

Electricity Demand Response

The electric supply problems in California and elsewhere during 2001 have brought national attention to the need for new capacity to meet growing electricity demand. The recent problems have spurred national attention to alternative responses to the crisis, particularly from the demand side. Demand-side solutions generally involve customer load reduction (through either curtailment or use of distributed generation) in response to price signals or directions from distribution utilities or system operators. By and large, these solutions also involve a greater degree of flexibility and interactivity than the load management programs implemented in past years. The former “demand-side management” programs were implemented in an era of regulated electricity supply to forestall the need for new generation, transmission, and distribution capacity additions through an “integrated resource planning” approach. The incorporation of demand response can produce multiple benefits—providing system operators one more option to use during system emergencies; creating tangible economic incentives to reduce demand by customers; mitigating electricity producers’ market power; and introducing demand elasticity in the face of high prices.

Demand response programs currently implemented across the United States include real-time pricing tariffs, emergency load curtailment programs, voluntary demand response programs, demand bidding programs, and direct load control.

- Real-time pricing tariffs expose customers to price volatility in the wholesale market. Wholesale market prices are passed through to customers who are charged on an hourly basis. Customers who can respond quickly

to high prices or shift their consumption to lower-price periods can reduce their electricity bills.

- Customers that participate in emergency load curtailment programs must reduce their consumption to predetermined levels in response to directions from system operators. In exchange for these reductions, customers receive discounted electricity rates or are paid directly for the reductions.
- Voluntary demand response programs also pay customers to reduce their load upon request by system operators, but the customer does not have a contractual obligation to curtail their demand.
- Demand bidding programs let the customer specify their own reservation bid for a specified level of load curtailment. If customer bids are at or below market clearing prices in the wholesale market, the customer must reduce demand by this amount and then receives payment for the reductions.
- Direct load control programs remotely cycle off customer appliances, such as air conditioners, water heaters, and pool pumps during times of high peak demand.



Although many of these programs are in their relative infancy, several underlying themes and findings can be identified. First, demand response programs were active this past summer. During the heat waves that blanketed the eastern half of the United States in late July and early August, system operators throughout the region turned to emergency curtailment programs and direct load control to reduce demand. Surprisingly, although demand response programs had been designed in preparation for the sum-

mer in California, they were not used to any great extent during this time frame due to cooler than normal weather and confusion over funding and regulatory jurisdiction.

Second, customers have the capability to reduce their load. In response to pleas from state officials and various rate incentives, California residents and businesses (including federal government facilities by Executive Order) reduced total state demand between 10 and 15 percent. A key rate incentive available in California is the 20/20 rebate program that provides a 20 percent reduction on electric bills if customers reduce their usage by greater than 20 percent. More than 30 percent of customers in the San Diego region have reduced their consumption to qualify for this incentive. Building managers in New York City who participated in Consolidated Edison's (Con Ed) and the New York Independent System Operator's demand response programs undertook a variety of actions, including shutting down banks of elevators, dimming lobby lighting, turning up air conditioner thermostats, shutting down nonessential equipment, and operating their emergency generators.

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Third, customer market research conducted by ICF Consulting in California and New York suggests that customers are interested in participating in emergency load curtailment programs and voluntary demand response programs as long as their reductions are used to forestall imminent outages and blackouts. However, most cus-

tomers are not interested in expending significant time and effort tracking wholesale prices and actively bidding and participating in these programs on a regular basis. As a result, customer involvement in real-time pricing programs and demand bidding will probably be limited to the largest and most flexible customers until advanced meters and information systems are widely deployed. These sentiments have been supported by reports in Wisconsin that customers are interested in reducing their demand only when payments approach \$1 per kWh reduced.

Fourth, a whole new demand response industry is developing. Companies in this industry are offering a wide range of services to utilities and their customers from software and hardware to aggregation of customer load reductions. New automated meter reading systems and energy information systems are being developed to provide customers the capability to monitor their usage and participate in demand response programs. ICF Consulting has been retained by the California Energy Commission to implement and fund customer installations of these systems in the small commercial and industrial sector. Our early experience has identified multiple vendors, interested customers, and a wide variety of strategies to reduce peak demand.

ICF Consulting is a key provider of demand response expertise. The firm develops and implements demand response programs for electric utilities, government agencies, and trade associations. The firm combines expertise in customer demand reduction strategies and implementation of energy efficiency outreach with detailed knowledge of the electricity market. 