National Energy Marketers Association

Achieving Significant, Near-Term Demand Response by Residential and Small-Commercial Customers

Demand Response (DR), or the ability of retail customers to reduce electricity demand at critical capacity times, is seen as increasingly important in a green, "Smart Grid" world.[i] Many view the regulatory approval, rate-base and installation of smart meters, load-control equipment and related telecommunications infrastructure at every residential location as a prerequisite to small consumers taking advantage of the cost savings and utility system benefits that DR Programs represent.[ii]

Utilities have helped consumers benefit from DR for 40 years without full saturation of smart meters through the use of various proven DR strategies. Similarly, DR can be jump-started now with millions of small retail energy consumers before every home and office is retrofitted with two–way, remotely-controlled metering technology and related communications and data storage investments to record and analyze energy usage data on an hourly basis.

The National Energy Marketers Association (NEM) submits that DR should be "jump started" now through the use of already proven DR strategies and the development of associated transitional, DR load profiles for residential and small-commercial customers by drawing from the utilities' 40 years of experience and extant, statistically reliable usage data plus new smart grid pilot programs. NEM and its members are uniquely situated to provide the benefits of load shifting and demand reductions to millions of mass-market retail consumers nationwide utilizing current metering practices at the utility and ISO level.[1]

Energy marketers operating as Aggregators of Retail Customers (ARCs), with the cooperation of forward-thinking utilities, and both state and federal regulators as well as regional RTO/ISOs, can provide competitive, low-cost DR products services and technologies while smart meters, load-control equipment and related utility telecommunications infrastructure investments are being considered, field tested and fully implemented. Early-stage, competitive, retail DR program implementation strategies could save consumers money, yield generation, transmission and distribution capacity benefits, and reduce the national carbon footprint, even before smart meters, load control technology and sizable utility investments in related hardware, software and telecommunications infrastructure are approved, funded and installed at every home and small business.

Consumers' ability to do business when they want, with whom they want, and then to buy what they want is one of the greatest consumer protections that government can offer. The availability of demand response, like the other pricing and value-added options that competitive energy markets yield, is another means to empower consumers. Consumer awareness can start today to embrace existing innovative technologies and strategies that smart-grid pilots have proven decrease mass-market demand for electricity.

The Endnotes to this proposal provide examples of existing technical program implementation issues related to these proposals.

Early-Stage Adoption of Low-Cost, Statistically Reliable, Demand Response Programs Can Be Implemented Nationwide for Millions of Homeowners and Small Businesses

Historically, utilities have reliably implemented Demand Response without smart meters on every customer through the use of statistical sampling. That is, the utilities placed smart meters on a subset of customers to determine the impact of DR Program design strategies on retail customer load profiles. By using the methods of statistics, the utilities would know how many and what types of customers to include in each subset of customers. Indeed, a similar statistical sampling methodology is used today in both standard utility rate design and in the allocation of capacity and other costs in competitive energy markets. Moreover, some ISOs use such statistical methods to monitor and provide capacity benefits to DR programs in their regions. Thus, the industry has long used these statistical sampling methods without full saturation of smart meters to reliably operate and price electricity.

Currently, one-size-fits-all standard load profiles are used to aggregate respective residential and small-business service classes for forecasting, scheduling, and ISO settlement processes. Today's consumers who embrace existing home energy management technologies that increase their ability to reduce energy usage at peak demand should be offered a load profile that better reflects the cost savings of their DR usage behavior. Furthermore, consumers who invest in cleaner, more efficient Energy Star home electric appliances should also benefit from a modified profile that better reflects the cost savings of their reduced demand.

Unlike standard load profiles that are in use for each small-customer class, regardless of the growing DR potential of specific consumers within each class, a new set of statistically reliable load profiles can be developed and implemented to support consumers pursuing an array of competitively provided DR and efficiency-related products, services, and technologies with resulting benefits and cost savings.

In so doing, it could save consumers money; yield generation, transmission and distribution capacity benefits; and reduce the national carbon footprint even before smart meters, load-control technology and sizable investments in related hardware, software and telecommunications infrastructure are approved, funded and installed at every home and small business.

Members of the National Energy Marketers Association are ready, willing, and able to assist utilities and RTO/ISOs to develop low-cost, DR Program design and implementation strategies that could provide millions of smaller, mass-market retail consumers nationwide with the opportunity to both participate in and benefit from the early adoption of DR programs. New DR program design strategies could implement a new set of Retail DR Load Profiles using current utility metering systems and historical usage data combined with the sophistication and statistical reliability of data developed by utility "smart grid" pilot programs, as well as the successful ongoing RTO/ISO Demand Response capacity purchasing, measurement, verification and settlement processes and protocols.

Examples of Demand Response Program Design and Implementation Strategies for Residential and Small-Commercial Customers

One of the most common demand response strategies historically has been the use of switches placed on appliances such as electric water heaters and air conditioners that would receive a remote communication signal to turn off or cycle the appliances. Indeed, there is so much confidence in this historic DR strategy that some entities, (e.g., PJM, the ISO that operates much of the power grid from Washington DC to Chicago) no longer requires any sampling with smart meters to assign this strategy a capacity benefit. In a related, more recent situation, the power grid operator in Texas gives homes with photovoltaic solar panels a "deemed" DR load profile with associated capacity and cost savings – even if no smart meter is installed. Finally, ISO New England is one of the few that provides a load-profile process that can reflect the capacity and cost savings from energy-efficiency measures like home energy management systems and Energy Star appliances.[2][iii]

Recent DR Impact Analyses as well as ongoing DR pilot programs suggest that a set of new DR program design strategies could encourage millions of small consumers to participate in existing programs with low-cost modifications that would permit participation before a full implementation of new smart grid and telecommunications infrastructures investments are made and installed in each home and office in the country.

Additionally, improvements in communication and control technology have allowed several alternative demand response program design strategies to emerge. For example, smart thermostats on air conditioners can be programmed by customers to adjust thermostat settings by time of day or even from a remote signal. Another important example was a study recently conducted and the results published by Baltimore Gas & Electric (BG&E) with an independent Impact Analysis performed by The Brattle Group.[3] BG&E implemented multiple alternative retail demand response program design strategies in the summer of 2008. The results showed, among many other things, that there were Retail DR Program Design Strategies that produced at least three statistically valid groupings of customers when the following DR strategies were implemented with multiple rebate/pricing scenarios:

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[2] *NEM also believes a Bayesian statistical and decision theory approach should be used in determining the amount and type of sampling. Essentially, classical statistics assumes we have no prior information that helps us understand what the likely outcome (e.g., DR load impacts) will be (e.g., from a given DR strategy.) In contrast, Bayesian statistics and decision theory provide a framework for recognizing the existence of prior information and the cost of obtaining new information, which typically leads to a smaller sampling size than classical statistics. This allows an industry to build on existing knowledge. Indeed, the fact that PJM has "deemed" the DR load profiles of certain DR strategies without requiring additional load profile sampling reflects the extensive prior experience with this strategy consistent with a Bayesian perspective. NEM believes a Bayesian perspective can be used to draw on prior experience in reducing the cost and sampling size necessary for other DR strategies as the body of experience is built for any particular strategy. See also: Endnote iii.*

[3] *See: http://www.brattle.com/_documents/uploadlibrary/upload768.pdf, "BG&E's Smart Energy Pricing Pilot Summer 2008 Impact Analysis," Ahmad Faruqui, Ph.D. and Sanem Sergici, Ph.D., The Brattle Group, April 29, 2009.* ***See also:*** *http://www.peaklma.com/documents/Hindes.pdf, "BG&E's Smart Energy Pricing Pilot: Summer 2008," Presentation at The Peak Load Management Alliance Spring 2009 Conference, by Cheryl Hindes, Director, Load Analysis and Settlement, BG&E.*

- Sending customers text messages during critical electric demand times to reduce electric use (and receive a rebate) **(Voluntary Manual Retail DR Strategy),**
- Sending customers such text messages, but also providing an orb that glowed green, yellow or red to indicate the power system conditions and hence cost (or size of rebate) from reducing electricity use **(Voluntary, Technology-Enabled Retail DR Strategy),**
- Combining A and B with a device that could remotely adjust the air conditioner operation **(Mandatory, Technology-Enabled Retail DR Strategy).**

BG&E found a significant demand response from each of these DR Program design strategies, with the amount of response (load reduction) increasing from Strategy A to Strategy B to Strategy C. NEM envisions working with the various state PUCs and the related utilities and ISOs in defining the demand response strategies for retail marketers to deliver in that area. Moreover, NEM envisions jointly defining the statistical load profile data necessary based on the data available with the utilities and national DR organizations.

Action Items

RTOs/ISOs –FERC

Review existing DR processes to identify how to streamline them for mass market retail DR that allows load sampling for a broader range of DR strategies, similar to ISO-NE. Fortunately, most RTOs/ISOs have the basic building blocks in place for this.

PSCs – Utilities

- Hold a workshop or some other forum with key stakeholders to define a process with energy marketers that:
  1. Identifies a standard set of DR strategies that should be delivered by energy marketers in that area
  2. Shares past and future data with ARCs/ISOs to provide the basis for "deemed" DR load profiles from past DR experience
  3. Indicates opportunities for sharing load sampling by the utilities and energy marketers on the standard set of DR strategies
- Define a mechanism for ARCs to get routine (monthly) updates on the DR experience from the AMI projects funded with either taxpayer or ratepayer funds.[4]
- To enhance Options 2 and 3 above, define how any financing costs of the DR hardware can be supported through appropriate investment incentive recovery mechanisms for consumers and ARCs.
- To further enhance Options 2 and 3, coordinate the development of protocols between the utilities, RTOs/ISOs and ARCs so that the DR can be used for local T&D benefits as well as system grid benefits.

Concluding Remarks

The National Energy Marketers and its members are committed to serving as the primary DR delivery channel to help consumers achieve DR benefits both before and after the smart grid is fully implemented. The public interest is well served in that it allows energy marketers to educate, mass market and aggregate retail DR customers, and to start developing DR capability with a set of first-generation DR load profiles, preparing consumers for a more-refined approach as full smart-grid implementation occurs. Additionally, mass market, retail DR programs can potentially help with transmission and distribution capacity shortages as well as generation capacity shortages. Therefore, implementing Retail DR pilots in conjunction with the local utility and the ISO, as directed by the State PUC, can potentially allow for all three capacity benefits to be captured for the benefit of the consumer as well as the system itself. Furthermore, energy marketers are uniquely situated to effectuate the multiple, cross-state mandates for reductions in energy consumption over the coming years.

Given current utility metering technology, today it will be difficult or impossible to determine whether or not any specific small customer has met its DR load profile unless and until smart meters are installed at each retail site. However, DR programs have been used by utilities with small-retail customers in the U.S. for 40 years in which the utility:

- Did not have a smart meter at each customer site
- "Reliably" could estimate the load profile impact of the DR
- "Reliably" designed rates/rebates to pay retail customers for their DR participation
- "Reliably" operated the grid using DR.

The key has been the use of a more-aggregated (yet reliable) load profile(s) and the use of statistical sampling. Data captured by utilities and the ISO as well as other credible experts in this field can readily be adapted by state PUCs and utilities to develop one or more first-generation, transitional retail DR load profiles to start to encourage DR behavior by residential and small-commercial customers as the full implementation of the smart-grid technology and related infrastructure occurs.

Endnotes:

[i] The federal government, RTOs/ISOs and state PUCs across the country have implemented laws, regulations and public policies that encourage significant investments by consumers, competitive Aggregators of Retail Customers (ARCs), regulated utilities, renewable-energy developers, and a growing number of energy-efficiency and demand-response (DR) products services and technology providers. These initiatives are intended to cost-effectively augment the domestic supply of traditional energy resources, reduce U.S. reliance on foreign energy supplies, reduce the carbon footprint of U.S. energy consumption and create new, high-quality "green" jobs, and economic growth. In the process, such measures have started to create significant new supplies of electrical energy, relieving near and mid-term concerns about shortages of generation capacity, improving transmission and distribution operational reliability and starting the implementation of a national smart grid upgrade of the U.S. energy infrastructure.

[ii] A new and growing high-tech industry has emerged to estimate measure and help consumers of all sizes to control the use of electrical energy. To date, many large consumers have the ability, either manually or automatically, to control and thereby to reduce energy usage and energy costs during critical peak times when utilities need maximum supplies of energy from traditional generation capacity (Megawatts), as well as a growing reliable supply of energy savings, load shifting and peak shaving (Negawatts).

To measure and verify the reduction of energy usage at critical times, many larger consumers as well as ARCs, including utilities and competitive suppliers, have invested in devices that automatically curtail load when activated by the consumer, competitive ARC or regulated utility during critical periods. In some cases, these control devices are complimented by the installation of "smart" meters that can communicate with the utility and provide hourly or more frequent energy usage data to verify the actual reduction that occurred at each consumer's site during a critical peak time event.

However, the purpose of this document is to suggest a number of cost-effective alternative means of implementing effective and reliable DR savings for residential and small-commercial classes of customers that include statistical sampling and an array of new technologies including smart meters that can provide reliable measurement and verification of energy savings related to DR and other alternative energy supply and efficiency initiatives.

[iii] **See**: "Bayesian Analysis of Optimal Sample Size and a Best Decision Rule for Experiments in Direct Load Control," *Journal of Econometrics (Annals 1979-1)*, Vol. 9 (January 1979), pp. 209-21; "A Brief Introduction to the Methodology of Optimal Experimental Design," *Journal of Econometrics (Annals 1979-2)* , Vol. 11 (September 1979), pp. 7-26; "Sample Design for Electricity Pricing Experiments: Anticipated Precision for a Time-of-Day Pricing Experiment," *Journal of Econometrics (Annals 1979-2)* , Vol. 11 (September 1979), pp. 195-205.