

Fair Hydro Plan Financing Program Servicing Review

November 14, 2017

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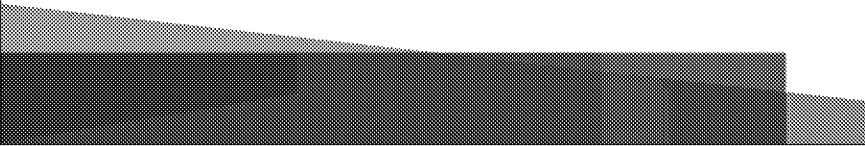
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Demand Forecasting

Section 5



Three types of Forecasts Used at the IESO for Ontario Demand

Short-term: looks ahead 5 minutes to 10 days; review forecast variances monthly

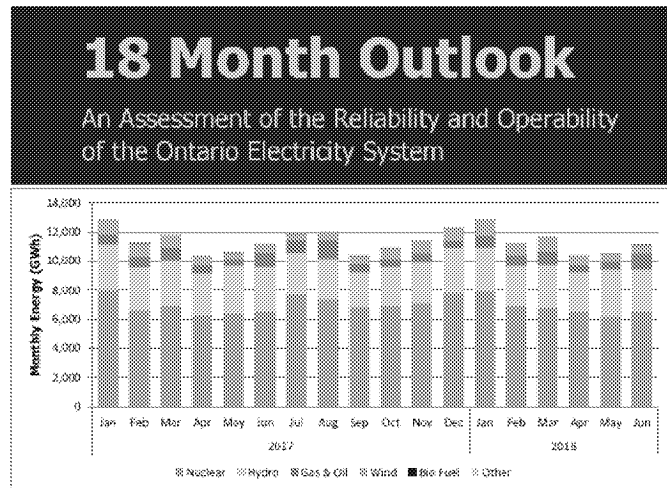
Mid-term: looks ahead 18 months, econometric approach; review of forecast variance month and quarterly

Long-term: looks ahead 20+ years, end-use approach, scenario-oriented; review forecast variance, 1- 3 years



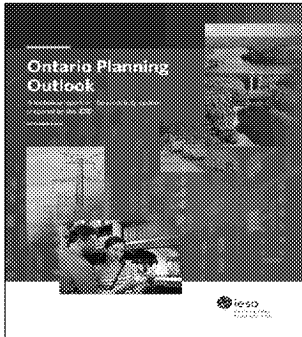
Example of Forecasting Ontario's Future Electricity Needs in Mid-Term

- The IESO plans and prepares for Ontario's future electricity needs by conducting forecasts and assessments of Ontario's current and short-term electricity requirements, as well as the adequacy and reliability of the integrated power system.
- Decisions made over the past decade mean that Ontario demand supply picture will remain positive for the foreseeable future.



- ☐ Adequate supply from a diverse supply mix
- ☐ Demand expected to remain flat for the long term
- ☐ Growth to be offset by conservation savings

Example of Forecasting in Long-term



The IESO's Ontario Planning Outlook:

- Provides a 10-year review (2005-2015) and a 20-year outlook (2016-2035) for Ontario's electricity system
- Responds to a June 10, 2016 request from the Minister of Energy for a technical report on the adequacy and reliability of Ontario's electricity resources
- Provides insights and considerations for the operational needs associated with implementing low-carbon resources, electrification and the growth of distributed energy resources
- Serves as a key input to the government's Long-Term Energy Plan (industry and public consultations are underway)



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On September 1, 2016, the IESO provided the Minister of Energy with the Ontario Planning Outlook, an independent report analyzing a variety of planning scenarios for the future of Ontario's energy system.

This report is expected to serve as the foundation for the government's next Long-Term Energy Plan, which is scheduled to be released in 2017.

As part of this process, consultations with consumers, businesses, stakeholders and Indigenous communities began in late October.

Here are a few high-level findings of the OPO:

Because of current and past investments, Ontario is well-positioned to meet provincial needs until the mid-2020s, while continuing to adapt to significant change across the sector.

Implementation of the province's climate change policies will have an impact on the demand for electricity, including through greater electrification of the economy.

There are a lot of variables, but our models suggest that electrification could result in long-term provincial electricity demands that are up to 40% higher than today.

In higher demand outlooks, additional investments in new resources (conservation, generation and transmission) would be required to meet the increase in demand. However, opportunities for increased conservation will also vary with increases and decreases in demand.

Conservation will play an increasing role in reliability, with long-term targets achieved through a combination of formal conservation programs as well as improvements to building codes and equipment standards

Ontario has the flexibility to adapt to the evolving sector.

In June of this year, the government released its Climate Change Action Plan.

This plan and the cap-and-trade program form the backbone of Ontario's strategy to cut greenhouse gas pollution to 15 per cent below 1990 levels by 2020, 37 per cent by 2030 and 80 per cent by 2050.

Action areas include transportation; buildings and homes; land use planning; industry and business; collaboration with Indigenous communities; research and development; government; agriculture; and forests and lands

Every action area described in the CCAP has implications for Ontario's electricity sector.

The IESO's role in enabling some of these initiatives remains unclear at this time but work is underway to clarify roles and responsibilities.

Specified Consumers Forecast

- The IESO's role to date has been providing annual TWh demand to the OEB for their use in setting RRP rates (Tiered and TOU)
- Monthly and annually the IESO provides information to the OEB based on actuals for rate updates and forecast analysis
- Specified consumers go beyond the RPP eligible
- We will have four years of data to develop forecasts for Clean Energy Adjustment rates

Monthly OEB RPP Variance Account Report

Month & Year	RPP Load Submitted by LDC's	Total Market AQEW	RPP vs. Total Market AQEW	"Gross" Accumulated IESO Variance Account ⁴	"Net" IESO Variance Balance (IESO VA less OPG Rebate) ⁴	Cumulative "Net" Interest	"Net" IESO Variance Balance (IESO VA less OPG Rebate) ⁴ including interest
	kWh Total	kWh	%	\$	\$	\$	\$
Oct-16	4,529,048,317	10,321,447,273	44.16%	\$676,854,013.85	\$73,058,109	-\$6,563,177.52	\$66,494,931
Nov-16	4,371,745,587	10,492,527,220	44.18%	\$70,224,836.60	\$70,224,837	\$11,022.06	\$70,235,859
Dec-16	4,713,221,033	11,689,726,329	44.10%	-\$27,637,063.96	-\$27,637,064	\$51,431.79	-\$27,585,632
Jan-17	5,335,304,962	11,828,819,703	44.36%	-\$6,002,338.17	-\$6,002,338	\$101,065.18	-\$5,901,273
Feb-17	4,979,491,689	10,417,870,348	44.43%	-\$29,244,185.66	-\$29,244,186	\$79,819.65	-\$29,164,366
Mar-17	5,198,153,131	11,408,408,037	44.18%	-\$66,756,693.44	-\$66,756,693	\$69,434.54	-\$66,687,259
Apr-17	4,435,407,154	9,695,799,202	44.15%	-\$18,568,705.33	-\$18,568,705	\$61,273.68	-\$18,507,432
May-17	4,401,035,843	10,013,011,756	44.22%	\$114,034,880.00	\$114,034,880	\$9,224.92	\$114,044,105
Jun-17	4,316,533,813	10,477,034,607	44.29%	\$136,510,260.51	\$136,510,261	-\$2,833.07	\$136,507,427
Jul-17	4,810,997,307	11,355,300,033	44.37%	\$139,258,989.16	\$139,258,989	\$72,109.96	\$139,331,099
Aug-17	4,997,167,274	11,139,446,944	44.24%	\$194,389,126.61	\$194,389,127	\$209,413.08	\$194,598,540
Sep-17	4,661,892,190	10,497,819,588	43.88%	\$181,526,277.37	\$181,526,277	\$338,578.91	\$181,864,856
12 month Total	56,749,998,299	129,337,211,040	43.88%	\$1,364,589,398	\$760,793,493	-\$5,562,637	\$755,230,856



RPP Actual Data Provided Annually to OEB

Month
&
Year

RPP Load Submitted by LDC's

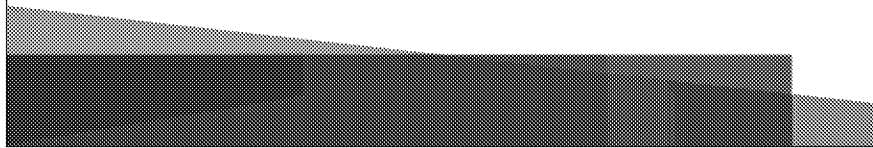
kWh

	Tier 1	Tier 2	Off-Peak	Mid-Peak	On-Peak	Total
Jan-16	637,976,003	464,204,706	2,636,399,973	657,938,514	710,262,746	5,106,781,942
Feb-16	595,724,594	525,880,527	2,699,953,177	687,596,504	752,207,397	5,261,362,199
Mar-16	597,533,357	480,748,952	2,854,666,780	699,022,293	760,033,065	5,392,004,447
Apr-16	550,093,929	394,249,578	2,444,294,636	649,011,891	692,002,948	4,729,652,983
May-16	536,991,396	361,830,793	2,271,112,686	631,127,296	642,343,305	4,443,405,475
Jun-16	459,807,948	453,145,981	2,245,584,988	627,783,522	626,357,836	4,412,680,275
Jul-16	505,538,987	504,035,509	2,610,264,925	721,816,971	756,455,872	5,098,112,263
Aug-16	524,532,869	592,724,382	2,978,511,701	854,694,883	955,019,790	5,905,483,625
Sep-16	445,790,365	485,187,893	2,681,804,343	778,185,207	886,297,264	5,277,265,073
Oct-16	473,630,840	381,853,178	2,300,875,221	668,235,067	704,454,012	4,529,048,317
Nov-16	507,879,719	382,854,290	2,222,797,673	633,096,983	625,116,921	4,371,745,587
Dec-16	656,156,035	343,293,598	2,342,419,219	649,809,799	721,542,383	4,713,221,033
12 month Total	6,491,656,041	5,370,009,387	30,288,685,321	8,258,318,930	8,832,093,539	59,240,763,218



Historic and Projected Energy Use

Section 6



Historic Electricity Demand

Some broad trends:

- 1940's – Mid 2000's: growth in absolute terms, but at a declining rate
- Mid 2000's – today: pronounced demand reduction (re: economy, conservation, pricing effects), now effectively flat
- Changing sectoral composition: commercial up, industrial down, residential in between



Historic Electricity Demand

- Declining intensity of electricity use in residential sector
- Since early 2000's, shift to a predominantly summer peaking system
- Peakier annual load shape
- Growing prevalence of generation located on distribution systems, widening difference between provincial demand and grid demand

Projected Energy Usage

Electricity Demand by Sector (TWh)		2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Residential		52	52	52	51	51	50	50	50	50	49	49	49	49	50	50	50	50	50	51
Commercial		52	52	52	51	51	51	52	52	52	52	52	52	52	52	52	52	53	53	54
Industrial		34	35	34	35	35	35	34	34	34	34	34	33	34	34	34	34	34	34	35
Transportation ¹		0	0	0	0	1	1	1	2	2	3	3	4	4	5	6	7	7	8	9
Other ²		5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5

Notes:

¹ Transportation includes Electric Vehicles and Transit

² Other = Agriculture, Remote Communities, Generator Demand, Industrial Electricity Incentive, and Street Lighting

Electricity Demand by End-Use (TWh)				Electricity Demand by End-Use (TWh)				Electricity Demand by End-Use (TWh)				Electric Vehicle (EV) Stock Forecast				
Residential Net Energy Demand by End-Use (TWh)				Commercial Net Energy Demand by End-Use				Industrial Net Energy Demand by Subsector				Thousands of EVs				
2017	2025	2035		2017	2025	2035		2017	2025	2035		2017	2025	2035		
AC Central	3.0	3.0	3.0	Space Heating	4.1	4.7	5.1	Chemicals	2.4	3.5	4.0	Households				Commercial SOFT
AC Room	0.5	0.5	0.5	Computer Equipment	5.0	5.2	5.4	Fabricated Metals	1.9	1.9	2.0	2017	5,581,089	3,305,815,503		
Clothes Dryers	2.5	2.5	2.2	Cooking	0.8	0.8	0.8	Food And Beverage	2.3	2.3	2.6	2018	5,666,227	3,356,412,223		
Clothes Washers	0.3	0.3	0.3	Cooling Chillers	1.1	1.0	1.1	Mining	6.5	7.4	7.0	2019	5,749,669	3,406,188,634		
Computers	1.1	1.3	1.4	Cooling DX	3.6	3.6	3.8	Transportation And Machinery	3.1	3.0	3.1	2020	5,831,807	3,455,870,987		
Cooking	2.5	2.2	2.3	Domestic Hot Water	0.7	0.4	0.4	Miscellaneous Industrial	4.0	4.0	4.4	2021	5,910,039	3,504,894,508		
Dehumidifiers	0.5	0.5	0.4	Elevators	0.3	0.3	0.3	Non-Metallic Minerals	1.3	1.2	1.2	2022	5,980,524	3,548,806,209		
Dishwashers	0.5	0.5	0.5	HVAC Fans Pumps	4.5	3.9	3.6	Paper Manufacturing	2.6	2.1	1.9	2023	6,046,212	3,590,932,451		
Domestic Hot Water	3.8	3.3	3.3	Lighting	19.0	19.0	19.6	Petroleum Refineries	1.7	1.8	2.0	2024	6,107,951	3,631,662,560		
Elevators	0.2	0.2	0.2	Miscellaneous Equipment	5.1	5.7	6.6	Plastic And Rubber	2.1	2.0	2.1	2025	6,166,993	3,670,932,197		
Forced Air Central Heating	1.4	1.2	1.5	Other Plug Loads	4.0	4.1	4.2	Primary Metals	4.5	3.9	3.7	2026	6,223,916	3,710,854,449		
Freezers	1.7	1.7	1.8	Refrigeration	3.8	3.0	2.7	Wood Products	1.0	0.9	1.0	2027	6,279,658	3,754,051,817		
Lighting	7.6	6.0	4.9									2028	6,335,207	3,798,150,194		
Miscellaneous	4.2	4.9	5.8									2029	6,390,108	3,840,274,838		
Baseboard Heating	6.7	5.9	5.7									2030	6,443,694	3,881,397,857		
Other Consumer Electronic	3.8	4.1	4.8									2031	6,498,305	3,922,332,509		
Refrigerators	4.4	4.4	4.6									2032	6,550,344	3,964,872,528		
Set Top Boxes	0.8	0.8	0.9									2033	6,600,290	4,007,469,324		
Space Heating Room	0.1	0.1	0.1									2034	6,647,466	4,050,118,742		
Swimming Pool Pumps	0.6	0.6	0.6									2035	6,691,553	4,092,547,558		
Televisions	2.5	2.9	3.5													
Ventilation And Circulation	3.2	2.6	2.5													

Growth and Economic Assumptions

Driver	2005-2015	2015-2025	2025-2035
Annual growth in number of residential households ^{1,2}	1.4%	1.3%	0.8%
Annual growth in commercial floor space ^{1,2}	1.9%	1.4%	1.1%
Annual growth in Ontario Industrial GDP ³	-2.0%	1.1%	1.4%

Notes:

¹ IESO's Residential and Commercial Projections are based on Statistics Canada's Projections for the period 2015 to 2035. IESO's Industrial Projections are based on Statistics Canada's Projections for the period 2015 to 2035, and IESO's from 2025 to 2035.

