Demand Response is Compelling for the Commercial Sector

By Peter Weigand & Ross Malme

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One could argue that this past summer demand response helped save the grid from rolling blackouts in several regions of the country. The ability of grid operators to call on commercial and industrial customers to reduce power consumption during peak hours has been a win-win for both grid reliability and the customers.

Customers participating in demand response programs not only save on the electric bill by reducing usage; they get paid additional amounts based on how much they reduce during demand response events. Demand response isn't new; it has been a fast growing subsector of the electric market for the past several years. The early adopters tended to be industrial customers with significant load. The commercial building sector is now hurrying to catch up and cash in on demand response opportunities.

For years building owners have worked to contain energy costs using standard solution approaches, such as energy efficiency projects or, in some markets, buying power from a competitive supplier. Over time that has been a losing battle against the long standing practice whereby utilities put through rate increases at regular intervals to cover the ever increasing costs of providing reliable electricity. Even with efficiency rebates and incentive programs, for commercial building customers the overall costs continue to rise.

Electricity Prices Will Rise

First and foremost, in case there is any doubt, electric bills are going to be higher, much higher. Here are some of the key reasons why:

1. More than 30 states have passed laws mandating utilities buy 10-33% of their generation from renewable sources. Renewable generation costs more to make and more to manage than traditional generation.
    a. Utilities always pass their costs through to customers, buildings represent 40% of the load in most utilities, hence…..
2. Demand for electricity continues to rise, even in the recession. At the same time we have NIMBY and BANANA (build absolutely nothing anywhere near anyone), hence the grid infrastructure is getting old and costs a lot more to either build new or maintain.
    a. Utilities always pass their costs through to customers, buildings represent 40% of the load in most utilities, hence…..
3. Utilities that don't control their own generation (over 50% of them) buy the extra power they need from the wholesale marketplace. On hot afternoons the wholesale price can be 10X or more than normal.
    a. Utilities always pass their costs through to customers, buildings represent 40% of the load in most utilities, hence…..
4. For years state utility commissions have somewhat limited the amount of rate increases to protect ratepayers (i.e., voters), but commissions seem to like the "pay based on what you use and when you use it model" (in utility speak, Time of Use rate). Commissions like it so much that over 650 utilities have moved to that pricing structure. To make sure utilities can better figure out when you use electricity, smart meters that measure consumption every 5 minutes are being installed nationwide.
    a. Buildings primarily use electricity during the day, and prices are higher during the day, hence……
5. To better manage the realities of grid reliability in light of tighter supplies, increasing demand, the intermittent characteristics of renewable generation, and older wires and infrastructure, utilities are turning to grid automation technologies and smart meters to optimize and control the grid. While desperately needed, these technologies aren't cheap.

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Although blaming the electric utility is common sport, the truth is the American consumer, legal system and local and national advocacy groups have all put the utility between a rock and a hard place. We all want the lights to stay on no matter what, but we don't want to pay for it, nor allow utilities to build the infrastructure needed to maintain reliability.

The Emergence of Demand Side Market Power

For years the supply side of the electric grid has been the focal point for providing reliability. Recently, a succession of important regulatory proceedings and market activities has occurred that will help propel the shift toward the demand side of the grid becoming as important as the supply side. The resulting market shifts have created a compelling case for the widespread adoption of demand response by the commercial sector. Each proceeding or market activity addresses key barriers to commercial building demand response participation.

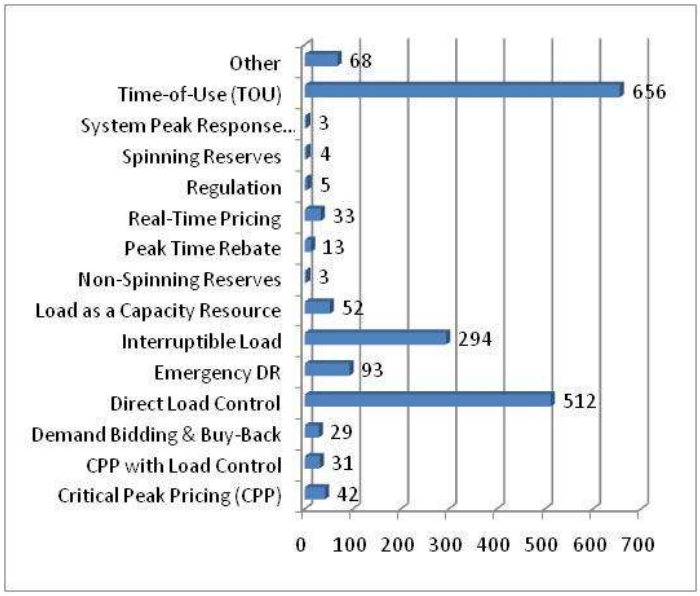
There are a handful of key Federal policies and legislation that, when pieced together, provide the regulatory foundation for the balance shift toward the demand side.

- First, in 2005, Congress passed the Energy Policy Act, which among other things, enabled dynamic utility rates and demand response and began removing barriers to end user (i.e. customers) participation in the energy marketplace.
- With the Energy Independence and Security Act of 2007, Congress gave the Federal Energy Regulatory Commission (FERC) the authority to actually implement the 2005 Act. FERC has long been a champion of open energy markets.
- The Department of Energy Smart Grid Investment Grant (SGIG) in 2009 poured $3.4 billion of the recovery act monies into utilities so they could upgrade meters and grid automation technologies.
- 2011 marks the watershed FERC rulings that will truly arm the building community not only to manage its energy, but potentially get paid in the process. FERC Order 719 required grid operators to accept demand response on the same basis as they do generation. FERC Order 745 further leveled the playing field between supply and demand by mandating that demand reduction is worth the same price as generation.
- For several years now the IRS has been handing out tax grants worth 30% of the cost of constructing renewable generation. This incentive, combined with the pressure of state renewable mandates has resulted in an explosion in the renewable markets.

For commercial building seeking guidance on how to implement demand response, in June 2011, the U.S. Green Building Council (USGBC) released a comprehensive LEED Demand Response Pilot Credit. USGBC's Demand Response Pilot Credit establishes an implementation roadmap with documentation and reference materials that enable any building to participate in demand response programs.

To assist commercial and industrial customers with where to find demand response programs and who to call on for assistance, the National DR Directory was launched in July 2011. The National DR Directory contains a compilation of reports on over 1,300 demand response programs across the U.S. Searchable by state, utility and program provider, this information tool enables commercial building energy managers to find and learn about demand response programs that fit. In addition, the National DR Directory has listings of service providers that specialize in working with buildings on demand response.

DR Programs in the US by Program Type

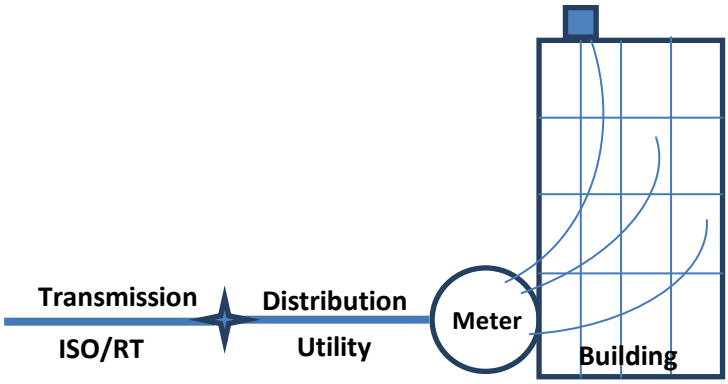


Source: National DR Directory

Many commercial customers, as well as those companies that serve them, are on a steep learning curve about how demand response works and how to tie all these events and activities together in an actionable and profitable way. Recently Skipping Stone launched its new training course, Demand Response 101, to assist commercial customers and other market participants in gaining the knowledge needed to play in the growing demand response marketplace.

Emerging Technologies

There are two important sides of the technology equation required to truly make demand response work for commercial buildings. The easiest way to differentiate between the two sides is to view them as being either behind the meter and in the building or from the meter forward to the market.



From the meter to the market, several technology-related initiatives will impact buildings, utilities and wholesale market operations. A key first step is tied to the current rush by utilities to install new smart meters that not only measure consumption in 5 to 15 minute increments, but provide two way communications, as well. The meter installation push has been greatly assisted by the $3.4 billion dollars provided by the Department of Energy Smart Grid Investment Grant program. Additionally, utilities and market operators are busy implementing grid automation, meter data management and demand response software to enable transactions between the utility grid and buildings participating in demand response programs.

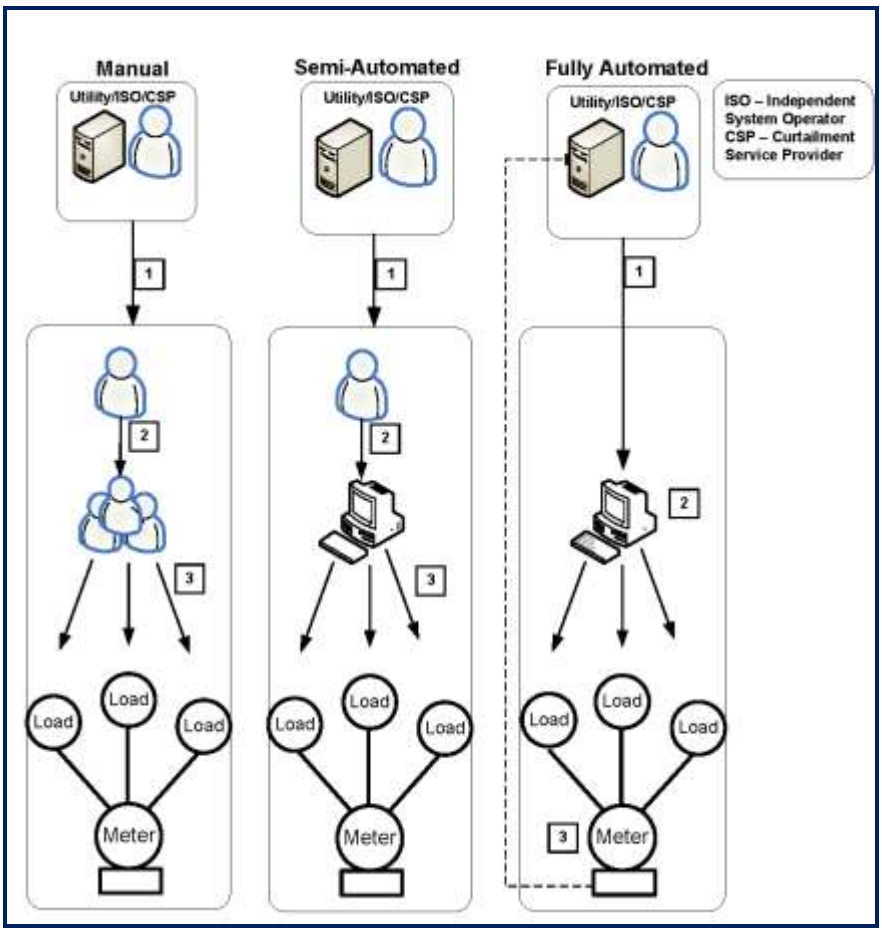
The large players in the building automation system markets have all been busy modifying their systems to enable buildings to respond to price signals and to automate demand response event management behind the meter. Thanks to venture capital investors investing billions into the clean tech arena, there are now numerous new technology firms offering a wide range of energy management, building automation and demand response enabling solutions. Many of these offerings utilize wireless controls, with data and applications relying on cloud computing methods. For the building community there are now myriad energy management and demand response technology choices unlike ever before.

Turning Information into Money

The foundational element for allowing buildings to take advantage of the balance shift is information. Yes, those are HVAC units, lights, elevators and they all consume electricity and produce cold air and the like. At the same time they also each produce data. When various the streams of data are captured, you have the elements needed to produce information. Information can be converted into money. While electricity costs money, information that manages electric use and demand response can both save and make money.

The most common ways buildings use energy information are squeezing efficiency savings out of existing energy consuming assets or attempting to time usage to avoid demand charges. The newest way to utilize that same information is to participate in demand response programs that pay the consumer to use less electricity during peak hours when the grid needs it. As an added bonus, the value of that load reduction, and hence information, is now the same as the value of generation, thanks to FERC.

The keys to taking maximum advantage of demand response revenues are data management, implementation and demand response program selection. There are three basic ways to implement demand response: manual, semi-automatic and automatic.



Source: LBNL

Selecting which demand response implementation method to use is a balancing act between technology and implementation costs, ability or desire to manage the data and information required, and how much money can be made versus how much load can be shed. Fortunately there are several options available for each of these key decision points.

Managing the data and information required to participate in semi-automatic and automatic DR programs requires either an investment in software and skills to run it, or a decision to outsource this function. A number of software vendors have systems on the market for managing DR data, information and load shedding events. Several of them also provide additional functionality to manage data and information for other aspects of energy management.

Outsourcing demand response management is a common practice. There are some 40 demand response aggregators, called Curtailment Service Providers or CSPs, who will perform everything from program sign up to building implementation to providing technology and management services. An emerging trend is for property management companies and building solutions companies to offer these same services.

Technology requirements for buildings to implement semi or auto DR call for the ability to control load, measure and verify load reductions before, during and after a load shed event, and to coordinate with the DR program entity (utility or ISO). The level of desired participation depends on how much a building manager wants to optimize revenue potential. Many buildings have technologies already installed that can be utilized for DR purposes. Newer building automation systems, load control devices and energy management systems are some examples.

The Future

There is a lot of talk about the "Smart Grid." Our grid has been intelligent for quite some time. Sophisticated models, well vetted contingency plans, double redundancies and so forth have created what is essentially a centralized command and control structure that manages the grid. The key change involved with smart grid is that the central control structure is migrating to a distributed intelligence structure to manage the supply and demand side and points in between. Utilizing smart meters, two-way communications over the internet, sensors and controllers at the demand device level inside buildings and so forth, we are busy creating a network of data and information we call the "Enernet" (energy internet).

The Enernet utilizes sophisticated, parallel, continuous, two-way real-time and multichannel communications with very granular elements of energy consuming and producing systems. Those systems might include generators and renewables, as well as industrial sites, campuses, buildings, and homes… and not just the building or home as a whole, but the sub elements down to the demand device will be connected to the Enernet.

Using the Enernet and automation with optimization intelligence, the grid operator will constantly exchange status with far flung automated distributed operating centers. These "ADOCs" constantly poll the assets under management for their status and capability to respond to grid conditions, as well as the monetary parameters of response capabilities, whether buying or selling, so that every building becomes both a buyer and seller throughout the day. This enables the grid to constantly "balance" itself by dispatching and settling supply/demand and buy/sell requests. It also enables utilities to shift price risk via time of use rates to the consumer.

At the same time the ADOC is communicating with the grid, it communicates with local systems in buildings, homes and industry. Within these facilities, modern energy management systems (EMS), integrated with security, process and weather systems make local capability assessments. Using these inputs in addition to managers' inputs regarding minimum requirements for the day and economic inputs, the EMS sends the capability status to the ADOC for processing.

When the grid posts a need, the ADOCs obligated to respond will issue "microinstructions." Rather than taking the sledgehammer approach of turning systems off or down, these microinstructions will have many small impacts that in total meet the need. Among them:

- Elements of a DR portfolio will participate as a class rather than as individual structures. For example, variable speed drives across several buildings might scale back 20% rather than one building being shut down.
- Dimmable ballasts can scale back 20%, imperceptible to the human eye if done over several minutes. The constant ADOC to EMS communications link allows this ramp time.
- Heating elements in driers and AC and refrigerator compressors in large numbers of homes might suspend operation for ten minutes without shutting down the host appliance entirely. This participation would rotate home to home so no one single home sees a perceptible impact.
- Electric vehicle chargers mitigate or curtail their demand, and might even contribute stored energy back to the grid from connected vehicles.

The technology and modeling to accomplish this exists today. The challenge is how to join the elements together. Who owns the network? Who owns and maintains the equipment? Who insures reliability? How do you make rank and file customers care? How does the money flow?

Conclusion

The Enernet, Demand Response, rising energy prices, buildings as generators are all very interesting for building owners; however, the economy, occupancy rates, tight budgets, and so forth have a lot of building

owners standing on the sideline while the energy markets march forward. While that may appear to be the conservative and safe play, in reality doing nothing is a very risky position.

Doing nothing assures that rising electricity prices will negatively impact a building's competitive positioning and the bottom line. A building that does not participate in demand response is giving up the opportunity to generate revenue and manage utility costs.

You might be surprised to find out that many forward thinking utilities support demand response. In the new energy world order, utilities need buildings to participate.

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Skipping Stone is a proud member of PLMA.

The Peak Load Management Alliance is a diverse association of leading energy professionals dedicated to developing and promoting consumer participation in electricity markets around the world using load management.

Membership in PLMA is open to any organization interested in demand response. Contact www.peaklma.com for more information.