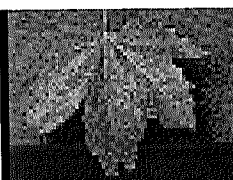


Energy Efficiency in Ontario: Potential and Provincial Progress

The Pembina Institute
November 2005



Ontario's Electricity Situation

- Demand-Supply Plan and Collapse of DSM efforts
- Ontario Hydro Restructuring and Market Experiments
- NAOP and reliance on coal
 - Health and Environmental Impacts
 - Difficulties bringing nuclear facilities back on-line
- August 2003 blackout and reliability/security of supply concerns

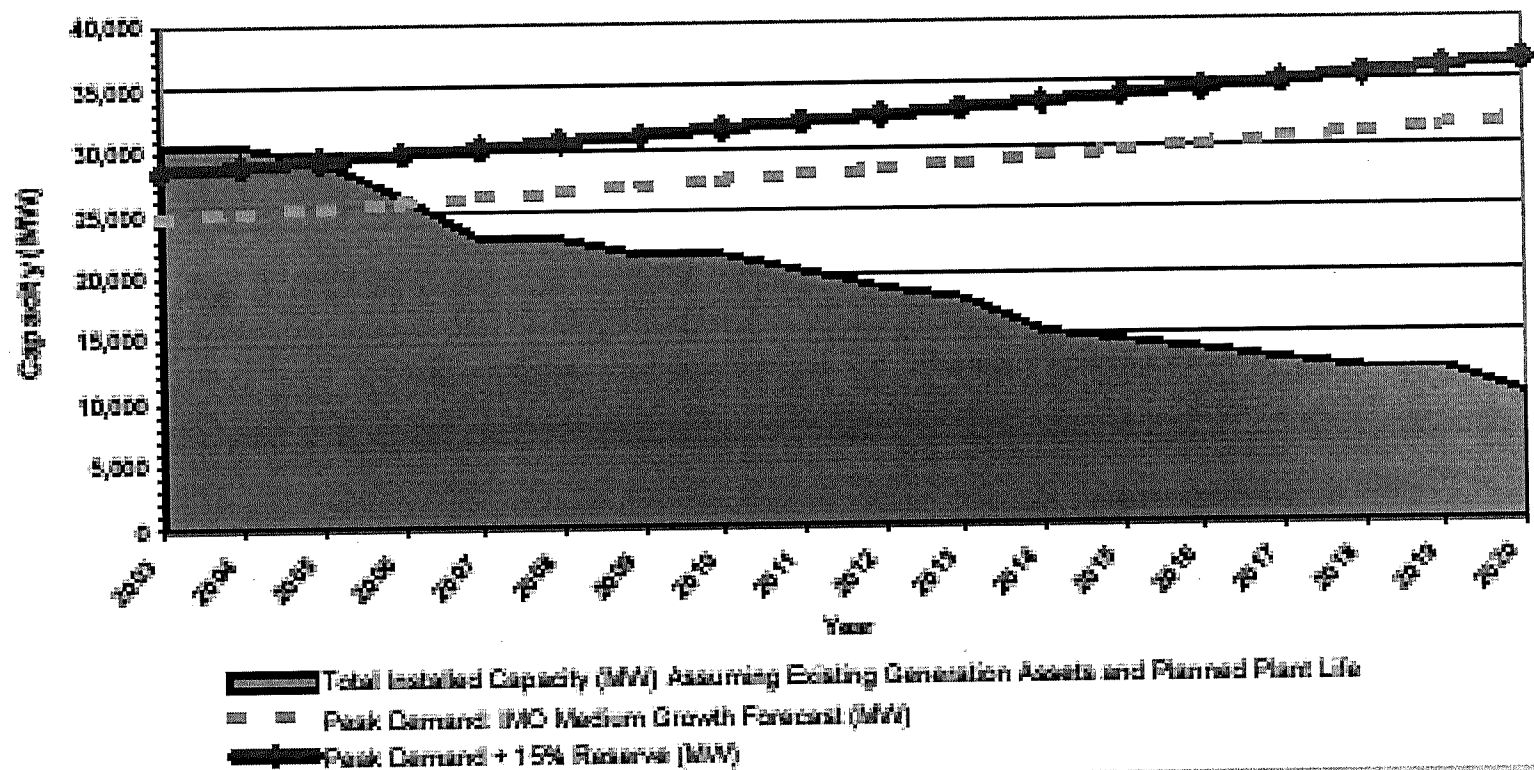


Ontario's Electricity Situation

- Projected end-of-life for existing nuclear and coal facilities
- Projected business as usual growth in demand

FIGURE 2.C

Existing Generation vs. Peak Demand



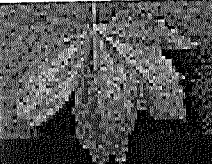
Pembina/CELA Project

Four Questions:

- Potential contribution from end-use efficiency, cogeneration, fuel switching and demand response
- Potential contribution from low-impact renewables (wind, hydro, biomass)
- Supply options for remaining grid demand
- Policy framework for implementation

CIMS Analysis

- Developed by EMRG at Simon Fraser University
- Designed for the purpose of testing the macro and micro impact of energy policy options



CIMS Analysis

- Incorporates most detailed information available on current end-use technologies on a jurisdictional basis
- Considers cost and performance commercially available high efficiency technologies

CIMS Analysis

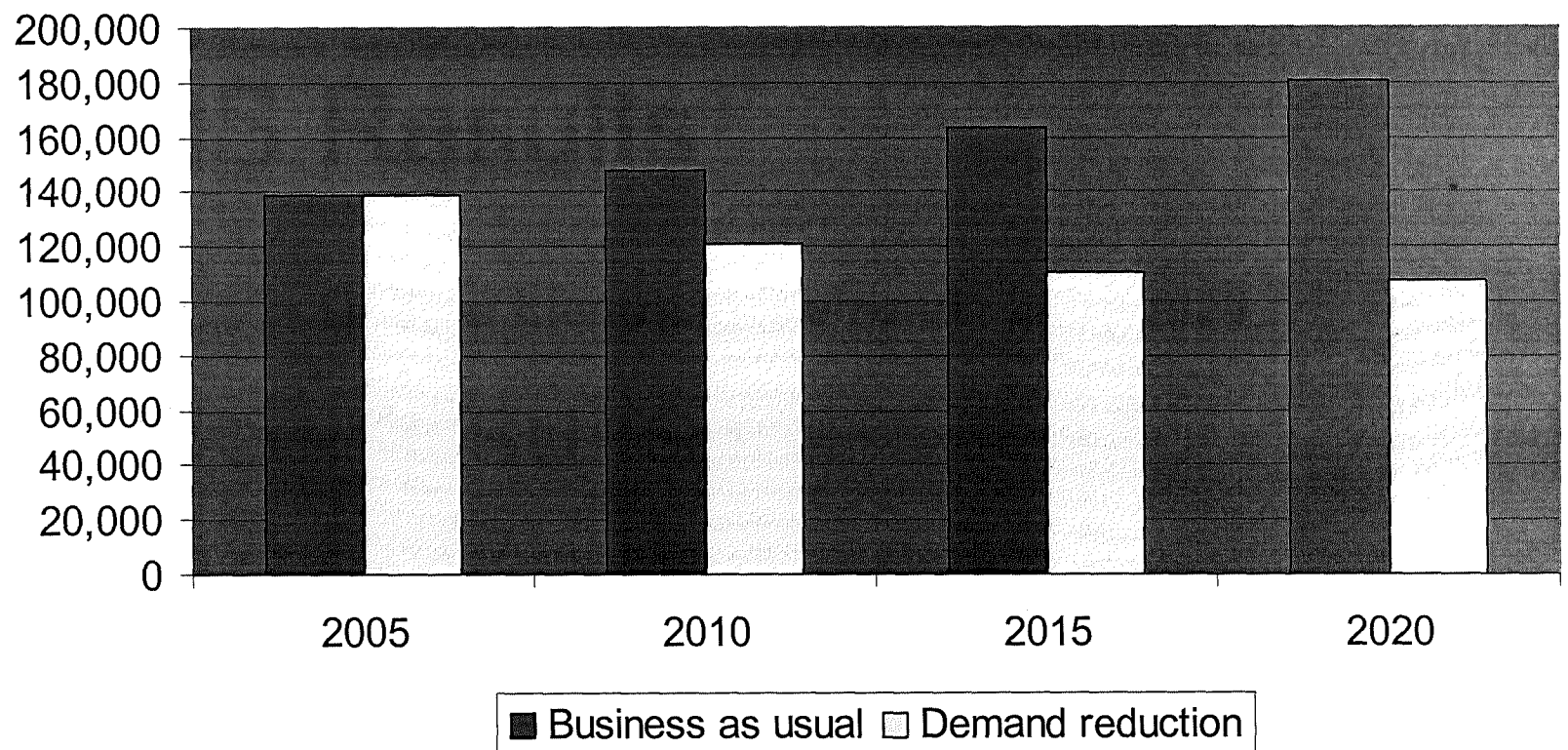
- CIMS used to project impacts of three types of policies against 'business as usual' projected demand 2005-2020
 - Remove constraints on cogeneration
 - Provide financial incentives for purchase of efficient technologies
 - Provide innovative financing measures to reduce payback time on efficiency investments

CIMS 'Business as Usual' Outlook

- Projects grid demand of 180,000 GWh by 2020
- Similar to IMO and ECSTF projections
- Uses Stats Can and NRCCan energy price forecasts

CIMS Results

Ontario Electricity Demand - 2005-2020



CIMS Results

- Reduction of 2020 demand to 107,000 GWh
- 73,500 GWh/Year reduction against 'business as usual'
- 41% reduction in demand against 'business as usual'

CIMS Results

- Results reflect:
 - Significant adoption of most efficient currently available technologies in all sectors by 2010
 - High levels of cogeneration in industrial and commercial sectors
 - Large shift from electric to natural gas heating

CIMS Results

- Largest savings from:
 - Commercial/institutional building shell and HVAC, and lighting improvements
 - Elimination of electric hot water heating in residential and commercial/institutional sectors
- Provision of innovative financing to reduce perceived payback period for efficiency investments has largest impact on behaviour

Impact on Natural Gas Consumption

- Increase of 130 PJ in gas consumption by 2020 attributable to fuel switching and increased cogeneration
- 12% higher than business as usual projection

Societal Costs and Benefits of Efficiency Gains

- Total investment \$18.2 billion over 2005-2020
- 96% recovered through energy savings
- Net savings for industrial and institutional/commercial sectors
- Net costs for residential sector of \$6 per person per year
- Does not take into account health and environmental co-benefits of avoided generation

Peak Capacity Requirement Reduction

- Capacity requirement reduction from CIMS projections of efficiency, cogeneration and fuel switching (using IMO load factors) = 12,300 MW by 2020.

Additional Peak Reductions from Demand Response

- Potential shift of 10% Peak through
Demand Response
(Navigant consulting study for IMO)



Peak Load Shaving through Demonstration Projects

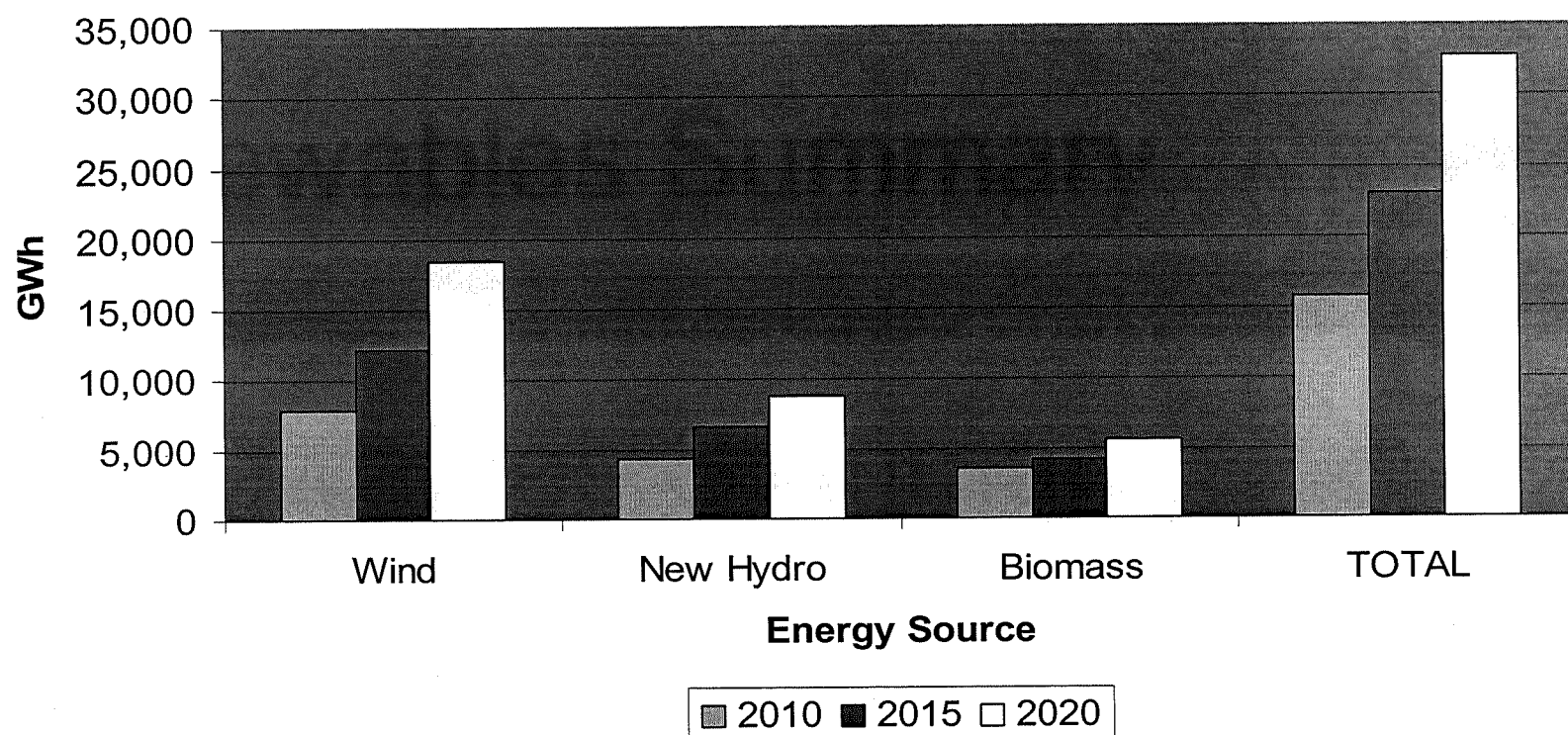
- 1000MW solar roof program to reduce peak demand 750MW.
- Addresses summer peaks

Peak Demand Reduction Summary

	2010 Peak (MW)		2015 Peak (MW)		2020 Peak (MW)	
	<u>Winter</u>	<u>Summer</u>	<u>Winter</u>	<u>Summer</u>	<u>Winter</u>	<u>Summer</u>
IMO Forecast for Peak Demand	26,000	27,800	26,500	28,700	28,000	30,000
Peak Demand Reduction from Energy Efficiency, Fuel Switching, and Cogeneration	(4,500)	(4,500)	(8,900)	(8,900)	(12,300)	(12,300)
Demand Response Measures	(2,330)	(2,330)	(1,980)	(1,980)	(1,770)	(1,770)
On-Site Generation		(250)		(500)		(750)
Net Grid Peak Demand	19,170	20,700	15,620	17,320	13,930	15,180

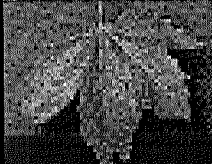
Renewables Summary

Projected Growth in Renewable Energy Supplies



Renewables Summary

- 9,800 MW installed renewable capacity, contributing 4,600MW to peak supply by 2020
- Remaining grid requirement by 2020: 25,633GWh/4500MW Capacity
- Less than full replacement of current coal generation (36,946GWh in 2003)



Remaining Base Load Options

- Imports

- Quebec/Manitoba Hydro
- Political, environmental and social risks

- Nuclear

- High and unpredictable capital costs
- Reliability, safety, waste management and life-cycle environmental concerns

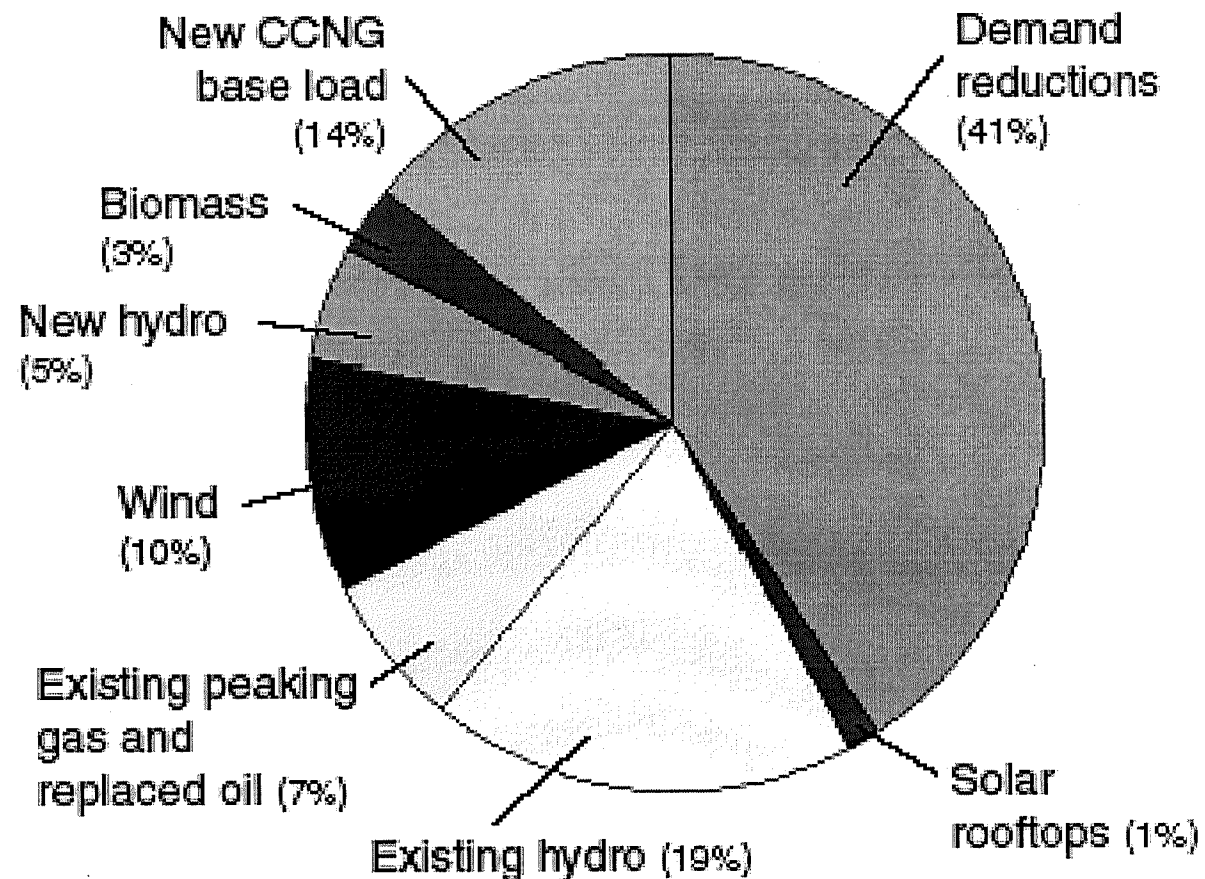
- Integrated gasification combined cycle

- Reduced smog and acid rain precursors and heavy metals, but not GHGs relative to conventional coal

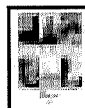
Remaining Base load Options

- Combined Cycle Natural Gas
 - Highest efficiency
 - Large reductions in smog and acid rain precursors, heavy metals and GHGs
 - May imply need to expand pipeline capacity
 - Long-term supply issues
- Transitional fuel to full reliance on renewables

Meeting 2020 Demand: A new power recipe for Ontario



% of GWh supplied
by source



Power for the Future
Thermostats in the classroom
Energy Efficiency Systems
in a Classroom

Energy Efficiency
The Ontario Power Generation
Energy Efficiency Program
www.opg.com/energy

Canadian
Government
The Greenhouse Gas
Reduction Fund
www.gc.ca

Policy Implications – Efficiency

- Minimum efficiency standards and building codes raised to 2004 high efficiency levels by 2010/2012
- Labeling of efficient technologies
- Planning and Municipal Act amendments

Policy Implications – Efficiency

- Ontario Energy Board mandate and DSM incentive mechanism for all electrical utilities
- Mandate to include low income program delivery

Policy Implications – Efficiency

- Establishment of Ontario Sustainable Energy Authority
 - Coordination
 - Standards Development
 - Assessment and demand forecasting
 - Research
 - Proposed Power Authority should be a division of sustainable energy authority

Policy Implications – Efficiency

- Rebate of sales tax and other financial incentives for 5 years to kick start market transformation
- Innovative financing programs in conjunction with utilities that allow efficiency investments to be paid out of savings
- Small (0.3 cents/KWh) system benefits charge to finance efficiency programs
- Access federal financing via Kyoto Protocol implementation agreement

Policy Implications – Cogeneration

- Net metering and removal of institutional barriers for industrial and commercial generators
- Power purchasing agreements for cogeneration at marginal prices
- Financial incentives and innovative financing tools for small cogenerators

Policy Implications – Peak Demand Reduction

■ Demand response

- Time of use, time of day, critical peak pricing
- Interruptible or ripple supply rates
- Smart metering

■ Peak Shaving

- Solar roofs program
- Net metering and removal of institutional barriers for on-site generators

The Provincial Policy Response

- Conservation Targets
 - 5% peak demand reduction by 2007
 - 10% reduction for provincial government operations by 2007
- Establishment of Conservation Bureau within Ontario Power Authority via Bill 100
 - Annual report
 - Awareness activities
 - Pilot projects

The Provincial Policy Response

■ CDM Directives

■ June 2005

- 250MW DM/DR
- Up to 1000MW CHP

■ October 2005

- 100MW in low-income and social housing
- 100MW lighting efficiency and appliance change out.

The Provincial Policy Response

- Electricity rate cap removal
 - Regulated price plan
- LDC CDM rate incentive
 - \$163 million available
- Smart Metering
 - 800,000 meters to be in place by 2007.

The Provincial Policy Response

- Net Metering Regulation for Generators up to 500Kw.
- Energy Efficiency Act Regulations

The Provincial Policy Response

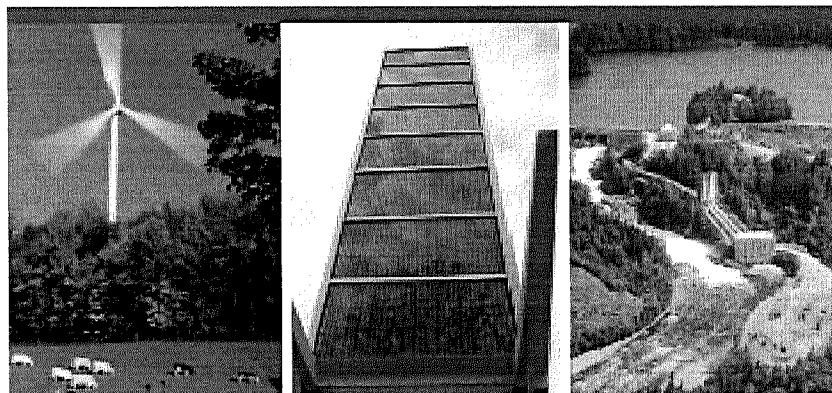
- Bill 24 – *Energy Conservation Responsibility Act, 2005*
 - Public Agency Energy Conservation Plans
 - Smart Metering Entity?
- Building Code Modifications?
- Future Targets?

The Provincial Policy Response

Supply investment vs. CDM Investment

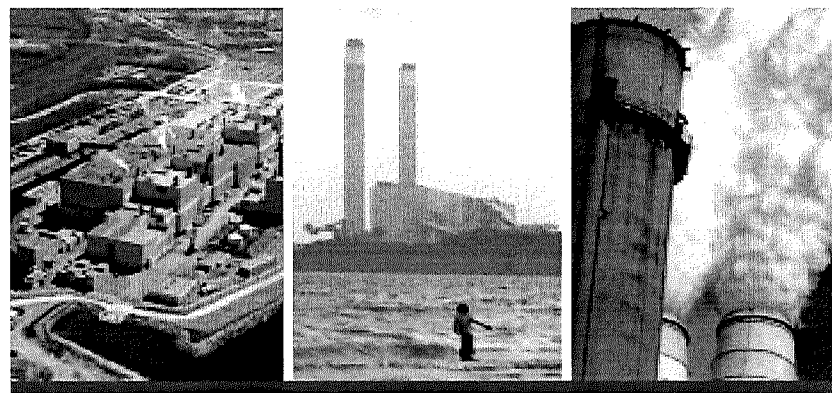
\$8.5 billion vs. \$163 million

\$50 Supply:\$1 CDM



Power for the Future

Towards a Sustainable Electricity System for Ontario



 **Pembina Institute**
for Appropriate Development



Canadian Environmental Law Association

www.pembina.org