

MATCHING TIME-OF-USE RATE PERIODS WITH GRID CONDITIONS MAXIMIZES USE OF RENEWABLE RESOURCES

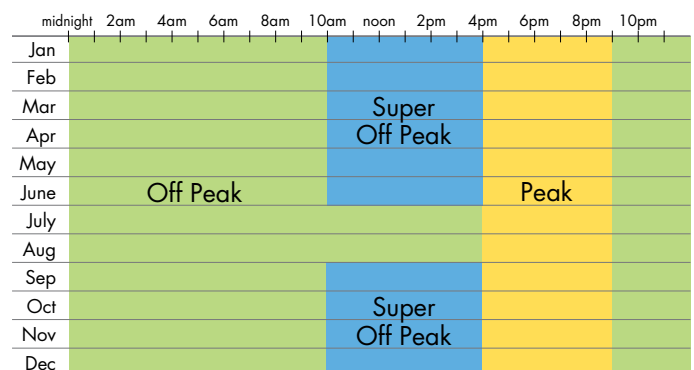
During certain times of the day, energy production in California can outpace demand, potentially throwing the supply and demand off balance. Since there is limited ability to store this excess power, it must be curtailed to maintain electric reliability. The state policy has driven investment in several approaches to maximize use of the renewable resources and support greenhouse gas reduction goals. Among these mechanisms is price signals to consumers when there's surplus and constrained supplies, so they can make decisions on use based on cost. Historically, time-variant pricing focused on the "peak" periods, the times when electric supply was scarce. Critical peak pricing signals higher energy prices to customers, encouraging them to conserve during those times, which can avoid the need to invest in additional generation and help keep electric costs down. Now, in this era of plentiful electricity from renewable sources, we need to alert customers not only to times when supply is constrained, but also when there is a surplus, to provide incentives to consumers to take advantage of low-cost electricity.

The California Independent System Operator (ISO), the operator of 80 percent of the state's electric grid, performed an analysis to determine when surplus and limited supplies might occur. Using data from 2013 and 2014, the study identified trends in renewable generation compared to electric demand on the system. The ISO also gathered data from the California Public Utilities Commission's 2024 long-term procurement planning process and 2021 wind and solar projections, as well as demand forecast for 2021 and 2024 produced by the California Energy Commission. From this data, the ISO created projections of future load curves of anticipated electricity needs and net load curves, calculated by subtracting solar and wind output from the overall demand. The ISO then created time blocks comparing the load to the 5-minute distribution of net load. The ISO observed patterns in the data that resulted in the recommended price periods as for weekdays and weekends through the year.

WEEKDAYS



WEEKENDS



The analysis showed that throughout the year, on both weekdays and weekends, supply is expected to be constrained during the peak hours from 4 p.m. to 9 p.m. when the sun is setting and solar output is declining. During the months of July and August, the supplies are even more limited during peak hours, and higher demand begins as early as noon.

More interesting, however, is the amount of time that supply is expected to be plentiful or in surplus. With the exception of July and August, on the weekends, supply surplus is expected to occur during “super off-peak” hours from 10 a.m. to 4 p.m. when solar generation is at its highest. Similarly, surplus conditions are expected during this same time period on March and April weekdays, when weather is mild and air conditioning use is at a minimum. Additionally, supply is projected to be generally plentiful starting at 9 p.m. through the next morning or afternoon, depending on the month.

With this information, time-of-use rates could be developed using lower prices and incentives to drive consumers to shift electric consumption to these off-peak or super off-peak periods. It will also be important to examine current time-of-use structures and re-align the pricing to be consistent with the expectations of available electric supply. Once customers understand the times the cost of electricity is at its lowest and cleanest, it is anticipated they will change their behavior to realize this benefit.

While this is only one of many strategies available to maximize use of renewable resources and reduce greenhouse gases, it is a valuable one. In addition to direct customer benefits, by using supply when it is ample and reducing use when electricity is limited, less investment will be needed, reducing costs for all consumers.