



Item 8: Proposed Changes for the 2014 Methodology for Determining Minimum Ancillary Service Requirements

Bill Blevins

Manager, Operations Planning

Board of Directors Meeting

ERCOT Public

December 10, 2013

Overview of Proposed Changes

- Update the factors used to adjust the Regulation Service quantities for additional installed wind generation
- Remove bias adjustment from ERCOT operational load forecast used by Control Room
- Modify the method used to determine the quantity of Non-Spinning Reserve Service (NSRS) capacity to be procured by using the operational load forecast bias that is based on the six-hours-ahead forecast instead of the midnight forecast

Regulation Service Adjustment for Additional Wind

- ERCOT has updated the analysis used to adjust the quantity of Regulation to be procured due to addition of wind capacity.
- This adjustment had been based on a 2008 GE study; the updated analysis uses the same methodology but updated actual wind data from the last five years.
- Conclusions:
 - Relationships between Reg needed and MW wind is still linear
 - Overall, increase in Reg needed per MW increase in installed wind is slightly less than what GE Study predicted
- MW Changes in Regulation requirements are small; less than 5MW in any hour

Link for Report on study to update the GE table

<http://www.ercot.com/calendar/2013/10/20131007-QMWG>

Problems with Current Implementation of Forecast Bias

- **The bias is currently calculated based on the historic error in the Day-Ahead forecast but is applied not only to the Day-Ahead load forecast but to the Real-Time load forecast as well.**
 - The load forecast becomes more accurate as the time of the forecast approaches real-time
- **The bias is applied to all of the alternative load forecast models regardless of which was actually used in determination of bias.**
 - This has resulted in bias-adjusted forecasts that are less accurate
- **The posting of unbiased forecast and/or biased forecast has created communication issues for ERCOT with external entities.**
- **The recommended changes to the Ancillary Services Methodology for 2014 will resolve these issues.**

ERCOT's Recommendation

ERCOT recommends that the Board approve the proposed changes to the Ancillary Services Methodology for 2014 as endorsed by 11/14/2013 ROS and 12/03/2013 TAC.



Date: December 3, 2013
To: Board of Directors
From: Bill Blevins, Manager of Operations Planning
Subject: Proposed Changes for 2014 Methodology for Determining Minimum Ancillary Service Requirements

Issue for the ERCOT Board of Directors

ERCOT Board of Directors Meeting Date: December 10, 2013

Item No.: 8

Issue:

Whether the Board should approve the proposed *Methodology for Determining the Minimum Ancillary Service Requirements* as presented herein to be effective February 1, 2014.

Background/History:

Ancillary Services are necessary to maintain the reliability of the ERCOT system. The ERCOT Nodal Protocols define these Ancillary Services and charge ERCOT with determining a methodology for the minimum levels of Ancillary Services required. Section 3.16 (2) requires ERCOT to review the methodology at least annually, and Section 3.16 (3) requires the ERCOT Board of Directors to review and approve ERCOT's methodology.

ERCOT Staff presented the 2013 Ancillary Services Methodology to the ERCOT Board of Directors on March 19, 2013, which the Board approved to be effective April 1, 2013 as requested.

The recommended changes from the 2013 Methodology for Determining Ancillary Services Requirements document approved by the Board on March 19, 2013 are related to the Regulation Reserve Service and Non Spinning Reserve Service. The changes are shown in red-line in Attachment A and can be summarized as follows:

- Update the factors used to adjust the Regulation Service quantities for additional installed wind generation
- Remove the Load Forecast Bias adjustment from ERCOT Load Forecast used by Control Room.
- Modify the method used to determine the quantity of Non-Spinning Reserve Service (NSRS) capacity to be procured by using the Load Forecast Bias that is based on the six-hours-ahead forecast instead of the midnight forecast

On December 3, 2013, the Technical Advisory Committee (TAC) unanimously endorsed the proposed changes to 2014 methodology as recommended by ERCOT, modified and endorsed by Reliability and Operations Subcommittee (ROS) with an effective date of 2/1/2014 and requested that ERCOT provide quarterly updates to ROS.

Key Factors Influencing Issue:

Ancillary Services are necessary to ensure that there are sufficient resources to serve system load and maintain system frequency in the ERCOT system. Determining the minimum amount



of services required to do this is based on operating experience, analysis, and engineering judgment. The proposed methodology reflects ERCOT's updated assessment of the minimum Ancillary Services needed for the ERCOT single Balancing Authority.

Conclusion/Recommendation:

ERCOT staff recommends that the Board approve the proposed changes to the *Methodology for Determining the Minimum Ancillary Service Requirements*, attached as *Attachment A*, as endorsed by the TAC to be effective February 1, 2014.



ELECTRIC RELIABILITY COUNCIL OF TEXAS, INC.
BOARD OF DIRECTORS RESOLUTION

WHEREAS, after due consideration of the alternatives, the Board of Directors (Board) of Electric Reliability Council of Texas, Inc. (ERCOT) deems it desirable and in the best interest of ERCOT to approve 2014 *Methodology for Determining the Minimum Ancillary Service Requirements* for implementation in 2014 and to be effective on February 1, 2014.

THEREFORE, BE IT RESOLVED, that ERCOT is hereby authorized and approved to implement the 2014 *Methodology for Determining the Minimum Ancillary Service Requirements* for 2014 and to be effective on February 1, 2014.

CORPORATE SECRETARY'S CERTIFICATE

I, Vickie G. Leady, Assistant Corporate Secretary of ERCOT, do hereby certify that, at its December 10, 2013 meeting, the ERCOT Board passed a motion approving the above Resolution by _____.

IN WITNESS WHEREOF, I have hereunto set my hand this ____ day of December, 2013.

Vickie G. Leady
Assistant Corporate Secretary

ERCOT Methodologies for Determining Ancillary Service Requirements

ERCOT Board approved ~~xx03/xx19~~/2013

Effective Date of ~~0x4/xx01/20xx13~~

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Executive Summary

Introduction

ERCOT Protocol 3.16(2) requires that methodologies for determining the amounts of Ancillary Services to be required by ERCOT must be developed at least annually. Protocol 3.16(3) requires approval of this methodology by the ERCOT Board of Directors.

This document discusses the various Ancillary Services for which requirements are to be developed. Further, detailed methodologies for determining those requirements are included as part of this document.

The approach taken is to provide the individual procedures that ERCOT will use for those services whose quantity requirements are not determined within the operations systems.

Overview of ERCOT AS Methodology

Methodologies are required for the determination of the quantities of Regulation Service (RGS) and Non Spinning Reserve Service (NSRS) that are required to maintain system reliability. Those procedures are discussed below.

These procedures are only intended for determining AS requirements for the upcoming month and will be performed prior to the 20th of each month. For any additional months in which ERCOT is required to provide an AS requirement forecast, the forecasted requirement will be set to the historical requirement for the same month of the previous year.

Regulation Service (RGS) Requirement

ERCOT has developed a procedure for determination of the base requirement for Regulation Service. The base requirement will be calculated as follows:

Calculate the 98.8 percentile of the 5 minute net load (load and wind) changes during the 30 days prior to the time of the study and for the same month of the previous year by hour. Also, calculate the 98.8 percentile of the up and down Regulation Service deployed during the 30 days prior to the time of study and for the same month of the previous year by hour. These results will be used to calculate the amount of Regulation Service required by hour to provide an adequate supply of Regulation Service capability 98.8% of the time.

ERCOT will calculate the increased amount of wind penetration each month and utilize tables updated tables based on actual historical wind data in the computation of Regulation Service requirements. The initial table was provided by GE in their final report to ERCOT. ~~in the computation of Regulation Service requirements.~~ The tables indicate additional MWs to add to the regulation requirements per 1000 MWs of increase in wind generation.

If it is determined that during the course of the 30 days prior to the time of the study that the ERCOT average CPS1 score was less than 100%, additional Regulation Up and Down will be procured for hours in which the CPS1 score was less than 100%.

Each month ERCOT will perform a back-cast of last month's actual exhaustion rate. If the exhaustion rate exceeded 1.2% in any given hour, ERCOT will determine the amount of increase necessary to achieve an exhaustion rate of 1.2 % for that hour.

Non-Spinning Reserve Service (NSRS) Requirements

The GE final report to ERCOT indicated that wind generation could be treated as negative load. The report went on to describe Load minus wind generation as Net Load. The impact of Net Load on the system was the basis for the analysis performed by GE. Net Load cannot be forecasted but Load and wind generation can be forecasted independently and then combined. The combination of Load forecast uncertainty and Wind forecast uncertainty on the system, creates operational risks that have to be mitigated through ancillary services and/or manual instructions taken by the ERCOT operators. ERCOT will calculate the historical Net Load by subtracting the actual **wind** from the actual Load. The historical Net Load will then be compared to the Load and wind generation forecasts to determine the historical accuracy observed in forecasting. ERCOT will then compute the amount of NSRS that is required to ensure that the combination of NSRS procured plus 500 MW of Responsive Reserve Service (RRS) plus the average amount of Regulation Up procured will result in a total capacity that is larger than or equal to 95 percent of the uncertainties observed in the Net Load accuracy evaluation. In the determination of the requirements, ERCOT will also consider the size of the largest unit. This is intended to cover exposure to the loss of the largest unit during periods of higher risk.

Responsive Reserve (RRS) Requirement

Responsive Reserves are resources ERCOT maintains to restore the frequency of the ERCOT System within the first few minutes of an event that causes a significant deviation from the standard frequency. The ERCOT Operating Guides set the minimum RRS requirement at 2300 MW for all hours under normal conditions. However, as a result of 500 MW of RRS being included in the Net Load analysis for NSRS, an additional 500 MW will be added to the 2300 MW minimum.

Regulation Service (RGS) Requirement Details

Introduction

Regulation Service consists of resources that can be deployed by ERCOT in response to changes in ERCOT System frequency to maintain the target ERCOT System frequency within predetermined limits according to the Operating Guides. ERCOT is required to evaluate normal requirements for Regulation Service – Up (regulation up) and Regulation Service – Down (regulation down) on an annual basis. It is ERCOT’s intent to use historical rates of Regulation Service usage to perform this evaluation. Regulation Service is deployed in order to correct actual frequency to scheduled frequency. This normal Regulation Service requirement may be increased by a multiple of two (2) during projected severe stress conditions such as forecasted extreme weather days.

Summary

To evaluate Regulation Service requirements, ERCOT will collect historical Resource Asset Registration Form (RARF) information, CPS1 data, Regulation Service deployment data, aggregate output data, and ERCOT system load data. This data is used to calculate the Regulation Service requirements with the mathematical expectation that sufficient Regulation Service will be available 98.8% of all periods. This implies that 1.2% of every month ERCOT expects to exhaust available Regulation Service and will perform a back-cast of last month’s actual exhaustion rate to determine if this expectation is being met. If the exhaustion rate exceeded 1.2% in any given hour, ERCOT will determine the amount of increase necessary to achieve an exhaustion rate of 1.2% for that hour.

Procedure

Using archived data, ERCOT will calculate the 98.8 percentile of actual Regulation Up and Down Service deployed hourly for the 30 days prior to the time of the study and the same month of the previous year. Additionally, the 98.8 percentile of positive and negative 5 minute net load changes will be calculated for the 30 days prior to the time of the study and the same month of the previous year. In order to consider the increased amount of penetration, ERCOT will calculate the increase in installed generation capacity and then, depending on the month of the year and the hour of the day, will add incremental MWs to the values determined using data from the previous year. The tables of Incremental MWs for Regulation Up and Down come from the study ERCOT performed during the summer of 2013, using similar techniques as GE but with actual wind data. Appendix of GE’s final report to ERCOT and contain additional MWs for every 1000 MW increase in wind capacity.—The increase in wind capacity will be calculated by taken the total nameplate capacity of wind resources in the ERCOT network model at the time of the procurement study and subtracting out the total nameplate capacity of wind resources in the ERCOT model at the end of the month being studied from the previous year.

For determining the base Regulation Up Service requirements, ERCOT will take the largest of the 98.8 percentile of the Regulation Up Service deployments over the last 30 days, the 98.8 percentile of the Regulation Up Service deployments for the same month of the previous year,

the 98.8 percentile of the positive net load changes over the last 30 days, and the 98.8 percentile of the positive net load changes for the same month of the previous year. For determining the base Regulation Down Service requirements, ERCOT will take the largest of the 98.8 percentile of the Regulation Down Service deployments over the last 30 days, the 98.8 percentile of the Regulation Down Service deployments for the same month of the previous year, the 98.8 percentile of the negative net load changes over the last 30 days, and the 98.8 percentile of the negative net load changes for the same month of the previous year. These Regulation Service requirements may be increased for hours in which the desired 1.2% exhaustion rate is exceeded.

During the 0600 & 2200 time periods, large schedule changes typically occur, related to 16 hour block energy sale products. Because of these large energy swings, ERCOT often finds its maximum deployment rate of Regulation Service insufficient to control frequency¹. During these times, ERCOT may see the need for extra Regulation Service to be available to cover the amount needed to respond to such large schedule changes. ERCOT may also include historic deployment of Responsive Reserve as a part of Regulation Service deployment in this analysis.

Additionally, if it is determined that during the course of the 30 days prior to the time of the study that the ERCOT average CPS1 score was less than 100%, ERCOT will procure an extra 10% of both Regulation Up and Down for hours of the day during the upcoming month in which the CPS1 score was less than 100%. This value will increase to 20% if the CPS1 score for the previous month falls below 90%. These additional reserves will assist ERCOT in ensuring that NERC requirements are met.

ERCOT will post these requirements as required by the Protocols.

¹ The restrictions are specified in protocol section 8.1.1.4.1(1) which states “ERCOT shall limit the deployment of Regulation Service of each QSE for each LFC cycle equal to 125% of the total amount of Regulation Service in the ERCOT System divided by the number of control cycles in five minutes.”

ERCOT Methodologies for Determining Ancillary Service Requirements

Incremental MW Adjustment to Prior-Year Up-Regulation Value, per 1000 MW of Incremental Wind Generation Capacity, to Account for Wind Capacity Growth

Month	Hour Ending																								
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
Jan.	4.12.8	3.94.2	6.13.1	2.83.7	4.42.5	2.20.4	2.82.3	2.52.2	3.14.2	8.15.9	4.77.6	6.05.7	4.34.7	2.83.3	5.12.8	4.12.3	3.14.0	-1.08.6	1.24.2	2.52.7	0.81.6	2.52.7	1.71.4	1.41.6	
Feb.	4.73.6	6.94.0	3.12.9	9.22.9	4.51.5	4.01.8	0.75.2	4.03.5	5.04.9	4.06.0	3.55.1	3.45.2	0.65.3	5.74.2	4.04.3	1.83.5	4.83.8	3.38.6	0.65.5	0.91.9	1.51.4	5.33.1	2.01.9	5.32.2	
Mar.	1.95.5	2.35.3	2.94.6	2.24.2	4.02.6	7.03.3	1.57.1	5.07.9	5.16.8	8.15.7	5.64.2	3.73.4	5.12.8	4.52.6	3.12.7	4.72.3	6.52.9	8.57.7	6.56.8	2.02.1	5.41.1	4.23.0	8.81.5	2.22.8	
Apr.	5.63.1	5.53.6	4.95.0	6.14.0	7.32.4	1.62.5	4.58.5	8.211.6	3.610.0	8.25.6	6.84.2	4.23.4	3.43.2	2.22.5	1.12.1	1.52.1	2.23.5	7.09.2	3.18.2	1.84.1	4.31.0	2.10.8	3.50.0	5.01.4	
May	4.93.6	7.13.3	4.94.3	6.94.3	3.54.2	2.23.3	4.58.7	4.68.8	2.58.1	7.25.7	3.76.0	4.04.4	3.53.6	4.63.8	6.13.9	2.74.2	2.14.7	5.011.6	8.55.9	1.90.6	1.50.0	0.11.0	5.41.4	4.72.5	
Jun.	3.12.3	8.82.6	4.83.3	6.73.7	8.93.9	2.02.4	5.28.5	3.08.2	5.76.6	5.94.5	3.24.2	3.33.1	3.92.5	1.22.5	1.80.7	2.60.2	0.61.3	-0.17.5	3.33.3	1.31.7	0.50.7	1.90.3	1.20.6	5.01.3	
Jul.	2.11.0	1.22.8	3.54.4	2.73.7	1.93.0	3.03.2	3.911.2	3.010.2	2.36.5	6.35.3	3.13.3	1.82.2	0.91.4	0.70.4	0.9	1.2-	1.7-	1.20.3	1.53.4	1.50.9	2.71.1	0.50.1	1.10.0	0.11.0	0.61.2
Aug.	1.81.4	1.43.8	1.84.5	2.64.5	1.82.2	1.10.9	4.66.3	3.76.8	4.36.6	3.16.6	3.93.2	3.12.6	0.82.1	0.61.2	1.11.4	3.11.3	3.01.3	0.64.6	2.41.2	1.50.9	0.10.7	0.00.8	0.21.1	1.11.3	
Sep.	1.23.2	1.54.0	1.23.7	1.73.5	2.21.8	2.61.9	3.26.9	4.97.7	2.28.3	2.36.9	2.13.5	2.04.8	3.83.8	1.82.3	1.51.6	2.01.2	1.43.0	0.69.2	2.23.1	1.90.9	0.80.1	0.30.4	0.50.8	1.21.9	
Oct.	2.03.4	3.12.8	2.82.4	2.92.2	3.01.7	2.61.8	2.85.0	4.85.8	7.36.1	2.65.9	6.24.0	5.55.4	2.23.2	4.12.2	0.81.2	1.01.7	2.83.1	1.26.8	1.30.8	2.02.1	2.70.0	1.60.2	2.31.8	2.52.5	
Nov.	0.42.7	2.63.2	2.93.6	5.23.0	4.22.2	3.52.3	2.24.6	4.65.3	3.76.9	3.16.8	5.95.1	2.75.6	3.44.1	1.73.7	2.61.8	3.71.7	5.65.8	0.212.8	2.84.8	1.63.8	2.61.0	0.121.6	3.12.2	0.71.4	
Dec.	5.42.8	5.42.4	3.31.4	5.32.1	3.41.2	4.00.4	1.92.8	4.22.7	4.53.8	3.84.6	6.16.8	5.37.0	3.86.0	5.14.4	4.03.3	3.13.0	6.25.0	-0.49.9	0.14.3	3.72.6	4.02.1	3.14.3	3.42.0	3.91.5	

Incremental MW Adjustment to Prior-Year Down-Regulation Value, per 1000 MW of Incremental Wind Generation Capacity, to Account for Wind Capacity Growth

Hour Ending

Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Jan.	-	-	-	-	-	-	-	-	2.0-	-0.2-	-1.8-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3.11	2.11	1.42	1.72	4.12	0.61	0.10	0.22	0.2	0.5	0.2	1.72	2.24	5.63	1.24	1.63	2.62	-1.35	-8.87	5.21	-5.88	4.35	3.45	5.83
Feb.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	5.22	1.53	1.23	2.84	3.13	1.41	0.10	0.12	1.82	4.72	2.72	1.02	2.02	1.63	0.73	1.82	1.52	-0.46	-5.47	6.21	3.71	3.67	8.47	4.14
Mar.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	6.62	1.73	2.63	5.72	2.32	1.42	0.31	1.80	0.90	5.93	3.54	6.02	3.81	3.62	4.13	3.33	4.43	-7.16	-1.36	-8.78	-5.49	3.06	8.75	2.73
Apr.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	6.74	6.34	5.93	1.53	1.04	1.52	5.72	0.21	5.50	6.12	4.24	2.53	5.61	6.42	3.64	4.24	4.34	-6.97	-3.97	7.81	-7.89	6.37	4.75	3.73
May	-	-	-	-	-	-2.8-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3.13	1.51	2.02	3.51	3.30	0.2	1.90	2.70	3.31	1.42	2.03	1.23	4.41	4.82	2.52	3.82	4.93	-5.58	-4.37	4.11	-8.69	9.58	4.35	6.33
Jun.	-	-	-	-	-	-0.8-	0.2-	-3.5-	-3.1-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3.81	5.60	3.61	1.52	0.50	0.7	1.2	0.7	0.2	0.60	1.50	0.10	0.21	3.62	3.62	3.42	6.33	9.11	-5.68	-4.17	-7.06	7.15	7.34	4.92
Jul.	-	-	-	0.2-	1.1-	1.1-	0.9-	-0.6-	0.0-	-0.4-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	4.22	3.41	1.10	0.3	0.6	0.7	1.0	0.5	0.5	0.7	0.40	1.60	2.01	1.42	2.12	5.43	4.42	-4.88	-1.59	-2.48	-5.86	5.95	5.64	4.32
Aug.	-	-	-	-	-	0.7-	-	-	0.0-	0.1-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1.52	0.61	0.51	0.10	1.50	0.9	0.40	0.10	0.2	0.1	0.10	0.01	0.91	2.11	4.12	2.84	2.83	-4.34	-4.75	-2.77	-5.05	3.45	6.05	6.52
Sep.	-	-	-	-1.1-	-0.2-	-0.4-	-1.2-	0.5-	-0.4-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	0.01	1.82	0.90	0.4	0.6	1.4	0.8	0.4	0.6	1.10	1.31	0.20	1.11	4.04	3.32	3.22	2.73	-3.17	-0.85	-5.27	-7.66	5.16	4.36	3.84
Oct.	-	-	-	-	-	-1.7-	0.6-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1.52	1.04	2.02	1.90	0.40	0.3	0.2	0.40	0.70	2.21	1.22	0.42	0.42	0.32	0.42	2.03	1.64	1.19	-9.36	-7.38	-3.86	4.44	3.74	4.32
Nov.	-	-	-	-	-	-	-	-	0.2-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2.21	3.82	1.42	0.01	1.50	2.61	2.51	1.31	0.6	1.01	2.52	1.22	2.42	1.11	1.31	0.13	0.94	0.46	8.21	5.21	-3.09	7.35	3.74	5.51
Dec.	-	-	-	-	-	-	-	-	4.3-	1.0-	-6.7-	-	-	-	-	-	-	-	-	-	-	-	-	-
	6.82	4.73	3.82	4.22	3.12	0.51	4.02	0.62	0.8	0.6	0.4	1.71	1.61	2.81	3.62	1.33	0.63	1.33	-5.07	6.01	-5.77	3.44	5.23	3.33

Non-Spinning Reserve Service (NSRS) Requirement Details

Introduction

Non-Spinning Reserve Service (NSRS) consists of Generation Resources capable of being ramped to a specified output level within thirty (30) minutes or Load Resources that are capable of being interrupted within thirty (30) minutes and that are capable of running (or being interrupted) at a specified output level for at least one (1) hour. NSRS may be deployed to replace loss of generating capacity, to compensate for load forecast and/or forecast uncertainty on days in which large amounts of reserve are not available online or when there is a limited amount of capacity available for Security-Constrained Economic Dispatch (SCED).

Summary

ERCOT will determine the 95th percentile of the observed hourly Net Load uncertainty from the previous 30 days from when the study is performed and from the same month of the previous year. Net Load is defined as the ERCOT load minus the estimated total output from WGRs. The estimated total output from WGRs considers what the total WGR output most likely would have been if the QSEs had not been given deployments to move their resources down. The forecast of Net Load is computed by subtracting the aggregate WGR High Sustained Limits (HSLs) in the Current Operating Plans (COPs) from the Mid-term Load Forecast (MTLF). The COPs and MTLF used are the updated values as of ~~midnight at the beginning of the~~ 86 hours prior to each Operating DayHour. The Net Load uncertainty is then defined as the difference between the Net Load and the forecasted Net Load. ERCOT will subtract 500 MW and the Regulation Up requirement from the calculated 95th percentile value to determine the amount NSRS to purchase during each hour of the day for the upcoming month. This 500 MW corresponds to 500 MW of the RRS requirement. 6 hours

ERCOT will purchase NSRS such that the combination of NSRS, 500 MW of RRS, and Regulation Up Services cover 95% of the calculated uncertainties from the Net Load performance analysis. For on-peak hours (hours ending 7 through 22), ERCOT will also set a floor on the NSRS requirement equal to the largest unit minus 500 MW.

Procedure

The days that are used for analysis are the last 30 days prior to the study and the days from the same month in the previous year. For the purpose of determining the amount of NSRS to purchase for each hour of the day during the upcoming month, hours will be placed into four (4) hour blocks. The 95th percentile of the Net Load uncertainty for the analyzed days for all hours which are considered to be part of a four (4) hour block will be calculated. The same calculation will be done separately for each block. ERCOT will then calculate the average Regulation Up requirement for each four (4) block, separately, for the upcoming month. The NSRS requirement for the upcoming month for each block is calculated as the 95th percentile calculation for that block minus 500 MW and minus the average Regulation Up requirement during the same block of hours.

~~Additionally, the average uncertainty in the net load forecast will be calculated using the same days of study and four (4) hour blocks. If it is determined that the net load forecast on average over-forecasted the observed net load for a four (4) hour block, then that average uncertainty will be added back to the NSRS requirement value calculated using just the percentile method described in the paragraph above. The calculated average uncertainty value for each block will be adjusted such that the sum of the two values does not exceed 1500 and ERCOT will place a cap of 1500 MW on the NSRS requirement. The adjusted average uncertainty value will not be set to a value less than 0, and will also be subtracted from the ERCOT load forecasts during the month for the sets of hours to which it applies.~~

Additionally, the average uncertainty in the Net Load forecast will be calculated using the same days of study and four (4) hour blocks. If it is determined that the Net Load forecast on average over-forecasted the observed Net Load for a four (4) hour block, then the average uncertainty will be added back to the NSRS requirement value calculated using just the percentile method described in the paragraph above. The calculated average uncertainty value for each block will be adjusted such that the sum of the two values does not exceed 1500 and ERCOT will place a cap of 1500 MW on the NSRS requirement. The adjusted average uncertainty value will not be set to a value less than 0 and will also be subtracted from the ERCOT load forecast that is used by the RUC engine during the month for the sets of hours to which it applies. The adjusted average uncertainty value shall not be used by the ERCOT Operator to select a load forecast, and shall not be included in ERCOT-published Load Forecasts.

After this analysis has been completed, ERCOT will apply a floor on the final NSRS requirement equal to the largest unit minus 500 MW. This floor will only be applied to on-peak hours, which are hour ending 7 through 22.

ERCOT will post these requirements as required by the Protocols.

Discussion

Historically, the need for NSRS has occurred during hot weather, during cold weather, during unexpected changes in weather, or during large unit trips when large amounts of spinning reserve have not been on line (spinning reserve in this document represents un-deployed online generation capacity). The increasing level of wind penetration has resulted in an increased level of operational risk. Wind output tends to be higher during off-peak hours when the system load is less and introduces a risk of decreasing output while the load demand is increasing. The periods when load is increasing and wind is decreasing requires other generation resources to increase output or come online quickly to compensate for the sudden Net Load increase. The risk of Net Load increases that are not forecasted exists for all hours of the day.

While Net Load analysis may cover reserves required for forecast uncertainty, it may not necessarily cover exposure to the loss of generation. Due to this risk, it may be necessary for ERCOT to have reserves available during high risk hours even if the forecast analysis does not indicate a need for NSRS to protect against forecast uncertainty.

Examples of circumstances when NSRS has been used are:

- Across peak hours during spring and fall months when hotter than expected weather with large amounts of capacity offline resulted in EEA events;
- Afternoons during summer seasons when high loads and unit outages outstripped the capability of base load and normal cyclic units;
- Cold weather events when early morning load pickup outpaced the ability of generation to follow;
- Major unit trips when large amounts of spinning reserve were not online; and
- During periods when the [wind](#) decreased and load demand increased.

Responsive Reserve Service (RRS) Requirement Details

The ERCOT Operating Guides set the minimum RRS requirement at 2300 MW for all hours under normal conditions. However, as a result of 500 MW of RRS being included in the Net Load analysis for NSRS, an additional 500 MW will be added to the 2300 MW minimum. This results in a total RRS minimum requirement of 2800 MW.

One type of Responsive Reserve is Interruptible Responsive Reserve. Interruptible Responsive Reserve is provided by Load Resources that are automatically interrupted when system frequency decreases to 59.7 Hz. The amount of RRS procured from these types of Resources during any given hour will be limited to 50% of the total RRS requirement for that hour. The limit therefore will be 1400 MW. The ERCOT Protocols state, “[t]he amount of Resources on high-set under-frequency relays providing RRS will be limited to 50% of the total ERCOT RRS requirement. ERCOT may reduce this limit if it believes that this amount will have a negative impact on reliability or if this limit would require additional Regulation Service to be deployed.”

Self arranged RRS used to fulfill a QSE’s RRS requirement will be limited to 50% from Load Resources excluding Controllable Load Resources.

If the percentage level for Load Resources, excluding Controllable Load Resources, specified in the Protocols is changed, that change will be reflected in these requirements.