

Notes for Remarks
to the Energy Matters Summit

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Getting to a Smarter Grid

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Introduction

It is nice to be here once again. This marks the fourth year we have been able to partner with the Region of Peel for this Summit and I am pleased to be invited back as one of the keynote speakers.

As you may know, the Ontario's Independent Electricity System Operator is responsible for balancing Ontario's demand and supply on a second by second basis. A good example of this was last Friday, when we saw demand drop suddenly by about 300 megawatts (MW) at the exact time Kate Middleton arrived at Westminster Abbey. This was basically my wife, my two daughters and all other royal watchers stopping what they were doing to see the much anticipated dress. Sadly, last night we didn't see a similar drop at 10 o'clock when the Ontario results for the election were coming out - the prospect of Steven Harper, Michael Ignatieff or Jack Layton doesn't carry quite the same allure as the Duchess of Cambridge. It is good to see that Ontarians have their priorities straight.

And now with those two things over, the media can go back to their favourite topic – electricity.

As I was preparing for this speech, I started to think about the challenges you must face. And I started to realize that many of us in this room have the same job. We are all trying to ensure our customers have a reliable and efficient supply of power and we're trying to get them more engaged in how to achieve that.

Your customers are patients and students, city employees, teachers and doctors and many other types of public service workers. I'm sure they often look to you to ensure the power stays on and to ensure building comfort and perhaps they also complain to you when the bills are going up.

But are you finding it difficult to get them more engaged? To convince them to invest and participate in energy efficiency projects? To help them understand the benefits of energy management?

I think I can relate.

As CEO of Ontario's IESO, all of Ontario's electricity customers expect us to provide reliable power, free from the risk of widespread blackouts without any price increases. That's getting harder to do given the investment that the electricity infrastructure needs.

At the IESO, we are working to engage consumers to ensure that we meet their energy needs as efficiently as possible. We are trying to help customers understand the benefits of investing in modernizing the province's electric infrastructure – in essence, making it a smarter grid.

I believe you in the public sector will be surrounded by smart grid development and implementation in the coming years. And that's what I want to talk about today.

First however, to set the stage, I want to give you an update on what's happened in a few key areas over the last 12 months – since I spoke to you last year. I will also cover some of the challenges I see over the next few years and how that will impact electricity customers.

The generation fleet in Ontario continues to transform faster and faster. Nine years ago when we opened the electricity market I didn't imagine we'd see this degree of change.

Coal output for the first quarter of 2011 was 10 per cent what it was in 2003 – the first full calendar year the electricity market was in operation.

New renewable generation like wind and solar are making serious headway in Ontario. Ontario is home to the world's largest solar farm in Sarnia. My counterpart in California, who used to live in Toronto, didn't believe me when I told him this. On a windy day, the wind turbines in Ontario can produce enough electricity to power a city the size of Mississauga. I say new renewables so as not to forget that Ontario has enjoyed a high percentage of clean hydroelectric power for almost a century.

These new renewables are not without their challenges.

The variability of wind is forcing us to make changes in the way we operate the system. In the week before Easter we saw a daily wind energy total of 28,000 megawatt hours on Sunday. The next day on Monday, when electricity demand was much higher, the daily wind output was less than a quarter of what it had been the day before.

As you can imagine, managing a power system with a high percentage of variable supply resources is very different from one dominated by more predictable nuclear, coal, gas and hydroelectric generation. Sometimes, like this past weekend, we can end up with more supply than Ontario can use - a far cry from my experience just a few years ago dealing with shortages.

But generally, when the wind does blow it offsets electricity that would otherwise be generated from gas or coal. As we begin to gain experience, we are finding we need new ways to operate the grid to accommodate variable generation. We've launched a renewable integration initiative in the IESO and have agreed with our stakeholders on a set of principles that will guide the changes required.

What else has happened in the last 12 months? Electricity prices have gone up. Not as much as some would have you believe, but they have increased. Much of the increase is a result of consumers paying the real price of power as generation, distribution and transmission investments have been made. This hasn't always been the case in Ontario. We sometimes made these investments without paying for them; at least initially. It kept prices low but created a debt that we are still paying off.

There are also other ways we are paying for electricity differently. You as public sector customers made the transition to market prices almost two years ago. You can read a case study at our IESO booth about some of the changes the Art Gallery of Ontario has made in that time.

And now, almost half of Ontario's residential consumers (more than two million customers) are on time-of-use rates. This time last year smart meters were installed but very few were paying for electricity when they used it. I can't overstate the significance of this. Ontario is recognized as a world leader in establishing this important foundation of a smart grid.

In Newmarket one of the communities that has been on time-of-use rates the longest have seen, in their initial analysis, a three per cent shift to weekend use - demonstrating that time-of-use prices provide a market signal that consumers can use: some electricity use cannot be shifted, but some is clearly discretionary.

We strongly believe in price signals at the IESO. In the last year we've implemented a government regulation that recovers Global Adjustment costs from larger facilities based on how they contribute to system peaks in Ontario. This change provides a signal for the largest customers to reduce demand at the most valuable times - times when the price of electricity is generally higher and the grid may be strained.

With a threshold of 5 MW I know this change only applies to a few of you in this room but it's a plan that could be extended to other customers in the future. And it demonstrates our focus on finding ways to create the right drivers for consumer behaviour and responsive demand.

So what are some of the challenges as we look to the future?

Ontario is well into its move from a conventional power system to a more distributed system with the influx of smaller renewable generation. Recent estimates suggest close to 6,000 MW of new and existing wind and solar resources will be in commercial operation by late 2012, with almost 11,000 MW projected by 2018 – today we see approximately 1,500 MW. New renewable generation will be producing about 15 per cent of our energy needs and a lot of it will be smaller, community-based generation or distributed generation.

The explosion of variable renewable supply and its location in distribution systems are causing us to examine other options and new technologies - like electricity storage which can smooth the ups and downs of wind and solar generation.

We expect that for the next few years we will have periods when we have more generation than we need, as I mentioned we had this past weekend. That will change around the middle of the decade when coal is shutdown and nuclear units start coming off line to be refurbished. So we will be adapting to some pretty large swings in the type of generation available over the next decade.

Prices are always top of mind for consumers. The challenges and price increases we are seeing in Ontario are happening in many other places in the world that are modernizing their grids and aiming for a cleaner supply.

This just serves to emphasize the need to find new and efficient ways to meet and manage our energy needs. This is where smart grids come in. Making our grid smarter is all about using information and communication technology to better integrate the supply, delivery and use of electricity. It will enable better decisions to increase sustainability, security and reliability while improving services, reducing capital investment and creating jobs.

We're witnessing now some early adopters of smart grid technologies and plans. Many of the current projects are pilot projects – a necessary first step.

Burlington Hydro – which I spoke about here two years ago has created Grid Smart City. Right now they are testing an electric car in a fleet environment to see what will be required if they transition an entire fleet to electric vehicles.

There's little doubt that urban centres, particularly through vehicle fleets, will initially see the largest growth of electric vehicles. Several utilities besides Burlington have

electric vehicle initiatives. The City of Toronto's Atmospheric Fund is also running an electric vehicle project. I'm sure there are others of you in this room testing out or thinking about how to move to or just be ready for electric vehicles.

While electric cars are Burlington's most recent project they have also built some intelligence into the grid in the downtown core. The system monitors and pre-empts issues, isolates faults and re-routes power – all without human intervention. While reliable electricity is becoming a near-must for everyone, this type of system is of particular interest to critical infrastructure like hospitals.

Markham was the first Ontario municipality to commission a project under the Feed-in-Tariff. It is a 250 kilowatt solar project at Town of Markham offices. In addition to putting up the panels, they will also have the generation information available on line so you can see how much energy the panels are producing and how much they have produced over the past 30 days.

In our own operations at the IESO, we are investigating whether load customers can provide some of the grid reliability services that generators have always provided. For example, one of the services we need is for very fast and very fine matching of generation and load at every instant. This has always been provided by generation, usually by fast acting hydro plants. But there are some electrical loads, like water treatment plants or cold storage facilities designed for peak conditions, but may have some flexibility at other times. These may be small individually, but in aggregate these amount to quite a bit of demand across the province, and should be able to provide some of these services we need as a system operator.

While I'm pleased about the initial progress we've seen in Ontario we are still just starting this race (or maybe it's a marathon) and there is a lot of track left to cover. We need to plan the next steps to prepare for the period that comes after pilot projects.

For the last three years I have had the privilege to chair Ontario's Smart Grid Forum. I'm pleased to announce we're releasing our second report of the Forum today.

The main goal of having a Smart Grid Forum is to bring industry leaders together to share ideas and develop a consistent vision for a consumer-oriented smart grid framework.

Through our reports, the Smart Grid Forum is providing guidance so that the pieces of a smart grid fit into a coherent direction for Ontario. We focus on identifying the

benefits that a modern grid can bring to customers, the investments needed to realize those benefits and the barriers that stand in the way.

A very important part of the Smart Grid Forum was added last summer. This is our Corporate Partners Committee that brings in the expertise of the people that are investing to develop, build and deliver the smart products and services that customers need. I'm happy to say that Steve Hall, who's largely responsible for this conference, has recently joined the Corporate Partners Committee. I know Steve will be a great addition.

So let me share with you some of the Forum's thoughts and recommendations that will require government and industry attention to overcome barriers to smart grid development in Ontario.

Ontario is a world leader in the implementation of advanced metering and variable pricing. Almost every home and small business in Ontario has a smart meter, with two million consumers currently paying time-of-use rates, a number that is increasing every week.

But smart meters are only a first step. There are on the horizon a wide range of tools and services that will provide consumers with greater control over their energy use. Home energy management systems, smart appliances, a greater variety of demand response programs as well as different pricing options have the potential to allow consumers to use electricity in ways that better suit their needs.

The Forum's Smart Home Roadmap shows how in-home technologies could evolve over the next 20 years. In only a few years, smart home technologies will be embedded in many household appliances, allowing consumers to collect real-time information about their energy use at a very granular level and respond to price or to control signals. Already many households in Ontario have peaksaver – the device that curtails air conditioning use. Last summer that provided 150 MW during the early July heat wave. That's enough to power a city the size of Thunder Bay and a real help to easing the strain on the grid.

By 2030 we expect the level of sophistication in the smart home will rise considerably, where the home, appliances, electric cars and in-home generation will interact seamlessly, using electricity as efficiently and cost-effectively as possible. Will we be ready to meet these needs? Will we have the right signals in place to encourage customers to shift their energy use and take advantage of new technologies? Will our energy policies and regulatory structures adapt? Will consumers be ready?

The Forum has called on the Ontario government to conduct annual surveys to gauge consumer interest and knowledge in smart technologies in the home so that gaps can be targeted. No doubt this will help some of you understand how quickly changes might be coming to your communities. And no doubt you will be collecting information and insights that you can share with others in the industry.

The provincial government anticipates that one out of every 20 cars in Ontario will in some way be powered by electricity by 2020. Electric vehicles are not expected to have a meaningful impact on the overall grid for a few years, but in local pockets this could be different.

If you think I keep coming back to electric cars in this talk, you're right. Electric vehicles have the potential to offer significant benefits to the grid – drawing electricity from the system during the lowest demand times and making better use of the electrical infrastructure. In future, electric vehicles may be used to store energy that could potentially be injected back into the grid during peak hours.

However, there could be considerable stress on distribution networks, including building systems, if too many car owners charge their vehicles during peak periods. The Ontario Smart Grid Forum recommends that the Ontario Ministry of Transportation track electric vehicle registration, to help local distribution companies identify potential areas where distribution networks may be stressed so they can plan appropriate upgrades.

The ability to store significant amounts of electricity will provide numerous benefits to the system – particularly when it comes to managing greater levels of wind and solar power in the provincial supply mix. Excess energy produced at periods of low demand could simply be stored until it's needed most.

There are many different types and sizes of energy storage – each with different applications. At the Sir Adam Beck facility in Niagara, there is a 174 MW facility where water is pumped into a reservoir in off-peak hours and used to generate electricity during peak hours - this is traditional storage. Other forms of storage being developed include batteries, flywheels, compressed air, thermal storage and fuel-cell technologies. Many of you may start to look at small scale storage to manage the load on your own assets, but it has a way to go to become price competitive.

To date there has been little focus on storage in Ontario. The Forum recommends that the Ontario Power Authority, and ourselves, the IESO, develop a framework to promote the integration of distributed energy storage where it is cost-effective.

In a smart grid environment, energy companies could use hourly or shorter time consumption data to develop new offerings such as demand response programs, energy storage services, EV charging packages and customized time-of-use rate plans.

The Forum is calling for the development of a test bed environment that would allow utilities and third-parties to test new applications against existing systems to ensure they are interoperable. We also identified the need for all parties to resolve the various technical and policy barriers to facilitating access by service providers to individual or aggregate electricity consumption information.

The Forum estimates that smart grid investments will be largely focused on increasing the efficiency and reliability of the grid and to accommodate new generation within distribution service areas. According to a recent report by the Electric Power Research Institute, every \$1 invested toward a fully functional smart grid has the potential to return roughly \$4 in direct and indirect benefits.

These investments in new infrastructure will work to modernize a system that is long overdue for renewal and expansion. These expenditures will be made through Green Energy Plans to be submitted by local distribution companies for review and approval by the Ontario Energy Board.

No doubt many of you here today will consider smarter technologies as you move forward with replacements or upgrades of your own facilities.

Private and public sector investments will spur spending on research and development as well as new products and services providing an additional stimulus to economic growth. Perhaps the most important of the Forum's recommendation relates directly to the significant public investment already made in smart meters and still expected to be made by distribution utilities.

The Forum recommends that a new public/private task force be set up to foster smart grid innovation, technology commercialization, and related economic development opportunities. In essence, to ensure that Ontario capitalizes on its public investment in grid modernization, leveraging the leadership position we currently hold.

So what are some of the things you need to keep in mind as you prepare for the future? Are you anticipating the impacts of new technologies on your communities? Is there space for local generation and electricity storage or easy access to thermal storage underground? Are you anticipating how charging stations will fit into city planning and approvals? Should schools and hospitals be considering how cars will charge up in their parking lots? Is there research that you need to do or are there projects you would like to undertake but need funding? There are a lot of important questions to ponder as the way electricity is produced, delivered and used in this province is transformed.

Public institutions are being asked to do more, a lot more often with a lot less, right at a time when change is imperative. And change usually comes with a cost. This is something we at the IESO are dealing with in a very profound way. With the Green Energy and Green Economy Act, our workload has increased – and we are developing new skills and expertise fast – all with constrained budgets. This is a management challenge. But our real challenge – is to continue to move toward a vision. We need to think big even if it is on a small budget.

I would suggest to everyone in the room, this re-imagination of the way we produce, deliver and consume electricity is central to our future success as individual consumers, as organizations, even as a province and a nation. If we can use electricity in an efficient, effective and sustainable way, we will have resolved a problem that has dogged our society for years, and will continue to weigh us down if we don't do anything different.

So I encourage you – accelerate your efforts and prove to the rest of Ontario, why the transformation of our energy system is needed, and why Ontario is on the right track. We need to move our electricity system into the 21st century – and for that to happen, people like you will need to lead the way.

Ontario's IESO is here to provide you the right information so that you have the ability to make wise choices in your energy needs.

Thank you