Demonstrating Resource Adequacy in ERCOT

Revisiting the ERCOT Capacity, Demand and Reserves Forecasts

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CONTENTS

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Following the winter ice storm and the summer heat wave of 2011, when the electricity grid in Texas experienced significant stress, ERCOT revised the load forecast in the December 2011 Capacity, Demand and Reserves (CDR) report, indicating that ERCOT would soon drop dangerously below its targeted reserve margin and achieve a negative value in 2020. In the three CDR reports released since the December 2011 CDR, the estimated reserve margins have grown steadily due to revisions to the load forecast and the addition of new resources. On January 27, 2014, ERCOT presented preliminary estimates for 2014 that show a continued improvement to future reserve margins.

Despite the improvements to the reserve margins in recent CDRs, concerns remain regarding ERCOT's ability to maintain and incentivize sufficient future resources. These concerns have only deepened following grid emergencies arising from extreme weather events and unanticipated generator outages, most recently in January 2014. It is worth noting that these emergency situations reflect system conditions that are not well represented by the CDR load forecast, which is based on an average of the previous 12 years of weather and system conditions. As such, ERCOT will continue to need a healthy reserve margin beyond the CDR's load forecast in order to withstand periods of sudden demand spikes or unplanned outages.

We reviewed several elements of the CDR report and determined that with some reasonable adjustments to forecast values, the target reserve margin will be met or exceeded for the next ten years. We summarize our research with two scenarios. The first is called Counting What Already Exists and the second is called Augmenting Demand-Side Resources in ERCOT. As discussed below, by modifying a few key assumptions in the CDR report and using the same normal weather conditions assumed by ERCOT, we find that Texas is projected to have sufficient resources and a healthy reserve margin well into the future. In addition, a few simple policy changes as outlined in the second scenario could significantly augment the amount of demand-side resources available to help ensure resource adequacy.

SCENARIO 1: COUNTING WHAT ALREADY EXISTS

The first scenario, Counting What Already Exists, makes several adjustments to the ERCOT assumptions from the most recent CDR reports about existing and forecasted resources. This scenario takes into account the new 2014 load forecast and approved generation resources that were not previously included; adjusts the Effective Load Carrying Capability of wind resources to represent more accurately their capacity factors; revises the accounting of energy efficiency programs; and includes the now active 30-minute Emergency Response Service product.

Adjusting the Load Forecast

Since the release of the May 2013 CDR, ERCOT has worked with Itron to revise elements of the load forecast methodology. Although the findings presented on January 27 are preliminary, they show significantly lower demand growth than previous forecasts for the first several years.[1] The largest difference between the Itron preliminary forecast and the previous forecasts prepared by Moody's stems from growth rate assumptions: where Moody's assumed a very optimistic level of incremental peak load growth in the first three or four years of the forecast followed by a leveling off of growth, Itron suggests a more gradual, linear growth rate through the end of the forecast period. As a result, the average annual peak demand growth rate for the ten-year planning period drops from 2.5% in the Moody's base case used in 2011, to 1.3% in the Itron preliminary forecast. This lower growth rate more closely resembles the 1.1% average annual peak demand growth rate observed in ERCOT from 2003-2013. By simply using the new demand forecast presented in January 2014, the reserve margin rises to more than 15% through 2018, before falling to 9% by 2023.[2]

Adding Resources with Interconnection Agreements

When the CDR is updated later this year, new generation resources that have an interconnection agreement will be added to the total amount of resources available. The December 31, 2013 ERCOT System Planning Report provides a list of new generation resources with interconnection agreements. The System Planning Report lists 15,000 MW of new generation resources set to come online before 2017; of those, more than 5,000 MW have received interconnection agreements since the May 2013 CDR. Additionally, we include a portion of Golden Spread Electric Cooperative's newly planned 808 MW gas generator, of which 404 MW are dedicated specifically to ERCOT.[3] We add these additional resources to the CDR resource forecast, as would be done in a typical CDR update. The inclusion of these additional resources leads to an overall forecasted reserve margin increase of 4.4% in 2023.

Adjusting the Effective Load Carrying Capability of Wind Resources

The Effective Load Carrying Capability (ELCC) estimates the amount of installed nameplate capacity that can be counted toward the reserve margin for wind resources. Even though several ERCOT-sponsored Loss of Load Studies have indicated higher ELCCs, current CDR reports assign wind resources an ELCC of

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[1] Opheim, Calvin and Mark Quan, "Review of Preliminary Load Forecast." Prepared for ERCOT workshop – Review CDR Load Forecast Methodology, January 27, 2014. Available at: http://www.ercot.com/calendar/2014/01/20140127-CDRWorkshop.

[2] In the appendix to this report, Exhibit A-1 shows the incremental impact of each adjustment used in the Counting What Already Exists scenario.

[3] The other 404 MW may be provided to either ERCOT or SPP. See: Golden Spread Electric Cooperative, "Golden Spread's Comments and Responses to Questions Posed to the Honorable Public Utilities Commission." Docket No. 40,000, Item No. 594, December 16, 2013. Available at: http://interchange.puc.state.tx.us/WebApp/Interchange/Documents/40000_594_775884.PDF

8.7% of installed capacity, significantly undervaluing wind's capacity contribution.[4] The most recent Loss of Load Study conducted on behalf of ERCOT estimated an ELCC for wind resources in non-coastal areas of the state to be 14.2% of nameplate capacity, while the ELCC for wind in the five coastal counties—Cameron, Kenedy, Nueces, San Patricio, and Willacy—was estimated to be 32.9%.[5] We adjusted the ELCC of wind resources by region, based on the capacity and geographical location of current and planned wind resources listed in the CDR reports. Adjusting the ELCC of wind resources increases the reserve margin by nearly 2% in 2023.[6]

A potential alternative to the ELCC methodology detailed above would be to use a three-year average of actual output during peak hours to determine the ELCCs for currently operating units in ERCOT, but use an ELCC based on regional averages for newer wind facilities. Whatever approach the ERCOT Board ultimately approves, the resulting impact to the reserve margin is likely to be consistent with the incremental impacts from the adjustment proposed in this section.

Energy Efficiency Resources

Currently the CDR's load forecast accounts for less than half of the energy efficiency mandates applicable within the ERCOT region. Each distribution utility that provides transmission within the competitive retail electric areas to its customers is statutorily required to implement energy efficiency programs that reduce demand by 0.40% of the previous year's peak demand, but the CDR only includes annual peak demand savings of 0.19% or 0.18% through 2019. Further, from 2020 through the end of the forecasted period, the most recent CDR phases out additional energy efficiency savings, drastically reducing annual peak demand savings to only 0.02% for each year from 2020 through 2022, and forecasting no peak demand savings in 2023. A more accurate portrayal of demand-side resources likely to be realized in ERCOT would include the full 0.40% of expected demand reductions. However, over time, some of the installed energy efficiency measures may be reflected in the load forecasts used by ERCOT. While we are not persuaded that a 50% discount is the appropriate adjustment to reflect these embedded energy efficiency resources, we maintain ERCOT's conservative approach in this scenario, increasing the forecasted incremental gains to a fixed 0.20% of the previous year's peak demand through the end of the forecasted period.

In addition to retail electric providers that participate within the competitive ERCOT market, Texas's grid contains Non Opt-In Entities (NOIEs), which are municipalities and cooperatives providing non-competitive electric service. Chapter 25 of the Public Utility Commission of Texas's rules and laws

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[4] In fact, in the Loss of Load Study that established the 13.75% reserve margin target, ERCOT suggested that the ELCC of wind resources in the CDR could be increased from the current average of 8.7% to 12.2%: ERCOT, "2010 ERCOT Target Reserve Margin Study." November 1, 2010.

[5] ECCO International, "2012 ERCOT Loss of Load Study: Study Results." Prepared for ERCOT, March 8, 2013. Available at: http://www.ercot.com/content/news/presentations/2013/ERCOT%20Loss%20of%20Load%20Study-2013-PartII.pdf.

[6] When incorporating the new wind generation with interconnection agreements listed in the prior section, we utilize the same methodology detailed here to determine the ELCC of each new wind resource.

establishes the energy efficiency target of 0.40% of the previous year's peak demand only for "electric utilities" and not for municipalities and cooperatives. However, NOIEs are required to "consider adopting and implementing energy efficiency programs … in a manner consistent with the standards established for other utilities in the state."[7] And, according to energy efficiency program updates filed with the PUC, several of the largest NOIEs—such as Austin Energy and CPS Energy—have been exceeding the 0.40% incremental energy efficiency target, reducing their combined peak demand by approximately 1% in 2012.[8] Further, several NOIEs have established ambitious demand-side savings goals, such as CPS Energy's goal to reduce peak demand by more than 700 MW by 2020 and Austin Energy's goal to reduce demand by 800 MW of demand between 2007 and 2020, indicating that NOIEs are committed to ongoing peak demand savings.[9] The recent energy efficiency achievements of NOIEs further establish that the 0.20% peak load impact of energy efficiency is a conservative assumption.

Despite the legislative target of 0.4% incremental peak demand reductions and the 50% adjustment used by ERCOT, the CDR actually applies an annual reduction of only 0.18% to 0.19% from energy efficiency programs until 2020, when incremental energy efficiency gains drop to 0.02%.[10] This extremely conservative approach is applied to the entire ERCOT peak load, effectively including the contributions from NOIEs, even though they are not covered by the legislation. For our first scenario, we merely adjust the annual reduction to a constant 0.20% per year through the end of the forecast. This adjustment has a minimal impact on the reserve margin through 2019, but from 2020 to 2023, the impact is more significant. The overall effect of this higher energy efficiency assumption is an increase in the reserve margin of nearly 1% in 2023.

Demand Response – Emergency Response Services

Historically, Texas has maintained different interruptible load programs to serve various purposes. In addition to a ten-minute spinning reserve program, ERCOT procures non-spinning interruptible load as emergency response services (ERS). In order to be eligible for the ERS program, demand response

[7] Texas House Bill 3693, available at: http://www.legis.state.tx.us/tlodocs/80R/analysis/html/HB03693H.htm.

[8] Estimated based on data available in the following: Nexant, "Measurement and Verification of CPS Energy's FY2013 DSM Program Offerings," Submitted to CPS Energy, May 22 2013, available at http://www.sanantonio.gov/sustainability/Environment/STEPAnnual2013.aspx, Austin Energy 2012 SB-924 Energy Efficiency Report filing to the State Energy Conservation Office, available at http://www.seco.cpa.state.tx.us/energy-reporting/public-power-reports.php, and Energy Information Administration Form 861 summer peak demand data for 2012.

[9] Note that these peak demand savings come primarily from energy efficiency but also may include some demand response. See: CPS Energy, "Corporate Sustainability Report 2010," pg. 16. Available at: http://www.cpsenergy.com/files/Sustainability_Report.pdf. Austin Energy, Austin Energy Resource, Generation and Climate Protection Plan to 2020, 2011, available at http://www.austintexas.gov/edims/document.cfm?id=137861.

[10] Although ERCOT's undervaluation of energy efficiency savings may appear insignificant, when applied to the entire ERCOT load, the impacts are substantial.

resources are required to be available for a four-hour segment, with three separate procurement seasons and four different hour options available.[11]

Two types of ERS products are available in ERCOT: 10-minute and 30-minute reserves. However, the CDR only accounts for the 10-minute reserves, increasing the resource forecast by 10% each year. Although it began as a pilot product, the 30-minute ERS product was available last summer on the order of 125 MW.[12] Most recently, more than 110 MW of 30-minute demand response resources responded during the Energy Emergency Alert event that occurred in ERCOT on January 6, 2014. In order to ensure adequate accounting of current resources, we added the 30-minute product to the 2014 forecast, increasing it by 10% per year just as the CDR does for the 10-minute reserves.[13] Cumulatively, the two ERS programs represent 600 MW of capacity in 2014 and grow to 1,416 MW in 2023. Adding the 30-minute ERS product increases the reserve margin by 0.4% in 2023.

Summary of Scenario 1

Altogether, the five simple adjustments to assumptions in the load and resource forecasts in the May 2013 CDR—updating the load and resource forecasts, and more accurately counting the capacity contributions of wind, energy efficiency, and demand response—produce a significant improvement in the forecasted reserve margin. As seen in Exhibits A-1 and A-2 in the appendix, the Counting What Already Exists scenario increases the reserve margin to nearly 25% by 2017 as new resources are added. After 2017, the reserve margin gradually declines as load grows steadily but no new generation is added, reaching 16.2% in 2023.[14] Not only does this scenario exceed the target reserve margin of 13.75% established in 2010, but it also eclipses the 15% target reserve margin proposed in the 2012 ERCOT Loss of Load Study.

The largest improvement in the reserve margin is due to the inclusion of new resources that have obtained interconnection agreements since the last CDR. However, if only half of the 3,078 MW of new resources are delivered or an equivalent amount of new retirements are announced, the reserve margin would only be reduced by 2.2% from the levels reported above. In such a situation, the resources available would decline by 1,605 MW and the reserve margin would fall to 14.0% by the end of the forecast, but it would still remain above the 13.75% reserve margin target.

[11] Hurley, Doug, Paul Peterson and Melissa Whited, "Demand Response as a Power System Resource." Prepared by Synapse Energy Economics for the Regulatory Assistance Project, May 2013.

[12] ERCOT, "Procurement results for 30-Minute ERS Pilot." May 21, 2013.

[13] In fact, ERCOT Nodal Protocol Revision Request 489 requires ERCOT to increase ERS by 10% per year in the CDR forecast. See: http://www.ercot.com/mktrules/issues/nprr/476-500/489/index.

[14] This reserve margin projection does not account for new resources that may come online after 2017, as the ERCOT December 2013 System Planning Report only extends to 2017.

SCENARIO 2: AUGMENTING DEMAND-SIDE RESOURCES IN ERCOT

Although several parties to the resource adequacy Docket No. 40,000 in Texas have called for new generation resources, re-activation of mothballed units, or even a new capacity market structure in order to mitigate dangerously low reserve margins, Scenario 1 provides a much less pessimistic reserve margin forecast. In Scenario 2, we build upon Scenario 1 by exploring how policies that expand the quantity of demand-side resources (demand response and energy efficiency) in ERCOT could further reduce stress on the grid and improve the reserve margin while avoiding more expensive generation alternatives or a capacity market structure.

Increasing the Energy Efficiency Target

Rather than holding the energy efficiency goal constant for the next decade, we assume a moderate increase in the savings goal, ramping up from 0.40% to 0.70% of the previous year's peak demand in 2016 and then increasing the current target to reach 1.0% of peak demand from 2018 on out.[15] (This target also applies to NOIEs, as they are included in the CDR load forecast to which we are making adjustments.) As in Scenario 1, we use ERCOT's conservative assumption of incorporating only half of the peak demand savings from this new goal in our scenario.[16] Although most states with an energy efficiency resource standard (EERS) set their goals based on reductions to annual sales, we continue Texas's practice of setting goals based on percentage of peak demand. A goal of a 1.0% reduction of peak demand is in line with what several other states—such as Maryland, Ohio and Pennsylvania—are targeting.[17]

Projected out, this scenario more than doubles the energy efficiency included in the Counting What Already Exists scenario, and is consistent with the goals that have been set in major NOIEs, such as Bluebonnet Electric Cooperative, CPS Energy, and Austin Energy. The effect of increasing the energy efficiency target is significant, and results in a reserve margin increase of 2.5% by 2023, an equivalent of 1,527 MW of generation.

[15] According to an Itron report from 2008, reaching 0.7% peak demand savings per year by 2015 would be feasible, and would result in savings roughly equivalent to the previous, non-peak demand based EE goal. See: Itron, "Assessment of the Feasible and Achievable Levels of Electricity Savings from Investor Owned Utilities in Texas: 2009-2018." Submitted to the PUCT, December 23, 2008.

[16] Maintaining a 50% reduction to the energy efficiency values is even more difficult to justify when the goal is effectively doubled. While the current load forecast may have some historical and future energy efficiency savings embedded in the forecast values, it is difficult to support a 50% embedded value for energy efficiency goals that have not yet been adopted. However, for the purposes of this report, the reserve margin improvements are still significant even when the 50% assumption is applied to the new, additional energy efficiency resources.

[17] ACEEE, "The 2013 State Energy Efficiency Scorecard." Report Number E13K, November 2013.

Additional Emergency Responsive Services

ERCOT currently predicts that its 10-minute ERS product, the only type of ERS included in the CDR, will grow by 10% per year through the end of the forecast period. Even when the new 30-minute ERS product is included, as is the case in the Counting What Already Exists scenario, ERS represents less than 1% of the system capacity requirement in 2014.[18] Given that other independent system operators—such as CAISO, PJM, NYISO, ISO-NE, and MISO—procure dispatchable demand response to represent anywhere from 2.0% to 4.5% of the system capacity requirement, ERCOT's ERS resources could potentially play a much greater role in meeting resource adequacy requirements.[19] In this scenario, we double the annual incremental ERS additions, from a 10% increase per year to a 20% increase per year, in order to arrive at the bottom end of the range of what other regions are currently achieving by 2023. The 1,699 MW of ERS capacity calculated with this methodology would represent slightly less than 2.0% of the system capacity requirement in 2023.[20] The impact of doubling the quantity of new ERS resources each year is an overall increase to the reserve margin of 0.5% for 2023, or approximately 283 MW.

Summary of Scenario 2

As seen in Exhibit A-2 in the appendix, the impact of the additional load resources in Scenario 2 pales in comparison to the incremental increases in the reserve margin produced as a result of merely counting all of the generation and load resources in Scenario 1. Nevertheless, the cumulative impact of increasing load resources available in ERCOT in Scenario 2 would raise the reserve margin by an additional 3% by 2023, an equivalent of 1,811 MW of generation.

RESULTS

As seen in Figure 1 below, by properly accounting for the resources that already exist in ERCOT but are not included or are undervalued in the CDR report, the reserve margin improves substantially. The reserve margin in Scenario 1 (Counting What Already Exists) remains above 20% through 2019 before declining to 16.2% in 2023. By further increasing demand-side resources, ERCOT could maintain a significant reserve margin surplus by the end of the forecasted period. As shown in the graph, the reserve margin for Scenario 2 quickly climbs above 20% and remains well above the current target reserve margin for the entire forecast period. Such a scenario would be significantly less expensive than

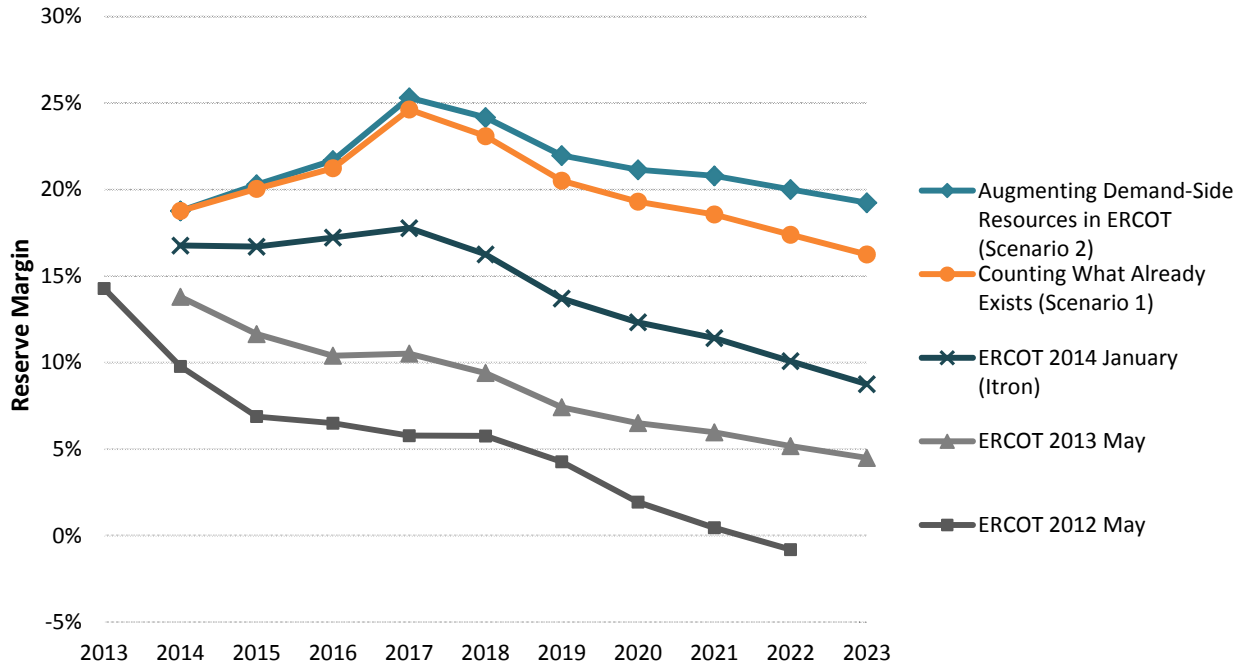
[18] We define the system capacity requirement as the forecasted firm load forecast multiplied by the required reserve margin of 13.75%. Following this methodology, for 2014 the system capacity requirement is 74,933 MW.

[19] Achieving higher levels of dispatchable demand response may require higher compensation for demand response providers, but we have not conducted an analysis to determine whether this would be the case.

[20] For the purposes of our scenario, we assume that this growth in demand response occurs through the ERS program. However, it could also occur through new or alternative programs developed by ERCOT or the utilities themselves.

alternative options, such as procuring more generation or moving towards a costly capacity market mechanism.

Figure 1. ERCOTT Reserve Margin Forecasts



It is worth noting that this part of our analysis makes no assumptions regarding how our scenarios would impact the economic equilibrium of the reserve margin. Although market dynamics suggest that a shortage of capacity would incentivize new resources through high energy prices and that a capacity surplus would lead to resource retirements due to depressed energy prices, our analysis does not account for any effects on energy prices that may result from our scenarios.

As mentioned above, it is important to note that the load forecast used in the CDR is based on an average of the weather that Texas has experienced over the last 12 years, rather than an unusual weather year consisting of major hurricanes, heat waves, droughts, or other abnormal weather conditions. Nevertheless, by building out energy efficiency and demand response, our analysis suggests that ERCOT could maintain a healthy reserve margin capable of maintaining a reliable electric grid for the next ten years, even in extreme weather conditions. Figure 1, above, displays the impacts of the January 2014 revised load forecast and Scenarios 1 and 2 on ERCOT's reserve margin, demonstrating that a significant resource shortfall is unlikely when resources are properly accounted for and demand-side resources are increased.

CONCLUDING THOUGHTS

The results of this analysis demonstrate that with modest alterations to the core assumptions in the CDR methodology, the resource adequacy situation in ERCOT appears to stabilize over a ten-year forecast horizon. By further expanding energy efficiency and demand response in ERCOT, the reserve margin is forecast to remain well above the target reserve margin for the planning period. The load resource additions outlined in Scenario 2 could be incentivized through two potential policy changes:

- Double the spending cap for ERS products[21]
- Raise the energy efficiency peak load reduction target to 0.7% annual rate by 2016 and to 1.0% annual rate by 2018

Taken alone, the demand-side policies in Scenarios 1 and 2 are projected ultimately to increase the reserve margin in ERCOT by 4.3%, producing nearly as great an impact as the inclusion of new generation resources with interconnection agreements. Investments in demand-side resources have historically also been highly cost effective, resulting in net savings for customers and reducing environmental impacts.

Additionally, there are several other assumptions that could influence the reserve margin in one way or another that are not included in this analysis. For instance, the combination of Loads in Security Constrained Economic Dispatch (SCED) and the Operating Reserves Demand Curve (ORDC) may incentivize higher levels of participation from new or existing price responsive demand response resources. Given that certain analysts, such as the Brattle Group, assume as much as 1,700 MW of price responsive demand already exists in ERCOT, these new resource adequacy and load resource bidding mechanisms could further increase the reserve margin by a significant amount.

Further, given that all new buildings in Texas must meet the 2009 International Residential Code and/or the 2009 International Energy Conservation Code, with several cities already adopting more ambitious building energy conservation goals, load growth may be reduced by a non-trivial amount each year through increasingly stringent building codes and standards. This continued evolution of building codes and standards is expected also to contribute to an increase in the reserve margin. In fact, the Texas Comptroller of Public Accounts is charged with periodically reviewing the energy codes and considering adopting more recent versions. Currently, the Comptroller is considering whether or not to adopt the 2012 IECC and 2012 IRC as the state minimum requirement.[22] Additionally, distributed renewable generation such as on-site solar has recently experienced rapid growth in Texas and is likely to continue to increase significantly in the coming decade. As a result, demand may continue to fall, leading to an additional increase in the forecasted reserve margin.

[21] The annual cost cap for ERS expenditures is currently limited to $50 million, pursuant to PUC Substantive Rule 25.507.

[22] For more information about the timing of this review, see http://seco.cpa.state.tx.us/tbec/notices.php

However, some future developments could have the opposite effect and reduce the capacity available on the ERCOT system beyond what is projected in the current CDR. An important piece of the puzzle is the retirement of current generating units. Although the December 2013 System Planning Report contained additional resources soon to join the ERCOT grid, it did not predict which, if any, generators may choose to retire over the forecast period. These retirements may be already planned, or may result from the addition of newer, more efficient, and cheaper load and generation resources; regardless, the retiring of current units would decrease both the capacity available to the grid and the overall reserve margin.

Higher demand growth is another factor that could result in a lower reserve margin than forecasted in our analysis. Such increases in demand could result from higher economic or demographic growth, whether from expansion of the oil and gas industry, rising levels of personal income, population influxes, or other factors.

Finally, it is important to note that this analysis only examines one aspect involved in ensuring that ERCOT delivers electricity in the most efficient and reliable way, at the lowest cost to consumers: resource adequacy. Although our results demonstrate that ERCOT should not experience any resource adequacy concerns in the coming decade, assuming historical weather patterns, the grid still must overcome other reliability concerns. In particular, as ERCOT continues to integrate more intermittent resources such as wind and solar, the grid will need to prioritize flexible resources of all types capable of providing services on short notice.

APPENDIX

Exhibit A-1. Incremental Percent Impact on Reserve Margin of Individual Adjustments to the CDR

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
ERCOT 2013 May	13.8%	11.6%	10.4%	10.5%	9.4%	7.4%	6.5%	6.0%	5.2%	4.5%
Adjusting the Load Forecast	3.0%	5.1%	6.8%	7.3%	6.9%	6.3%	5.8%	5.4%	4.9%	4.3%
ERCOT 2014 January	16.8%	16.7%	17.2%	17.8%	16.3%	13.7%	12.3%	11.4%	10.1%	8.8%
Adding Additional Resources	0.2%	1.3%	1.9%	4.7%	4.7%	4.6%	4.6%	4.5%	4.4%	4.4%
Adjusting the ELCC of Wind	1.5%	1.8%	1.8%	1.8%	1.8%	1.7%	1.7%	1.7%	1.7%	1.7%
Adjusting the EE Forecast	0.0%	0.0%	0.0%	0.1%	0.1%	0.1%	0.3%	0.5%	0.7%	0.9%
Adding the 30-minute ERS Product	0.2%	0.2%	0.3%	0.3%	0.3%	0.3%	0.4%	0.4%	0.4%	0.4%
Total Counting What Already Exists	18.8%	20.0%	21.2%	24.6%	23.1%	20.5%	19.3%	18.6%	17.4%	16.2%
Increasing the EE Savings Target	0.0%	0.0%	0.2%	0.4%	0.8%	1.1%	1.5%	1.8%	2.2%	2.5%
Increasing ERS	0.0%	0.2%	0.3%	0.3%	0.3%	0.3%	0.4%	0.4%	0.4%	0.5%
Total Augmenting Demand-Side Resources	18.8%	20.3%	21.7%	25.3%	24.2%	22.0%	21.1%	20.8%	20.0%	19.2%

Note: The incremental adjustment percentages listed in above are all relative to the previous baseline forecast or scenario. For instance, the percent increase from Adjusting the Load Forecast is relative to the reserve margin forecasted in the May 2013 CDR; however, the percent increase listed from Increasing the EE Savings Target in Scenario 2 is the incremental improvement compared to the final reserve margin forecasted in Scenario 1.

Exhibit A-2. Incremental Megawatt Impact of Individual Adjustments to the CDR

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Adjusting the Load Forecast	1,717	3,017	4,174	4,475	4,321	4,076	3,855	3,667	3,371	2,983
Adding Additional Resources	154	843	1,277	3,211	3,211	3,211	3,211	3,211	3,211	3,211
Adjusting the ELCC of Wind	1,015	1,210	1,217	1,217	1,217	1,217	1,217	1,217	1,217	1,217
Adjusting the EE Forecast	0	10	20	32	45	58	187	320	457	608
Adding the 30-minute ERS Product	125	138	151	166	183	201	221	244	268	295
Increasing the EE Savings Target	0	0	104	209	421	637	855	1,076	1,300	1,527
Increasing ERS	0	132	145	160	176	193	213	234	257	283

Exhibit A-3. Incremental Impact on Reserve Margin of Individual Adjustments to the CDR