Resource Adequacy in ERCOT

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ERCOT Market

- High Level Market Design
  - Energy Only
  - Voluntary Day-Ahead Market
    - Co-optimizes energy and reserves hourly for next day
  - Real-Time Market
    - 5-minute nodal pricing
    - 15-minute settlement
  - Biannual and Monthly Congestion Revenue Rights (CRR) Auctions

What is the proper amount of Planning Reserves?

- Should Resource Adequacy be based on a 1-in-10 year LOLE study?

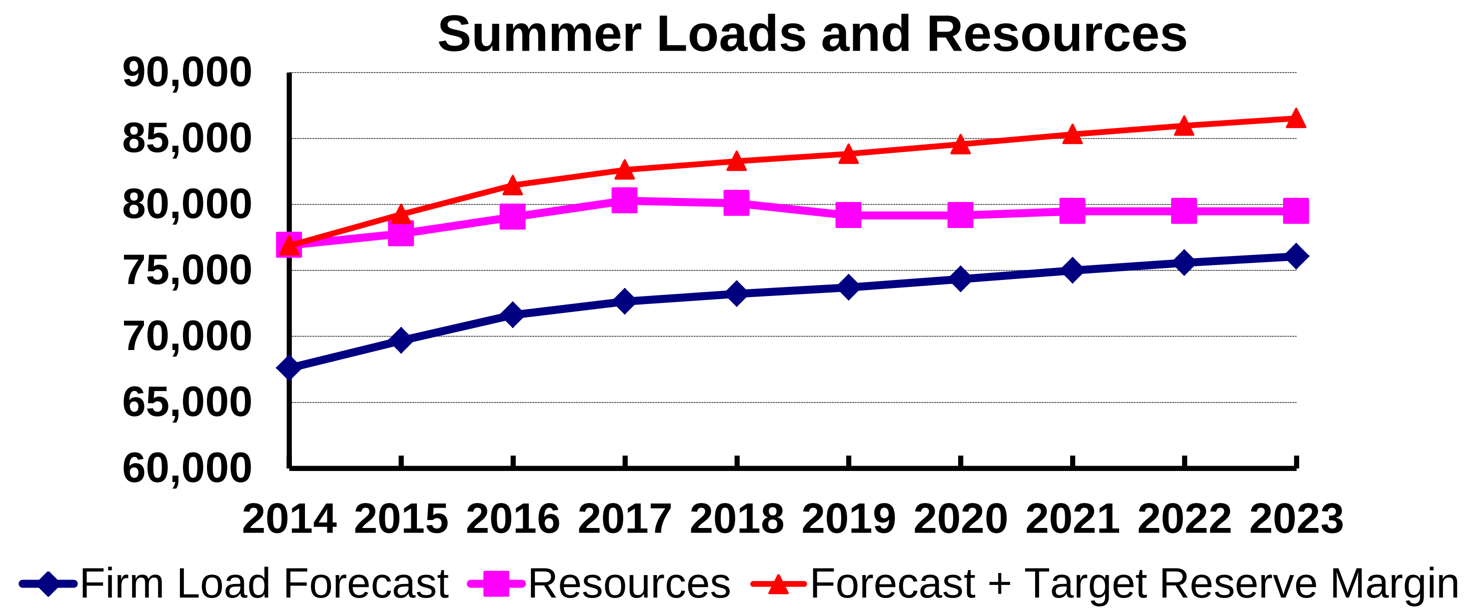
- Should Resource Adequacy be based on an Economic Evaluation of Loss of Load Impacts? If so, how will it compare to the 1-in-10 year LOLE study?

- What is Peaker Net Margin (PNM) and how does it relate to Resource Adequacy?

Resource Adequacy and Scarcity Pricing Concerns

- Proper market signals are crucial to incent investment
- Latest Capacity, Demand, and Reserve(CDR) Report shows reserve levels falling below target levels beginning with 2015
- Study performed by the Brattle Group in 2012 indicated a equilibrium reserve margin of:
  - 6.1% with offer caps at $3,000
  - 8% with offer caps at $9,000
  - http://www.ercot.com/content/news/presentations/2013/Brattle%20ERCOT%20Resource%20Adequacy%20Review%20-%202012-06-01.pdf
- With reserve margins projected to fall below target levels, there has been significant focus on improving Real-Time scarcity pricing

Resource Adequacy Reserve Forecast

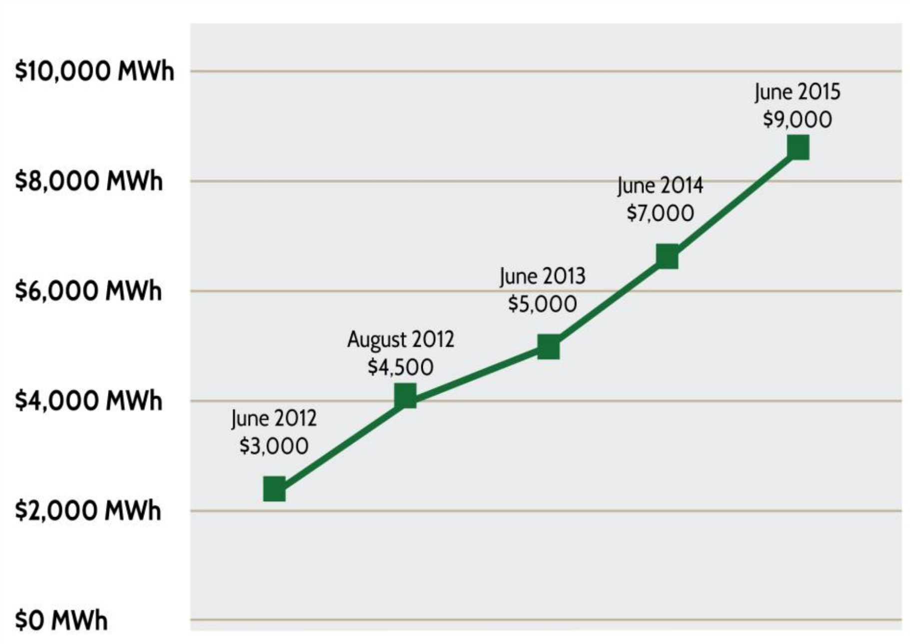


- Outlook from ERCOT's Capacity, Demand and Reserves (CDR) Report released in May
  - http://www.ercot.com/content/news/presentations/2013/CapacityDemandandReserveReport-May2013.pdf
- Report assumed a target reserve margin of 13.75%
  - Wind generation is included at 8.7% of nameplate capacity

Recent Changes Affecting Resource Adequacy

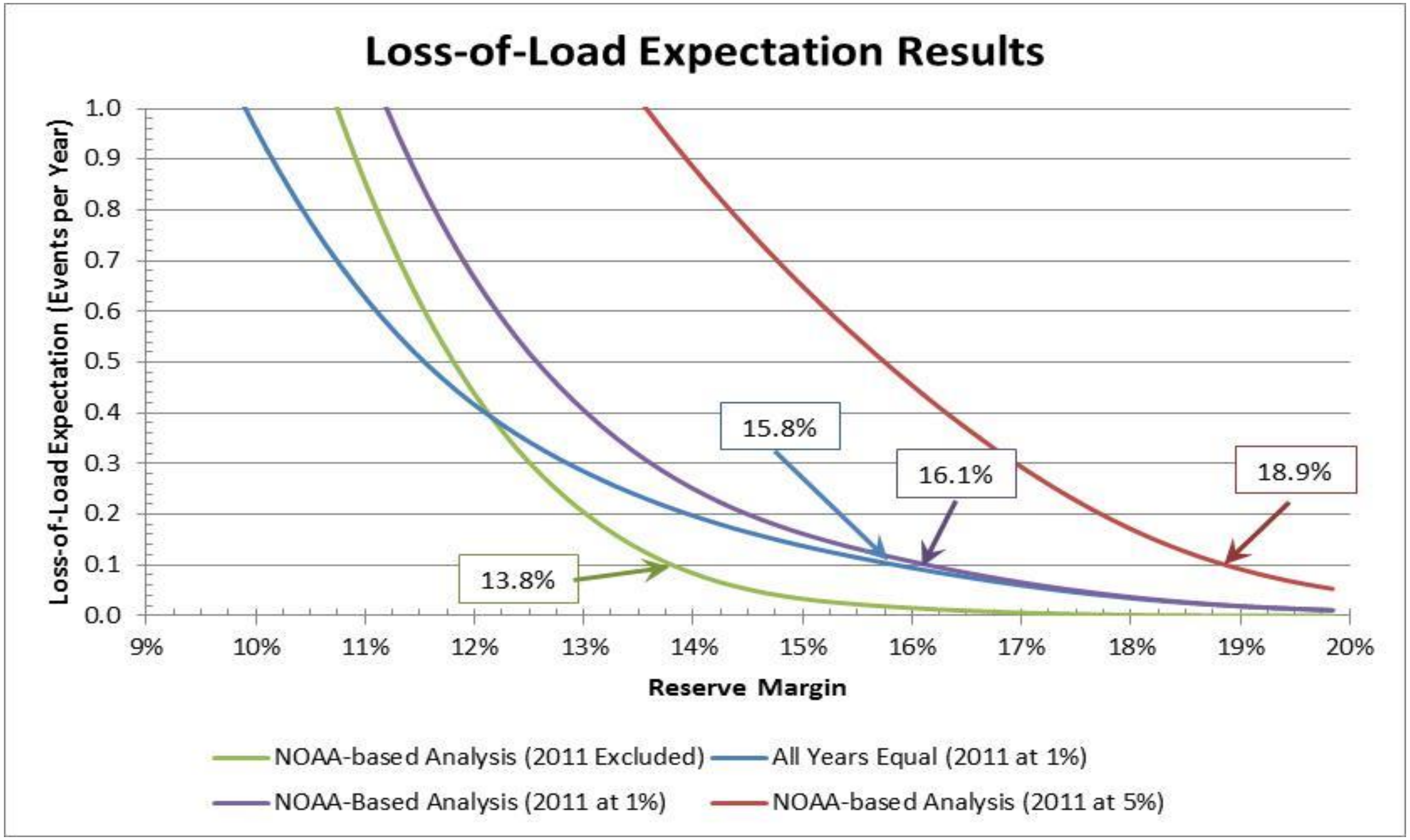
- Increases in the System-wide Offer Cap over the next two years
- Energy Offer Curve floors for capacity reserved for Ancillary Services on Generators
- Standing deployment for Non-Spinning Reserve Service carried by On-line Generators

Scheduled Changes to the System-wide Offer Cap (2012-2015)



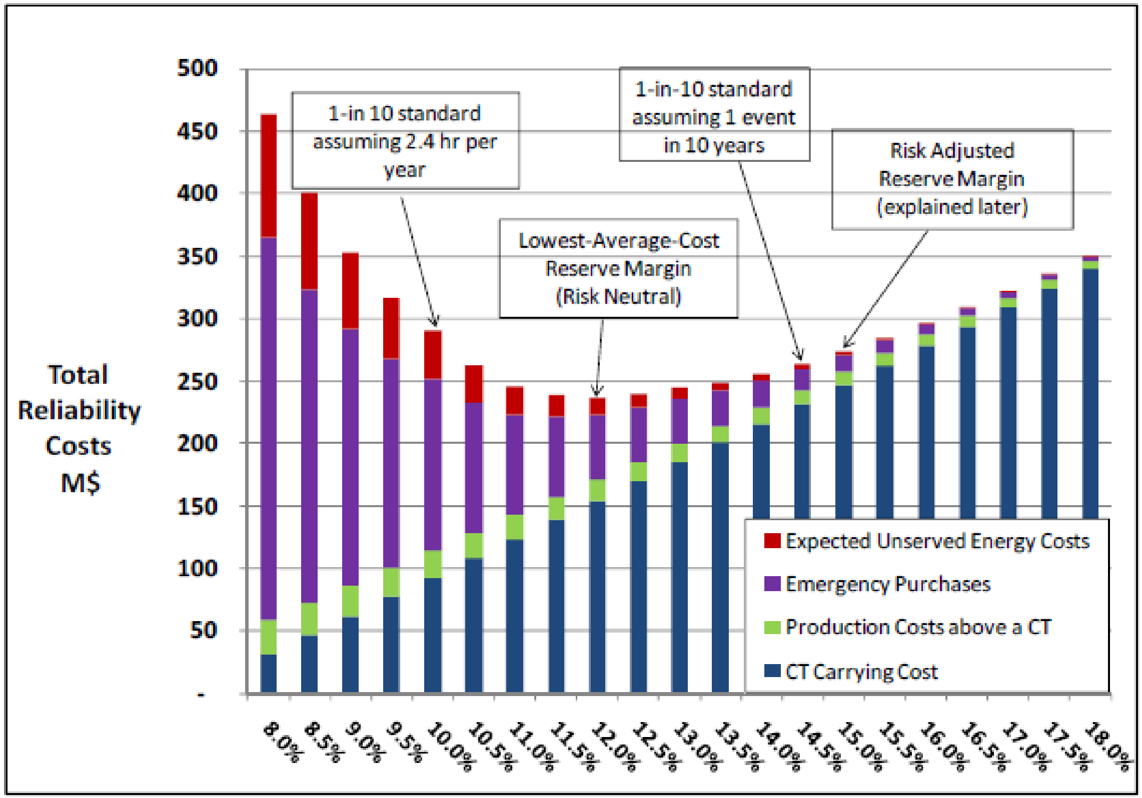
What is the proper Planning Reserve Margin?

- The graph below shows how weather can affect the 1 event in 10 year LOLE analysis
  - Based on *an ELCC of non-coastal Texas wind of 14.2% and coastal wind of 32.9%.*



Economic Evaluation of Loss of Load Impacts

- Some regions evaluate the total customer cost of reliability and select a reserve margin that minimizes overall cost
- Requires an evaluation of the regional value of unserved customer load

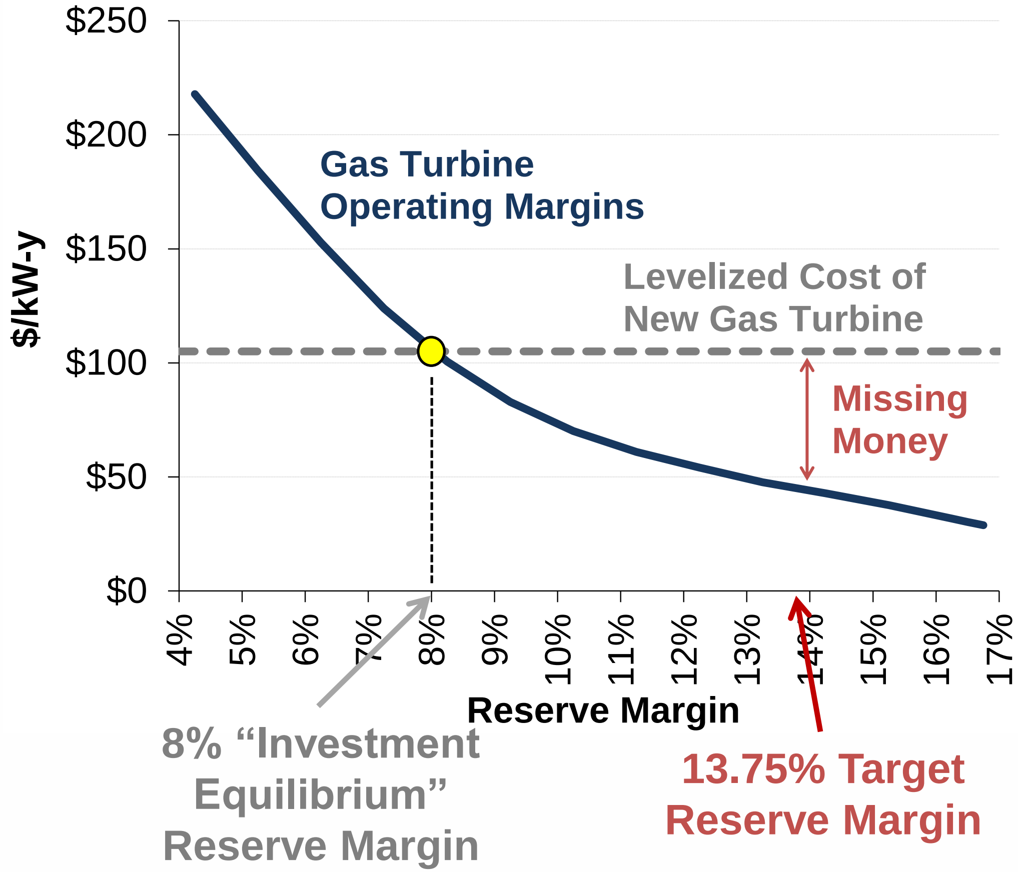


Source: Carden, Pfeifenberger and Wintermantel, *The Economics of Resource Adequacy Planning: Why Reserve Margins Are Not Just About Keeping the Lights On*, NRRI Report 11-09, April 2011.

Findings
There is “Missing Money at the Target Reserve Margin

- Generators cannot earn much with low gas prices and low market heat rates, except during scarcity conditions
- But at high reserve margins, there is almost always more than enough supply, so scarcity-driven high prices are rare, hence “missing money”
- We expect the reserve margin to fall to approximately 8% before energy prices can support investment of new plant (apart from some limited low-cost opportunities)
- Reliability could improve if large amounts of DR develop (unlikely to happen quickly)

Generators Earn Less at High Reserve Margins



slide from Brattle presentation

Note: based on a $9,000 price cap and gradual scarcity pricing

Background & Objective of Hogan B+

- GDF SUEZ commissioned Professor William W. Hogan to draft "Electricity Scarcity Pricing through Operating Reserves: An ERCOT Window of Opportunity." Professor Hogan's paper was filed in PUCT Project No. 40000 on November 14, 2012

- At its November 16, 2012 Open Meeting, the Commission directed ERCOT to study and report on the potential implementation of the proposals in Professor Hogan's paper

- ERCOT reported to the Commission that one element important to Professor Hogan's approach (the real-time co-optimization of energy and ancillary resources) could not be implemented by ERCOT in the near-term, and would require further investigation

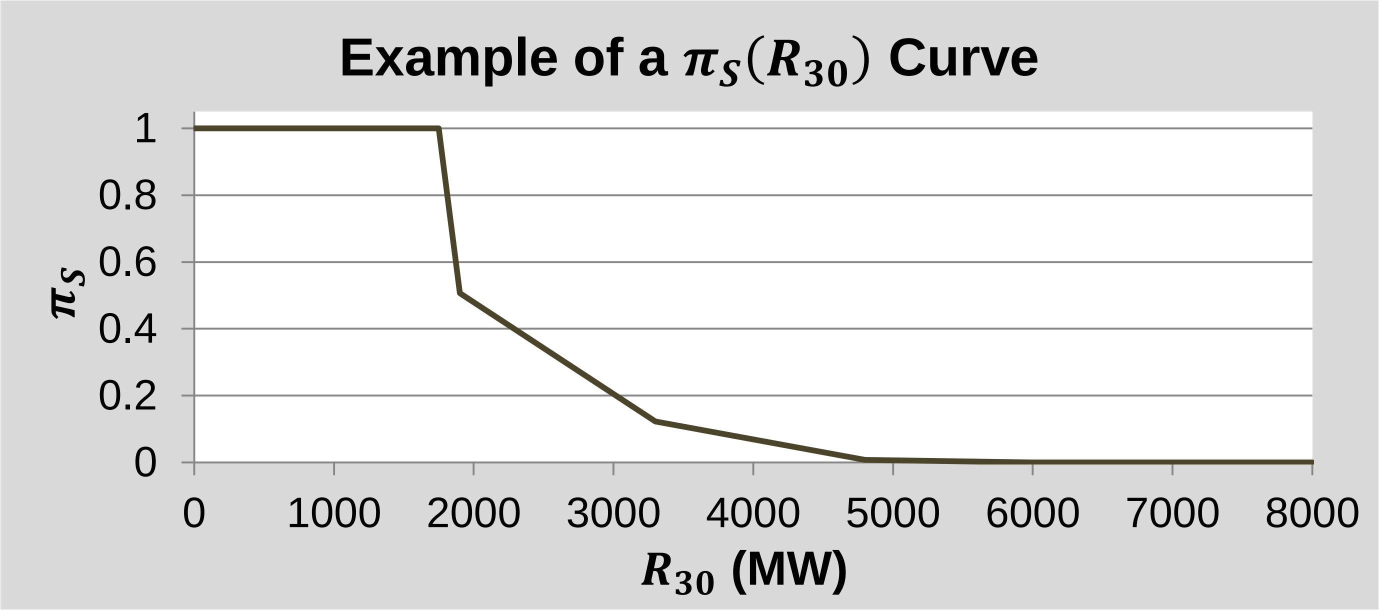
- ERCOT committed to work with Professor Hogan to determine if key aspects of Professor Hogan's approach could be implemented in the near-term, and to provide alternatives for such near-term action

Implementing the Hogan B+ Approach

- ERCOT estimates that implementing the near-term solution could be accomplished in 6- 8 months at a cost between $100,000 & $200,000
- Can the ORDC B+ Solution generate sufficient revenues to support a target reserve margin?
  - The CDR reports for 2011 and 2012 showed a Planning Reserve margin approximately equal to the 13.75% target
  - The PNM for 2011 was $125,001
  - The PNM for 2012 was $33,952
  - The PNM for 2011 did support a 13.75% Planning Reserve target due to the extreme summer weather and high number of scarcity intervals
  - The PNM for 2012 did not support a 13.75% Planning Reserve target due to the low numbers of scarcity intervals and less extreme temperatures
- The Back-Cast for 2011 & 2012 utilizing the ORDC B+ approach is highly dependent on the level of minimum contingency reserves and the Value of Lost Load (VOLL)

Implementing the Hogan B+ Approach

- The Real-Time reserves prices would be calculated based on analysis of historical risk and VOLL
- The price for On-line, spinning reserves would also act as a price adder for the Real-Time energy price
- Resources that sold reserves in the Day-Ahead Market but are dispatched for energy in Real-time will have to buy back reserves at the Real-Time price



Additional PNM for 2011 & 2012 for Different VOLLs and Minimum Contingency Levels

- The numbers in these Tables are in addition to the realized PNM in 2011 & 2012, $125,001 & $ 33,952 respectively

VOLL	Total Additional PNM under Interim Solution B+ with X at 1375 MW ($/MW)		Total Additional PNM under Interim Solution B+ with X at 1750 MW ($/MW)		Total Additional PNM under Interim Solution B+ with X at 2300 MW ($/MW)	
	2011	2012	2011	2012	2011	2012
$5000/MWh	38,544	7,740	67,892	17,267	192,728	53,194
$7000/MWh	62,141	11,189	107,327	24,809	296,489	76,367
$9000/MWh	85,773	14,643	146,795	32,362	400,361	99,568

- Estimated additional PNM for 2011 and 2012 by only increasing the SWCAP

SWCAP	Total Additional PNM if SWCAP Increased to VOLL ($/MW)	
	2011	2012
$5000/MWh	57,631	2,877
$7000/MWh	114,168	5,883
$9000/MWh	170,706	8,889

Energy-weighted Average Price Adder P_S ($/MWh) for Different VOLLs and Minimum Contingency Levels (X)

VOLL	Energy-weighted average price increase with X at 1375 MW ($/MWh)			Energy-weighted average price increase with X at 1750 MW ($/MWh)			Energy-weighted average price increase with X at 2300 MW ($/MWh)		
	2011	2012	2011 & 2012 combined	2011	2012	2011 & 2012 combined	2011	2012	2011 & 2012 combined
$5000/MWh	7	1.08	4.08	12.03	2.4	7.28	33.74	7.36	20.71
$7000/MWh	11.27	1.56	6.48	19.06	3.45	11.35	52.08	10.55	31.57
$9000/MWh	15.54	2.05	8.87	26.08	4.5	15.42	70.42	13.75	42.43

Summary

- ORDC B+ implements scarcity pricing based on the level of Operation Reserves in Real-Time

- The back cast of 2011 & 2012 suggests that the ORDC B+ with a higher minimum contingency reserve level can support a Planning Reserve target of 13.75%

- The back cast does not account for future market behavior changes that may result from the implementation of ORDC B+

Questions

- http://interchange.puc.texas.gov/WebApp/Interchange/application/dbapps/filings/pgSearch_Results.asp?TXT_CNTR_NO=40000&TXT_ITEM_NO=392