Load Resource Overview and Changes Introduced With the Real-Time Co-Optimization

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ERCOT Public

Introduction

Key changes implemented with the RTCB project affecting Load Resources (LRs), their Resource Entities, and Qualified Scheduling Entities (QSEs)

- New Terms and Concepts
- Introduction to Self-Provision
- Day-Ahead Market (DAM) Changes
- Telemetry Changes for NCLRs and CLRs
- Real-Time Market (RTM) and Operational Changes
- Deployment and Recall of Load Resources
- Performance Analysis
- Monthly Reports
- Real Time Self-Provision Examples

This is not an all-encompassing review of changes – Focus is on LRs

Introduction to Self-Provision

- What is self provision?
  - Self-provision is a new concept in RTC+B where QSEs have the option to cover their Ancillary Service (AS) position with load resources that operate with an Under Frequency Relay (UFR)
    - If the QSE has a responsibility at the end of the adjustment period, the QSE can telemeter self-provision amount to ensure AS responsibility are awarded/met in real time
    - (Day Ahead AS Awards + Day Ahead Self Arranged AS + net of AS Trades Sold – AS Trades Purchased)
  - ***Different than self-arrangement***
- Who does self-provision apply to?
  - NCLRs that are qualified for AS that operate utilizing an armed UFR:
    - RRS UFR
    - RRS FFR
    - ECRS resources with a UFR
- When can a Load Resource that is not a Controllable Load Resource (CLR) self-provide AS?
  - Self-provision is resource-specific and managed in real time through telemetry, which is set by the QSE.
- Why was self-provision created?
  - Self-provision was introduced in response to Market Participant concerns about frequent AS reassignments during real-time operations. It was developed to prevent the constant arming and disarming of UFRs

Self-Arrangement vs Self-Provision

- Self-Arrangement
  - Applies to the Day-Ahead Market (DAM)
  - Allows QSEs with Ancillary Service (AS) obligations to procure AS on their own
  - Prevents ERCOT from purchasing AS on their behalf in DAM
  - Process remains unchanged under Real-Time Co-Optimization (RTC)
- Self-provision
  - Self-provision in the Real-Time Market (RTM) applies to AS suppliers using under-frequency relays
  - Intended to reduce AS reassignments during real-time operations
  - Helps avoid the need to frequently arm or disarm relays
  - New concept under Real-Time Co-optimization (RTC)

Day-Ahead Market (DAM) Changes

- Existing qualification limits to provide AS will be retained for all LRs, but new Resources will be required to demonstrate their capability through a qualification test
  - ***No additional testing for existing LRs***
- ASDCs will be added to the DAM optimization and will be used in the determination of the AS quantities procured and the MCPCs
- QSEs then prepare COPs to show projected Resource availability and their AS capability for each AS Type coming out of DAM
  - AS Responsibility field is replaced by AS Capability by each AS Type

- ***No Changes Required***
  - AS Plan posted by 06:00 in the Day-Ahead for LSE QSEs
  - After DAM runs, AS Awards are published based on the DAM AS procurement
  - Participation of CLRs in DAM will be similar to Generation Resources

Telemetry Changes for NCLRs and CLRs

- Resource status for NCLRs or CLRs will either be ONL or OUTL.
  - Eliminated Statuses
    - ONRGL, FRRSUP, FRRSDN, ONCLR, ONRL, ONECL, and ONFFRRRSL.
- Resource specific AS Responsibility and AS Schedule will be eliminated
- QSE telemeters current capability to provide Reg Up, Reg Down, RRS, ECRS and Non-Spin:
  - Self-provided capacity for RRS-UFR and ECRSM w/ UFR showing as Armed
  - NCLR telemeters its RRS capability as a MW value
  - NCLR telemeters its ECRS capability in the form of a 10-minute blended ramp rate measured as MW/min
    - i.e. 6.0 MW/min = 60 MW of capability
  - NCLR telemeters its Non-Spin capability in the form of a blended 30-minute Ramp Rate measured as MW/min
    - i.e. 2.0 MW/min = 60 MW of capability
- ERCOT sends AS Awards via ICCP after every SCED execution
- For CLRs, the UDBP is replaced by the UDSP
  - Updated Desired Set Point (UDSP)—UDSP will be a single value that is the sum of two components: Base Ramp and Resource-specific Regulation Service instruction.
- See RTC Telemetry Changes on RTC+B Training webpage
- ERCOT Nodal ICCP Communications Handbook RTC+B v4.03

Self-Provision Achieved via Telemetry Points for NCLRs

LEGEND

Existing point from QSE for both Current and RTC
Existing ICCP From QSE in Current System, going away in RTC
RED RTC ONLY ICCP from QSE
Existing Point FROM ERCOT, exist in both
New RTC ICCP FROM ERCOT

- QSEs will be able to self-provide in real-time via telemetered ICCP points

Remote	Station Shortname	Device	Device Type	Description	New ICCP Object Name	ICCP Data Type	Owner
ACMQ	SUBSTN	Non-Controllable Load Resource	LR	Net Load MW	ACMQLR_SUBSTN_NPF_LD1_MW	RealQ	ACMQ
ACMQ	SUBSTN	Non-Controllable Load Resource	LR	High-set Under-frequency Relay Status	ACMQLR_SUBSTN_HSUF_LD1_ST	StateQ	ACMQ
ACMQ	SUBSTN	Non-Controllable Load Resource	LR	Load Resource Breaker Status	ACMQLR_SUBSTN_LRCB_LD1_ST	StateQ	ACMQ
ACMQ	SUBSTN	Non-Controllable Load Resource	LR	Resource Status	ACMQLR_SUBSTN_RST_LD1_ST	DiscreteQ	ACMQ
ACMQ	SUBSTN	Non-Controllable Load Resource	LR	Load Resource Low Power Consumption	ACMQLR_SUBSTN_LPC_LD1_MW	RealQ	ACMQ
ACMQ	SUBSTN	Non-Controllable Load Resource	LR	Load Resource Maximum Power Consumption	ACMQLR_SUBSTN_MPC_LD1_MW	RealQ	ACMQ
ACMQ	SUBSTN	Non-Controllable Load Resource	LR	Responsive Reserve Responsibility	ACMQLR_SUBSTN_RRRS_LD1_MW	RealQ	ACMQ
ACMQ	SUBSTN	Non-Controllable Load Resource	LR	Responsive Reserve Schedule	ACMQLR_SUBSTN_RRSC_LD1_MW	RealQ	ACMQ
ACMQ	SUBSTN	Non-Controllable Load Resource	LR	Non-Spin Responsibility	ACMQLR_SUBSTN_NSRS_LD1_MW	RealQ	ACMQ
ACMQ	SUBSTN	Non-Controllable Load Resource	LR	Non-spin Schedule	ACMQLR_SUBSTN_NSSC_LD1_MW	RealQ	ACMQ
ACMQ	SUBSTN	Non-Controllable Load Resource	LR	ECRS Responsibility	ACMQLR_SUBSTN_ECRS_LD1_MW	RealQ	ACMQ
ACMQ	SUBSTN	Non-Controllable Load Resource	LR	ECRS Schedule	ACMQLR_SUBSTN_ECSC_LD1_MW	RealQ	ACMQ
ACMQ	SUBSTN	Non-Controllable Load Resource	LR	Resource Status RTC	ACMQLR_SUBSTN_RSTR_LD1_INDX	DiscreteQ	ACMQ
ACMQ	SUBSTN	Non-Controllable Load Resource	LR	Current Capability to provide FFR	ACMQLR_SUBSTN_FFRC_LD1_MW	RealQ	ACMQ
ACMQ	SUBSTN	Non-Controllable Load Resource	LR	Current Capability to Provide UFR	ACMQLR_SUBSTN_UFRC_LD1_MW	RealQ	ACMQ
ACMQ	SUBSTN	Non-Controllable Load Resource	LR	Non-Spin Ramp Rate	ACMQLR_SUBSTN_NSRR_LD1_MW	RealQ	ACMQ
ACMQ	SUBSTN	Non-Controllable Load Resource	LR	ECRS Ramp Rate	ACMQLR_SUBSTN_ECRR_LD1_MW	RealQ	ACMQ
ACMQ	SUBSTN	Non-Controllable Load Resource	LR	Self Provided RRS UFR	ACMQLR_SUBSTN_SPUF_LD1_MW	RealQ	ACMQ
ACMQ	SUBSTN	Non-Controllable Load Resource	LR	Self Provided RRS FFR	ACMQLR_SUBSTN_SPFF_LD1_MW	RealQ	ACMQ
ACMQ	SUBSTN	Non-Controllable Load Resource	LR	Self Provided ECRS	ACMQLR_SUBSTN_SPEC_LD1_MW	RealQ	ACMQ
ACMQ	SUBSTN	Non-Controllable Load Resource	LR	RRS UFR AS Award	ACMQLR_SUBSTN_UFRA_LD1_MW	RealQ	ERCOT
ACMQ	SUBSTN	Non-Controllable Load Resource	LR	ECRS AS Award	ACMQLR_SUBSTN_ECRA_LD1_MW	RealQ	ERCOT
ACMQ	SUBSTN	Non-Controllable Load Resource	LR	NSRS AS Award	ACMQLR_SUBSTN_NSRA_LD1_MW	RealQ	ERCOT
ACMQ	SUBSTN	Non-Controllable Load Resource	LR	FFRS AS Award	ACMQLR_SUBSTN_FFRA_LD1_MW	RealQ	ERCOT
ACMQ	SUBSTN	Non-Controllable Load Resource	LR	Non-spin Deployed	ACMQLR_SUBSTN_NDPL_LD1_ST	StateQ	ERCOT
ACMQ	SUBSTN	Non-Controllable Load Resource	LR	Resonspive Deployed	ACMQLR_SUBSTN_RDPL_LD1_ST	StateQ	ERCOT
ACMQ	SUBSTN	Non-Controllable Load Resource	LR	ECRS Deployed flag	ACMQLR_SUBSTN_MMEC_LD1_ST	StateQ	ERCOT

ICCP Change Request Example RTC+B V1.4 on RTC ERCOT webpage

RTC Dispatch of Ancillary Services by Resource Type

1) ***Current AS Qualification for Resources will carry over into RTC***
2) ***All AS Dispatch will be Resource Specific***

A/S Award Type	Gen	Comb Cycle	Quick Start	Sync Cond	ESR	CLR	NCLR
Regulation	UDSP-LFC	UDSP-LFC			UDSP-LFC	UDSP-LFC	
Online NonSpin	UDSP-SCED	UDSP-SCED	UDSP-SCED		UDSP-SCED	UDSP-SCED	ASM
Offline NonSpin	ASM	ASM					
ECRSS (SCED)	UDSP-SCED	UDSP-SCED		Freq	UDSP-SCED	UDSP-SCED	
ECRSM (Manual)							ASM
ECRS-UFR							ASM/Freq
Offline ECRS			UDSP-SCED				
RRS-PFR (inc SyncCond)	UDSP-SCED	UDSP-SCED		Freq	UDSP-SCED	UDSP-SCED	
RRS-UFR							ASM/Freq
RRS-FFR	Freq	Freq			Freq		ASM/Freq

Key:
UDSP = Updated Desired Set Point (4 sec)
ASM: AS Manager / XML Dispatch
UDSP-LFC: LFC telemetry dispatch
UDSP-SCED: SCED portion of telemetry dispatch
Freq: Responds to frequency

Resource abbreviations:
Gen = Generation
CombCycle = Combined Cycle
Sync Cond = Synchronous Condenser
ESR = Energy Storage Resource (Battery)
CLR = Controllable Load Resource
NCLR = Non-Controllable Load Resource

RTM and Operational Changes for CLRs

1) NPRR1244 - All Controllable Load Resources capable of providing Primary Frequency Response(PFR) shall provide PFR, i.e., the CLRs that are qualified for Regulation and/or RRS
2) Need to submit offers for real-time to cover telemetered AS capabilities if showing ONL status, otherwise ERCOT calculates and will use a proxy offer for energy and AS
3) Awards and deployments will respect operating limits including MPC, LPC and ramp rates
4) In general, participate like a conventional Generator

No Deployment or Recall Changes for CLRs

RTM and Operational Changes for NCLRs

1) Telemetry is critical
   a) NPC, LPC, Resource Status and Ramp Rates are key input data used in the procurement process.
2) Awards for AS will be subject to limits/constraints for each service type; e.g. additional awards for RRS-UFR
3) Supplemental Ancillary Service Market Process or SASM has been eliminated
4) NCLRs may self-provide RRS and ECRS subject to validation rules:
   a) Under-frequency relays must be armed
   b) Load Resources are validated against telemetered AS capabilities
   c) The amount of RRS and ECRS a QSE self-provides must not be more than the QSEs total Ancillary Service position (including awards, self-arranged amounts, and trades)
5) Note that awards can be partial amounts of AS (e.g. 20 MW offer; 20 MW capability; 10 MW award)
6) QSEs can update AS offers for the operating hour in the operating hour
7) SCED will use a proxy offer for AS if NCLR is showing status of ONL, has headroom, and no offer submitted or offer does not cover the amount of AS available from the NCLR
8) AS Awards published is the sum of self provided AS and any extra AS Award subject to headroom availability

Deployment and Recall for NCLRs

1) No Group Assignments for deployment or recall
2) Manual deployment for Non-Spin, ECRS and RRS is done similarly today:
    a) Operator dials in a MW value, e.g. 500 MW, and then the AS Deployment manager issues resource specific instructions:
        i. Non-Spin
        ii. ECRSM – No relay or relay not armed, then
        iii. ECRSM – UFR armed, then
        iv. ECRSM and RRS-UFR – both deployed at the same time when NCLR has an armed UFR, then
        v. RRS-UFR
3) The 3-hour return to service was a compliance metric that has been eliminated
    a) AS positions for future hour are financial, so this compliance metric is no longer applicable

Conditions not affected by RTC:

a) Deployment instructions are resource specific and done by XML instruction
b) NCLRs need to remain deployed until recalled
c) Once deployed, NCLRs are subject to an Imbalance charge similar to today
d) Once recalled, it's important to cover AS financial position by returning to service or covering any shortage thru allowed substitution or market trades

Performance Analysis for CLRs

1) CLR is evaluated against UDSP instead of UDBP
2) Performance is based on CLREDP methodology in Section 8 of the Protocols *(no change)*
3) Evaluated for PFR response to FMEs if qualified for RRS and/or Regulation *(no change)*
4) No change to compliance metrics

Performance Analysis for NCLRs Overview

No Change with RTC but reminder:

1) Evaluate QSE level and Resource Specific event performance from time of deployment to recall instruction
2) Baseline capacity uses a 5 min average of NPF prior to instruction date/time stamp
3) Instructed capacity is part of the XML instruction
4) Resource deployment performance must be greater than 95% of instructed value
5) Evaluation also looks at over-performance and should be less than 150% of instructed value
6) Failures fall into the following categories
    a) Fail to deploy based on ramp time limit
    b) Fail to meet the 95% minimum requirement
    c) Exceed the 150% limit particularly for RRS and ECRS (excess UFR response)
    d) Fail to remain deployed/return to service prior to getting a recall instruction
7) Suspensions remain the same (2 failures with 365 days and the NCLR may be suspended)

Reports

1) NCLR Deployment Performance Report for AS (NSRS, ECRS and RRS) are done monthly
    a. QSE Level Report is done on a pass/fail basis for each event– secure report
        1. Individual report for all QSEs for RRS and ECRS and then a 2nd Report for Non-Spin
    b. Resource specific report done for each QSE on a pass/fail basis – certified report
        1. Individual report for each QSE for RRS and ECRS and then a 2nd report for each QSE showing all NCLRs providing Non-Spin
2) CLR Deployment Performance Report for AS (NSRS, ECRS and RRS) are done monthly
    a. Monthly report on CLREDP performance
    b. Event Performance for FMEs and PFR response from CLRs (if required)
3) Market Participation Report for all Load Resource
    a. Monthly report for LR Awards in RTM providing AS, broken down by type (NCLR and CLRs), CMZ and Delivery Hour

Self-Provision Scenarios

- For the next few example scenarios, please assume the following:

1. All load resources are fully qualified for RRS UFR, RRS FFR and ECRS operating with a UFR
2. All load resources have standard/acceptable offers submitted to SCED in real time
3. All ECRS Awards in this set of scenarios are for ECRS operating with a UFR

Scenario 1

- NCLR_1 has a 15 MW RRS AS Position, 10 MW from DAM award and 5 MW from RRS Trade

Scenario ** Assume AS qualified for All Headroom (NPF-LPC)	MPC	NPF	LPC	RST	UFR	Self-provided RRS UFR(MW)	Self-provided ECRS (MW)	Current Capability to provide UFR (MW)	ECRS (10min) Ramp Rate (MW/min)	RRS UFR AS Award	ECRS AS Award	**Notes**
• NCLR_1 is qualified to provide 15 MW. • DAM awards NCLR_1 with 10MW RRS. • QSE also has additional 5MW RRS Position via RRS Trades.	15	15	0	ONL	Arm	15	0	15	0	**15**	0	NCLR_1 Telemetry needs to show: Status = ONL, MPC >= NPF >= 15 MW, NPF-LPC >= 15 MW, RRS capability >= 15 MW, RRS self-provided telemetry = 15 MW **SCED will respect the 15 MW self-provided RRS and award the resource 15 MW RRS UFR.**

QSE to ERCOT Telemetry
ERCOT to QSE ICCP

Scenario 2 and 3

- NCLR_2 has AS Positions of 25 MW RRS and 10 MW of ECRS with no additional room to provide AS.
- NCLR_3 has AS Positions of 10 MW RRS and 25 MW of ECRS with additional headroom to provide AS.

Scenario ** Assume AS qualified for All Headroom (NPF-LPC)	MPC	NPF	LPC	RST	UFR	Self-provided RRS UFR(MW)	Self-provided ECRS (MW)	Current Capability to provide UFR (MW)	ECRS (10min) Ramp Rate (MW/min)	RRS UFR AS Award	ECRS AS Award	**Notes**
• NCLR_2 has NO HEADROOM and the following AS positions: • 25 MW of RRS • 10 MW of ECRS	35	35	0	ONL	Arm	25	10	25	1	**25**	**10**	NCLR_2 is telemetering enough capability (NPF-LPC) to cover its self-provided amounts, and enough capability to meet its self-provided telemetered amounts. The resource is awarded 25 MW of RRS and 10 MW of ECRS.
• NCLR_3 HAS headroom and the following AS positions: • 10 MW of RRS • 25 MW of ECRS	50	50	0	ONL	Arm	10	25	25	2.5	**10~25**	**25**	NCLR_3 has 15 additional MW of capacity. The resource will be awarded at least 10 MW of RRS as it is self-providing 10 MW. In this scenario the resource is awarded 10-25 MW of RRS due to additional capacity telemetered. NCLR_3 is awarded 25 MW of ECRS as it is telemetering 25 MW of capability and self-providing 25 MW of ECRS.

QSE to ERCOT Telemetry
ERCOT to QSE ICCP

Scenario 4

- QSE 1 is awarded 50 MW of RRS UFR in the Day Ahead. QSE 1 has 3 Load Resources with 100 MW of capability in its portfolio to spread the 50 MW obligation across.

Scenario ** Assume AS qualified for All Headroom (NPF-LPC)	MPC	NPF	LPC	RST	UFR	Self-provided RRS UFR(MW)	Self-provided ECRS (MW)	Current Capability to provide UFR (MW)	ECRS (10min) Ramp Rate (MW/min)	RRS UFR AS Award	ECRS AS Award	**Notes**
• NCLR_4 carries 30 MW of self-provision	45	45	5	ONL	Arm	30	0	30	0	**30**	0	NCLR_4 was awarded 30 MW of RRS while self-providing 30 MW. The resource has additional headroom, but the capability to provide RRS UFR is set to 30 MW. The resource will be awarded 30 MW.
• NCLR_5 does not self-provide RRS	15	15	0	ONL	Dis-Arm	0	0	15	0	**0**	0	Despite telemetering 15 MW RRS capability, NCLR_5 is not awarded RRS due to UFR status set to dis-armed.
• NCLR_6 carries 20 MW of self-provision	40	40	10	ONL	Arm	20	0	30	0	**20~30**	0	NCLR_6 telemetered a RRS capability of 30MW and self-provided 20MW of RRS. The resource will be awarded at least 20 MW, due to self-provided telemetry of 20 MW, and up to 30 MW as its capability to provide RRS UFR is set to 30 MW and has ample capacity.

QSE to ERCOT Telemetry
ERCOT to QSE ICCP

Questions and for more info contacts

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RTC+B Training videos

https://www.ercot.com/committees/tac/rtcbtf/training

Home > Committees and Groups > Technical Advisory Committee > Real-Time Co-optimization plus Batteries Task Force > RTC+B Training Videos

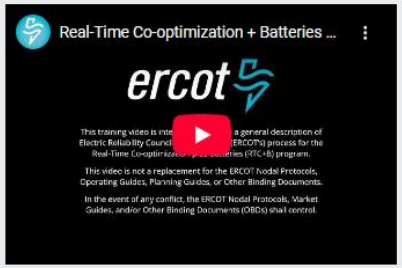
RTC+B Training Videos

The videos on this page have been created by ERCOT under the RTC+B Task Force to assist in market transition and readiness for existing QSE personnel.

As ERCOT and Market Participants prepare for transitioning to the RTC+B market design, there is the need to provide specific details to the market to help understand the key changes to business processes and systems. The videos provided below should be regarded as a library of "market readiness content" that is being built over the coming months to help QSE personnel transition from current business processes and systems to the changes for RTC+B implementation. ERCOT's normal training content will also be updated in the future, but these videos serve as an intermediate bridge to help understand the transitional changes to the new market design.

RTC+B SETTLEMENT OVERVIEW

NEW MODIFIED MARKET SUBMISSIONS IN RTC+B



REAL-TIME CO-OPTIMIZATION + BATTERIES EDUCATION

RTC TELEMETRY CHANGES

- See RTC Training Webpage

Appendix - Acronyms

- Ancillary Services (AS)
- Ancillary Service Demand Curve (ASDC)
- Controllable Load Resource (CLR)
- Current Operating Plan (COP)
- Day-Ahead Market (DAM)
- ERCOT Contingency Reserve Service (ECRS)
- High Sustained Limit (HSL)
- Load Frequency Control (LFC)
- Load Resource (LR)
- Load Serving Entity (LSE)
- Locational Marginal Price (LMP)
- Low Power Consumption (LPC) = (LSL in EMS)
- Low Sustained Limit (LSL)
- Max Power Consumption (MPC) = (HSL in EMS)
- Market Clearing Price for Capacity (MCPC)
- Net Power Consumption (NPC)
- Nodal Protocol Revision Request (NPRR)
- Non-Spinning Reserve Service (Non-Spin)
- Operating Reserve Demand Curve (ORDC)
- Qualified Scheduling Entity (QSE)
- Real-Time Co-optimization (RTC)
- Real-Time Market (RTM)
- Regulation Down (Reg-Down)
- Regulation Up (Reg-Up)
- Resource Limit Calculator (RLC)
- Responsive Reserve Service (RRS)
- Security-Constrained Economic Dispatch (SCED)
- Supplemental Ancillary Service Market (SASM)
- System-Wide Offer Cap (SWOC)
- Under-Frequency Relay (UFR)
- Value of Lost Load (VOLL)