

2017 Long-Term Energy Plan – Fuels and Electricity Outlooks

Working Draft

August 2017

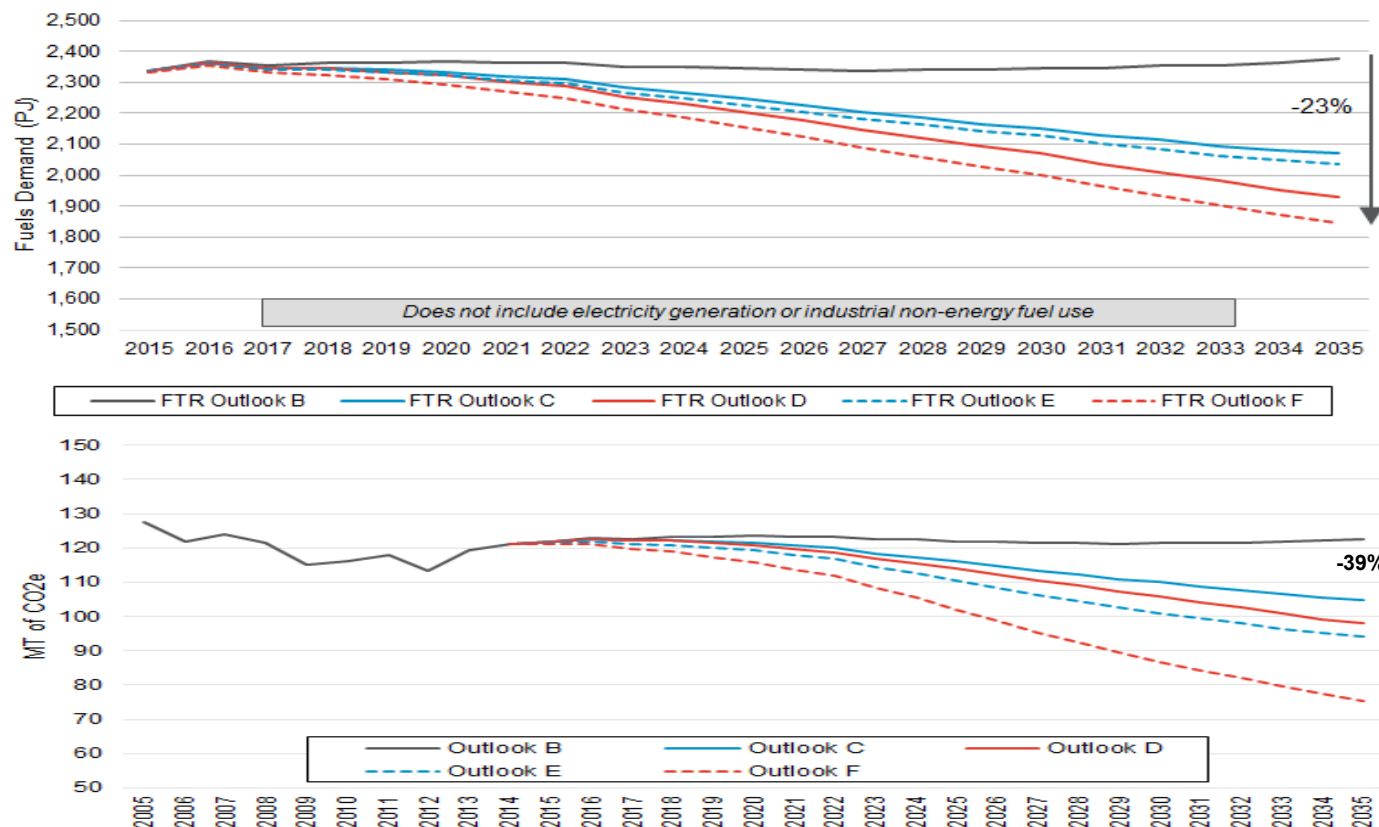
Agenda for Discussion

1. Overview of 2017 Long-Term Energy Plan (2017 LTEP) Outlooks/Forecasts and confirmation of modelling assumptions:
 - A. Fuels; and
 - B. Electricity.
2. Discussion of inputs into the development of the 2017 LTEP Residential Electricity Price Forecast:
 - C. Ontario's Fair Hydro Plan; and
 - D. Other inputs into the development of the residential electricity bill (e.g., adjusting the inflationary cap, changes in residential consumption, etc).
3. Summary of next steps/critical path.

1A.) 2017 LTEP – OUTLOOK AND FORECASTS FOR FUELS

A. 2017 LTEP – Fuels Outlooks and Forecasts – Context

- In 2016 to assist the development of the 2017 Long-Term Energy Plan 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.



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A. 2017 LTEP – Fuels Outlooks and Forecasts – Approach

- Fuels modelling for 2017 LTEP aligns with IESO's Updated Outlook for electricity (i.e., higher electric vehicle uptake from Outlook C/D and updated prices for carbon and natural gas).
- The following approach is proposed:
 - FTR Outlook F Targets
 - IESO Updated Outlook with fuels-only assumptions that meet the FTR Outlook F Targets for greenhouse gas (GHG) emissions without additional impacts on the electricity sector. Involves fuels sector initiatives such as:
 - Natural gas demand-side management (e.g., conservation, building efficiency);
 - Renewable natural gas; and
 - Lower-carbon fuels for transportation (e.g., natural gas, ethanol, biodiesel, hydrogen, etc).
 - Additional analysis is required to determine an appropriate and credible set of fuels-only assumptions to meet FTR Outlook F emission targets. Ministry is retaining Navigant to provide additional advice on this work. Note: Navigant was retained to develop the FTR.

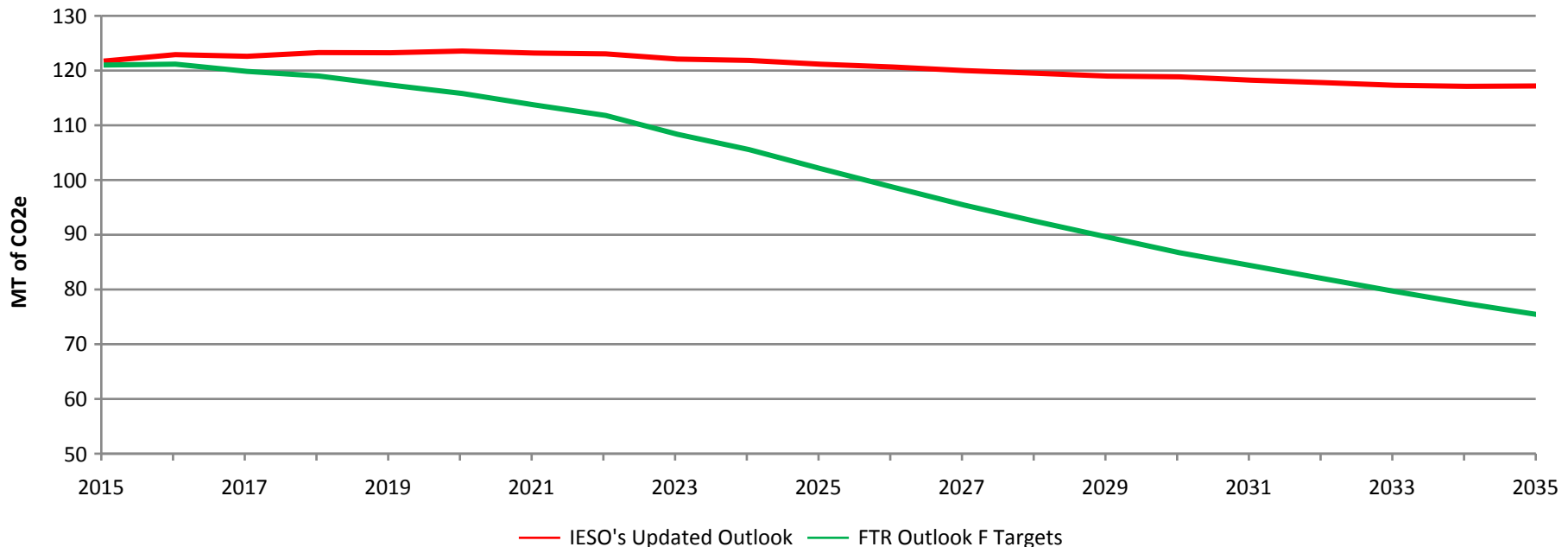
A. 2017 LTEP – Fuels Outlooks and Forecasts – Summary of Original Fuels Modeling Assumptions

- 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
<i>To be updated in proposed modelling approach</i>	
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 litres of ethanol - Additional 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)	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
<i><u>Not</u> included in proposed modelling approach</i>	
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.

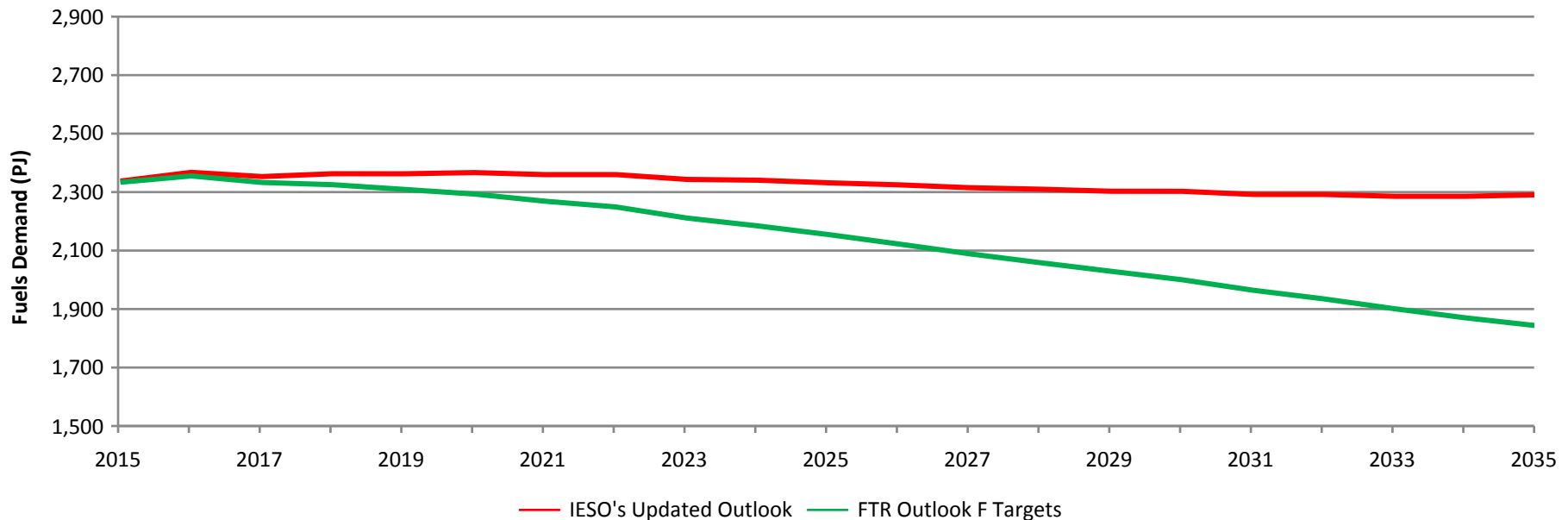
A. 2017 LTEP – Fuels Emissions Outlook

- The chart below shows that GHG emissions from Ontario's fuels sector are expected to decline as a result of electrification of vehicles, as well as conservation and alternative fuel-switching.
 - Note: The chart is illustrative pending further analysis of specific fuels-only assumptions to meet FTR Outlook F emission targets.
- The FTR Outlook F emission targets represent a reduction in fuels sector GHG emissions of 36% by 2035 relative to IESO's Updated Outlook.



A. 2017 LTEP – Fuels Demand Outlook

- The chart below compares fuels demand under IESO's Updated Outlook and the FTR Outlook F Targets scenario.
 - Note: The chart is illustrative pending further analysis of specific fuels-only assumptions to meet FTR Outlook F emission targets. Fuels demand is not specifically being targeted in this analysis.

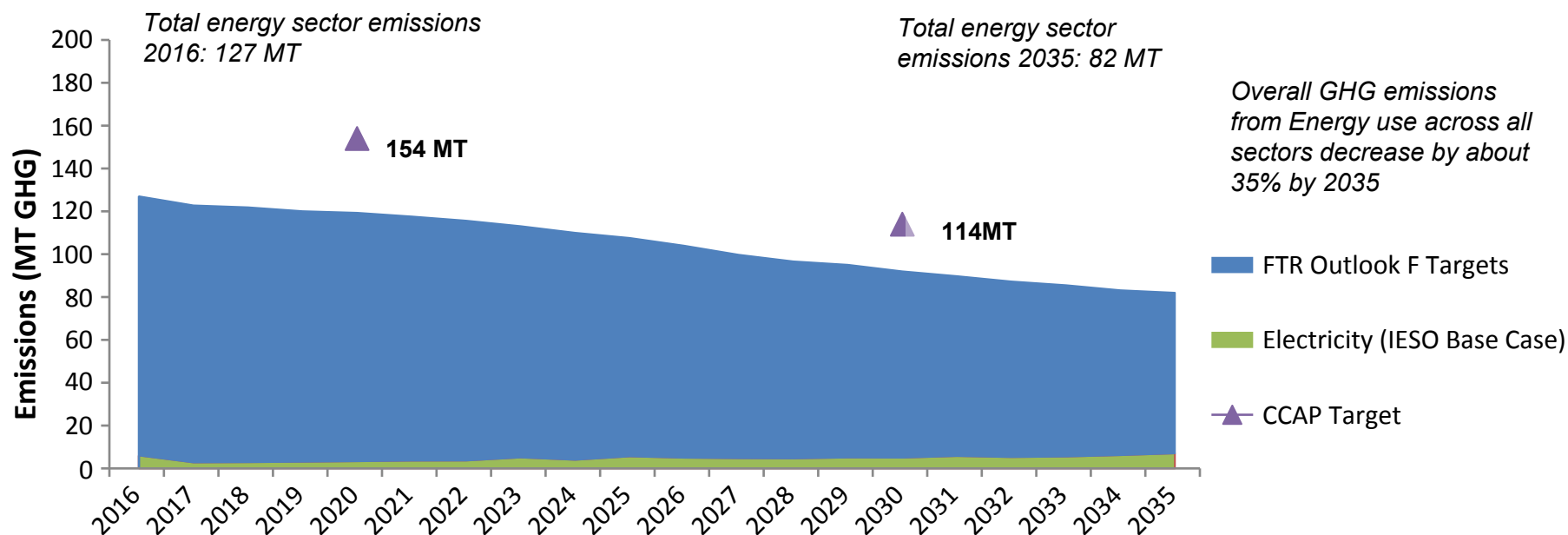


A. Considerations – Fuels Modelling

- Ministry is exploring how to achieve FTR Outlook F Targets in manner that would not result in the need for incremental electricity generating capacity beyond the planned supply resources outlined in IESO's Updated Outlook (i.e., no additional electrification of home heating and industrial processes).
- As such, adopting the FTR Outlook F Targets scenario includes the following considerations to determine an appropriate and credible set of assumptions:
 - Implementing conservation initiatives such as building energy efficiency upgrades through the use of demand-side management to further reduce fuels demand and emissions – including sectors without Ontario Energy Board (OEB) regulated programs (i.e., heating oil and propane);
 - Increasing lower-carbon fuels use in home heating through the adoption and deployment of new and emerging technologies (e.g., renewable natural gas); and
 - Switching to lower-carbon fuels within the transportation sector (i.e., fuels such as ethanol, biodiesel and natural gas, likely in the form of compressed natural gas or liquefied natural gas) and explore the use of emerging technologies (i.e., hydrogen use in public transit).
- Although adopting the FTR Outlook F Targets scenario demonstrates a decline in GHG emissions, it will have cost implications for consumers of fuels (i.e., transportation and home heating).

A. Considerations – Integrated Modelling

- The combined GHG emissions from Ontario's energy sector (i.e., electricity and fuels) under the proposed FTR Outlook F Targets would decrease by 35% by 2035 relative to 2016 levels, and would remain well below the economy-wide CCAP target for 2030.



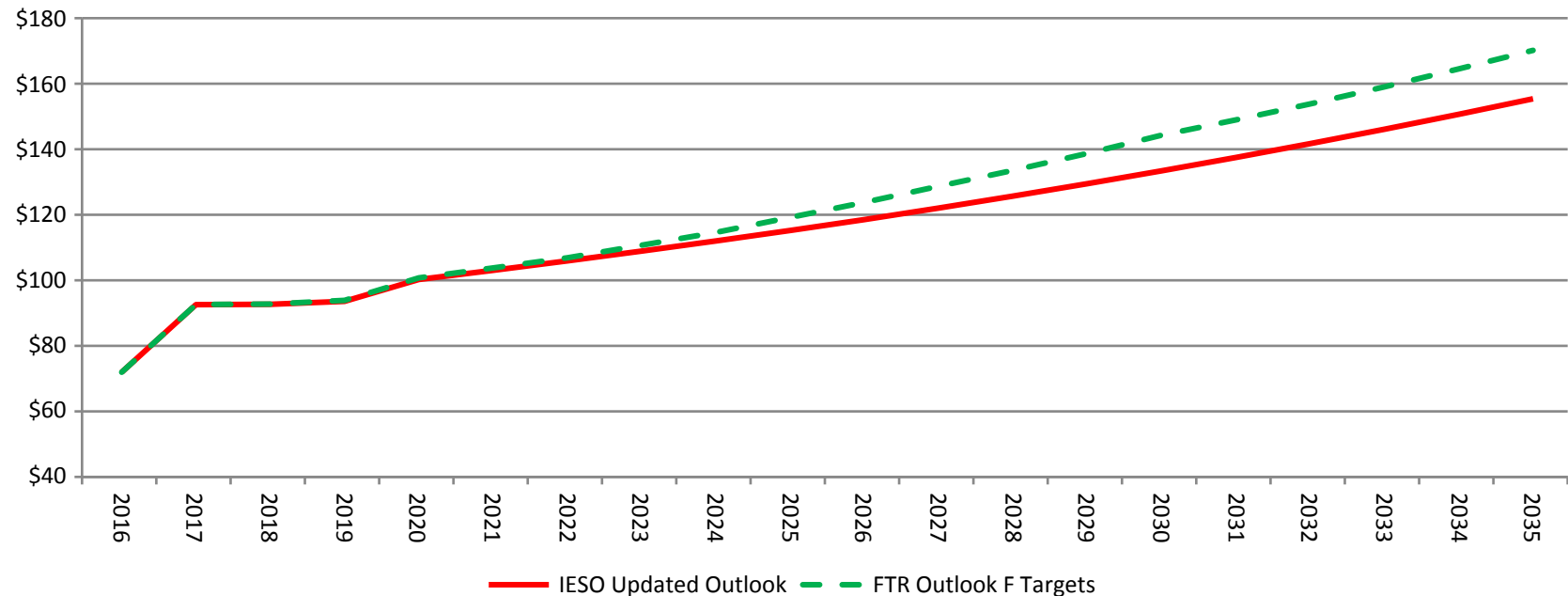
Note: Emissions excludes non-energy sources including agriculture, waste, and non-energy related industrial processes. Updated IESO base case for electricity subject to key assumptions, Emissions from FTR Outlook F used as a proxy pending updated modelling from Navigant. CCAP Targets for Ontario are 15% and 37% reduced emissions from 1990 levels (~182 MT) by 2020 and 2030 respectively.

A. Residential Natural Gas Bill Outlook

- The chart below shows the residential bill under: IESO's Updated Outlook and FTR Outlook F Targets. Analysis is ongoing to ensure appropriate scenario modelling and bill treatment.
 - Bills relative to IESO's Updated Outlook are expected to increase primarily due to further substitution of higher-cost RNG.

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

**Typical Residential Natural Gas Bill
(with tax, nominal \$ per month)**



1B.) 2017 LTEP – OUTLOOK AND FORECASTS FOR ELECTRICITY

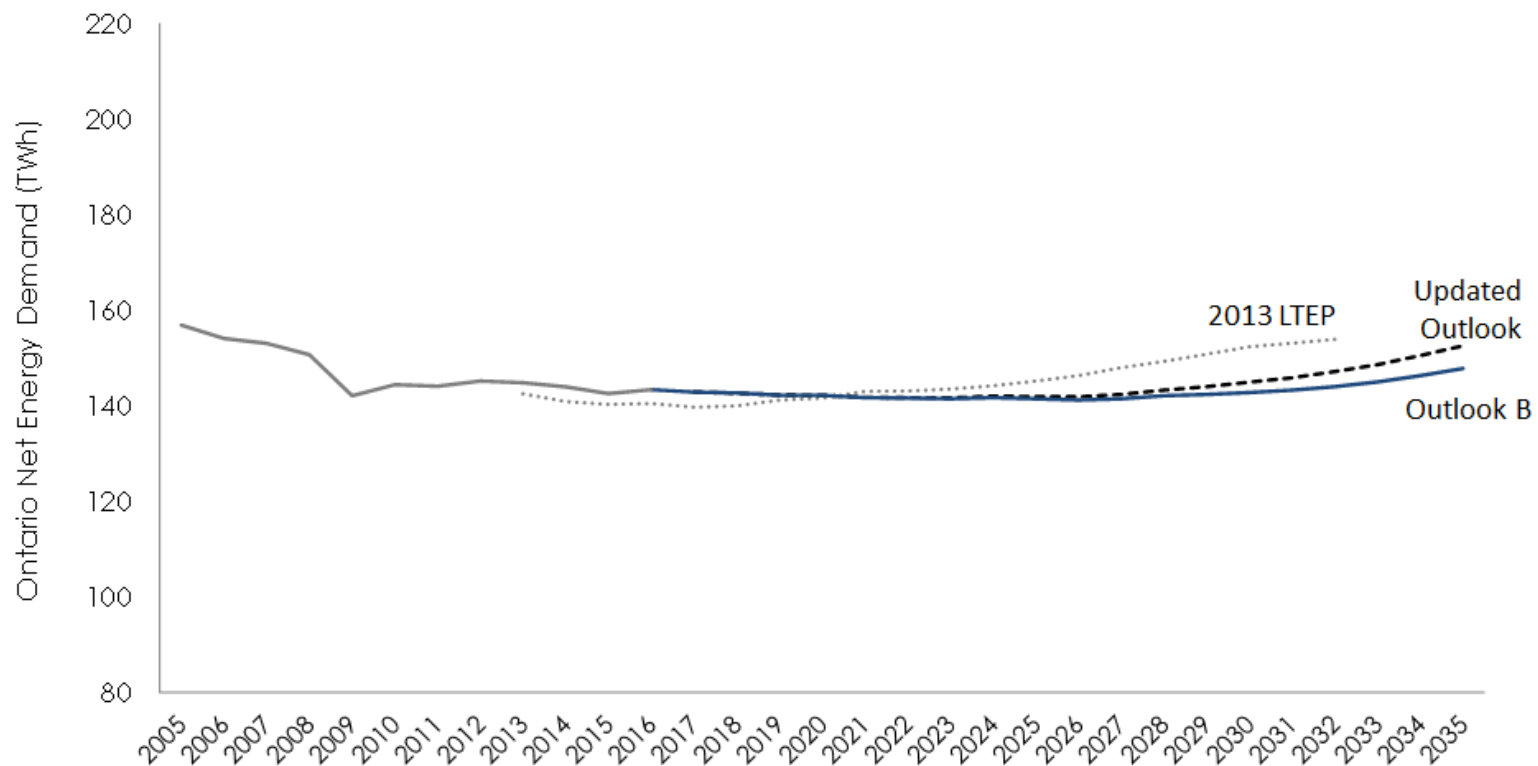
B. 2017 LTEP – Electricity Outlooks and Forecasts

- The Long-Term Energy Plan (LTEP) is the energy sector's roadmap. It includes 20-year outlooks / forecasts, and identifies initiatives to position the energy sector for the future. Past LTEPs have included:
 - Forecast of typical residential electricity bills
 - Electricity Demand Outlook;
 - Electricity Supply Outlook; and
 - Emissions Outlook.
- The introduction of Ontario's Fair Hydro Plan (OFHP) has impacted the residential electricity bill by reducing costs in the near term. Over the long-term the incurred debt will be repaid by electricity consumers.
- Action have been undertaken to lower electricity costs for all consumers. Current actions that are underway or have been agreed to bend the future cost curve, include:
 - Savings from IESO's Market Renewal of up to \$5.2 billion over a 10-year period beginning in 2021 have been incorporated into the electricity outlooks; and
 - Ontario Energy Board (OEB) is expected to reevaluate its performance mechanisms to ensure that high-cost LDCs are becoming more efficient through the years.
 - ENERGY and its agencies have also considered other options to remove costs from the electricity system through other funding sources and supply mix decisions.

See Appendix for more detail on measures that have been implemented and measures underway.

B. 2017 LTEP – Electricity Demand Outlook

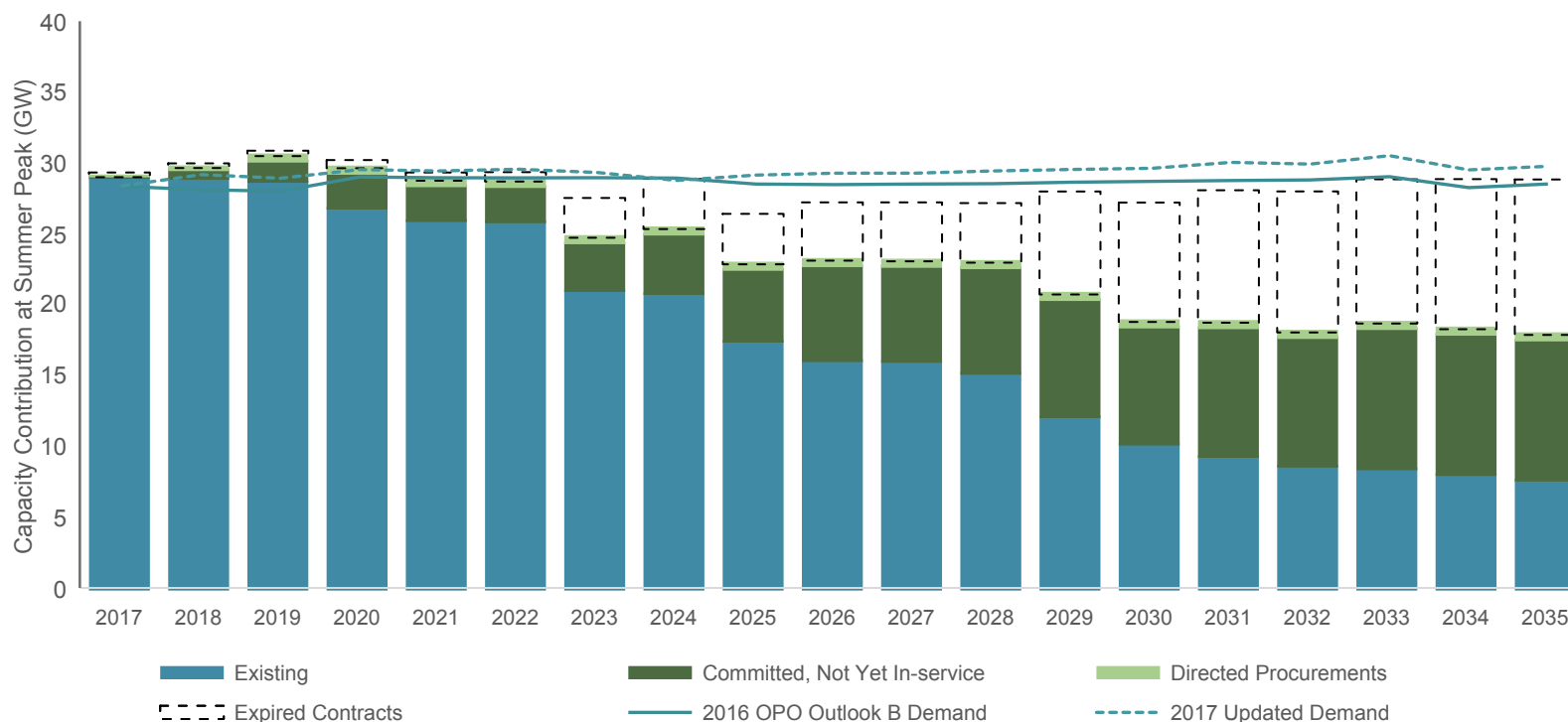
- The following chart compares the demand forecast in 2013 LTEP, IESO's outlook publically released in September 2016 (Outlook B), and the new updated outlook for 2017 LTEP.
- The updated outlook is based on Outlook B with increased EV uptake (2.4 million EVs by 2035) and recent sector updates (about 5 TWh higher than Outlook B by 2035).



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B. 2017 LTEP – Electricity Supply Outlook

- 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.
 - 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.



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B. 2017 LTEP – Electricity Outlooks and Forecasts – Summary of Modelling Assumptions

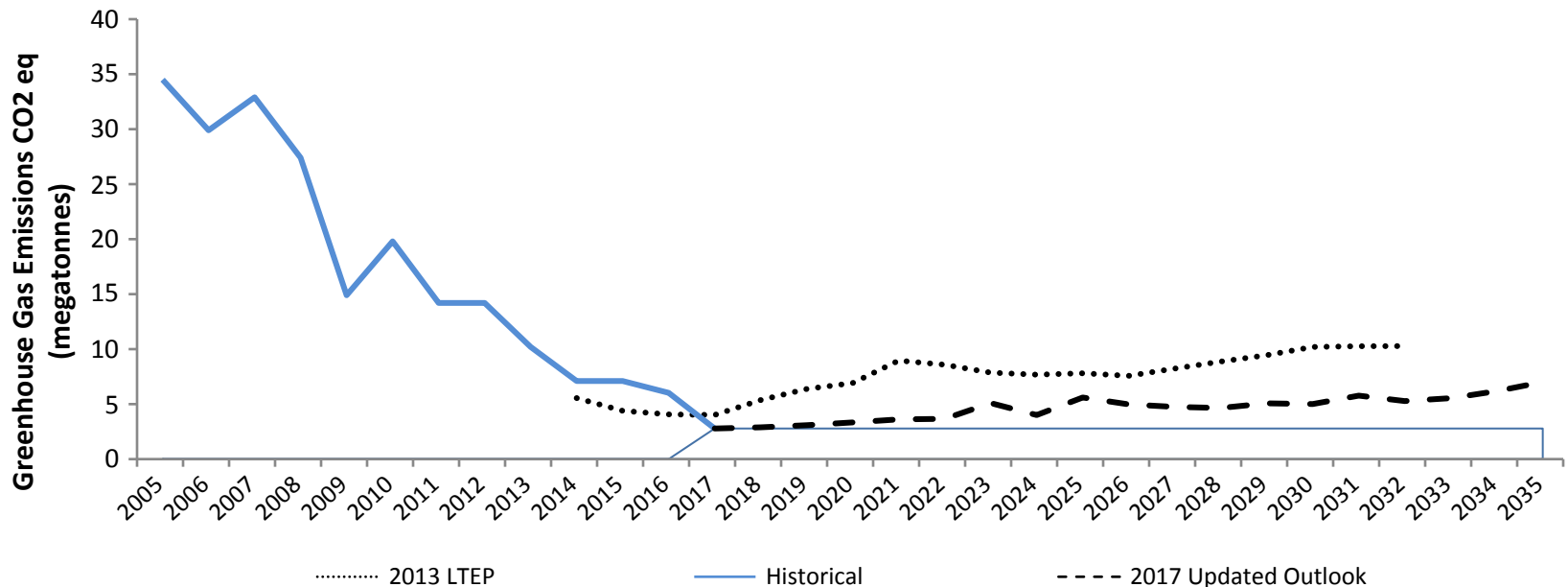
Outlook	Key Assumptions
Supply	<u>Nuclear</u> - Refurbishment schedule reflects OPG's current business plan and the amended Bruce refurbishment schedule; and - Pickering is assumed to operate to 2022/2024. <u>Renewables</u> - Suspension of LRP II and EFW; and - FIT 5 and microFIT 2017 are the remaining renewable programs to be procured that are not yet online or contracted. <u>Electricity Trade Agreements</u> - Ontario-Quebec (2.3 TWh per year from 2017 to 2022 inclusive, 500 MW capacity per winter December 2016 to March 2023 from Ontario to Quebec and 500 MW Quebec to Ontario).
Demand	Based on OPO Outlook B, with the addition of EVs per OPO Outlook D (i.e., 2.4 million EVs by 2035). Note: Transportation-related electricity is modelled separately.
Conservation and Demand Response	- 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.

B. 2017 LTEP – Electricity Outlooks and Forecasts – Summary of Modelling Assumptions (cont'd)

Outlook	Key Assumptions
Price	• Reflects OPG smoothed rates. • Assumes the generation assets will continue to be available for the duration of the planning outlook, where the costing of expired contracts reflect: – Natural gas is converted to a generic gas plan with assumptions per Hatch report; – Wind is based on LRP I, with a discounted capital cost re-investment for end of life components; – Solar is based on LRP I, except that future investments for end of life components decline in cost in recognition of technological improvements; and – Note: Both the wind and solar re-investment costs are lower than that used in the OPO. • 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 and 2018; Adjustments to forecast methodology to calculate the fixed and variable elements of the distribution costs. • The estimated bill for a residential consumer now incorporates May and July 2017 actuals (whereas a forecast for the year was previously used).

B. 2017 LTEP – Electricity Emissions Outlook

- With the retirement of coal plants, greenhouse gas (GHG) emissions have dropped by over 80% in the past 10 years. Today, Ontario electricity sector GHG emissions represent about 2% of Ontario's overall economy-wide GHG emissions.
- The trend of lower emissions is forecast to continue over the planning outlook.



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B. 2017 LTEP – Electricity Emissions Outlook (cont'd)

- IESO undertook analysis of new scenarios including a flat GHG outlook and a declining GHG outlook.
- [Placeholder – description of scenario; e.g., GHG emissions could be reduced further during this period with additional clean energy and/or conservation (e.g., clean imports, additional renewables, lower demand).]

Placeholder for graph

B. 2017 LTEP – Electricity Emissions Outlook (cont'd)

Considerations

- [Placeholder – Measures that reduce GHG emissions would increase total system cost. These investments in emission reductions should be funded through the GGRA to avoid added pressures on the rate base.]

2. INPUTS INTO THE DEVELOPMENT OF THE 2017 LTEP RESIDENTIAL ELECTRICITY PRICE FORECAST

2017 LTEP – Residential Electricity Price Forecast

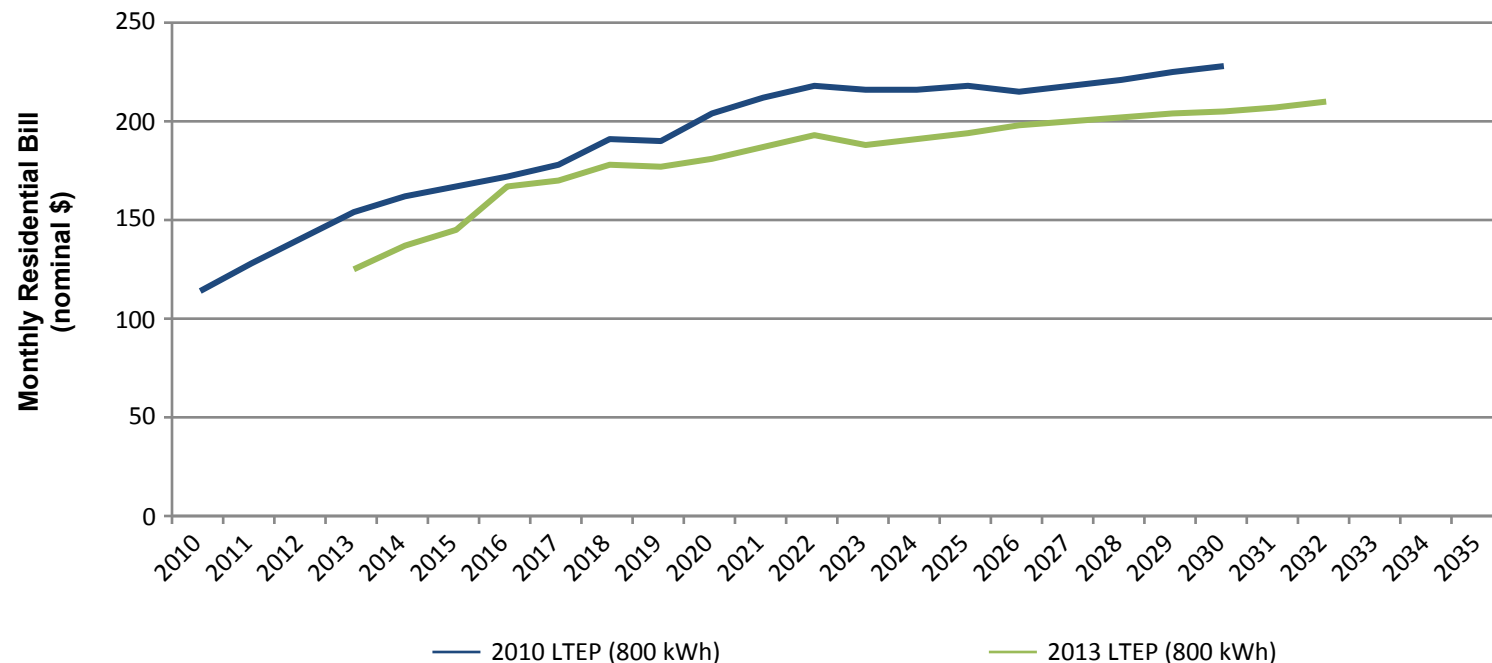
- The 2017 LTEP price forecast needs to show progress at lowering costs relative to the 2013 LTEP.
- The modelling assumptions for 2017 LTEP Residential Electricity Price Forecast include:
 - Benefits from implementing IESO's Market Renewal which includes a number of initiatives focused on more efficiently meeting demand; and
 - Ontario's Fair Hydro Plan (OFHP).
- A decision is required on other inputs which impact the presentation of the residential bill, in the near, medium and long-term, including:
 - I. Adjusting the inflationary cap; and
 - II. Changes in residential consumption.

A. Ontario's Fair Hydro Plan

- The Ontario Fair Hydro Plan Act, 2017 requires the Minister of Energy to calculate the “Fair Allocation Amount” (FAA) for each 6-month period to 2047.
 - The FAA is the accumulated difference between the allocation of clean energy costs and any associated financing costs payable by specified consumers under the OFHPA and the allocation of clean energy costs that would have been payable by those same consumers absent the OFHPA.
- The FAA aligns clean energy costs with clean energy benefits into the future.
- The Minister is required by the Act to provided the FAA to the Ontario Power Generator (OPG) as Financial Services Manager.
 - The FAA is expected to be set out in a letter from the Minister to OPG.
- The FAA is a constraint on the debt that the Financial Services Manager can finance.
- This is an important input in the development of the 2017 LTEP residential price forecast curve (i.e., the forecast cannot be finalized until the OFHP payback period is finalized).
- The FAA is necessary for the development of a Financing Plan by OPG and must precede the rating and sale of the asset (Summer/Fall 2017 TBC).

A. 2017 LTEP – Residential Price Forecast

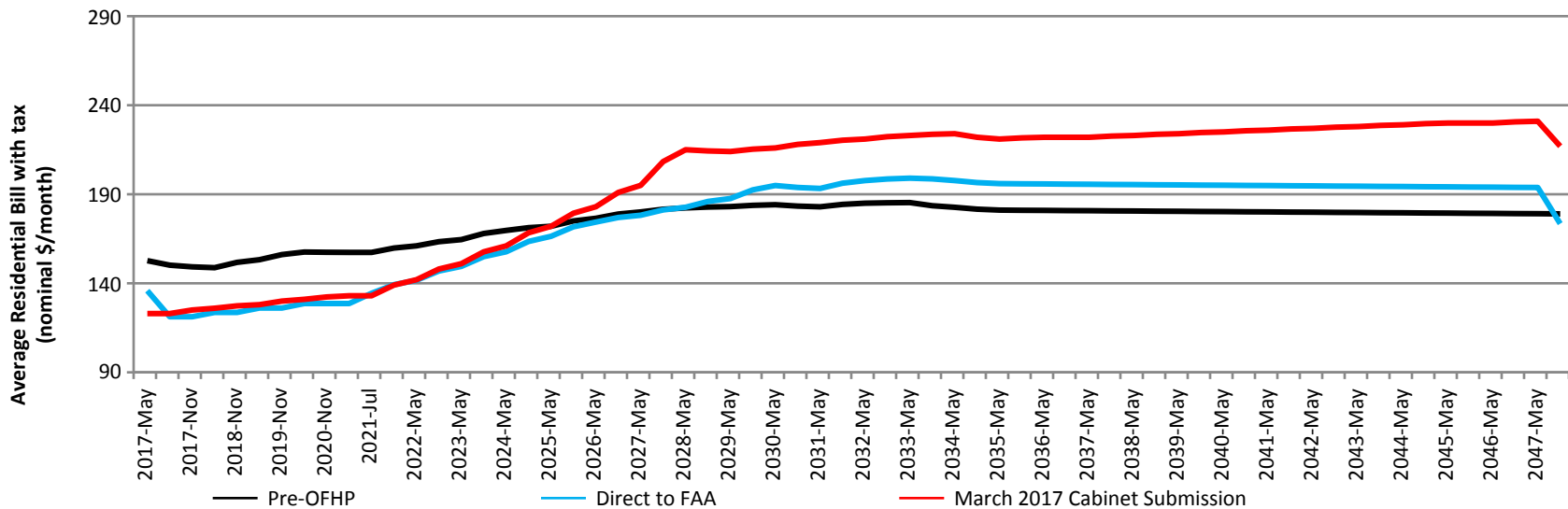
- The 2017 LTEP will include an updated residential electricity bill forecast.
- LTEP residential bill forecasts have followed a trend of being lower than the prior LTEP.



Note: OFHP – Direct to FAA (750 kWh) based on a preliminary July 2017 forecast; forecast is subject to change. As of 2017, the OEB reports residential bill impacts using an average consumption of 750 kWh per month.

A. Ontario's Fair Hydro Plan – Fair Allocation Amount

- Under current OFHP forecasts, residential electricity rates would increase at an average rate of about 5% between the end of the inflationary cap until the recovery period (i.e., 2021-2027).
- Maximum debt is estimated to reach \$21.3 billion in 2029. Note: Public estimate was \$28 billion.
- Demand, interest, financing, technology performance and system cost assumptions can significantly impact the price forecast.



	2017-May	2017-Jul	2018-May	2019-May	2020-May	2021-Jul	2022-May	2023-May	2024-May	2025-May	2026-May	2027-May	2028-May	2029-May	2030-May	2031-May	2032-May	2033-May	2034-May	2035-May	2036-May	2037-May	2038-May	2039-May	2040-May	2041-May	2042-May	2043-May	2044-May	2045-May	2046-May	2047-May	2048-May
Average Residential Bill (\$/month)	136	121	124	126	129	134	142	149	158	166	174	178	183	188	195	193	198	199	198	196	196	196	195	195	195	195	195	195	194	194	194	194	173
Change in bill (%)	n/a	-10.8%	2.0%	2.0%	2.0%	4.5%	5.4%	5.5%	5.5%	5.5%	4.8%	2.2%	2.5%	2.7%	3.9%	-0.8%	2.3%	0.7%	-0.7%	-0.9%	-0.1%	-0.1%	-0.1%	-0.1%	-0.1%	-0.1%	-0.1%	-0.1%	-0.1%	-0.1%	-0.1%	-10.5%	
Total Accumulated Debt (\$B)	0.2	1.0	3.3	5.8	8.5	11.5	13.6	15.5	17.2	18.4	19.3	20.2	20.9	21.3	21.2	20.9	20.5	19.9	19.1	18.2	17.2	16.2	15.1	13.9	12.7	11.3	9.9	8.3	6.7	4.9	3.1	1.0	0.0

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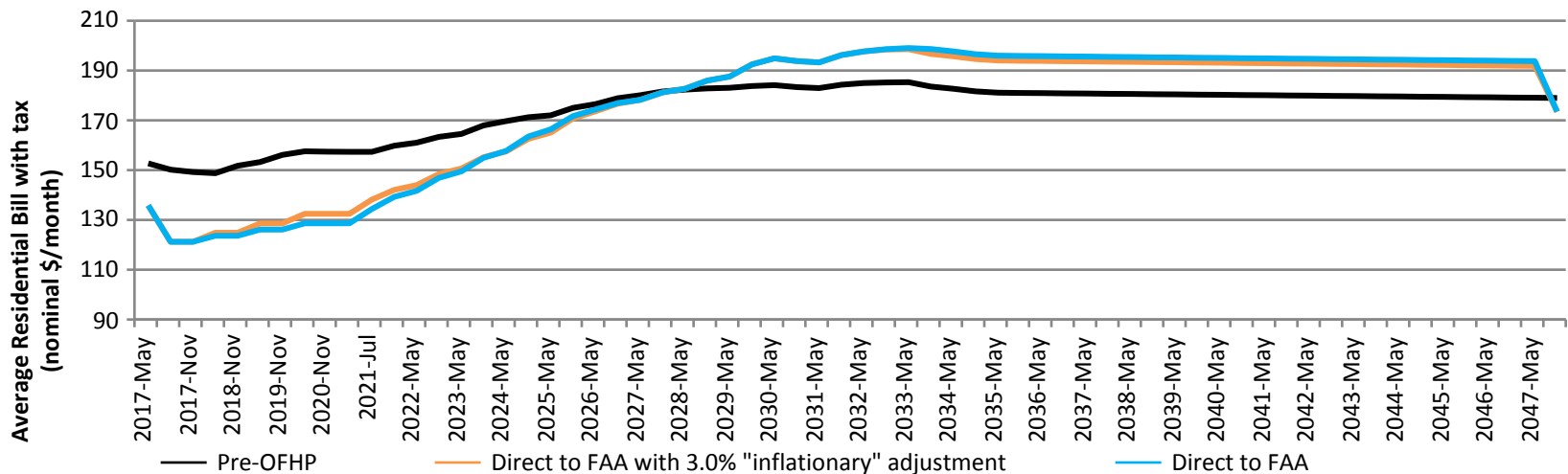
Note: Based on a preliminary July 2017 forecast; forecast is subject to change. Assumes 30-year financing period and a nominal interest rate of 5% (compounded monthly). Pre-OFHP forecast beyond 2035 is extrapolated.

B. Other Inputs In the Residential Price Curve

- The 2017 LTEP could include other inputs that impact the presentation of the residential bill, such as:
 - I. Adjusting the inflationary cap; and
 - II. Changes in residential consumption.
- A summary of each is provided in the following slides.

B1. Adjust the Inflationary Cap

- Under Ontario's Fair Hydro Plan (OFHP), typical residential bills would increase at the "rate of inflation" for four years.
- Increasing this cap would have the effect of reducing the incurred debt and smoothing the step change in rates when they return to the Fair Allocation Amount (FAA).
- OFHP modelling previously based on 2% "rate of inflation". A 3.0% increase during the inflationary cap period reduces the debt over the duration of the program by \$1.7 billion down to a total of \$19.6 billion. Furthermore, residential electricity rates would increase at an average rate of about 4.5% between the end of the inflationary cap until the recovery period (i.e., 2021-2027).

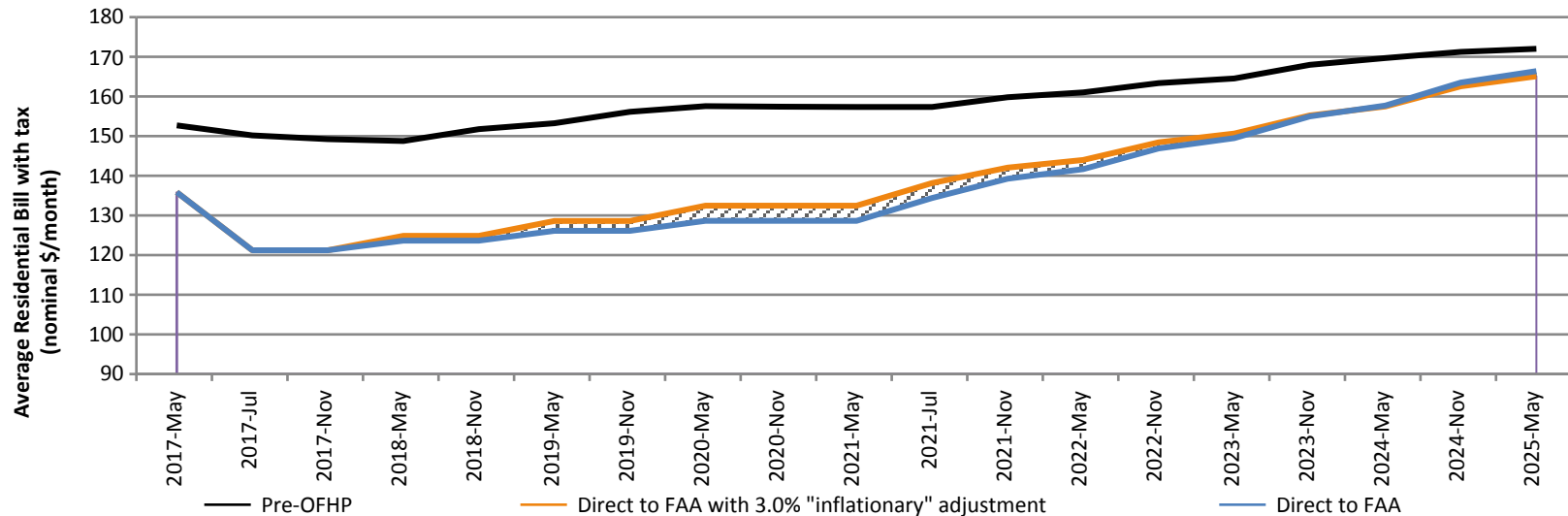


	2017-May	2017-Jul	2018-May	2019-May	2020-May	2021-Jul	2022-May	2023-May	2024-May	2025-May	2026-May	2027-May	2028-May	2029-May	2030-May	2031-May	2032-May	2033-May	2034-May	2035-May	2036-May	2037-May	2038-May	2039-May	2040-May	2041-May	2042-May	2043-May	2044-May	2045-May	2046-May	2047-May	2048-May
Direct to FAA																																	
Average residential bill	136	121	124	126	129	134	142	149	158	166	174	178	183	188	195	193	198	199	198	196	196	196	195	195	195	195	195	195	194	194	194	194	173
Change in bill (%)	n/a	-10.8%	2.0%	2.0%	2.0%	4.5%	5.4%	5.5%	5.5%	5.5%	4.8%	2.2%	2.5%	2.7%	3.9%	-0.8%	2.3%	0.7%	-0.7%	-0.9%	-0.1%	-0.1%	-0.1%	-0.1%	-0.1%	-0.1%	-0.1%	-0.1%	-0.1%	-0.1%	-0.1%	-10.5%	
Total Accumulated Debt (\$B)	0.2	1.0	3.3	5.8	8.5	11.5	13.6	15.5	17.2	18.4	19.3	20.2	20.9	21.3	21.2	20.9	20.5	19.9	19.1	18.2	17.2	16.2	15.1	13.9	12.7	11.3	9.9	8.3	6.7	4.9	3.1	1.0	0.0
Direct to FAA with 3.0% "inflationary"																																	
	136	121	125	129	132	138	144	151	157	165	174	178	183	188	195	193	198	199	196	194	194	194	194	193	193	193	193	193	192	192	192	192	173
Change in bill (%)	n/a	-10.8%	3.0%	3.0%	3.0%	4.3%	4.2%	4.6%	4.5%	4.8%	5.2%	2.6%	2.5%	2.7%	3.9%	-0.8%	2.3%	0.4%	-1.4%	-0.9%	-0.1%	-0.1%	-0.1%	-0.1%	-0.1%	-0.1%	-0.1%	-0.1%	-0.1%	-0.1%	-0.1%	-9.6%	
Total Accumulated Debt (\$B)	0.2	1.0	3.2	5.5	8.0	10.5	12.4	14.1	15.7	17.0	17.9	18.7	19.3	19.6	19.4	19.1	18.6	17.9	17.2	16.4	15.5	14.6	13.6	12.6	11.4	10.2	8.9	7.5	6.1	4.5	2.8	0.9	0.0

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Note: Based on a preliminary July 2017 forecast; forecast is subject to change. Assumes 30-year financing period and a nominal interest rate of 5% (compounded monthly). Pre-OFHP forecast beyond 2035 is extrapolated.

B1. Adjust the Inflationary Cap (cont'd)



	2017-May	2017-Jul	2018-May	2019-May	2020-May	2021-Jul	2022-May	2023-May	2024-May	2025-May
Direct to FAA										
Average residential bill	136	121	124	126	129	134	142	149	158	166
Change in bill (%)	n/a	-10.8%	2.0%	2.0%	2.0%	4.5%	5.4%	5.5%	5.5%	5.5%
Total Accumulated Debt (\$B)	0.2	1.0	3.3	5.8	8.5	11.5	13.6	15.5	17.2	18.4
Direct to FAA with 3.0% "inflationary"										
Average residential bill	136	121	125	129	132	138	144	151	157	165
Change in bill (%)	n/a	-10.8%	3.0%	3.0%	3.0%	4.3%	4.2%	4.6%	4.5%	4.8%
Total Accumulated Debt (\$B)	0.2	1.0	3.2	5.5	8.0	10.5	12.4	14.1	15.7	17.0

Considerations

- The four-year inflationary cap has been publicly communicated.
- Inflationary increases are specified in O.Reg. 195/17 to be applied by the Ontario Energy Board (OEB) when setting Regulated Price Plan (RPP) rates. This regulation would need to be amended to alter or extend the increase cap.
- Raising the "inflationary" increases during the cap period reduces total accumulated OFHP debt as shown in the Appendix.

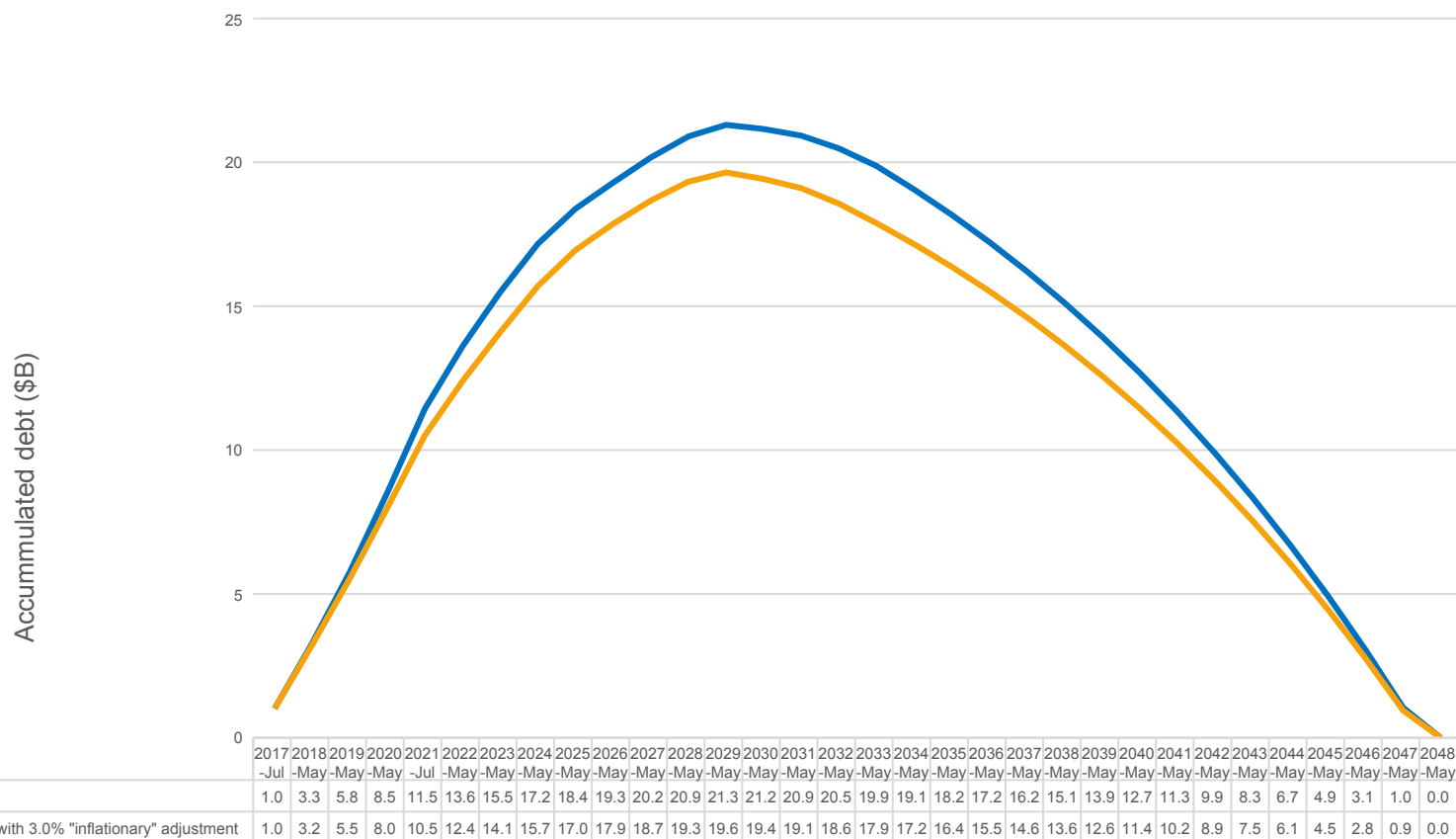
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B1. Adjust the Inflationary Cap – Impact on Total Accumulated OFHP Debt

Considerations

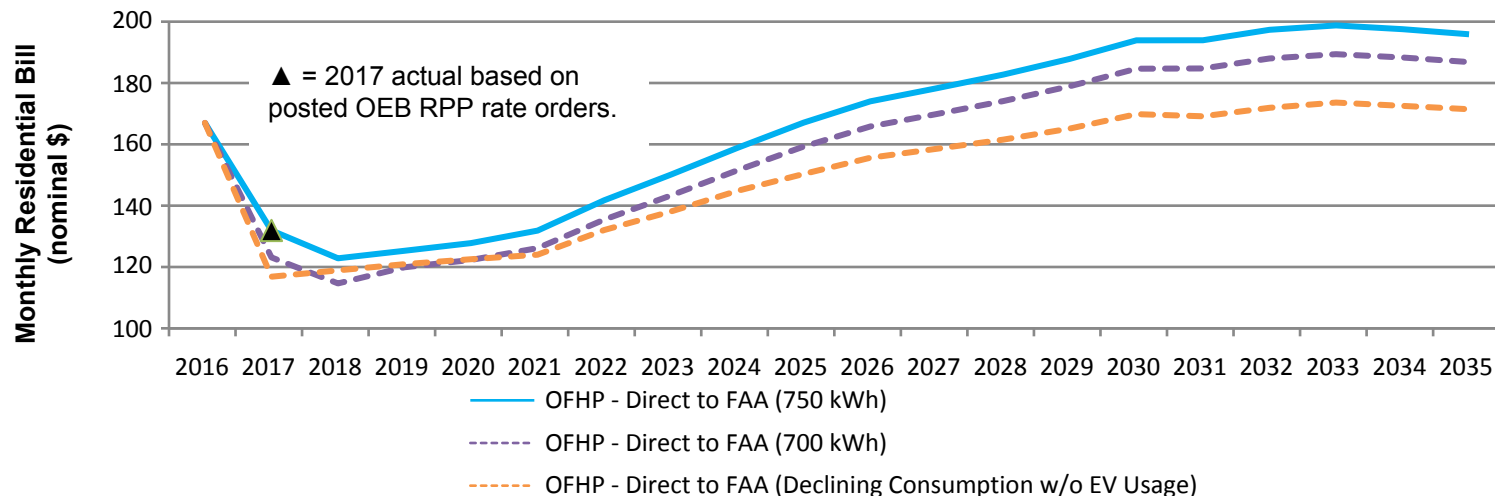
- Raising the “inflationary” increases during the cap period reduces total accumulated OFHP debt as shown in the summary provided below.



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B2. Changes in Residential Consumption

- Over the forecast period, residential bill impact is expected to change due to factors such as:
 - Declining size of average residential dwellings;
 - Increasing energy efficiency; and
 - Increasing electrification of space heating, water heating and transportation.
- The below graph shows the impact of declining residential consumption over the forecast period:
 - 750 kWh/month:** Based on current OEB Ontario average and OFHP modeling to date;
 - 700 kWh/ month*:** Illustrative example of reduced consumption (Note: Average consumption over the forecast period is 640 kWh/month); and
 - Declining Annual Consumption*:** A steady decline in average consumption over the planning period from 730 kWh/ month in 2017 to 600 kWh/ month in 2035**.



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* Note: Does not include the impact of the change in debt and the impact of lower consumption on fixed delivery rates.

** Note: A typical household's monthly consumption could rise from 750 kWh to ~1,000 kWh with on-site EV charging.

B2. Changes in Residential Consumption (cont'd)

Considerations

- 2010 and 2013 LTEPs both used OEB average consumption for the full life of the price curve (i.e., 800 kWh/month).
- The OEB has observed a trend of declining consumption since 2005, and IESO's Updated Outlook would support presenting either a reduced average (700 kWh/month) or annual average consumption in the 2017 LTEP. However, the forecast should be qualified to note:
 - While the residential demand outlook includes increased electrification of space and water heating, it does not account for increased electrification due to adoption of EVs. The OPO modelled electricity demand separate from transportation-related electricity demand – this approach was also used in the IESO's Updated Outlook.
 - EV impact on residential consumption depends on the number of EVs per household, charging location and vehicle type. The Updated Outlook assumes 2.4 million EVs in 2035. Including the total electricity demand from all EVs in the residential outlook would increase average monthly residential consumption by 10-15%.
 - While increased adoption of EVs could lead to an increase in household electricity bills, it would also result in a corresponding decrease in a household's expenditure on gasoline/diesel.
 - Net metering could help offset increased consumption from EVs, on average and for participants with EVs.
 - » A typical net metered residential solar PV system can generate an average of over 400 kWh of electricity each month, helping to reduce household consumption from the grid.*
 - » The Ministry is proposing to allow third party providers to own and operate net metering facilities, which could expand net metering participation.
 - Monthly electricity consumption varies significantly across the province, influenced by dwelling size (condo or single-family home), as well as fuel type used for space and water heating, among other factors.

2015 Average Monthly Residential Consumption**

LDC	Toronto Hydro	Hydro Ottawa	Hydro One	Ontario Average
Consumption	620 kWh	631 kWh	954 kWh	746 kWh

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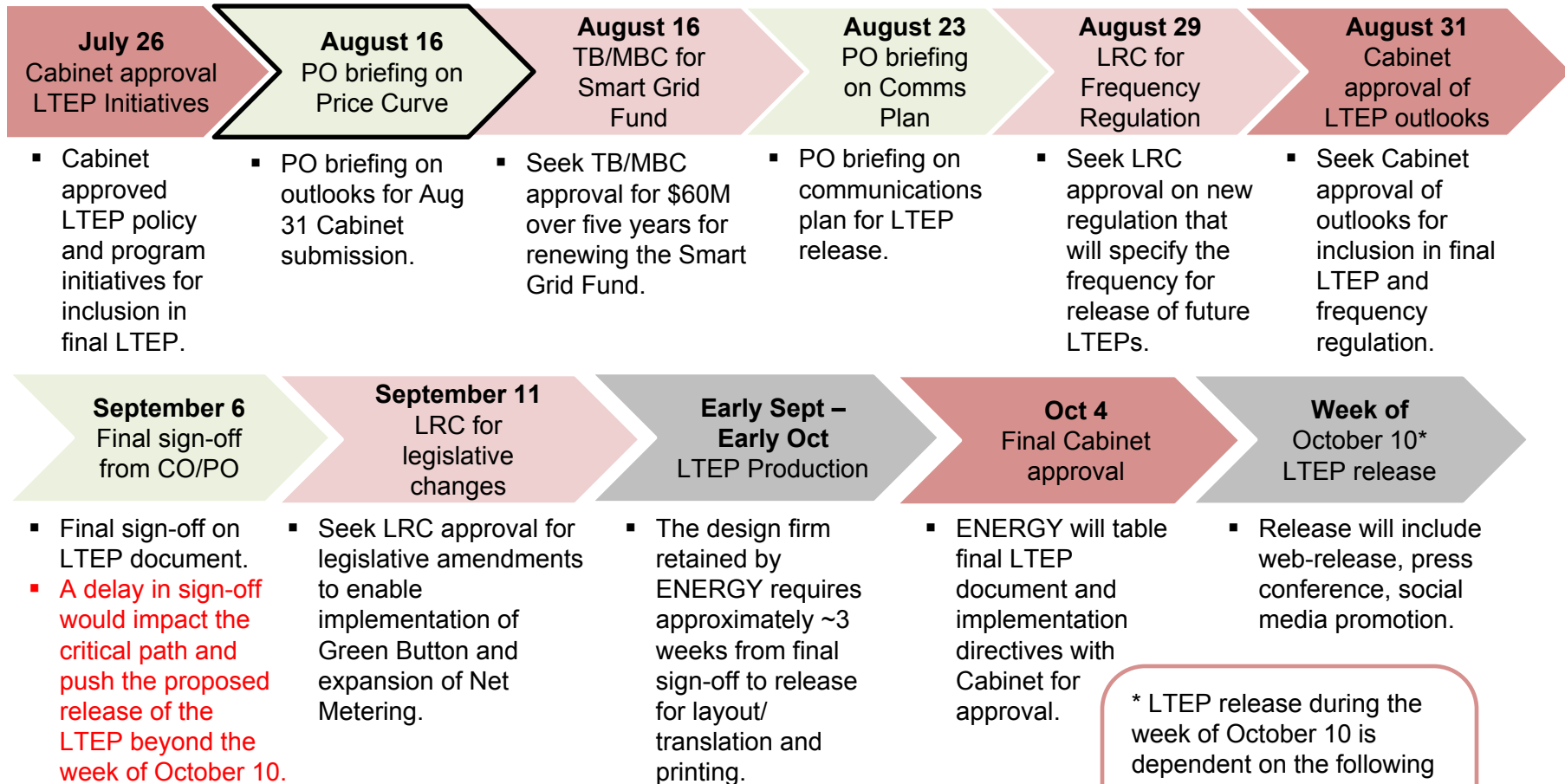
*Assumes a 4kW rooftop solar PV system. A typical residential net metering participant consumes ~50% on site and exports ~50% to the grid.

**Source: OEB 2015 Yearbook for Electricity Distributors

3. NEXT STEPS / CRITICAL PATH

Timeline of Next Steps

- The following timeline illustrates the steps needed for an early October LTEP release.



* LTEP release during the week of October 10 is dependent on the following approvals:

- Cabinet on Aug 31;
- CO/PO on Sept 6;
- Cabinet on Oct 4.

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APPENDIX

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Bending the Cost Curve for Electricity Ratepayers

- The government has indicated publicly that the upcoming 2017 LTEP will continue the trend of taking costs out of the electricity system and making it more affordable for ratepayers.
- Ontario has taken a number of actions to lower electricity costs for all consumers by:
 - Deferring investments in generation (e.g., new build nuclear), improving market efficiency (e.g., wind dispatch) and decreasing the cost of renewable procurements (e.g., Green Energy Investment Agreement (GEIA) renegotiation, decreasing Feed-In Tariff (FIT) prices, competitive Large Renewable Procurement (LRP));
 - Increasing cost effectiveness and improving efficiency by adopting new electricity market approaches (e.g., no NUG contract extensions and demand response);
 - Suspending the LRP II and the Energy from Waste Standard Offer Program (EFWSOP) – up to \$3.8 billion in cost savings; and
 - Limiting FIT5 procurement target to 150 MW and suspending future FIT procurements – an average annual savings of \$15 million.
- ENERGY and its agencies are also considering options to remove costs from the electricity system through efficiencies, other funding sources and supply mix decisions.

1. Bending the Cost Curve – IESO's Market Renewal (cont'd)

- IESO's Market Renewal includes a number of initiatives focused on more efficiently meeting demand over the near and longer terms. Market Renewal includes the following:
 - Introduce a Day-Ahead Market based on a Single Schedule Market to provide greater certainty to market participants and lower the cost of producing electricity.
 - Reduce the cost of scheduling and dispatching resources to meet demand as it changes from hour to hour and minute to minute through Enhanced Real-Time Unit Commitment.
 - More efficiently manage unexpected short-term changes on the system by enabling More Frequent Intertie Scheduling.
 - Improve the way Ontario procures resources to meet our longer-term supply needs by implementing an Incremental Capacity Auction.

Considerations

- An independent third party report estimates that benefits from IESO's Market Renewal could reach up to \$5.2 billion over a ten-year period beginning in 2021. Note: IESO has incorporated some of this saving into its current Outlook for electricity system costs and residential bills (i.e., Through reduced capacity payments for generators once their contracts expire).
- In addition to the up to \$5.2 billion in estimated benefits, non-quantified benefits are likely to deliver additional value, for example:
 - Inefficiencies in the current market design need to be managed using extensive time and resources including expensive external legal expertise and consultants.
- In other jurisdictions that went through similar changes, actual efficiencies realized have been greater than those expected often because of the non-quantifiable benefits.
 - For example, Southwest Power Pool, a system operator covering 14 U.S. states, realized \$1 billion in savings over a two year period compared to an expected saving of \$400 million.

2. Bending the Cost Curve – Finding Greater Efficiencies and Savings in the Distribution Sector Savings (cont'd)

- Ontario's distribution sector represents \$3.6 billion in annual costs, and typically makes up ~20% of the average residential electricity bill.
- The 2012 Ontario Distribution Sector Review Panel (ODSRP) Report proposed that there was opportunity for \$1.7 billion in savings over 10 years through capital planning optimization and operations, maintenance and administrative (OM&A) reductions as a result of LDC consolidation.
- While the ODSRP recommended legislating LDC consolidation, the majority of the savings they identified were in OM&A costs. These cost reductions could be targeted through other regulatory mechanisms, with a stretch savings target of about \$135 million, to be sustained year over year.

Considerations

- Through LTEP, the Ministry will request the Ontario Energy Board (OEB) via the LTEP implementation directive to use its authority to create more effective tools to harvest more efficiencies and savings in the distribution sector. Examples of potential mechanisms include:
 - Financial penalties for LDCs who do not meet performance expectations;
 - Requiring LDCs to partner and share back office services; and
 - Modernizing regulatory compliance processes to reduce costs.
- The Ministry will also ask the OEB to reevaluate its performance mechanisms to ensure that high-cost LDCs are becoming more efficient through the years and ensure clear metrics are in place to allow for proper evaluations of the low performing LDCs (e.g. further strengthen the scorecard that is already in place by the OEB that evaluates LDCs on various metrics and make it publicly available).

3. Bending the Cost Curve – Other Measures (cont'd)

- The Ministry could take steps to further reduce the cost curve by:
 - I. Transferring the cost of electricity conservation and demand management (CDM) programs, either in whole or in part, from rates to the Greenhouse Gas Reduction Account (GGRA);
 - II. Supply mix funding changes (e.g., suspending current and/or planned renewable initiatives or funding them from another source); and
 - III. Enhancing existing measures (e.g., Ontario Rebate for Electricity Consumers (OREC)).
- Initiatives 1-2 above benefit all electricity consumers because it decreases total GA. Consumers that pay disproportionately more GA than other consumers (i.e., Class B) would see a greater reduction than consumers that pay lower GA (i.e., Class A).
 - For example, under current forecasts, every \$100 million removed from GA reduces Class B rates by about \$0.76/MWh.
- Initiative #3 above would benefit consumers eligible for OREC (i.e., same as OFHP-eligible consumers, such as residential households, most small businesses and farms).
- The following slides provide more information on other measures to reduce and/or shift costs for electricity consumers.

I. Other Measures – Funding Conservation from GGRA Proceeds

- Removing conservation costs from the Global Adjustment (GA) starting in 2018 reduces accumulated debt associated with OFHP by \$3.2 billion from 2021 to 2029 under the scenario that directly returns to the FAA curve after the capped period.

Considerations

- The Ministry could take steps to further reduce the cost curve by transferring the cost of electricity conservation and demand management (CDM) programs, either in whole or in part, from rates to the Greenhouse Gas Reduction Account (GGRA):
 - The Conservation First Framework (CFF) and Industrial Accelerator Program (IAP) are in place until December 31, 2020, however transferring the costs of programs from rates to the GGRA could begin in 2018.
- Removing conservation costs from the Global Adjustment (GA) could achieve ratepayer cost reductions starting in 2027:
 - While less debt and interest is accrued in early years, the OFHP holds bills low until 2027.
- Initiatives funded through GGRA must undergo annual approval by the Minister of the Environment and Climate Change, are subject to fluctuations in the revenue amounts collected through Cap and Trade audits, and will compete with other GHG reduction initiatives.
- GA funding could be used as a backstop for CDM programs if GGRA funding was not available in a given year.

Conservation must be considered in the context of supply/demand planning. Therefore, it is recommended that the Ministry and its agencies continue to maintain oversight of conservation programs even if funded by GGRA.

II. Other Measures – Supply Mix Funding Options or Suspension

- There are several supply mix and funding options to reduce system costs that achieve similar outcomes:
 - Suspending current and/or planned renewable initiatives; or
 - Funding current and/or planned renewable costs from a different source (e.g., GGRA, federal funding).

Considerations

- Similar funding systems are in place already in Canada. Alberta funds its renewable generating resources with funds generated through its carbon tax.
- Shifting the funding of a percentage (10%) of renewable costs from the Global Adjustment (GA) to the GGRA starting in 2017 would result in cumulative savings of \$7.4 billion, a portion of which would accrue to OFHP consumers (analysis ongoing).
 - The required GGRA funding would be variable due to changes in renewable capacity and generation, and well as variability in the wholesale electricity price.
 - Funding renewables would reduce available GGRA funding for other programs and initiatives.
 - There would be additional administrative burden to shift, manage and track a subset of total renewable costs.
- Not proceeding with MicroFIT 2017 and FIT 5, and exiting LRP1 contracts would result in cumulative savings of over \$1.5 billion.
 - LRP 1 contracts have already been issued. Contract amendments or terminations without the consent of developers could result in legal proceedings against IESO and the Province.
- Similar to seeking federal funding for transmission infrastructure, the 2017 LTEP could represent an opportunity to seek federal funding for renewable generation.

III. Other Measures – Enhancing Existing Measures (OREC)

- Enhancing the Ontario Rebate for Electricity Consumers (OREC) would reduce consumer bills by shifting costs to the tax base.
- Rate relief could be provided through on-bill rebates and ‘shaped’ to align with the post-inflation cap annual funding gap.

Considerations

- There will be a fiscal impact on the province resulting from increasing OREC funding.
- Should smoothing be provided to OFHP eligible consumers, increasing OREC funding could be combined with other initiatives to meet the funding gap between the FAA forecast and required funding.
- Potential impacts on OFHP accounting are still being analyzed.