Feedback Form

Pathways to Decarbonization – February 24, 2022

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

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

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

Policy

Topic	Feedback
Are the assumptions indicated reasonable and comprehensive in terms of scale and timing?	The overall framework is reasonable. We understand IESO's inclination to limit the policies in the shorter time-frame Moratorium Modelling to those that are already legislatively enacted or announced in detail. However, if market dynamics and the general thrust of federal policy indicate that a policy is reasonably foreseeable, there may be a solid rationale for adding it. For example, if differences in carbon policy result in modeled imports of large volumes of energy from jurisdictions that continue to generate using coal (e.g. MISO, PJM) it would be reasonable to assume that if that were to materialize in real life, Carbon Border Adjustment policies would be expedited. Without being prescriptive, if the lack of prior legislative enactment of a likely policy results in modeling outputs that appear to be a distortion of reasonable outcomes, IESO should consider the reasonability of including that policy in its Moratorium Modelling. It may also be worth bearing in mind the degree to which federal carbon policies ultimately drive provincial policies.

Topic	Feedback
Are there other considerations for the IESO?	No additional comments

Demand

Topic	Feedback
Are the assumptions indicated reasonable and comprehensive in terms of scale and timing?	No additional comments

Topic	Feedback
Are there other considerations for the IESO?	Given the changing/growing types of end use demands for electricity being modeled, we assume IESO will be building in the seasonality and variability of the different demand sub-categories (such as space heating) to match against the seasonal availability and variability of the supply resources being modeled.

Resources

Topic	Feedback
Are the assumptions indicated reasonable and comprehensive in terms of scale and timing?	The overall framework is reasonable, however in modeling, the details have major impacts. We have some specific comments on cost levels (a need for costs appropriate for Ontario), the characterization of OM&A (a need to separate variable from fixed OM&A where, as is the case for storage, cost causality requires it, as counting all costs as fixed may lead to significant distortions in the modeling outputs) and some related matters.

Topic	Feedback
Are there additional data sources that we should consider	The NREL ATB may provide a reasonable trajectory for resource costs over time for some of the generating technologies, however Ontario costs are usually materially different such that a simple application of an exchange rate does not do justice to the differences in labour and material costs. IESO could, with the agreement of developers, use their firsthand knowledge of resource costs to inform the starting point from which costs can escalate. Recent input price escalation due to supply disruption and non-electricity sector demand may suggest different trajectories on a case-by case basis. Holding workshops with developers and market participants may be of great assistance in arriving at reasonable real-world cost assumptions for resources. Speaking with banks that have been financing power projects in Ontario would also be an excellent (and efficient) source of guidance on project costs (as we understand AESO has done in Alberta).

Topic	Feedback
Are there other considerations for the IESO?	Supply Chain Security: As the Stakeholder Advisory Committee's "Challenge Statement Urgency and Timing of New Resources" working group has highlighted, "the impacts of international resource supply chains and resource security are areas of growing importance and should be considered in meeting future system needs". The technology-specific Resource assumptions include numerical scoring of Technological Readiness Level, and Commercial Readiness, but does not include scoring of Supply Chain Security. As recent previously unthinkable pandemics and world events have highlighted, depending on far-flung supply chains (especially in potentially unstable or sanctionable jurisdictions) for technology and fuel has tangible reliability implications. A scoring of technologies and their associated resource and fuel inputs for domestic content would be a useful addition. Likely access of Ontario's electricity sector to resources could be another factor. We would suggest a Supply Chain Security Index along the lines of the following for a composite of equipment, embodied resources in the equipment, and fuel according to the jurisdictions in which they are currently available in quantity: 4) all available in Ontario; 3) all available in Canada; 2) all available in North America; 1) all available in the rest of the world / overseas

General Comments/Feedback

*More detailed comment on fixed and variable O&M expenses:
The NREL Annual Technology Baseline of necessity makes a number of simplifications in how its data is presented. One of those simplifications which may lead to non-intuitive outcomes is classifying all Operating & Maintenance expense as fixed for some resources, when in fact significant portions are variable. For example, NREL cites Cole et al, 2021 for its assumption that lithium-ion batteries have O&M in the amount of 2.5% of capital costs, all of which are defined as fixed. (Cole, Wesley, Will A. Frazier, and Chad Augustine. "Cost Projections for Utility-Scale Battery Storage: 2021 Update." Technical Report. Golden, CO: National Renewable Energy Laboratory, 2021. https://www.nrel.gov/docs/fy21osti/79236.pdf.)

However, Cole notes (p10) that these fixed costs are consistent with providing cell augmentation to compensate for approximately one cycle per day. Given that cycling is the primary cause of degradation, this classification will result in erroneous results if used for modeling purposes. For example a battery with a reasonable capital cost, cycling 250 times per year, could incur a per-MWh cost in the order of $20/MWh-cycle if half of the 2.5% of capital was attributed to the variable expense incurred by cycling. Even if cycling costs have been wrapped in a take-or-pay long term service agreement by some vendors, competitive processes for procuring unbundled capacity (such as the LT-RFP) will incent both developers and vendors to unbundle cycling costs in order to offer a lower cost of capacity. Omitting a variable cost of this nature could significantly distort how a modelled resource behaves in the energy portion of a simulation. And if cycling costs are not unbundled, cycles over the threshold could become very expensive or unavailable in real-life situations, a phenomenon that would not be captured when modelling these costs as fixed. While we understand IESO must make simplifying assumptions, we strongly advise against following NREL's oversimplification in this instance and would instead recommend a 50/50 FOM/VOM split, as not doing so risks a serious mis-read of the portfolio required for decarbonization. We would recommend that all types of resources be examined re fixed vs. variable expenses.
*Comment on the generic storage duration assumptions:
For the blocks of 4,8,12 and 24+ hour storage, various technologies have been included in each duration block. We would caution against blending or averaging the characteristics of multiple technologies into a duration block, as some will be at the low end of the range on one characteristic but at the high end on another such that blending may result in distorted outputs. We would recommend that for the 8-hour storage and 12-hour storage in particular, the inputs be delineated by technology i.e. Li-ion, Flow Battery, CAES, Pumped Hydro.
*Comment on Firm Imports: we would comment that while Quebec is likely to be able to supply summer capacity it is already looking to acquire winter capacity (and Ontario may eventually reach a winter peak) – this should be taken into consideration, as should the cost and timelines for augmented transmission. There may also be earlier opportunities to import more energy from Quebec in off-peak hours over existing transmission infrastructure to charge storage resources to provide more energy to Ontario in on-peak hours.
*Operability: with increasing carbon taxes and alternative fuels it is likely that gas combined cycle plants may dispatch at lower capacity factors. The ancillary services that these resources provide while online (including operating reserve, ramp, regulation, inertia, voltage control) will need to be supplemented by new resources, and IESO should ensure it provides for these operability services in its analyses and scenarios.
We would like to commend the IESO for taking on this complex and important task, which is providing guidance to policy makers on how to achieve the fundamental goal of progressively decarbonizing our electricity sector and broader economy in the most cost-effective manner possible while maintaining the system reliability which we all depend on. We also thank the IESO for its diligent effort to stakeholder the inputs for this task. We trust that by following some of the guideposts that have served Ontario well to date such as maintaining a prudently diverse supply mix; responsibly using and stewarding Ontario's natural endowments and human ingenuity to their best advantage; taking a balanced and reasonable approach to decision-making and analysis; and fostering sector-wide collaboration in the public interest will help IESO and stakeholders steer us on a good path.