
Long-Term Energy Plan Update

Jobs and Economic Policy Committee – November 2, 2016

Minister

Deputy Minister

Purpose

- The presentation provides an update on the LTEP process including the following:

Background

- LTEP 2013 Achievements
- Changes to LTEP process since 2013

LTEP Process Update

- Technical Reports
- Discussion Questions for Cabinet
- Consultation and Engagement

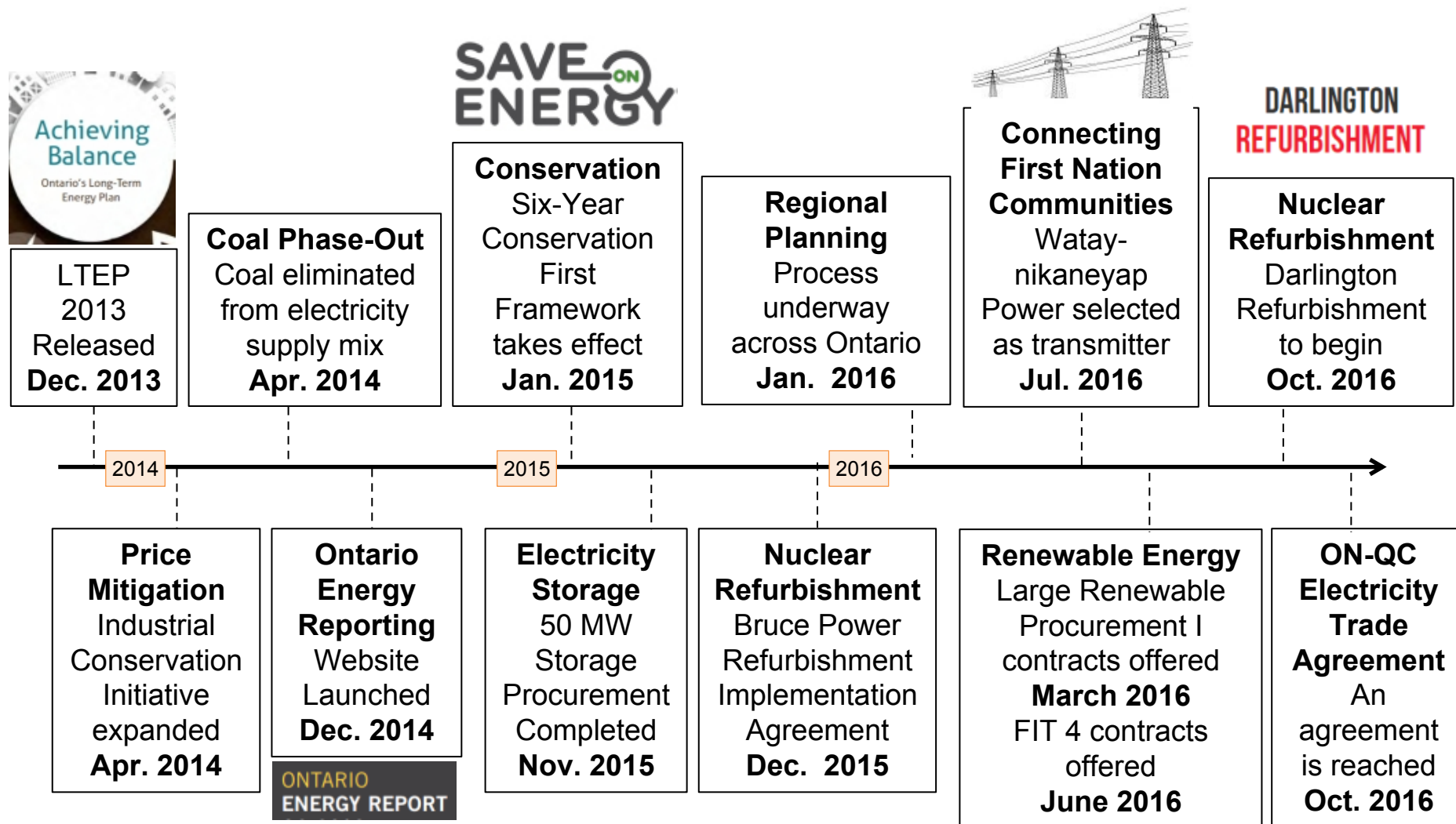
LTEP 2013



- Ontario's last LTEP was released following Cabinet approval, on December 2, 2013.
- The plan set out direction for the energy sector including conservation, generation, transmission/distribution, oil/gas, Indigenous participation, and regional planning.
- The plan identified five principles that guide energy decisions:
 - Cost effectiveness;
 - Reliability;
 - Clean energy;
 - Community engagement; and
 - An emphasis on conservation and demand management
- The plan was informed by the most comprehensive engagement process the Ministry of Energy has ever undertaken.

Key LTEP 2013 Achievements

- Progress on initiatives identified in LTEP 2013 include:



Changes Since LTEP 2013

- A number of changes make the next LTEP different than the previous one:

New Energy Planning Process

The *Energy Statute Law Amendment Act, 2016* enshrined a new energy planning process that builds on the planning principles used by the Ministry to develop the 2010 and 2013 LTEPs. As part of the new process, two technical reports have been released publicly prior to engagement sessions

Broader Energy Focus

In the next LTEP, the intention is to take a broader view of the province's energy needs and consider how the uses of electricity and fossil fuels influence each other.

Align with CCAP

The LTEP is an opportunity to further elaborate on and consult on CCAP initiatives relating to energy (EV charging; energy efficiency; fuel switching).

Outlooks in LTEP technical reports are consistent with CCAP objectives to 2020.

New Energy Planning Process

- After the 2013 LTEP, the Ministry of Energy took time to reflect on its energy planning process. It determined that the process used for developing the 2010 & 2013 LTEP's should be enshrined in legislation.
- These changes were made through the *Energy Statute Law Amendment Act, 2016* (Bill 135) which was passed in June 2016 and came into force on July 1, 2016.
- The next LTEP will follow this planning process. The process will include:



Creating the LTEP

- LTEP process begins with IESO technical report.
- ENERGY leads LTEP development, engagement, and consultations.
- Cabinet approves the LTEP and directives issued to IESO and OEB asking for Implementation Plans

Implementation

- IESO and OEB develop plans for implementing LTEP objectives.
- Minister of Energy approves OEB and IESO implementation plans.

Procurements & Programs

- IESO and OEB develop programs and policies, or procure resources outlined in their Implementation Plans.

Broader Energy Focus

- In the previous LTEPs, there has been less of a focus on oil, gasoline and natural gas relative to the electricity produced in the province itself.
- In light of Ontario's emission reduction goals and Climate Change Action Plan (CCAP) initiatives related to the fuels sector, the plan is for the next LTEP, to take a broader view of the province's energy needs.
- Given GHG emissions from the electricity sector make up only 4% of the province's total emissions*, Ontario's transition to clean generation means that focus will have to shift from electricity to other energy sectors like heating, transportation, and industry.
- The next LTEP would also consider how the uses of electricity and fuels influence each other.
- The Ministry of Energy intends to take an integrated approach and plan for how the transition to a low-carbon economy will affect all aspects of energy demand.

* Source: OPO 2016

Alignment with Climate Change Policy

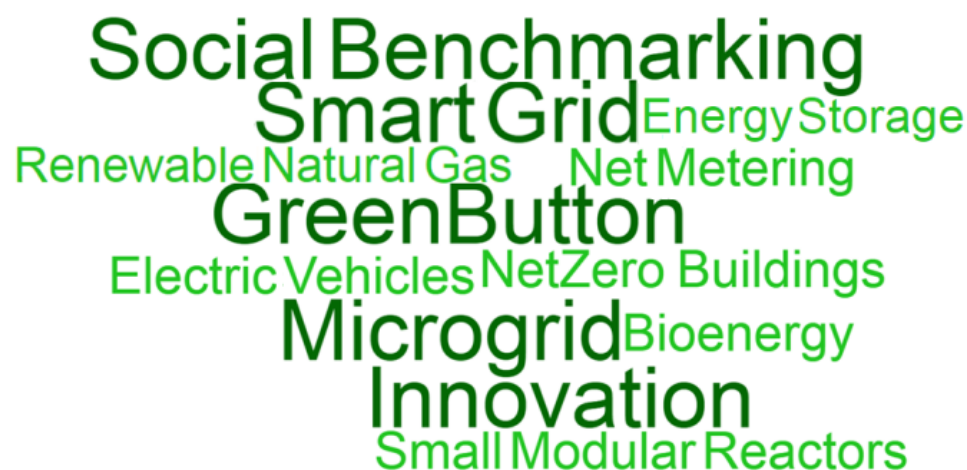
- The CCAP outlines how cap and trade auction proceeds will be used in the first compliance period (2017-2020) to fund actions to reduce greenhouse gas (GHG) emissions.
- The CCAP cabinet minute stipulates that ENERGY is responsible for work on 21 actions.
- The LTEP technical reports considered the CCAP in their forecasts, in particular increasing electrification.



- The LTEP presents an opportunity for the government to further elaborate on and consult on Ontario's new climate change policies and initiatives as they relate to energy.

Energy Innovation

- The next LTEP intends to consider innovation and changes in customer behaviour that are encouraging the spread of new energy technologies.
- Trends in energy storage, smart homes, microgrids, distributed energy and electric vehicles will change the way customers use energy and utilities manage their energy systems.
- Ontario can further encourage innovation in the energy sector through a number of supportive initiatives including:
 - **Net Metering:** ENERGY is implementing an updated net metering program that allows customers to generate renewable energy and receive credits on their bill for surplus power sent back to the grid.
 - **Smart Grid Fund:** Supports projects that integrate new beneficial technologies like microgrids, electric vehicles and storage. These technologies will help modernize the grid, if barriers to their uptake can be overcome.
 - **Green Button:** A data standard that gives customers the ability to access and share their utility data in an electronic, standardized and secure way. CCAP committed to expanding Green Button province-wide as a way to help conserve energy and water.

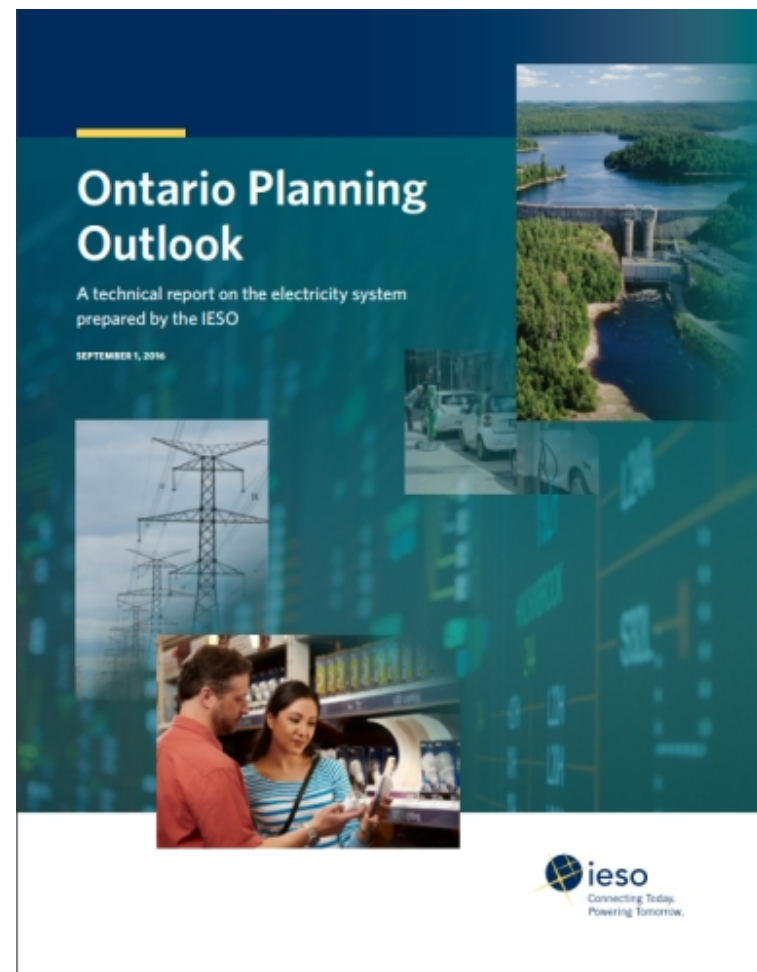


Summary of Electricity Technical Report

Electricity Sector Technical Report

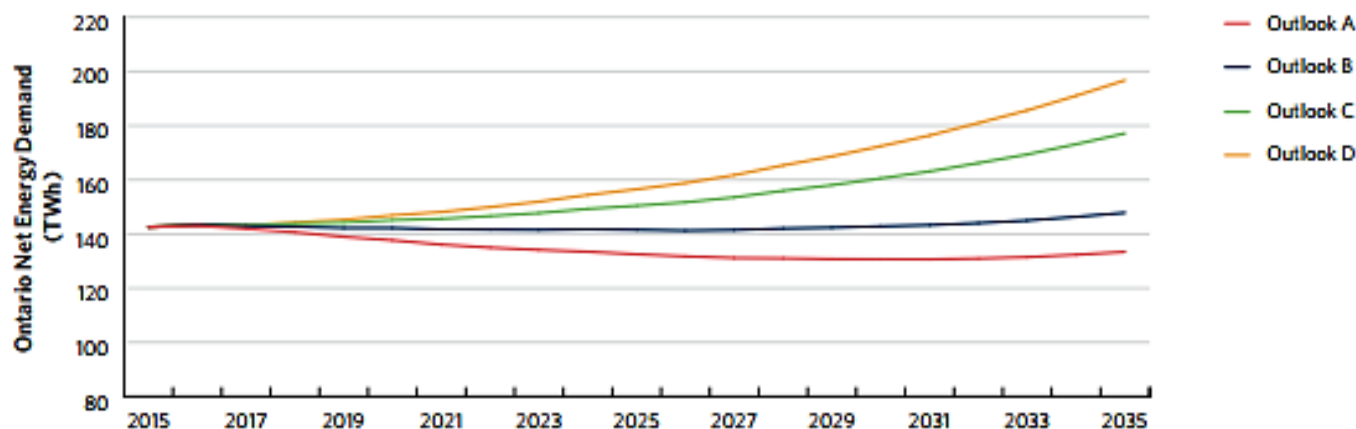
IESO Ontario Planning Outlook

- The first step in the LTEP process was the release of the Ontario Planning Outlook (OPO) by the IESO on September 1, 2016.
- The OPO includes a ten-year review and a twenty-year outlook (to 2035) for electricity demand, supply, system costs, conservation and emissions.
- The purpose of the report is to allow the Ministry, Indigenous groups and communities and stakeholders to start from a common point of understanding in advance of LTEP consultations and engagement.
- The OPO considers other government commitments, including the Climate Change Action Plan, the *Climate Change Mitigation and Low-Carbon Economy Act, 2016*.



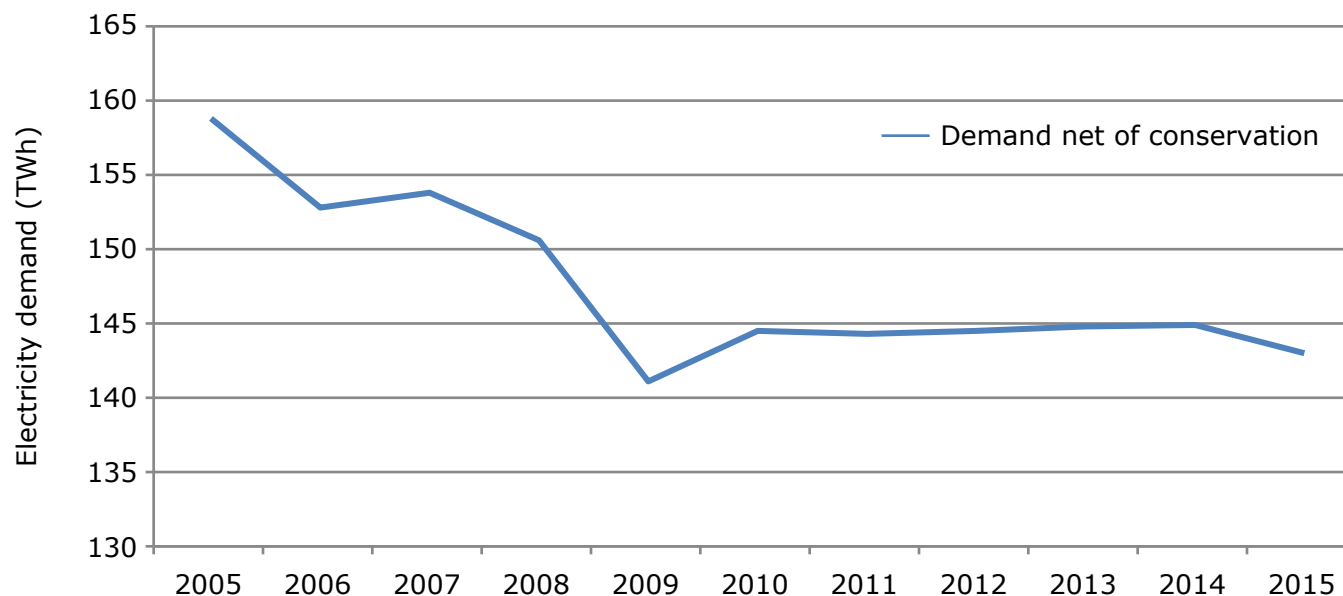
Ontario Demand Scenarios

- The IESO's Ontario Planning Outlook (OPO) is a technical report that provides a 10-year review (2005-2015) and a 20-year outlook (2016-2035) for Ontario's electricity system.
- As a result of investments over the past decade in the sector, the province is in a strong position to meet the range of demands for electricity that could occur.
 - The OPO includes a range of demand outlooks that all reflect the actions identified in the Climate Change Action Plan:
 - Outlook A (or “low demand outlook”),
 - Outlook B (or “flat demand outlook”),
 - Outlooks C and D (or “higher demand outlooks”), which consider higher levels of electrification associated with policy choices on climate change.



Ontario Historic Demand -

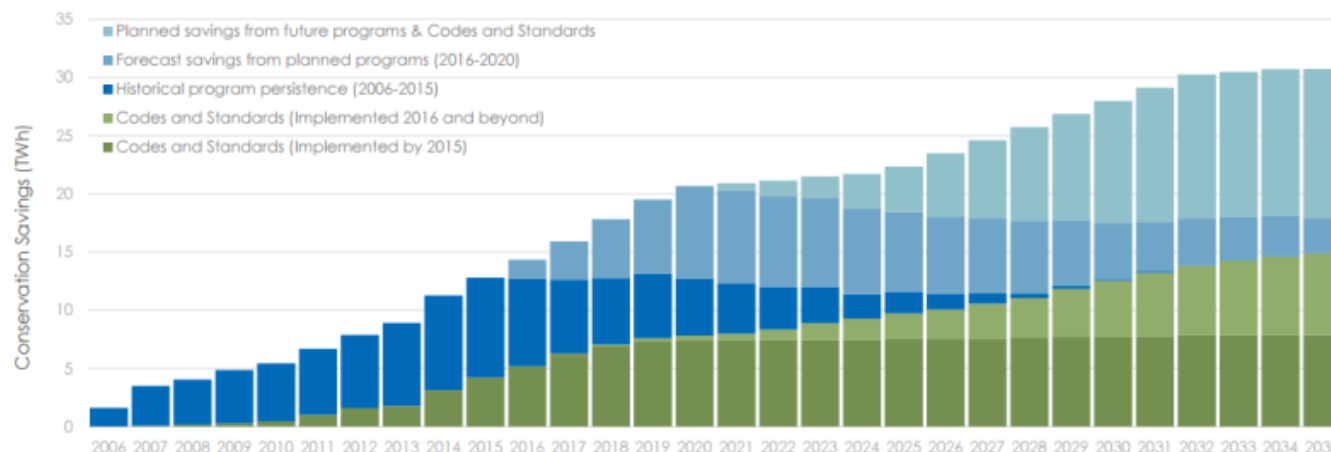
- Demand for electricity declined over the last 10 years as a result of conservation, changes in the economy, and pricing effects.
- Electricity saved through conservation programs and changes to codes and standards has increase substantially in Ontario over the last 10 years, rising from 1.6 TWh in 2006 to 12.8 TWh in 2015.



(Source: OPO 2016)

Ontario Conservation Outlook

- Residential electricity intensity has been steadily decreasing over the last 10 years, in part because of conservation and energy efficiency.
 - In April 2016, the OEB updated its typical household monthly electricity consumption to 750 kWh. Since late 2009, the OEB had defined this value to be 800 kWh per month. Prior to that, the OEB standard was 1,000 kWh per month.
- All four OPO demand outlooks reflect achievement of the LTEP 2013 electricity conservation target to achieve 30 TWh of electricity savings by 2032.
 - IESO recently completed an achievable potential study on cost-effective electricity savings that can be achieved in Ontario. Results indicate that Ontario's electricity conservation target of 30 TWh in 2032 is achievable, but aggressive, and that there is limited potential to achieve cost-effective electricity conservation beyond this target.

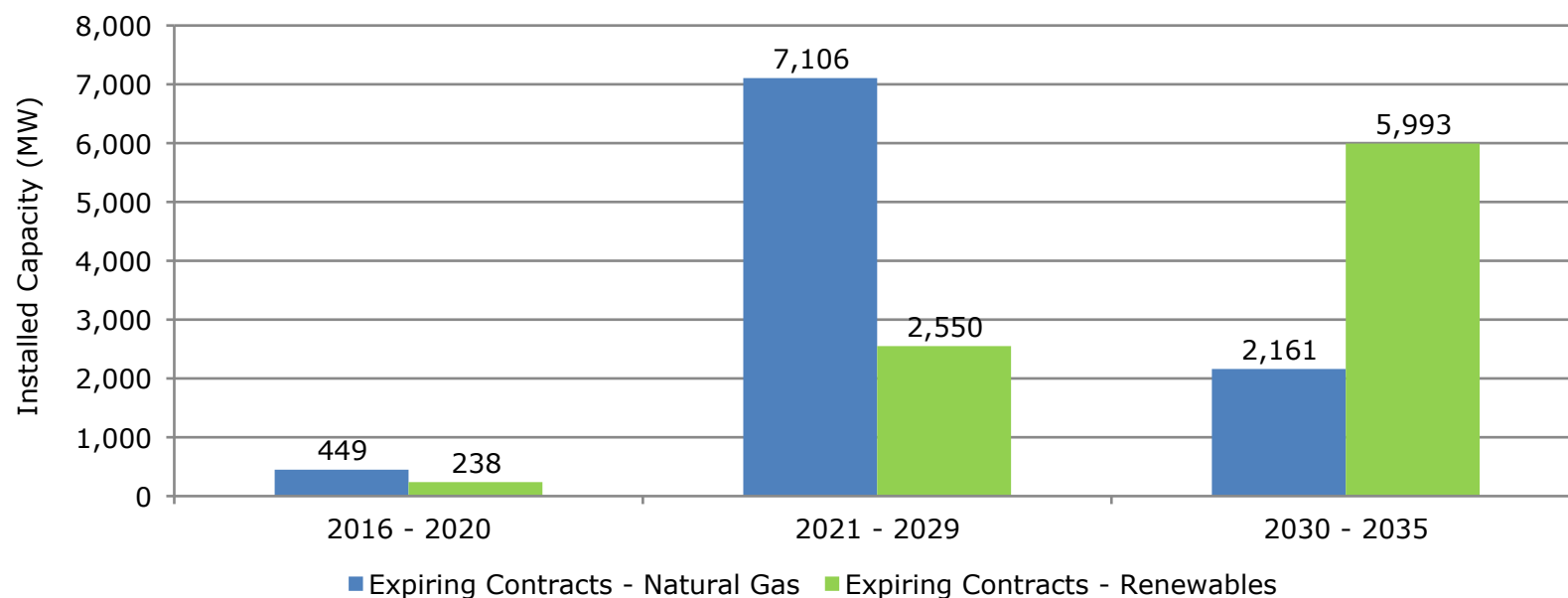


Ontario Supply Resources

- The OPO states that Ontario's existing, committed and directed resources are sufficient to meet the flat or lower demand outlook. Higher demand could create a need for additional resources in the mid-2020's, and could make Ontario into a winter peaking jurisdiction resulting from the electrification of heating load.

Ontario Expiring Contracts

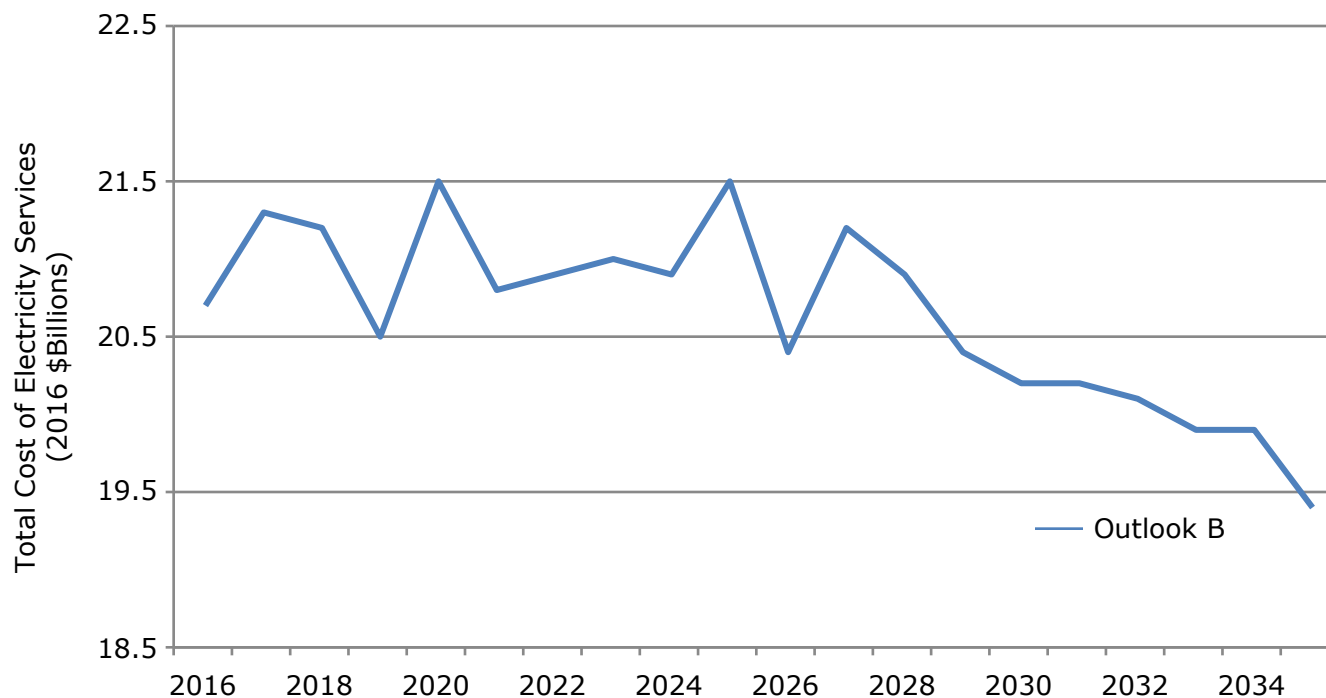
- Approximately 18,500 MW of existing, contracted generation will reach contract expiry by 2035, including about 9,700 MW of natural gas capacity.
- The lower electricity demand can be managed by not renewing contracted generation.
- Contracted generation gives Ontario the flexibility to align future investments with the Province's evolving energy needs, opportunities, and priorities.



(Source: OPO 2016)

Ontario Cost Outlook

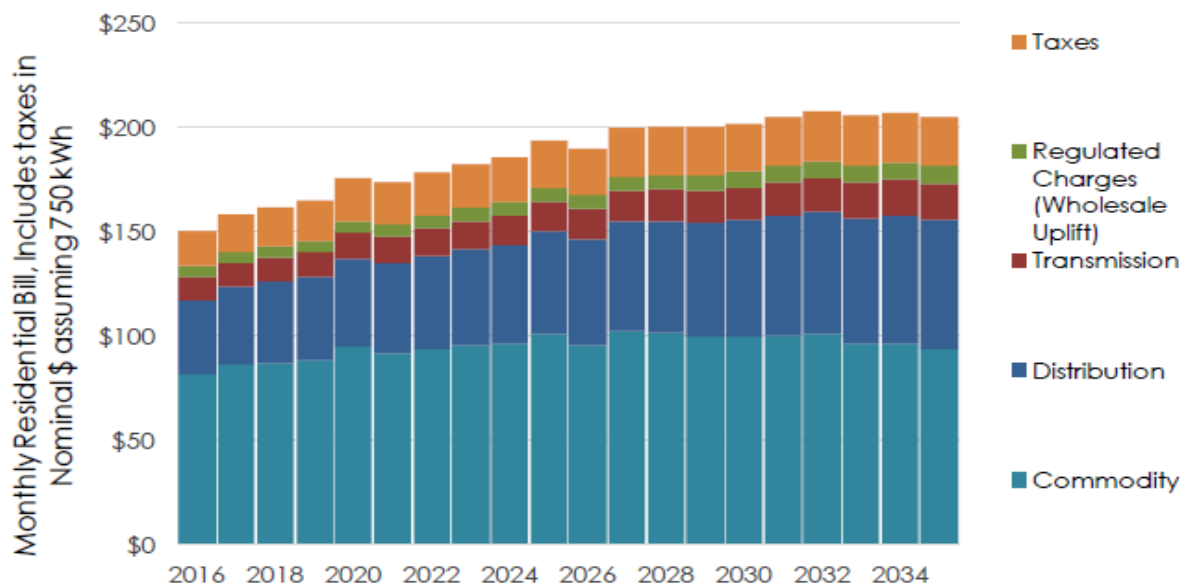
- Under flat demand, the total cost of electricity service would average ~\$21 billion per year (2016\$) over the next 10 years, and decrease to ~\$19 billion per year by 2035.



- In higher demand outlooks, annual cost of electricity service would rise by approximately \$4 billion to \$10 billion by 2035 (2016\$). Unit costs would be within the same range as the flat demand outlook due to associated consumption increases.

Ontario Residential Bill Impacts

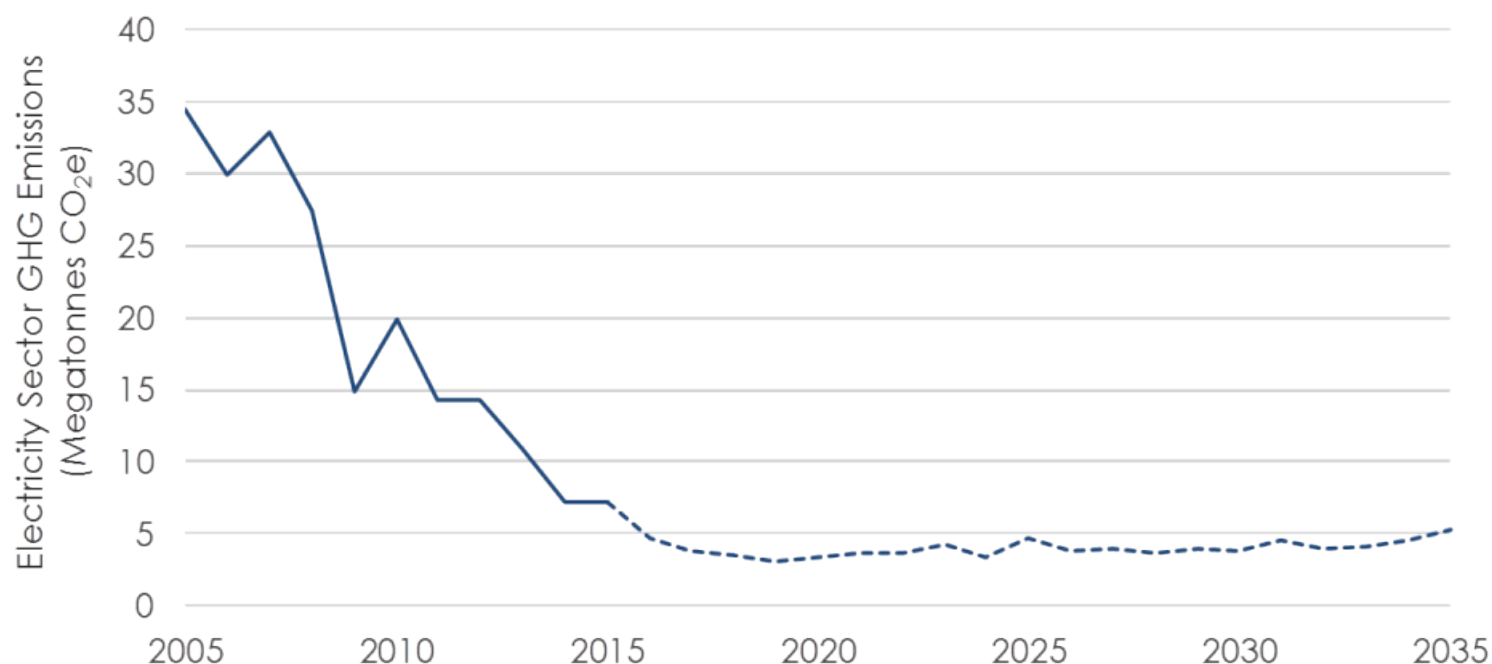
- The monthly residential bill was calculated assuming consumption of 750kWh/month. The residential bill outlook is part of the IESO's draft analysis and was not publicly released in the final OPO.
- Based on the draft analysis, for Outlook B (i.e. flat demand) average monthly bills are forecast to grow by an annual 1.6% over 20 years and result in a monthly bill of \$205/month in 2035.
 - For reference this does not include the 8% rebate on bills, nor does it reflect the suspension of the LRP II procurement.
 - Policies and program proposed in the next LTEP would impact the average monthly bill.



Note: The average monthly demand would not be expected to remain 750kWh/month under the high demand forecasts (Outlooks C&D), so the residential bill impact forecast may be an underestimate in those outlooks.

Ontario Emission Outlook

- **Emissions:** The OPO projects that electricity sector emissions are expected to continue to decline over the next five years. Beyond this period, emissions will depend on demand and amount of generation supplied by natural gas.

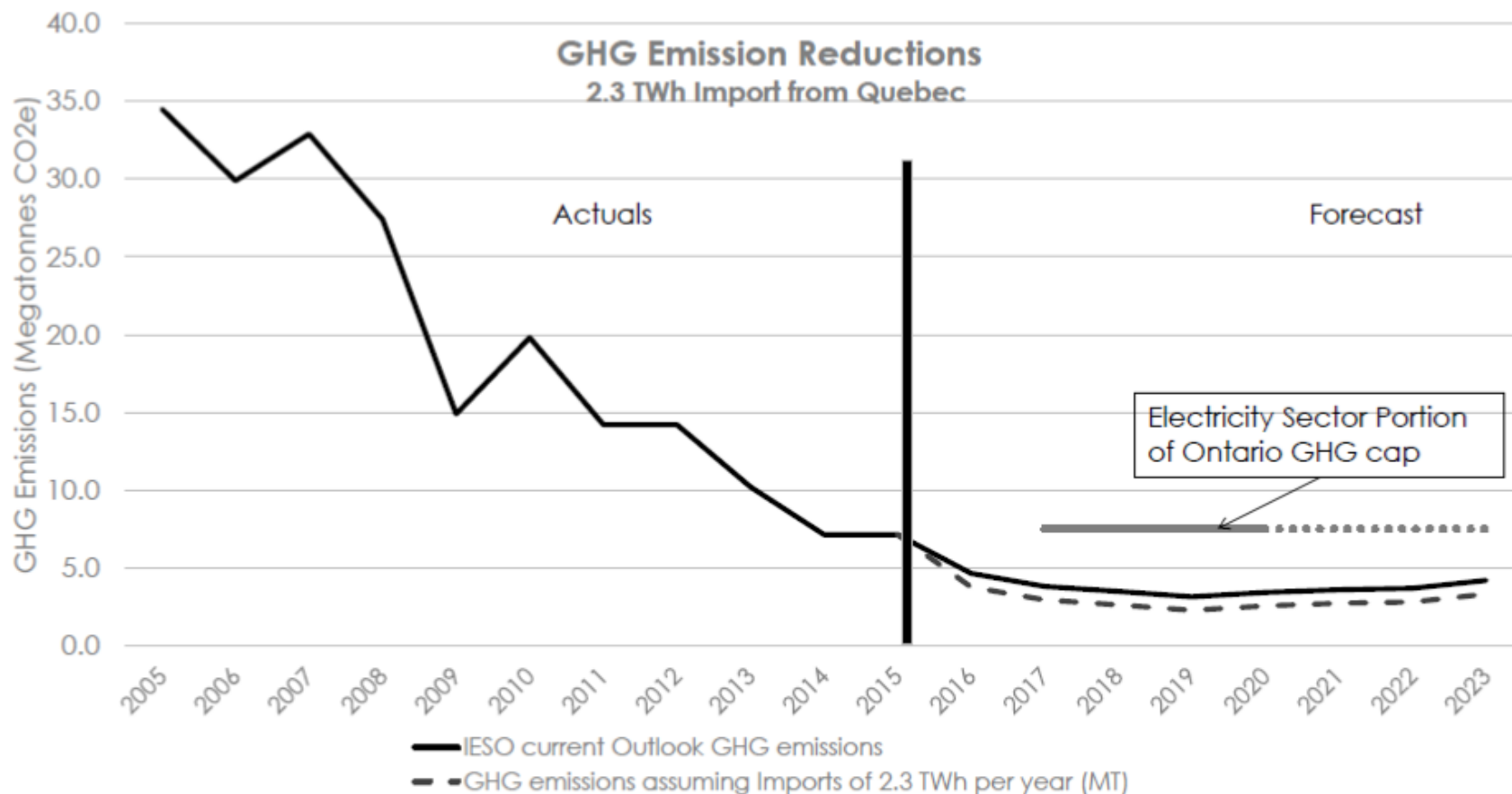


Recent Developments not in the Ontario Planning Outlook

Ontario-Quebec Collaboration Initiatives

- In September 2014, Ontario and Quebec established an energy working group to explore mutual energy issues, including electricity trade opportunities.
 - In November 2014, the provinces held a joint cabinet meeting and agreed to pursue a ten year *“Seasonal Electricity Capacity Sharing Agreement”* and to explore additional opportunities for a longer term electricity trade agreement.
- In September 2015, a subsequent joint cabinet meeting was held where Premiers endorsed a Memorandum of Understanding (MOU) that laid the groundwork for discussions on a longer term electricity trade agreement.
 - The MOU stated that a potential electricity trade agreement would reduce greenhouse gas (GHG) emissions, provide value to both provinces and align with each jurisdiction’s policy initiatives.
 - Ontario was represented in these discussions by the Independent Electricity System Operator (IESO) and Infrastructure Ontario (IO).
- On August 5, 2016, Hydro Quebec and IESO reached an agreement on the principal terms of a medium-term electricity transaction consistent with the 2015 MOU.
 - By November 30, 2016, IESO/IO and Hydro Quebec expect to arrive at a final contract.

Impact of GHG Emissions in Ontario from Agreement with Quebec



(Source: IESO, 2016)

Large Renewable Procurement II Suspension

- On September 27, 2016, the Minister directed the IESO to suspend the second phase of the Large Renewable Procurement (LRP II) process.
 - The OPO advised that Ontario has sufficient supply over the coming decade to meet projected energy demand.
 - Given this strong energy position, a large amount of additional power is not needed at this time. It was therefore decided to suspend LRP II, along with the Energy-from-Waste (EFW) Standard Offer Program, halting procurement of over 1,000 MW of new renewable and EFW projects.
- Ontario will honour the renewable contracts that have been signed, including those signed under LRP I.
- This decision will maintain system reliability while saving up to \$3.8 billion in electricity system costs relative to the 2013 LTEP forecast, saving the typical residential electricity consumer an average of approximately \$2.45 per month on their electricity bill.

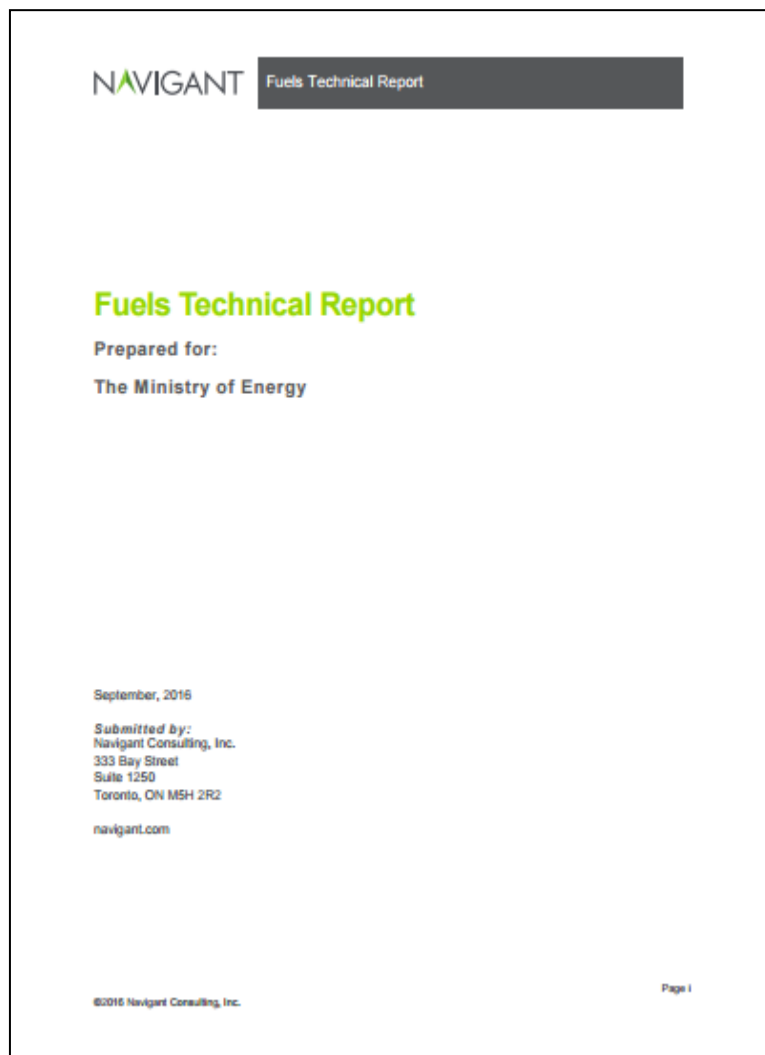
Rate Mitigation – New Initiatives

- Ontario announced a number of initiatives in September 2016.
- The government is introducing legislation that, if passed, would provide an eight per cent rebate to five million electricity consumers, including residential consumers; multi-unit residential buildings and other facilities used as residential rental units such as long-term care homes and school residences; small businesses; and farms.
- The eight per cent saving would go into effect as of January 1, 2017 and would result in savings of about \$130 per year or \$11 per month for a typical Ontario residential consumer.
- The Rural or Remote Rate Protection (RRRP) program reduces electricity delivery costs for approximately 330,000 customers located in rural areas. Ontario intends to increase funding to the RRRP, which, combined with the eight per cent rebate, would result in electricity relief for eligible consumers of approximately \$45 per month or \$540 per year.
- Electricity consumers not eligible for the 8 per cent rebate will receive an on-bill benefit via the Greenhouse Gas Reduction Account as part of the Climate Change Action Plan.
- Ontario is proposing to expand eligibility for the Industrial Conservation Initiative (ICI). ICI would be expanded to include all sectors and all electricity consumers over 1 MW would be eligible. ICI provides a strong incentive for large electricity consumers to shift their electricity consumption to off-peak hours to reduce their bills by about one-third. Reducing peak system usage improves reliability and lowers total costs.

Summary of Fuels Technical Report

Fuel Sector Technical Report

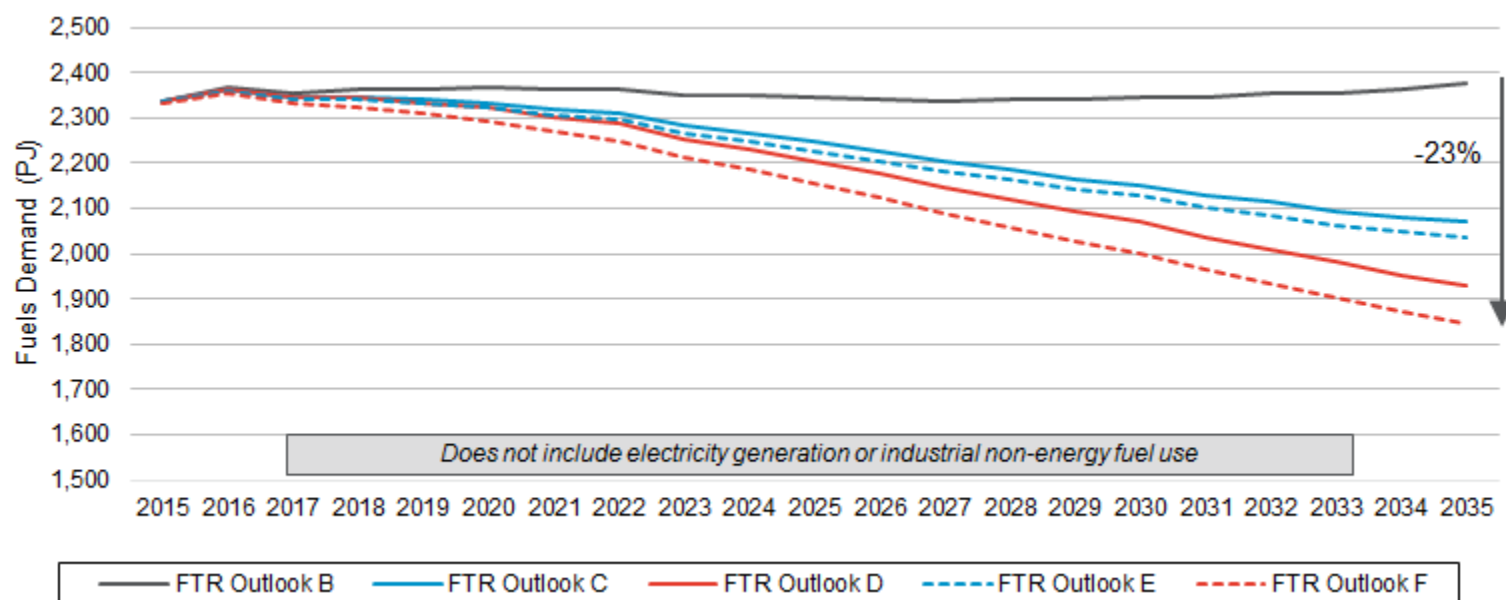
Fuels Technical Report



- Fuels such as natural gas, gasoline, diesel, propane and biofuels supply three quarters of the province's primary energy use.
- Given the importance of the fuel sector to Ontario's quality of life and economy, Ontario is expanding its assessment of the fuels sector. This includes:
 1. On September 30, 2016, the Ministry released the **Fuels Technical Report** (FTR) on Ontario's fuels sector, similar to IESO technical report on the electricity sector. The report was developed by Navigant
 2. The Ministry also established a **Fuels Sector Working Group** made up of companies and associations from Ontario's fuels sector. The group advised on the FTR, and will provide input on policies and programs through LTEP consultations and engagement.

Fuels Sector Demand

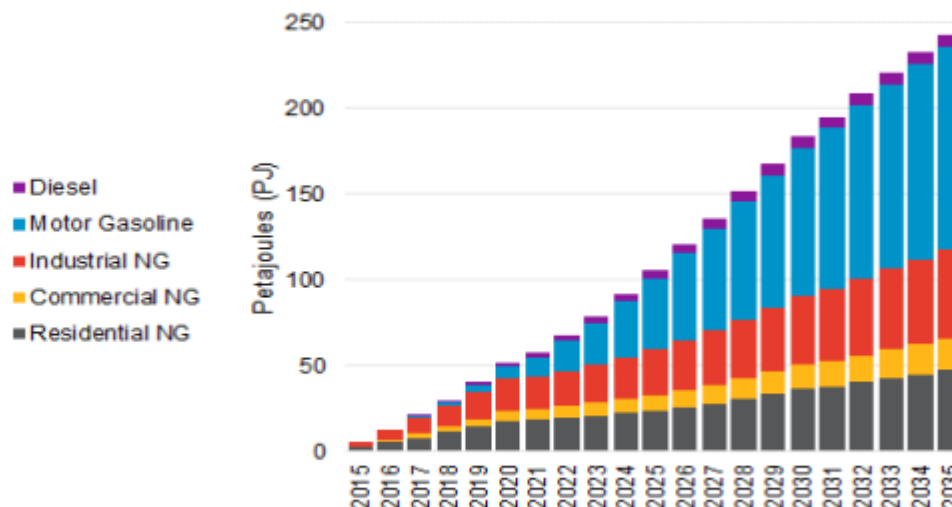
- The Fuels Technical Report (FTR) includes a review of fuels consumption and a set of twenty year outlooks for demand, supply, costs and GHG emissions.
- Like the OPO, the FTR is consistent with the assumptions in the CCAP. The fuels and electricity technical reports share common assumptions on economic activity, demographic data and electrification of equipment and transportation.
- The report includes five demand outlooks. Changes in demand are a result of electrification, as well as conservation and uptake of alternative fuels.



Fuels Sector Conservation Outlook

- The demand outlooks incorporate varying levels of conservation and fuel switching.
- Specific to natural gas, the OEB recently completed an achievable potential study on cost-effective natural gas savings that can be achieved in Ontario.
 - Results indicate that there is significant potential beyond current levels of activity for cost-effective conservation of natural gas.

Figure 35: Conservation Achievement and Outlook to 2035 (Outlook B)

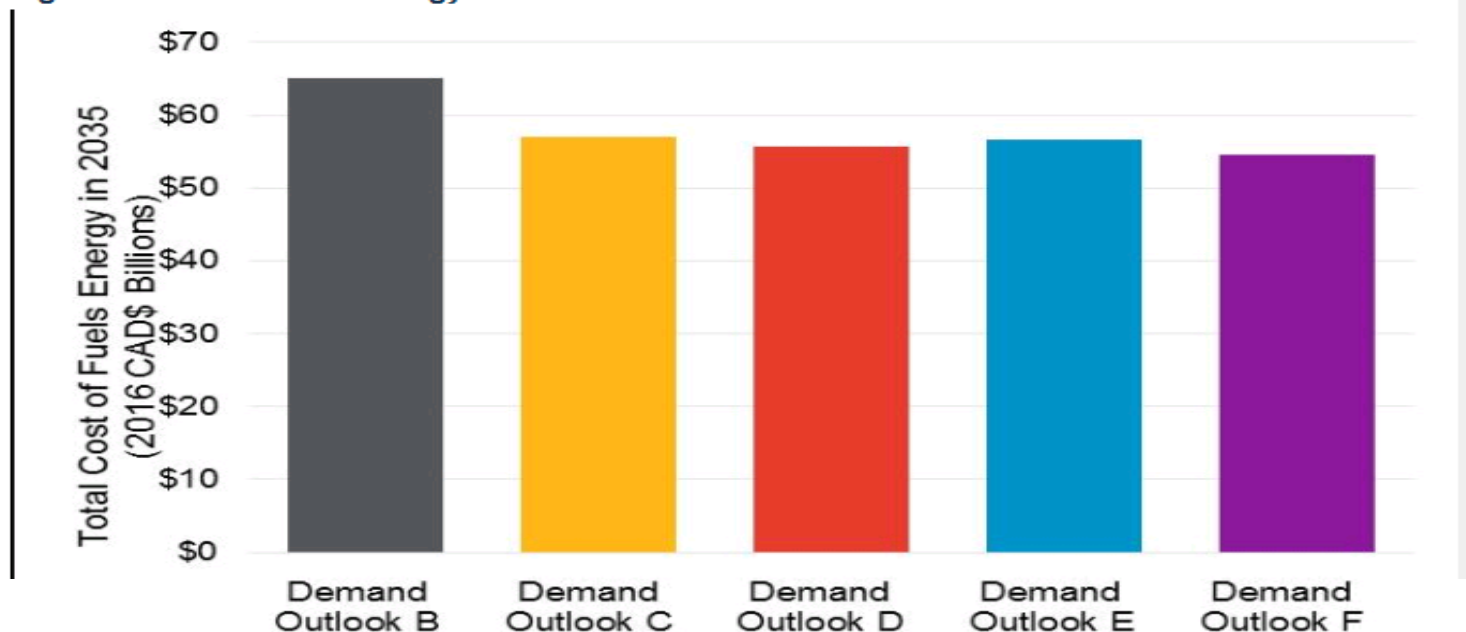


Source: CanESS & Navigant Analysis, 2016

Fuels Sector Supply and Costs

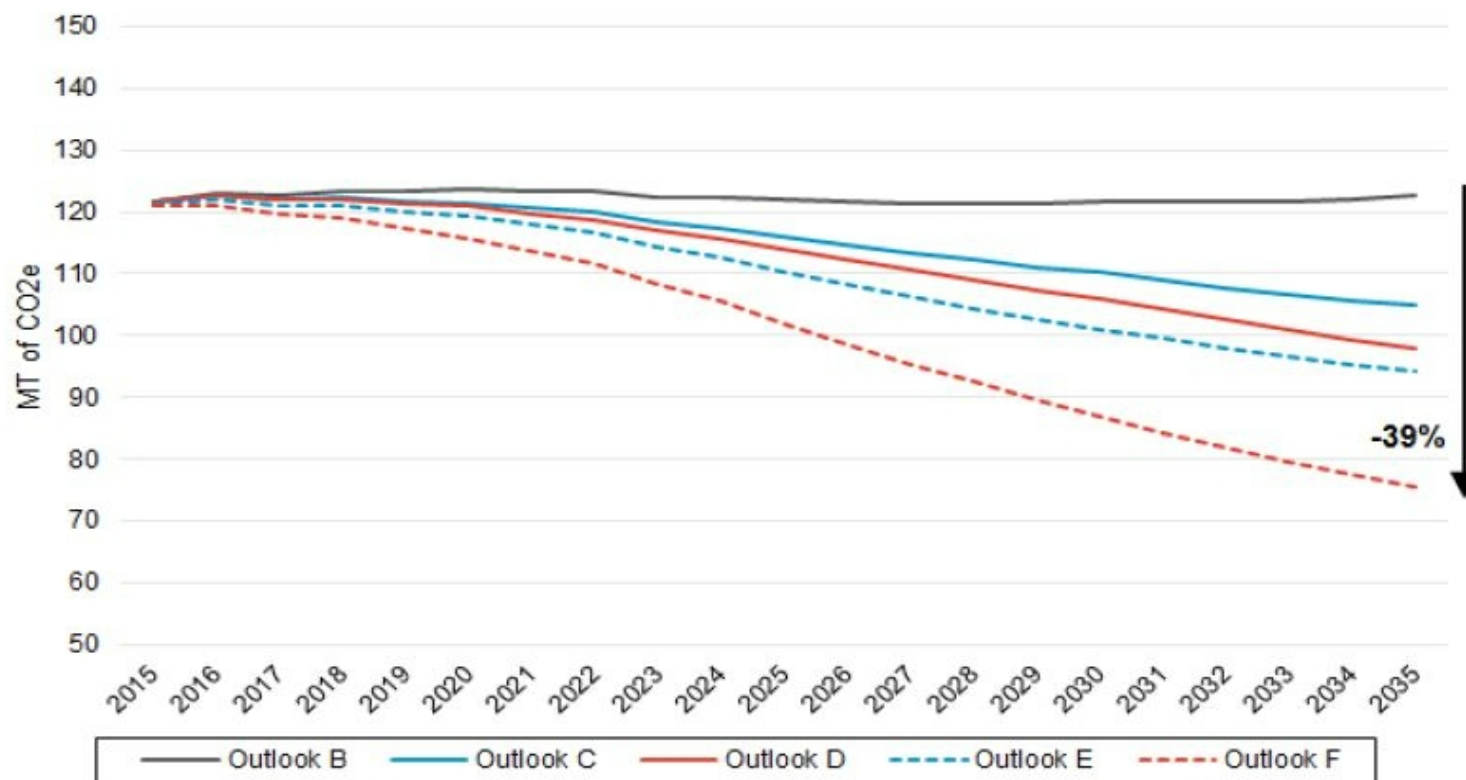
- In all scenarios, the supply outlook is expected to provide sufficient quantities of product to meet Ontario's demands for conventional fossil fuels. Where outlooks see demand growth for alternative fuels, new investment in infrastructure and new imports of alternative fuels may be required
- Total fuels energy costs are expected to decline in most outlooks compared to the flat demand outlook (B), primarily due to reduced demand resulting from electrification of space-heating, industrial process, and light-duty transportation.

Figure 43: Cost of Fuels Energy Across Demand Outlooks



Fuels Sector Emissions Forecast

- In most demand outlooks, the fuels report projects that emissions from Ontario's fuels sector are expected to decline as a result of electrification, as well as conservation and update of alternative fuel-switching.

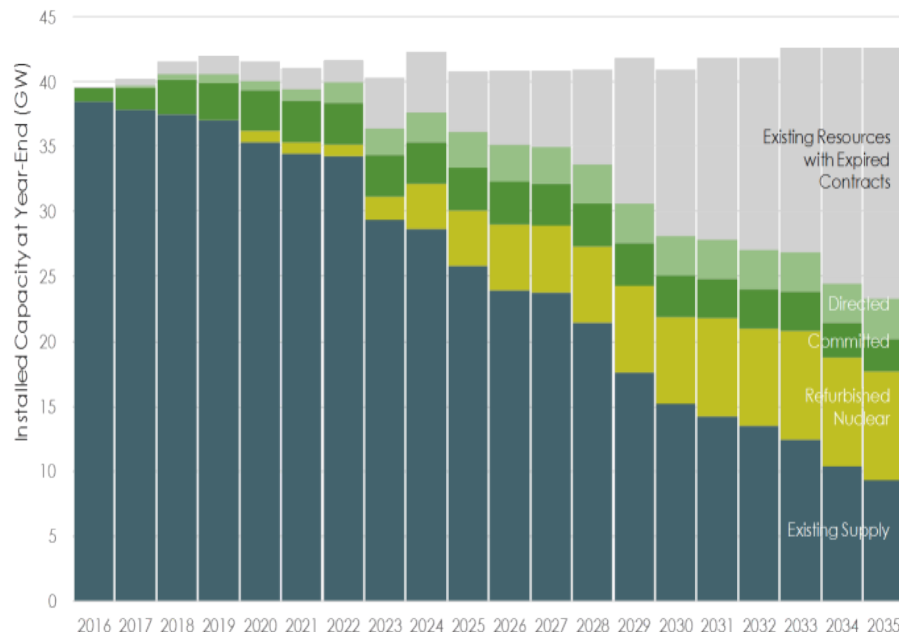


Source: CanESS & Navigant Analysis, 2016

Discussion Questions for Cabinet

Supply Mix

Installed capacity at year-end 2016-35



Key Considerations

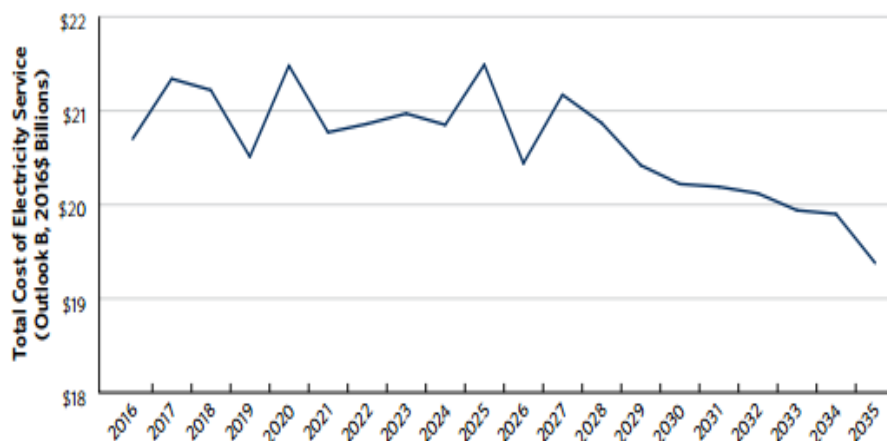
- Planning for Ontario's future energy requires balancing priorities including cost, reliability & emissions.
- Ontario is in a strong position to address a range of demand scenarios.
- Future demand is likely to be met by a mix of technologies and fuel sources, each with different effects on costs, reliability, emissions and supporting infrastructure (e.g., transmission).
- Emerging technologies including demand response, small modular nuclear reactors or small scale renewables may offer flexible options to address changes in demand.

Question

The 2013 LTEP was prescriptive with respect to supply and conservation targets. Should the 2017 LTEP be less prescriptive, focusing on outcomes (e.g., clean supply)?

Affordability

**Total Cost of Electricity Service
Ontario Planning Outlook Flat Demand**



Key Considerations

- The OPO indicates the average unit cost of electricity service in the flat demand Outlook will decrease by an average of 0.3 % per year over the next 20 years.
- The OPO notes Ontario has sufficient resources to meet its demand outlooks through the mid-2020's.
- The government recently announced plans to reduce costs including the proposed HST rebate; enhancements to the Rural or Remote Rate Protection Program and the suspension of LRP II.
- For residential customers, several programs and credits are available to help the most vulnerable consumers.

Question

Ontario is in a strong supply situation and has taken measures to mitigate electricity costs. Should the 2017 LTEP focus on further reducing costs?

Customer Choice and Innovation

Key Considerations

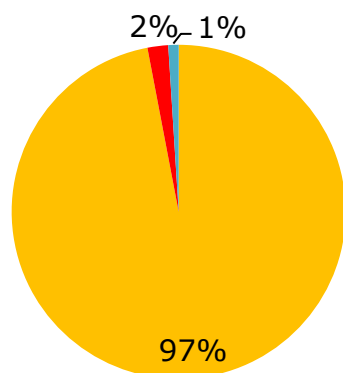
- Access to energy data can empower customers to manage costs by providing the tools and information needed to help consumers make decisions about energy use and encourage conservation.
- LDCs have opportunities for service improvement as they modernize their systems. Regulatory incentives are the primary tools that direct LDCs to pursue grid modernization.
- Efficiencies and new business models made possible by new technologies like smart grid hold promise, but regulatory incentives must allow LDCs to develop new business cases.
- New service providers are entering the market to provide services to customers.

Question

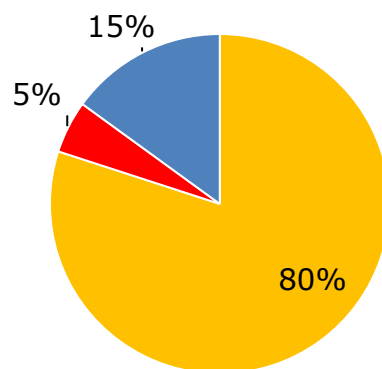
How can customers benefit from technology and tools to make choices about their energy use, and what are the incentives that could support increased customer choice ?

CCAP Alignment and Fuels Integration

Outlook B - 2035



Outlook F - 2035



- Conventional Fuel
- Alternative Fossil Fuel
- Alternative Biofuel

Total Fuels Demand: ~2,400 PJ

Total Fuels Demand: ~1,800 PJ

Context

- With the 2017 LTEP, the intention is to provide an integrated picture of the energy sector, looking at both electricity and other fuels such as natural gas and oil.
- The CCAP outlines how cap and trade auction proceeds will be used in the first compliance period (2017-2020). The LTEP and its supporting technical reports cover a 20-year period (to 2035).
- The CCAP and Fuels Technical Report discuss potential for alternative fuels to displace conventional fossil fuels. These fuels are more expensive than conventional fossil fuels, but may be less costly than options such as electric heating.

Question

Does the LTEP need to be more flexible to help ensure consistency between the different timeframes in CCAP & LTEP? How does the LTEP integrate CCAP objectives given implications of cost and the risk of stranding energy infrastructure?

Indigenous Energy Policy



Key Considerations

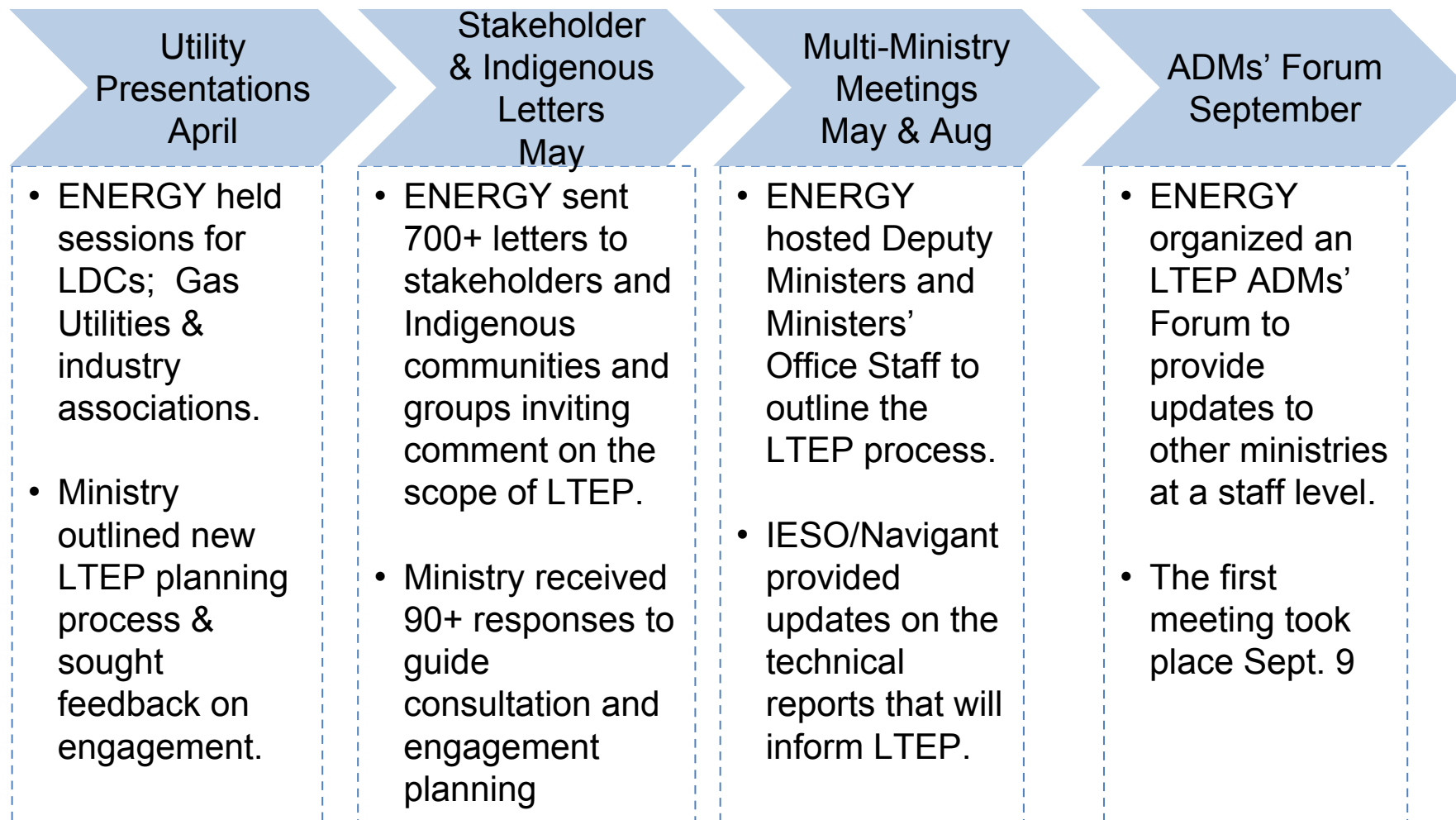
- Indigenous energy policy poses complex challenges in reconciling energy affordability and access to energy sources supportive of CCAP goals.
- The requirements of Indigenous communities are diverse: one size does not fit all and creative and flexible approaches are essential.
- The province's respect for First Nation self-government and commitment to reconciliation and working together on issues of mutual interest underpin these complexities.
- In August 2015, the Chiefs of Ontario signed an historic Political Accord with the Government of Ontario. This Accord guides the relationship between First Nations and the Province.

Question

How will the province use the LTEP to continue supporting Indigenous participation in the energy sector given the changing and limited opportunities on the ground going forward?

Consultation and Engagement Process

Early LTEP Engagement in 2016



LTEP Engagement Process and Tools

- A comprehensive engagement process is supporting LTEP development.
- Stakeholders and Indigenous communities and groups are invited to submit formal submissions only through the EBR. The request for submissions was posted on October 13 and will be open until December to provide adequate time to allow for the submission of written comments.
- ENERGY is hosting engagement sessions for Indigenous communities in parallel with public consultations. LDCs are being engaged through separate sessions.
- LTEP engagement includes the following tools:

Tactic	Stakeholder	Public	Engage Level
Environmental Registry submission	✓	✓	High
Stakeholder sessions	✓		High
Indigenous Engagement Sessions			High
Public Open Houses		✓	High
Telephone town hall session		✓	Low
Online survey & talks tool	✓	✓	Medium
Power Play interactive game	✓	✓	Low

LTEP Consultation Sessions

- General LTEP consultations include:

10:00 – 12:00: Community specific meetings

- Community specific meetings with ENERGY partners.

1:00 – 4:00: Stakeholder roundtable sessions

- Presentations on two technical reports: IESO's *Ontario Planning Outlook* and the Ministry's *Fuels Technical Report*.
- Roundtable discussions on key energy topics.

7:00 - 9:00: Public open houses

- Open house for the public to engage with Ministry staff.
- Opportunity for the public to complete the online survey in person.

Locations for Engagement Sessions



Please note: This is a preliminary list of locations, and subject to change. Consultation dates on the next slide

LTEP Consultation Session Locations

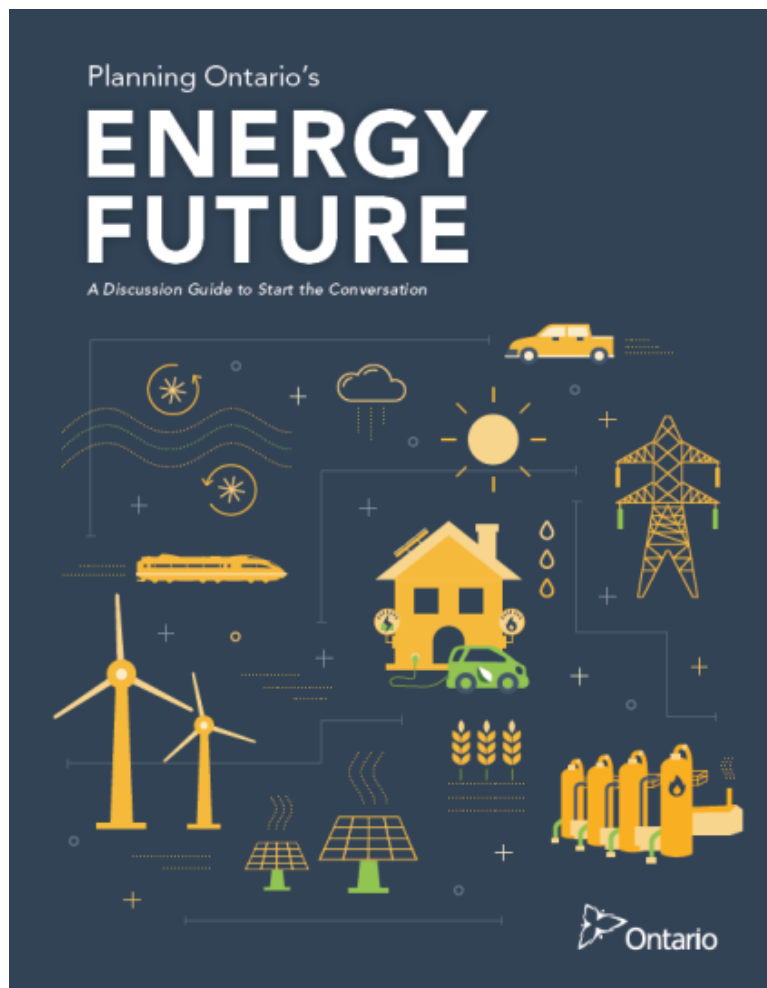
Date	Community
Oct. 24/25	Toronto
Oct. 27	Sudbury
Nov. 1	Barrie
Nov. 1	Kenora
Nov. 2	Thunder Bay
Nov. 3	Peterborough
Nov. 15	Sault Ste. Marie
Nov. 16	Timmins
Nov. 17	St. Catharines

Date	Community
Nov. 21	Guelph
Nov. 22	Pembroke
Nov. 23	Ottawa
Nov. 24	Kingston
Nov. 28	Windsor
Nov. 28	Kitchener
Nov. 29	London
Nov. 30	Toronto

LTEP Indigenous Engagement

- The Ministry is hosting regional sessions on LTEP for Indigenous communities in parallel with public consultations. Subject to feedback from Political-Territorial Organizations, communities and other appropriate organizations, Indigenous sessions are being held in 16 locations.
- Indigenous LTEP sessions invite stories about and showcase Indigenous successes in the energy sector, inform and get feedback about programs and funding for energy sector participation, and educate about billing and the energy system,.
- Letters were sent in May, 2016, to First Nation Chiefs and leaders of PTOs, Tribal Councils and the Métis Nation of Ontario to inform them of the upcoming LTEP and to solicit input into the planning process.
- The Ministry met with the Chiefs of Ontario (COO) to provide an overview of and invite comments on its LTEP engagement plan. The IESO has also met with COO and is renewing its funding support for COO energy-focused staff.
- As with the last LTEP, eligible travel costs are being reimbursed for all participants.
- A workbook is being used at Indigenous sessions along with the general LTEP discussion guide.

LTEP Discussion Guide



- The Ministry released a discussion guide on October 13.
- The purpose of the discussion guide is to seek input on the objectives that could be included in LTEP and how to best realise the policy objectives.
- The discussion guide includes
 - A description on the LTEP process;
 - A discussion on how the LTEP aligns with CCAP;
 - Information on Ontario's current energy supply mix and prices; and
 - Demand forecasts.
- The discussion guide also includes open-ended questions on a number of energy policy topics.-

Cabinet Minute

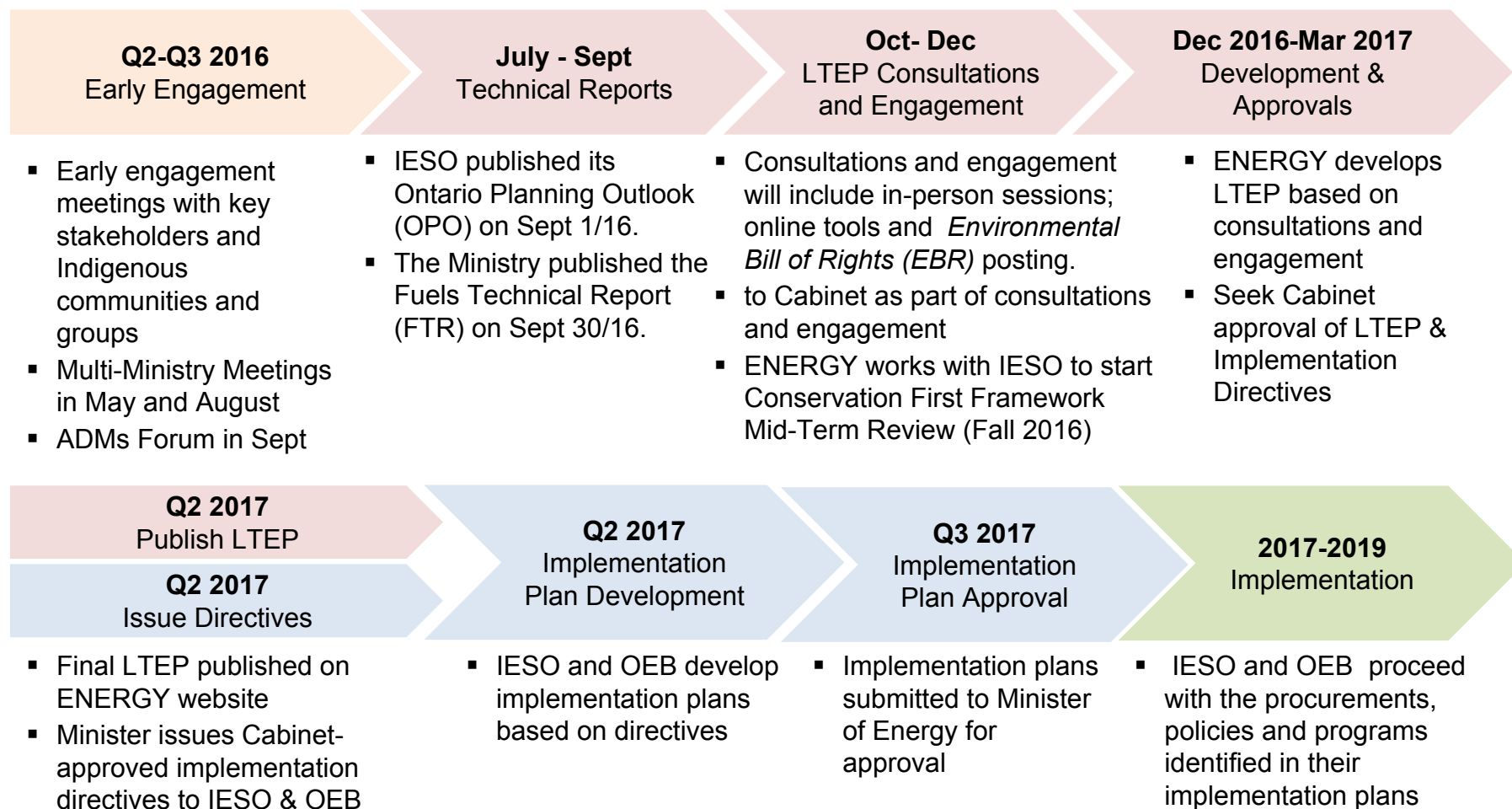
Proposed Cabinet Minute (new slide)

- Cabinet agreed that
 1. Cabinet was provided with an update on the LTEP process, including a summary of technical reports, engagement process, and discussion questions to inform LTEP development.
 2. The Ministry of Energy continue with consultation and engagement in support of the development of the LTEP.
 3. The Ministry of Energy report-back in 2017 and seek Cabinet approval on the LTEP and implementation directives for the Independent Electricity System Operator and Ontario Energy Board.

Appendix

LTEP Planning Process

Timing of LTEP Milestones



IESO Assumptions Across OPO Demand Outlooks

Sector	Outlook A	Outlook B	Outlook C	Outlook D
Residential (52 TWh in 2015)	48 TWh in 2035	51 TWh in 2035	Oil heating switches to heat pumps, electric space and water heating gain 25% of gas market share (58 TWh in 2035)*	Oil heating switches to heat pumps, electric space and water heating gain 50% of gas market share (64TWh in 2035)
Commercial (51 TWh in 2015)	49 TWh in 2035	54 TWh in 2035	Oil heating switches to heat pumps, electric space and water heating gain 25% of gas market share (63 TWh in 2035)	Oil heating switches to heat pumps, electric space and water heating gain 50% of gas market share (69 TWh in 2035)
Industrial (35 TWh in 2015)	29 TWh in 2035	35 TWh in 2035	5% of 2012 fossil energy switches to electric equivalent (43 TWh in 2035)	10% of 2012 fossil energy switches to electric equivalent (51 TWh in 2035)
Electric Vehicles (<1 TWh in 2015)	2 TWh in 2035	3 TWh in 2035	2.4 million electric vehicles (EVs) by 2035 (8 TWh in 2035)	2.4 million EVs by 2035 (8 TWh in 2035)
Transit (<1 TWh in 2015)	1 TWh in 2035	1 TWh in 2035	Planned projects, 2017-2035 (1 TWh in 2035)	Planned projects, 2017-2035 (1 TWh in 2035)
Other**	5 TWh	5 TWh	5 TWh	5 TWh
Total*** (143 TWh in 2015)	133 TWh in 2035	148 TWh in 2035	177 TWh in 2035	197 TWh in 2035

Note: Outlooks C and D assume the same economic drivers as Outlook B.

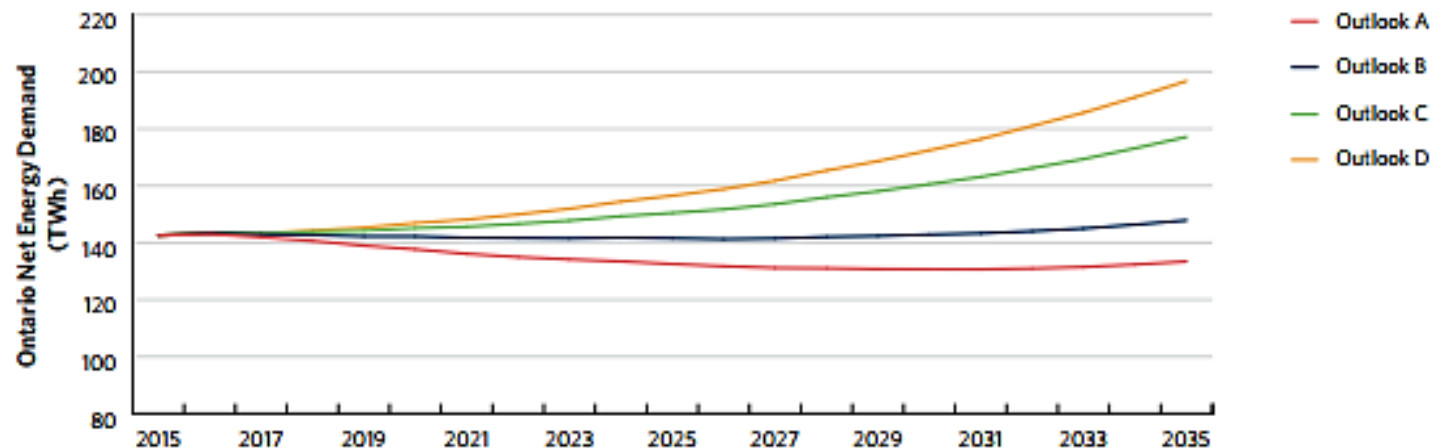
* By 2035, of the number of natural gas fuelled space and water heating equipment being sold in Outlook B (due to existing equipment reaching end of life and new additions driven by growth in the residential and commercial sectors), 25 percent of this stock in Outlook C and 50 percent in Outlook D is replaced with air-source heat pumps.

** Others = Agriculture, Remote Communities, Generator Demand, IEI and Street Lighting

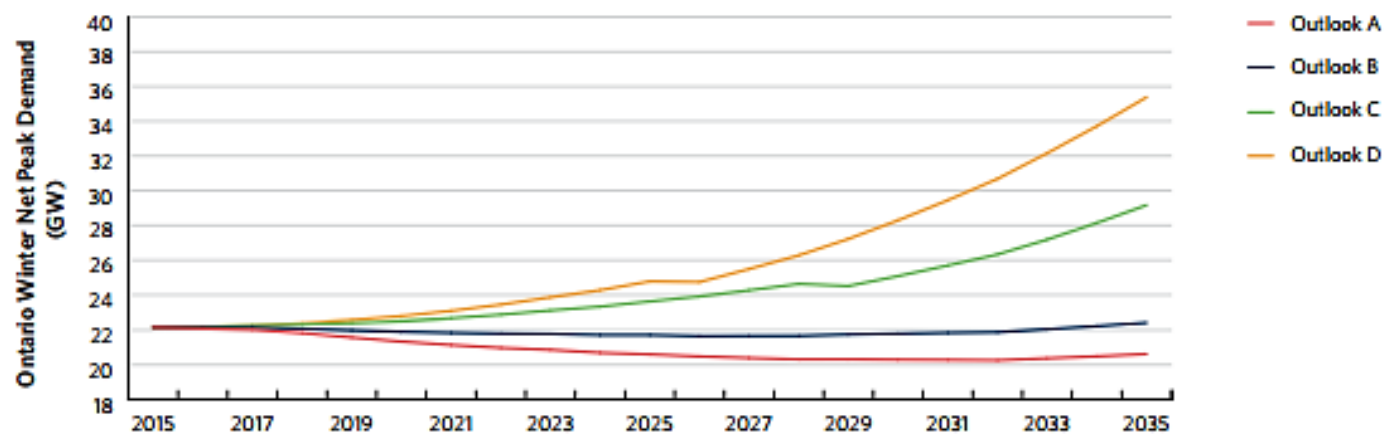
*** Total may not add up due to rounding

OPO Demand Outlooks

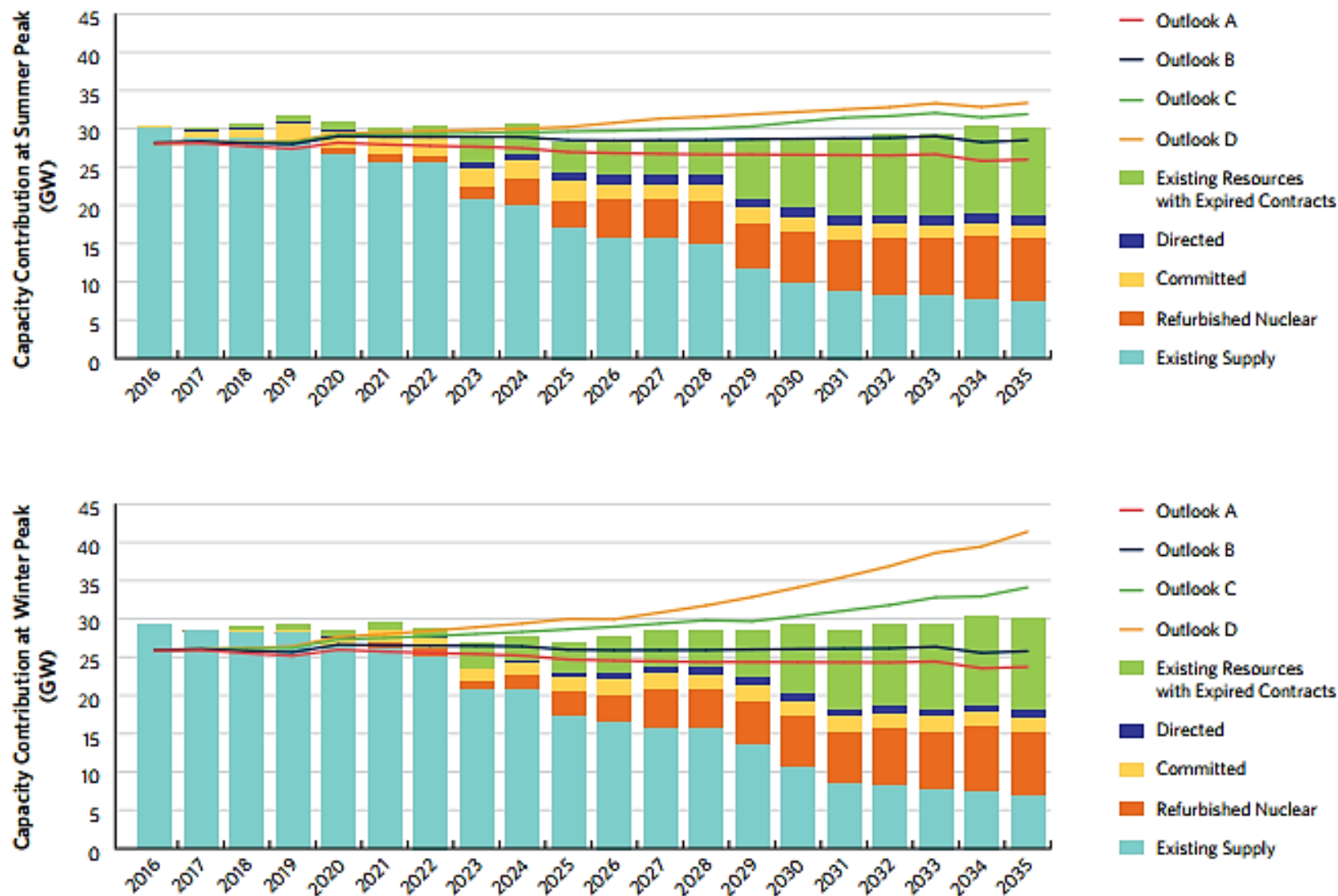
Total Electricity Demand by Outlook



Ontario Net Winter Peak Demand across Demand Outlooks



OPO Outlook for Available Supply at the Time of Peak Demand



Fuels Technical Report Assumptions Incremental to the OPO

#	Outlook E	Outlook F
1	200,000 single-family fossil-fuel-heated dwellings have their building envelope sufficiently improved to reduce heating load by 20 GJ/year.	600,000 single-family fossil-fuel-heated dwellings have their building envelope sufficiently improved to reduce heating load by 20 GJ/year.
2	85,000 multi-family fossil-fuel-heated dwellings have their building envelope sufficiently improved to reduce heating load by 9 GJ/year.	255,000 multi-family fossil-fuel-heated dwellings have their building envelope sufficiently improved to reduce heating load by 9 GJ/year.
3	2% reduction in heating load for fossil-fuel heated commercial buildings due to improved building envelope.	6% reduction in heating load for fossil-fuel heated commercial buildings due to improved building envelope.
4	90 million urban trips per year on diesel-fueled buses.	180 million urban trips per year on diesel-fueled buses.
5	600 diesel-fueled buses replaced by natural gas buses.	1,200 diesel-fueled buses replaced by natural gas buses.
6	650 million litres of gasoline replaced by ethanol.	1,300 million litres of gasoline replaced by ethanol.
7	500 million litres of petro-diesel replaced by biodiesel.	1,000 million litres of petro-diesel replaced by biodiesel.
8	500 million litres of petro-diesel replaced by renewable diesel.	1,000 million litres of petro-diesel replaced by renewable diesel.
9	70,000 propane light-duty vehicles on the road.	175,000 propane light-duty vehicles on the road.
10	150,000 hydrogen fuel-cell light-duty vehicles on the road.	300,000 hydrogen fuel-cell light-duty vehicles on the road.
11	7.5% of heavy duty freight vehicle km traveled powered by natural gas.	15% of heavy duty freight vehicle km traveled powered by natural gas.
12	78 PJ of RNG injected to the system.	155 PJ of RNG injected to the system.
13	2 PJ of residential natural gas use reduction due to improved efficiency (incremental DSM).	5 PJ of residential natural gas use reduction due to improved efficiency (incremental DSM).
14	2 PJ of commercial natural gas use reduction due to improved efficiency (incremental DSM).	11 PJ of commercial natural gas use reduction due to improved efficiency (incremental DSM).
15	12 PJ of industrial natural gas use reduction due to improved efficiency (incremental DSM).	24 PJ of industrial natural gas use reduction due to improved efficiency (incremental DSM).

FTR Demand Outlooks

Sectoral Breakdown of Energy Demand by Outlook, 2015 vs 2035

