

“THE FIVE PHASES OF AN EFFECTIVE DEMAND RESPONSE PROGRAM”

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ABSTRACT

Energy Curtailment Specialists is dedicated to furthering the design and implementation of quality demand response programs across the country. We believe this paper will provide a high level overview of the five phases of an effective demand response program: (1.) Program Design; (2.) Marketing & Enrollment; (3.) Pre-event assessment & readiness (meters, demand response audits); (4.) Event activations (notification system and customer interaction); (5) Post-Event (performance measurement & analysis, press coverage, readiness for next event). The paper outlines program design development that can maximize demand response benefits and participation, including advanced notification, number of call hours, penalty and performance structures, and baseline methodology. The paper establishes why clear program rules are essential for participation in demand response programs. In addition, the paper addresses the ability to foster significant growth in demand response programs.

EFFECTIVE DEMAND RESPONSE PROGRAMS

Up until recent times the term “capacity” in both the regulated and deregulated markets has been historically defined as generation or supply-side power. Due primarily to consistently increasing demands for electricity across the country, coupled with a relatively stagnant supply pool and an aging transmission infrastructure, most markets are now looking towards the demand side for solutions or at the very least include demand-side management as an integral part of their overall strategy.

Demand response resources are now included in long-term planning studies, both at the wholesale and utility level. It was long thought that demand-side resources were resources that could not be counted on during times of emergencies. That thought pattern has now changed somewhat based on the fact that demand response has established high performance ratings in many markets¹. In light of the clear directives of the Federal Energy Regulatory Commission’s Order 890 which clearly states that demand side resources must be treated equal to supply side resources in the various markets, clearly there is now a greater understanding and recognition that demand response resources can comprise good reliable capacity.

FIVE PHASES OF A SUCCESSFUL DEMAND RESPONSE PROGRAM

It is important to understand that demand response is now a thriving stand-alone business in the energy industry. The Federal Energy Regulatory Commission has stated that U.S. reliance on natural gas to meet peak load will continue to increase wholesale market prices, and that demand response has the ability to lower wholesale prices during these peak demand times without the use of costly peaking

¹ As just one example, during the 5 event days called by NYISO for NYC in the summer of 2006, demand response resources performed on average at ~91%. This is as reliable as most supply side products. (Provide source for the 91% figure if possible)

units. The availability of demand response programs, as well as participation in those programs, is continuing to grow in the United States. States are now looking for demand response to assist in solving reserve shortage problems, help eliminate extraordinary price spikes, and alleviate transmission constraints. Demand response programs have even assisted in eliminating the need to build peaking units each year to meet peak demands. Moreover, demand response, when achieved through pure load curtailment (without the use of distributed generation), has the ability to not only mitigate market volatility and price spikes, but it also reduces greenhouse gases during critical peak load days. This type of curtailment is the “greenest” of demand response and needs to be recognized for the additional benefits it brings to both wholesale and retail demand response markets. When given the choice, would the markets prefer a 1 MW load reduction achieved through running a backup diesel generator or a 1 MW load reduction achieved through shutting down equipment?

It is critical that demand response programs are developed with adequate price signals or pricing that will cover participants’ lost opportunity costs sustained through their participation. Demand response programs must facilitate long-term price signals, as programs take years to develop and grow. We must look to demand response as a resource that will deliver year after year. It is critical to realize that one of the greatest values from demand response is “RELIABILITY”. Participants understand grid instability and the threat of a blackout or brownout. However, participants also know well the high opportunity costs that are lost due to power outages, or curtailment events. Given that, many participants are willing and able to curtail usage for short and infrequent durations. The number one driving question associated with demand response participation is: “Will the payment for participating in a demand response program provide enough revenue to justify the loss of revenue for our core business, while reducing demand?” Without the capacity payment, participation within the wholesale demand response markets would not be what it is today. Loads have the same capacity value as generators and should be allowed the same capacity payments for their availability as any other resource in the wholesale market.

Below are the five phases of developing a highly successful demand response program, from both a wholesale and retail level.

PHASE ONE: PROGRAM DESIGN

The first phase of any successful demand response program is to design the program in a manner in which the interests of the utility (ensuring reliability) and the interests of the end-use customer (providing the incentive to enroll) are delicately balanced. Providing the customer incentive is a critical component of program design, and indicates to customers that there is a clear understanding of exactly what is necessary to entice an end-use customer to agree to shutdown their production equipment, halt their process, or inconvenience their guests and/or employees. The following components represent a structured design for a robust and sustainable demand response program in any utility or wholesale market.

1. *Compensation to Participating Customers:* The single most important piece of the demand response program puzzle is the compensation that is to be paid to participants. Determining what the appropriate dollars are is easier to establish in a market where demand response is treated as capacity because there is an open market determination of

price by those selling capacity and those buying capacity. For a utility that is developing a program, their interest is obviously in paying the least amount possible to achieve the MW levels of participation they need to achieve. The starting point (the highest point) would be to tie the compensation to the avoided cost of a power plant that would otherwise be needed in the absence of the demand response program. The utility should understand that there are more than just financial benefits to demand response. These benefits include reductions in greenhouse gases, grid stability, and community goodwill. If demand response is something the utility is serious about, the pricing component should be at or near their avoided cost level. According to the U.S. Department of Energy, “Benefits of Demand Response and Recommendations”² well-structured pricing and incentive-based demand response can produce significant savings in close to real time, often at lower costs than supply-side resources. In addition, according to a study conducted by Ernest Orlando Lawrence Berkeley National Laboratory³ over 80% of customers surveyed indicated that the manner in which a demand response program offers incentives was a key issue. Customers ranked this the most important factor, and results were driven by two factors, compensation for demand response participation levels (risk level) and options associated with payment. It is clear that customers that enroll in mandatory programs will be looking for financial incentives that meet their risk level. If pricing levels do not meet the customers risk level there will be little participation within the program. The more dollars available, the more participation and the more reliable that participation will be.

2. *Establishing the parameters of the program (size thresholds, eligible service classes, etc):* It is important to identify the minimum kW qualifications, service classes that are eligible, etc. The lower the kW threshold the less restrictive the program is, and greater accommodations can be made for a broader class of resources. If minimum threshold levels are set too high, curtailable resources will potentially be lost to the market. With lower thresholds you allow greater participation for schools, nursing homes, commercial properties, small to mid-size hotels, and mid-size manufacturing facilities. Broadening the range of customer availability not only enhances the program from a MW quantity standpoint, but also helps develop a much broader goodwill and understanding in the community regarding energy conservation.
3. *When will the Demand Response Resources under the proposed program be required?* Demand response programs need to consider what time period programs will operate and how customers will be called upon during that time period. For a full year program, consideration must be given for variable pricing reflective of the expected true need of the resource at various times of the year. Because it is much less likely that there will be a need to call a demand response resource in the winter months (unless the utility experiences a winter peak day or the utility has a winter peak load), utilities should maintain the right to call upon demand response resources for a limited test period to verify viability of a curtailment commitment. No matter what the duration of the program throughout the year, consideration should be given to adopting a maximum number of hours per event day, per month, and per year. Resources are much more reliable when called for shorter durations and less frequently. From a utility or market

² “Benefits of Demand Response in Electricity Markets and Recommendations for Achieving Them”, http://www.oe.energy.gov/DocumentsandMedia/congress_1252d.pdf

³ “Demand Response Program Design Preferences of Large Customers: Focus Group Results From Four States”, June 19, 2006, <http://eetd.lbl.gov/ea/EMS/reports/60610.pdf>

standpoint, generally speaking there would be more interest in a reliably performing resource for a four hour window than a not-so-reliable resource asked to reduce for eight consecutive hours.

4. *Advanced Notification of Events:* Demand response programs that provide a courtesy advanced notification have higher performance ratings than programs requiring almost immediate response. Based on Energy Curtailment Specialists, Inc. demand response events, when our customers are given a day-ahead notification our customers are much more reliable, not to mention significantly more inclusive. Facilities that have automated curtailment abilities can certainly comply with in-day notifications, but programs will not find many larger end-users with automated systems or a willingness to install such systems. By implementing only an in-day notification program, a market would be leaving a significant majority of potential demand response prospects out of these programs. One of the most overlooked facets of a demand response program is the need for longer advanced notifications. Participation by most large electric end-users in a day-of program is simply not feasible. There are very few larger manufacturers that would be able to respond to a day-of call with little advance notice. The equipment and processes utilized within the facility, along with a need to shift potentially a large number of employees, render any demand response program a dead-end proposition in most instances, thereby leaving many large loads unable to participate. Utilities have the ability to forecast reserve shortages on a day-ahead schedule and demand response programs that use this forecasted shortage as advanced notice have the ability to maximize participation in these programs. This is another critical feature of any well designed demand response program and this particular component of a program (advance notification) can make or break the success of the program.
5. *Baseline and Measurement of Curtailment:* The precise baseline to use in a demand response program has long been a source of debate in the industry. From ECS' perspective we understand that there is a need to reduce "free ridership"⁴, but it is also apparent that under some baseline methodologies that are frequently promoted (i.e. CBL⁵ based upon last 10-days of usage) that results are usually unfair to the demand response participant, unreasonable and act as a barrier to entry for many of these resources. In most situations these resources essentially provide more curtailment under the CBL baseline methodologies than they are given credit for. Additionally, a reliable demand response program requires that a participating facility know what they need to do to perform successfully during an event, when they are called upon to reduce demand. The CBL is an ever-changing baseline and provides no specific kW level as a target for customers to "get down to" during an event. Baselines that utilize an average peak demand from the last like period help to reflect the customer's true usage patterns. An average peak demand baseline is an easy and understandable method that reflects what usage might have been without the curtailment event. However, in using an Average Peak Monthly Demand methodology care must be given to select a window in which the baseline will be calculated. In New York State's robust demand response market a peak demand baseline window of 12:00 pm to 8:00 pm is used as well as a four month seasonal

⁴ "Free Ridership" refers to a situation in which a facility can get credit for reducing energy when they in reality do nothing other than what they would normally do in the absence of a called event.

⁵ "CBL"- Customer Baseline Load

average to establish the average peak demand during a season. This calculation helps to reduce the potential for “free ridership” within the program and allows customers to know what kW level they must reach during event calls. The Federal Energy Regulatory Commission has set forth a criteria⁶ that there must be a balanced development for the baseline. Baseline methods must have predictability, simplicity, accuracy, minimization of gaming, and consistency with other methods used by ISO/RTO. A KEMA panelist reported to the Federal Energy Regulatory Commission that no one baseline method works well for all types of accounts.⁷ Relatively simple methods can work reasonable well for many, if not most customers. The Regulatory Assistance Project⁸ also noted that highly successful demand response programs like Georgia Power and Duke’s are using a modified Average Peak Demand Day methodology when calculating load reductions.

6. *Penalty Structure:* When devising a penalty structure much care must be given to balance competing interests. This component of a demand response program carries significant weight to the end use customer. Before deciding if they want to participate in such a program, facilities must consider what penalties they will sustain if they are unable to perform in any given event. It is important to realize that facilities will not incur the significant opportunity cost necessary to shut down their operation unless the compensation is adequate and there is not an unreasonable sanction if they fail to comply for unforeseen reasons. It is also equally important when calculating a penalty to use an aggregate approach in determining performance and penalty. Using the aggregate approach allows a demand response provider to call upon some of its resources that have the ability to provide greater kW of curtailment than originally estimated to cover a resource that may not be able to fully curtail on an event day. If a demand response provider is obligated to provide a certain number of megawatts (MW) of demand response to a market or utility, that market or utility should care less what resources in particular that response comes from so long as the committed number of MW in the aggregate are achieved and taken off the system. The end result is a large group of reliable resources that will provide proven MW over the long period of time.
7. *Event Trigger Mechanism:* Another critical feature of a demand response program is found in the trigger mechanism for event calls. Demand response programs have historically involved calls either for operational reasons (reliability issues, grid instability, reserve shortages) or economic reasons (high electric price days). A very important facet of a demand response program, in terms of its marketability, relates to the predictability of when a resource can expect to be called upon. Demand response programs that are triggered for economic reasons tend to be unattractive to potential demand response prospects, primarily due to a higher number of called events. Economic programs lack predictability from the customer’s standpoint because price spikes can be unknown and unpredictable. Demand response programs that are triggered for reliability reasons have greater participation from a broader customer sector and have higher reliability and performance ratings than purely economic programs which are frequently voluntary.

⁶ Demand Response in Wholesale Markets Technical Conference, April 23, 2007 Docket No. AD07-11-000

⁷ “Measurement and Evaluation of Demand Response Resources, Part 3” Miriam Goldberg, KEMA, Inc. to the FERC in response to Demand Response in Wholesale Markets, Docket No. AD07-11-000

⁸ “Framing Paper #3: Metering and Retail Pricing”, New England Demand Response Initiative, 1 May 2002, F. Weston, J. Lazar, The Regulatory Assistance Project

8. *Resource Flexibility:* It is important for participants in a demand response program to maintain some sense of resource flexibility from month to month. Some customers might have the ability to curtail larger amounts during shoulder months, or vice-versa. A program should allow for resources to change their committed curtailment levels from month to month or on some other conditions primarily because businesses operate under different situations at different times of the year. If a facility can provide the market with a one MW reduction in July, but only a 500 kW reduction in September, the resource should be able to commit to exactly what it can do during a certain set time period. In this example, if the market does not allow some flexibility the resource would have to commit only 500 kW for the entire period and the market loses the opportunity for the other 500 kW that the resource can provide in July. By allowing a customer to determine what they can commit to each month, this allows the customer to participate even in months when curtailment might be lower due to business circumstances.
9. *Form of Payment to Customer:* ECS recently surveyed its customer base regarding form of payment for curtailment events. We found that high marks were given for the fact that we provide the customer with a direct payment as opposed to them merely getting a credit on their energy bill. Customers like that they can take this payment and spend it for whatever purpose or expense they desire. Many of the customers also indicated that this payment is then used for energy efficiency upgrades to their facilities.

PHASE TWO: MARKETING and ENROLLMENT

The following is a summary of what Energy Curtailment Specialists, Inc. believes are critical components needed to maximize enrollment in any demand response program. This summary is based on our extensive marketing experience in the demand response field, and we believe are critical components for getting the customer to buy-in.

1. *Branding:* It is essential to brand the demand response program to provide greater recognition by customers. When customers recognize a program name they take ownership in that program and tend to pass along information regarding the program to others. Through branding the program is recognized, more widely talked about, and branding helps to facilitate getting the message out to others about the program.
2. *Development of Marketing Materials:* Development of marketing materials that identify the benefits of a demand response programs and curtailment methods are critical components of marketing and enrollment of customers. Marketing material can be developed to target a specific industry or business, facilitating greater enrollment and buy-in from the customer.
3. *Aggressive Marketing and Written Materials:* It is very important when starting up a demand response program to aggressively get the word out about the program and the benefits customers will realize from the program.
4. *Development of Internet Website:* Another critical piece of marketing is found in development of a dedicated website for the program. The website is a portal that

perspective customers can go to and find program information, answers to their questions, and general program information.

5. *Webinars / Seminars*: It is important when starting a demand response program to host seminars and webinars for prospects. These information sessions promote the program and provide critical information.

PHASE THREE: PRE-EVENT ASSESSMENT AND READINESS

After marketing and enrolling customers into a demand response program it is critical that the energy reduction capabilities of the customer are determined, and to make sure they are prepared to reduce energy consumption when called upon. For some customers this will involve the installation of actual equipment, while for other customers it involves intense preparation. Enrolling a customer is meaningless unless that customer has the tools necessary to perform the requisite energy reduction when called upon. It is vital that customers perform the following five minimum steps in preparing for future events:

1. *Installation of Interval Metering System*: Installation of an interval metering system is a critical component for the customer and in many cases can provide real-time access to meter data which allows a customer to track how they are performing and adjust loads accordingly during events. At the very least an interval metering system is necessary to measure the customer's performance. A majority of larger commercial and industrial customers will be likely to have interval metering installed at their facilities already, thereby facilitating easier participation in a demand response program.
2. *Demand Response Audit*: By performing a demand response audit of a participating facility, performance will be maximized. This audit allows the customer to identify what equipment can be shut down, reduced, or adjusted, and what the kW value of such adjustments will be.
3. *Establishing a Reduction Action Plan (RAP)*: Once the customer determines what equipment can be adjusted, eliminated, or reduced the RAP is an integrated strategy and checklist of what, when, and how reductions will take place during an event. It is a documented plan for each facility, and is facility specific.
4. *Installation of Automated Equipment (where applicable)*: For some facilities the installation of automated equipment will be necessary to enable the customer to fully participate and automate their load reductions. Where applicable this equipment can be a critical component of how the facility will maximize their load reductions. There are a number of applications, however, where automation isn't as feasible, for instance in most industrial settings where even if they might *want* to automate processes, they typically would not hand over control of the facility to a third party demand response provider.
5. *Ensure Communication for Event Calls*: When an event is called it is critical to have multiple contacts as well as multiple avenues for contact at the participant's facility.

Several contacts and ways of communicating that information is essential so that participants are timely informed about event activations.

PHASE FOUR: EVENT ACTIVATIONS

After a site is properly prepared to participate, the next phase of the program is to ensure that the event activations themselves go smoothly. Once the event is triggered, there must be an automated notification system that effectively and rapidly notifies customers. There are several developed notification solutions that can simultaneously notify several thousands of customers within minutes of event activation. A good notification system has the ability to notify thousands of contacts within a two to three minute time period by way of telephone, fax, pager, and e-mail. Once the notification system has been activated it is critical for participants to confirm their participation. This notification can be performed through the use of the demand response website or some other protocol, and allows the customer to quickly relay a message that they will be participating in the activated event.

PHASE FIVE: POST-EVENT

Following all events it is important to compile all the data and analyze performance of each resource. Even more critical is sharing this analysis with the customer. It helps to identify issues and determine whether or not there is an opportunity to increase the participant's kW commitment. Customers might also have to determine if a decrease is needed if analysis and results show that committed levels could not be obtained during the called event. It is critical for all customers to review and determine if their commitment levels need to be adjusted from time to time, thereby allowing maximum participation and reducing the risk of penalties.

CONCLUSIONS AND RECOMMENDATIONS

There is a tremendous and obvious need to further the development of demand response programs throughout the United States as reserve margins continue to shrink. Demand response programs to develop in markets that allow for greater participation, and in markets that seek to eliminate barriers of entry. It is Energy Curtailment Specialists, Inc. recommendation that the following steps be taken to further development of demand response programs and participation within these markets:

Design Programs that Foster Participation

Establish parameters of program that will facilitate participation from all sectors of the market, thereby maximizing program volume.

Establish when Demand Response Performance will be needed

It is critical to set the time frame in which resources will be needed daily, weekly, annually, or for a stated number of months.

Consider Providing as Much Advance Notification for Resources as Possible

Establishing a day-ahead notification, even if only a *courtesy* notice, can maximize participation and performance during event calls. If a quick response program is desired,

consideration should be given to two types of programs, one with a longer advance notification and one with a shorter response time, with the latter being valued higher based upon the market's needs. Limiting a program to only quick response resources substantially affects the marketability of a program and many of the largest resources in the market will be unable to participate. Industrials, for example, generally have to plan to curtail by shifting hundreds of employees and multiple processes.

Utilize a Baseline that is Easily Understood and Eliminates Barriers

Setting a baseline using an average peak monthly demand eliminates the uncertainty of an ever-changing baseline, like that used in a typical CBL methodology. The average peak demand is also easily understood by customers and provides greater insight into usage during called events. It is also not difficult to tighten the average peak demand approach in a way that prevents "free-ridership".

Develop a Balanced Penalty Structure

Penalty structures should be developed by balancing the two most significant interests of a demand response program: marketability and reliability. Clearly, one cannot have a reliable demand response program without a reasonable penalty. However, the penalty structure cannot be so onerous that participants will stay away from the program because the penalty would far exceed the potential revenue or other benefit they would receive.

Clear Event Trigger for Events

Demand response participants must know what the trigger mechanism will be for events. With clear event triggers participants learn the signs of when and how events will be called, and thereby start to anticipate when they need to be ready to respond. This, in turn, leads to a more reliable resource.

Resource Flexibility

Demand response participants must be free to change their committed kW on a monthly basis or at some other interval as their business needs change. This facet sends a clear indication to participants that utilities and markets understand that customers needs and business conditions are ever-changing and moving.

Aggressive Marketing and Branding the Program

Branding of demand response programs will help potential participants recognize the program and foster actual participants to take ownership in the program. The most important piece associated with customer enrollment is getting customer buy-in for the program. Marketing must be aggressive to get the message out and customers must have a deep understanding of the program and the program benefits for all.

Pre-Event Assessment and Readiness

After customers have been enrolled in a demand response program there must be a strong emphasis placed on assessing how the customer will be able to perform and preparing the customer for the event call. A large piece of readiness is found in installation of equipment for the customers, including metering. Additionally, a reduction action strategy and demand response audits assist the customer in determining their committed load reductions. This leads to a more reliable resource.

Notification of an Event and Fostering a Successful Response by the Customer

Event notifications must go smoothly and typically there is only one shot to get the word out with a straightforward and understandable message. Once a demand response event has been triggered it is extremely important that participants are notified and prepared to perform during the event call promptly. The bottom line is that everything done to date is in preparation for the customer to perform during event calls and if the message is not clear and untimely, or if the incorrect contact information is in the system, all that preparation was meaningless.

Post-Event Assessment

Following every event it is important to provide the participant with compiled data and analysis as to how they performed during the events. This must include a detailed analysis of committed kW levels and how each participant performed against their commitment. Post-event assessment also assists the participant in determining if their kW commitment should be increased or decreased based on past event performance.

Energy Curtailment Specialists, Inc. believes that attention to each detail of the “Five Phases of an Effective Demand Response Program” are imperative for a successful program. The true success of a demand response program is seen not merely in the amount of MW that the program enrolls, but rather is determined by the amount of MW that the program *actually delivers* when response is needed.