

Stakeholder Feedback and IESO Response

IESO Reliability Standards Review – August 26 webinar

Following the August 26, 2020 webinar on the planning assumptions related to resource adequacy, the IESO received feedback from participants on the areas to prioritize, the methodology and assumptions, as well as the potential impacts of the proposed changes on participant's businesses (outage planning, investment decisions, etc.).

The IESO received feedback from:

- [APPrO](#)
- [Capital Power](#)
- [Ontario Power Generation](#)
- [Ontario Water Power Association](#)
- [Power Workers Union](#)
- [TC Energy](#)

This feedback has been posted on the [Reliability Standards Review webpage](#).

Notes on Feedback Summary

The IESO appreciates the feedback received from stakeholders on the design proposal. The feedback has been noted and will be considered as the engagement moves forward. The IESO has provided a summary below, which outlines specific feedback or questions for which an IESO response was required at this time.

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Areas to Prioritize:

Feedback

In the August 26th meeting, the IESO presented information on the six areas due allowances are permitted, and described the methodology and approach to each. The IESO recommended two areas for further analysis and potential changes:

1. Forced outages and derating
2. Assistance over interconnection with neighbouring areas (i.e., real-time imports).

Five stakeholder submissions indicated support for the IESO to review the above categories, stating:

- We support the IESO's priorities of reviewing the forced outage and non-firm import modeling assumptions.
- Capital Power supports the IESO's plans to review its assumptions and approach to modeling forecasted forced outage rates and non-firm imports.
- OPG supports the IESO's plan to evaluate the use of non-firm imports and the forced outage assumptions used in resource adequacy analysis.
- The PWU appreciates the efforts of the IESO to better understand reliability standards and eliminate unnecessary requirements, particularly as Ontario begins to enter a period of capacity shortfall.
- TC Energy supports the selection of the two areas of focus. Forced outages and imports from neighbouring jurisdictions are significant components of the ability of a power system to supply peak demand needs.

Through a number of feedback submissions, stakeholders provided recommendations the IESO's analysis include the other due allowance areas as well, stating:

- We recommend that the IESO also prioritize reviewing the demand and transmission capability assumptions in the resource adequacy modeling.
- Priority should also be assigned to the areas of demand uncertainty and transmission capability.
- Would it not be prudent to look at the trend on reliability by fuel type rather than simply assume historical outage rates going forward?
- The IESO should likely weight more recent data more heavily, applying existing climate change models.
- TC Energy recommends including demand uncertainty as a third area of focus given the impact of climate change and the changes to Ontario's demand composition over the last decade.

IESO Response

IESO appreciates the support for this endeavour. Based on feedback received, the two areas identified will remain the initial priority. The feedback related to demand uncertainty, effective capacity, and transmission capability is appreciated. The IESO regularly reviews its planning outlook methodologies and will consider the opportunities that exist to make improvements in these areas going forward.

Forced Outages and Derating:

Feedback

With respect to the IESO's described approach to forced outages and derating, stakeholders provided the following feedback.

Methodology and assumptions:

- Noting that the IESO's forced outage rate assumptions are based on historical performance, and suggesting the existing methodology may become less accurate, one stakeholder recommended the IESO develop a methodology to forecast forced outage rates.
- The IESO should consider whether changes in fleet operation will impact projected forced outage rates.
- Projected forced outage rates need to consider the extent to which the existing fleet will be challenged to respond to changes in weather normalized demand.
- To the extent that the IESO has changed its practices with regards to permitting the flexible scheduling of planned outages, forecasted forced outage rates should also consider any impact these changes may have on fleet performance going forward.
- The IESO should consider retaining the contingency allowance for the gas fuel supply uncertainty during the winter months and consequently procuring additional capacity for the winter season when needed.
- It would be beneficial if the IESO would incorporate fuel insecurity into the forecast and procure additional capacity for the winter season to meet this need. The Capacity Auction may be the appropriate mechanism to address short term seasonal needs.

IESO Response

- IESO agrees that historical performance may not be entirely predictive of future forced outage rates; however, attempting to predict future forced outage rates may introduce as much or more uncertainty into resource adequacy modeling. As mentioned in the comments during the presentation, future performance is a function of asset age, current condition, future operation and future maintenance investments. At present, no existing model can accurately combine all those elements into an accurate predictive model of future performance.
- Currently, the gas fleet is underutilized and fuel security is not a major supply risk today. As the supply mix evolves in the future, fuel security is an area the IESO will continue to monitor.

Assistance over Interconnections with Neighbouring Areas:

Feedback

With respect to the IESO's described approach to assistance over interconnections with neighbouring areas, stakeholders provided the following feedback. A number of stakeholders suggested it would be helpful to have access to more of the data and inputs used to drive the modelling.

Methodology and Assumptions

- One stakeholder submitted a number of suggestions on the factors considered for modeling non-firm imports:
 - *Capacity available in neighbouring jurisdictions:* it would be helpful for the IESO to describe what information would be relied on in this analysis.
 - *Supply availability in real-time:* it is important to capture the correlation between extreme weather demand and supply availability in neighbouring jurisdictions.
 - *Sufficient inertia capability:* Planned and forced transmission outages affecting the inerties should be modeled if non-firm imports will be relied upon.

- *Imports likely to flow under tight supply conditions/prices:* More discussion is needed about how the IESO would assess the likelihood to flow.
- *Deliverability within Ontario:* adding significant import capacity from Michigan or NY-Niagara will exacerbate the forecast bottlenecked capacity issues on the FETT interface. This is another reason to include planned and forced transmission outages in the resource adequacy modeling.
- *Ability to manage non-discretionary outages:* The IESO should review its outage assessment methodology.
- *Non-firm imports assumptions should account for committed firm imports:* import capacity that clears the Capacity Auction will compete with non-firm imports for resources in neighbouring jurisdictions and capacity on the interties.
- *Non-market neighbours are more complex to assess:* neighbouring jurisdictions without markets are less transparent and it is more difficult to rely on historical data to determine non-firm import assumptions.
- Capital Power supports the IESO's efforts to thoughtfully consider the extent to which non-firm imports may be included in resource adequacy assumptions. This analysis should include the expected impacts of weather-related demand and future transmission outages.
- Changes to intra-day temperatures, the duration of multi-day weather events and correlation with neighbouring jurisdictions are all factors that need to be considered when forecasting the availability of non-firm imports.
- Planned internal and external transmission outages and/or constraints should also be modelled and considered as part of this analysis.
- What needs to be considered in the Methodology are the following:
 - Excess capacity available in neighbouring areas
 - Excess supply available in neighbouring areas in real-time (timing of each area's peak demand)
 - Sufficient intertie capacity (max limits) with consideration for constraints and limitations.
 - Imports likely to flow under tight supply conditions/prices
 - Deliverable within Ontario - what would flow on a market perspective
 - Ability to manage non-discretionary outage (regulatory requirements) - regulatory licensing outages
 - The study should be divided into summer and winter periods in order to match the capacity planning periods and seasonal assessments.
 - No more than four years should be considered when reviewing historical data for this study for the reason that any older information may no longer be relevant due to changing supply/demand balance in other jurisdictions.
 - Firm imports obtained from the Capacity Auction also need to be factored into the methodology including any competition from such.
 - The benefits from the use of non firm imports needs to be balanced with the potential increased difficulty in scheduling outages.
- The PWU recommends the following actions be taken to ensure a more robust consideration of the potential risks and mitigation options:
 - Assess and evaluate the uncertainties impacting the need for capacity before decisions are made regarding non-firm imports.
 - Consider non-firm imports as part of the reliability assessment only if they reduce the risk to system reliability.
 - Conduct a cost benefit analysis and only include non-firm imports as part of the reliability assessment assuming that they will reduce total system costs.

- Analyze the real risks to system reliability associated with the intermittency of renewable resources.
- TC Energy recommends the IESO take time to clearly describe the tools and methodology they use for assessment:
 - Specifically, for real-time imports, the IESO should describe their assumptions for neighbouring jurisdictions' capability to export during peak demand hours.
 - The IESO should describe how real-time imports and forced outages are being assessed in other jurisdictions and the IESO should undertake a concerted and structured process to share data and associated models and methodologies so stakeholders can replicate analysis and help identify areas for improvement.
- The IESO should share data and models with stakeholders to allow for robust review and commentary. The ability of interested parties to replicate results is an important component to building confidence in determining system need and stimulating investment. Each stakeholder group views system need through their own lens. Having the data inputs to independently assess the matter is a prerequisite to aligning the various sector participants needed to develop the most cost-effective solutions for Ontario's resource adequacy needs in the future. Shared information also allows interested parties to present solutions to the IESO and decision makers using a verified data set.

IESO Response

- IESO proposes to use the NPCC Review of Interconnection Assistance Reliability Benefit report as the best measure of future supply availability in neighbouring jurisdictions. The report uses the resource adequacy models submitted by IESO and its neighbours, as well as a demand forecast based on weather years with peaks that are much more correlated than average.
- IESO proposes to capture the correlation between extreme weather demand and supply availability in neighbouring jurisdictions by examining available import offers during recent periods of high demand and high need.
- The specifics of how non-firm imports will be modeled have yet to be determined. Intertie outages will be considered as part of the overall modeling approach.
- IESO proposes to assess whether imports are likely to flow under tight supply conditions/prices by examining actual import flows during recent periods of high demand and high need.
- The FETT interface is included in the resource adequacy model. Increased bottling would be reflected if significant imports from MI or NY-Niagara are assumed.
- IESO is working on aligning the resource adequacy assessment used for long-term planning and the adequacy assessment used for outage planning.
- IESO will make sure to not "double-count" firm import capacity if there are future firm import capacity contracts.
- Neighbouring jurisdictions participate in the Ontario market, which provides information on how these jurisdictions are likely to behave in the Ontario market in the future.
- The IESO is undergoing a review of how weather is modeled in their various demand forecasts. The IESO is committed to being transparent with the market on methodologies and processes.
- Reliability requirements must meet resource adequacy criteria and transmission security standards and criteria. In resource adequacy models, due regard to transmission constraints is given in accordance with Requirement R4 of NPCC Directory #1. This is done by reflecting major interfaces with their all-in-service transfer capabilities and considering any known planned transmission outages. These all-in-service transfer capabilities respect the ability to accommodate the next limiting contingency (i.e., recognized forced transmission outage – "N-1" or "N-2"). It is important to note, however, that for long-term resource adequacy

assessments used for system planning it is highly unlikely that planned transmission outages are known beyond one-year out. Planned transmission outages are normally considered for adequacy assessments performed in the 18-month timeframe for the Reliability Outlook to inform outage management decisions. IESO is exploring the idea of probabilistically modeling forced transmission outages in resource adequacy assessments.

- The study will be divided into winter and summer seasonal values.
- The study will use the last four years of data.
- IESO believes the cost savings associated with non-firm imports (~\$70,000-\$130,000/MW per year in avoided capacity costs) outweigh the potential for increased difficulty in outage scheduling.
- The need for capacity is based on a probabilistic model that captures some uncertainties. Other uncertainties (major recessions, policy decisions) are difficult to predict and generally out of scope of these assessments. Major changes in demand are generally assessed through the use of different scenarios.
- At the amount of non-firm import capacity being proposed, there is minimal risk to system reliability. The non-firm import capacity would be required for reliability purposes less than once every four years.
- The estimated capacity cost savings (~\$70,000-\$130,000/MW per year) are greater than an extra few hours of higher HOEP prices every few years.
- IESO has recently updated its wind data set to account for 30 years of simulated wind production. This new dataset provides a comprehensive time series of intermittent wind production for use in the resource adequacy model.
- The representation of non-firm and firm imports in other jurisdictions varies. The most common approach is to model the neighbouring jurisdictions. These models vary in complexity.
- The IESO annually publishes forecast data related resource adequacy in the Annual Planning Outlook. We will review what further data could be made public, subject to confidentiality requirements.

Demand Uncertainty:

Feedback

Several stakeholders suggested the IESO explore the area of demand uncertainty, and provided the following feedback. Central themes in the feedback focus on how the IESO treats historical weather, as well as a desire for increased visibility into the modelling.

Methodology and Assumptions

- We recommend that the IESO's future resource adequacy modeling include a sensitivity that removes the ICI program. There is uncertainty about the future of this program, and it would be helpful for all participants to understand the impact of different scenarios related to ICI on resource adequacy.
- The IESO should review its weather correction methodology to assess whether normal and extreme weather variability has changed over time. Other jurisdictions have found that there is higher weather variability in more recent years and have increased their load forecast uncertainty assumptions with respect to high temperatures.
- The IESO should undertake to update its demand uncertainty assumptions to incorporate projected changes in weather patterns (e.g. average temperatures, multi-day heat events, extreme weather scenarios) related to climate change. Changes in weather patterns arising from climate change may result in shifts to forecasted demand curves without necessarily

reflecting changes in forecasted average temperatures. The IESO should prioritize ensuring that its resource adequacy model is accounting for projected changes in weather patterns due to climate change.

- Assumptions and modeling techniques should be transparently communicated so that participants can reproduce the IESO's base case and consider different sensitivity scenarios for the purpose of anticipating and responding to future system needs.
- The IESO's resource adequacy model should consider scenarios under which the ICI program is continued, terminated, or replaced by alternative demand-side resources/incentive programs, including DERs. It is not yet clear what the future is for the ICI program in Ontario. The IESO's resource adequacy modeling should transparently consider scenarios where the ICI program is discontinued and/or replaced with alternative demand-side incentive programs and participation from DERs.
- The demand profile of recent years and existing climate science projections indicate that the demand uncertainty determined based on the past 31 years of weather data may not sufficiently represent the current and future uncertainty. In order to adapt to the changing climate and the market response to those physical impacts, the IESO should consider incorporating climate projections into the model.
- The IESO (and NPCC peers) should incorporate the best available climate change data into forecast modelling.
- Any proposed change to be made to reliability standards at this time should explicitly incorporate climate change modeling.
- The IESO should move forward on initiatives to improve visibility/modeling of generation connected at the distribution system and take a leadership role amongst its peers in this regard.
- Policy changes could cause further changes to Ontario's demand profile that should be reflected in the IESO's resource adequacy assessment.

IESO Response

- The future of the ICI program is a policy decision. As of right now, the ICI program is reflected in the current outlooks. Moving forward, we will examine ways to reflect coming issues that could affect resource adequacy needs, including policy decisions.
- The IESO is undergoing a review of how weather is modeled in their various demand forecasts. The IESO is committed to being transparent with the market on methodologies and processes.
- IESO is working to improve modeling of DERs in resource adequacy assessments.

Scheduled Outages and Deratings:

Feedback

One stakeholder suggested the IESO explore the area of scheduled outages and deratings, and provided the following feedback.

Methodology and Assumptions

- Modeling and assessment of the impacts of the penetration of intermittent generation and market forces on hydroelectric operations has been undertaken by a number of groups (including EPRI, of which the IESO is a member). The OWA would be pleased to share these analyses with the IESO to help improve the approach to outages and deratings. The substantial financial benefits of phasor data are in its utilisation in real-time. The exact

financial benefit by the PMU implementation is not explicitly quantifiable due to many reasons including following.

IESO Response

- The IESO would welcome any information or analyses that could potentially help improve resource adequacy assessments.

Transmission Transfer Capabilities:

Feedback

Two stakeholders suggested the IESO explore the area of transmission transfer capabilities, and provided the following feedback.

Methodology and Assumptions

- Reliance on assistance from interconnections with non-firm imports may not be realizable. This is corroborated by the IESO's recently proposed market manual change to enable the option of entering into a Reliability Must-Run contract with Manitoba Hydro to provide "additional firm capacity to ensure availability of needed additional energy" between September 1 to October 31 prior to the completion of the EW tie line. Although this appears to be a firm import versus a non-firm import, it demonstrates the difficulty in relying on other jurisdictions solely through economic forces.
- OPG would like the IESO to provide the assessment in arriving at this decision, its impact on resource adequacy plans and its impact on both supply and load in the Northwest in particular if the import is constrained on.
- Ontario presently has some significant generation that is constrained, even under normal conditions, by internal transmission limitations, most notably on the North/South and East/West tie interfaces. Why wouldn't IESO examine the impact of expanding those limits by improving internal (Ontario) inter-zonal transmission rather than look out of province?
- The IESO currently assumes that all transmission facilities are in-service in its resource adequacy modeling. This is an optimistic assumption given that transmission facilities are frequently out of service during high demand periods. This is more likely to become an issue as existing supply retires and there are insufficient resources in the East zone. The IESO is forecasting that the FETT interface will become binding more frequently and will bottle capacity in southwestern Ontario.
- We recommend that the IESO review its transmission limit assumptions and methodology. At a minimum, it would be prudent to model known planned transmission outages that reduce interface limits.
- We also recommend that the IESO and industry start discussions about modeling forced outages on transmission facilities to understand the potential impact on adequacy.

IESO Response

- The Reliability Must-Run contract with Manitoba Hydro option was identified to meet a specific, locational need. Non-firm imports differ in that they meet a general, provincial need; as such, the non-firm imports do not require the same level of assurance. The resource adequacy assessment that informed the NW capacity product was submitted to the OEB as part of IESO's most recent East-West Tie Update.

- Reliability requirements must meet resource adequacy criteria and transmission security standards and criteria. In resource adequacy models, due regard to transmission constraints is given in accordance with Requirement R4 of NPCC Directory #1. This is done by reflecting major interfaces with their all-in-service transfer capabilities and considering any known planned transmission outages. These all-in-service transfer capabilities respect the ability to accommodate the next limiting contingency (i.e., recognized forced transmission outage – “N-1” or “N-2”). It is important to note, however, that for long-term resource adequacy assessments used for system planning it is highly unlikely that planned transmission outages are known beyond one-year out. Planned transmission outages are normally considered for adequacy assessments performed in the 18-month timeframe for the Reliability Outlook to inform outage management decisions. IESO is exploring the idea of probabilistically modeling forced transmission outages in resource adequacy assessments.
- IESO considers planned transmission outages that reduce interface transfer capabilities in its resource adequacy and transmission security assessments. However, it is not commonplace for transmission outages to be submitted to the IESO beyond one-year in the future. And so, long-term resource adequacy assessments used for system planning normally do not contain any planned transmission outages because they are not usually known by the IESO. However, planned transmission outages are normally known and considered for adequacy assessments performed for the Reliability Outlook to inform outage management decisions.
- The IESO is investigating the availability and quality of data that would be required to consider probabilistically modeling forced transmission outages in resource adequacy assessments.

Potential Impacts of the Proposed Changes of Participants’ Businesses:

Feedback

Stakeholders submitted feedback describing the potential impact of the proposed changes on their businesses. Some of the feedback focused on the areas the IESO proposed making changes to, while other feedback focused on additional areas recommended for exploration.

Several stakeholders suggested transparency and the ability to reproduce the methodology would be helpful:

- Transparency and reproducibility of the resource adequacy methodology will support investment in existing and prospective resources. It will avoid surprising participants with sudden changes to capacity needs and allow participants to plan investment and retirements in a more rigorous way.
- Accuracy, transparency, and reproducibility are the most critical features of the resource adequacy model. Capital Power is most concerned with ensuring that the IESO’s resource adequacy model is to the greatest extent possible, a transparent and accurate reflection of forecasted system needs.
- Overstating or over-forecasting system requirements leads to unnecessary investment in system resources, while understating requirements leads to situations where the market operator and policy makers must react quickly, potentially overpaying for resources that could have been better planned had system needs been communicated earlier. Efforts to increase the accuracy and reliability of the forecast will help support better planning decisions and enhance opportunities for competition, thereby lowering costs for all consumers.

Another stakeholder noted potential challenges in scheduling planned generation outages:

- The proposed changes have the potential to make it more difficult to schedule planned generation outages. For example, relying on non-firm imports in the planning timeframe will reduce the amount of resources available in the operational timeframe when assessing planned outages. This could require reviewing the assumptions used in assessing planned outages in the operational timeframe.
- A decrease in capacity requirements, in conjunction with the use of extreme weather forecasting in outage planning, will make it more difficult to schedule outages during the summer months. Infrastructure is aging and without investment in maintenance or sustaining capital the frequency and duration of outages may increase.
- Modeling that more accurately reflects the current and expected operating regimes of the hydroelectric fleet and the impacts thereon will increase participant confidence in the IESO's projections and/or identify changes that should be made in order to reduce the impact.

A number of stakeholders commented on demand uncertainty, and its potential impact:

- Improved projections and broader understanding of the climate considerations incorporated would increase greater market participant confidence in the forecasts and could improve generation and outage planning.
- Improved projections could also inform potential investments in generation upgrades or expansions based on regional opportunities and projected streamflow levels.
- More accurate predictions and the communication of modeling assumptions will increase participant confidence in the IESO's projections.

On the topic of forced outages, OPG provided the following feedback:

- Natural gas pipeline constraints have serious implications for reliability and price volatility. Increased reliance on gas-fired electricity generation increases the potential for fuel interruption to supply certain facilities during the winter season.

With respect to the area of transmission transfer capabilities, the following feedback was submitted by Ontario Waterkeepers' Association:

- Transmission improvements would un-bottle energy/capacity and limit the potential for negative LMP expected in those areas in the new market construct.
- Transmission improvements would open up investment opportunities for new hydroelectric capacity in those areas.

IESO Response

- The IESO provides resource adequacy forecast data in the Annual Planning Outlook and associated modules. Over time, more data has been added to these products. Moving forward, IESO will review what further data can be published, subject to privacy considerations.
- IESO is constantly working on improvements to the resource adequacy forecast, both on the demand and supply sides.
- The IESO recognizes the impact that non-firm imports could have on outage scheduling. Aligning resource adequacy methodologies between the planning and operation planning timeframes remains a priority.
- IESO is currently investigating methods to model hydroelectric generators individually, instead of on an aggregated zonal basis. If implemented, this would allow for better modeling of the current operational regime.

- The IESO is undergoing a review of how weather is modeled in their various demand forecasts. The IESO is committed to being transparent with the market on methodologies and processes.
- Currently, the gas fleet is underutilized and fuel security is not a major supply risk. Fuel security issues will continue to be monitored in light of any changes to Ontario's demand forecast and supply mix.
- More information on transmission constraints will be published in the 2020 Annual Planning Outlook.

General/Other Feedback:

Feedback

APPrO indicated they support the IESO's efforts to make its resource adequacy methodology more transparent and allow market participants to reproduce those results, and made the following recommendations to improve transparency:

- Provide all input data including all hourly load forecasts broken down by zone, assumptions for embedded generation and ICI, hourly generation profiles, planned outage assumptions by unit/plant, forced outage assumptions unit/plant. For greater clarity, the IESO should provide all system data, assumptions, methodologies and models as may be required such that interested stakeholders could replicate the loss-of-load probability and expectation (LOLP/LOLE) result using multi-area reliability simulation software (whether with GE MARS or other software package). This will allow participants to reproduce the IESO's results and would assist both in validating the reasonableness of the assumptions and in providing confidence in the result. It would also allow them to make their own reliability assessments.
- Provide all output data from the model runs including all LOLP/LOLE results and any sensitivity analyses (e.g., for ICI).

TC Energy provided the following recommendations on the planning process:

- Establishing a process for stakeholders to offer differing conclusions and perspectives with respect to the Reliability Standards review is beneficial for the IESO and the electricity sector. The IESO should adopt a governance structure that efficiently allows stakeholders to question the IESO about the analysis and conclusions of the Reliability Standards Review. Stakeholders should also be encouraged to identify differences with respect to the advisability of assumptions and methods in the Reliability Standards analysis and to present alternative viewpoints in an organized manner. This is not to say that stakeholders should have the ability to determine the results of the Reliability Standards Review. Instead, the IESO should seek to ensure all parties' viewpoints are represented and a process is in place to present their analyses. The current approach using standard feedback forms is not suitable for the depth of analytics and technical assessment related to Reliability Standards.

IESO Response

- The IESO provides resource adequacy forecast data in the Annual Planning Outlook and associated modules. Over time, more data has been added to these products. Moving forward, IESO will review what further data can be published, subject to privacy considerations.
- The IESO welcomes discussions on how to improve the stakeholder engagement process.

Resource Adequacy:

Feedback

APPrO requested that the IESO improve the transparency of the resource adequacy modeling in support of the resource adequacy engagement, noting they appreciate the additional information the IESO provided in the 2019 APO but there currently is not enough information for market participants to carry out their own resource adequacy modeling or to validate the IESO's resource adequacy modeling. It is important that market participants can reproduce the IESO's results and run their own analyses to support their investment decisions.

IESO Response

- The IESO provides resource adequacy forecast data in the Annual Planning Outlook and associated modules. Over time, more data has been added to these products. Moving forward, IESO will review what further data can be published, subject to privacy considerations.