Committee:	Cabinet
Meeting Date:	August 31, 2017
Ministry:	Energy
Last reviewed by: N/A	**Tracking to:**

SUBMISSION TITLE:	Approval of the Long Term Energy Plan – Part 2

REQUEST/DECISION REQUIRED:

- The Ministry of Energy (ENERGY) is seeking policy approval to finalize Ontario's next Long-Term Energy Plan (LTEP). The LTEP is the government's roadmap for the energy sector and generally identifies the needs for investments over the shorter term, while broadly mapping out the direction of the energy sector over a 20 year timeframe.
  - ENERGY received approval on July 26, 2017 for the overarching themes of the next LTEP as well as approval of initiatives to be announced through the document.
  - ENERGY will return to Cabinet on October 4 to seek Cabinet Approval of the document and will release the document on the week of October 10 as outlined in Appendix E.
  - The proposed Cabinet Minute is noted in Appendix A.

- At this time, ENERGY is seeking Cabinet approval of modelling outlooks to be included in the 2017 LTEP, including:
  - Typical Residential Electricity Bill
  - Typical Residential Natural Gas Bill
  - Fuels Supply and Demand
  - Electricity Supply and Demand
  - Greenhouse Gas (GHG) Emissions (Fuels and Electricity)

ENERGY is also seeking approval for the communication strategy associated with LTEP.

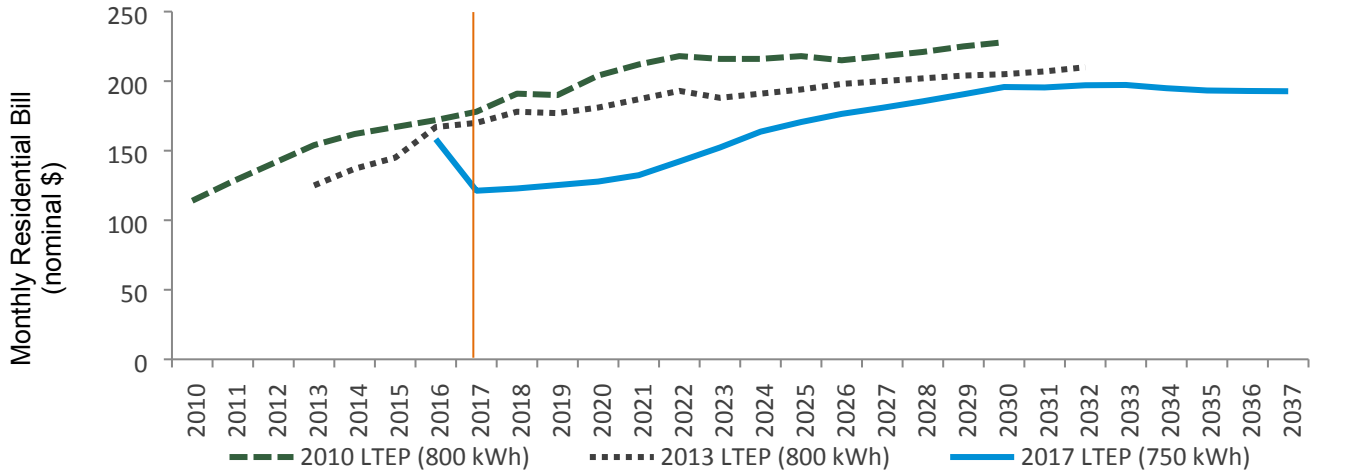
KEY POINTS:

2017 Long-Term Energy Proposed Outlooks

Residential Electricity Prices

- ENERGY's modelling assumptions for 2017 LTEP residential electricity price forecast include:
  - Benefits from implementing IESO's Market Renewal which includes a number of initiatives focused on more efficiently meeting demand; and
  - Ontario's Fair Hydro Plan (OFHP), which lowers typical residential electricity bills by 25 per cent. Following the four year inflationary cap, residential electricity rates increase at an average rate of about 5 per cent over 7 years period (from 2021 to 2027), which is lower than what was forecast in previous March 2017 OFHP Cabinet Submission (i.e., 6.5 per cent).

KEY POINTS (CONT'D)



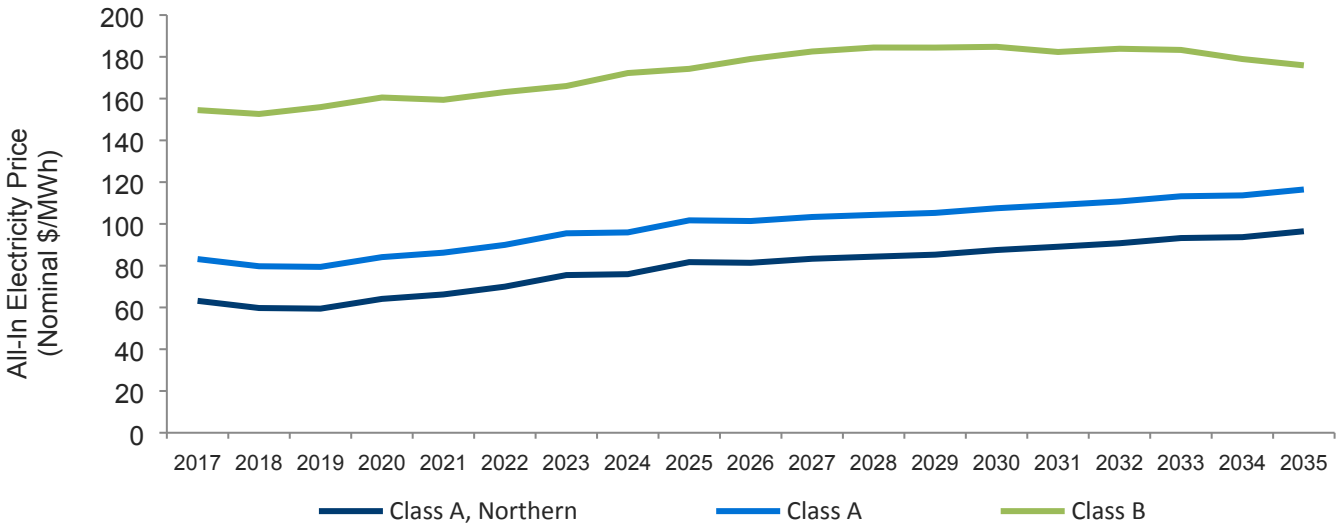
	2017 July (No OFHP)	2017 July (OFHP)	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
Monthly Bill	162	121	123	125	128	132	142	152	164	171	176	181	186	191	196	195	197	197	195	193	193	193
per cent Change		-25%	2%	2%	2%	4%	7%	7%	7%	4%	3%	2%	3%	3%	3%	0%	1%	0%	-1%	-1%	0%	0%

- Under the Global Adjustment (GA) refinancing component of the OFHP, the *Ontario Fair Hydro Plan Act*, 2017 requires that the Minister of Energy calculate the Fair Allocation Amount (FAA) for each 6-month period to 2047. The FAA aligns clean energy costs with clean energy benefits in the future.
  - ENERGY has indicated this figure is still under development and is an important input in the development of the 2017 LTEP residential price forecast curve as it will generally determine the rate of accumulation of debt under the plan, when recovery of the debt will begin, the pace of debt recovery, and related impacts on residential electricity prices.
  - The FAA is a constraint on the debt (a cap) that the Financial Services Manager (Ontario Power Generation) can finance, which would limit the amount that can be deferred.

<u>Electricity Prices for Large Businesses and SME's</u>

- The proposed 2017 LTEP price outlook for an illustrative large business and small and medium enterprises (SMEs) reflects average increases in line with inflation over the forecast period.
- The actual commodity price for large businesses is dependent on their operational requirements and ability to shift electricity consumption to off-peak hours.
- Some SMEs are not eligible for the refinancing of Global Adjustment (GA) under OFHP, but are benefiting from the tax-basing of social programs and will benefit from the elimination of the Debt Retirement Charge (DRC) in April 2018.
- In addition, ENERGY states that they will work with Ministry of Economic Development and Growth (MEDG) and other ministries to identify opportunities to decrease electricity costs for SMEs that currently do not benefit from rate mitigation programs.

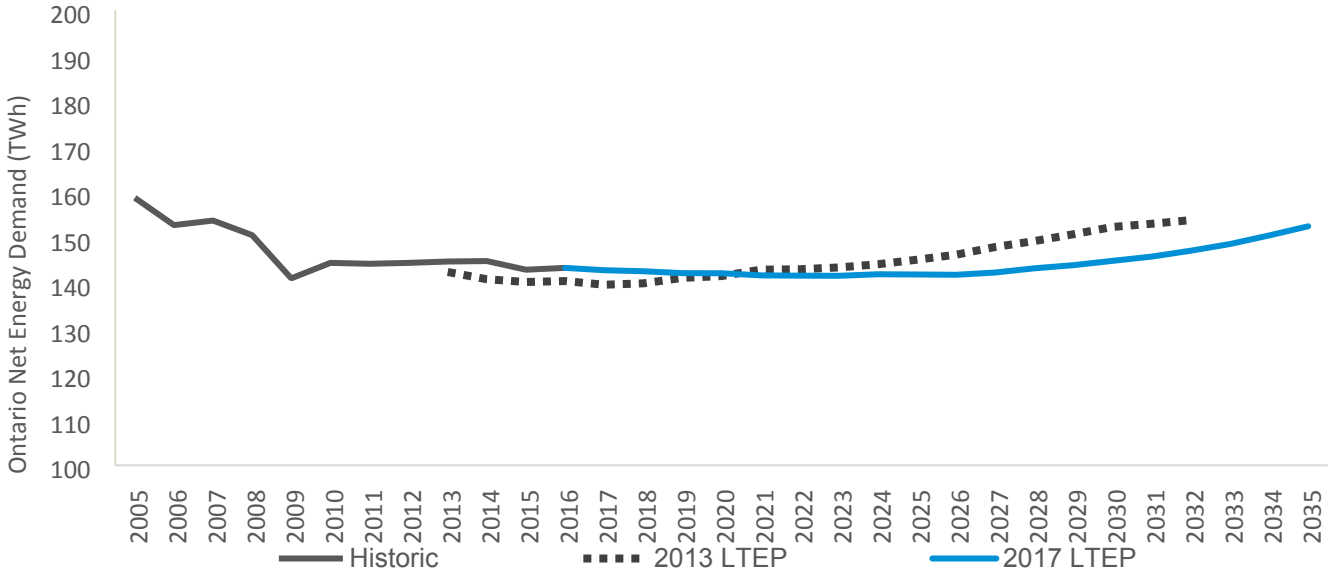
KEY POINTS (CONT'D)



Electricity Demand

- The proposed 2017 LTEP demand outlook over the planning horizon reflects continued conservation savings and increased electrification of the transportation sector.

- The following chart shows that there are moderate increases in electricity demand. ENERGY states that this demonstrates the important and vital role that conservation and energy efficiency will continue to play in the province.



- In an earlier deck ENERGY stated that their updated outlook for 2017 LTEP is based on "Outlook B" from the Ontario Planning Outlook (OPO) with increased electric vehicle (EV) uptake (2.4 million EVs by 2035) and recent sector updates (about 5 Terawatt hours (TWh) higher than Outlook B by 2035).

KEY POINTS (CONT'D)

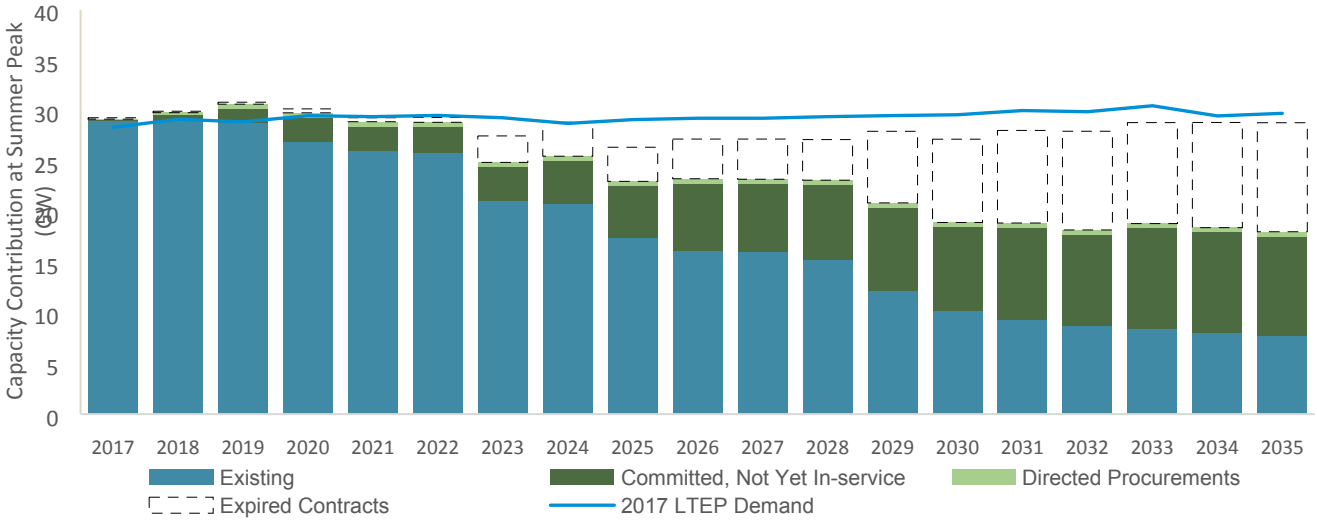
- It was further noted by ENERGY that the IESO updated outlook did not include the implications of significant additional electrification of heating, industrial processes, and public transit, which are accounted for in the Fuels Technical Report (FTR) Outlooks F Targets for GHG emissions reductions from the fuels sector.
- Key assumptions as outlined in the earlier deck and the Cabinet briefing note are outlined in Appendix B.

Electricity Supply

- The proposed 2017 LTEP supply outlook over the planning horizon meets the projected demand while maintaining the flexibility to respond to future variations in the demand forecast.

- 18 GW of supply resources will reach the end of their contact term by 2035. There will be a need for additional resources in the early 2020s if demand materializes.
  - These resources could offer into the electricity and/or capacity market to provide additional supply as required.
  - Maintaining flexibility allows for the electricity system to meet increases and decreases in future demand.
  - This "planned flexibility" in supply planning will be crucial given that the development and commercialization of new disruptive technologies could lead to lower than forecast electricity demand.

- In an earlier deck, ENERGY outlined assumptions for the supply forecast. The supply forecast includes the most recent nuclear refurbishment and operations timelines, the suspension of the Large Renewable Procurement II, (LRP II) and Energy From Waste Standard Offer Program (EFWSOP), and the December 2016 Ontario-Québec electricity trade agreement (See Appendix B- Key Modelling Assumptions).



KEY POINTS (CONT'D)

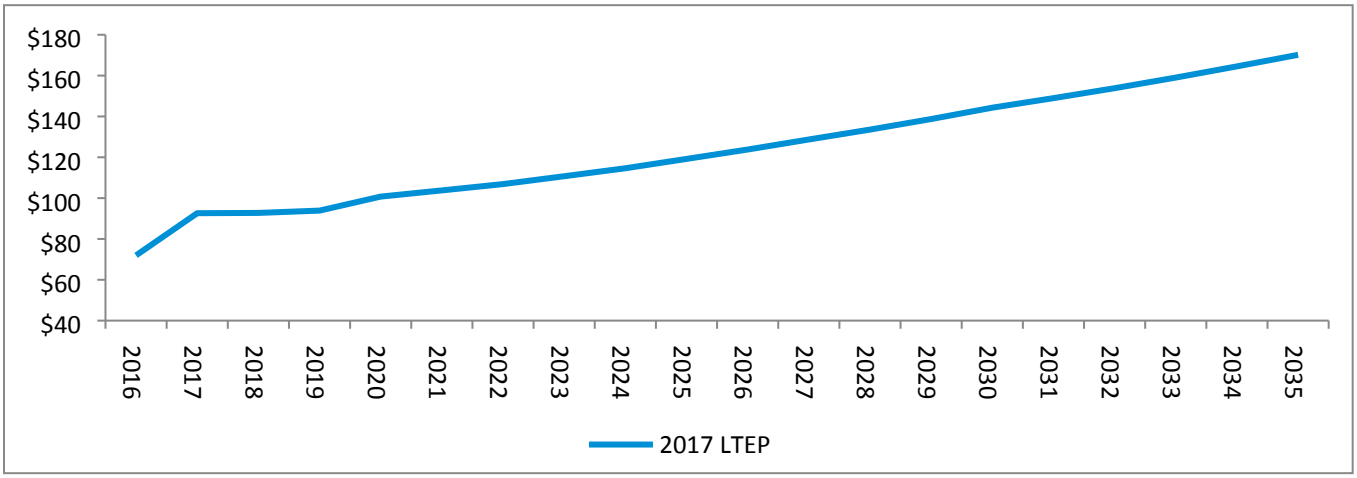
Typical Residential Natural Gas Bill

- The proposed 2017 LTEP outlook for residential natural gas notes that gas bills are steadily increasing due to:
  - Increasing commodity price for conventional natural gas;
  - Increasing cost of emission allowances for conventional gas; and
  - Substitution of conventional natural gas for higher-cost renewable natural gas (RNG).

  Note: The chart assumes a constant monthly consumption each year.

- There would be similar trends in the cost of transportation fuels (e.g., gasoline) due to higher commodity costs, emission allowances, and substitution for higher-cost renewable sources (e.g., ethanol blending).

- GGRA funding could help mitigate the cost increases related to RNG for natural gas consumers.



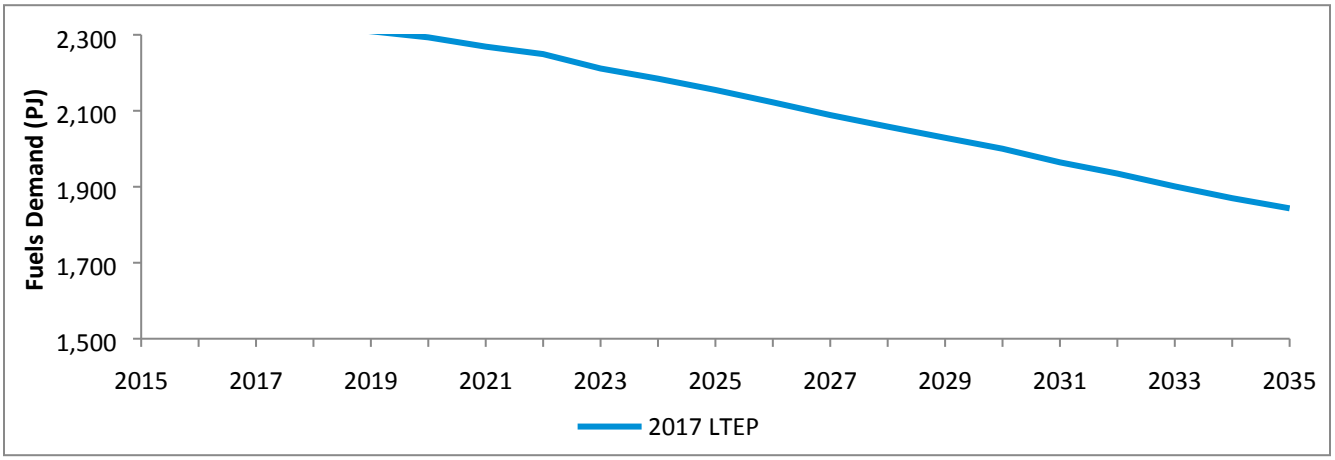
	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Monthly Bill	$72	$93	$93	$94	$101	$104	$107	$111	$115	$119	$124	$129	$134	$139	$144	$149	$154	$159	$165	$170
per cent Change		29%	0%	1%	7%	3%	3%	4%	4%	4%	4%	4%	4%	4%	4%	3%	3%	3%	3%	3%

- In an earlier submission ENERGY outlined that for fuels outlooks they are proposing to use the IESO updated outlook with fuels-only assumptions that meet FTR Outlook F targets for greenhouse gas (GHG) emissions.
  - FTR Outlook F assumptions used in ENERGY's modeling approach include increased electric vehicle (EV) update, transportation sector fuel switching and building envelope improvements. Additional information on FTR Outlook F modelling assumptions is available in Appendix C.
  - In the earlier deck ENERGY mentioned that while adopting FTR Outlook F targets would decline in GHG emissions in forecasts, it will also have cost implications for consumers of fuels. ENERGY further mentioned that they are retaining Navigant Consulting to provide additional advice on this work.
  - FTR outlooks and FTR outlook F assumptions are in Appendices C and D.

Fuels Demand

- The proposed 2017 LTEP fuels demand outlook over the planning horizon shows a steady decline due to:
  - Continued conservation savings (i.e., building envelope improvements and increased efficiency of equipment in the residential, commercial and industrial sectors); and
  - Increased electrification of transportation (i.e., equivalent to 2.4 million EVs by 2035).

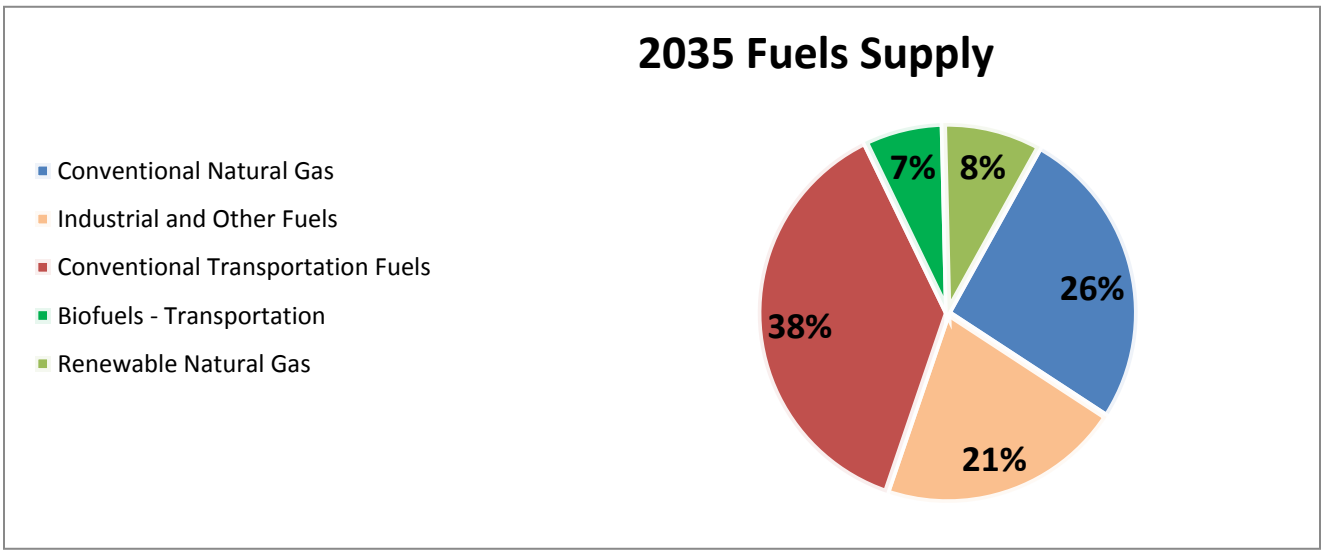
KEY POINTS (CONT'D)



Fuels Supply

- The proposed 2017 LTEP fuels supply outlook over the planning horizon shows supply that meets demand (i.e., 1,843 petajoules (PJs) in 2035) while demonstrating a steady transition to renewable and lower-carbon fuels.

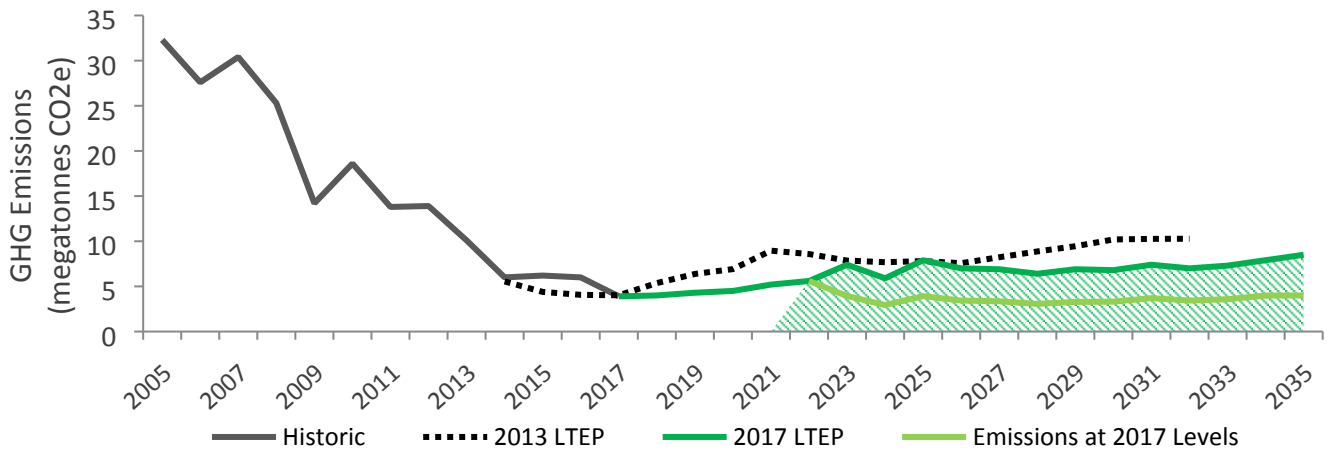
- The share of renewable natural gas and bio-fuels for transportation in Ontario's fuel supply increases from 2 per cent in 2015 to 15 per cent in 2035. The share of conventional natural gas declines from 36 per cent to 26 per cent.



Electricity GHG Emissions

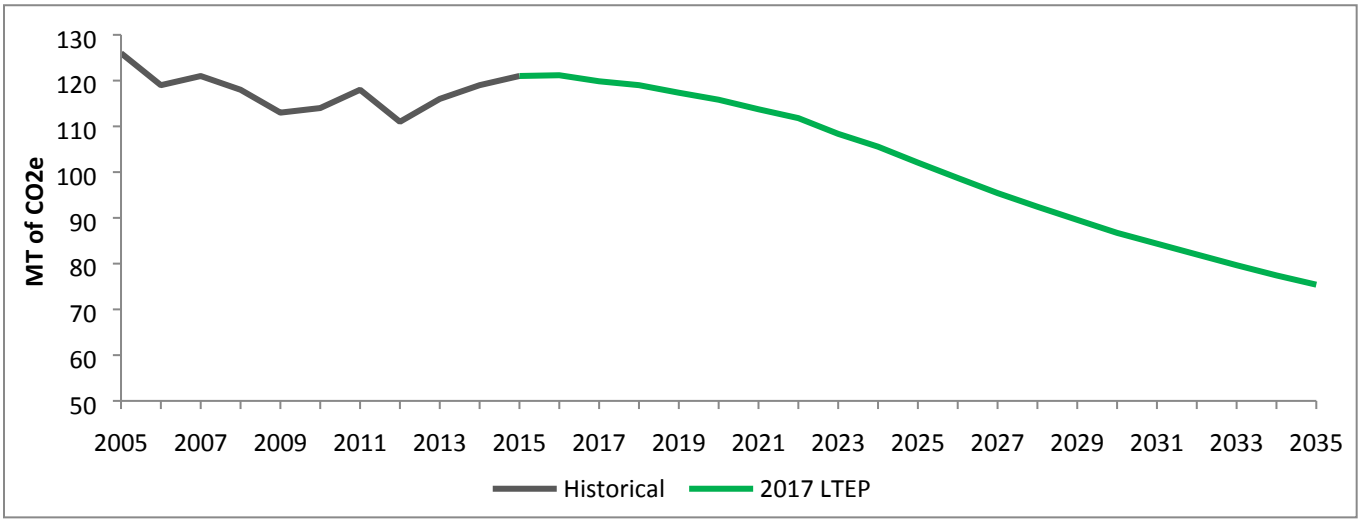
- With the retirement of coal plants, greenhouse gas (GHG) emissions have dropped by over 80 per cent in the past 10 years. Today, Ontario electricity sector GHG emissions represent about 2 per cent of Ontario's overall economy-wide GHG emissions.
  - By 2030, electricity sector emissions are forecast to decrease by at least 73 per cent relative to 1990.
  - According to ENERGY, taking immediate actions to maintain current emissions levels could lead to a cost increase of about $15 billion to $20 billion between 2017 and 2035 according to preliminary IESO estimates.

KEY POINTS (CONT'D)



Fuels GHG Emissions

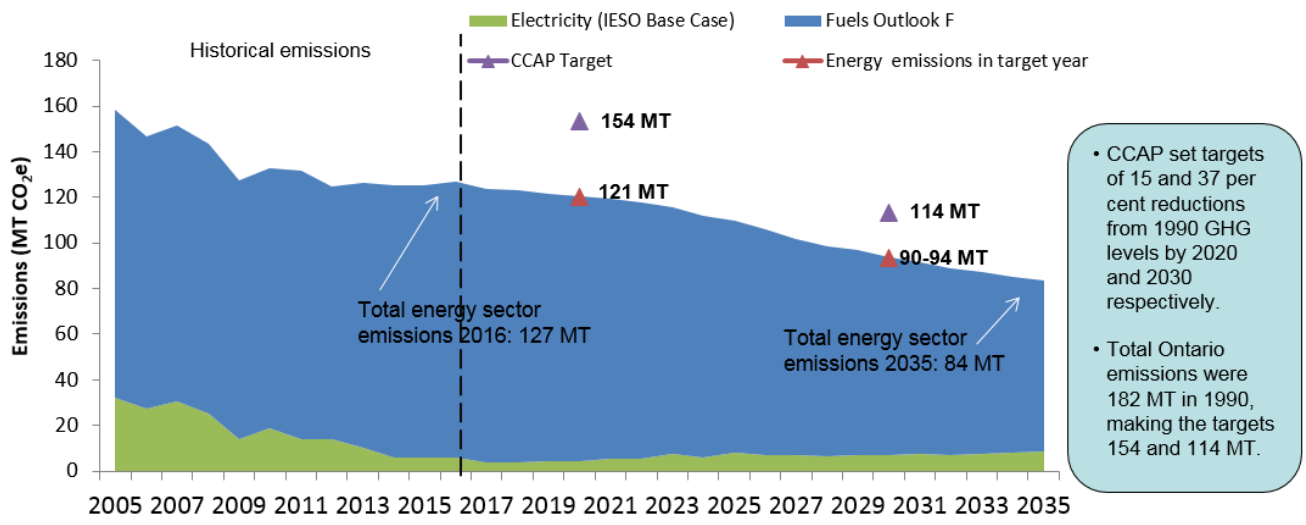
- The 2017 LTEP emissions outlook for the fuels sector is expected to steadily decline as a result of electrification of vehicles, conservation and a transition to renewable and lower-carbon fuels.
  - Compared to 2016 levels, the emissions outlook for the fuels sector shows a reduction of 38 per cent by 2035.
  - By 2030, fuels sector emissions are forecast to decrease by 18 per cent relative to 1990 (TBD).



Integrated Fuels and Electricity GHG Emissions

- The combined GHG emissions from Ontario's energy sector would decrease by 34 per cent by 2035 relative to 2016 levels, and would remain well below the economy-wide CCAP target for 2030.
  - By 2030, energy sector emissions are forecast to decrease by 29 per cent relative to 1990 (TBD).

KEY POINTS (CONT'D)



KEY CONSIDERATIONS (CONT'D)

Electricity Bill Forecast

- ENERGY should clarify what FAA amount it has assumed in the residential bill forecast for the LTEP.
  - As noted by ENERGY, the FAA is necessary for the development of a Financing Plan by Ontario Power Generation (the financial services manager) and the residential price forecast.
  - Any adjustments to the inflationary cap would have to be contingent on corresponding FAA amounts.
  - The FAA is a constraint on the debt (a cap) that the financial services manager can finance.

- The current ENERGY forecast for residential bills is lower than the March 2017 Cabinet Submission forecast. The price forecast is likely based on assumptions that go beyond those shared by ENERGY. For example, there are likely assumptions made about the level and extent of procurements from expiring contracts, and savings from market renewal initiatives.
  - It is not clear what factors contribute to the variance from the March 2017 Cabinet submission outlook.
  - ENERGY should explain what assumptions are included in the Direct to FAA forecast.
  - For example, ENERGY should clarify what OPG smoothed rates have been assumed.
  - ENERGY has also shown that bills are anticipated to be lower than the 2013 LTEP but they have also used a residential consumption assumption that is 50 kWh lower than the 2013 LTEP.

- A key risk to the forecast is the assumptions surrounding how expiring contracts will be brought back after 2021 to meet the anticipated shortfall in electricity supply.
  - Price forecasts after 2021 will be increasingly dependent on the rates provided to these generators.

- It should be noted that changes to demand, interest, financing, technology performance and system cost assumptions can significantly impact this price forecast and Energy should identify all risk associated with adopting these assumptions.

KEY CONSIDERATIONS:

- ENERGY should be required to consult with the MOECC on their demand assumptions.
  - A report from Power Advisory Limited, released at the time of the OPO, noted that Outlook B, the outlook proposed for LTEP is essentially a flat demand scenario.
  - The report notes that any electrification initiatives that serve to increase demand could drive up prices; ENERGY should outline in LTEP how those risks would be mitigated, particularly as many of those electrification initiatives could be driven by the Climate Change Action Plan.

Electricity Supply and Demand

- The 2017 LTEP electricity supply outlook chart reflects capacity contributions at summer peak rather than installed capacity. It is consistent with the summer peak electricity outlook form the 2016 IESO OPO.
  - The IESO OPO affirms that there is currently flexibility in the system to adapt to lower demand but notes additional resources would be require to meet increased demand outlooks.

Fuels Demand

- ENERGY has not outlined a rationale as to why IESO's updated outlook with FTR outlook F GHG assumptions should be used in LTEP modelling.
  - ENERGY outlined that they are using IESO's updated outlook with FTR outlook F GHG assumptions in an earlier deck.
  - ENERGY has indicated that they have not yet determined an appropriate and credible set of fuels-only assumptions to meet FTR outlook F emissions targets.
  - ENERGY does not identify why the Fuels outlook it uses is appropriate relative to the others available.

- Outlook F from the FTR has yields the lowest Ontario energy-related fuels demand of all the outlooks presented in the FTR
  - FTR Outlook F reflects all the assumptions adopted by the IESO for the OPO Outlook D, but include additional levels of natural gas DSM and the displacement of some conventional fuels with less carbon-intensive alternatives.

- OPO Outlook D includes higher levels of demand driven by electrification associated with policy choices on climate change

Energy's fuel demand outlook lowers fuel demand and fuel emissions compared to IESO Updated Outlook.

Name of analyst:	Usman Zahid/Karim Javeri/Emily Kerr
Date:	August 28, 2017
Branch / Division:	Strategic Project Finance Branch/Corporate and Electricity Finance Division/OFA (MOF)

APPENDIX A: PROPOSED CABINET MINUTE

Cabinet agreed that:

1. The Ministry of Energy (ENERGY) prepare for approval a 2017 Long-Term Energy Plan (2017 LTEP) that includes the following outlooks and forecasts:

   A. For the electricity system:
      i. A moderate demand outlook that reflects significant electrification of the transportation sector and continued conservation savings;
      ii. A supply outlook that meets the projected demand while maintaining the flexibility to respond to future variations in the demand forecast;
      iii. Residential cost outlooks that show progress from the 2013 Long-Term Energy Plan (2013 LTEP) and reflect government initiatives to reduce costs, including through Ontario's Fair Hydro Plan; and
      iv. Industrial cost outlooks that are relatively flat in real dollars and reflect the elimination of the Debt Retirement Charge (DRC) in April 2018.
   B. For the fuels system:
      i. A declining demand outlook that reflects continued conservation savings and the impact of carbon pricing; and
      ii. A supply outlook that meets the projected demand while demonstrating a steady transition to renewable and lower-carbon fuels.
   C. For the integrated energy system, a declining greenhouse gas (GHG) emissions outlook that:
      i. Supports the provincial target of reducing emissions 37 per cent below 1990 levels by 2030; and
      ii. Reflects implementation of the province's climate change policies consistent with the cap and trade program and the Climate Change Action Plan (CCAP).

2. ENERGY will work with Ministry of Economic Development and Growth (MEDG) and other ministries to identify opportunities to decrease electricity costs for small and medium-sized enterprises (SMEs) that currently do not benefit from rate mitigation programs.

3. ENERGY will continue to work with Ministry of Environment and Climate Change (MOECC) and partner ministries to identify opportunities to align the province's climate change policies with the 2017 LTEP.

4. ENERGY and its agencies (i.e., Independent Electricity System Operator and Ontario Energy Board) will continue to identify future options to remove costs from the electricity system through efficiencies, other funding sources and supply mix decisions. Current actions that are underway or have been agreed to bend the future cost curve include:
   A. IESO Market Renewal; and
   B. OEB Finding Greater Efficiencies and Distribution Sector Savings.

5. ENERGY work with the Premier's Office and Cabinet Office on a communications strategy for the rollout of the 2017 LTEP.

APPENDIX B: SUMMARY OF ELECTRICITY OUTLOOKS AND FORECASTS MODELLING ASSUMPTIONS

Outlook	Key Assumptions
Electricity Supply	Nuclear – Refurbishment schedule reflects OPG's current business plan and the amended Bruce refurbishment schedule. – Pickering is assumed to operate to 2022/2024. Renewables and Energy from Waste – Suspension of LRP II and EFW. – FIT 5 and microFIT 2017 are the remaining renewable programs to be procured that are not yet online or fully contracted. Electricity Trade Agreements – Ontario-Québec (2.3 TWh per year from 2017 to 2022 inclusive, 500 MW capacity per winter December 2016 to March 2023 from Ontario to Québec and 500 MW Québec to Ontario. Discussions with Québec on an extended agreement not reflected in supply forecast.
Electricity Demand	– Electricity demand based on OPO Outlook B, with additional electrification equivalent to 2.4 million EVs by 2035. OPO outlook B included: o Growth of residential households (14% over 2015-2025 and 9% over 2025-2035) and commercial floor space (15% over 2015-2025 and 11% over 2025-2035), and annual Industrial GDP growth (1% for 2015-2035) – Conservation: Reflects 2013 LTEP energy efficiency target of 30 TWh by 2032 and assumes that the near term target set in the Conservation First Framework and Industrial Accelerator Program of 8.7 TWh will be achieved by 2020; and – Demand Response (DR): any DR currently procured through the DR auction would continue to be available in future auctions.
Fuels Demand	Building Envelope Improvements: – 1,100,000 single family fossil-fuel heated dwellings improve building envelope to reduce heating load by 20 GJ/year – 400,000 multi-family fossil fuel heated dwellings improve building envelope to reduce heating load by 9 GJ/year – 12% reduction in heating load for fossil-fuel heated commercial buildings Equipment Efficiency Improvements: – 8.3 PJ of reduced residential natural gas use – 13 PJ of reduced commercial natural gas use – 32 PJ of reduced industrial natural gas use Transportation Sector Switching: – Additional 1.7 billion litres of ethanol – Additional 2.2 billion litres of biodiesel /renewable diesel – Switching from diesel to natural gas / hydrogen / propane, etc.

	– Additional urban trips on buses (instead of cars) Renewable Natural Gas (RNG) – 170 PJ of RNG injected into the system Electrification: Vehicles – Additional 1,400,00 light-duty electric vehicles (EVs) – Additional 30,400 heavy duty EVs Not specifically included in proposed approach, but reflected in FTR Outlook F and OPO Outlook D: – Public Transit Electrification: Incremental 39,000,000 trips using electrified public transit – Heating and Industrial Electrification: 2,100,000 households upgrade/switch from natural gas to electricity for heating; 80 million square metres of commercial floor space switches from natural gas to electricity for heating; 57 PJ of industrial fossil fuel demand switches to electric equivalent.
Price	– Reflects changes related to the partial GA refinancing under the OFHP. – Reflects Ontario Power Generation (OPG) smoothed rates. – Assumes the generation assets will continue to be available for the duration of the planning outlook, consistent with the OFHP. – Benefits from implementing IESO's Market Renewal which includes a number of initiatives focused on more efficiently meeting demand; – Natural gas price forecast is based on the Sproule projection of February 2017. – Carbon price is based on the actual floor price for the March 2017 cap and trade auction, inflated at 5% as per the cap and trade regulation and 2% inflationary increase. – Updated transmission rates to reflect current application before the OEB for 2017/2018.

APPENDIX C: SUMMARY OF FTR OUTLOOK F MODELLING ASSUMPTIONS

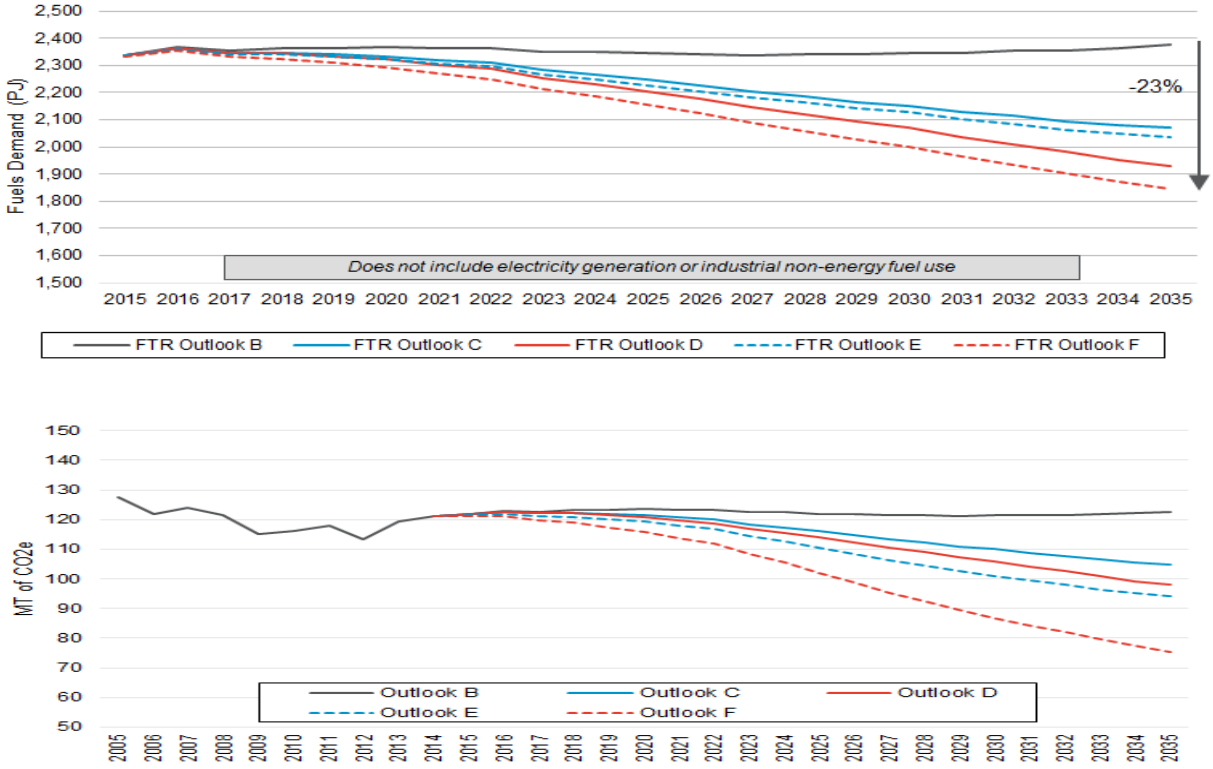
- The following table shows the original FTR Outlook F modelling assumptions. These are subject to change in the proposed approach, pending further analysis to meet the FTR emissions targets without any additional impacts on the electricity sector.

Initiative	Key Assumptions
To be updated in proposed modelling approach	
Building Envelope Improvements	• 600,000 single family fossil-fuel heated dwellings improve building envelope to reduce heating load by 20 GJ/year • 255,000 multi-family fossil fuel heated dwellings improve building envelope to reduce heating load by 9 GJ/year • 6% reduction in heating load for fossil-fuel heated commercial buildings
Transportation Sector Switching	• Additional 1.3 billion liters of ethanol • Additional 2 billion liters of biodiesel /renewable diesel • Switching from diesel to natural gas / hydrogen / propane, etc. • Additional urban trips on buses (instead of cars)
Renewable Natural Gas (RNG)	• 155 PJ of RNG injected into the system
Electrification: Vehicles	• Additional 1,400,00 light-duty electric vehicles (EVs) • Additional 30,400 heavy duty EVs
<u>Not</u> included in proposed modelling approach	
Electrification: Public Transit	• Incremental 39,000,000 trips using electrified public transit
Electrification: Heating and Industrial	• 2,100,000 households upgrade/switch from natural gas to electricity for heating. • 80 million square metres of commercial floor space switches from natural gas to electricity for heating. • 57 PJ of industrial fossil fuel demand switches to electric equivalent.

APPENDIX D: FUELS TECHNICAL REPORT OUTLOOKS

- In 2016, to assist the development of the 2017 LTEP, a Fuels Technical Report (FTR) was prepared.
  - The FTR outlined five scenarios based on the same primary assumptions contained in the Independent Electricity System's (IESO) Ontario Planning Outlook (OPO) with additional "fuels only" initiatives considered in FTR Outlooks E and F.
  - Fuels modelling for 2017 LTEP aligns IESO's Updated Outlook for electricity.

FTR Fuels and Emissions Outlook



- FTR Outlook B, reflects all of the assumptions adopted by IESO for the OPO Outlook B, and further assumes that natural gas demand-side management (DSM) programs supporting efficiency and conservation improvements will continue at present levels of funding and that transportation fuels standards will proceed as planned.

- FTR Outlooks C and D reflect all of the assumptions adopted by IESO for the OPO Outlooks C and D, and further assume that natural gas DSM will continue at present levels of funding and that transportation fuels standards will proceed as planned.

- FTR Outlooks E and F reflect all of the assumptions adopted by IESO for the OPO Outlooks C and D (respectively), but also explore different levels of additional natural gas DSM, and the displacement of some conventional fuels with less carbon-intense alternatives.

APPENDIX E: NEXT STEPS

Following approvals the Ministry will develop the final LTEP document and OEB and IESO Implementation directives and report back to Cabinet for approval.