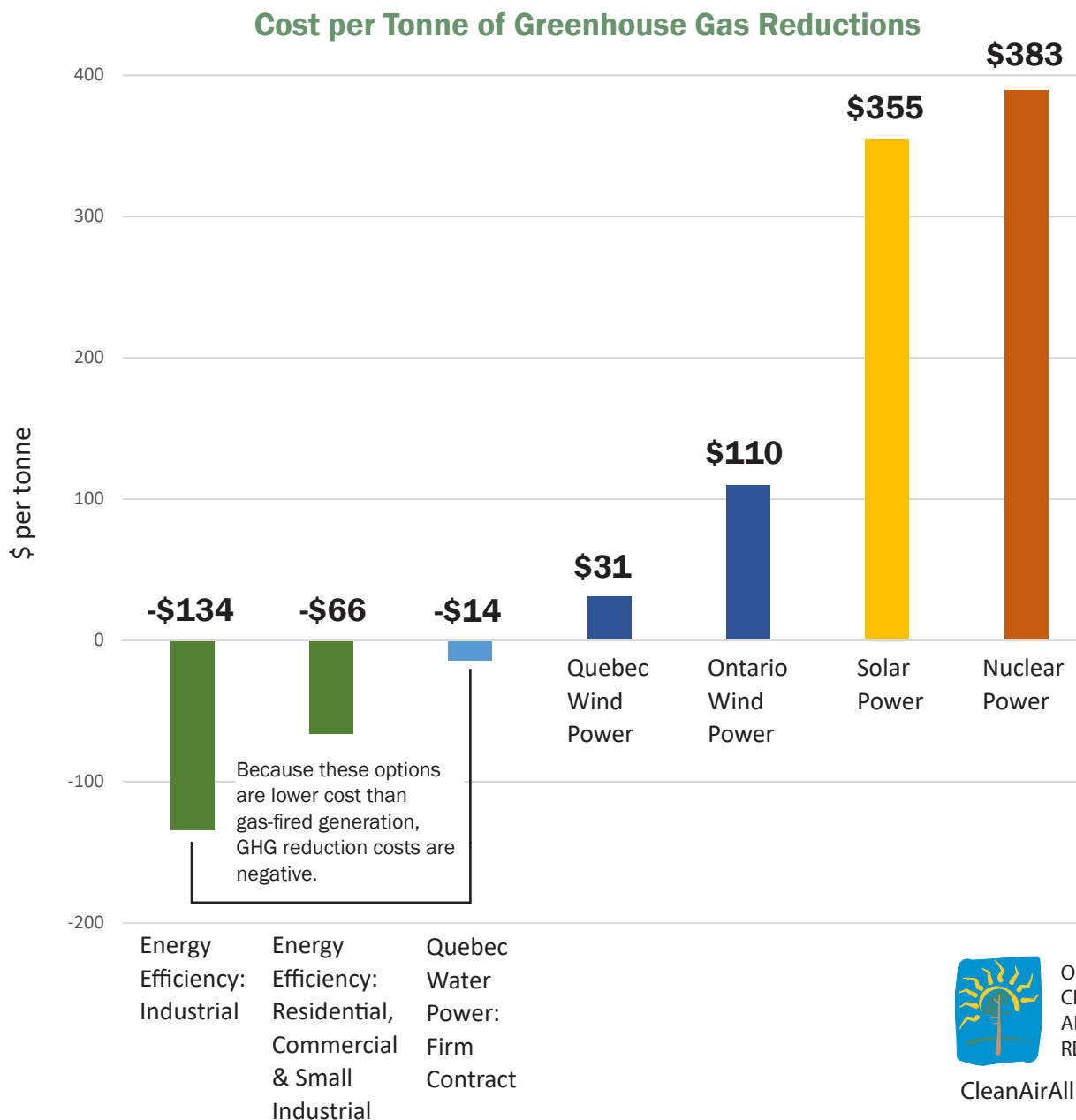


Ontario's Greenhouse Gas Reduction Options: A Cost Comparison

Ontario's electricity-related greenhouse gas (GHG) emissions are produced by the province's natural gas-fired power plants. The chart below shows the cost per tonne of reducing these emissions by investing in energy efficiency and by switching to alternative electricity supply options. Since energy efficiency and Quebec water power can keep our lights on at a lower cost than gas-fired generation, these options have a negative cost per tonne for emission reductions, meaning they simultaneously lower our electricity bills and our GHG emissions. On the other hand, the financial costs of wind, solar and nuclear energy are greater than those of gas-fired generation. Therefore pursuing these GHG reduction options will increase costs compared to gas-fired generation.



Ontario's electricity-related greenhouse gas (GHG) emissions are produced by its natural gas-fired power plants. According to the Ontario Power Authority, the GHG emission rate of a combined-cycle natural gas-fired power plant is 290 grams/kWh. According to the Independent Electricity System Operator, assuming a 95% annual capacity utilization rate and a commodity cost of gas of \$5.50/MMBtu (2014\$) at the Dawn Hub near Sarnia, the cost of natural gas-fired generation in 2020 will be 5.4 cents per kWh.¹ Therefore to calculate the cost of reducing our GHGs by switching to alternative electricity resource options, one must compare their costs per kWh to that of natural gas-fired generation.

Energy Efficiency – Industrial: The IESO has a \$500 million budget to reduce the electricity consumption of Ontario's large-volume industrial customers by 1.7 billion kWh per year in 2020. The IESO assumes that these savings will persist for 20 years. Therefore, the average cost per kWh saved is 1.5 cents.² This means that reducing our natural gas-related GHG emissions (290 grams per kWh) by investing in industrial energy efficiency measures will cost –3.9 cents per kWh (1.5 cents per kWh – 5.4 cents per kWh). That is –0.0134 cents per gram (–3.9/290) or –\$134 per tonne.

Energy Efficiency – Residential, Commercial & Small Industrial: According to the Ontario Power Authority, the average cost of residential, commercial & small industrial energy efficiency programs is 3.5 cents per kWh.³ Therefore the cost of reducing our natural gas-related GHG emissions (290 grams per kWh) by investing in residential, commercial & small industrial energy efficiency measures is –1.9 per kWh (3.5 cents per kWh – 5.4 cents per kWh). That is –0.0066 cents per gram (–1.9/290) or –\$66 per tonne.

Quebec Water Power - Firm Contract: In October 2016, Ontario concluded an agreement with Hydro Quebec to purchase 2 billion kWh of water power per year at a price of 5 cents per kWh for seven years.⁴ Therefore the cost of reducing our natural gas-related GHG emissions (290 grams per kWh) by importing water power from Quebec is –0.4 per kWh (5 cents per kWh – 5.4 cents per kWh). That is –.0014 cents per gram (–0.4/290) or –\$14 per tonne.

Quebec Wind Power: In 2014, Hydro Quebec used a competitive procurement process to contract for wind power at an average generation cost of 6.3 cents per kWh.⁵ Therefore the cost of reducing our natural gas-related GHG emissions (290 grams per kWh) by importing wind power from Quebec is 0.9 per kWh (6.3 cents per kWh – 5.4 cents per kWh). That is 0.0031 cents per gram (0.9/290) or \$31 per tonne.

Ontario Wind Power: In March 2016 the IESO procured new wind power supplies at an average cost of 8.59 cents per kWh.⁶ Therefore the cost of reducing our natural gas-related GHG emissions (290 grams per kWh) by investing in wind power is 3.19 per kWh (8.59 cents per kWh – 5.4 cents per kWh). That is, 0.011 cents per gram (3.19/290) or \$110 per tonne.

Solar Power: In March 2016 the IESO procured new solar power supplies at an average cost of 15.7 cents per kWh.⁷ Therefore the cost of reducing our natural gas-related GHG emissions (290 grams per kWh) by investing in solar power is 10.3 per kWh (15.7 cents per kWh – 5.4 cents per kWh). That is, 0.0355 cents per gram (10.3/290) or \$335 per tonne.

Nuclear Power: Ontario Power Generation (OPG) is seeking permission from the Ontario Energy Board to raise its price of nuclear electricity by 180% to 16.5 cents per kWh in 2025. According to OPG, the price increase is needed to finance the continued operation of the Pickering Nuclear Station and the re-building of the Darlington Nuclear Station.⁸ Therefore the cost of reducing our natural gas-related GHG emissions (290 grams per kWh) by investing in nuclear power is 11.1 per kWh (16.5 cents per kWh – 5.4 cents per kWh). That is, 0.0383 cents per gram (11.1/290) or \$383 per tonne.

Endnotes

- 1 Ontario Power Authority, *Supply Mix Analysis Report*, Volume 2, (December 2005), page 213; Independent Electricity System Operator (IESO), *Conservation & Demand Management Energy Efficiency Cost Effectiveness Guide*, (March 2015), pages 57 & 58; email from Terry Young, Vice President, IESO to Jack Gibbons, Ontario Clean Air Alliance, (October 20, 2015); and email from Chuck Farmer, Director, Stakeholder & Public Affairs, IESO to Jack Gibbons (Feb. 6, 2017).
- 2 Email from Terry Young, IESO to Jack Gibbons (July 13, 2015).
- 3 Ontario Power Authority, *Conservation First Framework Update: Presentation to SAC*, (June 24, 2014), pages 7 & 8.
- 4 Denis Lessard, "Hydro-Quebec signe un contract ferme avec l'Ontario", *La Presse*, (October 21, 2016)
- 5 Hydro Quebec, *Press Release*, "Calls for tenders for the purchase of 450 MW of wind power: Hydro-Quebec Distribution accepts 3 bids totaling 446.4 MW", (December 16, 2014)
- 6 IESO, *News Release*, "IESO Announces Results of Competitive Bids for Large Renewable Projects", (March 10, 2016).
- 7 IESO, *News Release*, "IESO Announces Results of Competitive Bids for Large Renewable Projects", (March 10, 2016).
- 8 Ontario Energy Board Docket No. EB-2016-0152, Exhibit N3, Tab 1, Schedule 1, Attachment 2, Table 14.