



# Regulation Strawman Design Discussion

RMDSTF

October 19, 2022

Regulation Signals  
1. Signal Design  
2. Product Type

## Regulation Signals:

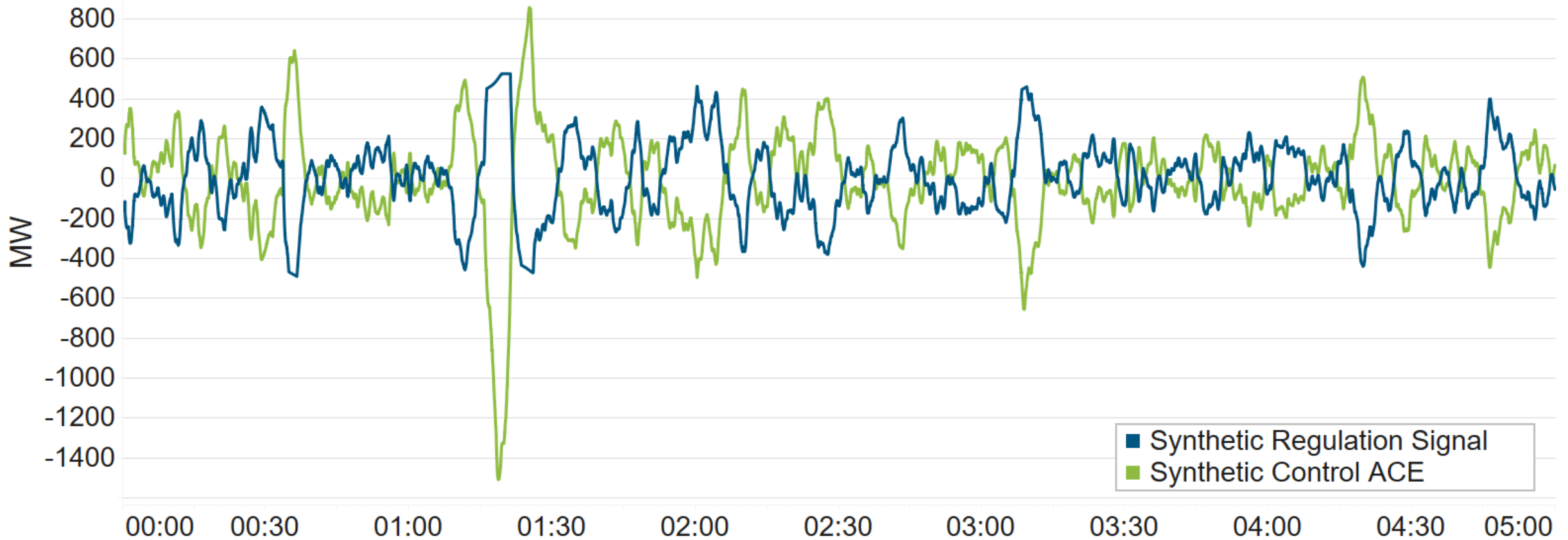
- Proposal 1: Single signal that all resources will follow
- Proposal 2: Keep RegA/RegD signals status quo

## Product Type:

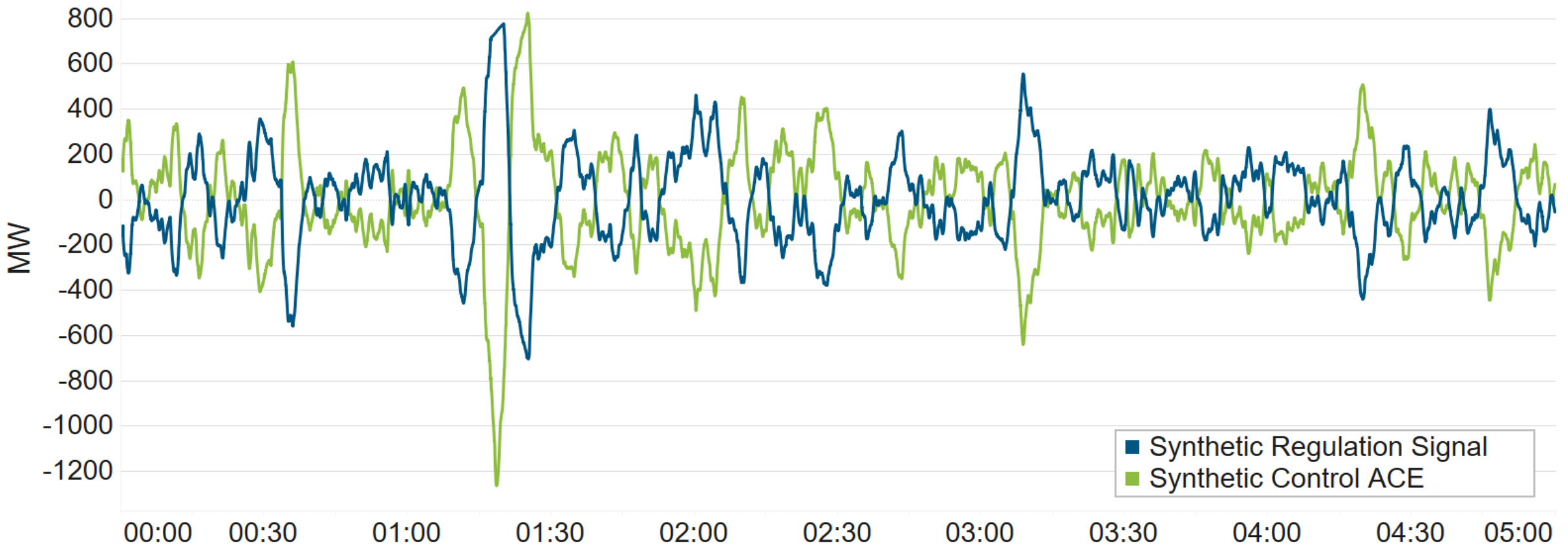
- Proposal: Regulation Up and Regulation Down Products

- Proposal 1: A single signal regulation design will allow PJM to better reflect the system needs to the regulation fleet to provide regulation service to PJM.
  - Resource agnostic signal aligned with system needs
  - Allows a simpler implementation for dispatch to operate and track, today's Reg A/D construct is not always clear on what regulation is available.
  - Allows for additional market products to be developed (regulation up/down). Removing the 2 signal complexity would allow for an easier transition to up and down signals

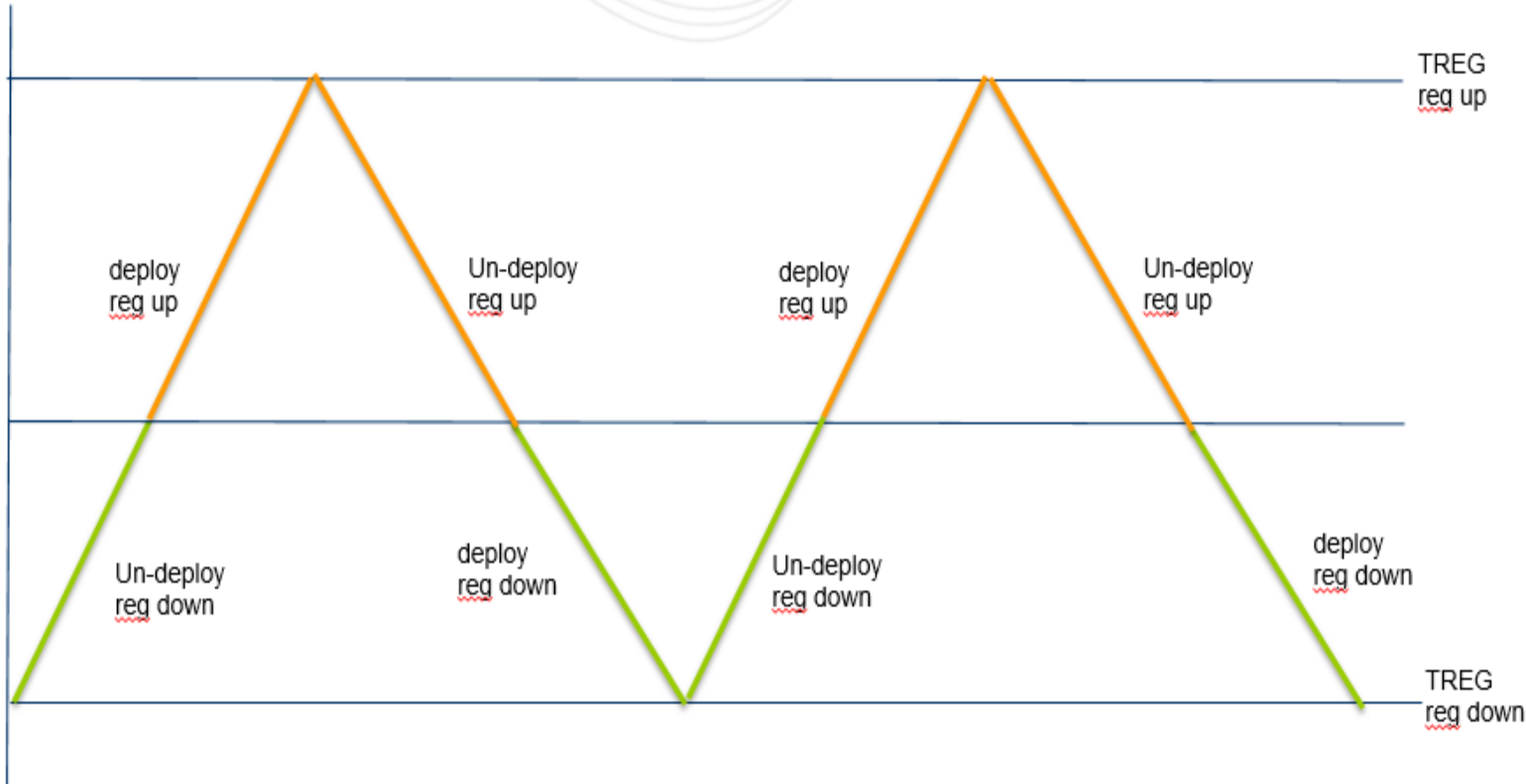
*Preliminary* mockup of an open loop controller for a hypothetical single signal:  
**Control Output for 09-20-2022 HE00-04 at 525 MW Available Regulation**



Preliminary mockup of an open loop controller for a hypothetical single signal:  
**Control Output for 09-20-2022 HE00-04 at 800 MW Available Regulation**



- Implement a Regulation Up and Regulation Down Products
  - 2 separate markets with separate requirements and clearing prices
  - Resources would be able to offer, clear and provide both products together, or can provide just 1 product within the hour
- Regulation up/down products will allow PJM to better address system needs in the future
  - PJM would have the ability to procure more or less of 1 product, depending on changing system needs
  - Reg Up/Down markets would allow the broadest set of resources to provide regulation service
  - Market efficiency on available resource capabilities, and minimized LOC



- Operationally, one product will be fully deployed and undeployed before the other product is asked to respond to an AGC signal

## Regulation Requirement Design:

- PJM is proposing to move away from the existing On/Off Ramp construct.
- Proposal 1: Dynamic Hourly Requirement
- Proposal 2: Base Requirement with Adders



- Proposal 1: Dynamic Hourly Requirement
- A formulaic hourly requirement designed to reflect the volatility seen on the system in real-time.
  - Expected load uncertainties, expected wind/solar uncertainties, expected interchange uncertainties in the near-term could all be considered as possible inputs.
  - Upper and lower bounds could be implemented to provide certainty.
  - Better aligns the regulation requirement with operational reality in real time.
  - Produces a requirement that is resilient to future system changes.

- Proposal 2: Base Requirement with Adders
- An hourly requirement that establishes a base MW level and raises or lowers the requirement based on system conditions.
  - Base requirement MW would be **X** MW
  - Adders suggested include % increases for periods of low CPS, of high intermittent resource commitment, of system emergencies.
  - Adders can reflect conditions in which Operators would manually adjust the requirement, providing formal guidelines and automation.
  - Better aligns the regulation requirement with operational reality in real time.

## Benefits Factor/ Rate of Technical Substitution

- Proposal:
  - Remove the BF/MRTS from the regulation market design

## Effective MW Calculation

- Proposal:
  - Keep an effective MW construct: Offer MW \* PerfScore

- Looking at removing the benefits factor/ MRTS *regardless* of what signals are in operations (proposal 1: one signal design or proposal 2: status quo A/D signals)
  
- Consideration for removing the BF/MRTS even with 2 signals in operations
  - Remove complexity that is an approximation and not always reflected of real-time system benefits.
  - Benefits changes with different A/D mixes are minimal and PJM signal will be proportioned differently depending on mix but still the same total regulation request.
  - Additional analysis being performed on a 100% regD fleet.

12. Schedule used for LOC  
 13. Use of desired MW (LMP vs. Ramp Limited)

## Regulation LOC

- Proposal : RegLOC calculation to use the energy schedule the unit is running on to provide regulation rather than

$$RegLOC\ Schedule = Least \left\{ \begin{array}{l} \text{available price\_based energy schedule,} \\ \text{greatest (available cost\_based energy schedule)} \end{array} \right\}$$

- RegLOC desired MW to use shadow calculation of Desired MW @ Ramp rate limit rather than Desired MW @ LMP

Offer Structure  
22. Components of Offer  
22a. Inclusion of VOM in reg offers  
23. Dual Offer Capability/process

## Components of Offer

- Proposal: Performance and Capability (Status Quo)

## Inclusion of VOM in reg. offers

- Remove VOM regulation performance cost offer, continue to allow VOM for regulation-only resources

## Dual Offer Capability/process

- Resources only offer 1 signal in an hour. Resources are allowed to be dual qualified (as applicable).

## Offer Structure

22b. Adjusted capability offer def.

22c. Adjusted performance offer def

### Adjusted Capability & Performance Offer Definition

- Proposal: Simplify clearing price calculation by removing performance, mileage, and BF components
- Continue to procure resources based on performance and pick up higher performing/lower cost resources first

- Existing calculation:

$$\text{Adjusted Regulating Capability Cost (\$)} = \frac{\left( \text{Capability Offer } \left( \frac{\$}{\text{MW}} \right) \right)}{\left( \text{Benefits Factor of Offered Resource} \right)} * \frac{\left( \text{Capability (MW)} \right)}{\left( \text{Historic Performance Score} \right)}$$
  

$$\text{Adjusted Performance Cost (\$)} = \frac{\left( \text{Performance Offer } (\$/\Delta\text{MW}) * \left( \text{Mileage of Offered Resource Signal Type } (\Delta\text{MW}/\text{MW}) \right) \right)}{\left( \text{Benefits Factor of Offered Resource} \right) * \left( \text{Historic Performance Score} \right)} * \left( \text{Capability (MW)} \right)$$

Proposal: Just use offers to set price



## Clearing Timing & Commitment process

- Proposal: Implementing a DA market for regulation and continue to balance in real-time
- DA and RT Market for regulation capability
  - Allow alignment of regulation reserves between DA and RT
  - Will allow for more efficient procurement in RT, ability to commit regulation in SCED
- Performance or mileage will only be paid to resources who provide the service in real-time

Offer Structure

24. Clearing Timing

25. Change in commitment

process

## Qualification Test

- Proposal: 1 self test +1 PJM test or 2 PJM tests for new resources.

## Components of Performance Scoring

- Proposal: Precision only calculation

## Minimum Allowable Thresholds

- Proposal: Participation: 50%, Payment: 25%

## Historic Performance Score

- Proposal: Continue to capture historic score, evaluate alternative solutions to 100 hour rolling average

Disqualified Resources

Change in Capability (MW)

Change in Communication Path or EMS – Existing or New Owner/MOC

New Resources

1 PJM-administered test

2 tests = 1 self-scheduled test + 1 PJM-administered test or 2 PJM-administered tests

New Performance Score of (an average of) PJM-administered test(s)

## Settlement

- 19. Application of benefits factor
- 20. Settlement Components
- Calculation of mileage
- 21. Mileage

### Application of substitution factor

- Proposal: Settlement does not include the benefits factor and replace mileage ratio with mileage

Capability \$ = MW\*PS\*capability clearing price

Performance \$ = MW\*PS\*Mileage\* performance clearing price

### Settlement Components

- Proposal: 5-minute pricing (status quo)
- Two part settlement for DA and RT, balancing

### Mileage

- Proposal 1: All movement regardless of direction (status quo)
- Proposal 2: Movement in control of ACE