Regulation Redesign Phase 2

Market Settlements Subcommittee

August 10, 2026

October 28, 2026 (Slides 12 and 13 updated)

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Regulation Redesign – Phase Implementation and Timeline

FERC Approval on June 14, 2024

Clean order accepting our Regulation Market Reform 205 filing

Phase 1 Went Live

Oct. 1, 2025

Phase 2 Go-Live

Dec. 1, 2026*

*FERC approved Phase 2 go-live date of Dec 1, 2026

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Regulation Signal and Market Products – Phase 2

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

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Phase 2 Summary of Changes

#	Design Components	Summary Description
1	**Signals and Products**	Bifurcate ***one*** signal bidirectional to two products, **RegUp and RegDn**, 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	**Requirement MW**	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	**Performance Metrics**	Phase 1 changes plus performance score, mileage and bias-factor calculation separately for RegUp and RegDn.
4	**Offer and Clearing Timing**	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	**Opportunity Cost Calculation**	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	**Settlement**	Regulation billing for Reg Up and Reg Dn – Separate clearing price credits for RegUp and RegDn – Ability to submit Regulation bilateral transactions separately for RegUp and RegDn – Separate clearing price charges for RegUp and RegDn – A single lost opportunity lost credit accounting for both RegUp and RegDn assignments – A single lost opportunity cost charge

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Regulation Clearing Price Credit
Capability (BLI 2340)

Phase 1

Regulation Market Capability Clearing Price Credit
$\text{Regulation MW} \times \text{Actual Performance Score} \times \frac{\text{RMCCP}}{12}$

Phase 2

Regulation Market Capability Clearing Price Credit
$\text{RegUp MW} \times \text{RegUp Actual Performance Score} \times \frac{\text{RegUp RMCCP}}{12}$
$\text{RegDn MW} \times \text{RegDn Actual Perf Score} \times \frac{\text{RegDn RMCCP}}{12}$

- Calculated for each 5-minute interval
- If actual 5-minute performance score by product type < 0.25, credit = $0

Phase 2 Impacts

Capability Clearing Price Credit for each Product:
RegUp and RegDn

Product Specific
- Assignments
- Performance Scores
- Clearing Prices

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Regulation Clearing Price Credit
Mileage (BLI 2340)

Phase 1

Regulation Market Mileage Clearing Price Credit

$$\text{Regulation MW} \times \text{Actual Performance Score} \times \frac{\text{Actual Mileage}}{\text{Daily Historic Mileage}} \times \frac{\text{RMMCP}}{12}$$

Phase 2

Regulation Market Mileage Clearing Price Credit

$$\text{RegUp MW} \times \text{Reg Up Actual Perf Score} \times \frac{\text{RegUp Actual Mileage}}{\text{Reg Up Daily Historic Mileage}} \times \frac{\text{RegUp RMMCP}}{12}$$

$$\text{RegDn MW} \times \text{RegDn Actual Perf Score} \times \frac{\text{RegDn Actual Mileage}}{\text{RegDn Daily Historic Mileage}} \times \frac{\text{RegDn RMMCP}}{12}$$

- Calculated for each 5-minute interval
- If actual 5-minute performance score by product type < 0.25, credit = $0

Phase 2 Impacts

Mileage Clearing Price Credit for each Product:
RegUp and RegDn

Product Specific

- Assignments
- Performance Scores
- Actual & Historic Mileage
- Clearing Prices

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Phase 2 Regulation Lost Opportunity Cost Credit (BLI 2340)

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

Lost Opportunity Cost Credit =

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

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

- Intra Commitment Opportunity Cost is multiplied by the applicable actual performance score.
  - If resource is providing both RegUp and RegDn products in the interval, a single intra-commitment opportunity cost is calculated and the weighted average of the RegUp and RegDn performance scores is used.
- Intra-commitment Opportunity costs and shoulder interval opportunity costs for Economic Load Response resources and Regulation only resources are zero.

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Phase 2 Regulation Clearing Price Charge (BLI 1340)

PHASE 2

RegUp Obligation =	Total Effective RegUp x	$\frac{\text{RT Load}}{\text{Total PJM RT Load}}$	+ RegUp Bilateral Sale – RegUp Bilateral Purchase
RegDn Obligation =	Total Effective RegDn x	$\frac{\text{RT Load}}{\text{Total PJM RT Load}}$	+ RegDn Bilateral Sale – RegDn Bilateral Purchase

Total Effective Regulation (excluding mileage) by product type is the hourly integrated sum of the 5-minute interval Regulation MW multiplied by the actual performance score for all pool-scheduled and self-scheduled resources.

RegUp Capability Clearing Price Charge =	Total RegUp RMCCP Credits x	$\frac{\text{RegUp Obligation}}{\text{Total PJM RegUp Obligation}}$
RegUp Mileage Clearing Price Charge =	Total RegUp RMMCP Credits x	$\frac{\text{RegUp Obligation}}{\text{Total PJM RegUp Obligation}}$
RegDn Capability Clearing Price Charge =	Total RegDn RMCCP Credits x	$\frac{\text{RegDn Obligation}}{\text{Total PJM RegDn Obligation}}$
RegDn Mileage Clearing Price Charge =	Total RegDn RMMCP Credits x	$\frac{\text{RegDn Obligation}}{\text{Total PJM RegDn Obligation}}$

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Phase 2 Regulation Lost Opportunity Cost Charge (BLI 1340)

PHASE 2

RegUp Obligation =	$\text{Total Effective RegUp} \times \frac{\text{RT Load}}{\text{Total PJM RT Load}} + \text{RegUp Bilateral Sale} - \text{RegUp Bilateral Purchase}$
RegDn Obligation =	$\text{Total Effective RegDn} \times \frac{\text{RT Load}}{\text{Total PJM RT Load}} + \text{RegDn Bilateral Sale} - \text{RegDn Bilateral Purchase}$
RegUp Purchases =	Max (RegUp Obligation – RegUp Self Scheduled Regulation MW, 0)
RegDn Purchases =	Max (RegDn Obligation – RegDn Self Scheduled Regulation MW, 0)
Reg Lost Opportunity Cost Charge =	$\text{Total Lost Opportunity Cost Credits} \times \frac{\text{RegUp Purchases + RegDn Purchases}}{\text{Total PJM RegUp and RegDn Purchases}}$

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MSRS – New Phase 2 Reports

MSRS Report	New Phase 2 Information
Regulation Hydro Opportunity Cost Details	Supporting details for hydro intra-commitment opportunity cost calculations
Regulation Intra-commitment Opportunity Cost Details	Supporting details for intra-commitment opportunity cost calculations for non-hydro generators
Regulation Shoulder Opportunity Cost Details	Supporting details for shoulder opportunity cost calculations

MSRS Report Documentation for new reports has been posted on pjm.com.
Report documentation (Description, CSV, and XML) is also posted with May MSS materials.

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MSRS Reports – Existing Reports

MSRS Report	Format changes	Phase 2 Impact
Regulation Market Credits	No	Phase 1 MSRS report designed to allow different product types • Phase 1 product type = Regulation • Phase 2 product types = RegUp or RegDn
Regulation Market Lost Opportunity Cost Credits	Yes	• Hydro details (Avg LMP, RT LMP) moved to new Hydro report • Additional details by product type (RegUp and RegDn)
Regulation Summary	Yes	Additional details by product type (RegUp and RegDn)
Hydro Peak Period Average LMP Details	No	No changes

MSRS report documentation (Description, CSV, and XML) is posted with May MSS materials.
MSRS Report Documentation on pjm.com for existing reports will be updated closer to implementation date.

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Regulation Hydro Opportunity Cost Details (New)

This report displays the customer account's 5-minute Regulation Opportunity Cost Details for hydro generation units.

The Opportunity Cost ($) XML Column Name and Column Number were updated on October 28, 2026.

The following columns will appear in the body of the report:

Online and CSV Column Name	XML Column Name	Column Number	Data Type
Customer ID	CUSTOMER_ID	4000.01	INTEGER
Customer Code	CUSTOMER_CODE	4000.02	VARCHAR2(6)
EPT Interval Ending	EPT_INTERVAL_ENDING	4001.40	VARCHAR2(40) mm/dd/yyyy HH24:MM format (Displays first interval of the day as hour 0 minute 05 and last interval of the day as hour 24 minute 00)
GMT Interval Ending	GMT_INTERVAL_ENDING	4001.41	VARCHAR2(40) mm/dd/yyyy HH24:MM format (Displays first interval of the day in relation to EPT interval as hour 04 minute 05 or hour 05 minute 05 (EDT/EST depending) and last interval of the day as hour 04 minute 00 of the next day or hour 05 minute 00 of the next day (EDT/EST depending))
Regulation Duration (% 5 Min Interval)	REG_DURATION	2340.72	NUMBER
Unit ID	UNIT_ID	4000.63	NUMBER(8,0)
Unit Name	UNIT_NAME	4000.64	VARCHAR2(75)
Unit Ownership Share	UNIT_OWNERSHIP_SHARE	3000.80	NUMBER
PJM-Assigned RegUp MW	PJM_ASSIGNED_REGUP_MW	2340.68	NUMBER
PJM-Assigned RegDn MW	PJM_ASSIGNED_REGDN_MW	2340.69	NUMBER
RegUp Bias Factor	REGUP_BIAS_FACTOR	2340.73	NUMBER
RegDn Bias Factor	REGDN_BIAS_FACTOR	2340.74	NUMBER
Reg Bidirectional Bias Factor	REG_BIDIR_BIAS_FACTOR	2340.75	NUMBER
Regulation Deviation MW	REGULATION_DEVIATION_MW	2340.76	NUMBER
Hydro Spill Indicator	HYDRO_SPILL_INDICATOR	4000.67	VARCHAR2(1) See possible values below
DA Scheduled MWh	DA_SCHD_MWH	3000.32	NUMBER
Hydro Average LMP ($/MWh)	HYDRO_AVG_LMP	2340.62	NUMBER
RT LMP ($/MWh)	RT_LMP	3000.25	NUMBER
Opportunity Cost ($)	OPPORTUNITY_COST	2340.96	NUMBER
Prorated Opportunity Cost ($)	PRORATED_REG_OPP_COST	2340.77	NUMBER
Version	VERSION	4000.07	VARCHAR2(12)

Hydro Spill Indicator: Y or N

Regulation Intra-Commitment Opportunity Cost Details (New)

This report displays the customer account's 5-minute Regulation Intra-Commitment Opportunity Cost Details for non-hydro generation units.

The Opportunity Cost ($) Column Number
was updated on October 28, 2026.

The following columns will appear in the body of the report:

Online and CSV Column Name	XML Column Name	Column Number	Data Type
Customer ID	CUSTOMER_ID	4000.01	INTEGER
Customer Code	CUSTOMER_CODE	4000.02	VARCHAR2(6)
EPT Interval Ending	EPT_INTERVAL_ENDING	4001.40	VARCHAR2(40) mm/dd/yyyy HH24:MM format (Displays first interval of the day as hour 0 minute 05 and last interval of the day as hour 24 minute 00)
GMT Interval Ending	GMT_INTERVAL_ENDING	4001.41	VARCHAR2(40) mm/dd/yyyy HH24:MM format (Displays first interval of the day in relation to EPT interval as hour 04 minute 05 or hour 05 minute 05 (EDT/EST depending) and last interval of the day as hour 04 minute 00 of the next day or hour 05 minute 00 of the next day (EDT/EST depending))
Regulation Duration (% 5 Min Interval)	REG_DURATION	2340.72	NUMBER
Unit ID	UNIT_ID	4000.63	NUMBER(8,0)
Unit Name	UNIT_NAME	4000.64	VARCHAR2(75)
Unit Ownership Share	UNIT_OWNERSHIP_SHARE	3000.80	NUMBER
RT Schedule Id	RT_SCHED_ID	3002.19	NUMBER
Economic Min MW	ECON_MIN_MW	3002.22	NUMBER
Economic Max MW	ECON_MAX_MW	3002.23	NUMBER
Regulation Min MW	REG_MIN_MW	3004.41	NUMBER
Regulation Max MW	REG_MAX_MW	3004.42	NUMBER
Reg Min MW Used	REG_MIN_MW_USED	2340.78	NUMBER
Reg Max MW Used	REG_MAX_MW_USED	2340.79	NUMBER
PJM-Assigned RegUp MW	PJM_ASSIGNED_REGUP_MW	2340.68	NUMBER
PJM-Assigned RegDn MW	PJM_ASSIGNED_REGDN_MW	2340.69	NUMBER
RegUp Bias Factor	REGUP_BIAS_FACTOR	2340.73	NUMBER
RegDn Bias Factor	REGDN_BIAS_FACTOR	2340.74	NUMBER
Reg Bidirectional Bias Factor	REG_BIDIR_BIAS_FACTOR	2340.75	NUMBER
Tracking Ramp Limit Desired MW	TRLD_MW	2340.80	NUMBER
Tracking Regulation Set Point MW	TRLD_AS_MW	2340.81	NUMBER
Biased Regulation Set Point MW	BIASED_REG_SET_POINT_MW	2340.82	NUMBER
LOC Indicator	LOC_IND	3004.60	VARCHAR2(1) See possible values below
Make Whole Indicator	MAKE_WHOLE_IND	3004.61	VARCHAR2(1) See possible values below
RT LMP ($/MWh)	RT_LMP	3000.25	NUMBER
Begin Point MW	BEGIN_POINT_MW	2340.83	NUMBER
End Point MW	END_POINT_MW	2340.84	NUMBER
Begin Energy Offer Price ($/MWh)	BEGIN_ENGY_OFFER_PRICE	2340.85	NUMBER
End Energy Offer Price ($/MWh)	END_ENGY_OFFER_PRICE	2340.86	NUMBER
RT Energy Offer Amount ($)	RT_ENERGY_OFFER_AMT	3001.88	NUMBER
Opportunity Cost ($)	OPPORTUNITY_COST	2340.96	NUMBER
Prorated Opportunity Cost ($)	PRORATED_OPP_COST	2340.77	NUMBER
Version	VERSION	4000.07	VARCHAR2(12)

LOC Indicator: Y or N
Make Whole Indicator: Y or N

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Regulation Shoulder Opportunity Cost Details (New)

This report displays the customer account's 5-minute Regulation Shoulder Opportunity Cost Details for generation units.

The following columns will appear in the body of the report:

Online and CSV Column Name	XML Column Name	Column Number	Data Type
Customer ID	CUSTOMER_ID	4000.01	INTEGER
Customer Code	CUSTOMER_CODE	4000.02	VARCHAR2(6)
EPT Interval Ending	EPT_INTERVAL_ENDING	4001.40	VARCHAR2(40) mm/dd/yyyy HH24:MM format (Displays first interval of the day as hour 0 minute 05 and last interval of the day as hour 24 minute 00)
GMT Interval Ending	GMT_INTERVAL_ENDING	4001.41	VARCHAR2(40) mm/dd/yyyy HH24:MM format (Displays first interval of the day in relation to EPT interval as hour 04 minute 05 or hour 05 minute 05 (EDT/EST depending) and last interval of the day as hour 04 minute 00 of the next day or hour 05 minute 00 of the next day (EDT/EST depending))
Unit ID	UNIT_ID	4000.63	NUMBER(8,0)
Unit Name	UNIT_NAME	4000.64	VARCHAR2(75)
Unit Ownership Share	UNIT_OWNERSHIP_SHARE	3000.80	NUMBER
EPT Shoulder Interval Ending	EPT_SHLD_INTERVAL_ENDING	4001.46	VARCHAR2(40) mm/dd/yyyy HH24:MM format (Displays first interval of the day as hour 0 minute 05 and last interval of the day as hour 24 minute 00)
Ramp In Indicator	RAMP_IN_INDICATOR	3004.60	VARCHAR2(1) See possible values below
Ramp Out Indicator	RAMP_OUT_INDICATOR	3004.61	VARCHAR2(1) See possible values below
RT Schedule Id	RT_SCHED_ID	3002.19	NUMBER
Economic Min MW	ECON_MIN_MW	3002.22	NUMBER
Economic Max MW	ECON_MAX_MW	3002.23	NUMBER
Regulation Min MW	REG_MIN_MW	3004.41	NUMBER
Regulation Max MW	REG_MAX_MW	3004.42	NUMBER
Reg Min MW Used	REG_MIN_MW_USED	2340.78	NUMBER
Reg Max MW Used	REG_MAX_MW_USED	2340.79	NUMBER
PJM-Assigned RegUp MW	PJM_ASSIGNED_REGUP_MW	2340.68	NUMBER
PJM-Assigned RegDn MW	PJM_ASSIGNED_REGDN_MW	2340.69	NUMBER
Tracking Ramp Limit Desired MW	TRLD_MW	2340.80	NUMBER
Tracking Regulation Set Point MW	TRLD_AS_MW	2340.81	NUMBER
RT LMP ($/MWh)	RT_LMP	3000.25	NUMBER
Begin Point MW	BEGIN_POINT_MW	2340.83	NUMBER
End Point MW	END_POINT_MW	2340.84	NUMBER
RT Energy Offer Amount ($)	RT_ENERGY_OFFER_AMT	3001.88	NUMBER
Shoulder Opportunity Cost ($)	SHLD_OPPORTUNITY_COST	2340.97	NUMBER
Version	VERSION	4000.07	VARCHAR2(12)

Ramp In Indicator: Y or N
Ramp Out Indicator: Y or N

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Phase 2 Settlements Specific Timeline

	Timeline
Regulation Redesign Settlements Impacts – updates at the MSS	May 2026 / August 2026
MSRS Report Documentation Available	May 2026
MSRS Train (Sandbox) Opens for Testing	August / September 2026
Manual 28 changes presented at MIC/MRC	September / October 2026
Special education sessions covering all Regulation Redesign areas	October / November 2026
Regulation Redesign Phase 2 go-live / MSRS Report changes effective	Dec. 1, 2026 at 00:00 EST*
December 2026 Bill Issued (First billing statement containing Phase 2 changes)	January 8, 2027

* FERC approved Phase 2 go-live date of Dec 1, 2026

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Key Takeaways

1

- Regulation Settlements impacted by Phase 2 of the Regulation Market Redesign
- Phase 2 changes will be effective Dec. 1, 2026

2

- MSRS Reports available in Train (Sandbox) in August/September 2026
- MSRS Reports available in Production beginning with December 2026 Billing Month

3

- New Report Documentation posted to MSRS webpage on pjm.com
- Changes to existing report documentation posted with May MSS materials.
- Additional communications will be sent to MSS distribution list containing details on sandbox/training availability and any documentation updates.

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Additional Information

- MSRS Report Documentation
- Regulation Redesign Phase 2 – Frequently Asked Questions (FAQ)
- Ancillary Services Phase 2 additional materials
- Regulation Market Design FERC Filing
- FERC Acceptance

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