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California Energy Commission Preliminary 2022 Summer Supply Stack Analysis

Background

Extreme heat events in 2020 impacted the western United States and strained electric system operations in California. In response, the California Energy Commission (CEC), California Independent System Operator (CAISO), and California Public Utilities Commission (CPUC) instituted actions in late 2020 and early 2021 to provide greater grid reliability for summer 2021, including emergency procurements and increased coordination among balancing authorities in the state.

However, 2021 has proved to be another extreme summer with heat events in June and July that taxed resources. With climate change, extreme weather events that were previously considered low probability events must be accounted for in electric sector planning. Planning reserve margins around 15%, historically considered robust in California, are now likely low given the risk to supply and demand under extreme heat, drought, wildfire threat and a changing resource portfolio.

As a result of the 2020 heat events, the CEC initiated an annual reliability outlook in early 2021, which assesses anticipated supply against anticipated demand under average and extreme weather conditions. This outlook is an hourly stack of available supply given projected hourly demand for the peak day of each month, July 2021 through September 2021. The first summer 2021 stack analysis was presented at a May 4, 2021 joint agency Integrated Energy Policy Report (IEPR) workshop. This first analysis included projections for August 2021 and September 2021 with the current information on CPUC expedited procurement, an average projection for resource adequacy imports considering average and extreme weather scenarios. The analysis showed the potential need to call on contingency resources of up to 2,300 MW during the 6 PM to 8 PM period under extreme weather. Contingency resources include voluntary and compensated customer load reductions, imports from other balancing authorities, and additional thermal generation.

Shortly after the May 4, 2021 IEPR workshop, it became apparent that an update of the analysis was necessary. Significant impacts to hydro supply and demand were identified due to the 2021 drought, CPUC staff identified procurement delays, and the Russell City Energy Center, a 600 MW electric generating facility, went offline due to a catastrophic incident with the steam turbine generator. CEC staff updated the stack analysis and presented the results at a July 8, 2021 joint agency IEPR workshop. The analysis showed a potential to call on contingency resources of up to 3,800 MW under an extreme weather scenario.

After the July 8, 2021 IEPR workshop, the CEC, CPUC, and CAISO agreed to develop a preliminary Summer 2022 Stack Analysis to better inform the public about potential implications if the 2021 California drought and western extreme heat events persist into summer 2022, as current National Oceanic and Atmospheric Administration models predict. Following are the input assumptions and the projected July 2022 thru September 2022 Stack Analysis considering both an average (15%) and extreme weather (22.5%) demand curve.

Summer 2022 Key Input Assumptions

Assumptions about demand and available resources in 2022 are based on the best available data at this time. Demand is based on the 2020 CEC IEPR Update Mid Demand Case. Available supply projections are based on the CAISO NQC list with modifications based on anticipated new resources, planned retirements and potential drought impacts. Supply assumptions are intended to reflect physical resource availability and may not necessarily reflect resource adequacy or other contracts. The assumptions used in the 2022 analysis are described below.

Table 1: Demand-side Assumptions

Demand Category	Assumptions
Base Demand	Hourly IEPR 2020 Update Adopted Demand for Year 2022
Drought Adjustment to Demand	200 MW to 400 MW decrease in peak period demand due to water agency pumping loads, consistent with impacts in 2021

Table 2: Supply-side Assumptions

Supply Category	Assumptions
Baseline Resources	Monthly NQC values from CAISO 2021 NQC List. Solar resources are converted to an hourly shape based on CEC PLEXOS model solar profiles.
Hydro Drought Derate	1,500 MW derate to California hydro capacity, reflecting continued drought into 2022. Derate is 500 MW greater than summer 2021.
Imports	Average 2015-2020 CAISO RA showings
Retirements	834 MW Redondo Beach Units 5,6 and 8 retired
CPUC Procurement Between 2021 and 2022	CPUC Procurement of 840 MW by August 2022; CPUC Expedited Procurement carry over of 556 MW from 2021

Table 3: PRM Assumptions

Demand Curve	PRM Assumptions
Extreme Weather	22.5% PRM: 6% for Operating Reserves, 7.5% for Outages, 9% for demand variability (equivalent to a greater than a 1-in-10 weather event)
Average Weather	15% PRM: 6% for Operating Reserves, 7.5% for Outages, 1.5% for demand variability

Results

Figures 1-3 display July, August, and September 2022 hourly supply stacks, respectively. There is a need for significant contingency resources in summer 2022 or additional procurement by summer 2022 under the 22.5% PRM demand curve. The contingencies range in amount from just under 600

MW to almost 5,200 MW, assuming a 22.5% demand curve. Under a 15% demand curve, contingencies are projected to only occur in the month of September in the net-peak hours.

Conclusions

The Summer 2022 Stack Analysis identifies the risk of potential energy shortfalls under both average and extreme weather planning reserve margins. This analysis projects an additional 600 MW to 5,200 MW of resources may be required to ensure electric system reliability for peak and net-peak hours during summer 2022 without the use of contingency resources. Additional resources are needed to provide electric system resilience against climate-induced drought and extreme heat events in California as well as wildfire-related outages or west-wide heat events compromising interstate energy transfers.

Figure 1: July 2022 Hourly Supply Stack under a 15% and 22.5% PRM

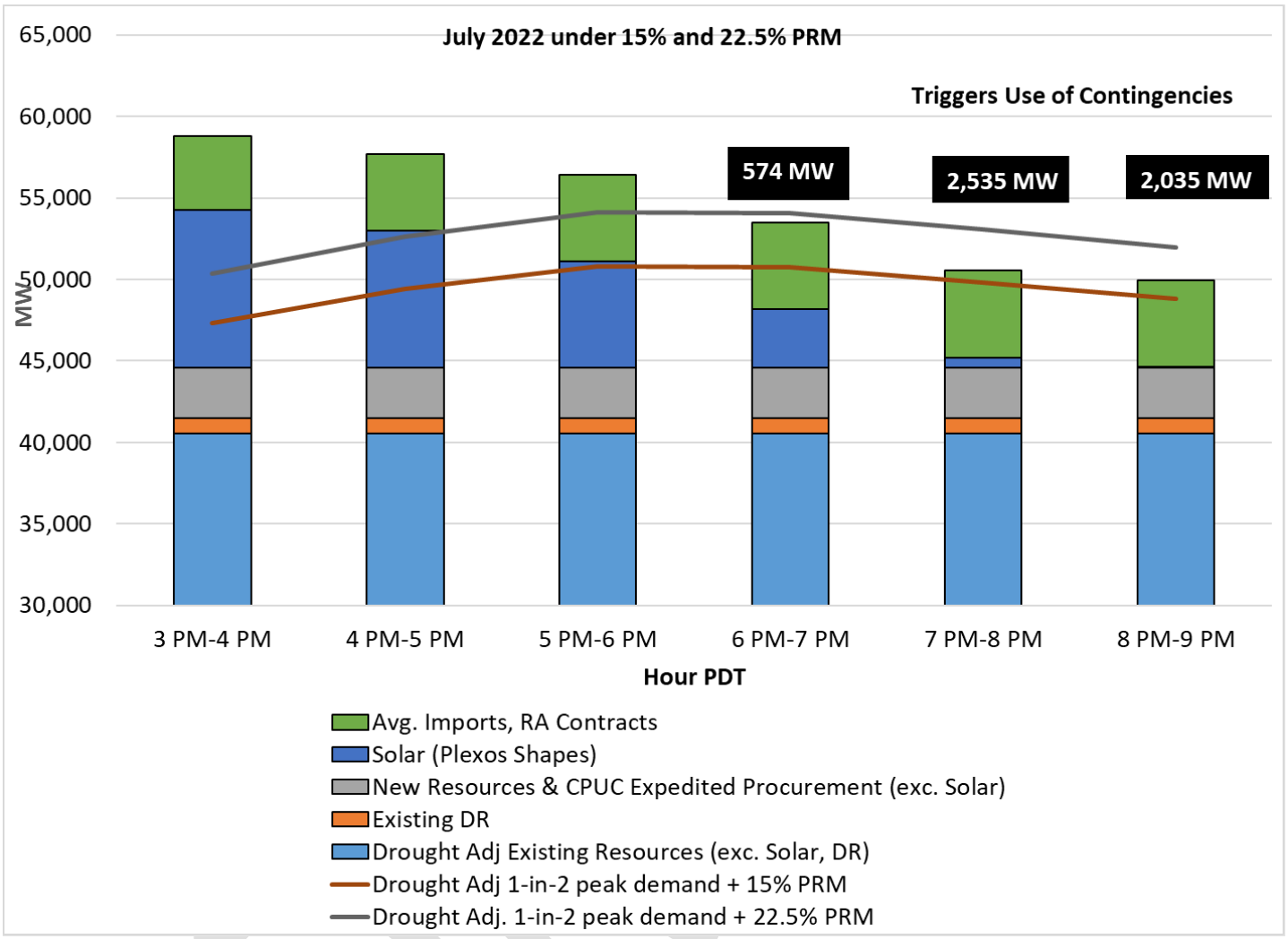

Figure 2: August 2022 Hourly Supply Stack under a 15% and 22.5% PRM

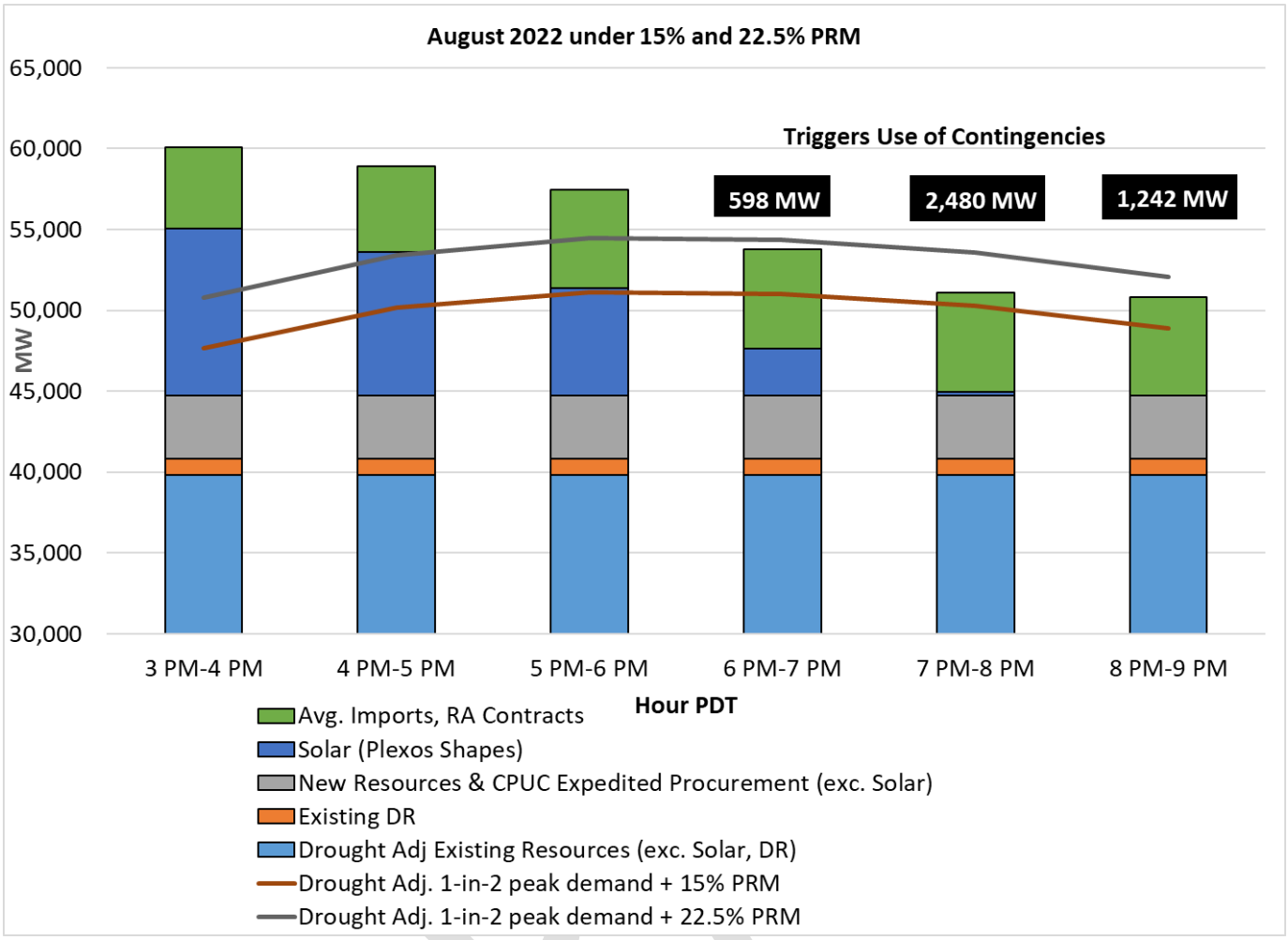

Figure 3: September 2022 Hourly Supply Stack under a 15% and 22.5% PRM