Ontario Clean
Air Alliance

Report Summary

Full report available at:
www.cleanairalliance.org

Increasing productivity and moving towards a renewable future

A New Electricity Strategy for Ontario

1.0 Introduction – Choosing the right path

Ontario's electricity system is at a crossroads: The commitment to a coal phase-out combined with our aging and unreliable nuclear plants means that the province must rapidly set a new direction to ensure it can deliver the services and quality of life made possible by an efficient and reliable electricity system. In choosing this new direction, the province must decide if it is going to re-invest in tried and failed nuclear technology or move to a high productivity and renewable electricity future that is ecologically and financially sustainable.

Before deciding which path to go down, it is important that we clearly understand the realities of the current system. For example, many of the concerns being expressed about rising electricity rates are based on a fundamental myth — that jurisdictions with lower electricity prices have a competitive advantage that leads to better economic performance and greater prosperity.

This report takes a detailed look at the real relationship between electricity costs and economic performance and finds that, in fact, it is jurisdictions with higher electricity costs that are the most productive users of electricity and the most successful in terms of general prosperity (based on incomes and GDP).

When we compare Ontario to its North American economic peer group (states and provinces with populations of six million or more), we find that it trails in general productivity as well as more specifically in electricity productivity (kilowatt hours used per unit of goods produced). As a result, it also trails in its overall economic success as measured by GDP per capita.

What we also see is a direct relationship between electricity prices and electricity productivity, with Ontario and Quebec boasting among the lowest prices in their peer group, but also some of the lowest electricity productivity levels.

With a clearer understanding of the links between power costs and economic performance, we can begin to intelligently redesign our power system to focus on rewarding efficient use instead of subsidizing inefficient consumption. To do this, we need to adopt a much more diverse and flexible approach to our electricity system, an approach that properly prioritizes conservation and efficiency as our least-cost and highest-benefit options for meeting our incremental power needs.

By embracing the longer-term goal of moving to a 100% renewable electricity system we can set the stage for significant improvements in our energy productivity, create new energy-sector economic opportunities, and an improved quality of life for all Ontarians.

Living better electrically — for awhile

Ontario Hydro was created in 1906 to sell electricity to the province's consumers at the lowest possible price while developing the province's low-cost waterpower resources. It was given numerous special privileges to help it fulfill its mission, including exemptions from having to earn a commercial rate of return and pay corporate income tax, and a virtual monopoly on power generation in the province.

Hydro, in turn, put its emphasis on both increasing electricity supplies and consumption: There were significant economies of scale to be realized in the generation and transmission of low-cost waterpower in these early years

as Ontario developed its major electricity infrastructure. This led to the cost of electricity in the province steadily dropping from 5.08 cents per kWh in 1914 to 0.99 cents per kWh in 1949.

However, Southern Ontario's supply of large-scale untapped waterpower resources was virtually fully exploited by the end of the 1950s. Ontario Hydro's subsequent transformation into a primarily coal and nuclear electricity generating company began in 1962 when it brought its Lakeview coal-fired power plant in Mississauga into commercial operation — at the time, the largest coal-fired generating station in the world.

Unfortunately, there were no similar economies of scale to be realized in coal and nuclear generation as there had been with waterpower, which made Hydro's continuing strategy of promoting increased use of electricity its first major mistake. The second major error was banking on nuclear energy to deliver reliable low-cost electricity, which in practice turned out to be far from the case. The result was the subsidization of coal and nuclear by cheap waterpower and the racking up of a huge nuclear debt.

The result: The wrong system in the wrong place

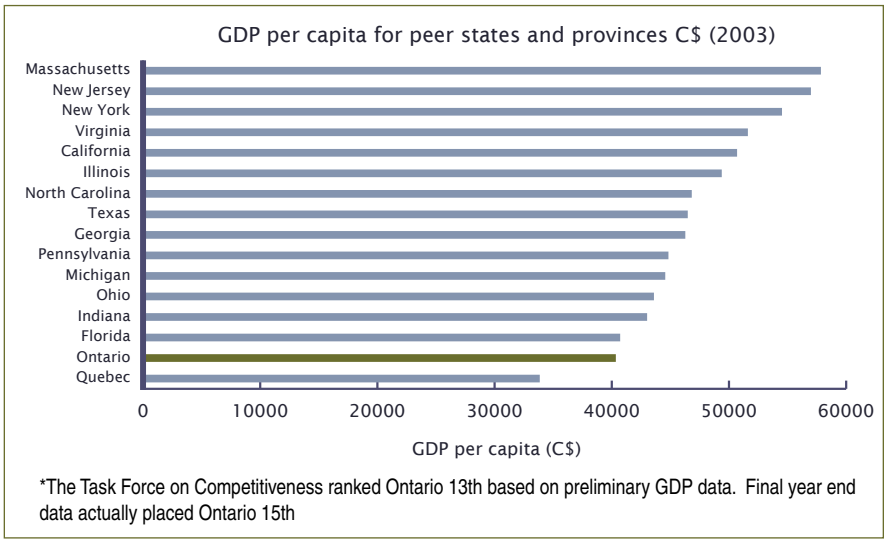
As a result of its programs to increase the demand and supply of electricity, by 1998 Ontario Hydro was obtaining 73% of its electricity supply needs from its coal and nuclear generating stations. However, this highly centralized system dependent on a few large generating stations was deeply flawed, with problems ranging from huge nuclear construction and repair cost overruns, declining performance in nuclear units, excessive transmission line losses, poor security of supply, and, most seriously of all, significant health and environmental impacts due to the province's growing reliance on dirty coal to replace faltering nuclear power stations.

It also led Ontario to trail its peers in both productivity and overall prosperity.

2.0 Productivity and prosperity - Ontario lags the pack

Ontario's Task Force on Competitiveness, Productivity and Economic Progress has identified 12 U.S. states that have a higher standard of living (Gross Domestic Product per capita) than Ontario among the province's 16 member peer group (states and provinces with a population of six million or more — see Figure 1). This prosperity gap is due to our lagging productivity, according to the Task Force.

Fig. 1 The prosperity gap: Ontario trails in GDP per capita*



*The Task Force on Competitiveness ranked Ontario 13th based on preliminary GDP data. Final year end data actually placed Ontario 15th

Ontario and Quebec have the third lowest and the lowest electricity prices respectively amongst the 16 member group. The two provinces also trail the pack in electricity productivity, with Ontario ranking 9th out of 16 and having one of the highest per capita electricity consumption rates in the world (see Figure 6).

Figures 2 and 3 shows the price of electricity and electricity productivity for Ontario, Quebec and the 14 richest U.S. states and reveal that jurisdictions with higher electricity prices have higher levels of electricity productivity. For example, New York State's price of electricity and its level of electricity productivity are both significantly higher than those of Ontario.

Our analysis (outlined in Figures 4 and 5) shows that there is a strong positive correlation between electricity prices, electricity productivity and living standards (GDP

Fig. 2 Electricity prices for 2003

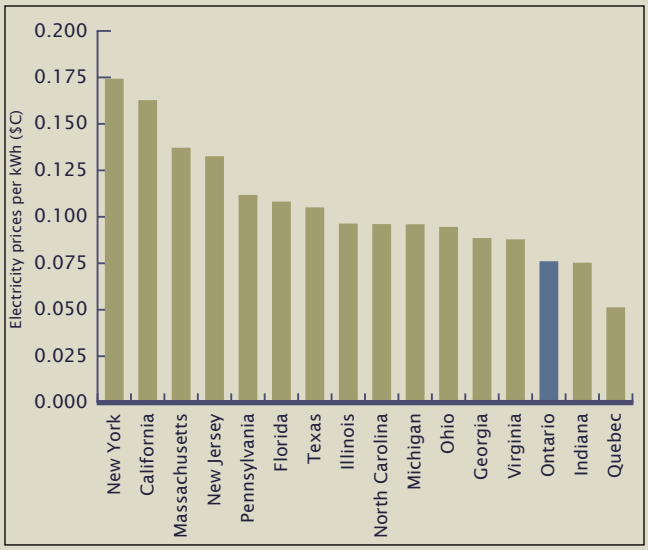


Fig. 3 Electricity productivity for 2003

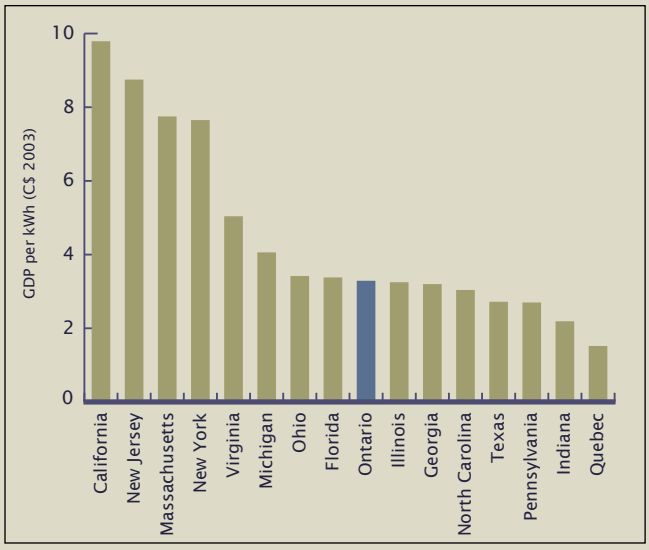


Figure 4: Relationship between electricity prices and electricity productivity

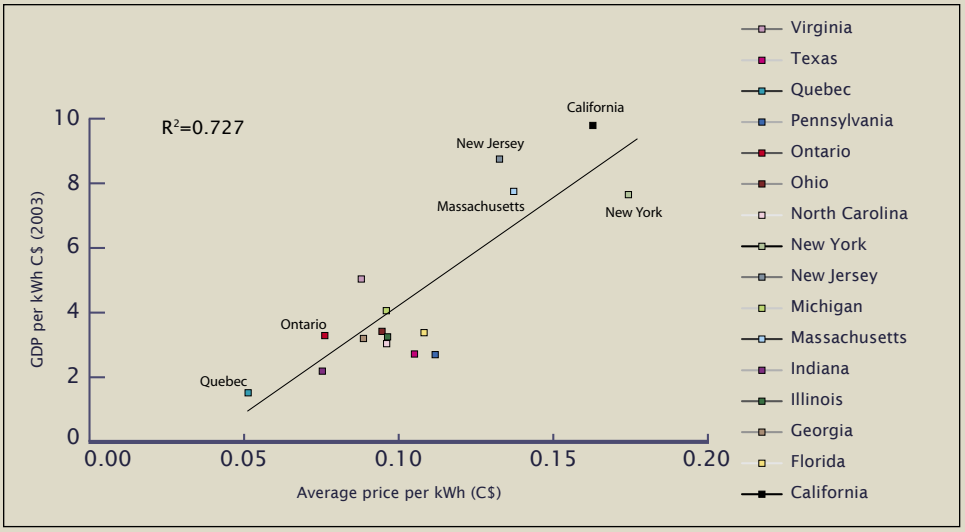
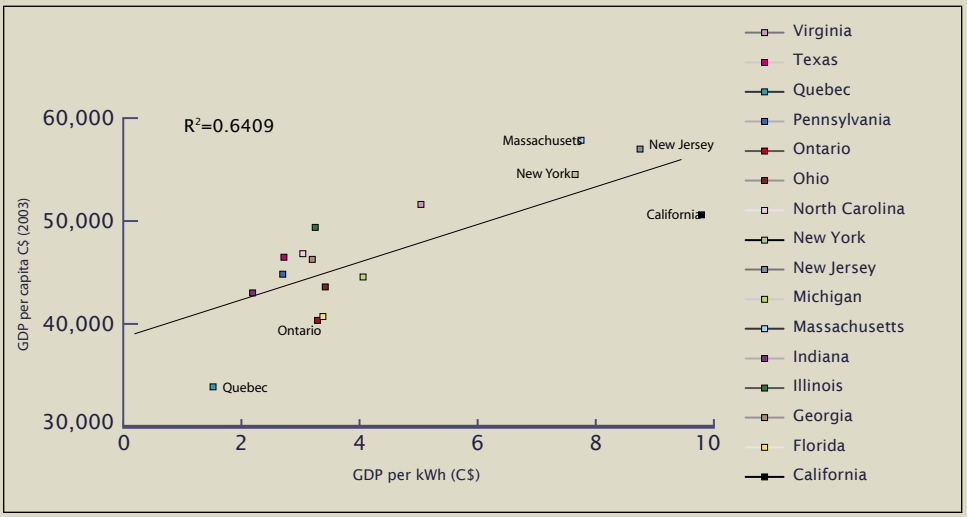


Figure 5: Relationship between electricity productivity and GDP per capita

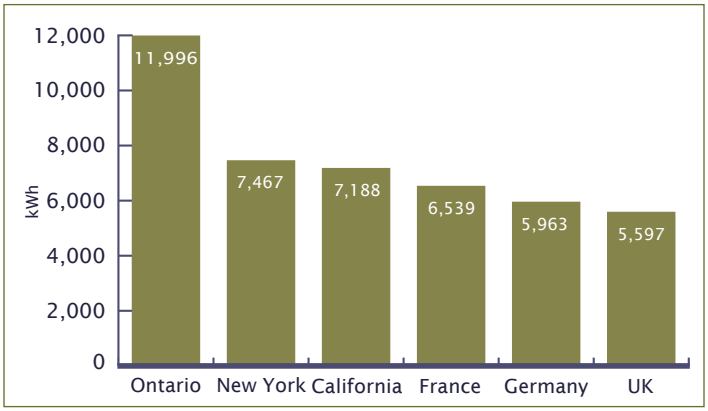


State/Province	GDP per kWh
California	$9.79
New Jersey	$8.75
Massachusetts	$7.75
New York	$7.65
Virginia	$5.04
Michigan	$4.06
Ohio	$3.42
Florida	$3.38
Ontario	$3.29
Illinois	$3.25
Georgia	$3.20
North Carolina	$3.04
Texas	$2.72
Pennsylvania	$2.70
Indiana	$2.19
Quebec	$1.52

For sources and more information, please see the full report at www.cleanairalliance.org

per capita). Four of the five richest jurisdictions in the 16 member peer group (Massachusetts, New York, New Jersey and California) have the highest electricity prices and the highest electricity productivity ratios. Similarly three of the four poorest jurisdictions in the peer group (Ontario, Indiana and Quebec) have the lowest electricity prices and low electricity productivity ratios.

Fig. 6: Per capita electricity consumption in 2000



Clearly, Ontario can raise its electricity productivity and its standard of living by raising its electricity prices up to their full cost.

Closing the prosperity gap

The Competitiveness Task Force has identified a number of areas that Ontario needs to address to close the productivity gap with its peer group. These include total capital investment as a percentage of GDP (where Ontario lags behind its peer group), innovation, specialized support (e.g., cooperation between industries and universities), and tilting government's investment focus away from current consumption and toward longer-term investments.

All of these areas can be addressed, in part, by improving our electricity productivity. For example, by focusing more on the lifecycle energy costs of capital investments, we will make more energy-efficient choices that have greater long-term value. Similarly, by embracing efficiency as a societal goal, we can drive innovation and the development of new technology and systems in Ontario. And by creating a more distributed and flexible electricity system, we create new financial and development opportunities for our larger urban centres.

But first we need to adjust the price and cost signals that drive much of our decision making around electricity generation and use.

Moving to a real cost electricity rate

In Ontario, we still have an electricity price structure that is distorted by a number of hidden subsidies for nuclear power. We must eliminate these hidden subsidies and move to a real-cost structure in electricity pricing as a first step in developing a new electricity strategy for the following three key reasons:

a) To increase our electricity productivity and raise our standard of living;

b) To increase our security of supply; and

c) To ensure inter-generational equity.

The six key actions that must be taken to reduce nuclear subsidies and raise the market price of electricity to its full cost are:

a) requiring Ontario Power Generation (OPG) to earn a competitive rate of return on its capital;

b) raising OPG's water rental rates to their full market value;

c) eliminating the Ontario Electricity Financial Corporation's $20 billion unfunded liability;

d) eliminating the Government of Ontario's responsibility for nuclear decommissioning with respect to all nuclear reactor restarts, retrofits and new builds;

e) eliminating the Government of Ontario's responsibility for the long-term storage of nuclear wastes with respect to all nuclear reactor restarts, retrofits and new builds; and

f) eliminating the Nuclear Liability Act's $75 million cap on nuclear operators' liabilities in the event of a nuclear accident for all nuclear plant restarts, retrofits and new builds.

These measures can also be used to provide the Ontario Government with increased revenues that it can use to finance public spending (e.g., schools, universities, healthcare), deficit reduction or other public-interest measures.

Eliminating just three of these current subsidies (OPG below-market return on equity, below-market value water power charges, OEFC's unfunded liability) would raise Ontario's electricity rates by approximately 30% from 2003 levels.

Electricity consumers can mitigate the bill impact of a 30% increase in electricity rates by increasing their electricity efficiency and switching to lower cost fuels for space and water heating (e.g., natural gas, propane). For example, if Ontario's electricity consumers could achieve New York State's level of electricity efficiency, our per cap-

ita electricity consumption would fall by 38%.

Low-income households should be protected from any net bill increase through a combination of energy conservation programs, heating retrofits and a flat-rate on-bill rebate for all Ontarians based on the bill impact of higher rates on the lowest income consumers. Such a rebate would encourage continued conservation while helping to eliminate the bill impact of higher rates on low income households.

3.0 A New Electricity Strategy for Ontario:2005-2020

The Ontario Clean Air Alliance believes Ontario can meet its future energy needs most efficiently and with the greatest societal benefit by adopting the goal of moving toward a 100% renewable electricity system as soon as practically possible. Such a goal is especially well-suited as a driver for improved electricity productivity for two reasons:

- it naturally addresses many of the externalized environmental and health costs that are not properly reflected in current fossil and nuclear generation costs by reducing or eliminating these impacts.
- much greater energy efficiency is a mandatory precursor to a successful transition to a renewable power base, which in turn will help to restore a virtuous cycle to our energy system (the more efficient we are, the more we can rely on low-impact renewable power and the more our electricity productivity increases).

Energy conservation and efficiency

Energy conservation and efficiency are the best options for moving towards a 100% renewable electricity system for the following reasons:

1. In order to meet all of our electricity needs from renewable sources we must reduce our aggregate level of electricity consumption.
2. Energy conservation and efficiency investments can reduce the bills of all electricity consumers, even with rising energy rates.
3. Energy efficiency investments increase our productivity and make our industries more competitive in international markets.

Three key efficiency elements:

1. **Demand Response:** Paying customers to reduce their demand during periods of peak system demand can provide significant benefits to Ontario, including reduced need for expensive generation and transmission infrastructure, less risk of brownouts and blackouts, lower and less volatile peak prices and reduced reliance on expensive (and often dirty) electricity imports.

The Ontario Power Authority (OPA) should pay large industrial and commercial customers, electric utilities (e.g., Toronto Hydro) and others the same price per kilowatt-hour (kWh) for demand reductions (a negawatt) as it pays generators for electricity supply during peak demand periods and should purchase all available demand reduction during such periods.

2. **Utility driven conservation programs:** Hydro One and Ontario's more than 80 municipal electric utilities are now entitled to retain a modest percentage of the cost savings generated for their customers by their energy conservation programs. For example, if Toronto Hydro's energy conservation programs reduce its customers' bills by $100 million, Toronto Hydro will get a $5 million profit bonus.
3. **Energy Efficiency Standards:** The Government of Ontario should establish stricter minimum energy efficiency standards for new buildings, appliances and electric motors. The up-front costs of such measures will be recovered through decreased lifecycle energy costs and greater economic efficiency. In many cases, additional up-front costs may be minimized or avoided through good planning and design.

More renewable power

In November 2004, then Energy Minister Dwight Duncan announced that as a result of its competitive bidding process for new renewable electricity supplies, the government has signed contracts with power producers for 10 new green power projects. The cost of these new green power supplies, 8 cents per kWh, is competitive with subsidized nuclear power.

A competitive bidding process is the best option to obtain renewable power from large investor-owned power

companies. However, for individuals, farmers and local community organizations interested in developing small renewable power projects (10 MW or less), the OPA should establish standard offer prices and should enter into electricity supply contracts with all small-scale renewable projects that are willing to accept the standard offer price.

Waterpower imports

Ontario also has the potential to import very significant quantities of clean waterpower from Manitoba. As a first step, Ontario could contract for 1,500 MW of Manitoba waterpower, which would provide the province with 8.8 to 11 billion kWh of electricity per year at a cost of 6.7 to 7.8 cents per kWh. These power imports would be equivalent to 5.8% to 7.3% of Ontario's electricity generation in 2003. In the longer-term, Ontario could import more than 5,000 MW of clean power from Manitoba, equivalent to 46% of Ontario's existing installed nuclear generation capacity.

Ontario also has the potential to import waterpower from Labrador. In March 2005 Ontario submitted a joint proposal with Hydro Quebec and SNC-Lavalin to the Government of Newfoundland and Labrador to support the development of 2,824 MW of waterpower on the lower Churchill River in Labrador.

Given Quebec's position at the bottom of the electricity productivity scale for its peer group, Hydro Quebec has the potential to dramatically increase its profits by investing in domestic energy conservation measures, which would make electricity available from its existing waterpower stations for export to Ontario and the U.S. Northeast. This would be one of the lowest-cost options to meet Ontario's electricity supply needs.

Combined heat and power

Virtually all of Ontario's buildings and factories use natural gas for heating. However, it is much more productive to use natural gas (or biomass) to simultaneously produce both heat and power (electricity). According to a report prepared for the Ontario Ministry of Energy, Ontario's total combined heat and power potential in 2020 will be 16,514 MW — equivalent to 95% of Ontario's existing installed coal and nuclear generation capacity.

To facilitate the development of combined heat and power projects, the OPA should establish a standard offer price for combined heat and power projects. In addition, new combined heat and power projects should be exempted from the 0.7 cent per kWh nuclear debt retirement charge.

Natural gas combined-cycle power plants

Natural gas-fired combined-cycle power plants can achieve energy efficiencies of up to 58%. As a consequence, natural gas-fired power plants have an important role to play as a bridging technology.

As a result of a competitive bidding process in 2005, the Government of Ontario agreed to enter into 20-year supply contracts with four natural gas-fired combined-cycle power plants. The average cost of these new supplies, based on the previous two years' actual natural gas prices and a 45% capacity factor, is 7.8 cents per kWh. Based on a 90% capacity factor, the cost of these new supplies will fall to 6.8 cents per kWh. Based on the U.S. Department of Energy's natural gas price forecast and a 90% capacity factor, the cost of these new electricity supplies will be approximately 6 cents per kWh in 2010. All of these projects will also be subject to stringent contract performance conditions that contain significant penalties for delays or failure to meet capacity targets.

Impact on natural gas demand

If Ontario were to replace all of its coal and nuclear plants exclusively with high-efficiency combined-cycle natural gas-fired power plants by 2020, North American natural gas consumption would rise by 2.5%.

However, if the coal and nuclear power plants are replaced by natural gas combined heat and power (cogeneration) plants, the increase in natural gas consumption would be reduced by 30% or more. As a consequence, under this scenario, the increase in North American gas consumption as a result of replacing all of our coal and nuclear generation with natural gas would be only 1.75%.

If, however, Ontario's 17,316 MW of coal and nuclear capacity are phased-out using a combination of one-third energy conservation, one-third renewables and one-third natural gas-fired combined heat and power, North American natural gas consumption would rise by only 6/10ths of 1%.

New economic opportunities

New energy technologies and services, everything from solar films, wind turbines and fuel cells to power-cycle control systems, smart meters, district heating and cooling systems or new lighting, are going to be one of the world's growth industries over the next few decades as fossil fuel prices continue to rise and societies look for ways to reduce the health and environmental impacts of conventional power production.

The biggest stumbling block to progress in this area has been the billions of public dollars consumed by the development and maintenance of CANDU nuclear technology that has never met its developers' promises. The federal government, for example, has spent an estimated $6 billion on the development of CANDU nuclear technology (this does not include the actual cost of building, maintaining or retrofitting actual nuclear power plants). In contrast, Canada's total expenditure on renewable energy research and development in 2003 was only $38 million.

4.0 Conclusion and recommendations

Moving to real and transparent energy rates can bring many benefits to Ontario — increased productivity, reduced pollution and other health and environmental impacts, a more responsive and reliable electricity system, more competitive industries and a higher quality of life. And contrary to conventional wisdom, such a move will not lead to major economic distress, but will, in fact, increase overall prosperity if it is part of an integrated package of measures designed to promote energy efficiency and conservation, demand response and new cleaner supply sources.

The ultimate goal of such a package is to combine a real cost electricity rate that serves as a clear signal about the costs of consumption (in other words, a meaningful marginal rate for electricity consumption) with measures that result in significant reductions in demand for electricity. Ideally, these two measures can counter-balance one another to ensure that efficiency and productivity are properly rewarded while the net bill impacts of higher rates are eliminated or minimized.

The transition to a real cost rate for electricity will require the phasing-in of some elements (such as the complete removal of hidden subsidies for nuclear power) along with the rapid introduction of others, such as protection measures for low-income consumers (heating system upgrades and electricity bill rebates for example) and aggressive demand response and efficiency and conservation programs.

There is no question, however, that such an approach is in Ontario's best long-term interests. We simply cannot continue to subsidize wasteful consumption and allow demand for electricity to grow completely unchecked. Not only are the health and environmental costs of such an approach unacceptable, so are the costs to Ontario's competitive position in an increasingly global knowledge economy.

Recommendations

- **Ontario should set a target for moving to a 100% renewable electricity system as soon as practically possible.** It should adopt an interim goal of 60% grid-supplied renewable power by 2020.
- To stimulate an increase in our electricity productivity and our standard of living (GDP per capita) **the Government of Ontario should eliminate the hidden subsidies for nuclear electricity generation and consumption.** Eliminating three of the six hidden subsidies for nuclear power would raise electricity rates by approximately 30% relative to 2003 rates. The Minister of Energy should direct the Ontario Power Authority (OPA) to develop a strategy to eliminate the subsidies for nuclear power and raise electricity rates up to their full cost.
- **Low-income households (home owners and tenants) should be protected from higher electricity rates through a combination of measures** that ensure that higher electricity rates will not lead to higher energy bills for low-income consumers.
- **Ontario should establish an on-bill rebate for residential customers** based on the impact of higher

electricity rates on the province's lowest income group. This flat-rate rebate should be financed through the increased revenues returned to government by Ontario Power Generation and would ensure that a strong incentive remains for residential customers to conserve electricity.

- **The OPA should be instructed to develop a strategy for Ontario to reach New York State's level of electricity productivity** (currently 2.3 times Ontario's rate) by 2020
- **The province should encourage the development of strong conservation and efficiency programs** by Hydro One, Ontario's municipal electric utilities (e.g., Hydro Ottawa, Toronto Hydro) and the Ontario Power Authority (OPA). The OPA should also develop an effective demand-response program as soon as possible.
- **The OPA should seek competitive bids for large renewable power projects on an annual basis** (e.g., 1,200 MW a year) while also establishing a standard offer price for small (10 MW or less) renewable projects. All new renewable projects should be exempted from the province's nuclear debt retirement charge.
- To obtain additional electricity supplies and to increase the competitiveness of Ontario's industries, the OPA should **establish a standard offer price for biomass and natural gas-fired combined heat and power systems** based on prices determined through the open bidding process for combined-cycle gas generators. The OPA should enter into supply contracts with all combined heat and power suppliers that are willing to accept the standard offer price. All new combined heat and power projects should be exempted from the province's nuclear debt retirement charge.
- The Government of Ontario and the OPA should **expeditiously assess the potential for cost-effective and ecologically sustainable water power imports** from Manitoba, Quebec and Labrador.
- **All "clean coal" projects should be subject to the Witmer Standard,** i.e., they should only be considered if their greenhouse gas, nitrogen oxides, sulphur dioxide and mercury emission rates are all equal to or lower than those of a natural gas-fired power plant.
- **Nuclear re-starts, retrofits or new builds are not cost-effective or reliable electricity supply options.** If the Government believes that re-investing in nuclear power may be an appropriate option to meet Ontario's incremental supply needs, we urge the Government to establish a competitive bidding process for new supplies where nuclear suppliers are required to compete on a level playing field with suppliers of high-efficiency natural gas-fired combined-cycle power plants. Specifically, all nuclear re-start, retrofit and new-build proposals must be subject to the same terms and conditions as natural gas-fired power plants, namely being subject to the same financial penalties and risks of contract termination for failure to achieve commercial in-service dates or capacity utilization rates; full responsibility for cost overruns; and 100% responsibility for the costs associated with nuclear power plant decommissioning; the long-term storage of its radioactive wastes; and a catastrophic nuclear accident.

Read the full report at www.cleanairalliance.org

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About the Ontario Clean Air Alliance
The Ontario Clean Air Alliance is a coalition of health, environmental, and consumer organizations, faith communities, municipalities, utilities, unions, and individuals working for cleaner air through a coal phase-out and the shift to a renewable electricity future. Our partner organizations represent more than six million Ontarians.

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