Bright Future

Avoiding Blackouts in Ontario

September 2003

An executive summary of this report is available at www.davidsuzuki.org/bright_future

David
Suzuki
Foundation

SOLUTIONS ARE IN OUR NATURE

Bright Future
Avoiding Blackouts in Ontario

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1.0 Introduction

On August 14, 2003, the lights went out all over Ontario. It shouldn't have come as a surprise. Consumers were warned in the summer of 2002 and again in 2003 that blackouts might occur at peak times. The blackout on August 14 came at a time when electricity use in Ontario and neighbouring U.S. states was almost at its highest level. Ontario remained in a state of emergency for days as its utilities worked to bring their systems back on line. When it happened, the power failure exposed the vulnerability of Ontario's electricity system and shook the confidence of consumers.

To deal with the ever-increasing demand for electricity, the province's strategy has been to simply boost supply by importing coal-fired electricity from the U.S. and extending the life of coal and nuclear powered plants in Ontario. This ties the province to an ever more complex, polluting, vulnerable and expensive system. Ontarians pay more than $12 billion a year to keep their electrical system running – and it's failing them.

Ontario needs a new strategy, one that focuses on reducing energy use through efficiency and conservation, rather than only increasing supply. Ontario has the means and the skills to reduce its power use quickly and inexpensively. Through a transition to energy-efficient technologies and renewable energy sources, Ontario can cut total demand for electric power by 20 per cent between now and 2010, and achieve further reductions after that. This transition to efficiency will achieve the following:

- Reduce electricity bills for consumers;
- Take pressure off the grid;
- Decentralize power production and leave local areas less vulnerable to electrical system shutdowns;
- Reduce smog and greenhouse gas emissions; and,
- Contribute to a dynamic and robust economy.

Using less energy isn't about making drastic lifestyle changes or sacrifices. Conservation and efficiency measures can be as simple as improving the standards for building new homes so that they use less energy for heating and cooling, or replacing and recycling an old refrigerator with one that doesn't waste as much power.

This kind of transition will require some financial investment. However, the alternative, to build large, centralized new power plants, is more expensive and fraught with problems.

Ontario currently depends on four conventional sources of electric power.

Figure 1: Ontario's End-Use electricity Demand 2001

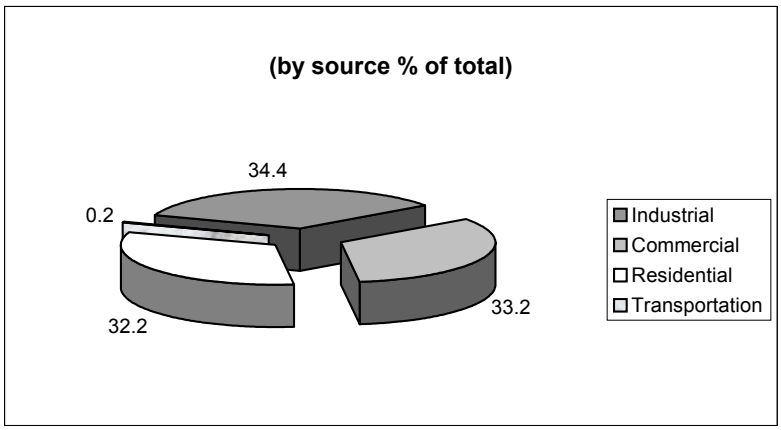
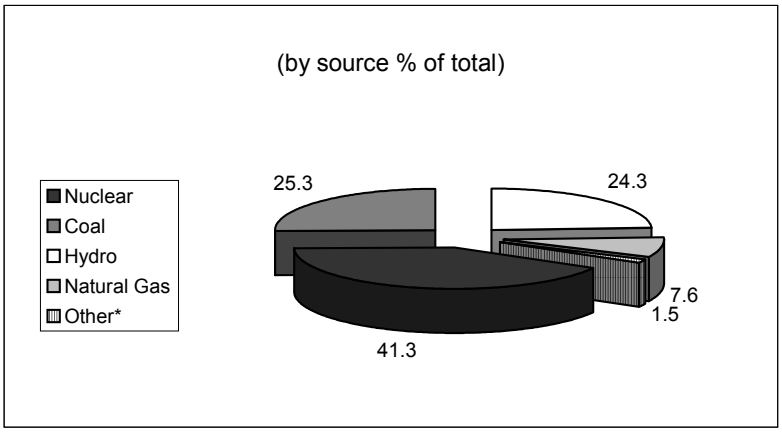


Figure 2: Ontario's Electricity Generation 2001



Note: Total input energy – 1,577 petajoules
Total end-use demand – 497 petajoules
Total end-use and losses – 553 petajoules
*Other (0.6% oil, 0.9% renewables)

Source: www.oeb.gov.on.ca/html/en/abouttheoeb/statsandmaps.htm

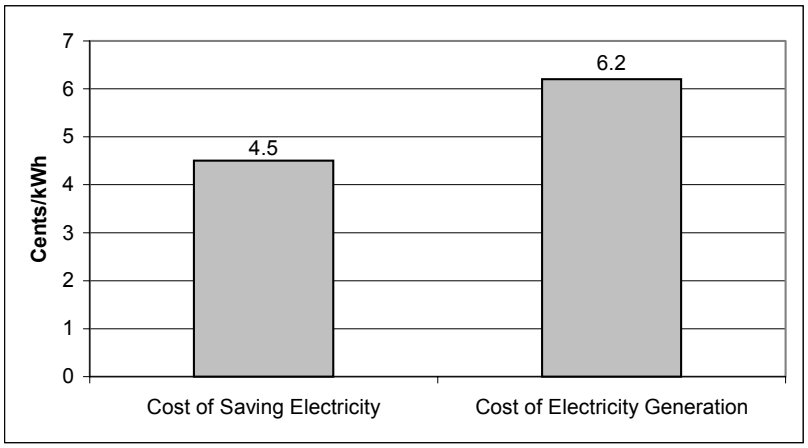
Hydroelectric power, the energy source that propelled industrial expansion in Ontario and Quebec from the early 1900s through the 1960s, now accounts for just a quarter of the power production in Ontario. The operation of existing hydro sites is mostly benign, but any proposal to build new dams would raise intense protests related to traditional land use and natural habitat. Coal, accounting for another quarter of Ontario's energy input, is a major source of smog and related health problems, and a significant contributor of greenhouse gas emissions. Nuclear energy is prohibitively expensive; the cost of refitting four aging Ontario reactors has risen from $800 million to $2.5 billion in a project that is years behind schedule. Natural gas was regarded as a less

polluting fossil fuel option a few years ago, but there are now uncertainties about supply and future price volatility.

Further, all of these sources of supply share a fundamental weakness. The construction of high-cost power generators and new high-voltage transmission lines provides a strong incentive to perpetually expand the electricity market to recuperate costs, eventually leading back towards system overload.

Bright Future addresses the issue of electricity supply by considering the large and growing range of profitable opportunities to reduce demand. Experience in California and other jurisdictions shows that helping consumers and industry to reduce demand for electricity is a cost-effective, environmentally friendly and viable way to restrain energy costs and achieve security of supply. California's record shows that the average cost of reducing demand by one kilowatt-hour (kWh) is about 4.5 cents; to produce a kWh in Ontario costs more than 6 cents.

Figure 3: Ontario's Electricity Options



Source: The cost of electricity generation is taken from *The Ontario Wholesale Electricity Market: Year in Review 2002-2003*, (Independent Electricity Market Operator, 2003), page 4. Cost of saving energy is based on the cost of comparable programs in the United States and Canada (see endnote 44).

Bright Future compares Ontario with California for two reasons. First, California has a long record of leadership in energy efficiency, and has held per capita consumption of electric power roughly steady since the mid-1970s. For example, the state's energy-efficiency standards for appliances and buildings have helped Californians save more than $15.8 billion in electricity and natural gas costs.

Second, California experienced its own electricity squeeze in the summer of 2001, but managed to avert a full-blown crisis. Drawing on past experience, the state government and residents moved to reduce peak load demand by

between 3,200 and 5,600 megawatts (MW) over the summer months.[1] One-third of Californians cut their electricity use by 20 per cent to qualify for a 20 per cent rebate on their bill. State buildings reduced their energy consumption, older buildings were weatherized and new buildings were constructed to higher standards. Since 2001, the state government and consumers have continued to work successfully to contain demand.

In addition to saving electricity, California's conservation and efficiency efforts reduced greenhouse gas emissions by close to 8 million tonnes of carbon dioxide, and nitrogen oxide emissions by 2700 tonnes during 2001 and 2002.[2] Electricity reductions of this scale are equal to the production from Ontario's largest coal-fired power plant, Nanticoke which produced 20.2 million tonnes of greenhouse gases, equivalent to the greenhouse gas output of six million new cars.

Some may protest that California and Ontario are not comparable cases because California is warmer in winter. In fact, both jurisdictions face the greatest strains on their electricity systems in mid-summer. Both have aging electrical infrastructure, and both are facing intense public debate about how to acquire new electricity supply without loading up the atmosphere with pollution and greenhouse gases. Both jurisdictions launched flawed deregulation projects in the late 1990s, with Ontario starting somewhat later; and both are re-thinking those schemes in light of their failure to provide energy security.

California now has a well-entrenched process for identifying and pursuing energy efficiency opportunities in the electrical system, and for developing new renewable sources of energy. The principles underlying the California government's approach include openness to public engagement, commitment to integrated resource planning, vigorous pursuit of renewable energy development and a strong belief in energy productivity.

Ontario can adopt the same principles, and begin a rapid transition to sustainable electricity use starting immediately. The government can facilitate this transition by implementing the following:

- Aggressive incentive programs to ease short term pressure on the system and reduce residential and small commercial customer load
- A comprehensive province-wide public education campaign to promote conservation and efficiency strategies
- Transparent, collaborative planning to rationalise energy investment and build public understanding of energy issues and choices
- Creation of an energy efficiency fund to support emerging energy efficiency technologies;
- Require investment by utilities in renewable energy technologies, to produce 10 per cent of total generating capacity in 2010 compared with 0.5 per cent today;

- Phasing out nuclear and coal-fired power plants

Bright Future shows that through planned, cost-effective energy efficiency measures, Ontario will be in a position to start phasing out its coal-fired plants, yielding significant clean air benefits and a large reduction in greenhouse gas emissions. The government should work with industry for the widespread adoption of proven, commercially available energy efficient technologies for lighting, heating, air conditioning and manufacturing and other functions. The trend to energy efficiency, already well established in the market, can be greatly accelerated through broad-based incentives for consumers and higher standards for manufacturers and builders.

The financial savings available from efficient systems are remarkable. From new lighting systems and 'smart' air conditioners to sophisticated industrial motors and boilers the vast range of efficiency options can reduce the use of electric power to the point that there is no need to invest in new conventional supply. Ontario and its industries can prosper by significantly and constantly reducing power requirements with no sacrifices in quality of life or comfort.

Ontarians are focused on the challenge and aware of the issues. They are concerned about the hazards related to conventional supply options. They have expressed support for successful energy-efficiency programs in their communities and for the development of renewable energy sources. Government is in a position to act now: it has knowledgeable people, many examples of successes in other jurisdictions, and a mandate from the public for change.

2.0 Ontario's Electrical System: A New Direction

A reliable supply of electric power is fundamental to the Ontario economy. Ontarians spend more than $12 billion per year to keep the electrical grid in operation.

For many years, Ontario's citizen-owned power system served the public well. The birth and development of Ontario Hydro is still regarded as a crowning achievement for the province. In the past quarter century, however, the outlook has changed dramatically. Demand for electricity continues to grow largely unabated and society is divided on how to generate new power. Air pollution, the unresolved issue of nuclear waste disposal, massive cost overruns on nuclear plant construction and retrofits, power shortages and most recently the massive blackout of 2003 have shaken the public's faith in the current electricity system.[3]

The province faces a dilemma: there is justifiable resistance to building new power plants, but also widespread anxiety about constant electricity shortages. Supply shortages are a threat to economic activity and business confidence, not to mention public health and safety. In most cases, utilities can fill the gap with high-priced power from the spot market, but in rare instances the power system simply fails. The recent blackout of August 2003 vividly illustrates the severe consequences of a loss of power. Although a thorough calculation has not yet been finalized, both the Premier and financial analysts have recently estimated the direct damage to the Ontario economy from the blackout at about $1 billion.

Ontario's political parties and public interest groups agree that the system for electric power production and distribution needs to be fundamentally re-oriented. A key answer lies in the organized, consistent reduction of energy use and a shift to cleaner sources of energy. These viable measures promise numerous benefits, including:

- A more decentralized power system that is less vulnerable to failures;
- Lower total investment in the electrical system, because efficiency strategies cost less than building new capacity;
- Reduced peak demand energy use;
- A transparent electric resource planning system that the public can understand and support;
- Cleaner air;
- A reduction in greenhouse gas emissions; and,
- New jobs for Ontarians in energy efficiency design and retrofitting.

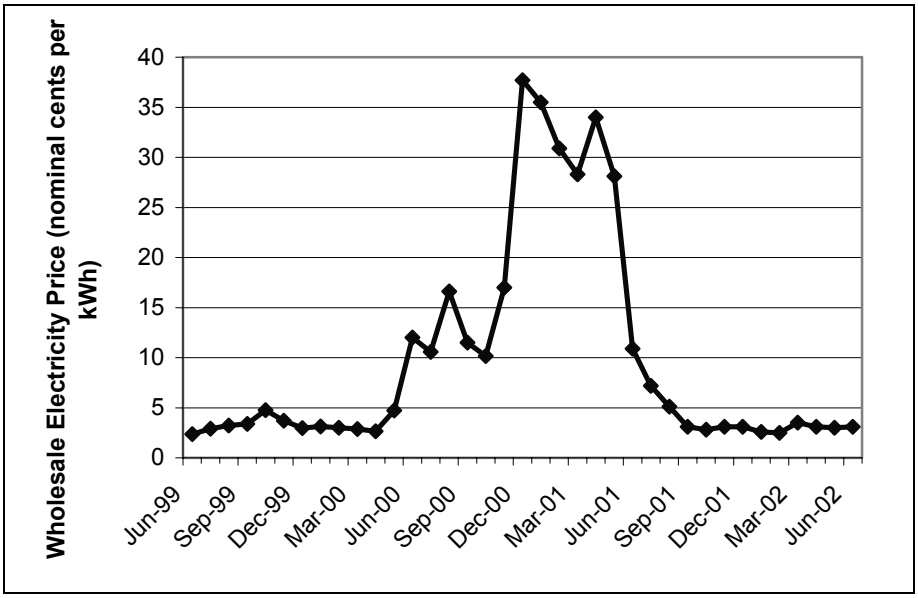
The key first step in achieving these benefits will be to redirect the resources and creativity traditionally devoted to large-scale, centralized power generation towards investing in smarter, more cost-effective energy efficiency technologies at the industrial, commercial, and residential level.

Many of these technologies are already proven and commercially available, from lighting and air conditioning to industrial fans and motors. Several of these options are described in the 2002 report, *Kyoto and Beyond*, from the David Suzuki Foundation and the Climate Action Network. A summary and the full *Kyoto and Beyond* report are available in the "Climate Change" area of the David Suzuki Foundation web site at www.davidsuzuki.org

2.1 Learning from California

To prepare for the coming transition, Ontario can learn from other jurisdictions. California, for example, was a world leader in energy efficiency and renewables for decades. In the 1990s, unfortunately, the state government launched a flawed deregulation of the electricity system. Imperfections in the deregulation program contributed to a major power squeeze in 2001, with rolling blackouts and a severe spike in prices due partially to market manipulations by power marketers and independent generators.[4]

Figure 4: California Wholesale Spot Market Electricity Prices



Source: Bachrach, D. Ardema, M., Leupp, A. (2003). *Energy Efficiency Leadership in California: Preventing the Next Crisis.* San Francisco: Natural Resources Defense Council, p.2[5]

California's Electricity Squeeze[5]

The episode that stimulated California's aggressive conservation efforts started in late 2000, after skyrocketing wholesale electricity prices precipitated financial crises at California's largest utilities. A combination of factors contributed to the high electricity prices: a sharp rise in natural gas prices, low hydropower supplies in the Northwest, and market manipulations.

The political fallout from the 2001 crisis in California is still with us. However, examination shows that the state and consumers responded quickly to the problem, and the damage, while significant, was less serious than it could have been. Since 2001, the state's energy system has recovered, partly because utilities are responsible once again, as they were until the late 1990s, for making long-term investments in system maintenance, efficiency and renewables. There were no rolling blackouts in 2002 or 2003. Utilities did not have to make spot market purchases at exorbitant prices. Total power consumption has fallen significantly, and much of this decrease is "locked in" through energy efficiency improvements in industrial, commercial and residential buildings and equipment.

California has returned to the leadership role that has allowed it to hold per capita energy consumption steady since the mid 1970s while consumption in the U.S. as a whole rose by 50 per cent. By comparison, Ontario's per capita electricity consumption has risen by 33 per cent since 1970. [6]

2.2 Applying Efficiency Strategies in Ontario

Ontario has historically focused mostly on building new capacity rather than aggressively seeking energy efficiencies. This focus has caused significant problems, but it also presents a great opportunity: the province is primed to take giant steps in improving its energy efficiency. The experience of other jurisdictions such as California will be helpful in designing and implementing versatile alternatives.

To stabilize the energy situation for 2003 and 2004, the Ontario government should implement the following:

- An interim incentive program to achieve load reductions among residential and small commercial customers in synergy with related federal initiatives; and,
- A comprehensive province-wide public education campaign focused on conservation and efficiency strategies.

For the longer term, to establish energy efficiency as the solution to demand pressure, and to expand the use of clean energy sources, we recommend that the provincial government establish:

- A more transparent public planning process for making collaborative decisions on the future of Ontario's electricity system.
- An energy efficiency fund**,** supported by a "public benefits charge" of 0.3 cents per kWh on electricity, equivalent to about $2.20 per month for a typical household. The fund would be used to develop and deliver programs to increase energy efficiency, support research and development, and extend energy efficiency opportunities to low-income customers, with a target of reducing provincial energy consumption by four per cent per year.
- A standards program regularly updated to ensure that existing buildings, electric appliances and electronic devices are replaced by equipment with the highest energy efficiency standards.
- A renewable portfolio standard requiring utilities to increase energy production from renewable energy sources from about 0.5 percent of total capacity today to a minimum of 10 percent by 2010 and 20 percent by 2020.

We also recommend, for reasons that are presented in detail below, that Ontario should begin to phase out its coal-fired electrical generating stations as soon as energy efficiency gains permit.

2.3 Electric Power and Ontario's Environmental Account

The first of the four key recommendations listed above is for a new, more transparent energy planning process for Ontario. This is intended, in part, to put all potential sources of energy supply on an equal footing, also to reduce the role of short-term politically motivated decisions and to diversify the portfolio as a risk mitigation strategy.[7]

In a decision-making system based on full, integrated, open accounting, *energy efficiency* would emerge as a primary energy source. Since at least 1975, progress in energy efficiency in Canada has generated more energy benefits than all other new sources of energy combined.[8]

An integrated accounting system would also give full weight to *economic costs and benefits related to the environment*. The electricity sector is currently a major source of smog and greenhouse gases, and this is a key factor in its unpopularity. Energy alternatives that reduce consumption, along with renewable energy sources (such as wind power) are technically feasible and economically competitive; their proliferation will reduce pollution; they will create good local

jobs and business opportunities across the country; they will insulate consumers against energy price swings; and they will increase the stability and reliability of the electricity system.

Switching to cleaner sources of electricity will help Ontario meet its energy needs in an affordable way, and also help the province and Canada to meet environmental commitments on acid rain, smog and climate change.

Smog and Coal

Air pollution in Ontario is so serious that the Ontario Medical Association (OMA) has declared it a "public health crisis." According to a 2000 report, the OMA estimates that approximately 2,000 Ontario residents die prematurely from smog each year.[9] Ontario hospitals spent over $640 million treating the victims of air pollution in 2002, while employers lost over $570 million in productivity due to illnesses caused by air pollution. According to the OMA, if we include the costs of premature mortality, pain, and suffering, smog costs Ontario over $10 billion per year.[10]

Ontario's coal-fired electrical generating plants are a major contributor to air pollution. They produce 15 per cent of Ontario's nitrogen oxide emissions and 24 per cent of sulphur dioxide emissions, both major sources of smog and acid rain. The coal-fired plants also produce 23 per cent of the provincial emissions of mercury, a neurotoxin that bio-accumulates in the food system. Mercury is responsible for 99 percent of the sport fish consumption limits in inland lakes in Ontario and other provinces, and hence has a major impact on First Nations communities and tourism.[11]

The U.S. and Canadian governments took a significant step in addressing the health impacts of air pollution by agreeing in December 2000 on the "Canada-U.S. Ozone Annex" to the 1991 Canada-US Air Quality Agreement. Under the terms of this 'smog treaty,' Ontario must limit its emissions of nitrogen oxides from electricity plants in the southern part of the province to 39 kilotonnes per year by 2007. This represents a 50 per cent reduction from 1998 levels.

In response, Ontario Power Generation has spent a quarter of a billion dollars installing catalytic reduction emission controls at the Nanticoke and Lambton coal-fired plants. Even with this major investment, the plants will still not meet the requirements of the Ozone Annex, and emissions of other pollutants such as greenhouse gases will actually increase. In fact, the emission-control investment has diverted resources from more permanent, healthier, and more environmentally sustainable alternatives.[12] Instead of implementing costly pollution controls, Ontario should invest in pollution prevention and phase out its coal-fired plants.

The province is proposing to reduce its nitrogen oxide emissions and sulphur dioxide emissions by 45 and 50 per cent respectively, and mercury emissions by 90 per cent, by 2010.[13-14] A coal phase-out, achieved as a result of improved

energy efficiency and more renewable sources, would provide Ontario with a large proportion of the reductions needed to achieve these goals.

Climate Change and Coal

Human activities, primarily the burning of coal, oil and gas to produce electricity and to power automobiles, homes and factories, are changing the climate. Burning these fuels emits greenhouse gases (principally carbon dioxide), which blanket the planet and trap heat. The resulting rise in temperature, if unchecked, will bring floods and droughts to the Great Lakes region, reduce lake levels and lake ice cover, and provoke extreme weather events. It will also magnify existing health and environmental problems such as smog.[15]

In 2002, Canada recognized the severity of the climate change threat when the federal government ratified the Kyoto Protocol, an international agreement that commits Canada to reducing its emissions of greenhouse gases to 6 per cent below 1990 levels. Which is 25 per cent below today's levels. By 2001, Ontario's greenhouse gas emissions were 11 per cent higher than 1990[16] and, if current trends continue, Ontario's greenhouse gas emission levels will be 16 per cent higher in 2010.[17]

Currently, five coal-fired generating stations provide a quarter of Ontario's electrical generating capacity and produce 18 per cent of the province's greenhouse gases.[18] These heavily polluting plants are typically used to provide peak-hour service only. A general reduction in energy use would allow system managers to decommission them altogether. This would achieve the bulk of reductions needed to meet Ontario's portion of Canada's Kyoto target.[19]

Air pollution and greenhouse gas emission reductions are best pursued simultaneously rather than as stand-alone targets. The smart way to clean up our air and to put the brakes on climate change is to plan for a transition away from fossil fuels through a combination of enhanced energy efficiency, conservation and new renewable sources. In developing its plan, Ontario could learn from California's decades of experience in implementing energy efficiency programs.

3.0 Energy Efficiency in California

3.1 California's Approach

California has managed to stabilize per-capita electricity use since 1975. The state has done this through a combination of integrated resource planning, efficiency standards, customer incentives, strategies for public awareness, active marketing, and research and development.

California also provides a clear example on how to react quickly to avoid blackouts. In late 2000 and early 2001, California's deregulated wholesale power market suffered a price and supply upheaval, and on seven occasions in early 2001 the Independent System Operator was forced to impose rolling blackouts. The National Electric Reliability Council forecasted in May 2001 that the state would experience 260 hours of blackouts during the summer, at an economic cost of between US$2 billion and $20 billion.[20] However, through conservation and efficiency measures Californians avoided a potential catastrophe. Evidence shows that the significant factor in averting the crisis was not a mild summer or an economic slowdown, but a direct reduction in peak-hour electricity consumption ranging from 3,200 to 5,600 MW over the four summer months of 2001.

Furthermore, the conservation efforts of 2001 and 2002 reduced greenhouse gas emissions by close to 8 million tonnes of carbon dioxide and 2,700 tonnes of smog-forming nitrogen oxides relative to 2000.[21]

California was able to achieve these large reductions quickly because the state had worked since the 1970s to develop public education and policy initiatives that raised awareness and fostered an infrastructure of contractors, energy service companies, vendors and retailers.

In summer 2001, California relied on this infrastructure to enhance efficiency and significantly reduce demand through:

20/20

The 20/20 Rebate Program was one of the key strategies implemented by California to avoid rolling blackouts.

The program provided a 20 per cent discount on power bills for customers of private utilities who reduced their summer electricity use by 20 per cent compared to the same month in the previous year.

State-wide, the program provided $286 million in rebates that helped achieve power use reductions totalling 5,258 GWh.

Source: Goldman et al. (2002). [1]

- Increased funding for the utilities' energy efficiency programs;

- Targeted peak reduction;
- The "20/20" rebate program; and,
- A state-wide campaign of public awareness ("Flex your Power") to encourage conservation and efficiency.

At the time the energy squeeze began, the state had energy efficiency programs and personnel in place, and could rapidly and effectively increase its funding for conservation and efficiency. When crisis loomed, Californians were able to reduce their electricity usage by 7.5 per cent and average monthly peak demand by 10.4 per cent during summer 2001.[22] Customer load reductions were achieved mostly through an innovative rebate program, supported by information strategies sponsored by the state and the media. This campaign of public education changed both customer behaviour and the management of energy use in business and industry. The resulting dip in consumption saved Californians an estimated US$660 million in spot market electricity purchases, and helped to avert the threat of economic disaster due to rolling blackouts.

Since 2001, California's system for implementing energy efficiency and increasing the use of clean energy sources has been greatly expanded. Among its key features are:

- A return to transparent public planning to ensure cost-effective energy investment;
- A state fund, supported by a levy on utility bills, for investment in cost-effective energy efficiency, which has been greatly expanded;
- Accelerated adoption of standards designed to remove low-efficiency products (e.g. motors, home appliances, plug load equipment) from the market;
- The integration of energy efficiency into the utilities' electric-resource portfolios, so investments for energy efficiency are considered side-by-side with power plant investments to meet customer needs;
- New revenue mechanisms to determine the utilities' fixed cost recovery, which ensure that utilities cannot profit by encouraging increases in electricity consumption, and similarly, that utilities are not financially harmed by energy saving investments; and,
- A requirement that utilities invest in the long-term development of renewable generating capacity and an accelerated Renewable Portfolio Standard target of 2010 instead of 2017.

3.2 Integrated Resource Planning

Priorities for investment in the California electrical system are determined through integrated resource planning (IRP). This process is intended to ensure that demand- and supply-side measures are identified, implemented and

evaluated by utilities in a consistent way, to provide energy services such as heating, cooling and lighting at the least total cost to society.

In the late 1980s and early 1990s, California prepared biennial resource plans based on integrated plans submitted by utilities. With electricity deregulation in the late 1990s, California abandoned IRP in favour of market approaches. In the aftermath of the 2001 crisis, the state reinstated IRP for investor-owned utilities (hereafter referred as privately-owned utilities). This policy reversal reflected the need for a reliable electric system and concern about the following issues:

- The pending retirement of approximately one third of the state's installed capacity;
- The need to maintain adequate reserve margins to prevent manipulation of the system to create false scarcities, and to meet summer peak demand;
- Concerns about over-dependence on natural gas for electricity generation; and,
- Uncertainty as to whether the private sector would invest in constructing new power generating plants in the state.

Key Characteristics of Integrated Resource Planning (IRP)

1. Explicit consideration of energy efficiency and load management as a resource alternative to building new power plants
2. Consideration of environmental costs of all electricity resource options.
3. Open, transparent public process with intervenor funding for public interest groups
4. Analysis of the uncertainties and risks posed by different resource portfolios and by external factors, for example, future natural gas price spiking
5. A mix of resources are owned by utilities, independent power producers and customers
6. Resource selection resides on a diverse set of criteria including economic development, environmental quality, fuel and technology diversity, risk mitigation, and electricity rates

Mandating Utility Support for Energy Efficiency

In October 2002, the California Public Utility Commission established a power procurement process based on the IRP framework. Through this action, the commission directed utilities to acquire new resources, whether through energy efficiency, renewable electricity generation or conventional generation. To comply, all privately-owned utilities must now present integrated resource plans that provide for substantial increases in energy efficiency program funding, over and above the "public goods charge" (PGC), which is money collected under statute through utility bills. The commission established this process in recognition of the fact that running energy efficiency programs is cheaper than building new power plants in California.

In response, the largest utilities proposed in 2003 to increase medium-term spending on energy efficiency by 60 per cent over and above existing spending via the PGC Fund. For example, Pacific Gas & Electric intends to invest an additional $300 million in energy efficiency between 2004 and 2008, and Southern California Edison proposes to invest an additional $100 million in the same period.

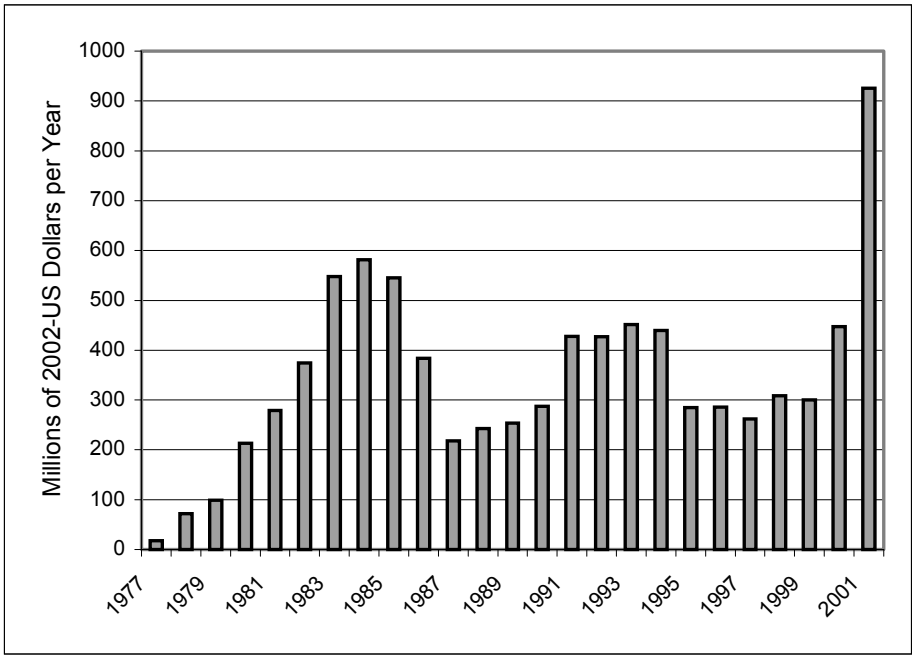
3.3 A Simple, Effective Strategy for Energy Efficiency

Since the mid-1970s, investments in energy efficiency programs and standards in California have provided enough energy savings to defer the construction of 20 large power plants.[23] The state's commitment to energy efficiency has its origins in the interruption of oil shipments from OPEC countries in 1973, which triggered sharp rises in electricity rates. The rate increases jolted consumers, who had grown accustomed to low and falling energy bills. In the late 1970s, the Public Utilities Commission ordered utilities to establish energy efficiency programs in response to customer complaints about high electricity bills.

Through the 1980s, California's energy conservation efforts achieved a critical mass under a new umbrella label: demand-side management. Utilities refined the use of practical measures such as incentives, training, low-interest loans and rebates, and reported significant reductions in the demand for electricity among those who took advantage of the programs. The system continued to deliver high quality energy services for heating, cooling, and lighting, while deferring the costly construction of new power plants.

As demand-side management grew in popularity, California's spending on energy efficiency grew from about $200 million in 1980 to a peak of almost $600 million in 1984. A decline in oil and gas prices in 1985 triggered a downturn in program activity, and funding consistently decreased until 1987. The Public Utilities Commission intervened, breaking the link between the utilities' revenues and the volume of electricity sold. The Commission removed the disincentive to invest in energy efficiency by authorizing utilities to collect ratepayer funds to buy what was now understood as conservation resources. Utilities once again found energy efficiency programs profitable: their funding for programs rose to close to $500 million a year in the early 1990s, and once again the construction of new capacity was deferred. But as utilities readied themselves for a competitive electricity market under California's proposed deregulation, they slashed their energy efficiency program budgets between 1995 and 1997. And again, the state government intervened.

Figure 5: Funding for Energy Efficiency in California



Source: Bachrach, D. Ardema, M., Leupp, A. (2003). *Energy Efficiency Leadership in California: Preventing the Next Crisis.* San Francisco: Natural Resources Defence Council, p.10[17]

The Public Goods Charge (PGC) Fund

The Public Goods Charge (PGC) Fund was established under Assembly Bill 1890 in 1996. The Fund draws from a surcharge on electricity and natural gas consumption, and generates approximately US$275 million per year for energy efficiency programs. The electric and gas utilities collect these revenues from customers. The Public Goods Charge Fund is currently scheduled to operate until 2011. The programs it funds are administered and implemented by California's three largest private utilities, with regulatory oversight by the California Public Utilities Commission.

Resources are also available for community-based organizations, local governments and private sector firms to implement non-utility programs.

The PGC Fund is the cornerstone of California's energy efficiency infrastructure. The Fund supports permanent programs and staff, codes and standards development, marketing programs, and research and development in energy efficiency. California's strategy is simple and effective. The state's financial incentives leverage changes in consumer behaviour by increasing the market share and lowering the price of high-quality, off-the-shelf energy efficiency technologies. As these technologies gain market share, they are incorporated into the state's codes and standards.

Public Interest Energy Research (PIER)

PIER is a $62 million annual fund administered by the California Energy Commission to support research and development by the private sector and universities and bring new energy services, technologies and products to the marketplace. PIER is a key catalyst for the next generation of sustainable energy technologies. It works in the following program areas:

- Energy Innovations Small Grant
- Residential and Non-Residential Buildings End-Use Energy
- Industrial/Agricultural/Water End-Use Energy Efficiency
- Renewable Energy Technologies
- Environmentally-Preferred Advanced Generation

PIER: www.energy.ca.gov/pier

The research and development program, known as 'PIER', supports the development of advanced and emerging technologies, which are then amplified in the marketplace by the state-wide programs.

By pursuing efficiency strategies, California's energy programs since 1975 have generated over 10,000 MW of peak demand reduction, the equivalent of 20 large power plants.[24] Currently, California's energy efficiency fund is building a new "conservation power plant" every year. The forecast for 2004/05 calls for an investment of almost $550 million from the PGC Fund.[25]

Table 1: California's Energy Efficiency Program Portfolio

For Existing Homes: Single Family Rebates Appliance Rebates Appliance Early Retirement/Recycling Multifamily Rebates	**For Existing Commercial Buildings:** Express Efficiency (rebates for small business) Standard Performance Contracting Energy Audits Building Operator Training and Certification
For New Construction: EnergyStar New Homes Savings by Design (commercial buildings)	**For Industry, Governments and Communities:** Information, Education and Training Emerging Technologies Codes and Standards Development

Codes and Standards - Locking in Energy Efficiency Cheaply and Permanently

- *Appliance Standards.* California's first appliance efficiency standards were enacted in 1974 through the State Energy Resources and Conservation Act. This 'first generation' of regulations set minimum performance standards

for the sale of new appliances such as refrigerators, freezers, and air conditioners.[26] As energy efficiency programs increase the market share of more efficient appliances, the minimum standards are raised, locking efficiency gains into California's economy at very low cost.[27]

In response to power shortages in the summer of 2000, the California Energy Commission was directed by the state legislature to adopt new and revised efficiency standards for 20 appliances, some of which were not within the scope of existing federal or state regulations.[28] The latest generation of California appliance standards came into effect in April 2003.[29]

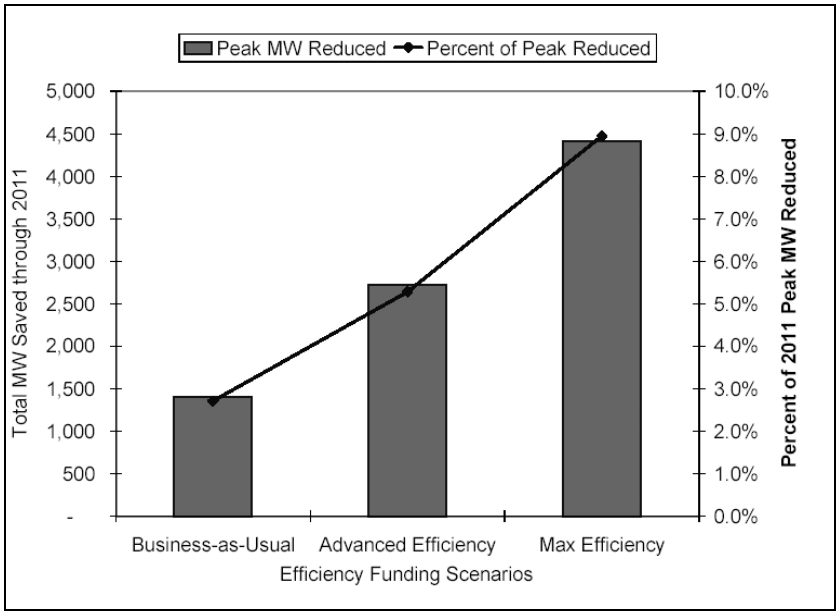
- *Building Standards.* The Energy Efficiency Standards for Residential and Non-residential Buildings, known as Title 24, were established in 1978 under a legislative mandate to reduce California's energy consumption. The standards are updated periodically to incorporate new energy efficiency technologies and methods. The California Energy Commission adopted new standards in 2001, as mandated by Assembly Bill 970, to reduce electricity demand during the height of the electricity crisis.

  Since energy-related codes and building standards came into effect in California, they have reduced peak demand in California by an estimated 6000 MW, equivalent to 12 large power plants.[30] The new standards that came into effect in June 2001 are expected to reduce demand by an additional 300 MW per year. New building codes due to come into effect in January 2005 will reduce demand even further and additional codes and standards are planned for 2007.

3.4 The Outlook for Energy Efficiency in California

It might seem that after more than 25 years in the business of energy efficiency, California might be running out of options. In fact, with the performance of energy efficiency technologies continuing to improve and costs falling, there are more opportunities all the time. A recent study, *California's Secret Energy Surplus: The Potential for Energy Efficiency*, shows that a doubling of existing spending on energy efficiency programs will capture another 3,500 MW of demand savings over a decade, equivalent to seven large conventional power plants.[31] The net benefits to the state, after subtracting the financial cost, are calculated at close to $8.6 billion.

Figure 6: Potential Efficiency Gains for California under Different Funding Scenarios



Source: Rufo, M. and F. Coito. (2002). *California's Secret Energy Surplus: The Potential for Energy Efficiency* [32]

3.5 Saving Money and Protecting the Environment

Throughout California's long experience, political leaders, business people and homeowners have come to realize that investments in energy efficiency can:

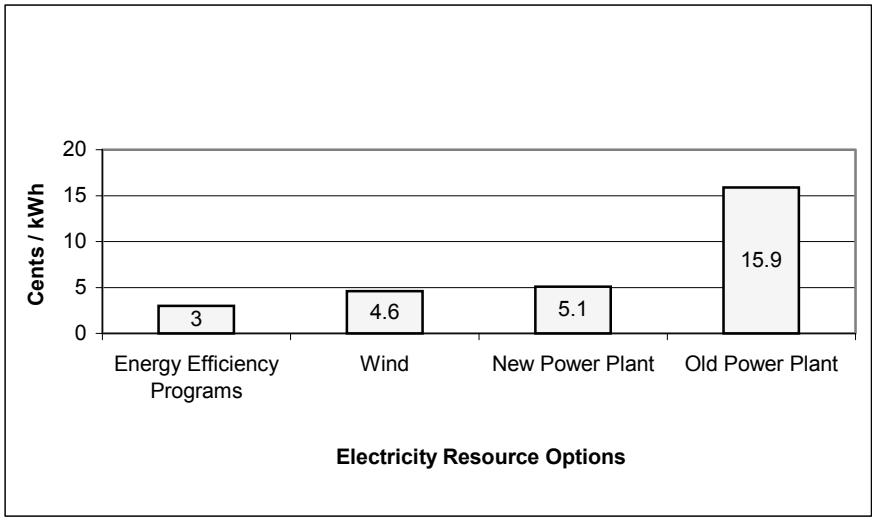
- Defer construction of new power plants and save ratepayers money;
- Reduce energy bills for those who participate in programs, and create more disposable income to re-invest in the economy; and,
- Reduce smog and greenhouse gas emissions.

In fact, Californians have such confidence in energy efficiency to reduce the load that the state turned to energy efficiency as one of its main tools to address the electricity crisis in 2001.[33] During the crisis, California was able to re-activate longstanding programs and ramp up its energy efficiency performance. As it continues to reform its electrical system, the state enjoys these advantages:

- A solid foundation of policies, agencies, programs, staff and contractors that can leverage increasing energy savings as funding is increased.
- An integrated strategy of incentive programs, efficiency standards and research and development that drives the increasing availability of energy efficiency technologies.

- Significant funding for public awareness, education and outreach strategies as well as industry training.

Figure 7: Costs of Generation versus Efficiency in California



Source: Energy Efficiency Programs. Global Energy Partners. *California Summer Study of 2001 Energy Efficiency Programs*, (Southern California Edison and The California Measurement Advisory Council, March 2003). Available at www.calmac.org.
Wind, Gas Combined Cycle, Combustion Turbine data from: California Energy Commission. *Comparative Cost of California Central Station Electricity Generation Technologies*, (California Energy Commission, August 2003) www.energy.ca.gov/energypolicy/documents/index.html

3.6 Building Renewable Energy into California's Electricity System

The windmills of California's Altamont Pass, constructed in the early 1980s, became a powerful global symbol of the potential for clean, renewable energy. However, with the high cost of the renewable prototypes, and then the advent of electricity deregulation, investors reduced their participation in renewables in California during the 1990s. Because of energy policy actions in other states, California started to lag behind Texas, Oregon, and New York.

The electricity squeeze of 2001 changed all this. In the aftermath, California policy makers and regulators realized that they had to go beyond green power marketing – that is, relying on consumers to pay a premium to support 'exotic' sources of power – if they wanted to spur renewable energy development. In particular, energy policy makers worried about California's growing

dependence on natural gas-fired electricity generation in an uncertain gas market. As a result, California decided to catch up to other states by setting renewable energy portfolio standards for utilities.

The Renewable Energy Portfolio Standard (RPS)

Signed into law in October 2002, California's Senate Bill 1078 mandated a 20 per cent minimum renewable energy content by 2017 for all private retail sellers of electricity.[34] The recently approved *Energy Action Plan* adopted in June 2003 accelerates the target to 2010. To meet this goal, California will build 600 MW of renewable capacity per year until 2010.[35] Most new capacity is expected to come from wind power, geothermal power and landfill gas.

As this initiative moves forward, California will gain better air quality and reduced dependence on natural gas, as well as employment benefits. A recent study estimates that full realization of the RPS goals will create 119,000 person-years of employment for Californians through 2017.[36]

Smaller-Scale Technologies and the Emerging Renewable Energy Program (ERP)

In February 2003, the California Energy Commission re-launched its former program for small-scale renewable energy systems, which had existed since 1998. The new Emerging Renewables Program (ERP) offers about $118 million for consumer rebates in its first year. The program focuses on small-scale systems (the bulk must be 10 kW or less, with a smaller proportion at less than 100 kW). The technologies approved for the program are designed to generate power in individual buildings and homes – photovoltaic (PV) systems, solar thermal electric systems, fuel cell technologies that utilize renewable fuels, and small wind systems.[37]

The goal of this initiative is to reduce the net cost of on-site renewable generation to consumers, and thereby stimulate increased sales of such systems. This will encourage manufacturers, sellers and installers to expand operations, improve distribution and reduce unit costs. Over 5,500 systems totaling about 21 MW of capacity have already been installed in residential and commercial sites, and 2,000 systems totaling 9 MW are currently under development.[38] The success of this program depends on the requirement that utilities purchase surplus power from small-scale renewable generators through a "net metering" policy. Such customer-based generation allows the benefits of distributed generation to become a reality.

As these figures indicate, California is making a major public investment in small-scale renewable systems in order to bring retail costs down and put these practical, valuable technologies into general use.

3.7 Successful Public Engagement

California enjoys many advantages in applying energy efficiency and renewable energy innovations, including a strong knowledge base and a solid infrastructure of programs and legislation.

An additional and sometimes overlooked strength is the ability of state agencies to communicate complex ideas to the public. This became clear during the electricity crisis of 2001.

Through a public campaign titled "*Flex your Power,*" and with the help of mass media outlets, the state successfully convinced residents of the urgency of conservation and efficiency initiatives and provided direction on where to get further information.[39]

Flex your Power included radio and TV ads, a web site, a multilingual toll-free line, direct mail, and co-ordination with community and consumer groups.

The campaign lasted two years (in 2001and 2002) and, in conjunction with the 20/20 initiative, and existing efficiency programs and infrastructure, is credited with achieving the peak load reductions that helped avert rolling blackouts in the summer of 2001.

4.0 Investing in Permanent Energy Savings for Ontario

4.1 Planning in the Public Interest

Canadian governments and utilities have been working with consumers for more than two decades to save energy. Through the 1980s and early 1990s, officials at Ontario Hydro gained considerable experience with integrated resource planning, partly in response to long-term public discontent with the development of the provincial nuclear energy program.

Many of these activities were set aside in Ontario during the period of deregulation and government downsizing in the middle and late 1990s. Still in the sudden absence of formal co-ordination or any significant demand-side management plans, and in the face of market and non-market barriers, the strong momentum of earlier initiatives continued to facilitate energy productivity improvements in Ontario during the 1990s.

Today, initiatives such as Green$aver are still in operation, and in collaboration with other members of the Green Communities Association, they provide home energy efficiency assessments and retrofit services across Ontario. The City of Toronto has implemented the Better Buildings Partnership and also has an energy efficiency department designed in part to promote the reduction of greenhouse gas emissions.[40] Other local governments, such as Sudbury, have active and wide-ranging programs aimed at reducing energy costs at city hall and in the community.

In short, Ontario has the people and the tools to implement conservation and efficiency strategies. What is needed now is strong political commitment at the provincial level to ensure that these strategies become the status quo.

To be effective, this requires adequate long-term funding that recognizes efficiency as a viable technical option that provides significant social and environmental co-benefits. And as the experience of California illustrates, the implementation and adoption of funding programs and efficiency efforts must be mediated by effective province-wide public education initiatives.

Making the transition to efficient energy use will also require comprehensive planning. During the periods of deregulation in both California and Ontario, planning for the public good and for the environment was severely compromised. Because energy is treated solely as a commodity for daily trading in the open market, the incentive for prudent, sustainable long-term investment is reduced. To counter this effect, transparent long term planning

must occur. Planning is essential in a system where buildings, industrial plants and power stations are replaced in cycles measured in decades.

The transition to efficiency must remain flexible enough to attract and encourage entrepreneurs, so that contractors, energy services companies, vendors and retailers can test and implement a variety of energy efficiency initiatives and respond quickly to new breakthroughs.

Ontario needs a transparent process for electrical energy planning and regulation so that:

- System-wide efficiency becomes the top priority in allocating investment, rather than the limitless expansion of generating capacity;
- Buildings, appliances, equipment and processes that use electricity efficiently become the norm, and thereby improve the competitiveness of the economy through lower electricity bills and a cleaner environment;
- The provincial government, the Independent Market Operator, utilities, and the public make concerted efforts to foster a transition to a cleaner energy future, where efficiency innovations and distributed power from the sun, wind, and small-scale hydro replace massive, highly centralized coal plants and nuclear facilities; and,
- Ontarians have continued access to clean air, clean water, and sufficient, reliable and affordable electricity.

Ontario needs to implement a public integrated resource planning process where citizens, public interest groups and emerging industries have the right to participate in a meaningful way.

This could be accomplished through a re-vamped Ontario Energy Board that is able to make and enforce electric utility decisions. A strengthening of the Intervenor Funding Act is also imperative to ensure that public interest groups can effectively participate in this democratic process.

4.2 The Energy Efficiency Fund

Ontario needs the essential services that electricity provides – light, comfort, transportation, information, financial services and economic activity. Therefore, the goal of provincial energy policy should always be to help consumers meet their needs with increasing levels of comfort and declining energy consumption.

There are valuable public benefits in getting more service from each kilowatt: lower bills, cleaner air, less disruption to the climate and a reallocation of discretionary spending to other goods and services. To capture those benefits Ontario should introduce a "public benefits charge" as soon as possible to fund energy efficiency programs. This initiative would take the form of a modest per-kilowatt surcharge, to be deposited in a dedicated energy efficiency fund. The fund would invest in programs for energy efficiency, appropriate research and development, and support for energy efficiency retrofits in low-income households.

Currently, 23 U.S. states have a public benefits charge on electricity sales, generating over US$2 billion annually.[41] California's Public Benefits Charge Fund, as noted earlier, generates US$275 million per year. Currently, California's energy efficiency fund is building a new "conservation power plant" every year. The forecast for 2004/05 calls for an investment of almost $550 million from the PGC Fund.[42]

In Ontario, a 0.3 cents per kWh charge on electricity would cost the average

Efficiency Vermont is North America's first energy-efficiency utility, an entity dedicated to reducing electricity costs and increasing the capacity of the electricity system through efficiency. Established in 1999, it has implemented energy efficiency measures in 67,868 businesses and households throughout the state.

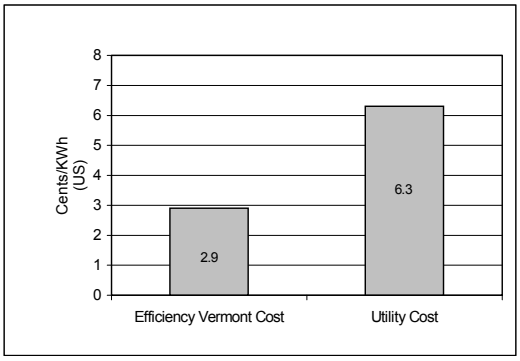
These measures include improvements in: lighting, refrigeration, cooking and laundry equipment, air conditioning, ventilation, switching space heat and hot water fuels, motors, design assistance, water conservation, transformers, LED exit lights, and LED traffic lights.

In 2002, Efficiency Vermont helped 32,311 electricity customers complete efficiency investments that resulted in 39,560 MWh of annual energy savings. This is the equivalent of the annual electricity consumption of 3,500 Ontario households, an impressive figure given that Vermont's population is only 5 per cent of Ontario's.

These savings cost ratepayers 53 per cent less than what utilities would have paid for this energy on the wholesale supply market. The benefit of these savings will continue for an average of 14.5 years, and save $26 million over the lifetime of these investments (this is over and above the $16.8 it cost to achieve these savings).

These investments have also eliminated 427,000 tonnes of greenhouse gas emissions that would have been generated from conventional energy sources.

Figure 8: *Cost of Meeting Vermont's Electricity Needs*



Source: www.efficiencyvermont.com

household $2.20 per month but would generate approximately $440 million annually.[43]

Investing this significant amount in energy efficiency could generate about 9,800 GW hours of reduction annually, equivalent to seven per cent of Ontario's annual demand, or three times the annual output of the Lakeview coal-fired plant.[44]

It should be emphasized that the payment of the public benefits charge would be an investment by consumers, to be recouped both through reduced energy use and the avoidance of debt payments associated with large power projects.

The proposed energy efficiency fund would mirror Ontario's Debt Reduction Charge program that was introduced in June 2001. The proceeds would be remitted to the Ontario Ministry of Finance and then passed to the fund administrator.

Energy efficiency fund programs must be designed to overcome the key obstacle that arises in utility-driven efficiency programs – that is, why should electricity sellers encourage their customers to save power? One way to avoid this conflict would be to administer the fund through a special-purpose provincial agency, similar to the system in Vermont. This single organization could realize economies of scale in managing program delivery or it could seek proposals for third-party delivery. A promising model for third party delivery of energy efficiency and related programs is through non-governmental and community-level organizations such as Canada's non-profit, community-based Green Communities Association.[45]

Another alternative would see a newly strengthened Ontario Energy Board administer the fund and create financial incentives for utilities to engage in efficiency programs, as was successfully done in California. It should be emphasized that some of Ontario's 92 utilities have the capacity to deliver large-scale energy efficiency programs, while smaller utilities might pool their resources to work with an outside service provider.

The energy efficiency fund would have three interlocking objectives: to promote research and development, to support the regular adoption of the highest standards for appliances and equipment, and to accelerate the widespread implementation of emerging technologies (because gains in market share quickly minimize production costs).

The modest energy efficiency charge (0.3 cents per kWh) added to each electricity bill in Ontario would be offset by reduced consumption, resulting in lower bills for consumers, a cleaner environment and new jobs in the energy efficiency sector. The fund would make a significant contribution towards achieving a 20 per cent reduction in electricity use in Ontario by 2010.

Electricity Subsidies: Investing in Inefficiency

Ontario opened the electricity market to competition on May 1, 2002. By November, public concern over high electricity prices led the Ontario government to cap the rate for consumers and small businesses at 4.3 cents per kWh (retroactive to May 1, 2002).[46] This rate freeze clearly provides no incentive for consumers to save electricity.

Furthermore, the price cap cannot reduce costs at Ontario's generating stations, and the retail price of electricity now sits well below the actual cost of production.

Since May 2002, electricity producers have been paid roughly 6 cents per kWh. The difference between the cost to consumers and the producer's price is currently subsidized by the Ontario Electricity Financial Corporation (OEFC), a public agency responsible for servicing and retiring the former Ontario Hydro's provincially guaranteed debt. The net cost of the price cap to Ontario taxpayers reached approximately $600 million in the first year.

In other words, Ontario is providing a $600 million annual power-production subsidy to utilities in addition to what consumers pay through their electricity bills. This sum is likely to rise as the utilities continue their efforts to patch up the nuclear plants and mitigate smog emissions from the coal plants. If similar amounts of money had been dedicated to energy efficiency programs, it could lead to a reduction in demand of over 13,000 GWh, which is equivalent to nine per cent of Ontario's 2001 electricity demand, or the combined output of the Atikokan, Lambton, and Thunder Bay coal-fired plants.[47] By redirecting financial incentives from power generation to efficiency and innovation, Ontario would break the cycle of perpetual rising electricity consumption and its associated environmental and health costs.

4.3 Permanent Energy Savings: New Codes and Standards

California's adoption of higher energy efficiency standards has reduced demand by 6,000 MW since the 1970s, and new standards are expected to save an additional 300 MW per year.[48] Ontario can dramatically reduce energy use and consumer power bills in the same way, by regularly updating its existing energy efficiency standards.

Appliance Standards

The Ontario government created the Energy Efficiency Act in 1987. The Act is currently undergoing its twelfth revision to add new products and raise standards. The improved efficiencies for appliances and consumer products resulting from the Act reduced carbon dioxide emissions by an estimated

500,000 tonnes in 1999, and its accumulated energy savings from its first 12 years of operation would be enough to power the cities of London and Windsor for one year.[49]

These standards do not, however, ensure that only the most efficient appliances are on the market. If the provincial government were to adopt the Energy Star standard as the minimum, new appliances would use between 10 and 50 per cent less energy than conventional ones. These new standards would lock in energy savings at a very low cost to government and guarantee lower energy bills for consumers.

Table 2: Comparisons Between Efficient and Conventional Appliances

Type of Appliance	Energy savings of an Energy Star-rated appliance over a conventional appliance	Cost savings relative to conventional appliance
Clothes washer	50%	$180 / year
Dishwasher	25%	$15 / year
Room air conditioner	10%	$45 / year
Dehumidifier	10 – 23%	$20 / year
Furnace	10%	Varies
Compact fluorescent light bulb	66%	$45 (over lifetime of bulb)

Source: www.energystar.gov

The Building Code

The Ontario Building Code was first adopted in 1975, and has been changed regularly since then. However, these changes have not always been for the better, as the provincial government weakened several of the energy efficiency requirements of the code under pressure from the home-building industry in 1996.

The federal government has created its own higher building code standards, but they are not a requirement for homebuilders. The R2000 standard for new homes was established in 1981 in order to develop ways of building homes that were comfortable and healthy to live in, but used less energy than conventional homes. Thousands of R2000 homes have been built and the standard has been regularly updated. Today, an R2000 home will use 10 to 30 per cent less energy than a conventional home.[50]

The C2000 program (for office buildings) is still in the pilot phase, but according to a study done for Natural Resources Canada, adopting this standard would result in a 35 to 50 per cent improvement in current energy

performance levels with only modest increases in design budgets. The combination of such an approach with other advanced technologies could have spectacular results.[51]

If Ontario were to adopt the R2000 standard for new homes, and the C2000 standard for commercial buildings, homes, offices and other buildings could be more comfortable while using less energy.

4.4 Getting Green Power On-line in Ontario

The implementation of a Renewable Portfolio Standard (RPS) for Ontario utilities would ensure that a growing percentage of electricity is produced from 'green power' – low impact renewable sources such as the wind, sun, run-of-the-river hydro and methane gas recapture. Under an RPS system, electricity providers would be required to include a minimum share of electricity from renewable sources in their electric power supply portfolio. This mandatory share would increase over time.

Currently, 12 U.S. states have legislated RPS and three others have "best efforts" targets.[52] The benefits of the RPS include reduced environmental impacts from electricity generation, reduced electrical system exposure to volatile fossil fuel prices, enhanced supply security and system flexibility, competition and innovation in the renewable energy sector, and reduced long-term costs for renewable technologies.

There is a political consensus in Ontario to move forward with a green energy standard for utilities. The government announced on July 3, 2003 that it intends to introduce legislation to establish a renewable portfolio standard of one per cent in 2006, with increases of one per cent per year up to a level of eight per cent by 2014. If implemented, these measures would add 3,000 MW of renewable energy generation to the system.

A more ambitious target of 10 per cent from green power and a 20 per cent reduction in energy use by 2010 through aggressive conservation and efficiency strategies would increase the reliability of Ontario's electricity system and make a significant contribution toward meeting Canada's Kyoto and clean air targets.

The achievement of these goals will require the addition of 12,200 GWh of new renewable energy generating capacity, or just over half of Ontario's estimated potential capacity – given current technology, and setting aside offshore wind development in the Great Lakes – plus a load reduction, via efficiency measures, averaging four per cent per year. As California, Vermont and other jurisdictions have shown, this reduction through efficiency will cost less than new conventional generating capacity.

Table 3: Ontario's Green Power Potential

Energy Source	Minimum Technical Potential (in MW)	Minimum Technical Potential (in GWh/year, rounded down)
Wind	7,500.0	19,700
Hydro	953.0	2,859
Biogas	70.6	600
Total	8,523.6	23,159

Source: Christine Elwell, Edan Rotenberg and Ralph Torrie, *Green Power Opportunities for Ontario*, (David Suzuki Foundation, CIELAP and the Toronto Renewable Energy Co-operative, 2002); the wind power potential has been updated based on the revised estimates in the *Ontario Wind Power Task Force Report: Industry Report and Recommendations* (Ontario Wind Power Task Force, 2002), p. 37-8 and includes only inland resources. The offshore wind potential in Lake Erie alone is estimated at 144,000 GWh/year, i.e. 98% of Ontario's 2001 electricity demand.

If energy efficiency and green power become policy priorities, Ontario could close its coal-fired plants by 2010 at the latest, and even earlier if other more environmentally-friendly sources are brought on-line. This would allow residents and industry to enjoy net gains in system reliability and clean air.

The implementation of energy efficiency strategies and a Renewable Portfolio Standard will require public understanding and support. Community-based green power projects, such as the Toronto Renewable Energy Cooperative's wind turbine built in collaboration with Toronto Hydro Energy Services near the Toronto waterfront, provide an excellent example on how to raise awareness among the public. To identify and implement a wider range of opportunities, the government should involve local organizations such as the

Ontario Sustainable Energy Association in the design and implementation of province-wide information campaigns.

The Ontario Sustainable Energy Association (OSEA) is a provincial non-profit association of local organizations who are developing sustainable energy projects in and for their communities. Some current projects of OSEA members include:

- The Toronto Renewable Energy Co-operative has built a 750 kW wind turbine at Exhibition Place in partnership with Toronto Hydro Energy Services, and is in the planning process of building a second wind turbine. This is the first generation project undertaken by Toronto Hydro and the first time a co-op and a publicly owned electricity company in Canada have joined forces for green power. The tower and the blades for the turbine were built in Ontario, demonstrating the province's potential to excel in this sector.

- In Kingston, Hearthmakers Energy Cooperative is playing a leadership role installing residential solar water heaters.
- In York Region, WindFall Eco-Works is completing a province wide inventory of potential micro-hydro sites.
- Hamilton's Positive Power Co-op is undertaking a wind resource assessment as the first step in building their own windmill.
- EcoPerth has mapped all of the homes in the city and found that 80% have good potential for solar hot water heaters.

4.5 The Lessons for Kyoto Implementation in Canada

Efficiency a Key National Strategy for Reducing Greenhouse Gas Emissions

By ratifying the Kyoto Protocol, Canada is committed to reducing its greenhouse gas emissions to levels six per cent below those of 1990, or 25 per cent below today's levels. According to Canada's national greenhouse gas inventory, this implies an emissions target of 570 Mt CO_2 /year[53] on average during the target period of 2008-2012.[54] Under current business-as-usual forecasts, emissions will grow to 810 Mt CO_2 by 2010.[55] This figure means that to fulfil our Kyoto obligations Canada must reduce its emissions by 240 Mt CO_2 from the business-as-usual scenario.

Power plants that use coal, oil, and natural gas to generate electricity emit about 111 Mt of CO_2 per year and are collectively the second largest greenhouse gas emitter in Canada (after the transportation sector).[56]

A study released in April 2003 indicates that fossil fuel electricity generation in general – and coal plants in particular – present most of the low cost mitigation options among Canada's large industrial emitters.[57] Furthermore, the study identifies efficiency gains (rather than fuel substitution) as the best option to achieve solid reductions of greenhouse gases, and to maximize environmental co-benefits (e.g. minimizing air pollution).[58]

Implementing the efficiency strategies set out in *Bright Future* will help Ontario significantly decrease its electricity load, and thereby enable the elimination of coal-generation. They also represent a unique opportunity to develop a large efficiency infrastructure of research & development specialists, contractors, retailers, energy services companies, and vendors. The development of this infrastructure will be of national importance for helping other provinces in efforts to reduce their dependency on fossil fuel electricity.

The climate-change-related energy-efficiency investments announced by the federal government in August 2003 are a step in the right direction.[59] The next logical step is to agree to energy efficiency as a key strategy for emission reduction initiatives at forthcoming meetings among the federal government and the provinces and territories.

A National Strategy for Renewable Energy

Energy efficiency implemented at a national-scale also represents an essential step to increase the share of renewable energy sources in Ontario and Canada. As overall energy use decreases, it will become easier to replace smaller demand loads with renewable resources instead of conventional sources of generation.

The transition towards a society characterized by efficiency and renewable energy has been examined in detail in the David Suzuki Foundation / Climate Action Network report *Kyoto and Beyond: The Low Emission Path to Innovation and Efficiency*.[60] This transition will require a concerted and significantly greater effort between the federal government, the provinces and territories.

The Renewable Portfolio Standard targets proposed here for Ontario will require a high level of support from the federal government to become a reality. Achieving these targets in Ontario will benefit the entire country in the form of lower greenhouse gas emissions and decreasing costs for renewable energy technologies (achievable through the large economies of scale available in Ontario).

Furthermore, the experience with Ontario's Renewable Portfolio Standard could become an example and a useful tool for the federal government in persuading other provinces and territories to adopt similar initiatives.

To facilitate a countrywide transition towards renewable energy, the federal government needs to significantly increase its funding commitment to renewable energy sources. An essential first step in that direction is to strengthen the Wind Power Production Incentive program and expand the scale and scope of eligibility of this initiative to other low-impact renewable sources.[61]

5.0 Summary and Conclusion

The Ontario government should undertake the following to avoid a long-term crisis in electrical energy supply and to reduce the risk of future blackouts:

- Announce the government's intention to move towards a 20 per cent reduction in province-wide electricity use by 2010.
- Create an interim incentive program to achieve near-term load reductions among residential and small commercial customers, in synergy with related federal initiatives.
- Implement a comprehensive province-wide public education campaign focused on conservation and efficiency strategies.
- Implement a transparent public planning process for making collaborative decisions on the future of Ontario's electricity system, to be administered by a restructured Ontario Energy Board.
- Create an energy efficiency fund, supported by a "public benefits charge" of 0.3 cents per kilowatt-hour (kWh) on electricity, equivalent to about $2.20 per month for a typical household. The fund would be used to develop and deliver programs to increase energy efficiency, support research and development, and extend energy efficiency opportunities to low-income customers, with a target of reducing provincial energy consumption by four per cent per year. The fund would be administered by an arms-length provincial agency.
- Create incentives for Ontario's 92 electric utilities to promote energy efficiency.
- Implement an effective standards program to ensure that existing buildings, electric appliances and electronic devices are replaced by equipment with the highest energy efficiency standards.
- Implement a renewable portfolio standard requiring utilities to increase energy production from renewable energy sources from about 0.5 per cent of total capacity today to a minimum of 10 per cent by 2010 and 20 percent by 2020. To capture the benefits of small-scale renewables utilities must be required to implement net metering policies.
- Seek federal support for Ontario energy efficiency initiatives that further the achievement of Canada's Kyoto objectives.
- Achieve consensus from the federal government and other provinces and territories that energy efficiency measures are the most cost-effective and viable path to achieving Canada's Kyoto target.
- Enlist federal support for Ontario initiatives as a way of achieving technological economies of scale that could benefit the other provinces and territories.

- Participate with the federal, provincial and territorial jurisdictions in developing and implementing an aggressive national renewable energy strategy.

Ontario will derive multiple benefits from the transition to electrical energy efficiency, including improved security of supply; greater system stability; reduced exposure to price volatility on both the electrical and fossil fuel markets; reduced per capita spending on the energy system; reduced emissions of air pollutants and greenhouse gases; and new jobs in businesses related to retrofitting and renewable energy.

The province is well positioned to begin this transition. Researchers and entrepreneurs are at work creating new technologies. Managers in local governments and large companies have gained confidence in the potential of efficiency-based approaches by saving millions of dollars through energy efficiency investments. Community-based groups and businesses are ready to take part in training, public education and energy audits. Professionals from the energy industry have valuable experience in energy planning and public engagement. In assembling this talent to build an efficiency-driven electrical system, Ontario will take a giant step towards the creation of a more reliable, more cost-effective and more environmentally beneficial electricity system.

Notes

1 Goldman, C., J. Eto, and G. Barbose. *California Customer Load Reductions during the Electricity Crisis: Did they Help to Keep the Lights On?* (Berkeley: E.O. Lawrence Berkeley National Laboratory, 2002) http://eetd.lbl.gov/ea/EMS/EMS_pubs.html

2 Bachrach, D., M. Ardema, and A. Leupp. *Energy Efficiency Leadership in California: Preventing the Next Crisis.* (San Francisco: Natural Resources Defense Council, 2002). The full report is available at www.nrdc.org/air/energy/eecal/eecal.pdf

3 For historical analyses of Ontario's electricity system, see: Daniels, R. (ed.) *Ontario Hydro at the Millennium: Has Monopoly's Moment Passed?* (Montreal and Kingston: McGill-Queen's University Press, 1996); Freeman, N., *The Politics of Power: Ontario Hydro and Its Government, 1906-1995*, (Toronto: University of Toronto Press, 1996); McKay, P., *Electric Empire: The inside story of Ontario Hydro*, (Toronto: Between the Lines, 1983); Nelles, H.V. *The politics of development: forests, mines & hydroelectric power in Ontario, 1849-1941*, (Toronto: Archon Books, 1974).

4 For more details see http://www.ucsusa.org/clean_energy/renewable_energy/page.cfm?pageID=68

5 The full report is available at www.nrdc.org/air/energy/eecal/eecal.pdf

6 According to the Independent Market Operator, Ontario's total end-use electricity demand in 2001 was 146.9 TWh www.theimo.com/imoweb/pubs/marketReports/10Year_ODF_2004jan_20030526.xls and according to Statistics Canada, Ontario's 2001 population was 11,894,900 www.statcan.ca/english/Pgdb/demo02.htm

7 In regulating utilities the usual method is to put the politics at arms length so that relevant goals are politically decided and then a Power Authority or a Utility Commission can operate to achieve these goals. This method removes day-to-day interference while allowing elected representatives to choose the overall goals. One way to do this is to enshrine the goals and the authority of the Commission in legislation. This forces debating and voting in parliament to make changes. (John Wilson, personal communication).

8 This is a reference to the overall ratio of GDP to consumption of all fuel and electricity and is therefore partly energy efficiency in the narrow sense and partly a structural change in the economy toward goods and services that require less energy per dollar of output. For more details see Torrie, R. (2003). *Phasing Out Nuclear Power in Canada: Toward Sustainable Electricity Futures*, (Campaign for a Nuclear Phaseout, July 2003), pp. 9-10. The full report is available at www.cnp.ca/resources

9 Ontario Medical Association, *The Illness Costs of Air Pollution in Ontario* (Toronto: OMA, 2000). The full report is available at www.oma.org/phealth/smogmain.htm

10 Ibid.

11 Ontario Ministry of the Environment, *Coal fired electricity generation in Ontario* (March 2001).

12 Chen, C., Biewald, B., and White, D., *A Clean Path to Ozone Annex Compliance: Phasing Out Ontario's Coal-Fired Power Plants*, (OntAIRio campaign, March 2003).

13 Ontario Ministry of the Environment, News Release, *Ontario Announces Bold Actions On Industry Emissions* (October 24, 2001).

14 Government of Canada and Government of Ontario, *Harmful Pollutants Annex to the Canada-Ontario Agreement: Respecting the Great Lakes Basin Ecosystem* (March 2002).

15 Kling, G.W., et al., *Confronting Climate Change in the Great Lakes Region: Impacts on our Communities and Ecosystems*, (Cambridge, Massachusetts: Union of Concerned Scientists and the Ecological Society of America, 2003).

16 Environment Canada's Greenhouse Gas Division data at www.ec.gc.ca/pdb/ghg/documents/tables/ontario_2001_e.pdf

17 *GHG Emissions by Province, 1990–2020*, Government of Canada. *Third National Report on Climate Change*, Figure 5.6 (Canada: Government of Canada, 2001). Available at: www.climatechange.gc.ca/english/3nr/3NR_Published_Version_EN.pdf

18 These figures are based on: *10 Year Outlook: An Assessment of the Adequacy of Generation and Transmission Facilities to Meet Future Electricity Needs in Ontario from January 2004 to December 2013*, (Independent Electricity Market Operator: March 31, 2003), p. 5; Olsen, Ken et al., *Canada's Greenhouse Gas Inventory 1990 – 2000*, (Environment Canada, June 2002), p. 119; and *Towards Sustainable Development: 2001 Progress Report* (Ontario Power Generation: 2002), p. 52.

19 Coal plant emissions in Ontario in 2000 were 37.6 megatonnes of carbon dioxide; total CO_2 emissions in the province were 207 megatonnes. Eliminating emissions from coal plants would leave 169.4 megatonnes from other sources, which is 6 percent lower than the province's 1990 emissions of 181 megatonnes.

20 Bachrach et al. op.cit 2, Goldman et al. op.cit. note 1

21 NRDC estimates that these carbon dioxide reductions are equivalent to taking 1.5 million passenger vehicles off the road for an entire year (Bachrach et al. 2003, op.cit. note 17)

22 These figures by the California Energy Commission are after making adjustments for temperature and economic growth see Goldman et al, pp. 23-24 op. cit. note 1

23 According to the California Energy Commission, utility energy efficiency programmes and state building and appliance standards have removed nearly 10,000 MW from California's peak electricity demand. See p.4 Bachrach et al. op.cit. note 2

24 Ibid.

25 California Energy Commission Interim Opinion, *Soliciting 2004-2005 Energy Efficiency Program Proposals and Addressing Scope of Proceeding* (August 1, 2003)

26 Kubo, T., H. Sachs, and S. Nadel, *Opportunities for New appliance and Equipment Efficiency Standards: Energy and Economic Savings Beyond Current Standards Programs*, (Washington, D.C.: American Council for an Energy Efficient Economy, 2001). Available at www.aceee.org/energy/eeassess.htm

27 Eilert, Patrick et al, *What's a Utility Codes and Standards Program Worth, Anyway?,* (Washington, D.C.: American Council for an Energy Efficient Economy, 2002). Available at www.aceee.org

28 Kubo et al. op.cit. note 26

29 For a detailed description of the latest standards see Appliance Efficiency Regulations at www.energy.ca.gov/appliances/documents/index.html

30 Rufo, M. and F. Coito. *California's Secret Energy Surplus: The Potential for Energy Efficiency*, page A-8 (Oakland, California: The Energy Foundation, 2002). The report is available at www.energyfoundation.org/documents/Secret_Surplus.pdf

31 Ibid.

32 Rufo and Coito, op.cit note 30, page ES-2

33 Goldman et al. (2002) op.cit. note 1

34 For more details see http://www.energy.ca.gov/portfolio/index.html

35 For details regarding the *Energy Action Plan* of the CPUC, CEC and CPA see www.energy.ca.gov/2003_energy_action_plan/index.html

36 Heavner, B., and B. Del Chiaro. *Renewable Energy and Jobs: Employment Impacts of Developing Markets in Renewables in California*, (Sacramento, California: Environment California Research and Policy Center, July 2003). Available in the "reports" section of www.environmentcalifornia.org

37 For more details see http://www.energy.ca.gov/renewables/emerging_renewables.html

38 Trenschel, D., Renewable *Energy Programs and Rebates* (2003). Presentation available at www.energy.ca.gov/renewables/emerging_renewables.html

39 For more details on the campaign see http://www.flexyourpower.com

40 For details about the Green Communities Association see www.gca.ca and for the Better Buildings Partnership and other initiatives see www.city.toronto.on.ca/wes/techservices/bbp/

41 American Council for an Energy Efficient Economy, *Summary Table of Public Benefit Programs and Electric Utility Restructuring*, updated May 2003, at www.aceee.org

42 California Energy Commission Interim Opinion, *Soliciting 2004-2005 Energy Efficiency Program Proposals and Addressing Scope of Proceeding* (August 1, 2003)

43 Calculation is based on total figures by the Independent Market Operator (IMO), according to the IMO, Ontario's total end-use electricity demand in 2001 was

146.9 TWh
www.theimo.com/imoweb/pubs/marketReports/10Year_ODF_2004jan_20030526.xls

44 Ontario's Independent Market Operator business as usual scenario anticipates a growth rate of one per cent per year. For details see *10 Year Outlook: An Assessment of the Adequacy of Generation and Transmission Facilities to Meet Future Electricity Needs in Ontario from January 2004 to December 2013*, (Toronto: Independent Electricity Market Operator: March 31, 2003), p. iii. The calculation assumes that reductions can be achieved at a cost of 4.5 cents per kilowatt-hour. This may be a conservative assumption, given that California (whose legacy of energy efficiency programs meant that they were already using 40 per cent less power per capita than the rest of the United States) has been achieving reductions at a cost of U.S. 3 cents per kWh (see notes 1 and 2). Similarly, a review of 40 demand side management programs undertaken in the U.S. commercial sector found that these programs saved energy at a cost of U.S. 3.2 cents per kilowatt hour. See Eto, J. et al., "Where Did the Money Go? The Cost and Performance of the Largest Commercial Sector DSM Programs", *The Energy Journal*, vol. 21, no. 2 (2000). BC Hydro, on the other hand, recently estimated that they could reduce demand by 5,800 gigawatt-hours at a cost of Cdn. 2.5 cents per kilowatt-hour. These electricity savings are equivalent to annual cost savings of $255 million. See *Conservation Potential Review* (Vancouver: BC Hydro, 2002). Available at: www.bchydro.com/info/reports/reports856.html

As stated earlier, this report promotes a reduction of electricity demand of four per cent per year and anticipates that some of the efficiency funds would be earmarked for research and development as well as low income support programs.

45 For more details see www.gca.ca

46 The cap was intended to be in place until 2006, although the havoc caused by the August 2003 blackout may force a rethinking of this approach.

47 This assumes a cost of 4.5 cents per kWh for reductions (see notes 43 and 44).

48 Rufo and Coito, op.cit. Note 30

49 Ontario Ministry of the Environment, *Media Backgrounder: Ontario's Actions on Air Pollution and Climate Change*, (October 5, 2000).

50 For more details see http://r2000.chba.ca/indexe.html

51 For more details see *C-2000 Program - Executive Summary: Achieving High Performance Through Better Technologies and Changes in the Design Process* at http://greenbuilding.ca/C2000/abc-2000.htm

52 See http://www.ucsusa.org/clean_energy/ for a list of the states and their RPS.

53 Emissions are reported on a carbon dioxide equivalent basis (i.e. all greenhouse gases have been converted to the equivalent of carbon dioxide based on the gases global warming potential, e.g. a tonne of methane equals 21 tonnes of carbon dioxide, a tonne of nitrous oxide equals 320 tonnes of carbon dioxide).

54 Government of Canada, op.cit. note 17

55 Government of Canada. *Climate Change Plan for Canada*, (Government of Canada, 2002). The report is available at www.climatechange.gc.ca/plan_for_canada/

56 Natural Resources Canada. *Canada's Emissions Outlook an Update*, (Analysis and Modelling Group, 1999). Available at: www.nrcan.gc.ca/es/ceo/update.htm

57 Firms engaged in fossil fuel electricity generation, fossil fuel generation and transportation, and manufacturing compose Canada's large industrial emitter sector.

58 Dunsky, P. and P. Henn, *Canadian Industry and Kyoto*, (Montreal: Helios Centre, 2003). www.helioscentre.org/downloads/papers/cahier_no2_April_2003.pdf

59 For more details see www.climatechange.gc.ca/english/publications/announcement/bg_budget.html

60 Available at www.davidsuzuki.org

61 For more information on the WPPI see www.canren.gc.ca/programs/index.asp?CaId=107