SENATE PUBLIC HEARING
Business & Commerce Committee
Senator John Carona, Chair
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Chairman Corona and Committee members,

The Center for the Commercialization of Electric Technologies (CCET) respectively submits this written testimony relevant to Committee Charge #2.

CCET's Mission and Technology Projects

CCET is a Texas non-profit formed in 2005 to enhance the safety, reliability, security, and efficiency of the Texas electric transmission and distribution system through research, development and commercialization of emerging technologies.

Since CCET's formation in 2005, CCET has completed a number of technology projects that investigated and promoted Smart Grid and related technologies and that help define the future of the ERCOT electric market. In addition to the completion of several technology projects during the last five years, CCET was, in January 2010, awarded a $13.5 million U.S. Department of Energy Stimulus grant. The total scale of the demonstration project is $27 million. The CCET Regional Smart Grid Demonstration grant is entitled ***Technology Solutions for Wind Integration in ERCOT and*** will last for a period of five years. We are now completing Phase I of this grant. We will be reporting on this grant effort in the future as results become available. Many of the objectives of this Regional Demonstration project are responsive to the Committee's Charge #2.

CCET's DR Pilot Project

A recent CCET project that is responsive to the Committee's Charge #2 is a Demand Response Pilot (DR) project completed during 2007-2009. The DR Pilot Program was a collaboration between three Retail Electric Providers (Direct Energy, Reliant Energy, and TXU Energy), three Transmission and Distribution Service Providers (American Electric Power, CenterPoint Energy – Houston Electric, and Oncor Electric Delivery), and demand response-enabling technology providers (Comverge and Corporate Systems Engineering). It was undertaken in order to explore the opportunities and challenges associated with implementing residential demand response programs in the restructured ERCOT market. The ERCOT market structure, as well as the use and integration of the latest technologies for advanced metering, intelligent grid operation, and in-home controls, make this pilot program unique. Residents of the Dallas and Houston service areas living within the footprints of Oncor Electric Delivery and CenterPoint Energy AMS deployments were recruited for participation in the pilot by the REPs from among their existing customers; in all, 213 households in the Dallas area and 133 households in the Houston area participated in the Pilot. In addition to bill rebates or similar incentives offered by the REPs, customers were given free programmable, communicating thermostats in exchange for their participation in the program, which involved allowing their air conditioners and, where applicable, pool pumps and electric water heaters to be controlled. While a number of challenges limited the ability of participant households to provide expected levels of demand reduction during called curtailment events, overall the Pilot accomplished its objectives of demonstrating the technical and operational feasibility of residential demand response in Texas's deregulated market.

Major Findings of the CCET DR Pilot are:

Proven Technology. It is possible to successfully integrate many of today's most advanced technologies for monitoring electricity usage, communicating with thermostats controlling air conditioner operation at homes, networking devices within homes, and controlling customer appliances through a voluntary residential demand response program. This pilot program has ~~also~~ demonstrated that demand response programs may be successfully implemented in an "unbundled" competitive electricity market where separate organizations are responsible for the various activities that must be coordinated in order to operate a voluntary demand response program.

KW Impacts. In curtailments called in the late summer and fall of 2008, an average demand reduction of 0.6 kW was estimated for participating homes in Dallas. The demand reduction that was achieved varied depending upon the curtailment strategy employed and customer-specific factors. Had Hurricane Ike and other delays not prevented the deployment of the program during the hottest period of the summer, and had more effective curtailment strategies been employed, we believe that an average demand reduction closer to 1 kW per home would have been attained.

Settlement Implications. Despite the fact that not all curtailment events for this pilot were timed to coincide with daily or seasonal demand peaks, comparison of averaged participant load shapes to the ERCOT load profiles for curtailment events showed that, during modeled curtailment events, participant energy use averaged between 1 and 2 kWh less than that predicted by the load profile. As load control and DR programs are brought to scale, the potential savings on marginal purchases on the balancing energy services market may become significant, particularly when curtailments are timed to coincide with periods of peak prices.

Demand Response in Off-peak Seasons. Given the importance of timing curtailment to periods of peak prices, it is important to note that many of the significant price spikes that have occurred in recent years in the ERCOT market have been due to constraints occurring in the fall and spring "shoulder" months. Because curtailments were called for this project in September and October, this study indicates that DR programs in Texas could provide additional value if market participants contract with participant customers not only for a certain number of summer peak hours, but also for additional hours in the shoulder months.

Market Effects. Had a "commercial-scale" demand response program been in effect during spikes in the price of balancing energy during the summer of 2008, wholesale prices could have been reduced by over 60% during the period of the spikes by enabling ERCOT to "slide down the bid stack".

Recommendations from the CCET Pilot are:

Settle ERCOT Wholesale Prices on 15-Minute Intervals. Market participants' level of interest in aggressively pursuing demand response may be determined by whether and how ERCOT decides to use 15-minute interval data for wholesale settlements. Rule 25.130 (h) established for ERCOT the objective of being able to use 15-minute interval data for this purpose by January 31, 2010, and ERCOT has been working for some time to establish the procedures that will allow them to accomplish this objective.

Deemed Savings or Stipulated Values for Use in ERCOT Settlement. A cost-effective and viable "interim solution" is needed while ERCOT's settlement system is being enhanced and while TDSPs are developing and implementing their AMI deployment plans, so that DR program participants' load shed during curtailment events may be better recognized. Such a solution could facilitate the development of residential demand response programs in the ERCOT market in the short term.

Establish a Preferred Method for Quantifying Savings. Even with advanced metering, quantifying savings requires a method to establish the counterfactual – what would have been consumed absent the curtailment event. In this pilot, savings were estimated according to two general methods: day-matching techniques and regression analysis. While each method has its advantages, in this pilot regression techniques were preferred, in part because this pilot was interested not only in estimating savings, but also in explaining the estimates. The inclusion of additional explanatory variables (e.g. temperature, hour of day) provides a greater level of understanding. However, day-matching methods may be more appropriate when estimating the savings associated with a specific individual event (e.g. for reporting).

Plan to Provide REPs and Curtailment Services Providers better information on market prices and appropriate times for deploying demand-side resources in the future. To maximize the value of investments in residential DR-enabling technology, market participants must be able to anticipate periods of peak prices. In the planned nodal wholesale market system, 15-minute advance price signals will not be provided. Any steps taken to provide advanced notice of wholesale prices in the nodal market would increase the future effectiveness of demand response efforts.

Expand Opportunities for Residential Demand Response. The value of residential demand response is not limited to the annual value of reduced generation purchases on the balancing energy services market. Currently, residential direct load control can participate in some programs, such as the Emergency Interruptible Load Service (EILS) program, but has limited ability to provide ancillary service, such as non-spinning reserves. Technological challenges would have to be overcome and revisions to protocols made, for residential DR resources to provide non-spinning reserves.

Promote "smart appliances" in Texas. Future opportunities for Residential Demand Response are likely to include direct load control programs like the CCET DR Pilot, but will also include the introduction of information (e.g. prices, real time power use) to households via the "Smart Grid," with the advanced meter providing a gateway into the home and using home area networks for communication between appliances and devices in the home. Promotion of smart appliances that can communicate on a home area network (HAN) will increase consumers' ability to manage their energy use and increase the loads available to DR programs.

Address the "Stranded Investment" Problem. Investments in customer-sited DR technology may be "lost" to the market when customers change retail provider or move out because the subsequent provider may not be able to communicate with the resource. PUCT Project #34610 is establishing business rules for access to HAN devices, which should address the information issue. Technological issues are also being addressed via continued development of standards in the communications protocols, including requirements that devices be tested by 3rd parties for interoperability.

Reference: CCET Web page and PDF document on DR Pilot Page at:
http://electrictechnologycenter.com/

Attachments

CCET Demand Response (DR) Pilot Project Summarized

I. Key Requirements for Residential Demand Response in the Texas Market

a. Advanced Meter Infrastructure owned and operated by the transmission and distribution (T&D) companies. Advanced meters, communication technology network and related data management systems.
b. In-home technologies beyond the meter can not be owned by T&D companies and will be owned and operated by the customer, vendors and retail electric providers (REP). Control equipment and near real time access to consumption and load data is required along with the opportunity to act via programs offered by retail service providers (REP).
c. ERCOT must settle demand response (DR) transactions. Accurate demand response data and an acceptable representation of customer's load profile are required.

II. CCET's DR Pilot Objectives

a. Demonstrate the technology
b. Determine how market participants work together
c. Accurately measure results
d. Assess customer response and gain knowledge about what is important to the consumer and what would be most easily adopted by them beyond this Pilot in order to guide ongoing DR programs

About the Smart Grid and Smart Houses

Concepts of the future Smart Grid and of Smart Houses are somewhat varied and are not easily defined separately by a particular set of devices and software. Clearly such future smart system concepts require the integration of information, devices and software across the system to deliver all of the anticipated efficiencies of utility management and the participation of consumers in demand management.

The smart devices and software systems deployed by the transmission and distribution companies stretching from the control room across the grid to, and including the meter, form the "backbone" upon which retail services such as programs, products and applications will be deployed. The CCET Pilot has enough "smarts" in the transmission and distribution company AMI systems and in devices and software installed in the houses by the retail companies and vendors to demonstrate demand response capability in the Texas market.

Attachments

CCET Demand Response Pilot Characteristics and Participants

I. The Pilot Definition

- Residential Sector
- Planned 500 Participants in Dallas & 500 in Houston (Oncor and CenterPoint Service Areas)
- 2008 summer season
- Incentives offered by Retail Electric Providers
- Enabled by communication technologies and Advanced Meter Deployment
- Measurement &Verification Done
- As if Settled by ERCOT

II. Opportunity to Leverage Early Rollout of AMS in Houston and Dallas

- Conducted a pilot to shift residential electric load off the daily peak
- Used advanced metering infrastructure
- Gauged customer reactions and acceptance
- Developed experience among market participants for residential demand response
  - TDUs – Transmission & Distribution Utilities
  - REPs – Retail Electric Providers
  - ERCOT
  - Customers

III. Participants

Houston

CenterPoint
Direct Energy
Reliant Energy
TXU Energy
Comverge

Dallas

Oncor
Direct Energy
Reliant Energy
TXU Energy
Current Group
Corporate Systems Engineering

ERCOT
Austin Energy (coordinated activities)
AEP Texas (via funding)

CCET

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GRIDPOINT Intelligent Energy Management

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