

Model Performance in ERCOT

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Data Sources Used in This Publication
ERCOT
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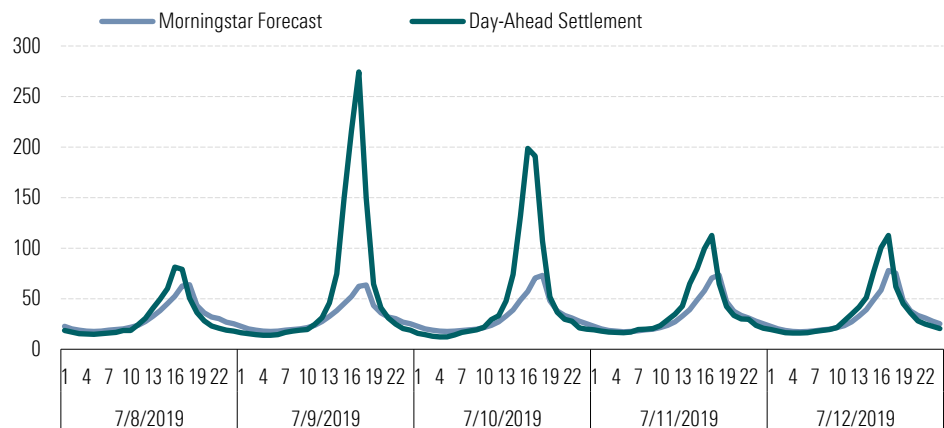
Modeling Electricity Prices in ERCOT

A little over a year and a half ago, Morningstar Commodity and Energy, in partnership with Morningstar Quantitative Research, began trying to answer a simple question: Could electricity load and price be accurately forecast in a purely statistical way? The team published three white papers that outlined the approach and some back-testing results, which showed a 24-hour mean absolute percentage error in ERCOT's coastal zone of around 2% ([PJM Quant Model](#), [PJM Quant Model the Next Step](#), [Quantitative Modeling: Refining the Model](#)). The model is now operating in a pseudo-live environment, allowing the project team to compare the results as daily settlements occur. This piece will look at the model's results from July 8, 2019, to July 12, 2019, for the day-ahead market at Houston hub in ERCOT.

Comparing Forecast to Actuals

Morningstar's day-ahead price forecast for Houston hub started the week in line with actual settlements, missing the around-the-clock power price for the day-ahead market on July 8 by \$0.32 per megawatt-hour (Exhibit 1). However, the day-ahead forecast failed to capture intraday peaks between July 9 and July 11. Power prices peaked for the week on July 9 at \$274/MWh. Overall the Morningstar model missed the around-the-clock power price peak by \$24, \$16, \$5, and \$3, respectively, for the remaining days of the week.

Exhibit 1 Day-Ahead Forecast to Actuals — ERCOT Houston Hub (\$/MWh)

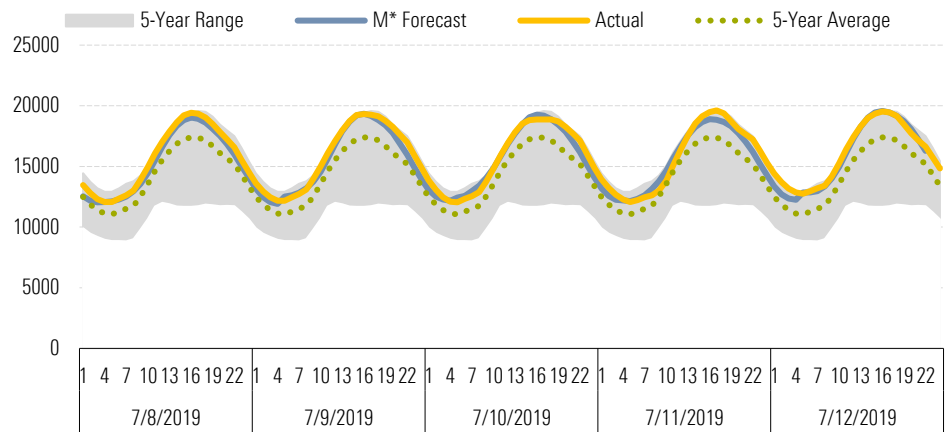


Source: ERCOT, Morningstar.

Strong Electricity Demand

Houston hub day-ahead prices moved up significantly last week, with daily peaks above \$100/MWh on four of the five weekdays. A combination of factors contributed to the higher prices. To start, load in ERCOT's coastal zone stayed strong throughout the period, exceeding the 5-year hourly average for July (Exhibit 2). Load either stayed toward the higher end of the 5-year range or exceeded previous highs for most of the week. On average, the Morningstar forecast missed actual load in the coastal weather zone by around 250 MW over the five-day period, highlighting the model's accuracy in high load environments.

Exhibit 2 Coastal Load July 8th to July 12th 2019 (MW)

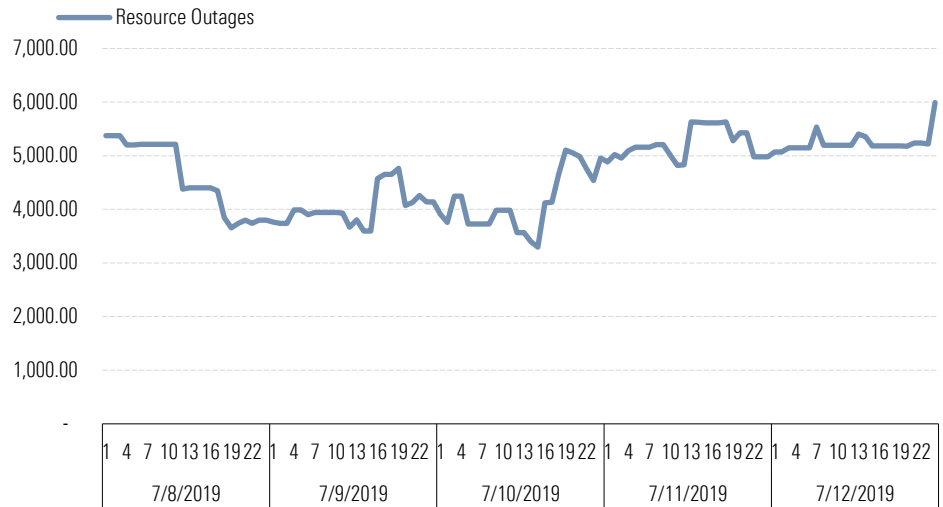


Source: ERCOT, Morningstar

Increasing Outages

Resource outages the week of July 8th started strong, but below the 3-year hourly outage average for July of 6,600 MW, before decreasing during the middle of the week (Exhibit 3). Resource outages moved down from 5,000 MW to around 3,800 MW Tuesday and Wednesday, before ticking back up into the weekend. Interestingly, the highest day-ahead price point seen last week was when outages were at their lowest point. Typically, few resources available during peak demand times push prices higher because more expensive resources are required to meet demand. Last week showed the opposite however and bears additional analysis after ERCOT publishes its July generation by fuel type report.

Exhibit 3 Resource Outages - ERCOT (MW)

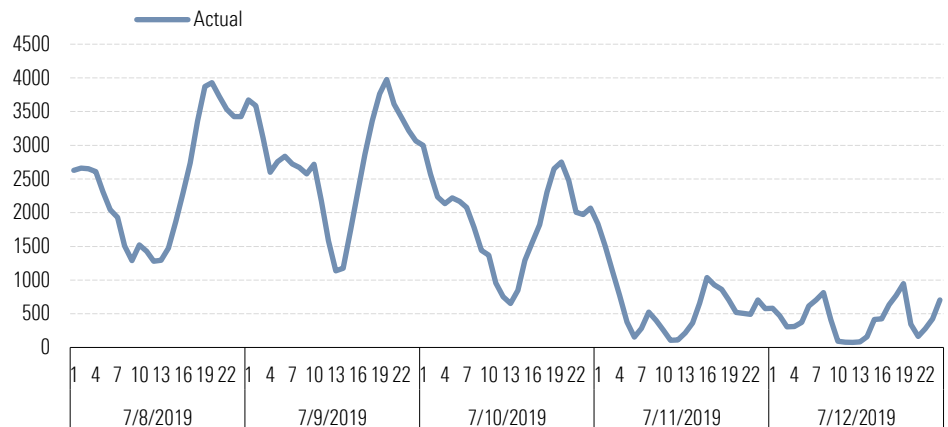


Source: ERCOT

Less Wind Means Lower Prices?

In addition to stronger demand and lower outages, July 9 saw a significant drop in intraday wind generation in South Houston (Exhibit 4), which could account for some of the price spike to \$274/MWh. Houston lost around 1,000 MW of wind on July 9 for a few hours before recovering, which might also have played a role in setting up a higher price environment for the rest of the week. Unexpectedly, the lowest prices last week were experienced when wind generation was at its lowest point, which is counterintuitive.

Exhibit 4 South Houston Wind Generation (MW)

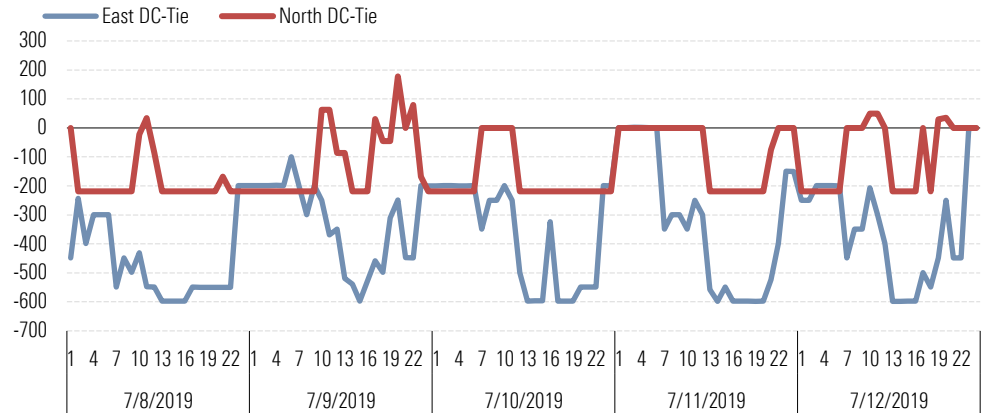


Reversing Flows

Increased demand across the ERCOT system last week led to imports of electricity close to capacity on two relevant direct current ties (Exhibit 5) for Houston hub pricing. Flows on the East and North DC ties

showed reliance on imports for much of the week. The price spike on July 9 overlapped to flows reversing on the North DC tie, which can be seen in Exhibit 5.

Exhibit 5 North DC and East DC Tie Flows (MW)



Source: ERCOT.

Conclusion

Trying to predict day-ahead prices in ERCOT is tough, and last week proved to be a good example of how quickly market conditions can change. While our model captured some of the peaks directionally, it failed to forecast the magnitude of the price move. While inherent challenges exist in forecasting price, fundamental assumptions around the relationship between renewables and price continue to evolve in ERCOT. The task of building a model to forecast load and power price is challenging, but ERCOT's current stack evolution represents a unique opportunity to determine the efficacy of a statistical approach, which makes the prospect of building a flexible model more interesting. ■■

Feedback

We actively seek feedback on model development from clients and prospects and would be interested in discussing the value of this work with commercial trading and analytics as well as to compare our results and approach with internal and external alternatives used by the industry. Please contact Matt Hong (matthew.hong@morningstar.com) or Michael O'Leary (michael.oleary@morningstar.com) for additional comments or questions.

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