Solving for the CAISO Problem(s)

It's no secret that California has been experiencing some problems with power. Going into this summer, the California Independent System Operator (CAISO) was the US region most likely to experience power shortages (DiSavino 2021).

Last year, they experienced rolling blackouts in August. In July of this year, the California Independent System Operator's (CAISO's) Board of Governors wore Hawaiian shirts to encourage California residents to dress more lightly on summer days to reduce the increased power demand that air conditioning causes on hot days, and to compensate for the lack of renewable generation during peak hours of the day (Sangree 2021). There have been warnings of potential rotating outages in the state throughout the summer (DiSalvino 2021).

These issues have residents, the CAISO, and market participants alike worried. Residents are concerned about outages and rising utility bills, the ISO is on the hook to ensure the region has reliable and accessible power, and market participants are exposed to further risk during volatile periods.

The bottom line is that CAISO has a capacity problem at times of peak demand. Since CAISO, and all deregulated ISO markets, operate using a model based on supply and demand economics, it's no surprise that energy prices in CAISO are increasing. The California Department of Market Monitoring (DMM) reported that CAISO's wholesale costs increased by 19% per MWh last year (Mullin 2021), making power more expensive for consumers. Yes Energy's data demonstrates that round-the-clock real-time and day-ahead prices were more than twice as high in July of 2021 as they were in July of 2019 or 2020.

Date/Time	TH_SP15_GEN-APND (RTLMP) Average	TH_NP15_GEN-APND (RTLMP) Average	TH_ZP26_GEN-APND (RTLMP) Average	TH_SP15_GEN-APND (DALMP) Average	TH_NP15_GEN-APND (DALMP) Average	TH_ZP26_GEN-APND (DALMP) Average
07/01/2019 00:00:00	30.38	28.63	28.66	31.50	30.26	30.36
07/01/2020 00:00:00	32.67	26.04	25.20	27.96	25.68	25.17
07/01/2021 00:00:00	65.59	68.12	62.51	67.89	67.14	64.68

Figure 1

While the above explanation is true, it is perhaps an oversimplification. Anyone working in the power industry knows there are multiple variables that affect nodal power prices. Extreme weather, whether hot or cold, can impact residential energy use as well as the grid's ability to produce and transport power, and California and the West, are experiencing increasing temperatures. Transmission outages and congestion can also have a significant impact on nodal pricing, and fires have impacted power supply and transmission in California (Balaraman 2021). Leveraging Yes Energy's data, in Figure 2 we can see that temperatures in July 2021 were above the 10-year average normal temperature for a greater number of days than in either July of 2019 or 2020. You can also see that Real-Time congestion in July of 2021 has increased significantly compared to the past two years. Viewing the top ten constraints in July of 2021 allows us to explore where the increased congestion on the system is coming from.

Examining the associated data points in Figure 3, we can infer that congestion around imports to CAISO have been prevalent this summer.

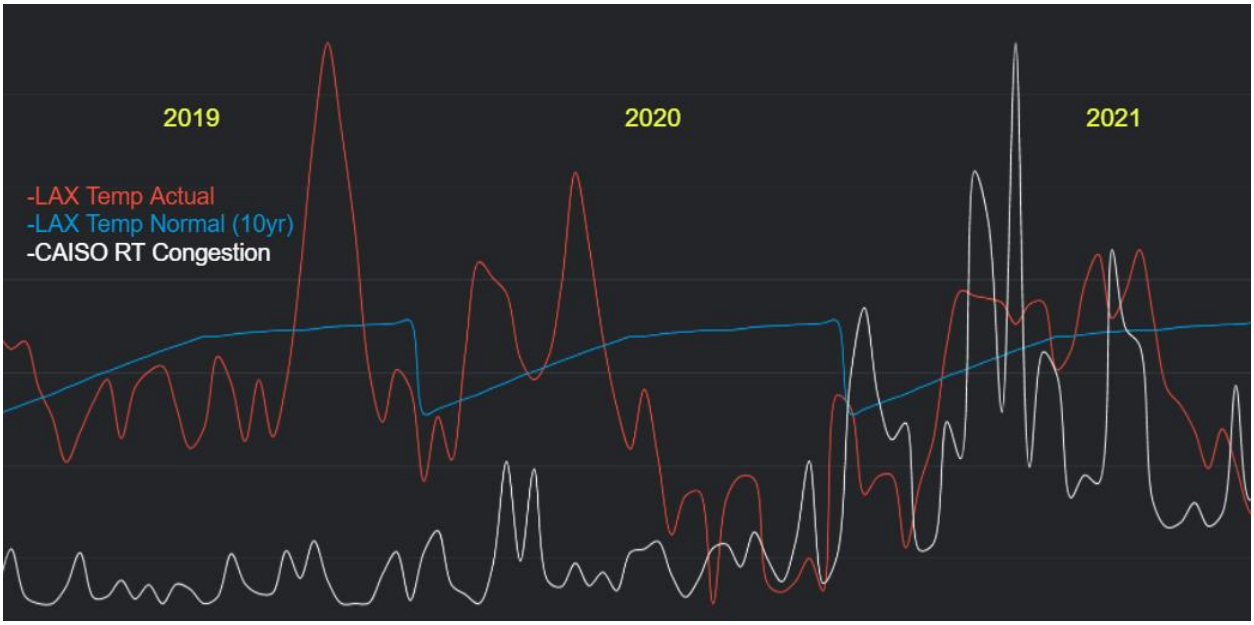

Figure 2

34116_LE GRAND_115_34134_WILSONAB_115_BR_1_1	PGE	PGE	839.00	112.77	150,694.00	202.55	2,268.28
OMS_9959454_CUYAMS_TAFT_70_1	PGE	PGE	378.00	50.81	64,662.55	86.91	457.03
33516_RIPON J_115_33514_MANTECA_115_BR_1_1	PGE	PGE	235.00	31.59	53,530.28	71.95	1,697.89
OMS_9959454_KTTLM_GATES_70_1	PGE	PGE	315.00	42.34	37,720.14	50.70	328.37
7430_CP6_NG	PGE		61.00	8.20	34,113.91	45.85	2,431.51
32214_RIO OSO_115_30330_RIO OSO_230_XF_2A	PGE		500.00	67.20	32,444.53	43.61	1,030.43
PSEI IMPORT	PSEI		1,258.0	169.09	26,699.81	35.89	920.40
22192_DOUBLTTP_138_22300_FRIARS_138_BR_1_1	SDGE	SDGE	61.00	8.20	25,738.50	34.59	1,213.46
34150_NEWHALL_115_34154_DAIRYLND_115_BR_1_1	PGE	PGE	192.00	25.81	25,568.68	34.37	1,985.75
SCL IMPORT	SCL		1,262.0	169.62	25,404.19	34.15	920.40

Figure 3

CAISO's capacity problem has presented itself for a variety of reasons. Intermittent renewable resources are not always available at times of peak demand, particularly problematic is when solar goes offline on hot evenings but demand remains steady. The quantity of gas and oil generation is also dwindling, and plants that were set for retirement due to significant operating costs have been kept running to compensate for the lack of capacity. California also has a big hydro problem (Sangree 2021). According to CAISO's president and CEO Elliot Mainzer, approximately 15% of California's energy supply comes from in-state hydro resources, the state additionally imports a significant amount of hydropower from the Pacific Northwest (Walton 2021). Diving into Yes Energy data in Figure 4, we can see total Hydro generation decreasing

year over year in July. Additionally, we can see that imports aren't making up for the significant drop in hydro capacity.

Date/Time	CAISO (HYDROGEN_HOURLY) Total	CAISO (IMPORTGEN_HOURLY) Total
07/01/2019 00:00:00	2992030.00	4408700.00
07/01/2020 00:00:00	1599658.00	4650056.00
07/01/2021 00:00:00	985571.00	4047763.00

Figure 4

The problem? Hydroelectric sources are running out of fuel, or rather, water. The DMM reported that the percentage of hydro contributing to CAISO's supply dropped from 14% in 2019 to 8% in 2020, and the average percentage for this year has been even lower than last for every month excluding March (Mullin 2021). At the end of June this year, California's hydro levels were 40% lower than last year's levels, Mainzer reported (Walton 2021). In the past couple of weeks, the Edward Hyatt Power Plant on the Oroville Dam shut down for the first time since the dam was built in 1967 due to low water levels (CBS SF Bay Area 2021). The Hyatt plant can produce up to 750 MW, although it generally produces between 100 and 400 MW (Mulkern 2021). Below, Figure 5 portrays all hydroelectric facilities currently in some state of unplanned reduced capacity as of 8/25/2021, encompassing some 126 generators.

Figure 5

In times of high volatility, while some market participants have the opportunity to increase profits significantly, others are losing out. Regulators, market participants, and citizens alike are on edge after the outages in ERCOT this year led to enormous defaults, loss of human life, and a PR disaster. It has been reinforced that outages at that scale, and prices that high, have the potential to lead to disaster. The DMM reported that the combination of hydro loss and

increased summer load last year led CAISO's market to be structurally uncompetitive for more hours than any year in the last five years. Bid-Cost recovery also increased by $3 million dollars last year (Mullin 2021), further increasing power prices. Whether you're an asset operator, asset developer, or financial trader, in a volatile environment like this, it's essential that your business has a strategy to ensure you don't get caught on the wrong side of the market. But clearly, there are a variety of factors that need to be taken into consideration when developing a strategy and operational plan. With so many variables contributing to increasing LMPs and capacity shortages, how are CAISO, utilities, IPPs, or financial traders supposed to solve the problem and ensure that they have a strategy to protect their organization going forward?

The answer lies in leveraging data. Armed with powerful, comprehensive nodal power market data, your business can explore the factors contributing to the capacity and pricing dynamics in CAISO. Leveraging this data can inform your business strategy to ensure that you're monitoring the components most likely to impact your profit margins. Yes Energy provides the best nodal market data available to power your business, in whatever format needed for where you are in your Big Data and Digital Transformation Journey. Explore the markets using our flagship solution, PowerSignals, or crunch millions of rows of data with our DataSignals Cloud and Lake solutions. Wherever you are on your journey, our data will provide the insights you need to make the best decisions possible in periods of market volatility.

To schedule a consultation and complimentary demo of our data solutions, click here and we'll be in touch!