Date: November 9, 2010
To: Board of Directors
From: Brad Jones, Technical Advisory Committee (TAC) Chair
Subject: 2010 Loss of Load Events (LOLEV)/Target Reserve Margin (TRM) Study

Issue for the ERCOT Board of Directors

ERCOT Board of Directors Meeting Date: November 16, 2010
Agenda Item No.: 7

Issue:
Whether the TRM and Effective Load Carrying Capability (ELCC) of Wind Generation be updated based on the recently completed LOLEV Study.

Background/History:
The Board voted in August 2002 to recommend a 12.5% TRM to the Public Utility Commission of Texas (PUCT). The TAC recommendation to the Board on this vote included a requirement to update the reserve margin target study every two (2) years, but the minutes of the Board meeting reflect that the Board did not include this requirement because "the margin would be analyzed in the future regardless of whether the Board adopted a certain time frame for such analysis." The capacity value of wind was initially set to 10%.

The Generation Adequacy Task Force (GATF) of the Wholesale Market Subcommittee (WMS) revisited the Capacity, Demand and Reserves (CDR) calculation of the reserve margin in 2005, but no additional analysis of the TRM was performed. As a part of this revisiting, the capacity value of wind used in the CDR was revised to 2.9%, based on reviewing the availability of wind generation during specific hours that were designated as "on-peak."

ERCOT contracted with Global Energy to produce a new LOLE/TRM study in 2007, which was completed and presented to the GATF. The GATF revisited the CDR calculation of the reserve margin and TAC brought a revised methodology paper to the Board for approval at the April 18, 2007 Board meeting. This methodology paper, which included a change in the capacity value of wind to the current 8.7% ELCC based on the results of the Global Energy study, was approved by the Board. This Global Energy study also indicated that a slight increase to the TRM was warranted, to either 12.9% or 13.6% depending on whether a combustion turbine or a coal unit was used as the proxy to vary the available capacity. However, this change to the TRM was not recommended to the Board at that time.

At the March 2010 ERCOT Board meeting, TAC presented a revised GATF Report that provided a review of the CDR reserve margin calculation and also included guidance on the planned LOLEV study that ERCOT would be performing. This report was approved by the Board, after some revisions by TAC, at the April 2010 ERCOT Board meeting. ERCOT completed this LOLEV study in October 2010 and presented the methodology to the GATF and the methodology and results to GATF, WMS and TAC.

Key Factors Influencing Issue:

ERCOT has completed an updated LOLEV study. This study is an analysis to quantify the impact of system volatility on reserve levels and reliability. This analysis is performed to review the appropriateness, given changes to the ERCOT system, of the TRM level used to evaluate resource adequacy in ERCOT. System volatilities such as generator outages and derating, load forecast uncertainties and intermittent nature of wind were studied. Reliability indices such as Loss of Load Events, Loss of Load Hours and Expected Unserved Energy for various levels of reserve margins were obtained.

Generator outages were modeled sequentially using random draws from two (2) exponential distributions. Mean Time to Failure and Mean Time to Repair for each of the generators were used to build sequences of generator availability and unavailability respectively. For each scenario, the simulation was iterated sufficiently to achieve established stopping criteria.

Load forecast uncertainties due to weather were studied by running Monte Carlo simulation for five (5) different load scenarios – extreme summer, warmer than average, average, cooler than average and much cooler than average. Each of these scenarios was assigned a probability of occurrence. All load scenarios were developed using Moody's base economic forecast.

Due to the inherent variability of wind powered generation on the ERCOT System, the availability of wind power generation needed to be treated differently than the availability of conventional generators in reserve margin calculations. The ELCC concept for variable resources like wind was introduced for this purpose in the past studies. ELCC indicates the percentage of the total nameplate capacity of wind that can be counted towards the calculation of the reserve margin. ELCC was evaluated by comparing the relative reliability of the installed or planned wind generation to the reliability of the planned 2012 fleet on an annual basis. Wind profiles developed by AWS Truewind for ERCOT Competitive Renewable Energy Zone (CREZ) study were used in this analysis.

The 2010 study was done using a fundamentally similar approach to that used for the 2007 study done by Global Energy, but with certain differences in inputs and assumptions. The current study uses a family of load profiles representing different weather conditions. All hours of the year are modeled instead of a representative week from each month. Generator outages are modeled sequentially. Wind volatility is modeled in a more dynamic way. The ELCC of existing wind is compared to the reliability of the existing fleet rather than hypothetical new generation. A much higher number of iterations were performed in order to ensure the statistical significance of the results. The capacity-weighted average Equivalent Forced Outage Rate of 5.62% was used for the 2007 study, whereas an Equivalent Demand Forced Outage Rate of 4.45% was used for the current study.

The ELCC of wind resources was calculated through this analysis to be 12.2%. The ERCOT TRM, based on a 0.1 Loss of Load Events metric that is equivalent to the "one day in ten years" metric that has traditionally been used in the industry, was found to be 13.75%.

ERCOT Staff reviewed the LOLEV/Reserve Margin Study at the October 25, 2010 Special WMS Meeting. WMS subsequently conducted two (2) email votes on the topic. The first

motion to endorse the LOLEV presentation from ERCOT and the ERCOT follow up questions and answers documentation and to recommend target reserve margin of 13.75% passed with 76.7% in favor, 23.3% opposed and three (3) abstentions from the Investor Owned Utility (IOU), Independent Retail Electric Provider (IREP) and Independent Power Marketer (IPM) Market Segments. The second WMS motion to recommend to TAC that ERCOT continue to use the 8.7% reserves for wind for the December CDR and/or until more data and analysis can be conducted to support the ELCC methodology passed with 93.3% in favor, 6.7% opposed and one (1) abstention from the IPM Market Segment. The presentation and voting documents can be accessed on the ERCOT website for the October 25, 2010 Special WMS Meeting.

On November 4, 2010, ERCOT Staff briefed the TAC on the study results and TAC conducted the following series of votes:

- The motion to endorse the WMS recommendation to recommend a target reserve margin of 13.75% failed with 17 votes in favor, seven (7) opposing votes from the Cooperative and Consumer (6) Market Segments and three (3) abstentions from the Cooperative, Independent Generator and IREP Market Segments.
- The motion to endorse retaining the current reserve margin of 12.5% failed with seven (7) votes in favor, 17 opposing votes from the Cooperative (2), Municipal (3), IOU (3), Independent Generator (4), IREP (2), and IPM (3) Market Segments and three (3) abstentions from the Cooperative and IREP (2) Market Segments.
- The motion to endorse the 13.75% reserve margin as produced in the ERCOT report was reinitiated and passed with 19 votes in favor, six (6) opposing votes from the Cooperative and Consumer (5) Market Segments and three (3) abstentions from the Cooperative, Consumer and IREP Market Segments.
- The motion to apply an 8.7% capacity value for wind in the CDR passed with 20 votes in favor, six (6) opposing votes from the Cooperative (2), Municipal (2) and Consumer (2) Market Segments and two (2) abstentions from the Municipal and IREP Market Segments.

The TAC voting documents can be accessed on the ERCOT website for the November 4, 2010 TAC meeting.

Alternatives:

1. Endorse the use of 13.75% as the TRM for ERCOT, and the use of the 8.7% as the capacity value of wind, to be used for reserve margin reporting purposes as recommended by TAC;
2. Endorse the use of 13.75% as the TRM for ERCOT, and the use of the 12.2% ELCC as the capacity value of wind, to be used for reserve margin reporting purposes as indicated by the 2010 ERCOT LOLEV Study;
3. Take no action, in which case the current 12.5% TRM and 8.7% capacity value for wind will continue to be used for reserve margin reporting purposes; or
4. Remand this issue to TAC with instructions.

Conclusion/Recommendation:

TAC recommends approval of the use of 13.75% as the TRM for ERCOT, and the use of the 8.7% as the capacity value of wind, to be used for reserve margin reporting purposes.

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 the use of 13.75% as the Target Reserve Margin for ERCOT, and the use of the 8.7% as the capacity value of wind, to be used for reserve margin reporting purposes;

THEREFORE, BE IT RESOLVED, that ERCOT is hereby authorized and approved to use of 13.75% as the Target Reserve Margin for ERCOT, and the use of the 8.7% as the capacity value of wind, to be used for reserve margin reporting purposes.

CORPORATE SECRETARY'S CERTIFICATE

I, Bill Magness, Corporate Secretary of ERCOT, do hereby certify that, at its November 16, 2010 meeting, the ERCOT Board passed a motion approving the above Resolution by _____.

IN WITNESS WHEREOF, I have hereunto set my hand this ___ day of November, 2010.

_____
Bill Magness
Corporate Secretary