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ANALYSIS OF RESOURCE ADEQUACY IN ERCOT—SUMMER 2017



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1. INTRODUCTION

This report extends LCG Consulting's analysis to the 2017 summer season (June through September) using market simulations with LCG's UPLAN Network Power Model. Resource adequacy analysis for the region is especially important during extreme summer loading conditions.

The ERCOT landscape is rapidly evolving, with unprecedented growth of renewables and transmission upgrades. Earlier this year LCG released the first and second quarterly studies looking at how the ERCOT grid can cope with strained network conditions.

For this report, LCG built scenarios examining "strained network conditions" that reflect historical average of generation outages, extreme weather forecasts and historical load conditions. These sensitivity cases were assessed for resource adequacy to see if peak demand is served. This report further illuminates which strained conditions might shift in the outlook for energy prices, Operating Reserve Demand Curve (ORDC), Peaker Net Margin (PNM), and congestion.

- Scenario 1 or Base Case: Forecasted Season Peak Load (50/50 forecast)
- Scenario 2: High Gen Outages
- Scenario 3: Low Wind
- Scenario 4: High Load

For each of these scenarios, LCG used its UPLAN sub-hourly model at 5 minute intervals to simulate the summer season of 2017. UPLAN's sub-hourly model accurately captures the operation of the ERCOT system, including the intricate ramping constraints of thermal units, of particular interest under the stress cases. Scenario 1 assumes typical use of reserve capacity conditions while the three other scenarios represent extreme cases.

2. DEFINITION OF SCENARIOS AND ASSUMPTIONS

Scenario 1 or Base Case: 50/50 Load

As the base case, in this scenario the peak demand forecast is 72,395 MW, reflecting normal weather conditions, based on ERCOT 50/50 demand forecast, which assumes 50% probability of being under or over achieved by the actual peak. LCG distributed this load across ERCOT proportional to nodal Load Distribution Factors (LDFs) published with ERCOT's Steady State Working Group (SSWG) network for 2017. The total resource capacity is 81,775 MW, using 77% of rated capacity for solar resources, 58% of coastal installed wind capacity, 14% of non-coastal installed wind capacity (per ERCOT Nodal Protocols Section 3.2.6.2.2), and current seasonal maximum limits of all other units. From this resource capacity, we assume 3,738 MW to be on forced outages and on maintenance for June through September weekdays based on IIR Outages Report (as of 06/02/2017). That leaves 5,642 MW of capacity available for operating reserve.

Scenario 2: High Gen Outages

This scenario assumes additional generating capacity of 2,049 MW to be on outage. With these excess outages, total use of reserve capacity is 5,787 MW and the capacity available for operating reserve falls to 3,593 MW. Other parameters remain the same as in Scenario 1.

Scenario 3: Low Wind

In this scenario, the wind output is adjusted 3,026 MW downward based on the 10th percentile of wind output associated with the 100 highest net load hours (load minus wind output) for the 2013-2016 summer Peak Load Seasons (ERCOT Final Summer SARA Report). Considering this reduction in wind output level, the capacity available for operating reserve is 2,616 MW. Other parameters remain the same as in Scenario 1.

Scenario 3: High Load

In this scenario, the load adjustment is based on historical extreme weather conditions and assumes the load increase of 3,666 MW (ERCOT Final Summer SARA Report). After this load adjustment, total use of reserve capacity is 7,403 MW and the capacity available for operating reserve is 1,977 MW. Other assumptions are the same as in Scenario 1.

Table 1 – Base Case Capacity and Demand Assumptions – Summer 2017 (MW)

Operational Resources (Thermal and Hydro), MW	67,228
Switchable Capacity Total, MW	3,087
less Switchable Capacity Unavailable to ERCOT, MW	-789
Mothball Resources, MW	0
Private Use Network Capacity Contribution, MW	4,201
Non-Coastal Wind Resources Capacity Contribution, MW	2,346
Coastal Wind Resources Capacity Contribution, MW	1,184
Solar Utility-Scale, Peak Average Capacity Contribution, MW	581
RMR Resources under Contract, MW	0
Non-Synchronous Ties Capacity Contribution, MW	425
Planned Thermal Resources with Signed IA, Air Permits and Water Rights, MW	2,785
Planned Non-Coastal Wind, MW	131
Planned Coastal Wind, MW	342
Planned Solar Utility-Scale with signed IA, MW	254
Total Resources, MW	81,775
Peak Demand, MW (Base Case)	72,395
Reserve Capacity, MW	9,380

Table 2 – Range of Potential Risks – Summer 2017 (MW) UPLAN Scenario Assumptions

	50/50 Load (Base Case)	High Outages (Scenario 2)	Low Wind (Scenario 3)	High Load (Scenario 4)
Seasonal Load Adjustment, MW	-	-	-	3,666
Maintenance Outages, MW	915	915	915	915
Thermal Forced Outages, MW	2,823	2,823	2,823	2,823
Additional Thermal Forced Outages, MW		2,049		
Low Wind Output Adjustment, MW			3,026	
Total Uses of Reserve Capacity, MW	3,738	5,787	6,764	7,403
Capacity Available for Operating Reserves, MW	5,642	3,593	2,616	1,977

3. SCENARIO MODELING AND METHODOLOGY

The nodal market simulations were performed using LCG's proprietary UPLAN Network Power Model (NPM) and PLATO-ERCOT data model at the five-minute dispatch level. UPLAN authentically replicates the engineering protocols and market procedures of a system operator. More detail on this sophisticated model is available in the Appendix of the report. For this study, UPLAN integrates the SSWG power flow network for Summer 2017 with planned upgrades and ERCOT standard and planning contingencies. Transmission upgrades for summer season were added based on the Transmission Project Information Tracking (TPIT) file, published in February 2017, and based on inputs from Day Ahead Market and Congestion Revenue Rights networks. Generation expansion and retirement assumptions relied on ERCOT publications. In addition, ERCOT publications and other public and private data sources provided electricity demand and transmission network topology assumptions including list of monitored elements, interface definitions and limits. Further overview on the UPLAN NPM and PLATO-ERCOT data model can be found in Appendix 1 and Appendix 2, respectively.

In the sensitivity cases, the generation outages and the load increase were distributed between available generating units and load points for each scenario. Monthly peak loads were modified based on 50/50 forecast published in February 2017, while the hourly load shapes use the 2016 RTP Economic Case load profiles published in September 2016.

4. SIMULATION RESULTS

If you are interested in receiving the full spring quarter outlook, please contact us at julie.chien@energyonline.com

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