

March 10, 2017

IESO Assumptions for ENERGY's 2017 Long-Term Energy Plan - CONFIDENTIAL

Prepared by IESO

This memo summarizes the discussion held on March 8, 2017 on the scenario development in anticipation for the 2017 LTEP between ENERGY and IESO.

Section 1 describes the assumptions that will serve as the basis for scenario development for the reference and sensitivity cases for 2017 LTEP. Section 2 identifies the number of scenarios the IESO will be assessing.

Please confirm and provide comments to 1) all input and assumptions and 2) the cases the IESO will be assessing as soon as possible as we cannot commence our work until we have confirmation from ENERGY.

Section 1 – Assumptions

Demand

- The reference case for the 2017 LTEP will be Outlook B of the 2016 Ontario Planning Outlook (OPO) with the addition of electric vehicle (EV) demand assumptions per Outlook D (i.e., 2.4 million EVs by 2035).
- Two sensitivities will be developed around Outlook B to illustrate higher and lower ranges.
 - The lower and higher range will start from the year 2026.
 - The lower range would have similar assumptions to OPO Outlook A.
 - The higher range would have assumptions noted below:
 - Higher household growth;
 - Higher new square footage growth in various commercial buildings; and
 - Better industrial performance.
- Details will be fine-tuned as the IESO develops the higher and lower ranges.

Conservation

- **Conservation outlook** will be consistent with the OPO, which incorporates the 2013 LTEP targets of 30 TWh by 2032. It also assumes that the near term target set in the Conservation First Framework and Industrial Accelerator Program of 8.7 TWh by 2020 will be achieved.
- **Demand Response** outlook will be consistent with the OPO (and 2013 LTEP). Time-of-use (TOU), Industrial Conservation Initiative (ICI) and demand response (DR) auction combined will be able to meet 10% of peak demand by 2025.

Commented [CH(1)]: 2017 LTEP will likely outline a higher conservation target. IESO's conservation team (Evelyn Lundhild) has commissioned specific analysis on this.

Questions for IESO

- 1) What are the modeling implications of incorporating a higher conservation target in the base case?
- 2) What would be the timelines to update the base case demand forecast and the related supply/costs forecasts to reflect a higher conservation target?

For additional details on incremental conservation potential, suggest IESO's power system planning team connect with the conservation team.

Commented [CH(2)]: There are currently no plans to establish a new DR target through the 2017 LTEP. Remove 2025 DR target. Report back on how much DR we would assume should there be no targets going forward.

March 10, 2017

Supply

- Nuclear schedule will be consistent with OPO, which includes OPG Business Plan and Bruce inputs:
 - Bruce as per the schedule in the finalized ABPRIA;
 - Pickering continued operations to 2022/2024 (Note: In March 2017, OPG Board approved operation of all six units to 2024 subject to system needs and project economics. As such, the additional two years is considered a supply option/scenario rather than a base case); and
 - Darlington as per the finalized refurbishment schedule.
- Inclusion of the October 2016 Ontario-Quebec Electricity Trade Agreement.
 - Energy 2.3 TWh per year (2017 to 2022 inclusive) Quebec to Ontario;
 - 500 MW capacity per winter December to March (2016/17 to 2022/23 inclusive) Ontario to Quebec; and
 - 500 MW capacity Quebec to Ontario in return for delivery of 500 MW to Quebec in 2015/16 as part of original capacity swap.
- Include recently contracted new resource e.g. Chaudiere Falls Gatineau No.1 and Hull No.2 waterpower contracts.
- Suspension of Large Renewable Procurement II and Energy From Waste Procurement as a result of the September 2016 direction.
- FIT 5 and microFIT 2017 are the remaining renewable programs to be procured that are not yet online or contracted.
- Elimination of hydro and non-hydro renewable “fillers” to meet capacity targets set in 2013 LTEP to reflect that no further renewable procurement programs will be pursued to meet capacity targets. 2013 LTEP renewable capacity targets were 10.7 GW for non-hydroelectric by 2021 and 9.3 GW for hydroelectric by 2025. These targets are assumed no longer in effect.

Costs

- Natural gas price forecast will use the Sproule projection as of February 2017. IESO will assess a lower and higher gas price forecast for sensitivity.
- Include new higher contracted price information for existing NUG contracts, as per January 19, 2017 SCC decision.
- Carbon cost will assume the reserve price (i.e., the floor price) projection in the base case (similar to OPO), and the “updated CA-QC-ON Bloomberg Nov 2016” projection for the sensitivity analysis.
 - Note that the reserve price projection is slightly different from the OPO forecast; it now includes the actual floor price for the March 2017 cap and trade allowance auction as notified in January 2017, and this value is inflated by 5% as per the cap and trade regulations and added an assumed inflation factor of 2%.
 - The “updated CA-QC-ON Bloomberg Nov 2016” projection has been provided to IESO via ENERGY.

Commented [AH(3)]: Incorporate attrition into this.

Request: IESO to confirm what assumptions it will make about potential attrition for future contracts.

Also, IESO to confirm what attrition (if any) it is assuming for existing contracts where projects haven't yet come into operation.

Commented [CH(4)]: CRED: What is the cut-off date for determining currently contracted resources (e.g. Dec 31, 2016)? See suggested addition above regarding Chaudiere projects, which were recently contracted.

Request:

IESO to reflect anticipated uptake of net metering. Modeling to consider recent Part 1 regulatory amendments and potential part 2 changes (i.e. enabling virtual net metering and third party ownership). Modeling should consider uptake driven by potential CCAP/GreenON incentives.

Commented [AUTHOR5]: SNAP

What assumptions has the IESO made regarding transmission assets coming in and out of service?

Commented [AUTHOR6]: SNAP

Will OPO assumptions for Distribution costs be updated? What assumptions for distribution costs will IESO use?

Using Toronto Hydro + inflation may not be an accurate reflection of those costs.

March 10, 2017

- See Appendix for the carbon price projection values.
- OPG nuclear rates will be consistent with the revised OPG Rate Smooth Proposal in EB-2016-0152. OPG has re-filed a revised rate smoothing proposal which will result in a lower customer bill for the 2017 to 2021 period. IESO will need a 20 year projection of the OPG rates associated with this revised rate smoothing proposal (prescribed nuclear, prescribed hydro and non-prescribed hydro), and the nuclear outage schedules associated with the energy production.
- No change to Bruce Power nuclear prices from OPO.
- Upon contract term expiry, for modelling purposes the IESO will assume the assets will continue to be available for the duration of the planning outlook (i.e. similar to Outlook B in OPO). For each scenario described in Section 2, the costing of the assets after contract expiry will be based on two different methodologies (for a total of six different cost scenarios):
 1. Cost Based Methodology similar to OPO which has a capital re-investment to increase the life of these assets.
 2. Market Based Methodology whereby the expired generation will operate in a market renewal environment that includes cost assumptions in an energy, operability and capacity market.

Contract Expiry Cost Assumptions	Cost Based Methodology	Market Based Methodology
Natural Gas	Generic gas plant with re-investment assumptions per Hatch Report	Capacity Market prices Energy Market prices Operability Market prices
Renewable Generation	Renewable rates as per OPO ¹	Capacity Market prices Energy Market prices Operability Market prices

Commented [AH(7)]: Only use market-based methodology for renewable generation.

Industrial Rates and Residential Bills

- Will include Ontario's Fair Hydro Plan and not include proceeds recycling.

¹ On the March 8, 2017 meeting, ENERGY and the IESO discussed the idea of performing sensitivities on prices for renewables upon contract expiry. For the 2017 LTEP, the IESO will assume that solar costs will continue to decline looking ahead, while all other costs for repowering will remain consistent per OPO.

Section 2 – Scenarios

Scenario	Demand	Description	Conservation	Description	Demand Response	Description	Supply	Description	Gas Price	Description	Carbon Price	Description
1	Reference	Per OPO Outlook B	Reference	Per OPO, 2013 LTEP targets of 30 TWh by 2032 and assumes that the near term target set in the CFF and IAP of 8.7 TWh by 2020 will be achieved	Reference	Per OPO, TOU, ICI, and DR auction combined will be able to meet 10% of peak demand by 2025	Reference	Nuclear schedule per OPO, inclusion of ON-QC trade agreement, no LRP2 and EFW, renewables up to FIT 5 and microFIT 2017, no fillers	Reference	February 2017 Sproule	Reference	Auction reserve price (floor price)
2									High	Higher	High	Updated Bloomberg CA-QC-ON Nov 2016
3									Low	Lower	Reference	Auction reserve price (floor price)

- Scenario 1 will serve as the “base case” for the 2017 LTEP.
- Impacts from scenarios 2 and 3 will only be shown starting in 2026.
- Discussions around the low and high demand sensitivities will be included.

Commented [CH(8)]: CRED: Same as CRED comment on p1:

2017 LTEP will likely outline a higher conservation target. IESO’s conservation team (Evelyn Lundhild) has commissioned specific analysis on this.

Questions for IESO

1) What are the modeling implications of incorporating a higher conservation target in the base case?

2) What would be the timelines to update the base case demand forecast and the related supply/costs forecasts to reflect a higher conservation target?

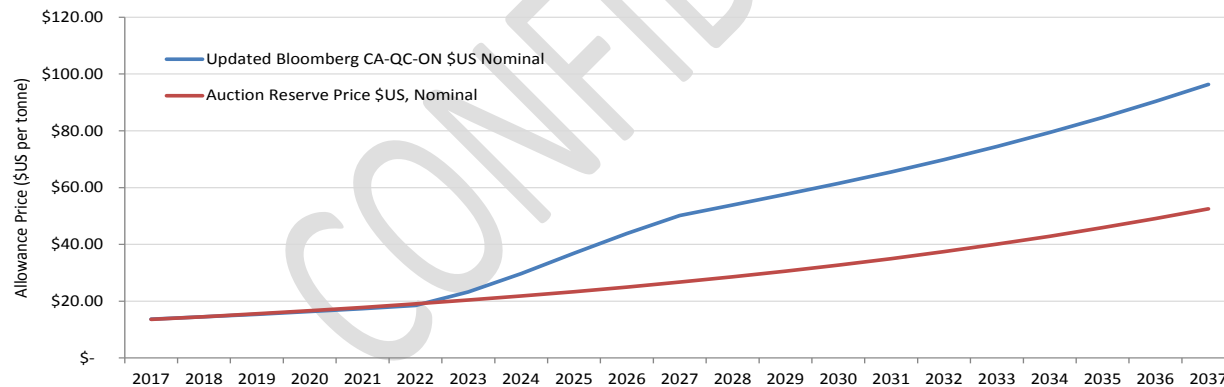
For additional details on incremental conservation potential, suggest IESO’s power system planning team connect with the conservation team.

March 10, 2017

Appendix

Carbon price projection

	Assume same rate of increase as that observed from 2029 to 2037																				
	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
Updated CA-QC-ON (\$US, Nominal) - Bloomberg Nov 2016 (Provided by ENERGY)	\$13.62	\$14.47	\$15.39	\$16.34	\$17.37	\$18.47	\$23.21	\$29.67	\$36.85	\$43.85	\$50.13	\$53.87	\$57.60	\$61.43	\$65.50	\$69.85	\$74.49	\$79.44	\$84.71	\$90.34	\$ 96.33
Auction Reserve Price (aka Floor Price) (\$US, Nominal) - Derived from Feb 2017 Auction Reserve Price, which is inflated by 5% plus inflation each year. Inflation assumed to be 2%. Reserve price is determined prior to each auction, and is taken as the higher of the CA and QC reserve price, converted to the same currency. The prevailing reserve price in a given year will depend on the exchange rate, as well as the inflation in each of the two jurisdictions.	\$13.57	\$14.52	\$15.54	\$16.62	\$17.79	\$19.03	\$20.36	\$21.79	\$23.32	\$24.95	\$26.69	\$28.56	\$30.56	\$32.70	\$34.99	\$37.44	\$40.06	\$42.87	\$45.87	\$49.08	\$ 52.51



Commented [AUTHOR9]:

SNAP

Re: Description of Auction reserve price- The first Ontario auction floor price is selected by higher of QC/CA, but are future floor prices selected this way?