



Notes for Remarks:

CanSIA Solar Ontario 2015

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SOLAR AND THE FUTURE OF ONTARIO'S ELECTRICITY SECTOR

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Thanks, John, it's a pleasure to be here.

So this morning, I am not going to talk about the usual IESO stats of number of applications, number of contracts, status of procurements – I am going to do what you asked me to do – to envision the future of Ontario's electricity system.

And as I sit here with David and Lisa this morning to talk about the future of Ontario's electricity system, it's clear that solar will have an increasingly large role to play.

There has been a significant trend in recent years as countries around the world are integrating large amounts of renewable energy while reducing coal-fired generation. Technological advancements are accelerating this trend as solar panel prices drop rapidly and panel conversion efficiency increases. It's also important to note the environmental context – as a result of the global effort to cut carbon emissions, clean resources like solar have become a very attractive.

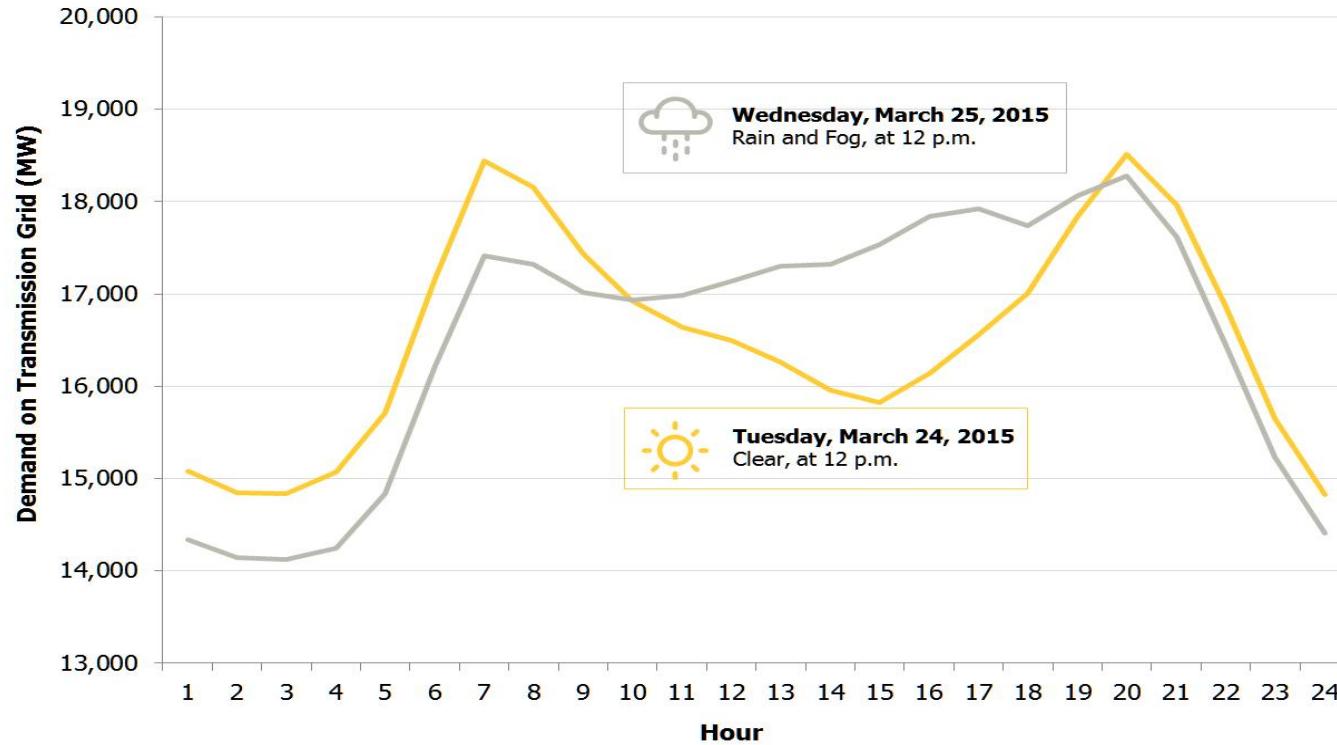
So it's a great time to be a part of the solar industry.

I have a few numbers but only for context....here in Ontario, our solar portfolio continues to grow – mostly at the distribution level, but we have some solar at the transmission level now as well. To give you an idea of what solar's share of the pie looks like – we have more than 34,000 MW of total capacity in Ontario. Distribution-connected solar now constitutes over 1,500 MW, and we expect to have approximately 1,900 MW online by the end of 2016 – this will be joined by approximately 240 MW on the transmission system over the same period.

And these numbers illustrate the increasing contribution solar is making to meet Ontario demand.

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Solar Making an Impact



As you can see, whether the sun is shining or not is making a big impact on Ontario's daily demand profile.

From an operational perspective, integrating solar output into our demand forecasts can be challenging. During the day when the sun is shining, the IESO's control room sees solar output as a drop in demand. To produce an accurate forecast, we require all variable resources greater than five megawatts to register with us. These facilities provide us with real-time operational and meteorological data that contributes to the efficient operation of the market.

I'd like to do a quick plug for our operations team ... for any of you in the audience that have a solar facility over five megawatts that have not registered, please contact us. We will assign you a project manager to help facilitate the registration process.

We are also evolving how and where we site solar projects in response to stakeholder feedback. The FIT 4 Program and Large Renewable Procurement include provisions that give municipalities and the general public more input into the decision-making process. For example, in FIT 4, local municipalities can provide an exemption to residential, commercial and industrial land-use restrictions. And in the LRP, projects must take into consideration whether they have municipal or abutting landowner support for their project.

These are positive steps that will lead to better relations between the solar industry, municipalities and the general public, and will help to foster the kind of environment that will allow solar to succeed.

When looking at the trends we're seeing and what the future might hold, it's apparent that the real story behind solar's upward trajectory is one of innovation.

For years we have talked about the *potential* for solar energy, but a recent MIT study titled "The Future of Solar Energy" says that we are already at a point where solar has the ability to meet the world's energy needs. It estimates that solar could supply many millions of megawatts globally by 2050.

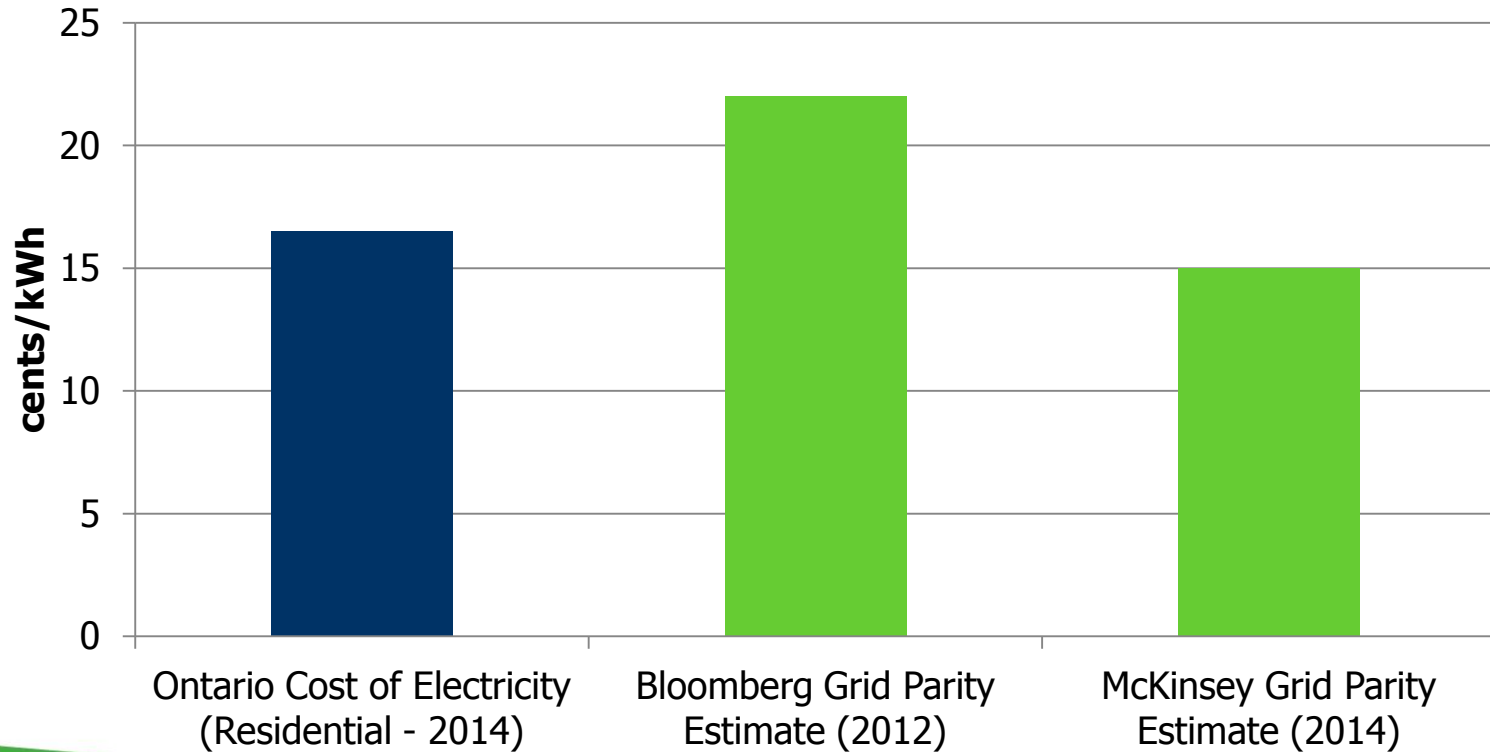
This is the result of years of innovation. As I mentioned before, the cost of solar manufacturing has been dropping dramatically while panel efficiency is rising. This is allowing solar to be cost-competitive with other resources.

For example, in Dubai – and I used to live there, so I know that the weather forecast never changes, it is always sunny and fair – a long-term power purchase contract for solar was recently signed for just five cents per kilowatt-hour. And projects under

construction in Brazil, Uruguay and other countries are reported to produce solar energy at costs below seven cents per kilowatt- hour. These low rates demonstrate how solar is approaching parity with other resources that have traditionally been more cost-effective options.

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Solar Grid Parity vs. Cost of Ontario Power (residential)



By some accounts, as you can see on this bar graph, the price of solar in Ontario has now dropped below the key “grid parity” point, at which the price of self-generation for many consumers is lower than the retail cost of electricity from the legacy system. And we are looking forward to working together to chart out the future of microFIT to net metering.

In addition, a recent study by the Rocky Mountain Institute says that solar-and-battery systems will be economical for homeowners in all 50 U.S. states in the next 10 to 15 years. These systems are already economic in parts of Hawaii, where I think it’s fair to say that solar energy is being pursued more aggressively than anywhere else in the world.

Hawaii passed legislation earlier this month that will require the state to make electricity generation 100 percent renewable by 2045. This is truly remarkable. Just six years ago, coal and oil accounted for 90 percent of Hawaii’s supply mix.

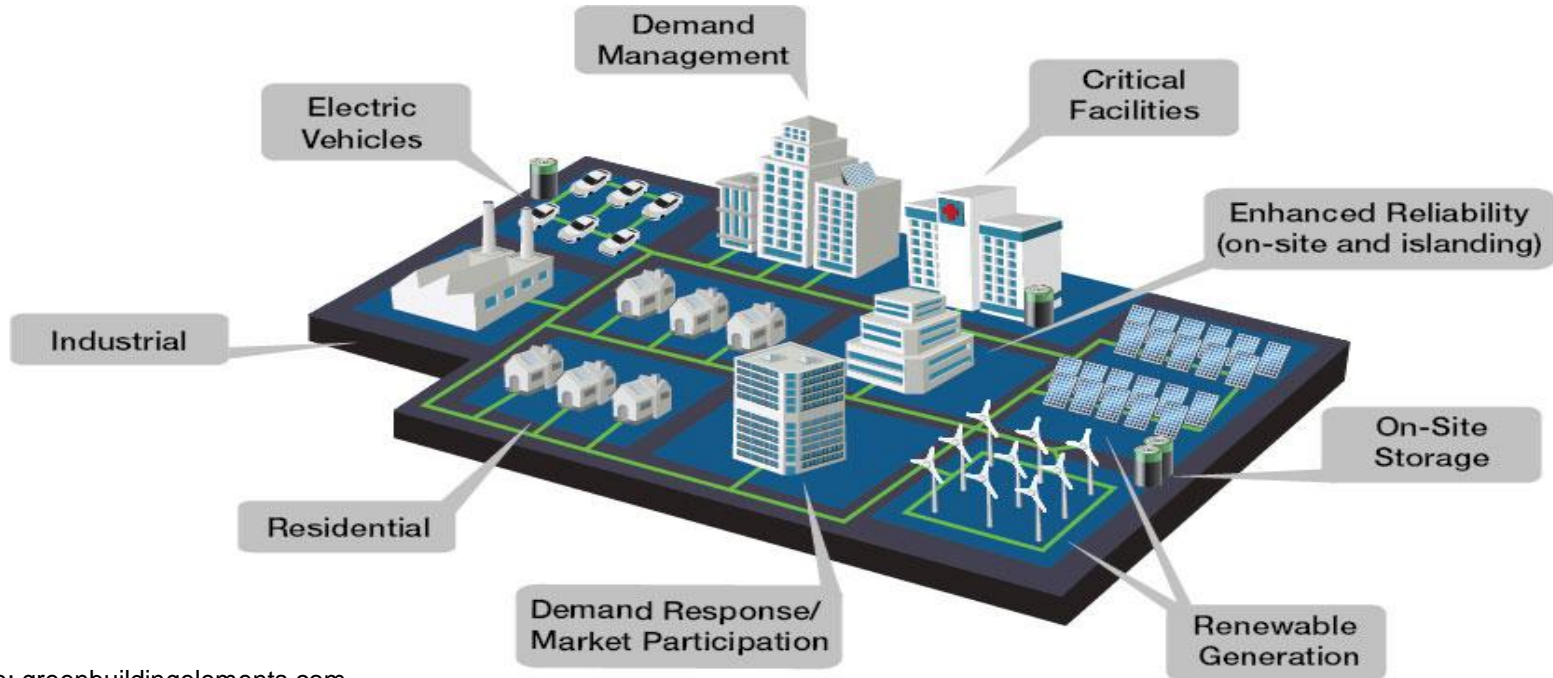
There are circumstances unique to Hawaii that led to the aggressive pursuit of renewable energy – the state has historically had exorbitant electricity rates due to the need to import coal and oil from the mainland – but even so, this is still a truly remarkable goal. And it demonstrates how innovation is making solar a more attractive alternative to traditional sources of supply. There will also be lessons to be learned from Hawaii’s experience regarding how to successfully integrate large amounts of renewable energy.

A key component to enhancing the value of solar in the years to come is energy storage. I’m sure everyone here has heard about Tesla’s in-home battery pack that was announced earlier this month. Behind this announcement, Tesla has been working on its “gigafactory,” which is now taking form in the Nevada desert to expand its production capacity and realize economies of scale. Tesla is not alone in that regard. Worldwide battery production capacity will easily more than double in the next five years. It is not clear at this moment just how far and how fast this will reduce energy storage costs, but I certainly have not seen anyone predicting those costs will go up.

Solar-and-battery could fundamentally change how consumers interact with the power grid. There has been a lot of talk of customer defection – that’s customers disconnecting from the power grid and becoming self-sufficient. I’m not so sure about this – I think there will continue to be a critical role for distributors and system operators. Here in Ontario, our distribution companies are well aware of the changing landscape, and they’re beginning to explore how they can adapt.

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Solar and Microgrids



Source: greenbuildingelements.com

For example, some local distribution companies have begun conducting pilot projects to better understand the technical capabilities of microgrids. In some cases, projects have also raised the possible future implications of microgrids. A project under consideration in Ottawa serves as an example. The project, named “Zibi,” is being designed to be a self-sufficient community right in the downtown core. It is interesting because the project has been initiated by a third-party developer – not a utility company.

The project combines advanced distribution management, green generation and storage, home energy management and monitoring, and innovative customer interaction. While the project is not initially intended to run autonomously from the Hydro Ottawa grid, it does raise interesting questions from a utility’s standpoint: what role should the utility company play in facilitating an energy campus within its service territory that could evolve to become an autonomous microgrid? What is the status of a customer that lies within the boundaries of that project? What precedent will it set for future projects? What is the governance model?

A recent study by the California Public Utilities Commission regarding such questions concluded that microgrids will change the role of the local utility company and shape it more into a distribution system operator with functions not unlike those of the IESO. We note with great interest that a similar debate is also currently playing out in front of the New York State Public Service Commission.

These are the broader changes that are shaping the future of our industry – but it is important to identify that solar is one of the driving factors of these changes. You don’t self-generate with a nuclear power plant. Solar is providing new possibilities for consumers, homeowners and communities to manage their electricity generation.

It is far from clear when or how such transformative changes might play out. But we need to acknowledge that our world needs to evolve to one of a more coordinated or integrated model of distribution and transmission decision making, resulting in more intelligent solutions for the consumer.

I’ve talked mostly about solar at the customer level. I should add that there is a lot of potential for solar at the utility-scale. In 2014 California generated more than five percent of electricity from utility-scale solar – in this case projects that were one megawatt or larger. As I mentioned earlier, here in Ontario we expect to have about 240 MW of transmission-connected solar by the end of 2016.

So I hope I’ve been able to paint a bit of a picture for you about the future possibilities of solar here in Ontario and how it fits into the broader trends we are witnessing. All of

us up here today are, in our own way, trying to set you up for success and make a strong and responsive sector. I'll leave it at that for now and I look forward to continuing our discussion in the Q&A.

Thank you.