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Report on Existing and Potential Electric System Constraints and Needs

December, 2010

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1. Executive Summary

The annual Electric System Constraints and Needs report is provided by the Electric Reliability Council of Texas, Inc. (ERCOT) to identify and analyze existing and potential constraints in the transmission system that pose reliability concerns or may increase costs to the electric power market and, ultimately, to Texas consumers. This report satisfies the annual reporting requirements of Public Utility Regulatory Act (PURA) Section 39.155(b) and Public Utility Commission (PUC) Substantive Rule 25.361(c)(15) and a portion of the requirements of Substantive Rule 25.505(c).

Background

ERCOT prepares this report annually to summarize the continuing efforts to plan a reliable and efficient transmission system. It provides highlights of completed improvements from 2009 through August 2010 and of planned improvements for 2011 through 2015 as well as an analysis of the impact of these cumulative improvements on future congestion.

As the transmission planning authority for the Region, ERCOT works with its stakeholders to identify the need for new transmission facilities based on engineering analysis of four principal factors:

Operational Results - The results of actual ERCOT operations are analyzed on a continual basis in order to identify areas of recurring congestion and to identify activities that can and should be taken to meet reliability standards while gaining efficiency from the existing network.

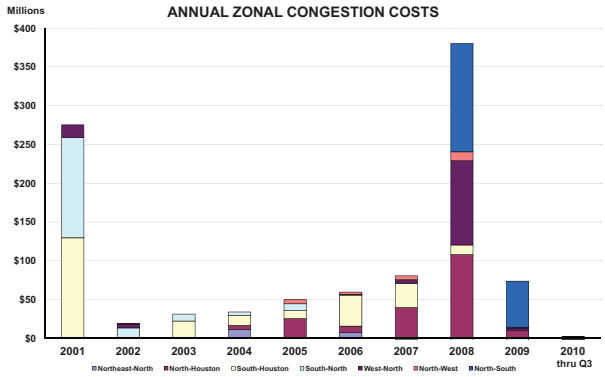
Load Forecasting - Load forecasts developed by ERCOT planning staff using econometric modeling techniques, as well as delivery point forecasts developed by the transmission providers, are used to study projected system needs due to customer load growth.

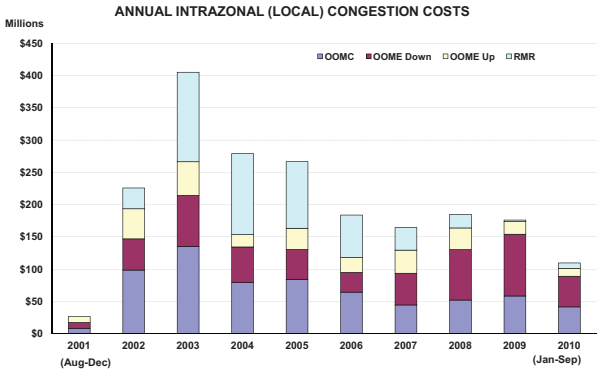
Generation Interconnections - ERCOT processes requests to interconnect, change, or decommission generation throughout the ERCOT Region. Studies of these requests enable planning staff to analyze and respond to the impact of the resulting changes in power injection into the system.

Transmission and System Studies - ERCOT planning staff, with input from stakeholders through the Regional Planning Group (RPG), evaluates and endorses transmission improvements required to meet the North American Electric Reliability Corporation (NERC) and the ERCOT Region's reliability criteria and to reduce expected congestion based on ERCOT's economic planning criteria.

Highlights

This report presents data and updates for each area of the ERCOT Region, including defined congestion zones, intra-zonal (local) congestion areas, and weather zones. Congestion costs are significantly down from a high of over $375 million in 2008, in part due to a combination of events, including a reduction in fuel costs, revised market rules, and transmission system improvements. In 2010, congestion costs were the lowest they have been since 2002.





Since 2009, ERCOT transmission providers have completed numerous improvement projects affecting approximately 1,933 miles of transmission and about 12,299 MVA of autotransformer capacity, with an estimated capital cost of over $2 billion.

SUMMARY OF MAJOR COMPLETED TRANSMISSION IMPROVEMENTS

Weather Zone	Completed Improvement	In-Service	Voltage	Circuit Miles
Coast	Meadow New Switching Station	May-10	345	0.1
Coast	Alvin New Switching Station	May-10	138	-
East	Tyler Grande New Switching Station and New Autotransformer	Apr-09	345/138	-
East	Singleton New Switching Station	Apr-09	345	0.5
Far West	Big Spring - Chalk - McDonald 69 kV Line Rebuild	Apr-09	138	35.2
Far West	Stanton East - Big Spring Switch 138 kV Line Rebuild and New Auto	May-10	138	21.6
North	Bowman - Jacksboro Switch Rebuild Line	Jun-10	345	46.7
North Central	Parkdale New SVC Installation	Jun-09	138	-
North Central	Goldthwaite - Evant Line Rebuild	May-10	138	24.0
North Central	RD Wells - Hickory New Line	May-10	69	1.6
North Central	Renner New SVC Installation	Jun-10	138	-
North Central	W. Levee - Norwood New Line	Jun-10	345	6.5
South	Lobo New Switching Station	Jun-09	138	-
South	Lobo - San Miguel New Line	Mar-10	345	113.8
South Central	Sandow Switch - Salty - Thorndale North - Taylor Line Upgrade	Apr-09	138	21.9
South Central	Taylor - Taylor West - Hutto Switch Line Upgrade	Jun-09	138	10.1
South Central	Sandow Switch - Elgin Switch Line Rebuild	Apr-10	138	21.8
South Central	Elgin - Gilleland Creek Line Upgrade	May-10	138	12.9
South Central	Hutto Switch - Salado Switch New Line	Jun-10	345	73.8
South Central	Hutto New Switching Station and New Autotransformer	Jun-10	345/138	-
West	Abilene South - Putnam Line Upgrade	Mar-09	138	35.3
West	Yellowjacket New Station and Phase Shifting Transformer	Jan-10	138	-
All Areas	Total Lines	2009-2010	345/138/69	1,933
All Areas	Total Autotransformers	2009-2010	345/139	12,299 MVA

The planned projects included in this report are estimated to cost over $9 billion over the next five years and are expected to improve or add 7,866 circuit miles of transmission lines and 27,026 MVA of autotransformer capacity to the ERCOT system. These totals include that portion of the planned Competitive Renewable Energy Zone (CREZ) additions that are planned to be in service by the end of 2013.

SUMMARY OF MAJOR PLANNED TRANSMISSION IMPROVEMENTS				
Weather Zone	**Completed Improvement**	**Voltage**	**In-Service**	**Circuit Miles**
Coast	Zenith Switching Station Addition	345	2011	-
Coast	Garrott - Midtown - Polk Upgrade	138	2011	2.4
Coast	Zenith - Fayettteville Double Circuit Line Addition	345	2015	120
East	Bell County East - TNP One Double Circuit Line Addition	345	2011	82.6
Far West	Faraday Switch Station and Autotransformer Addition	345/138	2014	-
North Central	Renner Static Var Compensators Phase II	138	2011	-
North Central	Hicks Autotransformer and Hicks - Elizabeth Creek Double Circuit Line Addition	345/138	2014	3.8
North Central	Jack County Autotransformer Addition	345/138	2015	-
South Central	Gilleland Creek Autotransformer Addition	345/138	2011	-
South Central	Zorn/Clear Springs - Gilleland Creek - Hutto Switch Double Circuit Line Addition	345	2011	165
All Areas	Total Lines	345/138/69	2011-2015	7,866
All Areas	Total Autotransformers	345/138	2011-2015	27,026 MVA

Additionally, this report contains an update of the CREZ process as well as a summary of the 2010 Long-Term System Assessment.

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2. Transmission Planning Process

The ERCOT transmission planning process integrates requests for transmission service to interconnect new power producers and consumers, as well as supports continued safe and reliable service while accommodating growth for existing customers. In collaboration with transmission providers and other interested stakeholders, ERCOT staff assesses the electric needs of existing and potential transmission system users, on both an individual and collective basis, to determine whether transmission upgrades are required and to respond to the need. All ERCOT recommendations are supported by a series of detailed technical analyses in accordance with industry-accepted performance criteria and practices and the Regional Planning Group (RPG) Charter and Procedures.

For this planning process, ERCOT seeks input from all market participants and stakeholders about options and possible solutions. The ERCOT-led RPG is a forum for market participants, as well as the general public, to provide input. Participants of the RPG have the opportunity to highlight needs and to propose solutions, which ERCOT staff will evaluate as a part of the overall system plan. The RPG also provides participants a way to review and comment on proposed projects that address transmission constraints and other system needs.

By utilizing the RPG forum, ERCOT is committed to being inclusive - to share proposals openly and to listen to a diverse spectrum of interested entities - in the development of transmission improvement proposals. Potential projects to be reviewed by ERCOT and the RPG can be proposed by ERCOT staff, individual transmission providers, other market participants, the Public Utility Commission of Texas (PUC), or the general public. The RPG generally meets monthly, as well as exchanges information via e-mail. Agendas and presentations are available publicly, and project files are posted to a secure web site.

As stated in the RPG Charter and Procedures[1], major projects must be endorsed by the ERCOT Board of Directors. Following the RPG review, ERCOT staff will complete an independent review of the projects and make recommendations to the ERCOT Board of Directors for approval. The ERCOT Board will be asked to endorse major projects that have met the following criteria:

- ERCOT staff has recommended the proposed transmission project based on its analyses of identified constraints, including proposals from transmission providers and any necessary requirements to integrate new generation facilities.
- The project has been reviewed and considered through the open RPG process.
- ERCOT staff has determined the designated provider of the additions.

Following the Board of Directors review, ERCOT will notify the PUC of all ERCOT Board-endorsed transmission facility additions and their designated providers.

1 The RPG Charter and Procedures document is available at http://www.ercot.com/committees/other/rpg/

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3. Load

Forecasting electrical demand and energy is one of the most significant factors in determining the future infrastructure needs of the ERCOT power system. Should the forecast understate the actual load growth, adequate facilities may not be in place in time to reliably serve the load. On the other hand, if the forecast overstates the actual growth, facilities may be built before they are necessary, resulting in inefficient use of resources.

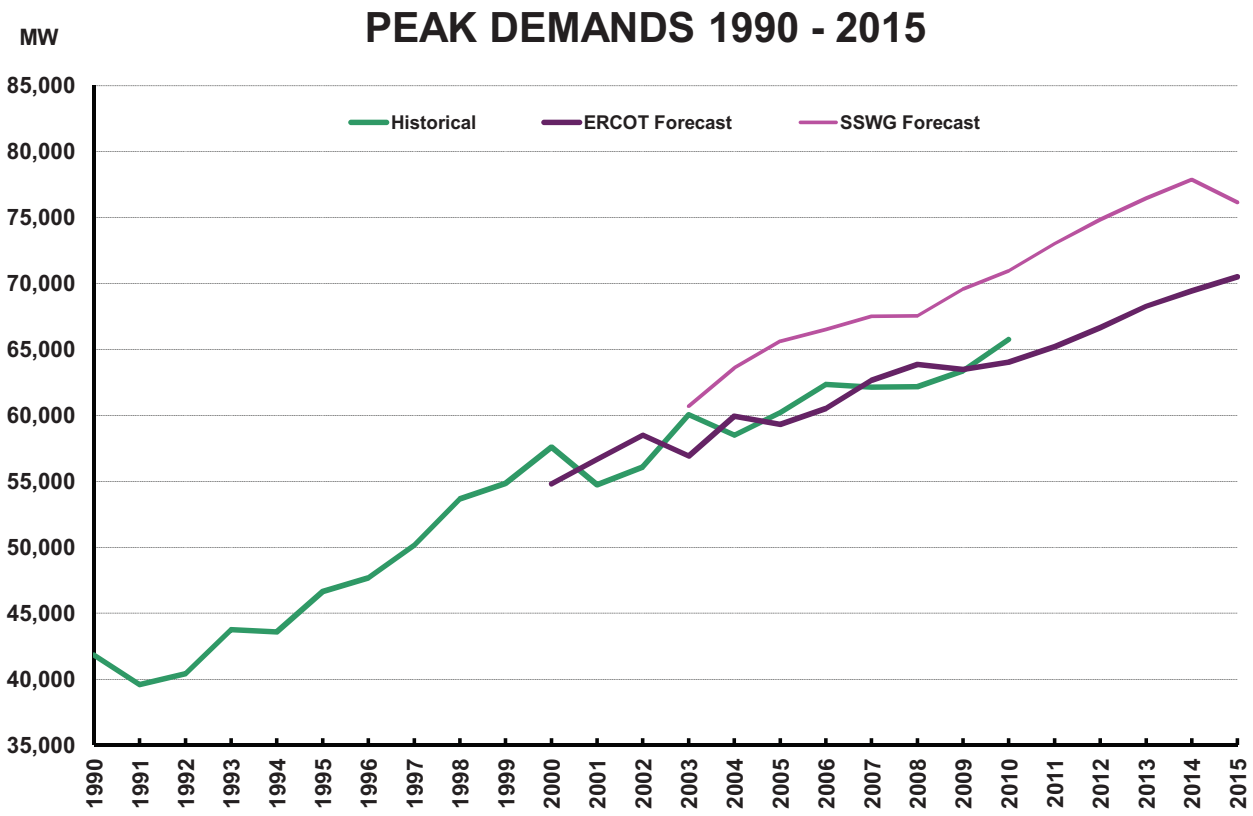
To develop the most reasonable load projections for the system, ERCOT load forecasters consider a wide range of variables such as population, weather, land usage, general business economy, governmental policy, and societal trends in terms of both historical load data and the best predicted future indicators available.

3.1 Peak Demand

The 2011 summer peak demand forecast of 65,206 MW represents a slight decrease from the 2010 actual peak demand of 65,776 MW, which occurred during a period of sustained, above-normal temperatures. The ERCOT system forecast for 2011 as reported in the 2010 Long-Term Hourly Demand and Energy Forecast (LTDEF) is virtually unchanged from the system forecast for 2011 as reported in the 2009 LTDEF. This forecast, as compared to a few years ago, is mainly due to the continuing economic recession as reflected in the economic outlook for the state of Texas.

The key factor driving the peak demands and energy consumption is the overall health of the economy as measured by economic indicators such as the real per capita personal income, gross domestic product (GDP), and various employment measures, including non-farm employment and total employment.

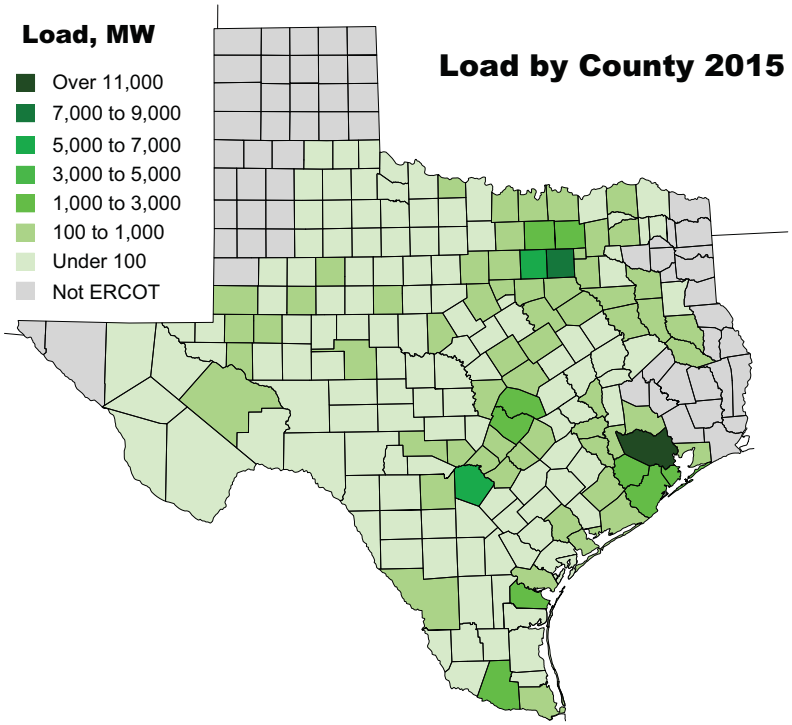
The figure below shows the historical peak demand from 1990 through 2010 and the forecasted peak demand through 2015. The historical compound growth rate for the last five years is slightly over 1%. The forecasted annual growth rate between 2011 and 2015, the next five years, is 1.89% due to a strong economic recovery after 2011 reflected in the economic forecast. The all-time hourly peak demand for ERCOT of 65,776 MW was recently set this past summer, occurring on August 23, 2010.

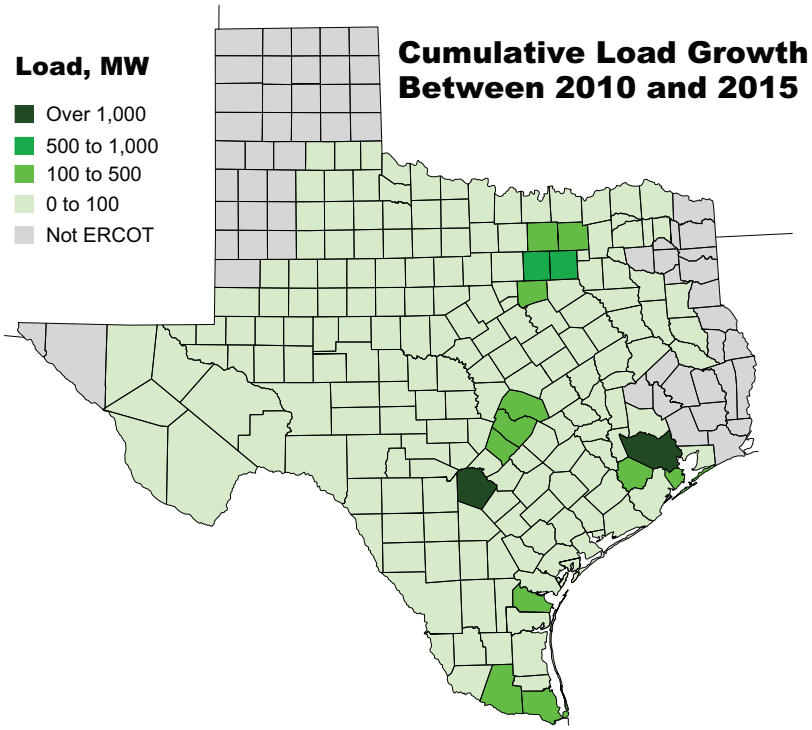


The Steady-State Working Group (SSWG) load forecast is developed by the aggregation of the individual load forecasts provided by each transmission and distribution provider submitted to ERCOT in the Annual Load Demand Request (ALDR). This forecast uses the non-coincident peak of each individual transmission and distribution provider. The SSWG load forecast, depicted above, was modified to remove the Private Use Network (PUN) load that is also excluded from the ERCOT load forecast. The SSWG forecast is used to determine the reliability needs of the ERCOT transmission system.

3.2 Non-coincident Peak by County

The loads by county shown to the right are non-coincident peak demand forecasts provided by the transmission and distribution providers in the 2010 ALDR. The counties with the greatest peak demands are Harris, Dallas, Tarrant, and Bexar. These four counties comprise roughly 46% of the load within ERCOT.





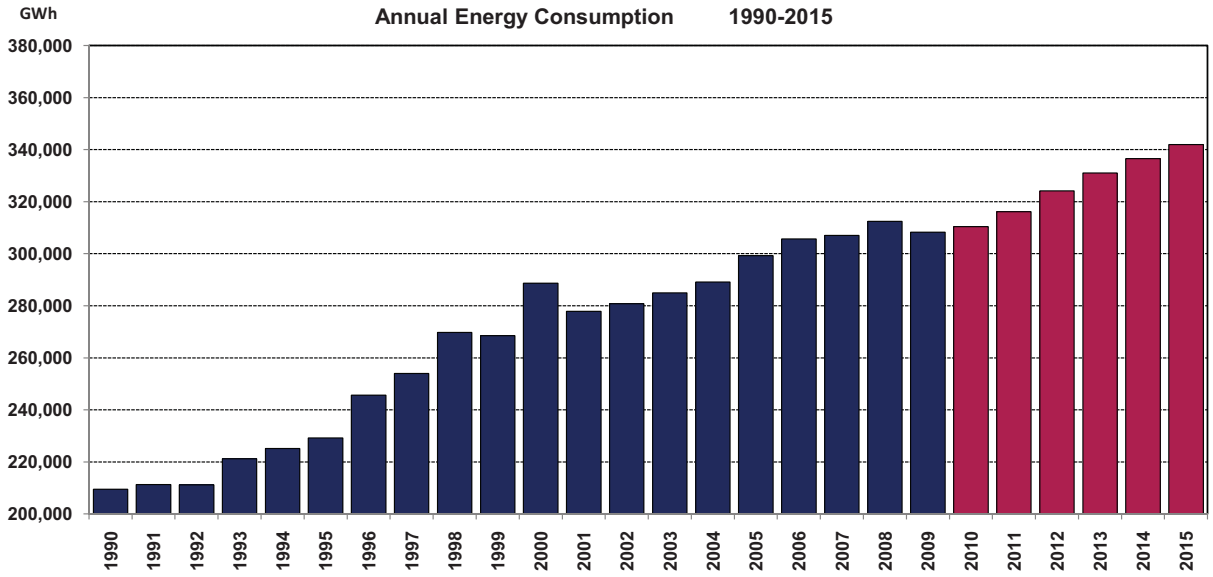
While ERCOT's overall peak demand forecast calls for almost a 2% annual growth rate, some areas within the state are experiencing growth as high as 6.5% per year. As expected, the greatest growth is around the metropolitan areas. The counties with the greatest expected cumulative load growth are Bexar, Harris, Dallas, and Tarrant. Other areas expected to experience significant load growth include the counties along Interstate 35 between San Antonio and Waco, counties near Dallas, Fort Worth and Houston, and the lower Rio Grande Valley.

3.3 Energy

While the peak demand forecast provides an indication of the size of electrical facilities that should be constructed to serve the expected peak demand, the energy usage forecast assists in determining the usage of these facilities over all hours of the year.

The overall energy forecast growth rate from 2010 to 2015 is 2.0%. The forecasted energy growth rate from the actual energy in 2009 to the forecast for 2010 is 0.7%. The key factor driving the low energy consumption is the outlook of the overall health of the economy as captured by economic indicators such as the real per capita personal income, gross domestic product (GDP), population, and various employment measures including non-farm employment and total employment.

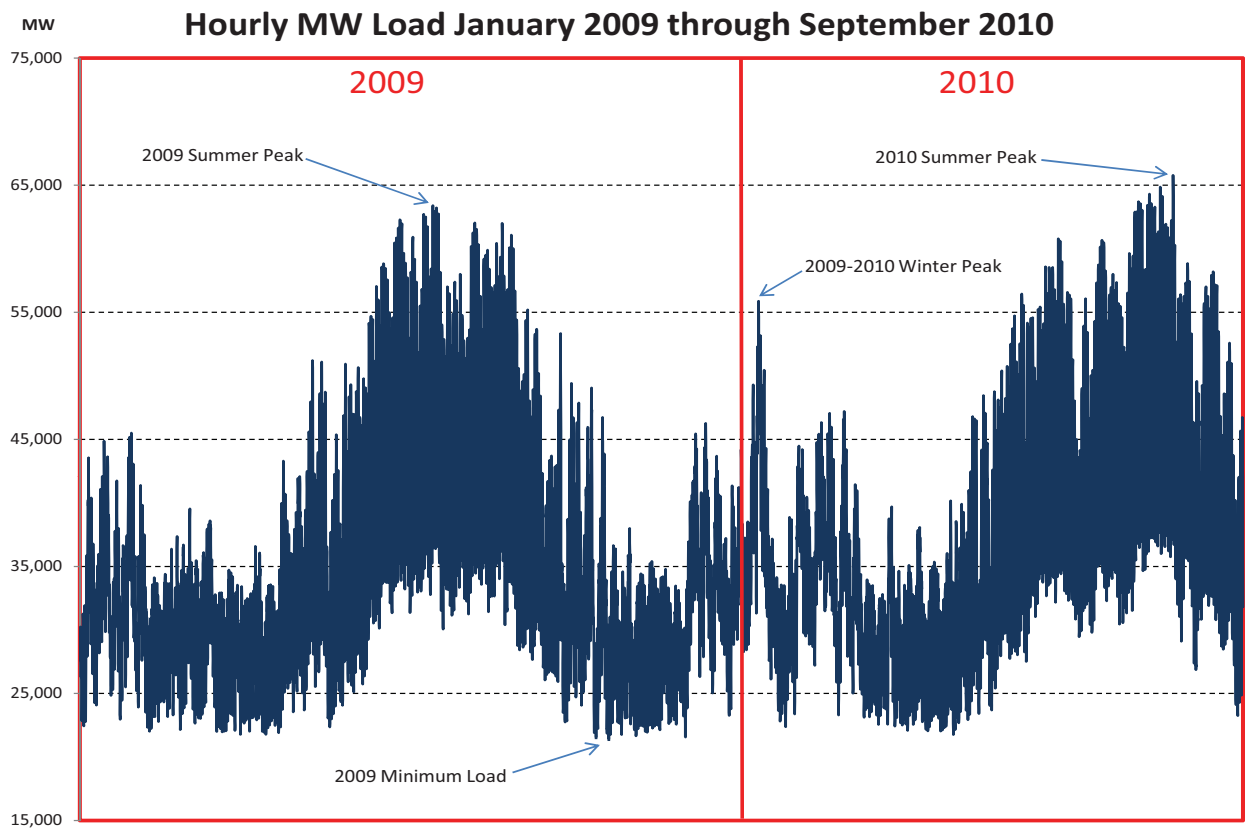
The figure below shows the historical and forecasted energy consumption.



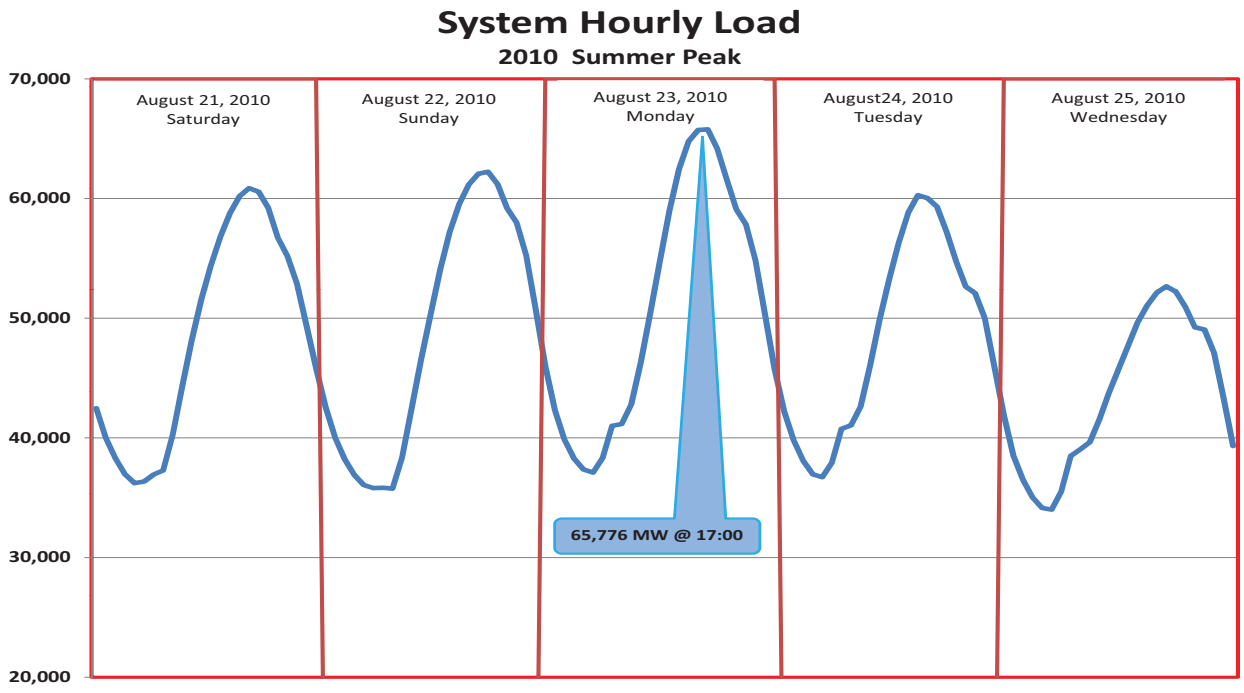
3.4 Hourly Load

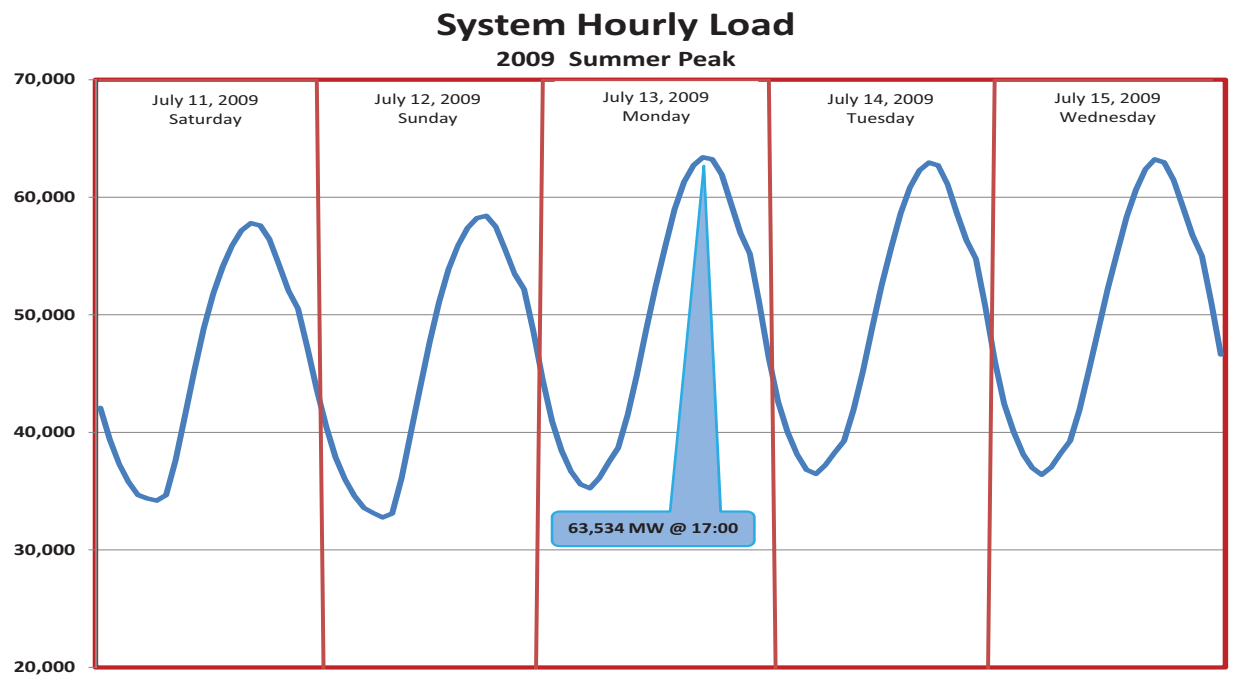
Hourly load is an extremely useful tool for understanding the magnitude of change and the pattern of load being served over a specific time. The following pages illustrate some of the varying load shapes encountered while operating the grid.

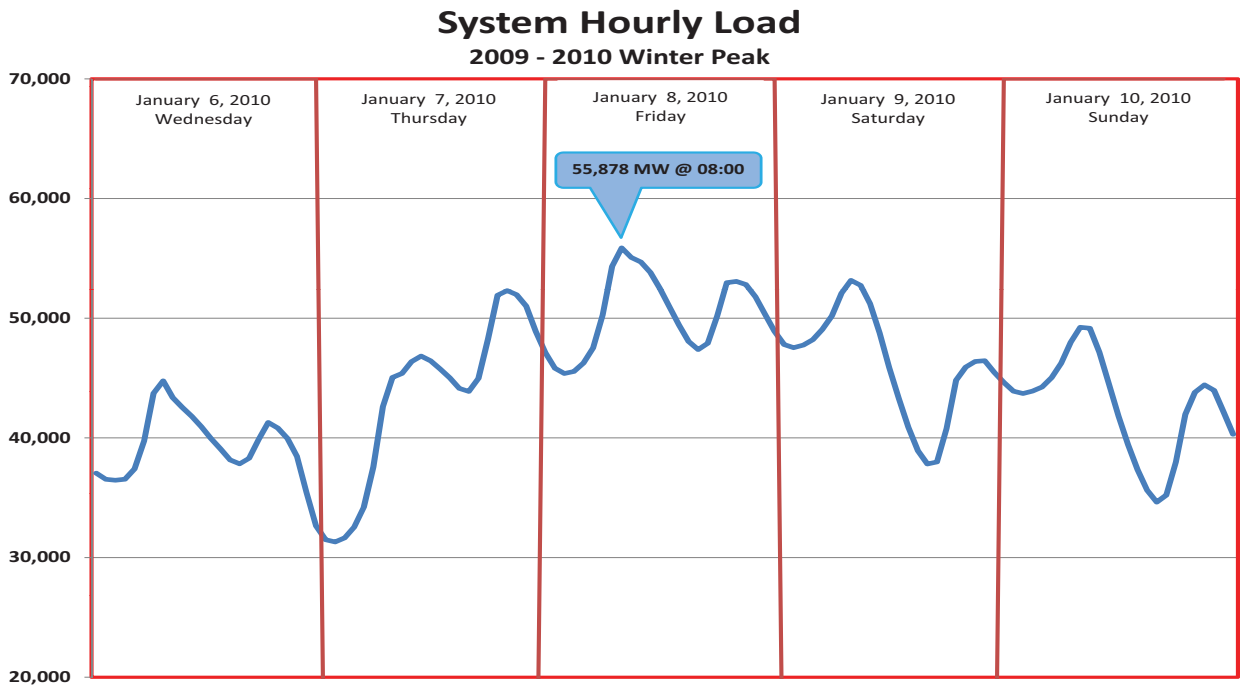
The chart below shows the actual load over the time frame of this report.

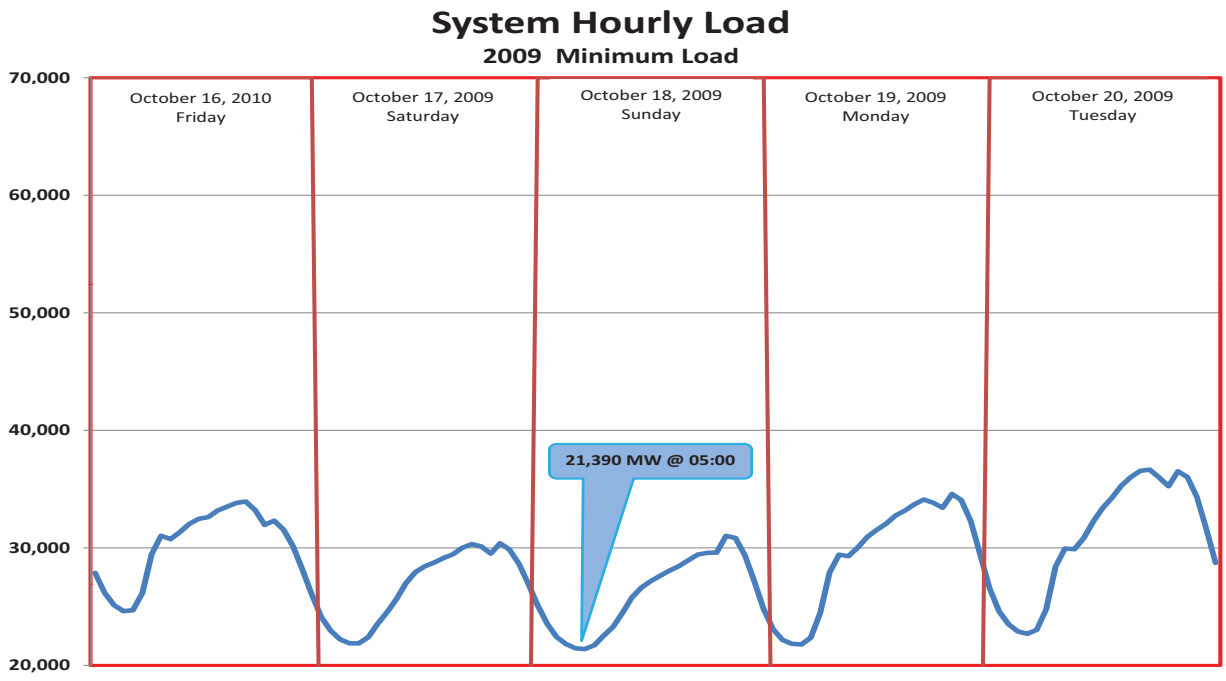


The following four charts are close up views around the minimum load and the seasonal peaks.






System Hourly Load
2009 - 2010 Winter Peak
70,000
60,000
50,000
40,000
30,000
20,000
January 6, 2010
Wednesday
January 7, 2010
Thursday
January 8, 2010
Friday
January 9, 2010
Saturday
January 10, 2010
Sunday
55,878 MW @ 08:00


System Hourly Load
2009 Minimum Load
70,000
60,000
50,000
40,000
30,000
20,000
October 16, 2010
Friday
October 17, 2009
Saturday
October 18, 2009
Sunday
October 19, 2009
Monday
October 20, 2009
Tuesday
21,390 MW @ 05:00

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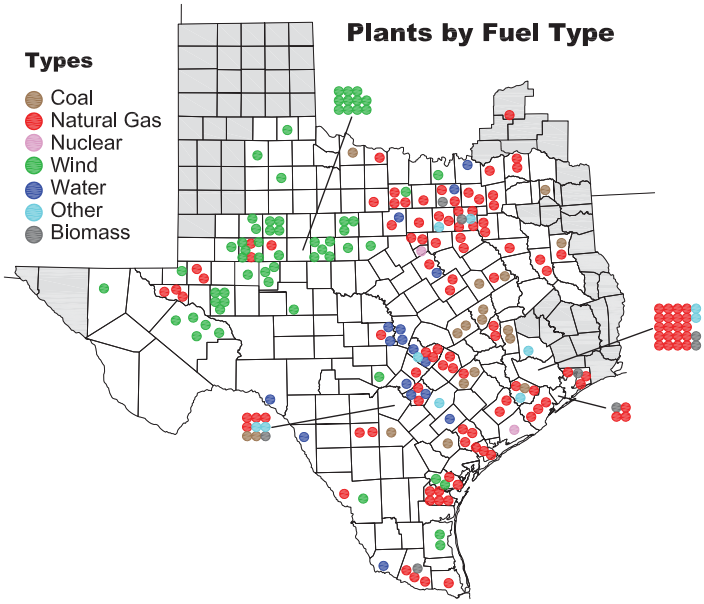
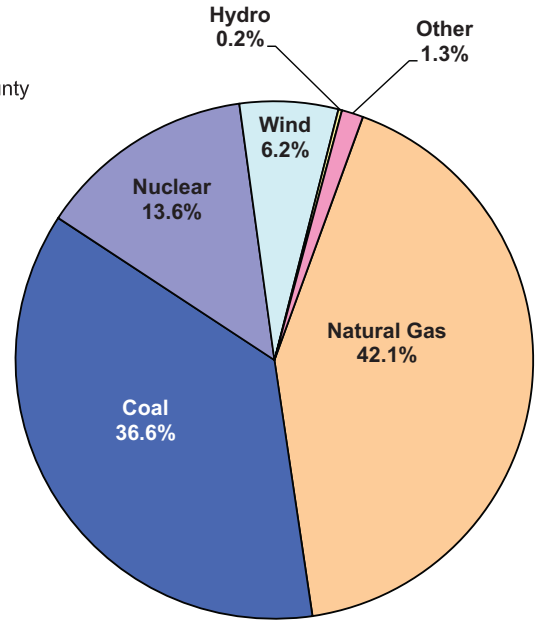
4. Generation

Current installed generation capacity[2] in the ERCOT Region is about 80,000 MW, which includes about 3,000 MW of generation that has suspended operations or been "mothballed" but not retired.

In terms of energy produced within ERCOT in 2009, approximately 42% was fueled by natural gas, followed by coal at 37%, nuclear at 14% and wind at 6%. The map below is an indicator of generating facilities across the Region by fuel type, and the pie chart shows the energy produced by fuel type.



Dots do not reflect actual location of the unit within the county

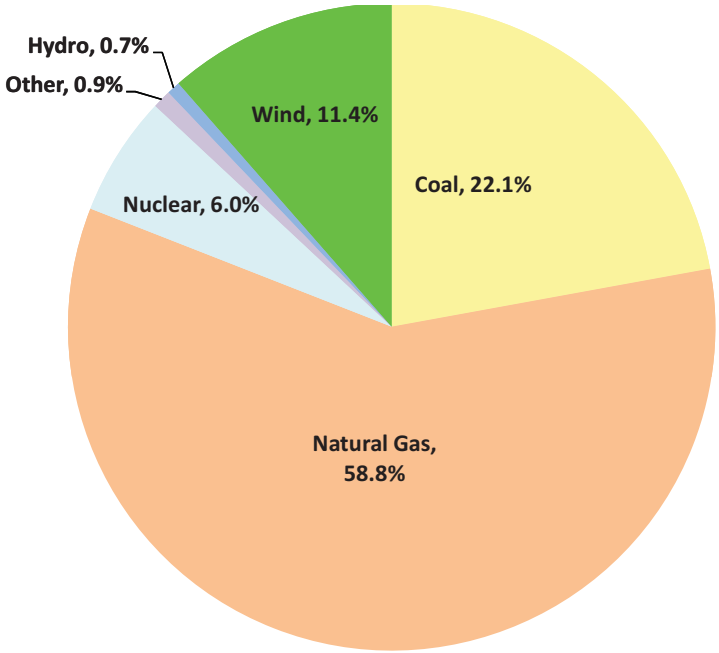


2009 Energy Generated by Fuel Type

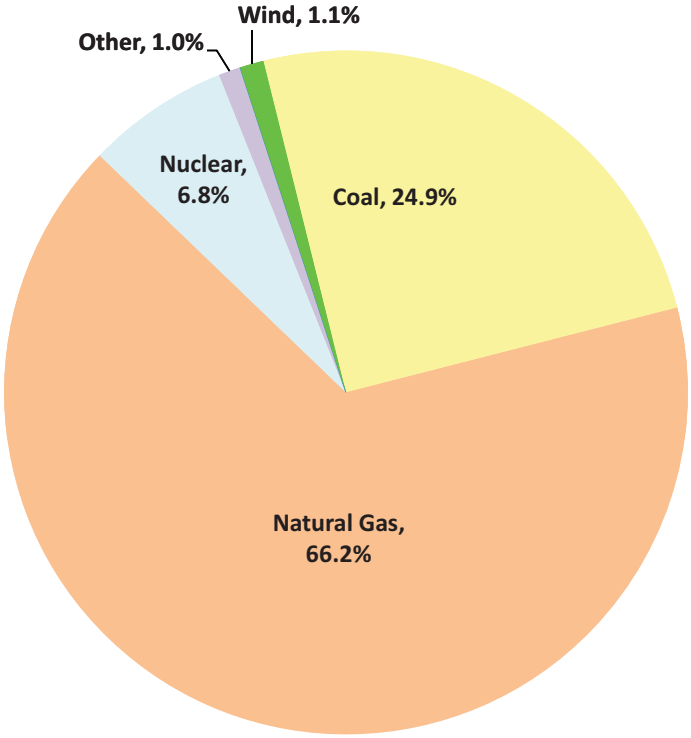
2 For additional information, please see the Capacity, Demand and Reserve report posted at http://www.ercot.com/news/presentations.

It is important to highlight the distinction between installed capacity and available capacity. Power from some fuel types, such as wind and water, may not be available coincident with system need.

In terms of installed capacity within ERCOT, approximately 59% is fueled by natural gas, followed by coal at 22%, wind at 11%, and nuclear at 6%. The pie chart to the right shows the installed capacity by fuel type.



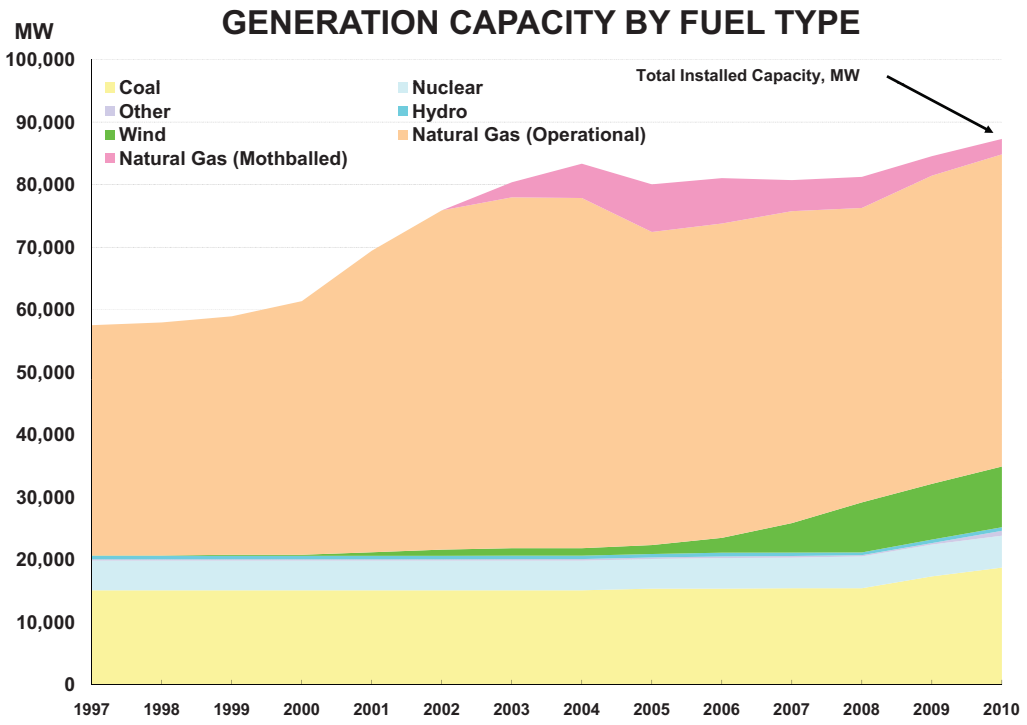
2010 Generation Capacity by Fuel Type



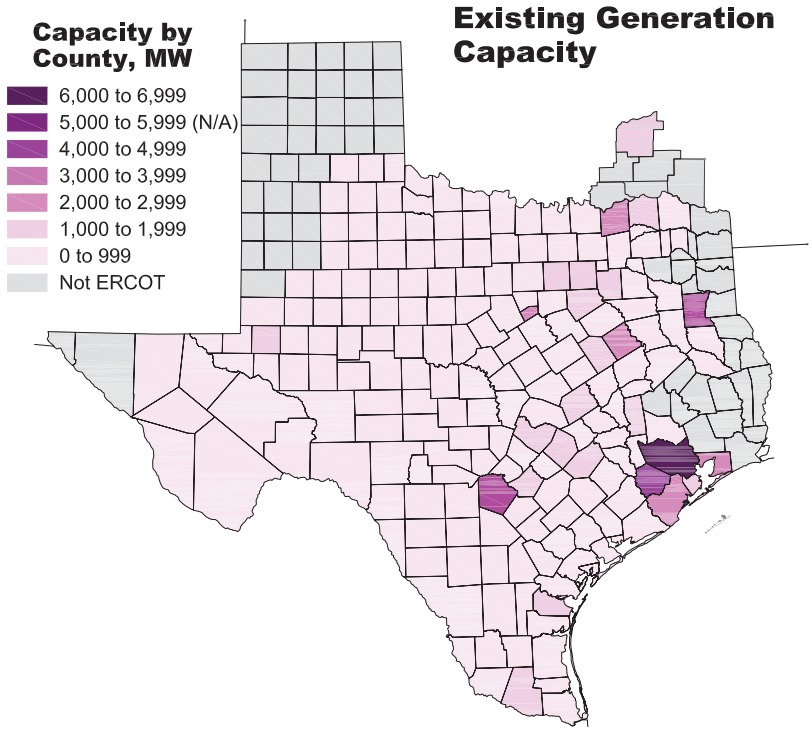
2010 Generation Availability by Fuel Type

In terms of available generation, the chart to the left illustrates the proportion of generation available after the wind and hydro sources have been discounted using availability factors of 8.7% and 0% respectively, giving a more realistic view of expected generation by fuel during system peak load conditions.

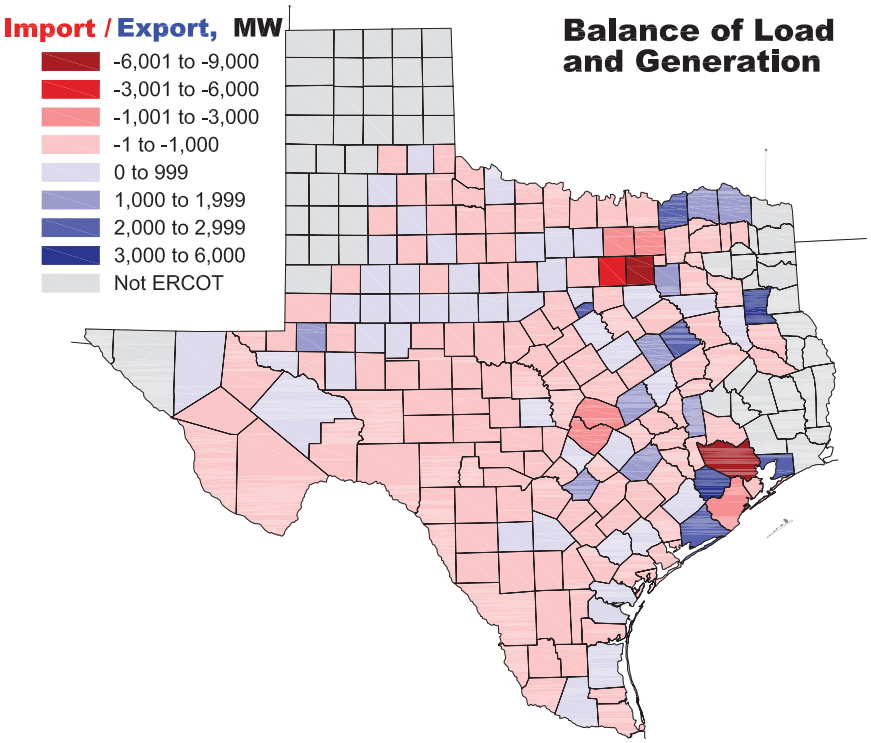
In 2010, most generation capacity additions were coal facilities, although new wind and gas-fired generators have been added. The chart below depicts installed capacity additions by fuel type.



The existing generation capacity by county shown on the map to the right is based on information from the generation companies and includes asynchronous ties to other regions, private network generation, distributed generation that is registered with ERCOT, and all Switchable Resources, which are Resources that can be connected to either the ERCOT Transmission Grid or a grid outside the ERCOT Region.

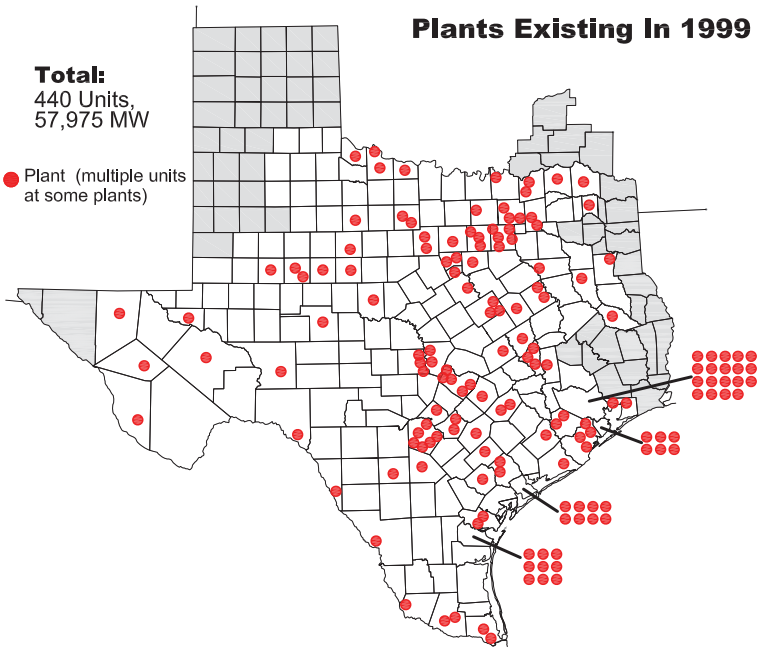


The map below illustrates the balance of load and generation within each county in the ERCOT Region for the summer of 2010. A county with more generation than load will export generation to other counties; comparatively, a county with more load than generation will import generation from other counties. Please note this map is for general illustrative purposes only, however it clearly shows that the Dallas/Fort Worth area, the Houston area, and the Austin/Round Rock area are importers and dependent on transmission to serve load.

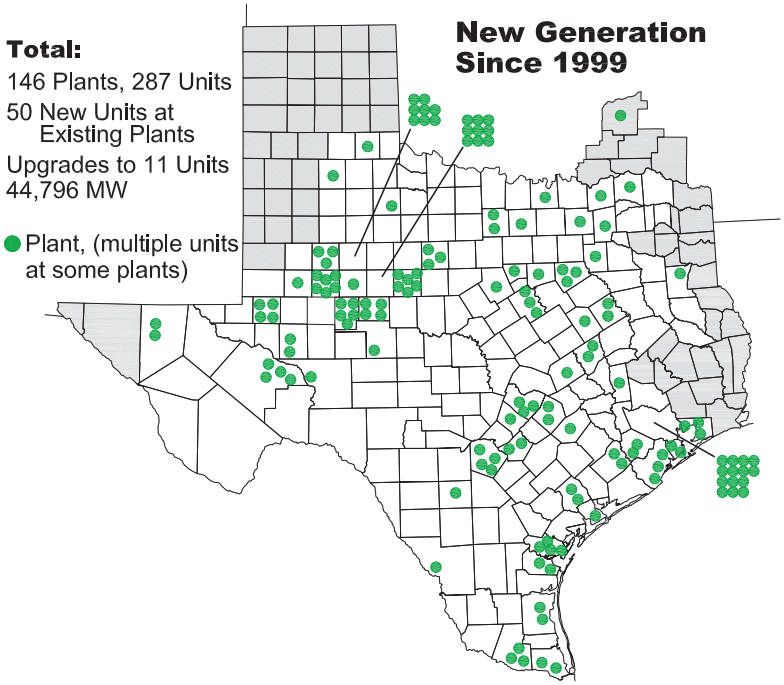


4.1 Historical Generation

In 1999, ERCOT had approximately 58,000 MW of installed generation capacity. Much of that generation was concentrated in the metropolitan areas of Houston, Dallas/Fort Worth, San Antonio, and Corpus Christi. The map to the right shows generation within the ERCOT Region as of 1999.



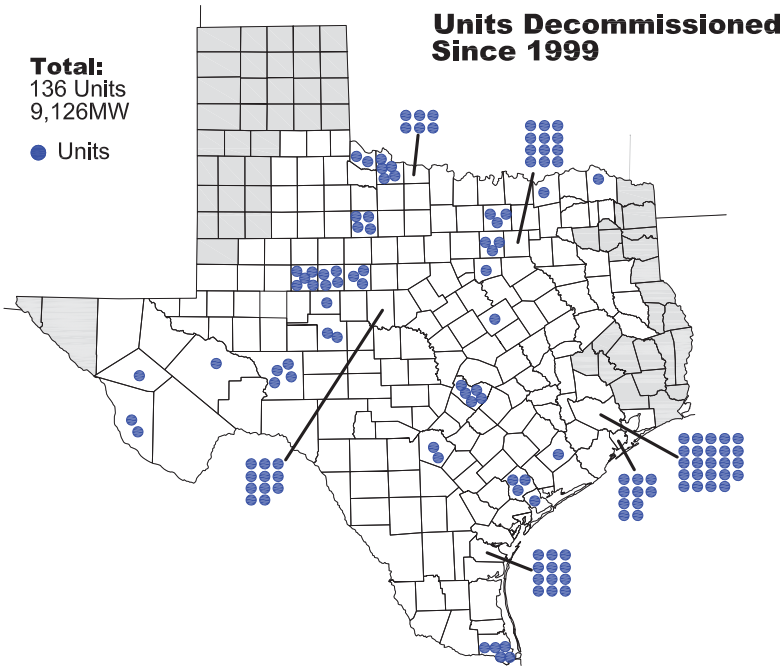
Dots do not reflect actual location of the unit within the county



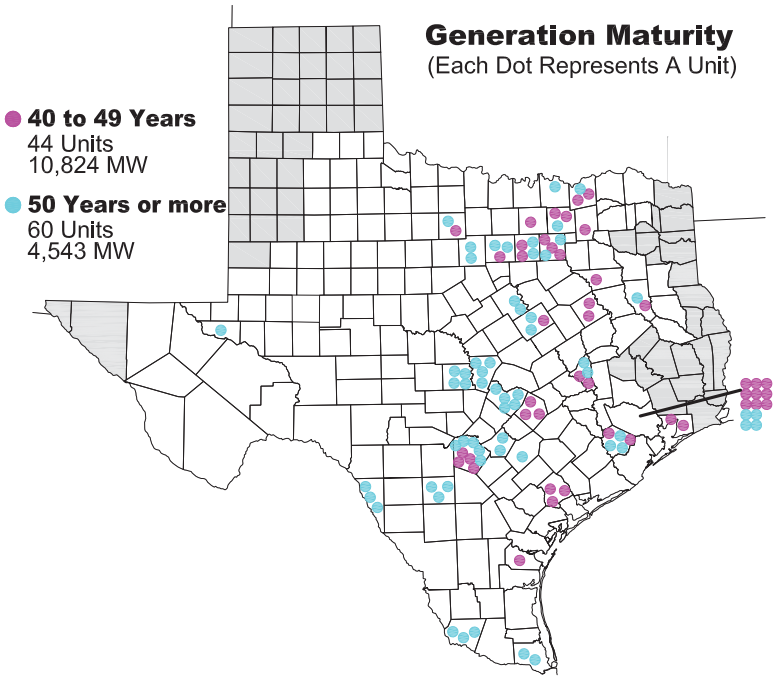
Dots do not reflect actual location of the plants within the county

Since 1999, ERCOT capacity has grown by adding new generation sites, expanding existing sites, and upgrading or repowering existing units. The additional generation totals almost 45,000 MW. Much of the new installed generation capacity added in the last few years is from large wind projects built in West Texas. This significant change in the generation portfolio has placed new challenges on the adequacy and the reliability of the existing transmission system. The map to the left shows generation added within the ERCOT Region between 1999 and September 2010.

Since 1999 a total of 136 units have been decommissioned. The map to the right shows generation within the ERCOT Region that has been decommissioned since of 1999. Decommissioning of older plants near metropolitan areas due to economics or environmental restrictions requires ERCOT to undertake an assessment of system reliability needs and to propose maintaining certain units under Reliability Must-Run (RMR) contracts and any transmission alternatives to these RMR sources.



Dots do not reflect actual location of the unit within the county

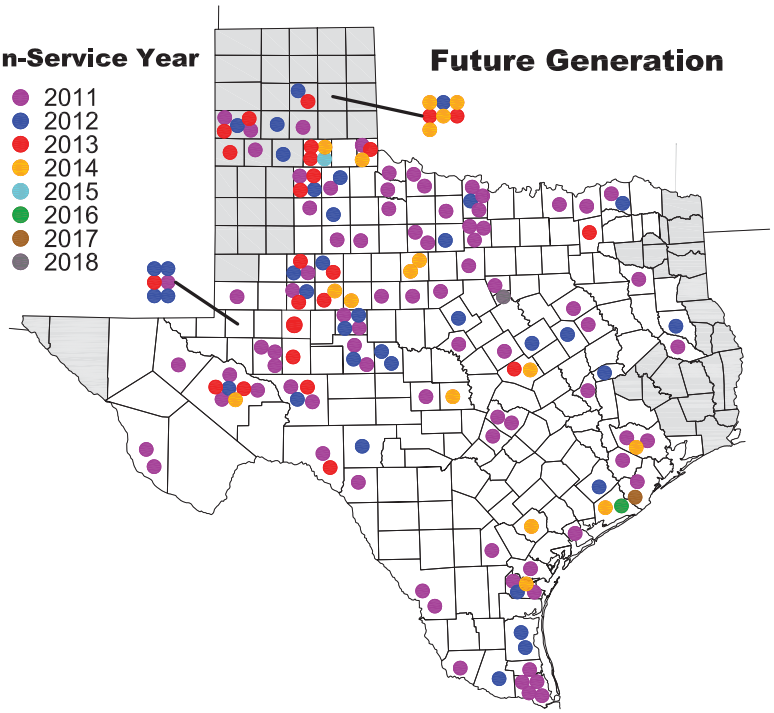


Dots do not reflect actual location of the unit within the county

Many factors, including fuel cost, O&M cost, efficiency, environmental requirements and revenues, influence whether a generating unit will remain in service or be decommissioned. Age, as an indication of the relative efficiency and maintenance cost of a generating unit, has been used to provide some limited insight into some of the factors that are considered in the decommissioning of units. Currently there is over 15,000 MW of generation within ERCOT that is over 40 years in age. Most of the older capacity is located in and around the larger metropolitan areas of the state. The map to the left shows generation that is over 40 years in age.

4.2 Future Generation

ERCOT has received interconnection requests for proposed generation having aggregate nameplate capacity over 65,000 MW. Of this capacity, over 60,000 MW is considered public information to some degree and is shown on the map to the right.



Dots do not reflect actual location of the unit within the county

The following table shows the interconnection requests for proposed capacity by fuel type, as of October 1, 2010.

Active Generation Interconnection Requests By Fuel Type (MW)				
Fuel	Confidential	Limited Public	Public	Total
Gas-CC		7,471	3,972	12,043
Gas-CT	600	247		247
Nuclear			5,900	5,900
Coal		1,740	3,213	4,953
Wind	3,628	29,127	5,953	38,708
Solar	340	699		1,039
Biomass		50	145	195
Other		740	1,300	2,040
Total	4,568	40,074	20,483	65,125

* The "Other" category includes generation fueled by petroleum coke, gasified petroleum coke, and batteries.

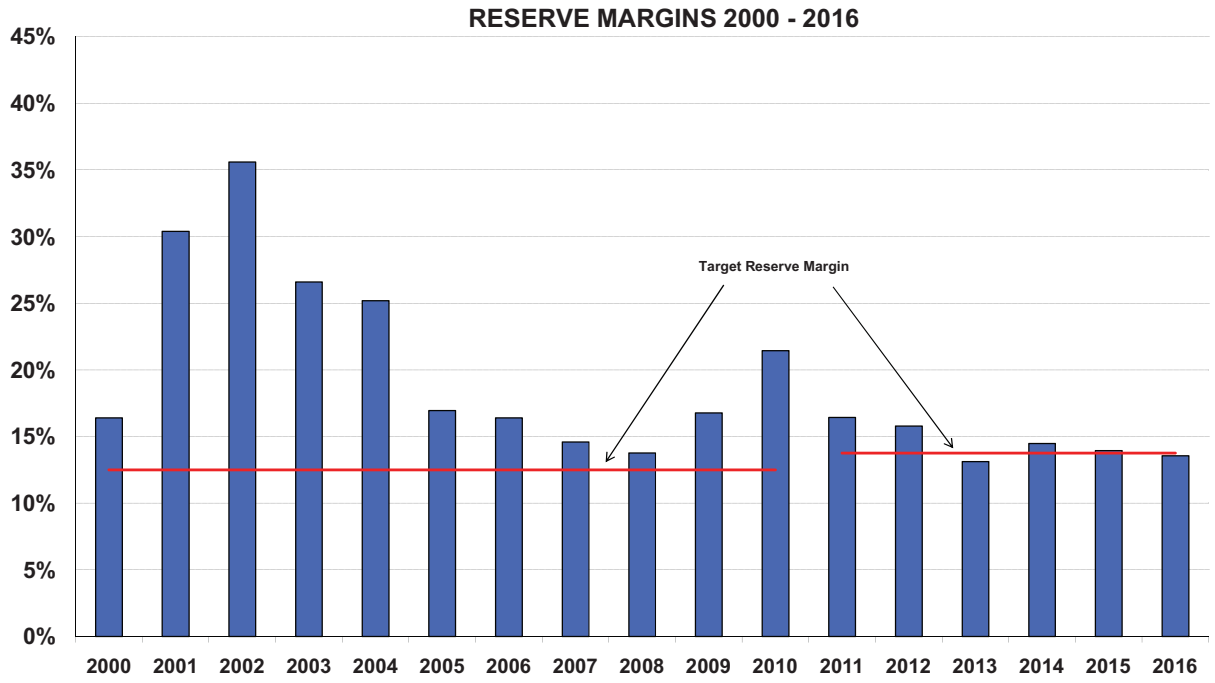
The following table shows the requests for new generation in ERCOT between October 2009 and September 2010.

Generation Interconnection Request Activity in 2010						
FUEL	Screening Studies Requested		Interconnection Studies Requested		Interconnection Agreements Signed	
	Number	MW	Number	MW	Number	MW
Coal	1	15	1	15	1	660
Gas - CC	2	645	2	645	3	2,940
Gas - CT	3	643	2	247		
Wind	33	6,204	27	6,488	1	250
Solar	9	460	6	260		
Other	2	740	2	740	1	1,300
Total	50	8,707	40	8,395	6	5,150
Projects may appear in more then one category						

There is much uncertainty associated with many of the proposed interconnections. One reason is that multiple interconnection requests may be submitted representing alternative sites for one proposed facility. For this and other reasons, it is possible that much of this capacity will not be built.

5. Reserve Margin

Reserve margin[3] is the percentage by which the available generating capacity in a system exceeds the peak demand. The chart below shows the historical and projected (as of December 16, 2010) reserve margins for the ERCOT system from 2000 through 2016, as well as the approved target. Between 1999 and 2004, different methodologies were used to calculate ERCOT's margins, which accounts for some of the wide variation of the margins shown. In 2005, the ERCOT Board of Directors approved a methodology that recognizes a generator's contribution to reserve is determined more by availability than by nameplate capacity. Beginning in 2006, the reserve margins have been calculated using this new methodology, applying a 12.5% target. In 2010, this target was adjusted to 13.75% for years 2011 and beyond by the ERCOT Board of Directors.



3 Reserve margin is calculated by the following formula: ((generation – demand) / demand). The Capacity, Demand and Reserve report reflects these calculations.

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