OCTOBER 30, 2020

Market Power Mitigation
Reference Levels and Reference Quantities
Solar and Wind resources

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Agenda

1. Introduction
2. Update on Stakeholder Engagement Process
3. Refresher: Reference Levels and Reference Quantities
4. Feedback Received
5. Example Workbooks
6. Next Steps
7. Questions

1. Introduction

- Engage with Wind and Solar resources on the reference level and reference quantity methodologies
- Support Wind and Solar resources in their review of the draft written guide and workbooks
- Answer technical questions on the written guide with the IESO's engineering services provider (Hatch)

2. Update on Stakeholder Engagement Process

- Reference level and reference quantity stakeholder engagement kick-off meeting was conducted on August 27, 2020. This meeting provided stakeholders the opportunity to ask clarifying questions on the posted materials – written guide and technology specific workbooks
- Next steps in the reference level engagement:
  - November 2020: Hydro, nuclear, storage and thermal sessions
  - Beginning in 2021: 1-on-1 consultation with market participants to establish resource-specific reference levels and quantities

3. Refresher: Reference Levels and Reference Quantities

- Reference levels and reference quantities play an important role in the Market Power Mitigation framework
- Market Power Mitigation detailed design documents introduced processes necessary to set, maintain and update reference levels
- Establishing appropriate reference levels is a high priority for both stakeholders and the IESO

3. Refresher: Reference Levels and Reference Quantities

Reference levels are *IESO*-approved values for a resource for what would have been offered by a *market participant* in the *energy* and *operating reserve* markets had they been subject to unrestricted competition. The *IESO* will approve reference levels for financial and non-financial *dispatch data* parameters of each resource

- An example of a financial *dispatch data* parameter is *energy offers* ($/MWh)
- An example of a non-financial *dispatch data* parameter is *energy* ramp rates (MW/min)

3. Refresher: Reference Levels and Reference Quantities

Reference quantities are *IESO*-approved values for the quantity of *energy* and *operating reserve* a *market participant* would be expected to offer had they been subject to unrestricted competition

These reference quantities can be modified by active outages, de-ratings, external factors such as ambient temperature, humidity, water flow conditions and other resource specific considerations

4. Feedback Received for Wind and Solar

- Proposed short-run marginal cost components for Wind and Solar resources:
  - seem reasonable
  - are consistent with the approach used in U.S. wholesale electricity markets

- Proposed approach for reference quantities for wind and solar resources seems reasonable

4. Feedback Received for Wind and Solar

- Stakeholders requested that the IESO insert illustrative information into the workbooks to provide examples of what content was expected
- Examples of wind and solar resource workbooks, completed for illustrative purposes, are discussed in the following slides
- These example workbooks are for discussion purposes only. The numbers and content found there are not an indication of expected values

5. Example workbooks

- The IESO has provided two example workbooks per technology type:
  - An example that shows a resource that is requesting a reference level and providing supporting materials
    - This resource may expect to offer positive offer prices into the market and wants to ensure that their reference level will protect their positive offers from mitigation
  - An example that shows a resource that submits a reference level of $0/MWh and thus is not required to provide any supporting materials
    - This resource may expect to offer low prices into the market. As it will be offering below the $25/MW no-look threshold for energy, the resource reduces the administrative burden by requesting a reference level of $0/MW
- We are only presenting the first example for wind and for solar as the second example in each case only requires supporting materials for establishing the relevant non-financial reference levels

Solar Resource Workbook

Reference Level Cost Components

	Cost Components	I. Units of measurement / formula eference	II. Applicability - Resource Type	III. Time-Based Applicability - Seasonality, On-Peak/Off-Peak Hours	IV. Input	V. Supporting Documentation Reference	VI. Comments
(A)	**Operating and Maintenance Costs**						
A.1	Major Maintenance	$/MWh	All Solar Resources	Applicable in all time periods	4	Internal definitions, invoices, accounting statements	Projected cost of eligible major maintenance/forecasted P50 generation
A.2	Scheduled Maintenance - Electrical	$/MWh	All Solar Resources	Applicable in all time periods	4	Internal definitions, invoices, accounting statements	Historical cost for the last 5 years/histrocial generation over the last 5 years
A.3	Unscheduled Maintenance – Electrical	$/MWh	All Solar Resources	Applicable in all time periods	1	Internal definitions, invoices, accounting statements	Historical cost for the last 5 years/historical generation for the last 5 years
A.4	Incremental Third Party Payments	$/MWh	All Solar Resources	Applicable in all time periods	0.1	Agreement terms & payment statements	As per relevant agreements

Solar Resource Workbook

Financial Dispatch Data Parameters

	Separate for Day Ahead and Real-Time markets				
#	**Parameter**	**Unit**	**Description**	**Formula**	**Reference value/cost curve**
1	*Energy offer*	$/MWh	The energy offer reference level will be used to create an energy cost curve consisting of up to 20 price-quantity pairs that will describe short run marginal costs across the range of energy production. The energy cost curve will be consistent with energy offer requirements as specified in Market Rules Chapter 7 Section 3.5.3.	Energy Reference Level = Operating and Maintenance Costs	9.1

Solar Resource Workbook

Non-Financial Dispatch Data Parameters

#	Non-Financial Reference Level	Unit	Description	Summer Value	Winter Value	Supporting Documentation Required
1	***Energy Ramp Rate***	MW/ min	The energy ramp rate profile across the dispatchable range that the resource expects to meet during normal operation.	25	25	Market participants to provide supporting documentation such as resource specifications, that show the ramp rate (MW/min) at which a resource can reach its active power capability.

Solar Resource Workbook

Supporting Documentation List

Attachment #	Supporting Document Name	Supporting Document Description
Attachment 1	Quote 1.pdf	Refer to page 10, for cost to support input into the major maintenance cost
Attachment 2	Invoice 1.pdf	Refer to page 4, for cost to support input into the scheduled maintenance
Attachment 3	*[etc. to be filled by Market participant to substantiate all inputs into reference levels]*	*[etc. to be filled by Market participant to substantiate all inputs into reference levels]*

Wind Resource Workbook

Reference Level Cost Components

	Cost Components	I. Units of measurement/ formula reference	II. Applicability - Resource Type	III. Time-Based Applicability - Seasonality, On-Peak/Off-Peak Hours	IV. Input	V. Supporting Documentation Reference	VI. Comments
(A)	**Operating and Maintenance Costs**						
A.1	Major Maintenance	$/MWh	All Wind Resources	Applicable in All Time Periods	2	Internal definitions, invoices, and accounting statement	Projected cost of eligible major maintenance/forecasted P50 generation
A.2	Scheduled Maintenance Electrical and Mechanical	$/MWh	All Wind Resources	Applicable in All Time Periods	10	Internal definitions, invoices, and accounting statement	Historical cost for the last 5 years/histrocial generation over the last 5 years
A.3	Unscheduled Maintenance Costs	$/MWh	All Wind Resources	Applicable in All Time Periods	1	Internal definitions, invoices, and accounting statement	Historical cost for the last 5 years/histrocial generation over the last 5 years
A.4	Incremental Third Party Payments	$/MWh	All Wind Resources	Applicable in All Time Periods	3	Agreement terms and payment statements	As per relevant agreements
A.5	Start-up Costs	$/MWh	All Wind Resources	Applicable in All Time Periods	0.1	SCADA metering and internal accounting	Historic Cost Per Start/Historic Generation Between Starts

Wind Resource Workbook

Financial Dispatch Data Parameters

	Separate for Day Ahead and Real-Time markets				
#	**Parameter**	**Unit**	**Description**	**Formula**	**Reference value/cost curve**
1	***Energy offer***	$/MWh	The energy offer reference level will be used to create an energy cost curve consisting of up to 20 price-quantity pairs that will describe short run marginal costs across the range of energy production. The energy cost curve will be consistent with energy offer requirements as specified in Market Rules Chapter 7 Section 3.5.3.	Energy Reference Level = Operating and Maintenance Costs	16.1

Wind Resource Workbook

Non-Financial Dispatch Data Parameters

#	Non-Financial Reference Level	Unit	Description	Summer Value	Winter Value	Supporting Documentation
1	***Energy Ramp Rate***	MW/ min	The energy ramp rate profile across the dispatchable range that the resource expects to meet during normal operation.	50	50	Example 100MW wind farm. Ramp-down is instantaneous. Values are for ramp-up. Winter is after units are warmed up.

Wind Resource Workbook

Supporting Documentation List

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6. Next Steps

- **Feedback:** Stakeholders should submit written feedback on the presented materials to engagement@ieso.ca by **Friday, November 13**
- **December 2020:** IESO will post final written guide and workbooks based on stakeholder feedback received during technology-specific sessions
- **Q1 2021 onwards**: IESO will start 1-on-1 consultations with market participants to establish resource-specific reference levels and quantities

Questions?

Thank You

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