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California Customer Load Reductions during the Electricity Crisis: Did they Help to Keep the Lights On?

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Abstract

Recurring electricity shortages and rolling blackouts were widely forecasted for summer 2001 in California. Despite these predictions, blackouts were never ordered – in large part, due to the dramatic reductions in electricity use throughout the state. Compared to summer 2000, Californians reduced electricity usage by 6% and average monthly peak demand by 8%. Our analysis suggests that these reductions were not caused by either the weather or the downturn in the state's economy; rather, they were the result of extraordinary efforts by Californians to reduce electricity consumption. Based on the California Independent System Operator's (CAISO) available operating reserve margin during summer 2001, we estimate that the peak load reductions, which ranged between 3,200 and 5,600 MW in the four summer months, potentially avoided between 50 and 160 hours of rolling blackouts.

This extraordinary response by Californians can be attributed to several factors including media coverage and informational campaigns that affected public awareness and understanding, real and/or perceived increases in electricity rates, and various policies and programs deployed by state policymakers and regulators to facilitate customer load reductions. Among these programs, we review the state's 20/20 rebate program, the utilities' energy efficiency programs, programs or initiatives implemented by the California Energy Commission and other state agencies, and load management and demand response programs offered by the state's investor-owned electric utilities and the CAISO.

We estimate that energy efficiency and onsite generation projects that were initiated in 2001 will account for about 1,100 MW of customer load reductions, once all projects are installed. These savings represent about 25-30% of the observed load reductions and are likely to persist for many years. The persistence of the remaining savings, which were due to changes that customers made in their conservation behavior and energy management operations, will be heavily influenced by customers' perception of continuing electricity crises or significant energy problems and price sensitivity to retail rate trends. The State's current demand response (DR) capability enrolled in utility or CAISO programs is somewhat lower than prior to the crisis. However, in the long run, enabling technologies for demand response deployed through the CEC's Demand Responsive Buildings and Real-time Metering programs have the potential to significantly increase demand response capability.

While unique factors led to the electricity crisis in California, we believe the lessons learned from electricity customers' response may be useful for other regions faced with the prospect of electricity shortages.

- During a short-term crisis, a comprehensive set of load reduction programs and policies can make a significant contribution towards maintaining electric system reliability and can be an effective alternative to strategies that rely solely on rationing demand (e.g. rolling blackouts) or dramatic price increases.

- Information from various media sources contributed to very high customer awareness of the electricity crisis and helped spur customers to take actions to reduce their electricity usage. Customers viewed the media as an important, and in many cases, trusted information source,

which appears to have increased their receptivity to participating in various State and utility initiatives.

- A commitment to ratepayer-funded energy efficiency programs and energy efficiency standards for appliances and buildings are critical elements of a long-term strategy to dampen growth in electricity demand. California's energy efficiency services delivery infrastructure, which was strengthened by years of ratepayer and State-funded programs, represents a significant resource that was ramped up quickly to respond to a short-term energy emergency.

- It is important for regulators to adapt and re-design utility load management programs and retail tariffs long before an electricity crisis, so that retail customer loads can participate directly in bulk power markets and respond to high prices and/or system contingencies.

- If regions are facing chronic electricity shortages for hundreds of hours, then a 20/20-type program is worth considering. This type of program is most appropriate for residential and small commercial customers. Among large C/I customers, a combination of voluntary initiatives in government and private sectors, targeted financial incentives for high-efficiency or demand response equipment, and pricing/rate design strategies that reflect wholesale market costs are more likely to achieve load reductions at lower cost than a 20/20 type program. If electricity shortages are projected for only a few hours, then other types of demand-side initiatives may be more appropriate and effective (e.g., voluntary conservation, demand response or energy efficiency programs, pricing).