

# **IESO Demand Response Pilot Program**

## **Program Details**

April 1, 2015

**Disclaimer**

This document has been prepared as a reference document for demand-side resources who may wish to submit a proposal into the Demand Response Pilot RFP. Users of this document are reminded that this is prepared for informational purposes only and is not a substitute for the RFP and Definitive Contract. Participants are advised to read and understand all of the RFP and Definitive Contract terms and conditions, as such documents may be amended from time to time. While every effort has been made to ensure the provisions of this guide are accurate at the time of publication, and in the event there is any conflict or inconsistency between this guide and the RFP and Definitive Contract, the terms in the RFP and Definitive Contract will govern.

## **Introduction**

The IESO is interested in learning about what new roles demand response (DR) can play in meeting the energy and capacity needs of Ontario's electricity system. To support this goal, the IESO will be procuring up to 100MW of price-responsive demand-side resources to participate in a DR Pilot Program. The pilot was launched via a competitive Request for Proposal (RFP) issued on April 1, 2015 and is aimed at better understanding the capabilities of DR for:

- meeting the capacity and energy needs of the IESO administered market;
- responding to five minute and hourly load changes in the real-time energy market; and
- committing to load curtailment day ahead or four hours ahead of real-time.

This document will serve as a reference document to demand-side resources who may wish to submit a proposal into the DR Pilot RFP and, if selected, participate in the DR Pilot Program. The document describes the objectives of the pilot, the different ways in which DR can participate and the process and obligations for participation in the pilot program.

This document will be of assistance to:

- stakeholders participating in the Demand Response Working Group and other interested stakeholders to prepare submissions for the DR Pilot RFP and potential participation in the DR Pilot program; and
- all interested stakeholders, including Market Participants, to understand the DR Pilot resources that will be participating in the IESO-administered market over the pilot contract term.

## **The IESO's Role in Demand Response**

The IESO has the responsibility to evolve existing DR programs as well as develop new market-based DR programs, products and services. In early 2014, the IESO communicated a workplan to meet these goals by:

- Better aligning the dispatch of existing DR resources (i.e. DR3) with operations in the real-time energy market and transitioning contracted DR to a market structure;
  - Market dispatch began in June 2014. The market transition of contracted DR, called Capacity Based Demand Response (CBDR), was completed in March 2015.
- Implementing a DR Auction as a competitive market mechanism under which DR resources will be able to offer their capacity into the IESO market;
  - The design of the DR Auction is currently being discussed in a stakeholder engagement. All details are available at:  
(<http://www.ieso.ca/Pages/Participate/Stakeholder-Engagement/Demand-Response-Auction.aspx>)
- Developing Pilot programs to demonstrate potential new DR capabilities.

## **Demand Response Pilots**

Over the past year, through the [Demand Response Working Group](#) (DRWG), the IESO has consulted with stakeholders on the potential for DR to provide additional products and services to the market that were traditionally provided by generation. The IESO maintains the balance of supply and demand by utilizing the ability of resources to respond to real-time changes in demand as well as committing resources to a schedule ahead of time. In the context of the DRWG, stakeholders indicated that DR resources may be able to provide these services to the market on a competitive basis with traditional supply resources.

The main objective of the DR Pilot is to better understand how and under what circumstances DR can help meet the province's electricity needs in the most reliable and efficient manner possible. The main areas covered in the pilot are:

### **5-Minute Load Following**

DR resources participating in the pilot by providing 5-minute load following will be responding to real-time dispatch instructions and adjusting their power consumption on a 5-minute basis as Ontario's demand for electricity fluctuates throughout the hour.

### **Hourly Load Following**

DR resources participating in the pilot by providing hourly load following will be responding to hour-ahead schedules and adjusting their power consumption on an hourly basis as Ontario's demand for electricity fluctuates throughout the day.

### **Unit Commitment**

DR resources participating in the pilot utilizing unit commitments can achieve schedules to match their technical requirements and business processes, as well as increase IESO visibility of future consumption behaviour, by providing commitments in day-ahead and four hours ahead of real-time to curtail their consumption.

Participants will elect in the RFP response whether they will make themselves available to provide 5-minute or hourly load following, and if they will be utilizing unit commitment.

In order to demonstrate these capabilities, the DR Pilot will provide an availability payment to all successful proponents. This availability payment is meant to cover the costs that a demand response provider will incur in order to make their load following capability available for utilization in the IESO-administered market.

To achieve the desired pilot learnings, and specifically to ensure that participants are making their load following capability available, selected resources will be required to submit bids into the market and follow their dispatch instructions for all hours of availability for which they are capable of responding to dispatch instructions. In order to observe the behaviour desired by the

DR Pilot Program, participants will be required to provide at least 100 hours of energy curtailment per contract year.

### **Next steps**

The IESO issued the RFP for the DR Pilot Program on April 1, 2015 and posted the RFP document on the MERX website. As part of the RFP process, the IESO will host a webinar on April 14, 2015 where interested stakeholders can ask questions related to the RFP document.

## **Glossary**

**contracted curtailment amount** is the amount of power that was contracted for demand response for the facility under the demand response pilot program, expressed in megawatts;

**demand response** means the reduction of energy consumption at a facility or set of facilities through Load Reduction, use of Behind-the-Meter Generation, or other commercially available technology that is capable of reducing the energy consumption from the IESO-controlled grid.

**demand response aggregator** (as defined in the market rules) means a person that is not a demand response direct participant and aggregates at least one demand response contributor to provide a portion of the aggregator's monthly contracted MW for the contracted dispatch period as outlined in the aggregator's demand response schedule;

**demand response contributor** (as defined in the market rules) means an interruptible load or behind the meter generator that is owned by a demand response direct participant, or with whom a demand response aggregator has enforceable rights, and in either case, who will provide a portion of the monthly contracted MW for the contracted dispatch period as outlined in the demand response schedule;

**demand response direct participant** (as defined in the market rules) means a person who is not a demand response aggregator and whose demand response contributors are owned by the demand response market participant and the facilities in which the demand response contributors reside are controlled by the demand response market participant;

**demand response market participant** (as defined in the market rules) means a person who is a market participant that is a demand response aggregator or demand response direct participant that participates only in the capacity based demand response program or the demand response pilot program;

**dispatch workstation** is the communication equipment that is required for 5-minute dispatchable resources to receive dispatch instructions and transmit information to the IESO. The equipment standards will be consistent with the current requirements as per Market Manual 6 for dispatchable loads and specified in the IESO Participant Technical Reference Manual;

**dispatchable demand response facility** is a load facility registered under a demand response market participant which is providing 5-minute load following to the IESO;

**facility** is a physical entity, or set of entities, that is located within the IESO control area;

**hours of availability** is the set of hours of a day that a facility is available to provide curtailment in the demand response pilot program, expressed as a set of hours in EST in the RFP response;

**hourly load facility** is a load facility registered under a wholesale consumer which is providing hourly load following to the IESO;

**hourly demand response facility** is a load facility registered under a demand response market participant which is providing hourly load following to the IESO;

**maximum curtailment time** is the maximum number of hours that a load facility can maintain reduce consumption of the contracted curtailment amount in accordance with the curtailment plan of the facility, expressed as an hourly value between 2 and 12 hours, rounded down;

**maximum facility load** is the maximum instantaneous power that a load facility can consume, expressed in megawatts;

**maximum reduction blocks per day** is the number of times that the facility can be scheduled to curtail its energy consumption by the contracted curtailment amount for the Minimum Curtailment Time within a dispatch day;

**measurement data submission** is the delivery of measurement data to the IESO from a meter that is not a revenue meter but meets criteria established to be the designated source of metering data to be used by the IESO for settlement purposes;

**measurement and verification (M&V) plan** in accordance with Market Manual 5.5, outlining the facility's contributor information, curtailment plan, electrical location, and metering configuration;

**minimum curtailment time** is the minimum number of hours that the load facility must maintain reduced consumption, equal to at least the contracted curtailment amount and in accordance with the curtailment plan of the facility, expressed as an hourly value between 2 and 12 hours, rounded up;

**months of availability** is the calendar months, on an annual basis, in which the facility will be available to curtailment in the demand response pilot program, expressed as a set of months in the RFP response;

**operational meter** is a meter that is the designated source of metering data to be used by the IESO for operation of the electricity system. Any such metering equipment shall meet the applicable specifications and other requirements set forth in the participant technical reference manual;

**ramp time** is the maximum number of minutes required for the load facility to reduce consumption from maximum facility load by the contracted curtailment amount, or increase consumption by the contracted curtailment amount to maximum facility load, in accordance with the curtailment plan of the facility, expressed as a number of minutes between 0 and 60, rounded up;

**real-time network** is a dedicated, internet based real-time communication network between the IESO and the facility. Any such internet based real-time communication network shall meet the applicable specifications and other requirements set forth in the participant technical reference manual;

**wholesale consumer** is a market participant who purchases electricity at the wholesale price in the IESO-administered markets and is directly connected to the IESO controlled grid.

**wholesale revenue meter** is a measurement device that is the designated source of metering data to be used by the IESO for settlement purposes in accordance with the VEE process described in Market Rules Chapter 9;

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## **Pilot Participants**

The DR Pilot Program will procure, through a competitive RFP process, up to 100 MW of capacity from demand-side resources to provide load following service, with contract sizes ranging from 1MW to 35MW of curtailment. The pilot program will be open to currently non-dispatchable consumers, participating as:

1. wholesale consumers, demand response direct participants, or demand response aggregators participating in hourly load following with the option to utilize unit commitment; or,
2. demand response aggregators participating in 5-minute load following.

Proponents will elect, in their RFP response, the load following service they wish to participate in and whether they will utilize unit commitment in their operation. Successful proponents will not be allowed to change their selections from what they elected in their RFP response.

Curtailment can be provided by load reduction or behind-the-meter generation (BMG); however, the RFP will select no more than a total of 50 MW of capacity from BMG facilities.

Participants and contributors under the Capacity Based Demand Response (CBDR) program will be eligible to participate in the pilot program, provided that the Hours of Availability specified in their RFP response do not overlap with the hours of availability in the CBDR program. The participant will be expected to manage their participation in each program such that they are able to fulfil their obligations. As such, the participant will take on all risk of conflicts in the operation and settlement of the programs.

## **Registration**

The pilot participants selected through the RFP must be, or become, authorized by the IESO as one of two types of market participants: a wholesale consumer or a demand response market participant. As part of the authorization process, participants in the IESO real-time markets must provide collateral (called 'prudential support') to cover funds that might be owed to the market if the participant were unable to make a payment. Participants will be required to post, through an irrevocable letter of credit, an amount equal to the contracted curtailment amount multiplied by \$10,000 per MW.

Once authorized, the market participant can register a facility, or a set of facilities aggregated as a single facility, with the IESO for each successful pilot contract awarded to the participant. The facility will be registered as a dispatchable demand response facility, an hourly load facility or an hourly demand response facility, based on the participation selections outlined in Table 1.

**Table 1 - Facility Types based on Participation Characteristics**

| <b>Facility Type</b>                  | <b>Market Participant Type</b>     | <b>Five Minute Load Following</b> | <b>Hourly Load Following</b> | <b>Unit Commitment</b> |
|---------------------------------------|------------------------------------|-----------------------------------|------------------------------|------------------------|
| Dispatchable demand response facility | Demand response market participant | ✓                                 |                              |                        |
| Hourly load facility                  | Wholesale consumer                 |                                   | ✓                            | Optional               |
| Hourly demand response facility       | Demand response market participant |                                   | ✓                            | Optional               |

For all facility types, the following information for the facility will be found in the participant’s RFP response and will be contractually binding information for the facility for the length of the DR Pilot Program:

1. Load Following Type: Hourly or Five Minute
2. Participation in Unit Commitment: Yes or No
3. Contracted Curtailment Amount: MW
4. Hours of Availability: Specific hours on each day of the week
5. Months of Availability: Specific months of participation
6. Curtailment Calendar: Minimum number of hours of curtailment for each Month of Availability
7. Ramp Time: Selected from 10 minutes, 15 minutes, 20 minutes, 30 minutes, or 60 minutes.
8. Availability Rate: \$/MWh

In addition to the contractual information, participants must provide the following information during facility registration, which may be modified from time to time to reflect changes to the facility throughout the DR Pilot Program, for all facility types:

- Maximum Facility Load;
- Measurement & Verification (M&V) plan; and,
- If participating in Unit Commitment:
  - Minimum curtailment time
  - Maximum curtailment time
  - Maximum number of reduction blocks per day.

Table 2 below summarizes the technical requirements of the three types of facilities.

**Table 2 - Technical Requirements for DR Pilot facilities**

| <b>Facility Type</b>                  | <b>Operational Metering or Real-time Network<sup>1</sup></b> | <b>Dispatch Workstation</b> | <b>Wholesale Revenue Meter</b> | <b>Measurement Data Submission</b> | <b>M&amp;V Plan</b> |
|---------------------------------------|--|-----------------------------|--------------------------------|------------------------------------|---------------------|
| Dispatchable demand response facility | ✓  | ✓                           |                                | ✓                                  | ✓                   |
| Hourly load facility                  | ✓ <sup>2</sup>   |                             | ✓                              |                                    | ✓                   |
| Hourly demand response facility       | ✓ <sup>3</sup>   |                             |                                | ✓                                  | ✓                   |

Facilities registered for the purpose of the participating in the pilot program may be required to undergo a System Impact Assessment (SIA) during registration and will not be eligible to apply for participation in the operating reserve (OR) market.

Each facility, regardless of whether it is a set of aggregated loads or is directly connected to the IESO-controlled grid, will be modeled as a single load resource in the IESO system with a maximum consumption equal to the registered Maximum Facility Load. The participant will connect the facility through operational metering or the real time network connection to this resource, as applicable, and will submit bids and receive dispatch instructions using the resource identifier associated with that facility. This resource identifier will be assigned through the facility registration process.

Once facility registration is complete, the IESO will issue a notification to the participant which authorizes the facility to start providing the load following service as of a specified start date, which will be no sooner than the start date specified in the contract. Each DR facility must be ready to begin pilot program participation and be capable of providing the contracted curtailment amount on the start date.

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<sup>1</sup> If a facility already has Operational Metering in place, then it will be used; otherwise, the participant shall provide and maintain, at its cost, a dedicated, internet based real-time communication network between the IESO and the facility. Any such internet based real-time communication network shall meet the applicable specifications and other requirements set forth in the participant technical reference manual Section 3.3:  
[http://www.ieso.ca/Documents/ptrm/ptrm\\_ptrmManual.pdf](http://www.ieso.ca/Documents/ptrm/ptrm_ptrmManual.pdf)

<sup>2</sup> Hourly Load facilities will only require an Operational Meter or Real-time Network if the Maximum Facility Load is greater than or equal to 5MW.

<sup>3</sup> Hourly Demand Response Facilities will only require an Operational Meter or Real-time Network if the Maximum Facility Load is greater than or equal to 5MW.

## Contributors under DR Aggregators

Hourly demand response facilities and dispatchable demand response facilities that are registered to a demand response aggregator will be made up of a set of demand response contributors. The demand response contributors must:

- be, for a given facility, all electrically located within the same IESO transmission zone<sup>4</sup>;
- have all provided the demand response aggregator with enforceable rights for their share of the contracted curtailment amount;
- have authorized the demand response aggregator to submit, on their behalf, bids which represent their capability to vary their consumption;
- be any individual size, but can provide an aggregated curtailment greater than or equal to the contracted curtailment amount; and,
- have an aggregated Maximum Facility Load that is less than or equal to 10 times the contracted curtailment amount.

Demand response aggregators may require contributor changes throughout the pilot contract term. All contributor change requests must be submitted to the IESO for review and receive IESO approval prior to the contributor change taking effect. The change request will include any item under the registration requirements that will be changed. Pilot participants may not change any contractually binding information during the pilot term.

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<sup>4</sup> See the Ontario Transmission System document for information on the transmission zones:  
[http://www.ieso.ca/Documents/marketReports/OntTxSystem\\_2014nov.pdf](http://www.ieso.ca/Documents/marketReports/OntTxSystem_2014nov.pdf)

## **Program Obligations**

Under the pilot program, the participants will be required to bid their consumption into the day-ahead commitment process and the real-time energy market, follow their real-time schedules, and meet certain performance standards. This section outlines the obligations for resources participating in the pilot program.

### **Availability**

Participants will contribute to Ontario’s capacity by being available for dispatch during their hours of availability in their months of availability. Availability is demonstrated by submitting bids for the contracted curtailment amount priced below \$2000 into the IESO pre-dispatch and real-time market, as described under Bidding.

Compensation for participation in the pilot will be through an hourly availability payment, paid on a monthly basis. Each resource will be paid based on the contracted curtailment amount, availability rate and hours of availability submitted in their RFP response. The payment will be calculated for a facility as the contracted curtailment amount (MW) times the number of hours of availability in the settlement month times the availability rate (\$/MWh). Participants will receive a prorated availability payment for hours that the facility was not fully available, as indicated by their bids in the energy market.

### **Bidding**

In order for a resource to participate in the energy market in real-time, the participant must have provided bids into the Day-Ahead Commitment Process (DACP) for that resource and must maintain those bids through to real-time according to the requirements described below.

The resources will submit bids which demonstrate their willingness to consume energy depending on the price in the energy market and their technical capability to vary consumption. The total bid quantity in each hour must equal their maximum potential consumption located behind their settlement quality meter.<sup>5</sup> For each hour, the resource’s bids will be structured based on one of the applicable scenario listed below:

1. If, for a given hour, the resource is capable of providing its full Contracted Curtailment Amount and this amount constitutes its maximum potential consumption for the hour:

| <b>Price-Quantity (P-Q) Pair</b> | <b>Price (\$/MWh)</b>                                    | <b>Quantity (MW)</b>          |
|----------------------------------|--|-------------------------------|
| 1                                | Based on price sensitivity of consumption for Contracted | Contracted Curtailment Amount |

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<sup>5</sup> Dependent on resource type, either the wholesale revenue meter or the meter used for measurement data submissions.

|   |                       |                               |
|---|-----------------------|-------------------------------|
|   | Curtailment Amount    |                               |
| 2 | Same as in P-Q Pair 1 | Contracted Curtailment Amount |

2. If, for a given hour, the resource is capable of providing its full Contracted Curtailment Amount but has a portion of its consumption which is non-dispatchable:

| Price-Quantity (P-Q) Pair | Price (\$/MWh)  | Quantity (MW)  |
|---------------------------|---|--|
| 1                         | \$2000  | 0  |
| 2                         | \$2000  | Non-dispatchable consumption                                 |
| 3                         | Based on price sensitivity of consumption for Contracted Curtailment Amount | Non-dispatchable consumption + Contracted Curtailment Amount |

3. If, for a given hour, the resource is consuming energy but is unavailable to provide any portion of its Contracted Curtailment Amount and is non-dispatchable:

| Price-Quantity (P-Q) Pair | Price (\$/MWh) | Quantity (MW)                |
|---------------------------|----------------|------------------------------|
| 1                         | \$2000         | 0                            |
| 2                         | \$2000         | Non-dispatchable consumption |

4. If, for a given hour, the resource is still consuming energy but is capable of curtailing some, but not all, of their Contracted Curtailment Amount (called a "derate"):

| Price-Quantity (P-Q) Pair | Price (\$/MWh)  | Quantity (MW)  |
|---------------------------|---|--|
| 1                         | \$2000  | 0  |
| 2                         | \$2000  | Non-dispatchable consumption                             |
| 3                         | Based on price sensitivity of consumption for available dispatchable MW | Non-dispatchable consumption + available dispatchable MW |

5. If, for a given hour, the resource is not consuming energy and will be offline, the participant will be required to remove the resource's bids entirely for that hour.

6. If, for a given hour, the resource is has qualified for and has elected to operate under a unit commitment in an hour:

| Price-Quantity (P-Q) Pair | Price (\$/MWh) | Quantity (MW)  |
|---------------------------|----------------|--|
| 1                         | \$2000         | 0  |
| 2                         | \$2000         | Non-dispatchable consumption                                 |
| 3                         | -\$2000        | Non-dispatchable consumption + Contracted Curtailment Amount |

Using this model, the contracted curtailment amount will always be set to the lowest price in the bid when it is available for dispatch. Participants will determine the price points in which to bid into the Ontario energy market to reflect their price sensitivity for providing curtailment.

The bids will also include ramp rates which indicate the rate, expressed in MW per minute, at which the facility can increase or decrease its consumption. This ramp rate allows the IESO to schedule changes in the resource's consumption at a speed that will match its capabilities. All submitted ramp rates are expected to be consistent with the contracted ramp time.

## **Curtailment**

Curtailment will be scheduled when, based upon the price sensitivity reflected in the bids submitted for the facility, as well as bids and offers submitted by other market participants and the state of the transmission system, the facility is the most cost-effective resource available to maintain the balance between supply and demand. In order to ensure that pilot participants have the opportunity to demonstrate their capability to provide the services desired by the pilot program, facilities will be obligated to provide at least 100 hours of curtailment per contract year based on the monthly curtailment calendar submitted in their RFP response.

Facilities will be assessed for fulfilment of the curtailment requirement on a monthly basis. The facilities can meet their curtailment requirement through scheduled curtailment in consecutive intervals/hours or spread across the month. If a facility does not meet the required number of curtailment hours for the month, the IESO will reduce the facility's availability payment for that month based on the proportion of curtailment hours missed out of hours required for curtailment in the month.

## **Capability Testing**

Pilot program facilities will be required to undergo capability testing during the initial months of the pilot program to ensure that each facility can reduce consumption by at least the contracted curtailment amount, respond to IESO real-time schedules and meet their registered ramp times.

The test will be performed after the fact using an economically scheduled curtailment chosen by the IESO for which the curtailment was equal to the contracted curtailment amount. During the selected curtailment event, the IESO will validate that the facility followed their dispatch instruction, within a deadband above or below its real-time schedule, and had ramping capabilities equivalent to its contracted Ramp Time. The deadband will be defined as the greater of (i) 5% of the real-time schedule for the resource and (ii) 20% of the contracted curtailment amount.

All facilities will be tested in the first month of participation. Each facility will receive a score out of 100% for the test. A score of greater than or equal to 75% will result in a "pass" for the test and thus allow the facility to participate in the pilot program without further testing. A facility with a score less than 75% will be re-tested using an economically scheduled curtailment in the

next month of availability. Facilities will be given three opportunities, all within consecutive months of availability, to pass the capability test. Upon a third capability test failure, the IESO may terminate the contract for non-performance. All facilities which receive a score of less than 100% will lose a portion of the availability payment which is a function of their test score for the month for which the curtailment was tested. The IESO will provide the participant with all test details and results following a test.

### **Measurement Data Submissions**

The pilot participants that are demand response market participants will be required to make measurement data submissions, with a 5-minute interval granularity, to the IESO on a monthly basis. The data submission deadline will be 6 business days before the end of the month following month of participation (i.e. for May, the measurement data is due on the 6<sup>th</sup> business day before the end of June). The IESO will process the submissions and respond to any participants with submission errors within 3 business days. The participants will then have 2 business days to correct the data submission and resubmit to the IESO.

If no measurement data submission has been received by the data submission deadline, then the participant will lose the resource's availability payment for the month of the missing measurement data. The measurement data must then be submitted with the following month's measurement data submission, 6 business days before the end of the next month. If no measurement data submission is received in the second submission month then the IESO may terminate the contract.

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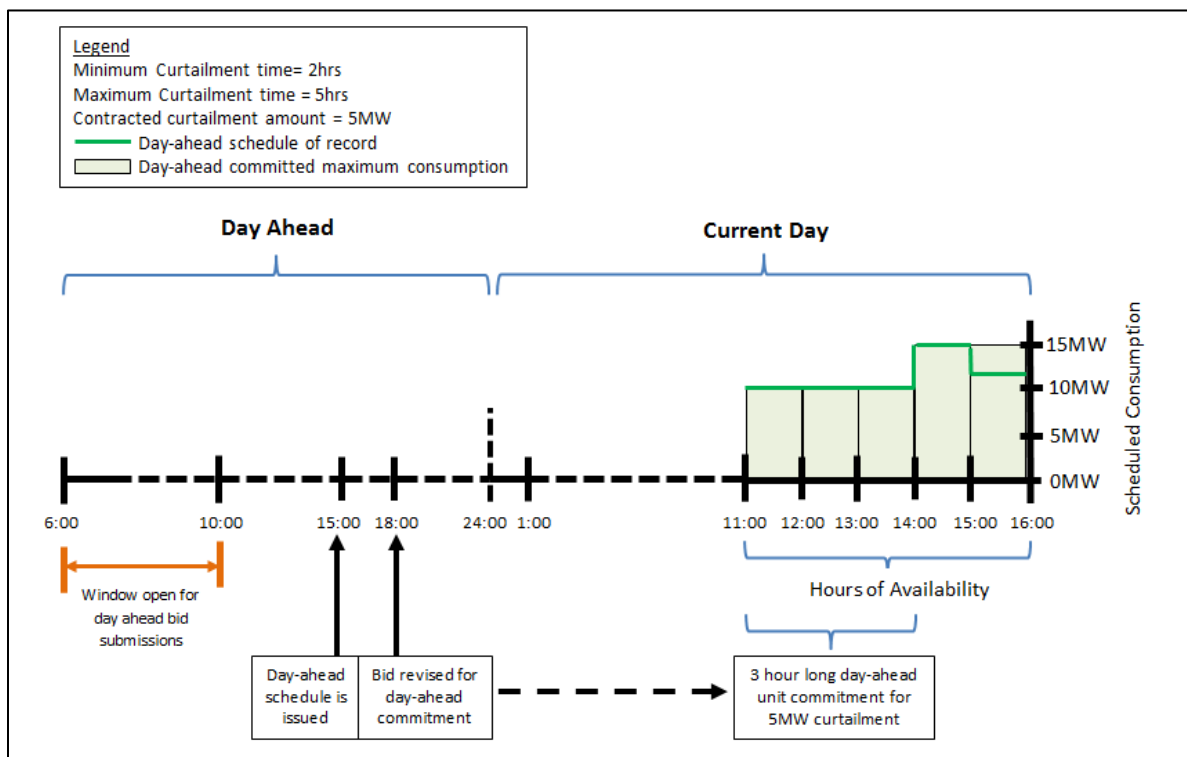
## Operation in the Ontario Energy Market

This section outlines the operation of pilot program facilities from day-ahead to pre-dispatch and into real-time in the Ontario energy market.

### Day-Ahead Commitment Process

Pilot participants will be required to submit bids in the Day-Ahead Commitment Process if they wish the facility to participate in real-time. Day-ahead bids must be submitted by 10:00 EST, and the day-ahead schedule of record will be communicated to participants no later than 15:00 EST. All facilities who have submitted day-ahead bids will be scheduled in the day-ahead schedule of record; however, only resources that have opted to utilize unit commitment will receive a bid guarantee for committing to curtail according to their day-ahead schedule of record.

When a facility is scheduled in the day-ahead schedule of record to reduce its consumption by at least 1MW and for at least the number of consecutive hours of the facility's minimum curtailment time, then the participant may elect to revise the facility's bids to achieve that schedule, as described above in Bidding. The commitment period may include some or all of the consecutive scheduled curtailment hours but must be at least equal to the minimum curtailment time and no more than the maximum curtailment time of the facility. The bids for each hour of a commitment period must be revised by 18:00 EST to indicate a day-ahead unit commitment. Figure 1 shows an example of a resource scheduling a single day-ahead commitment period.



**Figure 1 - Example of a Day-ahead Unit Commitment**

In the example in Figure 1, the facility has been scheduled in the day-ahead schedule of record to curtail by at least 1 MW in HE 12, 13, 14 and 16. For the purposes of this example, all of these hours fall within the facility's hours of availability. Since the registered minimum curtailment time is 2 hours, only the consecutive hours of HE12, HE13 and HE14 are eligible for a day-ahead unit commitment. The maximum curtailment time is 5 hours so the participant may elect to commit to reduce for either the minimum curtailment time of 2 hours, or for the scheduled curtailment time of 3 hours. In this example, the participant revised the facility's bids for a unit commitment with a 3 hour commitment period. The remaining two hours will not have any day-ahead unit commitment. The participant may attempt to commit these remaining hours with a four hour-ahead commitment, described below, or operate without a commitment in these hours and will be responsible for ensuring the real-time bids for those hours reflect the facility's capability to reduce consumption.

Multiple commitment periods, up to the registered maximum reduction blocks per day, can be committed by the participant for a facility on a given dispatch day when separate consecutive hour blocks have been scheduled for curtailment in the day-ahead schedule of record, provided that each commitment period meets the criteria for a unit commitment as specified above.

To recognize that system conditions may change between the time the participant arranges a unit commitment for future hours and when the facility reduces its consumption to meet that commitment, facilities that have arranged eligible unit commitments will be eligible for a demand response bid guarantee to account for these differences. Specifically, the demand response bid guarantee will compensate the facility for honouring their unit commitment schedule even though it may no longer be cost-effective in real-time for them to do so. Any hours committed based on the day-ahead schedule of record will be compensated based on the bid price submitted in to the day-ahead commitment process.

If the resource is unable to meet their day-ahead commitment in real-time then the participant must revise their bids at least 2 hours prior to each affected hour to +\$2000 for any hours within the commitment period which are no longer available for curtailment.

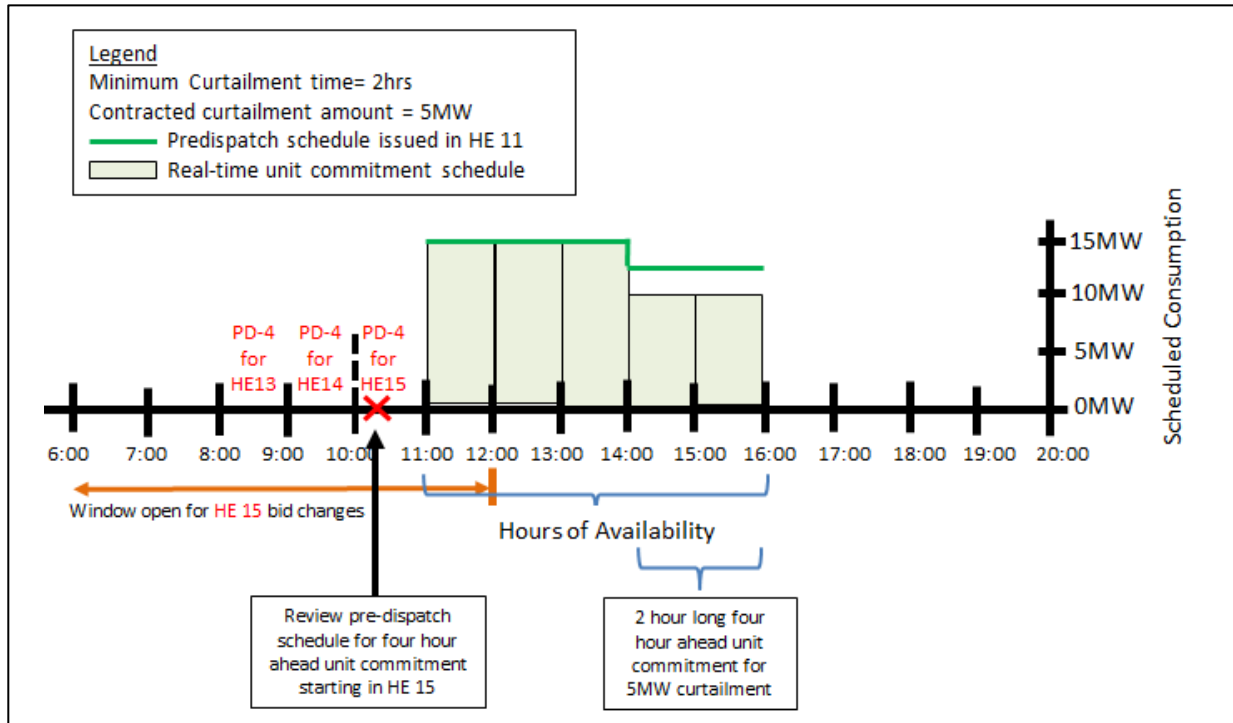
## **Four Hour Ahead Commitments**

Pre-dispatch bids may be submitted as early as 15:00 EST day-ahead, and may be modified without restriction up to 2 hours prior to each real-time hour. All facilities for which bids have been submitted will be scheduled in the pre-dispatch scheduling process; however, only resources that have opted to utilize unit commitment will be eligible to receive a bid guarantee for committing to curtail according to their four hour ahead pre-dispatch schedule.

When a facility is scheduled in the four hour ahead pre-dispatch schedule to reduce its consumption by at least 1MW and for at least the number of consecutive hours of the facility's minimum curtailment time, then the participant may elect to revise the facility's bids to achieve that schedule, as described above in Bidding. The commitment period may include some or all of the consecutive scheduled curtailment hours but must be at least equal to the minimum

curtailment time and no more than the maximum curtailment time of the facility. Participants may use existing day-ahead commitment period hours in the four hour ahead commitment period to meet the minimum curtailment time requirement. The bids must be revised for each hour of the four hour ahead commitment period no more than 2 hours prior to the first hour in order to indicate a four hour ahead unit commitment.

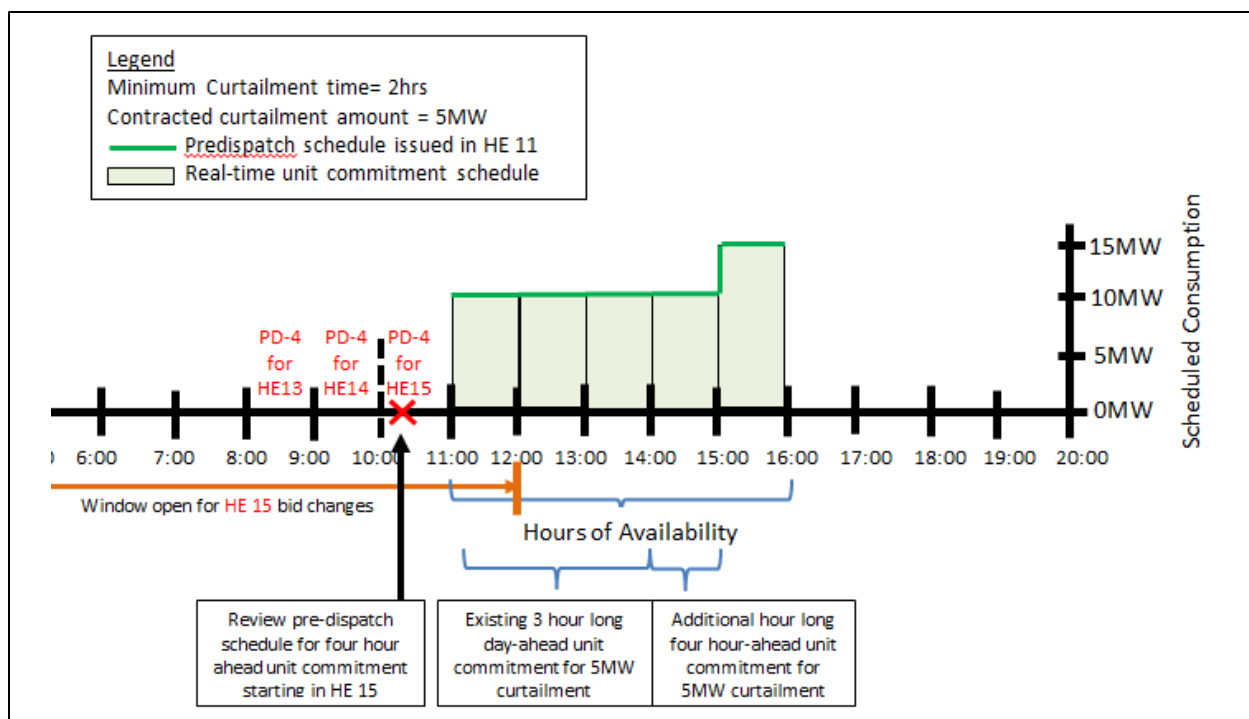
Figure 2 shows an example of a resource scheduling a four hour ahead unit commitment without an existing day-ahead commitment.



**Figure 2 – Example of a four hour ahead unit commitment**

In the example in Figure 2, the facility is scheduled in the four hour ahead pre-dispatch schedule for HE 15 to curtail by 2MW in HE 15 and 16 during the hours of availability. Since this facility has a two hour minimum curtailment time, the resource needs to be scheduled to curtail by at least 1MW in two hours to schedule a four hour ahead unit commitment. The participant must revise the facility’s bids for HE 15 and 16 prior to the close of the submission window at 12:00 EST. In this example, the participant revised to resource’s bids for a unit commitment with a 2 hour commitment period. The remaining three hours will not have any commitments and the participant will be responsible for ensuring the real-time bids for those hours reflect the resource’s capabilities.

Figure 3 shows an example of a resource scheduling a four hour ahead unit commitment with an existing day-ahead commitment.



**Figure 3 – Example of a four hour ahead unit commitment with an existing day-ahead commitment period**

In the example in Figure 3, the resource is scheduled in HE 12, 13 and 14 for a day-ahead unit commitment. The four hour ahead pre-dispatch schedule published in HE11 for HE 15 has the resource scheduled to curtail by 5MW in HE 15. Since this resource has a two hour minimum curtailment time, the resource needs to be scheduled to curtail by at least 1MW in two hours to schedule a four hour ahead unit commitment. The commitment period, which now includes the day-ahead unit commitment for three hours plus one additional hour scheduled in the four hour ahead pre-dispatch schedule, meets the eligibility requirements. The participant must revise the facility's bids for HE 15 prior to the close of the submission window at 12:00 EST. In this case, the participant revised the resource's bids for a unit commitment with a 4 hour commitment period. The remaining one hour will not have any commitments and the participant will be responsible for ensuring that the real-time bids for those hours reflect the facility's capabilities.

Multiple commitment periods, up to the registered maximum reduction blocks per day, can be created for the dispatch day based on separate consecutive hour blocks scheduled for curtailment in the day-ahead schedule of record and four hour ahead pre-dispatch schedule, provided that each commitment period meets the criteria for a unit commitment as specified above.

To recognize that system conditions may change between the time the participant arranges a unit commitment for future hours and when the facility reduces its consumption to meet that commitment, facilities that have arranged eligible unit commitments will be eligible for a demand response bid guarantee to account for these differences. Specifically, the demand response bid guarantee will compensate the facility for honouring their unit commitment

schedule even though it may no longer be cost-effective in real-time for them to do so. Any hours committed based on the four hour ahead pre-dispatch schedule will be compensated based on the bid price that was used to determine the schedule in the four hour ahead pre-dispatch.

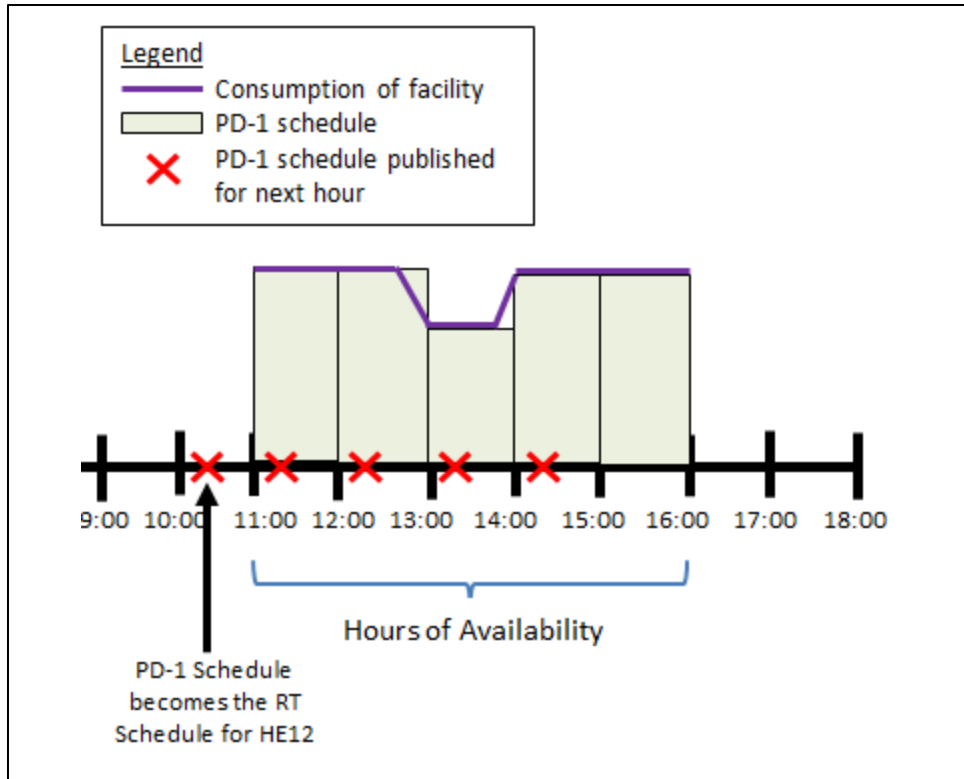
The demand response bid guarantee will be calculated for each commitment period, which may consist of day-ahead committed hours as seen in Figure 1, PD-4 committed hours as seen in Figure 2 or a combination of both as seen in Figure 3.

If the facility is unable to meet their four hour ahead unit commitment in real-time then the participant must revise their bid price at least 2 hours prior to each affected hour to +\$2000 for any hours within the commitment period that are no longer available for curtailment.

### **Hourly Load Following**

For hourly load following facilities, the hour-ahead pre-dispatch schedule will be the facility's real-time schedule and the facility must consume according to that schedule in real-time. All facilities will be required to follow their real-time schedule in real-time, except when ramping down or up. Facilities will be expected to begin to reduce their consumption in order to meet their real-time schedule at the start of the hour and reduce their consumption according to the facility's registered ramp time.

Figure 4 shows an example of a facility providing hourly load following.



**Figure 4 - Example of Operation for Hourly Load Following**

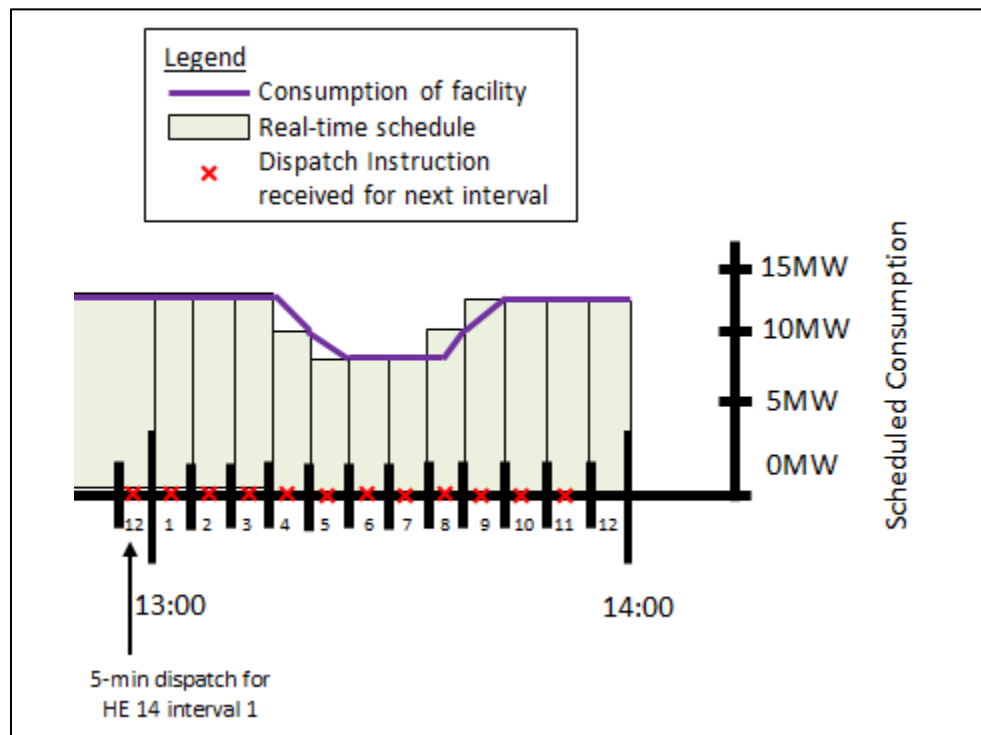
In the example in Figure 4, the facility is scheduled to curtail in HE 14 then return to full consumption in HE 15. For each hour, the real-time schedule was provided in the previous hour by the hour-ahead schedule. The facility must ramp down to meet the curtailment at the start of HE 14, then ramp up to be at normal consumption by the start of HE 15.

The bid submission window will close two hours prior to the start of each real-time hour. The participant will be responsible for ensuring the real-time bids reflect the facility's capabilities. If an hourly load following facility cannot reduce by the contracted curtailment amount in 30 minutes or less to follow hour-to-hour scheduling timelines, then the facility must elect in the RFP submission to utilize unit commitments and will revise their bids to indicate the facility is non-dispatchable prior to the close of the submission window for any hour of availability that is within a commitment period.

## 5-minute Load Following

The 5-minute load following resources will receive dispatch instructions through their dispatch work station for each interval (5-minutes) and must respond accordingly. All resources will be required to follow their dispatch instructions in real-time. Dispatch instructions provide a MW target that must be achieved by the end of the 5-minute interval for which the instruction was sent. These resources will provide ramp rates with their bids and the IESO will honour those rates during dispatch in real-time; however, the resource is expected to bid a ramp rate equivalent to their registered ramp time for the contracted curtailment amount.

Figure 5 shows an example of a resource providing 5-minute load following.



**Figure 5 - Example of Operation for 5-minute Load Following**

In the example in Figure 5, the resource is scheduled every 5-minutes for the next 5-minute interval. The resource is economic to reduce consumption in HE 14 interval 4 but has a ramp rate of 0.5MW/min, or 10 minutes to ramp the 5MW contracted curtailment, the resource is schedule to reduce consumption by 2.5MW for HE 14 interval 4. This dispatch instruction must be met by the end of HE 14 interval 4. The resource is still economic to reduce consumption in HE 14 interval 5 so is scheduled to continue ramping down by an additional 2.5MW by the end of this interval. The resource remains economic to curtail in HE 14 interval 6 and 7 so maintains reduced consumption. In HE 14 interval 8 the resource is no longer economic to reduce consumption so is scheduled to ramp up by 2.5MW, again due to the ramping requirements. In HE 14 interval 9 the resource completes the ramp back up to full consumption. The resource remains scheduled to full consumption for the remaining intervals 10 to 12. For each interval, the dispatch instruction was provided in the previous interval.

### **Following Dispatch Instructions**

All resources must consume to follow their real-time schedule, unless the resource is an hourly load following resource and in the process of ramping to meet their next hour's schedule. A resource is considered to be following their real-time schedule if they are consuming within the acceptable deadband of the real-time schedule. The deadband in any interval will be the greater of (i) 5% of the real-time schedule for the resource and (ii) 20% of the contracted curtailment amount. For example, a resource that has 20MW maximum consumption and a 4MW pilot

contracted curtailment amount would have a deadband of  $\pm 1\text{MW}$  when dispatched to full consumption, and a deadband of  $\pm 0.8\text{MW}$  when dispatched to 16MW for curtailment.

For hourly load following resources, the real-time schedule for all intervals of each hour will be constant at the PD-1 schedule. The hourly load following resources will be considered in the 'process of ramping' for the length of time of the resource's registered ramp time prior to the first interval of the real-time dispatch hour when the schedule is different from the current hour and the next hour.

**– End of Section –**



## **Settlement**

Settlement will be performed on a monthly basis and the settlement amounts will be applied to last trade date of the month of participation in the pilot program, as indicated in the Physical Market Settlement Schedule and Payment Calendar.<sup>6</sup> Availability payments, clawbacks, charges and bid guarantees will be settled on the applicable month-end of the participation month; however, adjustments may be made in subsequent months. The following section will outline all compensation and charges under the DR Pilot Program.

## **Available Capacity Compensation**

The contracted curtailment amount will be purchased using an hourly availability payment. This payment will be subject to clawbacks under the scenarios outlined in this section.

### **Availability Payment**

The resource will be paid a monthly availability payment during months where they have indicated in their RFP submission that they are available for curtailment. The payment will be based on the contracted number of hours of availability during the month. The payment will be calculated as the contracted curtailment amount (MW) times the number of hours of availability in the month times the availability rate (\$/MWh). Each facility will be paid based on the contracted curtailment amount, availability rate and hours of availability submitted in their RFP response. The payment for the month will be calculated as:

$$\text{Availability Payment} = \sum_{h=1}^n \text{Contracted MW} \times \text{Availability Rate}$$

Where:

- "h" represents an hour within the hours of availability;
- "n" is equal to the number of hours of availability in the month;
- "Contracted MW" is the contracted curtailment amount; and
- "Availability Rate" is the hourly rate submitted in the RFP proposal.

### **Availability Clawback**

The availability payment may be clawed back in full or in part through the availability clawback. An availability clawback will be applied in hours where the facility was deemed unavailable for load following, as indicated in table 3.

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<sup>6</sup> <http://www.ieso.ca/Pages/Participate/Calendars/Market-Calendars.aspx>

**Table 3 - Hourly Unavailability Factors**

| <b>Condition for Unavailability</b>  | <b>Unavailability Factor</b>  |
|--|---|
| No bids have been submitted for the facility in real-time  | 1.0   |
| The contracted curtailment amount for a facility is bid as non-dispatchable (bid price of \$2000) in the four hour ahead pre-dispatch and the facility elected to participate in Unit Commitment in the RFP                            | 1.0   |
| The bid quantity of the last dispatchable lamination (bid price less than \$2000) in four hour ahead pre-dispatch is less than the contracted curtailment amount and the facility elected to participate in Unit Commitment in the RFP | $\frac{\text{Contracted Curtailment Amount} - \text{Bid Quantity}}{\text{Contracted Curtailment Amount}}$ |
| The contracted curtailment amount for a facility is bid in as non-dispatchable (bid price of \$2000) in real-time and the facility elected not to participate in Unit Commitment in the RFP  | 1.0   |
| The bid quantity of the last dispatchable lamination (bid price less than \$2000) in four hour ahead pre-dispatch is less than the contracted curtailment amount and the facility elected to participate in Unit Commitment in the RFP | $\frac{\text{Contracted Curtailment Amount} - \text{Bid Quantity}}{\text{Contracted Curtailment Amount}}$ |

The clawback for the month will be calculated as:

$$\text{Availability Clawback} = \sum_{h=1}^n -1 \times UF_h \times \text{Contracted MW} \times \text{Availability Rate}$$

Where:

- "h" represents an hour within the hours of availability;
- "n" is equal to the number of hours of availability in the month that the Resource was not available to provide curtailment;
- "UF" is the Unavailability Factor for each hour of the hours of availability in the month that the facility was not available to provide curtailment, as indicated in Table 3; otherwise  $UF_h$  is equal to 0. If multiple 'Conditions for Unavailability' listed in the table above are applicable in any hour of availability, the single largest Unavailability Factor will be used;
- "Contracted MW" is the contracted curtailment amount; and
- "Availability Rate" is the hourly rate submitted in the RFP proposal.

**Availability Charge**

An availability charge will be calculated, if required, after the availability clawback and will be applied to the month when the facility fails to meet the curtailment schedule for the month. All availability charges will be capped such that they never exceed the availability payment, minus any clawbacks, paid to the participant for that facility for the applicable month.

If an availability charge is applied, then the availability charge amount for the month will be calculated as:

$$\begin{aligned}
 \textit{Availability Charge} &= -1 \times \textit{Min}(CF \times \textit{Availability Payment}, \textit{Availability Payment} \\
 &+ \textit{Availability Clawback})
 \end{aligned}$$

Where:

- “CF” is the Curtailment Factor for a Month of Availability calculated as:

$$CF = \frac{\text{number of curtailment hours not achieved}}{\text{expected number of curtailment hours}}$$

- “Availability Payment” is the availability payment, defined above, applied for the applicable month; and
- “Availability Clawback” is the availability clawback, defined above, applied for the applicable month.

**Monthly Availability Adjustment**

An availability adjustment amount will be calculated and applied, if required, to a previous month when the facility fails to meet a DR Pilot obligation as identified in Table 4. All monthly availability adjustments will be capped such that they never exceed the availability payment, minus clawbacks and availability charges, paid to the participant for the facility for the applicable month.

**Table 4 - Monthly Availability Factors**

| <b>Condition for Monthly Availability Adjustment</b>                             | <b>Settlement Month of Availability Payment for Adjustment</b> | <b>Adjustment Factor</b> |
|--|--|--------------------------|
| Facility received a score less than 100% on a capability test                    | Month of curtailment event for the load following ability test | 1 - Resource Score       |
| No measurement data submission has been received by the data submission deadline | Month with no measurement data submission                      | 1.0                      |

If a monthly availability adjustment is applied, then the monthly availability adjustment amount for the applicable month will be calculated as:

*Monthly Availability Adjustment Amount*

$$= -1 \times \text{Min}(AF \times \text{Availability Payment}, \text{Availability Payment} + \text{Availability Clawback} + \text{Availability Charge})$$

Where:

- "AF" is the adjustment factor for a month of availability as indicated in Table 4; otherwise AF is equal to 0. If multiple 'Conditions for Monthly Availability Adjustment' listed in Table 4 are applicable in any month, the single largest adjustment factor shall be selected for the purpose of calculating a monthly availability adjustment for such month;
- "Availability Payment" is the availability payment, defined above, applied for the applicable month;
- "Availability Clawback" is the availability clawback, defined above, applied for the applicable month; and
- "Availability Charge" is the availability charge, defined above, applied for the applicable month.

## **Unit Commitment Compensation**

Facilities participating in unit commitment will be eligible for a bid guarantee, as outlined in this section.

### **Demand Response Bid Guarantee**

Demand Response Bid Guarantees (DRBG) will compensate facilities for meeting their unit commitment schedule when, over the period of the commitment, real-time conditions mean that it was no longer cost-effective for them to do so. This will happen when a facility is economically scheduled to curtail, either day-ahead or in the four hour ahead pre-dispatch schedule, at a certain bid price but the real-time market clearing price is lower than that bid price, meaning that the participant should have continued to consume absent a unit commitment.

A commitment period will be a set of consecutive hours for which the resource was eligible for a unit commitment in either day ahead or four hours ahead and revised their bids to achieve the commitment. The commitment period may consist of day-ahead committed hours, four hour ahead pre-dispatch committed hours, or a combination of both, and the demand response bid guarantee will use the bid price, for each hour, reflective of when the committed was made for that hour. If a facility was scheduled for unit commitment in the day-ahead schedule of record, the bid guarantee will use the bid price that was considered in the day-ahead commitment process for comparison with the real-time market clearing price. If a facility was scheduled for unit commitment in the four hour ahead pre-dispatch schedule, the bid guarantee will use the bid price that was considered in the four hour ahead pre-dispatch for comparison with the real-time market clearing price.

The DRBG will ensure that, if over the commitment period, the real-time price is less than the bid cost for the contracted curtailment amount then the facility will be compensated for the difference. The DRBG will be calculated as follows for all 5-minute intervals, within the hours of availability, of the commitment period and will only be applied if it is positive, meaning that a payment is owed to the participant.

$$DRBG = \text{Max} \left( 0, \sum_{i=1}^n \text{Contracted MW} \times (\text{bid price}_i - \text{Market Price}_i) \right)$$

Where:

- "i" represents an interval within the unit commitment;
- "n" is equal to the number of intervals in the unit commitment;
- "Contracted MW" is the contracted curtailment amount;
- "bid price" is equal to the bid price of the last lamination from the bids used either in the day-ahead commitment process or for scheduling in the four hour ahead pre-dispatch schedule, as applicable; and
- "Market Price" is as defined in the Chapter 11 of the market rules.<sup>7</sup>

### **Bid Guarantee Adjustments**

The IESO may review the eligibility for any bid guarantee paid out during the DR Pilot program. If a facility is deemed to have been inappropriately paid for an ineligible bid guarantee then the IESO may claw back the applicable guarantee. A facility will be deemed ineligible for a bid guarantee if at least one of the following conditions is not met:

1. The facility must be economically scheduled to reduce by at least 1 MW in all hours of their commitment period in either the day-ahead schedule of record or the four hour ahead pre-dispatch schedule, as applicable per hour.
2. The unit commitment is at least the number of consecutive hours of the facility's minimum curtailment time and at most the number of consecutive hours of the maximum curtailment time.
3. The facility was following their dispatch instruction within a deadband above or below its dispatch instruction, equal to the greater of (i) 5% of the real-time schedule for the facility and (ii) 20% of the Contracted curtailment amount, during all hours of the unit commitment, excluding any applicable ramp period at the end of the curtailment.

– End of Section –

– End of Document –

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<sup>7</sup> Market rule definitions can be found at: [http://www.ieso.ca/Documents/marketRules/mr\\_chapter11.pdf](http://www.ieso.ca/Documents/marketRules/mr_chapter11.pdf)