



Hydro Ottawa ONTARIO ELECTRICITY GENERATION



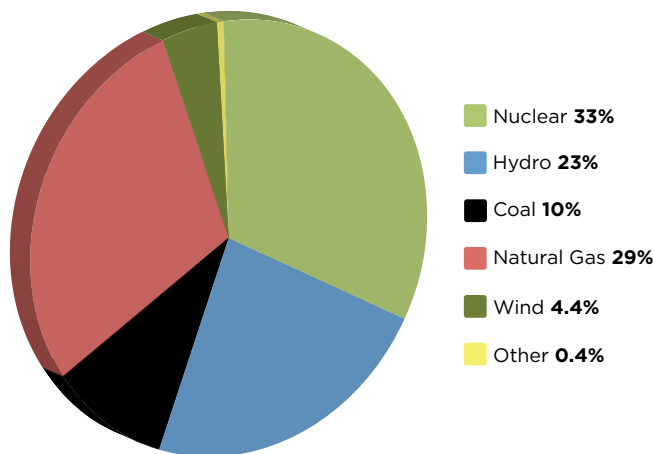
A leading, trusted, integrated utility services company

Ontario has a diverse and reliable electricity generation supply mix.

ELECTRICITY GENERATION CAPACITIES

Ontario's installed electricity generating capacity as of August 2012 was 34,517 megawatts (MW). The pie chart below shows the installed capacity of each type of generation, and their relative percentage of the total installed generation:

Installed Generation Capacity in Ontario – 2011*



Source: Independent Electricity System Operator, July 2012.

* Chart does not include generators within local distribution service areas, except those participating in Ontario's electricity generation market.



The total installed capacity is considerably more than the highest-ever demand for power in Ontario, which was 27,005 MW (August 1, 2006). It is important that the installed capacity is at least 15 percent higher than the anticipated peak demand at any time, to ensure there is enough electricity supply in the event of equipment breakdowns.

The amount of generation actually available at any one time is dependent on equipment maintenance outages and other factors, such as availability of stored water for hydroelectric generation or the availability of wind for wind power. Generating companies attempt to minimize maintenance and maximize generating capacity when power demands are highest (summer and winter).

There are more than 20 different companies that own and operate power generators connected to Ontario's electricity grid. The largest is Ontario Power Generation, which supplies about 60 percent of generation in the province.

ELECTRICITY GENERATION USAGE

In 2011, Ontario's cumulative electricity demand was 141.5 terawatt-hours, or 141.5 billion kilowatt-hours. The typical Ottawa residence uses about 8,100 kilowatt hours per year (675 kilowatt hours per month).

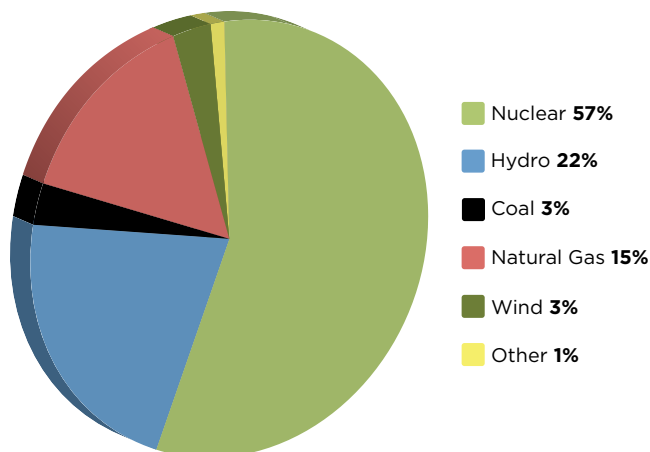
Electricity demand fluctuates depending on the time of day and the season. Demand can be 5,000 MW to 10,000 MW higher at supper time than in the middle of the night. Peak demand during a hot summer day can also be 10,000 MW higher than peak demand during a mild spring or fall day when demand for air conditioning or heating is low.

For almost all of the past century, the highest annual peak demand was experienced on a very cold day in the winter. Over the past 15 years, the highest annual peak demands have been set in the summer, because of the increased use of air conditioning.

The cost and availability of electricity generation are factors that determine which generating stations operate at any given time. Nuclear, large hydroelectric and wind-powered facilities operate continuously when available. Smaller hydroelectric stations that store water behind dams, as well as natural gas and coal-fired generation, each operate as needed, with the least expensive called on first. Below is a pie chart that shows how much of Ontario's electricity demand each form of generation supplied in 2011.

The percentages for each form of electricity generation in this pie chart are somewhat different compared with the installed capacity percentages in the pie chart on the previous page. This is because of differences in technologies and economics – those generating technologies that are less expensive to operate, that are designed for continuous operation, or that are more likely to be available, will operate more frequently than the others.

Electricity Generation in Ontario – 2011



Source: Independent Electricity System Operator, July 2012

ELECTRICITY GENERATION TECHNOLOGIES

The major types of electricity generation and their attributes are as follows.

Nuclear

Nuclear power plants contribute 11,446 MW or 33 percent of installed generation in Ontario, but accounted for almost 57 percent of Ontario's power generation in 2011. Ontario's power system is one of the most nuclear-reliant in the world.



Nuclear power stations were built between 1971 and 1993. They are expensive to build but relatively inexpensive to operate, with low and stable fuel costs, since the fuel is natural uranium and it makes up only a small percentage of operating costs. Nuclear units are designed for continuous operation and have only a limited ability to operate at a reduced capacity. Once they are shut down, it can take up to three days for a nuclear unit to reach full capacity again. Therefore, they tend to operate continuously when not shut down for maintenance.

A video on "How a nuclear station works" can be found at: www.opg.com/news/videos.asp

Hydroelectric

Ontario is fortunate to have a relatively large hydroelectric generating capacity at 7,947 MW, or 23 percent of its generating capacity. The province's water-powered stations include large stations that run continuously near Niagara Falls and on the St. Lawrence River; as well as smaller stations that store water behind dams, and that may run only a few hours a day. Most of Ontario's hydroelectric power is the lowest-cost electricity available, and it runs as available. A significant factor in the amount of hydroelectric generation is Ontario water levels — when there is lots of water available, generation from these stations increases. The hydroelectric stations represented 22 percent of generation in 2011.

A video on “How a hydro station works” can be found at: www.opg.com/news/videos.asp

Natural Gas

Ontario has built a number of natural-gas-fueled electricity generators over the past decade. The installed capacity is 9,987 MW, or 29 percent of total capacity. For the past several years, natural gas has been at a relatively low price, which makes these stations more attractive to build and operate. Natural gas stations also have the advantage of very



low air pollution emissions compared to coal or oil. However, natural gas burning emits the greenhouse gas carbon dioxide, at about half the rate of coal-fueled generation.

Natural gas stations are quick to start up and can increase or decrease generation rapidly. This flexibility is a benefit, in that system operators use these generators to help balance supply with the ever-changing electricity demand. Natural gas met almost 15 percent of Ontario's electricity demand in 2011.



Coal

Coal-fired generation was once a large percentage of Ontario's electricity generating capacity. The Ontario government is planning to phase out coal-fired generation by the end of 2014, and has already shut down a number of units. The capacity at the end of 2011 was 3,504 MW, or 10 percent of Ontario's total electricity-generating capacity. In 2011, coal-fired generation was responsible for less than 3 percent of Ontario's electricity generation.

This form of electricity generation, like natural gas, can start up and shut down relatively quickly to follow demand. Coal is also a relatively inexpensive fossil fuel. Its drawbacks are that technologies must be added to reduce emissions that result in smog and acid rain; it also emits relatively large amounts of carbon dioxide, for which no economic control technology has yet been proven.

A video on “How a thermal station works” can be found at: www.opg.com/news/videos.asp



Wind

Ontario's wind generation has increased rapidly in percentage terms over the past five years, and a number of new projects are planned. As of the end of 2011, Ontario had 1,511 MW of installed wind-generation capacity, or 4.4 percent of the province's total generating capacity. Wind power has the benefits of being emission-free, and costs have decreased as the technology has matured. However, capacity factors (the amount of time a turbine operates) are affected by wind availability. In 2011, wind power accounted for 2.6 percent of electricity generation.

Other renewable energy technologies

Ontario is encouraging other emission-free or carbon-neutral renewable energy technologies through various pricing incentives. The province has some landfill-gas generation, a small amount of solar generation (with a number of solar projects in development), and a commitment to biomass generation. These renewable energies accounted for 122 MW or 0.4 percent of installed generating capacity at the end of 2011, and 0.8 percent of 2011 generation.

THE ROLE OF ENERGY EFFICIENCY

While not a form of electricity supply, energy efficiency can have a large impact on the need for electricity generation and the building of new generating capacity. Energy efficiency can be the least expensive and most environmentally effective way of contributing to reliability, sustainability and affordability into the future.

The cost savings from efficiency investments usually result in attractive pay-back periods, and then the cumulative savings build quickly. According to the Ontario government, the investment of about \$1.7 billion in conservation programs from 2006 to 2010 is saving provincial electricity customers \$3.8 billion in avoided costs.

In terms of sustainability, the National Round Table on the Environment and Economy has identified increasing energy efficiency as key to reaching Environment Canada's goal of a 60-70 percent reduction in greenhouse gas emissions (compared to current levels) by 2050. It predicts that 40 percent of the target reductions could be achieved through energy efficiency measures.

Sources: Websites of the Independent Electricity System Operator; Ontario Power Generation; Canadian Electricity Association; Canadian Wind Energy Association; Ontario Ministry of Energy.

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