Power Workers' Union (PWU) Submission regarding Treatment of Corporate Power Purchase Agreements ERO 019-7853

December 17, 2023

The Power Workers' Union (PWU) is pleased to submit comments and make recommendations to the Ministry of Energy (Ministry) regarding the proposal to allow Industrial Conservation Initiative (ICI) participants to offset their facility's demand in the top five peak hours of a base period through power purchase agreements (PPAs) with renewable generation facilities that are not connected behind the facility's meter. The types of technologies that could be eligible under the proposal may include wind, solar, small hydroelectric (i.e., less than 10 megawatts), biofuel and battery storage.

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-cost, low-carbon energy solutions to enhance the competitiveness of Ontario's economy.

The Ministry's proposal is intended to leverage the structure of the billing practices for ICI participants who pay the full Hourly Ontario Energy Price (HOEP) and a portion of the Global Adjustment based on their share of system peak demand. The ICI has been heavily leveraged by vendors of Behind-the-Meter (BTM) storage and natural gas Combined Heat and Power (CHP) to help ICI participants shave their peak demand during times when demand is measured by the system. This has greatly benefited industrial users, some of whom have dramatically reduced their exposure to the GA costs, which have historically been the larger component of the energy bill.

The Ministry is seeking to use the same mechanisms to enable clean energy vendors to help ICI participants benefit from investments in new clean energy facilities, this time in Front-of-the-Meter (FTM), in order to:

a. Provide system benefits;
b. Enhance Ontario's industrial competitiveness; and,
c. Promote new clean generation such as solar, wind, hydro, biofuel and battery storage.

The PWU believes that the underpinning economics do not support the objectives of the Ministry and makes the following recommendations.

1) The Ministry should not implement this corporate PPA approach given its high costs of securing supply for meeting Ontario's generation and capacity needs;

Should the Ministry ignore the above recommendation and proceed with its proposal, then the following conditions should be included:

2) This initiative should not commence until May of 2027, when Ontario's capacity needs and cost structure may be more favorable;
3) Only new facilities should be eligible for Corporate PPAs under the ICI proposal;
4) Any grid-connected FTM supply should be dispatchable by the IESO, at no cost to it, including curtailment when the gas-fired generation it is intended to replace is not on the margin; and,
5) Eligible renewables facilities (wind and solar) should be paired with co-located storage to minimize the cost to grid and be responsible for incremental system delivery and other integration costs they cause.

Recommendation #1 - The Ministry should not implement this corporate PPA approach given its high-costs of securing supply for meeting Ontario's generation and capacity needs.

The approach will add cost to the system and not provide the desired benefits, and industry has better alternatives to advance ESG objectives. This recommendation is supported by five factors: mismatched supply types; cost; ICI participant risk and evolving peak needs; unrealizable IESO benefit assumptions; and Clean Energy Credit (CEC) alternatives.

a) The resources identified by the Ministry's proposal are not the types of supply required by Ontario.

The IESO procurements requirements very clearly specify that Ontario's electricity system requires firm dispatchable supply.

Ontario does not need more intermittent renewables generation.[1] The IESO requirements include 4-hour continuous output commitments which renewables cannot provide without storage, effectively ruling out standalone renewables.[2] Non-dispatchable intermittent renewables must be accompanied by fast ramping resources such as natural gas-fired generation. This is inconsistent with Ontario's intent to phase out gas generation. Ontario already has over 7000 MW of non-dispatchable intermittent wind and solar resources (~5400 MW are grid connected).

Furthermore, while pairing storage with renewables offers better benefits, storage on its own will not provide Ontario with the clean energy benefits for quite some time as gas-fired generation will be on the margin 100% of the time by 2027 and is forecast to remain so for several decades.[3]. Due to losses in the storage system, charging storage with electricity from natural gas-fired generation increases emissions by 15% compared to reliance on gas-fired generation only.

b) The identified eligible resources are high-cost options for the IESO.

The costs of the resources are first described, followed by the cost implications under the IESO Administered Markets (IAMs), and then the costs and benefits to an ICI participant.

1) Directly procured resource costs

Clean Energy Canada (CEC) published the expected costs of renewables as shown in Table 1, both with and without battery storage. The LCOE values represent the expected energy prices that a developer would expect and that either the IESO or the ICI participant may expect to pay if the costs of the new resource were only recovered from energy, such as with the existing Feed-in-Tariff (FIT) programs. Alternatively, the annual revenue requirement is indicated which represent either the minimum cost for IESO to procure the resource directly or the cost recovery that the ICI participant must realize from its potential PPA with a developer coupled with the terms of the ICI.

[1] While the IESO has recently been announced that procurements for new renewables may be forthcoming, the specific requirements have yet to be disclosed and the method for addressing the system consequences will be subject to review, https://ieso.ca/Corporate-IESO/Media/News-Releases/2023/12/IESO-Proposes-New-Clean-Electricity-Supply.

[2] IESO, LT1 RFP, August, 2023.

[3] IESO 2022 APO reference demand case; IESO P2D Study, 2022; PWU Submission to the ECCC on the Clean Electricity Regulation (CER), Nov 2023, PWU submission to the IESO on APO/AAR Reform, Dec 2023.

Table 1

2027 Energy Cost Benchmark (CEC 2023)			
Technology	LCOE ($/MWh)	Cap Factor	Ann Rev Need ($K/MW)
Solar	$ 75.00	20%	$ 131.40
Solar + Battery	$ 175.00	19%	$ 291.27
Wind	$ 41.00	40%	$ 143.66
Wind + Battery	$ 88.00	37%	$ 285.23

2) Cost implications under IAMs

The IAMs pay for energy production through the HOEP and the energy capacity through capacity contracts or auctions.

Table 2 provides the market context for the avoided energy costs that the new renewables facilities may offer by displacing natural gas-fired generation output. These also represent the avoided HOEP costs that an ICI participant may realize under the proposed PPA. The IESO HOEP forecast for 2027 of $33.70/MWh is the average over the entire year.[4] The HOEP present during solar operations is slightly higher at $40.44. An additional carbon price has been identified to reflect the January 2023 changes to the EPS.[5] The result is the effective HOEP that may be relevant to wind ($41.20) and solar ($47.94) PPAs. The CEC peaker and CCGT variable costs are provided for reference to validate the reasonableness of the assumed HOEP.

Apart from wind facilities, the LCOE of the proposed eligible resources are all higher than the expected HOEPs.

Table 2

Variable Cost Comparisons				Total w Carbon Price	
Source	Overall	During Solar Ops*	Pot. Carbon Price Incr.	Wind	Solar**
IESO HOEP 2027	$ 33.70	$ 40.44	$ 7.50	$ 41.20	$ 47.94
Nat Gas Peaker (CEC)	$ 39.30		$ 10.20		$ 41.18
CCGT (CEC)	$ 31.60		$ 7.50	$ 39.10	

*Apr-Sep, 8am to 7pm, Avg premium difference 2022,2023 = 20%

** Gas Peaker case for solar is a blended rate based on peaker vs CCGT capacity factors)

[4] IESO, 2022 APO. Note that the CEC and IESO both assumed the same cost of natural gas. This price includes the carbon price reflecting the EPS benchmark performance standard of 370 kg/MWh that was in effect in December 2022.

[5] In January 2023, the EPS was modified to reflect an emissions stringency requirement of 310 kg/MWh. Note that some other third-party analyses (e.g. Power Advisory, CEC) have modelled the full carbon price that would apply under the federal OBPS and that would add on the order of an additional $45 to the HOEP. The EPS has not incorporated this change and expectations are that it won't due to the substantial industrial competitiveness implications or migrating the HOEP to $100/MWh.

Table 3 summarizes the capacity cost implications to the IESO. Two scenarios are provided: (1) All costs are funded through an annual capacity payment; and (2) Recognizing the HOEP value and estimating the required additional capacity payments to meet the annual revenue needed by the developer. Fundamental to capacity cost assumptions are the capacity contributions expected from the resources. The IESO's 2022 APO identifies the expected peak contribution factors for solar and wind in 2027 as 26% and 11.5% respectively.[6,7,8]

If the required annual revenue were only obtained from capacity payments, this would equate to a cost to the IESO of $505K/MW of reduced peak demand for a solar PPA without a battery. Adding a battery would cost the IESO $485K/MW. Given that the eligible facilities also provide energy contributions as part of their fixed process, it is unreasonable to assume that all their costs should be recovered by capacity payments.

The PPA Scenario in Table 3 shows that after accounting for the avoided energy costs at HOEP values, a solar PPA would still need a $47K/year/MW capacity payment at an IESO cost of $182K/MW. This is greater than the $138K natural gas peaker capacity cost that the solar contribution might displace. Wind may provide a benefit if PPAs can be secured for the same price as the expected HOEP.

Table 3

2027 Capacity Cost Benchmark						
	Capacity Payment Only			PPA Scenario		
Technology	Ann Rev Need ($K/MW)	Contribution at peak*	Effective IESO Capacity cost ($K/MW/Year)	Rev at HOEP ($K/MW)	Need Cap Cost ($K/MW)	Eff IESO Cap Cost ($K/MW)
Solar	$ 131.40	26%	$ 505.38	$ 83.99	$ 47.41	$ 182.34
Solar + Battery	$ 291.27	60%	$ 485.45	$ 79.79	$ 211.48	$ 352.46
Wind	$ 143.66	12%	$ 1,249.25	$ 144.36	$ (0.70)	$ (6.09)
Wind + Battery	$ 285.23	60%	$ 475.38	$ 133.54	$ 151.69	$ 252.81
Nat Gas Peaker			$ 138.46			
CCGT			$ 164.62			

*IESO coincident peak demand and wind/solar output capacity factor, IESO 2022 APO.

Battery contribution based on size of battery = 60% of wind/solar capacity

3) Potential revenue for ICI participants in a corporate PPA is at risk

The ICI benefits for participants is determined each year by the contribution made to reducing peak demand. The peak demand days for 2022 are shown in Table 4 along with the coincident solar and

[6] Ontario's resource adequacy requirement is an expected loss of load equivalent (LOLE) of less than 0.1 days/year. As a result, the derating for intermittent renewables should be assessed based on the lowest available capacity that exists for 99.973% of the hours that are coincident with peak demand. An analysis of solar and wind systems compared to Ontario's demand showed that of the top 30 demand hours in each of 3 consecutive years, both types of generation had multiple hours where they produced little to no generation. In fact, an assessment of the top 14 peak hours in 2022 showed that solar had negligible output in 2 of them including in the 6th highest demand hour. This is far less reliable than the derating factors forecast by the IESO 2022 APO.

[7] PWU submission to the IESO's Reliability Standards Review, Sept 2020.

[8] Analysis of IESO 2022 generation and demand data.

wind capacity factors for those hours. Using the prescribed ICI formula, the solar and wind contribution at peak under the Corporate PPA proposal would be 37% and 47% respectively. However, it is notable that in 2022, at the highest demand hour, the average solar output in Ontario was only 25% of available capacity and for wind it was only 16% on August 6.[9] These impact both the benefits realizable by the IESO and well as risk to the assumed calculated values for the ICI.

Table 4

Top 5 Demand Peaks 2022						
Date	Hour Ending (EST)	Ontario Demand (MW)	Solar CF at Peak		Wind CF at peak	
Tuesday, July 19, 2022	18	22,607	25%		37%	
Wednesday, June 22, 2022	17	21,954	53%		37%	
Monday, August 29, 2022	17	21,871	24%	'<-- Lowest	58%	
Wednesday, July 20, 2022	16	21,850	44%		71%	
Sunday, August 7, 2022	17	21,778	38%	*22% on Aug 6*	32%	<-- Lowest, *but 16% on Aug 6*
		22,012	37%	Avg	47%	Avg

Note: Aug 6 was 6th Peak demand day with only 17 MW less demand as Aug 7, but was the 5th AQEW demand day at 150 MW more than Aug 7

Table 5 shows how the above results would impact the ICI calculation for a 1 MW solar or wind facility under a PPA with a 1 MW industrial user. The first column shows the benefit that would arise today under the 2022 GA costs. The remaining columns show the benefit that could arise from a GA value with an average HOEP of $41. This shows that an ICI participant with a solar PPA would benefit by $100K/year, a wind PPA a $128K/year and a solar battery facility $163K/year. The values are higher than required revenue identified in Table 3 for standalone solar, wind, or wind with batteries. The ICI participant would realize a net benefit, for example, of $50K for the solar scenario and $128K for a wind scenario, making it potentially attractive to an. ICI participant.

However, this would cost the IESO and all other rate payers, $389k/MW for solar, and a very high $1100k/MW for wind → three to six times the capacity cost that might be incurred if the IESO procured capacity resources directly. The Ministry should not support this high-cost proposal. Note also that the identified benefit that may accrue to ICI participants would not offset the 200% cost growth in the HOEP since 2020 that industrial users may face. Regardless of this proposal, the Ministry will need an alternative approach to counter the competitiveness issues that those cost increases will entail.

Table 5

	2022-2023 Period	est 2027 HOEP at $41		
ICI Calculation (Ref)	Solar Case	Solar Case	Wind Case	with Battery
Avg Monthly GA ($M)	943		0	
GA after Tax Basing ($M)	678	500	500	
Avg system peak (MW)	22,012	22,012	22,012	
Sample Industrial User Pk Demand (MW)	1	1	1	
PDF	0.0045%	0.0045%	0.0045%	
Mthly GA Charge ($K)	$ 30.80	$ 22.71	$ 22.71	
ICI Reduction based on solar	37%	37%	47%	60%
ICI benefit/year ($K/MW installed)	$ 136.71	$ 100.82	$ 127.91	$ 163.55
*Effective IESO capacity cost**		*$ 389.25*	*$ 1,112.27*	*$ 272.58*

** Note: Effective IESO capacity cost uses the capacity contribution values from IESO's 2022 APO: 26% for solar, 11.5% for wind*

[9] IESO data.

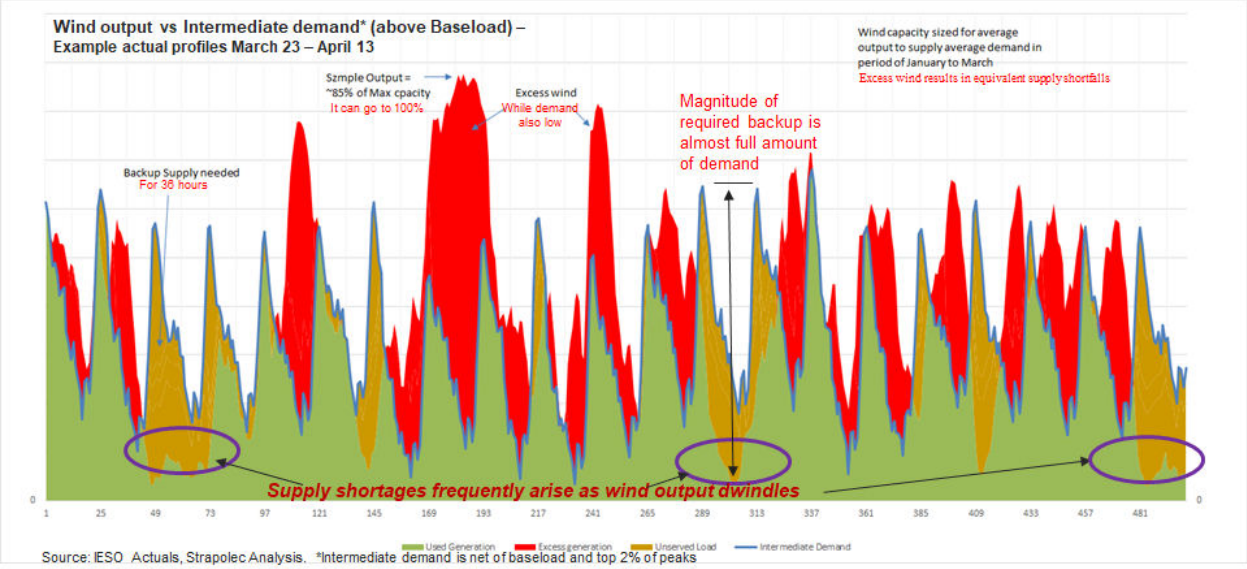
c) ICI participants may be unwilling to undertake the 30+ year commitments that underpin the identified cost assumptions.

Firstly, several of the eligible facility options should not be favorable to ICI participants. For solar facilities equipped with a battery, the ICI participant may recover $163K/year, which is less than its needed cost of $211K identified in Table 3 above. Wind battery options appear to be breakeven propositions for ICI participants, but the pursuit of related PPAs comes with risk.

For solar only options, the system will shift to winter peaking by 2030, making the business case non-viable after that point as solar has no material system contribution during the anticipated winter peaks.

For wind, winter peaking may be more favorable, however an ICI participant can be expected to want these costs and benefits to be confirmed in a reliable way. This is because, even for wind, output could be as low as 5% of its capacity as illustrated in Figure 1.[10]

Figure 1



d) The IESO may not be able to realize even the small capacity benefits that may be unlocked by the PPAs.

The IESO will be unable to avoid the new capacity costs of a peaking or CCGT facility until the ICI participants facility agreements have been implemented and the firm capacity values determined that could be used by IESO planners. This process could delay the IESO's realization of savings by many years until the resource adequacy assessments begin to alter the procurement strategies. For solar options, no savings would be realized given the expected shift to winter peaking.

e) Industry has more favorable ESG options.

It would be more economical for industry to add clean energy to its portfolio, through the Clean Energy Credit system recently introduced in Ontario. CEC participation will not: entail 30-year commitments and the associated financial risks; and can be paired with the type of generation desired.

[10] Figure originally produced in the PWU submission to ECCC on the Clean Electricity Regulation, November 2023.

In addition, this approach will come as a benefit to other ratepayers and not a cost. The Ministry should favor this approach.

Should the Ministry decide to pursue this proposal notwithstanding the above noted recommendation, then the following conditions should be included:

Recommendation #2 - This initiative should not commence until May of 2027, when Ontario's capacity needs and cost structure may be more favorable.

Ontario's future capacity needs are dependent upon the IESO's ability to successfully address the gap that will emerge with the shutdown of the Pickering Nuclear Generating Station.

It is worth noting that the rising cost of the HOEP is correlated with the increasing use of natural gas after the Pickering closure and the economics of the corporate PPAs are even less favorable before 2027. Costs may drop by 15% from today according to the CEC.

Recommendation #3 - Only new facilities should be eligible for Corporate PPAs under the ICI proposal.

It is important that only new facilities be eligible for this proposal. This is because the capacity contribution of all existing proposals is already factored into Ontario's resource adequacy needs. There will be no capacity benefit realized by the system by allowing ICI participants to get credit for those existing facilities. But it will still come at that same very high cost to the rest of Ontario's ratepayers.

Recommendation #4 - Any grid-connected FTM supply should be dispatchable by the IESO, at no cost to it, including curtailment when the gas-fired generation it is intended to replace is not on the margin.

Absent any constraints, industry may be encouraged by the proposal to overinvest in renewables and create surplus supply, particularly during the shoulder seasons. Such an outcome could require the IESO to curtail system assets at a higher cost to rate payers to protect private investors. This provision would help ensure that higher costs are not incurred by rate payers.

Recommendation #5 - Eligible renewables facilities (wind and solar) should be paired with co-located storage to minimize the cost to grid and be responsible for incremental system delivery and other integration costs they cause.

The implications of building out Ontario's constrained transmission system are significant given the anticipated increasing demand driven by electrification. Ontario will need to take an efficient and cost-effective approach to develop the required delivery infrastructure to manage this energy transition without transmission constraint induced brownouts.

Building transmission for renewables is less efficient and more expensive due to their low capacity factors and intermittency. Firming wind's 40% intermittent capacity factor to an 80% capacity factor using storage and limiting the output to 60% could cut the costs of new transmission systems by 70%.

At the same time, the connection costs and costs of allocating bandwidth throughout Ontario's system in order to ensure that the output of the facilities can be used should be recovered by the IESO from the facility proponents and all be borne by the PPAs contemplated by the developer and ICI participant. If the IESO were procuring new resources, they would be locating them optimally within their system. It is unlikely that these commercial opportunities would be equally optimized without criteria applied to them.

Closing

Ontario faces an evident and urgent capacity shortage with the closure of the Pickering Station and increasing electricity demand from electrification. Ontario requires a prudent procurement focus on securing the lowest cost system solutions in order to provide a reliable, affordable and sustainable electricity system. The proposed corporate PPAs for renewable energy is not an appropriate mechanism for achieving Ontario's goals. The Ministry's *Powering Ontario's Growth* directives for new nuclear and the IESO's centralized and locally focussed needs procurement approach would be a more effective way to sustain the competitiveness of Ontario's energy system.

The PWU has a successful track record of working with others in collaborative partnerships. We look forward to continuing to work with the Ministry 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.