

A Primer on Distributed Energy Resources in Ontario

Sources of Electricity in Ontario

Based on a combination of data from the IESO (Independent Electricity System Operator), electricity generation in 2016 was provided by:

- nuclear 61%
- hydroelectric 24%
- natural gas 9%
- wind 6%
- solar <1%
- bioenergy <1%

Renewable Generation

Wind

- Wind turbines capture the kinetic (moving) energy in the wind and convert it to electricity. The energy of the wind causes the turbine blades to rotate, which turns a shaft that moves magnets in the generator, thereby creating electricity.
- According to the Ontario Ministry of Energy, there are approximately 1,500 wind turbines in Ontario, which have the capacity to generate more than 2,700 megawatts (MW) of electrical power. These wind energy projects are expected to produce enough electricity each year to power more than 750,000 homes.

Solar

- Solar photovoltaic (PV) technology converts the sun's rays into electricity. Light from the sun stimulates electrons in the solar PV semiconductor material and creates a flow of electricity. Even on cloudy days, solar PV systems can still produce some electricity.
- According to the Ministry of Energy, there are more than 3 million solar PV modules installed in Ontario, which all together can generate 1,100 MW, or enough electricity to power more than 140,000 homes per year. Solar PV modules can be found in large-scale ground mounted solar farms in rural areas, as well as on residential and commercial building rooftops all across the province.

Energy Storage

- Energy storage technologies capture electricity and dispatch it to the grid when required.
- Energy storage is particularly useful in capturing energy from renewable generators.
- Some examples of energy storage technologies include:
 - Batteries – typically lithium-ion or liquid electrolyte.
 - Flywheels – use a rotor inside a vacuum to store and discharge energy.
 - Electric vehicles (EVs) – along with their batteries, EVs can store or supply electricity to the grid through charging stations.
 - Thermal energy – reduces electricity consumption by storing off-peak energy as thermal energy which can be used to supply heat or hot water.
 - Pumped storage – water from a hydroelectric plant is pumped into a reservoir and then released when needed.

What's a watt?

- Kilowatts (kW) are a common measure of electrical power, equal to 1,000 watts. Megawatts (MW) are another common measure of electrical power. One megawatt is equal to one million watts.
- A standard unit for measuring electrical energy produced or consumed over time is the kilowatt hour (kWh). One kWh is the amount of electricity consumed by ten 100-watt light bulbs burning for one hour.

Smart Grid

- The smart grid is an intelligent electricity infrastructure that uses technology such as sensors, monitoring, communications, automation and computers to improve the flexibility, reliability and efficiency of the electricity system. A smart grid will:
 - empower Ontarians to better manage their electricity use and take advantage of conservation and small-scale generation opportunities
 - allow more renewable electricity generation, such as wind and solar power, to connect to the electricity grid
 - help utilities identify and fix outages more quickly
 - give businesses opportunities to provide innovative products and services to a growing market, creating jobs and sparking economic growth
 - enable electric vehicles to be charged conveniently.

***For more
information***

<http://www.energy.gov.on.ca/en/ontarios-electricity-system/>
<http://www.ieso.ca/Pages/Ontario%27s-Power-System/Smart-Grid/default.aspx>
<http://ieso.ca/Pages/Ontario%27s-Power-System/Smart-Grid/Energy-Storage.aspx>
www.collus.com
www.entegrus.com
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