Curtailment Program Update

Through utility incentives, lower demand charges, and decreased energy bills in some cases, commercial and industrial facilities benefit from participating in curtailment programs. There are many factors to consider when deciding if a curtailment program is right for your facility, from incentive amounts to length of expected curtailments. Each type of curtailment program offers slightly different policies and terms, but the underlying concept for all of them is that many small reductions in demand can balance high wholesale power prices or periods of high power demand. Curtailment not only benefits the reliability of the grid and delays the need for new generating plants, but it can also lead to savings on energy and demand charges at the facility level.

What Is Curtailment?

Many electric utilities and independent system operators (or ISOs, which are regional power grid management organizations) offer voluntary curtailment programs for their commercial and industrial customers. Depending on their characteristics, the programs can also be known as load-management, load-shedding, or demand-response (DR) programs. These programs are essentially agreements between the utility and energy users. They grant reduced rates or rebates to customers who are willing to curtail their electricity demand (load) on request by turning equipment down or off. A curtailment "event"—the period of time in which the grid is strained or wholesale prices are high—varies depending on the circumstance and the program. Many program types are available, with various risks and rewards. Some programs are contractually limited to only a few curtailment events per year, and some curtail frequently. Facilities may receive notification of the event a day, or an hour, or less, in advance. Depending on the systems that are curtailed, building occupants may not notice at all when curtailment occurs, they may notice and not be bothered, or they may be inconvenienced.

Program Types Available

Curtailment programs are as varied as the utilities and ISOs that offer them. Some utilities offer a smorgasbord of programs, while others offer only one. Wherever your company is located, the curtailment programs available to you can be categorized in several ways.

Reliability-Based and Price-Based Programs

Demand-response programs fall into two broad categories: reliability-based and price-based. Facilities in reliability-based programs receive requests or orders to decrease their load in order to provide relief to the grid. These notifications may be provided a day in advance based on weather predictions or minutes in advance in emergencies. Price-based programs are designed to help utilities cope with high market prices for electricity—utilities can minimize the amount of high-cost electricity they must purchase during times of peak demand by asking facilities to use less. In either case, customers typically pledge that they will reduce a certain amount of electrical load at needed times.

Voluntary Versus Mandatory Response

Customers in voluntary programs can decide case-by-case if they will shut off equipment or limit demand in response to the utility notification. Customers in mandatory programs must comply with the utility request for demand reduction and reduce the amount of load to which they are contractually obligated. Failure to comply when enrolled in a mandatory response program can result in fines or ejection from the program.

Same-Day or Day-Ahead Notification

Whether voluntary or mandatory, curtailment programs differ in the timing in which facility operators are notified before a curtailment event. In some cases, a utility or ISO provides notice less than an hour before the event. This can be caused by an unforeseen occurrence such as the loss of a transmission line or a sudden spike in wholesale prices. In a day-ahead notification program, customers have more time to prepare for the event. For example, a customer receives day-ahead notification from the utility that the following day will be exceptionally hot and the grid will likely be strained—thus, an event is called. The customer advises its employees that temperatures in the building may be slightly elevated the following day because temperature setpoints on air-conditioning units will be increased during the event. Day-ahead notification allows staff to plan to dress lightly.

Risks and Benefits

A risk of participating in mandatory curtailment programs is the possibility of penalties for noncompliance. These penalties are levied because a large customer's inability to decrease load as expected may make it necessary for the utility to purchase power at high prices in an emergency. Penalties are assessed as fines per kilowatt-hour (kWh) of energy used in excess of the level the customer agreed to curtail to. In other cases, penalties appear not as fines but as decreased incentive payments in the future.

Benefits include lower rates most of the time, decreased demand charges (fees based on a facility's peak energy demand), the possibility of decreased energy bills, and direct payments from the utility or ISO. Programs with shorter notification times, more and longer events, and guaranteed reductions generally pay more. Facilities with loads over 200 kilowatts (kW) can earn in the range of $20,000 to $30,000 per year. Payments may be calculated per year, per event, or per kW or kWh reduction during an event and are paid to customers as bill credits in most cases. Facilities that participate in DR programs can help improve overall reliability of the local electric system, contributing to the public good by making blackouts less likely.

Logistics of Participating

Typically, customers must meet a few minimum requirements to participate in curtailment. Many programs set the bar for participation at a specific total load—say, 200 kW—for commercial and industrial customers. In addition, many entities require participants to have specific types of meters. ISO-New England, for example, requires customers to have real-time meters or interval

Capacity Bidding

In capacity bidding, facilities determine a specific amount of electricity that they can cut the following day and receive payments accordingly. Several campuses of California State University participate in capacity bidding. Pumps, pools, lights, fountains, and fans on variable-frequency drives are typical curtailment targets. Depending on participation, the university can receive $25,000 to $75,000 or more per event. As the capacity payments become consistent, they become expected sources of revenue and lead to reductions in future operating budgets.

What Facilities Are the Best Candidates for Curtailment?

Your facility might be a good candidate if it has:

- Large loads to curtail (either at the individual facility or across aggregated facilities)
- Nonessential loads (such as decorative fountains or lights in unoccupied areas)
- Operational flexibility (the ability to temporarily switch off a process load)
- Fuel switching or energy storage options
- An energy-management system that controls significant portions of lighting, HVAC, or process equipment

meters that are capable of recording data in five-minute increments to prove that they curtailed a specific amount of load. Customers sign a contract to participate in a program; the length of contracts varies, as do customers' abilities to get out of a contract early. For some programs, customers will have to pay for upgraded metering and communications equipment.

Once a facility has signed up for a DR program, the next step is to determine which building systems will be affected. Most facilities need to target nonessential loads that won't have a big impact on operations and may not even be noticeable. Lighting and HVAC are the most common systems that are reduced in curtailment programs. In unoccupied areas, lighting may be dimmed or turned off. Several components and types of HVAC systems can be addressed—for example, chilled water, air handling, fans, and pumps. Facility managers can adjust chilled water systems' temperature setpoints, use all available steam or gas chillers before electric ones, and cool areas in advance of a curtailment event (known as *precooling*). Airflow speeds can be adjusted in air handling systems, fans, and pumps that are fitted with variable-frequency drives. Direct expansion systems can be shut off if not needed, or their setpoints can be adjusted. Other commonly addressed items that can be turned off or down are signs, pumps, refrigerators, and motors.

In other cases, process loads can participate in curtailment as long as the reward for participating is greater than the value of any inconvenience or losses. A manufacturing plant may be able to complete the day's production outside of the curtailment period without compromising the required amount of output for the day.

Curtailment can be done manually (with an employee turning items off or down) or, in many cases, via an energy-management system (building automation system). A facility that can switch its electrical load to an onsite generator can also participate in curtailment. Backup generation typically consists of diesel generators, so local or state air-quality regulations may impede this method of curtailment.

Trend: Aggregators

In some regions that have a lot of curtailment (such as California and New England), many customers use aggregators or curtailment-service providers. These firms assist customers with signing up for and responding to curtailment events. They get paid for bringing customers to a utility's or ISO's program. One benefit to customers of using such a firm is that it handles communications with the program sponsor and often absorbs any fine that the utility may levy against a customer for not fulfilling a curtailment pledge. Aggregators can enroll several small facilities owned by the same customer and pool their collective demand so that the customer as a whole meets program thresholds. On the other hand, the firms deduct a share or fee from payments before sending the rest of the payment to the customer.

Here are some questions to ask of an aggregator before signing up:

- Will I pay any up-front charges to get started?
- Will I need to replace my meter?
- How will I be informed of a curtailment event?
- How will you calculate my payments?
- How frequently will I be paid and how is the payment delivered?
- Will you help me figure out how to respond to a curtailment event?
- Can you provide references of other businesses you have worked with?
- If we don't manage to curtail as much as we promised, will we pay a penalty? Or does the aggregator take responsibility for penalties?

New Frontier: Auto-DR

What's next for commercial and industrial curtailment programs? Some say it's automated demand response, or auto-DR. Researchers at the Lawrence Berkeley

National Laboratory's Demand Response Research Center are working on ways for utilities or ISOs to communicate directly with a building's energy-management and control system to automatically carry out curtailment and communicate information about the curtailment back to the utility or ISO. The researchers say that auto-DR could allow facilities to participate more easily and cheaply and perhaps receive bigger payments. The technology behind the concept is still being refined, but several promising pilot projects are underway. Facility managers are sure to hear more about auto-DR in the future.