Feedback Form

Pathways to Decarbonization – February 24, 2022

Feedback Provided by:

Name: John Stephenson

Title: Chapter Leader

Organization: Citizens Climate Lobby Canada

Email: [redacted]

Date: 2022-03-23

Following the February 24 engagement webinar, the Independent Electricity System Operator (IESO) is seeking feedback from stakeholders on the items discussed during the webinar. The webinar presentation and recording can be accessed from the engagement web page.

Please submit feedback to engagement@ieso.ca by **March 16**. Please attach research studies or other materials for consideration by the IESO to support your submission.

If you wish to provide confidential feedback, please submit as a separate document, marked "Confidential". Otherwise, to promote transparency, feedback that is not marked "Confidential" will be posted on the engagement webpage.

Although this is submitted after the March 16th deadline, I hope you will consider it "better late than never" and taking into account it was prompted by the recently released slide deck for the presentation on operability on March 24th.

Policy

Topic	Feedback
Are the assumptions indicated reasonable and comprehensive in terms of scale and timing?	Since fossil fuels must soon be phased out, it is long-past time that electricity and heat (including buildings and industry) were considered as an interconnected energy system. See what Germany is doing - https://climateinstitute.ca/publications/electricity-system-innovation/

Topic	Feedback
Are there other considerations for the IESO?	Absent fossil fuels, meeting ramps relies on either big dams or burning something (other than fossil fuels). Access to big dams is limited. Biomass is plentiful and generally agreed to be carbon neutral. But biomass boilers cannot be turned up and down as flexibly as gas plants. But the electricity output of biomass cogeneration plants can be ramped up by restricting the heat extraction. See presentation to Club of Rome by Dr. Jamie Stephen (especially slide 42 on Amager Bakke plant in Copenhagen). https://canadiancor.com/wp-content/uploads/2021/02/DE_Missing_Canada_20210217.pdf

Demand

Topic	Feedback
Are the assumptions indicated reasonable and comprehensive in terms of scale and timing?	No – the IESO underestimates demand because it discounts the impact of electrification: (1) it appears to not take seriously, as it should, that reaching zero GHG emissions by around 2030 is a necessity not an option – this leads, not only, to inappropriate toleration of gas-fired generation, but also, to underestimating the impact of electrifying heating under the prevalent conventional wisdom that it will be achieved by installing air source heat pumps in every building (2) it seems to have no idea about the magnitude and duration of heating peaks. It is not for nothing that the capacity of the Ontario gas distribution system is 85,000 MW (see appended extract from my draft report, an earlier version of which accompanied my first feedback form).

Topic	Feedback
Are there other considerations for the IESO?	If electricity retail prices were reformed, as they should be and quite likely will be because the current system is a mess, and all energy was charged at the marginal price, significant new revenue would be generated from business that can control its demand and thereby make good use of low energy prices; this includes green hydrogen, and district heating with large-scale energy storage; because the heat market is bigger than the electricity market, there is significant potential for power-to-heat which makes sense only if the power going to heat would otherwise be surplus; and there is bound to be a lot of that on a zero emission grid, which will require overbuild of wind, (run-of-river) water and sun and possibly nuclear.

Resources

Topic	Feedback
Are the assumptions indicated reasonable and comprehensive in terms of scale and timing?	Flexible biomass fired combined heat and power is not considered. The price limit on conservation appears to be related to the running costs of gas plants without carbon price on the full emissions, which is inappropriate because the carbon price fleshes out the total cost to society. The gas plant operating costs should include the carbon prices on all emissions, not just above the too lenient standard. The reason is that every extra tonne of emissions the gas plants produce must be reduced by another actor in another sector and the carbon price is the approximate cost of that. So, you are failing in your fiduciary duties to your shareholders, the people of Ontario by not minimizing their total costs of electricity + carbon taxes. The idea of leaving some gas plants (e.g., owned by the public corporation OPG) on reserve duty, decommissioning the steam cycles to leave simple cycle GT's available for rapid startup does not seem to be contemplated.

Topic	Feedback
Are there additional data sources that we should consider	To properly estimate the magnitude and duration of heating peaks you need to consider hourly outside air temperatures from Environment Canada. This leads to results as in Figure 2 per the appended extract from my draft report.
Are there other considerations for the IESO?	1) the local economic development benefits of local resources substituting for imported gas, e.g. (a) the infrastructure for district heating, and markets for local waste heat and (b) a market for low grade fibre to replace shutdown pulp mills, of which there are a large number recently in Ontario, leaving impoverished communities, thereby promoting active forestry management which has diverse benefits to Ontarians including GHG reduction. See previous reference re Dr. Jamie Stephens presentation to Club of Rome. 2) energy security – surely a lesson to be learned from the invasion of Ukraine. We should not allow ourselves to be dependent on imports of fossil fuel. The gas fracking bubble, in particular, could burst suddenly at any time for a number of reasons, including environmental regulations, exhaustion of the resource and the fact that the frackers are not making money. In any case, gas will not be allowed in a zero emissions future, so if it will be difficult and take a long time to replace, we should start now.

General Comments/Feedback

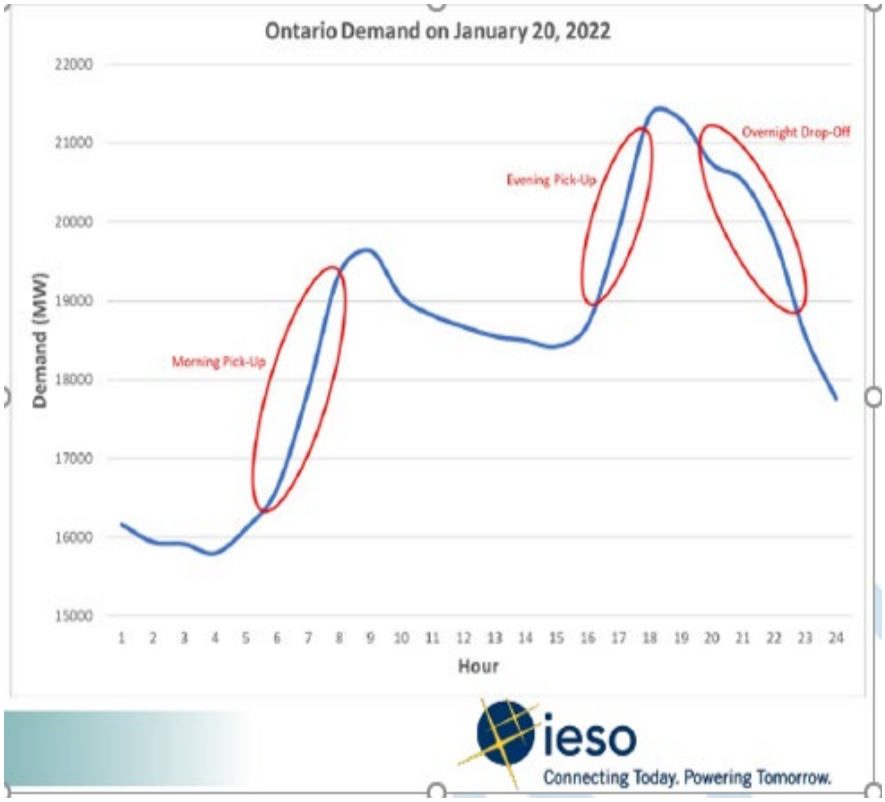
The IESO needs to realize that climate change is real, it's us, it's bad, it has to be addressed now (not by 2050), it can easily be addressed in the electricity sector, which should be the first sector to reach zero emissions, as many other decarbonization measures are based on electrification. The IESO has an important role in addressing it. It should take a professional approach, according to science and show social leadership, not be subservient to populist politicians and denialists.

The other mega-point I've tried to make is that future interconnection with heat both for buildings and electricity must be considered more rigorously. Second law efficiency must be pursued, not using electricity for heat (unless it would otherwise be surplus, e.g., surplus wind energy to heat makes sense), except for surplus energy especially not for low temperature heat for buildings, as well as capital efficiency and efficient use of materials taking into account embedded carbon (of which there is a lot in steel, concrete, aluminium and copper needed for electricity system infrastructure, but not so much district energy infrastructure) and the logistical insecurity of depending on imports

of both fossil fuels and rare metals. Take the lower cost, simpler route of district heating than trying to electrify building heating.

***

Appendix – extract from my draft report



Large scale thermal energy storage (TES) is an effective way to meet peaks in heating demand. Heating peaks are much more severe than the electricity system in Ontario is accustomed to. This is illustrated by first looking at Figure 1, then Figure 2.

Figure 1 is from a recent presentation by the IESO. It shows the usual early morning and late afternoon ramps, which typically have a magnitude of about 3,000 MWe and duration of 3-4 hours.

Figure 1 TYPICAL RAMPS BEFORE ELECTRIFICATION OF HEATING

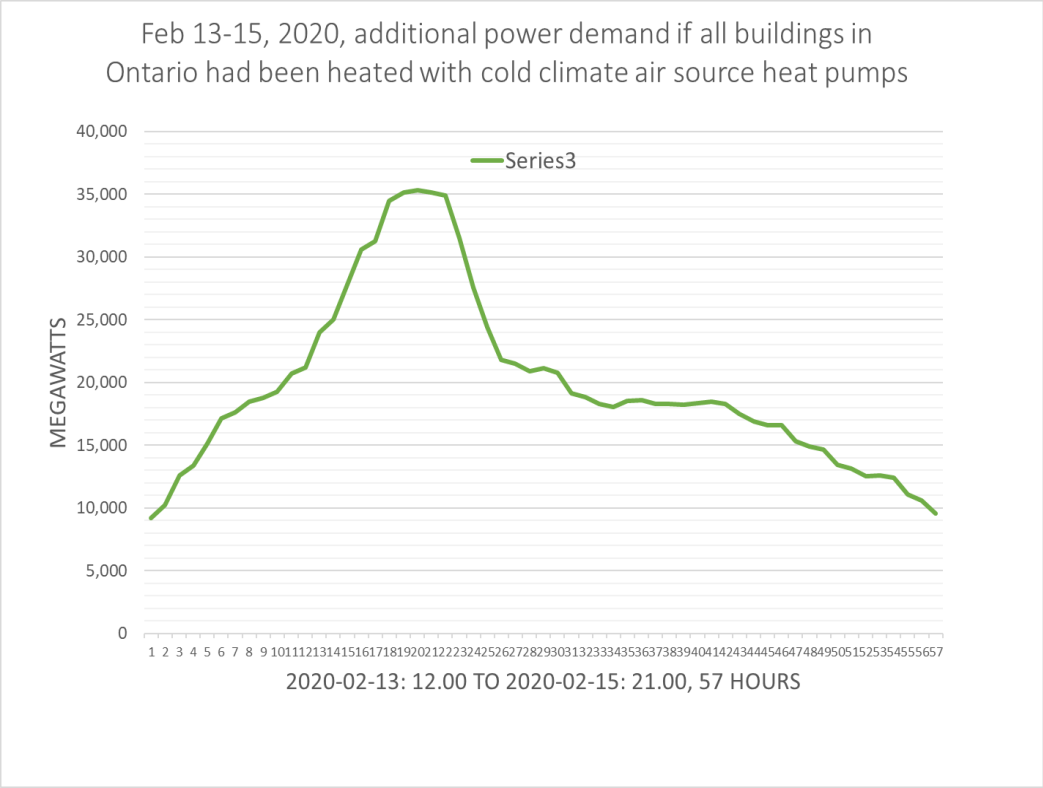


Figure 2 IMPACT ON ONTARIO GRID OF ELECTRIFICATION WITHOUT DEMAND MANAGEMEN T

Figure 2 was created with an Excel model based on hourly temperature data from Environment Canada and actual consumption of gas and oil in the residential and commercial sectors, as reported by Statistic Canada. It depicts the estimated impact on the Ontario electricity demand profile over two days in February, 2020 if all the buildings currently heated by natural gas or fuel oil had been, instead, heated by cold climate air source heat pumps (CCASHP). It takes into account both the dependence of heat demand on outside air temperature according to the generic heat transfer equation $Q = U * A * \Delta T$ and the dependence of Coefficient of Performance (COP) of heat pumps on source temperature. This is explained more fully in Appendix 1 and the Excel model will be sent to anyone who asks for it.

By comparing Figures 1 and 2, paying particular attention to the values on the axes, it is clear that electrification of heating would create peaks of magnitude and duration like nothing the electricity system has seen, or wants to see – meeting such peaks would be very expensive in $/kWh because the additional investment for generation, transmission and distribution would be utilized for only short periods of time each year.

Specifically, as an example, the 2020 peak illustrated in Figure 2 ramped 25,000 MWe because the outdoor temperature fell from around zero at noon on February 13th to minus 19°C by 8 AM the following day, then still hadn't recovered completely after a total of 57 hours. In fact, there was a 105-hour period around the peak when demand was above the winter average. Readers may recall 2020 was not an unusually cold winter. Long duration batteries discharge over 8 hours.

It would have increased the winter electrical peak by between double and triple (the usual peak of about 20,000 MWe on a winter morning plus 35,000 MWe). This result from my own simple Excel model is broadly in line with the findings of a 2019 studyi commissioned by the Canadian Gas Association (CGA) prepared by ICF International consultants using much more sophisticated models to assess the implications of electrification Canada-wide. Figure 3 is a snapshot of Figure 7 from the CGA report showing the peak hour electric load clearly tripling in the Low EE Sensitivity case (characterised by low energy efficiency efforts and no improvement in heat pump technology).

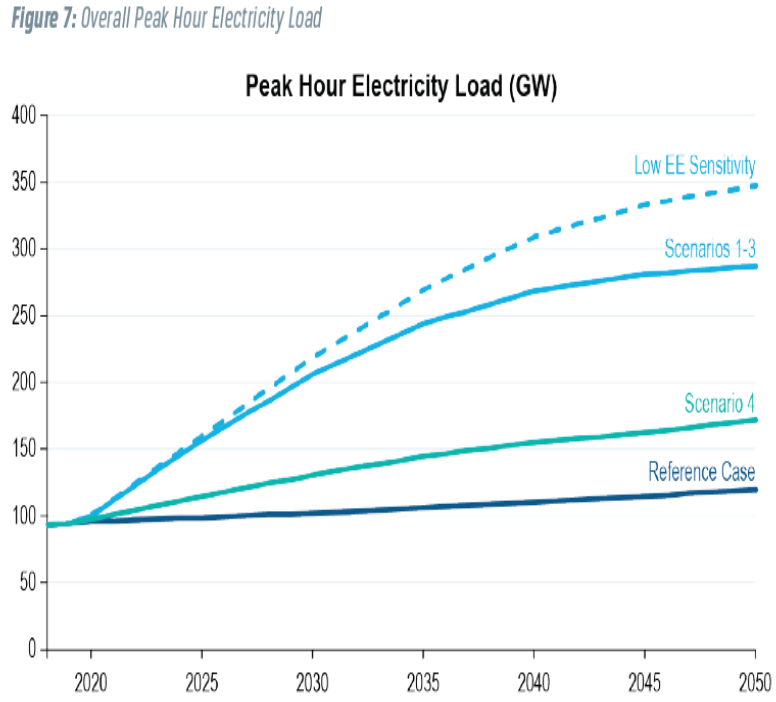


Figure 3 IMPACT ON GRIDS CANADA WIDE OF TOTAL ELECTRIFICATION

Scenarios 1-3 incorporate "aggressive assumptions in heat pump efficiency and rapid improvements in building shell improvements" yet still show the peak demand increasing to two and half times the reference case. (Scenario 4 assumes Canadians continue to rely on natural gas for cold days. That would not achieve zero emissions).

[1] Implications of Policy-Driven Electrification in Canada, A Canadian Gas Association Study prepared by ICF, October 2019