

# 2007

# ONTARIO MARKET OUTLOOK

Volume 1

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IESO Control Room

The Independent Electricity System Operator (IESO) operates and settles a \$10 billion market that brings together almost 300 sellers and buyers of electricity. Every five minutes, the IESO balances the supply of and demand for electricity across the province of Ontario and establishes a market clearing price that reflects the cost of providing electricity to Ontario consumers.

The Ontario Market Outlook is published annually to report on the current state of the Ontario electricity market and identify future opportunities and challenges for the continued development of the market.

For more information, visit [www.ieso.ca](http://www.ieso.ca).

# EXECUTIVE SUMMARY

May 1, 2007 marked the five year anniversary of the opening of Ontario's wholesale electricity market. The wholesale market is a key component of the various industry reforms and restructuring that have transformed the Ontario electricity industry over the past 10 years. Over this time the Ontario electricity industry has evolved from a self-regulated Ontario Hydro monopoly to the more decentralized hybrid market structure that exists today. A number of price, supply and demand response benefits have been realized in the first five years of the market.

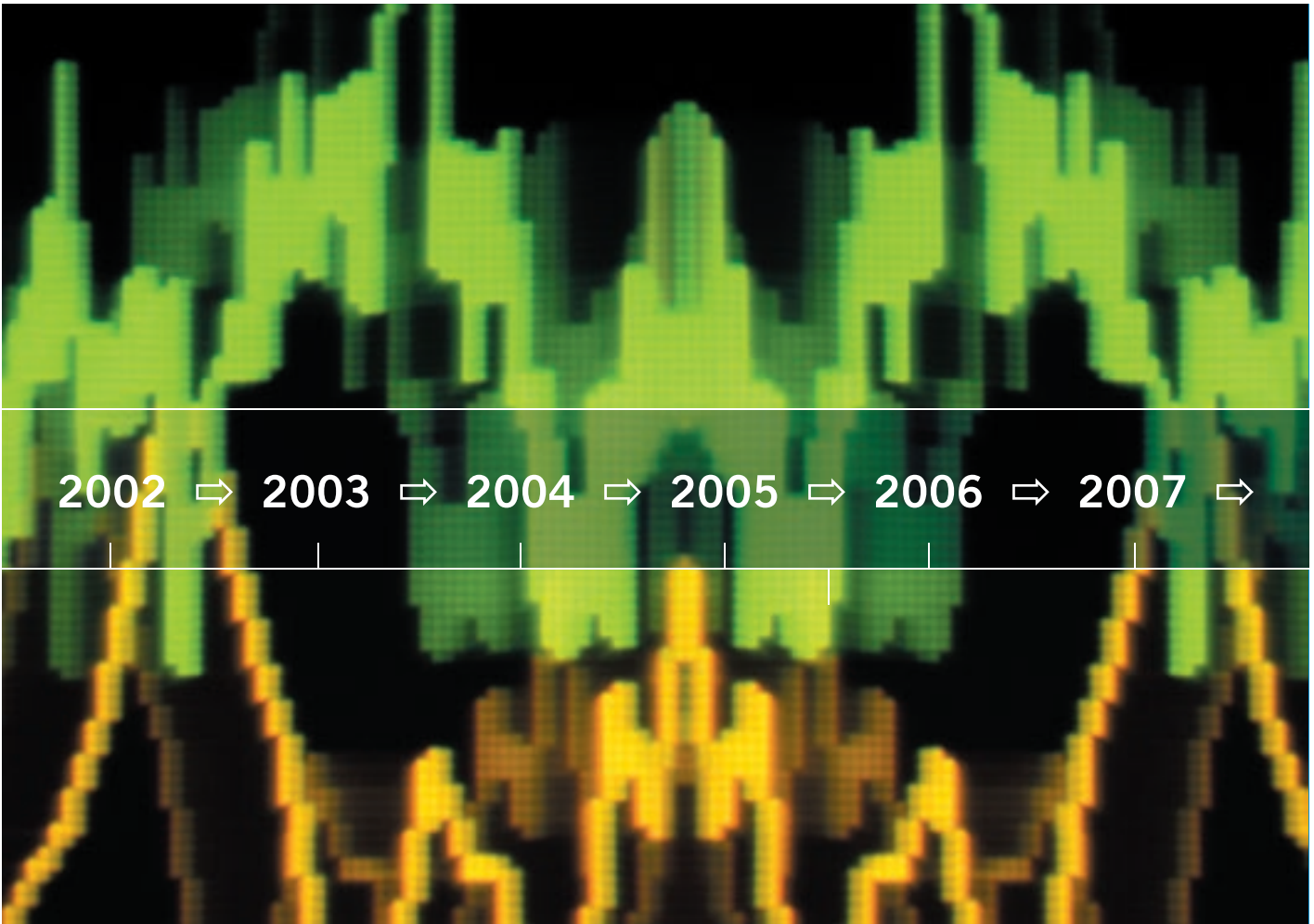
The Independent Electricity System Operator (IESO) operates and settles a \$10 billion market that brings together almost 300 sellers and buyers of electricity. Every five minutes, the IESO balances the supply of and demand for electricity across the province of Ontario and establishes a market clearing price that reflects the cost of providing electricity to Ontario consumers.

The market price of electricity has decreased since the market opened five years ago. After adjusting for fuel price increases, the average load-weighted Ontario wholesale electricity price has decreased by an average of two per cent per year, between 2003 and 2006.

On the supply side, more than 4,400 megawatts (MW) of new or refurbished generation has come on line since 2002 and Ontario's hybrid market has resulted in plans for approximately 7,000 MW of additional generation to be in service by 2011. Existing generators have also increased output under the market structure, particularly nuclear generators. For example, the capacity factor of all nuclear generators in the Ontario market has increased from 80 per cent in 2003 to 85 per cent in 2006.

The province's average annual supply margin has increased from 13 per cent in 2002 to 20 per cent in 2006. Other than 2005, when the 1,130 MW coal-fired Lakeview Generating Station was taken out of service, the Ontario supply margin has improved continuously since market opening.

More than 50 per cent of the electricity being used in Ontario is by consumers who pay the hourly price. Hourly price signals encourage large volume customers to shift electricity consumption from high price periods to low price periods. New programs, such as Ontario's Smart Metering Initiative, will further encourage residential customers to reduce their electricity bills by shifting their electricity use from higher priced periods to lower priced periods, reducing the demand peaks that can strain Ontario's electricity system.



Industry reforms have led to an increase in the level of transparency of the day-to-day operations of the industry. Many types of operational and market data are available from the IESO website – information that aids all participants in decision making. At the same time, the increased transparency has fostered a more informed level of scrutiny, which has enhanced the public accountability of all market participants, including the IESO itself. A strong argument can be made that the increased industry transparency has significantly contributed to the operational efficiency gains over the past five years.

The Ontario Market Outlook is published annually to report on the current state of the Ontario electricity market and identify future opportunities and challenges for the continued development of the market. This five-year anniversary retrospective Outlook looks back on some of the trends and results since market opening in 2002, and looks ahead to some of the future opportunities to realize benefits for the province. Outlooks published in the future will be more forward looking.

# AN OVERVIEW OF THE ONTARIO ELECTRICITY MARKET

In late 1995 the Government of Ontario appointed an advisory committee to study and assess options for phasing in competition in the Ontario electricity system. In 1996 the Advisory Committee, headed by former Federal Finance Minister Donald MacDonald, recommended the restructuring of Ontario Hydro and the transition to a wholesale competitive electricity market, followed by a competitive retail market.

Under the *Electricity Act, 1998*, the former Ontario Hydro was restructured into Ontario Power Generation Inc. (OPG), Hydro One Inc., the Independent Electricity Market Operator (IMO), the Electrical Safety Authority and the Ontario Hydro Financial Corporation (renamed the Ontario Electricity Financial Corporation in 1999).

The Ontario competitive electricity market opened on May 1, 2002. In December 2004, the Government of Ontario passed the *Electricity Restructuring Act, 2004*, which further reorganized the province's electricity sector to create a hybrid electricity market; a competitive wholesale market coexisting with regulated prices in parts of the electricity sector. Also at that time, the Ontario Power Authority (OPA) was created and the IMO was renamed the Independent Electricity System Operator (IESO).

**TABLE 1: The Ontario Market at a Glance (2006)**

Market Participants	<b>271</b>
Retail Customers	<b>4.5 million</b>
Available Generating Capacity	<b>31,000 MW</b>
Record Peak Demand	<b>27,005 MW</b>
Annual Energy	<b>151 TWh</b>
Average Energy Price	<b>\$48.75/MWh</b>
Wholesale Transactions	<b>\$10.4 billion</b>

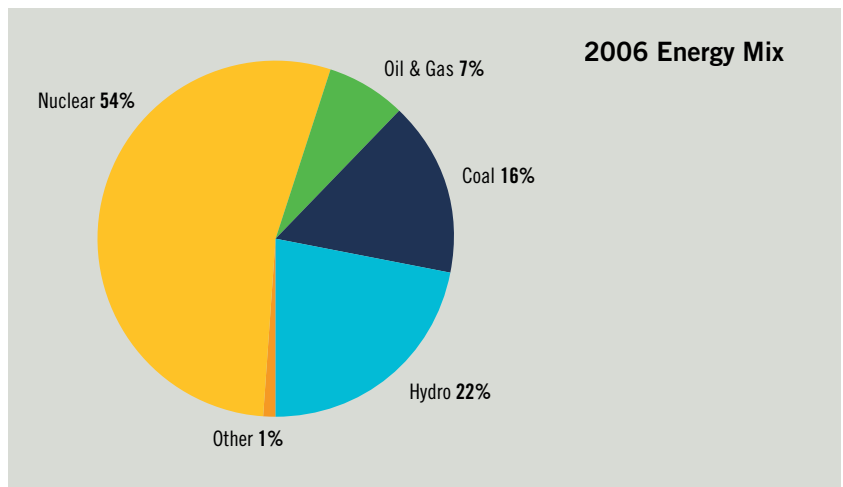
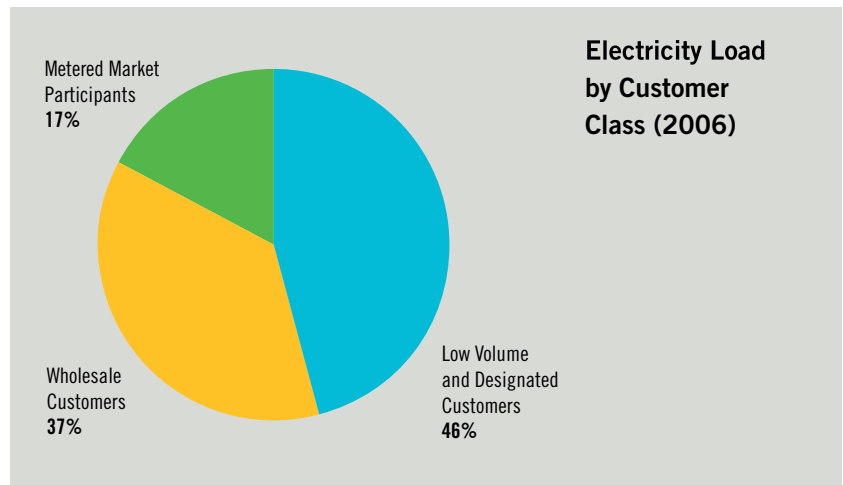
While there are a number of different organizations in the industry today, each has its specific set of accountabilities. OPG generates electricity, Hydro One delivers electricity, the IESO ensures integrated operations across the province and over the interconnections, the OPA is responsible for long-term planning and conservation programs, and the Ontario Energy Board (OEB) is the regulator. There are also approximately 90 local distribution companies (LDC) that deliver electricity to businesses and homes in their jurisdictions across the province.

Ontario electricity customers generally fall under two different rate classifications. Large volume customers who pay the hourly wholesale price for electricity adjusted by the cost of any supplemental payments and rebates, and low volume consumers that pay a fixed price for electricity under the regulated price plan (RPP) established by the OEB.

Large volume consumers are those who use more than 250,000 kilowatt hours (kWh) per year. They are either registered as market participants who then purchase their electricity directly from the IESO, or they are billed by their LDC. These market participants and wholesale customers represent approximately 55 per cent of total electricity consumption in Ontario.

Consumers that use less than 250,000 kWh per year, which includes more than four million homeowners, and other designated consumers such as municipalities, universities, schools and hospitals pay a fixed price for electricity under the RPP. The RPP prices are designed to recover the cost of supplying electricity to customers under the plan. The rates reflect the cost to purchase electricity from the wholesale market, the cost of making any supplemental payments to contracted generators and any rebates provided by regulated generators. The rates are fixed for a minimum of six months, at which point they may be re-set by the OEB.

Ontario is part of a bigger North American electricity market, which stretches as far west as the Rocky Mountains, as far east as the Atlantic Ocean and to the Gulf of Mexico in the south. Ontario is interconnected with New York, Michigan, Manitoba, Minnesota and Quebec. Imports and exports occur between these jurisdictions on an hourly basis. While imports have played an important role in maintaining reliability in Ontario over the past five years, they are primarily transacted for economic reasons, often displacing higher priced domestic generation.



# MARKET TRANSPARENCY

Today’s wholesale electricity market provides a level of transparency that did not exist prior to market opening. Individuals and organizations now have access to information on supply and demand conditions published hourly on the IESO website. This increased transparency has led to more informed decision making on behalf of all industry participants including electricity suppliers and consumers.

For the development of efficient wholesale markets, it is essential that all market participants have access to relevant information to make informed decisions. Since market opening, the IESO has continuously improved access to market information on demand, supply and network issues, some of which is listed below.

One of the major benefits of industry reforms is wholesale market price signals. Participant response to these price signals enhances efficient supply and demand response, and as a result, reliable operations. Price signals are by far the most effective and transparent indicator to the industry, providing all participants with economic drivers to operate in a manner that will be to the benefit of all. Prices signal the short-term need for additional supply from domestic generation and through imports and for efficient demand response and conservation efforts.

Similarly, market information is readily available from most jurisdictions surrounding the Ontario market. The availability of real-time information about these markets results in more efficient inter-jurisdictional trade which leads to improved efficiency of operation and enhanced reliability benefits for the entire region.

The availability of timely and transparent market information has also enabled demand response from customers when it is most needed.

On a number of occasions when the system was strained, customers quickly responded to expectations of high market prices by reducing their electricity consumption.

This behavioural response was notable on August 1, 2006, when Ontario set a record peak demand. IESO market information revealed pre-dispatch prices in excess of \$200 per megawatt hour (MWh) which prompted a number of customers to either shift consumption to lower priced periods or operate back-up generators. These actions contributed to ease the operational challenges that would otherwise have occurred.

Generators with high ramp rates and operational flexibility, such as fossil generators and hydroelectric facilities, also have the ability to quickly respond to market signals. The operators of these facilities follow real-time data in order to make efficient decisions regarding their operations. Consumers receive the benefits of these efficiencies through electricity prices being lower than they would otherwise have been.

The publication of hourly generator output also increases awareness of the environmental characteristics of particular types of generation. There is room for increased transparency by better linking production and consumption decisions to the environmental attributes of the generation being operated; an enhancement the IESO is considering adding to its information products.

**TABLE 2: Information and Data Published by the IESO**

Hourly actual demand, prices, intertie schedules and flows
Hourly actual generator unit/station output and capability
Hourly generator and transmission system planned outages
Hourly system status and security and adequacy assessments
Hourly projections of demand, prices, and intertie schedules
Operating reserve requirements and prices
Transmission rights auction information
Daily, weekly, and monthly summary reports on market activities, prices and costs
18-month Outlook Assessment of Ontario system reliability
Ontario Reliability Outlook
Market Surveillance Panel report

# NEIGHBOURING MARKETS

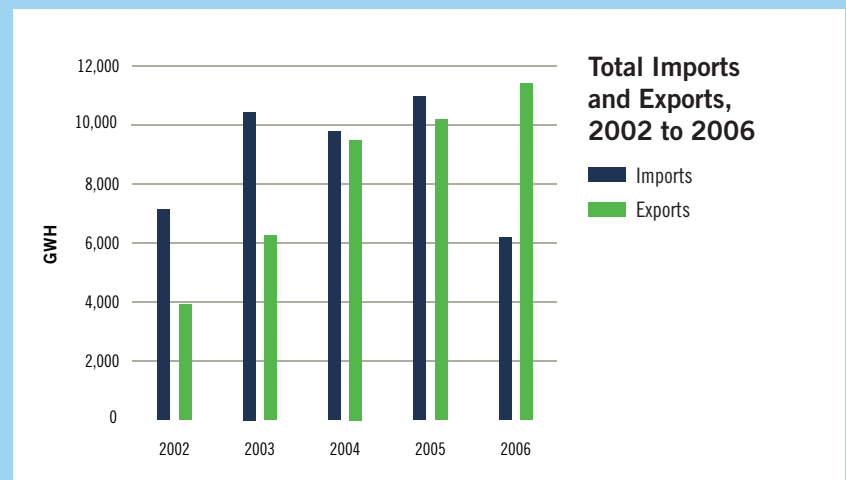
Ontario is part of a bigger, well connected, North American electricity market and trade between Ontario and its neighbouring markets is vibrant. In 2006 alone, over \$800 million in electricity was traded across Ontario's interconnections. As illustrated below, trade activity between Ontario and its neighbours continues to increase and is expected to continue to provide benefits to Ontario from a reliability and economic perspective.

There is between 4,000 MW and 5,000 MW of transmission capacity between Ontario and other jurisdictions including New York, Michigan, Manitoba, Minnesota and Quebec. Construction is underway to expand Ontario's interconnection capacity with Quebec. The new bi-directional connection will provide Ontario with access to an additional 1,250 MW of hydroelectric supply from Quebec. This interconnection is expected to be in service by 2009.

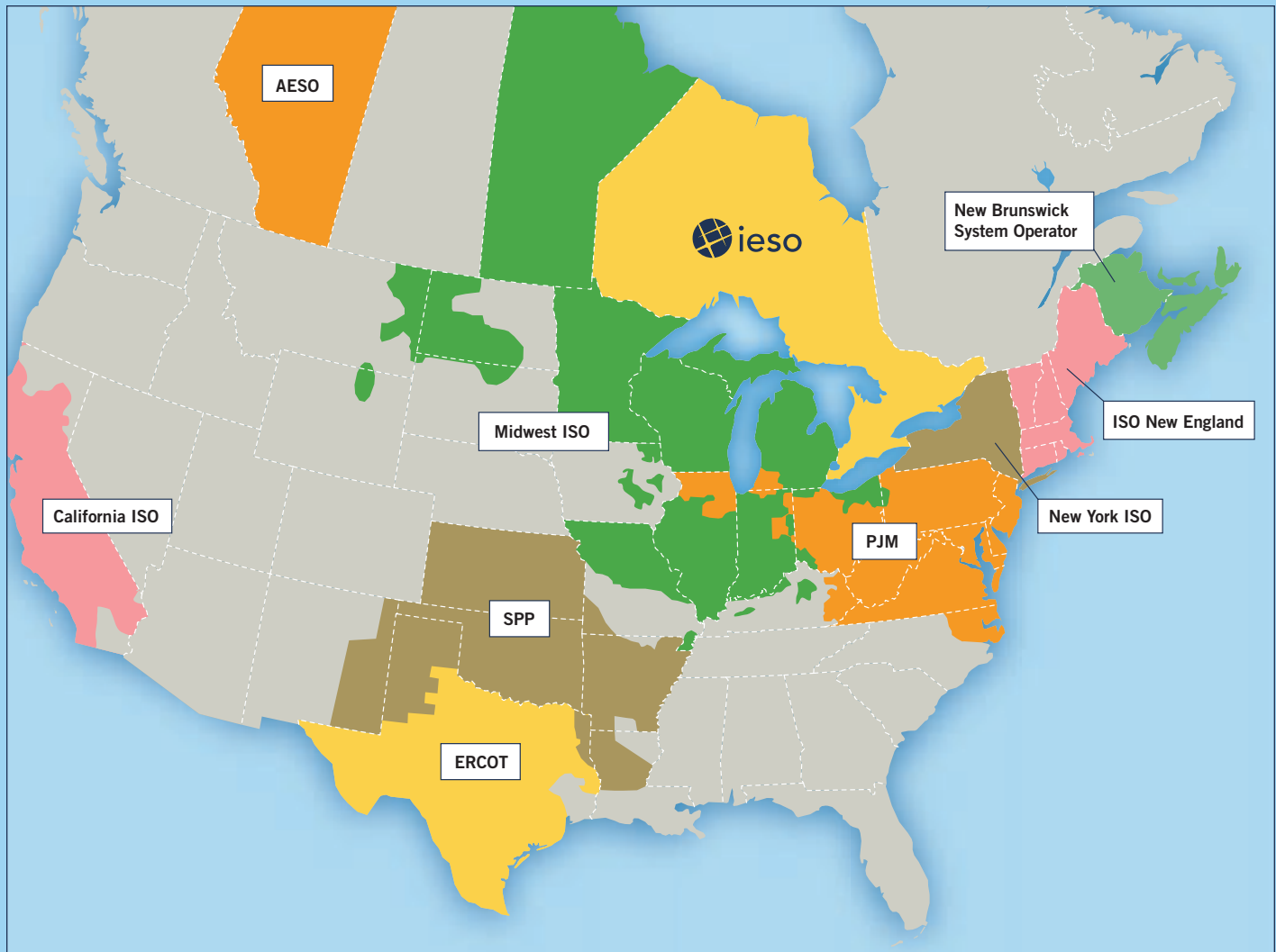
Being interconnected to other markets allows Ontario to achieve a level of reliability that would otherwise require a significantly greater investment in domestic generating capacity, and associated higher costs. This benefit was particularly noticeable in 2002 and 2005 when in some hours there was insufficient domestic generation to meet Ontario demand. In fact, in 2005, Ontario demand plus required operating reserve exceeded domestic generating capacity in 593 hours. During these hours, Ontario relied on imported power from its neighbours to meet its internal requirements.

With more moderate weather, improved supply conditions and some day-ahead scheduling arrangements in place, this situation only occurred during 246 hours in 2006. Overall, Ontario was a net exporter of electricity in 2006 for the first time since 2000.

Trade is very sensitive to supply and demand conditions in Ontario. Importers and exporters respond quickly to the changes in hourly electricity prices. When supply conditions were tight during the summers of 2002 and 2005, high prices in Ontario attracted imports from neighbouring jurisdictions, thereby reducing the price for Ontario consumers. Imports and exports tend to provide a stabilizing influence on Ontario's electricity prices. In addition, Ontario generators are able to export their surplus capacity, which contributes to the recovery of their fixed costs.



## NORTH AMERICAN ELECTRICITY MARKET



Boundaries are approximate

**TABLE 3: Comparative Data for North American Independent System Operators and Regional Transmission Operators (2006)**

	Peak Load (MW)	Installed Generation (MW)	Transmission (km)	Population Served	Jurisdictions Covered	Market Participants	Wholesale Transactions (\$ millions)
Midwest ISO	136,520	162,981	150,600	40,000,000	15 states; 1 province	256	\$24,200
PJM (Pennsylvania, New Jersey and Maryland)	144,644	164,634	90,200	51,000,000	13 states + DC	420	\$20,100
ISO-NE (New England)	28,127	33,477	12,900	14,000,000	6 states	310	\$9,000
NYISO	33,939	38,958	17,700	19,200,000	NY	330	\$8,610
CAISO	45,431	54,500	41,000	30,000,000	CA	95	\$2,450
ERCOT	62,339	80,141	61,100	20,000,000	TX	762	\$27,000 (retail market; whls figs not available)
SPP (Southwest Power Pool)	42,227	45,950	84,150	4,500,000	8 states	23	n/a*
IESO	27,005	31,000	29,000	12,000,000	ON	271	C\$10,400
AESO	9,661	11,497	21,100	3,400,000	AB	200	C\$4,176
New Brunswick	5,716	6,723	13,500	1,160,424	NB, NS, PEI + NMe	17	C\$1,400
<b>TOTAL</b>	<b>535,609</b>	<b>629,861</b>	<b>521,250</b>	<b>195,260,424</b>	<b>45 states + DC; 6 provinces</b>	<b>2,684</b>	<b>C\$117,112<sup>†</sup></b>

Data provided by Independent System Operators and Regional Transmission Operators

\*The SPP Energy Imbalance Services Market launched on February 1, 2007. No data available for 2006.

<sup>†</sup>US dollar values converted to Canadian dollars at US \$1 = C \$1.107 (Bank of Canada, May 3, 2007)

# A FIVE YEAR REVIEW

Bruce A Turbine Hall

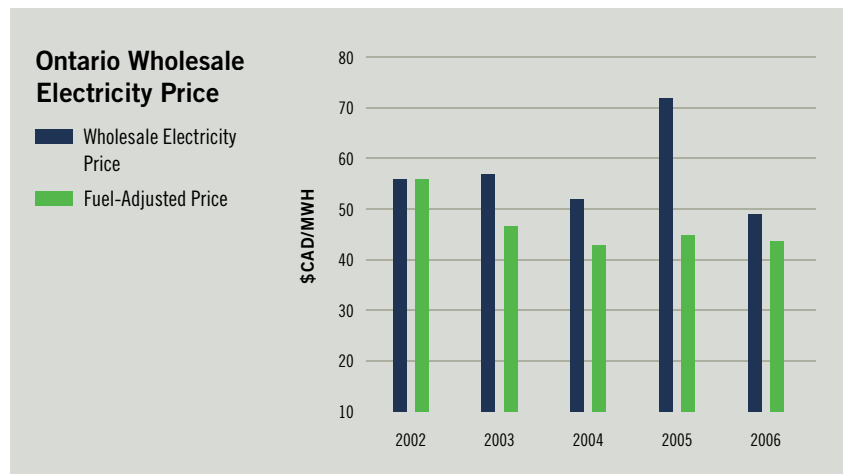


## Wholesale Electricity Price

The Ontario market operates under a single market clearing price auction. Suppliers inside and outside the province review the IESO's demand forecast information and determine how much electricity they can supply and at what price. They send these offers to supply electricity to the IESO. Every five minutes, the IESO matches the offers with the demand for electricity. It first accepts the lowest priced offers and then stacks up the higher priced offers until enough have been accepted to meet customer demand and provide adequate reserves. All suppliers are paid the same price – the market clearing price, which is based on the last offer accepted.

The market price of electricity has decreased since the market opened five years ago. After adjusting for fuel price increases<sup>1</sup>, the average load-weighted Ontario wholesale electricity price has decreased by an average of two per cent per year, between 2003 and 2006. The substantial increase in the hourly prices in 2005 is attributed to the increase in the price of natural gas following hurricanes Katrina and Rita, with those prices being 40 per cent higher in 2005 than in 2004.

The decline in the fuel-adjusted load-weighted price demonstrates the reductions being achieved in the underlying costs of supplying Ontario's electricity demand. This partly reflects that more of Ontario's demand is being satisfied with lower cost, more fuel-efficient generators. This also illustrates how in a market model, changes in fuel prices such as natural gas, a major component of the cost to produce electricity, have an immediate and direct impact on the price of electricity.



<sup>1</sup> The IESO constructed a Fuel Price Index which is a weighted average of coal, uranium and natural gas prices. The weights are the actual annual production shares for each fuel type. The reference year is 2002. The fuel adjustment calculation essentially maintains fuel prices at 2002 levels. The resulting price trend therefore strips out the effect of fuel price inflation on the wholesale price of electricity and it shows the trend in the cost of electricity after accounting for fuel cost increases.

## Other Electricity Costs

The wholesale price of electricity is only one component of consumers' total electricity bills. There are other additional charges that consumers pay. Table 4 below summarizes these charges in dollars per MWh on an annualized basis.

The global adjustment, which is calculated monthly, can be a charge or a credit to consumers. It reflects the difference between wholesale market prices and regulated rates for nuclear and baseload hydroelectric generation and contract prices for electricity from clean and renewable generators, non-utility generators and for conservation and demand response programs. In 2005 the global adjustment was an average credit of \$7.48 per MWh and in 2006 it was an average charge of \$4.37 per MWh.

In addition to the global adjustment, the OPG rebate is paid to consumers on a quarterly basis. It consists of 85 per cent of OPG's market revenues that are above the government regulated prices set for its coal and flexible hydroelectric generators. The rebate will be in effect until April 30, 2009. Over the last five years the OPG rebate has been a credit to customers.

The debt retirement charge is the cost of recovering the residual stranded debt assumed by the Ontario Electricity Financial Corporation (OEFC) upon restructuring of the electricity sector in 1999.

## Supply

Ontario's overall supply situation has improved significantly since the market opened in 2002. More than 4,400 MW of new or refurbished generation has come on line since 2002 and Ontario's hybrid market operation has resulted in plans for approximately 7,000 MW of additional generation to be in service by 2011.

Existing generators have also increased output under the market structure, particularly nuclear generators. Overall, Ontario's nuclear generating stations have exhibited an upward trend in performance. The capacity factor of these generators has increased from 80 per cent in 2003 to 85 per cent in 2006. This improved performance is influenced by the competitive and transparent environment in which generators operate today as compared to before market opening in 2002. It also reflects, in part, the increased operating drivers that all nuclear generators face in the hybrid market, as those nuclear units only earn additional revenue to the extent that they produce additional energy.

**TABLE 4: All-in Wholesale Electricity Cost (in dollars per MWh)**

Year	2002	2003	2004	2005	2006
Wholesale Electricity Price	55.89	57.09	52.21	72.14	48.75
Global Adjustment	n/a	n/a	n/a	-7.48	4.37
OPG Rebate	-12.41	-8.35	-6.85	-6.67	-1.08
Congestion Management Settlement Credit	1.70	0.76	0.60	1.47	0.80
Intertie Offer Guarantee	2.11	0.34	0.30	0.53	0.22
Transmission Losses and Operating Reserve Charges	1.73	1.44	1.67	1.87	1.18
Transmission Charges	8.77	8.36	8.12	8.17	8.24
Black Start, Voltage Support, Regulation	0.18	0.45	0.52	0.50	0.89
Debt Retirement Charge	7.00	7.00	7.00	7.00	7.00
IESO Fee	0.96	0.96	0.96	0.96	0.91
Rural Remote Charge	1.00	1.00	1.00	1.00	1.00
<b>All-in Wholesale Electricity Cost</b>	<b>66.93</b>	<b>69.05</b>	<b>65.53</b>	<b>79.49</b>	<b>72.28</b>

NOTE: 2002 refers to the period May 2002 to December 2002. Please note that figures for 2002 through 2004 do not include the OEFC payment for non-utility generator contract amounts in excess of market revenues; however these payments are included in the global adjustment values for 2005 and 2006. Strictly speaking, the Debt Retirement Charge is not a wholesale charge but is included in this table to provide a more complete picture of the charges that impact a typical consumer's bill. The OPG rebate has existed since the market opened in 2002. Initially, it was the Market Power Mitigation Agreement (MPMA) rebate. This was followed by the Business Protection Plan Rebate. The current OPG rebate has existed since April 2005.

## Conservation and Demand Response

One of the key features of the wholesale market is that it produces dynamic price signals. Many large volume customers stand ready to modify their consumption based on market prices.

Price responsive demand has been a key benefit of industry reforms. As the Market Surveillance Panel (MSP) has stated “price responsive behaviour not only benefits price responsive customers directly, it benefits all load by reducing demand and shifting load from peak to off-peak periods. The result is prices that are lower than they would otherwise be, reliability is increased, and resources are used more efficiently.”<sup>2</sup>

There are essentially two types of price responsive customers within Ontario, those that are dispatchable within the IESO’s wholesale market and those that are non-dispatchable.

Dispatchable consumers are generally large industrial customers that are capable of adjusting their electricity consumption in response to five-minute dispatch instructions from the IESO. These customers participate directly in the wholesale market by making hourly bids to buy electricity. At the opening of the market in 2002, there were only two large industrial consumers representing 65 MW of consumption that were dispatchable. Currently there are nine large industrial consumers that are dispatchable for over 700 MW of consumption.

In addition, these large consumers provide as much as 500 MW of additional operating reserve to the market, which provides them with the opportunity to be paid by the market for this service. The provision of operating reserve by customers helps to increase the competitiveness of reserve supply, which lowers the overall cost of meeting the province’s reserve requirements and translates into savings for all electricity consumers.

IESO analysis has also identified as much as 200 to 400 MW of non-dispatchable price responsive consumers. In its most recent report, the MSP illustrated an example of how on one occasion, three large volume customers responded to a price increase by reducing their consumption by 25 MWh. The MSP quantified the impact that this response had on the prices. In one hour, the response resulted in a market price that was nine dollars per MWh lower than what it would have been in the absence of the demand response. This relatively modest demand reduction by these customers provided a price benefit to all customers through a lower price. The demand response also reduced the need to schedule expensive peaking generation.

The OPA and LDCs have introduced a number of broader conservation and demand management (CDM) programs, which encourage electricity customers of all sizes to adopt energy efficiency measures and engage in demand response activities. Targeted CDM savings totalling more than 1,000 MW are being pursued by a number of market participants. By encouraging efficient demand response from the province’s consumers, these programs can provide economic benefits to all Ontarians by reducing the need to build and operate costly peaking generation.

<sup>2</sup> Market Surveillance Panel Report for the period September 2002-January 2003, page 104 and 105.

# FUTURE MARKET OPPORTUNITIES

By 2010, all Ontario customers will have a smart meter installed



Although Ontario's wholesale electricity market has undergone a number of changes and improvements over the past five years, many opportunities to enhance the efficiency and effectiveness of the market continue to present themselves. In fact, market participants, the MSP, the IESO and other stakeholders have identified a number of challenges in today's market which will require coordinated efforts to overcome. The issues identified range from the fidelity of price signals to the impact of the market on generator operations.

Many industry participants, including the MSP, have expressed concerns about the credibility of advanced price signals in the Ontario wholesale electricity market. Without an effective pre-dispatch or day-ahead market price signal, generators and consumers are unable to make efficient decisions and cannot plan their operations for the following day. In addition to improving the reliability of its one hour pre-dispatch signals, the IESO is working with the OPA on market initiatives such as long-term forward contracting, which will help to provide additional price certainty. From a market perspective, the IESO continues to explore how a day-ahead market would facilitate efficient decision making by buyers and sellers of electricity.

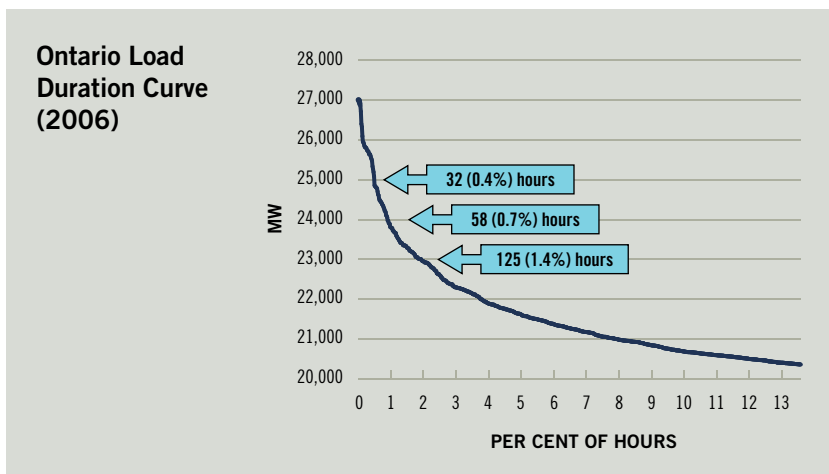
As it has regularly done during the past five years, the IESO continues to work closely with market participants and other stakeholders to develop and implement solutions to the challenges that face the sector. The IESO's Stakeholder Advisory Committee, which represents the wide range of interested parties in this sector, provides advice and recommendations to the IESO Board of Directors on these types of market development and planning decisions. Looking forward, many other valuable opportunities to further develop this market exist.

## Conservation and Demand Response

The ability of consumers to alter their electricity consumption in response to changes in price is an important component of an electricity market as an effective market requires active participation on both the supply and demand sides. Shifting consumption from peak periods when the cost of production is high to off-peak periods when the cost of production is lower will reduce the province's overall generation cost and translate into savings for customers. In addition, it will provide for more efficient use of Ontario's electricity assets and will help maintain a reliable system.

This shift in consumption will also reduce the need for future investment in peaking generation and lower the province's overall investment cost. For instance, Ontario demand peaked at 27,005 MW, but exceeded 25,000 MW for only 32 hours in 2006. Positive CDM results can go a long way towards meeting demands that occur in so few hours over the year. Enabling more price responsiveness is a key to future market evolution.

The OPA is developing a suite of electricity conservation, education and incentive programs aimed at encouraging more energy conservation and demand response. Many of the OPA programs will either use or be based on market signals to induce demand response and conservation. The IESO is working with the OPA to integrate these programs into the IESO's system operations.



In a market context, the key to enabling price responsiveness is accurate price signals. Consumers need accurate information about prices and they need this information well in advance so that they can plan their consumption. Consumers also need information of how changes in their consumption patterns can lead to real savings on their electricity bills.

The IESO is investigating a pilot project with several LDCs that would provide interested consumers who have smart meters with hourly market price signals and additional information on the benefits of changing their consumption patterns in response to these prices. This pilot project should complement the government's Smart Meter Initiative by encouraging consumers that can benefit from paying hourly prices to do so.

### Smart Meters

Ontario's Smart Metering Initiative involves installing 800,000 smart meters by the end of the year and smart meters for all Ontario customers by 2010. This will empower electricity consumers by providing them with the knowledge and opportunity to manage their costs. In Ontario's electricity market today, generators have all the necessary information and incentive to respond to price signals but the majority of customers do not. As discussed previously, this is an important element of an efficient market and critical to enabling effective CDM.

More than four million Ontario customers are currently on the OEB's RPP, which means they pay a fixed price for electricity, regardless of the time of day. The Ontario government's plan to install smart meters for every customer provides an opportunity to change this. Because smart meters measure electricity consumption on an hourly basis, they enable the implementation of time-of-use pricing. The time-of-use prices, set by the OEB, reflect the cost of electricity during different periods in the day. This means that customers will pay less for electricity consumed during periods when demand is low and will pay more when demand is high.

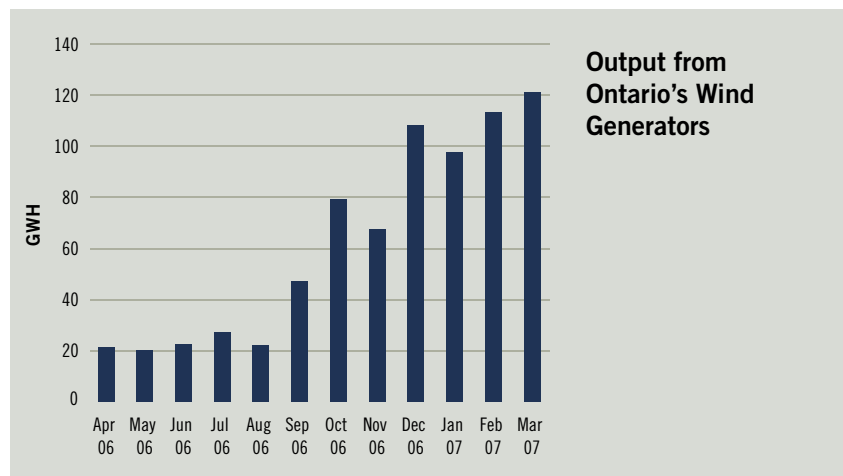
The challenge is to ensure that this information is available to customers in a timely and accessible fashion, and that customers are aware of the potential to manage their costs. To that end, customer education efforts will be critical to the successful achievement of the benefits that can arise from smart meters.

Smart meters also offer the opportunity for operational and planning benefits for LDCs, and the data collected will also be valuable in the design, implementation and monitoring of CDM initiatives.

### Environment

Since the market opened in 2002, there has been growing public awareness of the impact that the electricity industry has on the environment. Ontarians are becoming better informed of the associated emission impacts of their electricity consumption. This is due, in part, to the level of attention now being given to global warming by the media, politicians and other leaders. It is also supported by the increased transparency that has followed from the reforms in the electricity industry.

A recent survey conducted by Angus Reid Strategies<sup>3</sup> revealed that three quarters of Ontario respondents said they were convinced global warming was occurring and almost half said they worried it would significantly impact their lives. Ontarians are prepared to do their part to help reduce the environmental footprint of the electricity industry.



<sup>3</sup>As described in <http://cnews.canoe.ca/CNEWS/Science/2007/03/21/3798329-cp.html>

The Ontario government has also taken action to address the environmental issues. It has placed more emphasis on the need for renewable energy supply sources and conservation. Last year, in its supply mix directive to the OPA the Minister of Energy identified three priorities:

- Continued effort to reduce the province's reliance on coal-fired generation ;
- A province-wide culture of conservation; and
- A preference for renewable sources of energy.

The government has set targets for both renewable energy supply and conservation and demand management that the OPA will work into its long-term supply plan. By 2025, conservation efforts are targeted to reduce peak demand by 6,300 MW and renewable energy resources, such as wind, hydroelectric and solar power, should make up 40 per cent of the province's supply mix.

In order to further its cross-border efforts, the government has announced its intention to investigate joining the United States' Regional Greenhouse Gas Initiative (RGGI) and the Western Regional Climate Action Initiative. Both initiatives are state-level strategic partnerships with mandates to reduce greenhouse gases.

The IESO will continue to do its part in promoting Ontario's environmental efforts. In addition, the IESO will continue to coordinate with the OPA in ensuring that all new environmentally sound sources of supply and conservation efforts can be integrated effectively, reliably and expeditiously onto the grid.

The IESO is exploring other ways to increase public awareness of the environmental impacts this sector can have. One opportunity is to publish data on daily or monthly levels of greenhouse gas emissions from particular types of electricity generators, which would further increase awareness of the consequence of increased electricity consumption.

Finally, the IESO is committed to supporting efforts to enable and develop an effective greenhouse gas emissions market in Ontario.

## Day-Ahead Market

The IESO will continue to pursue opportunities that foster the further development of Ontario's electricity market. Specifically, the IESO is committed to enhancing today's hybrid market structure so it can continue to deliver reliable and efficient electricity to Ontarians, while continuing to capture the benefits of the regional market within which Ontario resides.

Consistent with this commitment, the IESO is investigating the development of a day-ahead market in Ontario. The IESO is currently working with stakeholders to identify potential benefits and requirements for a potential day-ahead market for Ontario. These consultations have a range of possible outcomes – from a full-featured day-ahead market to retaining or enhancing the existing day-ahead reliability programs.

There are several factors that may offer potential benefits for the Ontario electricity industry from developing a day-ahead market. Electricity consumers have commented at various times over the first five years of the market that better day-ahead price signals would allow them to plan their operations such that they can operate more efficiently than under today's real-time price-only system. Suppliers cite examples such as increased coordination of gas and electricity markets, improved start-up scheduling, and better management of hydroelectric utilization as areas that can benefit from better day-ahead signals. The IESO is also investigating the potential for additional reliability benefits from a day-ahead market through improved coordination between domestic resources and imports or exports with other jurisdictions.

# GLOSSARY

## **Black Start Capability**

This is the capability of a generation facility to start without any outside electrical supply so as to be used to energize a defined portion of the grid. The IESO contracts for this capability and associated costs are recovered through an uplift charge to consumers.

## **Congestion Management Settlement Credit**

In some cases, a generation unit, dispatchable load facility or an import or export transaction may be directed by the IESO to supply or consume less or more energy than it would otherwise be economically scheduled to supply or consume in order to assist in addressing among other things transmission flow constraints on the system. Such actions result in the payment of Congestion Management Settlement Credits, which are recovered through an uplift charge to consumers.

## **Day-Ahead Market**

In a day-ahead market, offers to supply and bids to purchase electricity are submitted to the market operator one day in advance. The market operator then matches the offers with the bids and forecast demand for electricity to arrive at market clearing prices for each hour of the following day.

## **Debt Retirement Charge**

This per unit charge has been set by the Ontario Ministry of Finance to pay down the residual stranded debt of the former Ontario Hydro.

## **Electrical Safety Authority**

The Electrical Safety Authority is responsible for regulating the safe use of electricity and equipment in Ontario, enforcing the Ontario Electrical Safety Code, and appointing inspectors. It is a stand-alone, financially self-sustaining not-for-profit corporation.

## **Global Adjustment**

This monthly adjustment, which can be a charge or credit on customers' bills, reflects the difference between wholesale market prices and the regulated and contracted rates paid for certain generation and demand response programs.

## **Hydro One Inc.**

Hydro One owns and operates the majority of the high voltage transmission lines in Ontario. It also owns and operates a number of distribution facilities in the province.

## **Independent Electricity System Operator**

The Independent Electricity System Operator (IESO) manages the province's power system so that Ontarians receive power when and where they need it. Ontario's IESO balances demand for electricity against available supply through the wholesale market and directs the flow of electricity across the transmission system.

## **Intertie Offer Guarantee**

Electricity imports into Ontario are selected a day-ahead and/or one hour ahead of real-time. If the offer price of an import selected in the day-ahead pre-dispatch of record or hour ahead pre-dispatch exceeds the real-time prices set in the market, importers are paid a day-ahead or real-time intertie offer guarantee payment to ensure they are kept whole to their offer. This cost is recovered through an uplift charge to consumers.

## **Market Surveillance Panel**

The Market Surveillance Panel, which reports to the Ontario Energy Board (OEB), monitors, investigates and reports on the activities and behaviour in the IESO-administered markets in Ontario's electricity sector.

## **Ontario Electricity Financial Corporation**

The Ontario Electricity Financial Corporation is responsible for managing the liabilities of the former Ontario Hydro. It also manages existing power purchase agreements with non-utility generators.

## **Ontario Energy Board**

The OEB regulates all non-commodity electricity rates, sets electricity prices for low volume and designated customers and licences the IESO and all market participants.

## **Ontario Power Authority**

The Ontario Power Authority is responsible for long-term planning and ensuring an adequate supply of electricity and demand response in Ontario for this time frame.

## **Ontario Power Generation Inc.**

Ontario Power Generation is the largest generator of electricity in Ontario. It owns and operates 22,000 MW of nuclear, fossil (e.g. coal, gas, oil), hydroelectric and wind generating capacity.

## **Operating Reserve**

Operating reserve is generation capacity or load reduction capacity that can be called upon on short notice by the IESO to replace scheduled energy supply which is unavailable as a result of an unexpected outage or to augment scheduled energy as a result of unexpected demand or other contingencies. Generators, loads and importers of operating reserve are paid a market clearing price for providing operating reserve and the cost is recovered through an uplift charge to consumers.

## **OPG Rebate**

This rebate is paid to Ontario customers on a quarterly basis. It consists of 85 per cent OPG's market revenues that are above the regulated rates set for its fossil generators (excluding Lennox Generating Station) and flexible hydroelectric facilities. This rebate will be in effect until April 30, 2009.

## **Regulated Price Plan**

This plan has been established by the OEB to set the prices charged to low volume and designated electricity customers. Under the plan, the prices reflect a forecast of the cost to procure energy from the wholesale electricity market and generators that are paid regulated or contracted rates for their output. Prices under the RPP may change every six months.

## **Regulation Service**

Regulation service is the ability of a generator to have its generation output adjusted frequently so that any power system frequency variations or imbalances between load and the output from generation facilities can be corrected.

## **Rural Rate Protection Charge**

This rate is used to partly offset the higher cost of providing electricity in rural and remote areas. This charge is reflected on consumers' bills as an uplift.

# IESO MARKET PARTICIPANTS

ABB Inc.	Cytec Canada Inc.	Great Lakes Power Limited – Transmission Division	Mississagi Power Trust	Smurfit-Stone Container Canada Inc.
Abitibi-Consolidated Company of Canada	De Beers Canada Inc.	Greater Sudbury Hydro Inc.	MMFX Steel of Canada, Inc.	Split Rock Energy LLC
ACH Limited Partnership	Direct Energy Marketing Inc.	Greater Toronto Airport Authority	Morgan Stanley Capital Group Inc.	Spruce Falls Inc.
Affinia Canada Corp	Direct Energy Marketing Limited	Greenfield Energy Centre LP	National Research Council Canada	St. Andrew Goldfields Inc.
Ainsworth Engineered Canada Limited Partnership	Dofasco Inc.	Grimby Power Incorporated	Neenah Paper Company of Canada	St. Marys Cement Inc.
Air Liquide Canada Inc.	Domtar Inc.	Guelph Hydro Electric Systems Inc.	New York Power Authority	St. Marys Paper Ltd.
Air Products Canada Ltd.	Domtar Pulp and Paper Products Inc.	Guelph Hydro Electric Systems Inc. – Rockwood Div.	Newmarket Hydro Ltd.	St. Thomas Energy Inc.
Algoma Steel Inc.	Dow Chemical Canada Inc.	Haldimand County Hydro Inc.	Newmont Canada Limited	Stelco Inc.
Algonquin Power (Nagagami) Limited Partnership	DTE Energy Trading Inc.	Haley Industries Limited	Niagara Falls Hydro Inc.	Sun-Canadian Pipe Line Company Limited
ALLETE, Inc. d/b/a Minnesota Power	Duke Energy Marketing Limited Partnership	Halton Hills Hydro Inc.	Niagara-on-the-Lake Hydro Inc.	Suncor Energy Products Inc.
American Water Services Canada Corp.	Dynegy Power Marketing Inc.	Hamilton Renewable Power Inc.	Norampac Inc. - Red Rock Division	Suncor Energy Products Inc. - Ripley
André Gauthier Holding Inc.	Dyno Nobel Nitrogen Inc.	Hamilton Specialty Bar Corporation	Norampac Inc. - Trenton Division	Susquehanna Energy Products, LLC
Atikokan Hydro Inc.	E. L. K. Energy Inc.	Hearst Power Distribution Company Limited	Norfolk Power Distribution Inc.	Tembec Pulp Group - Kraft Pulp Division - Smooth Rock Falls
Atlantic Packaging Products Ltd.	Ecotricity Guelph Inc.	Horizon Utilities Corporation	North Bay Hydro Distribution Limited	Terra International (Canada) Inc.
Atomic Energy of Canada Limited	Emera Energy Incorporated	HQ Energy Marketing Inc.	Northern Ontario Wires Inc.	Terra Power Systems Inc.
Attawapiskat Power Corporation	Enbridge Ontario Wind Power L.P.	Hydro Hawkesbury Inc./Hawkesbury Hydro Inc.	Northern States Power Company	Terrace Bay Pulp Inc.
Barrick Gold Corporation – Holt McDermott Mine	Enbridge Pipelines Inc.	Hydro One Brampton Networks Inc.	NorthPoint Energy Solutions Inc.	The Cincinnati Gas & Electric Company
Barrie Hydro Distribution Inc.	Energy Advantage Inc.	Hydro One Networks Inc.	Notre Development Corporation	The Detroit Edison Company
Beaver Power Corporation.	Energy Ottawa Inc.	Hydro Ottawa Limited	NOVA Chemicals (Canada) Ltd.	Thunder Bay Hydro Electricity Distribution Inc.
BJ Energy LLC	Energy Profiles Limited	IBM Canada Limited.	Novelis Inc.	Tillsonburg Hydro Inc.
Bluewater Power Distribution Corporation	Enersource HYRO Mississauga Inc.	Imperial Oil Limited	NRG Power Marketing Inc.	Timminco Limited
Bowater Canadian Forest Products Inc.	Enwin Powerlines Ltd.	Inco Limited - Ontario Division	O.N.Tel Inc.	Toromont Energy Ltd.
BP Canada Energy Company	Enwin Utilities Ltd.	Inmet Mining Corporation	Oakville Hydro Electricity Distribution Inc.	Toronto District School Board
Brant County Power Inc.	EPCOR Merchant and Capital L.P.	Innisfil Hydro Distribution Systems Limited	Ontario Clean Water Agency	Toronto Hydro Energy Services Inc.
Brantford Power Inc.	EPCOR Power Development Corporation	Interlake Acquisition Corporation Limited	Ontario Electricity Financial Corporation	Toronto Hydro-Electric System Limited
Brighton Beach Power L.P.	EPCOR Regional Power Services Limited Partnership	Invista Canada Company	Ontario Power Generation Inc.	Toyota Motor Manufacturing Canada Inc.
Brookfield Energy Marketing Inc.	Erie Shores Wind Farm Limited Partnership	Invista Canada Company - Bath Site	Orangeville Hydro Limited	Tractebel Canada Inc. - West Windsor Power
Brookfield Energy Marketing LP - Lievre	Erie Thames Powerlines Corporation	Iroquois Falls Power Corp.	Orillia Power Distribution Corporation	TransAlta CoGeneration LP
Brookfield Power Wind Prince LP	Espanola Regional Hydro Distribution Corporation	Ivaco Rolling Mills 2004 L.P.	Oshawa PUC Networks Inc.	TransAlta Energy Corporation
Bruce Power Inc.	Essex Powerlines Corporation	J.P. Morgan Ventures Energy Corporation	Oxy Vinyls Canada Inc.	TransAlta Energy Marketing (US) Inc.
Burlington Hydro Inc.	ESSROC Canada Inc.	Jungbunzlauer Canada Inc.	PanAbrasive Inc.	TransAlta Energy Marketing Corp.
Cabot Canada Ltd.	Exelon Generation Company LLC	Kashechewan Power Corporation	Parry Sound Power Corporation	TransCanada Energy Ltd.
Calpine Energy Services Canada Partnership	Falconbridge Limited - GECO Division	Kellogg Canada Inc.	Peninsula West Utilities Limited	TransCanada Power Marketing Limited.
Cambridge and North Dumfries Hydro Inc.	Falconbridge Limited - Mattabi Division	Kenora Hydro Electric Corporation Ltd	Peterborough Distribution Inc.	Twin Falls Limited Partnership
Campbellford-Seymour Electric Generation Inc.	Falconbridge Limited – Ontario Divisions	Kingston Cogen Limited Partnership	Peterborough Utilities Inc.	TXU Energy Trading Canada Limited
Canadian Hydro Developers, Inc.	Festival Hydro Inc.	Kingston Electricity Distribution Limited	Placer Dome (CLA) Limited	UBS Commodities Canada Ltd.
Canadian Niagara Power Inc.	First Commodities Ltd.	Kinross Gold Corporation	Port Colborne Hydro Inc.	Umbata Falls, Limited Partnership
Cardinal Power of Canada L.P.	First Nickel Inc.	Kirkland Lake Gold Inc.	Portlands Energy Centre Inc.	Valerie Falls Limited Partnership
Cargill Energy Trading Canada Inc.	Five Nations Energy Inc.	Kirkland Lake Power Corp.	Powerex Corporation.	Veridian Connections Inc.
Carmeuse Lime (Spragge) Limited	Flakeboard Company Limited	Kitchener-Wilmot Hydro Inc.	PowerStream Inc.	Veridian Connections Inc. - Gravenhurst
Carmichael Limited Partnership	Ford Motor Company of Canada, Limited - Essex Site	Lac Des Iles Mines Ltd./North American Palladium Ltd.	PowerTrail Inc.	W&E International (Canada) Corp.
Cascades Fine Papers Group Thunder Bay Inc.	Ford Motor Company of Canada, Limited - St. Thomas Site	Lafarge Canada Inc. Cement Operations	PPL EnergyPlus LLC	Wasaga Distribution Inc.
CASCO Inc. – Cardinal	Ford Motor Company of Canada, Limited - Windsor Site	Lafarge Canada Inc. Construction Materials Group- Eastern Region	Praxair Canada Inc.	Washington Mills Electro Minerals Corporation
Cat Lake Power Utility Ltd.	Fort Albany Power Corporation	Lake Shore Gold Corp.	Premstar Energy Canada Ltd.	Waterloo North Hydro Inc.
Centre Wellington Hydro Ltd.	Fort Frances Power Corporation	Lake Superior Power Limited Partnership	PSEG Energy Resources and Trade	Welland Hydro Electric System Corporation.
Chapleau Public Utilities Corp.	Fortis Energy Marketing & Trading G.P.	Lakefront Utilities Inc.	PUC Distribution Inc.	Wellington North Power Inc.
Chatham-Kent Hydro Inc.	FortisOntario Inc.	Lanxess Inc.	Rainbow Energy Marketing Corporation	Wescast Industries Inc.
Citadel Financial Products S.a.r.l.	General Motors of Canada Limited	Lehman Brothers Commodity Services Inc.	Rideau St. Lawrence Distribution Inc.	West Coast Huron Energy Inc.
Clean Power Operating Trust	GenSet Resource Management Inc.	Lighthouse Energy Trading Co., Inc.	River Gold Mines Ltd.	West Nipissing Energy Services Inc.
Clinton Power Corporation	Georgia-Pacific Canada Inc.	London Hydro Inc.	Rodan Energy and Metering Solutions Inc.	West Perth Power Inc.
CMS Energy Resource Management Company	Gerdau AmeriSteel Cambridge Inc.	Long Sault Joint Venture	Roxmark Mines Limited	Westario Power Inc.
Cochrane Power Corporation	Gerdau AmeriSteel Corporation	MAG Energy Solutions Inc.	Royal Group Technologies Limited	Weyerhaeuser Company Limited
COLLUS Power Corporation.	Glen Miller Power, Limited Partnership	Manitoba Hydro Electric Board	Saint-Gobain Ceramic Materials Canada Inc.	Whitby Cogeneration Limited Partnership
Commercial Alcohols Inc.	Goldcorp Inc. Red Lake Mine	Marathon Pulp Inc.	Saracen Merchant Energy LP	Whitby Hydro Electric Corporation
Comsatec Inc.	Goreway Station Partnership	McMaster University	Select Energy New York Inc.	Williams Energy Marketing & Trading Canada Inc.
Connectiv Energy Supply Inc.	Grand Valley Energy Inc.	Merrill Lynch Commodities Canada, ULC	Selectpower Inc.	Williams Operating Corporation
Constellation Energy Commodities Group, Inc.	Great Lakes Power Limited – Distribution Division	Middlesex Power Distribution Corporation	Sempra Energy Solutions	Windsor Casino
Constellation NewEnergy Canada Inc.	Great Lakes Power Limited – Generation Division	Midland Power Utility Corporation	Sempra Energy Trading Corp.	Woodstock Hydro Services Inc.
Constellation NewEnergy Inc.		Milton Hydro Distribution Inc.	SESCO Enterprises Canada Ltd.	WPS Energy Services of Canada Corporation
Consumers Energy Company		Mirant Canada Energy Financial Products Ltd.	SESCO Enterprises, LLC	WPS Energy Services, Inc.
Coral Energy Canada Inc.			Shell Canada Products Limited	
			Sifto Canada Inc.	
			Silverhill Ltd.	



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