ERCOT Update on Real-Time Co-optimization

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Overview

- Current status

- Next steps

- Future milestones

- There are many references to "Key Principles" (KPs).

  - KPs are high level design elements upon which ERCOT engages stakeholders before writing detailed Nodal Protocol Revision Requests (NPRRs).

  - KPs are intended to advance NPRR discussion on details and minimize any high level re-design of Real-Time Co-optimization (RTC) prior to implementation.

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Commission Instructions on RTC

- **Commission instructions in Project No. 48540**
  - [48540-60, Memorandum by Chairman Walker (June 26, 2019)](#)
  - [June 27, 2019 Open Meeting](#)
  - [48540-62, ERCOT's Letter to Commissioners Re RTC Project Timelines (July 17, 2019)](#)
  - [July 18, 2019 Open Meeting](#)

- **Ancillary Services Demand Curves (ASDCs)**
  - Curves should follow current Operating Reserve Demand Curve (ORDC) parameters
  - *See* KP1.1 - Ancillary Service Demand Curves and Current Market Price Adders

- **System-Wide Offer Cap (SWCAP) and Power Balance Penalty Curve (PBPC)**
  - Set SWCAP to $2,000 per MWh
  - Set Max ASDC to $9,000 per MWh
  - Set Value of Lost Load (VOLL) to $9,000 per MWh
  - Prices shall be capped at $9,000 per MWh, exclusive of congestion costs
  - Low System-Wide Offer Cap (LCAP) will apply if necessary
  - *See* KP1.2 - System-Wide Offer Cap and Power Balance Penalty Curve

- **Ancillary Service (AS) Offers**
  - Creation of proxy AS Offers if qualified and available but not offered
  - *See* KP1.3 - Offering and awarding of Ancillary Services in Real-Time

- **Suite of AS Products**
  - All AS products finalized with the approval of [NPRR863, Creation of ERCOT Contingency Reserve Service and Revisions to Responsive Reserve](#)
  - *See* KP2 - Suite of Ancillary Service Products

- **Day-Ahead Market (DAM)**
  - Commission advised against the addition of DAM enhancements that could jeopardize the RTC delivery timeline
  - *See* KP5 - Day-Ahead Market consideration (*Note:* moved to KP8, out-of-scope items)

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Update on Current Status

- There was significant effort in 2019 to support RTC concept development.

- The RTC Task Force (RTCTF) & Technical Advisory Committee (TAC) have focused on delivering ERCOT's KPs.[1]

- As of Nov. 20, 2019, TAC has endorsed 51 of the 66 KPs (77%).

  - Separately, there are 17 reporting and compliance design elements that were recently initiated.

- All design items are in flight for consideration at the final three RTCTF meetings; at this point, all ERCOT proposals are under review.

  - This reflects a tight schedule, but there is focus and support to finish on time for the February 2020 ERCOT Board meeting.

Next Steps

- TAC serves as the stakeholder body that reviews and endorses RTC KPs.

- Final TAC endorsement of RTC KPs is expected on Jan. 29, 2020. This will include a consolidated package of RTC KPs and a full record of TAC votes.

- All RTC KPs are on track for ERCOT Board endorsement on Feb. 11, 2020.
  - Any stakeholder who is opposed to an RTC KP may request ERCOT Board consideration in accordance with Section VIII of the ERCOT Board Policies and Procedures.

- Following ERCOT Board endorsement of RTC KPs, ERCOT will develop applicable NPRRs and corresponding impact analyses. ERCOT expects to share RTC NPRRs with stakeholders in March 2020.

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Future Milestones

- Upon completion of RTC KPs and ERCOT's initial delivery of draft NPRRs, 2020 milestones are as follows:
  - Q2–Q4 – Stakeholders will consider NPRRs based on RTC KPs.
    - NPRRs will be vetted through stakeholder process (PRS, TAC, Board).
    - RTCTF will meet regularly with stakeholders to address issues, comments, and finalize NPRRs.
    - *Milestone: Nov. 11, 2020, PRS approval*
    - *Milestone: Nov. 18, 2020, TAC approval*
    - *Milestone: Dec. 10, 2020, Board approval*
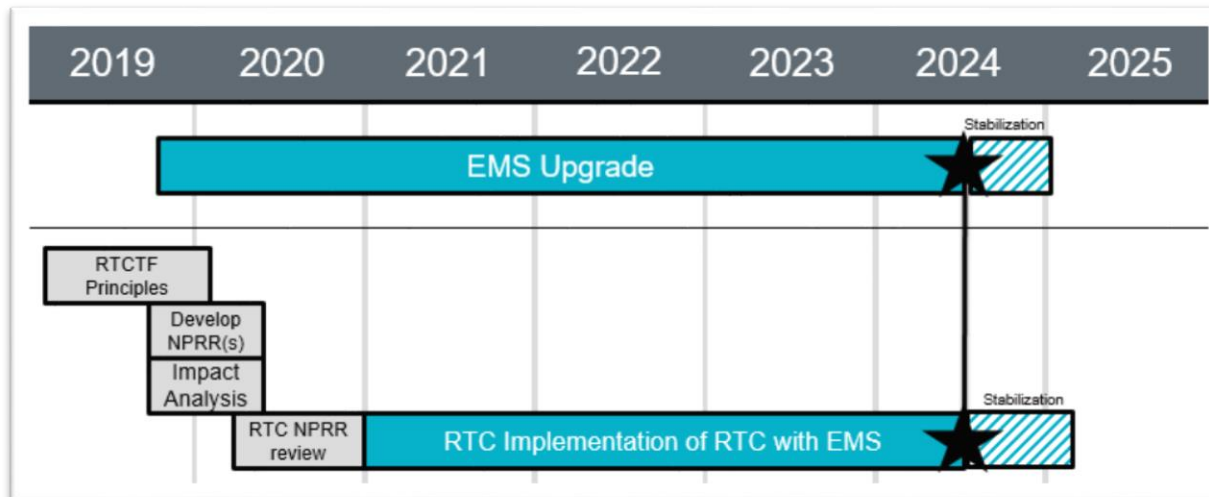
- These milestones support the current goal to finish requirements for RTC by Q1 2021, with an implementation goal of 2024 in conjunction with the EMS upgrade, as documented in PUC Project No. 41837, PUCT Review of RTC in the ERCOT Region.

Additional Commission Action will be Needed

- PUC Subst. R. 25.505, *Reporting Requirements and the Scarcity Pricing Mechanism in the Electric Reliability Council of Texas Power Region*, will require modifications to bring Commission rules regarding SWOC and LCAP into alignment with Commission RTC instructions and NPRRs associated with the implementation of RTC.

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Additional Materials

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Status of Key Principles

Key Principle	Decision Points and Issues for Developing Principle Concepts	Date Topic was First Presented to the RTC Task Force	Related Principle Concepts under Dicussion (Y, with Principle Concept Number(s), or N)?	Related Principle Concepts Approved by TAC (Y,with Date and Principle Concept Number(s), or N)?	Estimated Date for First/Next Discussion	Estimated Final Meeting for Moving to TAC for Vote
Key Principle 1.1 – Ancillary Service Demand Curves and Current Market Price Adders	Determining the shape and price points for the demand curves for each of the AS products, not including Regulation Down	8/9/19	Y (4, 5)	Y (4 - 9/25/19, 5 - 10/23/19))	n/a	n/a
	Determining the shape and price points for the Regulation Down demand curve	10/30/19	Y(8)	N	n/a	n/a
	Elimination of the ORDC price adders	8/9/19	Y (1)	Y (1 - 9/25/19)	n/a	n/a
	Continuation of the Reliability Deployment Price Adder process	8/9/19	Y (2, 3, 6, 7)	Y (3- 9/25/19)	n/a	n/a
Key Principle 1.2 – System-Wide Offer Cap and Power Balance Penalty Curve	New value for SWOC	8/9/19	Y (1, 2)	Y (1, 2 - 9/25/19)	n/a	n/a
	Need for separate SWOC in DAM	8/27/19	Y (3)	N	n/a	n/a
	New value and shape for the PBPC	8/9/19	Y (1, 2)	Y (1, 2 - 9/25/19)	n/a	n/a
	Capping of energy prices	8/9/19	Y (1, 2)	Y (1, 2 - 9/25/19)	n/a	n/a
	Effect of energy price capping on AS prices	8/9/19	Y (3) - Later deleted	N	Following dicussion, RTCTF came to consensus that adjustments would not be made to AS prices when energy prices are capped.	n/a
Key Principle 1.3 - Offering and Awarding of Ancillary Services in Real-Time	Constraint formulation for RTC (e.g., Resource constraints, rules for RRS, ramp sharing, NFRC etc.)	6/21/19	Y (3, 4, 5, 6, 7, 8)	Y (3, 4, 5, 6, 7, 8(a and b) - 10/23/19, 8c - 11/20/19)	n/a	n/a
	Any cases in which AS isn't re-awarded in RTC (e.g., discussion on RRS being provided by Load Resources on UFR).	6/21/19	Y (2)	Y (2 - 10/23/19)	n/a	n/a
	Method for QSEs to indicate temporary inability to provide AS	6/21/19	Y (1)	Y (1 - 10/23/19)	n/a	n/a
	ERCOT management of cases where AS is infeasible (e.g., deployment of Regulation resulting in physical transmission constraint over-loading)	8/9/19	Y (9)	Y (9 - 11/20/19)	n/a	n/a
	Offer structure for AS offer in Real-Time	4/30/19	Y (10)	Y (10 - 10/23/19)	n/a	n/a
	Timeline for submission of AS offers for Real-Time	4/30/19	Y (11)	Y (11 - 10/23/19) but RTCTF will have new version going to TAC	n/a	n/a
	Are changes to Verifiable Costs needed?	n/a	N	N	After additional discussion, ERCOT staff doesn't believe any changes are needed for RTC.	After additional discussion, ERCOT staff doesn't believe any changes are needed for RTC.
	Creation of proxy AS offers	8/27/19	Y (12, 13)	Y (12, 13 - 11/20/19)	n/a	n/a
	Changes to validation of AS trades (related to AS self-provision in real-time)	10/30/19	Y (14)	N	12/3/19	1/10/20
	Behavioral rules for AS Offer submittals	11/19/19	Y (15)	N	Related Principle Concepts withdrawn	n/a
Key Principle 1.4 – Systems that Input into the Real-Time Optimization	Changes to RLC calculations	4/30/19	Y (1, 2)	Y (1 - 7/24/19, 2 - 8/28/19)	n/a	n/a
	Telemetry changes, like those associated with any change to the RLC logic, both from the QSEs to ERCOT and from ERCOT to the QSEs	6/21/19	Y (2, 3, 4)	Y (2 - 8/28/19)	n/a	n/a
Key Principle 1.5 – Process for Deploying Ancillary Services	Maintaining of existing RTM clearing timeframe	4/30/19	Y (2)	Y (2 - 7/24/19)	n/a	n/a
	Changes to the AS Manager	5/13/19	Y (1)	Y (1 - 7/24/19)	n/a	n/a
	LFC - Changes to existing UDBP framework	4/30/19	Y (4, 5)	Y (4, 5 - 7/24/19)	n/a	n/a
	LFC - Portfolio vs. Resource-specific deployment, particularly for Regulation	4/30/19	Y (3)	Y (3 - 7/24/19)	n/a	n/a
	LFC - Distribution of Regulation instructions	4/30/19	Y (5, 6)	Y (5, 6 - 7/24/19)	n/a	n/a
	LFC - Process for deploying RRS	7/12/19	Y (7, 8, 9)	Y (7, 8, 9 - 8/30/19)	n/a	n/a
	Impact of ASDCs	7/12/19	Y (9, 10)	Y (9, 10 - 8/30/19)	n/a	n/a
	Removal of the existing process for QSEs to update telemetered AS schedules following manual deployment (specifically for Generation Resource and CLRs)	7/12/19	Y (9)	Y (9 - 8/30/19)	n/a	n/a
	Elimination of Non-Spin Offer Floor	7/12/19	Y (11)	Y (11 - 8/30/19)	n/a	n/a
	Continued ability of the Real-Time optimization (i.e., RTC) to be executed off-cycle, between regularly scheduled 5-minute executions.	4/30/19	Y (12)	Y (12 - 8/30/19)	n/a	n/a
	RTC failure process	7/12/19	Y (13)	Y (13 - 8/30/19)	n/a	n/a
	Changes to Emergency Operation Settlement	10/30/19	Y (14, 15)	N	n/a	n/a
	Removal of separate Regulation and FRRS signals	10/30/19	Y (16)	N	n/a	n/a
Key Principle 1.6 – Ancillary Service Imbalance Settlement with RTC	Potential use of existing energy imbalance calculations as basis	4/30/19	Y (1)	Y (1 - 7/24/19)	n/a	n/a
	Separate AS imbalance calculation for each AS product	4/30/19	Y (2)	Y (2 - 7/24/19)	n/a	n/a
	Allocation of non-zero AS imbalance amounts	4/30/19	Y (3, 4)	Y (3, 4 - 7/24/19)	n/a	n/a
	Credit exposure changes associated with AS Imbalance	10/30/19	Y (5)	N	n/a	n/a
	Update the Default Uplift calculation to include RT Awards as Market activity	n/a	N	N	Moved to KP5 as topic is actually associated with having virtual AS offers in the DAM	Moved to KP5 as topic is actually associated with having virtual AS offers in the DAM
	Additional details associated with having virtual AS Offers and/or Bids in the DAM, if needed.	n/a	N	N	PUCT direction received 7/18/19 (no further detailed RTCTF discussion expected)	PUCT direction received 7/18/19 (no further detailed RTCTF discussion expected)

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Status of Key Principles

Key Principle	Item					
Key Principle 2 – Suite of Ancillary Service Products	List of AS products and what type of Resources can provide them	9/19/19	Y (1)	Y (1 - 11/20/19)	n/a	n/a
	Definition of AS products to align with the Real-Time Co-optimization (RTC) framework, specifically time limitations (E.g., can a 10 MWh hour battery offer 120 MW of AS for a 5-minute interval?)	9/19/19	Y (2, 3, 4, 5, 6)	Y (2, 3, 4, 5, 6 - 11/20/19)	n/a	n/a
	Changes to the qualification process with RTC processes and any definition changes	9/19/19	Y (2, 3, 4, 5, 6)	Y (2, 3, 4, 5, 6 - 11/20/19)	n/a	n/a
Key Principle 3 – Reliability Unit Commitment	Functionality and Process Concepts - RUC AS penalties	5/13/19	Y (2)	Y (2 - 7/24/19)	n/a	n/a
	Functionality and Process Concepts - Details on changes to COP or alternative source of Resource information	5/13/19	Y (3, 4)	Y (3, 4 - 7/24/19)	n/a	n/a
	Functionality and Process Concepts - Source of AS Offers that RUC will use	5/13/19	Y (5, 6)	Y (5, 6 - 7/24/19)	n/a	n/a
	Functionality and Process Concepts - Consider qualified OFF and OFFQS Generation Resources when determining non-binding AS awards	5/13/19	Y (7, 8)	Y (7, 8 - 7/24/19)	n/a	n/a
	Functionality and Process Concepts - Current RUC recommendation deferral process	5/13/19	Y (9)	Y (9 - 7/24/19)	n/a	n/a
	RUC Settlement - Capacity short calculation and allocation of RUC make-whole, including the potential consideration of QSEs who are short on their AS Supply Responsibility.	6/21/19	Y (12)	Y (12 - 8/30/19)	n/a	n/a
	RUC Settlement - Changes to RUC claw-back and make-whole	6/21/19	Y (10, 11)	Y (10, 11 - 8/30/19)	n/a	n/a
	Additional detail on COP information changes	10/9/19	Y (15)	N	n/a	n/a
	Potential floors for AS Offers on Resources committed through the RUC process	10/9/19	Y (16, 17, 18, 19)	N	n/a	n/a
	Process for determining the amount of individual AS products that can be provided by a Resource	10/9/19	Y (13, 14)	N	n/a	n/a
	QSEs instructed to be committed by RUC may elect to forgo RUC Settlement	10/9/19	Y (20)	N	n/a	n/a
Key Principle 4 – The Supplemental Ancillary Service Market Process	Elimination and replacement of the SASM process	5/13/19	Y (1)	Y (1 - 7/24/19)	n/a	n/a
Key Principle 5 – Day-Ahead Market	Functionality and Process Concepts - Ancillary Service Demand Curves (ASDCs) in the DAM	8/27/19	Y (1, 2)	Y (1, 2 - 10/23/19)	n/a	n/a
	Effect of negative self-arrangement of AS on DAM ASDCs	12/3/19	Y (2a)	N	12/19/19	1/10/20
	Functionality and Process Concepts - Ancillary Service (AS) Offers that aren't directly associated with a Resource ("Virtual" or "Financial-only" AS Offers)	9/19/19	Y (7(a-i))	Y (7(a-i) - 11/20/19)	n/a	n/a
	Functionality and Process Concepts - AS Bids to Buy	n/a	N	N	PUCT direction received 7/18/19 (no further detailed RTCTF discussion expected)	PUCT direction received 7/18/19 (no further detailed RTCTF discussion expected)
	Functionality and Process Concepts - Changes to the current DAM AS insufficiency process	8/27/19	Y (3)	Y (3 - 10/23/19)	n/a	n/a
	Credit exposure changes associated with any changes to DAM submittals	10/9/19	Y (7(a-i))	Y (7(a-i) - 11/20/19)	n/a	n/a
	Settlement Concepts - Impacts on AS Obligation process for Load-Serving Entities (LSEs) if ASDCs in the DAM	8/27/19	Y (4, 5, 6)	Y (4, 5, 6 - 10/23/19)	n/a	n/a
	Settlement Concepts - Settlement of AS Offers that aren't directly associated with a Resource ("Virtual" or "Financial-only" AS Offers)	9/19/19	Y (7(a-i))	Y (7(a-i) - 11/20/19)	n/a	n/a
	Settlement Concepts - Settlement of AS Bids to Buy and how those AS Bids would impact the AS Obligation calculation for LSEs	n/a	N	N	PUCT direction received 7/18/19 (no further detailed RTCTF discussion expected)	PUCT direction received 7/18/19 (no further detailed RTCTF discussion expected)
	Update the Default Uplift calculation to include RT Awards as Market activity	11/19/19	Y (7(j))	N	n/a	n/a
	Continued need for negative self-arrangment of AS in the DAM	n/a	N	N	After additional discussion, RTCTF doesn't believe any changes are needed for RTC.	n/a
Key Principle 6 – Market-Facing Reports	Posting of Ancillary Service Demand Curves (ASDCs)	11/19/19	Y (1, 2)	N	12/19/19	12/19/19
	Real-Time Market (RTM) Ancillary Service (AS) awards and prices	11/19/19	Y (1, 2)	N	12/19/19	12/19/19
	Reports related to system conditions using Resources' High Ancillary Service Limits (HASLs)	11/19/19	Y (1, 2)	N	12/19/19	12/19/19
	Day-Ahead Market (DAM) awards information if there are AS Offers that aren't directly associated with a Resource ("Virtual" or "Financial-only" AS Offers)	11/19/19	Y (1, 2)	N	12/19/19	12/19/19
	Day-Ahead Market (DAM) awards information if there are AS Bids to Buy	n/a	N	N	PUCT direction received 7/18/19 (no further detailed RTCTF discussion expected)	PUCT direction received 7/18/19 (no further detailed RTCTF discussion expected)
	Changes to RTM and DAM disclosure reporting	11/19/19	Y (1, 2)	N	12/19/19	12/19/19
	New Reliability Unit Commitment (RUC) reporting associated with changes in functionality (e.g., on sufficiency of AS-qualified capacity in RUC in optimization)	11/19/19	Y (1, 2)	N	12/19/19	12/19/19
	New elements and changes to Settlement extracts	11/19/19	Y (1, 2)	N	12/19/19	12/19/19
	Changes to performance monitoring reports to align with any changes in performance metrics	11/19/19	Y (1, 2)	N	12/19/19	12/19/19
	Reports assoicated with AS Supply Responsbility	11/19/19	Y (1, 2)	N	12/19/19	12/19/19
	Removal of Supplemental Ancillary Service Market (SASM) reporting	11/19/19	Y (1, 2)	N	12/19/19	12/19/19
	Removal of Operating Reserve Demand Curve (ORDC) reporting	11/19/19	Y (1, 2)	N	12/19/19	12/19/19
Key Principle 7 – Performance Monitoring	Change in GREDP formulation to account for potential LFC changes	10/30/19	Y (1)	N	12/19/19	12/3/19
	Changes to base point deviation charge calculations that align with changes to GREDP	12/3/19	Y (4)	N	12/19/19	1/10/20
	Performance related to a release of a Resource's HASL through a change in AS schedule	11/19/19	Y (3)	N	12/19/19	12/19/19
	Removal of the concept of AS Responsibility in RT	11/19/19	Y (2)	N	12/19/19	12/19/19
	Performance monitoring during the transition into RTC during the time period immediately following implementation	12/3/19	N	N	12/19/19	1/10/20
Key Principle 8 – Out of Scope Items	Identifying proposals that are out of scope for the RTC project and/or may warrant post-RTC review	Discussion will be on-going thoughout the year	Y (Noted in the KP document with history/rationale)	n/a	Discussion will be on-going thoughout the year	12/19/19