POWER WORKERS' UNION

October 15, 2021

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

Re: DER Roadmap Engagement – DER Potential Study

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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 DER Potential Study that is part of the DER Roadmap engagement. 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

List of PWU Employers

Alectra Utilities (formerly PowerStream)
Algoma Power
AMEC Nuclear Safety Solutions
Aptum (formerly Cogeco Peer 1)
Atlantic Power Corporation - Calstock Power Plant
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Independent Electricity System Operator
Inergi LP
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Kinectrics Inc.
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Lakeland Power Distribution
London Hydro Corporation
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Newmarket Tey/Midland Hydro Ltd.
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Ontario Power Generation Inc.
Orangeville Hydro Limited
Portlands Energy Centre
PUC Services
Quality Tree Service
Rogers Communications (Kincardine Cable TV Ltd.)
Sioux Lookout Hydro Inc.
SouthWestern Energy
Synergy North (formerly Kenora Hydro Electric Corporation Ltd.)
Tillsonburg Hydro Inc.
The Electrical Safety Authority
Toronto Hydro
TransAlta Generation Partnership O.H.S.C.
Westario Power

Power Worker's Union Submission on the IESO's DER Roadmap Engagement
October 15, 2021

The Power Workers' Union (PWU) is pleased to submit comments and recommendations to the Independent Electricity System Operator (IESO) regarding the September 2021 webinar on the Distributed Energy Resources (DER) Roadmap. 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 grow and enhance the competitiveness of Ontario's economy.

This webinar continued the IESO's work on integrating DER into the IESO market and involved three stakeholder presentations on the types of DER deployed in Ontario and an overview of a third party DER Potential Study. The PWU's comments are focused on the DER Potential Study design as feedback on the stakeholder presentations is not due until the end of October.

The DER Potential Study is to be concluded in June of 2022 and is planned to progress in four stages: DER pre-assessment; technical potential assessment; economic potential assessment; and achievable assessment. These assessments will consider a range of scenarios with variable parameters e.g. carbon pricing, incentives, changes in market participation rules, etc.

The preliminary results of the DER pre-assessment were shared at the webinar and included the types of DER that should receive further study and the screening criteria used to identify them. DER candidates were identified for both Front of the Meter (FTM) and Behind the Meter (BTM) technologies including generation (e.g. solar), storage (e.g. batteries), EV charging (e.g. V2H), and flexible loads (e.g. smart water heaters, appliances). The IESO has requested feedback on its preliminary results in three areas:

- Pre-assessment screening criteria – are they appropriate and/or should others be included?
- Pre-assessment results – should any DER technologies be included/excluded?
- Scenarios – What factors should be prioritized for variation in scenarios to be modeled?

We understand that the pre-assessment prioritization efforts are intended to help manage the scope of the study within the OEB's budget parameters. The PWU supports this study to help clarify existing DER deployments and those expected to emerge in the medium-term and how both will contribute to meeting system needs. However, the PWU is concerned about the lack of focus on value to ratepayers in the framework that has been laid out and the lack of consideration of the role of rate programs in achieving that value.

Ultimately, these technologies should be evaluated on their ability to provide the lowest total system cost solution i.e., cost to ratepayers.

The PWU recommends that the IESO undertake the following:

1. Clarify how the DER assessments metrics impact screening criteria;
2. Clarify the meaning of the screening criteria and add new criteria as appropriate;
3. Simplify the ongoing assessments in the study by grouping them into fewer categories;
4. Remove or deprioritize BTM residential storage and all solar technologies in the potential study;
5. Hydrogen electrolysers should be included;
6. Several criteria should be considered when modelling the scenarios; and,
7. The outcomes of the scenario analyses should be focused on the total system value to ratepayers.

Recommendation #1: Clarify how the DER assessments metrics impact screening criteria

The IESO's consultant identified assessment metrics that they used to characterize each DER technology. These metrics included dispatchability, aggregated control and ability to provide grid services. The consultant's qualitative assessment of each technology was provided. However, it remains unclear as to how the impacts of these metrics were used in the next step to score the screening criteria.

For example, the assessment metrics of "dispatchability" and "ability to provide grid services" appear to correlate with the screening criteria for "Alignment with System Needs and Characteristics". However, residential BTM solar and dual-fuel space heating are both assessed as not dispatchable. Yet, under the alignment with system needs, solar is rated as "Mid", while dual-fuel space heating is rated as "Low". It is not clear how the solar rating was determined. To the PWU this suggests that residential BTM solar does not align with system needs because it is not dispatchable and provides intermittent output with no material capacity benefit to meet system peaks which are migrating to later in the evening and in the winter. Residential BTM solar should be rated as "Low". The PWU has noted several such discrepancies.

The consultants should outline how the characterization of the technologies feeds into the ratings of the screening criteria, including the relative qualitative or quantitative weighting of these assessment metrics.

Recommendation #2: Clarify the meaning of the screening criteria and add new criteria as appropriate

Significant ambiguity exists with respect to how some of the screening criteria have been applied. This ambiguity results from the inadequate definition and separation of the issues. This is particularly evident with respect to three of the screening criteria:

a) Alignment with System Needs and Characteristics

The assessment of the capability of a technology to "*align with system needs"* can be provided from two perspectives: under the control of the IESO; or, in response to rate program incentives. The definition provided by the consultant appears to specifically relate to grid services implying some form of dispatchability by the IESO. The meaning of grid services in the context of the screening criteria is unclear.

In contrast, much of the value of BTM demand side management activities can be achieved by smart switches responding to time-of-use incentives or other rate programs such as the Industrial Conservation Initiative (ICI). Through an aggregator, BTM demand side management can also be coordinated with the IESO, even for such small home energy demand side management items as controllable thermostats, water heaters, and EV charging.

It is arguable that when small DERs are aggregated into a larger portfolio they can align well with system needs, even if not directly controlled by the IESO. The consultants should better define what this category means, particularly the referenced grid services in the definition. This criterion should also reflect its ability to align with system needs via IESO dispatch or in response to rate programs with a potential for aggregated control.

b) Expected Cost-Effectiveness

It is not clear how *cost effectiveness* is defined in this context — "cost effectiveness to whom?". The measure for a DER solution should be viewed from the perspective of the regulated ratepayer and the IESO's mandate to manage the bulk system to provide low-cost, reliable electricity. The measure should therefore focus on minimizing the total cost to ratepayers.

The ambiguity of this screening criteria is exemplified by the "High" cost-effectiveness rating for Residential BTM solar versus "Mid" for FTM solar. The rationale for these ratings is unclear as the cost of larger scale solar installations is lower on a $/MWh basis[1]. The PWU suggests that the cost effectiveness of all solar options be rated "Low" as solar provides minimal contributions to meeting system needs due to its intermittency, low capacity value and need in Ontario for both firming and backup supply.[2]

Battery Storage's rating of "Mid" versus Residential BTM Solar's "High" rating provides another example. Studies have shown that batteries operate more effectively when their operating factors are not driven by the solar intermittency seen in Ontario.[3] These ratings should be reversed. In addition, residential BTM Battery Storage is expensive and cost forecasts to 2035 suggest that they will remain so well beyond the IESO's study period. BTM residential battery storage should be rated "Low", with the exception of rare cases, e.g. for back up generation as it is not anticipated that residential customers will install BTM batteries in the next 10 years.[4]

In a broader context of cost effectiveness to the public, the value of investments in Ontario's electricity system is also manifested in other economic considerations e.g. trade balance, GDP, and job creation. These should be considered when the IESO is determining the cost effectiveness of DER investments.

The cost effectiveness of future DER deployment should not be predicated on the potential incremental value to be derived. To date, DER penetration has been stimulated by high-cost rate programs e.g. net metering that was not anchored to the delivery of system benefits. Analyses shows that net metering programs have increased costs in other jurisdictions.[5] The full cost of the rate programs and any other incentives should be included in the assessment of the total cost and impact on ratepayer bills.

These examples highlight the need for a clear definition of *cost-effectiveness*.

c) Alignment with Customer Goals

The proposed definition of customer goals includes reduced emissions, rate impacts and efficiency improvements. However, it is unclear as to how these have been evaluated and rated.

Back-up generation, residential BTM solar, other micro generation, and residential BTM storage all are rated as "High. By contrast, non-residential BTM and FTM solar and storage are rated as "Mid". These ratings suggest that these items are somehow beneficial to those residential customers who choose to install them, presumably under the net metering program. Yet, non-residential BTM storage installed under the ICI program aligns better with those individual customers but is rated lower. Furthermore,

[1] Scott P. Burger; Jesse D. Jenkins; Samuel C. Huntington; Ignacio J. Perez-Arriaga, IEEE Power & Energy Magazine, "Why Distributed? A Critical Review of the Trade-offs Between Centralized and Decentralized Resources", 2019
[2] Strategic Policy Economics, Renewables-Based DER in Ontario, 2018
[3] Strategic Policy Economics, Renewables-Based DER in Ontario, 2018
[4] ICF, DER Impact Study on behalf of the OEB, 2021
[5] PWU, Submission to MENDM Changes to Ontario's Net Metering Regulation to Support Community-Based Energy Systems, 2020

both programs increase costs to the other ratepayers in the province, the effect of which should be included in the definition of cost effectiveness mentioned above.

These examples illustrate the conflicts between different ratepayer groups and rate impacts inherent in these programs. The criteria for *alignment with customer goals* should reflect the broader regulated ratepayer base and not be predicated on the ongoing presence of rate programs that are not promoting overall lower electricity bills. This screening criterion requires clarification.

Recommendation #3: Simplify the ongoing assessments in the study by grouping them into fewer categories

We understand that the study has budget limitations and that the IESO is seeking feedback regarding the prioritization of these limited funds. Eighty-five separate DER technologies have been grouped into 10 categories. Two of the categories address distributed generation and storage. There are two categories related to EVs and six related to Demand-Side Management (DSM) or controllable loads. Grouping options generically into DSM may help simplify the study as all technologies interact with the IESO administered markets and can have simplified use cases. For example, an aggregator of diverse DSM applications would enact controls in response to dispatch instructions or price signals without the IESO needing to know what devices were being controlled. The same logic applies to combining the two EV categories.

Recommendation #4: Remove or deprioritize BTM residential storage and all solar technologies in the potential study

The IESO asked for technologies to be excluded from the study to minimize the study costs. In Ontario, the value of solar is low given its intermittency, low capacity value, and need for both firming and backup supply. The cost of solar technologies has been shown to be very high from a total cost perspective.[6] This is particularly true for residential solar. From a total cost perspective, these options are not effective and without the Feed-In-Tariff (FIT) and Net Metering programs would not be adopted in Ontario.

Three other factors suggest solar DERs provide low system value for Ontario:

a) Ontario already has more solar than it needs, and it is being curtailed.[7]
b) California has identified that the incremental value of ongoing solar installations is declining rapidly due to over adoption. By 2030 solar-only installations including BTM are expected to have near 0% Effective Load Carrying Capability (ELCC).[8]
c) Ontario's summer peak now occurs later in the season and later in the day, both less optimum times for solar generation capacity.

This is in direct opposition to the IESO's primary objective in evaluating DER. Studies have shown that solar would not be procured under the IESO's current processes e.g. IAMs, as it provides comparatively little value against those measures of system need.[9]

[6] Strategic Policy Economics, Renewables-Based DER in Ontario, 2018
[7] IESO, 2020 Year-End review, 2020
[8] Astrape Consulting, Joint California IOU ELCC Study, 2020
[9] Strategic Policy Economics, Electricity Markets in Ontario, 2020

Residential BTM storage is not likely to see adoption as mentioned above.

Recommendation #5: Hydrogen electrolysers should be included

Analyses demonstrate that the benefits of this study would be maximized by prioritizing the most cost-effective solutions: non-residential BTM and FTM battery storage; EVs; DSM; and, hydrogen technologies.[10] Analysis shows that by 2030, just 8 years from now and within the study's contemplated timeframe: dual fueled hybrid heating could provide 700 MW of capacity benefits, EVs and DSM could provide 400-500 MW of capacity benefit in winter and 50-100 MW in the summer, and hydrogen electrolysers could provide 300 MW of demand response to address the emerging winter peaking needs that will occur as the economy electrifies. Analysis shows that by 2030 Ontario will only require 1.3 to 1.7 GW of additional storage capacity. This storage capacity could be provided by only 3 to 5% of an anticipated 1 million EVs on the road by then.

Hydrogen is a noticeable omission in the preliminary list of DER candidates identified by the pre-assessment. While categorized as Power 2 Gas in the measures list, the value of hydrogen Power 2 Gas electrolysis to the system is not limited to the reuse of the hydrogen. It is the flexibility offered by the electrolyser to provide peak demand response and demand smoothing. Analysis shows that hydrogen electrolysers can provide peak capacity at values far less than those occurring in the IESO's current capacity auctions. As well, the potential exists to displace the need for natural gas-fired generation on the grid over time.

Emerging hydrogen applications for heavy-duty transportation, industry and blending into the natural gas distribution system indicates significant potential for the penetration of hydrogen electrolysers into the market.[11] For example, OPG is exploring electrolyser use of up to 200 MW of electrolyser capacity.[12]

Recommendation #6: Several criteria should be considered when modelling the scenarios

The study timeframe for assessing DER potential in Ontario is the next 10 years. The modelling will vary several parameters such as carbon pricing, incentives, market rules, cost curves, and energy pricing. However, criteria should be considered to assess the validity of any assumptions post 2030:

a) Ontario's emerging capacity gap will increase the use of natural gas-fired generation in the supply mix.

   The IESO's recently released Gas Phase Out Study concluded that it is not possible for Ontario to phase out natural gas generation over the next 10 years. However, there may be significant pressure to phase out gas-fired generation as soon as practical after that.

   Some types of DER may provide value when there is high gas-fired generation on the system after 2026 but may not have a role by 2035. The value of some DER options-wind and solar- are dependent on co-existing natural gas-fired generation capacity. It is therefore important the scenarios assess how the timing of a natural gas phaseout impacts the economic life and cost of a

[10] Strategic Policy Economics, Electrification Pathways to Reduce Emissions in Ontario, 2021
[11] Green Ribbon Panel, The Green Ribbon Panel Report, 2020
[12] OPG, News Release "OPG supports Ontario in building the hydrogen economy", 2021

DER investment. Similarly, the viability of IAMs and DER should be assessed as studies indicate that IAMs become ineffective for non-emitting resources.[13]

b) Electrification of the economy will change the nature and shape of demand

Studies have shown that Ontario will migrate towards winter peaking.[14] For example, this could eliminate the value of solar capacity. In general, the nature of demand will progress towards flatter demand profiles as DSM benefits are realized.[15]

The need by the system for non-rate-based DER benefits should be assessed for the possible implications of electricity demand due to climate policies.

c) Incentives to DER penetration are predominantly from the net metering and/or ICI rate programs

Possible incentives to DER adoption as a result of rate programs, including ICI, Time of Use, or other potential innovations should be modelled and the sensitivity on ratepayer electricity costs and government benefits should be assessed for implications.

Recommendation #7: The outcomes of the scenario analyses should be focused on the total system value to ratepayers

As noted previously, a clear definition of cost-effectiveness is critical for assessing the benefits of DER in meeting system needs. The scenario outcomes should address the following implications:

1) Impact on total ratepayer electricity costs;
2) The role and value split between rate programs and IESO incentives; and,
3) The value to government implied by large investments in any DER technology solutions that impact trade balance, GDP and jobs.

Closing

The PWU is supportive of the IESO's efforts to evaluate the role DER could play in the future of Ontario's electricity system. However, the PWU supports investments that minimize the electricity costs for all ratepayers.

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 advance innovation across Ontario's electricity system. The PWU is committed to the following principles: Create opportunities for sustainable, high-pay, high-skill jobs; ensure reliable, affordable 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, the objectives for supplying low-cost and reliable electricity in Ontario. The PWU looks forward to discussing these comments in

[13] Strategic Policy Economics, Electricity Markets in Ontario, 2020
[14] EPRI, Canadian National Electrification Assessment, 2021
[15] Strategic Policy Economics, Electrification Pathways to Reduce Emissions in Ontario, 2021

greater detail at the IESO's convenience and is willing to provide more in-depth presentations on these findings should the IESO be interested.