Regulation Redesign
Phase 1 Implementation Update

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System Operations Subcommittee
July 1, 2025

Regulation Redesign Phase 1 Implementation

Action Required	Deadline	Who May Be Affected
Communicate to staff about the Regulation Redesign Phase 1 implementation	**10/1/2025**	Regulation Market Participants

Regulation Redesign – Phase Implementation and Timeline

FERC Approval on June 14, 2024

Clean order accepting our Regulation Market Reform 205 filing

Phase 1 Go-Live

Oct. 1, 2025

Phase 2 Go-Live

Oct. 1, 2026

Phase 1 Summary of Changes

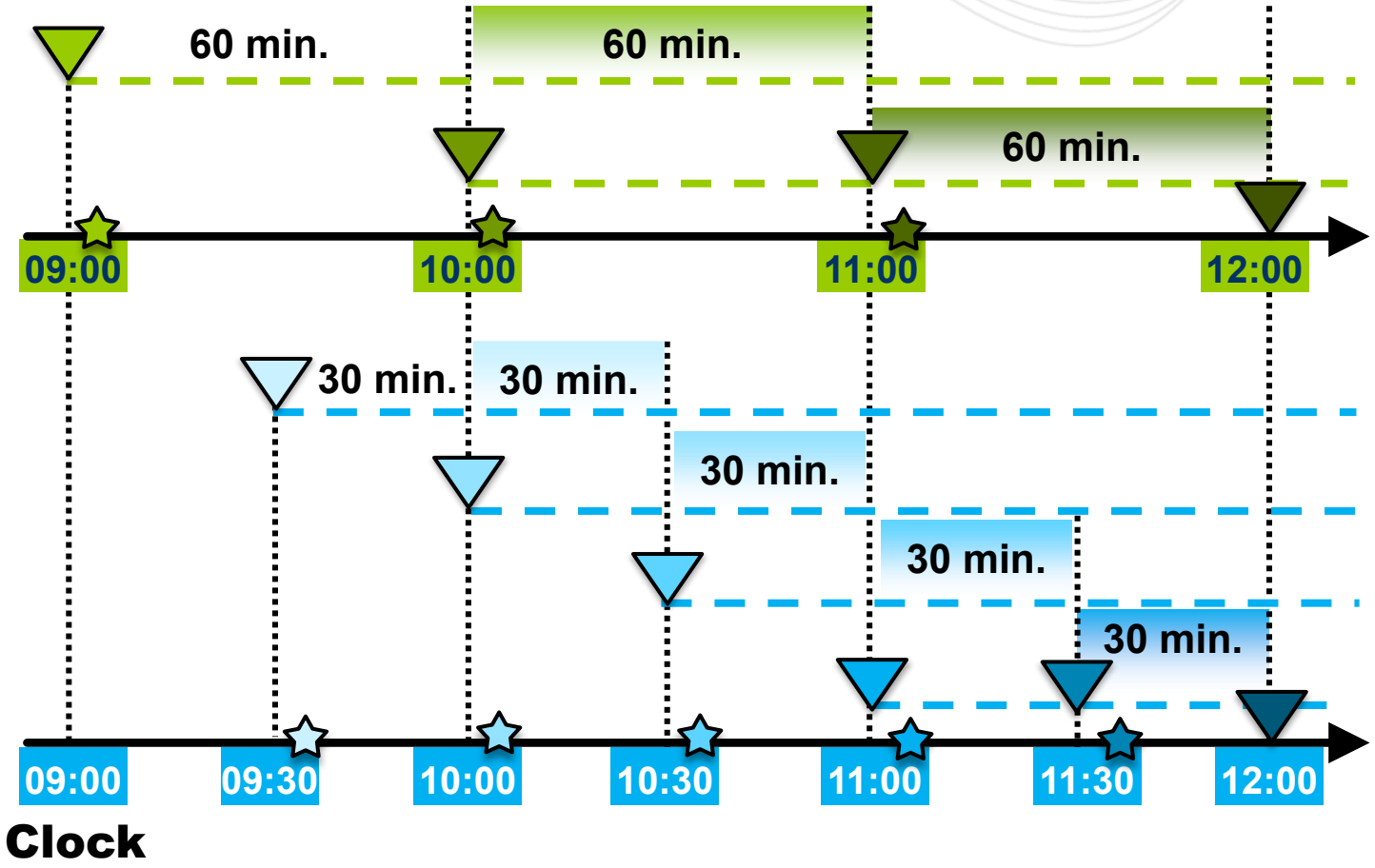
#	Design Components	Summary Description
1	**Signals and Products**	Change from ***two*** signals (RegA and RegD) bidirectional to ***one*** signal bidirectional that all resources that are assigned Regulation in a given market interval will follow.
2	**Requirement MW**	Changes to better reflect operational needs, with consideration both to historic and future system conditions
3	**Performance Scoring**	Change from accuracy, delay and precision to precision only.
4	**Offer and Clearing Timing**	Eliminate “cost increase in VOM” except for Reg-only resources, change from hour clearing and commitment to 30-minute clearing and commitment.
5	**Opportunity Cost Calculation Reform**	1. Use the schedule the resource is running for energy or else the cheaper of available schedule for offline. 2. Use tracking desired MW at LMP ramp rate limited. 3. Use the area between LMP and the energy schedule the resource is running on.
6	**Settlement**	For the eligible resources, Settlement will calculate the shoulder interval opportunity cost for two five-minute ramp-in intervals before the resource Regulation operation and two five-minute ramp-out intervals following the resource Regulation operation (currently, three intervals ramp-in and three intervals ramp-out). Also, Settlement will update the calculation for the Regulation Mileage Credit (currently Performance Credit) such that the mileage ratio is equal to [Real-Time Regulation Mileage/Historic Regulation Mileage]

Regulation Requirement Updates

Season	Dates	Hours Ending	Requirement MW
Winter	Nov. 1 – Feb. 28	HE 5 – 10, HE 17 – 24	750
		HE 1, HE 11	650
		HE 2 – 4, HE 12 - 16	550
Spring	March 1 - April 30	HE 19 – 1, HE 6 – 9	750
		HE 2, HE 10	650
		HE 3 – 5, HE 11 – 18	550
Summer	May 1 – Sept. 15	HE 5 – 1	750
		HE 2	650
		HE 3 – 4	550
Fall	Sept. 15 – Oct. 31	HE 6 – 9, HE 18 – 24	750
		HE 1, HE 10	650
		HE 2 – 5, HE 11 – 17	550

Regulation Clearing and Commitment in ASO – Phase 1 & 2

Move to a 30-Minute Clearing Time and Commitment Duration



STATUS QUO

- **60 minutes** prior to target time
- Looks ahead 60 minutes beyond target time

PHASE 1 & 2

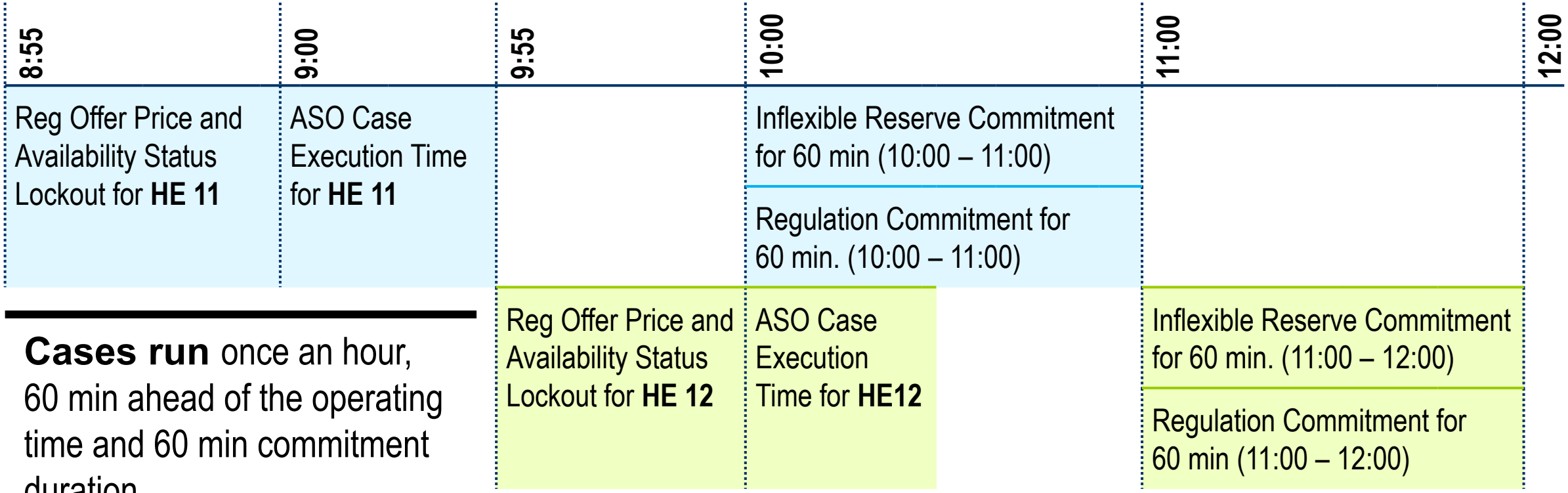
- **30 minutes** prior to target time
- Looks ahead 30 minutes beyond target time

Legend

- Case execution time
- Case approval
- Service provided

Current ASO Cases

Current ASO

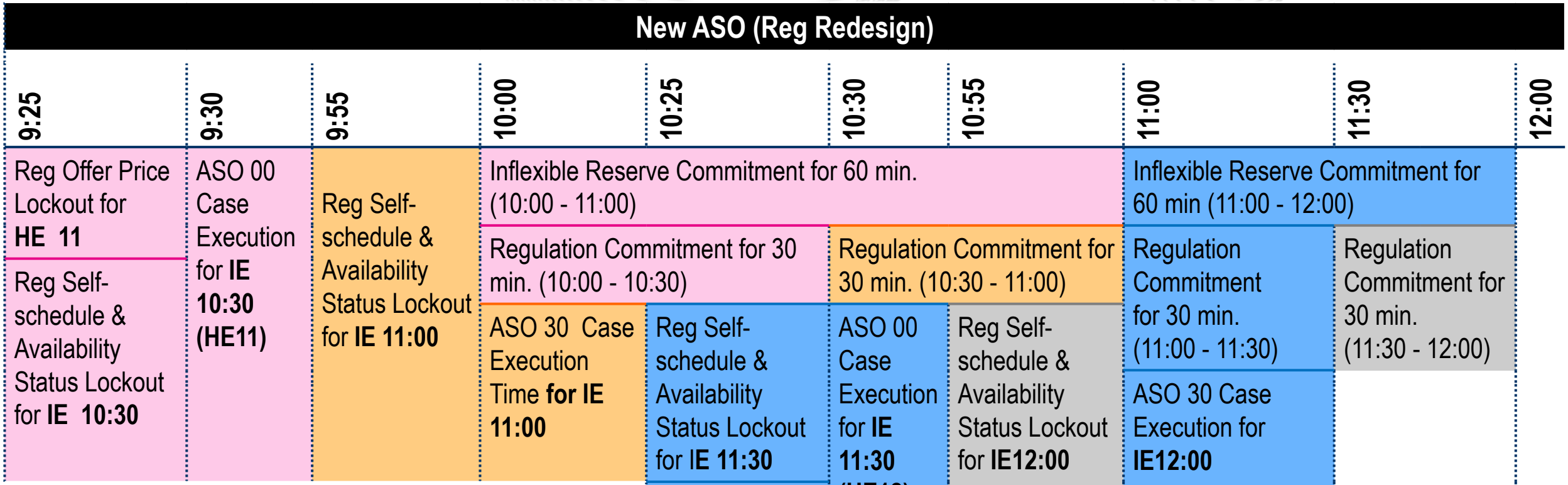


Cases run once an hour, 60 min ahead of the operating time and 60 min commitment duration

Offers lockout 65 min before the operating hour

HE = *Hour ending*

New ASO Input Lockout and Solution Target Times



Cases run twice an hour – hh:00 and hh:30, 30 min ahead of the operating time, 30 min commitment duration for Regulation, and 60 min commitment duration for inflexible Reserves

***HE** = Hour ending | **IE** = Interval ending*

Offer Price and MW lockout 35 min before the ***operating hour***, self-schedule and availability status lockout 35 min before the ***operating interval***;

Sample ASO Case Execution, Posting and Target Intervals

Cases	Execution Time	Products Types	Markets Gateway Posting Deadline	Target Time (Begin)
ASO 00	9:30	Regulation & Reserves	9:50	10:00
ASO 30	10:00	Regulation Only	10:20	10:30
ASO 00	10:30	Regulation & Reserves	10:50	11:00
ASO 30	11:00	Regulation Only	11:20	11:30

- Regulation and Reserves results notification of at least 10 minutes before the operating time
- If ASO 30 is missed, All-Call must go out by **hh:20** to extend the last **Regulation assignment**;
- If **ASO 00** is missed, All-Call must go out by **hh:50** to extend the last **Regulation and Inflexible Reserve assignment**

Qualification Testing

Reduce testing requirements for qualification

- New resources will test 2 times (status quo: 3)
- Disqualified Resources will test 1 time (status quo:3)

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)

Posted Documents for Phase 1 Changes

The following documents have been posted on the Ancillary Services page under a new section called **Regulation Redesign**:

PJM.com > Markets & Operations > Ancillary Services >

1. **Regulation Effective MW Requirement Definition (2025-2026) – PDF**
2. **Regulation Cost-Based Offer Validation Phase I – XLS**
3. **Self-Administered Regulation Test – XLS**
4. **40-Minute Performance Score Template – XLSM**
5. **XML Schema – XSD**
6. **PJM External Interface Specification Guide – PDF**
7. **Regulation Redesign Phase 1 FAQ – PDF**
8. **Markets Gateway: Regulation Redesign Phase 1 - Sandbox Virtual Session – PDF**

Phase 1 Milestones and Tentative Timeline

No.	Milestone	Timeline
1	**Regulation Redesign project – information update at the TCF**	May 5, 2025
2	**Regulation Redesign project – information update at the MIC/OC**	May 7- 8, 2025
3	**Markets Gateway Train (Sandbox) Opens for Testing**	May 15 - 30, June 18 and later, 2025
4	**RegD resources conversion testing begins**	June 2025
5	**All related manuals first read (Phase 1): M11, M12, M15, M28**	July 2025
6	**All related manuals endorsed (Phase 1): M11, M12, M15, M28**	August 2025 (September if needed)
7	**Special education session**	August 12 / September 5, 2025
8	**Regulation Redesign Phase 1 market opens**	Sept. 25, 2025
9	**Regulation Redesign Phase 1 go-live (cutover)**	Oct. 1, 2025, at 00:00

Email Contacts

No.	Inquiry	Email Contact
1	To request a Regulation test	RegulationTesting@pjm.com
2	Regulation telemetry – signal setup or conversion	PJMTelemetrySupport@pjm.com
3	Regulation Redesign questions	RegulationDesign@pjm.com
4	Communication to PJM Member Relations	custsvc@pjm.com

Manual 12, Balancing Operations

Ilyana Dropkin, Sr. Engineer II
Performance Compliance

System Operations Subcommittee
July 1, 2025

Revision 56 (10/01/2025):

All changes are conforming to Regulation Redesign Phase I

- Subsection 2.1.1 EMS Applications – renamed Area Regulation (AR) to Regulation control
- Subsection 2.1.2 PC Applications – updated definition of Performance Score Calculation Engine (PSCE)
- Subsection 3.1.2 PJM Control Implementation – Removed RegD mentions, Updated Exhibit 5: Real Time Market Application Process Flow and updated definition of Ancillary Service Optimizer (ASO)
- Subsection 3.1.3 PJM Member Control Implementation – Updated Exhibit 6: PJM Member Interface and associated text for Exhibit 6.

Revision 56 (10/01/2025):

All changes are conforming to Regulation Redesign Phase I

- Section 4.3 Regulation and Section 4.4 Qualifying Regulation Resources
  - Updated consistency use of Regulation control signal (RegA)
  - Capitalized Regulation Requirement
  - Updated hour to interval
  - Updated correct numbering of Exhibits
  - Renamed Area Regulation to Regulation; Area Regulation test to Regulation test
  - Removed mentions of RegD

Revision 56 (10/01/2025):

All changes are conforming to Regulation Redesign Phase I

- Subsection 4.3.2 Regulation Signal
  - Renamed section from Regulation Signals to Regulation Signal
  - Renamed: ARegA to Areg, TRegA to Treg, CRegA to Creg; Removed: ARegD, TRegD, CRegD
- Subsection 4.3.3 Determining Regulation Assignment
  - New requirements will be set for Regulation that will be posted on https://www.pjm.com/markets-and-operations/ancillary-services.aspx annually
- Subsection 4.3.4 Dispatching Regulation
  - Removed Regulation Excess

Revision 56 (10/01/2025):

All changes are conforming to Regulation Redesign Phase I

- Section 4.4 Qualifying Regulation Resources
  - Renamed Area Regulation test to Regulation test
  - Removed mentions of RegD tests
  - Updated changes to the signal path re-test – existing resource owner to set the resource performance score to the re-test qualification score for the exception of changes to the signal path are initiated by PJM or impacts all or a large portion of PJM Regulation fleet.
  - Reduce from 3 to 2 consecutive regulation tests for new qualifying resources
  - Deleted subsection 4.4.3 Certifying Multiple Turbines or Hydro Units at a Single Site
  - Re-numbered existing subsections 4.4.3 through 4.4.8

Revision 56 (10/01/2025):

All changes are conforming to Regulation Redesign Phase I

- Subsection 4.4.4 Disqualification and Re-Qualification of a Regulation Resource
  - Reduce from 3 to 1 regulation test for disqualified resources to qualify back into Regulation market
  - Changed from 100 hours to 200 (30 minute) intervals
- Subsection 4.4.5 Performance Score Calculation
  - Removed Accuracy (Correlation), Delay and Precision scores.
  - Updated formulas for Performance scores.
- Subsection 4.4.9 Regulation De-assignment
  - Added a new subsection 4.4.9 to describe a new rule that self-de-assignment will result in zero score for the remainder of the commitment period.

- Subsection 2.1.1 EMS Applications - Renamed Area Regulation (AR) to Regulation control

2.1.1 EMS Applications

- Automatic Generation Control (AGC) — This program runs every two seconds, calculating Area Control Error (ACE), ~~Area~~ Regulation control ~~(AR)~~ and economic dispatch.

- Subsection 2.1.2 PC Applications - Updated definition of Performance Score Calculation Engine (PSCE)

  - Performance Score Calculation Engine (PSCE) – is a ~~.net~~ Java application that calculates the ~~hourly~~ interval and historic performance score of a resource's regulation response compared to the regulation signal sent by PJM. PSCE also calculates the mileage ~~of each regulation signal by hour~~.

- Subsection 3.1.2 PJM Control Implementation - Removed RegD mentions

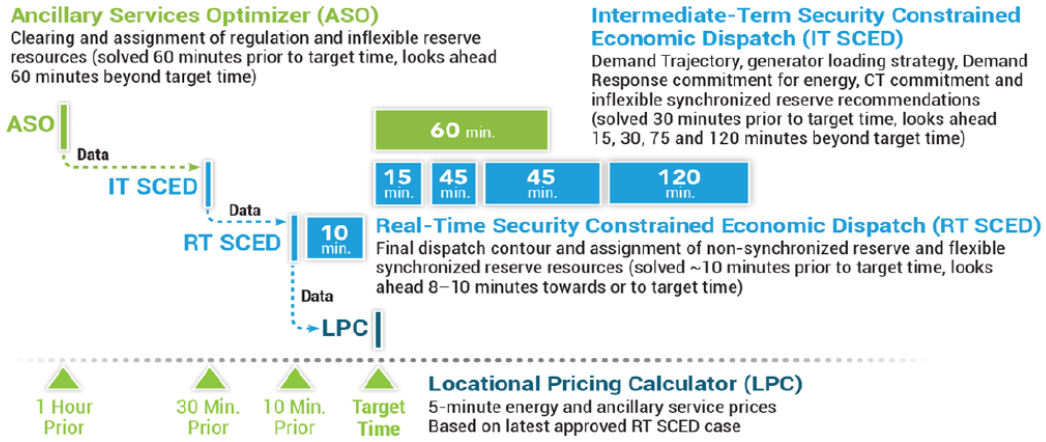
PJM calculates ~~two~~ Regulation signal~~s~~, as shown by Exhibit 3.

- Regulation control signal (RegA) is~~—~~ l~~L~~ow-pass filter of ACE. The Regulation control signal is sent to each resource owner. The resource owners receive the signal and then send the signal to each regulating resource. ~~for traditional regulating resources~~
- ~~RegD – High-pass filter of ACE for dynamic or fast response resources~~

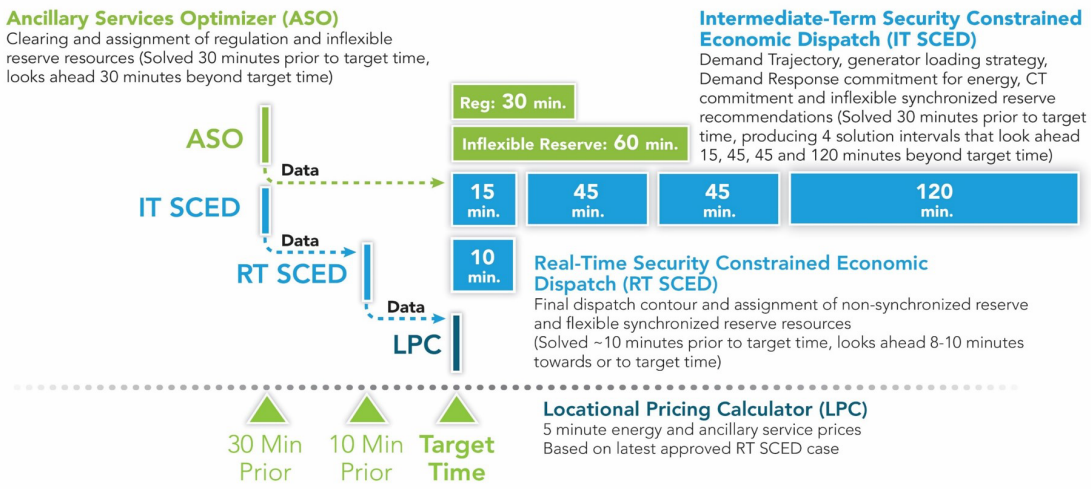
~~At present, PJM sends the Regulation signal in the following form to the participating resource owners:~~

- ~~Digital – The Digital Regulation signal is sent to each resource owner. The Generation Owners receive this signal and then send the appropriate signal to each regulating resource.~~

- Subsection 3.1.2 PJM Control Implementation - Updated Exhibit 5: Real Time Market Application Process Flow



Old Exhibit



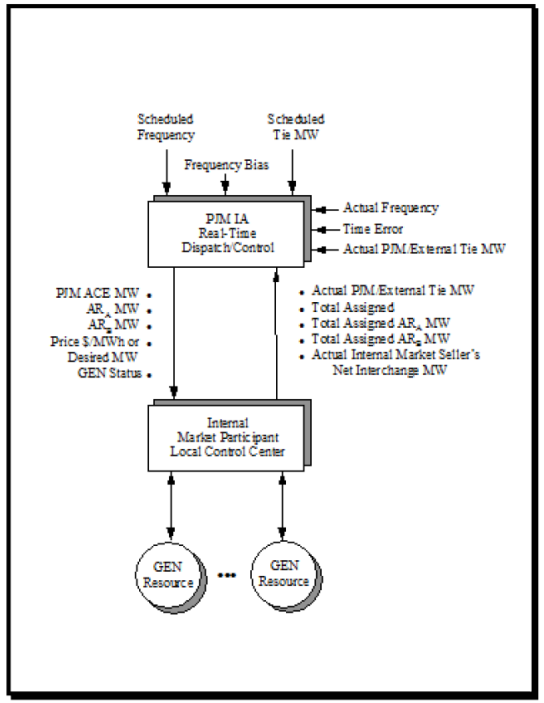
New Exhibit

- Subsection 3.1.2 PJM Control Implementation - Updated definition of Ancillary Service Optimizer (ASO)

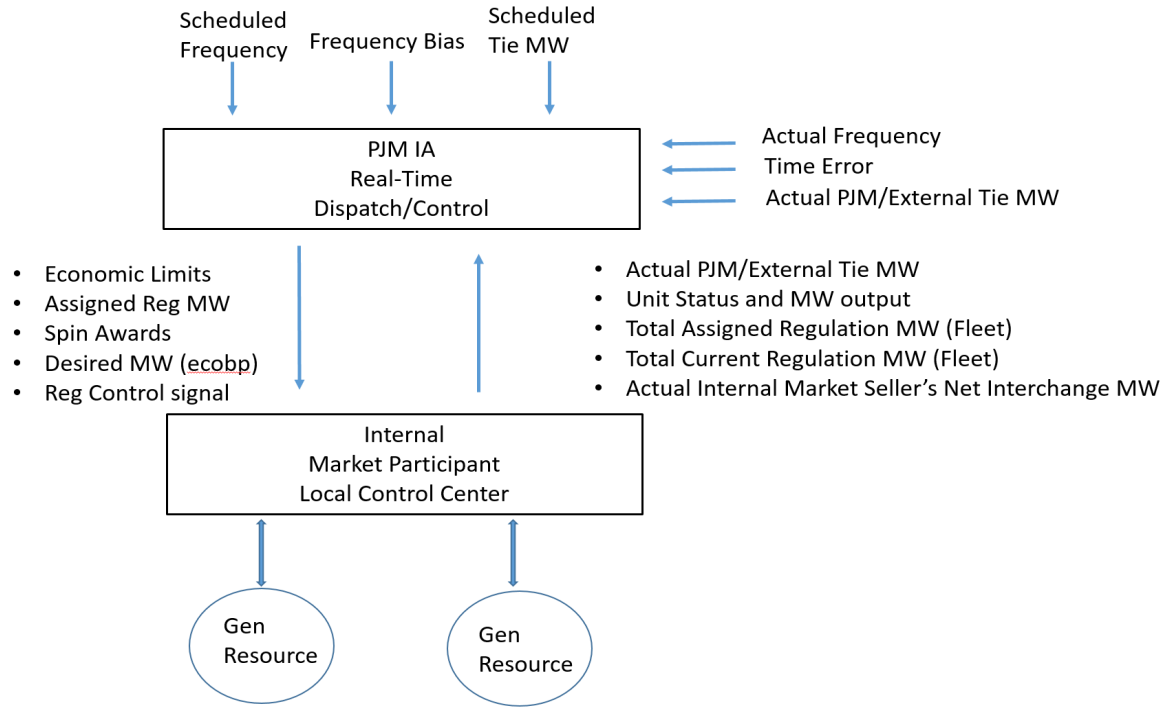
The real-time market applications consist of the following:

- **Ancillary Service Optimizer (ASO):** The Ancillary Services Optimizer (ASO) performs the joint optimization function of energy, reserves and regulation. The ASO creates an interval-based solution over a one half hour look-ahead period, as well as performs the regulation three pivotal supplier test. ASO does not calculate final market clearing prices. The main functions of ASO are the commitment of all regulation resources for the next half hour interval and inflexible reserve resources for the next operating hour. More information about ASO can be found in Manual 11, Section 2.5.1.

- Subsection 3.1.3 PJM Member Control Implementation – Updated Exhibit 6: PJM Member Interface



Old Exhibit



New Exhibit

- Subsection 3.1.3 PJM Member Control Implementation – Updated associated text for Exhibit 6.

The following information is sent by PJM to the Generation Owners:

- Economic Limits~~PJM ACE megawatt~~
- Assigned Regulation megawatt ~~either RegA or RegD~~
- Spin awards
- Desired megawatt (economic basepoint)
- Regulation control signal~~Generator status~~

The following information is sent by the PJM Members to PJM:

- Actual PJM/external tie line megawatt
- Unit status and MW output~~Actual total generation megawatt~~

- Subsection 3.1.3 PJM Member Control Implementation – Updated associated text for Exhibit 6.

  - Total assigned Regulation megawatt (fleet)~~either RegA or RegD~~
  - Total current Regulation megawatt (fleet)
  - Actual net interchange megawatt

  The PJM Member's Generation Owner converts the total dispatch signal ~~(price or megawatt)~~ and the Regulation signal to individual unit control signals. PJM Member resources that are dispatchable by PJM are expected to respond to the dispatch and regulation signals received from PJM. PJM Members are expected to operate their generating resources as close to desired output levels, as practical, consistent with Good Utility Practice.

- Section 4.3 Regulation and Section 4.4 Qualifying Regulation Resources
  - Updated consistency use of Regulation control signal (RegA) rather than Area Regulation; Capitalized Regulation Requirement; Updated correct numbering of Exhibits.

4.3.1 PJM RTO Regulation Market Obligations

The Regulation R~~r~~equirement for the PJM RTO can be found in this manual in Section 4.3.3, Determining Regulation Assignment. The resources assigned to meet this requirement must be capable of responding to the Regulation control~~AR~~ signal immediately, achieve their bid capability within five minutes and must increase or decrease their outputs at the ramping rates that are specified in the data that is submitted to PJM.

The PJM RTO requires that the Regulation range of a resource is at least twice the amount of Regulation assigned, and that the resource can symmetrically provide the total amount of Regulation assigned (a full raise and lower of assigned regulation from set-point) as illustrated in Exhibit 7~~12~~ below.

- Section 4.3 Regulation and Section 4.4 Qualifying Regulation Resources
  - Updated hour to interval
  - Removed mentions of RegD
  - Renamed Area Regulation to Regulation; Area Regulation test to Regulation test

4.4.1 Regulation Qualification Test

~~Traditional Resource Test~~

The RegulationAR test is run during a continuous 40-minute period when, in the judgment of the PJM test administrator, economic or other conditions do not otherwise change the base loading of the resources that are being tested. All resources performing a Regulation test must set and hold for the test duration the MW-value base point that the resource is regulating around. Changes in base loading for a resource during the test period invalidate the test for that resource. ~~A separate set of tests are required for qualification for the traditional signal (RegA) and the dynamic signal (RegD).~~ The RegulationAR test follows a simulated Regulation signal and will last for 40 minutes.

- Subsection 4.3.2 Regulation Signal
  - Renamed section from Regulation Signals to Regulation Signal
  - Renamed: ARegA to Areg, TRegA to Treg, CRegA to Creg; Removed: ARegD, TRegD, CRegD

4.3.2 Regulation Signal~~s~~

Resource owners will receive from PJM:

- Assigned Regulation (AReg~~A or ARegD~~) – This is the assigned ~~hourly~~interval Regulation quantity (MW) that is cleared from the Regulation market system. It is assigned for each individual resource that is qualified to regulate in the PJM market. This value, although typically static for the interval~~hour~~, will be sent on a 10-second scan rate. ~~Resources will receive a separate assignment for RegA and RegD if the regulating resource is dual qualified, but the regulating resource will be assigned to follow only one signal for the hour.~~
- Regulation Control Signal~~s~~ (RegA~~, RegD~~) – Real-time instantaneous resource owner fleet Regulation signal (+/- MW). This signal is used to move regulating resources in the owner's

- Subsection 4.3.2 Regulation Signal - Continue
  - Renamed section from Regulation Signals to Regulation Signal
  - Renamed: ARegA to Areg, TRegA to Treg, CRegA to Creg; Removed: ARegD, TRegD, CRegD

Resource owners will send to PJM:

- Total Regulation (TReg~~A or TRegD~~) – This is the real-time fleet regulation capability (MW) that represents the active resource owner's ability to regulate. Ideally the value of this quantity should be the sum of the resource owner's non-zero a~~A~~ssigned Regulation quantities for the majority of the interval~~hour~~, but must reflect any reductions in regulating capability as they occur (resource's AGC limit restrictions, resource "off control" conditions, etc.). This value shall be calculated every two seconds and sent on a two-second scan rate. ~~A fleet owner must separate the fleet so resources following RegA report TRegA and resources following RegD report TRegD.~~
- Current Regulation (CReg~~A or CregD~~) – This is the real-time fleet regulation feedback (+/- MW) that represents the active position of the fleet with respect to the +/- TReg capability.

- Subsection 4.3.3 Determining Regulation Assignment
  - New requirements will be set for Regulation that will be posted on https://www.pjm.com/markets-and-operations/ancillary-services.aspx annually

4.3.3 Determining Regulation Assignment

The PJM RTO's Regulation Rrequirement ~~is 525 effective MW during non-ramp hours and 800 effective MW during ramp hours. The ramp and non-ramp period will be determined seasonally, based on system conditions, and~~ is initially set to 550MW during low regulation hours, 650MW during transition hours, and 750MW during high regulation hours specified in the Regulation Requirement MW table, effective October 1st, 2025. The Regulation Requirement MW will be reviewed annually in October, with hourly statistics of system performance metrics from the previous year, including ACE time out of bounds, BAAL minutes, regulation utilization and min/max regulation deployment. The review will determine either no change in the requirement MW or adjustment of -25MW/+25MW/+50MW at the hourly level based on the adjustment threshold table that is posted on pjm.com. However, the adjusted MW cannot be less than the prior hour by 150MW or more. The adjusted Regulation Requirement MW shall be effective from November 1st of the current year through October 31st of the following year.

The Regulation Requirement MW table is posted on pjm.com at:

http://www.pjm.com/markets-and-operations/ancillary-services.aspx

PJM Members Actions

- Each LSE determines its estimated Regulation obligation for the operating day based on its own forecast load and the information received via the PJM ALL-CALL.
- Resource owners view the half hour~~ly~~ Regulation market results via Markets Gateway (available at least ten (10) minutes~~half an hour~~ before the operating interval~~hour~~) as to those resources to which Regulation has been assigned. Resource owners that have self-scheduled Regulation on any of their resources inform the PJM dispatcher when those resources are online and able to provide the self-scheduled Regulation.

- Subsection 4.3.4 Dispatching Regulation
  - Removed Regulation Excess

~~**Regulation Excess**~~

~~If, during the period, an excess in assigned Regulation occurs and the total PJM RTO Regulation value exceeds the objectives by 15 MW or more, the PJM dispatcher de-assigns Regulation economically based on each resource's total cost to provide Regulation, including real time opportunity cost and the resource's Regulation offer price.~~

- Section 4.4 Qualifying Regulation Resources
  - Removed mentions of RegD tests

~~**Dynamic Resources**~~

~~The qualification test procedures described above for resources that will follow the dynamic Regulation signal (RegD) are the same as the qualification test for RegA. For each test, resources will follow a signal for 40 minutes and be scored using the performance score calculation. Resources must complete a separate set of tests to qualify for the traditional signal (RegA) or the dynamic signal (RegD).~~

- Section 4.4 Qualifying Regulation Resources
  - Updated changes to the signal path re-test – existing resource owner to set the resource performance score to the re-test qualification score for the exception of changes to the signal path are initiated by PJM or impacts all or a large portion of PJM Regulation fleet.

Changes to the Signal Path Re-Test – Existing Resource Owner

For previously qualified resources where an existing resource owner makes changes to the Energy Management System (EMS) or Generation Management System (GMS), or other changes which would constitute a change in the Regulation signal path, resource owners must conduct testing based on mutual agreement with PJM. This includes, but is not limited to, the EMS/GMS database, Inter-Control Center Communication Protocol (ICCP) servers and Communication Front End (CFE) replacements and/or upgrades. After system verification, the resources~~' historic~~ performance score will be set to the re-test qualification score~~maintained~~. This test must be administered by PJM. If the changes to the signal path are initiated by PJM or impacts all or a large portion of the PJM Regulation fleet, then keeping historic performance scores will be implemented following test to prove signal path verification.

- Section 4.4 Qualifying Regulation Resources
  - Reduce from 3 to 2 consecutive regulation tests for new qualifying resources

4.4.2 Certifying Regulating Resource

A resource may be certified only after it achieves two~~three~~ consecutive scores of 75 percent or above. Resources providing dispatchable energy and Regulation service needs to provide testing at the low economic and high economic Regulation limits.

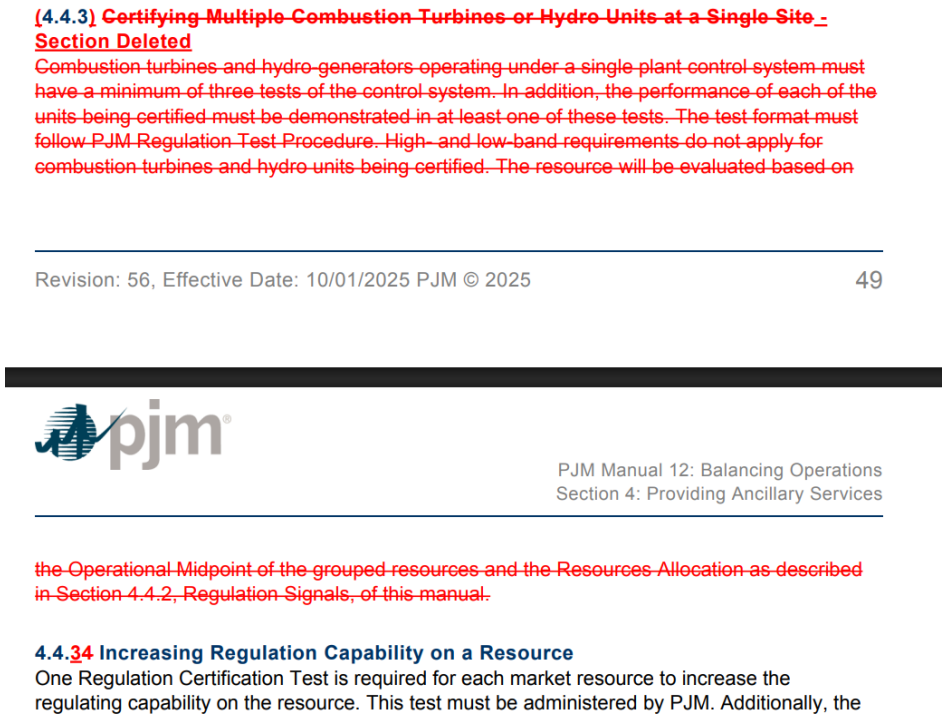
A resource may choose one option that is more preferable for the resource:

1st Option: 1 self-administered test and 1 PJM-administered test

2nd option: 2 PJM-administered tests

If a resource picks the first option, then a self-administered test has to be performed prior to PJM-administered test.

- Section 4.4 Qualifying Regulation Resources
  - Deleted subsection 4.4.3 Certifying Multiple Turbines or Hydro Units at a Single Site
  - Re-numbered existing subsections 4.4.3 through 4.4.8



(4.4.3) ~~Certifying Multiple Combustion Turbines or Hydro Units at a Single Site~~ - Section Deleted

~~Combustion turbines and hydro-generators operating under a single plant control system must have a minimum of three tests of the control system. In addition, the performance of each of the units being certified must be demonstrated in at least one of these tests. The test format must follow PJM Regulation Test Procedure. High- and low-band requirements do not apply for combustion turbines and hydro units being certified. The resource will be evaluated based on~~

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PJM Manual 12: Balancing Operations
Section 4: Providing Ancillary Services

~~the Operational Midpoint of the grouped resources and the Resources Allocation as described in Section 4.4.2, Regulation Signals, of this manual.~~

4.4.34 Increasing Regulation Capability on a Resource

One Regulation Certification Test is required for each market resource to increase the regulating capability on the resource. This test must be administered by PJM. Additionally, the

- Subsection 4.4.4 Disqualification and Re-Qualification of a Regulation Resource
  - Reduce from 3 to 1 regulation test for disqualified resources to qualify back into Regulation market
  - Changed from 100 hours to 200 (30 minute) intervals

4.4.45 Disqualification and Re-Qualification of a Regulation Resource

Regulating resources that have not met performance thresholds over a specified time period will be disqualified and must re-qualify to offer into the Regulationregulating market for applicable signal type (RegA or RegD). The disqualification threshold is based on the historic performance score. The historic performance score is a rolling average actual intervalhourly performance score for the last 200 intervals100 hours a resource has operated or a weighted average of the average of the twothree initial or requalification scores that are then averaged with available actual intervalhourly performance scores. The intervalhourly performance score calculation is described in Section 4.4.56, Performance Score Calculation, of this manual.

When the historical performance score falls below 40 percent by signal type, PJM will notify the resource owner and the resource will no longer be eligible to offer into the Rregulation market for the applicable signal type.

The resource owner may schedule a re-test as soon as practicable. One Regulation Certification Test is required for each resource to re-qualify for Regulation market. When a regulating resource re-tests, it will follow the testing procedure described in Sections 4.4.1–4.4.3

$$Interval = \frac{X^{*}Qualification\ Performance\ Score + Y^{*}Actual\ Performance\ Score}{200}$$

Where 2100 – X = Y and Y is the number of intervalshours after qualification. After 2100 30 minute intervalshours of actual performance scores X → 0.

- Subsection 4.4.5 Performance Score Calculation
  - Removed Accuracy (Correlation), Delay and Precision scores.

Delay and Correlation Score

For each 10-second interval starting from Time 0 +10, PJM will calculate a Delay Score to quantify the delay in response between the regulation signal (RegA) and the resource change in output. To calculate the match, use the statistical correlation function (r), which measures the degree of relationship between the two signals. By shifting the time periods to compare the signals, delay (δ) is defined at the point in time of the maximum correlation between the two signals. This generates both a Correlation and Delay Score as:

Where the Delay Score allows a 10-second latency for signal propagation delay for regulating resources.

Correlation and Delay are determined together by finding the 10-second interval with the highest coincident Correlation and Delay score. The 10-second interval that will determine Correlation and Delay for each scoring period is:

$$\max_{\Delta = 0 \text{ to } 5 \text{ Min}} (Delay\ Score + Correlation\ Score)$$

Correlation During Periods of Zero Slope

If the standard deviation of the regulation signal is less than a threshold value, then the Correlation shall be calculated as the 1 – absolute difference between the slope of the regulation signal and the slope of the response. The performance score for Correlation and Delay will be calculated by using linear regression to find the slopes of the regulation signal and the resource response.

Performance Score Calculation

For each 10-second set of calculations the performance score will be averaged over a five minute period for PJM will determine a composite Performance Score per resource as a unit-less scalar ranging from 0 to 1. The Performance Score will be a weighted average of the performance score components, as:

$$Performance\ Score(t) = \max_{i=0 \text{ to } 5\text{min}} \left[A * Delay\ Score(t+i) + B * Correlation\ Score(t+i)\right] + C * Precision\ Score(t)$$

- Subsection 4.4.5 Performance Score Calculation
  - Updated formulas for Performance scores.

$$Error = Avg\ of\ Abs\left|\frac{Abs\left(Response_{10sec} - Signal_{10sec}\right)}{0.5 * IntervalSignal_{AvgAbs} + 0.5 * AReg}\right|$$

$$IntervalSignal_{AvgAbs} = \frac{1}{n}\sum Abs\left(Signal\right)$$

$$Performance\ Score = 1 - \frac{1}{n}\sum Abs(\ Error)$$

Where n is the number of samples in the interval and AReg is the assigned Regulation megawatt. The performance score~~hour and the precision~~ allows a 10 second latency for signal propagation delay for regulating resources.

- Subsection 4.4.9 Regulation De-assignment
  - Added a new subsection 4.4.9 to describe a new rule that self-de-assignment will result in zero score for the remainder of the commitment period.

4.4.9 Regulation De-assignment

Self-de-assignment results in zero score for the remainder of the commitment period. PJM Dispatcher de-assignment does not impact performance score.

PJM Actions

- PJM will assign zero in performance score for self-de-assignment for the remainder assigned interval.

PJM Member Actions

- None

Contact

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Regulation Redesign Phase 1 Implementation Update

Manual 12, Rev 56 – Regulation Redesign Phase 1

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