Green Energy, Market Renewal and the Ontario Experience

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Ontario’s IESO: Not Your Average ISO

The Independent Electricity System Operator (IESO) works at the heart of Ontario's power system – ensuring there is enough power to meet the province's energy needs in real time while also planning and securing energy for the future.

We do this by:

- Planning
- Enabling Conservation
- Operating the Grid and Wholesale Market
- Ensuring Supply
- Engaging Stakeholders and Communities
Ontario’s Diverse Supply Mix: A 10-Year Review

Changes over the last decade:

– Have addressed the reliability concerns of a decade ago

– Have transformed Ontario’s supply mix (retirement of coal-fired generation coupled with significant growth in renewable resources and natural gas-fired generation)

– Have reduced greenhouse gas emissions in Ontario’s electricity sector by more than 80 percent

– Will meet the province’s electricity needs well into the next decade, with planned investments
Contracted Supply (Q3 2016)

### Total Contracted Capacity by Fuel Type

<table>
<thead>
<tr>
<th>Fuel Type</th>
<th>Contract Capacity (MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bio-energy</td>
<td>494</td>
</tr>
<tr>
<td>Hydroelectricity</td>
<td>2,426</td>
</tr>
<tr>
<td>Solar</td>
<td>2,630</td>
</tr>
<tr>
<td>Wind</td>
<td>6,065</td>
</tr>
<tr>
<td>CHP</td>
<td>575</td>
</tr>
<tr>
<td>Other</td>
<td>24</td>
</tr>
<tr>
<td>SC/CC</td>
<td>8,671</td>
</tr>
<tr>
<td>Nuclear</td>
<td>6,300</td>
</tr>
</tbody>
</table>

**Legend:**
- Bio-energy
- Hydroelectricity
- Solar
- Wind
- CHP
- Other
- SC/CC
- Nuclear
Renewable Resources and Operability

What are we seeing?
- Growth in grid-connected renewable generation
- Increased penetration of distributed energy resources (DERs)
- Impacts on frequency, voltage and power flows
- Emerging technologies, inc. storage, smart grid applications, grid intelligence and analytics
- Reduced flexibility of the resource fleet
- Challenges associated with forecasting generation output (Tx- and Dx-connected), demand for electricity, consumer behaviour, conservation effects
- Need for improved situational awareness

What have we done?
- Improved forecasting capabilities – not just of Tx-connected wind farms but also Dx-connected facilities with installed capacity greater than or equal to 5 MW
- Transitioned contract-based demand response to a competitive auction
- Approved demand response pilot projects to test new technologies
- Examined ways to get additional flexibility from existing and new resources
- Launched a pilot project with PowerStream as a first step towards enhancing IESO/LDC coordination
- Improved tools, processes, modelling and training
- Issued an RFI and an RFP for additional regulation service
- Integrated energy storage (Alternative Technologies for Regulation, 2012; Storage Phase 1, 2014; Storage Phase 2, 2015)
Other Drivers of Change

The IESO’s Ontario Planning Outlook:

– Provides a 10-year review (2005-2015) and a 20-year outlook (2016-2035) for Ontario’s electricity system

– Responds to a June 10, 2016 request from the Minister of Energy for a technical report on the adequacy and reliability of Ontario’s electricity resources

– Provides insights and considerations for the operational needs associated with implementing low-carbon resources, electrification and the growth of distributed energy resources

– Serves as a key input to the government’s Long-Term Energy Plan (industry and public consultations are underway)

The Government of Ontario’s Climate Change Action Plan

– Was released on June 8, 2016

– Describes the actions the province will take over the next five years to fight climate change, reduce greenhouse gas pollution and help move Ontario to a prosperous low-carbon economy

– Includes a detailed list of action items, intended funding, and timetables to help the province achieve its greenhouse gas reduction targets through the cap and trade program
Market Renewal: Why?

- 20 year old Market Design and Tools
- Inefficiencies in our current market design
- The sector is changing
Market Renewal Overview

OBJECTIVES

Significantly Improve Efficiency + Prepare for Future Change

Initiatives

- Single Schedule System
- Day-Ahead Market
- Enhanced Unit Commitment
- Capacity Auction
- Enabling System Flexibility

Context

- Distributed Energy Resources
- Increased Electrification
- Decarbonization
- Increased Regional Coordination
- New Technologies
Market Renewal Priorities

- Practical Solutions
- Transparent Process
- Value for Consumers
- Flexible to Future Change
- Focus on Efficiency
- Reflect Stakeholder Feedback
The Benefits Case for Market Renewal

- To get an accurate sense of the potential costs and benefits, the IESO hired an expert, independent third party: the Brattle Group

- Its analysis indicates there are substantial potential benefits to moving ahead with the project, including a $3.5 billion efficiency benefit (2021-2030)

- Of that figure, $3.0 billion in efficiency benefits are expected to flow to consumers, with the remaining benefits being shared among other market participants, most notably generators

- There are other non-quantifiable benefits associated with the project

- Approximately half the savings are expected to come from utilizing existing assets, where possible, rather than building new ones

- The remainder will come from finding new ways to manage resources on the grid much more efficiently
Questions?
IESO Resources

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