

Parking Lot Solar

A Wide-Open Opportunity
to Meet Toronto's Climate
and Energy Goals



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Overview

The City of Toronto has passed a resolution calling for the Independent Electricity System Operator (IESO) and Toronto Hydro to phase-out virtually all use of the Portlands gas-fired electricity generating station by 2035, increase local renewable energy generation, and secure low carbon electricity to meet current and future needs. This plan would aim to affordably meet growing electricity needs, advance climate goals, and help us all to breathe cleaner air.¹ Solar installations over open-air parking lots are a tremendous opportunity to advance these goals.



Solar installations
over open-air
parking lots are a
**tremendous
opportunity
to advance
Toronto's
goals**

Parking Lot Solar Generation Can Help Phase-Out the Portlands Gas Plant

The Portlands gas-fired power plant is located on Toronto's waterfront. It is the City's largest source of greenhouse gas emissions and a major source of fine particulate matter and other air pollutants that are known to adversely affect our health. In 2023, it generated 2.1 terawatt-hours (TWh) of electricity and current plans have it operating even more by 2030².



The solar output from installations over larger parking lots in Toronto has the technical potential to equal more than 2.5 times the output of the Portlands power plant. There are over 7,000 open air parking lots with 80 parking spaces or more (>1,500 square metres) within the City of Toronto. If we adopt the rule set by France, requiring all open parking lots greater than 1,500 square

metres to cover at least half of their surface areas with solar by 2028³, Toronto could generate 5.8 TWh of electricity per year from solar panels with a combined capacity of 4.8 gigawatts (GW) (see methodology below and the analysis spreadsheet posted on the Ontario Clean Air Alliance website).

Covering half of the area of parking lots with solar may be conservative. It is likely that most large parking lots will have minimal shading and few obstacles. Economies of scale and fixed installation costs also mean that owners will want to maximize the installation size to shorten paybacks. **Table 1** shows the annual generation potential when parking lot coverage is increased. Toronto's annual parking lot solar electricity potential is equivalent to 24-34% of its total electricity consumption in 2023 (23.7 TWh⁴). This new generation could go a long way towards meeting Toronto's need for low carbon electricity which is forecast to grow as buildings and transportation are electrified.

Table 1 | Parking lot solar potential in Toronto

Area covered by solar panels	GW installation size	TWh generation/yr	% of Toronto's total electricity consumption in 2023
70%	6.7	8.1	34%
60%	5.7	7.0	30%
50%	4.8	5.8	24%



The solar output from installations over larger parking lots in Toronto has the technical potential to equal more than **2.5 times the output of the Portlands power plant**

Parking Lot Solar Generation Can Support Renewable Energy Goals and Help Communities

The electricity generated by parking lot solar panels is a form of local renewable energy that will help Toronto meet its climate goals. In fact, one of the city's recommended climate actions is for ground mount solar to be installed on 50% of parking lots.⁵

Adding renewable generation capacity within the city avoids major investments in transmission lines because the electricity is generated where it is consumed (but may require upgrades to distribution lines and transformers). When paired with batteries, these systems can provide greater resilience during the power outages that are becoming more frequent and severe thanks to climate change.

Parking lot solar generation benefits local communities in other ways. Parking lot owners enjoy reduced electricity costs or a new revenue stream with power purchase agreements; an opportunity to pair solar with EV chargers on the lots; and the ability to provide vital power during power outages if solar is paired with batteries. Parking lot customers benefit from shaded parking spaces that are also shielded from frost and snowfall in winter. Large parking lots are also opportunities for community solar projects that allow residents to invest in clean energy. And the whole community benefits from the reduced urban heat island effect when asphalt surfaces are covered by solar panels⁶. Installation and maintenance of solar panels will also create local jobs.

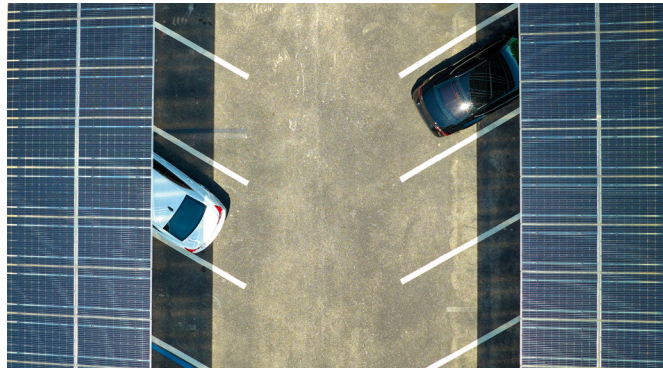


The electricity generated by parking lot solar panels are a form of local renewable energy that will help Toronto to meet its climate goals

Parking Lot Solar is a Low Carbon Source of Electricity That Can Help to Meet Current and Future Needs

The 5.8 TWh of electricity that can be generated if large, open parking lots cover half of their surface area with solar panels would allow Toronto to avoid 1.9 million tonnes (MT) of greenhouse gas emissions in 2030. That is the equivalent of the annual emissions from 582,000 passenger vehicles⁷.

And solar panels would also produce electricity at times when it is most needed. **A full third of Toronto's solar generation potential occurs during the time-of-use peak hours** in summer when Ontario's electricity system is strained by high air conditioner use and the cost of electricity generation is high. A further 34% of generation occurs during summer and winter mid-peak hours. Peaks and mid-peak hours are when Ontario's electricity system is most reliant on polluting gas power plants.



Solar panels over parking lots have huge potential to support the City of Toronto's goal of phasing-out the Portlands gas plant

Conclusions

In conclusion, solar panels over parking lots have huge potential to support the City of Toronto's goals of phasing-out the Portlands gas plant, increasing renewable generation, and building a clean, distributed, resilient electricity system that would provide benefits for us all.

The IESO and Toronto Hydro should work with the City of Toronto to develop a plan to promote the installation of solar panels on Toronto's large open air parking lots, including a standard offer price for the supply of solar electricity to Toronto Hydro's grid.

Methodology

Q Geographic Information System (QGIS) and City of Toronto zoning maps were used to get a count and total footprint area of open-air parking lots in the city with areas greater than 1,500 square metres.

Solar panels were assumed to have 186 W/sq m⁸.

PVWatts⁹ was used to estimate the kWh/kW for open rack solar panels in Toronto using default parameters with 35° tilt, 180° azimuth (south-facing), and no production in January (due to snow coverage).

It was assumed that only 50%-70% of parking lot surface area can be covered by solar panels to account for shading, setbacks from property lines, and other features.

Annual generation during time of use blocks was calculated from Engineering Climate Datasets for Toronto¹⁰

The 2024 and 2030 marginal emissions factor for each TOU period was calculated by taking the average emissions from an Ontario gas power plant (390 g CO₂e/kWh)¹¹ multiplied by the percentage of time gas is on the margin for the TOU period¹². The annual greenhouse gas emissions avoided with the solar array was calculated using this marginal emission factor, the percentage of annual solar generation that occurs during each TOU period and the annual kWh of electricity generated by the array.

Sources

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- 12 IESO Customer Relations April 8, 2024 response to Jack Gibbons, Ontario Clean Air Alliance (Inquiry #6854).

