8.4 Assessment of Need for Power

8.4.1 Reserve Margin Calculation Methodology

In determining the need for power, ERCOT considers the reserve margin needed to ensure reliable system operation and supply of power. The reserve margin helps ensure that there will be sufficient generating resources available to meet the load, while providing allowance for generating facilities that may be unavailable due to planned or forced outages. The reserve margin is the percent by which the generating capacity exceeds the peak demand and is defined as:

$$\frac{\text{Available Resources} - \text{Firm Load}}{\text{Firm Load}}$$

The current generation reserve margin requirement for the ERCOT region is 12.5%, as approved by the ERCOT Board in August 2002. The following is a brief summary of the methodology for the reserve margin calculation (Reference 8.4-1). The terms used here are defined below.

Firm Load equals

- Long-Term Forecast Model total summer peak demand
- minus loads acting as resources (LaaRs) serving as responsive reserve
- minus LaaRs serving as non-spinning reserve
- minus balancing up loads (BULs)

Available Resources equals

- installed capacity using the Summer Net Dependable Capability (SNDC) pursuant to ERCOT testing requirements (excluding wind generation)
- plus capacity from private networks
- plus Effective Load Carrying Capability (ELCC) of wind (i. e., 8.7% of name plate generation)
- plus reliability must run (RMR) units under contract
- plus 50% of non-synchronous ties
- plus SNDC of available switchable capacity as reported by the owners
- plus available “mothballed” generation
- plus planned generation with a signed generation interconnection agreement (SGIA) and a TCEQ air permit, if required
- plus ELCC of planned wind generation with SGIA

- minus retiring units

Loads acting as resources (LaaRs) are capable of reducing or increasing the need for electrical energy or providing ancillary services such as responsive reserve service or non-spinning reserve service. LaaRs must be registered and qualified by ERCOT, and will be scheduled by a qualified scheduling entity (Reference 8.4-2).

- Responsive reserve service is provided by operating reserves that 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. These unloaded generation resources are online, capable of controllably reducing or increasing consumption under dispatch control and that immediately respond proportionally to frequency changes. The amount of capacity from unloaded generation resources or DC tie response is limited to the amount that can be deployed within 15 seconds.

- Non-spinning reserve service is provided by LaaRs that are capable of being interrupted within 30 minutes and that are capable of running or being interrupted at a specified output level for at least 1 hour.

Balancing up Loads (BULs) are also capable of reducing the need for electrical energy when providing balancing up load energy service, but are not considered resources as defined by the ERCOT Protocols (Reference 8.4-2). Refer to Subsection 8.4.2.

Summer Net Dependable Capability is the maximum sustainable capability of a generation resource as demonstrated by a performance test lasting 168 hours (Reference 8.4-3).

A private network is an electric network connected to the ERCOT transmission grid that contains loads that are not directly metered by ERCOT (i. e., loads that are typically netted with internal generation) (Reference 8.4-3).

Effective Load Carrying Capability – ERCOT selected Global Energy Decisions, Inc. (GED) to complete a new target reserve margin study. GED used their unit commitment and dispatch software (MarketSym) to analyze the impact of load volatility, wind generation, unit maintenance, and unit forced outages on expected unserved energy, loss of load probability, and loss of load events. GED ran the model with the base set of generating units and a generic thermal generator (550 MW) and determined the expected unserved energy. GED removed the generic thermal generator and added new wind generation until the same expected unserved energy was achieved. The amount of new wind generation will have the same effective load-carrying capability as the 550 MW thermal generator. It was found that 6,300 MW of wind had the same load carrying capacity as 550 MW of thermal generation. Thus, the effective load carrying capacity (ELCC) of wind is 8.7% (Reference 8.4-4).

Reliability must run service is provided under agreements for capacity and energy from resources which otherwise would not operate and which are necessary to provide voltage support, stability or management of localized transmission constraints under first contingency criteria (Reference 8.4-2)

Switchable capacity is defined as a generating unit that can operate in either the ERCOT market or the Southwest Power Pool (SPP) market, but not simultaneously. These switchable generating units are situated in close proximity to the transmission facilities of both ERCOT and SPP, which allows them to switch from one market to the other when it is economically appropriate.

Mothballed capacity includes generation resources for which generation entities have submitted a Notification of Suspension of Operations and for which ERCOT has declined to execute an RMR agreement. Available mothballed generation is the probability that a mothballed unit will return to service provided by the owner multiplied by the capacity of the unit. Return probabilities are considered protected information under the ERCOT Protocols (Reference 8.4-3).

Planned generation capacity is based on the interconnection study phase. A generation developer must go through a set procedure to connect new generation to the ERCOT grid. The first step is a high-level screening study to determine the effects on the transmission system of adding the new generation. The second step is the full interconnection study, which is a detailed study done by transmission owners to determine the effects of the new generation (Reference 8.4-3). The owners of STP 3 & 4 have requested the screening study and it has been completed by ERCOT. The full interconnection study will not be requested for several years.

There is uncertainty associated with a number of the inputs to the ERCOT reserve margin calculation. The methodology considers these uncertainties to the extent possible in a formulaic approach while attempting to produce an equation to calculate an ERCOT reserve margin forecast that produces a reasonable estimate of such reserve margins and while not being overly cumbersome or complex. It is not possible to create an equation that can capture all of the impacts of market prices on capacity reserves. However, ERCOT believes that the approved methodology represents an accurate calculation of reserve margin (Reference 8.4-1).

The reserve margins reported in the 2007 CDR (Reference 8.4-3) and summarized in Table 8.4-1 were calculated using the methodology described above. As shown in that table and Figure 8.4-1, through 2008, ERCOT's reserve margin remains above the 12.5% requirement set by the ERCOT Board of Directors. However, ERCOT predicts that by 2009, the reserve margin will fall below 12.5%.

ERCOT cannot order new capacity to be installed to keep the reserve margin from falling below the required 12.5%, but publication of the various ERCOT reports and continuous collaboration between ERCOT and the market participants ensure that they are aware of the demand and capacity situation. Figure 8.4-1 was compiled from the reserve margin forecasts from 1999 – 2007 and compares specifically the forecasts from the 2005, 2006, and 2007 CDRs. If the PGCs do not voluntarily react to market economic forces and add generation capacity, the reserve margin could fall below the required minimum in the very near future.

8.4.2 ERCOT Demand Side Working Group

The ERCOT Demand Side Working Group (DSWG) was created in 2001 as a task force by a directive of the Public Utility Commission of Texas (PUCT) and was converted to a permanent working group in 2002. A broad range of commercial and industrial consumers, load serving entities and retail electric providers (REPs), transmission/distribution service providers, and power generation companies participate in the DSWG meetings and initiatives. Their mission is to identify and promote opportunities for demand-side resources to participate in ERCOT markets and to recommend adoption of protocols and protocol revisions that foster optimum load participation in all markets. The current ERCOT market rules allow demand-side participation under three general classes of services: voluntary load response, qualified balancing up load, and load acting as a resource. (Reference 8.4-5)

Voluntary load response refers to a customer's independent decision to reduce consumption from its scheduled or anticipated level in response to a price signal. This applies to situations in which the customer has not formally offered this response to the market. The practice has also been known as "passive load response" and sometimes as "self-directed load response." Voluntary loads gain financially from the ERCOT markets by reducing consumption when prices are high, but a load's ability to receive extra financial compensation depends entirely on its contractual relationship with its REP and qualified scheduling entity (QSE). Any advanced metering, communication, or curtailment infrastructure required for load participation is a contractual matter between the load and its REP, and does not involve ERCOT. The QSE and REP are reimbursed by ERCOT only for the energy imbalance and do not receive capacity payments. Because the load is not recognized by ERCOT as a resource, it is not subject to being curtailed involuntarily during emergency situations.

Balancing up loads (BULs) refer to loads that contract with a QSE to formally submit offers to ERCOT to provide balancing energy by reducing their energy use. BULs are paid only if they actually deploy (reduce energy use) in response to selection by ERCOT, but if deployed, they receive two separate forms of compensation. They receive a payment for actual load reduction based on prevailing Market Clearing Price for Energy. They also receive a capacity payment based on the Market Clearing Price for Capacity in the non-spinning reserves market. This is an additional reward for the BULs submitting bids into the balancing energy market even though they are not actually providing non-spinning reserves. Payments are made to a BUL's QSE, who may pass the value on to its REP, who may in turn pass the value along to the BUL. Many variations in products offered by REPs are available and the load customer has choices on how it may receive value for its interruptible load.

Customers with interruptible loads that can meet certain performance requirements may be qualified to provide operating reserves under the Load Acting as a Resource (LaaR) program. In eligible ancillary services (AS) markets, the value of the LaaR load reduction is equal to that of an increase in generation by a generating plant. In addition, any provider of operating reserves selected through an ERCOT AS market is eligible for a capacity payment, regardless of whether the demand-side resource is actually curtailed. To participate in the ERCOT market as a LaaR, a customer must

register each individual LaaR asset and also register with ERCOT as a resource entity (Reference 8.4-6).

As described above, the reserve margin calculation methodology subtracts the LaaRs and BULs from the load forecast, which reduced the load forecast for 2007-2012 by 1,125 MW per year. Voluntary load responses are not included in the CDR.

8.4.3 Comparison of ERCOT Studies with NUREG-1555 Criteria

Sections 8.0 through 8.4 have described several ERCOT studies and reports on which STPNOC has relied for the need for power evaluation. The tables and figures in these sections have been taken from, or been generated from the data in, the ERCOT studies and reports. According to NUREG-1555, an NRC independent evaluation of the need for power may not be needed if the NRC determines that the State/region-prepared evaluation is (1) systematic, (2) comprehensive, (3) subject to confirmation, and (4) responsive to forecasting uncertainty. Each of the NUREG-1555 criteria is addressed below with respect to the collective ERCOT reports.

Systematic – ERCOT is required by the PUCT to provide extensive studies, issue reports, make recommendations for transmission system needs and resource adequacy, and even make legislative recommendations to further those objectives. Analysis is pursued in the context of the competitive ERCOT market using load growth scenarios, industrial growth projections, regional transmission topology, sub-regional modeling, and new generation characteristics. The development of these reports is subject to a vigorous stakeholder input process. The output of the Long-Term Forecast Model or LTFM (Reference 8.4-7) is used as input to the CDR (Reference 8.4-3). There is an orderly and efficient progression of data and calculation results.

Comprehensive – ERCOT's planning responsibilities are broad. The Long Term System Assessment (Reference 8.4-8), for example, uses projections and variations in scenarios such as fuel prices, load growth, and environmental regulations. The study looks forward ten years and includes high-, low-, and base-case assumptions for a variety of factors. The CDR accounts for every resource in the entire ERCOT region and accurately designates its status.

Subject to Confirmation – the analyses and reports benefit from extensive stakeholder input and stakeholder scrutiny in the ERCOT stakeholder process, as well as review by the PUCT, who has the ultimate responsibility for market oversight in ERCOT. Both the Long-Term Peak Demand study (Reference 8.4-7) and the CDR look at historical information as a check on past forecasting performance. From 1999 to 2006, the ERCOT peak demand and energy consumption forecasts have been within ± 5% of the actuals. (Reference 8.4-9)

Responsive to Forecasting Uncertainty – The Long-Term Forecasting Model resolves one measure of the uncertainty associated with extreme weather impacts on peak demands by using a more extreme weather profile to obtain the forecasts. It then uses a 90th and 10th percentile "confidence band" to bound contingencies. From 1999 to 2006, the ERCOT peak demand and energy consumption forecasts have been within ± 5% of the actuals. Also the reserve margin calculation methodology has been

revised several times since 2005 to reduce the uncertainties associated with the inputs to the calculation.

The studies performed by ERCOT regarding need for power collectively satisfy the four criteria in NUREG-1555 and obviate any need for further independent evaluation.

8.4.4 Conclusions

ERCOT has concluded that a significant amount of new generation will be needed to meet the demand projected for 2016 along with maintaining the 12.5% reserve margin that is needed to maintain system reliability, regardless of which load scenario is under consideration (Reference 8.4-8).

Figure 8.4-2 provides the ERCOT generation capacity and demand projections for 2012-2027, which demonstrates a steady divergence between demand and capacity for the period. Figure 8.4-3 provides the potential ERCOT generation capacity needed from 2012-2027. Baseload generation capacity currently provides approximately 24.5% of the peak demand and is forecast to provide approximately 30.1% by 2012.

The ERCOT studies did not include the generation capacity that will be provided by STP 3 & 4. It is anticipated that the 1370 MWe (gross) from STP 3 will be available in 2015 and 1370 MWe from STP 4 will be available in 2016. At that time, the need for new capacity in Texas is predicted to be between 20,000 to 50,000 MWe as shown in Figure 8.4-3. Thus, the need for new capacity in ERCOT in 2015-2016 is substantially greater than the new capacity to be provided by STP 3 & 4. As a result, not only will there be a need for power from STP 3 & 4, there will be a need for a substantial amount of other new generating capacity.

In this regard, a number of companies have announced their intentions to build new generating capacity in the ERCOT region, including new nuclear plants by Exelon and TXU. Additionally, other companies have announced their intentions to construct other types of generation capacity, including fossil-fueled facilities. However, only 550 MW of new gas-fired generation capacity (in 2008), 750 MW of coal-fired generation capacity (in 2011), and 800 MW of coal-fired generation capacity (in 2012) were included in the 2007 CDR resources forecast. None of the announced nuclear capacity is included in the resources forecast.

In summary, the ERCOT studies have forecast a shrinking reserve margin that does not satisfy ERCOT goals to maintain system reliability by 2009. By the time STP 3 & 4 are projected to enter commercial operation in 2015-2016, there will be a substantial need for power not only from STP 3 & 4, but from other new generating plants as well.

8.4.5 References

8.4-1 Memo from Read Comstock, TAC Chair to ERCOT Board of Directors, "Methodology for Reserve Margin Calculation," available at http://www.ercot.com/meetings/board/keydocs/2005/0517/Item_11b_-_Reserve_Margin_Calculation.pdf, accessed on June 20, 2007.

8.4-2 "ERCOT Protocols, Section 6: Ancillary Services," available at http://www.ercot.com/mktrules/protocols/current/06-080107.doc, accessed on August 2, 2007.

8.4-3 "Report on the Capacity, Demand, and Reserves in the ERCOT Region, May 2007," available at http://www.ercot.com/news/presentations/2007/07CDR05172007-final.xls.

8.4-4 "Analysis of Target Reserve Margin for ERCOT, Warren Lasher, January 12, 2007," available at http://www.ercot.com/meetings/gatf/keydocs/2007/20070112-GATF/GATF_LOLP_Presentation_1_12_07_as_presented.ppt#360,15,Generic Coal Additions, accessed on August 2, 2007.

8.4-5 "ERCOT Demand Side Working Group," available at http://www.ercot.com/services/programs/load/DSWG_Presentation_to_PUCT_Workshop_9_15_06.ppt, accessed on July 22, 2007.

8.4-6 "Load Acting as a Resource," available at http://www.ercot.com/services/programs/load/laar/index.html, accessed on July 24, 2007.

8.4-7 "2007 ERCOT Planning Long-Term Hourly Peak Demand and Energy Forecast – May 8, 2007" available at http://www.ercot.com/news/presentations/2007/2007_ERCOT_Planning_Long_Term_Hourly_Demand_Energy_Forecast_.pdf, accessed on July 13, 2007.

8.4-8 "Long Term System Assessment for the ERCOT Region, December 2006," available at http://www.ercot.com/news/presentations/2006/Attch_A_-_Long_Term_System_Assessment_ERCOT_Region_December_.pdf.

8.4-9 "Long Term Demand and Energy Forecasting – Planning," available at www.ercot.com/meetings/other/keywords/2007/0124-LoadForecast/KDonohoo_ERCOTLongTermDemandEnergForecastingPlanning01242007.ppt, accessed on June 2, 2007.

Table 8.4-1 Forecast Summer Capacity, Baseload Generation Units Only

	2007	2008	2009	2010	2011	2012
Firm Load Forecast	62,669	64,010	65,383	66,830	68,331	69,608
Resources, MW	71,812	72,048	71,960	72,394	72,939	73,703
Reserve Margin	14.6%	12.6%	10.1%	8.3%	6.7%	5.9%
Baseload Generation, MW	17,621	17,621	19,057	19,998	21,378	22,178
% of Resources that are Baseload Generation	24.5%	24.5%	26.5%	27.6%	29.3%	30.1%

Compiled from Reference 8.4-3

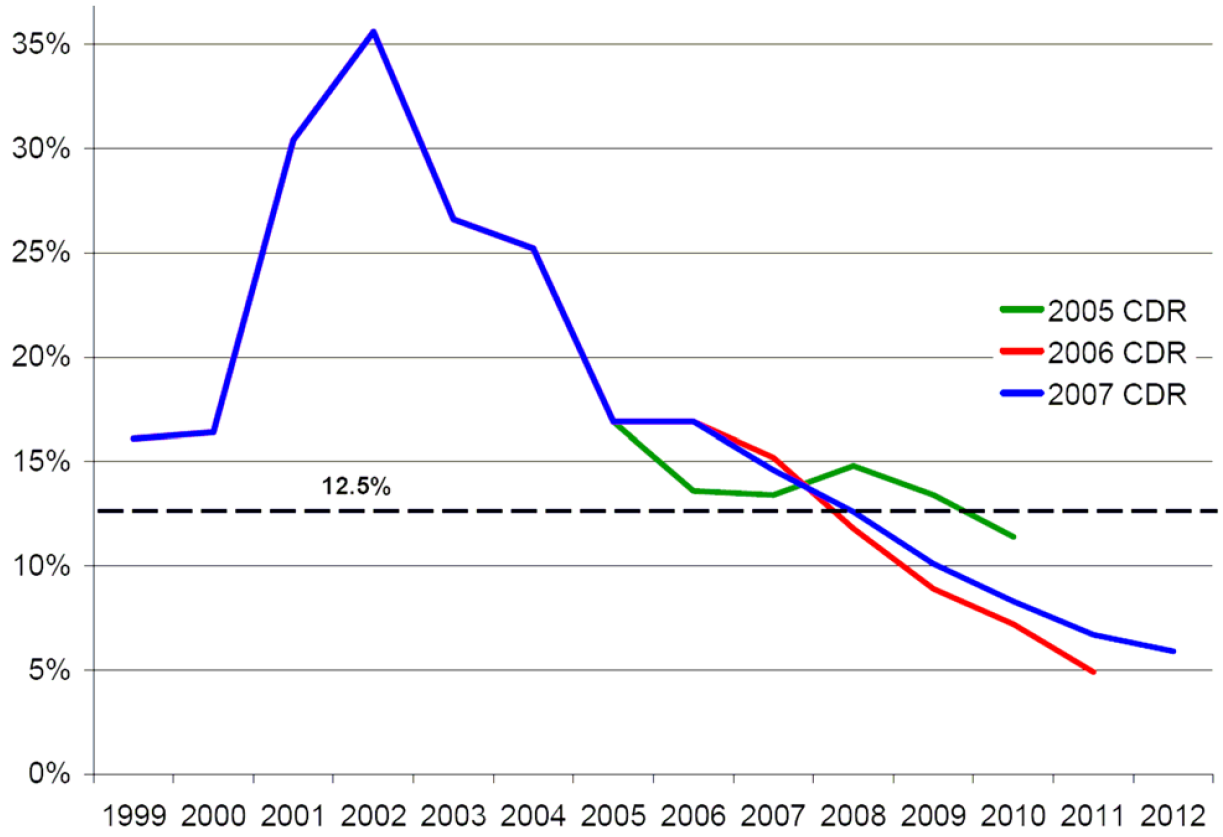

Figure 8.4-1 ERCOT Reserve Margin Forecasts, 1999-2012

Compiled from 2005 CDR, 2006 CDR, and 2007 CDR

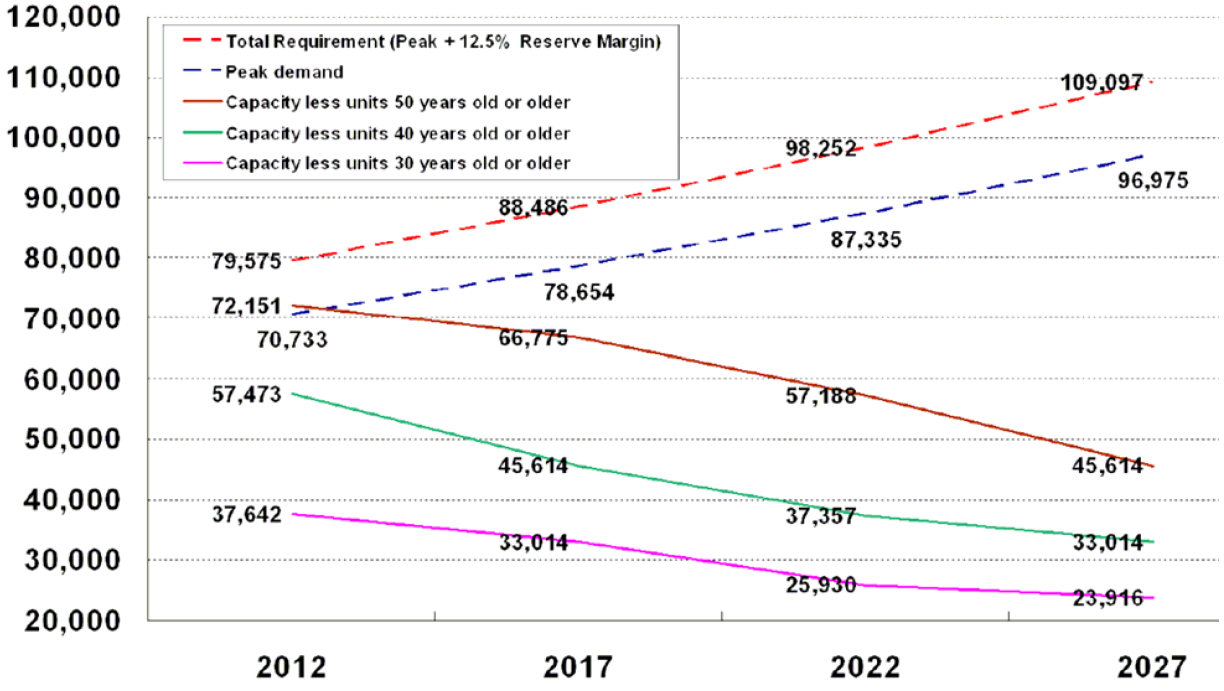

Figure 8.4-2 ERCOT Generation Capacity and Demand Projections (MW)

Reference 8.4-3

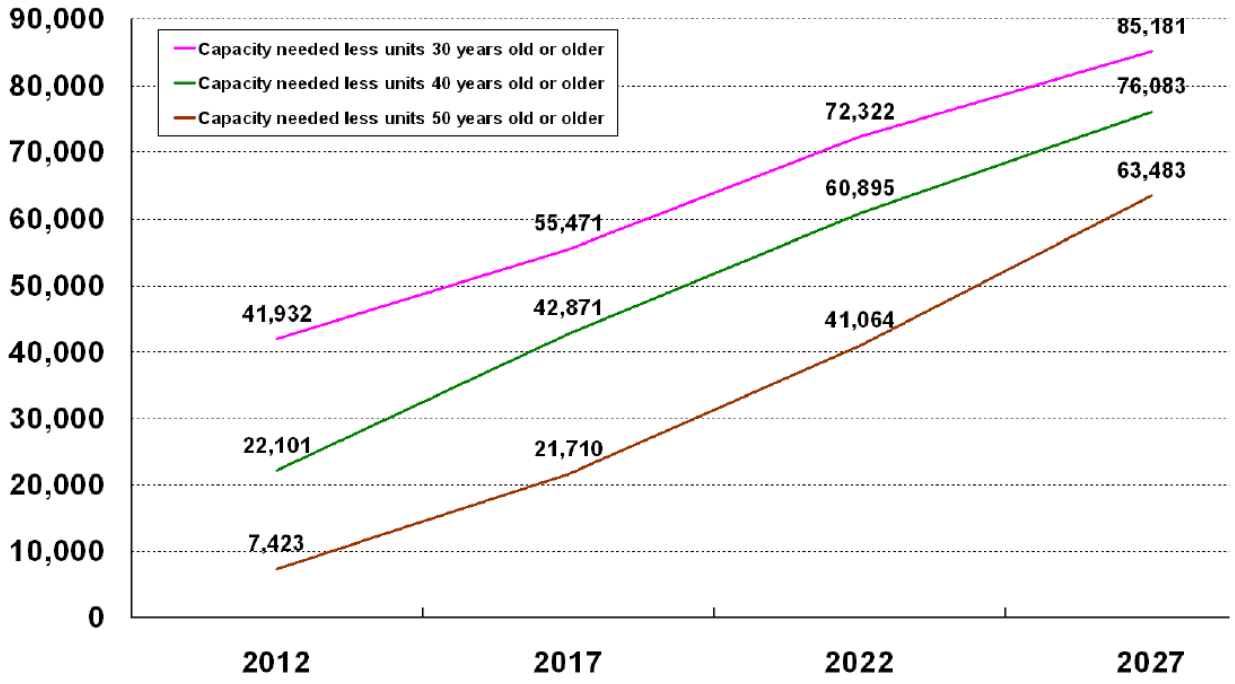

Figure 8.4-3 Potential ERCOT Generation Needed (MW)

Reference 8.4-3