June 22, 2018

Barbara Ellard
Director, Markets and Procurement
Independent Electricity System Operator
1600-120 Adelaide Street West
Toronto, ON M5H 1T1

Dear Barbara,

Power Advisory LLC has coordinated this submission on behalf of a consortium of renewable generators, energy storage providers, and industry associations (i.e., the "Consortium[1]") regarding Energy Workstream design elements that were presented by the Independent Electricity System Operator (IESO) at the May 23 and 24 Market Renewal Program (MRP) meetings.

More specifically, this submission outlines the Consortium's feedback regarding variable generation (VG) (i.e., wind and solar generation) participation within the contemplated Day-Ahead Market (DAM) design. The Consortium understands the IESO's proposal is to require all resources (e.g., generators) who wish to participate in the Real-Time Market (RTM) to also participate in the DAM, including VG resources. However, participation in the DAM is uniquely problematic for VG resources. One key issue regarding mandatory participation in the DAM for VG resources is fuel security. Unlike other resource types (e.g., gas-fired generation, etc.), fuel availability is beyond a VG resource's control, and is difficult to predict in the day-ahead timeframe. For this and other reasons, DAM participation by VG resources in other wholesale electricity markets across North America is typically voluntary.

Based on the DAM design details that have been provided by IESO thus far, this submission presents the risks associated with VG participation in the DAM, and identifies areas where more dialogue is needed between the IESO and VG stakeholders. For clarity, the risks identified apply to VG resources that are Market Participants (i.e., transmission-connected wind and solar

[1]Consortium members include: Algonquin Power; BluEarth Renewables; Boralex; Brookfield Renewable Power; Canadian Wind Energy Association (CanWEA); EDF Renewables; EDP Renewables (EDPR); Enbridge; Energy Storage Canada; ENGIE; H2O Power; Kruger Energy; NextEra Energy Canada; Pattern Energy; Suncor; wpd Canada; and, Canadian Solar Industries Association (CanSIA)

generators and distribution-connected wind and solar resources who have opted to become Market Participants).

Financially Binding Schedule and VG Energy Production Forecast

The Consortium has a major concern regarding the financial risk that VG resources will be assuming resulting from must-offer participation in the DAM and the subsequent penalty structure when VG resources are unable to comply with their DAM energy production schedules in the RTM. VG resources will face risks to comply with day-ahead schedules because real-time fuel availability (wind and solar irradiance) is beyond the reasonable control of VG resources. By participating in the DAM and being subject to financially binding day-ahead market schedules for energy production in the RTM, VG resources will be taking on the financial risk of penalties for the forecast to actual energy production deviations in the RTM (i.e., if the forecast fuel does not show up in real time). There will also be risks associated with under-forecasting fuel availability in the day-ahead timeframe. In the case of under-forecasting (or submitting a conservatively low energy offers in the DAM), VG resources could potentially be seen as physically withholding and therefore potentially be subject to market power mitigation.

During the May 23 DAM stakeholder consultation meeting, the IESO illustrated the proposed offer submission process regarding VG forecasts in the DAM. Though not specific regarding timelines, directionally the IESO has proposed that VGs will be responsible for submitting hourly offers within the DAM, where the VG forecast will be utilized in the initial and final DAM passes while the IESO's forecast is used in the reliability pass.

The Consortium acknowledges that the IESO is giving VGs a choice between using their own energy production forecasts for their offer quantities submitting in the DAM or to use the IESO's centralized forecast. However, at the May 23 DAM stakeholder consultation meeting, the IESO failed to acknowledge the known deficiencies and issues associated with forecasting energy production from VG resources, particularly in the day-ahead timeframe. As the IESO is well aware, forecast uncertainty pertaining to energy production from VGs is highly dependent on the look-ahead time period. That is, forecasting in the day-ahead time period is difficult because energy production from VGs is affected by climatic factors, rather than a readily available fuel supply. Therefore, the further into the future the forecast is, the forecast becomes more uncertain and therefore prone to forecast errors. It is widely understood that VG energy production forecasts have better certainty closer to real-time. The IESO made note of this in their June 2016 Enabling System Flexibility stakeholder consultation meeting, presenting data

indicating that while centralizing VG energy productions forecasts significantly reduced forecast uncertainty when compared to individual VG generators' forecasts, forecast uncertainty still exists. The number of hours where forecast errors were greater than ± 5% of adjusted capacity were highest for the forecasts further into the future.

The Consortium requests the IESO to respond to the following questions.

- Has the IESO compared the proposed DAM design regarding participation obligations of VGs to those currently used in other wholesale electricity markets? Please provide a list of design elements for VGs that are analogous to these other markets.
- Has the IESO considered DAM design that incorporates energy production forecasts for VGs, without the financially binding commitment (in whole or part?) that is consistent with operations in other wholesale electricity markets?

Reference Quantities

During the March 27 DAM stakeholder consultation meeting, the IESO indicated that all registered supply resources (e.g., generators) must offer an energy reference quantity into the DAM, with the energy reference quantity being equal to installed capacity less the more restrictive of outage-reportable events or pre-approved operating restrictions. As part of this proposal, these supply resources will be penalized if deemed by the IESO to be physically withholding quantities of available energy from the DAM (i.e., not offered available energy within the DAM). During the May 23 Market Power Mitigation stakeholder consultation meeting, the IESO clarified that the reference quantity will not amount to a strict offer obligation, but will instead be used when conducting after-the-fact assessments of potential physical withholding. As outlined above, the accuracy of VG forecasts is less reliable in the day-ahead timeframe. Therefore the Consortium seeks to understand what the after-the-fact assessments will be based on regarding VGs. For example will a VG resource's forecast be used as a reference?

The concept of reference quantities for VGs needs to be better understood, particularly in relation to the above-noted risks associated with must-offer obligations in the DAM. In order to facilitate a better understanding of the IESO's proposal, the Consortium requests that the IESO produce a series of illustrative examples compiling all aspects of the design thus far, demonstrating VG participation in the DAM from the day-ahead timeframe and into real-time, while incorporating aspects of the VG forecast and two-settlement process.

Interaction Between Contracts and Market Rules

In order to manage risks associated with fuel security in real-time (i.e., fuel is not available in real-time as forecast day-ahead) and a financially binding day-ahead schedule, the IESO suggested at the May 23 DAM stakeholder consultation meeting that VG resources could use several laminations of price-quantity (P/Q) pairs within each hour of their DAM offers. For example, a 100 MW wind generator with a day-ahead energy production forecast of 80 MW could conservatively offer 50 MW at -3$/MWh, and 30 MW at $1,000/MWh. As noted in slide 11 of the May 23 DAM stakeholder consultation meeting materials, VG resources are subject to floor prices set within applicable IESO Market Manuals driven by applicable IESO Market Rules. What was not acknowledged by the IESO at that meeting is that most VG resources are also subject to contractual price caps (e.g., $0/MWh), meaning that they are not paid under the supply contract for energy delivered if that energy was offered at a price exceeding a cap specified within the contract. This interaction between VG contracts (e.g., Feed-in Tariff, etc.) and IESO Market Rules and Market Manuals is an example of the type of issues that will require further discussion with both IESO Contract Management and the IESO Market team and Market Participant VG contract counterparties. For this and other reasons (outlined in the Consortium's Contracts submission to the IESO dated November 23, 2017), the Consortium recommends that the IESO continuously work with Suppliers (i.e., VGs) to understand contract implications relating to IESO's Market Renewal Program (MRP).

Increased Complexity and Administrative Burden

According to the IESO proposed DAM design that has been presented thus far, the Consortium has identified several areas where VG resources will be exposed to increased complexity and administrative tasks. Requiring VG participation in the DAM through must-offer obligations will introduce a number of new obligations for VG resources, some of which will be on-going, and all of which have associated costs. For example, currently the IESO manages VG participation within the Day-Ahead Commitment Process (DACP) itself by utilizing the IESO's energy production forecasts for all VGs 5 MW and larger. As part of this process the IESO's forecast is used. Under the proposed DAM design, there will be a transfer of responsibility for forecasting from the IESO to VG resources. The implication of this is that VG resources who do not already produce their own energy production forecasts will be required to do so, and others who do produce their own forecasts may need to make improvements to these forecasts.

Additionally, the IESO is proposing that all Market Participant classified VG resources will have must-offer obligations in the DAM. Therefore, the day-ahead offer process for these VGs will be more complicated than the current real-time offer submission process for several reasons, with the implication being that VG resources will have to invest time and resources in managing day-ahead must-offers.

- Currently, offers for dispatch in the RTM are submitted by VG resources as a function of installed capacity rather than expected (forecast) energy production. That is, the quantity portion of a VG resource's P/Q offer remains unchanged for the most part. This point was illustrated by the IESO on slide 11 of the May 23 DAM presentation. It is therefore typical for standing P/Q pairs to be offered by VG resources for real-time dispatch, meaning that VG resources do not generally make frequent modifications to their offers today.
- The requirement for VG participation in the DAM means daily offers must be made by each VG resource in the DAM, therefore VG resources will have to actively manage both the price *and* quantity element of the day-ahead P/Q pairs for each hour of the day-ahead offers. Offer prices may or may not be subject to change frequently (depending on the VG resource's strategy), however offer quantities will need to be updated by VGs for each hour, according to the day-ahead forecast and depending on the VG resource's offer strategy.
- Further, in order to manage the risks associated with a financially binding day-ahead schedule, multiple P/Q pair laminations are likely to be required for each hour in the DAM. This varies drastically from the current approach to using standing offers today.

Summary of Risks and Uncertainties

Based on the IESO's proposed DAM design thus far, risks and uncertainties regarding what has currently been presented by the IESO specific to VG participation in the DAM are as follows.

- Under the current proposal, VG resources are assuming new financial risks associated with the deviation from day-ahead energy production schedules to real-time energy production schedules, which is primarily a function of energy production forecast accuracies and errors.
- A VG resource's ability to mitigate aforementioned financial risks through strategically offering multiple price/quantity pairs is hindered by Market Rule/Manual floor prices and

contractual price caps. More information is required regarding other potential mechanisms to help mitigate financial risks (e.g., virtual transactions).

- VG resources will be taking on new must-offer obligations in the DAM with increased complexities, including on-going tasks associated with managing the submission of day-ahead offers.
- There is uncertainty regarding future contractual amendments and implications stemming from the introduction of the DAM.

Conclusions and Proposed Next Steps

The Consortium thanks the IESO for the opportunity to provide feedback on the DAM design and on other elements of MRP. Within this submission, a number of design elements have been identified as requiring further dialogue between VGs and the IESO. Therefore the Consortium proposes an in-person meeting with the IESO DAM design team to further discuss the contents of this submission.

Additionally, the Consortium requests the IESO to respond to the following questions and comments.

- Has the IESO compared the proposed DAM design regarding participation obligations of VGs to those currently used in other wholesale electricity markets? Please provide a list of design elements for VGs that are analogous to other markets.
- Has the IESO considered DAM design that incorporates energy production forecasts for VGs, without the financially binding commitment (in whole or part) that is consistent with operations in other wholesale electricity markets?
- The Consortium requests that the IESO produce a series of illustrative examples which compile all aspects of the design thus far, demonstrating VG participation in the DAM from the day-ahead timeframe and into real-time, incorporating aspects of the VG forecast and two-settlement process.
- The Consortium requests more information on how virtual transactions may be used to help address the risks identified within this submission.

As the design of the DAM evolves and more details are presented, the Consortium will continue to evaluate the impact on non-emitting resources and more specifically VGs.

Sincerely,

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