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ANALYSIS OF RESOURCE ADEQUACY IN ERCOT—Q1 2017

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1. INTRODUCTION

LCG Consulting (LCG) conducted this study to investigate the operational implications of strained network conditions in ERCOT in the first quarter (January through March—Q1) of 2017 using market simulations with LCG's UPLAN Network Power Model.

The considered scenarios of "strained network conditions" reflect extreme weather forecasts and historical load conditions during the past years. LCG aims to assess the impact of several sensitivity cases related to load and wind penetration on the adequacy of generator resources to serve peak demands.

A deterministic approach is used to analyze the sufficiency of installed resources to meet the peak electrical demand in ERCOT in Q1 2017.

For this study, three scenarios were examined:

1. Scenario 1 or Base Case: 50-50 Load
2. Scenario 2: High Load
3. Scenario 3: High Load / Low Wind

For each of these scenarios, LCG used UPLAN sub-hourly (5-min interval) model to simulate three months, generating results of interest including energy prices, Operating Reserve Demand Curve (ORDC), Peaker Net Margin (PNM), and congestion. UPLAN's five-minute interval simulation accurately captures the operation of the ERCOT system including the sub-hourly ramping constraints of thermal units, which is particularly important under the stress cases. Scenario 1 assumes expected weather and generator outage conditions while the two other scenarios represent extreme cases.

2. DEFINITION OF SCENARIOS AND ASSUMPTIONS

Scenario 1 or Base Case: 50-50 Load

This scenario represents the Base Case for Q1 2017. The peak demand forecast is 58,591 MW, reflecting normal weather conditions, based on ERCOT 50-50 demand forecast. The total resource capacity is 69,389 MW, using 80% of rated capacity for solar resources, 55% of coastal installed wind capacity, 12% 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 3,871 MW is to be on forced outages and 6,721 MW on maintenance. That leaves 12,614 MW capacity available for operating reserve.

Scenario 2: High Load

This scenario is developed to reflect extreme weather on the Q1 load. The load adjustment is about 14% based on an extreme weather forecast using 2011 weather data. 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. Other parameters remain the same as in Scenario 1. With this excess load, the capacity available for operating reserve is 5,013 MW.

Scenario 3: High Load / Low Wind

In this scenario, the load is the same as in Scenario 2 while the output from wind generators is lower. Scenario 3 adjusts wind output downward by 1,830 MW, which corresponds to an input adjustment of 10% lower wind capacity. Other assumptions are the same as in Scenario 1. Considering this reduction in wind output level and increase in load, the capacity available for operating reserve falls to 3,184 MW.

Table 1 – Base Case Capacity and Demand Assumptions – Q1 2017 (MW)

Operational Resources (Thermal and Hydro)	69,389
Switchable Capacity Total	3,820
Switchable Capacity Unavailable to ERCOT	(663)
Mothball Resources	0
Private Use Network Capacity Contribution	4,182
Non-Coastal Wind Resources Capacity Contribution	3,038
Coastal Wind Resources Capacity Contribution	717
Solar Utility-Scale, Peak Average Capacity Contribution	18
RMR Resources to be under Contract	0
Non-Synchronous Ties Capacity Contribution	246
Planned Thermal Resources with Signed IA, Air Permits and Water Rights	615
Planned Non-Coastal Wind with signed IA	368
Planned Coastal Wind with signed IA	36
Planned Solar Utility-Scale with signed IA	31
Total Resources	81,797
Peak Demand (Base Case)	**58,591**
Reserve Capacity	23,206

Table 2 – Range of Potential Risks – Q1 2017 (MW) UPLAN Scenario Assumptions

	Forecasted Peak Load (Base Case)	**High Load (Scenario 2)**	**High Load / Low Wind (Scenario 3)**
Average Quarterly Load Adjustment	-	7,601	7,601
Typical Maintenance Outages	6,721	6,721	6,721
Typical Forced Outages, Thermal	3,871	3,871	3,871
Low Wind Output Adjustment	-	-	1,830
Total Uses of Reserve Capacity	10,592	18,193	20,023
Capacity Available for Operating Reserves	12,614	5,013	3,184

3. SCENARIO MODELING AND METHODOLOGY

The nodal market simulations for this study were performed using LCG's proprietary UPLAN Network Power Model (NPM) and PLATO-ERCOT data model at the five-minute dispatch level. It replicates the engineering protocols and market procedures of a system operator. The model also integrates the SSWG network published in October 2016, and ERCOT standard and planning contingencies. Transmission upgrades for Q1 were added based on the Transmission Project Information Tracking (TPIT) file, published in October 2016. Generation expansion and retirement assumptions were based 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 load increase and the wind output reduction are distributed between available wind units and load points for each scenario. Monthly peak loads were modified based on ERCOT Long-Term Daily Forecast (also referred to as ERCOT 50-50 load forecast) published in January 2017, while the hourly load shapes use the 2016 RTP Economic Case load profiles published in September 2016.

4. SIMULATION RESULTS

Wind output and load affect prices, according to the market simulations. Decreasing wind in an already strained system with high load yields the greatest effect.

If you are interested in receiving the full report, please contact us at Julie.chien@energyonline.com.