Technical Corner

Demand Response: Utility to Facility

US$133.70 per barrel. This was the peak prix du jour for oil when writing this article; since, dipping slightly but not by much. Keeping pace with fuel pricing is impossible for many consumers. Additionally, many service companies are imposing a "fuel surcharge" or similar sympathy-related fee for the increased cost of doing business at these elevated price levels.

All the while, consumers are using more energy. They are heating and cooling larger homes, making longer commutes to work, and feeding more electricity into their ever-growing collection of devices. These range from larger refrigerators to triple-digit-Wattage home-theater systems and the large-screen LCDs and plasma displays that go with them. One can argue gluttony but on the flip-side, it's perhaps cheaper to eat at home and to create one's own theater than to continually go to restaurants and to the cinema.

Regardless, with all of the additional burdens on the electric grid, electric utility companies, or their independent system-operator equivalents, are (a) forced to build new production plants or to fire-up emergency generators, (b) forced to buy from neighboring utilities or from factories, or (c) posed with the need to encourage curtailment – to have consumers be the catalysts for reducing energy use during periods of peak use. It is this latter option that can be managed automatically from the consumer side; what used to be known in the early 1990s as demand-side energy management (DSEM or simply DSM). The sudden rebirth of DSM for preventing energy shortfalls now has a new name, Demand Response (DR); but the song is the same: encourage consumers to shed usage (load) during peak and instable periods of electricity supply. The goal is to prevent having to build new plants, burn diesel generators, and buy from others while being able to increase grid reliability (up-time), reducing blackouts.

There are many initiatives in this field today; some under government funding and others under the trend to "green" the environment. What they all have in common is the willingness of companies/homeowners to participate in programs that benefit both the Earth and the bottom line: programs that provide rebates or discounts for easing some of the demand on the grid for a few hours a week or a few days a year by the request of the electricity provider. The business case for the provider is simple: no new plants, no diesel, and no buying from others.

But what does such a program entail? It's quite simple, really: rather than the antiquated double-meter systems where the utility can cut the power to the air conditioning meter "at will" in return for a reduced electric rate on that meter, in these new programs buildings and homes (consumers) receive messages from their electric provider (or a middleman company that handles the logistics). The message tells the consumer that there is a high-rate "event" approaching (minutes to days in advance based on weather, holidays, and regulations imposed on the timing of such "events"). The building or home then responds automatically to the new rate by, for example, reducing air conditioning and dimming lights – "automatically" based on rules established by the owners/occupants of the buildings/homes, sometimes by a contract to shed an agreed-upon amount, and other times at the random choice of the owner/occupant.

Imagine being a homeowner involved in such a program: if the normal rate of electricity is 10¢ per kWh, perhaps you might be offered a new rate of 5¢ if you are willing to accept rate tiers of 5¢, 25¢, and 50¢ on notice from the provider. Your thermostat or similar module could then act in your personal interest (your threshold of discomfort) to curtail load whether you're home or away. With proper integration, you could have the thermostat communicating with your electronic calendar, knowing your schedule.

To accomplish this, we need to have devices that are "DR savvy," that is, thermostats, lights, TVs, and appliances that can accept messages from the provider and intelligently act upon them. It's a tall order, especially from a simple desk lamp, unless we realize that the full-range of DR knowledge needn't propagate down into the individual devices, where a simple load-curtail-able interface would suffice. We can begin to build hierarchies of curtailment interfaces, where a lighting controller would direct the load-shed of individual ballasts, for example. Such a lighting controller might receive its curtailment message from a home-wide controller – perhaps the device that actually consults or contains the family calendar.

It may seem far-fetched but it is being implemented today in buildings and homes. The LonMark Utility Task Group is working with several organizations around the world to interface to their curtailment messages and deliver a unified occupant-side structure for disseminating their messages to the various devices using LON. Then in kind, the Task Group is also defining the type of feedback from those devices to be shared with the electricity provider, third-party data aggregators, and the owner/occupant.

The result to the consumer is the potential to save a bit of money, prevent a blackout, and perhaps reduce their energy-consumption footprint in the process. Not a bad day's work for not having to work to do it. The impact may not reduce the cost of oil, but overall it could reduce some of the dependency on oil if peak loads can be shed and additional generation and capacity isn't needed to support those peak events.

Jeremy J. Roberts
Technical Director
LonMark International