**Power Workers' Union Submission on the IESO's Long Term 2 RFP Engagement**

January 15, 2024

The Power Workers' Union (PWU) is pleased to submit comments and make recommendations to the Independent Electricity System Operator (IESO) regarding the IESO Resource Adequacy and Long-Term 2 (LT2) RFP engagement initiated on December 13, 2023. The PWU remains 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 IESO provided an overview of Ontario's emerging system reliability needs and its cadenced approach to upcoming procurements that are intended to help competitively acquire needed energy and capacity. The IESO also provided a high-level overview of the expected procurement design, revenue model and deliverability considerations. The IESO has asked for general feedback on the: proposed revenue model innovations; cadenced nature and target setting of the LT and medium-term (MT) RFPs; resource eligibility and DER considerations; system congestion and delivery implications; rated criteria for consideration; and, approach to long-lead time resources.

The IESO's procurement approach is overly complex and replete with planning and analysis deficiencies that underpin unmitigated reliability and affordability risks. Additionally, the proposed Enhanced Power Purchase Agreement (PPA) approach will unnecessarily add ratepayer costs. Addressing the defined unserved load with the intended renewables resources could require up to 9000 MW of new resources by 2029, not the 2000 MW by 2030 identified by the IESO.

The following fourteen recommendations are intended to improve the IESO's approach across five key categories:

*Proper specification of the system needs is critical*

1. Define "unserved energy" and the conditions under which it must be supplied by the generation being procured;
2. Consider the benefits of reducing the use of natural gas-fired generation at times when unserved load conditions do not exist;
3. Characterize the transmission constraints that bidders are expected to navigate as this materially affects anticipated curtailments, particularly in regions with low gas-fired generation capacity;

*Understanding the possible solutions to meeting system needs has implications on procurement design*

4. Recognize that electricity markets will be costly and inefficient at integrating non-emitting resources;
5. Reconsider the IESO's enhanced PPA revenue model as it will result in higher costs without reducing risks;
6. Environmental attributes should accrue to the IESO since the HOEP already includes a carbon price which is passed on to ratepayers;
7. Recognize that independent wind and solar solutions cannot supply the needed unserved energy and remove biases against the eligibility of other technologies;
8. Consider procuring firm baseload and intermediate supplies instead of unserved energy;

9. Collaborate with the Ontario Energy Board (OEB) to incentivize Behind-the-Meter (BTM) Demand Side Management (DSM) Distributed Energy Resources (DERs) through rate programs to reduce Tx / Dx costs by smoothing demand and not rely on IESO administered markets;

*Accommodation of long-lead time generation development can optimize development*

10. Expand considerations for long-lead time generation resource development and eligible resources;
11. Structure MT RFP planning and targets to manage the gaps in the development of long-lead time resources;

*Expansion of evaluation criteria can optimize affordability*

12. The primary criteria should be the total system cost impact of integrating a project proposal to meet the need;
13. The total aggregated net cost to taxpayers and ratepayers of a project proposal should be assessed; and,

*Reforming the IESO procurement process will accelerate siting acceptance and improve reliability*

14. Mitigate procurement and development risks by reforming the IESO's procurement approach to leverage Regional Planning constructs that enable acceptable siting opportunities.

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***Detailed Recommendations***

*Proper specification of the system needs is critical*

**Recommendation #1 -** Define "unserved energy" and the conditions under which it must be supplied by the generation being procured.

The IESO introduced the LT2 RFP as emphasizing the need to procure energy generating resources on the basis of a forecast system need to supply 5 TWh of unserved energy that is expected to emerge by 2029 after consideration of all recent procurement activities. They emphasize that the LT2 RFP process will be focused on securing the supply to meet this energy need. The IESO then describes that this need may be met by approximately 2 GW of new nameplate generation of eligible resources that would participate in the IESO administered markets. Finally, the IESO-proposed Enhanced PPA only addresses energy costs and the influence of the IESO's energy market with no criteria related to how the resources would address the unserved load. As a result, it is not clear exactly what the IESO is seeking to procure. The PWU suggests that the IESO's bias towards administered market compatibility should not be the driver but should rather focus on the alignment of generation output to the system need to supply unserved demand.

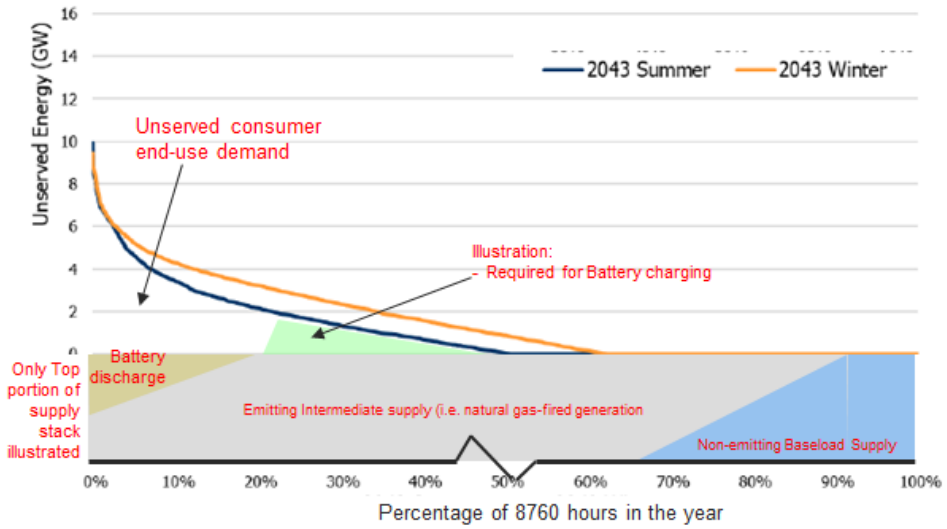
The IESO should clearly define "unserved energy" and specify the system need in clear terms that proponents can understand. This helps enable an objective assessment of how any proposed resources could meet the need. This would entail specifying two criteria: the magnitude of unserved energy being addressed by year over the term of the contracts; and, exactly what the hourly unserved energy is that must be supplied, when it occurs and how that could change over the forecast period.

With respect to the first point, the preliminary APO materials identified the unserved load to range from 5 TWh in 2029 to 12 TWh in 2031. The IESO needs to be more specific about the magnitude of the unserved load that will be targeted by this procurement, and how any remaining shortfall will be addressed.[1]

Regarding the second point, the two figures below illustrate how the hourly unserved energy needs could be specified. The first figure (Figure 30 from the 2022 APO) depicts unserved energy and illustrates additional implications from the system supply mix. The second figure illustrates the summary energy profile considerations for generation capability using the Daily Demand profiles from the Preliminary 2023 APO materials. Note that both winter and summer unserved energy needs exist because the IESO forecasts that Ontario will be dual peaking across these two seasons by 2030.

The PWU assumes that unserved energy is defined by demand that exceeds system generation capacity at various points in time. This suggests that the IESO's underlying model has the natural gas-fired generation fleet as well as the new battery resources operating at maximum available output at those times. Furthermore, it implies that if batteries must be charged while end user load is fully consuming the other system generation resources, then this unserved battery charging is part of the unserved energy that must be accounted and supplied by the new resources. These definitions are illustrated on the figure below.

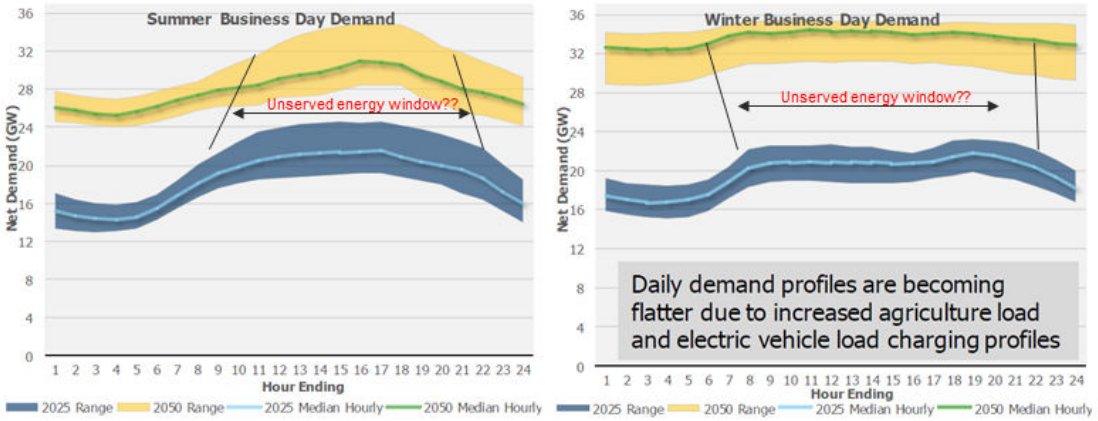
**Figure 30 | Unserved Energy By Season, Case 2** (extracted from 2022 APO for Illustrative purposes)




From the above 2022 APO figure, it is clear that the IESO has the capability to pinpoint the hours in the energy forecast model where the unserved energy is expected to emerge. This hourly profile of specific hours can be communicated as a requirement that the proposed resources must address. The implication of the definitions illustrated in the figure above is that the unserved energy will correlate with periods of high demand in both winter and summer as illustrated for business day demand in the figure below. A more detailed specification would provide the daily unserved energy profiles by month, the quantities required, expected frequency and duration of required resources output.

[1] PWU submission to the IESO on the Preliminary APO Materials, Jan 2024.

## Daily Demand Profiles




It is critical that proponents be capable of reliably supplying the needed energy at the times identified since, given the above definition of unserved energy, there are no other resources available for back up. This is a reliability requirement not unlike capacity.

In this context, referring to the simply derived nameplate capacities reflected in the IESO materials (e.g. 2000 MW by 2030) is irrelevant and confusing as the nameplate capacity will be completely dependent on the proponent's proposed solution. For example, the 5 TWhs must be supplied for 3 months in winter and summer and only on business days for 12 hours. Therefore, the 5 TWh would represent the energy required from the resource for 18% of the time that it may be potentially operating in the year. To address this need with wind only resources would require over 9 GW (assuming an average wind facility output capacity factor of 33%).

This inconsistency with the IESO's representation begs the question: Exactly how much of the unserved energy need will the IESO procure through the LT2 RFP? The need for this question reinforces the need for the IESO to clarify.

If unserved energy is indeed the requirement, the IESO must define the energy needed, by when and at what location to clearly and properly inform prospective bidders. This includes the 8760-hour forecasts by region by year for the term of the anticipated contracts. This data prerequisite exists regardless of the procurement approach that is adopted by the IESO.

**Recommendation #2 -** Consider the benefits of reducing the use of natural gas-fired generation at times when unserved load conditions do not exist.

As described above, the need to supply unserved energy may be limited to a small portion of the hours in a year. Non-emitting generation will inherently be available all year long. As such, their output during periods of energy adequacy could be used to displace natural gas-fired generation and reduce emissions from the electricity system.

This benefit has value, which the IESO's proposed Enhanced PPA captures as the day ahead market price. The IESO should be clear about the objectives of its procurement plan. For example, assuming displacing

natural gas is an objective, new supplies should not be valued when they are displacing other non-emitting supplies but instead be curtailed. Otherwise, ratepayers pay twice for the same energy output.

To enable developers to properly assess the economic implications of curtailment on their bids, the IESO should communicate the magnitude and times during which this additional benefit will be valued and the conditions under which the output may be curtailed.

**Recommendation #3 -** Characterize the transmission constraints that bidders are expected to navigate as this materially affects anticipated curtailments, particularly in regions with low gas-fired generation capacity.

As discussed in Recommendation #1, the IESO should identify the system needs on an 8760-basis by region and how this could change in its resource procurements over time. Transmission constraints introduce deliverability considerations that impact not only system requirements but also the economics of the proposed projects.

As requested by participants at the December webinar, the IESO should identify the transmission constraints that may inhibit generation output from supplying the identified loads including: the nature of the constraint(s); location; and, forecast procurement timelines. Analyses have shown that approximately 40% of wind energy output within a transmission zone can be bottled by transmission system constraints thereby reducing for example, the flow of non-emitting generation output from southwestern Ontario.[2]

To help address this, the IESO should provide a "cost" map or table of Ontario's transmission system depicting the cost per MW of Tx capacity from different possible generation sources to different load sources. This would support the inclusion of transmission costs in the evaluation criteria discussed later on, i.e. a northern wind farm scenario would incur 1000 kms of transmission and losses to serve Toronto.

*Understanding the possible solutions to meeting system needs has implications on procurement design*

**Recommendation #4 -** Recognize that electricity markets will be costly and inefficient at integrating non-emitting resources.

The PWU has previously advised the IESO of the substantial analyses that shows how ill-suited competitive electricity markets are for providing an economic basis for integrating non-emitting resources.[3] It is notable that Alberta, the only other jurisdiction in Canada that relies on electricity markets, is currently revisiting the efficacy of relying on electricity markets for non-emitting supplies.[4]

Several uncertainties represent specific cost risks that cannot be mitigated for ratepayers:

[2] Strategic Policy Economics, Renewables and Ontario/Quebec Transmission System Interties, 2016.
[3] PWU submissions to the IESO on Resource Adequacy in 2021, 2022; Strategic Policy Economics, Electricity Markets in Ontario, 2020.
[4] Alberta reviewing electricity market ahead of reforms with aim of ensuring affordable, reliable power, January 3, 2024 - The Globe and Mail.

- The evolution of carbon pricing and the potential alignment of Ontario's Emissions Performance Standard (EPS) to the federal Output Based Pricing System (OBPS).
    - While it is not clear how policy objectives may evolve on this topic, a recent Power Advisory report estimates that the market price could exceed $100/MWh if the EPS is aligned with the OBPS.[5] This compares to $47/MWh if the current EPS framework is not changed.
- Impact of future supply mix variations on the HOEP
    - Power Advisory analysis in the DER Potential study for the IESO suggests that HOEP could climb substantially under certain supply mix assumptions.[6]
- The exclusion from the 2023 APO of the expected demand from the electrification of heat creates resource adequacy risks.[7] As mentioned in the DER potential study, constrained system conditions place upward pressure on the hourly price.
- Implications of battery operations will generally add a 15% premium to the HOEP when called upon
    - Under forecast supply mix conditions, battery charging will largely rely on natural gas-fired generation. The energy losses in the charge/discharge cycle will translate into an ~15% price premium. When batteries are on the margin, the HOEP will thus increase by 15%. This premium will then be paid to all market participants, including those covered by the enhanced PPA as discussed below, causing the cost of all gas fired generation to rise.

The IESO should assess how these cost implications will benefit developers under IESO market rules and what the incremental cost burden to ratepayers may be as compared to alternatives.

**Recommendation #5 -** Reconsider the IESO's enhanced PPA revenue model as it will result in higher costs without reducing risks.

The IESO has proposed an enhanced PPA revenue model in an attempt to transform a simple PPA agreement into a form that reflects a markets-based procurement platform. The PWU believes that the IESO proposal introduces unnecessary and unmitigated risk into the system only to "*Incentivize resource to align operations with market signals, promoting system reliability and responsiveness to market prices*".[8] Note that the above Recommendation #4 argues in general against aligning PPAs for non-emitting supplies into market structures.

The IESO's proposal is simply a contract for difference between market price and the revenue needed by proponents for their investment. However, it adds an element of upside and downside risk that is neither necessary or useful. As such, the specifics of the proposed enhanced PPA will not achieve the objectives set out by the IESO and will result in higher costs without reducing risks.[9]

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[5] Power Advisory et al., Ontario Clean Energy Corporate PPAs –Ontario Government Proposed Framework and Consultation, Nov 2023.
PWU submission on Corporate PPAs, Dec 2023.

[6] Power Advisory and Dunsky, DER Potential Study Prepared for the IESO, Sept 2022.

[7] PWU submission to the IESO on the Preliminary 2023 APO, Jan 2024.

[8] Quote from IESO LT2 RFP Materials, December 13, 2023, page 66.

[9] It is important to note that the PWU felt that the approach was not effectively explained during the webinar and hence there may be several elements of misunderstanding among stakeholders. The PWU acknowledges that the IESO has offered further discussion on the PPA implementation.

The foundational identified benefit entails "*producing energy when it is most valued and not contributing to surplus conditions when it is not*".[10] While the targeted wind and solar resources are curtailable, so they do not contribute to surplus conditions, they are not inherently dispatchable to produce energy when it is most valued, without co-located storage. Adding storage increases costs.

The inability of the targeted procurement of renewables resources to supply energy when needed is addressed by Recommendation #7. The proposed enhanced PPA introduces risks in two ways: the requirement for bidders to consider curtailments in their price proposals; and, the design of the Grid Reliability Payment (GRP) mechanism.

The LT2 RFP materials propose that proponents provide an annual energy production factor (a percentage of the total number of hours in the year where they may be able to provide energy) that "*takes into account curtailment*". This parameter is used to calculate the GRP.

The energy production factor requires bidders to undertake a complex forecasting exercise to estimate their curtailment factors which introduces uncertainty and risk. Since this factor is used to calculate the GRP, it manifests as cost risk. Uncertainties in curtailment assumptions arise from several factors most of which are not within the control of the proponents but will be controlled by the IESO, including:

- As Ontario's supply mix and demand profile evolve over time, the periods of unserved demand and amount of gas-fired generation on the margin that can be displaced by these resources will change.
- The introduction of Local Market Pricing, which impacts how local demand, local supply mix and local transmission constraints will play into the deliverable output.
- Curtailment uncertainty will be particularly high risk for new renewables over the period of 2030 to 2034 as the combined effective capacity of the existing and new renewables on the system could double in this timeframe until the older renewable resources complete their contracts. It is highly likely that new renewables resources will have coincident production profiles to existing renewables resources. It is important to note that the identified unserved energy in the 2029 to 2034 timeframe is net of the output from existing renewables.

Since the proposed LT2 RFP contracts are for extended periods e.g., 20 years, this creates uncertainty over long term curtailment assumptions, in turn leading to substantial risk in determining the energy production factor. Making this uncertainty transparent for all proponents requires the IESO to communicate this demand/supply profile interplay anticipated in each year by region, including the ability of system storage assets to be used for risk mitigation.

It is already known that 2500 MW of system storage is inadequate to smooth renewable intermittency and meet the unserved demand if the need requires potentially adding 9000 MW of renewables by 2034 to meet the specified 5 TWh of unserved energy requirements in 2029.[11] As mentioned earlier, the required capacity could be even greater if the IESO targets the 12 TWh need in 2031. The IESO needs to specify how local system storage assets will be used in each region (i.e. wind in the north is not helpful to storage in the southwest as there are too many Tx constraints).[12]Furthermore, estimates suggest that 20% of the renewables will need to be curtailed.[13] Developers will have difficulty making this

[10] Quote from IESO LT2 RFP Materials, December 13, 2023, page 58.
[11] Strategic Policy Economics, Electrification Pathways for Ontario, 2021.
[12] Strategic Policy Economics, Renewables and Ontario/Quebec Transmission System Interties, 2016.
[13] Strategic Policy Economics, Electrification Pathways for Ontario, 2021.

assessment. The IESO must model these detailed scenarios and inform proponents of the revenue risks, particularly in the first 5 years of new facility operations when the other renewables assets remain on the system.

The proposed Grid Reliability Payment mechanism will pay proponents the difference between their deemed revenue requirement (determined by the stated annual production factor and proposal price) and the deemed energy revenue that the IESO estimates would be earned in a particular month from the energy market. The definition of the deemed energy revenue introduces additional revenue risks and uncertainties for proponents that can be illustrated by considering the GRP calculations for a solar example. Ontario's transition to dual peaking demand by 2030 has particular relevance.

- During the *fall/winter months,* solar facilities will have little to no actual market revenue. Additionally, the deemed market revenue, which is based on the annual capacity factor, will exceed those market revenues. When subtracted from the average monthly revenue requirement, the proponents will have a monthly shortfall.
- Furthermore, *in winter months*, when the Day Ahead Market Price is high, this shortfall will be magnified.
- During *spring months in a* period of high solar output, solar resources will have weak market revenues as prices will be generally lower. However, there could be significant curtailments. The combination of high output at lower prices will moderate the benefit of the GRP received.
- During *summer months*, when the Day Ahead Market Price is also high, GRP payments will be moderated. Furthermore, solar resources will realize strong market revenues higher than deemed resulting from high production factors and at a premium since the Day Ahead Market Price daytime hours typically have a price premium over the average day ahead market price for the month.

This significant variation in seasonal Enhanced PPA payments does not serve the IESO's stated objective of the revenue model to provide: *predictable earnings, decoupling from seasonal market fluctuations.*"[14] Given the significant uncertainty in these variables for intermittent renewables, while the GRP may ensure "*…any revenue shortfalls, between **deemed** and **monthly revenue requirements**, are bridged by the IESO via a GRP*"[15] it cannot ensure that actual shortfalls from the proponent's revenue requirements are not systemically introduced. Furthermore, determining whether these calculations will net to the actual needed revenue requirement is complex and outside the ability of proponents to reliably estimate and prepare their bids.

Regardless of how well the IESO communicates the curtailment assumptions, these uncertainties coupled with the vagaries of operationalizing the proposed Enhanced PPA will create the need for proponents to hedge their pricing proposals with risk premiums. This poses significant revenue and cost risks to both proponents and ratepayers.

There is no evident correlation with the enhanced PPA terms and the explicit need to supply the desired unserved energy gap. This raises the importance of a previous question: What is the IESO actually trying to procure? Recommendation #7 addresses the suitability of intermittent renewables for meeting the unserved energy needs of the system.

[14] Quote from IESO LT2 RFP Materials, December 13, 2023, page 66
[15] Quote from IESO LT2 RFP Materials, December 13, 2023, page 66.

**Recommendation #6 -** Environmental attributes should accrue to the IESO since the HOEP already includes a carbon price which is passed on to ratepayers.

At the December webinar, the IESO's response to participant questions suggested that the environmental attributes could remain with the proponent. This is not the appropriate approach. The environmental attributes accrue to the IESO since the HOEP already includes a carbon price and that carbon price is both passed on to ratepayers and paid to the proponents via market revenues under the proposed Enhanced PPA. It is notable that in the LT1 RFP, the IESO retained ownership of the environmental attributes.

**Recommendation #7 -** Recognize that independent wind and solar solutions cannot supply the needed unserved energy and remove biases against the eligibility of other technologies.

The IESO advised the government that it "*will run a technology agnostic procurement focusing on non-emitting supply such as wind, hydro, bioenergy and solar generation*."[16] However, their approach is not unbiased:

- In its report to the government, the IESO discounts the value of bio-energy and waterpower assets in meeting its procurement needs;
- The IESO's claim of technological agnosticism is based on the RFP being "open" to any non-emitting resources able to meet the performance criteria. However, the LT2 RFP procurement timeframes that allow only 4 to 5 years of development limits the technology options to wind, solar, and co-located storage; and,
- In fact, the IESO is bifurcating the procurement to secure wind and solar resources for 2030 and provide the long-lead time provisions for waterpower to identify any potential resources.
    - However, the allowable maximum 9-year development timeframe may also be unrealistic and other provisions for long lead items should be considered as addressed in Recommendation 10.

The countervailing factor is that the resources to be procured must meet the performance criteria. Specifically, the IESO's main performance driver is addressing the identified unserved energy with market participating dispatchable assets, as described earlier. The IESO must recognize that independent wind and solar solutions cannot meet this need: wind / solar assets are not dispatchable; and, even if backed up with substantial storage, analysis shows they cannot reliably supply the IESO's unserved energy needs.[17]

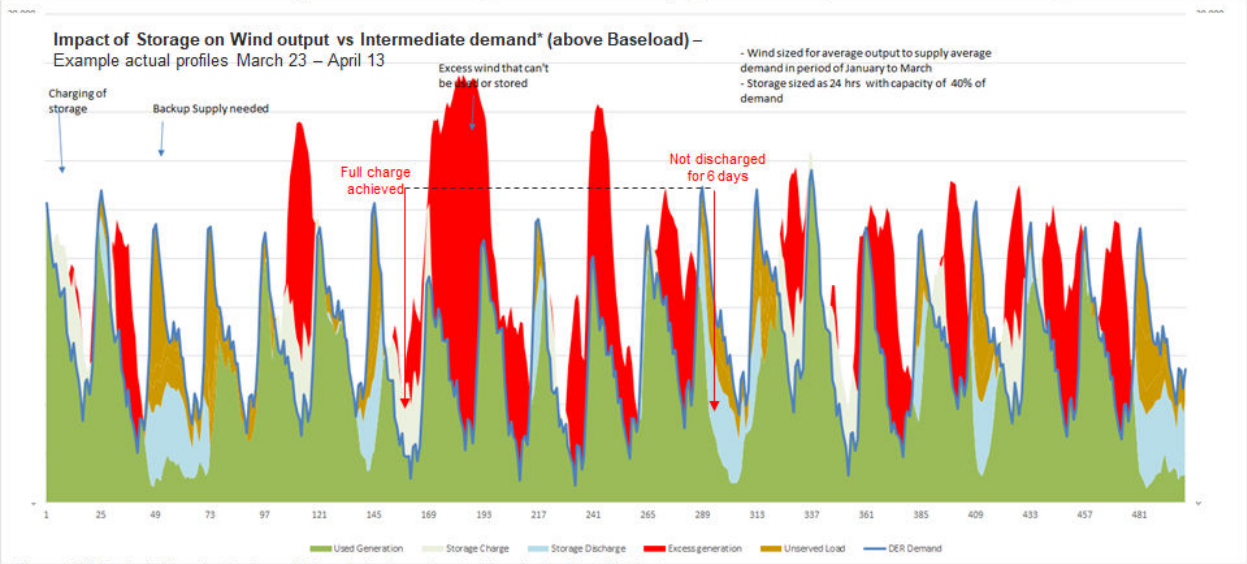
The figure below shows the profile of actual wind generation in Ontario against a profile of intermediate demand and sized that matches total output to total demand. This model includes substantial 24 hours of storage, capable of supplying 40% of the modeled peak demand. Even with this storage, substantial periods occur (indicated by the brown color), when unserved energy exists. Wind can be absent for

[16] IESO, Evaluating Procurement Options for Supply Adequacy, A Resource Adequacy Update to the Minister of Energy, Dec 11, 2023.
[17] M. Brouillette, Presentation to the Council for Clean and Reliable Energy, October 2023; PWU submission on the Clean Electricity Regulation, November, 2023.

several days, even at night. Wind can also generate significant output for substantial periods of time when generation is not needed, during both times of high and low demand.

**Wind Output vs Intermediate Demand – Ontario – With Storage**

Even 24-hour storage still needs significant backup generation, and comes at a high cost




Source: IESO Actuals, Strapolec Analysis. *Intermediate demand is net of baseload and top 2% of peaks

These findings are somewhat at odds with other models of renewables integration with Ontario's electricity system. Modeling approaches remain a significant point of discussion within the sector. For example, Natural Resources Canada (NRCan) is funding the Energy Modeling Hub which is focused on identifying better modeling options.[18] However, some modelling myths persist. It is a myth that wind/solar can solve Canada's net zero electricity challenge—it is not possible.[19] This conclusion was reinforced at a recent Energy Hub Modeling event with representatives of all modeling approaches attending.[20] It was very clear from the presentation of all participants that represented electric utilities that the most commonly used energy models developed by academic institutions, including those used by the ECCC for the CER design did not adequately reflect the dynamics of the electricity system with sufficient fidelity to identify the reliability considerations[21] -- much like indicated by the figure above.

Ontario's Ministry of Energy should carefully review the type and use of the models being used by its consultant and the relevance to the IESO's procurement approach. The PWU has provided detailed analysis, recommendations, and references in previous submissions on modelling to the Ministry.[22]

The IESO's recent report to the government presented "going forward" cost perspectives.[23] These perspectives are a gross misrepresentation of the costs for addressing Ontario's unserved energy needs.

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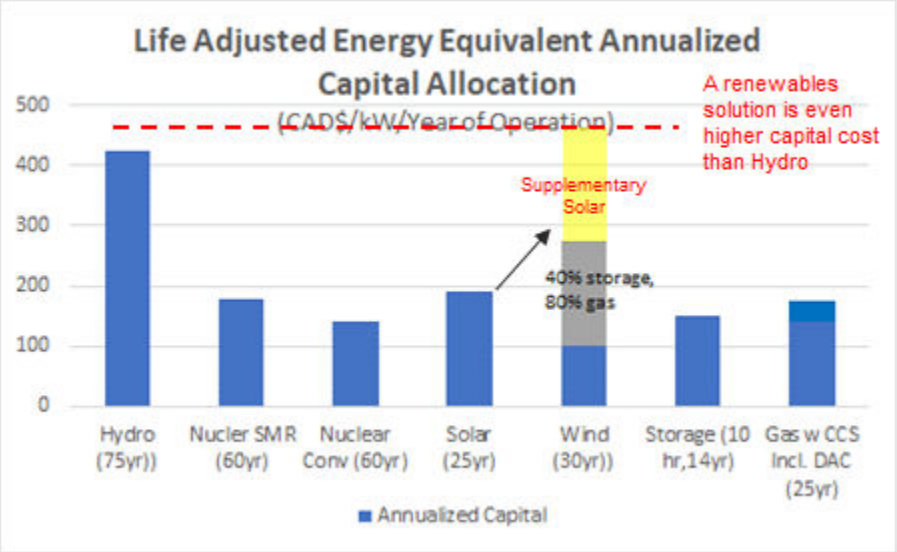
[18] NRCan, https://natural-resources.canada.ca/science-and-data/funding-partnerships/opportunities/grants-incentives/energy-innovation-program/energy-innovation-program-national-energy-systems-modelling-call/25515.
[19] PWU submission to the ECCC on the Clean Electricity Regulation, Dec 2023.
[20] EMH Annual Forum 2023 – December 11-12 in Ottawa.
[21] EMH presentations by NERC, IESO, NB Power, Electricity Canada and discussions with Strapolec, ATCO.
[22] PWU submission to the Ministry of Energy, July 2022.
[23] IESO, Evaluating Procurement Options for Supply Adequacy, A Resource Adequacy Update to the Minister of Energy, Dec 11, 2023.

While the costs trends are true, as discussed previously, renewables need to be backed up by storage and gas-fired generation in order to meet a specified demand profile, such as unserved energy. It is the total cost of the solution that ratepayers will pay.

In fact, addressing Ontario's emerging unserved dual peaking energy needs would require a solution that combines both wind and solar resources, all backed up by storage and gas-fired generation. Solar cannot meet needs in winter and wind cannot in summer. And only half of the output of both may be useful since Ontario is in an energy surplus during the spring and fall. Furthermore, wind blows more at night when demand is low, increasing storage costs and the sun shines bright in spring when demand is low and output may not be needed.

Proponents argue that renewables are low cost because of their lower capital costs. However, when the costs of the equivalent energy generating capacity of wind and solar assets are considered, they are not materially different compared to other options as indicated in the figure below.[24] Furthermore, when the costs of the fully integrated system are considered, renewable options are the most costly, even higher than the cost of new hydro, which many consider to be prohibitive.




**Recommendation #8 -** Consider procuring firm baseload and intermediate supplies instead of unserved energy.

If Ontario's need is to reduce the generation output from natural gas-fired generation and create the capability to address variable unserved energy needs, the IESO should seek to procure assets that can reliably deliver baseload and intermediate supply. These supplies could then be prioritized in the supply

[24] M.Brouillette, Presentation to the Council for Clean and Reliable Energy, October 2023; PWU submission on the Clean Electricity Regulation, November, 2023. The figure reflects the capacity factor and the different economic life of the assets. These annualized equivalent investments are very similar. However, wind also needs 40% of the storage capacity and 80% of the gas capacity, making those portfolio solutions the highest capital cost (gray). Underlying cost assumptions were obtained from the IESO's P2D report for 2030.

dispatch stack to operate before natural gas-fired generation thus freeing up the flexible gas generators to meet the variable unserved energy needs in periods of higher demand.

Options to meeting baseload and intermediate demand could include: co-located hybrid solutions of renewables, storage and new natural gas; biomass assets like Atikokan; and waterpower and new nuclear in the longer term.

Procuring firm baseload supplies has the advantage of optimizing the use of existing transmission infrastructure by smoothing demand and supply variabilities. This can help to cost effectively support Ontario's energy transition and the managed expansion of the provincial grid as electrification driven demand increases.

These assets would be better aligned with traditional PPAs as their output is predictable and dispatchable with no benefit discernable from energy market dynamics.

**Recommendation #9 -** Collaborate with the Ontario Energy Board (OEB) to incentivize Behind-the-Meter (BTM) Demand Side Management (DSM) Distributed Energy Resources (DERs) through rate programs to reduce Tx / Dx costs by smoothing demand and not rely on IESO administered markets.

The PWU has advocated that BTM DSM solution incentives through rate programs offer the optimal approach to managing the costs of electric system expansion due to electrification of the economy.[25] The PWU advised the OEB to support a reformed integrated energy planning framework that prioritizes benefit costs analysis and regional planning efforts.[26]

The PWU has also so advised the IESO that market mechanisms are not suitable for incenting DER adoption.[27] The IESO should re-evaluate the economics of its initiatives to promote DER adoption through its market mechanisms.

*Accommodation of long-lead time generation development can optimize development*

**Recommendation #10 -** Expand considerations for long-lead time generation resource development and eligible resources.

The IESO has laid out provisions for allowing long-lead time assets to respond to the LT2 RFP even if commercial operations dates may extend to 2034. This is intended to provide proponents with up to 9 years of development time should that be required e.g., for waterpower. The selection of 2034 as a "no-later-than date" appears arbitrary and is only weakly supported by the argument that there is significant uncertainty around government policies after 2035.

[25] Strategic Policy Economics, Electrification Pathways for Ontario, 2021.
[26] PWU submission to the OEB on the framework for energy innovation, January 2023.
[27] PWU submission to he IESO on IESO York Region NWA Demonstration Project EPRI Study, August 17, 2023; PWU Submission to the IESO on the DER Potential Study, October 28, 2022.

Yet, Ontario's energy forecast includes continuous demand growth for the entire planning period. There is no ambiguity about the longer-term need. The PWU has been consistently advocating for the IESO to initiate long term procurements for large scale bulk system assets such as baseload supply.[28]

The IESO should be entertaining long-lead time bids for commercial operations up until 2040, providing a 15-year development time, which is more consistent with industry estimates. There is no material risk to the IESO entertaining such long-term objectives. Getting supply in place a few years earlier than the demand materializes is not a material cost risk given the forecast continuous growth and subsequent asset life and it would serve to reduce gas-fired generation output sooner.

The IESO's failure to plan for and procure long-lead time non-emitting resources exposes Ontario to serious resource adequacy challenges with only short-term solutions. Not having enough resources leaves Ontario at an economic competitive risk with neighboring jurisdictions.

The IESO should open its procurement approach to all forms of non-emitting supply including geothermal, nuclear and carbon capture upgrades for natural gas-fired generation. For carbon capture, it is notable that if 80-90% capture efficiency can be achieved (i.e. 10-20% of output generates emissions), it would be superior to using unabated gas-fired generation to supplement 30% of renewables output.

The LT2 RFP presents the opportunity for the IESO to accelerate its processes for procuring long-lead time non-emitting resources resulting in a comprehensive, flexible, and risk-informed long-term energy transition plan for Ontario.

**Recommendation #11 -** Structure MT RFP planning and targets to manage the gaps in the development of long-lead time resources

The IESO can develop a long-term energy transition plan for cost effective resource adequacy using the MT RFP as the tool that addresses the development time gaps for long-lead time assets.

The IESO is currently proposing to alternate LT RFPs with MT RFPs over a cadenced 9 to 12 month alternating schedule. The IESO's currently proposed target for MT RFPs of 75% of the installed capacity of eligible resources is arbitrary and not supported by an analysis of the most cost-effective approach to filling near-term supply gaps with minimal long-term stranded asset costs.

Utilizing the proposed MT RFP target setting approach will become more challenging as existing resources get tapped out or reconfirmed as such contracts impact on requirements for new LT RFP targeted needs. More strategic MT RFP planning would identify the resources coming off contract, their eligibility for short term extensions, or need for longer term extensions, and remaining long-term supply gaps. The IESO should also allow long-lead time proponents to propose transition options within their bid (e.g., extending their owned gas plant assets for specified time) as the PWU has previously suggested.[29]

[28] PWU submission to the MENDM on electricity system planning reform, 2021.
[29] PWU submission to IESO Resource Adequacy and APO engagement, 2020, 2021, 2022.

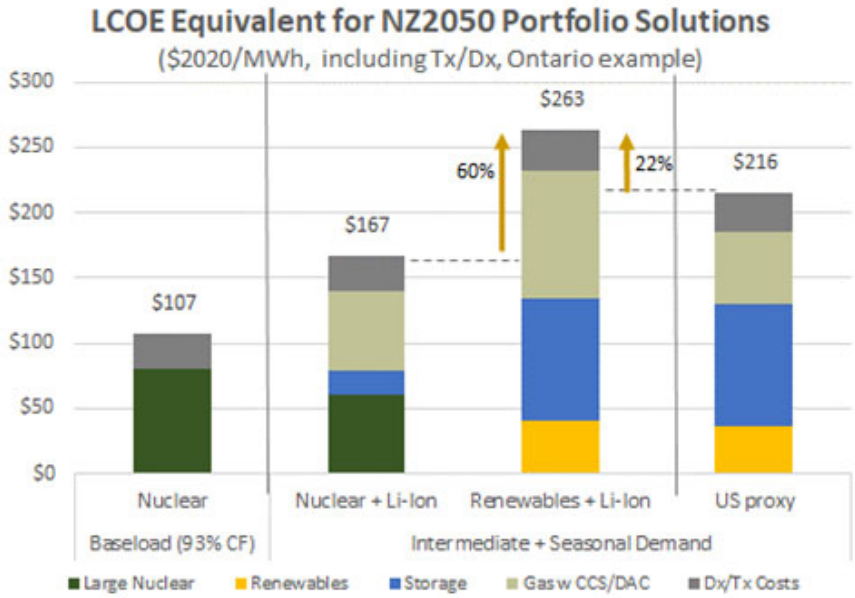
*Expansion of evaluation criteria can optimize affordability*

**Recommendation #12 -** The primary criteria should be the total system cost impact of integrating a project proposal to meet the need.

The primary evaluation criteria proposed by the IESO is the proposed price of energy per MWh.

However, when measured against a specified system need, such as Ontario's unserved energy challenge or providing baseload generation to enable gas-fired capacity to address the variable needs, the best solutions will require the integrated operation of many assets. In particular, renewables will require storage, gas fired generation backup, and substantially greater transmission capacity.

The evaluated costs of project proposals are better compared by an LCOE of the requisite integrated system cost for meeting demand, as shown below.[30] The LCOE includes not only capital costs, but also financing and operating costs over the life of the asset. To analyze system costs, solutions must be measured against their ability to reliably serve real unserved demand, baseload and/or intermediate demand.




Baseload options such as hydro, nuclear, or gas-fired generation equipped with CCS (nuclear is illustrated) appear to be straightforward and may also be addressed with portfolio solutions similar to those for meeting intermediate demand. To supply intermediate demand, all generation options require additional investments in storage and back up gas-fired generation. This applies to nuclear solutions (middle bar) as well as for the renewables-based solutions.

Ontario modeling shows that integrated renewables solutions could be 60% more costly than nuclear based solutions even for meeting intermediate demand which is not a traditional function for nuclear.

[30] Presentation to the Council for Clean and Reliable Energy, October 2023; PWU submission on the Clean Electricity Regulation, November, 2023.

This is a critical policy matter since the cost of electricity will drive the pace of decarbonization. The affordability of Ontario's energy transition relies on finding the electricity generation mix with the lowest available integrated ***system*** LCOE. Proper modelling of the contribution of renewables to the system is material to these scenarios and outcomes as described earlier.

Other critical parameters that should be requested as evaluation criteria include:

1. Tx system capacity consumed by the proposed project and the implied Tx operating factor of the resulting capacity allotment. This can be assessed using the Tx system cost map defined earlier to create transparent and objective evaluation criteria.
2. Risk informed schedule to commercial operation and need for MT risk mitigation. Proponents should be asked about the risks inherent in their schedule so that the IESO can evaluate the costs of any mitigation deemed necessary.

**Recommendation #13 -** The total aggregated net cost to taxpayers and ratepayers of a project proposal should be assessed.

The total net cost to taxpayers and ratepayers is a function of government incentives, subsidies, liabilities, and the economic impacts of the projects.

Economic impact benefits should be assessed. Project proponents should be requested to specify the domestic content of the direct spend in their projects. The IESO should then use a consistent methodology to translate those direct expenditures into net direct, indirect, and induced economic benefits and, specifically, the tax benefits to government. An evaluation criterion can be the tax benefits to government that can be used to offset the costs to ratepayers when assessing the total aggregated net costs.

Also, decommissioning liability costs should be transparently included in the proponents bid for IESO validation. Other risk factors requiring IESO validation include the solvency of the bidder and provision of decommissioning funds.

Finally, the economic impact for Ontario of having cost competitive electricity is a material factor in the global energy transition. The IESO should develop benchmarks for various trends in neighboring jurisdictions to indicate how their electricity costs can impact Ontario's competitiveness. For example, as shown in the LCOE illustration above, a renewables-based solution in Ontario would have electricity costs 22% plus higher than those in the U.S. The impacts on economic opportunity are substantive.

*Reforming the IESO procurement process will accelerate siting acceptance and improve reliability*

**Recommendation #14 -** Mitigate procurement and development risks by reforming the IESO's procurement approach to leverage Regional Planning constructs that enable acceptable siting opportunities.

The IESO is committed to making municipal and indigenous support a mandatory requirement for proponent proposals. The IESO has stated it will support efforts to engage with local stakeholders.

However, the IESO will need to refine its engagement practices going forward given some of the recent challenges.

The IESO's recent report to the Ministry states that:

> *In order to maintain reliability, a significant level of development is required to meet emerging energy needs by the end of the decade. In order for this activity to be efficient, cost-effective and timely, the IESO, Ontario Government, and developers will need to work together to ensure effective and timely project development. It will also be critical that there is purposeful and regular engagement with and support from stakeholders, municipalities and Indigenous Nations.*
>
> *There is a need for effective engagement with municipalities and communities to mitigate against the risks of a growing incidence of unwilling hosts as volume of development and deployment of electricity infrastructure increases.*

At its recent APO webinar, the IESO downplayed the relevance of regional planning to the Outlook stating that this process is run by the local distribution companies. The PWU believes this represents a missed opportunity for better planning integration for several reasons e.g., recent municipal opposition to new gas-fired generation. The regional planning process should be expeditiously reformed to serve the role of collaborative, integrated problem solving for meeting local and regional electricity infrastructure challenges that meet the needs of residents and businesses in those areas.

To further accelerate municipal engagement, the IESO could prioritize regions with the greatest needs and constraints to overcome and initiate discussions with LDCs, municipalities and first nations on local needs and solution options.

These outcomes should be transparently integrated into the IESO's annual outlook for Ontario to facilitate establishing the total system costs for taxpayers and ratepayers and achievable resource development options.

**Closing**

The PWU believes that the IESO should better prepare Ontario to meet its emerging electricity system needs by increasing transparency, reducing complexity, and eliminating planning and analysis deficiencies that are creating unmitigated reliability and affordability risks, including the unnecessary Enhanced PPA-induced costs for ratepayers.

The IESO should expeditiously focus on: comprehensive specification of system needs; understanding the possible solutions; better accommodating long-lead time generation development; expanding evaluation criteria to optimize affordability; and, reforming the IESO procurement process to integrate regional planning.

The PWU has a successful track record 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.