Reliability Outlook

An adequacy assessment of Ontario's electricity system

FROM OCTOBER 2020 TO MARCH 2022

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Executive Summary

Ontario's power system responded well to the challenges of recent months, including COVID-19 and unusually hot weather. The weather, along with the Industrial Conservation Initiative hiatus, caused electricity demand to reach levels the province hasn't seen since 2013. All available resources were required to manage the tight system conditions. Ontario's generators, importers, and demand response providers all rose to the occasion.

The recovery of Ontario's economy from COVID-19 continues to gain steam. Commercial and industrial loads have picked back up and electricity consumption patterns are gradually returning to pre-COVID levels. However, there remains some uncertainty about the pandemic's impacts on demand for electricity over the next 18 months and beyond. The IESO continues to monitor the situation closely.

As we approach the Fall season, electricity demand is expected to decline relative to summer due to the milder temperatures. Surplus baseload generation, typical during Spring and Fall, will be managed through market mechanisms, such as exports.

Looking further ahead, there is a forecast surplus of capacity for winter 2020/2021, a trend that is expected to continue over the next few winters. In contrast, a capacity need is expected to increase in the coming years during the summer periods. To ensure the reliability of the grid, the IESO's target capacity for the summer of 2021 is 700 MW to be acquired through the capacity auction. The auction will be held on December 2, 2020 and allow eligible demand response providers, generators with expiring contracts, system-backed capacity import and storage to compete.

If extreme weather conditions materialize, the IESO may delay generator maintenance outage requests to ensure that Ontario demand is met during the summer peak periods.

Note to readers: A Resource Adequacy Engagement will launch on September 28, 2020 to begin developing a framework for competitive acquisition/re-acquisition of resources that effectively balances cost-effectiveness and risk over various planning timeframes. Stakeholders interested in participating can register at www.ieso.ca or by contacting engagement@ieso.ca, and meeting materials will be made available online.

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1. Introduction

This Outlook covers the 18 months from October 2020 to March 2022, and supersedes the Outlook released on June 29, 2020.

The purpose of the 18-month horizon in the *Reliability Outlook* is to:

- Advise market participants of the resource and transmission reliability of the Ontario electricity system
- Assess potentially adverse conditions that might be avoided by adjusting or coordinating maintenance plans for generation and transmission equipment
- Report on initiatives being implemented to improve reliability within this time frame

This Outlook assesses resource and transmission adequacy based on the stated assumptions, following the Methodology to Perform the Reliability Outlook. Due to uncertainties associated with various assumptions, readers are encouraged to use their judgment in considering possible future scenarios.

Additional supporting documents are located on the IESO website.

Security and adequacy assessments are published on the IESO website on a daily basis and progressively supersede information presented in this report.

For questions or comments on this Outlook, please contact us at 905-403-6900 (toll-free 1-888-448-7777) or customer.relations@ieso.ca.

2. Updates to this Outlook

2.1 Updates to the Demand Forecast

The demand forecast used in this Outlook is informed by actual demand, weather and economic data through to the end of July 2020, and has been updated to reflect the most recent economic projections. Actual weather and demand data for August 2020 are included in the tables.

2.2 Updates to Resources

This *Reliability Outlook* considers planned generator outages over the 18-month period, submitted by market participants to the IESO's outage management system as of September 8, 2020. Market participants are required annually to submit information to enable the IESO to conduct reliability assessments. This information, provided to the IESO through Form 1230, was submitted by April 1, 2020.

2.3 Updates to the Transmission Outlook

This Outlook also considers transmission outage plans that were submitted to the IESO's outage management system by July 29, 2020.

2.4 Updates to the Operability Outlook

The outlook for surplus baseload generation (SBG) conditions over the next 18 months is based on generator outage plans submitted by market participants to the IESO's outage management system as of September 8, 2020.

3. Demand Forecast

The IESO has updated the demand forecast to reflect current-COVID-19 conditions. Economic disruption from COVID-19 was widespread and caused changes to the provincial electricity consumption patterns. As the province has re-opened, those patterns have started to move back towards the pre-COVID environment.

Going forward, the situation remains fluid, with considerable uncertainty. The IESO will continue to monitor and provide updated forecasts as new information becomes available.

The IESO is responsible for forecasting electricity demand on the IESO-controlled grid. This demand forecast covers the period October 2020 to March 2022 and supersedes the previous forecast released in June 2020. Tables of supporting information are contained in the 2020 Q3 Outlook Tables.

The coronavirus and the ensuing public health and policy responses, have had significant effects on Ontarians' behaviour and economic activity. Initially, these effects had a profound impact on electricity consumption patterns. The stay-in-place order and the closure of non-essential businesses caused overall electricity consumption to drop. With more people working from home, residential consumption increased and as the summer temperature increased, the residential sector air conditioning load caused the system to be much more weather sensitive and pushed up peak demands. Coupled with the temporary suspension of the Industrial Conservation Initiative[1] (ICI), the 2020 summer peaks were the highest they had been since 2013. Commercial loads have dropped but the declines have not offset the increase in residential loads. This means peaks have trended higher than previously. These conditions will persist through this winter, leading to higher winter peaks than previously expected. With the staged re-opening of the economy, commercial and industrial loads have picked back up and consumption patterns are gradually returning to pre-COVID levels. The economic consequences of the pandemic are likely to result in a significant drop in annual energy demand for 2020.

Going forward, the re-opening of schools will further boost electricity demand across the province. However, many Ontarians will remain working from home, impacting the demand for electricity across the various sectors.

The IESO continues to monitor the situation and will provide updated forecasts when more information becomes available.

[1] The Industrial Conservation Initiative is expected to resume in May 2021.

Table 3-1 | Forecast Energy Summary

Year	Normal Weather Energy (TWh)	% Growth in Energy
2020 (Forecast)	130.3	-2.1%
2021 (Forecast)	132.0	0.5%
2022 (Forecast)	133.0	0.8%

Table 3-2 | Forecast Seasonal Peaks

Season	Normal Weather Peak (MW)	Extreme Weather Peak (MW)
Winter 2020-21	20,837	22,581
Summer 2021	22,729	24,482
Winter 2021-22	20,858	22,073

Table 3-3 | Weekly Energy and Peak Demand Forecast

Week Ending	Normal Peak (MW)	Extreme Peak (MW)	Load Forecast Uncertainty (MW)	Normal Energy Demand (GWh)
04-Oct-20	17,976	20,222	786	2,269
11-Oct-20	16,581	17,007	507	2,246
18-Oct-20	16,633	17,107	392	2,226
25-Oct-20	16,767	17,412	318	2,295
01-Nov-20	17,040	17,761	416	2,336
08-Nov-20	17,732	18,462	601	2,373
15-Nov-20	18,334	18,593	342	2,427
22-Nov-20	18,672	19,334	607	2,512
29-Nov-20	18,892	19,735	409	2,558
06-Dec-20	19,740	20,734	555	2,666
13-Dec-20	19,805	21,455	690	2,689
20-Dec-20	19,784	21,537	362	2,699
27-Dec-20	19,653	21,451	528	2,604
03-Jan-21	19,778	21,594	528	2,602
10-Jan-21	20,585	22,581	570	2,796
17-Jan-21	20,674	22,554	547	2,817
24-Jan-21	20,837	22,543	483	2,824
31-Jan-21	20,825	22,297	404	2,823
07-Feb-21	20,424	21,680	734	2,734

Week Ending	Normal Peak (MW)	Extreme Peak (MW)	Load Forecast Uncertainty (MW)	Normal Energy Demand (GWh)
14-Feb-21	19,981	21,202	635	2,722
21-Feb-21	19,760	21,092	581	2,684
28-Feb-21	19,509	20,966	501	2,694
07-Mar-21	18,914	20,172	531	2,593
14-Mar-21	18,211	19,542	649	2,541
21-Mar-21	17,790	19,269	611	2,475
28-Mar-21	17,689	18,806	569	2,426
04-Apr-21	17,248	18,368	567	2,325
11-Apr-21	16,655	17,291	471	2,305
18-Apr-21	16,624	17,365	496	2,296
25-Apr-21	16,404	17,150	531	2,242
02-May-21	16,418	17,280	721	2,238
09-May-21	17,602	20,458	849	2,290
16-May-21	17,808	20,648	845	2,306
23-May-21	17,821	20,709	1,175	2,274
30-May-21	18,368	20,926	1,330	2,255
06-Jun-21	18,996	21,510	1,292	2,345
13-Jun-21	20,343	22,589	1,055	2,479
20-Jun-21	20,978	23,084	835	2,510
27-Jun-21	21,613	23,719	754	2,562
04-Jul-21	21,283	23,359	1,016	2,532
11-Jul-21	22,585	23,729	814	2,645
18-Jul-21	22,639	24,482	838	2,742
25-Jul-21	22,710	24,354	1,035	2,752
01-Aug-21	22,729	24,287	841	2,750
08-Aug-21	21,963	24,218	958	2,647
15-Aug-21	21,932	24,270	985	2,678
22-Aug-21	22,066	24,038	1,362	2,665
29-Aug-21	21,514	23,538	1,413	2,617
05-Sep-21	21,114	23,242	1,370	2,587
12-Sep-21	21,248	23,166	680	2,531
19-Sep-21	19,990	22,626	781	2,442
26-Sep-21	18,981	21,344	420	2,397
03-Oct-21	18,278	20,472	554	2,343
10-Oct-21	17,003	17,503	786	2,297
17-Oct-21	17,122	17,557	507	2,273
24-Oct-21	17,260	17,804	392	2,337
31-Oct-21	17,408	18,108	318	2,372
07-Nov-21	17,691	18,487	416	2,388

Week Ending	Normal Peak (MW)	Extreme Peak (MW)	Load Forecast Uncertainty (MW)	Normal Energy Demand (GWh)
14-Nov-21	18,633	18,817	601	2,458
21-Nov-21	18,931	19,487	342	2,545
28-Nov-21	19,103	19,956	607	2,594
05-Dec-21	19,947	20,974	409	2,691
12-Dec-21	19,925	21,445	555	2,730
19-Dec-21	19,931	21,427	690	2,743
26-Dec-21	19,964	21,770	362	2,765
02-Jan-22	19,776	21,227	528	2,613
09-Jan-22	20,224	21,982	570	2,752
16-Jan-22	20,689	22,073	547	2,873
23-Jan-22	20,858	22,059	483	2,880
30-Jan-22	20,787	22,070	404	2,879
06-Feb-22	20,446	21,840	734	2,799
13-Feb-22	20,099	21,503	635	2,778
20-Feb-22	20,024	21,498	581	2,773
27-Feb-22	19,926	21,479	501	2,718
06-Mar-22	19,480	20,714	531	2,667
13-Mar-22	18,919	20,091	649	2,600
20-Mar-22	18,460	19,790	611	2,531
27-Mar-22	18,265	19,322	569	2,482
03-Apr-22	17,825	18,911	567	2,392

4. Resource Adequacy

The IESO expects to have sufficient generation supply for winter 2020/2021, accounting for zonal transmission constraints. Potential risks in summer 2021 are expected to be mitigated by outage rescheduling.

This section assesses the adequacy of resources to meet the forecast demand. Resource adequacy is one of the reliability considerations used for approving outages. When reserves are below required levels, with potentially adverse effects on the reliability of the grid, the IESO will reject outage requests based on their order of precedence. Conversely, when reserves are above required levels, additional outages can be contemplated, provided other factors – such as local considerations, operability or transmission security – do not pose a reliability concern. In those cases, the IESO may place an outage at risk, signaling to the facility owner to consider rescheduling the outage.

The existing installed generation capacity is summarized in Table 4-1. This includes capacity from new facilities that have completed the IESO's market registration process since the previous Outlook. The forecast capability at the Outlook peak is based on the firm resource scenario, which includes resources currently in commercial operation, and takes into account deratings, planned outages and an allowance for capability levels below rated installed capacity.

Table 4-1 | Existing Grid-Connected Resource Capacity

Fuel Type	Total Installed Capacity (MW)	Forecast Capability at Outlook Peak Normal Weather (MW)	Forecast Capability at Outlook Peak Extreme Weather (MW)	Number of Stations	Change in Number of Stations	Change in Installed Capacity
Nuclear	13,009	10,504	9,988	5	0	0
Hydroelectric	9,060	5,238	4,529	76	0	0
Gas/Oil	11,317	9,339	8,914	32	0	0
Wind	4,486	634	634	39	0	0
Biofuel	295	254	254	7	0	0
Solar	478	64	64	10	0	0
Demand Measures	-	28	28	-	-	-
Firm Imports (+) / Exports (-) (MW)	-	0	0	-	-	-
Total	38,644	26,061	24,412	169	**0**	**0**

4.1 Assessment Assumptions

4.1.1 Generation Resources

All generation resources scheduled to come into service, be upgraded or be shut down within the Outlook period are summarized in Table 4-2. This includes generation projects in the IESO's connection assessment and approval (CAA) process, those under construction, and contracted resources. Details regarding the IESO's CAA process and the status of these projects can be found on the Application Status section of the IESO website.

The estimated effective date column in Table 4-2 indicates when the market registration process is expected to be complete for each generation resource, based on information available to the IESO as of September 8, 2020. Two scenarios are used to describe project risks:

- The **planned scenario** assumes that all resources scheduled to come into service are available over the assessment period.
- The **firm scenario** assumes resources are restricted to those that have reached commercial operation status at the time this assessment was completed.

Planned shutdowns or retirements of generators that have a high likelihood of occurring are considered for both scenarios.

Table 4-2 | Committed Generation Resources Status

					Capacity Considered	
Project Name	**Zone**	**Fuel Type**	**Estimated Effective Date**	**Project Status**	**Firm (MW)**	**Planned (MW)**
Henvey Inlet Wind Farm	Essa	Wind	2020-Q3	Commissioning	0	300
Romney Wind Energy Centre	West	Wind	2020-Q4	Commissioning	0	60
Calstock	Northeast	Biofuel	2020-Q4	Expiring Contract	-38	-38
Iroquois Falls	Northeast	Gas	2021-Q4	Expiring Contract	-131	-131
Total					**-169**	**191**

Notes on Table 4-2:

The total may not add up due to rounding and does not include in-service facilities. Project status provides an indication of the project progress, using the following terminology:

• Under Development – projects in approvals and permitting stages (e.g., environmental assessment, municipal approvals, IESO connection assessment approvals) and projects under construction

• Commissioning – projects undergoing commissioning tests with the IESO

• Commercial Operation – projects that have achieved commercial operation status under the contract criteria, but have not met all of the IESO's market registration requirements

• Expiring Contract – contracts that will expire during the Outlook period are included in both scenarios only up to their contract expiry date. Generators (including non-utility generators) that continue to provide forecast output data are also included in the planned scenario for the rest of the 18-month period.

4.1.2 Generation Capability

Hydroelectric

A monthly forecast of hydroelectric generation output is calculated based on median historical values of hydroelectric production and contribution to operating reserve during weekday peak demand hours. Through this method, routine maintenance and actual forced outages of the generating units are implicitly accounted for in the historical data (see the first row in Table 4-3). To reflect the impact of hydroelectric outages on the reserve above requirement (RAR) and allow the assessment of hydroelectric outages as per the outage approval criteria, the hydroelectric capability is also calculated, without accounting for historical outages (see the second row of Table 4-3). Table 4-3 uses data from May 2002 to March 2020, which are updated annually to coincide with the release of the Q2 Outlook.

Table 4-3 | Monthly Historical Hydroelectric Median Values for Normal Weather Conditions

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Historical Hydroelectric Median Contribution (MW)	6,327	6,266	6,068	6,021	6,116	5,940	5,790	5,431	5,227	5,600	5,851	6,312
Historical Hydroelectric Median Contribution without Outages (MW)	6,835	6,854	6,593	6,542	6,561	6,427	6,238	5,998	6,068	6,430	6,601	6,815

Thermal Generators

Thermal generators' capacity, planned outages and deratings are based on market participant submissions. Forced outage rates on demand are calculated by the IESO based on actual operational data. The IESO will continue to rely on market participant-submitted forced outage rates for comparison purposes.

Wind

For wind generation, monthly wind capacity contribution (WCC) values from the weekday peak hour are used. The process for determining wind contribution can be found in the Methodology to Perform the Reliability Outlook. Figure 4-1 shows the monthly WCC values, which are updated annually with the release of the Q2 Outlook.

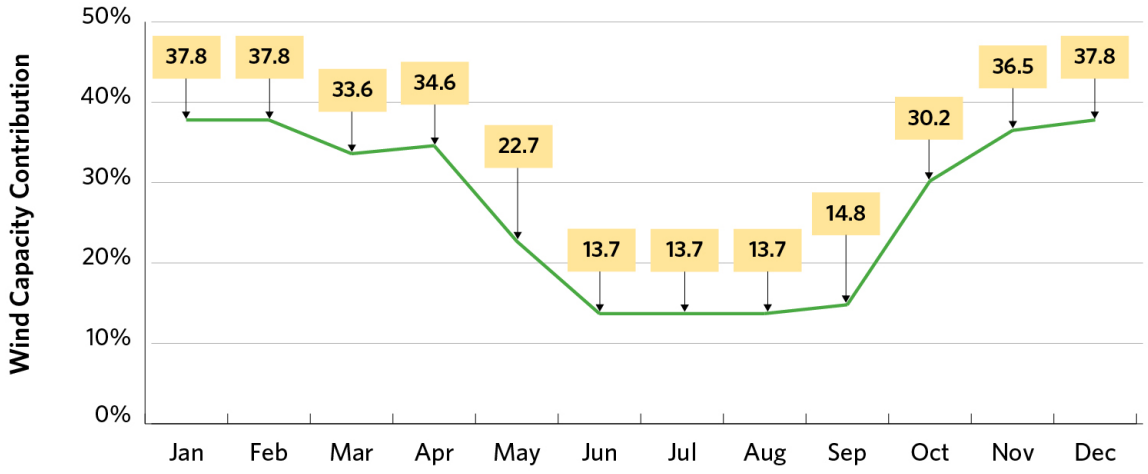

Figure 4-1 | Monthly Wind Capacity Contribution Values

Solar

For solar generation, monthly solar capacity contribution (SCC) values are used from the weekday peak hour. Information on how the solar contribution is calculated can be found in the Methodology to Perform the Reliability Outlook. Figure 4-2 shows the monthly SCC values, which are updated annually for the release of the Q2 Outlook.

The grid demand profile has been changing, due in part to the penetration of embedded solar generation, which is pushing summer peaks to later in the day. As a result, the contribution from grid-connected solar resources has declined at the time of peak Ontario demand.

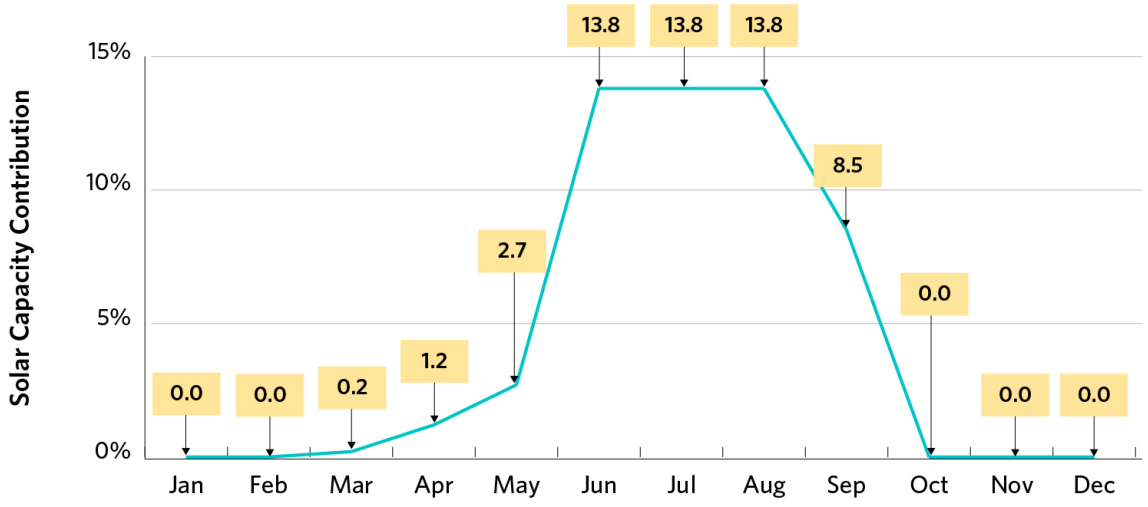

Figure 4-2 | Monthly Solar Capacity Contribution Values

4.1.3 Demand Measures

Both demand measures and load modifiers can impact demand, but differ in how they are treated within the Outlook. Demand measures, such as dispatchable loads and demand response procured through the IESO's capacity auction, are not incorporated into the demand forecast and are instead treated as resources. Load modifiers are incorporated into the demand forecast. The impacts of activated demand measures are added back into the demand history prior to forecasting demand for future periods.

4.1.4 Firm Transactions

Capacity-Backed Export

The IESO allows Ontario resources to compete in the capacity auctions held by certain neighbouring jurisdictions, but only if Ontario has adequate supply. Capacity-backed exports of 15 MW of installed capacity were successful in the New York Independent System Operator (NYISO) auctions for delivery between May and October 2020. The winter auction results for November 2020 to April 2021 were not available at time of writing.

System-Backed Exports

As part of the electricity trade agreement between Ontario and Quebec, Ontario will supply 500 MW of capacity to Quebec each winter from December to March until 2023. In addition, Ontario will receive up to 2.3 TWh of clean energy annually, scheduled economically via Ontario's real-time markets. The imported energy will target peak hours to help reduce greenhouse gas emissions in Ontario. The agreement includes the opportunity to cycle energy.

As part of this capacity exchange agreement, Ontario can call on 500 MW of capacity during summer before September 2030, based on the province's needs. Ontario does not expect to call on this capacity during this 18-month period.

4.1.5 Summary of Scenario Assumptions

To assess future resource adequacy, the IESO must make assumptions about the amount of available resources. The Outlook considers two scenarios: a firm scenario and a planned scenario.

The starting point for both scenarios is the existing installed resources shown in Table 4-1. The planned scenario assumes that all resources scheduled to come into service are available over the assessment period. The firm scenario considers only those resources that have reached commercial operation status as of the time of this assessment. Generator-planned shutdowns or retirements that have a high likelihood of occurring are considered for both scenarios. They also both reflect planned outages submitted by generators. Table 4-4 shows the available resources that are forecast for the 18 months, under the two scenarios in normal weather conditions, at the time of the summer and winter peak demands during the Outlook.

Table 4-4 | Summary of Available Resources under Normal Weather

Notes	Description	Winter Peak 2020/2021		Summer Peak 2021		Winter Peak 2021/2022	
		Firm Scenario	Planned Scenario	Firm Scenario	Planned Scenario	Firm Scenario	Planned Scenario
1	Installed Resources (MW)	38,644	39,004	38,644	39,004	38,644	39,004
2	Total Reductions in Resources (MW)	12,062	12,301	12,692	13,001	11,889	12,128
3	Demand Measures (MW)	688	688	28	28	145	145
4	Firm Imports (+) / Exports (-) (MW)	-500	-500	0	0	-500	-500
5	Available Resources (MW)	26,770	26,891	25,980	26,031	26,400	26,521
6	Bottling (MW)	655	679	81	81	603	603
7	Available Resources without Bottling (MW)	27,424	27,570	26,061	26,112	27,003	27,124

Notes on Table 4-4:

1. Installed Resources: The total generation capacity assumed to be installed at the time of the summer and winter peaks.

2. Total Reductions in Resources: The sum of deratings, planned outages, limitations due to transmission constraints and allowances for capability levels below rated installed capacity.

3. Demand Measures: The amount of demand expected to be available for reduction at the time of peak.

4. Firm Imports/Exports: The amount of expected firm imports and exports at the time of summer and winter peaks.

5. Available Resources: Installed Resources (line 1) minus Total Reductions in Resources (line 2) plus Demand Measures (line 3) and Firm Imports/Exports (line 4). This differs from the Forecast Capability at System Peak shown in Table 4-1 due to the impacts of generation bottling (transmission limitations).

6. Available Resources without Bottling: Available resources after they are reduced due to bottling.

4.2 Capacity Adequacy Assessment

The capacity adequacy assessment accounts for zonal transmission constraints resulting from planned transmission outages assessed as of July 29, 2020. The generation planned outages occurring during this Outlook period have been assessed as of September 8, 2020.

The outbreak of COVID-19 has added some uncertainty to our forecasts. The IESO will continue to provide timely updates to these assessments as information becomes available.

4.2.1 Firm Scenario with Normal and Extreme Weather

The firm scenario incorporates all capacity that had achieved commercial operation status as of September 8, 2020.

Figure 4-3 shows Reserve Above Requirement (RAR) levels, which represent the difference between available resources and required resources. The available resources exclude capacity acquired through capacity auctions. The required resources equals demand plus the required reserve.

The reserve requirement in the firm scenario under normal weather conditions is met throughout the entire Outlook period. In the firm scenario under extreme weather conditions, the reserve is lower than the

requirement for a total of seven weeks in 2021. Under the current outage schedule, the RAR is below the -2,000 MW threshold for two weeks in June, two weeks in July, two weeks in August and one week in September of 2021. This potential shortfall is largely attributed to planned generator outages scheduled during those weeks. If extreme weather conditions materialize, the IESO may reject some generator maintenance outage requests to ensure that Ontario demand is met during the summer peak periods.

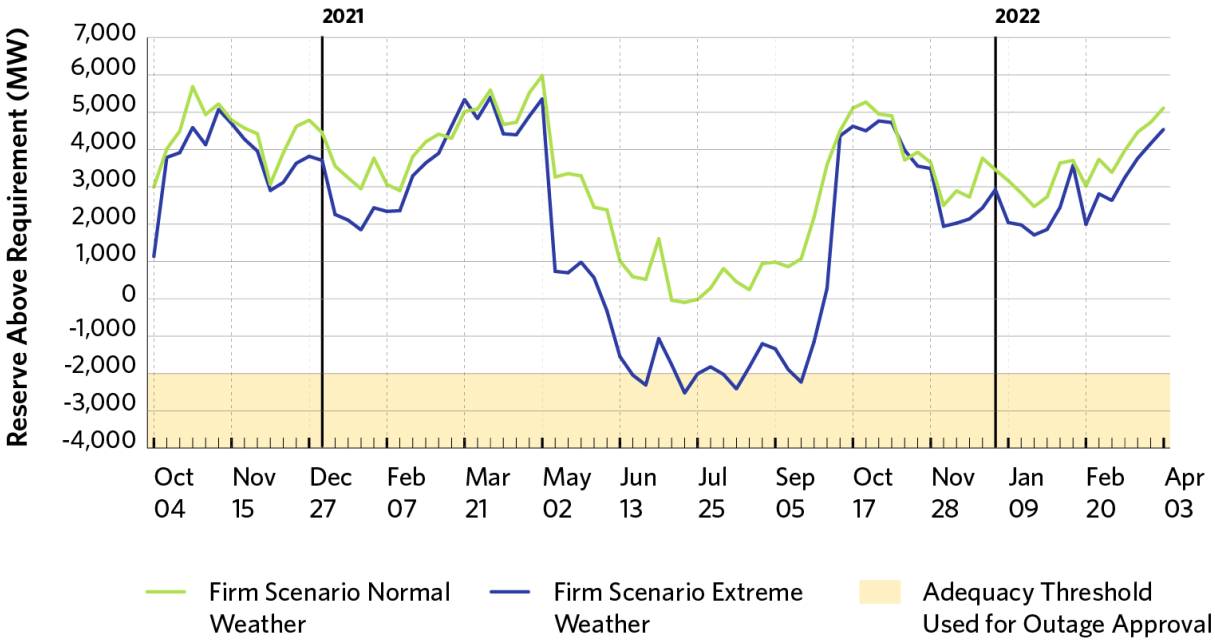

Figure 4-3 | Comparison of Normal and Extreme Weather: Firm Scenario Reserve Above Requirement

4.2.2 Planned Scenario with Normal and Extreme Weather

The planned scenario incorporates all existing capacity, as well as all capacity expected to come into service. Approximately 360 MW of new generation capacity is expected to connect to Ontario's grid over this Outlook period, while 169 MW of generation capacity contracts will expire, and these resources will no longer be available to meet demand for electricity.

Figure 4-4 shows RAR levels under the planned scenario. As observed, the reserve requirement will be met throughout the Outlook period under normal weather conditions.

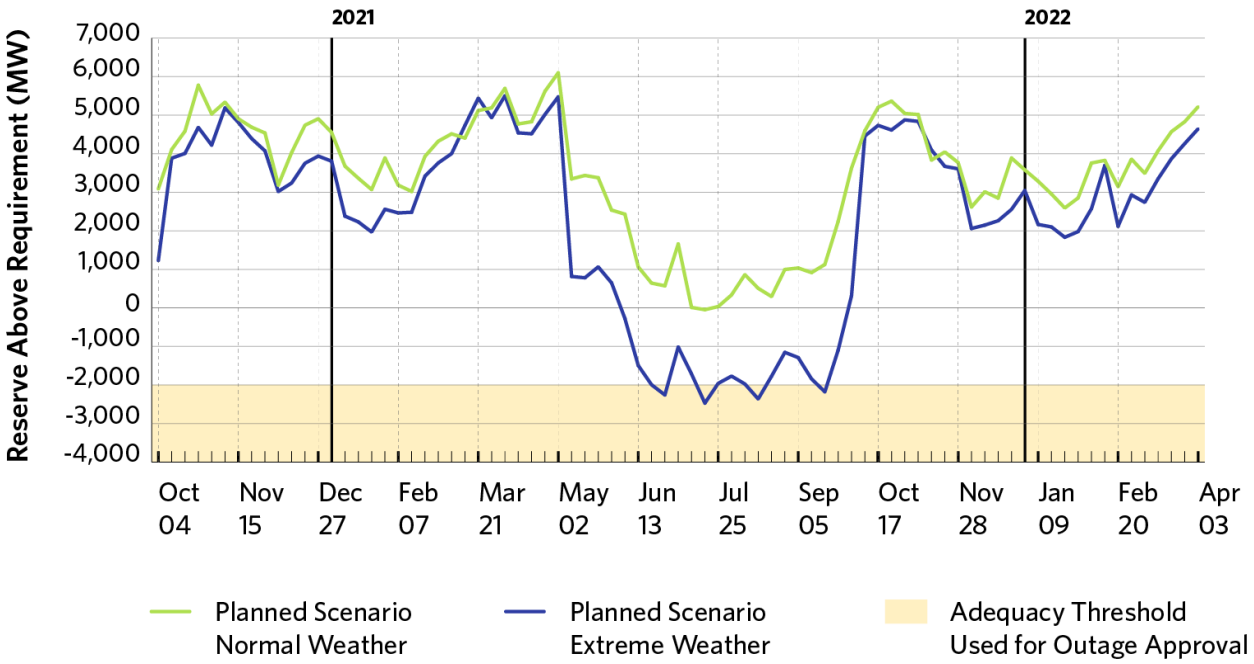

Figure 4-4 | Comparison of Normal and Extreme Weather: Planned Scenario Reserve Above Requirement

4.2.3 Comparison of the Current and Previous Weekly Adequacy Assessments for the Firm Extreme Weather Scenario

Figure 4-5 compares forecast RAR values in the current Outlook with those in the previous Outlook, which was published on June 29, 2020. The difference is primarily the result of changes in planned outages.

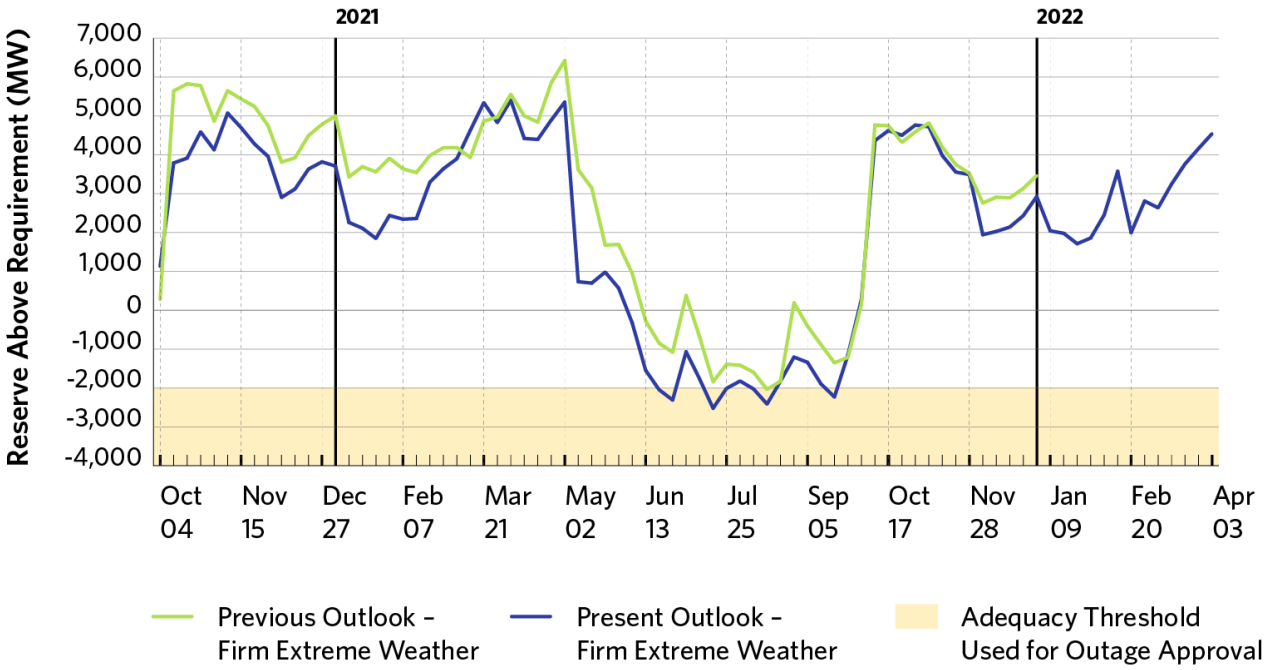

Figure 4-5 | Comparison of Current and Previous Outlook: Firm Scenario Extreme Weather Reserve Above Requirement

Resource adequacy assumptions and risks are discussed in detail in the Methodology to Perform the Reliability Outlook.

4.3 Energy Adequacy Assessment

This section assesses energy adequacy to determine whether Ontario has sufficient supply to meet its forecast energy demands, while highlighting potential adequacy concerns during the Outlook time frame. At the same time, the assessment estimates the aggregate production by resource category to meet the projected demand based on assumed resource availability.

4.3.1 Summary of Energy Adequacy Assumptions

The energy adequacy assessment (EAA) uses the same set of assumptions as the capacity assessment, as outlined in Table 4-1 and Table 4-2, which indicate the total capacity of committed resources and when they are expected to be available over the next 18 months. The monthly forecast of energy production capability, based on energy modelling results, is included in the 2020 Q3 Outlook Tables.

For the EAA, only the firm scenario in Table 4-5 with normal weather demand is assessed. The key assumptions specific to this assessment are described in the Methodology to Perform the Reliability Outlook.

4.3.2 Results – Firm Scenario with Normal Weather

Table 4-5 summarizes the energy simulation results over the next 18 months for the firm scenario with normal weather demand both for Ontario and for each transmission zone.

Table 4-5 | Summary of Zonal Energy for Firm Scenario Normal Weather

	18-Month Energy Demand		18-Month Energy Production		Net Inter-Zonal Energy Transfer	Zonal Energy Demand on Peak Day of 18-Month Period	Available Energy on Peak Day of 18-Month Period
Zone	TWh	Average MW	TWh	Average MW	TWh	GWh	GWh
Bruce	0.9	68.0	59.4	4,528.0	58.5	1.5	115.5
East	12.5	956.0	17.6	1,344.0	5.1	25.8	100.6
Essa	12.7	964.0	3.8	287.0	-8.9	26.9	15.7
Niagara	5.9	453.0	20.7	1,580.0	14.8	15.5	52.4
Northeast	15.8	1,200.0	14.6	1,116.0	-1.2	27.1	34.9
Northwest	5.5	420.0	7.0	533.0	1.5	8.2	20.9
Ottawa	20.3	1,545.0	0.2	18.0	-20.1	41.8	0.9
Southwest	40.2	3,059.0	7.6	582.0	-32.6	91.9	26.1
Toronto	72.2	5,496.0	60.2	4,586.0	-12.0	175.3	166.6
West	20.0	1,526.0	14.6	1,115.0	-5.4	50.0	77.5

Ontario	**205.9**	**15,687.0**	**205.9**	**15,687.0**	**0.0**	**464.0**	**611.1**

4.3.3 Findings and Conclusions

The EAA results indicate that Ontario is expected to have sufficient supply to meet its forecast energy needs throughout the outlook period for the firm scenario with normal weather demand, without having to rely on support from external jurisdictions.

The figures and tables in this section are based on a simulation of the province's power system, using the assumptions presented within the Outlook to confirm that Ontario will be energy adequate.

Figure 4-6 breaks down projected production by fuel type to meet Ontario's energy demand for the next 18 months, while Figure 4-7 shows the production by fuel type for each month. The province's energy exports and imports are not considered in this assessment. Table 4-6 summarizes these simulated production results by fuel type, for each year.

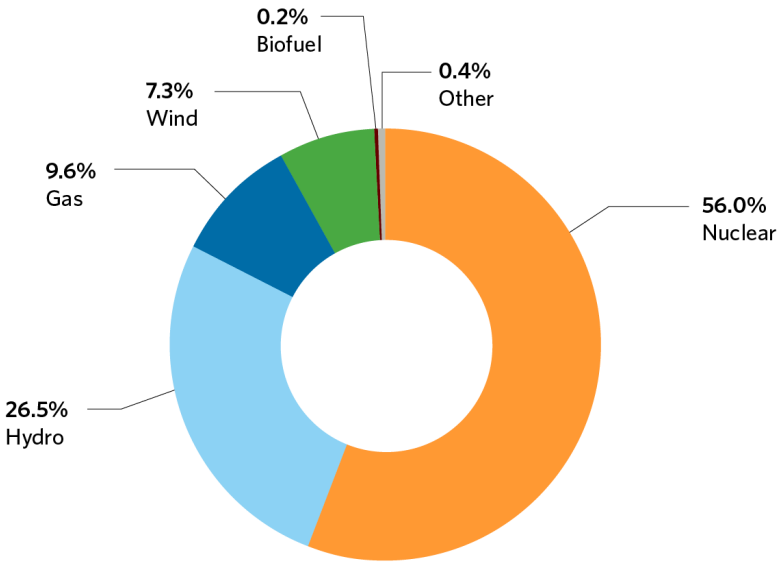

Figure 4-6 | Forecast Energy Production by Fuel Type

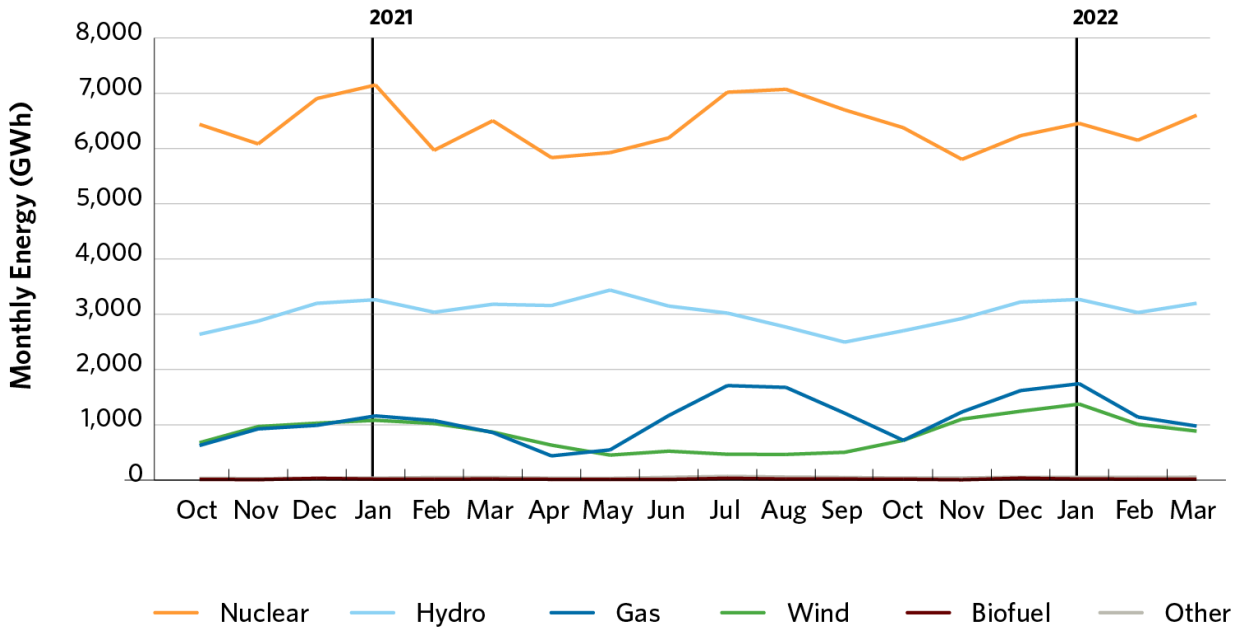

Figure 4-7 | Forecast Monthly Energy Production by Fuel Type

Table 4-6 | Ontario Energy Production by Fuel Type for the Firm Scenario Normal Weather

Fuel Type (Grid-Connected)	2020 (Oct 1 – Dec 31) (GWh)	2021 (Jan 1 – Dec 31) (GWh)	2022 (Jan 1 – Mar 31) (GWh)	Total (GWh)
Nuclear	19,425	76,779	19,207	115,411
Hydro	8,715	36,365	9,499	54,579
Gas & Oil	2,543	13,418	3,861	19,822
Wind	2,675	9,082	3,269	15,025
Biofel	53	215	54	323
Other (Solar & DR)	92	539	148	779
Total	**33,503**	**136,398**	**36,038**	**205,939**

5. Transmission Reliability Assessment

Ontario's transmission system is expected to continue to reliably supply province-wide demand, while experiencing normal contingencies defined by planning criteria for the next 18 months. However, some combinations of transmission and/or generation outages could create operating challenges.

The IESO assesses transmission adequacy using a methodology based on conformance to established criteria, including the Ontario Resource and Transmission Assessment Criteria (ORTAC), NERC transmission planning standard TPL 001-4 and NPCC Directory #1 as applicable. Planned system enhancements and projects, and known transmission outages are also considered in the studies.

Ontario's transmission system is expected to continue to reliably supply province-wide demand while experiencing normal contingencies defined by planning criteria for the next 18 months.

5.1 Transmission Projects

This section considers the information transmitters provide with respect to transmission projects that are planned for completion within the next 18 months. The list of transmission projects is provided in Appendix B1. Note that the planned in-service dates in this table and throughout this document are as of March 2020. These dates are subject to change as a result of the impact of the COVID-19 pandemic on project logistics. Any changes will be communicated through subsequent Reliability Outlooks.

5.2 Transmission Outages

The IESO's assessment of transmission outage plans is shown in Appendix C, Tables C1 to C11. The methodology used to assess the transmission outage plans is described in the Methodology to Perform the Reliability Outlook. This Outlook reflects transmission outage plans submitted to the IESO as of July 29, 2020.

5.3 Transmission Considerations

The purpose of this section of the report is to highlight projects and outages that may affect the scheduling of other outages and/or may affect reliability, and to categorize these considerations by zone.

Bruce, Southwest, and West Zones

Hydro One has begun replacing the aging infrastructure at the Bruce 230 kV switchyard, which requires careful coordination of transmission and generation outages. This project is scheduled to be completed by Q2 2021. A two-and-a-half-week outage of circuits B501M starting January 25, 2021 and a one-week outage of circuit B502M starting November 9, 2020 will impact the transfer capability out of the Bruce zone.

Significant growth in the greenhouse sector has led to a number of customer connection requests in the Windsor-Essex region that are expected to exceed the capacity of the existing transmission system in the area. A new switching station at the Leamington Junction is proceeding toward a Q2 2022 in-service date. Outages may be more challenging to facilitate as new load connections are made and required transmission reinforcements are being implemented.

Toronto, East, and Ottawa Zones

Operational challenges due to high voltages in eastern Ontario and the Greater Toronto Area continue to occur during low-demand periods. High voltages are a challenge driven by lower minimum demand for electricity. Minimum electricity demands have continued to decrease in response to COVID-19. The IESO and Hydro One are currently managing this situation by removing from service certain 500 kV circuits mainly in eastern Ontario and occasionally in the Bruce area during those periods. Up to three 500 kV circuits were removed from service during instances of the lowest demand periods in Ontario. To address this issue on a longer-term basis, two 500 kV line-connected shunt reactors will be installed at Lennox TS with a target in-service date of Q4 2020 for the first reactor and Q4 2021 for the second reactor.

Aging circuit breakers in the Richview 230 kV switchyard are to be replaced by Q1 2021. Hydro One and the IESO will coordinate the outages required to reduce the impact on the Flow East Toward Toronto transfer capabilities.

Northwest, Northeast, and Essa Zones

In the Kapuskasing area, system reinforcements are planned for Q4 2021. During the construction of these reinforcements, certain outages may be restricted.

A two-and-a-half-week breaker outage at Hanmer TS started in July 28, 2020 will reduce transfer capability south on the North-South Tie. A one-month outage of circuit X504E starting September 28, 2020 will reduce transfer capability of the North-South Tie.

A two-week outage in September 2020 and a four-week outage in November 2020 of circuits E510V and E511V respectively will impact transfer capabilities between the Essa and Toronto zones.

Significant construction activities for the East West Tie reinforcement project will also occur over the Outlook period, requiring outages to existing transmission facilities in the northwest. A two-week outage of circuits A24P, A8L, and M23L starting November 9, 2020 will reduce transfer capability between the Northwest and Northeast zones.

Interconnections

The failure of the phase angle regulator (PAR) connected to the Ontario-New York 230 kV interconnection circuit L33P in early 2018 continues to hinder the province's ability to import electricity from New York through the New York-St. Lawrence interconnection and from Quebec through the Beauharnois interconnection. This has required enhanced coordination with affected parties and more focused management of St. Lawrence-area resources in real-time. Careful coordination of transmission and generation outages will continue to be required in the area.

PARs are unique pieces of equipment and replacements are not readily available. Replacement options for the unit are being investigated jointly with the IESO, Hydro One, NYISO and the New York Power Authority. The preferred replacement option is a new PAR with a +/- 60-degree angle range, based on the recommendation by the joint New York/Ontario team to Hydro One for tendering. The return-to-service date for the L33P PAR is expected to be March 2022. L34P PAR will be replaced after L33P is complete. The return-to-service date for L34P PAR is expected to be March 2023.

A planned two-week outage of circuit L51D starting September 21, 2020 will impact equipment at Lambton TS and reduce import and export transfer capability between Ontario and Michigan.

6. Operability

During the Outlook period, Ontario will continue to experience potential surplus baseload generation conditions, much of which can be managed with existing market mechanisms, such as exports and curtailment of variable generation.

This section highlights existing or emerging operability issues that could impact the reliability of Ontario's power system.

6.1 Surplus Baseload Generation

Baseload generation is made up of nuclear, run-of-the-river hydroelectric and variable generation, such as wind and solar. When baseload supply is expected to exceed Ontario demand, market signals reflect such conditions through lower prices, and resources in Ontario and at the interties respond accordingly. The resulting market outcomes may include higher export volumes, dispatching down of hydroelectric generation and grid-connected renewable resources, and nuclear manoeuvring or shutdowns. For severe surplus conditions that could affect the reliability of the system, the IESO may take out-of-market actions, such as manually curtailing resources and/or imports.

Ontario is expected to experience potential surplus baseload conditions during the shoulder periods throughout the Outlook. Figure 6-1 highlights the periods during which expected baseload generation may exceed forecast demand.

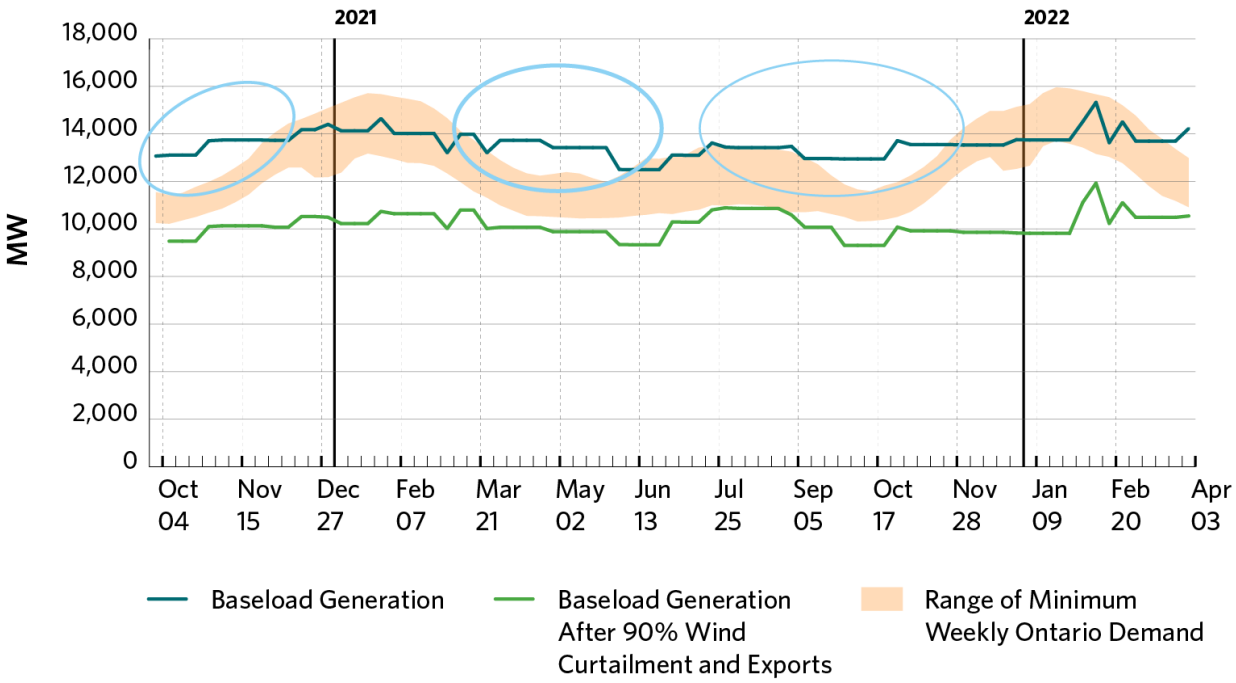

Figure 6-1 | Minimum Ontario Demand and Baseload Generation

Surplus baseload conditions can be managed with existing market mechanisms signaling for exports, and by curtailing variable and nuclear generation. Going forward, as shown in Figure 6-2, existing mechanisms will be sufficient for managing SBG.

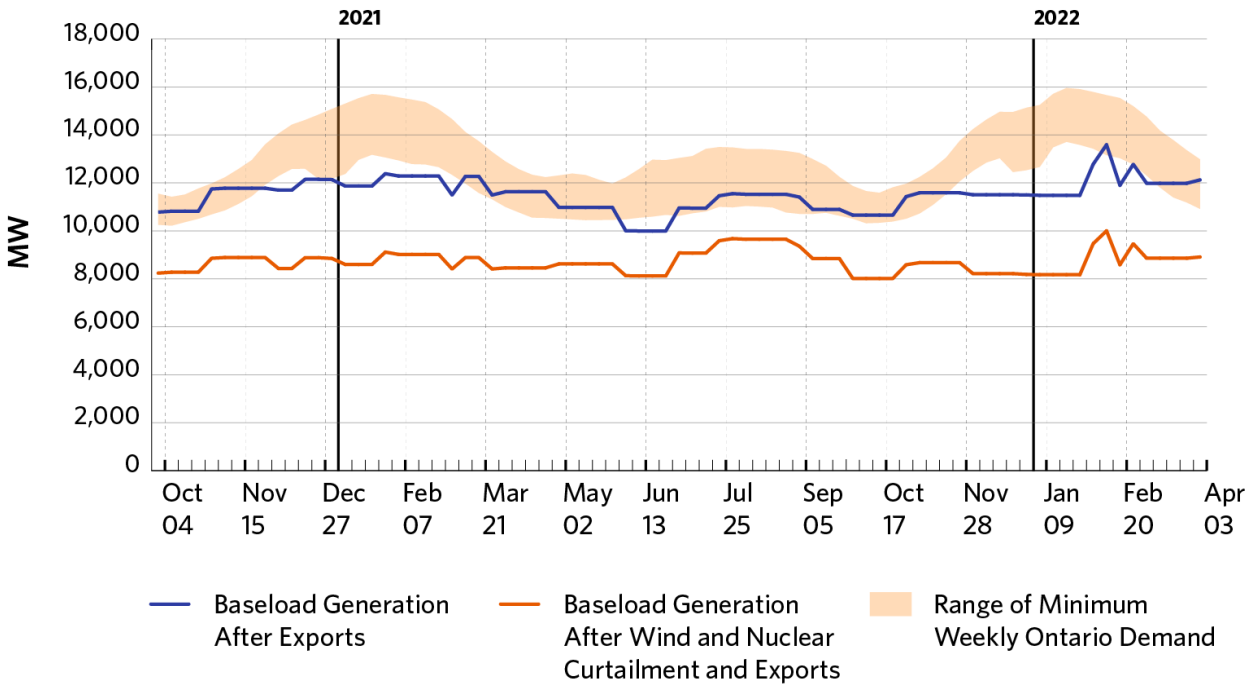

Figure 6-2 | Minimum Ontario Demand and Baseload Generation

The baseload generation assumptions include expected exports and run-of-river hydroelectric production, the latest planned outage information and in-service dates for new or refurbished generation. The expected contribution from self-scheduling and intermittent generation has been updated to reflect the latest data. Information on the dispatch order of wind, solar and flexible nuclear resources can be found in Market Manual 4 Part 4.2. Output from commissioning units is explicitly excluded from this analysis due to uncertainty and the highly variable nature of commissioning schedules. Figure 6-3 shows the monthly off-peak wind capacity contribution values calculated from actual wind output up to March 31, 2020. These values are updated annually to coincide with the release of the Q2 Outlook.

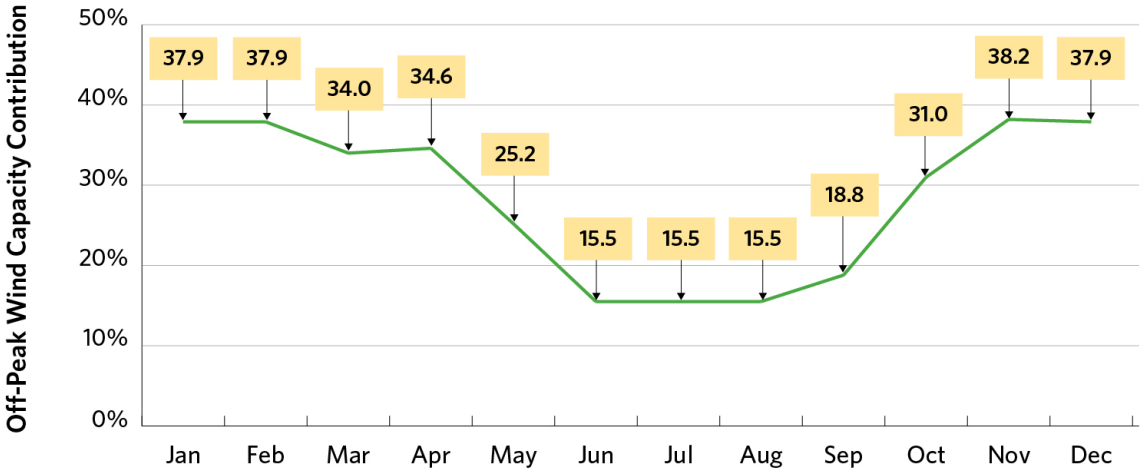

Figure 6-3 | Monthly Off-Peak Wind Capacity Contribution Values

7. Resources Referenced in This Report

The table below lists additional resources in the order they appear in the report.

Table 7-1 | Additional Resources

Resource	URL	Location in This Report
Reliability Outlook Webpage	http://www.ieso.ca/en/Sector-Participants/Planning-and-Forecasting/Reliability-Outlook	Introduction
Security and Adequacy Assessments	http://www.ieso.ca/power-data/data-directory	Introduction
2020 Q3 Outlook Tables	http://www.ieso.ca/-/media/files/ieso/document-library/planning-forecasts/reliability-outlook/ReliabilityOutlookTables_2020Sep.xls	Throughout
Connection Assessments and Approval Process	http://www.ieso.ca/en/sector-participants/connection-assessments/application-status	Assessment Assumptions
Methodology to Perform the Reliability Outlook	http://www.ieso.ca/-/media/files/ieso/document-library/planning-forecasts/reliability-outlook/ReliabilityOutlookMethodology2020Sep.pdf	Throughout
Capacity Auction	http://www.ieso.ca/en/Sector-Participants/Market-Operations/Markets-and-Related-Programs/Capacity-Auction	Demand Measures
Enabling Capacity Exports	http://www.ieso.ca/en/Sector-Participants/Market-Renewal/Capacity-Exports	Firm Transactions
Ontario Resource and Transmission Assessment Criteria	http://www.ieso.ca/-/media/files/ieso/Document%20Library/Market-Rules-and-Manuals-Library/market-manuals/market-administration/IMO-REQ-0041-TransmissionAssessmentCriteria.pdf	Transmission Considerations
NERC Transmission Planning Standard TPL-001-4	http://www.nerc.com/pa/Stand/Reliability%20Standards/TPL-001-4.pdf	Transmission Considerations
NPCC Directory #1	https://www.npcc.org/Standards/Directories/Directory_1_TFCP_rev_20151001_GJD.pdf	Transmission Considerations
Market Manual 4 Part 4.2	http://www.ieso.ca/-/media/Files/IESO/Document-Library/Market-Rules-and-Manuals-Library/market-manuals/market-operations/mo-dispatchdatartm.pdf?la=en	Surplus Baseload Generation
Grid-LDC Interoperability Standing Committee	http://www.ieso.ca/Sector-Participants/Engagement-Initiatives/Standing-Committees/Grid-LDC-Interoperability-Standing-Committee	Distributed Energy Resources

8. List of Acronyms

CAA	Connection Assessment and Approval
CROW	Control Room Operations Window
DER	Distributed Energy Resource
DR	Demand Response
EAA	Energy Adequacy Assessment
ESAG	Energy Storage Advisory Group
FETT	Flow East Toward Toronto
GS	Generating Station
GTA	Greater Toronto Area
ICI	Industrial Conservation Initiative
IESO	Independent Electricity System Operator
IRRP	Integrated Regional Resource Plan
kV	Kilovolt
LDC	Local Distribution Company
MW	Megawatt(s)
NERC	North American Electric Reliability Corporation
NPCC	Northeast Power Coordinating Council
NYISO	New York Independent System Operator
ORTAC	Ontario Resource and Transmission Criteria
PAR	Phase Angle Regulator
RAR	Reserve Above Requirement
RAS	Remedial Action Scheme
SBG	Surplus Baseload Generation
SCC	Solar Capacity Contribution
TS	Transmission/Transformer Station
TWh	Terawatt-hour(s)
WCC	Wind Capacity Contribution

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