lead in formulating an Ontario Alternative Fuel/Energy Strategy. Other pertinent ministries and agencies shall be consulted including: Enterprise, Opportunity and Innovation; Agriculture and Food; Training, Colleges, and Universities; Education; Finance; Management Board; Municipal Affairs and Housing; Natural Resources; Native Affairs; Northern Development and Mines; Transportation; Ontario Power Generation; Hydro One and/or successor companies; Ontario Energy Board; Independent Electricity Market Operator; and Natural Resources Canada. A coordinating Branch shall be established within the Ministry of Environment and Energy to deal with alternative fuel/energy policy and programs. An independent Technical Advisory Group reporting to the Minister of Environment and Energy shall be appointed to advise on alternative fuel/energy technologies and levels of assistance to individual technologies.
3. An Ontario Energy Research Institute shall be established by March 1, 2003 to advance the manufacture and use of alternative fuel and energy products in Ontario. The Institute should have responsibility for oversight of all alternative fuel/energy projects and be a Schedule 3 Agency reporting to the Ministry of Environment and Energy. It should have an annual budget of \$40 million and a guaranteed minimum 10-year lifespan. Its functions should include: policy development and implementation, including product specifications and standards in conjunction with the Technical Standards and Safety Authority; development of partnerships with the private sector and post-secondary institutions; testing of technologies at a demonstration site, with a \$10 million funding commitment over 3 years; development of an educational program, including a comprehensive website and alternative fuels/energy component within the elementary and secondary educational science curriculum, in cooperation with Ministry of Education; securing of matching federal and private sector funding; funding

programs to promote alternative fuels/energy installations at Ontario universities, community colleges; working with municipalities on energy planning; and monitoring and assessment of worldwide developments in alternative fuels/energy.

4. The Ontario government shall undertake a comprehensive legislative and regulatory review to consider amendments to legislation/regulations regarding alternative fuels/energy, including energy efficiency and conservation by June 30, 2003.

5. The Ontario government's 'Core Business' and related 'Core Activities' within all relevant Ontario ministry and agency Business Plans shall be revised to establish priorities for alternative fuel and energy, including energy efficiency and conservation. Performance measures shall be developed for the increased use of alternative fuels/energy in Ontario ministry/agency operations.

6. The Committee supports the development of a registry for airborne contaminants by the Ministry of the Environment and Energy that includes annual reporting of greenhouse gas emissions and other smog forming pollutants by large and small emitting sectors. Relevant work of Environment Canada, the U.S. Environmental Protection Agency, and the North American Commission for Environmental Cooperation should also be consulted.

7. The Ontario government shall use a 'Life Cycle Costing' approach to assess costs and impacts of new fuel/energy technologies. In assessing the costs of new alternative fuel/energy sources, comparisons should be made with the costs of new conventional sources of fuel/energy.

8. With respect to fuels: propane, natural gas, methanol, biofuels, ethanol, hydrogen, hythane (hydrogen and natural gas/methane mixture) and electricity are generally considered alternative fuels. With respect to energy sources: hydraulic, wind, solar, biomass, hydrogen/fuel cells, earth energy and co-generation are generally considered renewable. Where suitable federal definitions exist for alternative and renewable fuels/energy, and related terms, they shall be adopted by the Ontario government for use in appropriate legislation/regulations, standards, policies and programs. Environment Canada's national *Ecologo* certification program should be used as a basis. Where a suitable definition does not exist, Ontario shall develop its own. Definitions shall be used consistently for all aspects of Ontario legislation/regulations and alternative fuels/energy policy and programs. Any alternative fuel/energy certification program should be 'self-sustaining' through the levying of appropriate certification fees upon proponents.

A.2 Principles and Provisions for Financial Assistance to Alternative Fuels/Energy

9. The Ministry of Finance shall offer flexible and effective tax incentives for investment in alternative fuel/energy technology. This will include a tax deduction called the Ontario Renewable and Sustainable Energy Development Tax Incentive whereby companies investing in equipment relating to renewable

and alternative fuels will be permitted to deduct from taxable income 25% of the capital cost in each of the three years following the purchase of such equipment. A similar tax incentive will apply to capital investments made by manufacturers of renewable and alternative fuels.

10. Ontario government financial programs and incentives for alternative fuels/energy should be structured to not interfere with the operation of the competitive commercial market and should not favour one technology over the other. Wherever possible, programs should serve only as bridge incentives and only offer assistance for a specified time period.

11. The Ontario government shall establish a dedicated alternative energy/technology demonstration fund to support results-oriented outcomes associated with proven technologies. The purpose of the fund shall be to assist alternative technologies to gain public acceptance and achieve significant market share, but should not favour a specific technology. Such a fund should include appropriate cost sharing by private or other public sector partners.

12. The Ministry of Finance shall issue specific bonds to finance alternative fuel/energy investments by the province.

13. The Ministry of Finance shall review the *Assessment Act* and give consideration to full or partial exemptions under the Act for alternative fuel/energy installations, equipment, or improvements to buildings, other structures or property. Specific provisions should be developed to deal with wind, solar, biomass and earth energy installations and related modifications and equipment. Consideration should be given to full or partial provincial compensation for such exemptions within municipalities, where there is a significant concentration of alternative/fuel energy installations.

14. The Ministry of Finance, in consultation with the wind industry, shall establish a standardized property assessment method for windfarms and wind turbine equipment and report by December 31, 2002. Consideration should be given to the impact on adjacent property values. The Ministry of Finance should consider a property tax holiday for new windfarms, similar to the 10 year tax holiday offered for new, rebuilt or expanded hydraulic stations.

15. The Ministry of Finance should examine other tax incentives or exemptions to encourage the production and installation of new alternative fuel/energy equipment in Ontario.

A.3 Renewable Portfolio Standard and Related Measures

16. The Ontario Government shall convene a Task Force with representation from all relevant stakeholder groups to determine a Renewable Portfolio Standard (RPS) for Ontario. The Task Force shall report its findings by March 1, 2003, and the RPS shall be in place by June 30, 2003, for all new renewable power sources. The RPS shall be amongst the most aggressive in North America and shall include provisions to eliminate carbon-based electricity generation in Ontario by

2015. The RPS shall include a renewable energy accreditation system, and an aggressive timetable and targets for the contribution of renewables. The operation and targets for the RPS shall be reviewed by the Ministry of Environment and Energy every four years. All local electricity distribution companies shall be required to develop compatible local renewable portfolio plans.

17. The Ontario government shall mandate the Ontario Energy Board to establish a Systems Benefit Charge for Ontario, as a nominal charge of 0.1 cent per kWh to be applied to electricity bills, to fund an Ontario renewable energy trust to support renewable electrical energy programs and projects. Funds may be allocated as subsidies to manufacturers, utilities and customers.

18. The Ontario government shall commit to developing a carbon tax (a tax based on the carbon content of the fuel consumed) in conjunction with an RPS, with a target implementation date of July 1, 2005.

A.4 Role of Ontario Energy Regulators and Utilities

19. The Ontario Energy Board and Independent Electricity Market Operator shall develop non-discriminatory interconnection standards for independent alternative electricity generators by July 1, 2003. Interconnection priority shall be given to renewable power.

20. The Ontario government, in conjunction with the Ontario Energy Board, shall act to remove barriers and restrictions on the use of district energy systems by local electrical distribution companies.

21. The Ontario government shall expand electricity labelling to include the requirement for mandatory disclosure by electricity retailers of the fuel/energy source(s) used to generate power, including disclosure of pollution emissions from generation sources. This information shall be provided on electricity bills by July 1, 2003.

A.5 Net Metering

22. The Ontario government shall require the Ontario Energy Board, Independent Electricity Market Operator and local electricity distribution companies to develop supportive policies, practices and appropriate technical/safety standards, including CSA or UL rated-meters, to permit net metering across Ontario by December 31, 2002. All meters sold in Ontario before December 31, 2006, shall be exempt from provincial sales tax. Net metering should be available for all applications up to 60kW, including community energy co-ops. The Ontario government shall require that all electrical distribution companies offer net metering, consistent with safety and operational requirements within their service areas, by July 1, 2004. Net metered power purchases shall also be recognized as part of an RPS.

A.6 Transmission and Powerline Connections

23. The Ontario government shall review and revise policies to facilitate non-discriminatory connection to the transmission grid by alternative energy generators and local distributed generation, including conservation and co-generation projects.
24. In place of new high voltage power lines or major extensions in the north, on Crown land, and in non-urban settings, the Ontario government shall establish a policy that electricity needs, where technically feasible, shall be met by alternative supply such as wind, solar, local small hydraulic, fuel cells, or distributed power sources.
25. Transmission inter-connections with neighbouring provinces or states should be utilized for the sale/purchase of renewable sources of power.

A.7 Emissions Trading and Renewables 'Set Aside'

26. The Ministry of Environment and Energy shall monitor and assess NO and SO₂ take-up under the renewable 'set aside' component of the emissions trading regulation. The 'set aside' shall be adjusted where appropriate to reflect actual activity. Measures shall be put in place to prevent parties from being credited multiple times for the same renewable transaction.
27. The Ministry of Environment and Energy should consider increasing the renewable 'set aside' provisions under the Emissions Trading Regulation to further encourage conservation and renewable energy. The operation of the emissions trading system shall be amended to be compatible with any future renewable portfolio standard adopted for Ontario. The Ministry of Environment and Energy shall develop a carbon trading system in conjunction with an RPS, with a target implementation date of July 1, 2005.
28. The definition of renewable energy project in the *Ontario Emissions Trading Code* (December 2001) shall be expanded to include new power generated from the use of biomass, such as methane from landfill and/or anaerobic composting, use of agricultural or wood wastes, and stacked fuel cells connected to the power grid.
29. The Ontario system of emissions trading shall be revised to ensure that pollution cannot be increased in certain geographical areas on the strength of reductions in other areas. There must also be an enhanced ability to verify that "traded" reductions in other jurisdictions actually occur and that the reductions are real and not changes that would have happened even without the emissions trade.

A.8 Operation of Traditional Carbon-Based Fuel Generating Stations

30. The Ontario government shall complete, within 12 months, an assessment of the feasibility and cost of converting all Ontario Power Generation coal and oil-fired generating stations to natural gas.

31. The Ontario government shall set stringent emissions limits that are no greater than the emissions limits for natural gas-fired generating stations for the operation of all current coal and oil-fired generating stations.

32. The Ontario government shall mandate the closure of the Ontario Power Generation Atikokan and Thunder Bay coal-fired generating stations no later than July 1, 2005. This capacity shall be replaced with a windfarm(s), possibly on the plateau adjacent to Thunder Bay. Consistent with recommendation 16, the Ontario government shall mandate the closure of all remaining coal or oil-fired generating stations by 2015.

33. Any requirement(s) to convert/replace current carbon-based fuel generation shall responsibly manage debt obligations associated with the original construction of these stations.

34. The preferred long-term goal is to eliminate traditional carbon-based fuel generation and, wherever possible, all new renewable power sources in Ontario shall be used to displace traditional carbon-based fuel generation.

35. The Independent Electricity Market Operator shall give preference to the sourcing of economic renewable power in the bulk dispatch of power. Coal-fired generation shall be given the lowest dispatch priority.

36. The Independent Electricity Market Operator shall take into account power dispatch policies in neighbouring states and provinces to ensure that Ontario does not import/export unwarranted amounts of non-renewable power.

37. The Ministry of Environment and Energy should work with Environment Canada to ensure that air quality impacts of traditional carbon-based fuel generated power in other provinces and states are equitably mitigated.

A.9 Energy Conservation and Efficiency Measures

38. The Ontario Energy Board shall require all local electrical distribution companies to operate demand-side management programs in their own operations and for their customers by July 1, 2003. A system of incentives and penalties identical to those for the natural gas industry shall be put in place. A specified portion of their revenues shall be allocated to demand-side management programs.

39. The Ontario government shall require that all electrical utilities commit to spend a set percentage of their gross revenue (0.2%) to promote energy

conservation. A partnership with the proposed Ontario Energy Research Institute shall be considered to include conservation as part of an overall education strategy.

40. Local electrical distribution companies shall aggressively pursue programs to promote the use of alternative fuel/energy sources. Such measures are particularly attractive within urban service areas.

41. Local electrical distributors shall undertake programs to establish 'time-of-use' rates for their customers by December 31, 2002 as a way to encourage energy conservation.

42. Management Board shall implement a 'house-in-order' energy conservation and efficiency program for its properties and operations. Specific targets and efficiency measures shall be developed within 12 months.

43. The Ministry of Environment and Energy shall review, update and expand the application of the Ontario *Energy Efficiency Act* to a broader range of electrical appliances and equipment within 12 months.

44. Within the Ontario government and Broader Public Sector, actual energy and efficiency savings from conservation shall be measured. These savings should be directed to defray the costs of conservation and efficiency measures.

45. The Ministry of Environment and Energy shall consult with local distribution and generation companies and major power consumers to assess and recommend solutions to barriers to conservation and efficiency programs in Ontario within six months.

46. The Ministry of Municipal Affairs and Housing shall work with stakeholders to assess opportunities for energy conservation and efficiency measures in the development, construction, and renovation industries.

47. The Ontario government shall commence a review of the *Ontario Building Code* to incorporate the most advanced science with respect to energy generation and conservation, mandate the use of co-generation units, and establish an objective for energy self-sufficiency in all residential and commercial construction. Technologies such as solar wall cladding heating applications, or equivalent, for commercial and multi-residential buildings will be mandatory, wherever feasible. Renewable energy audits using the Natural Resources Canada RETScreen (Renewable Energy Technology Screen pre-feasibility analysis software for renewable energy projects) or similar software, where feasible, will also be mandatory.

48. The Ontario government under the "Ontario Clean Development Program" shall establish aggressive targets for energy conservation, for fixed and mobile applications, that are the toughest in North America.

49. There should be a mandatory evaluation of energy efficiency and conservation measures prior to approval of major new generation projects.

A.10 Government Procurement Programs

50. The Ontario government shall establish commitments and targets for alternative fuel/energy, including energy efficiency and conservation for universities/community colleges, public and separate schools, and the hospital/health care sector. Energy plans for individual institutions shall be prepared and shall include targets for alternative fuel/energy use and/or energy efficiency and conservation measures by December 31, 2003.

51. The Ontario government shall conduct a complete assessment of all government buildings, vehicles/equipment ('on and off-road' vehicles, boats, airplanes and stationary generators) to determine the extent and potential for alternative fuel/energy utilization by December 31, 2002.

52. The Ontario government shall undertake alternative fuel/energy 'pilot' projects within its operations, and the Broader Public Sector. Wherever possible, private or transfer-partner financial participation shall be encouraged. The practical results of these applications shall be assessed and applied.

53. Provincial operating and capital funding programs to the Broader Public Sector shall be revised to require the use of alternative fuel and energy applications and technologies, including efficiency and conservation measures. Programs should encourage assessments of the broader environmental, social and economic benefits of such applications. The Broader Public Sector should consider public private partnerships to bring alternative fuel/energy applications on stream.

54. Effective immediately, all new Ontario government/agency buildings, all 'SuperBuild' projects, and all buildings constructed by the Broader Public Sector must conduct an alternative fuels/energy audit to make provision for the application of such technologies, including co-generation systems. Wherever possible, life-cycle costing shall be employed in such evaluations. An objective shall be: to make every government building, and government funded building, energy self-sufficient (see glossary for definition).

55. Management Board shall establish a retrofit program to convert all government buildings to alternative fuels/energy use by July 1, 2015.

56. Management Board shall establish an immediate program for the use of low-level ethanol and biodiesel-based fuels by the government fleet. Fuelling depots should be established to support this policy as public-private partnerships.

57. Management Board shall mandate that 10 % of the government vehicle fleet, and 30% of the Ministry of Environment and Energy fleet, shall be electric or fuel cell/hythane-powered by July 1, 2005.

58. GO Transit and the Ontario Northland Transportation Commission shall be required to utilize low sulphur fuels (gasoline and diesel) in their operations by July 1, 2003.

59. The Ministry of Natural Resources shall undertake to make all provincial parks, preserves and conservation areas energy self-sufficient by July 1, 2006.

60. The Ontario government shall establish an objective, and work in cooperation with affected stakeholders, to convert petroleum-based electricity generation, where technically feasible, on all Crown lands and lands that fall within provincial jurisdiction north of the 52nd parallel of latitude to renewable electricity generation by July 1, 2007.

A.11 The Municipal Sector

61. All municipalities in Ontario shall be mandated to develop policies and programs to increase the utilization of alternative fuel/energy in their operations by December 31, 2003. These policies should include conservation and efficiency measures.

62. All provincial funding programs, cost-sharing arrangements and grants to municipalities shall be reviewed to establish incentives for the use of alternative fuel/energy sources and technologies.

Vehicle purchases

63. The Ontario government shall provide a 25% provincial contribution toward the purchase of alternative-fuelled municipal vehicles (except garbage trucks, which must compete on an even basis with the private sector).

64. The Ontario government, boards of education and school bus operators shall establish a program to utilize alternative fuels, including ethanol-based gasoline and biodiesel fuels for their fleets, with all vehicles to be converted to use these or other alternative fuels no later than July 1, 2007. An accelerated depreciation allowance shall be made available for the purchase of new school buses powered by non-diesel alternative fuel.

65. The Ontario government shall mandate that public vehicles be converted to 100% clean fuel technologies according to the following timetable: all airport equipment by July 1, 2007; all municipal heavy vehicles (sweepers, garbage trucks, fire engines, etc.) by July 1, 2008; and all other municipal cars and light trucks by July 1, 2012. All new vehicles in these categories purchased after January 1, 2005 must be alternative fuel powered with standards equivalent to or tougher than the leading jurisdiction in North America.

Land use planning and development

66. The Ministry of Municipal Affairs and Housing shall review the 'healthy environment component' of the municipal Smart Growth initiative to include

measures to promote the use of alternative fuels/energy, including efficiency and conservation measures.

67. The Ministry of Municipal Affairs and Housing shall review the *Building Code Act*, *Municipal Act*, *Planning Act*, *Social Housing Reform Act*, and other pertinent legislation, to make provision for alternative fuel/energy and application of the most advanced technology, including efficiency and conservation measures. Where appropriate, Ontario should specify the Natural Resources Canada R-2000 (residential) and C-2000 (advanced commercial buildings program) standards in the *Building Code* and other acts and regulations.

68. Effective immediately, energy self-sufficient newly built homes will be eligible for a maximum of \$4000 land transfer tax refund (double the current provision).

69. The Ministry of Municipal Affairs and Housing shall seek to amend the *Planning Act* by July 1, 2003 to include the requirement of sustainable development.

70. The Ministry of Municipal Affairs and Housing shall incorporate alternative fuel/energy standards and applications in its five-year review of the *Provincial Policy Statement*, issued under the *Planning Act*.

71. All municipalities in Ontario shall incorporate policies within their Official Plans, zoning by-laws and other land use control documents to make provision for alternative fuel/energy.

Public Transit

72. Effective immediately, provincial operating and capital funding to municipal and regional transit (GO Transit) services shall be restricted to the acquisition and operation of alternative fuel/energy technologies, including the use of alternative-fuelled vehicles. The Ontario government, municipalities, transit and ferry operators shall establish and fund a program to expand alternative fuel use including ethanol-based and biodiesel fuels for the transit fleet across Ontario.

73. Effective immediately, all future provincial support to municipal transit systems must be applied to alternative-fuelled vehicles. No municipal transit system will be allowed to purchase non-alternative fuelled vehicles after January 1, 2005, and 100% of municipal bus fleets must be converted to 'clean' technologies (preferably hydrogen) by January 1, 2015. All municipal electrically-powered transit services (subways, light rail transit services, streetcars and trolley buses) must be 100% 'green' electrically powered by July 1, 2004.

74. The Ontario government shall commit to the full 'hydrogenization' of the GO Transit rail and bus fleets by December 31, 2006.

75. Local municipal transit and ferry operators shall be required to utilize low sulphur fuels (gasoline and diesel) in their operations by July 1, 2003.

A.12 Relationship to Federal Energy Policies

76. The Ontario government, led by the Ministry of Environment and Energy, shall actively participate in, and where appropriate augment, federal alternative fuel/energy initiatives.
77. The Ministry of Enterprise, Opportunity and Innovation shall consider participation in Industry Canada's Technology Partnerships program where these investments augment an enduring renewables industry.
78. The Ministry of Environment and Energy shall work with Environment Canada to accelerate the requirement for the use of low sulphur 'on-road' and 'off road' gasoline and diesel fuel for all uses, including railway locomotives.
79. The Ministry of Environment and Energy should encourage the Federal Government to apply the same air emissions and sulphur content standards to railway diesel fuel and locomotives as for 'on road' diesel fuel and engines.
80. The Ontario and federal governments, and relevant stakeholders, shall develop codes and standards for alternative fuel/energy technical applications including fuel cells.
81. The Ministry of Environment and Energy shall work with federal departments to better disseminate public information on viable alternative fuel and energy options, including conservation and energy efficiency.

A.13 Consumer Awareness and Education

82. The Ministry of Enterprise, Opportunity and Innovation and the Ministry of Environment and Energy shall establish a program with Ontario-based manufacturers and distributors of alternative fuel/energy products to increase public awareness of technologies and applications.
83. Government and industry shall launch energy efficiency and conservation information programs directed at specific sectors of the economy. Performance evaluations should be employed to measure the effectiveness of these programs.
84. The Ontario government, in partnership with the federal government and key stakeholders, shall prepare public information on assistance available to purchasers of alternative fuelled vehicles, and in concert with manufacturers, actively promote these programs. Enhanced consumer and public awareness about potential and uses of clean energy sources, including wind and solar power, should be encouraged.
85. The Ontario government shall update the elementary and secondary educational curriculum to include relevant content on alternative fuel and energy. Opportunities shall be pursued to establish coverage of alternative fuel/energy and related technologies in university, community college programs and in the trades, in cooperation with industry. Training on installation and repair services shall

also be covered. Appropriate use should be made of online educational resource and instructional methods.

86. The Ministry of Municipal Affairs and Housing, in cooperation with the Ontario Energy Research Institute, shall develop a curriculum and training program on a complete range of environmentally sustainable subjects relating to residential and commercial construction, with particular emphasis on new building regulations and environmental technologies.

87. Educational and research partnerships on alternative fuels/energy shall be established involving government, industry and post-secondary educational institutions.

88. The Ontario government shall fund centre(s) of excellence within the public post-secondary system for all aspects of alternative fuels/energy research and development, including manufacturing, and sales and service. Wind energy, solar energy, biomass and hydrogen/fuel cells are considered to be promising areas for research and potential partnerships between the education sector, government and industry.

B. SPECIFIC ALTERNATIVE FUEL/ENERGY SOURCES AND TECHNOLOGIES

B.1 Water Power

89. The Ministry of Natural Resources, along with pertinent stakeholder groups, shall undertake an assessment of the available waterpower potential in Ontario within 12 months. The analysis should assess potential upgrades of existing hydraulic stations, as well as the potential of undeveloped water power sites.

90. Using a watershed-based planning approach, priority shall be given to hydraulic upgrades and modifications that increase the waterpower potential of existing generating facilities or other water control structures. Hydraulic power upgrades should conform with run-of-the river hydraulic design principles. Requests for proposals should be issued by the Ministries of Environment and Energy and Natural Resources for the development of priority undeveloped waterpower sites within 12 months.

91. Hydro One and/or successor transmission company(ies) shall investigate transmission grid extensions or upgrades to enable the connection of existing or new hydraulic generating stations and report back within 12 months.

92. The Ontario government shall assess incentives to encourage upgrading of existing hydraulic generation sites or other existing water control structures with undeveloped water power potential. All feasible upgrades and renovations shall receive accelerated approval by July 1, 2004. Such upgrades shall receive complete property tax relief for five years.

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93. New hydraulic power capacity in Ontario shall be recognized by the Ontario government as new renewable power. All of this new capacity should be assigned to displace existing coal-fired generation.
94. The Ministry of Natural Resources shall assess wind energy potential in the vicinity of hydraulic generation sites at remote locations to determine whether windfarms may be developed at these locations to power pump storage facilities.
95. The Ministries of Environment and Energy and Natural Resources shall designate the Beck 3 generating site as a priority for development. The output of the Beck 3 project shall be recognized as renewable power.
96. The Ministry of Northern Development, in conjunction with stakeholders, shall expand capital support for small-scale hydraulic developments in remote communities.

B.2 Wind Power

97. The Ontario government shall respond to the recommendations of the Ontario Wind Power Task Force by December 31, 2002.
98. The Ministry of Natural Resources, in conjunction with stakeholder groups, shall assess priority sites for wind power development on Crown land. Proposals for development should then be considered by December 31, 2002.
99. The Ministries of Environment and Energy and Natural Resources shall develop a standardized policy for wind energy development sites on Crown land by December 31, 2002.
100. The Ministries of Finance and Natural Resources shall develop a resource revenue policy for new wind farm developments on Crown land by December 31, 2002.
101. The Ministry of Finance shall match the Federal wind power production incentive for new wind power projects. Consideration shall also be given to expanding this incentive to a similar incentive for new solar, biomass and small hydraulic projects within Ontario.
102. The Ministry of Municipal Affairs and Housing shall amend the *Planning Act* by December 31, 2002 to apply a provincial standard to zoning for windfarms/wind turbines and solar energy systems to make them immune from local municipal prohibition, and thereby allowed across Ontario 'as of right.' Municipalities shall be allowed to specify reasonable conditions, such as spacing of turbine units or siting of solar panels, as part of site plan approval.
103. The Ontario government, in cooperation with their federal counterparts, First Nations and remote communities, shall assess the renewable energy potential, including wind, solar and biomass in the vicinity of remote communities by July 1, 2003.

104. The Ministry of Environment and Energy, under the *Environmental Assessment Act*, shall develop a standardized environmental assessment process for windfarm proposals, and other emerging renewable energy sources by December 31, 2002.

105. The Ontario government, in association with the federal government, shall compile and make available comprehensive GIS (geographic information systems) wind energy data on a cost recovery basis to wind power developers, and other stakeholders by December 31, 2002.

106. The Ontario government and the wind industry shall prepare a public information package on wind turbine technology and its applications by December 31, 2002.

B.3 Solar Power

107. The Ontario government shall establish a 3-year program to provide a rebate of up to 25% of the purchase price, up to a set maximum, for the installation of solar panels on up to 100,000 homes including new, existing and multi-family dwellings, across Ontario. The program will be monitored by the Ontario government to ensure that solar panels continue to be offered at competitive rates.

108. The Ontario government, in association with the federal government, shall compile and make available comprehensive GIS (geographic information systems) insolation data on a cost recovery basis to solar power developers, and other stakeholders by December 31, 2002.

109. Local electricity distribution companies across Ontario should consider 'pilot' programs to promote solar PV installations. Photovoltaic installations should be considered at electricity distribution facilities and on private, commercial, institutional, industrial, and residential dwellings.

B.4 Transportation Fuels, Vehicles and Engines

110. The Ontario government shall work with stakeholders including agricultural producers, the petroleum industry and federal representatives, to assess the potential to expand ethanol and biodiesel production and availability in Ontario by July 1, 2003.

111. The Ministries of Environment and Energy; Enterprise, Opportunity and Innovation, and their federal counterparts, shall work with the renewable fuels and petroleum industries to establish a low-level ethanol content requirements for 'on road' gasoline in Ontario.

112. The Ontario government, in cooperation with industry, shall work to establish a province-wide network of ethanol-based fuelling stations along major provincial highways as soon as possible. For general usage, E10 (10%) ethanol mixture gasoline should be readily available, fleet uses require E85 (85%) ethanol mixture gasoline.

113. Ontario shall adopt the Auto Makers' Choice Gasoline specification by December 31, 2003. As an incentive, the provincial gasoline tax shall be reduced by two cents per litre on all 'clean' gas sold, defined to include gasoline meeting the Auto Makers' Choice or equivalent specification, and gasoline with at least 10% ethanol content. Any retailer not vending gasoline which meets the defined specifications by that date will be required to pay an additional five cents per litre "pollution tax," thereby creating a considerable price spread between the "dirtiest" and "cleanest" grades of gasoline.

114. By July 1, 2006, all diesel sold in Ontario must either be biodiesel, contain ethanol or an additive package, or a combination thereof, and be formulated to meet the shall adopt a renewable fuel standard specifying that 6% of fuels by volume should be from renewable sources by 2010.toughest fuel standards in North America.

115. Ontario shall adopt a renewable fuel standard specifying that 6% by volume of all transportation fuels should be from renewable sources by July 1, 2010.

116. The Ministry of Finance shall exempt biodiesel, hydrogen as a fuel, and hydrogen fuel cells for use in Ontario from provincial fuel, sales, and retail taxes. The Ministry shall also assess the cost of exempting other fuel additives that enhance fuel efficiency and emissions performance by December 31, 2002.

117. The Ministry of Environment and Energy, through the Drive Clean program and in cooperation with Environment Canada, should assess the emissions associated with expanded ethanol based fuel and biofuels use in Ontario. A database on the emissions characteristics of alternative fuels use should be developed.

118. The Ministry of Environment and Energy shall not require hybrid vehicles to undergo Drive Clean inspections for six years, and electric and hydrogen/fuel cell vehicles shall be exempt from Drive Clean.

119. Provincial sales and fuel tax incentives should be equitably applied to all alternative-fuelled vehicles, whether original equipment manufactured, or converted to alternative fuel use.

120. The Ontario government shall expand retail sales tax incentives for selected alternative-fuelled vehicles including all motorized two-wheeled and four-wheeled (or more) vehicles, for 'on road' or 'off road' use, as follows: natural gas vehicles will have the sales tax reduced to 6%; hybrid vehicles reduced to 4%; and all electric vehicles and fuel cell vehicles reduced to 2% for a period of no less than five years. There shall be an additional \$2000 grant for pure hydrogen cars/trucks/off-road vehicles up to 25% of the value of the vehicle.

121. Ontario retail, fuel, and sales tax policy shall be coordinated with taxation policies of the federal government to encourage alternative fuel and vehicle use. Due to changes in motor vehicle aerodynamics, the Ontario government, in

cooperation with the federal government, shall assess the removal of the \$100 tax on air conditioners in motor vehicles imposed under the federal *Excise Tax Act*.

122. The Ontario government shall require all railroads operating in Ontario to utilize “clean” diesel according to the following schedule: ‘road grade’ diesel by January 1, 2004 and diesel-ethanol (or diesel with similar technical specifications) by January 1, 2005. The Ontario government shall offer significant assessment relief (set at a fixed rate per kilometre below the current average rate) for any rail system that completely converts to hydrogen fuel cell motive power. All locomotives must be converted to hydrogen by January 1, 2015.

123. Due to the high air emission characteristics of older 2-cycle engines, only the latest technology (fuel injected, catalytic converter equipped or equivalent) 2-cycle engines shall be offered for sale in new mobile applications (snowmobiles, all-terrain vehicles, propelled mowers, etc.) within Ontario effective July 1, 2004; and marine engines by July 1, 2006; and in new portable equipment (mowers, trimmers, blowers and other landscaping equipment, chainsaws and cutters, etc.) effective July 1, 2007. The Ministry of Environment and Energy shall monitor pertinent air emission and technical requirements developed by the U.S. Environmental Protection Agency, California Environmental Protection Agency, and other leading North American jurisdictions to ensure that Ontario’s requirements match, or exceed, these standards. The Ministry of Environment and Energy, in cooperation with manufacturers, major retailers, marinas, dealers and other stakeholders, shall develop financial and other incentive programs to encourage the retirement of older engines, as well as an outreach, education, and labelling program to promote this transition to clean technologies.

124. The Ontario government shall establish a program that matches, up to a maximum of \$500, financial incentives provided by motor vehicle manufacturers or retailers to encourage the retirement of 1987 model year and older automobiles and light trucks.

125. In the formulation of Ontario alternative fuels and vehicle policy, provision shall be made for appropriate exemptions to accommodate major classes of vehicles, equipment, or engines that cannot operate on mandated alternative fuels. Consideration should be given to phasing-in the introduction of alternative fuels/engine requirements for new vehicles, equipment and engines used in Ontario in these cases.

B.5 Fuel Cells and Hydrogen

126. The Ontario government shall join and actively participate in the Canadian Fuel Cell Alliance.

127. The Ontario government shall, under the auspices of the Ontario Energy Research Institute (proposed in recommendation #3), take an active role in public-private partnerships to promote research in the application of fuel cell technology in motor vehicles, including railway locomotives, and in stationary applications within Ontario by July 1, 2003.

128. The Ontario government shall undertake a public-private partnership in conjunction with bus and fuel cell manufacturers, and transit and motor coach operators, to operate fuel cell powered buses in Ontario. As part of the requirement to move to 100% clean technologies outlined in recommendation 73, a 25% capital grant for the term of five years shall be offered to municipalities for the purchase of hydrogen-powered buses.

129. The Ontario government shall establish a program to rapidly acquire and test a number of hydrogen powered light and heavy-duty vehicles for the government fleet. Provisions should be made for government to share in any commercially viable modifications that result from such tests.

130. Management Board shall establish a program to install and test stationary fuel cells in public institutions and buildings. Provision should be made for government to share in any commercially viable modifications that result from such tests.

131. The Ontario Energy Board and Independent Electricity Market Operator shall ensure that there are no barriers to the connection of stacked fuel cells to the power grid as outlined in recommendations 19 and 23.

132. The Ontario government shall ensure that commercially available fuel cell vehicles and power sources are offered appropriate incentives *or* exemptions under the Ontario *Retail Sales Tax Act*.

133. The Ontario government shall undertake an assessment of the long-term potential of using off-peak nuclear power for the production of hydrogen in Ontario and report its findings by December 31, 2002.

B.6 Biomass Fuel/Energy

134. The Ontario government, in conjunction with stakeholders, shall examine opportunities for increased landfill gas collection and use from existing or abandoned landfill sites.

Biomass-derived Power

135. The Ontario government, in association with the agricultural industry including livestock producers, shall commit to a demonstration program for the collection and use of livestock-derived biogas as a power source by December 31, 2002.

136. The Ontario government, in conjunction with the agricultural industry, shall assess opportunities to make use of energy crops, such as switchgrass and crop wastes, for fuel or power generation in Ontario.

137. The Ontario government, in cooperation with the forest industry, shall assess opportunities to make greater use of wood wastes for heat or power production.

138. The Ministry of Environment and Energy, the Ontario Energy Board and the Independent Electricity Market Operator shall review policies to facilitate the connection and supply of biomass-derived power sources into the transmission grid.

139. The Ministry of Finance shall establish a financial incentive program that provides tax benefits to producers who install and utilize technologies that enhance the use of biomass fuel/energy in industrial operations by December 31, 2002.

Other Energy Sources

140. The Ministry of Environment and Energy in conjunction with affected municipalities, shall investigate the technical merits of deep lake water cooling for Thunder Bay and other Lake Superior communities. The Ministry and other lakefront municipalities across Ontario should assess other opportunities to utilize deep lake water cooling technology.

B.8 Commitment and Funding

141. The Ontario government should establish an appropriate commitment to and funding support for the recommendations of the *Final Report* of the Select Committee on Alternative Fuel Sources within the time frames put forward in the *Report*.

GLOSSARY OF TERMS

This glossary contains non-technical explanations of key terms. It is designed to assist the reader in understanding the various alternative fuel and energy matters discussed in the Report within an Ontario context. A variety of technical glossaries, background reports and officials were consulted in the compilation of this glossary.

Alternative Fuel

Alternative fuels are substantially non-petroleum fuels which can be used to power motor vehicles. They have energy security and environmental benefits. The following are commonly recognized as alternative fuels: methanol and denatured ethanol as alcohol fuels, natural gas (compressed or liquefied), liquefied petroleum gas, hydrogen, fuels derived from biological materials, and electricity.

Anaerobic Digestion

Anaerobic digestion is the process by which organic matter is decomposed by bacteria in the absence of oxygen. The decomposition process produces a gaseous by-product often called 'biogas,' primarily composed of methane, carbon dioxide, and hydrogen sulfide, which can be collected and used as a fuel.

Biodiesel

A biodegradable transportation fuel for use in diesel engines that is produced from oils or fats from vegetable or animal sources. Biodiesel is used as a component of diesel fuel.

Biofuels

Refers to various alcohols, ethers, esters and other chemicals produced from cellulosic biomass such as herbaceous and woody plants, agricultural and forestry residues, and components of municipal and industrial waste. Biofuels can be used for transportation or to generate electricity. Generally, biofuels add fewer emissions to the atmosphere and unlike petroleum are produced from renewable resources.

Biomass

Biomass refers to any organic matter that can be converted into energy. Bioenergy technologies make use of the energy content of agricultural crop wastes, wood waste, the organic components of municipal solid waste, energy crops and methane captured from landfills, municipal waste water treatment, and manure lagoons on farms. Biomass can be used as a solid fuel, or converted into liquid or gaseous forms for the production of electricity, heat, or for use as transportation fuels.

Broader Public Sector

In the Ontario context, the Broader Public Sector refers to municipalities, universities, and community colleges, schools, hospitals, and related institutions.

CANDU reactors

Canada Deuterium Uranium (CANDU) reactors are Canadian-developed nuclear power systems. CANDU reactors use a pressure tube reactor, heavy-water moderator, and natural uranium fuel to produce electricity. All nuclear generating units in Ontario use the CANDU design, including the Pickering, Bruce and Darlington stations.

Capacity

Capacity is the maximum power output or the load which a generating unit, generating station, or other electrical apparatus can supply. Common units include kilowatt (kW) and megawatt (MW).

Carbon-based fuel (fossil) or Thermal Generating Station

An electrical generating station that uses coal, oil, or natural gas to produce steam which is fed into a turbine and generator to produce electricity. Ontario Power Generation operates five coal-fired generating plants: Lakeview (Mississauga), Nanticoke (Lake Erie), Atikokan (Northwestern Ontario), Lambton (Sarnia), and Thunder Bay (Northwestern Ontario). In addition, OPG operates the Lennox station, which burns residual fuel oil or natural gas.

Carbon Dioxide (CO₂)

A product of combustion that has become an environmental concern in recent years. CO₂ does not directly impair human health but is a greenhouse gas that traps the earth's heat and contributes to global warming.

Carbon Monoxide (CO)

A colourless, odourless gas produced by the incomplete combustion of fuels with a limited oxygen supply, as in automobile engines. When carbon monoxide is inhaled, it is absorbed by the blood more readily than oxygen and causes body tissues to be deprived of oxygen.

Carbon tax

A tax based on the carbon content of the fuel being used. This tax would increase the prices of a fuel with a high carbon content, such as coal, to thereby decrease the quantity demanded or used to reduce greenhouse gases. A carbon tax may be seen as either a competing or a complementary policy instrument to emissions trading. Revenues may also be used to fund greenhouse gas mitigation programs.

Climate Change

The United Nations Intergovernmental Panel on Climate Change (1990) states that "increases in greenhouse gas concentrations since pre-industrial times have led to a positive radiative forcing of climate, tending to warm the surface of the Earth and produce other changes of climate."

Cogeneration

Cogeneration involves the simultaneous production of electricity and thermal energy. Cogeneration facilities, which may be incorporated as part of an industrial operation, use significantly less fuel to produce electricity and thermal energy than would be needed to make the two separately.

Conservation

The wise use of all resources including increasing efficiency of use, reducing consumption of scarce resources and reducing waste. Energy conservation may mean using more of one type of energy efficiently to replace an inefficient use of another, resulting in an overall reduction in energy use.

Demand

The rate at which electricity is delivered to or by a system, part of a system, or piece of equipment expressed in kilowatts, or other suitable unit, at a given instant or averaged over a specified period of time.

Demand Side Management (DSM)

Measures undertaken to control the level of energy usage at a given time, by increasing or decreasing consumption. Consumers, utilities, or third parties can undertake DSM efforts.

Distributed Generation

Small-scale localized power generation that provides electric power at or closer to the point of use as opposed to a central generating station.

District Energy System

District energy, also known as district heating and cooling, is the technology for providing heating (and possible other forms of energy) from a central plant to multiple users.

Drive Clean program

A mandatory emissions testing program for motor vehicles in southern Ontario which began in 1999. In general, cars and light trucks that are more than three model years old are required to pass an emission test as a condition for registration renewal every two years. On July 1, 2002 the program will be extended to apply to vehicles across southern Ontario's smog zone. Actual testing is carried out at private accredited Drive Clean garages. Heavy duty trucks and buses are tested as part of their annual safety inspections.

Dual-fuel, or bi-fuel vehicle

A vehicle with two separate fuel systems designed to run on either an alternative fuel, or gasoline or diesel, using only one fuel at a time.

Earth energy

Natural heating or cooling properties of the earth used in energy applications such as heat pumps. May also include "lake water cooling" as proposed by EnWave to use Lake Ontario water to help cool commercial buildings linked in a district heating system in the downtown Toronto core commencing in 2004.

E10

Ethanol/gasoline mixture containing 90% gasoline and 10% ethanol by volume.

E85

Ethanol/gasoline mixture containing 85% ethanol and 15% gasoline by volume.

EcoLogo

The EcoLogo is a registered trademark of Environment Canada designating products and services that are more environmentally responsible. Environment Canada is in the process of developing a guideline to determine the definition of “low-impact renewable electricity” that will be able to qualify for the EcoLogo label.

Electricity

A manufactured form of energy, as opposed to naturally occurring energy resources such as coal, oil, or natural gas. On a large scale, electricity is produced by rotating machines (generators) which operate on the principle that an electric current is generated whenever a conductor moves through a magnetic field.

Electrolysis

Breaking a chemical compound down into its elements by passing a direct current through it. Charging water with an electrical current to separate hydrogen and oxygen is one method used to produce commercial hydrogen.

Emission(s)

Emissions are pollutants released into the air, land or waterways from industrial processes, household activities or transportation vehicles and other sources. Air emissions pertain to atmospheric air pollution; land emissions consist of materials released or deposited on land, water emissions refer to pollutants released into waterways.

Emission Cap

An upper limit placed on the allowable airborne emissions from a polluting facility or from a group of such facilities, such as the traditional carbon-based fuel generating stations of Ontario Power Generation, within a defined region such as Ontario.

Emissions trading

An air pollution mitigation policy which allows one emission source, such as a power plant, to meet a prescribed emissions standard by buying credits or allowances from another source. The other source earned the credits or allowances by implementing pollution control measures that reduced its emissions below the prescribed standard. In Ontario, an emissions trading program has been established through *Ontario Regulation 397/01* under the *Environmental Protection Act*. Ontario’s emissions trading regulation currently applies to the emission of NO and SO₂ from the six carbon-based fuel generating stations of Ontario Power Generation. The regulation includes a ‘set aside’ for renewable energy projects that result in reductions of emissions of NO and SO₂ from fossil fired electricity-generating facilities. It is also possible to structure an emissions trading system based upon emissions of carbon.

End-Use Energy Demand (or Secondary Demand)

Energy used by consumers for residential, commercial, industrial and transportation purposes, and hydrocarbons used for non-energy purposes.

Energy

Defined by physicists as the capacity for doing work. Although the international unit of energy is the joule, energy is measured commercially in kilowatt hours. Residential meters record a household's consumption of electric energy in kilowatt hours over a period of time.

Energy Efficiency

Using less energy/electricity to perform the same function.

Energy Self-Sufficient

As applied to a building or facility, energy self-sufficient is an energy use pattern where, over a specified period of time, a facility generates enough power 'on site' to meet its total energy requirements through solar, onsite wind power, cogeneration, energy conservation and efficiency measures, fuel cells, biomass, or other earth energy cooling or heating applications. A building or facility may remain connected to the power grid or piped fuel supplies.

Energy-from-waste

Energy-from-waste is the recovery and combustion of waste to produce electricity and other value-added products such as hydrogen, and synthetic hydrocarbons.

Ethanol

A liquid alcohol that can be produced from cellulosic materials such as crop residues (e.g. straw) forestry wastes, municipal solid waste and recycled newsprint. Ethanol can be added to gasoline, enhancing combustion, resulting in fewer emissions. Also known as ethyl alcohol or grain alcohol.

Externalities

Externalities occur when the activity of one person or organization has an inadvertent impact on the well-being of another. Many aspects of environmental degradation, such as air pollution, global warming, loss of wilderness, and contamination of water bodies, are viewed as externalities of economic activities.

Fuel

A material used to create heat or power through chemical conversion in processes such as burning or electrochemistry.

Fuel cell

A fuel cell is an electrochemical device that continuously converts the chemical energy of a fuel and an oxidant into electrical energy. The most common fuel used in a fuel cell is hydrogen; other fuels include phosphoric acid, molten carbonate, and solid oxide. In various applications fuel cells can electrically power motor vehicles, or in stationary applications serve as a power source. With pure hydrogen fuel this results in no tailpipe release of greenhouse gases or smog-forming pollutants.

Gasification

A method of generating electricity from biomass by first converting it into a combustible gas.

Green Power

Green power is used to describe electricity produced by sources that are less harmful to the environment than traditional carbon-based fuels. While there is no strict definition of green power, generally renewable sources such as solar, wind power, earth energy (used in heat pumps), biomass, and small hydraulic power sites are considered green power sources.

Greenhouse Gases

Carbon dioxide, methane, or nitrous oxide, and water vapour are amongst the gases that contribute to the warming of the atmosphere.

Hybrid Vehicle

Usually entails a vehicle that employs a combustion engine system together with an electric propulsion system.

Hydrocarbon

A chemical compound consisting of hydrogen and carbon formed in a variety of bond structures such as oil, methane, propane, butane, etc. that is normally used as a fuel.

Hydraulic Power

Electricity produced by water falling through turbines. Hydro-electric power is produced on the waterways of Ontario.

Hydrogen

A chemical element with the chemical designation H. Hydrogen can be used as a fuel source since it has a very high energy content.

Hythane

A fuel which is composed of a mixture of 50% hydrogen and 50% natural gas/methane by volume, which when compressed together, creates a cleaner burning CNG (compressed natural gas).

ITER (International Thermonuclear Experimental Reactor)

ITER is an international nuclear fusion demonstration project involving partners from Japan, Russia, and the European Union which may be located adjacent to the Darlington nuclear generating station in Clarington, Ontario. ITER's mission is to demonstrate the scientific and technological feasibility of fusion energy for peaceful purposes. The Ontario government has pledged \$300 million toward the estimated \$2 billion potential Canadian contribution to this project.

Joule

A standard measurement of a unit of energy. One joule is defined as the amount of energy exerted when a force of one Newton is applied over a displacement of one meter. One joule is the equivalent of one watt of power radiated or dissipated for one second.

Kilowatt (kW)

One thousand watts, or 1.35 horsepower.

Kilowatt hour (kWh)

The amount of electrical energy produced or consumed by one kilowatt unit for one hour (one thousand watt hours).

Kyoto Protocol

An Accord formulated at an international meeting in Kyoto, Japan in December 1997 involving Canada and 160 other countries which set specific reduction targets for greenhouse gases. Under the Protocol, Canada is committed to reducing its greenhouse gas emissions by 6% from 1990 levels by 2012. Discussions are underway between the federal and provincial governments concerning issues related to emission reduction strategies and the possible Canadian ratification of this protocol later in 2002.

Life Cycle Costing

Life Cycle Costing is used to establish the full cost of controlling and operating an asset over its life, or for the period that it is controlled by an entity. The three components of Life Cycle Costing are capital costs, ongoing and recurring costs, and salvage and disposal costs. Life Cycle Costing is discussed in relation to the operation of electrical generating stations.

Load Management

Activities or programs put in place by a utility designed to influence the timing and amount of electricity that customers may use.

Low Impact Hydraulic

The federal EcoLogo program defines low impact hydraulic generation to include water projects that have a minimal impact on the surrounding environment, such as installing a generator in a fast flowing stream, or fitting an existing water control structure with a power generator (often referred to as run-of-the-river power generating plants).

Megawatt (MW)

A unit of energy equivalent to one thousand kilowatts, or one million watts.

Methane and landfill gas collection

Methane is the simplest of the hydrocarbons and the principal constituent of natural gas. Methane is generated by the decomposition of wastes in landfills and from manure and fermentation associated with domestic livestock. It may be collected at landfill sites and flared, or used as a fuel to power generators to produce electricity.

Methanol

A liquid fuel formed by catalytically combining CO with hydrogen in a 1:2 ratio under high temperature and pressure. Commercially, it is typically manufactured by steam reforming natural gas.

Municipal Solid Waste

Waste material from households and businesses in a community that is not regulated as hazardous.

Natural gas

Natural gas is composed of mixtures of hydrocarbon gases and vapours consisting principally of methane in gaseous form. It may also be compressed under high pressures, typically between 2000 and 3600 psi (pounds per square inch), and held in a container (compressed natural gas). The gas expands when released for use as a fuel.

Net metering

Net metering is the practice of using a bi-directional electrical meter to measure consumption and generation of electricity by a small generation facility (such as a house with a wind or solar photovoltaic system). The net energy produced or consumed is purchased from or sold to the generator.

Nitrogen oxides (NO_x)

Oxides of nitrogen are a component of air pollution that can be produced by the burning of traditional carbon-based fuels. Nitrogen oxides react with volatile organic compounds to form smog, and are major components of acid rain. The City of Toronto Medical Officer of Health reports that nitrogen dioxide is the air pollutant with the greatest adverse impact on human health.

Nuclear power

Power obtained by splitting heavy atoms (fission). A nuclear power plant uses a controlled atomic chain reaction to produce heat. The heat is used to make steam, which runs conventional turbine generators to produce electricity.

Off-peak

The period of low-energy demand, as opposed to maximum, or peak, demand.

Ozone

Tropospheric ozone (smog) is formed when volatile organic compounds (VOCs), oxygen, and NO_x react in the presence of sunlight. Though beneficial in the upper atmosphere (stratospheric ozone protects the earth from the sun's ultraviolet rays) at ground level ozone is a respiratory irritant and is considered a pollutant.

Particulates

A broad term encompassing thousands of types of chemicals that are emitted during energy consumption, including fine dusts, metal particles, and nitrogen oxides. These particulates are all small enough to be inhaled into the lungs, causing detrimental impacts on human health. The Ontario Medical Association

notes that “there does not seem to be a threshold level for ground level ozone or particulates below which no health effects are observed.”

Passive Solar Design

Passive solar design optimizes the amount of energy that can be derived from the sun without mechanical means through the orientation and density of buildings, the size and position of glazed areas, and materials used for the remainder of the structure in order to maximize free solar gains.

Peak Demand

The maximum rate of energy consumption that occurs within a given period of time within a utility service area. There are daily and seasonal peaks in demand.

Petajoule

One petajoule is equal to 10^{15} joules.

Propane

A heavy flammable gaseous alkane (C_3H_8) found in crude petroleum and natural gas. Propane is used as a fuel.

Remote community

A settlement in northern Ontario (many of which are First Nations' communities) which is not connected to the transmission grid. These communities usually rely on diesel generators for power, which are costly to operate and may also cause adverse local air quality conditions.

Renewable Energy

Renewable energy is derived from sources that cannot be depleted and are self-replenishing. They can generally be replaced, will always be available, can be sustained indefinitely, and are essentially non-polluting. Renewable sources may include wind, solar, biomass, run of river hydraulic, new hydraulic power from existing dams, and earth energy.

Renewable Fuel Standard

A policy requirement to increase the renewable content in motor vehicle fuels by mandating the increased use of ethanol, or other renewable fuels, in gasoline and diesel.

Renewable Portfolio Standard (RPS)

A market-based public policy to increase the amount of renewable energy within a jurisdiction. An RPS usually requires that a certain percentage of electric consumption within a jurisdiction comes from defined renewable sources.

Smog

A visible haze caused primarily by particulate matter and ozone.

Solar photovoltaic

Solar photovoltaic technology converts sunlight directly into electricity through the use of semiconductors built into solar panels or roofing materials.

Solar thermal

Technologies that use the sun to heat liquids which can provide heat energy for domestic water heating. There are also solar systems to assist in the heating of water for swimming pools and to pre-heat air drawn into building ventilation systems.

Stacking

The process of placing individual fuel cells adjacent to one another to form a fuel cell stack. Normally, the stack is connected in a series.

Sulphur dioxide

Sulphur dioxide is a component of air pollution and acid rain that is produced by the burning of traditional carbon-based fuels. Sulphur dioxide exposure is associated with adverse health impacts including increased hospitalisation and death from pulmonary and heart disease, particularly amongst asthmatics and those with existing breathing problems.

SuperBuild

A long-term capital infrastructure funding program of the Ontario government managed by the Ontario SuperBuild Corporation, with leveraged private sector and partner participation, originally announced in the *1999 Ontario Budget*. Major infrastructure priorities include transportation, post-secondary education, health care, environmental protection and technology.

Sustainable

Related to a method of harvesting or using a fuel or energy resource so that the resource is not depleted or permanently damaged over time.

Switchgrass

A hardy native North American perennial grass which can serve as a renewable fuel crop. It can be grown on marginal lands with minimal inputs of water and fertilizer. In pelletized form it can be burned in specially designed stoves and may also serve as feedstock for ethanol production.

Systems Benefit Charge

The addition of a specified per unit charge or tax on sales of electricity, with the revenue generated used for, or to encourage, investments in energy efficiency measures and/or renewable energy projects. A system benefit charge is normally a nominal charge which is added to a customer's electric bill.

Time of use rate

Electrical power rates that vary by time, usually associated with peak and off-peak times during the day. Rates may also vary by season.

Transmission system or grid

The network of bulk electric power lines, related structures and connections. At present in Ontario this network is owned and operated by Hydro One Incorporated.

Vehicle Conversion

Retrofitting a motor vehicle to run on an alternative fuel.

VOCs (volatile organic compounds)

Reactive gases released during combustion or evaporation of a fuel. VOCs react with NO_x in the presence of sunlight and heat to form ozone, a component of smog.

Wind turbine

A system that uses air foils or blades attached to a drive shaft in order to capture the kinetic energy of the wind. The wind pushes against the blades/foils and spins a drive shaft. The drive shaft moves a generator to produce electricity.