

Board Report

Variable	Unit	Description
RTRUCNBBRESP _q	MWh	<i>Real-Time RUC Ancillary Service Supply Responsibility for the QSE in Non-Buy-Back hours</i>—The Real-Time Ancillary Service Supply Responsibility for Reg-Up, RRS and Non-Spin pursuant to the Ancillary Service awards, for the 15-minute Settlement Interval that falls within a RUC-Committed Hour, discounted by the system-wide discount factor for the QSE q. [NPRR863: Replace the description above with the following upon system implementation:] <i>Real-Time RUC Ancillary Service Supply Responsibility for the QSE in Non-Buy-Back hours</i>—The Real-Time Ancillary Service Supply Responsibility for Reg-Up, ECRS, RRS, and Non-Spin pursuant to the Ancillary Service awards, for the 15-minute Settlement Interval that falls within a RUC-Committed Hour, discounted by the system-wide discount factor for the QSE q.
RTRUCASA _{q, r}	MW	<i>Real-Time RUC Ancillary Service Awards</i>—The Real-Time Ancillary Service award to the RUC Resource r for Reg-Up, RRS, and Non-Spin for the hour that includes the 15-minute Settlement Interval that falls within a RUC-Committed Hour for the QSE q. [NPRR863: Replace the description above with the following upon system implementation:] <i>Real-Time RUC Ancillary Service Awards</i>—The Real-Time Ancillary Service award to the RUC Resource r for Reg-Up, ECRS, RRS, and Non-Spin for the hour that includes the 15-minute Settlement Interval that falls within a RUC-Committed Hour for the QSE q.
RTCLRNSRESP _q	MWh	<i>Real-Time Controllable Load Resource Non-Spin Responsibility for the QSE</i>—The Real Time telemetered Non-Spin Ancillary Service Supply Responsibility for all Controllable Load Resources available to SCED discounted by the system-wide discount factor for the QSE q, integrated over the 15-minute Settlement Interval. [NPRR1069: Replace the description above with the following upon system implementation of NPRR987:] <i>Real-Time Controllable Load Resource Non-Spin Responsibility for the QSE</i>—The Real Time telemetered Non-Spin Ancillary Service Supply Responsibility for all Controllable Load Resources, not including modeled Controllable Load Resources associated with ESRs, available to SCED discounted by the system-wide discount factor for the QSE q, integrated over the 15-minute Settlement Interval.

Board Report

Variable	Unit	Description
RTCLRNSRESPR _{q, r, p}	MWh	<i>Real-Time Controllable Load Resource Non-Spin Responsibility for the Resource</i>—The Real-Time telemetered Non-Spin Ancillary Service Resource Responsibility for the Controllable Load Resource <i>r</i> represented by QSE <i>q</i> at Resource Node <i>p</i> available to SCED, integrated over the 15-minute Settlement Interval. [NPRR1069: Replace the description above with the following upon system implementation of NPRR987:] <i>Real-Time Controllable Load Resource Non-Spin Responsibility for the Resource</i>—The Real-Time telemetered Non-Spin Ancillary Service Resource Responsibility for the Controllable Load Resource <i>r</i> or modeled Controllable Load Resource associated with an ESR represented by QSE <i>q</i> at Resource Node <i>p</i> available to SCED, integrated over the 15-minute Settlement Interval.
RTRMRRESP _q	MWh	<i>Real-Time Ancillary Service Supply Responsibility for RMR Units represented by the QSE</i>—The Real-Time Ancillary Service Supply Responsibility as set forth in the end of the Adjustment Period COP for Reg-Up, RRS, and Non-Spin for all RMR Units discounted by the system-wide discount factor for the QSE <i>q</i>, integrated over the 15-minute Settlement Interval. [NPRR863: Replace the description above with the following upon system implementation:] <i>Real-Time Ancillary Service Supply Responsibility for RMR Units represented by the QSE</i>—The Real-Time Ancillary Service Supply Responsibility as set forth in the end of the Adjustment Period COP for Reg-Up, ECRS, RRS, and Non-Spin for all RMR Units discounted by the system-wide discount factor for the QSE <i>q</i>, integrated over the 15-minute Settlement Interval.
RTCLRNSR _{q, r, p}	MWh	<i>Real-Time Non-Spin Schedule for the Controllable Load Resource</i>—The validated Real-Time telemetered Non-Spin Ancillary Service Schedule for the Controllable Load Resource <i>r</i> represented by QSE <i>q</i> at Resource Node <i>p</i>, integrated over the 15-minute Settlement Interval. [NPRR987: Replace the description above with the following upon system implementation:] <i>Real-Time Non-Spin Schedule for the Controllable Load Resource</i> —The validated Real-Time telemetered Non-Spin Ancillary Service Schedule for the Controllable Load Resource or modeled Controllable Load Resource associated with an ESR, <i>r</i> represented by QSE <i>q</i> at Resource Node <i>p</i>, integrated over the 15-minute Settlement Interval.

Board Report

Variable	Unit	Description						
RTCLRNS _q	MWh	<i>Real-Time Non-Spin Schedule for Controllable Load Resources for the QSE</i>—The Real-Time telemetered Non-Spin Ancillary Service Schedule for all Controllable Load Resources for the QSE <i>q</i>, integrated over the 15-minute Settlement Interval discounted by the system-wide discount factor. [NPRR987: Replace the description above with the following upon system implementation:] <i>Real-Time Non-Spin Schedule for Controllable Load Resources for the QSE</i>—The Real-Time telemetered Non-Spin Ancillary Service Schedule for all Controllable Load Resources, not including modeled Controllable Load Resources associated with ESRs, for the QSE <i>q</i>, integrated over the 15-minute Settlement Interval discounted by the system-wide discount factor.						
SYS_GEN_DISCFACOR	none	<i>System-Wide Discount Factor</i> – The system-wide discount factor used to discount inputs used in the calculation of Real-Time Ancillary Services Imbalance payment or charge is calculated as the average of the currently approved Reserve Discount Factors (RDFs) applied to the temperatures from the current Season from the year prior.						
UGEN _{q, r, p}	MWh	<i>Under Generation Volumes per QSE per Settlement Point per Resource</i> —The amount under-generated by the Generation Resource <i>r</i> represented by QSE <i>q</i> at Resource Node <i>p</i> for the 15-minute Settlement Interval.						
UGENA _{q, r, p}	MWh	<i>Adjusted Under Generation Volumes per QSE per Settlement Point per Resource</i> —The amount under-generated by the Generation Resource <i>r</i> represented by QSE <i>q</i> at Resource Node <i>p</i> for the 15-minute Settlement Interval adjusted pursuant to paragraph (6) above.						
[NPRR987: Insert the variables “UPESR_{q, r, p}” and “UPESRA_{q, r, p}” below upon system implementation:] <table> <tr> <td>UPESR_{q, r, p}</td><td>MWh</td><td><i>Under-Performance Volumes per QSE per Settlement Point per Resource</i>—The amount the ESR under-performed divided evenly among the modeled Generation and Controllable Load Resources <i>r</i> in the ESR, represented by QSE <i>q</i> at Resource Node <i>p</i>, for the 15-minute Settlement Interval.</td></tr> <tr> <td>UPESRA_{q, r, p}</td><td>MWh</td><td><i>Adjusted Under-Performance Volumes per QSE per Settlement Point per Resource</i> — The amount the ESR under-performed divided evenly among the modeled Generation and Controllable Load Resources <i>r</i> in the ESR, represented by QSE <i>q</i> at Resource Node <i>p</i>, for the 15-minute Settlement Interval adjusted pursuant to paragraph (6) above.</td></tr> </table>			UPESR _{q, r, p}	MWh	<i>Under-Performance Volumes per QSE per Settlement Point per Resource</i> —The amount the ESR under-performed divided evenly among the modeled Generation and Controllable Load Resources <i>r</i> in the ESR, represented by QSE <i>q</i> at Resource Node <i>p</i> , for the 15-minute Settlement Interval.	UPESRA _{q, r, p}	MWh	<i>Adjusted Under-Performance Volumes per QSE per Settlement Point per Resource</i> — The amount the ESR under-performed divided evenly among the modeled Generation and Controllable Load Resources <i>r</i> in the ESR, represented by QSE <i>q</i> at Resource Node <i>p</i> , for the 15-minute Settlement Interval adjusted pursuant to paragraph (6) above.
UPESR _{q, r, p}	MWh	<i>Under-Performance Volumes per QSE per Settlement Point per Resource</i> —The amount the ESR under-performed divided evenly among the modeled Generation and Controllable Load Resources <i>r</i> in the ESR, represented by QSE <i>q</i> at Resource Node <i>p</i> , for the 15-minute Settlement Interval.						
UPESRA _{q, r, p}	MWh	<i>Adjusted Under-Performance Volumes per QSE per Settlement Point per Resource</i> — The amount the ESR under-performed divided evenly among the modeled Generation and Controllable Load Resources <i>r</i> in the ESR, represented by QSE <i>q</i> at Resource Node <i>p</i> , for the 15-minute Settlement Interval adjusted pursuant to paragraph (6) above.						
<i>r</i>	none	A Generation or Load Resource.						
<i>y</i>	none	A SCED interval in the 15-minute Settlement Interval. The summation is over the total number of SCED runs that cover the 15-minute Settlement Interval.						
<i>q</i>	none	A QSE.						

Board Report

Variable	Unit	Description
p	none	A Resource Node Settlement Point.
[NPRR987: Insert the variable “g” below upon system implementation:]		
g	none	An ESR.

- (8) The payment to each QSE for the Ancillary Service reserves associated with RUC Resources that have received a RUC Dispatch to provide Ancillary Services in which the 15-minute Settlement Interval is part of a RUC Buy-Back Hour based on the RUC opt out provision set forth in paragraph (12) of Section 5.5.2 for a given 15-minute Settlement Interval is calculated as follows:

$$\text{RTRUCRSVAMT}_q = (-1) * (\text{RTRUCRESP}_q * \text{RTRSVPOR})$$

$$\text{RTRDRUCRSVAMT}_q = (-1) * (\text{RTRUCRESP}_q * \text{RTRDP})$$

Where:

$$\text{RTRUCRESP}_q = \sum_r \text{RTRUCASA}_{q,r} * \frac{1}{4}$$

The above variables are defined as follows:

Variable	Unit	Description
RTRUCRSVAMT_q	\$	<i>Real-Time RUC Ancillary Service Reserve Amount</i> —The total payment to QSE q for the Real-Time RUC Ancillary Service Reserve payment associated with ORDC for each 15-minute Settlement Interval.
RTRDRUCRSVAMT_q	\$	<i>Real-Time Reliability Deployment RUC Ancillary Service Reserve Amount</i> —The total payment to QSE q for the Real-Time RUC Ancillary Service Reserve payment associated with reliability deployments for each 15-minute Settlement Interval.
RTRUCRESP_q	MWh	<i>Real-Time RUC Ancillary Service Supply Responsibility for the QSE</i>—The Real-Time Ancillary Service Supply Responsibility pursuant to the Ancillary Service awards for Reg-Up, RRS, and Non-Spin for all RUC Resources that have opted out per paragraph (12) of Section 5.5.2 for the QSE q, for the 15-minute Settlement Interval. [NPRR863: Replace the description above with the following upon system implementation:] <i>Real-Time RUC Ancillary Service Supply Responsibility for the QSE</i>—The Real-Time Ancillary Service Supply Responsibility pursuant to the Ancillary Service awards for Reg-Up, ECRS, RRS, and Non-Spin for all RUC Resources that have opted out per paragraph (12) of Section 5.5.2 for the QSE q, for the 15-minute Settlement Interval.

Board Report

Variable	Unit	Description
RTRUCASA _{<i>q, r</i>}	MW	<i>Real-Time RUC Ancillary Service Awards</i>—The Real-Time Ancillary Service award to the RUC Resource <i>r</i> for Reg-Up, RRS, and Non-Spin for the 15-minute Settlement Interval that falls within a RUC-Committed Hour for the QSE <i>q</i>. [NPRR863: Replace the description above with the following upon system implementation:] <i>Real-Time RUC Ancillary Service Awards</i>—The Real-Time Ancillary Service award to the RUC Resource <i>r</i> for Reg-Up, ECRS, RRS, and Non-Spin for the 15-minute Settlement Interval that falls within a RUC-Committed Hour for the QSE <i>q</i>.
RTRSVPOR	\$/MWh	<i>Real-Time Reserve Price for On-Line Reserves</i> —The Real-Time Reserve Price for On-Line Reserves for the 15-minute Settlement Interval.
RTRDP	\$/MWh	<i>Real-Time On-Line Reliability Deployment Price</i> —The Real-Time price for the 15-minute Settlement Interval, reflecting the impact of reliability deployments on energy prices that is calculated from the Real-Time On-Line Reliability Deployment Price Adder.
<i>q</i>	none	A QSE.
<i>r</i>	none	A Generation Resource.

8.1.1.2.1.3 Non-Spinning Reserve Qualification

- (1) Each Resource providing Non-Spin must be capable of being synchronized and ramped to its Ancillary Service Schedule for Non-Spin within 30 minutes. Non-Spin may be provided from Generation Resource capacity that can ramp within 30 minutes or Load Resources capable of unloading within 30 minutes. Non-Spin may only be provided from capacity that is not fulfilling any other energy or capacity commitment.
- (2) A Load Resource providing Non-Spin must provide a telemetered output signal.
- (3) Each Generation Resource and Load Resource providing Non-Spin must meet additional technical requirements specified in this Section.
- (4) QSEs using a Controllable Load Resource to provide Non-Spin must be capable of responding to ERCOT Dispatch Instructions in a similar manner to QSEs using Generation Resource to provide Non-Spin.
- (5) Each QSE shall ensure that each Resource is able to meet the Resource's obligations to provide the Ancillary Service Resource Responsibility. Each Generation Resource and Controllable Load Resource providing Non-Spin must meet additional technical requirements specified in this Section.
- (6) For any Resource requesting qualification for Non-Spin, a qualification test for each Resource to provide Non-Spin is conducted during a continuous eight hour period agreed

Board Report

to by the QSE and ERCOT. ERCOT shall confirm the date and time of the test with the QSE. ERCOT shall administer the following test requirements.

- (a) At any time during the window (selected by ERCOT when market and reliability conditions allow and not previously disclosed to the QSE), ERCOT shall notify the QSE by using the messaging system and requesting that the QSE provide an amount of Non-Spin from each Resource equal to the amount for which the QSE is requesting qualification. The QSE shall acknowledge the start of the test.
- (b) For Generation Resources: during the test window, ERCOT shall send a message to the QSE representing a Generation Resources to deploy Non-Spin. ERCOT shall monitor the adjustment of the Generation Resource's Non-Spin Ancillary Service Schedule within five minutes for Resources On-Line. ERCOT shall measure the test Resource's response as described under Section 8.1.1.4.3, Non-Spinning Reserve Service Energy Deployment Criteria. ERCOT shall evaluate the response of the Generation Resource given the current operating conditions of the system and determine the Resource's qualification to provide Non-Spin.
- (c) For Load Resources, ERCOT shall send an instruction to deploy Non-Spin. ERCOT shall measure the Resource's response as described under Section 8.1.1.4.3.

[NPRR1011: Replace Section 8.1.1.2.1.3 above with the following upon system implementation of the Real-Time Co-Optimization (RTC) project:]

8.1.1.2.1.3 Non-Spinning Reserve Qualification

- (1) Each Off-Line Resource being offered in to provide Non-Spin must be capable of being synchronized and ramped to its Ancillary Service award for Non-Spin within 30 minutes. Non-Spin may be provided from Generation Resource capacity that can ramp within 30 minutes or Load Resources capable of unloading within 30 minutes. Non-Spin may only be provided from capacity that is not fulfilling any other energy or capacity commitment.
- (2) All Resources qualified to participate in SCED are also qualified to provide Non-Spin when the Resource is On-Line. The amount of Non-Spin for which the Resource is qualified when On-Line is limited to the amount of capacity that can be ramped or unloaded within 30 minutes.
- (3) A Controllable Load Resource offering to provide Non-Spin must be qualified to participate in SCED and must provide a telemetered output signal, including breaker status.
- (4) Each Resource providing Non-Spin when Off-Line or providing Non-Spin as a Load Resource other than a Controllable Load Resource must meet additional technical requirements specified in this Section.

Board Report

- (5) QSEs using a Controllable Load Resource to provide Non-Spin must be capable of responding to ERCOT Dispatch Instructions in a similar manner to QSEs using Generation Resource to provide Non-Spin.
- (6) Each QSE shall ensure that each Resource is able to meet the Resource's obligations to provide the Ancillary Service award.
- (7) For any Resource requesting qualification for providing Non-Spin when Off-Line or providing Non-Spin as a Load Resource other than a Controllable Load Resource, a qualification test for each Resource to provide Non-Spin is conducted during a continuous eight hour period agreed to by the QSE and ERCOT. ERCOT shall confirm the date and time of the test with the QSE. ERCOT shall administer the following test requirements.
 - (a) At any time during the window (selected by ERCOT when market and reliability conditions allow and not previously disclosed to the QSE), ERCOT shall notify the QSE by using the messaging system and requesting that the QSE provide an amount of Non-Spin from each Resource equal to the amount for which the QSE is requesting qualification. The QSE shall acknowledge the start of the test.
 - (b) For the Resources being tested during the test window, ERCOT shall send a message to the QSE representing a Resource to deploy Non-Spin. ERCOT shall measure the test Resource's response as described under Section 8.1.1.4.3, Non-Spinning Reserve Service Energy Deployment Criteria. ERCOT shall evaluate the response of the Resource given the current operating conditions of the system and determine the Resource's qualification to provide Non-Spin.
- (8) The maximum quantity of Non-Spin that an individual Resource is qualified to provide is limited to the amount of Non-Spin that can be sustained by the Resource for at least one hour.

8.1.1.4.3 *Non-Spinning Reserve Service Energy Deployment Criteria*

- (1) ERCOT shall, as part of its Ancillary Service deployment procedure under Section 6.5.7.6.2.3, Non-Spinning Reserve Service Deployment, include all performance metrics for a Resource receiving a Non-Spin recall instruction from ERCOT.
- (2) A Non-Spin Dispatch Instruction from ERCOT must respect the minimum runtime of a Generation Resource. After the recall of a Non-Spin Dispatch Instruction, any Generation Resource previously Off-Line providing Non-Spin is allowed to remain On-Line for 30 minutes following the recall. During that time period, the On-Line Generation Resource is treated as if the Non-Spin is being provided.
- (3) Control performance during periods in which ERCOT has deployed Non-Spin shall be based on the requirements below and failure to meet any one of these requirements for

Board Report

the greater of one or 5% of Non-Spin deployments during a month shall be reported to the Reliability Monitor as non-compliance:

- (a) Within 20 minutes following a deployment instruction, the QSE must update the telemetered Ancillary Service Schedule for Non-Spin for Generation Resources and Controllable Load Resources to reflect the deployment amount.
- (b) Off-Line Generation Resources, within 25 minutes following a deployment instruction, must be On-Line with an Energy Offer Curve and the telemetered net generation must be greater than or equal to the Resource's telemetered LSL multiplied by P1 where P1 is defined in the "ERCOT and QSE Operations Business Practices During the Operating Hour." The Resource Status that must be telemetered indicating that the Resource has come On-Line with an Energy Offer Curve is ON as described in paragraph (5)(b)(i) of Section 3.9.1, Current Operating Plan (COP) Criteria.
- (c) If an Off-Line Generation Resource experiences a Startup Loading Failure (excluding those caused by operator error), the Resource may be considered for exclusion from performance non-compliance if the QSE provides to ERCOT the following documentation regarding the incident:
 - (i) Its generation log documenting the Startup Loading Failure; and
 - (ii) Equipment failure documentation such as, but not limited to, GADS reports, plant operator logs, work orders, or other applicable information.
- (d) Controllable Load Resources must be available to SCED, and within 25 minutes following a deployment instruction must have a Real-Time Market (RTM) Energy Bid and the telemetered net real power consumption must be greater than or equal to the Resource's telemetered LPC.
- (e) For QSEs with Load Resources that are not Controllable Load Resources, 30 minutes following deployment instruction the sum of the QSE's Load Resource response shall not be less than 95% of the requested MW deployment, nor more than 150% of the lesser of the following:
 - (i) The QSE's award for Non-Spin from Load Resources that are not Controllable Load Resources; or
 - (ii) The requested MW deployment.

The QSE's portfolio shall maintain this response until recalled.

- (f) During periods when the Load level of a Load Resource that is not a Controllable Load Resource providing Non-Spin has been affected by a Dispatch Instruction from ERCOT, the performance of a Load Resource in response to a Dispatch Instruction must be determined by subtracting the Load Resource's actual Load response from its Baseline. "Baseline" capacity is calculated by measuring the

Board Report

average of the real power consumption for five minutes before the Dispatch Instruction if the Load level of a Load Resource had not been affected by a Dispatch Instruction from ERCOT. The actual Load response is the difference between the Baseline and the average of the real power consumption data being telemetered to ERCOT over the Settlement Interval for the period beginning 30 minutes after the Dispatch Instruction and ending at the time of recall. The instantaneous response at any point in time during the sustained response period must be no less than 95% and no more than 150% of the Dispatch Instruction.

- (4) A Load Resource that is not a Controllable Load Resource providing Non-Spin must return to at least 95% of its Ancillary Service Resource Responsibility for Non-Spin within three hours following a recall instruction unless replaced by another Resource as described below. However, the Load Resource should attempt to return to at least 95% of its Ancillary Service Resource Responsibility for Non-Spin as soon as practical considering process constraints. For a Load Resource that is not a Controllable Load Resource that is unable to return to its Ancillary Service Resource Responsibility within three hours of recall instruction, its QSE may replace the quantity of deficient Non-Spin capacity within that same three hours using other Resources not previously committed to provide Non-Spin.
- (5) ERCOT may revoke the Ancillary Service qualification of any Load Resource that is not a Controllable Load Resource for failure to comply with the required performance standards, based on the evaluation it performed under this Section. Specifically, if a Load Resource that is not a Controllable Load Resource that is providing Non-Spin fails to respond with at least 95% of its Dispatch Instruction for Non-Spin within 30 minutes of an ERCOT Dispatch Instruction, that response shall be considered a failure. Two Load Resource performance failures within any rolling 365-day period shall result in disqualification of that Load Resource. After six months of disqualification, the Load Resource may reapply for qualification provided it submits a corrective action plan to ERCOT that identifies actions taken to correct performance deficiencies and the disqualified Load Resource successfully passes qualification test as specified in Section 8.1.1.1.

[NPRR1011: Replace Section 8.1.1.4.3 above with the following upon system implementation of the Real-Time Co-Optimization (RTC) project:]

8.1.1.4.3 Non-Spinning Reserve Service Energy Deployment Criteria

- (1) ERCOT shall, as part of its Ancillary Service deployment procedure under Section 6.5.7.6.2.3, Non-Spinning Reserve Service Deployment, include all performance metrics for a Resource receiving a Non-Spin recall instruction from ERCOT.
- (2) A Non-Spin Dispatch Instruction from ERCOT must respect the minimum runtime of a Generation Resource.
- (3) Control performance during periods in which ERCOT has manually deployed Non-Spin shall be based on the requirements below and failure to meet any one of these

Board Report

requirements for the greater of one or 5% of Non-Spin deployments during a month shall be reported to the Reliability Monitor as non-compliance:

- (a) Off-Line Generation Resources, within 25 minutes following a deployment instruction, must be On-Line with an Energy Offer Curve and the telemetered net generation must be greater than or equal to the Resource's telemetered LSL multiplied by P1 where P1 is defined in the "ERCOT and QSE Operations Business Practices During the Operating Hour." The Resource Status that must be telemetered indicating that the Resource has come On-Line with an Energy Offer Curve is ON as described in paragraph (5)(b)(i) of Section 3.9.1, Current Operating Plan (COP) Criteria.
- (b) If an Off-Line Generation Resource experiences a Startup Loading Failure (excluding those caused by operator error), the Resource may be considered for exclusion from performance non-compliance if the QSE provides to ERCOT the following documentation regarding the incident:
 - (i) Its generation log documenting the Startup Loading Failure; and
 - (ii) Equipment failure documentation such as, but not limited to, GADS reports, plant operator logs, work orders, or other applicable information.
- (c) Controllable Load Resources must be available to SCED, and must have a Real-Time Market (RTM) Energy Bid and the telemetered net real power consumption must be greater than or equal to the Resource's telemetered LPC.
- (d) For QSEs with Load Resources that are not Controllable Load Resources, 30 minutes following deployment instruction the sum of the QSE's Load Resource response shall not be less than 95% of the requested MW deployment, nor more than 150% of the lesser of the following:
 - (i) The QSE's award for Non-Spin from Load Resources that are not Controllable Load Resources; or
 - (ii) The requested MW deployment.

The QSE's portfolio shall maintain this response until recalled.

- (e) During periods when the Load level of a Load Resource that is not a Controllable Load Resource providing Non-Spin has been affected by a Dispatch Instruction from ERCOT, the performance of a Load Resource in response to a Dispatch Instruction must be determined by subtracting the Load Resource's actual Load response from its Baseline. "Baseline" capacity is calculated by measuring the average of the real power consumption for five minutes before the Dispatch Instruction if the Load level of a Load Resource had not been affected by a Dispatch Instruction from ERCOT. The actual Load response is the difference between the Baseline and the average of the real

Board Report

power consumption data being telemetered to ERCOT over the Settlement Interval for the period beginning 30 minutes after the Dispatch Instruction and ending at the time of recall. The instantaneous response at any point in time during the sustained response period must be no less than 95% and no more than 150% of the Dispatch Instruction.

- (4) Once Non-Spin capacity has been manually deployed by ERCOT, the Resource's Non-Spin capacity shall remain available for dispatch by SCED until ERCOT issues a recall instruction or the Resource has exhausted its ability to maintain the deployed capacity after meeting the requirements of paragraph (2) of Section 8.1.1.3.3, Non-Spinning Reserve Capacity Monitoring Criteria, whichever occurs first.
- (5) A Load Resource that is not a Controllable Load Resource providing Non-Spin must return to at least 95% of its Ancillary Service Resource Responsibility for Non-Spin within three hours following a recall instruction unless replaced by another Resource as described below. However, the Load Resource should attempt to return to at least 95% of its Ancillary Service Resource Responsibility for Non-Spin as soon as practical considering process constraints. For a Load Resource that is not a Controllable Load Resource that is unable to return to its Ancillary Service Resource Responsibility within three hours of recall instruction, its QSE may replace the quantity of deficient Non-Spin capacity within that same three hours using other Resources not previously committed to provide Non-Spin.
- (6) ERCOT may revoke the Ancillary Service qualification of any Load Resource that is not a Controllable Load Resource for failure to comply with the required performance standards, based on the evaluation it performed under this Section. Specifically, if a Load Resource that is not a Controllable Load Resource that is providing Non-Spin fails to respond with at least 95% of its dispatch instruction for Non-Spin within 30 minutes of an ERCOT Dispatch Instruction, that response shall be considered a failure. Two Load Resource performance failures within any rolling 365-day period shall result in disqualification of that Load Resource. After six months of disqualification, the Load Resource may reapply for qualification provided it submits a corrective action plan to ERCOT that identifies actions taken to correct performance deficiencies and the disqualified Load Resource successfully passes qualification test as specified in Section 8.1.1.1.

Revised ERCOT Impact Analysis Report

NPRR Number	<u>1093</u>	NPRR Title	Load Resource Participation in Non-Spinning Reserve
Impact Analysis Date	September 28, 2021		
Estimated Cost/Budgetary Impact	Between \$450k and \$650k See Comments		
Estimated Time Requirements	The timeline for implementing this Nodal Protocol Revision Request (NPRR) is dependent upon Public Utility Commission of Texas (PUCT) prioritization and approval. Estimated project duration: 10 to 14 months		
ERCOT Staffing Impacts (across all areas)	Implementation Labor: 71% ERCOT; 29% Vendor Ongoing Requirements: No impacts to ERCOT staffing.		
ERCOT Computer System Impacts	The following ERCOT systems would be impacted: • Market Operation Systems 68% • Data Management & Analytic Systems 17% • Energy Management Systems 6% • Credit, Settlements & Billing Systems 6% • Grid Decision Support Systems 1% • ERCOT Website and MIS System 1% • Content Delivery Systems 1% • Integration Systems 1%		
ERCOT Business Function Impacts	No impacts to ERCOT business functions.		
Grid Operations & Practices Impacts	ERCOT will update grid operations and practices to implement this NPRR.		

Evaluation of Interim Solutions or Alternatives for a More Efficient Implementation

None offered.

Comments

To ensure additional capacity from Load Resources providing Non-Spinning Reserve (Non-Spin) is available to ERCOT Operators in summer 2022, ERCOT may have to implement this NPRR in phases.

Board Report

NOGRR Number	<u>232</u>	NOGRR Title	Related to NPRR1093, Load Resource Participation in Non-Spinning Reserve
Date of Decision	October 22, 2021		
Action	Recommended Approval		
Timeline	Urgent – to allow ERCOT to explore temporary work-arounds to allow Load Resources that are not Controllable Load Resources to participate in Non-Spinning Reserve (Non-Spin) so that additional capacity is available to ERCOT Operators for the upcoming winter and summer 2022.		
Proposed Effective Date	Upon system implementation of Nodal Protocol Revision Request (NPRR) 1093, Load Resource Participation in Non-Spinning Reserve		
Priority and Rank Assigned	Not applicable		
Nodal Operating Guide Sections Requiring Revision	2.3, Ancillary Services 2.3.2.1, Additional Operational Details for Non-Spinning Reserve Service Providers		
Related Documents Requiring Revision/Related Revision Requests	NPRR1093 Other Binding Document Revision Request (OBDRR) 032, Non-Spin Changes Related to NPRR1093, Load Resource Participation in Non-Spinning Reserve OBDRR033, ORDC Changes Related to NPRR1093, Load Resource Participation in Non-Spinning Reserve		
Revision Description	This Nodal Operating Guide Revision Request (NOGRR) aligns the Nodal Operating Guide with revisions from NPRR1093 to allow Load Resources that are not Controllable Load Resources to provide Non-Spinning Reserve (Non-Spin) Ancillary Service.		
Reason for Revision	☒ Addresses current operational issues. ☒ Meets Strategic goals (tied to the <u>ERCOT Strategic Plan</u> or directed by the ERCOT Board). ☒ Market efficiencies or enhancements ☐ Administrative ☐ Regulatory requirements ☐ Other: (explain) <i>(please select all that apply)</i>		

Board Report

Business Case	Alignment between Protocols and the Nodal Operating Guide is necessary and proper.
ROS Decision	On 9/21/21, ROS voted via email to grant NOGRR232 Urgent status; to recommend approval of NOGRR232 as submitted; and to forward to TAC NOGRR232 and the Impact Analysis. There were five abstentions from the Cooperative (3) (Golden Spread, LCRA, STEC), Independent Generator (Calpine), and Municipal (Garland) Market Segments. All Market Segments participated in the email vote.
Summary of ROS Discussion	On 9/21/21, there was no discussion.
TAC Decision	On 9/29/21, TAC voted via roll call to recommend approval of NOGRR232 as recommended by ROS in the 9/21/21 ROS Report. There were six opposing votes from the Cooperative (4) (LCRA, STEC, Brazos Electric, Golden Spread) and Independent Generator (2) (Luminant, Calpine) Market Segments and two abstentions from the Independent Power Marketer (IPM) (Shell) and Municipal (Garland) Market Segments. All Market Segments participated in the vote.
Summary of TAC Discussion	On 9/29/21, TAC reviewed the ERCOT Opinion and ERCOT Market Impact Statement for NOGRR232. Please see the 9/29/21 TAC Report for the TAC discussion on NPRR1093.
ERCOT Opinion	ERCOT supports approval of NOGRR232.
ERCOT Market Impact Statement	ERCOT Staff has reviewed NOGRR232 and believes the market impact for NOGRR232 allows ERCOT to access additional capacity from Load Resources participating in Non-Spin that otherwise would not be accessible, will improve Non-Spin offer liquidity, and will allow ERCOT to procure the required quantities of Non-Spin more competitively.
Board Decision	On 10/22/21, the ERCOT Board recommended approval of NOGRR232 as recommended by TAC in the 9/29/21 TAC Report.

Sponsor	
Name	Sandip Sharma
E-mail Address	sandip.sharma@ercot.com
Company	ERCOT
Phone Number	512-248-4298

Board Report

Cell Number	
Market Segment	Not applicable

Market Rules Staff Contact	
Name	Cory Phillips
E-Mail Address	cory.phillips@ercot.com
Phone Number	512-248-6464

Comments Received	
Comment Author	Comment Summary
None	

Market Rules Notes

Please note administrative revisions, authored as “ERCOT Market Rules”, have been made to this NOGRR.

Proposed Guide Language Revision

Board Report

2.3 Ancillary Services

(1) The types of Ancillary Services required by ERCOT are described below:

ANCILLARY SERVICE TYPE	DESCRIPTION	ERCOT AUTHORITY ACTION
Regulation Down Service (Reg-Down) and Regulation Up Service (Reg-Up) (for Generation Resources) <i>Reference: Protocol Section 2, Definitions and Acronyms</i>	Resource capacity provided by a Qualified Scheduling Entity (QSE) from a specific Generation Resource to control frequency within the system which is controlled second by second, normally by an Automatic Generation Control (AGC) system.	a. Reg-Down energy is a deployment to increase or decrease generation at a level below the Generation Resource's Base Point in response to a change in system frequency. b. Reg-Up energy is a deployment to increase or decrease generation at a level above the Generation Resource's Base Point in response to a change in system frequency.
Reg-Down and Reg-Up (for Load Resource) <i>Reference: Protocol Section 2</i>	Load Resource capacity provided by a QSE from a specific Load Resource to control frequency within the system.	a. Reg-Down is a deployment to increase or decrease Load as deployed within its Ancillary Service Schedule for Reg-Down below the Load Resource's Maximum Power Consumption (MPC) limit in response to a change in system frequency. b. Reg-Up is a deployment to increase or decrease Load as deployed within its Ancillary Service Schedule for Reg-Up above the Load Resource's Low Power Consumption (LPC) limit in response to a change in system frequency.

Board Report

ANCILLARY SERVICE TYPE	DESCRIPTION	ERCOT AUTHORITY ACTION
Responsive Reserve (RRS) <i>Reference: Protocol Section 2</i>	Operating reserves on Generation Resources, Load Resources, and Resources capable of providing Fast Frequency Response (FFR) maintained by ERCOT to help control the frequency of the system. RRS on Generation Resources and Controllable Load can be used as energy during an Energy Emergency Alert (EEA) event.	RRS may only be deployed as follows: a. Through automatic Governor action or under-frequency relay in response to frequency deviations; b. By electronic signal from ERCOT in response to the need; and c. As ordered by an ERCOT Operator during an EEA or other emergencies.

Board Report

ANCILLARY SERVICE TYPE	DESCRIPTION	ERCOT AUTHORITY ACTION
Non-Spinning Reserve (Non-Spin) Service <i>Reference: Protocol Section 2</i>	a. Off-Line Generation Resource capacity, or reserved capacity from On-Line Generation Resources, capable of being ramped to a specified output level within 30 minutes, and operating at a specified output for the entire duration of the Non-Spin obligation. b. Controllable Load Resources that are capable of ramping to an ERCOT-instructed consumption level within 30 minutes and consuming at the ERCOT-instructed level for the entire duration of the Non-Spin obligation. c. Load Resources that are not Controllable Load Resources and that are not controlled by under-frequency relay. Load Resources that are not Controllable Load Resources providing Non-Spin must be capable of reducing Load in response to an Extensible Markup Language (XML) Dispatch Instruction within 30 minutes and remain deployed until recalled by ERCOT.	Deployed in response to loss-of-Resource contingencies, Load forecasting error, or other contingency events on the system. See Protocol Section 6.5.7.6.2.3, Non-Spinning Reserve Service Deployment.
Voltage Support Service (VSS) <i>Reference: Protocol Section 3.15, Voltage Support</i>	Reactive capability of a Generation Resource that is required to maintain transmission and distribution voltages on the ERCOT Transmission Grid within acceptable limits. All Generation Resources with a gross rating greater than 20 MVA shall provide VSS.	Direct the scheduling of VSS by providing Voltage Profiles at the point of interconnection. The Generation Resource is obligated to maintain the published voltage profile within its Corrected Unit Reactive Limit (CURL).

Board Report

ANCILLARY SERVICE TYPE	DESCRIPTION	ERCOT AUTHORITY ACTION
Black Start Service (BSS) <i>Reference: Protocol Section 3.14.2, Black Start</i>	The provision of Generation Resources under a Black Start Agreement, which are capable of self-starting without support from within ERCOT in the event of a Partial Blackout or Blackout.	Provide emergency Dispatch Instructions to begin restoration to a secure operating state after a Partial Blackout or Blackout.
Reliability Must-Run (RMR) Service <i>Reference: Protocol Section 3.14.1, Reliability Must Run</i>	The provision of Generation Resource capacity and energy under an RMR Agreement.	Enter into contractual agreements to retain units required for reliable operations. Direct the operation of those units that otherwise would not operate and that are necessary to provide reliable operations.

[NOGRR187, NOGRR204, NOGRR210, and NOGRR211: Replace applicable portions of paragraph (1) above with the following upon system implementation of NPRR863, NPRR989, NPRR1005, or NPRR1007, respectively:]

(1) The types of Ancillary Services required by ERCOT are described below:

ANCILLARY SERVICE TYPE	DESCRIPTION	ERCOT AUTHORITY ACTION
Regulation Down Service (Reg-Down) and Regulation Up Service (Reg-Up) (for Generation Resources and Energy Storage Resources (ESRs)) <i>Reference: Protocol Section 2, Definitions and Acronyms</i>	Resource capacity provided by a Qualified Scheduling Entity (QSE) from a specific Generation Resource or ESR to control frequency within the system which is controlled second by second, normally by an Automatic Generation Control (AGC) system.	a. Reg-Down energy is a Resource-specific deployment to increase or decrease generation at a level below the Generation Resource's or ESR's Base Point in response to a change in system frequency. b. Reg-Up energy is a Resource-specific deployment to increase or decrease generation at a level above the Generation Resource's or ESR's Base

Board Report

		Point in response to a change in system frequency.
Reg-Down and Reg-Up (for Load Resource) <i>Reference: Protocol Section 2</i>	Load Resource capacity provided by a QSE from a specific Load Resource to control frequency within the system.	a. Reg-Down is a Resource-specific deployment to increase or decrease Load below the Load Resource's Maximum Power Consumption (MPC) limit in response to a change in system frequency. b. Reg-Up is a Resource-specific deployment to increase or decrease Load above the Load Resource's Low Power Consumption (LPC) limit in response to a change in system frequency.
Responsive Reserve (RRS) <i>Reference: Protocol Section 2</i>	Operating reserves on Generation Resources, ESRs, Load Resources, and Resources capable of providing Fast Frequency Response (FFR) maintained by ERCOT to help control the frequency of the system. RRS on Generation Resources, ESRs, and Controllable Load can be used as energy during an Energy Emergency Alert (EEA) event.	RRS may only be deployed as follows: a. Through automatic Governor action or under-frequency relay in response to frequency deviations; b. By electronic signal from ERCOT in response to the need; and c. As ordered by an ERCOT Operator during an EEA or other emergencies.
ERCOT Contingency	a. Off-Line Generation Resource or ESR capacity, or reserved capacity from	Deployed in response to loss-of-Resource contingencies, Load forecasting error, or other

Board Report

Reserve Service (ECRS) <i>Reference: Protocol Section 2</i>	On-Line Generation Resources or ESRs, capable of being ramped to a specified output level within ten minutes, and operating at a specified output for at least one hour. b. Controllable Load Resources dispatchable by SCED that are capable of ramping to an ERCOT-instructed consumption level within ten minutes and consuming at the ERCOT-instructed level for at least one hour. c. Load Resources other than Controllable Load Resources that may or may not be controlled by under-frequency relay that are capable of interrupting within ten minutes at ERCOT instruction for at least one hour	contingency events on the system. See Protocol Section 6.5.7.6.2.4, Deployment and Recall of ERCOT Contingency Reserve Service.
Non-Spinning Reserve (Non-Spin) Service <i>Reference: Protocol Section 2</i>	a. Off-Line Generation Resource or ESR capacity, or reserved capacity from On-Line Generation Resources or ESRs, capable of being ramped to a specified output level within 30 minutes, and operating at a specified output for at least one hour. b. Controllable Load Resources that are capable of ramping to an ERCOT-instructed consumption level within 30 minutes and consuming at the ERCOT-	Deployed in response to loss-of-Resource contingencies, Load forecasting error, or other contingency events on the system. See Protocol Section 6.5.7.6.2.3, Non-Spinning Reserve Service Deployment.

Board Report

	instructed level for at least one hour. c. Load Resources that are not Controllable Load Resources and that are not controlled by under-frequency relay. Load Resources that are not Controllable Load Resources providing Non-Spin must be capable of reducing Load in response to an Extensible Markup Language (XML) Dispatch Instruction within 30 minutes and remain deployed until recalled by ERCOT.	
Voltage Support Service (VSS) <i>Reference: Protocol Section 3.15, Voltage Support</i>	Reactive capability of a Generation Resource or ESR that is required to maintain transmission and distribution voltages on the ERCOT Transmission Grid within acceptable limits. All Generation Resources and ESRs with a gross rating greater than 20 MVA shall provide VSS.	Direct the scheduling of VSS by providing Voltage Profiles at the Point of Interconnection Bus (POIB). The Generation Resource or ESR is obligated to maintain the published voltage profile within its Corrected Unit Reactive Limit (CURL).
Black Start Service (BSS) <i>Reference: Protocol Section 3.14.2, Black Start</i>	The provision of Generation Resources under a Black Start Agreement, which are capable of self-starting without support from within ERCOT in the event of a Partial Blackout or Blackout.	Provide emergency Dispatch Instructions to begin restoration to a secure operating state after a Partial Blackout or Blackout.
Reliability Must-Run (RMR) Service <i>Reference: Protocol Section 3.14.1, Reliability Must Run</i>	The provision of Generation Resource capacity and energy under an RMR Agreement.	Enter into contractual agreements to retain units required for reliable operations. Direct the operation of those units that otherwise would not

Board Report

		operate and that are necessary to provide reliable operations.
--	--	--

2.3.2.1 Additional Operational Details for Non-Spinning Reserve Service Providers

- (1) Non-Spin Service Generation Resource providers must be capable of being synchronized and ramped to a specified output level within 30 minutes of notification of deployment and run at a specified output level for at least one hour, as specified in item (1)(a) of Protocol Section 3.17.3, Non-Spinning Reserve Service.

[NOGRR211: Replace paragraph (1) above with the following upon system implementation of NPRR1007:]

- (1) Non-Spin Service Generation Resource providers, including MW from power augmentation, must be capable of being synchronized and ramped to a specified output level within 30 minutes of notification of deployment and run at a specified output level for at least one hour, as specified in item (1)(a) of Protocol Section 3.17.3, Non-Spinning Reserve Service.
- (2) Non-Spin Controllable Load Resource providers must be capable of ramping to an ERCOT-instructed consumption level within 30 minutes and consuming at the ERCOT-instructed level for at least one hour, as specified in item (1)(b) of Protocol Section 3.17.3.
- (3) A Load Resource that is not a Controllable Load Resource providing Non-Spin must be capable of reducing Load based on an XML Dispatch Instruction issued by ERCOT within 30 minutes and maintaining that deployment until recalled.
- (4) To become provisionally qualified as a provider of Non-Spin, a Load Resource shall complete the following requirements:
 - (a) Register as a Load Resource with ERCOT;
 - (b) Complete asset registration of the Load Resource;
 - (c) Provide ERCOT the appropriate Non-Spinning Load affidavit;
 - (d) Test to verify appropriate voice communications are in place for VDIs by ERCOT;
 - (e) Provide telemetry through the QSE to ERCOT in accordance with all applicable requirements set forth in paragraph (5) of Protocol Section 6.5.5.2, Operational Data Requirements; and

Board Report

- (f) Be able to consume at an ERCOT-instructed level during an ERCOT deployment for a minimum of one hour up to a maximum of the hours of service responsibility.

[NOGRR211: Replace item (f) above with the following upon system implementation of NPRR1007:]

- (f) Be able to consume at an ERCOT-instructed level during an ERCOT deployment for a minimum of one hour.
- (5) To become and remain fully qualified as a provider of Non-Spin, the Load Resource shall complete all the requirements for provisional qualification identified above and the following:
 - (a) Respond successfully to an actual ERCOT deployment or pass simulated or actual testing according to ERCOT's Procedure; and
 - (b) Perform verification testing as described in Section 8, Attachment G, Load Resource Tests.

ERCOT Impact Analysis Report

NOGRR Number	<u>232</u>	NOGRR Title	Related to NPRR1093, Load Resource Participation in Non-Spinning Reserve
Impact Analysis Date	September 1, 2021		
Estimated Cost/Budgetary Impact	None.		
Estimated Time Requirements	No project required. This Nodal Operating Guide Revision Request (NOGRR) can take effect upon Nodal Protocol Revision Request (NPRR) 1093, Load Resource Participation in Non-Spinning Reserve.		
ERCOT Staffing Impacts (across all areas)	Ongoing Requirements: No impacts to ERCOT staffing.		
ERCOT Computer System Impacts	No impacts to ERCOT computer systems.		
ERCOT Business Function Impacts	No impacts to ERCOT business functions.		
Grid Operations & Practices Impacts	No impacts to ERCOT grid operations and practices.		

Evaluation of Interim Solutions or Alternatives for a More Efficient Implementation

None offered.

Comments

There are no additional impacts to this NOGRR beyond what was captured in the Impact Analysis for NPRR1093.

Board Report

OBDRR Number	<u>032</u>	OBDRR Title	Non-Spin Changes Related to NPRR1093, Load Resource Participation in Non-Spinning Reserve
Date of Decision	October 22, 2021		
Action	Recommended Approval		
Proposed Effective Date	Upon system implementation of Nodal Protocol Revision Request (NPRR) 1093, Load Resource Participation in Non-Spinning Reserve		
Priority and Rank Assigned	Not applicable		
Other Binding Document Requiring Revision	Non-Spinning Reserve Service Deployment and Recall Procedure		
Supporting Protocol or Guide Section(s) / Related Documents	NPRR1093 Nodal Operating Guide Revision Request (NOGRR) 232, Related to NPRR1093, Load Resource Participation in Non-Spinning Reserve Other Binding Document Revision Request (OBDRR) 033, ORDC Changes Related to NPRR1093, Load Resource Participation in Non-Spinning Reserve		
Revision Description	This OBDRR aligns the Non-Spinning Reserve Deployment and Recall Procedure with revisions from NPRR1093 to allow Load Resources that are not Controllable Load Resources to provide Non-Spinning Reserve (Non-Spin) Ancillary Service.		
Reason for Revision	☒ Addresses current operational issues. ☒ Meets Strategic goals (tied to the <u>ERCOT Strategic Plan</u> or directed by the ERCOT Board). ☒ Market efficiencies or enhancements ☐ Administrative ☐ Regulatory requirements ☐ Other: (explain) (please select all that apply)		
Business Case	Alignment between the Protocols and Other Binding Documents is necessary and proper.		
TAC Decision	On 9/29/21, TAC voted via roll call to recommend approval of OBDRR032 as submitted and the Impact Analysis. There were six opposing votes from the Cooperative (4) (LCRA, STEC, Brazos Electric, Golden Spread) and Independent Generator (2) (Luminant,		

Board Report

	Calpine) Market Segments and two abstentions from the Independent Power Marketer (IPM) (Shell) and Municipal (Garland) Market Segments. All Market Segments participated in the vote.
Summary of TAC Discussion	On 9/29/21, TAC reviewed the ERCOT Opinion and ERCOT Market Impact Statement for OBDRR032. Please see the 9/29/21 TAC Report for the TAC discussion on NPRR1093.
ERCOT Opinion	ERCOT supports approval of OBDRR032.
ERCOT Market Impact Statement	ERCOT Staff has reviewed OBDRR032 and believes the market impact for OBDRR032 allows ERCOT to access additional capacity from Load Resources participating in Non-Spin that otherwise would not be accessible, will improve Non-Spin offer liquidity, and will allow ERCOT to procure the required quantities of Non-Spin more competitively.
Board Decision	On 10/22/21, the ERCOT Board recommended approval of OBDRR032 as recommended by TAC in the 9/29/21 TAC Report.

Sponsor	
Name	Sandip Sharma
E-mail Address	sandip.sharma@ercot.com
Company	ERCOT
Phone Number	512-248-4298
Cell Number	
Market Segment	Not applicable

Market Rules Staff Contact	
Name	Cory Phillips
E-Mail Address	cory.phillips@ercot.com
Phone Number	512-248-6464

Comments Received	
Comment Author	Comment Summary
LCRA/STEC 101521	Opposed the TAC recommendation for OBDRR032 and recommended the Board reject OBDRR032

Board Report

LCRA/STEC 102021	Updated position statement withdrawing opposition to OBDRR032
------------------	---

Market Rules Notes

Please note that the following OBDRR(s) also propose revisions to this Other Binding Document

- OBDRR035, Related to NPRR1101, Create Non-Spin Deployment Groups made up of Generation Resources Providing Off-Line Non-Spinning Reserve and Load Resources that are Not Controllable Load Resources Providing Non-Spinning Reserve

Proposed Other Binding Document Language Revision

1. Nodal Market Non-Spinning Reserve Service Deployment and Recall Procedure

For any Non-Spinning Reserve (Non-Spin) Service that is not continually deployed to Security-Constrained Economic Dispatch (SCED) as part of a standing On-Line Non-Spin deployment, there are four situations that will cause Non-Spin to be deployed:

- Detection of insufficient capacity for energy dispatch during periodic checking of available capacity.
- Disturbance conditions such as a unit trip, sustained frequency decay or sustained low frequency operations.
- SCED not having enough energy available to execute successfully.
- When Off-Line Generation Resource(s) and/or Load Resource(s) that are not Controllable Load Resource(s) providing Non-Spin are the only reasonable option(s) available to the Operator for resolving local issues.

In each of these cases, the ERCOT operator will make the final decision and initiate the deployment. The ERCOT operator shall deploy Non-Spin in amounts sufficient to respond to the operational circumstances. This means that Non-Spin may be deployed partially over time or may be deployed in its entirety. If Non-Spin is deployed partially, it shall be deployed in increments of 100% of each Resource's capacity. To support partial deployment, ERCOT shall, following the Day-Ahead Market (DAM), rank, for each hour of the Operating Day, the Resources supplying Non-Spin in an economic order based on DAM Settlement Point Prices. Partial Non-Spin deployment and recall decisions shall be based on each Resource's economic cost order. When deploying Non-Spin, the Load Resources that are not Controllable Load Resources will be deployed after other Non-Spin from Off-Line Generation Resources.

2. Non-Spin Deployment

ERCOT may deploy Non-Spin, which has not been deployed as part of a standing On-Line Non-Spin deployment, under the following conditions:

Board Report

- When (High Ancillary Service Limit (HASL) – Gen – Intermittent Renewable Resource (IRR) Curtailment) – (30-minute net load ramp) < 0 MW, deploy sufficient Non-Spin capacity so that (HASL – Gen – IRR Curtailment) – (30-minute net load ramp) > 500 MW.
- When Physical Responsive Capability (PRC) < 3200 MW and not expected to recover within 30 minutes without deploying reserves, deploy all or a portion of the available Non-Spin capacity.
- When Physical Responsive Capability (PRC) < 2500 MW, deploy all of the available Non-Spin capacity.
- When the North-to-Houston (N_H) Voltage Stability Limit Reliability Margin < 300 MW, deploy Non-Spin (all or partial) in the Houston area as needed to restore reliability margin.
- When Off-Line Generation Resources providing Non-Spin are the only reasonable option available to the Operator for resolving local issues, deploy available Non-Spin capacity on only the necessary individual Resources.

If a condition other than those listed above indicates that additional capacity may need to be brought On-Line to manage reliability, operators will evaluate the system condition and deploy Non-Spin as needed if no other better options are available to resolve the system condition. Under emergency, the emergency process will govern the deployment of Non-Spin.

Following a Non-Spin deployment, the following steps should be taken:

2.1. Off-Line Generation Resource reserved for Non-Spin

- The Qualified Scheduling Entity (QSE) will be sent a Resource-specific Dispatch Instruction that Non-Spin has been deployed.
- The Dispatch Instruction must include the expected amount of *capacity* that will be available for SCED and the anticipated duration of the deployment.
- The QSE will ensure that the Non-Spin Ancillary Service Schedule telemetry for that unit has been reduced to zero within 20 minutes of the Dispatch Instruction.
- The QSE must have the Resource On-Line with an Energy Offer Curve and the telemetered net generation must be greater than or equal to the Resource's telemetered Low Sustained Limit (LSL) multiplied by P1 where P1 is defined in the "ERCOT and QSE Operations Business Practices During the Operating Hour" within 25 minutes of the Dispatch Instruction.
- SCED will respond to the changes in Resource Status that are received by telemetry from the QSE.
- Once the Resource is On-Line it is Dispatched as any other Generation Resource including any provisions for processing generation less than the Resource's LSL.
- The Resource must, at a minimum, be capable of providing all the Non-Spin energy to SCED within 30 minutes of the Dispatch Instruction.

Board Report

2.2. On-Line Generation Resource with an Energy Offer Curve

- For a Resource that *will not use power augmentation* to provide any portion of its Non-Spin Ancillary Service Resource Responsibility:
 - The QSE shall set the value of the Non-Spin Ancillary Service Schedule to zero within the 30-second window prior to the start of the delivery hour.
 - ERCOT will automatically calculate new HASL constraints for SCED using the telemetry of the Resource's Non-Spin Ancillary Service Schedule.
 - The total amount of capacity reserved on that Resource for Non-Spin shall be considered as a standing Non-Spin deployment Dispatch Instruction for the duration of the Operating Hour.
 - A Non-Spin deployment Dispatch Instruction from ERCOT is not required for standing Non-Spin deployments.
- For a Resource that *will use power augmentation* to provide a specific MW portion of its Non-Spin Ancillary Service Responsibility:
 - The QSE shall set the value of the Non-Spin Ancillary Service Schedule to the appropriate value within the 30-second window prior to the start of the delivery hour.
 - The QSE may set the value of the Non-Spin Ancillary Service Schedule equal to the MW amount of Non-Spin that will be provided via power augmentation; otherwise, the QSE may set the value of the schedule to zero.
 - If the Non-Spin Ancillary Service Schedule is set to zero, then the total amount of capacity reserved on that Resource for Non-Spin shall be considered as a standing Non-Spin deployment Dispatch Instruction for the duration of the Operating Hour.
 - If the Non-Spin Ancillary Service Schedule is set to a non-zero value, then the QSE will be sent a Resource-specific Dispatch Instruction indicating that Non-Spin has been deployed for the total amount of the Non-Spin Schedule.
 - The Dispatch Instruction must include the expected amount of *capacity* that will be available for SCED and the anticipated duration of the deployment.
 - The QSE shall reduce the Resource's Non-Spin Ancillary Service Schedule to zero within 20 minutes following a deployment instruction.
 - ERCOT will automatically calculate new HASL constraints for SCED using the telemetry of the Resource's Non-Spin Ancillary Service Schedule.
- The QSE must, at a minimum, ensure that the Normal Ramp Rate represented by the Resource's ramp rate curve is sufficient to allow SCED to fully Dispatch the Resource's Non-Spin Resource Responsibility within 30 minutes, regardless of whether or not the Resource uses power augmentation to provide the service.

Board Report

2.3. On-Line Generation Resource with Output Schedules

- The QSE shall set the value of the Non-Spin Ancillary Service Schedule to zero within the 30-second window prior to the start of the delivery hour.
- ERCOT will automatically calculate new HASL constraints for SCED using the telemetry of the Resource's Non-Spin Ancillary Service Schedule.
- If the QSE is sent a Resource-specific Dispatch Instruction indicating that Non-Spin has been deployed:
 - The Dispatch Instruction must include the additional amount of *energy* (MW) that needs to be produced by the Resource and the estimated duration of the deployment.
 - For Dynamically Scheduled Resources (DSRs) providing Non-Spin, as soon as the QSE receives the deployment, the QSE shall adjust the telemetry Output Schedule to reflect the Non-Spin deployment. A DSR QSE with a Load Resource that has provided Non-Spin will ensure that the Output Schedule is not reduced to reflect the Load deployment if the Load Resource is part of the DSR Load that the Resource follows.
 - For non-DSRs (with Output Schedules) providing Non-Spin, ERCOT shall increase the Output Schedule used in SCED by the difference between telemetered Non-Spin Ancillary Service Resource Responsibility and Ancillary Service Schedule to reflect the amount of Non-Spin energy that is to be provided by the Resource in response to the Non-Spin deployment.

2.4 Controllable Load Resource with Non-Spin Ancillary Service Resource Responsibility

- The QSE will be sent a Resource-specific Dispatch Instruction that Non-Spin has been deployed.
- The Dispatch Instruction must include the expected amount of capacity that will be available for SCED and the anticipated duration of the deployment.
- The QSE will ensure that the Non-Spin Ancillary Service Schedule telemetry for that Controllable Load Resource has been reduced to zero within 20 minutes of the Dispatch Instruction.
- The QSE must have the Controllable Load Resource's telemetered Resource Status as On-Line (ONRGL and/or ONCLR, whichever is applicable) with an RTM Energy Bid, and the Controllable Load Resource's telemetered net real power consumption must be greater than or equal to the Controllable Load Resource's telemetered LPC plus its total upward Ancillary Service Resource Responsibility.
- ERCOT will automatically calculate new LASL constraints for SCED using the telemetry of the Resource's Non-Spin Ancillary Service Schedule.
- Once the Controllable Load Resource's Non-Spin capacity has been released to SCED, this capacity is Dispatched as any other Resource available to SCED.

Board Report

- The Controllable Load Resource must, at a minimum, be capable of providing all the Non-Spin energy to SCED within 30 minutes of the Dispatch Instruction.

2.5 Load Resource that is not a Controllable Load Resource with Non-Spin Ancillary Service Resource Responsibility

- The QSE must show the Load Resource's telemetered Resource Status as On-Line (ONRL) and, if equipped with an under-frequency relay, the relay should not be armed and the status should indicate Disabled.
- Load Resources will be separated into groups of approximately 500 MW and a list of group assignments posted to the MIS shortly after the DRUC process is completed. Resources will be assigned group assignments according to a random selected process to be developed by ERCOT.
- Load Resources can be deployed individually, in groups, or as the entire block of Load Resources providing Non-Spin.
- The QSE will be sent a Resource-specific Dispatch Instruction for the Non-Spin deployment indicating a time and date stamp, QSE, Dispatch Asset Code, and Deployed MW.
- The Dispatch Instruction must include the expected amount of capacity that will be expected to be dropped by the Load Resource within 30 minutes.
- The QSE will ensure that the Non-Spin Ancillary Service Schedule telemetry for that Load Resource has been reduced to zero within one minute of receiving the Dispatch Instruction.
- The Load Resource must, at a minimum, be capable of remaining deployed until recalled.

3. Recall of Non-Spin Deployment

The deployed Non-Spin may be recalled in a manner that is expected to maintain (HASL – Gen – IRR Curtailment) – (30-minute net load ramp) > 1000 MW and PRC is > 3200 MW. Load Resources that are not Controllable Load Resources will be recalled first, followed by Generation Resources until all the non-spin is recalled.

Following the recall of a Non-Spin deployment, the following steps should be taken:

- After recall, the QSE for a Generation Resource will be allowed to use normal shutdown procedures to take the Generation Resource Off-Line if the QSE wants to shut down the Resource. In this case, the Non-Spin Ancillary Service Schedule for that Generation Resource will be reset to equal the Non-Spin Ancillary Service Responsibility for that Generation Resource for that hour. A QSE with a Generation Resource that was previously Off-Line will be allowed to keep the Generation Resource On-Line after the minimum On-Line time, provided that the difference between its High Sustained Limit (HSL) and LSL is greater than or equal to its Ancillary Service Resource Responsibility.
- A QSE with a Generation Resource (with an Energy Offer Curve) that will stay On-Line may set the value of the Non-Spin Ancillary Service Schedule equal to the MW amount

Board Report

of Non-Spin that will be provided via power augmentation; otherwise, the QSE will ensure that the value of the Non-Spin Ancillary Service Schedule for that Resource is set to 0 MW.

- A QSE with a DSR Generation Resource (with an Output Schedule) that will stay On-Line will back out the Non-Spin addition that was made to the Output Schedule. This can be incrementally deleted depending on the size of the deployment and Normal Ramp Rate. For non-DSR Generation Resources, SCED will use the QSE-submitted non-DSR Output Schedule once the Non-Spin has been recalled.
- A QSE with a Controllable Load Resource that has provided Non-Spin will ensure that the Load energy and Non-Spin capability is restored within three hours of the recall instruction of the Non-Spin deployment. If the QSE cannot restore within three hours of the recall of Non-Spin deployment by ERCOT, the Non-Spin capability must be replaced by the QSE on other Generation or Controllable Load Resources capable of providing the service.
- A QSE with a Load Resource that is not a Controllable Load Resource that has provided Non-Spin will ensure that the Load energy and Non-Spin capability is restored within three hours of the recall instruction of the Non-Spin deployment issued by ERCOT. If the QSE cannot restore within three hours of the ERCOT recall instruction of the Non-Spin deployment, the Non-Spin obligation must be replaced by the QSE from other Non-Spin qualified Resources capable of providing the service.
- The QSE will ensure that the Non-Spin Ancillary Service Schedule telemetry for a Load Resource that is not a Controllable Load Resource continuously and accurately represents the amount of Load Resource that has been restored following a recall instruction and is available for subsequent deployment.

If Non-Spin has been deployed in the Houston area to help manage the N₂H Voltage Stability Limit, the deployments will be recalled once reliability margins have been restored to a manageable level.

4. Non-Spinning Reserve Service Deployment and Recall Procedure Revision Process

Revisions to the Non-Spinning Reserve Service Deployment and Recall Procedure shall be made according to the approval process as prescribed in Protocol Section 6.5.7.6.2.3, Non-Spinning Reserve Service Deployment.

ERCOT Impact Analysis Report

OBDRR Number	<u>032</u>	OBDRR Title	Non-Spin Changes Related to NPRR1093, Load Resource Participation in Non-Spinning Reserve
Impact Analysis Date	September 1, 2021		
Estimated Cost/Budgetary Impact	None.		
Estimated Time Requirements	No project required. This Other Binding Document Revision Request (OBDRR) can take effect upon Nodal Protocol Revision Request (NPRR) 1093, Load Resource Participation in Non-Spinning Reserve.		
ERCOT Staffing Impacts (across all areas)	Ongoing Requirements: No impacts to ERCOT staffing.		
ERCOT Computer System Impacts	No impacts to ERCOT computer systems.		
ERCOT Business Function Impacts	No impacts to ERCOT business functions.		
Grid Operations & Practices Impacts	No impacts to ERCOT grid operations and practices.		

Evaluation of Interim Solutions or Alternatives for a More Efficient Implementation

None offered.

Comments

There are no additional impacts to this OBDRR beyond what was captured in the Impact Analysis for NPRR1093.

Board Report

OBDRR Number	<u>033</u>	OBDRR Title	ORDC Changes Related to NPRR1093, Load Resource Participation in Non-Spinning Reserve
Date of Decision	October 22, 2021		
Action	Recommended Approval		
Proposed Effective Date	Upon system implementation of Nodal Protocol Revision Request (NPRR) 1093, Load Resource Participation in Non-Spinning Reserve		
Priority and Rank Assigned	Not applicable		
Other Binding Document Requiring Revision	Methodology for Implementing Operating Reserve Demand Curve (ORDC) to Calculate Real-Time Reserve Price Adder		
Supporting Protocol or Guide Section(s) / Related Documents	NPRR1093 Nodal Operating Guide Revision Request (NOGRR) 232, Related to NPRR1093, Load Resource Participation in Non-Spinning Reserve Other Binding Document Revision Request (OBDRR) 032, Non-Spin Changes Related to NPRR1093, Load Resource Participation in Non-Spinning Reserve		
Revision Description	This OBDRR aligns the Methodology for Implementing Operating Reserve Demand Curve (ORDC) to Calculate Real-Time Reserve Price Adder with revisions from NPRR1093 to allow Load Resources that are not Controllable Load Resources to provide Non-Spinning Reserve (Non-Spin) Ancillary Service.		
Reason for Revision	☒ Addresses current operational issues. ☒ Meets Strategic goals (tied to the <u>ERCOT Strategic Plan</u> or directed by the ERCOT Board). ☒ Market efficiencies or enhancements ☐ Administrative ☐ Regulatory requirements ☐ Other: (explain) (please select all that apply)		
Business Case	Alignment between the Protocols and Other Binding Documents is necessary and proper.		

Board Report

TAC Decision	On 9/29/21, TAC voted via roll call to recommend approval of OBDRR033 as submitted and the Impact Analysis. There were six opposing votes from the Cooperative (4) (LCRA, STEC, Brazos Electric, Golden Spread) and Independent Generator (2) (Luminant, Calpine) Market Segments and two abstentions from the Independent Power Marketer (IPM) (Shell) and Municipal (Garland) Market Segments. All Market Segments participated in the vote.
Summary of TAC Discussion	On 9/29/21, TAC reviewed the ERCOT Opinion and ERCOT Market Impact Statement for OBDRR033. Please see the 9/29/21 TAC Report for the TAC discussion on NPRR1093.
ERCOT Opinion	ERCOT supports approval of OBDRR033.
ERCOT Market Impact Statement	ERCOT Staff has reviewed OBDRR033 and believes the market impact for OBDRR033 allows ERCOT to access additional capacity from Load Resources participating in Non-Spin that otherwise would not be accessible, will improve Non-Spin offer liquidity, and will allow ERCOT to procure the required quantities of Non-Spin more competitively.
Board Decision	On 10/22/21, the ERCOT Board recommended approval of OBDRR033 as recommended by TAC in the 9/29/21 TAC Report.

Sponsor	
Name	Sandip Sharma
E-mail Address	sandip.sharma@ercot.com
Company	ERCOT
Phone Number	512-248-4298
Cell Number	
Market Segment	Not applicable

Market Rules Staff Contact	
Name	Cory Phillips
E-Mail Address	cory.phillips@ercot.com
Phone Number	512-248-6464

Board Report

Comments Received	
Comment Author	Comment Summary
None	

Market Rules Notes

None

Proposed Other Binding Document Language Revision

1. PURPOSE

For each Security-Constrained Economic Dispatch (SCED) process, ERCOT calculates a Real-Time On-Line Reserve Price Adder (RTORPA) and a Real-Time Off-Line Reserve Price Adder (RTOFFPA) based on the On-Line and Off-Line available reserves in the ERCOT System and the Operating Reserve Demand Curve (ORDC). The price after the addition of RTORPA to Locational Marginal Prices (LMPs) approximates the pricing outcome of Real-Time energy and Ancillary Service co-optimization since RTORPA captures the value of the opportunity cost of reserves based on the defined ORDC. Additionally, the Real-Time Off-Line Reserve Capacity (RTOFFCAP) shall be administratively set to zero when the SCED snapshot of the Physical Responsive Capability (PRC) is less than or equal to the PRC MW at which Energy Emergency Alert (EEA) Level 1 is initiated. An Ancillary Service imbalance Settlement is done based on Protocol Section 6.7.5, Real-Time Ancillary Service Imbalance Payment or Charge, to make Resources indifferent to the utilization of their capacity for energy or Ancillary Service reserves.

This document describes:

- The ERCOT Board-approved methodology that ERCOT uses for determining the Real-Time reserve price adders based on ORDC.
- The ERCOT Board-approved parameters for implementing ORDC.

2. METHODOLOGY FOR IMPLEMENTING ORDC

For each execution of SCED, the System Lambda of the power balance constraint will be determined and the ORDC will be based on analysis of the probability of reserves falling below the minimum contingency level (PBMCL) multiplied by the difference between Value of Lost Load (VOLL) and System Lambda. This approach is needed with the current rules in order to ensure that power balance is given the highest priority and can result in a reserve price that is near zero with an energy price near System-Wide Offer Cap (SWCAP) under scarcity conditions.

Determining the following values is a major part of implementing ORDC to calculate Real-Time Reserve Price Adder:

1. VOLL
2. PBMCL
3. RTORPA and RTOFFPA

Board Report

2.1 Determine VOLL

The VOLL is a parameter for implementing the ORDC and is set on a daily basis to be equal to the SWCAP, as defined in Protocol Section 4.4.11, System-Wide Offer Caps.

2.2 Determine PBMCL

Another key part of the ORDC concept is the determination of the PBMCL. PBMCL is derived by making certain adjustments to the Loss of Load Probability curve (LOLP). LOLP is the probability, at a given level of reserves, of the occurrence of a loss of reserves greater than the reserve level and is therefore determined by calculating the mean and standard deviation of differences between the hour-ahead forecasted reserves and the reserves that were available in Real-Time during the Operating Hour using historical data, as described in greater detail, below. The LOLP curve is defined as follows:

$$LOLP(\mu, \sigma, R) = 1 - CDF(\mu, \sigma, R)$$

Where CDF is the Cumulative Distribution Function of the normal distribution with mean μ and standard deviation σ .

Once the LOLP curve is derived, ERCOT creates a Shifted Loss of Load Probability (SLOLP) curve. The SLOLP is the LOLP with mean μ shifted by the factor $S * \sigma$, and for a given value reserve level R can be calculated as:

$$SLOLP(\mu_s, \sigma, R) = 1 - CDF(\mu_s, \sigma, R)$$

Where $\mu_s = \mu + S * \sigma$ and CDF is the Cumulative Distribution Function of a normal distribution with mean μ_s and standard deviation σ .

The last step in determining PBMCL is shifting the SLOLP curve further to the right by a defined minimum contingency level, X , and setting the value of SLOLP to one for reserve levels below the minimum contingency level. The PBMCL curve for a given reserve level (R) is determined as follows:

$$\pi(R) = \begin{cases} SLOLP(R - X), & R - X > 0 \\ 1, & R - X \leq 0 \end{cases}$$

The detailed logic for determining LOLP is described as below:

- 1) For each Operating Hour in the study period, calculate the system-wide Hour-Ahead (HA) reserve using the snapshot of last Hourly Reliability Unit Commitment (HRUC) for the Operating Hour (at the end of Adjustment Period):

$$HA \text{ Reserve} = RUC \text{ On-Line Gen COP HSL} - (RUC \text{ Load Forecast} + RUC \text{ DCTIE Load})$$

Board Report

+ *RUC On-Line Load COP Non-Spin Responsibility* + *RUC On-Line Load COP Reg-Up Responsibility* + *RUC On-Line Load COP RRS Responsibility* + *RUC Off-Line Gen COP OFFNS HSL* + *RUC Off-Line Gen COP CST30HSL*

The calculation above excludes the following Generation Resources:

- (a) Nuclear Resources; and
- (b) Resources with ONTEST Current Operating Plan (COP) Status.

[OBDRR017: Insert the language below upon system implementation of NPRR987:]

For the purpose of calculating the HA Reserve, the component of an Energy Storage Resource (ESR) that is modeled as a Generation Resource is considered a Generation Resource and the component of an ESR that is modeled as a Controllable Load Resource is considered a Load Resource.

- 2) For each SCED interval in the study period, calculate the system-wide available SCED reserve using SCED telemetry and solution as:

SCED Reserve = SCED On-Line Gen HSL – SCED Gen Base Point + SCED On-Line Load Telemetry RRS Schedule + SCED On-Line Load Telemetry Reg-Up Responsibility + SCED On-Line Load Telemetry Non-Spin Schedule + SCED Off-Line Gen OFFNS HSL + SCED Off-Line RTCST30HSL - SCED under-generation Power Balance MW

[OBDRR017 and OBDRR028: Replace applicable portions of the formula “SCED Reserve” above with the following upon system implementation of NPRR987 or NPRR1069, respectively:]

SCED Reserve = SCED On-Line Gen HSL – SCED Gen Base Point + SCED On-Line ESR Capacity + SCED On-Line Load Telemetry RRS Schedule + SCED On-Line Load Telemetry Reg-Up Responsibility + SCED On-Line Load Telemetry Non-Spin Schedule (excluding ESR-CLRs) + SCED Off-Line Gen OFFNS HSL (excluding ESR-Gens) + SCED Off-Line RTCST30HSL (excluding ESR-Gens) - SCED under-generation Power Balance MW

The calculation above excludes the following Generation Resources:

- (a) Nuclear Resources;
- (b) Resources with telemetered net real power (in MW) less than 95% of their telemetered Low Sustained Limit (LSL); and
- (c) Resources with a telemetered status of:
 - (i) ONTEST;
 - (ii) STARTUP (except Resources with Non-Spin Ancillary Service Resource Responsibility greater than zero); or
 - (iii) SHUTDOWN.

Board Report

[OBDRR017: Insert the language below upon system implementation of NPRR987:]

The SCED On-Line ESR Capacity is defined as:

$$\text{Min}(\text{ESRGen HSL} - \text{ESR - Gen Base Point}, \frac{\text{SOC}_s^{\text{Telem}} - \text{SOC}_s^{\text{OperMin}}}{\Delta t}) + \text{ESRCLR Bas}$$

$$\text{Where } \Delta t = \frac{1}{4} \text{ hour}$$

- 3) For each Operating Hour in the study period, calculate the hourly average system-wide SCED reserve by averaging the interval SCED reserve in step 2).

- 4) For each Operating Hour in the study period, calculate the system-wide Reserve Error as:

$$\text{Reserve Error} = \text{HA Reserve} - \text{SCED Reserve (Hourly Average)} + \text{Firm_Load_Shed (Hourly Average)}$$

- 5) Calculate the mean (μ) and standard deviation $\mu)(\sigma)$ using the calculated Reserve Error in step 4) for the study period. This μ and σ are then used to determine the PBMCL curve as described above.

2.2.1 Calculation of $R_s R_s$ and $R_{sns} R_{SNS}$

R_s is the reserves from Resources participating in SCED plus the Reg-Up and Responsive Reserve (RRS) from Load Resources and the additional available capacity from Load Resources other than Controllable Load Resources (CLRs) with a validated Real-Time RRS Schedule. $R_{SNS} R_{sns}$ is equal to R_s plus the reserves from Resources that are not currently available to SCED but could be available in 30 minutes.

- 1) $R_s R_s$ is calculated based on SCED telemetry and solution as:

$$R_s = \text{RTOLCAP} = \text{RTOLHSL} - \text{RTBP} + \text{RTCLRCAP} + \text{RTNCLRCAP} - \text{RTOLNSRS} - \text{RTPBPC}$$

[OBDRR009 and OBDRR017: Replace applicable portions of the formula “ R_s ” above with the following upon system implementation of OBDRR009 or NPRR987 as applicable:]

$$R_s = \text{RTOLCAP} = \text{RTOLHSL} - \text{RTBP} + \text{RTCLRCAP} + \text{RTNCLRCAP} + \text{RTESRCAP} - \text{RTOLNSRS} - \text{RTPBPC} + \text{RTCDCTF}$$

Where:

$$\text{RTCLRCAP} = \text{RTCLRBP} - \text{RTCLRLPC} - \text{RTCLRNS} + \text{RTCLRREG}$$

$$\text{RTNCLRCAP} = \text{Min}(\text{Max}(\text{RTNCLRNPC} - \text{RTNCLRLPC}, 0.0), \text{RTNCLRRRS} * 1.5)$$

[OBDRR017: Insert the language below upon system implementation of NPRR987:]

For ESRs:

Board Report

$$RTESRCAP = \text{Min}(\text{ESRGen HSL} - \text{ESR - Gen Base Point}, \frac{SOC_s^{Telem} - SOC_s^{OperMin}}{\Delta t}) + \text{ESRCLR Base Point}$$

Where $\Delta t = \frac{1}{4}$ hour

[OBDRR009: Insert the formula “RTCDCTF” below upon system implementation:]

$$RTCDCTF = RTCDCTICL + RTCDCTICE - RTCDCTI + RTCDCTE - RTCDCTEC$$

Where

- *RTOLCAP* is the system total Real-Time On-Line reserve capacity of all On-Line Resources for the SCED interval.
- *RTOLHSL* is the system total Real-Time telemetered High Sustained Limits (HSLs) for all Generation Resources available to SCED for the SCED interval, discounted by the system-wide discount factor, except for the following:
 - Nuclear Resources;

[OBDRR017: Insert the language below upon system implementation of NPRR987:]

- ESRs;
- Resources with telemetered net real power (in MW) less than 95% of their telemetered LSL; and
- Resources with a telemetered Resource Status of:
 - ONTEST;
 - ONRUC (including On-Line Reliability Must-Run (RMR) Resources but excluding those Reliability Unit Commitment (RUC) Resources that have been awarded a Day-Ahead Market (DAM) Three-Part Supply Offer for the hour);
 - For a Combined Cycle Generation Resource with a Resource Status of ONRUC that was RUC-committed from one On-Line configuration to a different configuration with additional capacity, the exclusion is equal to the maximum of zero and the telemetered HSL value minus the COP HSL of the Qualified Scheduling Entity (QSE)-committed configuration for the RUC hour at the snapshot time of the RUC instruction.
 - STARTUP (except for Resources with Non-Spin Ancillary Service Resource Responsibility greater than zero); or
 - SHUTDOWN.
- *RTBP* is the system total SCED Base Points for all Generation Resources (excluding nuclear Resources, Resources with a telemetered ONTEST, STARTUP (except Resources with Non-Spin Ancillary Service Resource Responsibility greater than zero), or SHUTDOWN Resource Status and Resources with telemetered net real power (in MW) less than 95% of their telemetered LSL) for the SCED interval discounted by the system-wide discount factor.

Board Report

[OBDRR017: Replace the variable “RTBP” above with the following upon system implementation of NPRR987:]

- *RTBP* is the system total SCED Base Points for all Generation Resources (excluding nuclear Resources, ESRs, Resources with a telemetered ONTEST, STARTUP (except Resources with Non-Spin Ancillary Service Resource Responsibility greater than zero), or SHUTDOWN Resource Status and Resources with telemetered net real power (in MW) less than 95% of their telemetered LSL) for the SCED interval discounted by the system-wide discount factor.

- *RTCLRCAP* is the system total Real-Time capacity from CLRs for the SCED interval. It is the sum of SCED Base Points less the telemetered CLR LSL and Non-Spin Schedule for all CLRs.

[OBDRR017 and OBDRR028: Replace applicable portions of the variable “RTCLRCAP” above with the following upon system implementation of NPRR987 or NPRR1069, respectively:]

- *RTCLRCAP* is the system total Real-Time capacity from CLRs for the SCED interval. It is the sum of SCED Base Points less the telemetered CLR LSL and Non-Spin Schedule for all CLRs excluding ESR-CLRs.
- *RTNCLRCAP* is the system total Real-Time capacity for all Load Resources other than CLRs that have a validated Real-Time RRS Ancillary Service Schedule for the SCED interval.
- *RTPBPC* is the system total SCED under-generation Power Balance MW violated for the SCED interval.
- *RTNCLRNPC* is the system total Real-Time net real power consumption from all Load Resources other than CLRs that have a validated Real-Time RRS Ancillary Service Schedule for the SCED interval discounted by the system-wide discount factor.
- *RTNCLRRLPC* is the system total Real-Time Low Power Consumption (LPC) from all Load Resources other than CLRs that have a validated Real-Time RRS Ancillary Service Schedule for the SCED interval discounted by the system-wide discount factor.
- *RTNCLRRRS* is the system total Real-Time RRS Ancillary Service Responsibilities from all Load Resources other than CLRs for the SCED interval discounted by the system-wide discount factor.
- *RTOLNSRS* is the system total Real-Time telemetered On-Line Non-Spin Ancillary Service Schedule for all On-Line Generation Resources for the SCED interval discounted by the system-wide discount factor.

Board Report

[OBDRR028: Replace the variable “RTOLNSRS” above with the following upon system implementation of NPRR1069:]

- *RTOLNSRS* is the system total Real-Time telemetered On-Line Non-Spin Ancillary Service Schedule for all On-Line Generation Resources, excluding the ESR-Gen, for the SCED interval discounted by the system-wide discount factor.

- *RTCLRBP* is the system total SCED Base Points from CLRs for the SCED interval discounted by the system-wide discount factor.

[OBDRR017 and OBDRR028: Replace applicable portions of the variable “RTCLRBP” above with the following upon system implementation of NPRR987 or NPRR1069, respectively:]

- *RTCLRBP* is the system total SCED Base Points from CLRs for the SCED interval, excluding ESR-CLRs, discounted by the system-wide discount factor.

- *RTCLRRLPC* is the system total Real-Time telemetered LPC from CLRs for the SCED interval discounted by the system-wide discount factor.

[OBDRR017 and OBDRR028: Replace applicable portions of the variable “RTCLRRLPC” above with the following upon system implementation of NPRR987 or NPRR1069, respectively:]

- *RTCLRRLPC* is the system total Real-Time telemetered LPC from CLRs for the SCED interval, excluding ESR-CLRs, discounted by the system-wide discount factor.

- *RTCLRREG* is the system total validated capacity from CLRs with Primary Frequency Response (not SCED qualified) Regulation-Up Ancillary Service Schedule discounted by the system-wide discount factor.

[OBDRR017 and OBDRR028: Replace applicable portions of the variable “RTCLRREG” above with the following upon system implementation of NPRR987 or NPRR1069, respectively:]

- *RTCLRREG* is the system total validated capacity from CLRs with Primary Frequency Response (not SCED qualified), excluding ESR-CLRs, Regulation-Up Ancillary Service Schedule discounted by the system-wide discount factor.

- *RTCLRNS* is the system total validated Real-Time telemetered Non-Spin Ancillary Service Schedules from CLRs for the SCED interval discounted by the system-wide discount factor.

Board Report

[OBDRR028: Replace the variable “RTCLRNS” above with the following upon system implementation of NPRR1069:]

- *RTCLRNS* is the system total validated Real-Time telemetered Non-Spin Ancillary Service Schedules from CLRs, excluding the ESR-CLR, for the SCED interval discounted by the system-wide discount factor.

[OBDRR017 and OBDRR028: Insert applicable portions of the variables “RTESRCAP”, “ESR-Gen”, “ESR-CLR”, and “SOC” below upon system implementation of NPRR987 or NPRR1069, respectively:]

- *RTESRCAP* is provided by ESRs and considers energy limitations of the Storage Resources and potentially higher RTOLCAP contribution when charging. To consider energy limitations, a specific time period is required. This time period is 15 minutes. This value will exclude ESR-Gen with a telemetered Resource Status of:
 - ONTEST;
 - STARTUP (except for Resources with Non-Spin Ancillary Service Resource Responsibility greater than zero); or
 - SHUTDOWN.
- *ESR-Gen* is the Energy Storage Resource modeled as Generation Resource when generating or idle.
- *ESR-CLR* is the Energy Storage Resource modeled as CLR when charging.
- *SOC* is the state of charge.

[OBDRR009: Insert the variable “RTCDCTF” below upon system implementation:]

- *RTCDCTF* is the total Real-Time change in Direct Current Tie (DC Tie) flows limited to +/- 1,250 MW in a single interval when ERCOT directs the following actions:
 - *RTCDCTI* is the ERCOT-directed DC Tie imports during an EEA or transmission emergency;
 - *RTCDCTICL* is the curtailment of DC Tie imports below the higher of DC Tie advisory import limit as of 0600 in the Day-Ahead or subsequent advisory import limit to address local transmission system limitations;
 - *RTCDCTICE* is the curtailment of DC Tie imports below the higher of DC Tie advisory import limit as of 0600 in the Day-Ahead or subsequent advisory import limit due to an emergency action by a neighboring system operator during an emergency that is accommodated by ERCOT;
 - *RTCDCTE* is the ERCOT-directed DC Tie exports to address emergency conditions in the receiving electric grid; or
 - *RTCDCTEC* is the curtailment of DC Tie exports below the higher of DC Tie advisory export limit as of 0600 in the Day-Ahead or subsequent advisory export limit during EEA, a transmission emergency, or to address local transmission system limitations.

Board Report

2) $R_{SNS}R_{sns}$ is calculated based on SCED telemetry and solution as:

$$R_{sns} = RTOLCAP + RTOFFCAP$$

$$RTOFFCAP = RTCST30HSL + RTOFFNSHSL + RTCLRNS + RTNCLRNSCAP + RTOLNSRS + RTRUCCST30HSL$$

$$RTNCLRNSCAP = \text{Min}(\text{Max}(RTNCLRNPC - RTNCLRRLPC, 0.0), RTNCLRNS * 1.5)$$

Where

- *RTOLCAP* is the system total Real-Time On-Line reserve capacity of all On-Line Resources for the SCED interval.
- *RTOFFCAP* is the system total Real-Time Off-Line reserve capacity for the SCED interval.
- *RTCST30HSL* is the system total Real-Time telemetered HSLs of Generation Resources, excluding Intermittent Renewable Resources (IRRs), that have telemetered an OFF Resource Status and can be started from a cold temperature state in 30 minutes and discounted by the system-wide discount factor.
- *RTNCLRNSCAP* is the system total Real-Time capacity for all Load Resources that are not CLRNs and that have a validated Real-Time Non-Spin Ancillary Service Schedule for the SCED interval.
- *RTNCLRNPC* is the system total Real-Time net real power consumption from all Load Resources that are not CLRNs and that have a validated Real-Time Non-Spin Ancillary Service Schedule for the SCED interval discounted by the system-wide discount factor.
- *RTNCLRRLPC* is the system total Real-Time Low Power Consumption (LPC) from all Load Resources that are not CLRNs and that have a validated Real-Time Non-Spin Ancillary for the SCED interval discounted by the system-wide discount factor.
- *RTNCLRNS* is the system total Real-Time Non-Spin Ancillary Service Responsibilities from all Load Resources that are not CLRNs for the SCED interval discounted by the system-wide discount factor.

[OBDRR028: Replace the variable “RTCST30HSL” above with the following upon system implementation of NPRR1069:]

- *RTCST30HSL* is the system total Real-Time telemetered HSLs of Generation Resources, excluding Intermittent Renewable Resources (IRRs) and ESR-Gen, that have telemetered an OFF Resource Status and can be started from a cold temperature state in 30 minutes and discounted by the system-wide discount factor.
- *RTCLRNS* is the system total validated Real-Time telemetered Non-Spin Ancillary Service Schedules from CLRNs for the SCED interval discounted by the system-wide discount factor.

Board Report

[OBDRR028: Replace the variable “RTCLRNS” above with the following upon system implementation of NPRR1069:]

- *RTCLRNS* is the system total validated Real-Time telemetered Non-Spin Ancillary Service Schedules from CLRs, excluding ESR-CLRs, for the SCED interval discounted by the system-wide discount factor.

- *RTOLNSRS* is the system total validated Real-Time telemetered On-Line Non-Spin Ancillary Service Schedule for all On-Line Generation Resources for the SCED interval discounted by the system-wide discount factor.

[OBDRR028: Replace the variable “RTOLNSRS” above with the following upon system implementation of NPRR1069:]

- *RTOLNSRS* is the system total validated Real-Time telemetered On-Line Non-Spin Ancillary Service Schedule, excluding ESR-Gen, for all On-Line Generation Resources for the SCED interval discounted by the system-wide discount factor.

- *RTOFFNSHSL* is the system total telemetered HSLs of Generation Resources that have telemetered an OFFNS Resource Status and discounted by the system-wide discount factor.

[OBDRR028: Replace the variable “RTOFFNSHSL” above with the following upon system implementation of NPRR1069:]

- *RTOFFNSHSL* is the system total telemetered HSLs of Generation Resources, excluding ESR-Gen, that have telemetered an OFFNS Resource Status and discounted by the system-wide discount factor.

- *RTRUCCST30HSL* is the system total Real-Time On-Line telemetered HSLs of ONRUC Resources that are qualified for RTCST30HSL for the SCED interval.

[OBDRR028: Replace the variable “RTRUCCST30HSL” above with the following upon system implementation of NPRR1069:]

- *RTRUCCST30HSL* is the system total Real-Time On-Line telemetered HSLs of ONRUC Resources, excluding ESR-Gen, that are qualified for RTCST30HSL for the SCED interval.

The system-wide discount factor used to discount inputs used in the calculation of reserves R_s and R_{sns} is calculated as the average of the currently approved Reserve Discount Factors (RDFs) applied to the temperatures from the current Season from the prior year.

Board Report

2.2.2 Calculation of $\pi_S(R_S)\pi_S(R_S)$ and $\pi_{NS}(R_{SNS})\pi_{NS}(R_{SNS})$

$\pi_S(R_S)\pi_S(R_S)$ and $\pi_{NS}(R_{SNS})\pi_{NS}(R_{SNS})$ are functions that describe the PBMCL at various reserve levels.

1) Calculation of Curve $\pi_S(R_S)\pi_S(R_S)$:

$\pi_S(R_S)\pi_S(R_S)$ is a function of the Real-Time reserves that should be available in the first 30 minutes of the hour and is intended to capture the PBMCL for that level of reserves. The general equation for $\pi_S(R_S)\pi_S(R_S)$ is:

$$\pi_S(R_S) = \begin{cases} SLOLP_S(R_S - X), & R_S - X > 0 \\ 1, & R_S - X \leq 0 \end{cases}$$

Where

- X in this equation is the minimum contingency level
- $SLOLP_SLOLP_S$ is the Shifted LOLPLOLP function for the spinning reserve.

$SLOLP_SLOLP_S$ is different from the 60 minutes $SLOLPLOLP$, which is calculated based on the hourly error analysis. The reserves are classified into two categories; those that are being provided by Resources in SCED and Load Resources providing Reg-Up and RRS and those that are being provided by Resources that are not currently available to SCED but could be made available in 30 minutes. Since the first reserve type is available immediately, those reserves are the only ones considered to be available to respond to any event that happens in the first 30 minutes of the hour. All reserve types are then considered to be available to respond to events that happen in the second 30 minutes of the hour. Because the error analysis is hourly, to capture the events within the first 30 minutes for $\pi_S(R_S)\pi_S(R_S)$, the distribution parameters need to be scaled to reflect the 30 minute timeframe, with $\delta = 0.5$ hour:

$$\mu'_S = \delta * \mu_S = 0.5\mu_S$$

$$\sigma' = \frac{\delta}{\sqrt{\delta^2 + (1 - \delta)^2}} * \sigma = 0.707\sigma$$

So the $SLOLP_SLOLP_S$ can be calculated based on the 60 minute $SLOLPLOLP$ as follows:

$$SLOLP_S(\mu'_S, \sigma', R) = SLOLP(0.5\mu_S, 0.707\sigma, R) = 1 - CDF(0.5\mu_S, 0.707\sigma, R)$$

2) Calculation of Curve $\pi_{NS}(R_{SNS})\pi_{NS}(R_{SNS})$:

Board Report

$\pi_{NS}(R_{SNS}) \pi_{NS}(R_{SNS})$ is a function of all the Real-Time reserves that can be expected to be available within the hour and is intended to capture the PBMCL for that level of reserves. The general equation for $\pi_{NS}(R_{SNS}) \pi_{NS}(R_{SNS})$ is:

$$\pi_{NS}(R_{SNS}) = \begin{cases} SLOLP(R_{SNS} - X), & R_{SNS} - X > 0 \\ 1, & R_{SNS} - X \leq 0 \end{cases}$$

This is similar to $\pi_S(R_S)$ but the key differences here are the types of reserves considered and the μ and σ that are used in calculating SLOLP

- *The total On-Line and Off-Line applies for the full change in net Load over the hour and there is no scaling adjustments needed for μ_s and σ in the $\pi_{NS}(R_{SNS}) \pi_{NS}(R_{SNS})$ calculations to account for timeframe differences*
- *X in this equation is the minimum contingency level*

2.3 Determination of Price Adders (RTORPA and RTOFFPA)

Once PBMCL is determined, the Real-Time On-Line Reserve Price Adder (RTORPA) and Real-Time Off-Line Reserve Price Adder (RTOFFPA) for each SCED interval can be calculated. P_S RTORPA (a.k.a. P_S) and RTOFFPA (a.k.a. P_{NS}) are functions of the PBMCL at various levels of Real-Time reserves, the net value of Load curtailment, and time duration during which the reserves are available. RTORPA P_S and RTOFFPA are determined as follows:

$$\begin{aligned} RTORPA &= P_S = v * 0.5 * \pi_S(R_S) + P_{NS} \\ RTOFFPA &= P_{NS} = v * (1 - 0.5) * \pi_{NS}(R_{SNS}) \end{aligned}$$

where

$$v = \max(0, VOLL - SystemLambda)$$

$$R_S = RTOLCAP$$

$$R_{SNS} = RTOLCAP + RTOFFCAP$$

Where v represents the net value of Load curtailment and is calculated as the VOLL minus the SCED System Lambda. System Lambda is subtracted from VOLL to reflect the scarcity value of the marginal dispatch capacity and to ensure that the final cost of energy does not go above the VOLL. The Off-Line Available Reserves (RTOFFCAP) will be set to zero when the SCED snapshot of the PRC is equal to or below the PRC MW at which EEA Level 1 is initiated.

3. METHODOLOGY REVISION PROCESS

Revisions to this document, and the parameters to be used in the methodology, shall be made according to the approval process as prescribed in Protocol Section 6.5.7.3, Security Constrained Economic Dispatch, which requires TAC review and ERCOT Board approval.

Board Report

4. ADDITIONAL PARAMETERS FOR IMPLEMENTING ORDC

The values of the additional parameters used in implementing ORDC are as follows:

4.1 Minimum Contingency Level

The minimum contingency level (X) is 2,000 MW.

4.2 SLOLP Distribution Shift Parameter

The SLOLP distribution shift parameter (S) is 0.5.

ERCOT Impact Analysis Report

OBDRR Number	<u>033</u>	OBDRR Title	ORDC Changes Related to NPRR1093, Load Resource Participation in Non-Spinning Reserve
Impact Analysis Date	September 1, 2021		
Estimated Cost/Budgetary Impact	None.		
Estimated Time Requirements	No project required. This Other Binding Document Revision Request (OBDRR) can take effect upon Nodal Protocol Revision Request (NPRR) 1093, Load Resource Participation in Non-Spinning Reserve.		
ERCOT Staffing Impacts (across all areas)	Ongoing Requirements: No impacts to ERCOT staffing.		
ERCOT Computer System Impacts	No impacts to ERCOT computer systems.		
ERCOT Business Function Impacts	No impacts to ERCOT business functions.		
Grid Operations & Practices Impacts	No impacts to ERCOT grid operations and practices.		

Evaluation of Interim Solutions or Alternatives for a More Efficient Implementation

None offered.

Comments

There are no additional impacts to this OBDRR beyond what was captured in the Impact Analysis for NPRR1093.