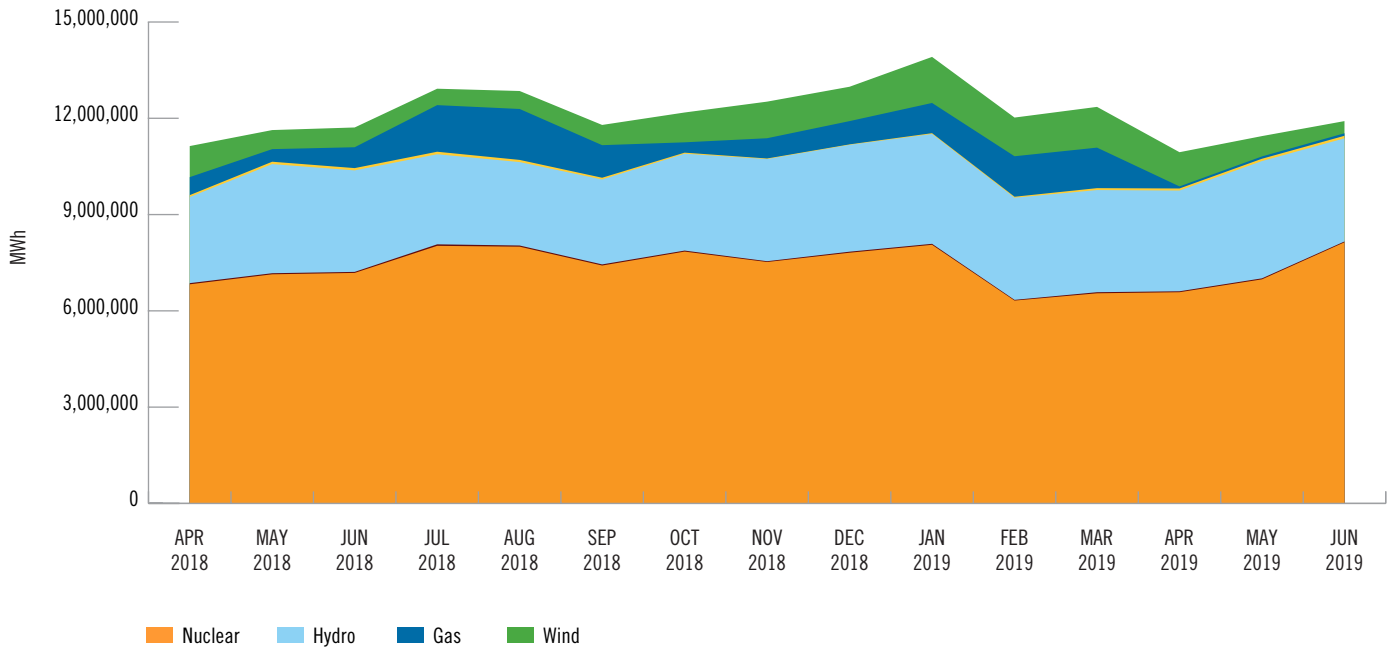


# Electricity Supply

## 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).



Source: IESO

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

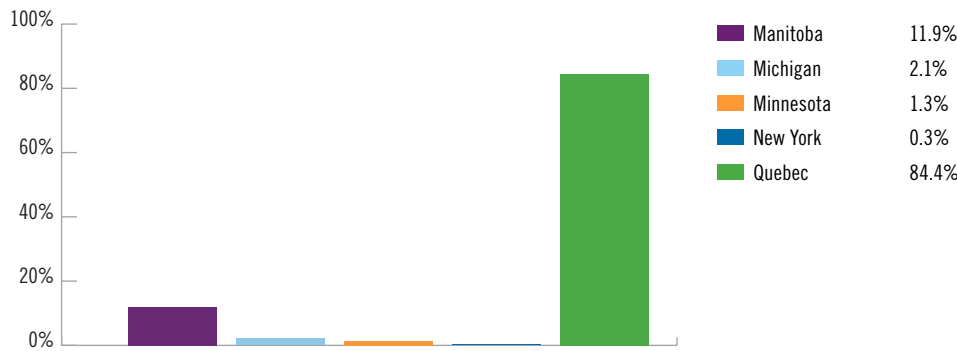
The data shown above is sourced from a report developed by the IESO, available at [reports.ieso.ca/public/GenOutputbyFuelMonthly/PUB\\_GenOutputbyFuelMonthly.xml](https://reports.ieso.ca/public/GenOutputbyFuelMonthly/PUB_GenOutputbyFuelMonthly.xml). The report uses settlement data to provide information 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

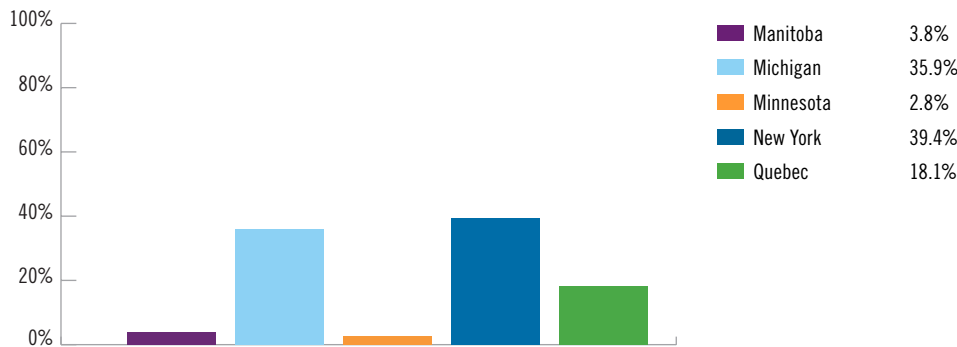
Ontario is connected to a large, stable network of transmission systems across North America, which supports system reliability and economic efficiency. Imports compete against domestic generation to provide energy at the best possible price and to support the province’s needs during periods of high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

### Q2 Imports



### Q2 Exports



Q2 (GWh)	Manitoba	Michigan	Minnesota	New York	Quebec	Total
Imports	106.84	18.68	11.43	2.64	756.66	<b>896.25</b>
Exports	197.25	1,849.81	141.83	2,027.34	929.47	<b>5,145.70</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.

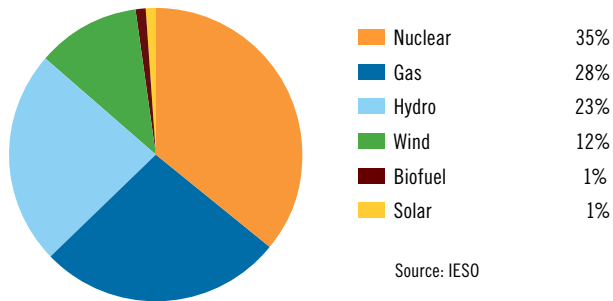
## New Facilities Registered in Q2

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

- Nanticoke Solar – 44 MW

*\*Note: One facility was approved for deregistration and another changed its rating. Therefore, the values presented in the Grid-Connected Capacity are lower.*

## Grid-Connected Generation Capacity



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

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
2019 YTD	13,009	8,499	0	10,277	4,486	295	424	<b>36,989</b>
2018	13,009	8,482	0	10,277	4,486	295	380	<b>36,929</b>
2017	13,009	8,490	0	10,277	4,213	495	380	<b>36,863</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>

\* 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

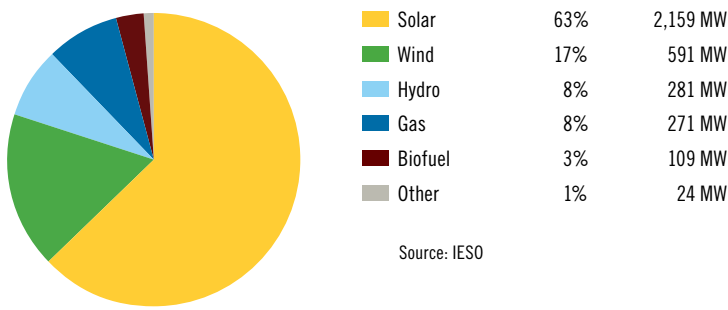
*Note: Numbers may not add up to totals due to rounding.*

## 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 Q2 2019, there was 3,436 MW of contracted generation in commercial operation within local distribution systems.

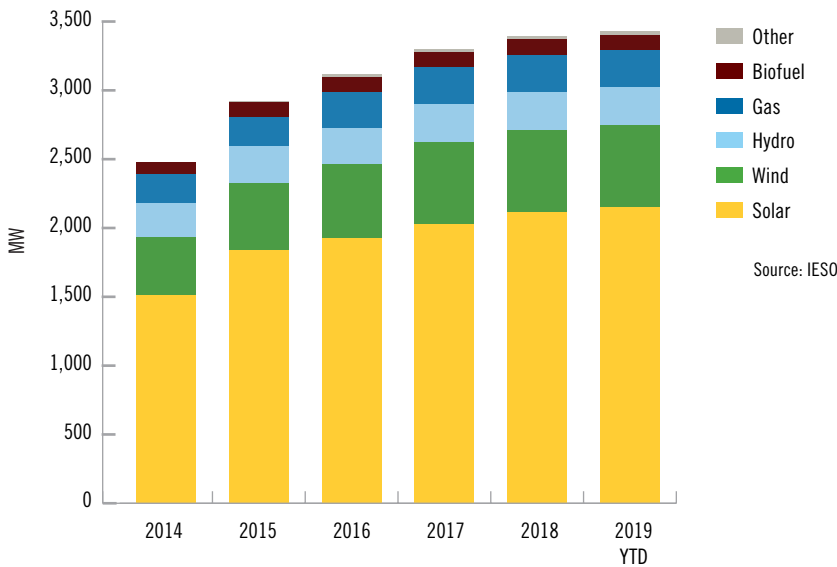
### Contracted Embedded Generation Capacity in Commercial Operation (Q2)



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

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.

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 [ieso.ca/power-data/supply-overview/transmission-connected-generation](http://ieso.ca/power-data/supply-overview/transmission-connected-generation).

### Total Grid-Connected and Contracted Embedded Generation Capacity

This table shows all grid-connected capacity and IESO-contracted embedded capacity in the province.

Year	Nuclear	Hydro	Coal	Gas	Wind	Biofuel	Solar	Other	Total
2019 Q2 (MW)	13,009	8,780	0	10,548	5,076	404	2,583	24	<b>40,424</b>
2019 Q2 (%)	32%	22%	0%	26%	13%	1%	6%	<1%	

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

**Available Capacity at Peak**

25,931 MW (Q2)

Peak Demand	20,248 MW (Q2)	Operating Reserve Requirement	1,432 MW (Q2)
Minimum Demand	10,328 MW (Q2)		

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 [ieso.ca/power-data/market-summaries-archive](https://ieso.ca/power-data/market-summaries-archive).

**Conservation**

The province established three targets in electricity saving<sup>2</sup> to be achieved through conservation programs for the period of 2015-2020. 1) the Conservation First Framework (CFF) delivered by LDCs and the IESO with a newly revised target of 6.0 terawatt-hours (TWh); 2) to fill the gap of the old target of 7.4TWh the newly establish Interim Framework (IF) as of March 22, 2019 has a target of 1.4 terawatt-hours and 189 megawatts (MW); and 3) the Industrial Accelerator Program (IAP) delivered to transmission-connected customers by the IESO with a target of 1.3 TWh. Overall the province continues to expect to achieve 8.7 TWh in savings by December 31, 2020. Programs reach all sectors and provide customers with incentives to help them use energy wisely.

As of Q2 2019, CFF Programs have achieved 6,227 gigawatt-hours (GWh) in electricity savings representing 104% of the 6.0 TWh target, and the IAP Program has achieved 427 GWh in electricity savings representing 33% of the 1.3 TWh 2020 target. The newly created IF Programs have achieved 8 GWh and 1MW in electricity and demand savings representing 1% of the 1.4 TWh and 1% of the 189 MW 2020 targets.

**Conservation Portfolio Progress – Results (as of 2019 Q2)<sup>3</sup>**

Incremental Progress		2019 Q2 Incremental	2015-2019 Q2 Incremental	2020 Target Progress (%)
LDC & IESO Delivered CFF	Peak Demand Savings (MW)	4	792	-
	Energy Savings (GWh)	20	6,227	104
IESO Delivered IAP	Peak Demand Savings (MW)	2	119	-
	Energy Savings (GWh)	2	427	33
IESO Delivered IF	Peak Demand Savings (MW)	1	1	1
	Energy Savings (GWh)	8	8	1
<b>Total Portfolio</b>	<b>Total Peak Demand Savings (MW)</b>	<b>7</b>	<b>912</b>	<b>-</b>
	<b>Total Energy Savings (GWh)</b>	<b>30</b>	<b>6,663</b>	<b>-</b>

Note: Totals may not align due to rounding.

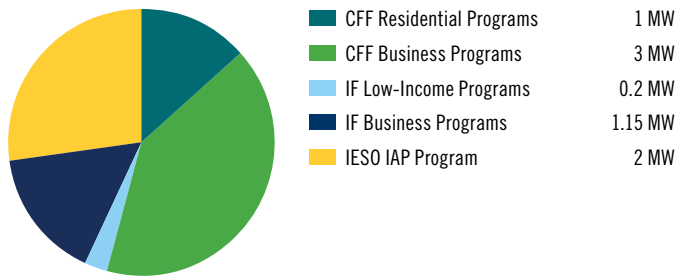
Source: IESO

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.

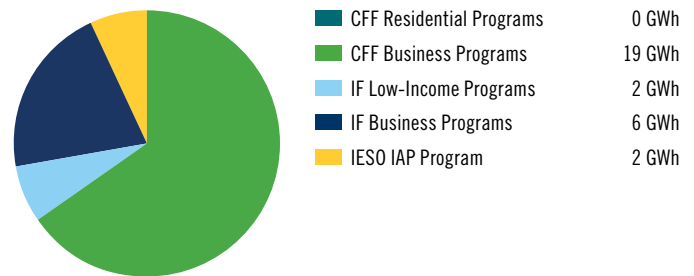
3. Results presented are 'reported' (i.e. 'unverified') based on project installation dates corresponding to the indicated period and are based on projects reported and invoiced to the IESO as of 2019 Q2.

### Incremental Savings (2019 Q2)

#### 2020 Annual Peak Demand Savings



#### 2020 Annual Energy Savings



Source: IESO

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

### 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.

Beginning in December 2015, DR capacity has been procured through a competitive DR Auction process. 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.

The December 2018 DR auction procured 818.4 MW for the summer six-month commitment period beginning on May 1, 2019, and 854.2 MW for the winter six-month commitment period beginning on November 1, 2019.

More information on the Demand Response Auction is available at: [ieso.ca/en/sector-participants/market-operations/markets-and-related-programs/demand-response-auction](https://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 2017, ICI is estimated to have reduced peak demand by 1,400 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, 2018, and ended on April 30, 2019.

#### Top 5 Peaks: Hours & System-Wide Consumption (Base Period: May 1, 2018 to April 30, 2019)

Date	Hour Ending	Allocated Quantity of Energy Withdrawn (MW)	Embedded Generation (MW)	Energy Storage Injections (MWh)	Total (MW)
September 5, 2018	17	22,551.315	1,076.151	0.446	<b>23,627.020</b>
July 5, 2018	15	22,415.022	1,418.704	0.008	<b>23,833.718</b>
July 4, 2018	18	22,122.730	734.709	0.393	<b>22,857.046</b>
August 28, 2018	17	21,643.799	1,069.941	0.581	<b>22,713.159</b>
September 4, 2018	17	21,379.327	803.919	0.759	<b>22,182.487</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 May 1, 2018 to April 30, 2019.

Source: IESO

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

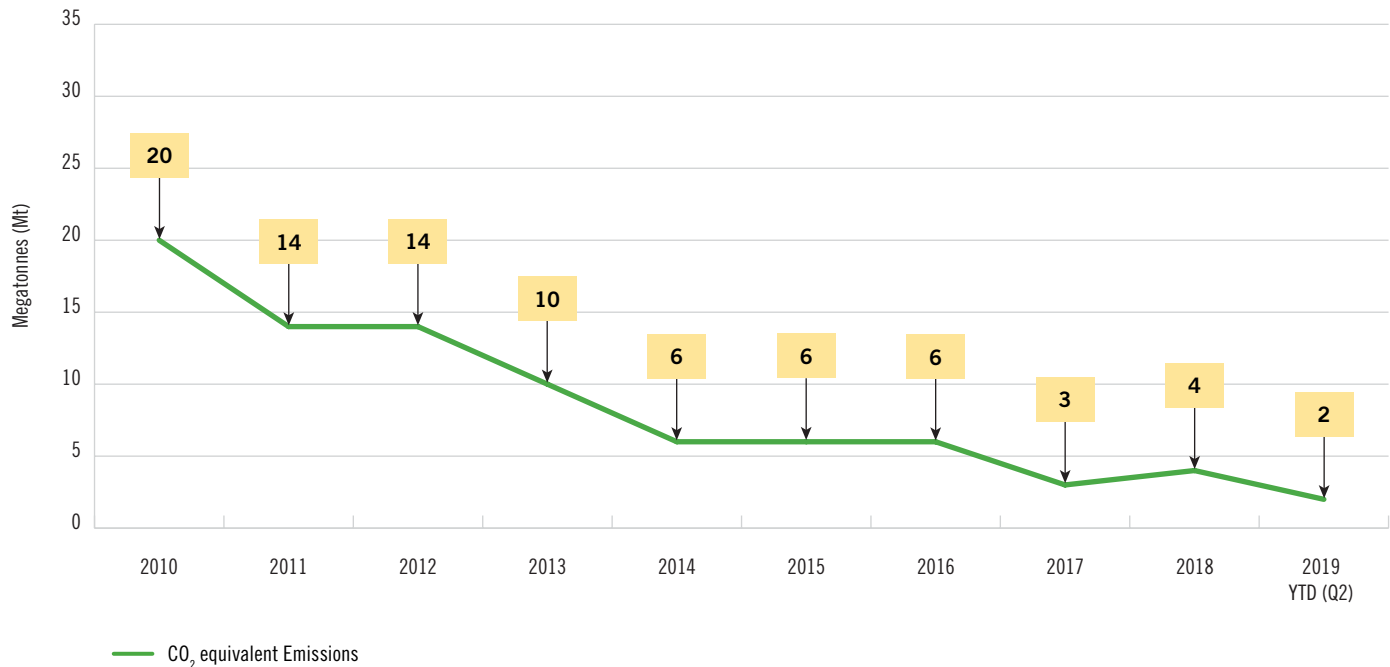
More information on the ICI is available at [ieso.ca/-/media/files/ieso/document-library/global-adjustment/ici-backgrounder.pdf?la=en](https://ieso.ca/-/media/files/ieso/document-library/global-adjustment/ici-backgrounder.pdf?la=en).

## 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>x</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 2010-2019. Year-to-date greenhouse gas emissions in Q2 2019 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)

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019 YTD (Q2)
SO <sub>x</sub> Emissions	38,507	11,966	10,342	10,192	846	424	579	644	504	254
NO <sub>x</sub> Emissions	27,358	18,198	19,867	17,973	11,448	10,355	9,323	5,695	5,924	2,979
PM <sub>2.5</sub> Emissions	843	518	468	445	309	262	239	195	210	105

Source: IESO, Environment Canada