

BETTER Builder

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Future Proofing and Energy Choices



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On our cover: Alan Clarke of IGEN Technologies (left) and Dugald Wells of Marshall Homes. Photograph by Patricia Howell.

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The Third Wave

Building Resiliency and Future Proofing Our Homes



*"You've got to think about big things while you're doing small things,
so that all the small things go in the right direction."* — Alvin Toffler

In 1980, Alvin Toffler published a bestseller called *The Third Wave*. He described three historic phases in which civilization has developed. The first was the agricultural transition from a hunter-gatherer structure. The second was the industrial age, largely driven by the burning of cheap fossil fuels like coal and petroleum. The third is the information age, where we connect to the internet using our smartphones in a process that is highly dependent on base metals.

We know now that the drivers of our prosperity have brought us to our current situation. When we think about Toffler's quote today, the "big thing" is climate change. The "small things" are what we do to move towards resiliency and future proofing our homes.

This is our annual future proofing issue. Inside, you'll find information and tips on future proofing (the process of anticipating the future and developing methods to minimize the effects of future events) and resiliency (the capacity to recover quickly from difficulty).

The Ontario Building Code package A1 reference house only requires 28 KBtu per hour on the coldest day of the year, but this load is too small for most furnaces. Our feature article on iGEN Technologies (page 16) explores a combination heating system that provides heat and hot water. It can power itself through a blackout in a winter storm by generating electricity. Dugald Wells from Marshall Homes is test driving this technology in his own cottage for potential use in a project in Pickering.

In a now-repealed Code change, electric vehicle charging stations had been required to be roughed in. Lou Bada explains why he supports the repeal on page 3. In "Ready, Set, Charge!" (page 28), we profile eCAMION, a Scarborough company that knows bigger batteries in cars require new technology for rapid charging. Alice Wang explains how they are working toward a network of high-tech rapid charging stations.

In "Resilient Construction" (page 5), Gord Cooke talks about resiliency planning for builders and how it can help us with a more demanding climate. Additionally, Doug Tarry reviews five significant ways we can reduce our carbon footprint (page 30).

The third wave requires that we think differently, and collectively, about clean prosperity. The Sustainable Housing Foundation (SHF) brings together thought leaders, builders and manufacturers to create an informed path forward. You can find a recap of the recent Sustainable Housing Foundation Dinner on page 13.

It seems fitting to quote Toffler again for his views of future success: "The illiterate of the future will not be those who cannot read and write but those who cannot learn, unlearn and relearn. If you do not have a strategy, you're part of someone else's strategy." Ask yourself: Is your strategy stuck in the second wave or is it moving forward in the third wave? **BB**



The Heat Is On

A small Richmond Hill company may have the next big thing in home heating innovation on its hands.

When talking to people about his company's product, Alan Clarke likes to say: "iGEN has solved a problem that most people don't even know they have until it's too late."

The chief business strategy officer of six-person iGEN Technologies (based out of Richmond Hill, Ontario) is referring to a challenge many home owners in Ontario have faced in recent years – namely, power outages in cold weather.

The one essential thing you need to be func-

tional during a winter power outage is your furnace – but given that it's an appliance that requires two power inputs (natural gas/propane and electricity), when the lights go out, so does the heat.

It was this exact scenario that sparked an idea for engineers Michael Chatzigrigoriou and Patrick Lai, who suffered a lengthy power outage in the wake of an ice storm in 2012. Clarke says that the two HVAC consultants came to the conclusion that "this is ridiculous; this is what we do for a living, and we can't heat our own homes."



Alan Clarke of iGEN Technologies (left) and Dugald Wells of Marshall Homes are testing iGEN's i2 units in Wells's new cottage.

The pair determined that there had to be a better way. They set about creating a self-powered furnace, a concept that – when presented to the masses – elicits plenty of ‘why didn’t I think of that?’ reactions, Clarke says.

Chatzigrigoriou and Lai spent about a year building a prototype and, by 2013, what would become the i2 was born. At this point, the pair decided to devote themselves to the project full-time in an effort to bring the product to market.

Running Itself

The i2 uses natural gas or propane, converting that energy into heat and enough electricity to run not only itself when the power goes out, but also a hot water heater, with enough surplus to keep your modem running and your cell phone charged.

The benefits the unit offers are plentiful, including utility cost savings from a more efficient heating appliance, environmental benefits (given that the i2 results in lower greenhouse gas emissions than traditional heating appliances) and the peace of mind that home heating won’t be affected by a blackout or utility interruption.

While there was an early investor in the company (who has since been bought out), iGEN has been mostly self-financed and is now 100% owned by Chatzigrigoriou, Lai and the team. Clarke says the company also received grants from various government agencies and industry associations and is currently engaged in efforts to raise more equity to “fuel our growth” – no pun intended.

The original concept for the i2 was a single unit, but the box was extremely heavy and large – about 50% wider than a traditional furnace, meaning it couldn’t fit through standard-sized doorways.

At this time (late 2017), the i2 was being tested at three independent labs. Once the performance data was verified, the next stage was to streamline the product down to a more manageable size.

The answer came in serendipitous form, as UK-based competitor Flowgroup plc had developed a product that operated on a similar principle (a replacement for residential boilers that generated an electricity stream that could be sold back to the grid). The company was running into some difficulties, so it wound up disposing of the business unit.

iGEN pounced, taking Flowgroup’s inventory of about 1,000 units off its hands and gaining the rights to the worldwide patents and intellectual property.



The i2 heating system installed and monitored in Coach House.

COURTESY iGEN TECHNOLOGIES

Solving Issues

This solved a couple of issues for iGEN. First, they were able to overcome the challenge of how to separate the heat and electricity generation from the heat distribution in the home. Second, by breaking the solution into two pieces, the size issue was resolved.

Now, there's a wall-hung piece (the boiler unit and vapour expansion cycle module, which generates the heat and electricity) and a floor unit that replaces the furnace, which includes a heat exchanger with a blower fan. Heat is transferred from the boiler unit to the heat exchanger with a hot water loop.

While the i2 uses the same ductwork as existing gas furnaces, Clarke explains that the installation process is a bit different, but traditional furnace installers should have no issues mastering it.

Still, the product is so unique that gaining certification for selling the i2 in North America has proved

challenging because, Clarke explains, no standard currently exists for self-powered appliances. In fact, iGEN is working with the Standards Council of Canada to develop a standard for this product, something it hopes is completed later this year or early in 2020.

In the meantime, iGEN has been granted approval to run an early adopter program – an initiative that's generated promising results, including an estimated \$1,863 utility cost savings over a 10-year period in a 1,500-square-foot home. The case study numbers were provided by third-party simulations, so they are merely estimates, Clarke says. But he adds that the company is heavily monitoring these initial field installs to get a more accurate sense of the annual savings.

Early Adopters

Clarke says the 44,000 BTU per hour output i2 is ideal for homes between 1,000 and 2,200 square feet, depending on the house age, quality

of construction, tightness of envelope and insulation quality.

According to Clarke, another 20 to 40 early adopter installs are planned before the end of 2019, but none may be more important than the i2 that's being tested in Dugald Wells's new cottage.

That's because this trial is not simply for a customer, but possibly a key business partner. Wells is the general manager of Pickering-based Marshall Homes, an innovator in energy-efficient housing and a company that's keenly interested to see if the i2 is ready for prime time.

Wells had been familiar with iGEN for some time, thanks to his long association (both professionally and personally) with Clarke, who himself first heard of iGEN while he was doing consulting work for Marshall Homes.

In the walkout section of the cottage, Wells had roughed in for radiant floor heating, but was unsure he was going to go that route given that it would require a second boiler.

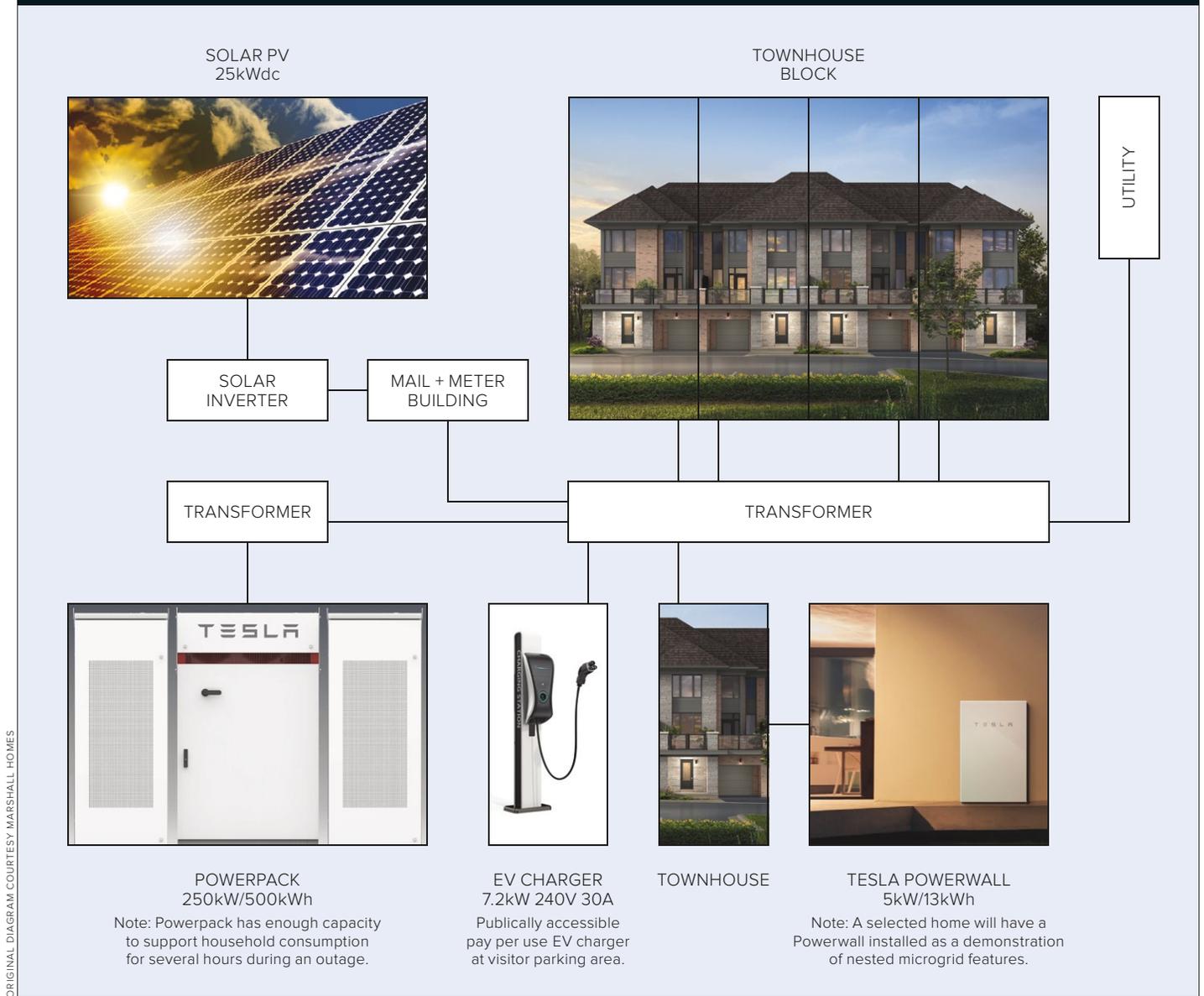
He says what really caught his attention was when he heard about iGEN's acquisition of Flowgroup's business unit because, over in the UK, it's generally all hydronic heating, he says.

Wells's goal was to tap off the iGEN's coil – the boiler in the UK version – to take hot water to use in the radiant flooring loop as well as for the forced air, "because otherwise I would have to buy a whole new furnace."

Running the Numbers

Wells approached Clarke to find out whether this would work. The iGEN team went off, did a bunch of calculations and determined that it could in fact be done.

THE MICROGRID AT ALTONA TOWNS



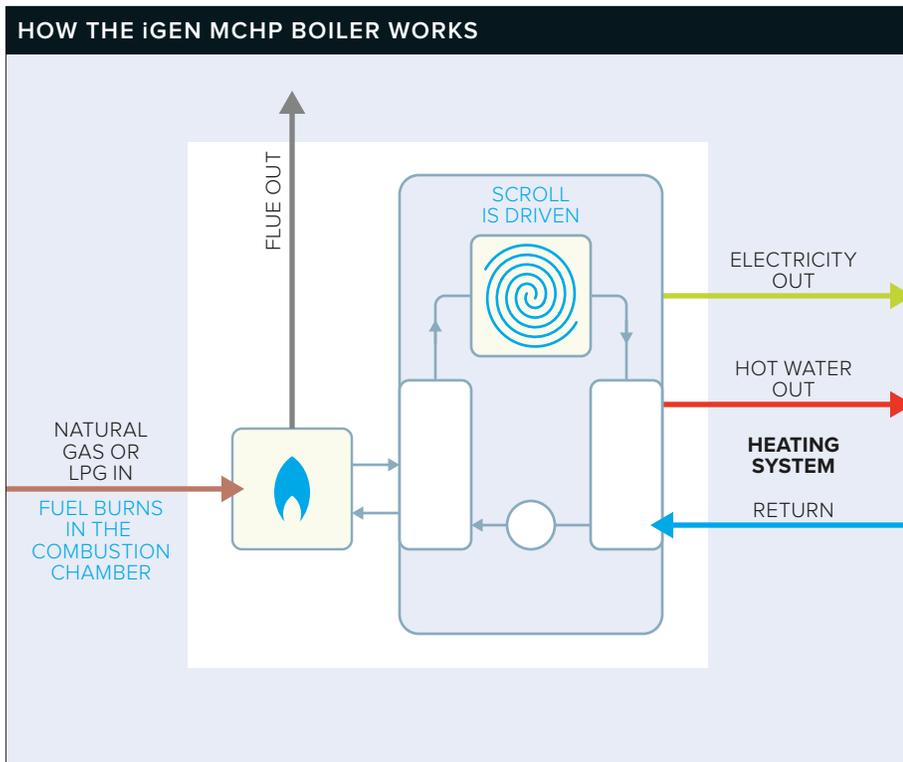
“So, with one unit, I am serving both my radiant floor heating loop as well as my forced air distribution,” Wells says. This offers multiple benefits, as his forced air system will run less often, and the radiant floor heating is more comfortable than forced air. It will deliver more even temperatures, greater energy efficiency, more comfort and fewer noise and temperature fluctuations with the forced air going on and off.

When Wells test drives the i2 this winter, it will be because Marshall Homes is considering adding the unit into the homes in an upcoming and very unique new housing development. Altona Towns, a 27-townhome project in Pickering, “goes right to the heart of how the electricity market works in this province.”

This ambitious project is a window into the future of housing, featuring a community that will be powered by

a microgrid, thereby reducing both utility bills and carbon footprint. It features a solar array and a powerful standalone battery made by Tesla.

The Tesla Powerpack is a fully integrated energy storage system that includes DC batteries, a bi-directional inverter and a Powerpack controller with intelligent software. It delivers multiple applications, including peak shaving, load shifting and emergency backup.



By being deemed a special demonstration project, Altona Towns was able to barter an agreement with utility company Elexicon and Opus One (which creates grid control software) so that – in the absence of virtual net metering – the condo corporation will be compensated for all the power generated that becomes available to the grid. The residents will benefit from this through reduced condo fees. Wells said they had to come up with this plan “because government policy is still in the dinosaur age.”

Cogeneration

This brings us to the issue of cogeneration (or combined heat and power (CHP)) and the possibilities it creates.

Currently, Wells says, it’s a one-way street, in which the utility gives you power and you give them money. So, if you want to have your own power generation or storage, you’re on your own (with the exception of special

deals involving wind or solar farms).

CHP systems tend to be large-scale grids, and micro CHPs are for small communities. Clarke calls their system “nano CHP” because it’s simply for the appliance. “We’re not trying to power the whole house; we’re just a better heating plant,” Clarke says.

Wells will put that theory to the test this winter as a trial run for much bigger things. “We’re interested, but ... at the end of the day, we’ve got to satisfy 27 home owners and we want to make sure that equipment functions as advertised,” he says. This will be determined by his own findings, the results from the other early adopters, and how iGEN’s service and response holds up should there be any issues.

If nothing else, Wells’s neighbours are fascinated by his cottage plans. He had a group of friends over and was showing them the i2. Suddenly, Wells was backed into a corner where a pile of wood lay, surrounded by a transfixed audience gathered in a semi circle. So,

he found himself on top of the wood pile, lecturing about the technology as they lobbed question after question at him. Obviously, there’s interest in this.

Lots at Stake

And just as clearly, there’s a lot at stake for iGEN over the next few months, but Clarke is bullish. “Depending on how well we are able to perform in Dugald’s cottage this winter, I think if everything goes as well as we expect it will, that will make a stronger case for Marshall Homes to include our units,” he says.

For Wells’s part, while he’s withholding judgment on the technology for the time being, he’s already made up his mind about the people behind the i2. As an entrepreneur himself, he has a good sense of what it takes to make it, and he sees those qualities in iGEN.

“I’m really impressed with them. They’re calm, they’re thoughtful.” The fact that they’ve been at it for a few years – with great personal sacrifice – speaks to their commitment, he adds. “They’re not a flash in the pan.”

Wells says if he were a Dragon’s Den investor, he’d be quite interested in iGEN: “I like what I see, but it’s early days. They’ve got a lot to prove.”

The opportunity for iGEN to prove it’s ready for prime time begins in earnest now. **BB**



Rob Blackstien is a Toronto-based freelance writer. Pen-Ultimate.ca