DRAFT
Modified Constraint Discussion Paper

The purposes of this paper are to:

a. Describe, through simplified and stylized examples, how three constraint equations affect the scheduling of energy and operating reserve within the real-time constrained (RTC) and the real-time unconstrained (RTU) sequences.
b. Describe how those constraint equations would affect the scheduling of energy and operating reserve within the RTU sequence with the 3x ramp rate and no modification.
c. Propose, for MPWG feedback that:
    - the existing modifications not be changed for the time being,
    - Issue #5 remain open; and
    - changing/removing the modifications be considered in the future as an incremental change to real-time pricing.

Constraint Equation Definition and Description

1. Appendix 7.5 section 6.3.4.1

$$Generation_g + \sum_{c \in \text{RESERVECLASSES}} Reserve_{r(g),c} \leq \text{GenerationMaximum}_g$$

Where

$Generation_g$	The total MW energy scheduled as at the end of the dispatch period corresponding to energy offer g∈ OFFERS.
$\sum_{c \in \text{RESERVECLASSES}} Reserve_{r(g),c}$	The sum of scheduled *operating reserve* of classes c corresponding to *operating reserve offer r.*
$\text{GenerationMaximum}_g$	The maximum MW *energy* level associated with *energy offer* g∈ **OFFERS**.

This constraint ensures that a generation facility is not scheduled for energy and operating reserve beyond the maximum MW offered quantity. This constraint becomes more critical as the output of a generation facility approaches its maximum offered capacity

2. Appendix 7.5 section 6.3.5B.1

$$Generation_g + \sum_{\substack{r \in \text{RESERVEOFFERS}, \\ c \in \{RS10, RNS10\}}} Reserve_{r(g),c} \leq \text{Generation}_g^{start} + \text{ReserveMaximum10}_g$$

Appendix 7.5 section 6.3.5B.2

$$Generation_g + \sum_{\substack{r \in \text{RESERVEOFFERS}, \\ c \in \text{RESERVECLASSES}}} Reserve_{r(g),c} \leq \text{Generation}_g^{start} + \text{ReserveMaximum30}_g$$

Where

$Generation_g$	The total MW energy scheduled as at the end of the dispatch period corresponding to energy offer g∈ OFFERS.
$\sum_{\substack{r \in \text{RESERVEOFFERS} \\ c \in [RS10, RNS10]}} Reserve_{r(g),c}$	The sum of scheduled 10-minute operating reserve classes c corresponding to operating reserve offer r.
$\sum_{\substack{r \in \text{RESERVEOFFERS} \\ c \in RESERVECLASSES}} Reserve_{r(g),c}$	The sum of scheduled operating reserve classes c corresponding to operating reserve offer r.
$\text{Generation}_g^{Start}$	The MW energy level associated with the energy offer at the start of a dispatch period. This will be the corresponding Generation_g variable from the previous dispatch period for the market schedule and the constrained pre-dispatch schedule, but will be based on operational metering data and/or the schedule from the previous dispatch period for the real-time schedule. If the schedule from the previous dispatch period is not available (non-critical intervals in the real time constrained dispatch schedule) it will be produced by interpolating the dispatches from the critical intervals before and after it.

$ReserveMaximum10_r$	The maximum total ten-minute operating reserve from operating reserve offer r that can be delivered within ten minutes given the ramping rate for operating reserve.
$ReserveMaximum30_r$	The maximum total operating reserve from operating reserve offer r that can be delivered within thirty minutes given the ramping rate for operating reserve.

These constraints ensure that a generation facility is not scheduled to provide energy and operating reserve beyond its offered ramping capability. These constraints may be impactive at all levels of generation output. These constraints are respected for a specific generation facility for a scheduled energy change by reducing the amount of operating reserve scheduled for that facility.

All three equations in the RTC sequences use actual energy ramp capability in “Generation” terms. All three equations in the RTU sequence incorporate the 3x ramp rate in “Generation” terms.

Example 1
Energy ramp rate is close to the OR ramp rate. Equations #2 and #3 are limiting.

Situation
Generator Starting Output = 200MW
Generation Maximum = 500MW
Ramp Rate Energy = 5MW/min
Ramp Rate OR = 4MW/min

Term Definitions
$\text{Generation}_g^{start}$ = 200MW

$\text{GenerationMaximum}_g$ = 500MW

Assume, for simplicity purposes, that the generator is economically scheduled in both the RTC and RTU to provide the maximum amount of energy that it can provide in 5 minutes.

$Generation_g$ = $\text{Generation}_g^{start}$ + energy schedule change [x ramp rate multiplier in RTU only]
= 200MW + (5MW/min x 5 min) [x ramp rate multiplier in RTU only]
= 200MW + (25 [x ramp rate multiplier in RTU only])

Ramp Rate Multiplier RTU = 3

$\text{ReserveMaximum10}_g$ = 4MW/min x 10min
= 40MW

$\text{ReserveMaximum30}_g$ = 4MW/min x 30min
= 120MW

Equations
1. $Generation_g + \sum_{c \in \text{RESERVECLASSES}} Reserve_{r(g),c} \leq \text{GenerationMaximum}_g$

RTC: [200MW + 25MW] + $\sum_{c \in \text{RESERVECLASSES}} Reserve_{r(g),c} \leq$ 500MW

225MW + $\sum_{c \in \text{RESERVECLASSES}} Reserve_{r(g),c} \leq$ 500MW

$$\sum_{c \in \text{RESERVECLASSES}} Reserve_{r(g),c} \leq 275\text{MW}$$

Maximum OR can be scheduled, so the equation is not limiting. The generator could be scheduled to provide the maximum amount of energy and OR in the RTC sequence and not exceed its maximum offered MW.

RTU: $[200\text{MW} + (25\text{MW} \times 3)] + \sum_{c \in \text{RESERVECLASSES}} Reserve_{r(g),c} \leq 500\text{MW}$

$$275\text{MW} + \sum_{c \in \text{RESERVECLASSES}} Reserve_{r(g),c} \leq 500\text{MW}$$

$$\sum_{c \in \text{RESERVECLASSES}} Reserve_{r(g),c} \leq 225\text{MW}$$

Maximum OR can be scheduled, so the equation is not limiting. The generator could be scheduled to provide the maximum amount of energy and OR in the RTU sequence and not exceed its maximum offered MW.

2. $Generation_g + \sum_{\substack{r \in \text{RESERVEOFFERS}, \\ c \in \{RS10, RNS10\}}} Reserve_{r(g),c} \leq \text{Generation}_g^{start} + \text{ReserveMaximum10}_g$

RTC: $[200\text{MW} + 25\text{MW}] + \sum_{\substack{r \in \text{RESERVEOFFERS}, \\ c \in \{RS10, RNS10\}}} Reserve_{r(g),c} \leq 200\text{MW} + 40\text{MW}$

$$225 + \sum_{\substack{r \in \text{RESERVEOFFERS}, \\ c \in \{RS10, RNS10\}}} Reserve_{r(g),c} \leq 240\text{MW}$$

$$\sum_{\substack{r \in \text{RESERVEOFFERS}, \\ c \in \{RS10, RNS10\}}} Reserve_{r(g),c} \leq 15\text{MW}$$

Maximum 10-minute OR that can be scheduled is 15MW and not exceed the generator ramping capability.

RTU: $[200\text{MW} + (25\text{MW} \times 3)] + \sum_{\substack{r \in \text{RESERVEOFFERS}, \\ c \in \{RS10, RNS10\}}} Reserve_{r(g),c} \leq 200\text{MW} + 40\text{MW}$

$$275 + \sum_{\substack{r \in \text{RESERVEOFFERS}, \\ c \in \{RS10, RNS10\}}} Reserve_{r(g),c} \leq 240\text{MW}$$

$$\sum_{\substack{r \in \text{RESERVEOFFERS}, \\ c \in \{RS10, RNS10\}}} Reserve_{r(g),c} \leq -35\text{MW}$$

In order to respect this constraint, scheduled energy would be reduced in the RTU so as to not violate this constraint in the RTU. No 10-minute operating reserve would be scheduled in the RTU.

In RTC, the generator can provide a combination of energy and 10-minute OR up to 40MW. In the RTU, the ramp rate multiplier overstates the amount of energy scheduled. This amount of overstated energy and the scheduled OR cannot exceed 40MW. In this example, the use of the ramp rate multiplier (in RTU) will not allow the generator to be scheduled for any 10-minute OR when the generator is physically capable of providing up to 15MW of 10-minute OR. Furthermore, the constraint restricts the energy to a lower level than the multiplier allows, which mitigates the intended effect of the multiplier. Modification of equation 2 is necessary to remove this distortion.

With a 12x ramp rate, this equation would likely always be limiting and always limit, inappropriately, the 10-minute operating reserve that could be scheduled in the RTU. This equation was modified when the 12x ramp rate multiplier was introduced so that this equation would never be limiting.

3. $Generation_g + \sum_{\substack{r \in \text{RESERVEOFFERS}, \\ c \in \text{RESERVECLASSES}}} Reserve_{r(g),c} \leq \text{Generation}_g^{start} + \text{ReserveMaximum30}_g$

RTC: $[200\text{MW} + 25\text{MW}] + \sum_{\substack{r \in \text{RESERVEOFFERS}, \\ c \in \text{RESERVECLASSES}}} Reserve_{r(g),c} \leq 200\text{MW} + 120\text{MW}$

$$225 + \sum_{\substack{r \in \text{RESERVEOFFERS}, \\ c \in \text{RESERVECLASSES}}} Reserve_{r(g),c} \leq 320\text{MW}$$

$$\sum_{\substack{r \in \text{RESERVEOFFERS}, \\ c \in \text{RESERVECLASSES}}} Reserve_{r(g),c} \leq 95\text{MW}$$

Maximum OR that can be scheduled is 95MW and not exceed the generator ramping capability.

RTU: $[200\text{MW} + (25\text{MW} \times 3)] + \sum_{\substack{r \in \text{RESERVEOFFERS}, \\ c \in \text{RESERVECLASSES}}} Reserve_{r(g),c} \leq 200\text{MW} + 120\text{MW}$

$$275 + \sum_{\substack{r \in \text{RESERVEOFFERS}, \\ c \in \text{RESERVECLASSES}}} Reserve_{r(g),c} \leq 320\text{MW}$$

$$\sum_{\substack{r \in \text{RESERVEOFFERS}, \\ c \in \text{RESERVECLASSES}}} Reserve_{r(g),c} \leq 45\text{MW}$$

In order to respect this constraint, the maximum OR that can be scheduled is 45MW.

In RTC, the generator can provide a combination of energy and OR up to 120MW. In the RTU, the ramp rate multiplier overstates the amount of energy scheduled. This amount of overstated energy and the scheduled OR cannot exceed 120MW. In this example, the use of the ramp rate multiplier (in RTU) will only allow the generator to be scheduled for 45MW of OR when the generator is physically capable of providing up to 95MW of OR. Modification of equation 3 is necessary to remove this distortion.

With a 12x ramp rate, this equation would likely always be limiting and always limit, inappropriately, the operating reserve that could be scheduled in the RTU. This equation was modified when the 12x ramp rate multiplier was introduced so that this equation would never be limiting.

Example 2
Energy ramp rate is much less than the OR ramp rate. Equations #2 and #3 are limiting.

Situation
Generator Starting Output = 200MW
Generation Maximum = 500MW
Ramp Rate Energy = 1MW/min
Ramp Rate OR = 5MW/min

Term Definitions
$\text{Generation}_g^{start}$ = 200MW

$\text{GenerationMaximum}_g$ = 500MW

Assume, for simplicity purposes, that the generator is economically scheduled in both the RTC and RTU to provide the maximum amount of energy that it can provide in 5 minutes.

$\textit{Generation}_g$ = $\text{Generation}_g^{start}$ + energy schedule change [x ramp rate multiplier in RTU only]
= 200MW + (1MW/min x 5 min) [x ramp rate multiplier in RTU only]
= 200MW + (5 [x ramp rate multiplier in RTU only])

Ramp Rate Multiplier RTU = 3

$\text{ReserveMaximum10}_g$ = 5MW/min x 10min
= 50MW

$\text{ReserveMaximum30}_g$ = 5MW/min x 30min
= 150MW

Equations
1. $\textit{Generation}_g + \sum_{c \in \text{RESERVECLASSES}} \textit{Reserve}_{r(g),c} \leq \text{GenerationMaximum}_g$

RTC: [200MW + 5MW] + $\sum_{c \in \text{RESERVECLASSES}} \textit{Reserve}_{r(g),c} \leq 500\text{MW}$

$205\text{MW} + \sum_{c \in \text{RESERVECLASSES}} \textit{Reserve}_{r(g),c} \leq 500\text{MW}$

$$\sum_{c \in \text{RESERVECLASSES}} Reserve_{r(g),c} \leq 295\text{MW}$$

Maximum OR can be scheduled, so the equation is not limiting. The generator could be scheduled to provide the maximum amount of energy and OR in the RTC sequence and not exceed its maximum offered MW.

RTU: $[200\text{MW} + (5\text{MW} \times 3)] + \sum_{c \in \text{RESERVECLASSES}} Reserve_{r(g),c} \leq 500\text{MW}$

$$215\text{MW} + \sum_{c \in \text{RESERVECLASSES}} Reserve_{r(g),c} \leq 500\text{MW}$$

$$\sum_{c \in \text{RESERVECLASSES}} Reserve_{r(g),c} \leq 285\text{MW}$$

Maximum OR can be scheduled, so the equation is not limiting. The generator could be scheduled to provide the maximum amount of energy and OR in the RTU sequence and not exceed its maximum offered MW.

2. $Generation_g + \sum_{\substack{r \in \text{RESERVEOFFERS}, \\ c \in \{RS10, RNS10\}}} Reserve_{r(g),c} \leq \text{Generation}_g^{start} + \text{ReserveMaximum10}_g$

RTC: $[200\text{MW} + 5\text{MW}] + \sum_{\substack{r \in \text{RESERVEOFFERS}, \\ c \in \{RS10, RNS10\}}} Reserve_{r(g),c} \leq 200\text{MW} + 50\text{MW}$

$$205 + \sum_{\substack{r \in \text{RESERVEOFFERS}, \\ c \in \{RS10, RNS10\}}} Reserve_{r(g),c} \leq 250\text{MW}$$

$$\sum_{\substack{r \in \text{RESERVEOFFERS}, \\ c \in \{RS10, RNS10\}}} Reserve_{r(g),c} \leq 45\text{MW}$$

Maximum 10-minute OR that can be scheduled is 45MW and not exceed the generator ramping capability.

RTU: $[200\text{MW} + (5\text{MW} \times 3)] + \sum_{\substack{r \in \text{RESERVEOFFERS}, \\ c \in \{RS10, RNS10\}}} Reserve_{r(g),c} \leq 200\text{MW} + 50\text{MW}$

$$215 + \sum_{\substack{r \in \text{RESERVEOFFERS}, \\ c \in \{RS10, RNS10\}}} Reserve_{r(g),c} \leq 250\text{MW}$$

$$\sum_{\substack{r \in \text{RESERVEOFFERS}, \\ c \in \{RS10, RNS10\}}} Reserve_{r(g),c} \leq 35\text{MW}$$

In order to respect this constraint, the maximum 10-miunte OR that can be scheduled is 35MW.

In RTC, the generator can provide a combination of energy and 10-minute OR up to 50MW. In the RTU, the ramp rate multiplier overstates the amount of energy scheduled. This amount of overstated energy and the scheduled OR cannot exceed 50MW. In this example, the use of the ramp rate multiplier (in RTU) will only allow the generator to be scheduled for 35MW of 10-minute OR when the generator is physically capable of providing up to 45MW of 10-minute OR. Modification of equation 2 is necessary to remove this distortion.

3. $Generation_g + \sum_{\substack{r \in \text{RESERVEOFFERS}, \\ c \in \text{RESERVECLASSES}}} Reserve_{r(g),c} \leq \text{Generation}_g^{start} + \text{ReserveMaximum30}_g$

RTC: $[200\text{MW} + (5\text{MW} \times 1)] + \sum_{\substack{r \in \text{RESERVEOFFERS}, \\ c \in \text{RESERVECLASSES}}} Reserve_{r(g),c} \leq 200\text{MW} + 150\text{MW}$

$$205 + \sum_{\substack{r \in \text{RESERVEOFFERS}, \\ c \in \text{RESERVECLASSES}}} Reserve_{r(g),c} \leq 350\text{MW}$$

$$\sum_{\substack{r \in \text{RESERVEOFFERS}, \\ c \in \text{RESERVECLASSES}}} Reserve_{r(g),c} \leq 145\text{MW}$$

Maximum OR that can be scheduled is 145MW and not exceed the generator ramping capability.

RTU: $[200\text{MW} + (5\text{MW} \times 3)] + \sum_{\substack{r \in \text{RESERVEOFFERS}, \\ c \in \text{RESERVECLASSES}}} Reserve_{r(g),c} \leq 200\text{MW} + 150\text{MW}$

$$215 + \sum_{\substack{r \in \text{RESERVEOFFERS}, \\ c \in \text{RESERVECLASSES}}} Reserve_{r(g),c} \leq 350\text{MW}$$

$$\sum_{r \in \text{RESERVEOFFERS}, c \in \text{RESERVECLASSES}} Reserve_{r(g),c} \leq 135\text{MW}$$

In order to respect this constraint, the maximum OR that can be scheduled is 135MW.

In RTC, the generator can provide a combination of energy and OR up to 150MW. In the RTU, the ramp rate multiplier overstates the amount of energy scheduled. This amount of overstated energy and the scheduled OR cannot exceed 150MW. In this example, the use of the ramp rate multiplier (in RTU) will only allow the generator to be scheduled for 135MW of OR when the generator is physically capable of providing up to 145MW of OR. Modification of equation 3 is necessary to remove this distortion.

Example 3

Generator is starting close to its maximum capacity. Equation #1 is limiting, so equations #2 and #3 are limiting as well.

Generator Starting Output = 400MW
Generation Maximum = 500MW
Ramp Rate Energy = 5MW/min
Ramp Rate OR = 4MW/min

Term Definitions

$\text{Generation}_g^{start} = 400\text{MW}$

$\text{GenerationMaximum}_g = 500\text{MW}$

Assume, for simplicity purposes, that the generator is economically scheduled in both the RTC and RTU to provide the maximum amount of energy that it can provide in 5 minutes.

$$\begin{aligned} Generation_g &= \text{Generation}_g^{start} + \text{energy schedule change [x ramp rate multiplier in RTU only]} \\ &= 400\text{MW} + (5\text{MW/min} \times 5\text{ min}) \text{ [x ramp rate multiplier in RTU only]} \\ &= 400\text{MW} + (25 \text{ [x ramp rate multiplier in RTU only]}) \end{aligned}$$

Ramp Rate Multiplier RTU = 3

$$\begin{aligned} \text{ReserveMaximum10}_g &= 4\text{MW/min} \times 10\text{min} \\ &= 40\text{MW} \end{aligned}$$

$$\begin{aligned} \text{ReserveMaximum30}_g &= 4\text{MW/min} \times 30\text{min} \\ &= 120\text{MW} \end{aligned}$$

Equations

1. $Generation_g + \sum_{c \in \text{RESERVECLASSES}} Reserve_{r(g),c} \leq \text{GenerationMaximum}_g$

RTC: $[400\text{MW} + 25\text{MW}] + \sum_{c \in \text{RESERVECLASSES}} Reserve_{r(g),c} \leq 500\text{MW}$

$$425\text{MW} + \sum_{c \in \text{RESERVECLASSES}} Reserve_{r(g),c} \leq 500\text{MW}$$

$$\sum_{c \in \text{RESERVECLASSES}} Reserve_{r(g),c} \leq 75\text{MW}$$

Maximum OR can not be scheduled, so the equation is limiting. The generator could be scheduled to provide 100MW of energy and OR in the RTC sequence.

RTU: $[400\text{MW} + (25\text{MW} \times 3)] + \sum_{c \in \text{RESERVECLASSES}} Reserve_{r(g),c} \leq 500\text{MW}$

$$475\text{MW} + \sum_{c \in \text{RESERVECLASSES}} Reserve_{r(g),c} \leq 500\text{MW}$$

$$\sum_{c \in \text{RESERVECLASSES}} Reserve_{r(g),c} \leq 25\text{MW}$$

Maximum OR can not be scheduled, so the equation is limiting. The generator could be scheduled to provide 100MW of energy and OR in the RTU sequence.

2. $Generation_g + \sum_{\substack{r \in \text{RESERVEOFFERS}, \\ c \in \{RS10, RNS10\}}} Reserve_{r(g),c} \leq \text{Generation}_g^{start} + \text{ReserveMaximum10}_g$

RTC: $[400\text{MW} + 25\text{MW}] + \sum_{\substack{r \in \text{RESERVEOFFERS}, \\ c \in \{RS10, RNS10\}}} Reserve_{r(g),c} \leq 400\text{MW} + 40\text{MW}$

$$425 + \sum_{\substack{r \in \text{RESERVEOFFERS}, \\ c \in \{RS10, RNS10\}}} Reserve_{r(g),c} \leq 440\text{MW}$$

$$\sum_{\substack{r \in \text{RESERVEOFFERS}, \\ c \in \{RS10, RNS10\}}} Reserve_{r(g),c} \leq 15\text{MW}$$

Maximum 10-miunte OR that can be scheduled is 15MW and not exceed the generator ramping capability.

RTU: $[400\text{MW} + (25\text{MW} \times 3)] + \sum_{\substack{r \in \text{RESERVEOFFERS}, \\ c \in \{RS10, RNS10\}}} Reserve_{r(g),c} \leq 400\text{MW} + 40\text{MW}$

$$475 + \sum_{\substack{r \in \text{RESERVEOFFERS}, \\ c \in \{RS10, RNS10\}}} Reserve_{r(g),c} \leq 440\text{MW}$$

$$\sum_{\substack{r \in \text{RESERVEOFFERS}, \\ c \in \{RS10, RNS10\}}} Reserve_{r(g),c} \leq \text{-35MW}$$

In order to respect this constraint, scheduled energy would be reduced in the RTU so as to not violate this constraint in the RTU. No 10-minute operating reserve would be scheduled in the RTU.

In RTC, the generator can provide a combination of energy and 10-minute OR up to 40MW. In the RTU, the ramp rate multiplier overstates the amount of energy scheduled. This amount of overstated energy and the scheduled OR cannot exceed 40MW. In this example, the use of the ramp rate multiplier (in RTU) will not allow the generator to be scheduled for any 10-minute OR when the generator is physically capable of providing up to 15MW of 10-minute OR. Furthermore, the constraint restricts the energy to a lower level than the multiplier allows, which mitigates the intended effect of the multiplier. Modification of equation 2 is necessary to remove this distortion.

3. $$Generation_g + \sum_{\substack{r \in \text{RESERVEOFFERS}, \\ c \in \text{RESERVECLASSES}}} Reserve_{r(g),c} \leq \text{Generation}_g^{start} + \text{ReserveMaximum30}_g$$

RTC: $$[400\text{MW} + 25\text{MW}] + \sum_{\substack{r \in \text{RESERVEOFFERS}, \\ c \in \text{RESERVECLASSES}}} Reserve_{r(g),c} \leq 400\text{MW} + 120\text{MW}$$

$$425 + \sum_{\substack{r \in \text{RESERVEOFFERS}, \\ c \in \text{RESERVECLASSES}}} Reserve_{r(g),c} \leq 520\text{MW}$$

$$\sum_{\substack{r \in \text{RESERVEOFFERS}, \\ c \in \text{RESERVECLASSES}}} Reserve_{r(g),c} \leq 95\text{MW}$$

Maximum OR that can be scheduled is 95MW, however, this violates constraint equation #1. In order to respect the constraint from equation #1, the maximum OR that can be scheduled is 75MW (25MW of energy and a total of 100MW for energy and OR).

RTU: $$[400\text{MW} + (25\text{MW} \times 3)] + \sum_{\substack{r \in \text{RESERVEOFFERS}, \\ c \in \text{RESERVECLASSES}}} Reserve_{r(g),c} \leq 400\text{MW} + 120\text{MW}$$

$$475 + \sum_{\substack{r \in \text{RESERVEOFFERS}, \\ c \in \text{RESERVECLASSES}}} Reserve_{r(g),c} \leq 520\text{MW}$$

$$\sum_{\substack{r \in \text{RESERVEOFFERS}, \\ c \in \text{RESERVECLASSES}}} Reserve_{r(g),c} \leq 45\text{MW}$$

In order to respect this constraint, the maximum OR that can be scheduled is 45MW. However, this violates constraint equation #1. In order to respect the constraint from equation #1, the maximum OR that can be scheduled is actually 25MW.

In RTC, the generator can provide a combination of energy and OR up to 100MW (25MW maximum of energy and the limit of 75MW maximum of OR). In the RTU, the ramp rate multiplier overstates the amount of energy scheduled. This amount of overstated energy and the scheduled OR cannot exceed 100MW. In this example, the use of the ramp rate multiplier (in RTU) will only allow the generator to be scheduled for 25MW of OR when the generator is physically capable of providing up to 75MW of OR. Modification of equation 3 is necessary to remove this distortion.

Proposal

Leave modifications as they are; however leave this issue open with the intent to consider changing/removing the modifications as a future incremental change to RT pricing.

Rationale:

- Analysis of the impact of the change to 3x ramp rate multiplier is not yet completed and IESO has committed to do analysis over the next 18 months. It is prudent to not change any other aspect of RT pricing until that analysis is completed.
- The analysis conducted supporting the proposed change from 12x to 3x was conducted using the existing modifications.