

# SOLutions



## THE RISE OF THE PROSUMER

SMART GRID,  
CONSUMER CHOICE  
AND A WHOLE  
NEW WORLD OF  
DISTRIBUTED  
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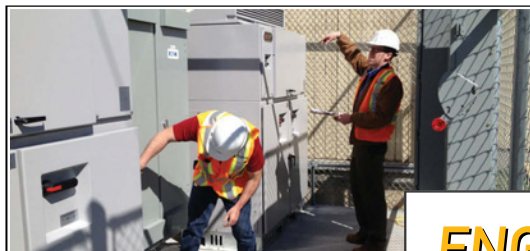
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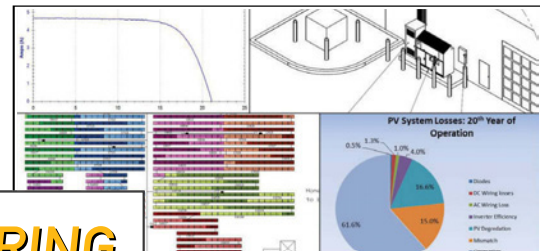
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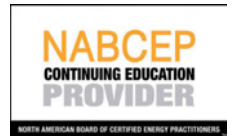


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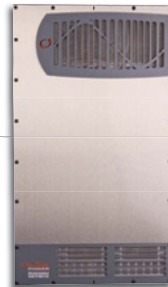
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**CanSIA**  
150 Isabella Street, Suite 605  
Ottawa, Ontario K1S 1V7  
Tel: 613-736-9077  
Toll-Free: 866-522-6742  
Fax: 613-736-8938  
[www.cansia.ca](http://www.cansia.ca)  
**Editor-in-Chief:** Patrick Bateman  
**Editor:** Sylvie Powell  
**CanSIA Staff**  
**President and CEO:**  
John A. Gorman  
[jgorman@cansia.ca](mailto:jgorman@cansia.ca)  
**Vice President:**  
Wesley Johnston  
[wjohnston@cansia.ca](mailto:wjohnston@cansia.ca)  
**Director of Business Development & Member Relations:**  
Patrick Bateman  
[pbateman@cansia.ca](mailto:pbateman@cansia.ca)  
**Policy & Research Advisor:**  
Paul Luukkonen  
[pluukkonen@cansia.ca](mailto:pluukkonen@cansia.ca)

**Conference and Events Manager:**  
Jessica Ward  
[jward@cansia.ca](mailto:jward@cansia.ca)  
**Conference and Events Coordinator:**  
Sharon Chester  
[schester@cansia.ca](mailto:schester@cansia.ca)  
**Communications & Member Relations Coordinator**  
Alex Macdonnell  
[amacdonnell@cansia.ca](mailto:amacdonnell@cansia.ca)  
**Administrative Assistant:**  
Kayla De Sousa  
[kdesousa@cansia.ca](mailto:kdesousa@cansia.ca)  
**Research Assistant:**  
Kyle Sroka  
[ksroka@cansia.ca](mailto:ksroka@cansia.ca)  
**Communications Coordinator:**  
Julia Ferrabee  
[jferrabee@cansia.ca](mailto:jferrabee@cansia.ca)  
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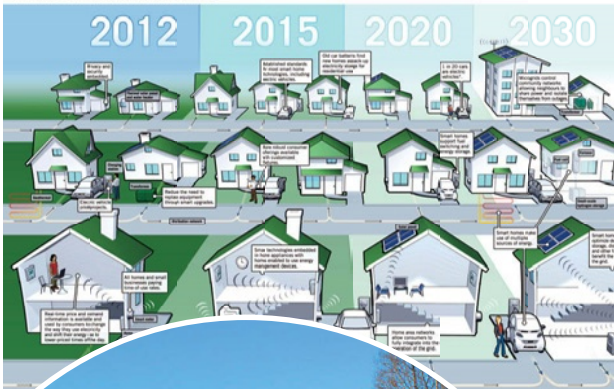
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Ontario Smart Home Roadmap



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## » VISION

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# THE RISE OF THE



# PROSUMER

## SMART GRID, CONSUMER CHOICE AND A WHOLE NEW WORLD OF DISTRIBUTED GENERATION

By Drew McKibben

### ELECTRICITY SYSTEMS ARE MOVING

away from centralized generation to smart grids and distributed generation, says **CanSIA President John Gorman**, and undoubtedly this would be good for the Canadian solar industry. But when, where and how will it happen?

“Consumer demand and the resulting market will fundamentally drive this evolution,” says Gorman. “They are going to start demanding services from utility companies, and all the pieces of the puzzle are already available right here in Ontario.”

Gorman’s metaphor is fitting. A smart grid, like a puzzle, has many pieces. The picture on the box is alluring, although extremely challenging to assemble, and the electricity industry is focused on putting it together. That said, smart-grid technologies are already at work in Canada and are an unstoppable evolutionary force in the electricity sector.

Essentially, a smart grid starts with two-way digital communications connecting electricity generators, system operators, distribution companies and consumers. This information can trigger automated responses to the benefit of everyone, improving the system’s efficiency, reliability and economics. **Tom Chapman, the Ontario Ministry of Energy’s Director of Transmission and Distribution Policy**, says the transmission network has been smart for a long time.

As early as the 1970s, system operators were using electronic sensors on high-voltage transmission systems to monitor power flows on a second-by-second basis, says Chapman. At this point, he explains, ‘smart’ technological upgrades are mostly about changes to the distribution network, and are well underway.

The last pieces of the smart-grid puzzle to snap into place will be products and services operating at the consumer level.

Upgrading consumers, so they too are smart, will complete the picture. It is important, therefore, that technology is deployed to communicate information to ratepayers, giving them an opportunity to make decisions based on economic and environmental factors. This, says Chapman, will move electricity customers “away from a culture where there is no interest in consumption, and where unlimited electricity is seen as a right.

“They’re going to understand that consuming electricity requires certain assets and resources, and those could have an impact on the province or jurisdiction where you live. Consumers will really begin to understand efficiency, renewable energy, solar panels on their roofs.”

**Paul Murphy, former President and CEO of the Ontario Independent Electricity System Operator (IESO), is now Chair of the Ontario Smart Grid Forum**, a coalition of utility companies, industry associations, public agencies and universities working to help define the Ontario smart grid.

“In today’s world of technology and the availability of devices to be able to sense, monitor, control and wirelessly communicate, I think our industry is years, and years, and years behind in adopting this technology,” says Murphy.

At the same time, Murphy is wholly pleased with the province’s motives and direction.

“It was a bold step for the Ontario government, I think, to mandate the installation of smart meters on every home in the province on a fairly short time scale,” he says.

“I applaud the recognition for the need to modernize the electricity system and embedding that in provincial policy through the Green Energy Act. That was an extremely good step and has translated into much-needed regulatory reform through

the Ontario Energy Board. Things have aligned ever since. It's a necessary evolution that needed a kick-start."

In 2004 the Government of Ontario began planning to remove electricity meters – a task that must be appreciated for its enormity – and ultimately replaced them with 4.7 million smart meters, which electronically track quantity and time of electricity usage. This changeover was complete in 2013, and now residential and small business consumers across the province pay variable, time-of-use rates. The Ontario Energy Board (OEB) reviews and sets rates in spring and fall. Customers can find detailed information on their electricity bills and learn peak hours of consumption are the best times to avoid using electricity and reduce the average price.

This is the obvious aspect of Ontario's smart-grid. Less obvious is the coming market for products and services designed to fit the new world of consumption management.

"I think consumers will become more involved," says Murphy, who lists the possibilities, some of which are already



"Consumers are going to change," says Gorman. "They'll change from simply receiving electricity, over which they now have no control or even knowledge of consumption, into prosumers, a consumer with the ability to manage and generate electricity."

– CanSIA President John Gorman

available. Among them, home security system providers that also monitor and report on your power consumption, or a programmable thermostat that automatically dials down air-conditioning through an optional provincial program that shaves consumption during peak demand. He also envisions a financial offering to consumers that permits control of smart appliances; this third-party service provider could aggregate reductions, selling them into the power market at peak prices.

"I don't think there's a groundswell yet of consumers out there shopping for these things. But one of the things that I just saw is a piece of legislation recently introduced in the U.S. that would essentially modify the Energy Star certification that appliances have, to expand that to certify appliances as being smart appliances."

Murphy believes Ontario has done a good job of setting the stage for an innovative new market for smart-grid products and services. "I think it'll be up



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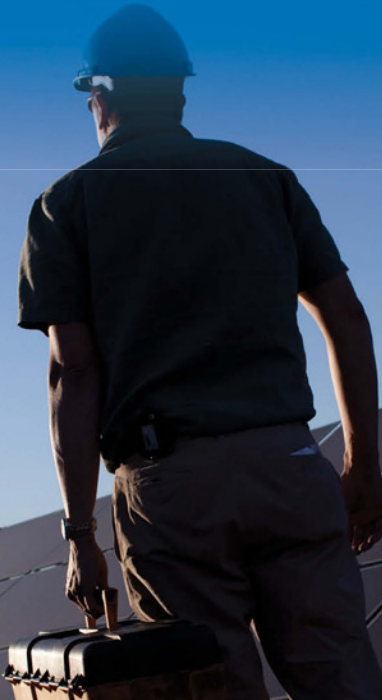
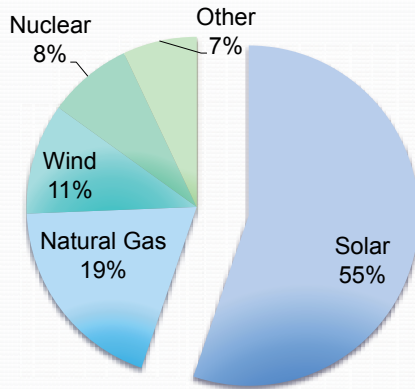


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# Preferred Electrical Source



If you could have a choice about the kind of electricity you could purchase for your own home, which **one** of the following would you choose?

Source: Artisan Ontario Market-Size Study, February 2013

to companies to actually recognize what it is that consumers want or don't like," he says.

What Ontarians want and don't like has been the subject of a new CanSIA, third-party research, based on interviews

with a randomly selected sample of 204 adult Ontario homeowners. It shows 58 per cent of consumers are less than satisfied with their electricity service based on cost, and 29 per cent don't like the generation resource mix. When

asked if they could choose an electricity source, and provided with the generation spectrum, solar was a clear winner with 55 per cent of respondents. Natural gas generation was a distant second with 19 per cent.

While these preferences do not consider a variance in price when choosing one resource over another, the research does show a significant segment of the population is willing to pay some premium for solar.

One of the most interesting findings is, when given a choice between simply buying the default Ontario energy mix and specifically buying solar energy, 60 per cent of respondents want the option, with 37 per cent of those preferring to install solar directly on their homes. This segment is where the smart grid – enabling distributed generation – could open new PV markets through consumer choice.

"Consumers are going to change," says Gorman. "They'll change from simply receiving electricity, over which they now have no control or even knowledge of consumption, into



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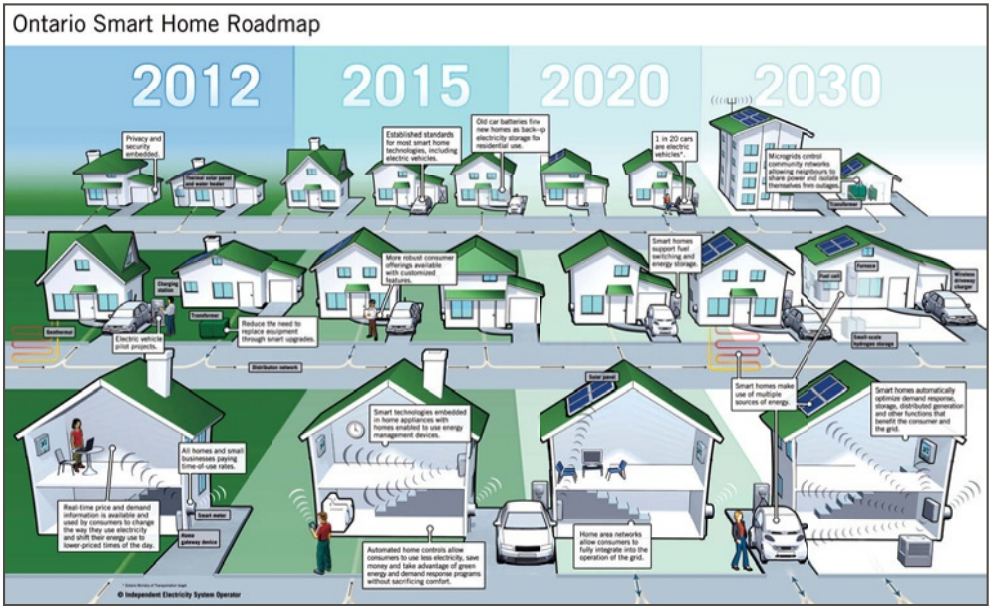


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Source: Independent Electricity System Operator (IESO)

prosumers, a consumer with the ability to manage and generate electricity.”

“Prosumer” is hybridized lingo meaning proactive-consumer. Ontario already has legions of them created through the ongoing availability of a feed-in tariff designed to encourage

renewables, the number well in excess of 10,000 and counting, and 99 per cent are generating PV power.

Ontario had 814MW of solar is operational as of June 30, 2013 with another 1184 MW under development. Assuming most contracts will be in

service within the next two years, Ontario can expect to have almost 2,000 MW of solar installed by 2015.

When contemplated collectively, all these numbers demonstrate the ability of PV to be installed quickly, to meet clean energy policy objectives of government, to attract private investment and satisfy consumer demand. In fact, these numbers would be larger now if the flood of Ontario consumers that lined up in response to the province’s PV feed-in tariff were able to get connected. Ontario’s 79 retail electric utilities, called local distribution companies (LDCs), were an unforeseen constriction

to a surprising demand for solar energy. LDCs lacked manpower to deal with the added workload of PV interconnection and cited technical limitations in their distribution systems.

Meanwhile, and parallel to the smart-meter installation program, the provincial government’s 2010 Green Energy Act had



already enabled utility investments in new infrastructure, which was the impetus for the OEB to write a new regulatory framework. The new framework requires LDCs to submit unique smart-grid plans, all now in an advanced state of development.

“This has now gone from a hypothetical discussion of the possibilities of a smart grid to really being ingrained in the regulatory dialogue in this province,” says **IESO Strategic Analyst Edward Arlitt**.

“It shows that the traditional utility sector here and the regulator are really starting to get down to the details of what this means for our capital investment plan. That alone is a huge shift. This is just happening now. This is the board of the regulator saying we are going to broaden the spectrum of what is considered here in terms of capital investment.”

And how will this affect the utilization of the electricity grid’s centralized, incumbent assets, asks Arlitt? By how much can provincial electricity systems change course?

## 100 GW

The world’s cumulative solar photovoltaic (PV) electricity capacity surpassed 100 gigawatts (GW) in 2012, achieving just over 102 GW. This global capacity to harness the power of the sun produces as much electricity energy in a year as 16 coal power plants or nuclear reactors of 1GW each, enough to cover the annual power supply needs of over 30 million European households. Each year, the world’s PV installations reduce CO<sub>2</sub> emissions by 53 million tons.

*Read more: EPIA, Global Market Outlook for Photovoltaics 2013–2017, May 2013*

“I guess that’s the big philosophical question that everyone is asking right now,” he says. “That’s more of a policy question than a technology question. There are things at a policy level that can either accelerate or slow down this phenomenon.”

As this relates to Ontario, Murphy cannot imagine a complete shift away from centralized, base-load generation in his lifetime. And the growth of distributed generation, he believes, should reflect private investment and market forces.

**Bala Venkatesh, Director of Ryerson University’s Centre for Urban Energy**, which is home to a

new laboratory testing smart grid ideas and products, believes Ontario distribution networks will soon no longer be a barrier to distributed generation. In fact, he sees a 180-degree turnaround in their role, from obstruction to marketplace.

“I don’t see the distribution system is a barrier. I see it as an enabler for smart grid technologies and their commercial transactions,” says Venkatesh.

### Beyond the Ontario grid

Ontario is not the only province undergoing this complex technological change, which will ultimately express

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“It shows that the traditional utility sector here and the regulator are really starting to get down to the details of what this means for our capital investment plan. That alone is a huge shift.”

– IESO Strategic Analyst Edward Arlitt

itself differently in every electricity jurisdiction across the country.

British Columbia has also switched to smart meters. BC Hydro, a vertically integrated Crown utility corporation, guided by government policy and a provincial regulatory commission, has nearly completed the changeover. The BC smart meter initiative does not include time-of-use pricing. It uses threshold pricing, through which consumers will pay an elevated price for higher consumption on a two-tiered structure. BC smart meters have attracted significant media attention based on consumer objections. Roughly 60,000 British Columbians, including former Premier Bill Vander Zalm,

have refused the changeover. Their objections include privacy concerns over the security of their personal electricity consumption data, an increased risk of rate inflation and the potential adverse health effects from the device’s wireless radio signals.

Without significant provincial solar incentives, and with reasonably low electricity prices, BC has yet to see distributed PV flourish.

Like BC, Alberta has yet to see a renewable energy strategy that specifically values distributed PV, but numerous small programs indicate Albertan’s appetite for solar is as keen as Ontarian’s. A provincial renewable energy strategy is in development,

and blue Alberta skies are a promising solar resource.

Unlike BC, Alberta has a unique, highly segmented, market-based approach to electricity, which includes the Power Pool, an hourly spot market that determines wholesale prices. While the provincial government has far fewer levers to manipulate the electricity market, the Alberta market is dynamic with corporate creativity, and open to innovative thinking. In this environment, Calgary-based Enmax shares Venkatesh’s view that smart distribution networks will not only support, but also enable distributed generation.

“The term smart grid came out and got co-opted very quickly,” says **John Rilett, Enmax’s Director of Residential Market Development.**

“People started thinking a smart grid has smart meters, but there are a number of aspects to it. It’s distributed solar on rooftops, connected safely and effectively, or distribution automation.

“In essence, as a utility, we’re looking for better ways to run the equipment we have, better ways to reduce outage time and get people back up and running

*continued on page 20*



*Photo courtesy of Enmax*

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continued from page 18

quicker, and ultimately to reduce the cost of servicing the system.”

Enmax operates the distribution network serving Calgary. It also actively markets electricity and natural gas across Alberta, with 835,000 residential and commercial customers. As a marketer, Enmax has been experimenting with distributed energy programs for at least five years, including natural gas micro-generation, solar thermal water heating and PV. Right now, says Rilett, “solar PV makes the most sense as a product.”

“The cost curve is moving the right way,” he continues. “The quality is moving the right way. It’s becoming a commoditized product. You can buy modules now from numerous manufacturers, and they’re very, very similar in quality, warranty and output. Increasingly, it is the installation and the financing, the cost structure, that makes it differentiated.”

In 2011, Enmax launched Generate Choice, now called Enmax Home Solar. Customers can buy or lease a system sized to their home. A 400W PV system, for example, can be installed for

about \$3,500. The lease, \$17 monthly, is equivalent to the price of electric energy the system will displace at today’s utility rates. Over the 15-year lease period, as electricity rates go up, PV energy replaces the increasingly expensive utility supply, but at a fixed price. It is a hedge against inflation.

In years to come, retiring coal generation, new-build natural gas plants and transmission upgrades could change how Albertans feel about electricity. But, at this point, the residential market lacks any meaningful motivation to manage costs. In fact, 65 per cent of residential consumers have ignored offerings from the competitive retail market, rejecting long-term contracts at a fixed price. Instead, they continue on a default regulated-rate, which reflects, and averages over time, the volatility of the spot.

Even so, Enmax Home Solar has slowly grown to 300 PV prosumers. “Things like time-of-use pricing or peak pricing, even threshold pricing, would definitely move it along a little quicker,” says Rilett.

Enmax is now working on expanding its distributed-PV offering to the small

business and commercial sector. This portion of the Alberta retail market is more active, and depending on the contract customers choose, they are likely subject to metered, interval pricing. And their daytime consumption during peak demand fits with PV’s energy production profile.

“Right now that’s everybody consuming more than 250 MWh per year,” says Rilett. “A mom-and-pop corner store may or may not get there, depending on how many fridges and freezers they have. A grocery store is a great example. They run during the day. They have a lot of fridges and freezers. They’ve got lights. They also have a lot of roof space.”

Perhaps unique among Canadian electric utilities, Enmax is interested in PV purely as a business proposition based on an evaluation of market factors, says Rilett. “We want to be well-positioned for the future,” he says. “We’ve done a number of things and tried to pick the things we think will go first.”

When it comes to PV, says Rilett, “what we don’t know is when, how much, how fast.”



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The experience of the European Union may offer some insight to the fundamental nature of distributed PV development. The EU has national markets as individually diverse as Canadian provinces, with a few markets leading the way in smart grid technologies and PV deployment.

Italy began its smart-grid evolution, for example, with the installation of smart meters starting in 2000, followed by time-varied pricing. With a solar tariff, the country has installed 16.5 GW of PV spread across nearly half a million sites. Germany, also with a history of solar tariffs, has been one of the top European investors in smart-grid technology, along with the UK, France and Italy, but has not yet committed to smart meters. It is the world's leading producer of PV energy.

**Gaëtan Masson, Head of Business Intelligence at the European Photovoltaic Industry Association,** says where electricity grids are equipped to accommodate distributed generation, and consumers are provided with a competitive alternative to the price

“If we look at countries where the penetration of PV is highest – Italy is six per cent of electricity demand, and Germany is roughly seven per cent – we are seeing more and more consumers interested in buying less electricity from the grid and equipping themselves with a decentralized source, with a PV system.”

– Gaëtan Masson, Head of Business Intelligence at the European Photovoltaic Industry Association

of default supply, solar has become an attractive option.

“If we look at countries where the penetration of PV is highest – Italy is six per cent of electricity demand, and Germany is roughly seven per cent – we are seeing more and more consumers interested in buying less electricity from the grid and equipping themselves with a decentralized source, with a PV system,” says Masson.

“But who is supposed to drive these changes?” he asks, bringing us back to the original question.

“It’s a complex issue, but I have a feeling consumers will apply pressure to decentralize the existing system once they realize they can produce part of their own electricity themselves,” says Masson. “This would put huge pressure on traditional electricity utilities, on the production side first, but on the organization of the grid as well. I think it will also completely change the way electricity markets are working.

“But we’re not there yet.” ●

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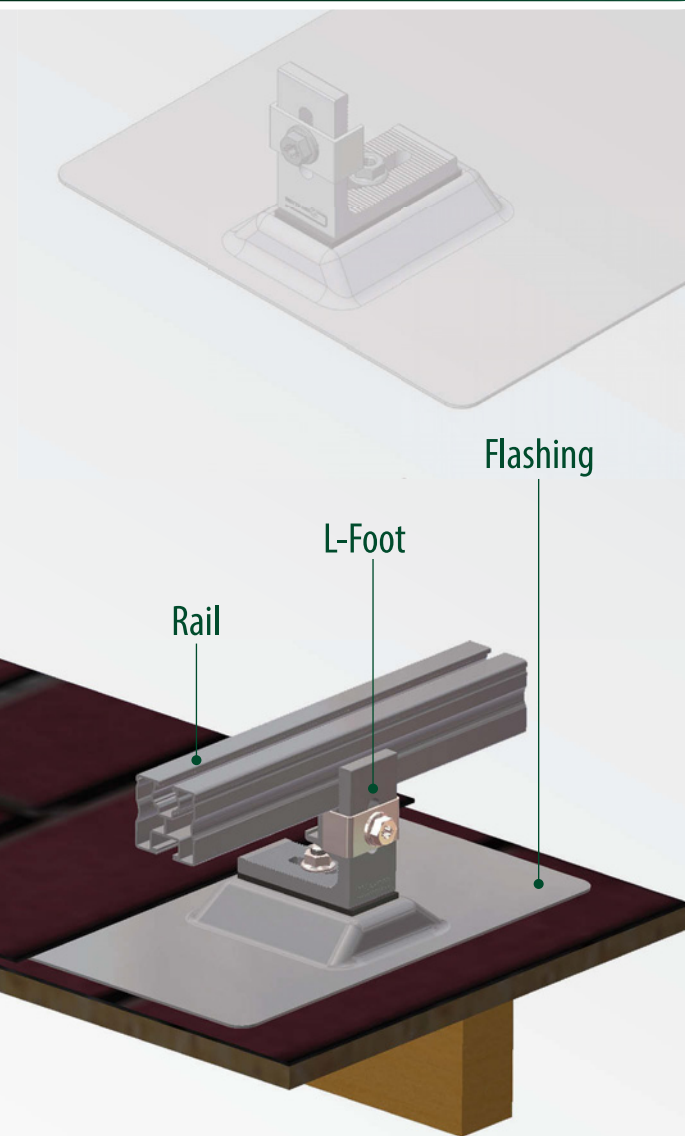


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# MARKETERS TARGET PROSUMERS



Photo courtesy of IKEA

## WHEN IKEA ANNOUNCED A

plan in September to start selling residential photovoltaic systems in its UK stores, the Swedish furniture giant tapped into a growing interest among consumers to make energy choices for themselves.

The company has teamed with China's Hanergy Solar Group to offer a standard 3.36 kW system for US \$9,200. Customers also receive an in-store design consultation, as well as an installation, maintenance and energy monitoring service.

IKEA's move is not just a sign that solar is moving into the mainstream, but also a symbol of an evolution underway in electricity markets around the world. The modernization of the grid, through the deployment of distributed generation and smart grid technologies, is enabling development of new products and services that will help consumers manage their own electricity generation and use it in ways never achievable before, says **CanSIA President John Gorman**.

"It's an exciting new world where consumers will be able to generate electricity, store it, manage their electricity consumption better and tailor a number of services to their needs."

The transformation Gorman is talking about is still in its infancy, but a number of products and programs are starting to make their mark. For example, the largest cable provider in the United States, Comcast, offers technology that learns a home's heating and cooling patterns and incrementally shaves off energy consumption based on those preferences. Or customers can opt for an energy management service that allows them to use their iPhones to remotely turn lights on and off. In addition,

*continued on page 25*

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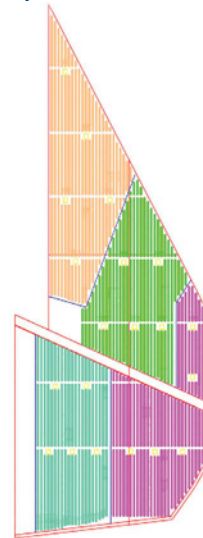
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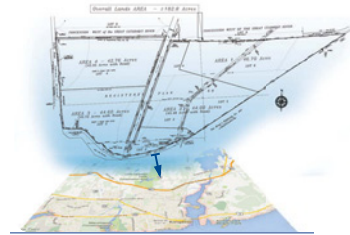


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major home appliance manufacturers are developing products that work with smart meters to avoid peak-hour energy usage.

Closer to home, Ontario's peak saver program allows utility companies to automatically switch off air conditioning and major appliances at times of peak demand, and Ottawa-based Energate has developed a thermostat that can be preprogrammed to respond to electricity price signals.

Gorman expects proactive consumers looking for new options in a time of rising electricity prices, people he calls prosumers, will drive further innovation.

**Tom Chapman, the Ontario Ministry of Energy's Director of Transmission and Distribution Policy** also expects new products to emerge as data becomes more accessible and consumers become more engaged.

"Certainly, we're seeing a proliferation of interest in coming up with value-added products and services based on the flexibility and the data and information the smart grid is starting to deliver," he says.

"A lot of the things we will be doing in 10 or 20 years time, we probably cannot envision today, but we do know what has happened in other industries. The telecom sector is one. When you give consumers the opportunity to use data, and you give the private sector the opportunity to come up with value-added services and products, there is a natural business proposition."

The province is trying to help kick start that process. It launched a challenge in October offering \$50,000 in funding to software developers for the best new apps that use electricity data collected by Ontario's 4.7 million smart meters. The contest is part of Ontario's Green Button initiative, which allows customers to download their electricity usage data from their utility's website by clicking on a green button. About half of Ontario's power consumers have access to usage information now through Green Button, with more local distribution companies planning to opt in. The next phase of the initiative, which London Hydro and Hydro One are piloting late this year, will allow customers to authorize the transfer of their energy usage data to web and mobile apps.

Providing access to information and the ability to act based on that information

is key, says associate professor **Warren Mabee, Canada Research Chair in Renewable Energy Development and Implementation at Queen's University.**

"I think if you have those kinds of tools, managing power starts to become really exciting," he says.

Mabee believes that as the cost of solar panels continues to drop and electricity prices continue to rise, consumers will increasingly want to use the power they generate and buy less from the grid.

"They will opt to use their own power during the day when the panels are generating. They'll be setting timers to do laundry at midday. They'll charge their cars. They'd do all that interesting stuff, but they'll do it within a personalized grid," he says.

"The very personal scale means that you're guaranteed multiple technological innovations and iterations within the space of very limited time. Think of the number of iPhones that are about. That's what we see with these things. So I get very excited by the potential for this." ●



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# ZEROING IN ON SUSTAINABILITY

## SOLAR SYSTEMS ARE KEY IN CREATING NET-ZERO ENERGY HOMES

By Nick Gustav

**FOR HOMEOWNERS, THERE ARE** few ways to turn a modest investment into a gift that keeps on giving, but by choosing to purchase solar-ready homes, they can help their wallets and the environment for years to come.

Solar PV and solar thermal energy systems play an integral part in the movement toward net-zero energy homes. Natural Resources Canada defines a net-zero home as one that produces as much energy as it uses on an annual basis, taking into account all energy used in the home, including heating, hot water, ventilation, air conditioning and all miscellaneous electrical consumption.

CanSIA partnered with Natural Resources Canada to develop “Solar Ready Guidelines,” a 21-page set of technical specifications that was published in 2013 and offers guidance to homebuilders on how to make homes solar ready. A few simple and inexpensive modifications made in the design and construction phases of a new home enable homeowners to save significantly on the future installation costs of solar systems.

“Most of the time, net-zero as a design incorporates solar, whether it’s solar PV or solar thermal, or both,” said **Jeremy Sager, Housing HVAC Project Officer at Natural Resources Canada**. “And usually, it’s pursued pretty thoroughly, with a lot of solar-system coverage involved in the home design, especially as solar PV prices have decreased pretty drastically recently. It’s becoming more common for builders to maximize the amount of roof space available and to cover areas with good exposure with solar panels.”

Sager said that for \$500 to \$800, homebuilders can make a new home solar-ready, whereas to make a home solar ready after construction usually costs about \$1,000 to \$1,500.

The process of making a home solar ready during construction is quite simple and typically requires only a few design modifications and installation items that onsite trades can accomplish in a short amount of time. First, the home’s rooftop space intended for the solar system should be properly oriented with minimal shading. The changes in loading characteristics of attaching solar systems to the roof should be considered, particularly in situations with low slope roofs. Second, the home should have conduits installed from the attic space down to the mechanical/electrical room.



“There are so many benefits that you get from improving the building envelope. Not only are you helping the environment because you’re reducing greenhouse-gas emissions, but if done right, you’ve got a more durable home that’s going to last longer and require less maintenance.”

– Paul Luukkonen, CanSIA’s Policy and Research Advisor



All photos courtesy of Net-Zero Energy Home Coalition



And lastly, the mechanical/electrical room should have some floor space set aside for solar thermal storage, wall space set aside for controls and hardware, an electrical outlet close by and the existing hot water heater should have a simple circulation loop plumbed into it.

Sager said some homebuilders are readily incorporating solar-ready designs into their homes, while others, particularly in tighter housing markets where cost is paramount, have been slow to embrace the concept. He said getting buy-in from homebuilders can be a challenge, but the movement toward net-zero homes has been gaining momentum as homeowners learn that solar systems can reduce or even eliminate their energy costs while also reducing greenhouse-gas emissions.

“Some builders market their homes as green homes or sustainable homes, so they welcome these guidelines because they provide guidance as to how to make homes ready for solar, and it’s a recognized approach,” Sager said. “For builders that are new to sustainability, they weigh this against anything else they



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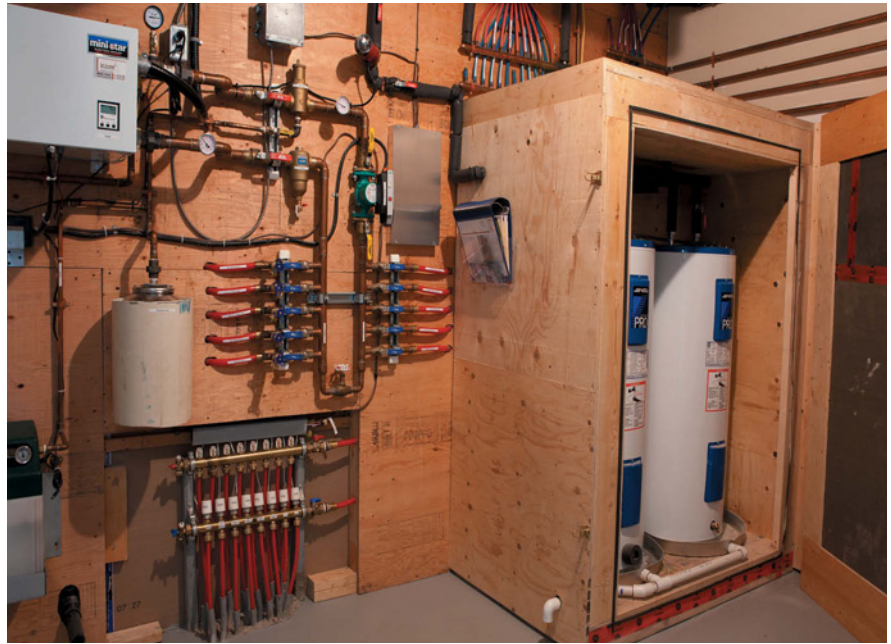
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can do, such as beefing up insulation levels or installing a high-performance HVAC system or a heat-recovery ventilator. So, some builders buy into the concept for sure, and other builders are more hesitant.”

Solar systems are key to enabling homes to reach net-zero. And when

it comes to net-zero homes, the old cliché that a penny saved is a penny earned also applies.

**Sonja Winkelmann, Executive Director of the Net-Zero Energy Home Coalition,** said better building envelopes is the first step in getting to

*continued on page 31*

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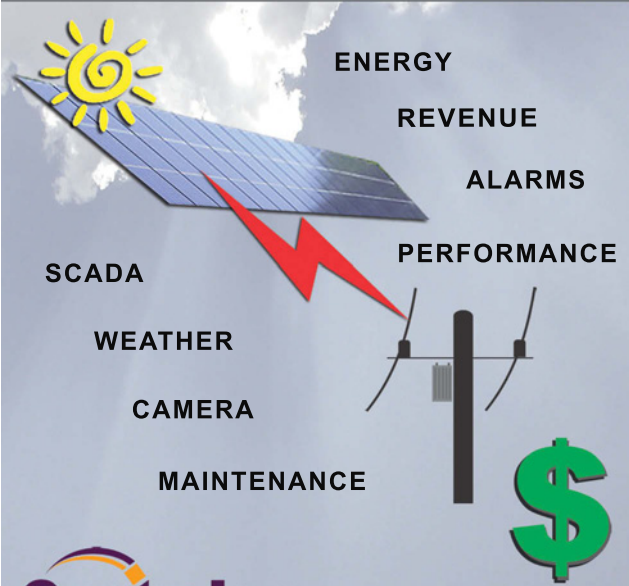
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*continued from page 29*

net-zero because they reduce the amount of energy a home needs to be operated, including the heating and cooling.

Winkelmann said the movement toward better insulated and air sealed walls is just one example of improvements to the building envelope that pay big dividends over time.

“There are so many benefits that you get from improving the building envelope,” Winkelmann said. “Not only are you helping the environment because you’re reducing greenhouse-gas emissions, but if done right, you’ve got a more durable home that’s going to last longer and require less maintenance. The house is going to be more comfortable,

*continued on page 33*



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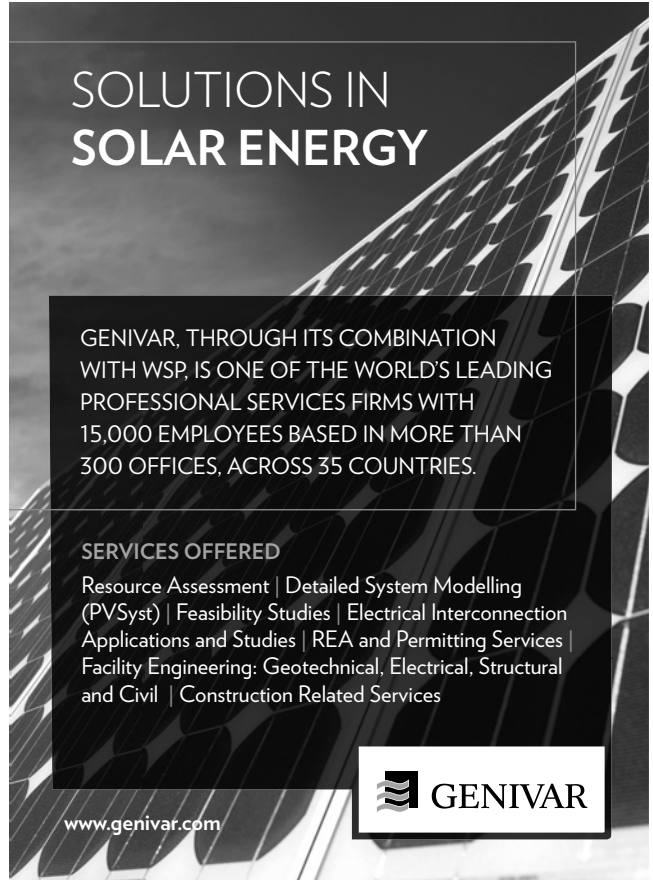
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continued from page 31

with less drafts, and you'll save money on utility costs."

**Paul Luukkonen, CanSIA's Policy and Research Advisor**, said the association has been engaging government regulators and building-industry stakeholders in an effort to have building codes reflect the importance of making homes solar ready providing the opportunity for more building owners to improve their overall energy use and building efficiency

"Consumers want to reduce costs by having a more energy-efficient home," generating energy with solar electricity and solar thermal heat from a free and abundant solar resource goes hand in hand with smart energy use and improved energy management Luukkonen said. More and more people want to make smart and reasonable energy choices. Solar ready, energy efficient buildings and clean generation are economic and responsible options for home owners and businesses alike.

Winkelmann said she expects the movement toward net-zero energy homes to continue its momentum as builders and homeowners become increasingly aware of the possibilities.

"What I'm excited about is that the [building] industry seems to be getting excited about net-zero as the next evolution of homes, and we will begin seeing more builders being able to deliver a net-zero home at an affordable price," Winkelmann said. "Hopefully, this will also be incorporated into social and affordable housing so that the people who really need it will be able to get into a house that has no energy bills over the span of a year." ●

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# NORTHWEST TERRITORIES STRATEGY ADVANCES REMOTE PV

Photo by Matthew Brost

By Drew McKibben

THE NORTHWEST TERRITORIES IS in its second year of a five-year plan to displace 10 per cent of the territory's diesel-powered electricity generation with photovoltaics, advancing the understanding of how solar power works in northern and remote Canada.

When asked why the territorial government is motivated to invest in solar when the private sector is not, **Wade Carpenter, Alternative Energy Specialist with the Department of Environment and Natural Resource** explains diesel prices are volatile and increasing, while the cost of PV technology has steeply declined. And, he says, it is prudent for government to be ahead on the technological learning curve when the economics get close.

The territorial government released its solar strategy, outlining numerous PV educational, research and installation objectives to be accomplished by 2017. The bulk of diesel displacement will be accomplished by helping utility companies advance solar-diesel hybridization. During the next five years, says the document, the government will





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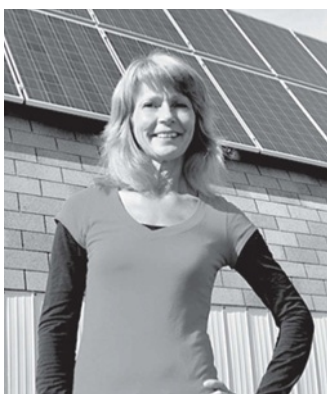
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Photo by Bart Coumont



invest in solar systems sized to meet 20 per cent of load in 24 communities; in sum, 1.8 MW of new PV capacity.

When the installations are complete, the reduction of fuel is pegged at 570,000 litres per year. Assuming a two per cent annual increase in the cost of diesel, the overall savings will be more than

\$28 million over the 30-year life span of the PV modules.

So far, 225 kW of PV have already been installed and everything is going according to plan. A big chunk of the goal, says Carpenter, will be the community of Inuvik, which will add about 645 kW of solar capacity.

“Often, I have to break it to southern companies that see the high cost of power up here and think they can beat it,” says Carpenter. “I explain they’re going to have a really tough time building a solar project for less than \$10 a watt in the north.”

Carpenter stresses the economic and geographic realities of the north

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Photo by Wade Carpenter/GNWT

demand careful consideration. For the 24-community plan, which does not include battery storage, the installed cost of solar is projected at \$12 per watt.

“Everything is more expensive,” he says. “Therefore, solar projects are more expensive. How much more expensive? It all really depends on the remoteness of the community. Is it accessible by road or only winter road half the year? Do you have to fly fuel in? There are a lot of different factors, so each one of our communities has a different grid parity, depending on its location.”

The “golden number” to essentially understand diesel displacement in NWT, says Carpenter, is \$6.50 per watt. That is the approximate maximum installed cost of an alternative generation system that will break even on fuel savings.

“That’s what parity means in the north right now. That’s when you hit parity with the displaced cost of diesel, and so far nobody has been able to do it.”

**Rob Lydan, North American Director of Solar Power for Hatch Ltd.**, an engineering consulting and research firm, says a good deal of work has been done to understand the value of renewable energy in hybridized generation systems. He says the upfront capital expense of PV, when calculated against reduced carbon-fuel costs over time in a remote Canadian setting, does not often make a good business case in the private sector.

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“We’ve done these studies, and there are cases associated with them. I’d say it’s in its infancy. Unfortunately, particularly for solar in Canada, as latitude increases, the further north you go the better idea wind energy becomes.”

While struggling to make a business case on a broader scale, remote PV hybrids are proving very economic in specific circumstances. **GGL Resources President Ray Hrkac** says his company has been using a wind-PV-diesel hybrid in NWT for 15 years. In the area of geological exploration, Vancouver-based GGL has grown its seasonal field operations from a 4-man to 22-man camp. Recently, it increased its system capacity to 1.4 kW of wind generation, and 1.24 kW of PV hybridized with a 16-kW diesel generator. The cost of installing the \$26,000 wind and solar components at the remote camp inflated the total cost to \$46,000. The ongoing cost of flying diesel to the site, however, at an average of \$860 a barrel, has made the wind and solar investment worthwhile. Fuel savings, says Hrkac, paid off the capital cost of renewable generation in one 18-week field season.

But the exploration business can be unpredictable, he says, so projecting the length of field operations can be difficult. Luckily, GGL has had a long-term outlook upon which to base its expectation for a return on the investment. And starting small, increasing system size and investment over time, was a valuable learning experience, says Hrkac.

“Other exploration companies may not have gone to the trouble of looking at this,” he says. “It’s a capital

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“The “golden number” to essentially understand diesel displacement in NWT, says Carpenter, is \$6.50 per watt. That is the approximate maximum installed cost of an alternative generation system that will break even on fuel savings.”

– Wade Carpenter, Alternative Energy Specialist with the Department of Environment and Natural Resource

cost commitment you have to put up front, but if you’re going into an area and believe you’re going to be working there for a number of seasons, you want to put the system in right away to get the economy.”

Interestingly, Carpenter expects the economics of PV-diesel hybrids to improve with higher PV penetration on a system, and the NWT strategy includes a goal to “investigate ways to deploy solar systems sized at up to 75 per cent of the average load in diesel communities.” With seasonally increased sunlight, says Carpenter, and with the addition of energy storage, there is “theoretic potential of running generators-off in the summer.

“There’s a study ongoing right now, and we expect results in the spring,” he says, adding that a 75 per cent PV system is being planned for installation in 2014 at Colville Lake.

“There are people who will say you shouldn’t do anything until the business case and the rate of return are economically proven, but that’s not how energy projects are always financed. You don’t get 20 per cent return on a Hydro project after five years,” says Carpenter.

“I think a lot of people will be curious to see how the technology works, at what scale and the overall economics after, say, five years of operation. A lot of this stuff can be modeled, but once you have a pilot project you have good real-world data, both economic and technical.” ●



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# GETTING INTO POSITION

## CanSIA ADVOCATES FOR SOLAR THERMAL

*By Nick Gustav*



**THE CANADIAN SOLAR THERMAL** industry celebrated a milestone in 2010, surpassing one million square metres of cumulative solar thermal systems in operation across the country.

The heady rate of acceptance came to a stall, however in 2011 with the cancellation of the federal ecoEnergy for Renewable Heat program and several provincial programs, that lead to a significant decline in the market for solar thermal in Canada. In an effort to reinvigorate the solar thermal industry, CanSIA has drafted a position paper detailing the benefits of solar thermal technology and calling for policies to facilitate its widespread adoption.

**Rob Waters, a CanSIA Board Member and the Chair of the Association's Solar Thermal Caucus,** said the position paper will be made available at Solar Canada 2013 in December and posted on CanSIA's website. Waters, the manager of solar products for Waterloo, Ontario-based Viessmann Manufacturing Co., said the position paper will be sent to policymakers and industry stakeholders across Canada.

"A lot of the discussion in the renewable industry is focused on solar PV, and solar thermal is kind of the stepsister who gets ignored," Waters said. "So, we want to make sure that any time



“There’s a lack of a long-term policy for solar thermal, and we want to draw attention to the fact that other jurisdictions are taking an active role in incorporating it into their energy policy, and it’s really important for Canada to do so as well.”

– Paul Luukkonen, CanSIA’s Policy and Research Advisor

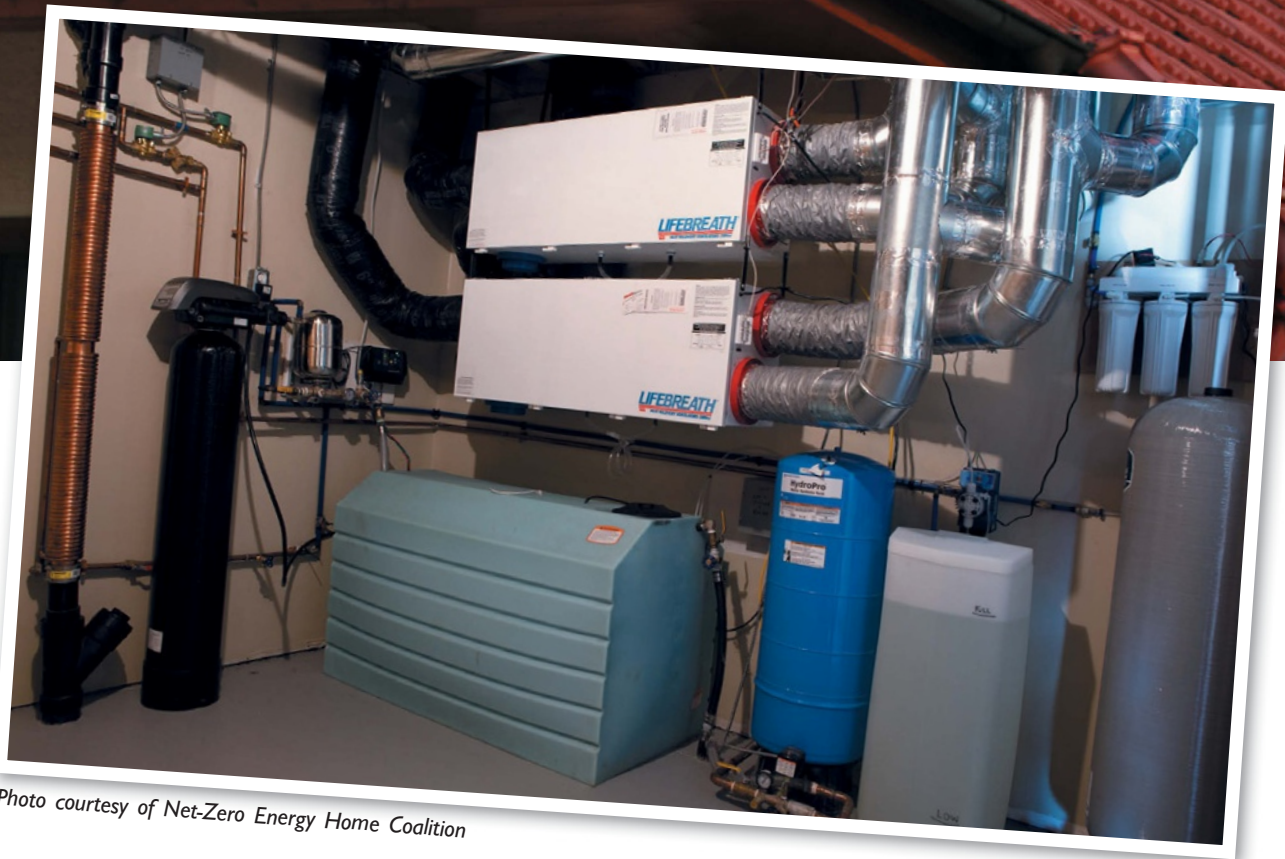


Photo courtesy of Net-Zero Energy Home Coalition

there's a discussion about renewables, energy conservation and reducing greenhouse-gas emissions, that solar thermal doesn't get forgotten. A lot of people don't understand it and why it's important, so we just want to keep it top of agenda and get this into as many hands as possible."

The position paper was authored by **David B. Richardson, a Ph.D. student at the University of Toronto**. The report notes that Canada gets an abundant amount of sunshine that allows for cost-effective installations of solar thermal heating projects across the country. Solar thermal energy can be used for both heating and cooling purposes, with the most common

applications being water heating, air heating and pool heating.

Widespread adoption of solar thermal technology offers many benefits, including reduced greenhouse-gas emissions, lower energy costs, energy conservation and domestic job creation, the report notes. CanSIA and the European Solar Thermal Industry Federation estimate that for every 100-square-metres of installed solar-thermal energy systems, the equivalent of one full-time job is created.

A majority of Canada's space- and water-heating requirements are met through fossil fuels, and domestic hot-water heating alone contributes about six-million tons of carbon dioxide

emissions each year. In light of that, solar thermal energy is especially appealing since it produces no emissions. The position paper notes that a 2009 report by the C.D. Howe Institute determined that solar thermal technologies provide the most cost-effective way to reduce greenhouse-gas emissions.

According to the position paper, a typical residential solar hot-water system can supply between 40 and 60 per cent of a home's water-heating energy needs.

"Canada's heating load is a huge part of its energy use, so it's very important that solar thermal be considered as a way to offset conventional heating requirements," said **Paul Luukkonen, CanSIA's Policy and Research**



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**Advisor.** “There’s a lack of a long-term policy for solar thermal, and we want to draw attention to the fact that other jurisdictions are taking an active role in incorporating it into their energy policy, and it’s really important for Canada to do so as well.”

The position paper outlines several barriers to widespread adoption of solar thermal, including a lack of financial incentives, the federal and provincial governments’ lack of long-term solar-thermal strategies and goals, and a lack of awareness about solar-thermal technologies among policymakers and the broader public.

The report notes that in today’s market the up-front installation costs

of solar thermal, low natural gas prices and a lack of financial incentives all combine to make the payback period for solar thermal quite long. This puts solar thermal at a disadvantage compared to traditional heating systems, as well as to some other renewables that are subsidized.

The report advocates a number of possible financial policy options that are being used in other jurisdictions. Examples are: municipalities offering low-interest loans on solar thermal installations, with homeowners repaying the loans through increased property taxes; rebates and subsidies which reduce the cost of solar thermal systems through an up-front cash incentive and tax incentives, such

as income-tax credits or accelerated depreciation rates, would effectively reduce the cost of the system installation. The report also advocates non-financial policies that can be used to encourage installation of solar thermal systems.

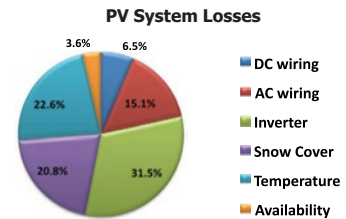
“The goal is to spur government officials and policymakers to consider solar thermal as a viable option in their conservation and renewable energy programs,” Waters said. “Solar thermal is a very viable, mature industry worldwide, and yet Canada has very little support for this segment of the industry, so we want to bring people’s attention to it. We want our membership to use this as a tool to advocate for the use of this technology.” ●

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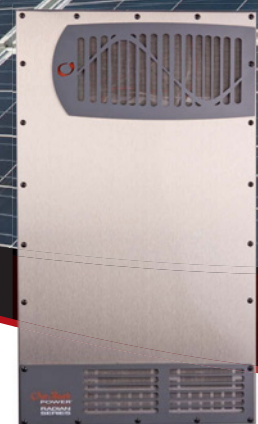
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This *CanSIA Membership Levels Guide* presents an overview of CanSIA's membership level structure so that you can decide which level is most appropriate for you or your organization and understand the benefits and services that you would receive.

For more information, visit [www.cansia.ca/membership](http://www.cansia.ca/membership), or contact **Patrick Bateman**, Director of Business Development & Member Relations.

## About CanSIA

A national trade association, CanSIA works on behalf of its members to facilitate and promote the responsible and sustainable growth of solar energy across Canada. CanSIA provides education and networking opportunities for members, researches and develops renewable energy policy options for different levels of Canada's government and implements a broad range of communications activities on solar energy.



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# CanSIA Membership Levels

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  - ▶ **Corporate I**—for Industry Leaders, Canada's highest profile and most active companies in the solar energy industry.
  - ▶ **Corporate II**—for prominent and active companies in the Canadian solar energy industry.
  - ▶ **Corporate III**—for companies in the Canadian solar energy industry with 2 – 5 employees and/or with revenues <\$1 million.
  - ▶ **Corporate IV**—for small companies with 1 – 2 employees or new to the sector.
- SUPPORTER** | for companies and organizations who are ACTIVE as a stakeholder in the advancement of solar industry capacity or SUPPORTIVE of the solar energy sector with an indirect commercial interest. Supporter CanSIA membership is available at two levels:
  - ▶ **Supporter I**—for larger and more active companies and organizations.
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CanSIA's membership year runs from July 1 to June 30. Members that renew their membership before June ahead of the membership year receive a 5% early bird discount. Dues are pro-rated quarterly for new members that join during a membership year.

\*According to the Canadian Revenue Agency guide T4002 – Business and Professional Income, "You can...deduct all annual dues or fees to keep your membership in a trade or commercial association." This does not constitute income tax advice. CanSIA Members are encouraged to seek independent income tax advice from a qualified tax accountant."

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