

The Honorable Severin Borenstein
Vice Chair, CAISO Board of Governors

May 24, 2024

Greetings Governor Borenstein:

At yesterday's Board of Governor's meeting you asked whether there is a relationship (correlation) between transmission congestion and the curtailment of wind and solar energy. The answer is that there is a clear and strong relationship between transmission congestion and the curtailment of solar and wind energy production. It is one of the major challenges in integrating more renewable energy sources to the grid.

Evidence of Increasing CAISO Transmission Congestion

Please see Table 4.6-1: *Summary of high-level investigation on major transmission congestion* on Page 109 of the Transmission Plan. For Path 15 the Transmission Plan states "Path 15 corridor congestion was attributed to both Path 15 path rating binding and binding of the 500 kV or 230 kV lines of the path when the flow is from south to north. The Path 15 corridor congestion was highly correlated with the Path 26 congestion, which was also observed when the flow is from south to north. Renewable generators in the PG&E Fresno/Kern area and offshore wind modeled at Diablo Canyon also contributed to the Path 15 corridor congestion."

I also mentioned that there is congestion from Las Aguilas to Moss Landing. Following is what the Transmission Plan states "Congestion on the Moss Landing - Las Aguilas 230 kV line under the N-1 contingency of the Moss Landing - Los Banos 500 kV line occurred when the flow was from Las Aguilas to Moss Landing. The congestion was observed in day time. The congestion is attributed to both the PG&E's Fresno area solar generation and the PG&E's Greater Bay Area load. The congestion was aggravated as solar generation in the PG&E Fresno area increased in this cycle's base portfolio."

Evidence of Increasing Curtailment

As you are aware, the CAISO produces an excellent daily report on wind and solar curtailment.¹ The report shows both local and system caused curtailment. Local curtailment is defined as market dispatch of generators with economic bids to mitigate local congestion. Congestion occurs when available, least-cost energy cannot be delivered to some loads because transmission facilities do not have sufficient capacity to deliver the energy. System curtailment is defined as market dispatch of generators with economic bids to mitigate system-wide oversupply. As you can see from the May 22, 2024 report the bulk of curtailment on the CAISO system is local.

Curtailment of Solar Generation in the Fresno Area

The Transmission Plan identifies the Fresno Area as one of the transmission zones that will have the most curtailment based on the modeled preferred system portfolio. Table 4.6-2 on Page 111 shows a summary of wind and solar curtailment in the base portfolio based on production cost

¹ http://www.caiso.com/Documents/Wind_SolarReal-TimeDispatchCurtailmentReportMay22_2024.pdf

modeling. The forecasted annual curtailment is over 18.8 percent (4,267 gigawatt hours) of the potential generation from the area. I urge you to look at the 20-Year Transmission Outlook Update which takes a longer horizon view of the need for additional transmission in the Central Valley and into the Bay Area. The impact continues to grow as more solar and battery generation is added in the San Joaquin Valley.

Curtailment Impacts and Solutions:

- Curtailment wastes available clean energy and reduces the economic benefit of developing more renewable energy.
- Upgrading the transmission infrastructure is crucial to handle the increasing amount of renewable energy that needs to come online.
- Other solutions include improved grid management (Grid Enhancing Technologies), deployment of more energy storage technologies, and improved forecasting of renewable energy generation.

I appreciate your asking of the question about curtailment at the May 23, 2024 meeting and look forward to a continued dialogue.

Regards,

Ed Smeloff

Cc: Board Governors Jan Schori, Mary Leslie, Angelina Galiteva and Joe Eto