Feedback Form

Market Renewal Implementation – Draft Calculation Engines Market Rules and Market Manuals – February 4, 2022

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To promote transparency, feedback submitted will be posted on the Implementation Engagement webpage unless otherwise requested by the sender.

Following publication on February 4, 2022 the Independent Electricity System Operator (IESO) is seeking feedback from stakeholders on the draft batch of Market Rules and Market Manuals for Calculation Engines. The draft documents can be accessed from the Implementation Phase documents webpage. Additionally, materials for the February 22, 2022 webinar where the IESO will provide an overview of the documents and will be posted to the engagement web page.

Please submit feedback to engagement@ieso.ca **by April 15, 2022**. If you wish to provide confidential feedback, please mark the document "Confidential". Otherwise, to promote transparency, feedback that is not marked "Confidential" will be posted on the engagement webpage.

Market Rules – Day-Ahead Calculation Engine

What feedback do you have on the Day-Ahead Calculation Engine draft market rule amendments?

Section / Topic	Feedback
4.2.2.11 - *$URRDG_b$* designates the maximum ramp rate in MW per minute at which the *resource* can increase the amount of *energy* it supplies.	Please clarify the definition of $URRDG_b$ in the Day-Ahead (DA) calculation engine, specifically contrasting the definition of $URRDG_b$ in DA calculation engine Section 4.2.2.11 versus Pre-Dispatch (PD) calculation engine Section 4.2.2.11 versus Real-Time (RT) calculation engine Section 4.2.2.15.
6.3.2.2 - determine *PFL_h* by adding the forecast MW quantities determined for each *non-dispatchable load*, *each price responsive load*, and each *dispatchable load* with no *bid* for *energy*, including forecast MW losses in the *demand* forecast areas.	The Price Responsive Load is excluded from the Pass 2 calculation. Why is this parameter included in Peak Forecasted Load in the Security Assessment function of Pass 2 of the DA calculation engine, stated in 6.3.2.2? OPG suggest to not italicize "each" in "each price responsive load".

8.5.4.6 - The amount of synchronized *ten-minute operating reserve* that a *dispatchable generation resource* may be scheduled to provide shall be limited by its *reserve loading point* for synchronized *ten-minute operating reserve*. This restriction shall be enforced by the following constraint for all hours $h \in \{1, \ldots, 24\}$ and all buses $b \in B^{DG}$ with $RLP10S_{h,b} > 0$:

$$\sum_{k \in K_{h,b}^{10S}} S10SDG_{h,b,k} \leq \left(MinQDG_b \cdot ODG_{h,b} + \sum_{k \in K_{h,b}^{E}} SDG_{h,b,k} \right) \cdot \left(\frac{1}{RLP10S_{h,b}} \right) \cdot \left(min \left\{ 10 \cdot ORRDG_b, \sum_{k \in K_{h,b}^{10S}} Q10SDG_{h,b,k} \right\} \right)$$

Please explain the functionality of the constraint in 8.5.4.6. Examples identifying situations in which it would restrict the scheduled synchronized ten-minute OR would be helpful.

Comparing 8.5.4.6 against the formula in 8.5.4.5:

$$\sum_{k \in K_{h,b}^{10S}} S10SDG_{h,b,k} + \sum_{k \in K_{h,b}^{10N}} S10NDG_{h,b,k} \leq 10 \cdot ORRDG_b$$

and 8.5.1.7:

$0 \leq SDG_{h,b,k} \leq ODG_{h,b} \cdot QDG_{h,b,k}$ for all $b \in B^{DG}$, $k \in K_{h,b}^{E}$;

$0 \leq S10SDG_{h,b,k} \leq ODG_{h,b} \cdot Q10SDG_{h,b,k}$ for all $b \in B^{DG}$, $k \in K_{h,b}^{10S}$;

$0 \leq S10NDG_{h,b,k} \leq ODG_{h,b} \cdot Q10NDG_{h,b,k}$ for all $b \in B^{DG}$, $k \in K_{h,b}^{10N}$; and

$0 \leq S30RDG_{h,b,k} \leq ODG_{h,b} \cdot Q30RDG_{h,b,k}$ for all $b \in B^{DG}$, $k \in K_{h,b}^{30R}$.

and assuming Q10SDG > 10*ORRDG,

1. The definition of reserve loading point (RLP) in *Market Renewal Program: Energy Offers, Bids and Data Inputs Issue 2.0*, Section 3.4.6.4 states: "Additionally, if the registered market participant anticipates that a generation unit will be operating below its reserve loading point for the entire duration of a given dispatch hour, an offer to supply operating reserve (OR) shall not be submitted for that dispatch hour." For a resource with (MinQDG*ODG + SDG) < RLP10S, how can a market participant anticipate the schedule would be below the reserve loading point when the PD schedule is not always equal to its RT schedule, e.g. the PD schedule for hydraulic resources?
2. If a resource's (MinQDG*ODG + SDG) >= RLP10S, the right side of the equation in 8.5.4.6 is greater than 10*ORRDG. However S10SDG is capped by the equations in 8.5.4.5 and 8.5.1.7, meaning 8.5.4.6 does not provide any additional constraint.

Furthermore, please provide an example for how 8.5.4.6 would reduce a resource's 10S OR schedule when its scheduled energy is below its reserve loading point.

Section / Topic	Feedback
	Finally, would forward economics drive the resource to its minimum load point (MLP) or above to respect the RLP, with the consideration that a resource cannot provide OR given the equation in 8.5.4.6 when it is below MLP?
8.6.1.6.2 - If the *resource* stays on at or above *minimum loading point* and $\mathrm{ODG_{h,b}} = 1, \mathrm{ODG_{h\text{-}1,b}} = 1$, the following constraint shall be applied: $\sum_{k \in K^E_{h-1,b}} SDG_{h-1,b,k} - 60 \cdot DRRDG_b \leq \sum_{k \in K^E_{h,b}} SDG_{h,b,k} \leq \sum_{k \in K^E_{h-1,b}} SDG_{h-1,b,k} + 60 \cdot URRDG_b$	Please clarify the definition of $URRDG_b$ in 8.6.1.6.2 with reference to the definition in Section 4.2.2.11. Please clarify if $URRDG_b$ represents the <u>maximum</u> value in the five sets of ramp rates submitted in the DAM for the dispatch day. If yes, this should be more explicit in the rules. Can $URRDG_b$ be any other number which is not within the five submitted sets of ramp rates?
8.6.4.1.2 - *energy* in amounts that would preclude such *resource* from providing *operating reserve* when activated, for all buses $b \in B^{ELR}$ where an *energy limited resource* is located and all hours $H \in \{1, \ldots, 24\}$: $\sum_{h=1..H} \left(ODG_{h,b} \cdot MinQDG_b + \sum_{k \in K^E_{h,b}} SDG_{h,b,k} \right) + 10ORConv \left(\sum_{k \in K^{10S}_{H,b}} S10SDG_{H,b,k} + \sum_{k \in K^{10N}_{H,b}} S10NDG_{H,b,k} \right) + 30ORConv \left(\sum_{k \in K^{30R}_{H,b}} S30RDG_{H,b,k} \right) - \sum_{i=1..N_{MaxDelViol_H}} SMaxDelViol_{H,b,i} \leq MaxDEL_b$	NQS resources can be energy limited resources. Please clarify why the formula in 8.6.4.1.2 does not include the scheduled energy portion of a NQS resource during the time it is ramping. For example, consider a NQS resource with 1000 MWh Max DEL and which produces 100 MWh during both ramp up and ramp down. For this resource, realistically only 800 MWh of Max DEL is available above MLP. Using the formula in 8.6.4.1.2, the DA calculation engine could potentially schedule this resource for 1200 MWh or more, depending on the number of starts the resource is scheduled for in the DAM, and would be in excess of the resource's actual available Max DEL. Is it the responsibility of the market participant to reduce the submitted Max DEL to account for energy produced during ramp hours?

Section / Topic	Feedback
10.5.2 - If the conditions in sections 10.5.1 are met, then the *day-ahead market calculation engine* shall test *resources* that can meet incremental load within Ontario for global market power, unless they are excluded because: [conditions in 10.5.2.1 and 10.5.2.2].	Do 10.5.2.1 and 10.5.2.2.2 refer to the same condition? If so, please confirm that 10.5.2.2.2 was intended to be removed. The status of 10.5.2.2.2 is ambiguous as presented: ~~10.5.2.2.2~~ if $PCong^{AOP}_{h,b} < PIntCong^{AOP}_{h,d} - \$1/MWh$ where $d \in D^{GMPRef}$ is true for all *global market power reference intertie zones.*
10.7.2.1 - if $L10SP_{t,bPDP} > ORGCondThresh$, the *pre-dispatch calculation engine* shall add *resource b* to $BCond_{t}^{GMP10S}$;	Are there typos in 10.7.2.1, 10.7.2.2, and 10.7.2.3? OPG proposes "day-ahead calculation engine" be used in place of "pre-dispatch calculation engine".
23.5.2 - For all (i) *resources* other than those specified in section 23.5.1 not connected to the *main island*; (ii) *non-quick start resources* where a price was not able to be determined in accordance with section 23.5.1; the *day-ahead market calculation engine* shall use the following logic in the order set out below to calculate *locational marginal prices*, using a node-level and *facility*-level substitution list determined by the *IESO…*	OPG requests that the IESO publish the node-level and facility-level substitution list as public reports to be available to Market Participants. If the lists will be published as public reports: 1. Will there be routine updates to the lists? 2. If so, what would be the update frequency? 3. What are the conditions (e.g. network structure changes) that would trigger an update of the lists, outside of any routine updates? If the lists cannot be published as public reports, please provide rationale as to why.

Market Rules – Pre-Dispatch Calculation Engine

What feedback do you have on the Pre-Dispatch Calculation Engine draft market rule amendments?

Section / Topic	Feedback
2.1.1.1 - For the *pre-dispatch calculation engine* runs from 1:00 EST to 19:00 EST in the current *dispatch day*, the pre-dispatch look-ahead period consists of the remaining hours of the current *dispatch day*;	The PD run at 00:00 EST is not included in 2.1.1.1. What is the rationale for this exclusion?

Section / Topic	Feedback
4.2.2.11 - *$URRDG_b$* designates the maximum ramp rate in MW per minute at which the *resource* can increase the amount of *energy* it supplies;	Similar to the comment made to the DA Calculation Engine Market Rule Section 4.2.2.11, please clarify the definition of $URRDG_b$ in the PD calculation engine, specifically contrasting the definition of $URRDG_b$ in the DA calculation engine versus the PD calculation engine and the RT calculation engine. IESO mentioned that one daily ramp rate (for ramp up or ramp down) is used for DA and PD; this is in addition to the five ramp rates that can be submitted (for ramp up or ramp down). 1. Is the URRDG in 4.2.2.11 referring to the daily ramp rate? 2. Is the daily ramp rate referring to the maximum or average ramp rate during the dispatch day? Market participants can submit up to five values for URRDG and DRRDG. These values align with different ramp capabilities at different resource outputs. The RT calculation engine respects a resource's output based on ramp capability whereas the DA and PD engines only consider one ramp rate for the resource's entire capability range. 3. Please explain how the DA and PD calculation engines will respect the resource's actual ramping capabilities at different loading points. 4. For a resource with a ramp rate of 6 MW/min between 0 MW and 20 MW and 1 MW/min between 20 MW and 100 MW, please clarify which ramp rate(s) will be used in the DA/PD/RT engines for the different loading points.

Section / Topic	Feedback
8.6.1.6.1 - For the first hour a *resource* reaches its *minimum loading point*, where $ODG_{t,b} = 1$, $ODG_{t-1,b} = 0$, the following constraint shall be applied: $0 \leq \sum_{k \in K^{E}_{t,b}} SDG_{t,b,k} \leq 30 \cdot URRDG_{b}$	8.6.1.6.1 uses a multiplier of 30 times the ramp rate in its formula. 8.6.1.6.2 uses a multiplier of 60 times the ramp rate in its formula. 1. Please provide the rationale(s) for the different multipliers in 8.6.1.6.1 and 8.6.1.6.2. 2. Please clarify how the PD calculation engine would address the following: a. Consider a NQS resource with a ramp rate of 1 MW/min, MLP of 60 MW and a capacity of 200 MW. In the previous hour, it is scheduled at 59 MW, which is below MLP. In the current hour, it is able to ramp up to 119 MW, however, based on 8.6.1.6.1 the resource's schedule would be suppressed to 30 MW.

Market Rules - Real-Time Calculation Engine

What feedback do you have on Real-Time Calculation Engine draft market rule amendments?

Section / Topic	Feedback
5.6.2.1.4 - $EvalSD_{i,b} \in \{0,1\}$, which designates that the *resource* has been de-committed by the *pre-dispatch calculation engine*, such de-commitment has been confirmed by the IESO, and the *resource* can be evaluated for *energy* schedules below its *minimum loading point*;	OPG proposes that the definition of EvalSD include a condition that would require a resource to be at or above MLP. This would reduce ambiguity.

Section / Topic	Feedback
8.5.3.5 - A constraint shall limit the schedule for a *non-quick start resource* at or above its *minimum loading point* when such *resource* is committed or when the *resource* shutdown is yet to be confirmed by the IESO. For all *non-quick start resource* buses $b \in B^{NQS}$ and intervals $i \in I$: $\sum_{k \in K_{i,b}^{E}} SDG_{i,b,k} \geq AtMLP_{i,b} \cdot MinQDG_{b}.$	OPG proposes to add in a general condition to 8.5.3.5 for the SDG parameter that includes the EvalSD parameter, similar to the OR scheduling equations in 8.5.1.3: $0 \leq S10SDG_{i,b,k} \leq (AtMLP_{i,b} + EvalSD_{i,b}) \cdot Q10SDG_{i,b,k}$ for all $k \in K_{i,b}^{10S}$; $0 \leq S10NDG_{i,b,k} \leq (AtMLP_{i,b} + EvalSD_{i,b}) \cdot Q10NDG_{i,b,k}$ for all $k \in K_{i,b}^{10N}$; and $0 \leq S30RDG_{i,b,k} \leq (AtMLP_{i,b} + EvalSD_{i,b}) \cdot Q30RDG_{i,b,k}$ for all $k \in K_{i,b}^{30R}$. i.e. Sum(SDG) >= (AtMLP + EvalSD) * MinQDG; with the current 8.5.3.5 allocated as a sub-bullet. This would give clarity in the following example: • A resource has a ramp-down rate of 5 MW/min with MLP at 100 MW. In the previous interval, it was at 200 MW and the PD engine de-commits the resource (EvalSD = 1). In the RT calculation engine, to respect the ramp-down rate, the resource must be scheduled above its MLP for several intervals before shutdown.
8.6.1.1 - Ramp rates shall be treated as constant over the full operating range of a *dispatchable generation resource* where the single ramp up rate, $URRDG_b$, and the single ramp down rate, $DRRDG_b$, are used.	Section 4.2.2.15, with reference to *Market Renewal Program: Energy Offers, Bids and Data Inputs Issue 2.0* Section 3.4.2.2 Hourly Dispatch Data – Energy Ramp Rate (page 29), indicates there can be up to five sets of ramp rates, $URRDG_{i,b,w}$, used in the RT calculation engine. Please explain why Section 8.6.1.1 states that a single ramp up rate ($URRDG_b$) and a single ramp down rate ($DRRDG_b$) will be used over the full operating range of a dispatchable generation resource. For a dispatchable generation resource with the following sets of ramp up rates: • 0-10 MW: 5 MW/min • 10-20 MW: 4 MW/min • 20-30 MW: 8 MW/min • 30-40 MW: 2 MW/min • 40-50 MW: 1 MW/min which ramp up rate is used if the resource is to ramp up across two break points, i.e. which ramp rate is selected as the $URRDG_b$ in Section 8.6.1.1?

Section / Topic	Feedback
8.6.1.5 - *Energy* schedules for a *dispatchable generation resource* cannot vary by more than an interval's ramping capability for that *resource*. This constraint shall be enforced by the following for all intervals $i \in I$ and buses $b \in B^{DG}$: $\sum_{k \in K^E_{i-1,b}} SDG_{i-1,b,k} - 5 \cdot DRRDG_b \leq \sum_{k \in K^E_{i,b}} SDG_{i,b,k} \leq \sum_{k \in K^E_{i-1,b}} SDG_{i-1,b,k} + 5 \cdot URRDG_b.$	With reference to the comment for Section 8.6.1.1, if there can be up to five sets of ramp rates used in the RT calculation engine for each ramping direction, why are only $URRDG_b$ and $DRRDG_b$ (the constant ramp up and ramp down rates from 8.6.1.1) referenced in the operational constraint calculation in Section 8.6.1.5? For a dispatchable generation resource with the following set of ramp up rates: • 0-10 MW: 5 MW/min • 10-20 MW: 4 MW/min • 20-30 MW: 8 MW/min • 30-40 MW: 2 MW/min • 40-50 MW: 1 MW/min if the resource is currently at 10 MW at the beginning of an interval, which ramp up rate ($URRDG_b$) is used in the equation in Section 8.6.1.5?

Market Rules – Chapter 11 Definitions

What feedback do you have on the new, modified, or deleted terms in Chapter 11?

Section / Topic	Feedback
Click or tap here to enter text.	OPG has no comment at this time.

General Comments/Feedback

OPG requests clarification on how reserve loading point is used in energy offers and its role in dispatch scheduling. From *Market Renewal Program: Energy Offers Bids and Data Inputs Detailed Design Issue 2.0* Section 3.4.6.4: "Additionally, if the registered market participant anticipates that a generation unit will be operating below its reserve loading point for the entire duration of a given dispatch hour, an offer to supply operating reserve shall not be submitted for that dispatch hour." This statement appears to direct market participants (MPs) to refrain from submitting OR offers for a resource if its dispatch schedule is expected to be below its RLP for the entirety of a dispatch hour.

1. Could the IESO elaborate on the intent of the statement quote above? OPG interprets the statement as "Market Participants shall not submit operating reserve offers if the resource is scheduled below its reserve loading point for entire duration of a given dispatch hour." Is this the correct interpretation?

2. How would the MP know whether the resource is scheduled below its reserve loading point prior to operating reserve offer submission?

3. How would the MP anticipate/infer a resource's schedule without having the scheduling output from the IESO for the dispatch hour?

OPG requests clarification of the treatment of the MLP and the RLP parameters by the DA and PD calculation engines after Market Renewal. The current IESO Dispatch Scheduling and Optimization (DSO) tool does not consider a resource's MLP and RLP as the minimum operating limits for providing OR. This can result in dispatch instructions that removes the resource's ability to offer OR, resulting in OR cancellation; see example below:

- In PD, a resource has MLP of 50 MW, RLP of 50 MW and has maximum OR offer at 20 MW;
- Through the current joint-optimization process, the resource receives an OR dispatch of 20 MW and energy dispatch of 30 MW;
- Resource is not able to provide OR at 30 MW, which is below both its MLP and RLP;
- Resource cancels its OR offer as it cannot meet the OR activation due to resource being scheduled below its MLP and RLP.

4. Is there a difference in consideration of the MLP and RLP between the current DSO and the enhanced DA and PD calculation engines, i.e. do the enhanced calculation engines consider the MLP and RLP as binding parameters in OR scheduling?

5. Can the IESO outline differences (if any) in energy and OR scheduling from the current DSO tool and the enhanced DA and PD calculation engines for the example presented above.

In closing, OPG thanks the IESO for the opportunity to provide feedback on the Calculation Engine Market Rules and appendices. Noting that the material presented is both mathematically dense and critical to MP's understanding of the new market, OPG suggests that the IESO hold multiple stakeholder engagement sessions between now and Market Go-Live, in which examples are presented in detail. These examples should focus on differences between the current market and the future market. The recent April 2022 session on Economic Operating Point is an example of a successful session that highlighted subject matter that is difficult to grasp simply by reading the design documents or rules.