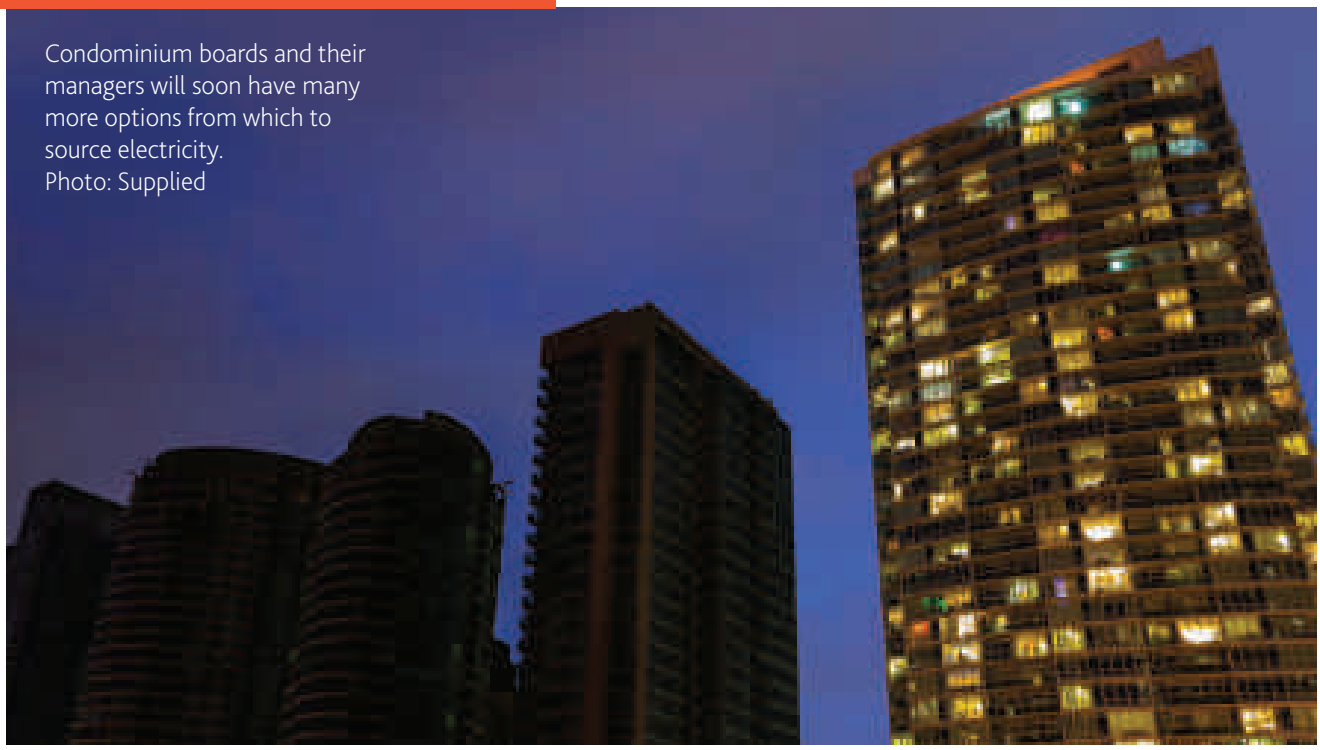

Condominium boards and their managers will soon have many more options from which to source electricity.
Photo: Supplied

Changing Landscape of Electricity Generation

By Luigi Benetton

We don't think much about what happens when we flip a switch or plug a cord into a wall socket. The electricity we need just comes to us.

Where that electricity comes from has been changing over the decades. And that evolution may soon lead to important choices for Ontario condominiums.

From remote to embedded power generation

Ontario generates much of its electricity far from where it's consumed. We rely on a costly transmission grid that can leave people vulnerable to outages. But various events have prepared Ontarians for changes to this paradigm.

On-site power generation had already been happening for some time in various other applications. Healthcare facilities can't risk interrupting life-saving medical procedures, while the data centres that businesses use for backup and to power cloud computing stay resilient thanks to on-site generation while also taking energy from the grid.

This imperative towards resilience hadn't yet made inroads in residential applications. That changed when, decades ago, a combination of highrise building fires and a lack of power to life safety systems resulted in people dying because they could not leave burning buildings. The Province of Ontario updated its building code in 1984 to mandate on-site emergency power generators to keep life safety systems online.

Many other steps followed. In the 2000s, Ontario stopped requiring on-site fuel storage for emergency backup generators. They can now draw continuously from a reliable natural gas distribution network. And since natural gas burns cleaner than diesel, which powers many legacy emergency generators, today's generators don't run afoul of environmental protection laws.

Ontario maintains a feed-in tariff (FIT) program that incents homeowners to install renewable power generation equipment on their premises.

Upcoming building code renewal may bring about more change. Government officials and industry experts have been thinking about grid stability thanks to events like the:

- two 2013 power outages suffered in the city of Toronto.
- major summer 2003 outage.
- 1998 Québec ice storm.

They've introduced the term "sustained occupancy" to describe a state where grid failures don't negatively affect citizens (i.e. all of us).

The Ontario Independent Electricity System Operator (IESO) has initiated a behind-the-meter generation (BMG) incentive program that reimburses owners for the lesser of:

- 40 per cent of the capital costs incurred

when installing *combined heat and power* (CHP) systems. These systems consist of generators that produce two types of usable energy: electricity and heat. This setup is sometimes referred to as *cogeneration*

• $200 per megawatt-hour saved in the first year of ownership of a CHP system. The systems must attain at least 65 per cent average annual efficiency to qualify for this incentive. Since CHP systems produce both electricity and heat, efficiency rises in wintertime when the system both heats the building and provides hot water, whereas in summer more excess heat is wasted.

These changes fit with our society, since we all rely more on electricity than ever before. Our needs go beyond heat and light to powering mobile phones and electric cars and modern healthcare appliances that help us to age in place.

On-site Power Generation Choices: Renewable Energy

Condominium boards must consider the choices that they have to make the right decisions for their buildings.

Wave energy. Wind turbines. Solar panels. Technologies like these generate great publicity for large corporations and government agencies that implement them. At a smaller, condominium-sized scale, though, renewable energy technology doesn't help corporations attain sustained occupancy.

Ontario does provide FIT incentives, but renewables still fall far short of the IESO behind-the-meter incentive efficiency bar.

Fuel cells can boost the efficiency of renewable energy infrastructure. For instance, these large, sophisticated batteries could store any excess power generated during windy periods for use when the wind is calm. Some people also use them for energy arbitrage, storing energy when the grid charges less and using it when the grid charges more. However, history has shown that fuel cells aren't effective as long-term backup power sources.

The technology in large-scale generators at power plants can be scaled down to CHP systems that fit inside the mechanical penthouses of modern buildings.

While they do use fossil fuels, an environmental strike against them, they consume fuel at much higher rates of efficiency. Unlike renewables, CHP systems produce two usable forms of energy: electricity and heat. The electricity doesn't have to travel an extensive transmission system, and the heat, which in large power plants typically escapes unused, does not go entirely to waste. It heats the hot water supply all year long and, in colder weather, also provides a building's heat.

CHP systems can vibrate and produce noise. High-frequency noise and vibrations are easier to mitigate than low-frequency noise, so CHP contractors collaborate with sound insulation specialists to keep these units from disturbing people nearby.

CHP systems are based on either turbines or reciprocating engines. Both:

• are proven, reliable technologies.

• use natural gas.

• easily reach levels of overall efficiency that qualifies them for the IESO behind-the-meter incentive.

The decision to acquire a CHP system is a complicated one. Of all the variables involved, cost efficiency interests everybody, so it's a good place to start.

CHP systems produce usable energy in different proportions of electricity versus heat. While buildings can use 100 per cent of the electricity produced, they waste at least some heat all year round, even in winter, since hot water and building heating rarely demand all the heat generators produce. So owners who demand the most bang for their natural gas buck need to lean towards generators that produce as much electricity and as little heat as possible. (Reciprocating natural gas engines produce about 35 per cent more electricity for each cubic meter of natural gas consumed than natural gas turbines, making them a more efficient choice that produces less waste heat.)

One other thing: CHP systems produce electricity at a lower cost than it sells for when acquired from the power grid. So the more electricity a building generates, the more money it saves on its power bills.

Cogeneration in Ontario is nascent both as an industry and as a concept to be considered by condominiums seeking cost savings and sustained occupancy. ■

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