



Operating Reserve Clarifications: Potential Solution Options - Desired MW Calculations

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Today's Focus Area: Desired MW Calculation

The **Desired MW calculation** includes several opportunities to strengthen incentives within the operating reserve make whole credit rules

#	Design Components1	Priority	Status Quo - Conceptual Description
6	MW used for Desired MW and When Each One is Used		
6a	Ramp-Limited Desired MW		Used when none of the other desired MW types are triggered
6b	Dispatch signal MW		Used when any of the following are true: A) Dispatch Signal MW is less than or equal to the Ramp-Limited Desired MW B) Dispatch Signal MW is greater than the Ramp-Limited Desired MW and the resource's Real-time MW is greater than the Ramp-Limited Desired MW (i.e., SCED is ramping the unit up and the unit is outpacing its ramp rate (without overshooting the dispatch signal)
6c	Dispatch LMP Desired MW (non-ramp limited)		Used when any of the following are true: A) % Off Dispatch > 20% B) Ramp-Limited Desired MW and Dispatch Signal MW are not available due to technical reasons or the resource offering limited dispatchability C) Resource's Fixed Gen Flag is set in Real-time but not Day-ahead (for deviation charges only) D) Resource's Fixed Gen Flag is set in Real-time, regardless of day-ahead use (for make whole credits only)
6d	Actual RT MW		For CTs: Desired MW = Actual MW
6e	DA MW (only used on the deviation charge side)		Used when the resource is non-dispatchable in real time
6f	Other		Placeholder for any other types of desired MW that stakeholders may want to introduce

Addressed herein

Addressed in next deck

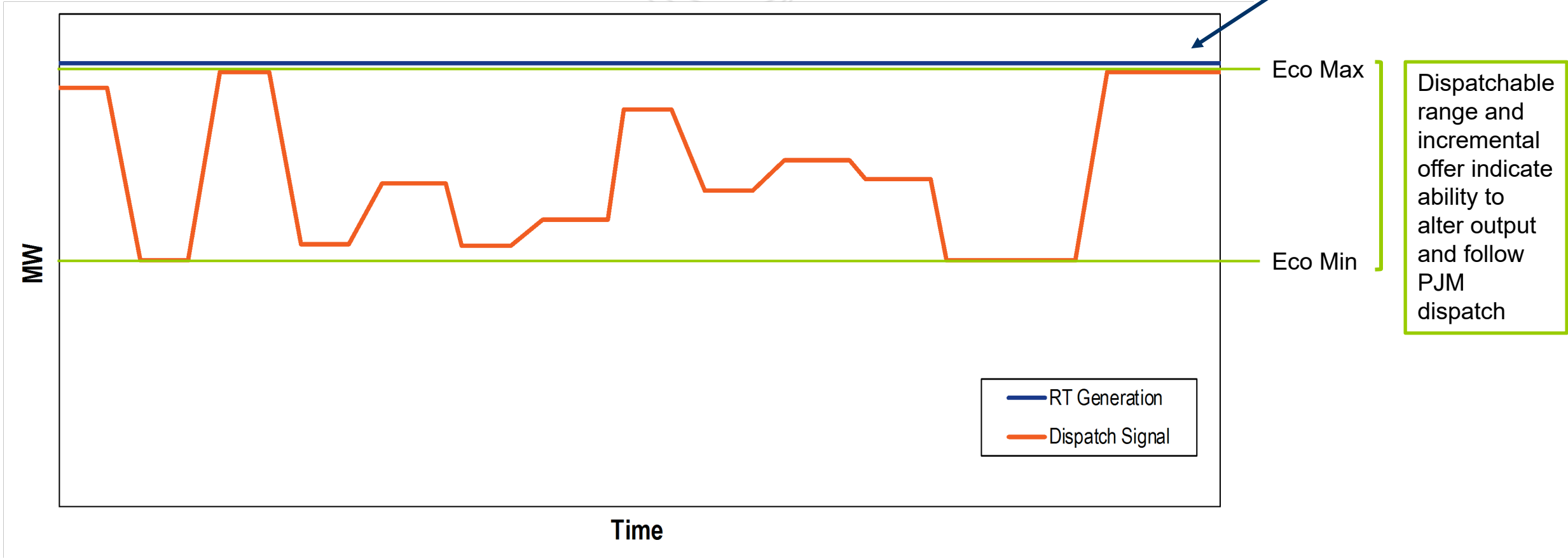
Resources are made whole to the lesser of Actual MW or Desired MW. CTs are the exception to this rule.

- CTs are always made whole to their actual MW, regardless of how well they follow dispatch.
- While this special treatment made sense at the time of implementation, PJM and the IMM believe it is no longer warranted.

- Prior to the implementation of CP, CTs were not required to have a dispatchable range.
 - Most CTs were called on to meet peak conditions or for constraint control and had little variability in output. Use of Actual MW was based on the assumption they would run at Eco Max, but with slight variability in output due to ambient conditions.
- Under CP, all industrial/frame CTs are required to have a dispatchable range.
 - Frame CTs have a 1.5 turn down ratio (ratio of eco max to eco min). It is no longer a given that these CTs will be automatically dispatched to Eco Max and remain there. Resources are expected to follow PJM's dispatch instructions.

Most CTs now share similar dispatchability to the rest of the fleet and do not require special treatment.

Resource is automatically made whole to actual despite generating above the MW desired by the dispatch signal



- As a general rule, PJM's operating reserve make whole credit rules are structured so that the opportunity for cost recovery is maximized when a resource follows PJM dispatch.
- This is not true for CTs under our current rules.
 - Cost recovery is maximized even when they operate above their dispatch basepoint. This creates an incentive to not follow dispatch.
 - Removing this special treatment will provide more flexible CT technologies with a stronger incentive to follow PJM's dispatch signal.
- CTs now have sufficient flexibility to be treated in the same manner as other resources.

Flexible CTs received 72% of all Balancing Operating Reserve credits in 2021.

Unit Type	BOR Credits (millions)	Share
AERO CT	\$25.9	20%
CC	\$3.3	3%
COAL	\$3.4	3%
FRAME CT	\$92.5	72%
OTHER	\$0.0	0%
RICE	\$0.9	1%
SOLAR	\$0.0	0%
STEAM OTHER	\$1.5	1%
WIND	\$0.1	0%
Total	\$127.5	100%



Impact of Removing Special Treatment for CTs

To understand the impact of the CT Rule on the magnitude of BOR credits, PJM reran the highest uplift days from summer of 2021 with the CT rule removed.

	Current: CTs made whole to Actual			Simulated: CTs made whole to Desired MW			Difference	
Date	BOR Credits (\$Million)	MW Made Whole	% of Total BOR Credits	BOR Credits (\$Million)	MW Made Whole	% of Total BOR Credits	BOR Credits (\$Million)	MW Made Whole
6/29/2021	\$2.387	187,296	97%	\$2.133	181,406	96%	\$.255	5,890
8/18/2021	\$2.220	163,317	97%	\$2.041	158,223	97%	\$.180	5,094
7/6/2021	\$1.772	182,579	92%	\$1.637	178,651	92%	\$.135	3,928
7/26/2021	\$1.705	148,062	99%	\$1.448	144,064	98%	\$.257	3,998
8/20/2021	\$1.704	158,943	98%	\$1.400	153,964	98%	\$.304	4,979
8/17/2021	\$1.355	121,955	97%	\$1.258	118,557	97%	\$.097	3,398
8/16/2021	\$1.186	81,505	99%	\$1.153	80,107	99%	\$.033	1,398
6/7/2021	\$1.119	133,560	97%	\$1.098	131,929	97%	\$.021	1,631
Total	\$13.448			\$12.167			\$1.282	30,316

Uplift payments to CTs were a total of \$1.3M or ~10% lower over these 8 days without the CT Rule.

- Aero CTs have a turn down ratio of 1 under the PLS limitations and are still considered inflexible under current PLS rules.
 - In practice, many of these offer some dispatch flexibility (Eco Max > Eco Min) to the market
- However, if ambient temperature adjustments do not exceed 10% of Eco Max, the removal of this rule is unlikely to impact inflexible CTs.
 - All resources are made whole to Actual MW when Actual MW is within 110% of Desired MW.
 - Offer price to which they are made whole is capped at the Desired MW.

- Is there general support for removing this special treatment for CTs?

Operating Reserve Clarifications

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