

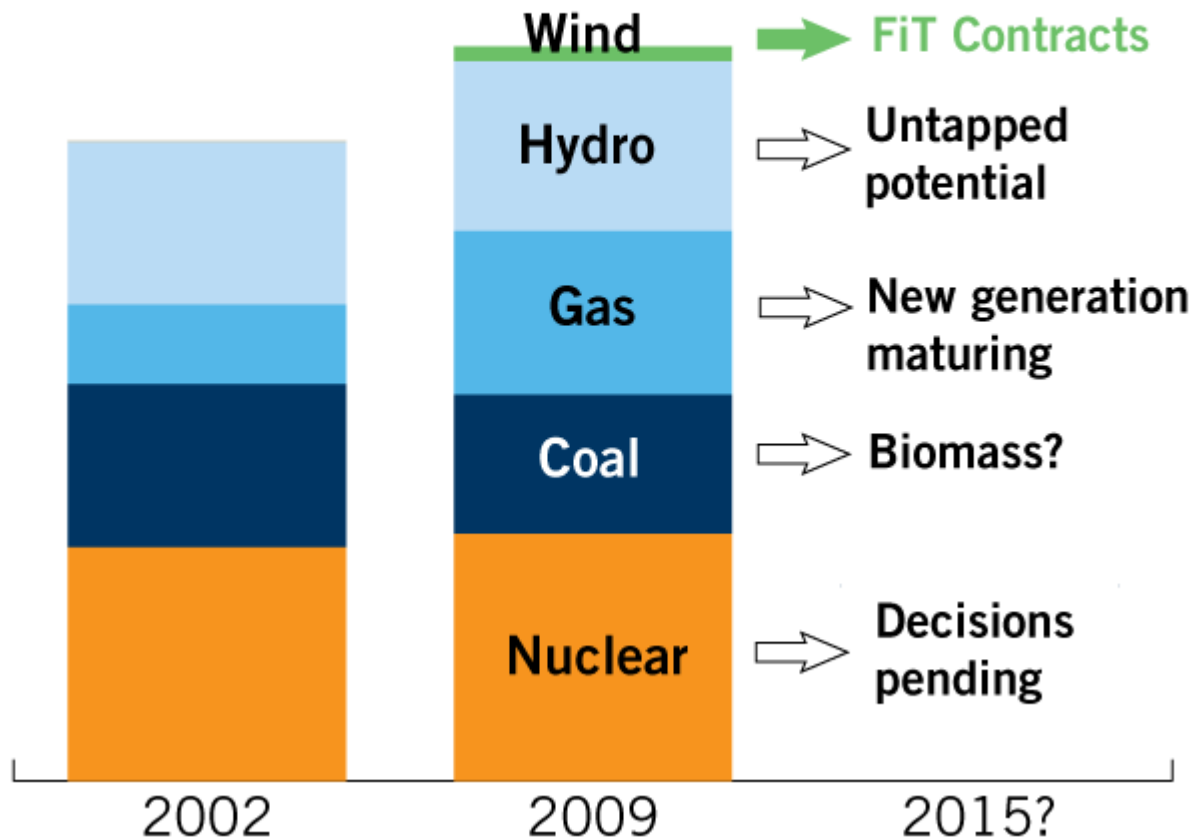
Operations in the Age of Smart Grids

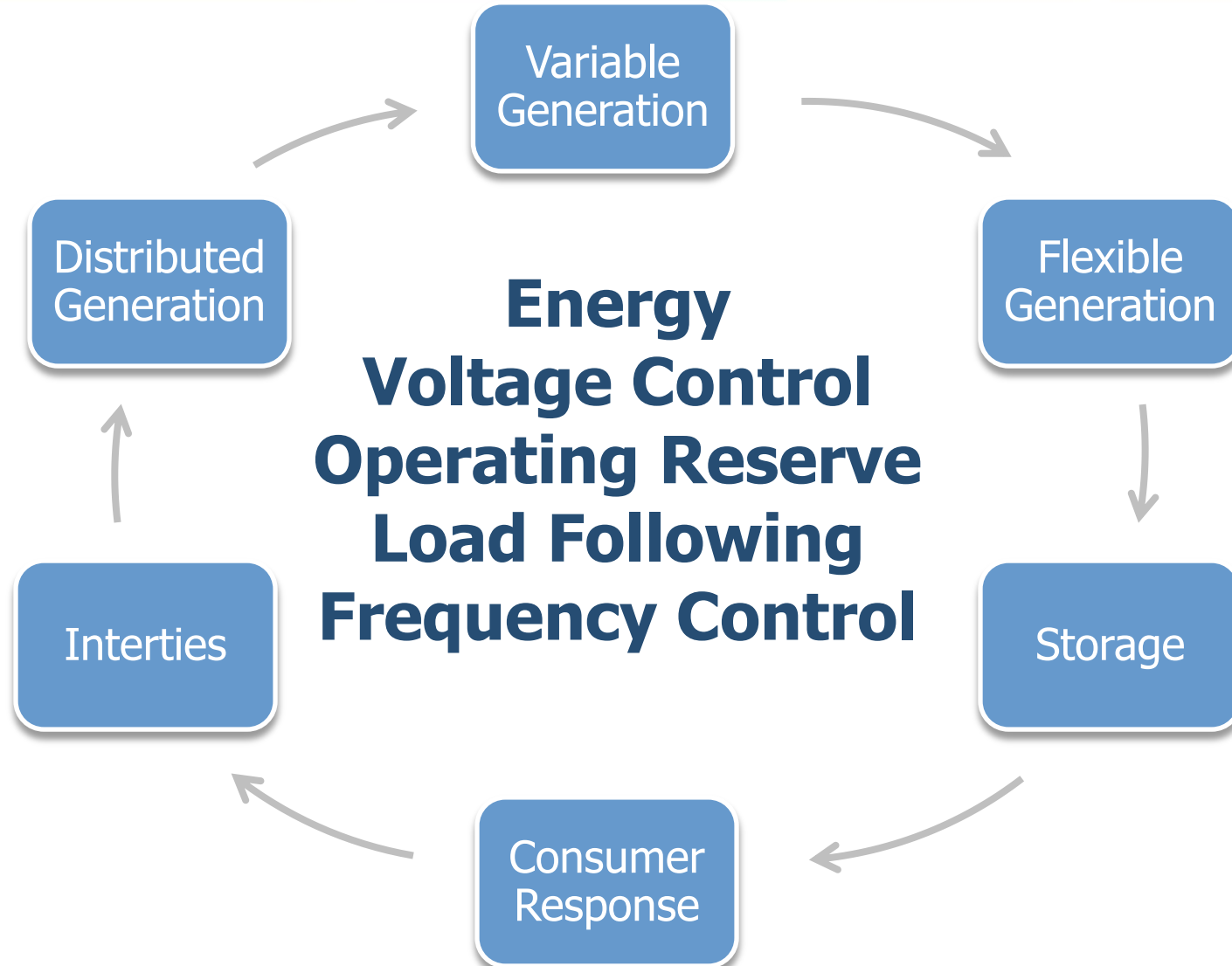
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Resource Adequacy: How Things Have Changed

THEN **NOW** **FUTURE**







Customer Control
Utility Flexibility
Adaptive Infrastructure

Co-ordination

- Standards and inter-operability
- Technology choices
- Systems integration across operators

Cyber Security

- Critical infrastructure
- Essential foundation
- Designed in from the start

Consumers

- Prices
- Education
- Choice
- Automation

Slide #1 – Introduction

I'd like to describe how all the investments and efforts by the government, agencies, and industry, to renew our electricity system will actually work together to achieve benefits for the ratepayer – after all, that is why we are doing this.

As the system and market operator, we've been challenged with the task of figuring out how to bring these new forms of supply – all with very different operating characteristics - together to provide a seamless, reliable and efficient electricity service.

This needs to be accomplished at a time when consumer opportunities to influence their consumption through TOU rates and smart appliances are emerging, and while their perceptions of what it means to be reliable and efficient are changing drastically as they consider electric vehicles and rooftop solar arrays to meet their own demand.

And it is that challenge that spurred us to initiate the Ontario Smart Grid Forum almost two years ago and why we remain keenly interested in the province achieving a smart grids.

For the next few minutes, I am going to touch on a number of themes raised in our most recent Reliability Outlook – and discuss how new smart grid technologies fit into our broader view of reliability.

Slide #2 – Resource Adequacy: How Things Have Changed

The IESO, which works on the province-wide scale, has to integrate all of these forms of supply. When you look at what has happened over the last few years – there has been an incredible amount of change in our supply and large commitments to further change.

Large scale wind is a growing part of the energy mix, and small scale (through RESOP, FIT and Micro-FIT) is just starting to get off the ground and is set to increase significantly within a few short years.

Hydro-electric resources provide a large volume of electricity into our system, and there is untapped potential for additional water-power in the future.

Large gas plants are maturing and after a few seasons of operation are a more predictable and manageable part of the marketplace.

Coal is being phased-out by 2014, but questions remain if there will be some conversion to biomass to produce electricity at those sites.

Nuclear provides about half of the electricity consumed in the province, but with some units reaching the end-of-life, decisions need to be made about refurbishment.

So if you look at the operating characteristics of this emerging supply mix – our task as operators is changing significantly. We at the IESO believe that this is manageable. We just need to develop new market structures and systems to manage this new supply mix – as the old tools just won't do the job.

Slide #3 – Flexibility from *all* Resources

From our perspective, system management in the coming years will be about extracting every bit of flexibility we can from the system. In our recent Ontario Reliability Outlook, we discuss the issues of operability and integration and the need to seek out new sources for the key components of reliability:

- Energy
- Voltage Control
- Operating Reserve
- Load Following
- Frequency Control

If we look at the variable generation coming on to the system – these will be curtailed in those circumstances when demand is low and output for all non-flexible generation is too high. The FIT contracts are structured to incent variable producers to do this. Better forecasting capabilities will help us provide better price signals resulting in more efficient dispatch of all facilities recognizing this variability.

On the other hand, we will be looking to maximize our flexible generation to respond to the changes in variable resources. Gas has different operating characteristics than coal. As new gas facilities have come online, we've been building on our experience with this resource to better understand these differences.

We will also need to know how much generation is serving local needs, so that the market can respond and dispatch accordingly. With an increase in distributed generation it will be important to coordinate the dispatch of wholesale market and distribution-connected resources to achieve local and global benefits of these investments.

Interties are another important balancing tool for the province and help the market manage surplus and shortfall situations. We have just added a new tie-line with Quebec and we are exploring ways to make our imports and exports more responsive to the scenarios created by variable generation. Don't be surprised if current hourly schedules become more frequent in the future as regional market become more integrated.

Storage will also help capture variable generation when it's not needed – and as the potential to provide a number of different ancillary services to the system.

And finally, the Consumer. We expect to see a greater interplay between supply and demand. Demand response, suitably incented, has the potential to provide the marketplace with a flexible cost-effective ability to self balance. We expect to reach a point where the way electricity is consumed is integrally tied to the way it is produced through market price signals.

We are set on the right path with smart meters. The ramp up of TOU rates this year is putting Ontario at the forefront in fostering a more engaged energy consumer. There's more ahead – in-home automation, electric cars and in-home generation. On the industrial side – opportunities are opening up. Our Technical Panel is right now considering a market rule amendment to allow load resources to provide frequency regulation services, something which was unheard of five years ago. The world is changing.

The task ahead is to figure how it will happen, when it happen and plan accordingly. Stepping back, and looking at the big picture, you can see that we need the tools and processes to allow the marketplace to weave all these elements together effectively and efficiently.

Slide #4 – Smart Grids

With many more active players in the system (as many as 4.5 million households!) – real gaps are evident – and they almost all revolve around information exchange and the ability to act on that information.

Picking up on Jon's presentation – the three main thrusts of the government's plan are critical for the development of an effective smart grid.

Customer control: The first priority is to bring consumers front and centre making available the information and tools to seize the opportunities to become more engaged in their energy choices – and receive the benefits from those choices.

Utility Flexibility: They will improve the efficiency of the system– whether it’s supporting the greater levels of distributed generation possible, mitigating faults, or reducing our energy needs through increased efficiencies.

Adaptive infrastructure: And lastly, it opens the door to expand new opportunities for our electricity system – including electric cars and storage and a system that can evolve easily to meet future needs as yet not contemplated.

You can see a picture emerging of much better integration of global and local needs an approach to system management and operation with many of the things that currently take place on a provincial scale, occurring within communities. You can envisage local systems contributing significantly to their peak needs, if local resources are responsive enough.

As the provincial system and market operator, we will need a much better sense of what is happening on a local level, so that we can dispatch appropriately from a provincial perspective. Both global and local needs can and will be met. We envisage scenarios, where we start to receive real time information about local production and consumption.

The interests of all system operators, the IESO, transmitters and LDCs are converging like never before. At the IESO, we are looking for ways to ensure our activities and your activities work in alignment and not at cross-purposes. And that, in many ways, boils down to sharing information and the support that smart grids can provide.

Slide #5 – Smart Grid Operation: Getting There

Of course, it’s an enormous undertaking. One of the reasons we initiated the Forum was to address the obstacles that stood in the way of achieving these goals.

And that’s why the Green Energy Act is so important – it sets out a clear agenda for our industry and sets the stage for development of a smart grid plan.

First and foremost – there is a clear sense throughout the industry of the need to co-ordinate our efforts. Developing smart grid capabilities for the province is just too great a task and requires such significant investment and prudent technology choices that we can’t work in isolation. For example, we need to ensure interoperability of our system, by ensuring appropriate standards

are in place. Similarly, integration of systems and decision tools to manage the grid in a coordinated way at all levels requires unprecedented coordination among all system operators. It is only through coordination that we will achieve the local and global benefits foreseen by investments underway.

Another area we will need to address is cyber security. There is a lot of talk about vulnerabilities that could emerge through smart grids. This is critical infrastructure we are building – with many more access points to common or shared networks. There are many more players potentially coming into the system, beyond traditional utility companies. We need to design stringent cyber security provisions into the system right from the get-go. This is our shared responsibility as service providers and central to the confidence consumers will have in smart grid systems.

And lastly – we need to think beyond the hardware and software and how to bring consumers into the picture. If we are going to benefit from the demand side of the market to provide reliability – we need prices to act as a co-ordinating force for demand response. We will also need raise awareness among this broader consumer base about their energy options and how to understand pricing signals, and how to take advantage of these opportunities.

The coming few years will be critical. We are on the verge of most Ontarians making the transition to time of use rates; increasing numbers of smart grid initiatives will be receiving OEB approval and start to be deployed; all under the umbrella of a provincial smart grid plan. We have a lot of work ahead of us – and many questions remain.

So I would like to open our discussion up to the floor – and ask you, what do you think are the central questions that need to be addressed moving forward?