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NPRR Number	351	NPRR Title	SCED Look-Ahead Step 1: Pricing: Calculate Non-Binding Prices and Basepoints for Initial Research into SCED Look-Ahead and allow Consumers to have a Forward Price Projection (formerly “Calculate and Post Projected Non-Binding LMPs for the Next 15 Minutes”)
Revision Description		<p>Using the inputs specified in this Nodal Protocol Revision Request (NPRR), ERCOT will calculate prices and base points over the next hour, using an hour-long optimization instead of a five-minute optimization. These calculated prices and base points will initially be non-binding, although it is anticipated that these will become binding as Security-Constrained Economic Dispatch (SCED) Look-Ahead progresses in future phases.</p> <p>Not covered by this NPRR are the larger pieces of SCED Look-Ahead, like Real-Time commitment of generators and Load Resources (possibly replacing or eliminating the Non-Spinning Reserve (Non-Spin) product), Real-Time co-optimization of energy and Ancillary Services (including determining when the co-optimization occurs), whether to charge Make-Whole Charges and to whom they should be charged to, and how these revisions will support the overall market design and Resource adequacy requirements.</p>	

Proposed Protocol Language Revision

6.3.2 Activities for Real-Time Operations

- (1) Activities for Real-Time operations begin at the end of the Adjustment Period and conclude at the close of the Operating Hour.
- (2) The following table summarizes the timeline for the Operating Period and the activities of QSEs and ERCOT during Real-Time operations where “T” represents any instant within the Operating Hour. The table is intended to be only a general guide and not controlling language, and any conflict between this table and another section of the Protocols is controlled by the other section:

Operating Period	QSE Activities	ERCOT Activities
During the first hour of the Operating Period		Execute the Hour-Ahead Sequence, including HRUC, beginning with the second hour of the Operating Period Review and communicate HRUC commitments

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Operating Period	QSE Activities	ERCOT Activities
		Snapshot the Scheduled Power Consumption for Controllable Load Resources
Before the start of each SCED run	Update Output Schedules for DSRs	Validate Output Schedules for DSRs Execute Real-Time Sequence
SCED run		Execute SCED
During the Operating Hour	<p>Telemeter the Ancillary Service Resource Responsibility for each Resource</p> <p>Acknowledge receipt of Dispatch Instructions</p> <p>Comply with Dispatch Instruction</p> <p>Review Resource Status to assure current state of the Resources is properly telemetered</p> <p>Update COP with actual Resource Status and limits and Ancillary Service Schedules</p> <p>Communicate Resource Forced Outages to ERCOT</p> <p>Communicate to ERCOT Resource changes to Ancillary Service Resource Responsibility via telemetry in the time window beginning 30 seconds prior to the five-minute clock interval and ending ten seconds prior to that five-minute clock interval</p>	<p>Communicate all <u>binding</u> Base Points, Dispatch Instructions and LMPs for energy and Ancillary Services using Inter-Control Center Communications Protocol (ICCP) or Verbal Dispatch Instructions (VDIs)</p> <p>Monitor Resource Status and identify discrepancies between COP and telemetered Resource Status</p> <p>Restart Real-Time Sequence on major change of Resource or Transmission Element Status</p> <p>Monitor ERCOT total system capacity providing Ancillary Services</p> <p>Validate COP information</p> <p>Monitor ERCOT control performance</p> <p>Distribute by ICCP, and post <u>on</u> the MIS Public Area, the LMPs created by each SCED process for each Resource Node, Load Zone and Hub. These prices shall be posted immediately subsequent to deployment of Base Points from SCED with the time stamp the prices are effective</p> <p>Post LMPs for each Electrical Bus <u>via</u> the MIS Public Area. These prices shall be posted immediately subsequent to deployment of Base Points from <u>each binding</u> SCED with the time stamp the prices are effective</p> <p><u>Post on the MIS Public Area the projected non-binding LMPs created by each SCED process for each Resource Node, the</u></p>

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Operating Period	QSE Activities	ERCOT Activities
		<p><u>projected Hub LMPs, and Load Zone LMPs. These projected prices shall be posted at a frequency of every five minutes from SCED for at least 15 minutes in the future with the time stamp of the SCED process that produced the projections</u></p> <p><u>Post on the MIS Certified Area the projected non-binding Base Points for each Resource created by each SCED process. These projected non-binding Base Points shall be posted at a frequency of every five minutes from SCED for at least 15 minutes in the future with the time stamp of the SCED process that produced the projections</u></p> <p>Post each hour on the MIS Public Area <u>binding</u> SCED Shadow Prices and active binding transmission constraints by Transmission Element name (contingency /overloaded element pairs)</p> <p>Post the Settlement Point Prices for each Settlement Point immediately following the end of each Settlement Interval</p> <p>Post parameters as required by Section 6.4.8, Ancillary Services Capacity During the Adjustment Period and in Real-Time, to<u>on</u> the MIS Public Area</p>

- (3) At the beginning of each hour, ERCOT shall post on the MIS Public Area the following information:
- (a) Changes in ERCOT System conditions that could affect the security and dynamic transmission limits of the ERCOT System, including:
 - (i) Changes or expected changes, in the status of Transmission Facilities as recorded in the Outage Scheduler for the remaining hours of the current Operating Day and all hours of the next Operating Day; and
 - (ii) Any conditions such as adverse weather conditions as determined from the ERCOT-designated weather service;
 - (b) Updated system-wide Load forecasts;

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- (c) The quantities of Reliability Must-Run (RMR) Services deployed by ERCOT for each previous hour of the current Operating Day;
- (d) Total ERCOT System Demand, from Real-Time operations, integrated over each Settlement Interval; and
- (e) Updated Electrical Bus Load distribution factors and other information necessary to forecast Electrical Bus Loads for each hour of the current Operating Day and all hours of the next Operating Day.

6.5.7.3 Security Constrained Economic Dispatch

- (1) The SCED process is designed to simultaneously manage energy, the system power balance and network congestion through Resource Base Points and calculation of LMPs every five minutes. The SCED process uses a two-step methodology that applies mitigation prospectively to resolve network Non-Competitive Constraints for the current Operating Hour. The SCED process evaluates Energy Offer Curves and Output Schedules to produce a least cost dispatch of On-Line Generation Resources to the total current generation requirement determined by LFC, subject to power balance and network constraints. The SCED process uses the Resource Status provided by SCADA telemetry under Section 6.5.5.2, Operational Data Requirements, and validated by the Real-Time Sequence, instead of the Resource Status provided by the COP.

[NPRR257: Replace paragraph (1) above with the following upon system implementation:]

- (1) The SCED process is designed to simultaneously manage energy, the system power balance and network congestion through Resource Base Points and calculation of LMPs every five minutes. The SCED process uses a two-step methodology that applies mitigation prospectively to resolve Non-Competitive Constraints for the current Operating Hour. The SCED process evaluates Energy Offer Curves and Output Schedules to produce a least cost dispatch of On-Line Generation Resources to the total current generation requirement determined by LFC, subject to power balance and network constraints. The SCED process uses the Resource Status provided by SCADA telemetry under Section 6.5.5.2, Operational Data Requirements, and validated by the Real-Time Sequence, instead of the Resource Status provided by the COP.
- (2) The SCED solution must monitor cumulative deployment of Regulation Services and ensure that Regulation Services deployment is minimized over time.
- (3) For use as SCED inputs, ERCOT shall use the available capacity of all committed Generation Resources by creating proxy Energy Offer Curves for certain Resources as follows:

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- (a) Non-WGRs and Dynamically Scheduled Resources (DSRs) without Energy Offer Curves

ERCOT shall create a monotonically increasing proxy Energy Offer Curve as described below for:

- (i) Each non-WGR for which its QSE has submitted an Output Schedule instead of an Energy Offer Curve; and
- (ii) Each DSR that has not submitted Incremental and Decremental Energy Offer Curves.

MW	Price (per MWh)
HSL	System-Wide Offer Cap (SWCAP)
Output Schedule MW plus 1 MW	SWCAP minus \$0.01
Output Schedule MW	-\$249.99
LSL	-\$250.00

- (b) DSRs with Energy Offer Curves

For each DSR that has submitted incremental and decremental Energy Offer Curves, ERCOT shall create a monotonically increasing proxy Energy Offer Curve. That curve must consist of the incremental Energy Offer Curve that reflects the available capacity above the Resource's Output Schedule to its HSL and the decremental Energy Offer Curve that reflects the available capacity below the Resource's Output Schedule to the LSL. The curve must be created as described below:

MW	Price (per MWh)
Output Schedule MW plus 1 MW to HSL	Incremental Energy Offer Curve
LSL to Output Schedule MW	Decremental Energy Offer Curve

- (c) Non-WGRs without full-range Energy Offer Curves

For each non-WGR for which its QSE has submitted an Energy Offer Curve that does not cover the full range of the Resource's available capacity, ERCOT shall create a proxy Energy Offer Curve that extends the submitted Energy Offer Curve to use the entire available capacity of the Resource using the SWCAP above the highest point on the Energy Offer Curve to the Resource's HSL and the offer floor from the lowest point on the Energy Offer Curve to its LSL, using these points:

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MW	Price (per MWh)
HSL (if more than highest MW in Energy Offer Curve)	SWCAP
1 MW above highest MW in Energy Offer Curve (if less than HSL)	SWCAP minus \$0.01
Energy Offer Curve	Energy Offer Curve
1 MW below lowest MW in Energy Offer Curve (if more than LSL)	-\$249.99
LSL (if less than lowest MW in Energy Offer Curve)	-\$250.00

(d) WGRs

- (i) For each WGR that has not submitted an Energy Offer Curve, ERCOT shall create a monotonically increasing proxy Energy Offer Curve as described below:

MW	Price (per MWh)
HSL	SWCAP
HSL minus 1 MW	-\$249.99
LSL	-\$250.00

- (ii) For each WGR for which its QSE has submitted an Energy Offer Curve, ERCOT shall create a monotonically increasing proxy Energy Offer Curve as described below:

MW	Price (per MWh)
HSL (if more than highest MW in Energy Offer Curve)	SWCAP
1 MW above highest MW in Energy Offer Curve (if less than HSL)	SWCAP minus \$0.01
Energy Offer Curve	Energy Offer Curve
1 MW below lowest MW in Energy Offer Curve (if more than LSL)	-\$249.99
LSL (if less than lowest MW in Energy Offer Curve)	-\$250.00

- (4) The Entity with decision making authority, as more fully described in Section 3.19.1, Annual Competitiveness Test, over how a Resource or Split Generation Resource is offered or scheduled, shall be responsible for all offers associated with each Resource, including offers represented by a proxy Energy Offer Curve.

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[NPRR240: Insert paragraph (5) and renumber accordingly upon system implementation:]

(5) Energy Offer Curves that were constructed in whole or in part with proxy Energy Offer Curves shall be so marked in all ERCOT postings or references to the energy offer.

(5) The two-step SCED methodology referenced in paragraph (1) above is:

- (a) The first step is to execute the SCED process to determine Reference LMPs. In this step, ERCOT executes SCED using the full Network Operations Model while only observing limits of Competitive Constraints. Energy Offer Curves for all On-Line Generation Resources, whether submitted by QSEs or created by ERCOT under this Section, are used in the SCED to determine “Reference LMPs.”
- (b) The second step is to execute the SCED process to produce Base Points, Shadow Prices, and LMPs, subject to security constraints (including Competitive and Non-Competitive Constraints) and other Resource constraints. The second step must:
 - (i) Use Energy Offer Curves for all On-Line Generation Resources, whether submitted by QSEs or created by ERCOT. Each Energy Offer Curve must be capped at the greater of the Reference LMP (from Step 1) at the Resource Node or the appropriate Mitigated Offer Cap and bounded at the lesser of the Reference LMP (from Step 1) at the Resource Node or the appropriate Mitigated Offer Floor; and
 - (ii) Observe all Competitive and Non-Competitive Constraints.
- (c) ERCOT shall archive information and provide monthly summaries of security violations and any binding transmission constraints identified in Step 2 of the SCED process. The summary must describe the limiting element (or identified operator-entered constraint with operator’s comments describing the reason and the Resource-specific impacts for any manual overrides). ERCOT shall provide the summary to Market Participants on the MIS Secure Area and to the Independent Market Monitor (IMM).

(6) For each SCED process, in addition to the binding Base Points and LMPs, ERCOT shall calculate a non-binding projection of the Base Points and Resource Node LMPs, Hub LMPs and Load Zone LMPs at a frequency of every five minutes for at least 15 minutes into the future based on the same inputs to the SCED process as described in this Section, except that the Resource’s HDL and LDL and the total generation requirement will be as estimated at future intervals. The Resource’s HDL and LDL will be calculated for each interval of the projection based on the ramp rate capability over the study period. ERCOT shall estimate the projected total generation requirement by calculating a Load forecast for the study period. ERCOT shall post the projected non-binding Base Points

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for each Resource for each interval study period on the MIS Certified Area and the projected non-binding LMPs for Resource Nodes, Hub LMPs and Load Zone LMPs on the MIS Public Area pursuant to Section 6.3.2, Activities for Real-Time Operations.