POWER WORKERS' UNION

June 18, 2021

Independent Electricity System Operator
1600-120 Adelaide Street West
Toronto, ON
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Via email to engagement@ieso.ca

Re: Feedback - Gas Phase-Out Impact Assessment

The Power Workers' Union ("PWU") represents a large portion of the employees working in Ontario's electricity industry. Attached please find a list of PWU employers.

The PWU appreciates the opportunity to provide input on the Feedback - Gas Phase-Out Impact Assessment. The PWU is a strong supporter and advocate for the prudent and rational reform of Ontario's electricity sector and recognizes the importance of low-cost, low-carbon energy to the competitiveness of Ontario's economic sectors.

The PWU believes that IESO processes and initiatives should deliver energy at the lowest reasonable cost while stimulating job creation and growing the province's gross domestic product (GDP). We are respectfully submitting our detailed observations and recommendations.

We hope you will find the PWU's comments useful.

Yours very truly,

Jeff Parnell
President

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Westario Power

Power Worker's Union Submission to the IESO's Gas Phase Out Assessment Consultation

June 16, 2021

The Power Workers' Union (PWU) is pleased to submit comments and recommendations to the Independent Electricity System Operator (IESO) regarding the Gas Phase Out Assessment consultation. The PWU is a strong supporter and advocate for the prudent and rational reform of Ontario's electricity sector and recognizes the importance of planning for low-carbon, low-cost energy solutions to enhance the competitiveness of Ontario's economic sectors.

Many municipalities, including Toronto, have begun passing motions banning the use of gas-fired electricity generators by 2030 to reduce emissions to tackle the looming threat of climate change.[1] However, natural gas generators play an important role in the balancing of Ontario's electricity grid and ensuring that customers across the province have access to electricity when they demand it.

This IESO consultation is to inform discussions on the phase-out of natural gas generators in Ontario by 2030. IESO is preparing an assessment considering such factors as reliability, operability, timing, cost, and wholesale market issues. The IESO is proposing to examine three scenarios:

- *Scenario 1*: Complete phase-out of gas generation by 2030, with a supply mix approach of new resources. This responds to the afore noted municipal resolutions.
- *Scenario 2*: A market-based approach that examines the potential of using higher gas prices to reduce gas generation to meet Ontario's 2030 reduction target and to provide market signals to clean energy developers.
- *Scenario 3*: Reduce emissions by 2030 with a supply mix approach of new resources.

The IESO is seeking stakeholder input on the scope and additional considerations for the assessment. The PWU recommends the following:

1. Reframe the challenge as one of reducing the emissions associated with the forecast need for natural gas plant usage;
2. Clarify the IESO's intended use of the emissions baseline for their scenario analysis;
3. Each of IESO's three scenarios should include the impacts of electrification on demand growth;
4. Cost assessments should reflect full system costs, including a carbon price;
5. A sensitivity analysis should be included in the assessment to determine viable dates for achieving the emission reductions for each scenario, not just for 2030;
6. Low-carbon baseload and intermediate generation technology options and configurations with distributed energy resources (DER)-e.g., nuclear and biomass should be assessed;
7. Seek stakeholder input on the viable technology options they expect will emerge post-closure of PNGS and as gas-plant contracts begin to expire;
8. Alternate and adequate procurement mechanisms are required to support non-market-based solutions to implement Scenarios 1 and 3;
9. Scenario 2 should consider realistic carbon prices, costs, complexity of alternatives, and the viability of electricity markets; and,
10. Scenario 3 should be viewed as a transition scenario with a net zero emission goal.

[1] The Energy Mix, "Toronto City Council Calls for Ontario Gas Phaseout", 2021.

Recommendation #1: Reframe the challenge as one of reducing the emissions associated with the forecast need for natural gas plant usage.

While achieving Ontario's emission reduction targets will require less reliance on natural gas generation, carbon emissions from a natural gas generating station are a function of the type of demand being supplied. The challenge that Ontario and IESO are facing is not to replace the natural gas-fired generating plants, but rather to replace the emissions associated with those plants.

Critical to advancing emissions reduction objectives is the understanding that emissions from gas plants are a function of their use in meeting three types of demand: baseload, intermediate and peak.[2] With the closing of the PNGS, natural gas generation will play an increasing role supplying these demand types. When baseload demand that is present 24 hours a day, 365 days a year is supplied by natural gas generation, it results in high carbon emissions, and is the primary factor affecting the increasing emissions forecast in the IESO's Annual Planning Outlook (APO).[3] The forecasted need for using natural gas-fired generation to meet baseload demand is a direct result of the planned retirement of PNGS. The IESO has prepared no plan to procure a low-carbon replacement(s).

While intermediate supply is required most days, it provides electricity less frequently but still with significant carbon emissions. Since peaking and reserve capacity rarely operate, their function and presence on the grid is not of material consequence to the grid's emission profile nor to the complaints that have emerged from municipalities.

From an emissions perspective, the IESO's assessment should focus on the role of supplying baseload and intermediate demand in their scenarios.

Recommendation #2: Clarify the IESO's intended use of the emissions baseline for their scenario analysis.

The IESO stated that it is assuming an emissions baseline for this assessment based on Ontario's average electricity sector emissions between 2016 and 2020. It is not clear how this reference will be used: Is it a desired goal?; A measure of success?; or some proxy for an assumption of individual gas-plant emissions output efficiencies. This requires clarification.

Recommendation #3: Each of the IESO's three scenarios should include the impacts of electrification on demand growth.

Dependence on the APO's reference demand forecast ignores the resource adequacy risks resulting from increased electrification of Ontario's economy. Electrification is considered a cost-effective way to reduce Ontario's carbon emissions, and indications that increased electrification will occur sooner than predicted are beginning to appear. Should this electrification materialize, Ontario will face further and more significant challenges in ensuring the adequacy of electricity supply in the province than the APO currently foretells. While the APO reference case has been the source of alarm over emissions concerns,

[2] PWU Submission on Resource Adequacy Engagement, October 2020
[3] IESO, APO, 2020

ignoring further electrification may both mask the degree to which there is an emissions problem and inhibit considerations of alternatives.

Absent such a plan, Ontario could see higher carbon emissions and have less flexibility in procuring low carbon alternatives. While the IESO has appropriately suggested that undertaking a new demand analysis for this assessment is outside of the project scope, conducting a sensitivity analysis for each scenario based on higher demand growth between 2030 and 2035 would be appropriate. Analyses suggest that a 25% increase in demand by 2030 above existing forecasts is a reasonable assumption.[4]

Recommendation #4: Cost assessments should reflect full system costs, including a carbon price.

IESO has included cost as a criterion in this assessment. These costs, however, have not been defined in the material. The appropriate cost measure should be "total system cost", with the details transparently communicated to stakeholders. The previously noted analysis suggests that a supply system, comprised of nuclear + storage technologies can have a lower total system cost than a comparable system consisting of carbon-capture equipped gas generation coupled with direct air capture. The total system costs could also be lower than a renewables-coupled-with-storage system.[5] These cost comparisons reflect both baseload and intermediate demand.

The assumptions around carbon price must also be stated to give context to the costs of gas-fired generation alternatives. It should be noted that if emission reduction is the objective, the carbon price itself becomes less relevant than the costs of non-emitting solutions.

Recommendation #5: A sensitivity analysis should be included in the assessment to determine viable dates for achieving the emission reductions for each scenario, not just for 2030.

Canada is seeking to have a 90% emission free grid by 2030;[6] and the U.S. has set a target of a 100% emission free grid by 2035.[7] Canada's target may prove difficult to achieve, given Ontario's plan to increase its dependence upon carbon-emitting natural gas generation.

Conducting a sensitivity analysis as part of the IESO's assessment would help identify the best ways and timing for acquiring the low-carbon resources required to reduce the emissions from gas-fired generators. As Scenario 1 suggests, it may not be feasible to fully eliminate the emissions from Ontario's gas generation supply or even dramatically reduce emissions by 2030 (Scenario 3). Sensitivity analyses

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[4] Strapolec, "Electrification Pathways for Ontario to Reduce Emissions", 2021.
[5] Strapolec, "Electrification Pathways for Ontario to Reduce Emissions", 2021.
[6] Government of Canada, "Powering our future with clean electricity", 2020. Retrieved from https://www.canada.ca/en/services/environment/weather/climatechange/climate-action/powering-future-clean-energy.html
[7] The White House, "FACT SHEET: President Biden Sets 2030 Greenhouse Gas Pollution Reduction Target Aimed at Creating Good-Paying Union Jobs and Securing U.S. Leadership on Clean Energy Technologies", 2021. Retrieved from https://www.whitehouse.gov/briefing-room/statements-releases/2021/04/22/fact-sheet-president-biden-sets-2030-greenhouse-gas-pollution-reduction-target-aimed-at-creating-good-paying-union-jobs-and-securing-u-s-leadership-on-clean-energy-technologies/

should also include an objective that is driven by both net annual emissions and cumulative annual emissions to 2050.

Bulk sources for low-emitting firm generation of this scale, along with the associated transmission infrastructure will take several years to build and commission. As well, any of the potential supply options, whether it is wind, hydro, natural gas with carbon capture and storage or new nuclear will face siting challenges.

The IESO should determine whether assuming later implementation dates will yield more viable and cost-effective approaches. It is arguable that 2035 may represent a more realistic timeframe for gas phase-out. This is important since large-scale, low-carbon supply solutions that cannot be built to scale for 2030 may be available by 2035 if procurements are commenced today. For example, procurement of conventional nuclear combined with storage begun today could make abundant, flexible, zero-GHG supply available before 2035. This approach could also mitigate or entirely avoid the challenges associated with the scenario of early termination of gas-fired generation contracts.

Recommendation #6: Low-carbon baseload and intermediate generation technology options and configurations with distributed energy resources (DER)-e.g., nuclear and biomass should be addressed in the assessment.

The IESO has asserted that "*much of what the IESO expects to be replacement supply with capability to meet reliability needs are either not developed or unproven at this scale. Therefore, a conservative approach would be needed to ensure reliabilit*y." The IESO also indicates that "*existing /established technologies will be used in all three scenario*s". The question being raised by municipalities is a forward-looking supply mix question about the emissions profile that extends to 2040. The question should not be "*If we had to live with the technologies of the last decade, what would we do?*". Rather it should be: "*What may be viable options as we look to the next decade?*".

There are many proven technologies as well as important technologies being piloted today. These emerging technologies should be commercially viable by the time the emissions problem emerges five years from now in 2026 and as gas plant contracts expire in the ensuing 5 years to 2030. That is a long time-horizon considering today's pace of innovation. During this transition period Ontario has the opportunity to build a lower emitting grid with minimal sunk cost risks to rate payers.

Low-carbon technology options that can provide Ontario's baseload and intermediate demand should be a priority for the assessment.

a) Baseload-emerging technology options.

Candidates for low emitting baseload supply include new nuclear, biomass, and carbon capture technologies to support gas-fired generation.

Nuclear: Nuclear is a proven technology and the backbone of Ontario's existing low-carbon grid. Ontario also benefits significantly from a well-established domestic nuclear supply chain. Advanced conventional nuclear technologies are available and small modular reactors (SMRS) are expected to be commercially viable by the end of the decade. Ontario Power Generation (OPG) is already planning a commercial grid scale SMR by 2028.

Carbon capture: Carbon capture technologies are aggressively being pursued across Canada for several applications.[8] If available, and more importantly, if cost effective, this approach would allow for the continued operation of gas-fired generation. However, there are several unknowns and challenges with respect to cost and efficacy that may not be resolvable in the next ten years for portions of Ontario's gas fleet, including:

a) While carbon capture is 90% effective, supplemental direct air capture is required to reduce net emissions to zero;
b) Direct air capture is an emerging technology itself and requires additional low emitting sources for electricity and heat;
c) Large-scale storage options are needed to store the sequestered carbon for the long-term. The extent to which storage capacity exists in Ontario is largely unknown, as are costs associated with it.
d) The transportation infrastructure required to deliver the captured carbon to long term storage has not been identified nor its costs. These challenges may be amplified in some instances by the location of the captured carbon; e.g. transporting captured storage from the Portlands Gas Generating Station in Toronto.

b) Intermediate-Emerging technology options.

Emerging distributed energy resource technologies are being proven today that can smooth intermediate demand at the local level. These technologies can shift load to low-carbon baseload instead of relying on natural gas-fired generation. DER technologies include demand side management, battery storage technologies, distributed storage using EV batteries, and employing electrolytic hydrogen production to provide continuous demand response and ancillary services.

These options are important to this assessment, as the IESO will also be examining the zonal implications for the transmission grid. Using DER to reduce intermediate demand will increase the demand for baseload supply. This in turn will reduce the requirements on the transmission system for handling low-capacity factor intermediate supplies, such as natural gas.

The IESO is already piloting many of these options. They are also being commercially developed today on a global scale and will yield viable non-emitting solutions to gas-fired generation prior to 2030.

While carbon capture and storage (CCS) may not be viable for all existing locations, it may be technically feasible to retrofit some existing gas generators to use hydrogen to produce electricity. Siemens' gas-fired generation burners are hydrogen compatible to varying degrees. The company plans to improve its gas turbine models to 100% hydrogen by 2030.[9] GE's gas turbines can also handle high concentrations of hydrogen, up to 95% in existing turbines.[10] For hydrogen fueled generation to be a low-emitting option

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[8] The Government of Canada recently proposed the introduction of an investment tax credit for capital invested in carbon capture, utilization, and storage (CCUS) projects in the 2021 budget. The Government of Canada currently has over $60 million of on-going investments for carbon capture and sequestration through NRCan (https://www.nrcan.gc.ca/science-and-data/funding-partnerships/funding-opportunities/current-investments/21146). Additional pushes for carbon capture include as part of Canada's recently announced "A Hydrogen Strategy for Canada" (2020).

[9] Siemens, Hydrogen Power with Siemens Gas Turbines, 2020.

[10] GE, Hydrogen fueled gas turbines. Retrieved from https://www.ge.com/gas-power/future-of-energy/hydrogen-fueled-gas-turbines

and cost-effective, the hydrogen must be produced using low-carbon electricity sources such as baseload nuclear.

Recommendation #7: Seek stakeholder input on the viable technology options they expect will emerge post-closure of PNGS and as gas-plant contracts begin to expire.

The IESO should seek stakeholder views and information regarding the planning assumptions and parameters for inclusion in its analysis of the three Scenarios. This is important given IESO's expressed concerns about the availability of viable solutions that will emerge in the next 5 to 10 years. Parameters could include cost ranges, implementation architectures for hybrid solutions, aggregator models for managing distributed energy resources, market or "no market" procurement mechanisms, and the interest in large scale solutions such as nuclear, hydrogen, or carbon capture. Some of the latter options are inhibited by the competitive markets, but may be viable without a market e.g., aggregated behind the meter applications.

Recommendation #8: Alternate and adequate procurement mechanisms are required to support non-market-based solutions to implement Scenarios 1 and 3.

Scenario 1 effectively models a policy intended to eliminate emissions from Ontario's gas fleet. Scenario 3, while similar, appears to suggest a slower transition timeline, although not yet defined. Even without the phase-out of gas generators in the province, IESO is forecasting a capacity shortfall of up to 3.6 GW in 2030, assuming the contract renewal of all existing resources, the majority of which are Ontario's existing gas generators. Prematurely phasing-out these generators could threaten Ontario's energy security, particularly if the anticipated growth in electricity demand from the electrification of the rest of the economy materializes.

Studies have shown that Ontario's electricity markets' approach is incompatible with the procurement of non-emitting solutions.[11] To secure low-carbon supply options, the IESO should consider alternative procurement mechanisms. Given the timelines for some of these options, capital requirements and the evident risks, it would be prudent for the IESO to start now. Some of these options, especially those of a larger scale, provide significant societal benefits. For example, nuclear technologies can contribute to increases in jobs, exports, research, medical treatments in the province, and a reduced reliance on energy imports. These benefits should be quantified and recognized during the planning process.[12]

Recommendation #9: Scenario 2 should consider realistic carbon prices, costs, complexity of alternatives and, the viability of electricity markets.

Scenario 2 is intended to evaluate how electricity markets could be employed to incent alternatives to carbon emitting gas-fired generation through the inclusion of a carbon price. Four challenges should be addressed to ensure that Scenario 2 is properly evaluated.

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[11] Strapolec, "Ontario Electricity Markets", 2020
[12] Strapolec, "Electrification Pathways for Ontario", 2021

Use of prevailing carbon price. The federal government has established a national "backstop" carbon price. The federal government's approach uses the Output Based Pricing System (OBPS) for applying the carbon price to natural gas-fired generation. Ontario was recently granted exemption from the OBPS since the province developed its Emissions Performance Standard (EPS). However, Ontario's EPS effectively exempts natural gas-fired generation from the carbon price for existing and new plants. The EPS is currently being aligned with the OBPS for existing plants, but there are no provisions being contemplated to align it on new gas plants. The OBPS transitions the carbon price for the full output of a new gas-fired station to $170/tonne by 2030. The federal legislation is intended to make carbon-emitting generation uneconomic in the next 8 years. The IESO's assessment should include analyses on the impacts of the federal carbon price for all three Scenarios.

Clarifying the breakeven carbon price. The IESO has provided no analysis that shows the breakeven point for natural gas generation under different carbon prices and market incentives that would incent alternative low-carbon options. It is also not clear whether the federal carbon pricing approach achieves or exceeds this goal. The IESO should undertake this analysis, including a comparison with the federal government's approach to estimate such a value. The breakeven point will likely be different for supplying baseload and intermediate demand. For baseload, studies show that a breakeven metric could be established by comparing total costs of solutions built around nuclear or natural gas generation with full carbon capture.[13]

Addressing the challenges of using electricity markets for non-emitting options. Current electricity market designs reflect the predominance of fossil-fueled generation such as natural gas. Studies have shown that due to the cost structures related to non-emitting resources, electricity markets are biased towards fossil-fuel generation procurement.[14]

Adapting markets to embrace the emerging technologies may be too complex. The IESO's market renewal program (MRP) and evolving market design has been complex, costly and underway for many years. The IESO recognizes that integrating new non-emitting resources adds further complexity. It has already deferred this critical work until post 2023 when the existing MRP IT investments are completed.[15] Modelling how the markets would function without natural gas-fired generation may help inform whether this approach is viable.

The IESO's assessment for Scenario 2 should consider and address all of these factors.

Recommendation #10: Scenario 3 should be viewed as a transition scenario with a net zero emissions goal.

Net zero emissions should be the end-goal of all three Scenarios. Scenario 3 represents the middle ground between the other two, with the emissions from gas-fired generation gradually decreased through a planned and managed approach. Absent from this scenario is a defined pathway for the

[13] Strapolec, "Electrification Pathways for Ontario", 2021
[14] Strapolec, "Electricity Markets in Ontario: An Examination of Mismatched Conditions and Options for Future Competitive Procurements", 2020.
[15] IESO engagement on Hybrid Resources, Enabling Resources, and Resource Adequacy with specific reference to the mid-term competitive mechanism

eventual transition to net zero in consideration of the limitations that will be uncovered from Scenarios 1 and 2.

In further defining the criteria for this scenario, it is important to consider the risks of locking the province into long-term solutions that rely on emitting resources that the province will eventually want to eliminate, and the associated sunk costs for rate payers.

Closing

The many economic and environmental risks posed by the phase-out of Ontario's natural-gas generators by 2030 is evident, as well as the need to address them. The PWU supports an assessment that transparently and comprehensively addresses Ontario's goal of securing and sustaining a low carbon electricity system for the future.

The PWU has a successful track record of working with others in collaborative partnerships. We look forward to continuing to work with the IESO and other energy stakeholders to strengthen and modernize Ontario's electricity system. The PWU is committed to the following principles: Create opportunities for sustainable, high-pay, high-skill jobs; ensure reliable, affordable, environmentally responsible electricity; build economic growth for Ontario's communities; and, promote intelligent reform of Ontario's energy policy.

We believe these recommendations are consistent with and supportive of Ontario's objectives to supply low-cost and reliable electricity for all Ontarians. The PWU looks forward to discussing these comments in greater detail with the IESO and participating in the ongoing stakeholder engagements.