

June 2020

ANALYSIS OF RESOURCE ADEQUACY IN ERCOT—JULY-DECEMBER 2020



LCG CONSULTING

4962 El Camino Real, Suite 112
Los Altos, CA 94022
Tel: 650-962-9670
www.EnergyOnline.com

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1. INTRODUCTION

LCG Consulting performed analysis of ERCOT for the second half of 2020, July through December, using market simulations with LCG's UPLAN Network Power Model. Resource adequacy analysis for the region is critical during extreme summer loading conditions as the reserves have tightened because of recent retirements. On top of this, the COVID-19 pandemic, and the society's response to it, are continuing to cause observed impacts to the power system and market.

For this report, LCG built scenarios to investigate compromised generation capacity during the summer, as well as modeling modified load and fuel price due to the COVID-19 pandemic. These sensitivity cases were assessed for resource adequacy to see if peak demand is served. This report further identifies strained conditions that might shift expected energy prices, Operating Reserve Demand Curve (ORDC), Peaker Net Margin (PNM), and congestion.

- Scenario 1 or Base Case: Summer SARA capacity
- Scenario 2: Summer SARA capacity + COVID-19 impact

Scenario 1 assumes reduced generation capacity in summer, from July to September, based on the pre-COVID-10 ERCOT 2020 summer SARA report. Scenario 2 uses ERCOT's COVID-19 load forecast which is based on information provided by Moody's Analytics in the April economic forecast. For each of these scenarios, LCG used its UPLAN hourly model to simulate the second half of 2020. UPLAN's robust performance has withstood decades of benchmarking and validation in the ERCOT system. For more details on modeling with UPLAN, see the appendix.

2. SCENARIO MODELING & METHODOLOGY

The nodal market simulations were performed using LCG's proprietary UPLAN Network Power Model (NPM) and PLATO-ERCOT data model at the hourly dispatch level. UPLAN authentically replicates the engineering protocols and market procedures of a system operator.

The study uses the SSWG Summer Peak Power Flow Case for 2020, published December 2019 by ERCOT SSWG group for the transmission network. Generation expansion and retirement assumptions are based on ERCOT publications. In addition, ERCOT publications and other public and private data sources provided electricity demand and transmission network topology assumptions including transmission upgrades, list of contingencies analyzed, list of monitored elements, interface definitions and limits.

LCG's 2020 ERCOT hourly load shapes are based on hourly weather zone load profiles from the 2013 weather year published by ERCOT's Regional Transmission Plan (RTP) Group and modified monthly peak forecasts for each weather zone based on the 50-50 load forecast published by ERCOT in January 2020. Electricity market modeling incorporated almost 900 generators, including existing facilities – based on the ERCOT Capacity Demand and Reserves report – and future units that have a Standard Generation Interconnection Agreement – using ERCOT Monthly System Planning reports and LCG assumptions. LCG produces proprietary natural gas price forecasts, as well as sub-bituminous and lignite coal prices, with data from EIA's 2019 Annual Energy Outlook.

Scenario 1 or Base Case: Summer SARA capacity

In this base case, the peak demand forecast is 77,064 MW, reflecting normal weather conditions based on ERCOT 50/50 demand forecast, which assumes 50% probability of being under or over the actual peak. LCG distributed this load across ERCOT proportional to the nodal Load Distribution Factors (LDFs) published with ERCOT's Steady State Working Group (SSWG) network for 2020. The total resource capacity is 86,907 MW.

Figure 1 shows the installed capacity by fuel type, and Figure 2 shows the installed capacity by load zone.

Scenario 2: Summer SARA capacity and COVID-19 impact

This scenario assumes decreased peak load and energy, which results from both reduced morning load and reduced overall load in other hours. The changes in load and energy are based on ERCOT's load forecast, which uses Moody's Analytics in the April economic forecast. Natural gas prices are also modified taking into account market effects of the COVID-19 pandemic. Other parameters remain the same as in Scenario 1.

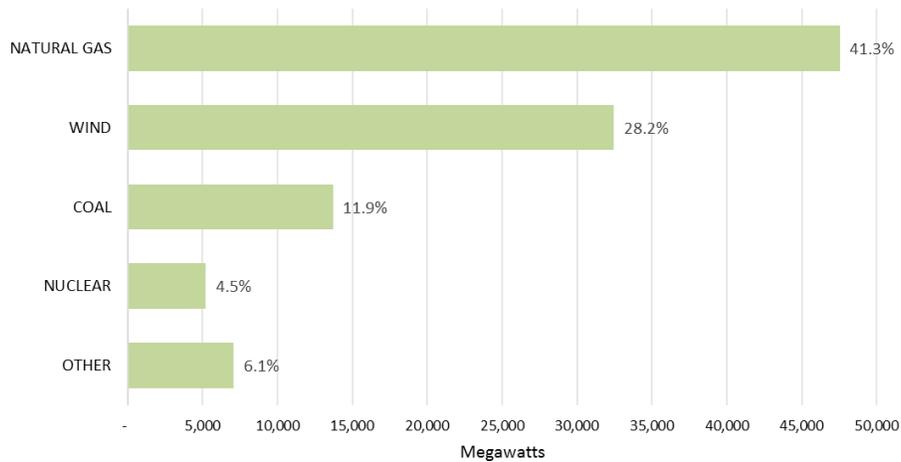


Figure 1 – Installed Capacity by Fuel Type, ERCOT, 2020

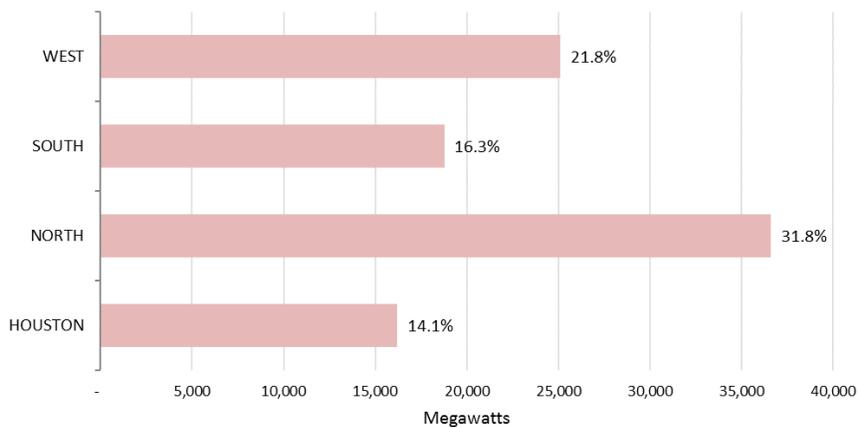


Figure 2 – Installed Capacity by Zone, ERCOT, 2020

3. SIMULATION RESULTS

3.1 Prices

Load zone prices are lower under the modified, COVID-19 case, as a result of lower load and fuel price. The simple monthly average zonal price between July and December decreases by 2-4% for Houston, North and South. The change is most significant in the West zone, where the price decreases by 14% under the COVID-19 conditions, which is due to the congestion that would happen under the base scenario. Average load zone prices for both scenarios are shown below in Figure 3.

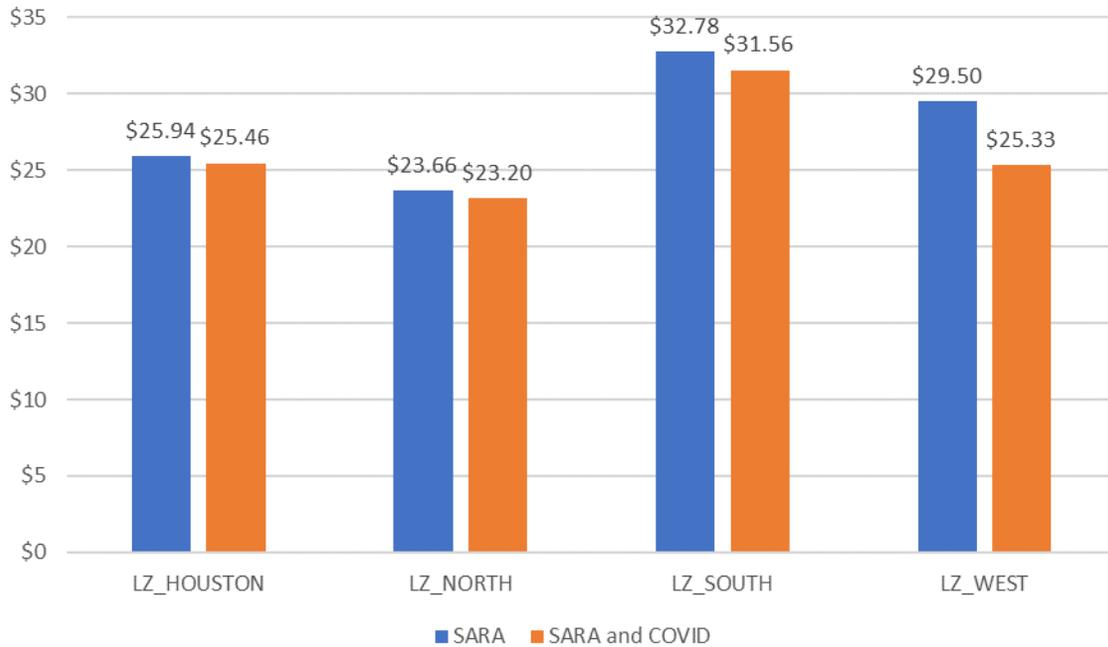


Figure 3 – Average Load-Weighted Zonal Prices by Scenario – July-December 2020 (\$/MWh)

Similar to the zonal price, trading hub prices also decrease due to COVID-19 impacts; in the four trading hubs, prices decrease about 2-3%.

Trading hub price results by scenario are shown below in Figure 4.

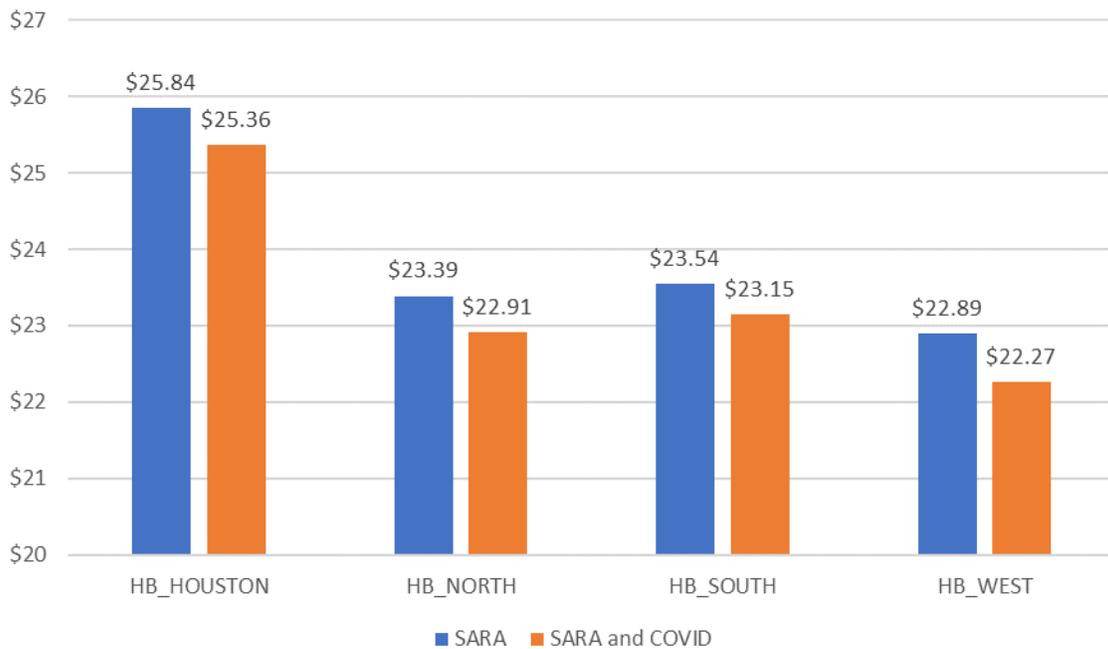


Figure 4 – Average Trading Hub Prices by Scenario – July-December 2020 (\$/MWh)

Figure 5 shows the system-wide price duration curve by scenario for the top 100 hours in second half of 2020. Here it can be seen that during high price hours, the prices in the COVID-19 scenario are much lower. This change could be the effect of lowered peak demand and lower fuel price working together under the COVID-19 scenario.

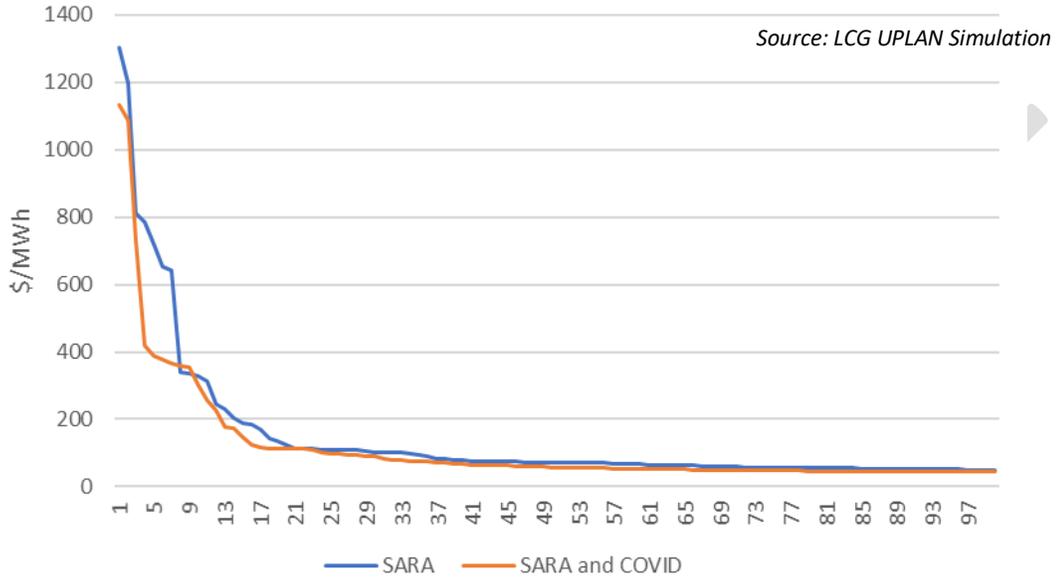


Figure 5 – System-Wide Price Duration Curve - Top 100 Hours – July-December 2020 (\$/MWh) ¹

As expected, the ORDC price adder increases in the extreme scenarios due to lower operating reserves. The base case, where the generation capacity is limited during summer months, shows higher ORDC price adders. The duration curve is shown in Figure 6 for the highest 100 hours of the second half of the year.

¹ Value includes ORDC price adder

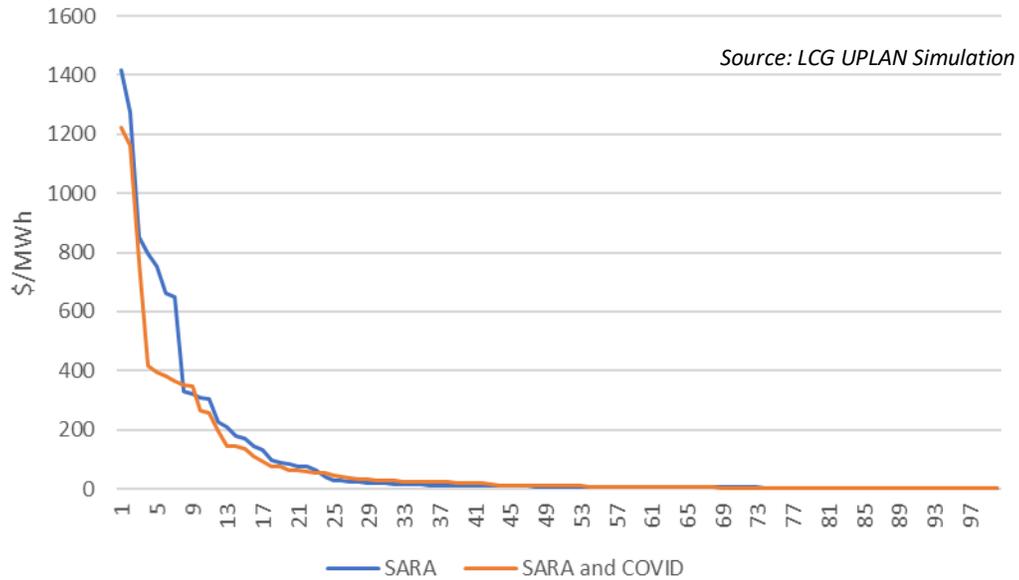


Figure 6 – Operating Reserve Price Adder Duration Curve - Top 100 hours – July-December 2020 (\$/MWh)

LCG’s simulation shows that the Peaker Net Margin (PNM), which also serves as a simplified measure of the annual net revenue of a peaking unit, is lower in the COVID-19 scenario. In the Base Case, the cumulative PNM value (July through December) is \$22,748. During the same period, the margin is \$21,288 in the COVID-19 case. Simulation results show that peakers gain the most in August (Figure 7).

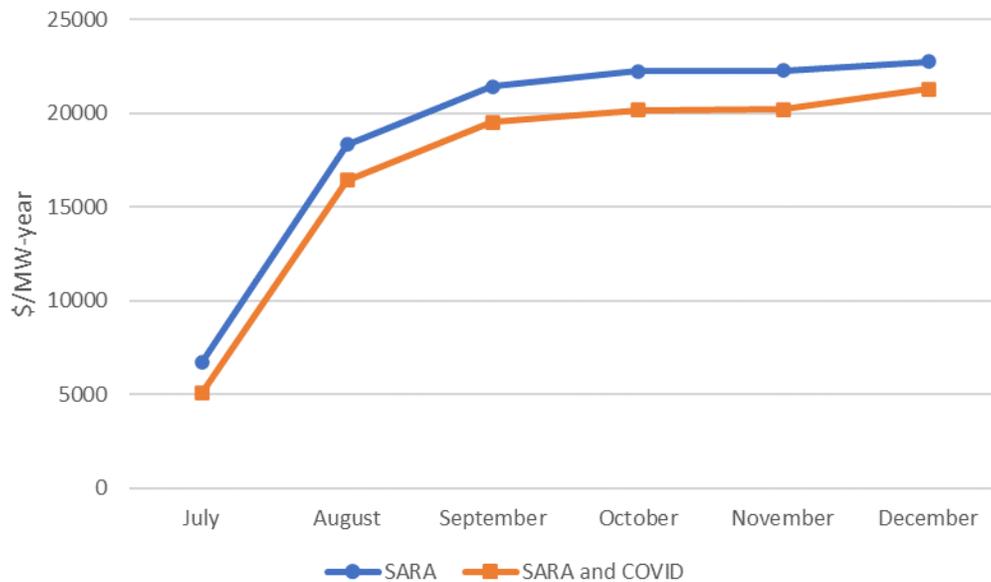


Figure 7 – ERCOT-wide Cumulative Peaker Net Margin

3.2 Generation

Natural gas is increasingly dominant in the ERCOT generation mix, and this trend appears in both cases. Both scenarios see a similar fuel mix, with natural gas accounting for more than 53% of generation. Under COVID-19 impacts, there is a substitution effect from coal to natural gas, due to the price decrease for natural gas, while generation from other fuel types are not affected much. Generation by fuel type for all scenarios are given below in Figure 8.

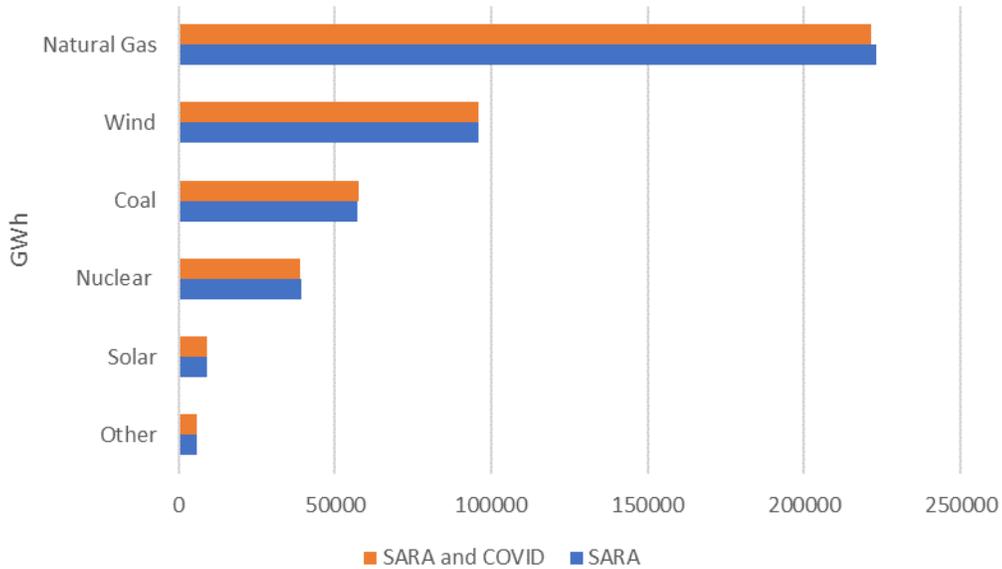


Figure 8 – Generation (GWh) by Fuel and Fuel Mix by Scenario – July-December 2020

4. CONCLUSION

Under expected conditions, the ERCOT region will see sufficient installed generating capacity to serve peak demands during the summer 2020. The risk of insufficient capacity is lower under the conditions of lowered energy demand scenario due to the COVID-19 pandemic. To drill down into a more comprehensive dataset, this report can be customized upon request to include additional details such as generator performance, hourly LMPs, transmission congestion, and other information of interest.

Under the scenarios explored here, ERCOT sees lower prices due to decreased load and fuel price from COVID-19 impacts. Due to congestion in the West zone under the business-as-usual scenario, the price in the West zone is most sensitive to a decrease in peak load and energy demand. The generation mix mainly shows a substitution effect from coal to natural gas, due to the decrease in natural gas prices.

APPENDIX. ABOUT LCG CONSULTING

LCG Consulting, based in Los Altos, California, is a widely-recognized leader in electricity market modeling and software development. Since it was founded in 1978 in Silicon Valley, LCG has played a leadership role in providing the utility industry with specialized software and consulting services in the areas of electric and gas deregulation. The company's most popular, best-in-class offerings, UPLAN and PLATO, are in widespread use by market participants worldwide. Our clients include an extensive range of public and private electric utilities, independent system operators, generation asset developers, electricity traders, power marketers, federal and state agencies, and a number of energy research institutes across the United States and abroad, including the United States Energy Information Administration. We specialize in energy model development for electricity markets, economic analysis of transmission and generation assets, tariff design and risk assessment.

LCG has more than 30 years of experience in the electric and gas utility industry. Over that period, LCG has conducted thousands of studies on electricity market forecasting and electricity industry restructuring in the United States and abroad. The company developed and supported models for all aspects of short- and long-term planning for many types of clients, including private and public energy companies, courts, investors, and ratepayers. LCG is one of the first companies to research the implications of competitive pricing and marketing and develop models to analyze competitive power markets.

LCG's professional staff, knowledgeable in utility restructuring and market design, offers a variety of consulting services to our clients including:

- Renewable technology and power storage integration analyses
- Economic valuation of generation and transmission resources over short- and long-term planning horizons
- Transmission analysis, CRR valuation, tariff design
- Congestion and curtailment risk analyses
- Forecasts of energy and ancillary service prices

Our popular web site energyonline.com is a rich source of current electricity market information.