



Update on Short-Term Goals

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May 4, 2018

Energy Price Formation Sr. Task Force

Short-Term (Q3 2018):

- Synchronized Reserve (SR) Market
 - Consolidation
 - Accuracy
 - Offers
- Dynamic Reserve Zone Modeling
- Simplified Operating Reserve Demand Curve (ORDC) Enhancements
- Fast-Start Pricing*
- Others??

Mid-Term (Q1 2019):

- 30-Minute Reserve Market
- Complete ORDC Modeling
- Fast-Start Pricing*
- Others??

Long-Term (TBD):

- Broader ELMP implementation
- Day-ahead Reserve Modeling and Shortage Pricing
- Others??

* Implementation dependent on FERC process and approval/rejection.

- The proposal herein represents a starting point for discussion within the stakeholder process. It should not be construed as a final proposal.
- General direction
 - Consolidate Tier 1 and Tier 2 reserves
 - Obligated to provide reserves during synchronized reserve event
 - Compensated, regardless of the occurrence of a synchronized reserve event
 - Subject to consequences for non-performance
 - Simplify offer structure
 - Use energy offer to calculate availability and reserve capability

By default, if a resource is available for energy, it is available for reserves

	Type of Resource	Change availability?	Must Offer Applicability (no change from status quo)
Online Capacity Resources	PJM-scheduled	No, will be based on energy availability	Yes
	Self-Scheduled	No, will be based on energy availability	Yes
	Hydro, PJM or Self-Scheduled	Yes	Yes
	Condensers (offline or in condensing mode)	Yes	Yes; If offline, then only during emergency conditions
Online Non-Capacity Resources	PJM-scheduled and Self-Scheduled	Yes	No
	Demand Resource	Yes	No

See OA Schedule 1 Section 1.7.19A for Must Offer requirement

	Type of Resource	Enter Offer MW?	Enter Offer Price?
Online Capacity Resources	PJM-scheduled	No, PJM will use energy parameters to calculate offer MW	Yes (up to \$7.50/MW)
	Self-Scheduled	Yes; to be considered for reserves, must have a dispatchable range	Yes (up to \$7.50/MW)
	Hydro, PJM or Self-Scheduled	Yes	Yes (up to \$7.50/MW)
	Condensers (offline or in condensing mode)	Yes	Yes (up to \$7.50/MW + condenser-specific costs status quo*)
Online Non-Capacity Resources	PJM-scheduled and Self-Scheduled	Yes	Yes (up to \$7.50/MW)
	Demand Resource	Yes	Yes (up to \$7.50/MW)

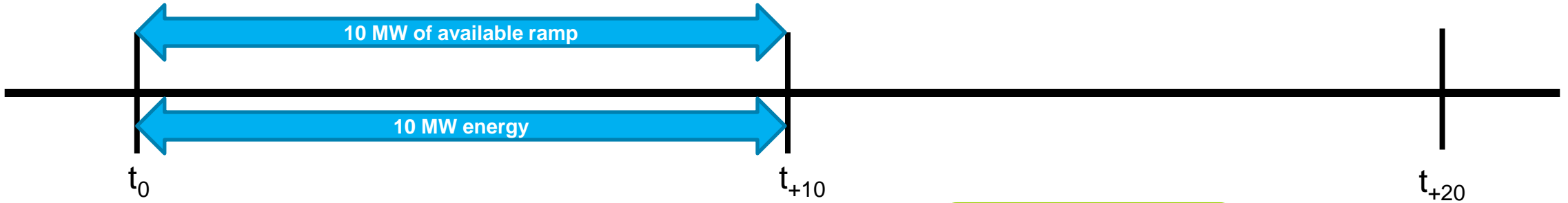
- In order to remove offer prices, resources need to be financially indifferent between providing energy or reserves
 - In order to be financially indifferent, the consequences for not following dispatch instructions need to be aligned
 - Deviations from energy dispatch incur balancing operating reserve charges
 - SR non-compliance penalty can be in excess of SR revenues
- For example, units A and B are being dispatched for energy: A has a reserve assignment and B does not
 - If a spin event is called and A does not respond, it will incur a non-compliance penalty including a retroactive compensation refund for all previously assigned hours
 - If B does not follow energy dispatch, it will incur deviation charges
 - Unit A is not financially indifferent between energy and reserves
- Synchronized Reserve offer prices help account for the difference in risk between not following energy and not following reserves

- Options to address incentives to offer synchronized reserves:
 1. Remove offer price and lower penalty
 - A synchronized reserve penalty aligned with the energy penalty (balancing operating reserve deviation rate) is not sufficient to incent event response
 2. Keep offer price and leave penalty as-is
 3. Others??

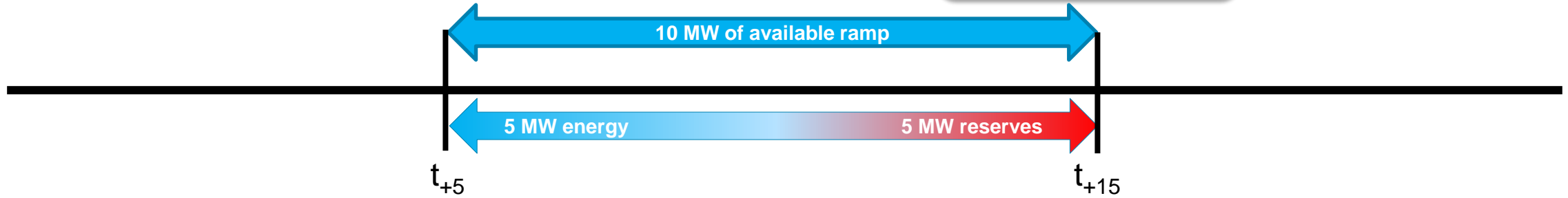
Estimating reserves using energy ramp rate

Unit
 Output = 200 MW
 Energy ramp rate = 1 MW/min
 Ecomax = 300 MW

RTSCED solution
 Dispatch point = 210 MW
 Reserves = 0 MW

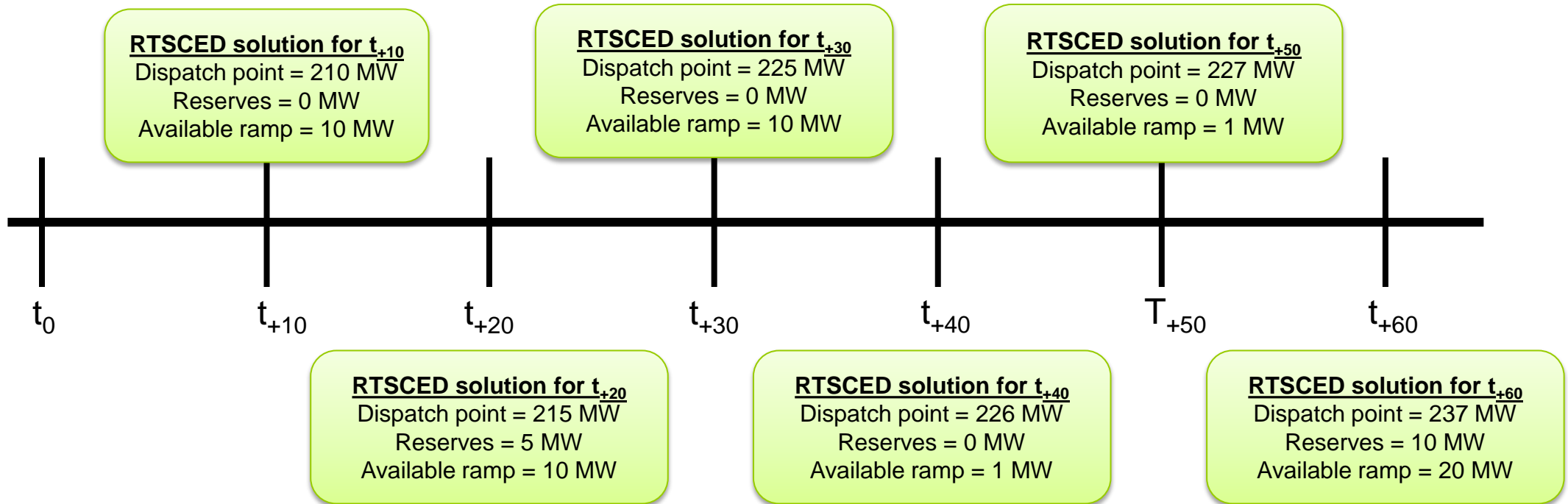


RTSCED solution
 Dispatch point = 215 MW
 Reserves = 5 MW



Unit
 Output at $t_0 = 200$ MW
 Energy ramp rate = segmented
 Ecomax = 300 MW

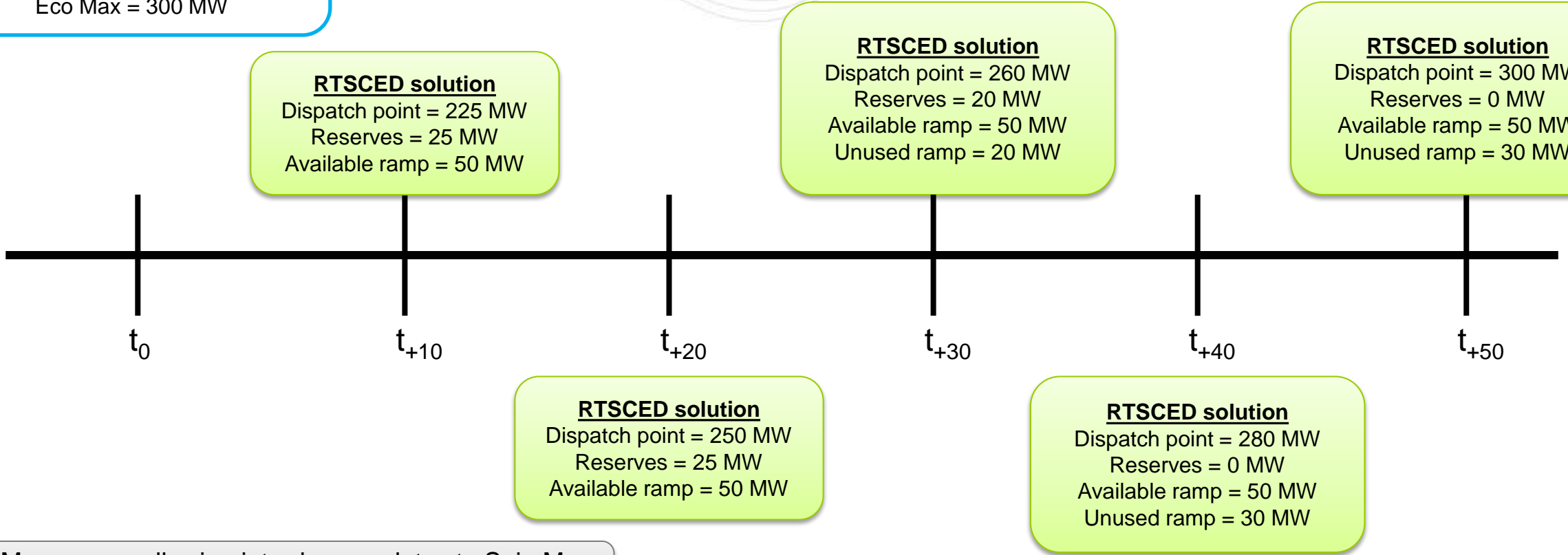
MW	Energy Ramp Rate
200 – 224.9	1.0 MW/min
225 – 226.9	0.1 MW/min
227 – 279.9	2.0 MW/min



Resources with Spin Max less than Eco Max

Unit

Output at t_0 = 200 MW
 Energy ramp rate = 5 MW/min
 Spin Max = 280 MW
 Eco Max = 300 MW



PJM proposes allowing intra-hour updates to Spin Max in Markets Gateway

Adding Intra-day Ramp Rate Changes requires additional discussion

- Pros
 - Better modeling of resources with operating limitations
- Cons
 - Can be used to influence market outcomes
- Could additional rules help address these concerns?
 - Limit amount of change?
 - Require explanation of change?
 - Impacts to uplift eligibility?