# Toronto's Next Electricity Plan (IRRP)

**MEDIA BACKGROUNDER**
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environmental defence

The Independent Electricity System Operator (IESO) is drafting Toronto's next regional resource plan, which will set out where Toronto's electricity will come from to meet the city's growing needs. Today, part of Toronto's electricity still comes from polluting gas plants. How can we ensure Toronto is powered by affordable, reliable and clean energy in the coming decades?

Past regional resource plans ignored cost-saving options like rooftop solar panels, energy efficiency upgrades, energy storage, district energy, and other local solutions. To contribute to the conversation about what a clean energy vision for Toronto could look like, EDC has put together a high-level vision of how the city could meet its additional electricity needs while phasing out its use of gas plants by 2035. This is meant to be a conversation starter about the options available to Toronto, not a precise prescription for how Toronto should meet its needs. We encourage all stakeholders to challenge our vision to help us improve it and help Toronto attain a clean, affordable and reliable power supply.

## How much electricity will we need?

Toronto currently consumes around 24 Terrawatt-hours (TWh) per year, and in 2023 peak demand was around 4,700 Megawatts (MW).[1] The IESO projects that by 2035, peak summer demand will be 6,300 MW and peak winter demand will be 7,000 MW. We estimate that Toronto will need between 34 and 37 TWh of electricity per year in 2035.[2] This means we need to fill a gap of around 10 to 13 TWh of additional generation.

> ***Reminder: Power, typically measured in MW, indicates how much electricity can be generated or used at any given time. Energy, often expressed in MWh (or TWh for larger quantities), is the energy consumption or generation over a specific period—such as one year. This backgrounder covers both aspects, as power is crucial for meeting peak demand, while energy provides a clearer picture of total annual electricity demand.***

In addition to growing electricity needs, closing the Portlands Energy Centre (PEC)—a gas plant—is essential to protect Torontonians' health and allow Toronto to meet its climate goals. Toronto's next energy plan must therefore account for a shutdown of the PEC except for in emergencies, as requested by the Toronto City Council in a motion on June 27th, 2024. PEC has a 550 MW capacity, and in 2023 it generated 2.1 TWh.[3]

## How should Toronto meet its demand?

**TORONTO CAN MEET OVER HALF OF ITS ADDITIONAL NEEDS WITH SUSTAINABLE SOLUTIONS DIRECTLY IN THE CITY**

| In-City Generation Source | Estimated annual production (TWh) |
|---|---|
| Demand response, efficiency and conservation | 3.6 |
| Solar PV on 50% of suitable rooftops in Toronto, paired with storage | 4.9 |
| Portlands Energy Center phaseout | (2.1) |
| **Total net new estimated in-city generation** | **6.4** |

*Table 1: Summary of estimated generation capacity, by source, in the city of Toronto. Loss in brackets represents the closing of Portland's gas-powered plant except for emergencies. Does not include the potential for district energy heating and cooling to reduce electricity demand.*

Meeting Toronto's growing electricity needs by burning more gas will accelerate the climate crisis and worsen local health impacts. The Portlands Energy Centre is also at odds with the City's plans to redevelop the Portlands area in Toronto. It's also not a cost-effective approach. Similarly, relying on the promise of expensive and slow-to-build nuclear power puts our grid's affordability at risk. Yet, these two options are the ones seemingly favoured by the IESO and the Ontario government.

We have an opportunity to ensure that Toronto's grid makes the most of cost-effective local energy sources and complements these with renewable energy on the grid. By 2035, Toronto could meet its additional resource needs by:

➔ **Reducing energy waste through efficiency and conservation measures.**

We estimate that Toronto could reduce its peak capacity needs by 440 to 860 MW (summer) and 360 to 720 MW (winter) for residential and commercial buildings through demand response measures such as smart thermostats, HVAC load control, commercial/industrial flexibility programs and electric vehicle load shifting. This alone could eliminate the need to use the Portlands Energy Center as a peaker plant.[4]

Overall, Demand-Side Management (DSM), which also encompasses energy efficiency retrofits, could avoid 3.6 TWh of annual electricity consumption by 2035. That's equivalent to 7-9 per cent of Toronto's projected total 2035 demand, or between a fourth and a third of the additional generation needed.

➔ **Making the most of Toronto's rooftop area with solar PV**.

Analysis done for Environmental Defence by Statistics Without Borders finds that if Toronto covered 50 per cent of its suitable rooftop area with solar PV by 2035, it could produce about 4.9 TWh annually,[6] which paired with storage would be enough to replace the Portlands' total contribution and meet 15-25 per cent of Toronto's additional needs by 2035.

While covering 50 per cent of rooftops by 2035 may seem ambitious, the City of Toronto's climate plan already plans for 100 per cent of suitable[7] rooftops to be covered by 2050. Consider that by the end of 2023, one in eight residential buildings in Germany had a photovoltaic system installed. The German region of Baden-Wuerttemberg requires solar panels on all new residential and commercial buildings. In 2019, 10 per cent of homes in San Diego already had solar rooftop installed. As early as 2016, dozens of neighbourhoods in Australia already had more than 50 per cent solar coverage on residential buildings.

➔ **Ensure reliability and maximal utilization of the existing grid capacity thanks to storage.**

Energy storage, from utility-scale and residential batteries and thermal storage solutions, is key to maximizing the utilization of zero-emissions generation capacity already on the grid and complementing rooftop solar PV. Toronto's IRRP should aim

for 1000 MW of storage by 2035, which aligns with the City's TransformTO goal of 2000 MW by 2050 and would more than replace the Portlands Energy Center.

➔ **Meeting the remaining demand via new utility-scale wind and solar**.

Research from Power Advisory[8] shows that the cheapest path to meeting Ontario's electricity needs is through renewable energy and efficiency. Toronto's electricity needs, which can not be entirely met from solutions *in* the city, must come from the cheapest and cleanest available energy sources to add to the grid: solar and wind.

As part of a renewable energy procurement process, it is time for Ontario to revisit the question of whether or not the Great Lakes are suitable for offshore wind. Estimates find wind farms located at 64 sites in the Great Lakes could produce between 111 and 150 TWh of electricity per year.[9] It's time to have a public conversation about the benefits of tapping this immense source of reliable, affordable energy.

➔ **Reducing electricity demand through district energy heating.**

Part of Toronto's projected electricity needs are based on the assumption that heating and cooling in buildings will come from stand-alone, in-building electric heat pumps. While heat pumps are a key climate solution, Toronto could reduce its projected electricity demand while meeting its climate goals by making better use of cost-effective district energy and renewable combined heat and power solutions to provide heat. While this potential is not quantified in this analysis, the IESO must ensure it is not inflating future electricity needs by ignoring the potential of decarbonized district energy heating.

Toronto's Deep Lake Water Cooling system, as well as the University of Toronto's move to electrify its central steam plant, are two examples of how district heating already makes more efficient use of electricity in our city to heat and/or cool buildings.

**What would this vision mean for costs?**

The above solutions are all cost-effective ways for Toronto to meet its electricity demands while phasing out the polluting Portlands Energy Center. While the exact cost of the plan will depend on the chosen energy mix and how it is delivered, the average energy costs presented below suggest the above vision would be a cost-effective way for Toronto to meet its additional electricity needs.

**Efficiency**: In 2022, the IESO average levelized unit energy cost (LUEC) of procuring a kWh of electricity savings was around 2 cents, or around 20 $/MWh.[10]

**Rooftop solar**: The IESO's 2024 levelized cost of energy puts distributed solar PV at 157 $/MWh, much higher than utility-scale renewables and higher than existing nuclear. Yet, the IESO projects that by 2050, electricity from distributed solar will cost 70 $/MWh. Lazard's Levilized Cost of Energy analysis[11] finds that residential solar PV can come in cheaper than nuclear and gas peaking, although cost varies. Meanwhile, solar PV on community, commercial and industrial buildings can be significantly cheaper than gas and nuclear. The lesson for Toronto is that if each building owner pays retail prices, the cost is likely to be higher than if a coordinated approach is taken by the IESO and Toronto Hydro, and we start with low-hanging fruit such as commercial and industrial rooftop solar.

Additionally, these costs do not take into account the fact that non-wire options like rooftop solar provide savings to the system thanks to the avoided cost of transmission, which further lowers the total cost of providing electricity.

**Storage**: In Ontario's latest capacity procurement round (LT1), storage projects that were awarded contracts came in at less than half the price of new gas plants. The average weighted price of storage was 672 $/MW-day, while gas was 1,681 $/MW-day. This confirmed the trends observed at the global level: storage is now cheaper than gas to ensure grid reliability and delivery during peak periods.

**Utility-scale wind and solar**: The IESO's levelized cost of energy 2024 report shows wind coming at 48 $/MWh and solar at 69 $/MWh, the cheapest sources of electricity on the grid.[12] This is likely to continue to go down, with future projections from Power Advisory placing LCOE at 42 $/MWh for wind and 47 $/MWh for solar.

**Nuclear:** The IESO's 2024 levelized cost of energy puts nuclear at 140 $/MWh and nuclear SMR at 155 $/MWh.

**Gas**: The IESO's 2024 levelized cost of energy puts gas at 185 $/MWh, higher than nuclear due to the low capacity factor. As mentioned above, the average price of gas for storage during LT1 was twice as expensive as batteries. The cost of energy is far from the only economic cost of gas, which has important local health impacts and increases the likelihood of immensely costly climate disasters.

## References


1. https://www.torontohydro.com/about-us/company-overview, see "electricity delivered"
2. While the IESO does not produce forecasts for annual electricity demand at the Toronto level, we calculated this in two ways.
   **Method 1:** Start with Toronto's current electricity consumption (~24 TWh), apply IESO's projected growth rate for Ontario (28-35% by 2035). This generates a low end estimate of 31 TWh and a high end of 32.4 TWh. If we assume extra growth for Toronto's higher electrification rate and economic growth (an arbitrary additional 10-15%): low end 34.1 TWh, high end 37.3 TWh.
   **Method 2**: Use the peak capacity projections from the IESO, and assuming a typical capacity factor of 55-60% for urban areas, you arrive at similar mid 30s TWh annual electricity demand.
3. https://www.cleanairalliance.org/wp-content/uploads/2024/11/Toronto-Solar-Report-nov-2024-nov-21-v_01.pdf
4. From the IESO's 2022 Distributed Energy Resources (DER) Potential Study, demand response could contribute 1.3 GW to 4.3 GW of achievable summer peak capacity reduction in Ontario by 2032 and 1.0 to 3.6 GW in Winter, depending on the scenario. If we assume Toronto represents about 20% of that achievable potential and that we can aim for at least the BAU+ (Expanded Electrification & Decarbonization) scenario, it would mean peak capacity reduction of 440-860 MW (summer) and 360-720 MW (winter).
   https://www.ieso.ca/-/media/Files/IESO/Document-Library/regional-planning/Toronto/toronto-irrp-20240416-forecasting-methodology.pdf
   With the estimates from above, we can also calculate Annual Savings (GWh)=Achievable DR Capacity (GW)×Peak Hours Per Year. Assume 300 peak hours/ year. Between 78-258 GWh per year from demand response.
5. No recent estimate for Toronto. Estimate is based on Ontario's proposed 2025–2036 framework which aims for 18 TWh of electricity savings for Ontario. Assuming Toronto represents 20% yields an estimate of 3.6 TWh. It is unclear whether "electricity savings" in the framework account for avoided demand thanks to behind-the-meter solar PV and battery systems, and there is therefore a risk of overlap between our DSM estimates and solar PV potential. We are seeking clarity with the IESO and will update accordingly.
6. Estimates based on the SolarTO dataset. Analysis by Statistics Without Borders. Methodology and data in appendix available upon request at media@environmentaldefence.ca
7. "Suitable" is defined by the City of Toronto's SolarTO database based on certain requirements available here:
   https://www.toronto.ca/services-payments/water-environment/net-zero-homes-buildings/solar-to/solarto-map/#location=&lat=&lng=&zoom=
8. Power Advisory. *Scenarios for a Net-Zero Electricity System in Ontario,* commissioned by The Atmospheric Fund. 2022.
   https://taf.ca/publications/scenarios-for-a-net-zero-electricity-system-in-ontario/
9. A 2008 report prepared for the Ontario Power Authority by Helimax Energy Inc., wind farms located at 64 sites in the Great Lakes could produce 111.5 terawatt-hours (TWh) of electricity per year. The Ontario Clean Air Alliance estimates the potential to be closer to 151 TWh of electricity per year, as the Helimax study did not include all potential sites and wind technology has greatly improved since the study.
10. https://www.ieso.ca/-/media/Files/SaveOnEnergy/CDM/2022-Energy-Efficiency-Annual-Update.pdf
11. https://www.lazard.com/media/xemfey0k/lazards-lcoeplus-june-2024-_vf.pdf
12. https://www.ieso.ca/-/media/Files/IESO/Document-Library/planning-forecasts/apo/Mar2024/Resource-Costs-and-Trends.pdf
    Power Advisory. *Scenarios for a Net-Zero Electricity System in Ontario,* commissioned by The Atmospheric Fund. 2022.
    https://taf.ca/publications/scenarios-for-a-net-zero-electricity-system-in-ontario/


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