

The Future of Electricity in Ontario

Ontario Ministry of Energy

January 30th, 2017

Rural Ontario Municipalities Association (ROMA) Conference

Presentation Outline

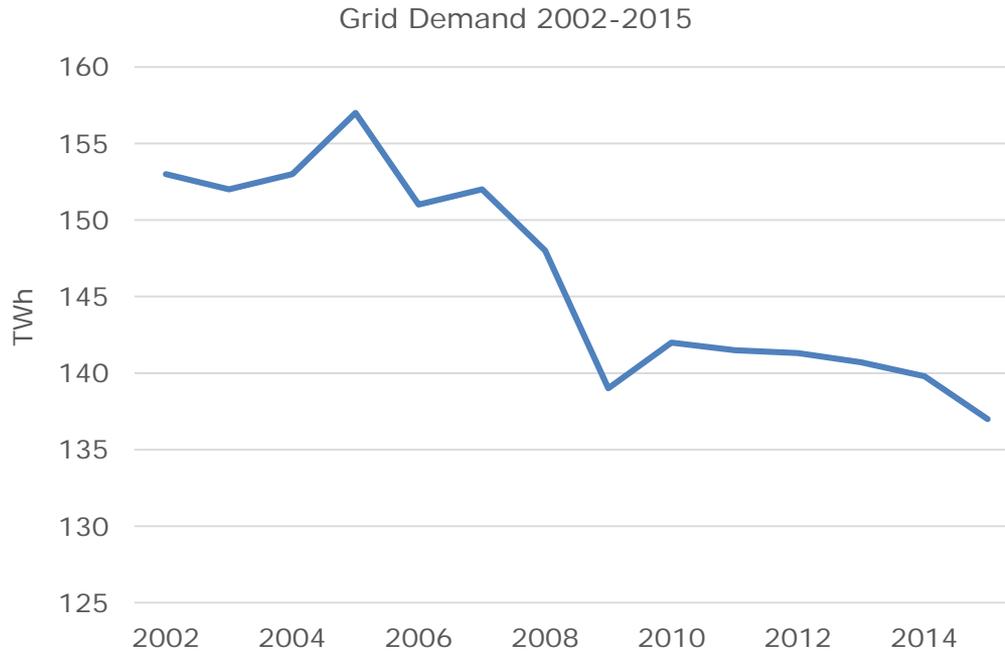
1. Today's electricity system
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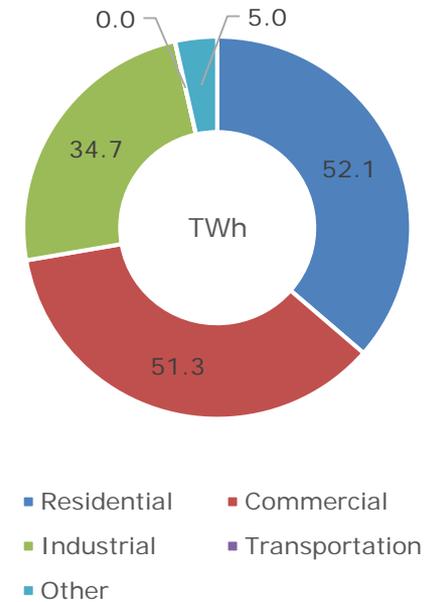
1. Today's electricity system

Annual demand

- Since 2005, annual grid demand has declined 13% to 137 TWh due to four factors:
 1. Changes in the economy
 2. Energy efficiency programs and improvements in building codes and equipment standards
 3. Changes in consumer behaviour
 4. Growing presence of embedded generation



Electricity demand by sector 2015

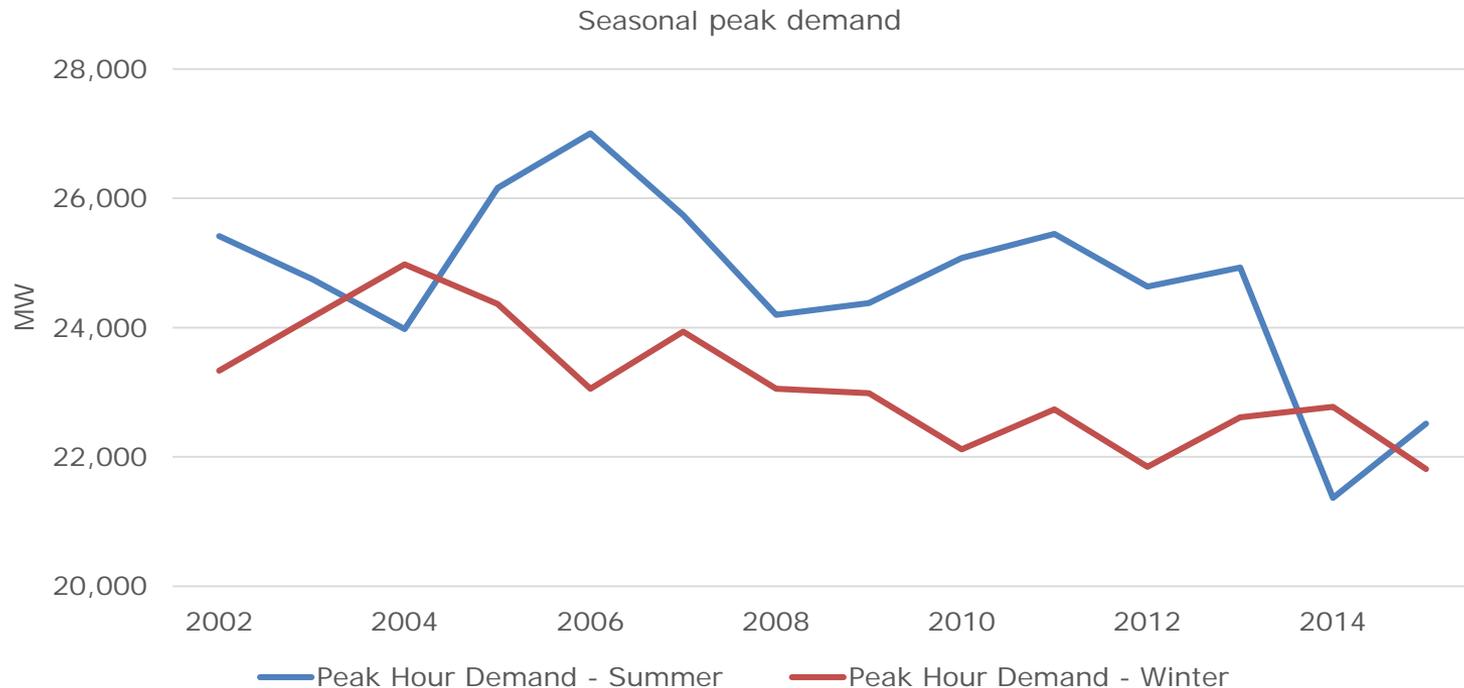


Source: IESO

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Peak demand

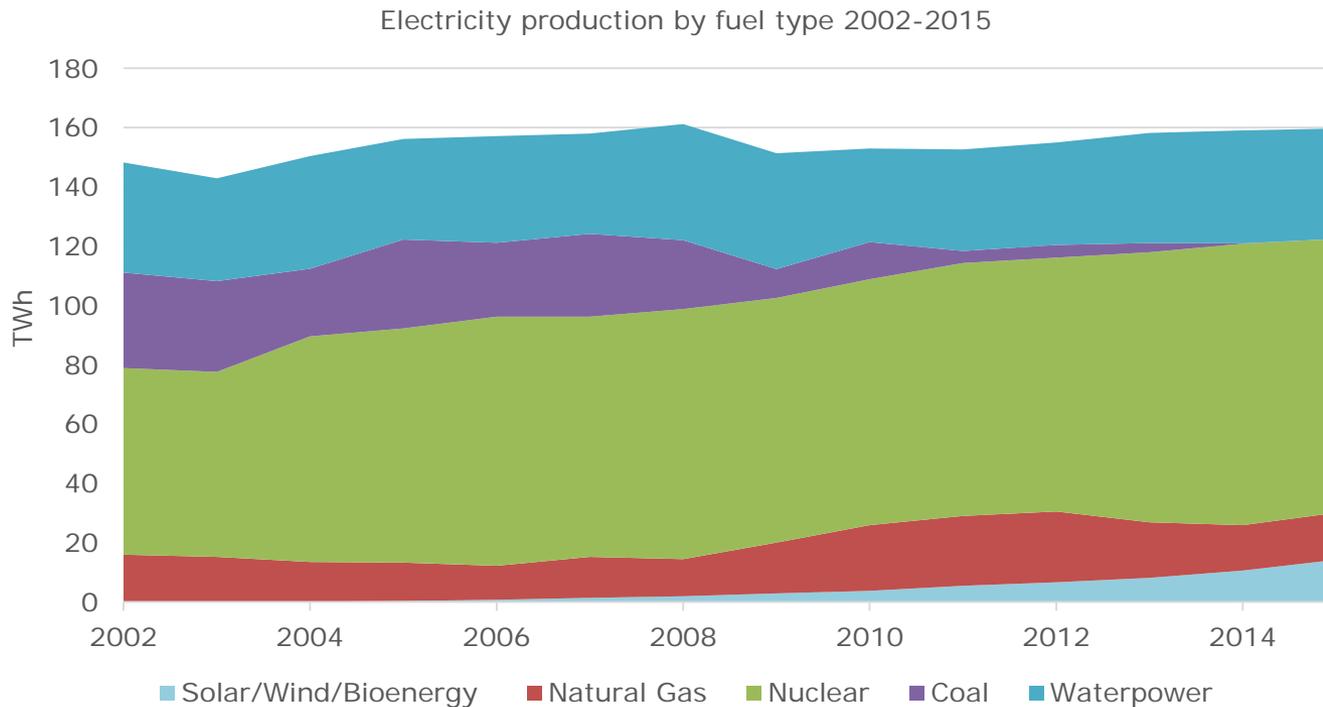
- Ontario is now a summer peaking jurisdiction as a result of demand from air conditioning units.
- Compared to 2002, peak annual grid demand during both summer and winter has declined due to conservation, energy efficiency programs and changes in consumer behaviour.



Source: NERC

Supply

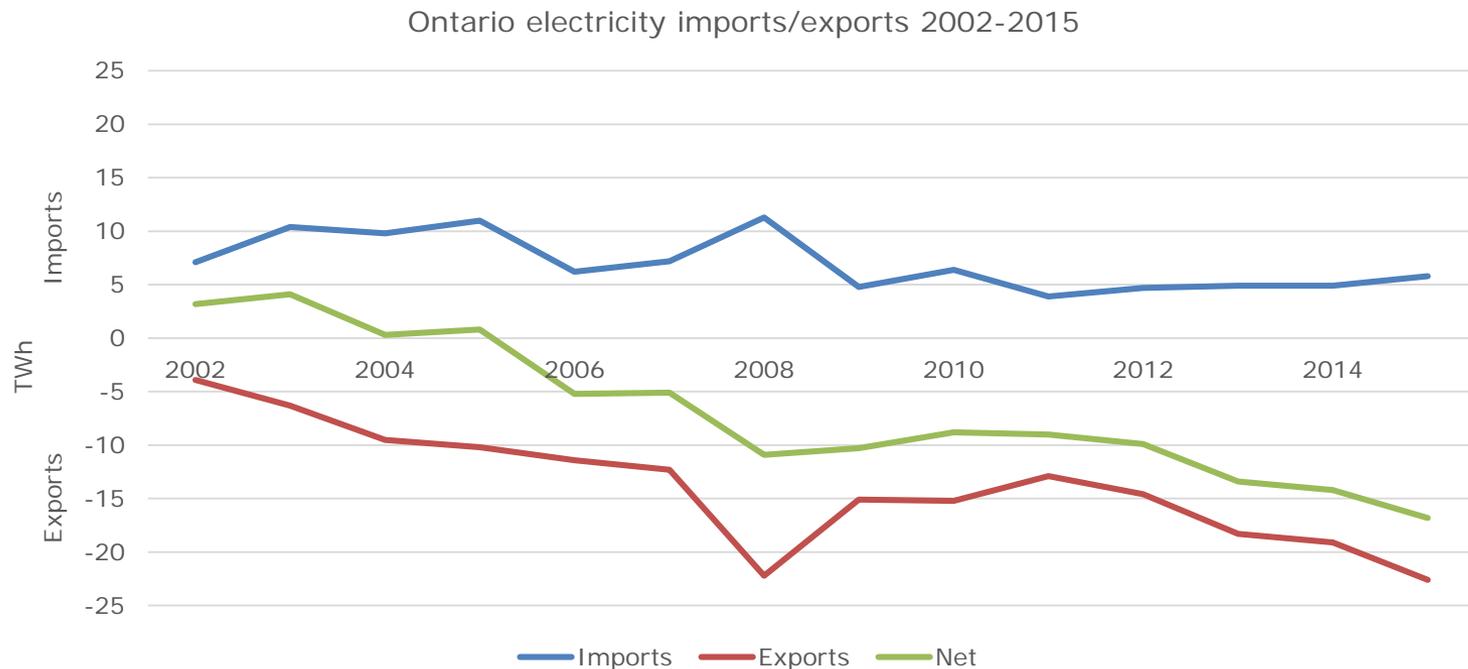
- The supply and generation mix has changed fundamentally since 2002:
 - Decline of coal in the generation mix from 22% share in 2002 to complete closure by 2014
 - Emergence of solar, wind and bioenergy to represent a 9% share of generation mix by 2015
 - Nuclear generation increasing share with natural gas and waterpower maintaining shares of ~10% and ~23% respectively



Source: NIR and IESO

Electricity trade

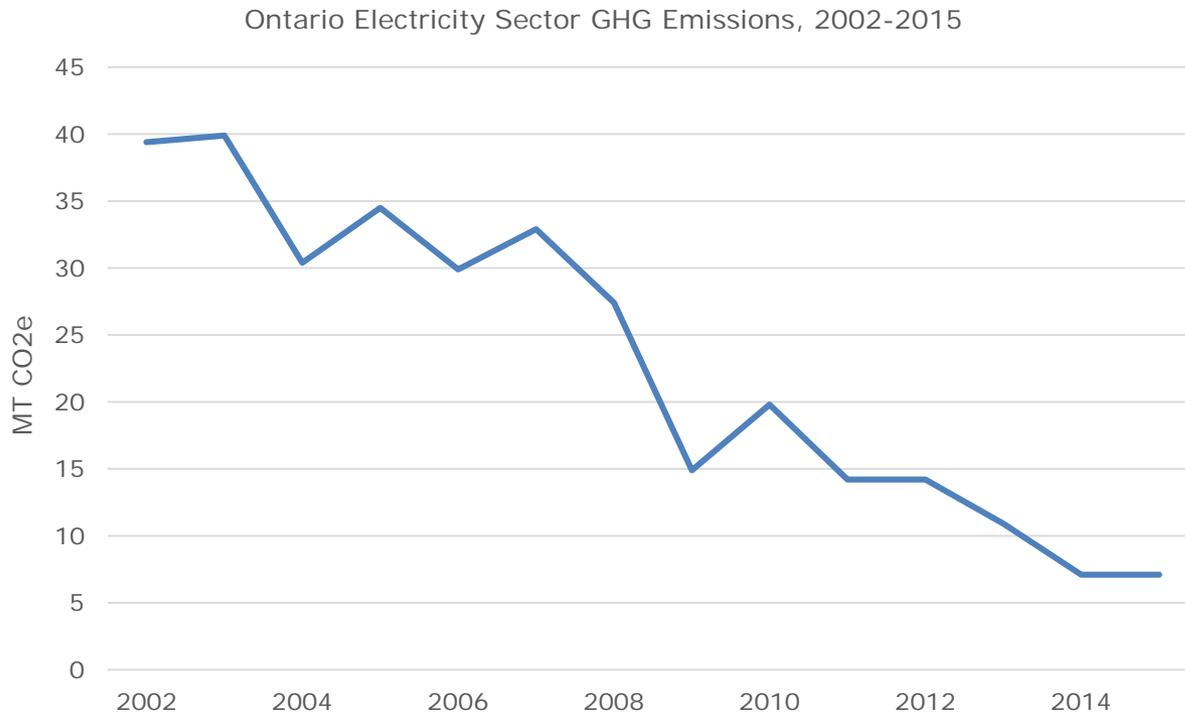
- Interties enable Ontario to trade electricity with neighboring jurisdictions to efficiently manage surplus generation and demand peaks.
- Ontario's electricity system has 26 interties with five neighboring jurisdictions.
- Since 2006, Ontario has been a net exporter with 16.8 TWh traded in 2015.
- Historically, Quebec is Ontario's primary source for imports while exports from Ontario typically go to Michigan and New York.



Source: IESO

Emissions

- GHG emissions from Ontario's electricity sector declined 82% between 2002 and 2015, primarily as a result of the closure of coal-fired generation and declining electricity demand.
- Approximately 90% of electricity generation in Ontario now comes from non-fossil fuelled generation.

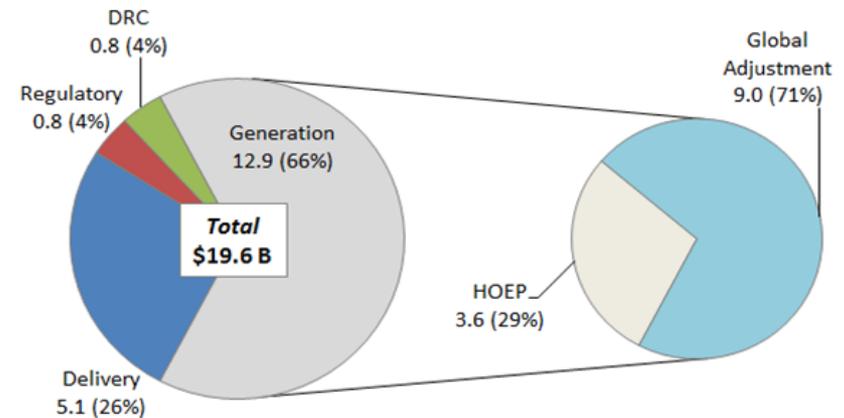


Source: NIR and IESO

System costs

- In Ontario, the costs associated with providing electricity service to consumers are recovered through the commodity, delivery, regulatory and tax components on the customer bill.
- For residential consumers, prices to recover the electricity cost are set through the Regulated Price Plan (RPP).
- In the commercial and industrial sector, electricity costs are split out by wholesale market prices (HOEP) and Global Adjustment (GA) costs.
- The GA charge ensures recovery of long-term generation, conservation and demand management costs, and is applied to all consumer groups.
- Total system costs in 2016, excluding HST, are projected to be approximately \$21 billion (2016\$). These costs are recovered from about 5 million consumers.
- Generation costs (i.e., commodity cost of electricity) represent roughly two-thirds of the total cost of electricity service in Ontario.

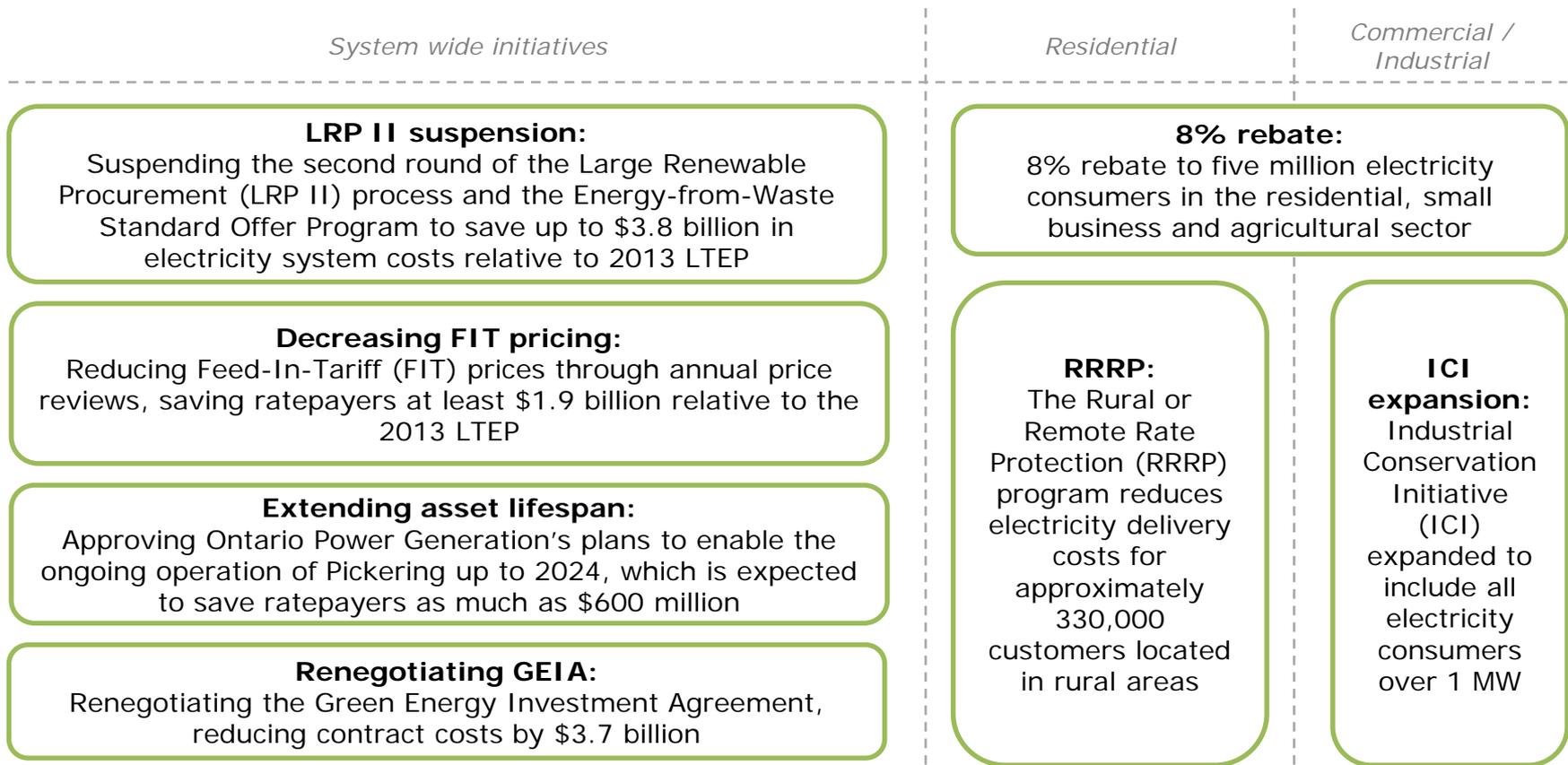
Electricity System Costs (2012\$B)
2016 (Projected)



Source: 2013 LTEP

Rate Mitigation Initiatives

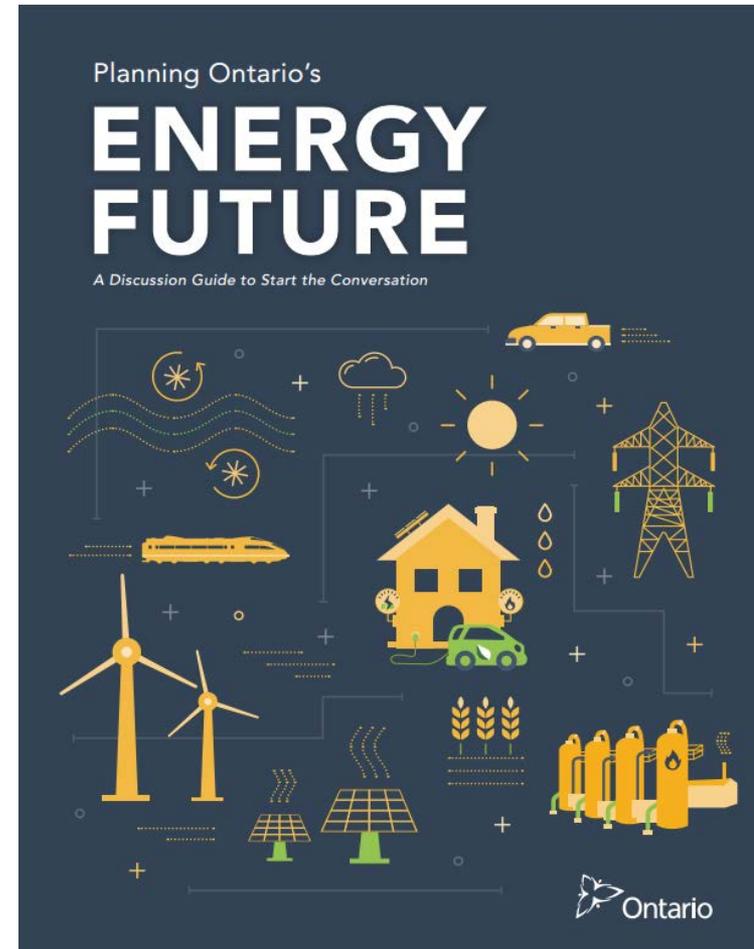
- Electricity costs are increasing as the necessary investments are made to decarbonize and modernize the province's electricity infrastructure (i.e., \$35 billion+ investment in cleaner generation and \$15.5 billion investment in Hydro One transmission and distribution systems).
- Since 2013, a number of actions have been taken to reduce overall electricity system costs:



2. Ontario's Long-Term Energy Plan (LTEP)

LTEP 2016

- The Ministry of Energy is consulting and engaging with Ontarians, First Nation and Métis communities and energy stakeholders to get views on the choices that need to be made for Ontario's energy future.
- The next LTEP will also expand the discussion of Ontario's energy future by including a comprehensive review of the province's fossil fuels sector and the supply of oil, gasoline and natural gas.
- On October 13, 2016, the Ministry published a discussion guide for 2017 LTEP, titled "Energy Future: A Discussion Guide to Start the Conversation".



LTEP Engagement Map

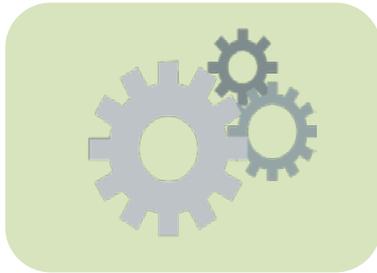
- The Ministry of Energy has held consultations and engagement sessions with Ontarians, First Nation and Métis communities and energy stakeholders across the province.



Produced by Ontario Ministry of Energy, December 2016

LTEP Process

- The 2016 LTEP will be developed through the following four stage process:



Phase 1 Technical Reports

Publication of two technical reports on the current state of Ontario's electricity and fuels sectors, each of which also contain 20-year outlooks to guide LTEP engagement and development.



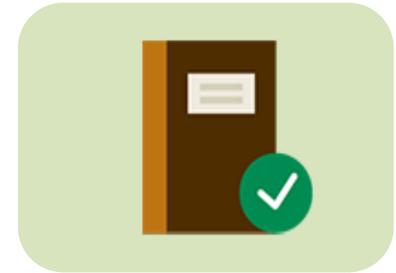
Phase 2 Engagement

The Ministry of Energy is actively seeking feedback from stakeholders and the public through in-person sessions, online tools, and the *Environmental Registry*.



Phase 3 Development

The Ministry of Energy will review all feedback collected through the LTEP engagement phase as well as information provided in the technical reports to develop the Long-Term Energy Plan.



Phase 4 Implementation

The Ministry of Energy's agencies, the Independent Electricity System Operator (IESO) and Ontario Energy Board (OEB) will develop plans for implementing the Long-Term Energy Plan's objectives.

We are here

Discussion guide questions for consideration

- The LTEP discussion guide has developed a series of questions across a broad range of subjects for participants to consider. A sample of these questions is provided below:

Supply Mix

- To meet a higher demand, what mix of new electricity resources would best balance the principles of cost-effectiveness, reliability, clean energy, community engagement, and an emphasis on Conservation First?
- What policies will Ontario need to adapt to a transformation in the fuels sector?

Clean Energy Supply

- What role should distributed renewable energy generation play in the ongoing modernization and transformation of Ontario's electricity system?
- What strategies should Ontario pursue to harness the potential of its nuclear sector to meet its future energy needs?

Regional Planning

- In areas expected to undergo a transformation from rural to suburban, through intense development, how could the province help to ensure that corridor lands are reserved/set-aside before development occurs to minimize the potential costs and inconvenience of acquiring and clearing developed lands in the future?

Innovation and Economic Growth

- Which innovations offer the greatest benefit to your community and the energy system as a whole?
- How should the public and private sectors cooperate to encourage innovation in the energy section?
- What actions could the government take to support the adoption of alternative fuels?

What we heard

- The stakeholder sessions were designed for table discussions on five broad topics, facilitated by Ministry of Energy staff.
- The topics were Prices, Delivery, Innovation, Supply and Conservation and covered both the electricity and fuels sectors.

Prices

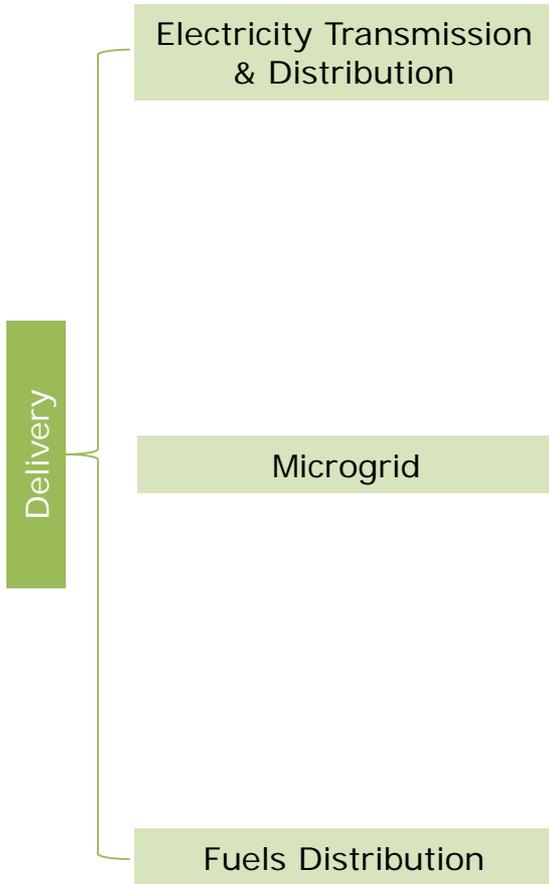
Electricity mitigation

Natural Gas mitigation

Bending the cost curve

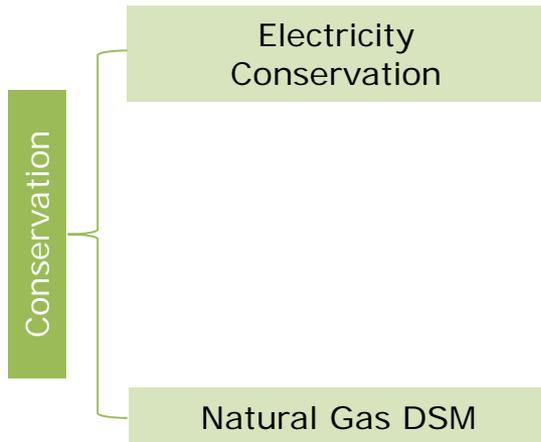
- **Cost certainty:** homes/businesses want predictability of costs.
- **Delivery Charge:** Customers not aware what it covers. Unfair that it varies across province.
- **Industrial Competitiveness:** Prices are putting Ontario at a competitive disadvantage in attracting investment. Need more support for all sizes of businesses.
- **LDC issues:** Customers identifying rising costs; challenge for utilities as they account for ~15% of bill.
- **RPP changes:** More TOU prices should be offered to recognize differences in homes/businesses' consumption patterns and incent the desired consumer behaviour to shift loads.
- **Support from Tax-Base:** More funding is needed from tax base given supply mix/costs are locked in.
- **Engagement/communication:** More efforts are needed to explain the different components of bill, why they have gone up and what support programs are available for different customer groups.
- **Utilize existing assets:** Government should re-contract with existing supply as contracts expire through competitive price auctions.

What we heard (cont'd)



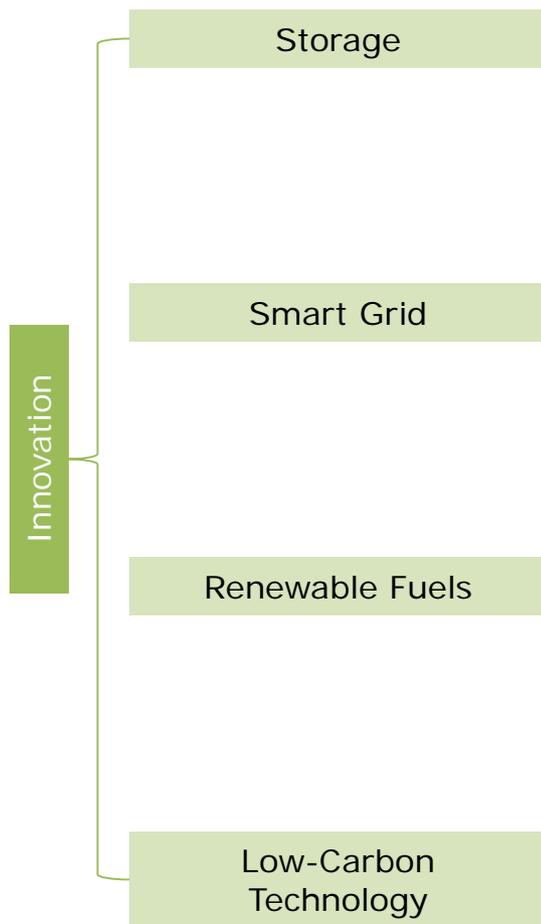
- **Investments:** Existing assets should be optimized where possible; community planning and non-wires solutions deserve more consideration in the regional planning process, cost allocation issues remain a concern; concern among utilities about uncertainty in planning for the range of future scenarios, microgrids and natural gas expansion could strand assets.
- **Economic Development:** There are barriers to transmission development; government should take a broader view of benefits of electricity infrastructure; reliability is a concern for large companies & essential services ; better communication is needed power quality and equipment sensitivity.
- **Rate Design:** Change rate design to allow for projects that provide system benefits.
- **Efficiencies:** Smaller LDCs and sharing services can be more efficient than mergers. Regulatory approaches should focus on incenting efficiencies.
- **Delivery Charge:** Change the name of Delivery Charge or provide more explanation on what it covers.
- **Natural Gas:** Need for natural gas access to rural areas to enable customer choice—and concerns about stranded natural gas assets in high electrification scenarios.
- **Raising Capital:** Provide opportunities for LDCs to raise capital from alternative sources.
- **Electrification:** Need to consider ways to protect and enable delivery infrastructure that supports goals of CCAP.

What we heard (cont'd)



- **Education/awareness:** Customers need to see price benefits of conservation. Programs should raise awareness of benefits of conservation to the grid.
- **CCAP:** Integrate CCAP initiatives with existing CDM/DSM
- **Tailored programs:** More programs for low-income, rural, northern customers
- **Broader focus:** Broaden conservation to include other fuels
- **Continuity:** Program continuity is critical for awareness and availability of providers & skills
- **Technology:** Focus on technology that can change behaviour/help manage energy use. Use technology for SME's to load-aggregate to participate in ICI
- **Line Loss:** There is no motivation to address line loss, there is untapped potential for savings.

What we heard (cont'd)



- **Business Models** Support innovative business models/rate design and remove barriers to spur investments in new technology, such as the smart grid, microgrids and distributed generation.
- **Regulation:** Changes to the regulatory framework are needed to incent innovation in technologies and business models.
- **Customer:** Focus innovation on customer needs and wants as they will determine which emerging technologies will become established. Customer education will be important to promote innovation.
- **Government Support:** Government support needed for research and commercialization of energy technologies and to open up new markets for Ontario's innovative energy products and services.
- **EV Integration:** Pursue/support the use of EVs as batteries for home storage and grid services in conjunction with distributed energy resources such as renewables.
- **Storage:** Storage technology shows significant promise for Ontario. The full range of storage technologies and applications should be supported.
- **Microgrid:** Support deployment in Northern Ontario today; explore ways for microgrids to greater reliability and new electricity business models in the future.
- **Outcomes Approach:** Clearly articulate sector challenges / constraints to industry, and provide the space for innovators to create the solutions.
- **Crowdsourcing:** Facilitate focused discussions with knowledge experts (i.e. not industry stakeholders) on specific energy issues with the goal of identifying evidence-based solutions.

What we heard (cont'd)

Supply

Nuclear

Renewables

Electricity Trade

Fuels

- **Asset optimization:** Need to optimize existing assets and get value from things the province has already invested in
- **Full lifecycle costs:** Consider full costs and emissions along full lifecycle
- **Supply principles :** Flexibility, scalability and diversity should be supply priorities.
- **Interties / storage:** deployment of storage technologies and intertie expansion can provide flexibility
- **Technology Neutral:** Government should set supply mix objectives and use market-based mechanisms e.g., capacity auctions
- **Lead times:** Consider lead-times of some resources when planning supply mix
- **Economic development:** Supply choices have an economic impact (consider costs and employment opportunities in planning)
- **Storage:** Storage technologies are vital to optimizing existing supply
- **Price signals:** establishment of clear price signals and mechanisms to incent innovation and flexible supply
- **Costs:** Should be a first consideration in making decisions
- **Renewables:** With no immediate need for procurement, use time available now to examine new technologies and innovations before procuring potential future large scale renewables.
- **Customer Choice:** Interested in producing their own electricity at home/business
- **Community planning:** Communities want to be involved in the decision-making process (e.g., project siting)

LTEP timelines

- Now that the LTEP engagement process is complete, the Ministry of Energy is moving to LTEP development. This process will include:



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