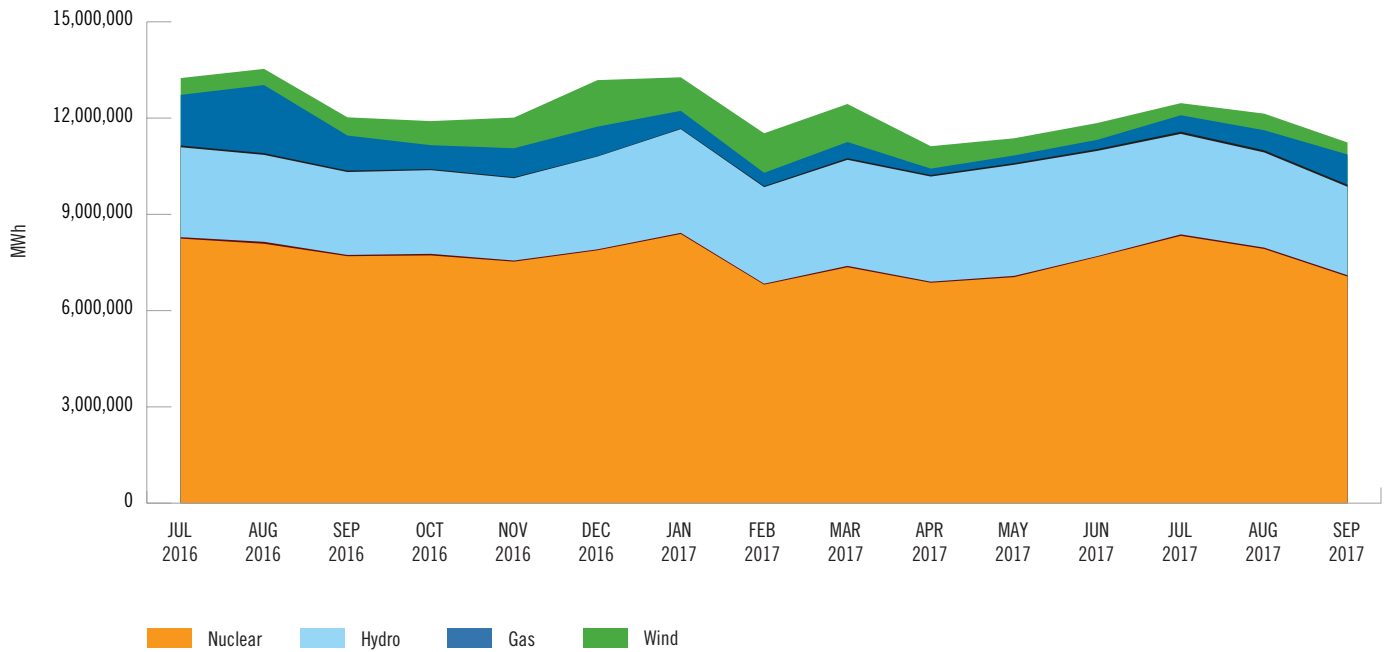


# Electricity Supply

## Monthly Energy Grid Output by Fuel Type

Ontario’s bulk electricity grid has a diverse supply mix, featuring baseload generators that provide energy around the clock, intermittent generators that generate when they are able (primarily wind and solar), and flexible generators that can change their output quickly (primarily natural gas).



Note: Total MW value may not add up to sum of column totals due to rounding.

Source: IESO

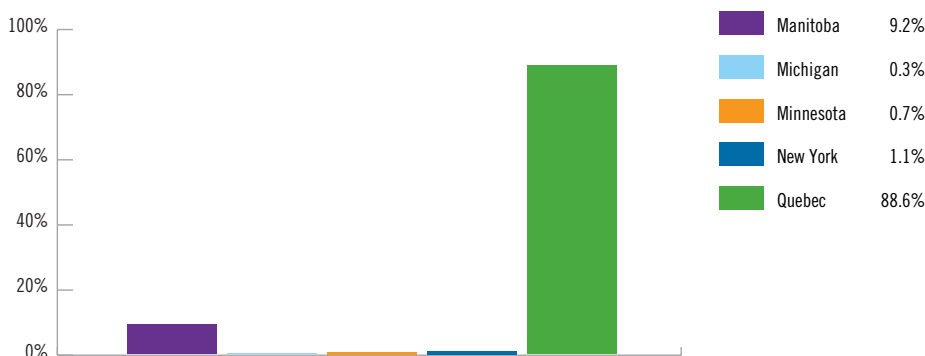
The data shown above is sourced from a report developed by the IESO, available at [reports.ieso.ca/public/GenOutputbyFuelMonthly/PUB\\_GenOutputbyFuelMonthly.xml](https://reports.ieso.ca/public/GenOutputbyFuelMonthly/PUB_GenOutputbyFuelMonthly.xml). The report uses settlement data to provide information for all self-schedulers, intermittent and dispatchable Ontario generators registered as a Market Participant. The report – which includes all grid-connected generators, plus those embedded generators that are also registered as market participants – is published monthly as per the Physical Settlement calendar.

## Imports and Exports

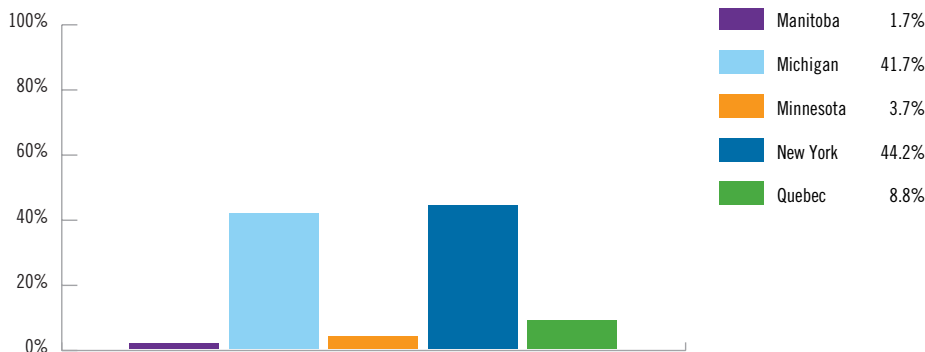
Ontario is connected to a large, stable network of transmission systems across North America, which supports system reliability and economic efficiency. Imports compete against domestic generation to provide energy at the best possible price and to support the province’s needs during periods of high demand. Ontario also exports energy when prices are higher, which helps to bring in revenue that helps offset other system and infrastructure costs and can help maintain system reliability during times of surplus generation.

Ontario imports and exports power across 26 interties with two provinces and three states. While Ontario is electrically interconnected with Manitoba, Michigan, Minnesota, New York and Quebec, the interties allow for electricity trade in transactions that can reach across eastern North America, contributing to a more diversified and competitive pool of supply.

### Imports



### Exports



Q3 (GWh)	Manitoba	Michigan	Minnesota	New York	Quebec	Total
Imports	186.92	6.68	14.9	22.86	1,802.97	<b>2,034.33</b>
Exports	74.86	1,844.53	163.77	1,955.2	390.09	<b>4,428.45</b>

Note: Numbers may not add up to totals due to rounding.

Source: IESO

## Installed Capacity Connected to Transmission Grid

Changes to installed transmission grid capacity in this quarter highlight the continuing process of renewal in Ontario’s electricity sector. While nuclear, hydroelectric and natural gas production accounted for the vast majority of bulk supply, new wind, biofuel and solar generators continued to connect to the transmission grid.

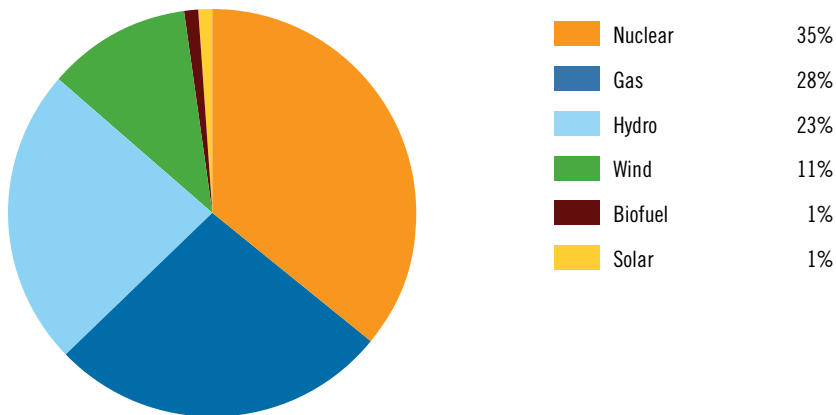
The [IESO Active Generation Contract List](#) provides the status of individual contracted electricity supply projects within different IESO procurement programs. The list is limited to generation facilities under contract to the IESO.

### New Facilities Registered in Q3

The following projects have completed commissioning and the market entry process and are included in the total installed IESO Market Participant generator capacity:

- Niagara Region Wind Farm (also known as West Lincoln NRWF) – 230 MW
- Upgrades at Bruce – 31 MW

### Grid-Connected Generation Capacity



Note: Data include all transmission-connected generation facilities and distribution-connected facilities that are Market Participants. Numbers may not add up to totals due to rounding.

Source: IESO

The table below shows the increased use of renewable resources for generating electricity in the province.

### Grid-Connected Generation Capacity

Year (MW)	Nuclear	Hydro	Coal	Gas*	Wind	Biofuel	Solar	Total
Q3 2017	13,009	8,480	0	10,277	4,213	495	380	<b>36,854</b>
2016	12,978	8,451	0	9,943	3,923	495	280	<b>36,070</b>
2015	12,978	8,432	0	9,942	3,504	495	240	<b>35,591</b>
2014	12,947	8,462	0	9,920	2,543	455	40	<b>34,367</b>
2013	12,947	7,939	2,291	9,920	1,725	124	0	<b>34,946</b>
2012	12,998	7,947	3,293	9,987	1,511	122	0	<b>35,858</b>
2011	11,446	7,947	4,484	9,549	1,412	122	0	<b>34,960</b>

\* Units that use natural gas, oil or are dual fuel, such as Lennox, NP Kirkland and NP Cochrane, are included in the Gas category.

Source: IESO

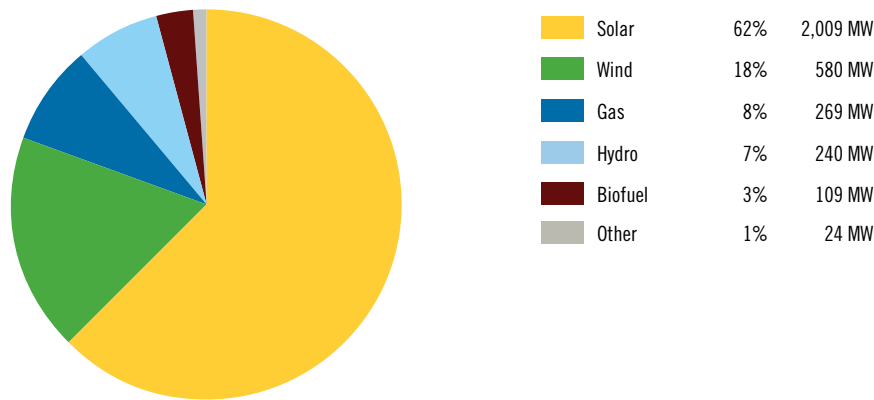
Note: Numbers may not add up to totals due to rounding.

### Embedded Generation (IESO-contracted)

Embedded generators supply electricity to local distribution systems, helping to reduce demand on the transmission grid and supporting some of the needs of local communities. While wind and solar make up the majority of contracted embedded generation, the IESO has contracted for increasing amounts of hydroelectric, combined heat and power, natural gas and biofuel systems that will also connect to local distribution networks.

By the end of Q3 2017, there was 3,231 MW of contracted generation in commercial operation within local distribution systems.

### Contracted Embedded Generation Capacity in Commercial Operation (Q3)

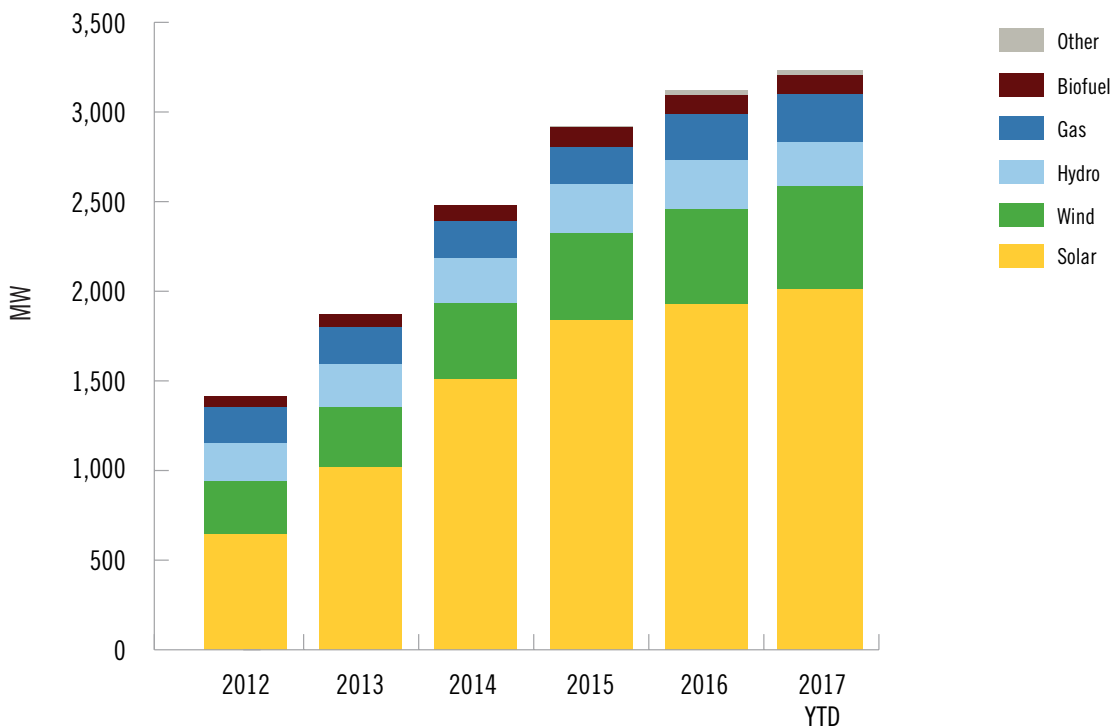


Note: Numbers may not add up to totals due to rounding.

Source: IESO

The table below shows the increased use of embedded generation to supply electricity to local distribution systems in the province.

### Contracted Embedded Generation Capacity in Commercial Operation



Note: Total IESO-contracted embedded generation in commercial operation at end of each period. Numbers may not add up to totals due to rounding.

Source: IESO

The data shown above are sourced from the IESO Progress Report on Contracted Supply. The report provides a quarterly update on the status of supply and procurement initiatives that are under development or in commercial operation, by fuel type, and aggregates total capacities as stated in each contract, which differs from values on installed capacity used for operation purposes. The report is available at [www.ieso.ca/power-data/supply-overview/transmission-connected-generation](http://www.ieso.ca/power-data/supply-overview/transmission-connected-generation).

## Total Grid-Connected and Contracted Embedded Generation Capacity

This chart shows all grid-connected capacity and IESO-contracted capacity in the province. It is calculated by adding the two capacity categories listed above.

Year	Nuclear	Hydro	Coal	Gas	Wind	Biofuel	Solar	Other	Total
2017 Q3 (MW)	13,009	8,720	0	10,546	4,793	603	2,389	24	<b>40,084</b>
2017 Q3 (%)	33%	22%	0%	26%	12%	2%	6%	<1%	

Note: Numbers may not add up to totals due to rounding.

Source: IESO

### Available Capacity at Peak

23,919 MW (Q3)

Peak Demand	21,786 MW (Q3)	Operating Reserve Requirement	1,418 MW (Q3)
Minimum Demand	10,487 MW (Q3)		

Source: IESO

Available capacity is all installed grid-connected capacity, less allowances made for seasonal derates, planned outages and the capacity of energy-limited resources. Reserves are required to ensure that the forecast Ontario Demand can be supplied with a sufficiently high level of reliability. Operating Reserve is the amount of supply resources required to handle the loss of the largest contingency on the grid, plus the loss of half the amount of the second largest contingency. More information on the criteria, tools and methodology the IESO uses to perform resource adequacy assessments can be found at [www.ieso.ca/power-data/market-summaries-archive](http://www.ieso.ca/power-data/market-summaries-archive).

## Conservation

As part of the Conservation First Framework (CFF) for 2015-2020, the province established a target of 7 terawatt-hours (TWh) in electricity savings<sup>2</sup> to be achieved through conservation programs offered by local distribution companies (LDCs). The province also established a target of 1.7 TWh to be achieved through the Industrial Accelerator Program (IAP), which is delivered by the Independent Electricity System Operator (IESO) to transmission-connected customers and their distribution-connected customers. Overall the province expects to achieve 8.7 TWh in savings by December 31, 2020.

As of 2017 quarter 3, LDC delivered CFF Programs have achieved 3,441 GWh in electricity savings representing 49% of the 2020 CFF target and the IESO delivered IAP Program has achieved 282 GWh in electricity savings representing 17% of the 2020 IAP target. For more details on quarterly results please see the quarterly IESO Conservation Progress Report via the IESO Conservation Reports website: [www.ieso.ca/power-data/conservation-overview/conservation-reports](http://www.ieso.ca/power-data/conservation-overview/conservation-reports).

### Conservation Portfolio Progress – Results (as of 2017 Q3)<sup>3</sup>

Incremental Progress		2017 Q3 Incremental	2015-2017 Q3 Incremental	2020 Target Progress (%)
LDC Delivered Programs	Peak Demand Savings (MW)	5	458	-
	Energy Savings (GWh)	26	3,441	49
IESO Delivered IAP Program	Peak Demand Savings (MW)	11	105	-
	Energy Savings (GWh)	80	282	17
<b>Total Portfolio</b>	<b>Total Peak Demand Savings (MW)</b>	<b>15</b>	<b>563</b>	<b>-</b>
	<b>Total Energy Savings (GWh)</b>	<b>106</b>	<b>3,722</b>	<b>-</b>

Note: Totals may not align due to rounding

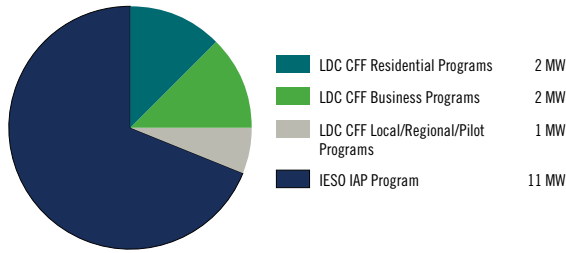
Source: IESO

2. All conservation metrics above are presented as 'net' savings which take into consideration the actual influence of the program on participants (e.g., estimating free-ridership and spill over savings). Furthermore, all savings presented above persist until the year 2020 at the end-user level (e.g., accounting for transmission and distribution system line losses). To align savings with generation level metrics, values should be increased by factor of 6.7% for distribution system level savings or a factor of 2.5% for transmission system level savings.

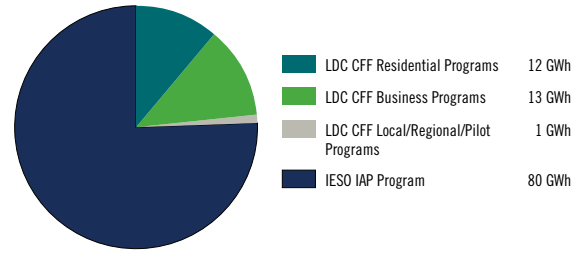
3. Results presented are 'reported' (i.e. 'unverified') based on project installation dates corresponding to the indicated period and are based on projects reported and invoiced to the IESO as of 2017 Q3.

### Incremental Savings (2017 Q3)

#### Peak Demand Savings



#### Annual Energy Savings



Note: Numbers may not add up to totals due to rounding; negative values due to adjustments to prior periods.

Source: IESO

### Demand Response (DR)

Demand response and peak savings programs benefit the electricity system and lower energy costs for consumers by contributing to overall peak savings for the province.

Demand response in the wholesale market is being transitioned from the contract-based Capacity-Based Demand Response (CBDR) program to an annual DR Auction. The DR Auction provides a transparent and cost-effective way to select the most competitive providers of DR, while ensuring that all providers are held to the same performance obligations. As the approximately 500 MW of capacity from CBDR contracts expire, that expiring capacity will be made available for competitive selection in the DR Auction.

The second annual DR auction was held in December 2016 and successfully secured 445.2 MW and 477.5 MW of DR capacity for the summer and winter commitment periods, respectively. The auction resulted in both increased participation and prices for DR capacity that are 12 to 17 percent lower than those achieved in 2015.

More information on the Demand Response Auction is available at: [www.ieso.ca/en/sector-participants/market-operations/markets-and-related-programs/demand-response-auction](http://www.ieso.ca/en/sector-participants/market-operations/markets-and-related-programs/demand-response-auction)

### Peak Savings

The Industrial Conservation Initiative (ICI) encourages large consumers to shift their energy use away from system-wide peaks. Customers who are able to reduce their impact on peaks benefit the system by reducing the need to build new infrastructure. In 2016, ICI is estimated to have reduced peak demand by 1,300 MW. Participating customers are assessed an individual Global Adjustment (GA) rate, based on the percentage that their demand contributes to the top five system coincident peaks measured during a defined base period.

The table below lists the top five daily peaks for the most recent base period, which began on May 1, 2016, and ended on April 30, 2017.

#### Top 5 Peaks: Hours & System-Wide Consumption (Base Period: May 1, 2016 to April 30, 2017)

Date	Hour Ending	Net Ontario Load (MW)	Embedded Generation (MW)	Total (MW)
August 10, 2016	18	22,636.692	572.321	<b>23,209.013</b>
September 7, 2016	17	22,526.876	635.985	<b>23,162.861</b>
August 11, 2016	17	22,317.771	789.884	<b>23,107.655</b>
July 13, 2016	18	22,188.464	753.156	<b>22,941.620</b>
August 12, 2016	17	21,904.371	765.541	<b>22,669.912</b>

Note: The value in the Total (MW) column is the number used to calculate a customer's Peak Demand Factor. The above values are used for the adjustment period July 1, 2017 to June 30, 2018.

Source: IESO

Information on peak tracking can be found at [www.ieso.ca/sector-participants/settlements/global-adjustment-for-class-a](http://www.ieso.ca/sector-participants/settlements/global-adjustment-for-class-a)

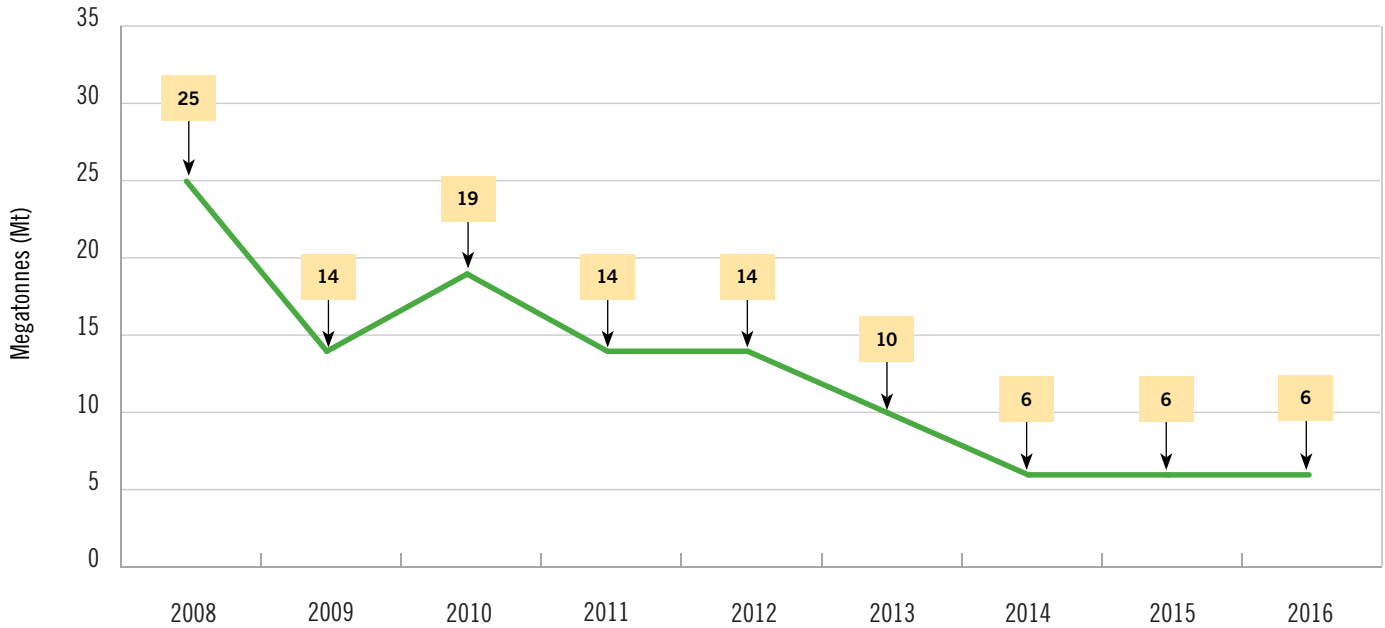
More information on the ICI is available at [www.ieso.ca/-/media/files/ieso/document-library/global-adjustment/ici-backgrounder.pdf?la=en](http://www.ieso.ca/-/media/files/ieso/document-library/global-adjustment/ici-backgrounder.pdf?la=en).

## Greenhouse Gas Emissions

The marked decline in greenhouse gas emissions (measured in tonnes of CO<sub>2</sub> equivalent) is a result of the phase-out of coal-fired electricity generation in the province and uptake of renewable generation and conservation measures. Emissions of oxides of sulphur (SO<sub>2</sub>) – which are predominantly a by-product of coal combustion – have also shown a marked decrease with the phase-out of coal-fired electricity.

### Greenhouse Gas Emissions for the Ontario Electricity Sector

The chart below shows annual greenhouse gas emissions (measured in tonnes of CO<sub>2</sub> equivalent) for the years 2008-2016. Year-to-date greenhouse gas emissions in Q3 2017 totalled approximately 2 Megatonnes (Mt).



Source: IESO, Environment Canada, Ontario Ministry of Environment and Climate Change

## Air Contaminants

Air contaminants, including oxides of sulphur (SO<sub>x</sub>), oxides of nitrogen (NO<sub>x</sub>) and fine particulate matter (PM<sub>2.5</sub>), are also released during combustion of fossil fuels.

### Air Contaminants for the Ontario Electricity Sector (Tonnes)

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017 YTD (Q3)
SO <sub>x</sub> Emissions	76,020	30,762	38,507	11,966	10,342	10,192	846	424	462	<b>88</b>
NO <sub>x</sub> Emissions	38,314	23,653	27,358	18,198	19,867	17,973	11,448	10,364	7,630	<b>2,569</b>
PM <sub>2.5</sub> Emissions	1,309	987	843	518	468	445	283	235	215	<b>122</b>

Source: IESO, Environment Canada