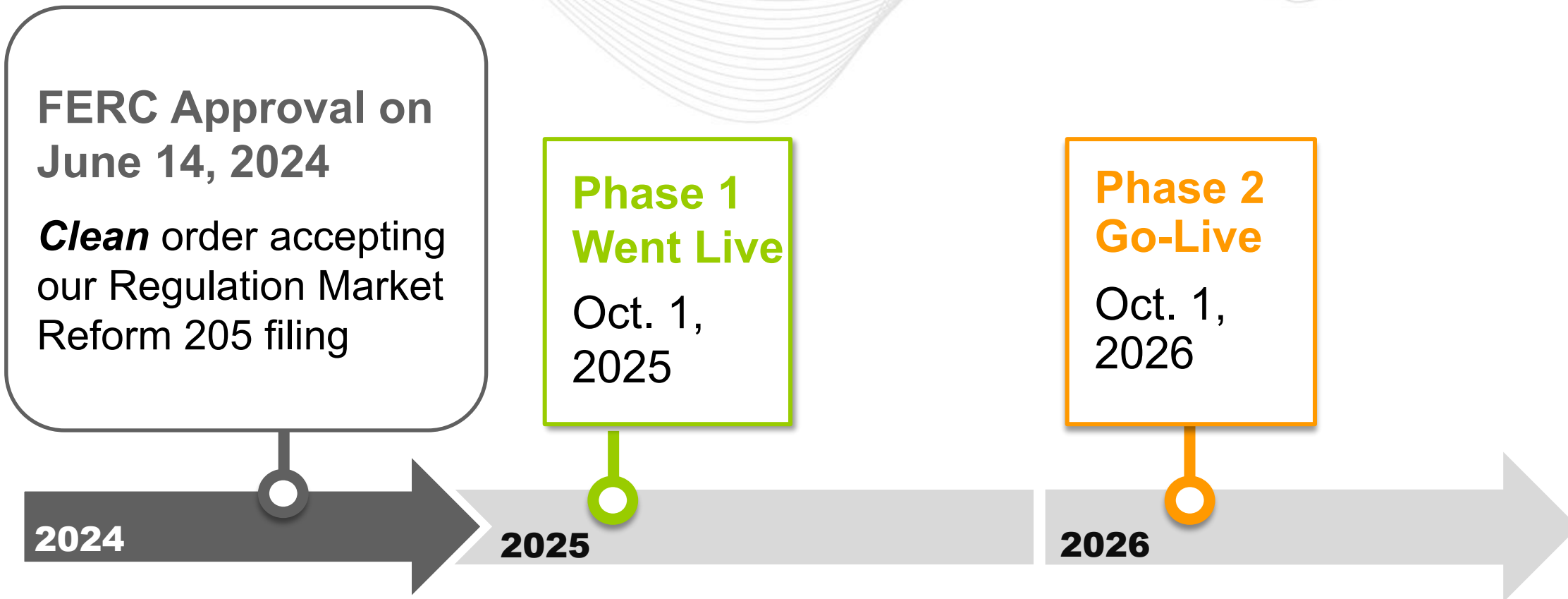




# Regulation Redesign Phase 2 Open House

March 30, 2026



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Moving From a One-Signal Bidirectional Product to One-Signal RegUp and RegDn Products **will split many of the design elements into two.**

## **Two Requirements:**

One for RegUp and one for RegDn

## **Two Offers:**

One for RegUp and one for RegDn

## **Two performance scores and mileages:**

One for RegUp and one for RegDn

## **Two clearing prices:**

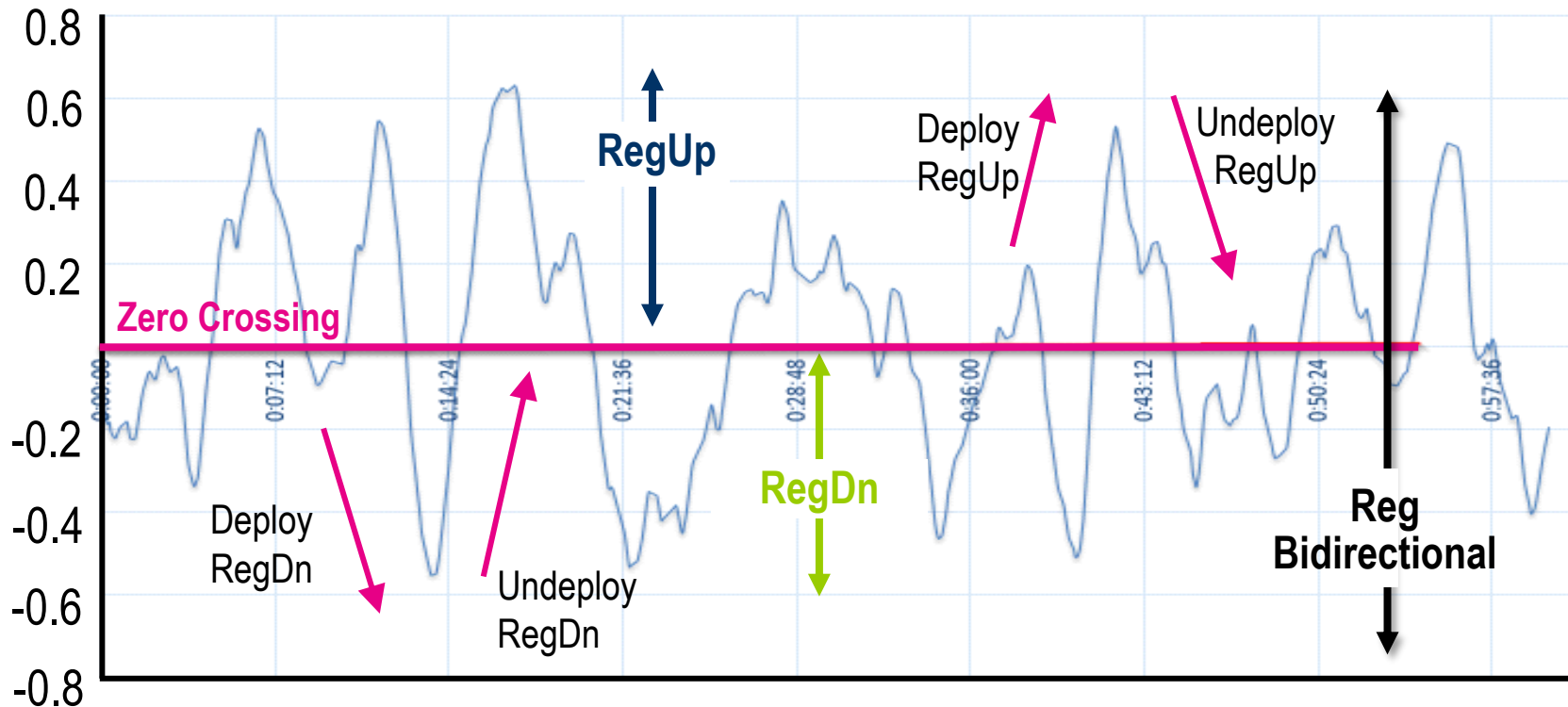
One for RegUp and one for RegDn

## **Two settlement billings:**

One for RegUp and one for RegDn

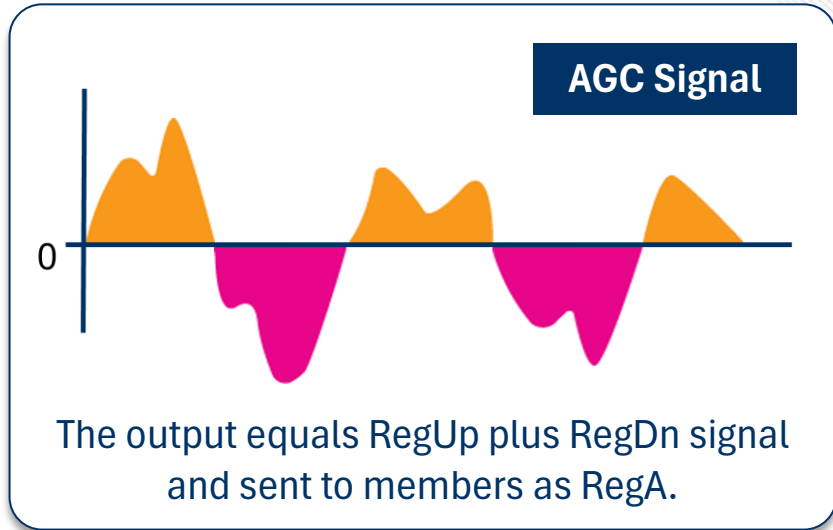
#	Design Components	Summary Description
1	<b>Signals and Products</b>	Bifurcate <b>one</b> signal bidirectional to two products, <b>RegUp and RegDn</b> , each with its own requirement, clearing price and settlement. Eligible resources will be able to offer, clear and follow either the RegUp, RegDn or both in a given market interval. Only one product is deployed at a time.
2	<b>Requirement MW</b>	Seasonal and hourly requirement MW separate for RegUp and RegDn may be asymmetric to better reflect operational needs, with consideration both to historic and future system conditions and with annual requirements MW updates.
3	<b>Performance Metrics</b>	Phase 1 changes plus performance score, mileage and bias-factor calculation separately for RegUp and RegDn.
4	<b>Offer and Clearing Timing</b>	Phase 1 changes plus offer MW, offer price and availability status separately for RegUp and RegDn. Offer MW will change from hourly granularity to 30 min. granularity.
5	<b>Opportunity Cost Calculation</b>	Separate resource's RegUp and RegDn opportunity cost for pricing. Settlements will calculate one intra-commitment opportunity cost that accounts for both RegUp and RegDn assignments on a resource. The settlements calculated intra-commitment opportunity cost will also account for the amount of energy produced while providing Regulation, referred to as "Regulation signal bias."
6	<b>Settlement</b>	<p>Regulation billing for Reg Up and Reg Dn</p> <ul style="list-style-type: none"> <li>- Separate clearing price credits for RegUp and RegDn</li> <li>- Ability to submit Regulation bilateral transactions separately for RegUp and RegDn</li> <li>- Separate clearing price charges for RegUp and RegDn</li> <li>- A single lost opportunity lost credit accounting for both RegUp and RegDn assignments</li> <li>- A single lost opportunity cost charge</li> </ul>

## Moving From a One-Signal Bidirectional Product to One-Signal RegUp and RegDn Products

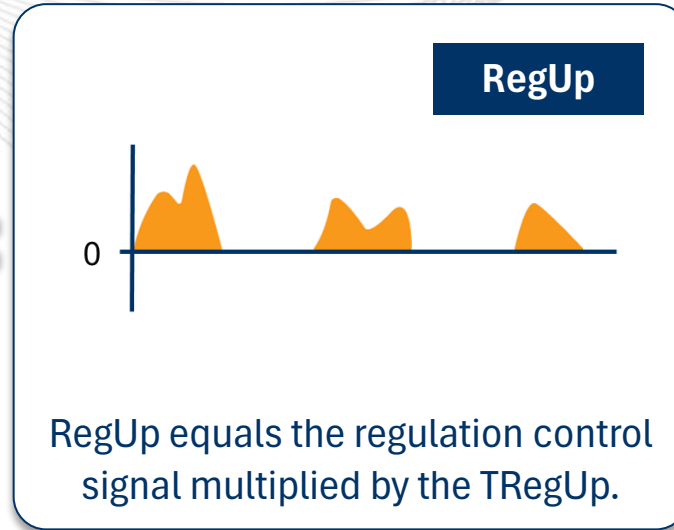


- RegUp product operates above the zero crossing.
- RegDn product operates below the zero crossing.
- Resources will be able to follow the full signal (bidirectional) by being assigned RegUp and RegDn.
  - Only one product will be deployed at a time.

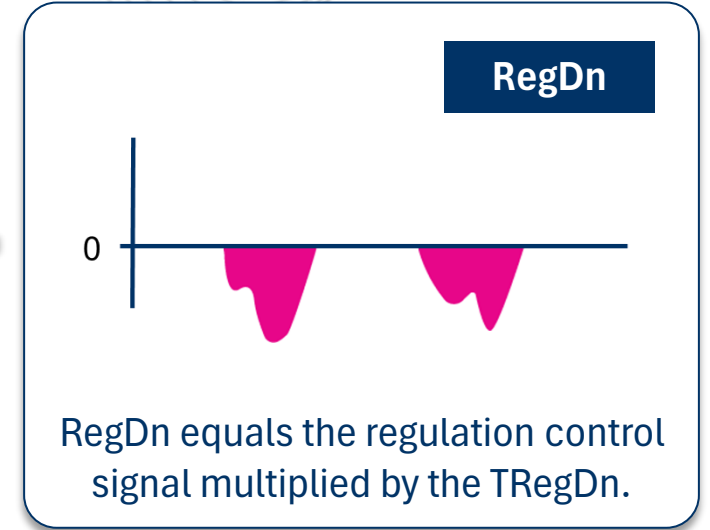
# Phase 2 Regulation Signal/Products



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## Types of Awards

	ARegUp	AReg Dn	RegUp	RegDn	Reg
<b>RegUp only</b>	10	0	RC*10	RC*0	0 to 10
<b>RegDn only</b>	0	10	RC*0	RC*10	0 to -10
<b>RegUp and RegDn</b>	10	10	RC*10	RC*10	10 to -10

*RC = Regulation controller signal*

[PJM.com > Markets & Operations > Ancillary Services > Regulation Redesign Phase 2 FAQs \(PDF\)](https://www.pjm.com/markets-operations/ancillary-services/regulation-redesign/phase-2-faqs)

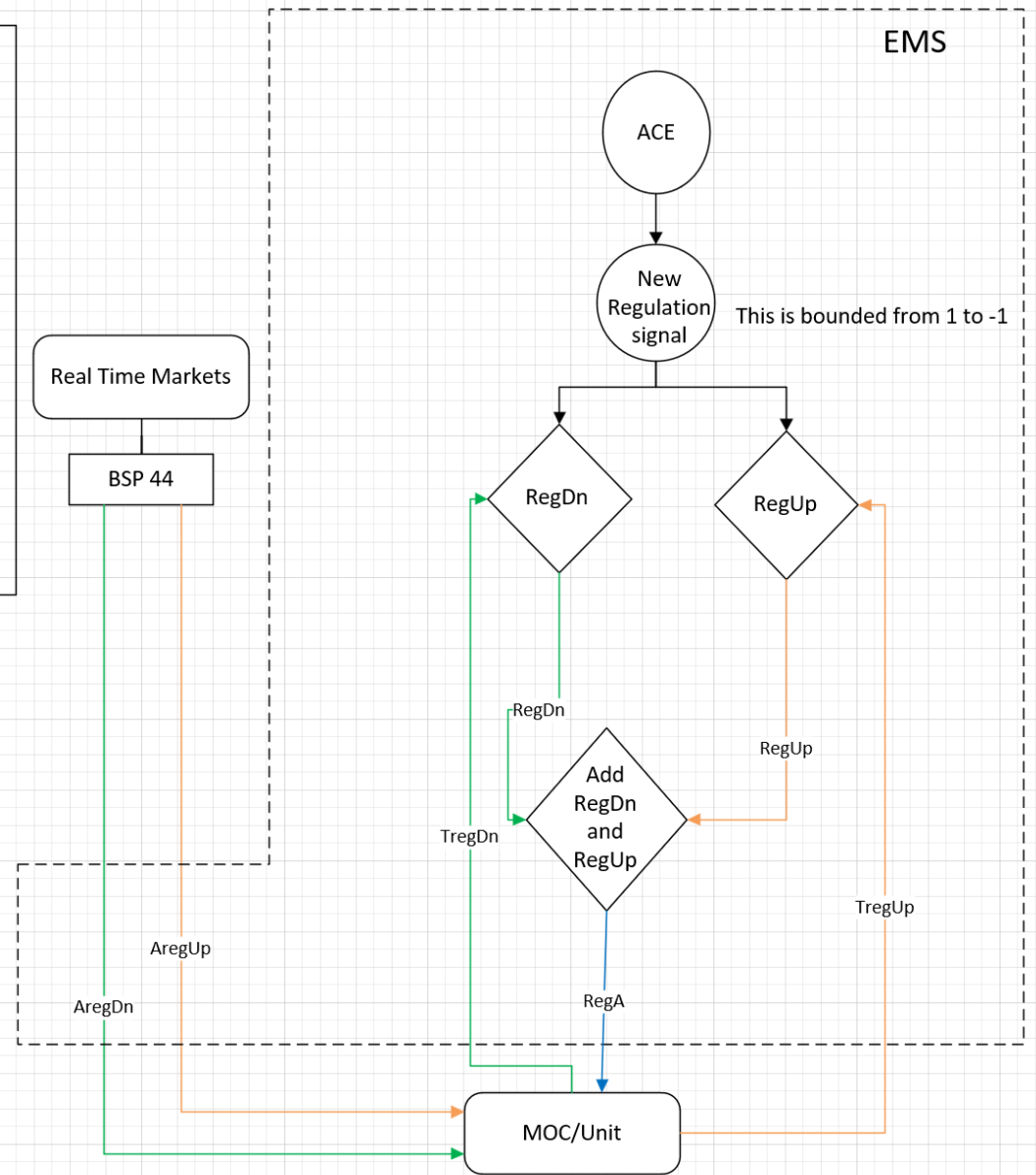
**Point Definitions:**

<b>TregDn</b> = Amount of down regulation unit can supply (max = AregD)	New
<b>RegDn</b> = Regulation down signal = $\text{if}(\text{Reg} > 0, \text{TregDn} * \text{Reg}, 0)$	Internal
<b>TregUp</b> = Amount of up regulation unit can supply (max = AregU)	New
<b>RegUp</b> = Regulation up signal = $\text{if}(\text{Reg} < 0, \text{TregUp} * \text{Reg}, 0)$	Internal
<b>RegA</b> = Regulatio signal sent to Members, consisting of both RegUp/Dn	Reuse
<b>AregDn</b> = Down Regulation awarded by Markets	New
<b>AregUp</b> = Up Regulation awarded by Markets	New
<b>CregDn</b> = Down Current Regulation (from members and calculated)	New
<b>CregUp</b> = Up Current Regulation (from members and calculated)	New
<b>SOC</b> = State of Charge	New

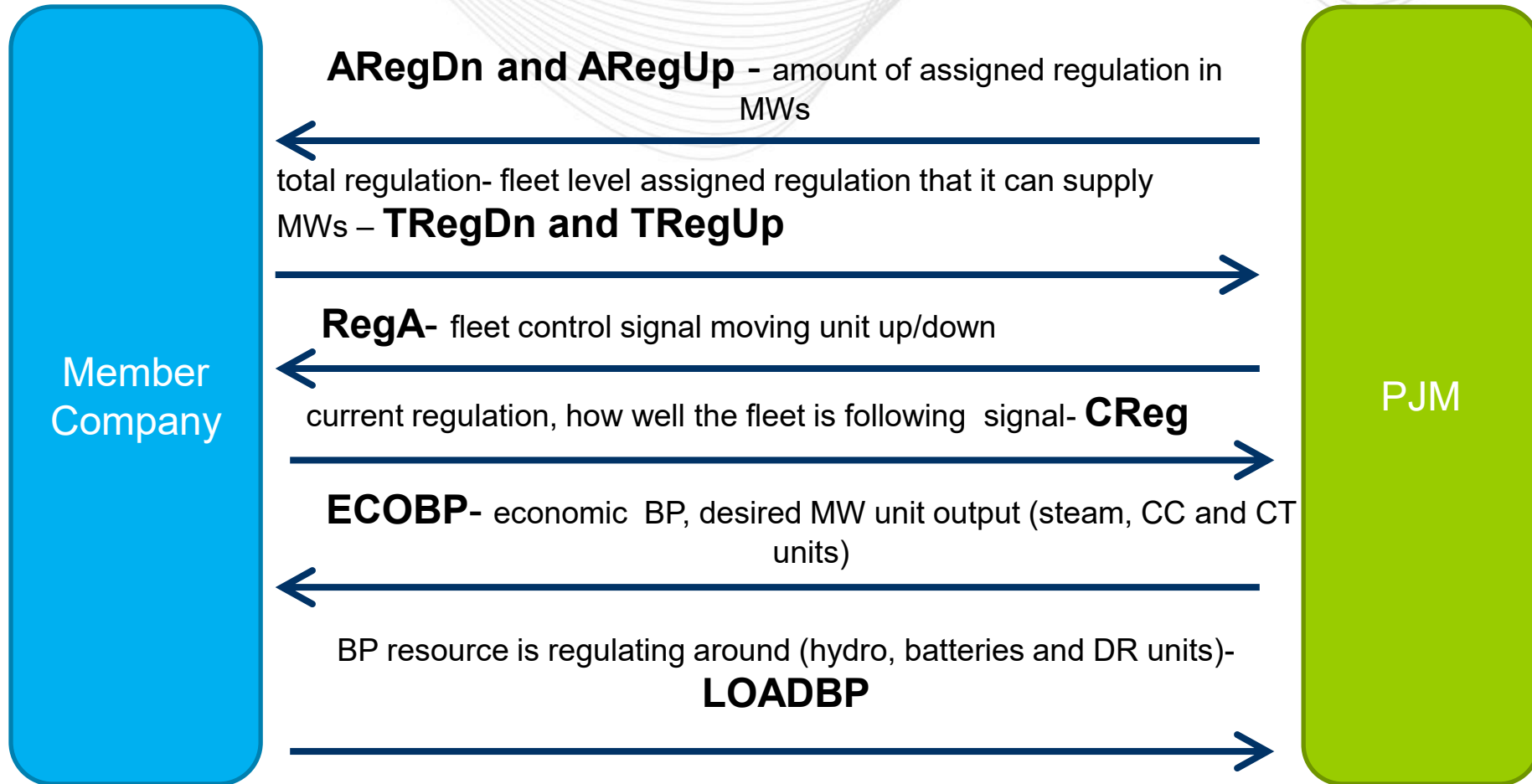
**Notes:**

With this version the members and EMS would have to add AregUp/Dn and TregUp/Dn signals. The members would all have to change their regulation control systems to accommodate this.

New regulation test signals will have to be created for both up and down regulation testing.



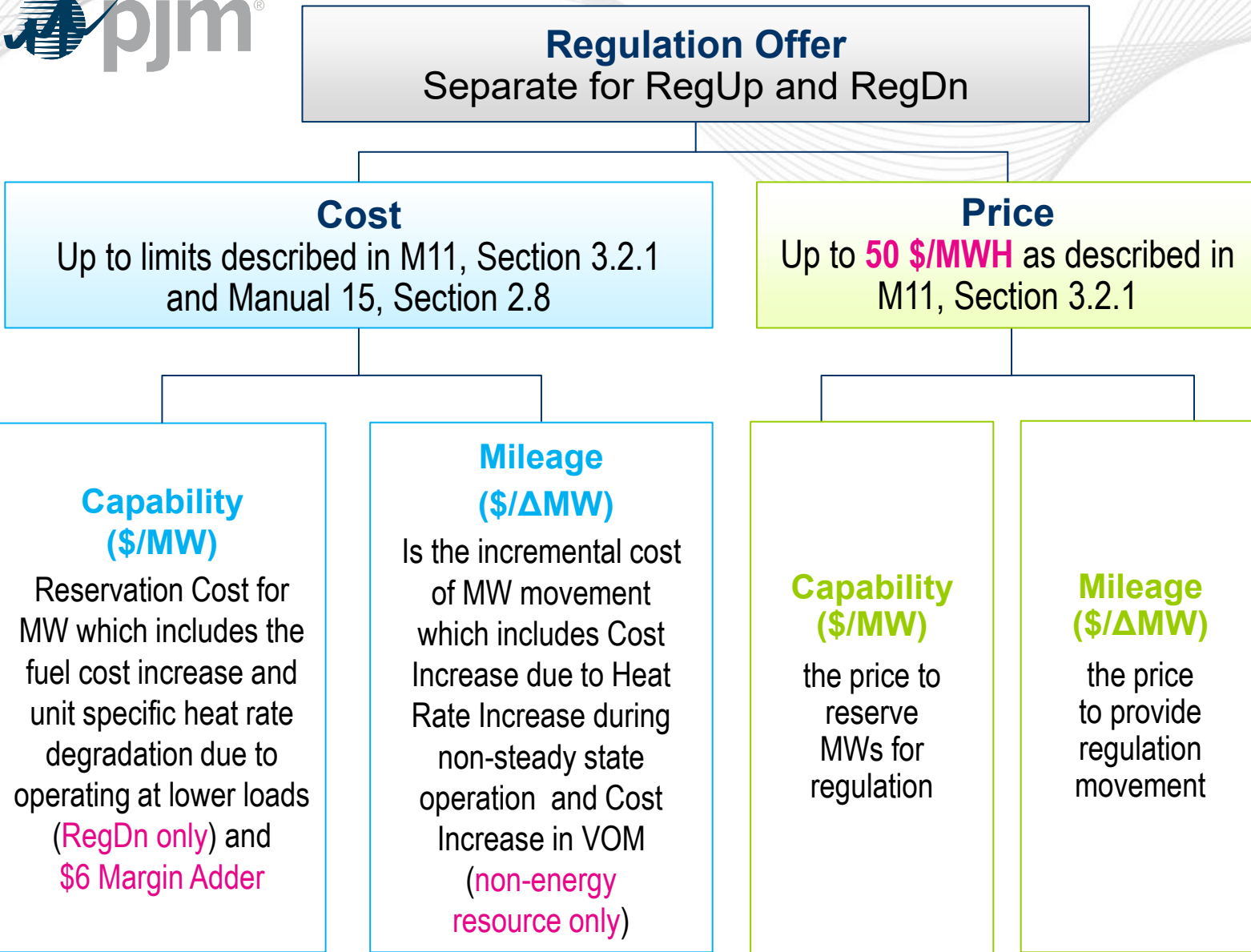
# Regulation Signal/Telemetry Requirements



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

*HE – Hour Ending*

[regulation-up-and-down-effective-megawatt-requirement-definition.pdf](https://www.pjm.com/regulation-up-and-down-effective-megawatt-requirement-definition.pdf)



- VOM is removed from Offers, except for Regulation Only Resources
- Under Regulation-Up and Regulation-Down products the Offer change by:
  - Price is now \$50/MWH per product (currently \$100/MWH for bidirectional)
  - Margin Adder is now \$6 per product (currently \$12 for bidirectional)
  - The cost for operating at lower loads is only realized for Reg-Down

**RegUp** only resource will follow regulation signal above the zero crossing only

**RegDn** only resource will follow regulation signal below the zero crossing only

**RegUp/RegDn** resource may submit offers into (and clear in) both RegUp and RegDn markets for the same interval

*Option available for Market Participants around the clearing constraint*

- Self de-assign will result in zero performance score in the regulation market interval (current or next)
- PJM dispatch de-assign does not impact performance score in the regulation market interval (current or next)

- Self-scheduled may be submitted for RegUp only, RegDn only, or for both RegUp and RegDn
  - A resource offering both RegUp and RegDn in the same interval cannot submit self-schedule in one direction only
- Participants offering both RegUp and RegDn may constrain clearing to bi-directional only, bi-directional and symmetrical, or leave offers unconstrained



# Regulation Clearing Price Credit: Capability (BLI 2340)

## Phase 1

### Regulation Market Capability Clearing Price Credit

$$\text{Regulation MW} \times \text{Actual Performance Score} \times \frac{\text{RMCCP}}{12}$$

- Calculated for each 5-minute interval
- If 5-minute performance score < 0.25, credits = \$0

## Phase 2

### Regulation Market Capability Clearing Price Credit

$$\text{Regulation Up MW} \times \text{Reg Up Actual Performance Score} \times \frac{\text{Reg Up RMCCP}}{12}$$

$$\text{Regulation Down MW} \times \text{Reg Down Actual Perf Score} \times \frac{\text{Reg Down RMCCP}}{12}$$

#### **PHASE 2 IMPACTS**

- Capability Clearing Price Credit for each Product: RegUp and RegDn
- Product Specific
  - Assignments
  - Performance Scores
  - Clearing Prices



# Regulation Clearing Price Credit: Mileage (BLI 2340)

## Phase 1

Regulation Market Mileage Clearing Price Credit	
Regulation MW x Actual Performance Score x	$\frac{\text{Actual Mileage}}{\text{Daily Historic Mileage}} \times \frac{\text{RMMCP}}{12}$

- Calculated for each 5-minute interval
- If 5-minute performance score < 0.25, credits = \$0

## Phase 2

Regulation Market Mileage Clearing Price Credit	
Reg Up MW x Reg Up Actual Perf Score x	$\frac{\text{Reg Up Actual Mileage}}{\text{Reg Up Daily Historic Mileage}} \times \frac{\text{Reg Up RMMCP}}{12}$
Reg Down MW x Reg Dn Actual Perf Score x	$\frac{\text{Reg Down Actual Mileage}}{\text{Reg Down Daily Historic Mileage}} \times \frac{\text{Reg Down RMMCP}}{12}$

**PHASE 2 IMPACTS**

- Mileage Clearing Price Credit for each Product: RegUp and RegDn
- Product Specific
  - Assignments
  - Performance Scores
  - Actual Mileage
  - Historic Mileage
  - Clearing Prices



# Phase 2 Regulation Lost Opportunity Cost Credits (BLI 2340)

If a pool-scheduled resource is not compensated for its offer plus any opportunity costs via the clearing prices, a resource receives a Lost Opportunity Cost Credit.

$$\text{Lost Opportunity Cost Credit} = \frac{(\text{Regulation Offer} + \text{Intra Commitment Opportunity Cost} * \text{Actual Performance Score} + \text{Shoulder Opportunity Cost})}{12} - \text{Regulation Clearing Price Credits}$$

If applicable 5-minute performance score < 0.25, credit = \$0

- Consistent with the Regulation Clearing Price Credits, the Intra Commitment Opportunity Cost is multiplied by the applicable actual performance score.
- If resource is providing both Reg Up and Reg Dn products in the interval, the weighted average of the RegUp and RegDn performance scores is used.



# Regulation Clearing Price Charge (BLI 1340)

## Phase 2

$$\text{Reg Up Obligation} = \text{Total Reg Up Supplied} \times \frac{\text{RT Load}}{\text{Total PJM RT Load}} + \text{Reg Up Bilateral Sale} - \text{Reg Up Bilateral Purchase}$$

$$\text{Reg Dn Obligation} = \text{Total Reg Dn Supplied} \times \frac{\text{RT Load}}{\text{Total PJM RT Load}} + \text{Reg Dn Bilateral Sale} - \text{Reg Dn Bilateral Purchase}$$

- Total Regulation Supplied (excluding mileage) is for both pool-scheduled and self-scheduled resources and is calculated by summing the 5-minute intervals Regulation MW multiplied by the Performance Score by product type for all eligible resources integrated for an hour

$$\text{Reg Up Capability Clearing Price Charge} = \text{Total Reg Up RMCCP Credits} \times \frac{\text{Reg Up Obligation}}{\text{Total PJM Reg Up Obligation}}$$

$$\text{Reg Up Mileage Clearing Price Charge} = \text{Total Reg Up RMMCP Credits} \times \frac{\text{Reg Up Obligation}}{\text{Total PJM Reg Up Obligation}}$$

$$\text{Reg Dn Capability Clearing Price Charge} = \text{Total Reg Dn RMCCP Credits} \times \frac{\text{Reg Dn Obligation}}{\text{Total PJM Reg Dn Obligation}}$$

$$\text{Reg Dn Mileage Clearing Price Charge} = \text{Total Reg Dn RMMCP Credits} \times \frac{\text{Reg Dn Obligation}}{\text{Total PJM Reg Dn Obligation}}$$



# Lost Opportunity Cost Charge (BLI 1340)

## Phase 2

$$\text{Reg Up Obligation} = \text{Total Reg Up Supplied} \times \frac{\text{RT Load}}{\text{Total PJM RT Load}} + \text{Reg Up Bilateral Sale} - \text{Reg Up Bilateral Purchase}$$

$$\text{Reg Up Purchases} = \text{Max} (\text{Reg Up Obligation} - \text{Reg Up Self Scheduled Regulation MW Supplied}, 0)$$

$$\text{Reg Dn Obligation} = \text{Total Reg Dn Supplied} \times \frac{\text{RT Load}}{\text{Total PJM RT Load}} + \text{Reg Dn Bilateral Sale} - \text{Reg Dn Bilateral Purchase}$$

$$\text{Reg Dn Purchases} = \text{Max} (\text{Reg Dn Obligation} - \text{Reg Dn Self Scheduled Regulation MW Supplied}, 0)$$

$$\text{Reg Lost Opportunity Cost Charge} = \text{Total Lost Opportunity Cost Credits} \times \frac{\text{Reg Up Purchases} + \text{Reg Dn Purchases}}{\text{Total PJM Reg Up and Reg Down Purchases}}$$

#	Markets Gateway Screen	Summary Description
1	<b>Demand Response &gt; Regulation Market &gt; Offers Generator &gt; Regulation Market &gt; Offers</b>	Product Type Column added for RegUp and RegDn Reg Self Scheduled column moved to Unit > Detail / Demand Response > Parameters
2	<b>Demand Response &gt; Regulation Market &gt; Updates Generator &gt; Regulation Market &gt; Updates</b>	Tab renamed to 'Hourly Updates' Reg MW column removed – Offer MW is moved to Period Updates New column Symmetry – as a drop down with list as 'None', 'Bidirectional', 'Symmetrical' Existing Offer Price and Cost columns replaced with Offer Price and Offer Cost columns for RegUp and RegDn
3	<b>Demand Response &gt; Regulation Market &gt; Availability Updates Generator &gt; Regulation Market &gt; Availability Updates</b>	Tab renamed to 'Period Updates' and will have all parameters with 30-min granularity RegUp MW and RegDn MW columns added Reg Availability replaced with RegUp and RegDn Availability columns Reg Self-Schedule moved to a separate column from Reg Availability and is a single column that applies to both RegUp and RegDn
4	<b>Demand Response &gt; Demand Response &gt; Parameters Generator &gt; Unit &gt; Detail</b>	Regulation Self-Schedule field added and applies to both RegUp and RegDn New column Symmetry – as a drop down with list as 'None', 'Bidirectional', 'Symmetrical'
5	<b>Generator &gt; Unit &gt; Detail</b>	Regulation Resource checkbox replaced with RegUp Resource and RegDn Resource checkboxes



# Markets Gateway Summary of Changes – Phase 2

#	Markets Gateway Screen	Summary Description
6	<b>Generator &gt; Dispatch Lambda</b>	Reg MW column replaced with RegUp MW and RegDn MW columns
7	<b>Demand Response &gt; Market Results &gt; Regulation Award</b> <b>Generator &gt; Market Results &gt; Regulation Award</b>	Split into separate RegUp and RegDn Regulation Award tabs. It will continue to be 30-minute granularity.
8	<b>Public &gt; Market Results Ancillary &gt; Regulation Results</b>	Split into separate RegUp and RegDn Regulation Award tabs. It will continue to be 30-minute granularity.
9	<b>Bilaterals</b>	Reg MW column replaced with RegUp MW and RegDn MW columns.

Offer Type	Markets Gateway Location	Deadline to Update
Daily Offer	Demand Response > Regulation Market > Offers	End of Rebid Period (14:15) the day before the Operating Day
	Generator > Regulation Market > Offers	
Hourly Updates	Demand Response > Regulation Markets > Hourly Updates	35 Minutes Prior to the Operating Hour*
	Generator > Regulation Market > Hourly Updates	
Period Updates (30-min granularity, only applies to Regulation)	Demand Response > Regulation Market > Period Updates	35 Minutes Prior to the Operating Period
	Generator > Regulation Market > Period Updates	

\*Note: Hourly Regulation Capability Offer Price/Cost and Hourly Regulation Mileage Offer Price/Cost can only be updated intraday for resources that are opted in to Intraday Offers (IDO). If opted out of IDO, they may still be submitted prior to 14:15 the day before the Operating Day



# Sample ASO Case Execution, Posting and Target Intervals

Cases	Execution Time	Products Types	Markets Gateway Posting Deadline	Target Time (Begin)
ASO 00	12:30	Regulation & Reserves	12:50	13:00
ASO 30	13:00	Regulation Only	13:20	13:30
ASO 00	13:30	Regulation & Reserves	13:50	14:00
ASO 30	14:00	Regulation Only	14:20	14:30

- 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**



# Data Viewer and PJM.com Summary of Changes – Phase 2

#	Location	Summary Description
1	<a href="#">Data Viewer &gt; Ancillary Services &gt; Market Clearing Prices</a>	Remove the following fields - RTO Regulation Capability - RTO Regulation Performance Add the following fields - RTO Regulation Up Capability - RTO Regulation Up Mileage - RTO Regulation Down Capability - RTO Regulation Down Mileage - RTO Secondary Reserve - MAD Secondary Reserve
2	<a href="#">PJM.com &gt; Markets and Operations</a>	In Ancillary Services section, replace Regulation Price with Regulation Up Price and Regulation Down Price.

No.	Milestone	Timeline
1	Regulation Redesign project – information update at the TCF begins	March 2026
2	Open Houses 1 & 2 (virtual)	March and July 2026
3	Markets Gateway Train (Sandbox) opens for testing	April 2026
4	RegUp/RegDn resources conversion testing begins	April 8, 2026
5	All related manuals first read (Phase 1): M11, M12, M15, M28	July 2026
6	All related manuals endorsed (Phase 1): M11, M12, M15, M28	August 2026 (September if needed)
7	Special education session	August/September 2026
8	Regulation Redesign Phase 2 market opens	Sept. 25, 2026
9	Regulation Redesign Phase 2 go-live (cutover)	Oct. 1, 2026, at 00:00



## Regulation market seller engagement

- Reliance on RegUp/RegDn offer data
- Proactively participates in the project activities
- Timely report of issues/concerns



## Rigorous testing and simulations

- Sandbox opens for offer data and market results
- Leveraging Market PCT in simulations for insightful market outcomes

The following documents have been posted on the Ancillary Services page under a new section called **Regulation Redesign Phase 2:**

[PJM.com > Markets & Operations > Ancillary Services >](#)

1. [Regulation Up & Down Effective Megawatt Requirement Definition \(PDF\)](#)
2. [Regulation Redesign Phase 2 FAQ \(PDF\)](#)
3. **Sample Regulation Up and Regulation Down Test Signal Pattern XLS**
4. [Regulation Conversion Testing Checklist for Phase 2](#)
5. **40-Minute Performance Score Template XLS**

Inquiry	Email Contact
<b>To request a Regulation test</b>	<a href="mailto:RegulationTesting@pjm.com">RegulationTesting@pjm.com</a>
<b>Regulation telemetry – signal setup or conversion</b>	<a href="mailto:PJMTelemetrySupport@pjm.com">PJMTelemetrySupport@pjm.com</a>
<b>Regulation redesign questions</b>	<a href="mailto:RegulationDesign@pjm.com">RegulationDesign@pjm.com</a>
<b>Communication to PJM Member Relations</b>	<a href="mailto:custsvc@pjm.com">custsvc@pjm.com</a>