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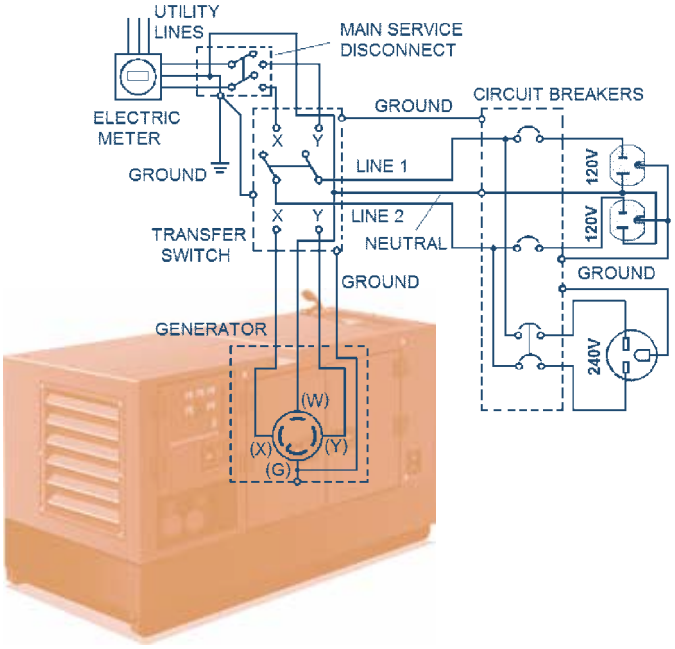
Sustained Occupancy in Condos

In Ontario, almost no residential buildings enjoy sustained occupancy when power outages occur



The southern Ontario ice storm of December 2013 threw the second of two crippling roundhouses at Toronto's power grid that year. While the summer outage certainly caused problems, the winter punch left thousands of people shivering in their homes.

Some of us were lucky. I could stay at other people's homes where power was restored faster, or never lost. That doesn't mean I appreciate having to leave my condo.

Nor do I like thinking about elderly neighbours who suffer health conditions that render them less able to fend for themselves during outages.

Those 2013 events stimulated discussion among City of Toronto staff, engineers and property management companies like the one that runs my condo. Those discussions eventually led to our previous manager presenting new possibilities we hadn't known about.

I've been tracing some of those discussions by talking to the experts involved. My personal interest? Sustained occupancy, which I picture happening like this: a winter storm knocks a tree onto power lines. The area those lines serve lose access to the grid for several sub-zero days. Residents in the area continue to enjoy heating, hot and cold running water and other things they need to weather the outage without leaving their homes.

My research ranged much farther than this narrow self-interest. They touched on grid resiliency, emergency management, even the thickness of my building's skin. Here's what I've uncovered so far.

Where we are now

Few residential buildings enjoy sustained occupancy in this province. The electrical equipment that supports gas-fired boilers (pumps, controls and so forth) often isn't connected to the building's emergency backup generator. That unconnectedness makes said boilers useless during an outage, to say nothing of things like non-emergency lighting, water booster pumps and appliances within suites.

Sure, we have emergency lighting, one elevator works and fire systems stand ready. That's all we need to leave a burning building. We meet building code specifications that came about when burning buildings were more of a concern than they are today.

Fernando Carou explains that tall building fire evacuation issues decades ago kick-started a process that led to the 1984 version of Ontario's Building Code, the version which mandates today's life-safety system backups. "We've become so good at preventing building fires that they rarely occur anymore," says Carou, a senior engineer, with the City of Toronto's Environment & Energy Division.

"We're going through a similar process now to enhance preparedness for area-wide grid failure," he optimistically adds.

Potential changes

Tim Short initially came up with the name "sustained occupation". "That sounded like a military operation," he chuckled. People tried several names before settling on "sustained occupancy".

That term is slowly infiltrating the CSA C282 standard, which outlines design and operating requirements for emergency generators in tall buildings. Short, manager of distributed energy for Enbridge Gas Distribution, sits on a committee that proposes an addendum to CSA C282 that advises designers to consider sustained occupancy loads, so long as the emergency performance of the backup generator is not compromised.

Options that don't need gas

Wary of succumbing to tunnel vision, I wanted to extend this discussion beyond generators.

The envelope on my building doesn't quite attain the ideal 60/40 opaque wall/punched window ratio you'd want in an energy efficient building. That said, it isn't what Brian Shedden would call a "terrarium" either. "It keeps the exterior environment at bay," he says of the envelope's job. "We want it to maintain thermal levels within the building as best as possible until power can be reestablished."

Shedden, an associate at engineering firm Entuitive, spends his days working on existing buildings. He concedes they need to keep the heat running. He also wants them to wear sweaters. "How do we renew the thousands of buildings built in the 60s and 70s, when energy performance, air leakage, weren't issues?" he asks. From his perspective, such buildings represent a major opportunity for improved performance, especially when they undergo overcladding, or reskinning.

Carou mentions certain City of Toronto Office of Emergency Management initiatives. The Community Agency Emergency Capacity Inventory asks organizations that are willing to pitch in during emergencies and have the resources to do so to complete an online survey.

The city has also published "Get Emergency Ready: High-Rise Living," a handy 24-page PDF that summarizes emergency preparedness for condo residents.

The Pareto principle

For all the good these initiatives can deliver, backup power generators still appear to be the 20 percent of effort condominium corporations can make to attain 80 percent of required emergency preparedness.

Thanks to 2007 changes in CSA standards, emergency power systems can get their fuel from continuously supplied natural gas. "Code requires only two hours of fuel for emergency generators," says Ed Porasz, President of M&E Engineering Limited, noting the limited (emergency systems only) load they're obliged to support.

Not having to store fuel on site means generators can escape this code-supported limitation and explore behind-the-meter generation options. Gary Thompson is OK with this way of thinking. He works for a 100-year-old utility, and while he's quick to point out it doesn't have 100-year-old assets, "we have assets that are way

past their end of life." Thompson, who works in generation & system studies, engineering & investment planning for Toronto Hydro, says his company is going through the arduous process of asking the regulator to approve investments into a grid "built to receive supply from centralized locations such as Niagara Falls and Bruce Nuclear" which are hundreds of kilometers away from the places where it's consumed.

Every condo is unique

Our board is checking out a generator setup that we might be able to acquire. But we need to take our building's quirks into account.

Emergency power comes from a Rolls-Royce diesel engine we share with two sister condominium corporations. It was installed when this nearly 30-year-old property was developed. It's been properly maintained and still keeps life-safety systems running throughout all three buildings and our shared facilities. (We haven't yet broached the topic at a Shared Facilities Committee meeting.)

Our building can't use the reserve fund to buy a generator, since we don't have one to replace. Besides, we pay our portion into our Shared Facilities Reserve Fund, so we're already saving money for a new generator. We keep our operating fund at a healthy enough balance to pay our bills, but no higher. As treasurer, I would balk at seeking a loan to pay for new equipment that "is not required by code," as Porasz reminds me. Besides, "power outages in Toronto are infrequent," he adds.

Rough pricing estimates

We aren't alone in freezing during winter power outages. "To my knowledge, every condo is just at code," says Rob Detta Colli, Manager of Energy and Sustainability for Brookfield Condominium Services Limited. He's handling an acute matter with a condo where battery backup provides, at most, 30 minutes of emergency power. It's enough to evacuate residents from their 40+ year-old building, but the residents want more.

This 300-suite building costed a generator to help it meet code. Detta Colli related the board's sticker shock at the $600,000 starting price tag. I've read other estimates starting from $100,000 just to meet code, never mind achieving sustained occupancy.

Our opportunity

Our previous property manager brought a combined heat and power (CHP) system to our attention. It's common in large industrial settings, and a gas microturbine variant may now fit in existing buildings, both physically and financially.

The solution provider worked with Brookfield to create an offer that would fit a condominium's budget. I can't disclose the business offer since the letter of intent our board signed with the provider expressly prevents me from doing so. But here's how the system would work:

Two gas microturbines run flat out, 24/7. These turbines would supply between 50 and 80 per cent of the energy our building uses. The remainder would come from the grid. On the surface, there's a lot to like about this arrangement. For one thing, the condo corporation could afford this arrangement.

Behind-the-meter generation would make a dent in our carbon footprint, since electricity

wouldn't be lost on its journey from remote power plants to power outlets in our suites. Besides, much of the heat those turbines generate could get used on site (in the winter, at least), reducing our usage of natural gas for heating. It's the locavore movement for the power generation crowd.

The CHP acronym, in our case, adds an "e" to form CHeP: Combined Heat and emergency Power. Since the turbines spin as long as gas reaches them, they'll keep spinning even if the grid fails. And that's our real goal: continuous delivery of power, which translates into sustained occupancy.

Thompson tells me we wouldn't be the first site in Toronto to go the CHP route. "At last count, we had 1,204 distributed generation connections on the system," he tells me. The grid welcomed about 300 connections in 2014 alone.

"There's a lot of interest. We welcome that. It's exciting that ratepayers are coming to the table with this type of technology."

My questions

While the technology appeals to the techie in me, the business benefits aren't assured. I want the power from these microturbines to heat our suites when the next ice storm wallops Toronto's grid. Nice-to-haves include keeping food in refrigerators from spoiling and the ability to cook that food.

We're about to ask detailed questions about our building's configuration as part of the study that will determine whether we're a fit for CHeP. I believe the micro-turbines ought to keep a boiler and circulation pump going. But what about the fan units in each suite? Could we drive them during a grid outage? Or do we just huddle next to heating units hoping to extricate warmth from them? Would Porasz's suggestion of powering hallway makeup air units help us?

Condo emergency systems get their own life safety load bus bar in the electric panel – no exceptions. "It has its own transfer switch to switch off all other loads in favor of the life safety loads," Short tells me.

Do our HVAC systems also reside on a dedicated bus bar? If they do, providing heat during outages should be more straightforward (and less cost-prohibitive) than if they don't.

Detta Colli suggested a common room that residents could frequent. We have a party room complete with working kitchen. Of course, we share that amenity with the other two buildings on the property.

Looking ahead

Some of the people I spoke with for this article are working to make sustained occupancy a reality. The last building code update happened in 2012, one year before Toronto's grid took its one-two punch. The next update is due in 2017.

Carou and company aren't waiting to create awareness of the matter. Like Short, he's also contributing to the CSA C282 updates and will provide input to the scheduled 2017 building code update. "There's a lead time to these things," he says.

Meanwhile, I look forward to having more answers my board can turn into progress towards sustained occupancy.