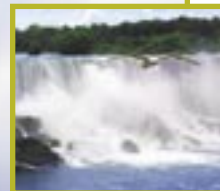


Put Some Energy Into a Smart, Green Strategy

THE GOVERNMENT OF ONTARIO HAS GIVEN SOME POSITIVE SIGNALS on the energy front: coal-powered plants are being phased out and the Premier has called for a culture of conservation. Ontario must take the next step on this path with a smart, green approach. Jurisdictions like California and Europe, which faced energy challenges earlier than Ontario, can point the way.

CRITICAL LONG-TERM DECISIONS ABOUT ONTARIO'S ENERGY FUTURE ARE BEING MADE RIGHT NOW. The time has come for Premier McGuinty and the Ontario Government to lead the way to a smart, green energy future without coal or nuclear power that will keep the lights on and protect Ontario's health, environment and economy.



Produced as a collaborative effort of WWF-Canada, Greenpeace Canada, Pembina Institute for Appropriate Development, Sierra Club of Canada, Ontario Clean Air Alliance, and the David Suzuki Foundation working together for a smart, green energy future for Ontario. For more information, visit wwf.ca





California has already built the equivalent of 12 ‘conservation power plants’ with energy efficiency investments, that has replaced the need for 12,000 MW of generation capacity (or almost 50 per cent of Ontario’s peak demand on a hot summer day). Renewable energy in California provides another 6,257 MW of capacity in 2005, or almost one-quarter of peak demand.

Smart and Green Is Practical

Accepting the Ontario Power Authority (OPA) recommendation would be a step in the opposite direction. Instead of yesterday’s approach of building more nuclear reactors, the Government of Ontario can direct the OPA to use a *conservation first*, California style, three-step energy hierarchy:

- First and foremost**, aggressive conservation to eliminate energy waste;
- Next**, rapidly deploy renewable energy supplies;
- Then**, use only the cleanest possible fossil fuels.

It’s not too late! A smart, green strategy is technically feasible, fiscally sound, realistic, and aligned with people’s concerns and interests. Ontario has more than enough conservation and power to keep the lights on without resorting to radioactive nuclear or dirty coal plants.

A Smart, Green Plan is Overdue

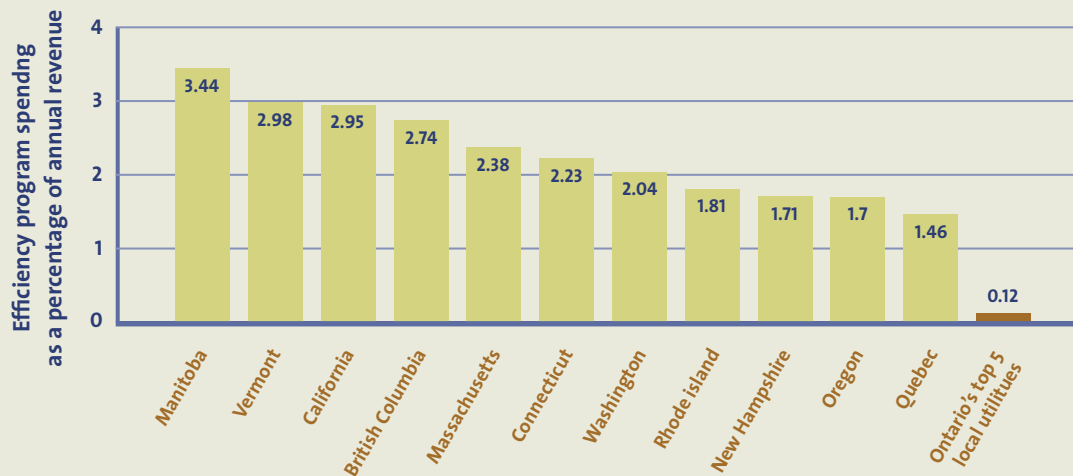
The government-appointed OPA has proposed a plan that would see electricity use growing 15 per cent by 2025, with new nuclear reactors providing half the total. Energy efficiency and conservation – the cheapest and cleanest ways to meet our energy needs – are virtually ignored; the OPA’s target of reducing the growth in electricity demand by only 1,800 MW over the next 20 years is unambitious by any standard.

Reject the OPA Plan

The OPA plan would repeat many of the mistakes that left Ontarian’s choking on a \$39 billion debt and toxic air pollution:

- While Ontario’s reactors were designed to operate for 40 years, Ontario Power Generation has admitted that even the best ones would need to be shut down or be rebuilt at a high cost after only 25 years.
- In Ontario, **one-fifth of the pollution that causes global warming** comes from electricity generating stations.
- Aging coal-fired generating stations are **the largest single sources of smog-causing pollution** in the province.
- The province’s three nuclear stations have created **30,000 tonnes of high-level radioactive waste that will have to be isolated for a million years**, and we still have no long-term disposal plan.
- The history of serious delays and cost overruns on nuclear generating facilities accounts for a large portion of the ‘stranded debt’ left by Ontario Hydro, and which show up on everyone’s bill at the rate of 0.7 cents/kWh. Nuclear performance has also been poor, with an average capacity factor in the 50 per cent range rather than the expected 85-90 per cent range.
- If the government subsidizes new reactors, taxpayers will foot the bill while still paying for old reactors that will soon be out of service.

Ontario lags behind in spending on energy efficiency



“It was the feeling of our experts that [the Power Authority’s conservation targets] are conservative. We think we can do better. Surely you could get 25 per cent or much more. We really want to roll up our sleeves and see how far we can go.” *Kim Allen, chief executive officer of Professional Engineers Ontario, Toronto Star, May 4, 2006.*

Aggressively pursuing energy conservation and renewable power is the only affordable way to keep the lights on.

Nuclear reactors take 10 to 12 years to build and many more years to pay for.

The world is on the verge of a profound shift in the way energy is produced and used. Will Ontario lag behind?

Ontario stands at a crossroads. The older coal and nuclear plants will have to be closed in the coming years, requiring that Ontario rebuild its electricity system. Past energy revolutions have brought an explosion of new profits, boosted productivity and improvements in human health. Investing in efficiency and new clean energy sources can make Ontario wealthier and healthier, too.

CLEAN COAL – NO SUCH THING

- Coal is the most carbon intensive fossil fuel, producing 70 per cent more CO₂ emissions for the same energy output as natural gas.
- So-called ‘clean coal’ programs cost hundreds of millions of dollars per year. However, while demonstration plants have shown the potential for reducing emissions of sulphur and nitrogen oxides, only very modest reductions in CO₂ emissions have been shown through higher power plant efficiencies.
- Proposals in Ontario to put scrubbers on our aging coal plants will only reduce a few of the dozens of pollutants from coal burning, while increasing the rest, including CO₂, as overall plant efficiency is reduced.¹



“The nuclear industry’s legacy of cost growth, technological problems, cumbersome political and regulatory oversight, and the newer risks brought about by competition and terrorism concerns may keep credit risk too high for even [federal legislation that provides loan guarantees] to overcome.” *Standard & Poor’s credit rating service*²

MORE NUCLEAR REACTORS: NOT SMART, NOT GREEN, NOT CLEAN. (no matter how many times and ways the letters are re-arranged)

- **Replacing fossil fuel-fired power stations with nuclear energy simply replaces one set of environmental problems with another.** Enormous amounts of radioactive wastes will require perpetual care (meaning that the risks and costs of current electricity consumption will be handed to generations far into the future) to prevent contamination of surface and groundwater, as well as radioactive emissions and other pollutants, while adding a unique set of accident, security, and weapons proliferation risks.
- **Investment in nuclear power gets in the way of going green.** Building reactors drains badly needed funds from energy efficiency and renewable energy programs, most of which have substantially lower specific greenhouse gas abatement costs than nuclear energy.
- **Nuclear is a base-load technology whose energy output cannot be adjusted.** It locks us into a highly centralized, inefficient power grid. So when energy savings are achieved and the growth in demand is reduced beyond the OPA’s 1,800 MW target, the OPA plan is to cut green power while the proposed nuclear plants would go ahead.
- **Nuclear energy only produces electricity, but we need a significant share of our energy in the form of heat (and cold).** In a nuclear supply scenario, if heat demand is covered by the usual fossil fuel fired boilers, nuclear power loses its greenhouse gas emissions advantage over highly efficient natural gas-fired cogeneration plants and has significantly higher emissions than renewable biomass-fired cogeneration plants.
- **Ontario must focus on reducing energy use, rather than on simply replacing current energy sources.** Real long-term solutions to problems like global warming will require us to reduce our demands on the environment.

Three Steps to a Smart, Green Energy Future

Not all energy can be switched to renewable sources overnight. However, the decisions made today can move Ontario step by step to a greener future.

Ontario should learn from the “least-cost approach” adopted by leading U.S. and European jurisdictions and adopt an “energy hierarchy”³ to prioritize where new energy resources come from.

Step 1: Stop wasting energy

Step 2: Use renewable energy

Step 3: Use the cleanest available fossil fuel in the most efficient way possible

This strategy would see conservation and hydro meeting Ontario’s base-load power needs. Wind, solar and biomass provide the bulk of remaining needs, with natural gas as a backup.

How a Smart, Green Energy Strategy Adds Up

Step 1: Stop energy waste

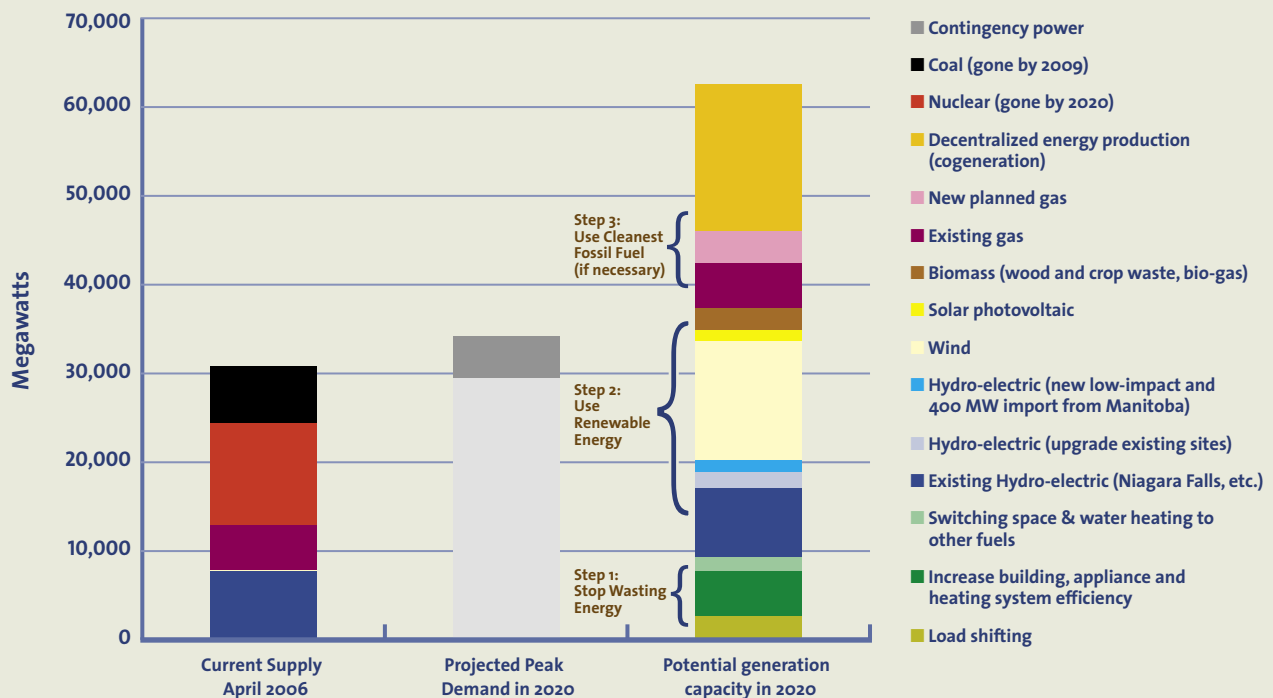
Sixty to seventy per cent of energy in the fossil and nuclear fuel that goes into large, centralized power plants never makes it into homes or workplaces as electricity, and another eight per cent is lost in transmitting it over long distances. Once delivered, much of the electricity goes right out the window or is wasted in inefficient equipment.

There are proven strategies for reducing this waste.

- **Better buildings:** Increase the minimum standards to EnerGuide 80 levels for new homes and ASHRAE 2004 for commercial buildings. This would save homeowners about \$400/year, with slightly higher building costs being more than offset by lower energy bills.

How a Smart Green Energy Strategy Adds Up:

Over 62,000 MW green and clean power sources available to meet expected peak demand of 29,500 MW by 2020.



“With rising energy costs and growing consumer demand for energy efficiency, the government’s proposals for higher energy efficiency standards in the Ontario Building Code simply do not go far enough.” *Joan Huzar, President of the Consumers Council of Canada, April 12, 2006.*

- **Better equipment:** Raise minimum standards for electrical equipment to Energy Star levels and require manufacturers to reduce waste from ‘energy vampires’: equipment that still draws power even when it is turned ‘off’.
- **Economic incentives for consumers to switch to more efficient equipment.** Ontario lags far behind leading jurisdictions in promoting energy efficiency. The government should require utilities to increase conservation spending to a minimum of 3 per cent of revenues by 2009.

According to research commissioned by the OPA itself, it is possible to reduce electricity demand by 5,100 megawatts through these types of programs by 2020 *while saving consumers over \$7 billion even after the costs of the programs are included.*⁴ 5,100 megawatts is about one fifth of the power used in Ontario on an average day, and more power than the largest nuclear or coal plants in the province can produce. **Yet the OPA has chosen to pursue only 1,310 megawatts of this money-saving potential.**

It is also possible to ease the strain on the system at times of maximum electricity use through measures such as Toronto Hydro’s new PeakSAVER program, which allows the utility to remotely throttle back air conditioners and water heaters at times of heavy demand. This also reduces power purchases at the times of highest prices. A study prepared for Ontario’s Independent Electricity System Operator found that 250 MW of peak-shaving (or 1 per cent of peak demand) would have saved Ontario consumers \$170 million in 2002-2003, and that there is the capacity to reduce peak demand by 10 per cent, or over 2,500 MW, through such measures.⁵ The OPA’s plan calls for capturing only 500 MW of this potential.

Another way to reduce electricity use is to switch to other fuels. Water and space heating are inefficient (and costly) ways to use electricity, yet they represent 37 per cent of total electricity consumption in the residential sector.⁶ The bulk of this is in low-income housing, whose residents can least afford the high costs.

Solar hot water heaters can cost-effectively cut the electricity consumption for water heating in half, while passive solar design, solar water systems, geothermal energy and biomass (as well as better insulation) can dramatically reduce the amount of energy used for space heating. And, where feasible, switching to natural gas for direct heating in the home captures over 90 per cent of the energy in the gas, whereas burning gas to generate electricity, then shipping it to the home and using it for heat results in a loss of over half of the energy in the gas. Pursuing these fuel-switching options could reduce demand by a further 1,600 MW.⁷

Together, these measures could reduce every-day base-load demand by 6,700 MW by 2020 or the equivalent of the Darlington and Pickering B nuclear plants combined. An additional 2,600 MW, or the equivalent of 3 of the 4 remaining coal-fired generating stations, would reduce peak demand.

Step 2: Use renewable energy

Wind and solar are the fastest growing sources of energy in the world, creating hundreds of thousands of new jobs in countries as diverse as Germany and China. Combined with strategies to maximize efficiency and sophisticated electronic management, renewables and decentralized power production are part of the new wave of ‘smart’ grids that are revolutionizing electricity systems.

Yet the Ontario Government has only committed to procure 5 per cent of electricity from low-impact renewable sources by 2007 and 10 per cent by 2010.

Hydroelectricity already meets about one-quarter of Ontario’s electricity needs and is the lowest-cost resource available. One of the easiest ways to increase this amount by up to 1,700 MW⁸ is to install newer, more efficient turbines in existing dams and to re-install turbines in smaller facilities that were closed during the ‘bigger is always better’ era of building coal and nuclear plants.

The old Ontario Hydro estimated that there are over 1,800 sites with 12,000 MW of hydropower potential remaining in the province. But many of these are inaccessible or would have significant negative environmental impacts.

A 15-year-old fridge and washing machine will use an average of 2,285 kWh of electricity per year. Modern Energy Star-rated ones would use only 700 kWh to do the same jobs, reducing the average home's total electricity consumption by 15 per cent and saving about \$175/year on hydro bills. (Source: Natural Resources Canada)

> This analysis only includes 1,000 MW of new, small-scale and low-impact hydro⁹ plus 400 MW of new hydro imports from Manitoba that the Ontario government has already contracted for.¹⁰ There is the potential for much larger hydro and wind power imports from Manitoba, Quebec and/or Labrador, but these proposals would have to be assessed for their environmental impacts.

Wind power is the fastest growing source of energy worldwide. The cost of wind power has dropped remarkably during the past two decades because of economies-of-scale, larger turbines and experience with wind energy. **Research conducted for the Ontario Power Authority found that there is 674,894 MW of wind power potential in the province, excluding parks and environmentally sensitive areas.**

> Of this technical potential, this analysis included only 13,431 MW that is within 20 km of existing distribution lines and south of the 50th parallel.¹¹

Biomass energy can be generated from sawdust, bark, waste wood, agricultural residues like straw and manure, or methane gas given off by decomposing organic matter in sewage treatment or composting facilities. Biomass can be **stored and used when needed**, providing a **constant, non-fluctuating supply** of electricity and heating.

> The potential may be three times (7,400 MW¹²) the 2,450 MW conservatively used in this analysis.¹³

Solar energy can generate clean, reliable power with little maintenance and free fuel. The most promising solar technologies in the short-term are those that capture the heat of the sun's rays to heat indoor space or water (see fuel-switching in Step One), but solar power can also be used to generate electricity. The costs of solar photovoltaic panels (which generate electricity) are still fairly high, but are dropping rapidly as the technology becomes mainstream. And they **produce the most power at times of peak demand and highest prices.**

> This analysis includes only 1,263 MW of solar capacity by 2020 – the equivalent of 450,000 residential roof-top systems – which is sure to be deemed overly conservative in ten years as the

price of solar continues to drop and the technology begins to be integrated directly into new buildings.

Geothermal energy is one of the cheapest and most reliable ways to heat and cool buildings today. Geothermal pumps draw energy from the earth via underground pipes. In winter, these systems bring the earth's warmth up into a building, concentrate it and distribute it using heat pumps and ventilation systems. In summer, they work in reverse, taking heat from inside and discharging it into the cooler earth. While it doesn't directly generate electricity, these types of geothermal systems do **avoid the need for using electricity, gas or oil to heat and cool buildings.** The **energy savings** achieved by installing a geothermal heat pump are **considerable**, with annual heating costs for an average house of only \$400.

Step 3: Use the cleanest available fossil fuel in the most efficient way possible

To meet the remainder of our energy needs during the transition to a 100 per cent renewable energy system, only the cleanest available fossil fuel should be selected, and used in the most efficient way possible. There are already technologies that allow decentralized facilities to produce heat and power at the same time for use on-site.

The 5,103 MW of gas-fired generating capacity in Ontario¹⁴ plus the 3,560 MW of gas-fired generation scheduled to be built in the next few years will back up renewable sources, especially on days when wind, sun or water levels are low.

A need for any more stand-alone gas generators is not foreseen. However, opportunities to move towards combined heat and power systems (known as **cogeneration**) **should not be missed.** If fossil fuels are going to be burned to produce heat, they might as well do double-duty and generate electricity at the same time. **Research prepared for the Ontario Ministry of Energy found that there is the capacity for generating 16,514 MW of electricity in combined heat and power plants by 2020.** Most of this (14,037 MW) is in large industrial facilities like paper mills and refineries,



but some of it (2,477 MW) is in small commercial buildings, hospitals and schools.¹⁵ A more recent assessment, conducted for the Pembina Institute, found 4,300 MW of cogeneration potential in the commercial/institutional sector.¹⁶ Not included

in this assessment was the possibility of using micro-turbines and fuel cells in homes and smaller buildings, which may well become cost-competitive as the technology improves.

Ontario's Energy Challenge

The Ontario Government has made an exemplary and world-leading commitment to phase out dirty coal plants. The Premier's commitment to make energy conservation a priority sets a clear benchmark for Ontario's energy future. Various jurisdictions, including California, Germany, Spain and Denmark provide important lessons for how to implement a smart, green energy plan.

Any plan that does not maximize energy conservation and efficiency and that is based

on costly, unreliable and vulnerable nuclear technology does not meet the test.

The direction of Ontario's energy future rests with the government, not the OPA. Smart, green instructions to the OPA are of critical importance, as directions given now will determine the province's environment, health and economy for decades to come.

It truly is time to put Ontario's energy into a smart, green strategy.

1 Stewart Boyle, *PowerSwitch!: Towards a CO₂-free Power Sector*, (WWF-International, 2003).

2 Cited in "Nuclear Power: The Shape of Things to Come?" *The Economist*, (July 7, 2005).

3 This is also called a 'loading order' approach to energy resource procurement. For details, see materials on the California Public Utility Commission website (www.cpuc.ca.gov) or for an example, see the City of London's Energy Strategy *Green Light to Clean Power* at www.london.gov.uk/mayor/strategies/energy.

4 ICF Consulting, *Electricity Demand in Ontario – Assessing the Conservation and Demand Management Potential*, report prepared for the Ontario Power Authority (Revised November 2005), see especially Table 7 Figure 20.

5 Navigant Consulting, *Blueprint for Demand Response in Ontario*, report prepared for the Independent Electricity System Operator, (April 2003), pp. 56 and 63.

6 ICF Consulting, *Electricity Demand in Ontario – Assessing the Conservation and Demand Management Potential*, report prepared for the Ontario Power Authority (Revised November 2006), p. 11.

7 Mark Winfield, Roger Peters and Matt Horne, *The Ontario Power Authority Supply Mix Report: A Review and Response*, (The Pembina Institute for Appropriate Development, February 2006).

8 Ontario Waterpower Association, figures provided to the Pembina Institute for Appropriate in February 2004.

9 Jose Etcheverry et al., *Smart Generation: Powering Ontario with Renewable Energy*, (David Suzuki Foundation, 2004).

10 Ontario Ministry of Energy, *Manitoba, Ontario Sign Power Sale Agreement*, News release (October 27, 2005).

11 Helimax Energy Inc., *Analysis of Wind Power Potential in Ontario*, report prepared for the Ontario Power Authority, (November 2005).

12 The 7,400 MW figure is from the BIOCAP Canada Foundation. See Jack Gibbons, *Meeting Ontario's Electricity Needs: A Critical Review of the Ontario Power Authority's Supply Mix Advice Report*, (Ontario Clean Air Alliance, January 27, 2006), p. 4.

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15 Haggler Bailly Canada, *Potential for Cogeneration in Ontario: Final Report*, report prepared for the Ministry of Energy, Science and Technology, (August 2000).

16 Mark Winfield, Roger Peters and Matt Horne, "The Ontario Power Authority Supply Mix Report: A Review and Response", (The Pembina Institute for Appropriate Development, February 2006), p. 10.