



Item 6.2: Real-Time Co-Optimization Implementation Update

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Technology and Security Committee Meeting

ERCOT Public

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Overview

- **Purpose**
Periodic Update on RTC+B project status
- **Voting Items / Requests**
No action is requested of the ERCOT Board; for discussion only

Key Takeaways:

- We are continuing to make good progress on RTC+B
- A planned go-live date of December 5, 2025 has been communicated to the stakeholders

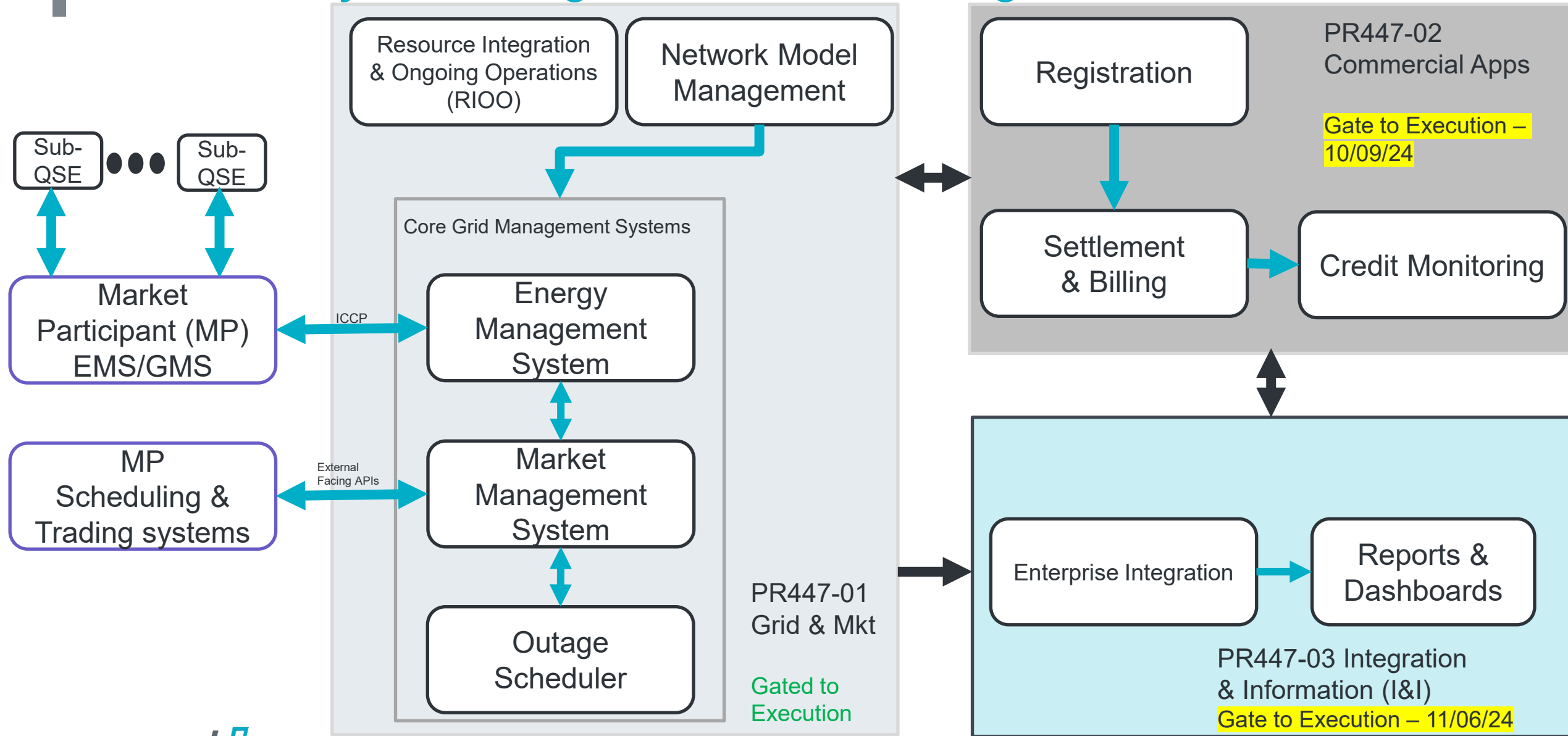
What is RTC+B+SOC

- **RTC (NPRR1007-1013)**
 - Current Real-Time Market (RTM) finds most effective set of Resources for providing Energy (but not Ancillary Services).
 - Real-Time Co-optimization would help find the most effective set of Resources for providing Energy & Ancillary Services.
 - Brings Operational and Economic Benefits - \$1.6B per year in energy cost reduction + more (see information in Appendix)
- **Batteries – Single Model for Batteries (NPRR1014)**
 - Switching Batteries from the current “Combo Model” to a “Single Model” in ERCOT core systems.
 - To implement “single-model” is to unify into single ESR
 - Better Modeling and the ESR is represented as it is, as one Resource
 - Single set of telemetry; “bid/offer curve” submittal; Performance Monitoring; and Settlements
- **State of Charge (SOC) Management (NPRR1204)**
 - Accounting for SOC (MWh) in Reliability Unit Commitment (RUC) and Security-Constrained Economic Dispatch (SCED).

****Links to additional materials on concepts of RTC, Single Model and SOC concepts available in Appendix.**

Key Takeaway: Co-optimize Ancillary Services in Real-Time; Accurate representation for Batteries; and Better accounting for ESR State of Charge.

Overview of System Changes – RTC+B+SOC Program



RTC+B+SOC Program Structure

Project	Total Budget	Actuals	Trend	Description
PR447-00 Program Control	\$13.9M	\$2,602,487	●	Includes Hardware \$6.7M, Software \$4.5M
PR447-01 Grid & Markets	\$24.8M	\$3,494,215	●	MMS/EMS/OTS/NMMS/RIOO/PI/OS/GridGeo
PR447-02 Commercial Apps	\$5.8M	\$980,475	●	S&B/CMM/Registration
PR447-03 Integration & Information (I&I)	\$5.3M	\$600,232	●	Middleware, dashboards, reports, data warehouse
Total	\$49.9M	\$7,677,409		

- Total budget may not foot due to rounding
- Actuals as of Sep 19, 2024

●	Not Tracking to Plan
●	At Risk
●	Tracking to Plan

Key Takeaway: Centralized Program Control structure with 3 project tracks are all on track



Major Dependencies in our critical path

11/23 1/24 4/24 7/24 9/24 10/24 3/25 **5/25** 6/25 7/25 9/25 11/25 12/25 3/26 6/26

Indicative dates

Target Go-Live Date Published

Production Code Freeze

12/5/25 Targeted Go-Live Date

Siebel Upgrade

Requirements

Planning & Design

CIM
DAM

RUC
SCED

Development + Unit Testing

Vendor Final Release

ERCOT Integrated Testing

Market Trials Environment Build

Develop & Publish External Interface Specs

Market Participant System Updates

QSE Submissions & Telemetry

Open Loop SCED

Closed Loop SCED/LFC

Market Trials

Transition to Go-Live & Stabilization

RTC

Key Takeaway: RTC Program targets to go-live on 12/5/2025

 Vendor Deliverables
 Market Trials Plan



Review - Major Short-term milestones for Oct '24 T&S Committee Meeting

Task	Due by	Status
PR447-01 GMS Project - Gate to Execution	Aug 21, 2024	Complete
PR447-03 I&I Wave 3 Planned CCR (establish remaining planning milestones)	Sep 06, 2024	Complete
PR447-00 RTC+B FAT EMS/MMS Servers Builds	Sep 06, 2024	Complete
PR447-00 Publish the planned release for RTC+B Go-Live (KR - Target Goal)	Sep 30, 2024	Complete

Major Short-term milestones for Dec '24 T&S Committee Meeting

Task	Due by
PR447-01 Vendor RUC Delivery	Oct 18, 2024
PR447-02 Commercial Applications Project - Gate to Execution	Oct 09, 2024
PR447-03 I&I Project - Gate to Execution	Nov 06, 2024
PR447-00 RTC+B ITEST Core EMS/MMS Server Builds	Nov 11, 2024
PR447-00 RTC+B Program Gate to Execution	Nov 15, 2024
PR447-00 RTC+B ITEST Environment Readiness (Server Builds/Data refreshes)	Jan 31, 2025
PR447-01 Vendor SCED Delivery	Feb 25, 2025
PR447-02 Commercial Applications ITEST Entry	Feb 12, 2025
PR447-00 RTC+B Market Trials EMS/MMS Server Readiness	Feb 28, 2025

RTC+B Key Result: Publish the planned release for RTC+B Go-Live

- Requirements Complete
 - Stretch: 07/31/24 - **Missed**
 - **Target: 9/30/24 - Achieved**
- Key components included:
 - Publish Market Trials Plan, entry/exit criteria
 - Finalize PR447-01 Grid & Markets execution plan
 - PR447-03 I&I identification and validation of upstream dependencies
 - Work sequencing and resource planning for overall Program
 - Testing, deployment plan & release coordination
 - PR447-02 Commercial Apps execution plan
- Links to RTC+B Program Go-Live Announcement:
 - [Market Notice](#)
 - [Press Release](#)
 - [Trending Topic Paper](#)

Appendix

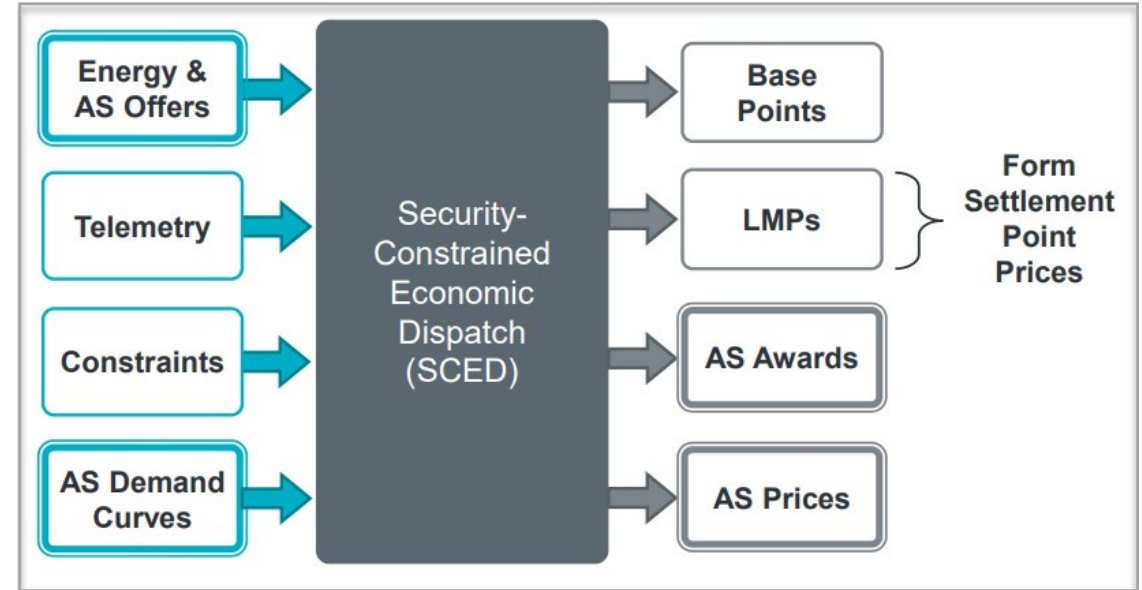
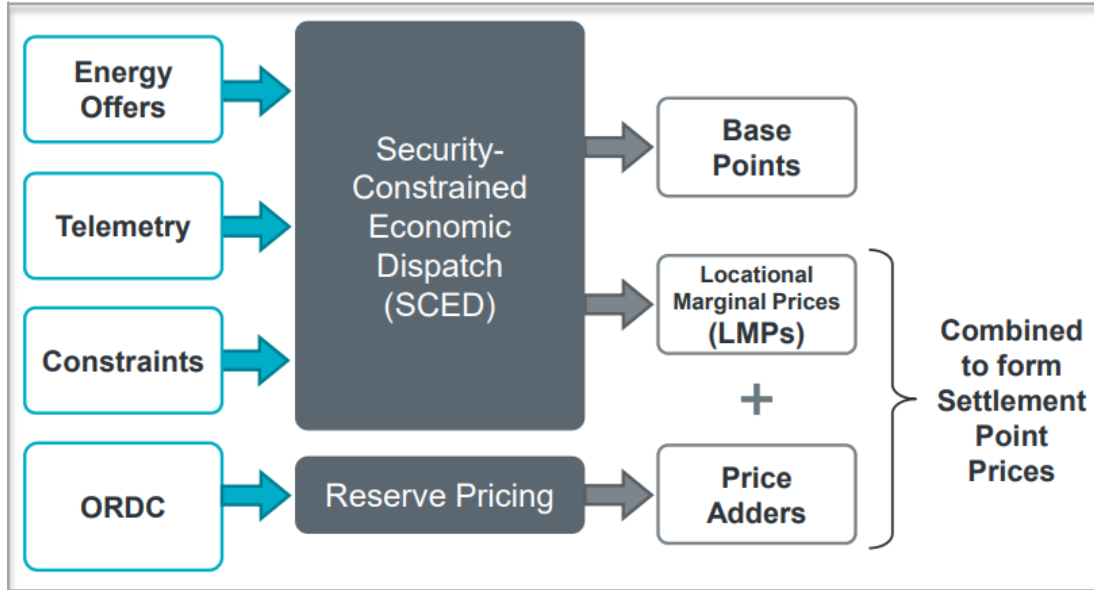
Links to educational material on the mechanics of RTC, Single Model and State of Charge:

- [RTC Updates to Reliability and Markets Committee - Overview of market design concepts & benefits](#)
- [RTCBTF - Refreshers on RTC Key Principles, Single Model and SOC](#)

Links to associated key documents:

- [RTC Key Principles](#)
- [NPRR1186 Interim SOC - Key Documents](#)
- [NPRR1204 SOC Considerations with RTC - Key Documents](#)

Today's market vs RTC



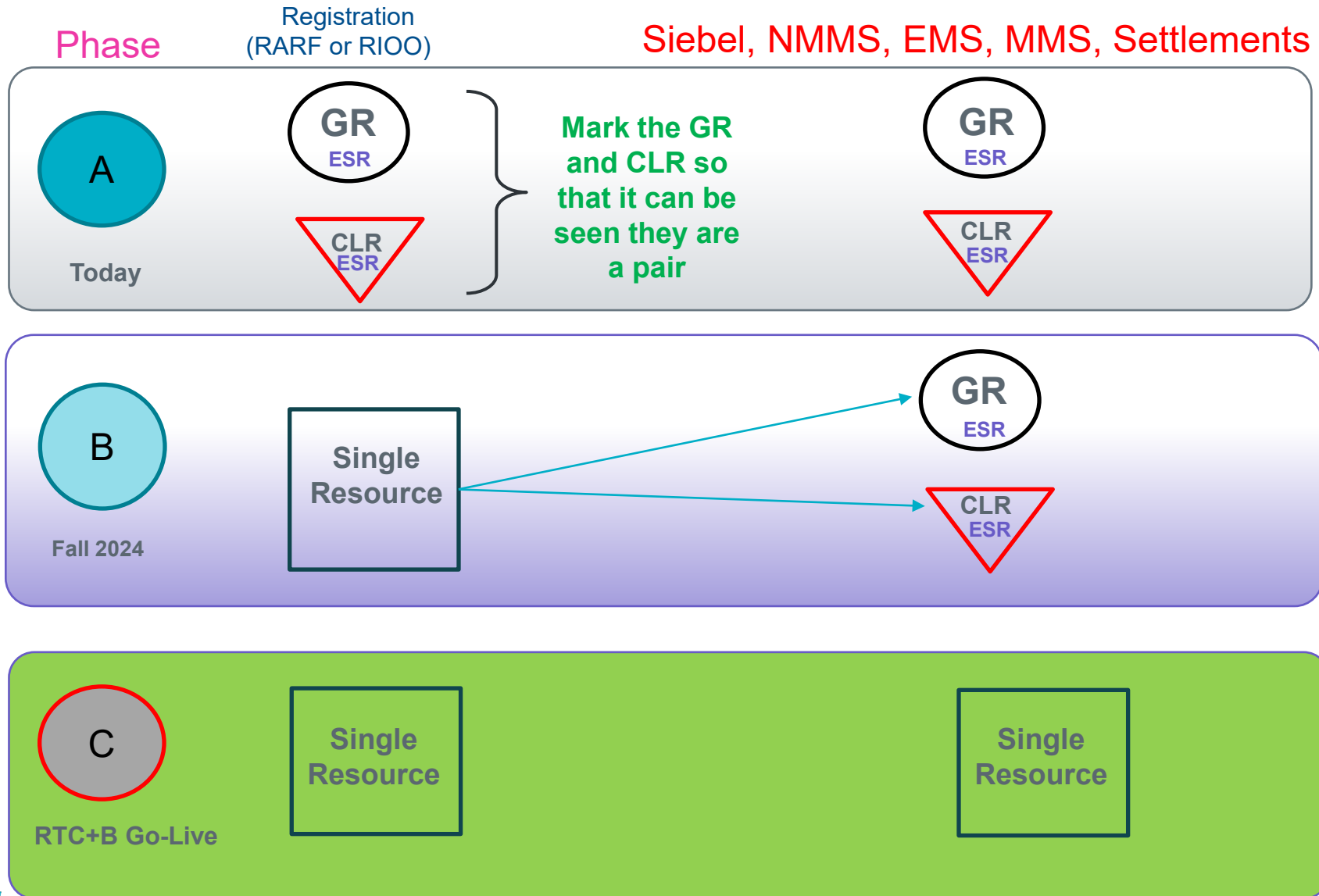
- Today's market:
 - Is designed to reflect scarcity through a process that is outside of the optimization.
 - Cost of AS is reflected in the form of Price Adders, not factored into LMP.
 - The ORDC sets the value of ERCOT System reserves.

- RTC:
 - Is designed to reflect scarcity within the optimization.
 - Cost of AS is factored directly into LMPs
 - Instead of using ORDC, individual AS Demand Curves (ASDCs) for each AS product (NSPIN, Reg-Up, RRS, ECRS).
 - Helps better distinguish and prioritize between various AS products.
 - Eliminates need for Supplemental Ancillary Services Market (SASM), co-optimized RUC and RTM will fulfill this role.

Operational & Economic Benefits of RTC

- Operational Benefits – The reliability benefits of RTC derive from our ability to:
 - Replace and replenish Ancillary Services every 5 minutes;
 - Effectively manage Resource-specific capabilities that can change rapidly and significantly in Real-Time and the hours leading up to Real-Time;
 - This includes Energy Storage Resources (ESRs), but is applicable to all Resource types (thermal, renewable, and demand-side Resources).
 - Dynamically adjust Ancillary Service quantities all the way up to Real-Time as uncertainties on the grid change over the day;
 - Better manage and reduce transmission congestion without sacrificing on our Ancillary Service needs;
 - Prioritize Ancillary Services to preserve the most critical capacity (i.e., capacity that can respond to frequency deviations) in cases where grid conditions become scarce; and
 - Automate many process that must be managed manually by Control Room staff today.
- Economic Benefits – These reliability benefits also equate to economic benefits for the end-use customer.
 - The Independent Market Monitor (IMM) released a report in 2018 that included its evaluation of the impacts of RTC on the ERCOT market.
 - Using 2017 as their simulated operating year, they found:
 - A \$1.6 billion reduction in total energy costs, which equates to a ~\$4/MWh reduction in price;
 - An \$11.6 million reduction in production costs to serve load;
 - An improvement in reliability due to a reduced overloading of transmission constraints and a reduced use of the Regulation Up Ancillary Service equating to \$4.3 million;
 - A \$257 million reduction in congestion costs; and
 - A \$155 million reduction in Ancillary Service costs.
 - As with the reliability benefits, these cost benefits are also likely increasing over time.

ERCOT Evolution for Battery Energy Storage Resources



ERCOT Evolution for State of Charge Considerations

- Interim Period SOC changes ([NPRR1186](#)), will still use the “Combo” battery model:
 - Introduces AS duration requirements in DAM.
 - Defines new COP fields for SOC minimum, maximum and planned target, to be used by RUC studies to determine ESR-GR capacity available to meet Load Forecast after satisfying ESR COP AS responsibilities. Also reflected in Real-Time HASL calculations.
 - Implements refinements to the ERCOT “SOC accounting-monitoring-expectations” approach. Provides clarity on how much SOC is required for each AS responsibility and how ERCOT will check to see if the SOC is adequate for the AS responsibilities.
- RTC+B SOC changes ([NPRR1204](#)), will use the new “Single” battery model:
 - **Day-Ahead Market (DAM)**
 - No SOC accounting.
 - Keeps Interim Period (NPRR1186) changes for tracking AS duration requirements in DAM.
 - **Reliability Unit Commitment (RUC)**
 - Include additional SOC accounting related constraints.
 - For every given hour, ensure there is sufficient Energy (SOC MWh) available in ESRs to sustain the MW dispatch for Energy and AS (for their respective durations), and validate this against COP minimum and maximum SOC values (introduced in NPRR1186).
 - The study/simulated dispatch for Energy and AS for a given hour are such that the resulting SOC accounting for the end of the hour will be equal to the planned hour-beginning SOC (COPs) for the next hour.
 - **Real-Time Market (RTM) – Security-Constrained Economic Dispatch (SCED) to:**
 - Perform Telemetry validations to make sure current SOC is within bounds of minimum and maximum SOC.
 - Incorporate SOC related constraints such that there is sufficient Energy to sustain the MW awards for Energy (base-points) and AS for their respective time duration, without violating telemetered minimum and maximum SOC bounds.

Acronyms used in this slide deck

CIM	Common Information Modeling
CMM	Credit Monitoring & Management
DSA	Dynamic Stability Analysis
EMS	Energy Management System
GMS	Generation Management System
I&I	Integration and Information
ICCP	Inter control Center Protocol
LFC	Load Frequency Control
MMS	Market Management System
MP	Market Participant
NMMS	Network Model Maintenance System

Acronyms used in this slide deck

OS	Outage Scheduler
OTS	Operator Training Simulator
RIOO	Resource Integration and Ongoing Operations
RLC	Resource Limit Calculator
RTC	Real-Time Co-Optimization
RTCA	Real-Time Contingency Analysis
S&B	Settlements & Billing
SCADA	Supervisory Control and Data Acquisition
SE	State Estimator
SOC	State of Charge
VSA	Voltage Stability Analysis