openADR ALLIANCE

Commercial and Industrial Deployments for Fast Response Grid Services

June 12, 2019

Jim Boch - IPKeys Power Partners

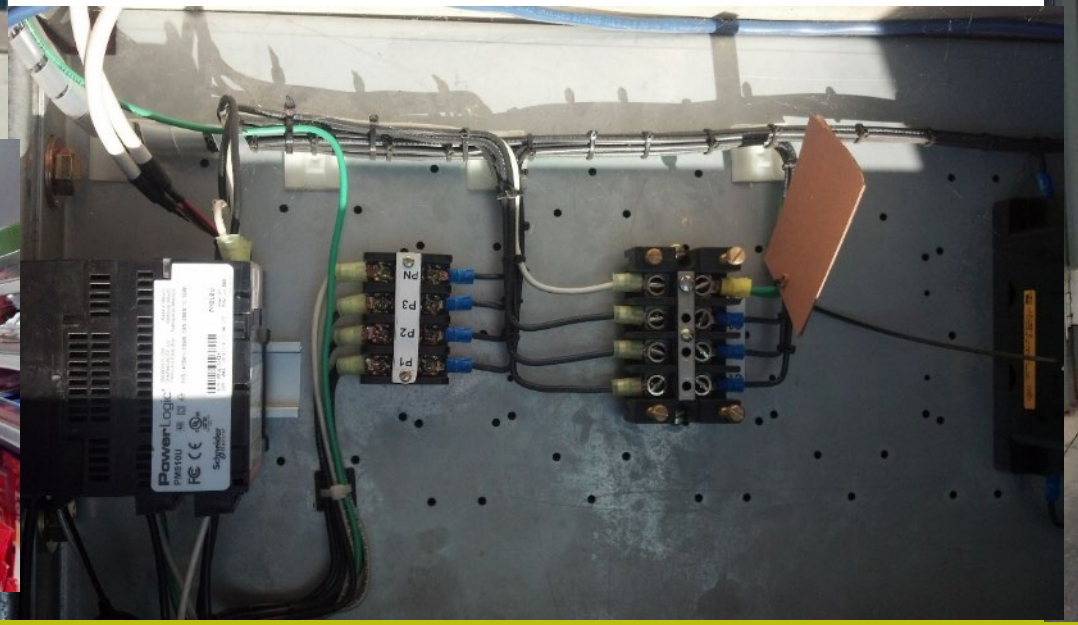
Chief Engineer Energy & Smart Grid

OpenADR 2.0b – Can it be used for all grid services?

- When the Oasis Standard, Energy Interoperation (OpenADR 2.0b) was released the question was repeatedly asked: Can a standard designed by a committee really meet the requirements for all grid services?
- Capacity
- Synchronous Reserves
- Regulation
- TOU
- Real Time Price (LMP)

PILOT = PJM – IPKeys – Walmart – Schneider - LBNL


Walmart
195
STOP

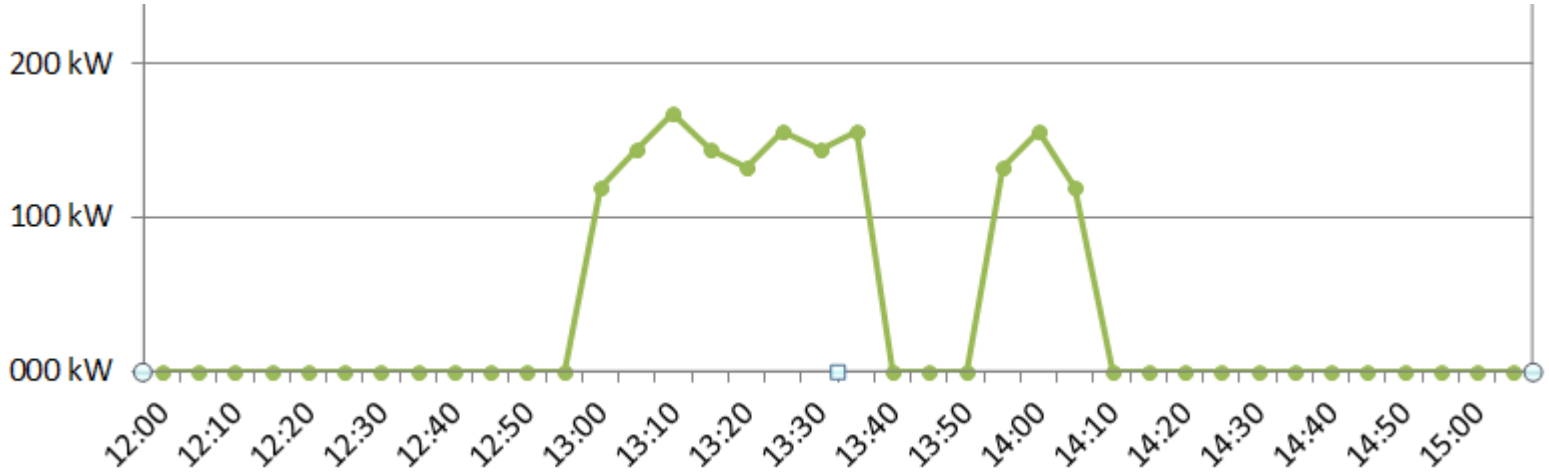

PowerLogic


novar
EISS

Sync Reserve – Utilizing Secure Web Cloud Services

Capacity – PJM, Walmart, LBNL

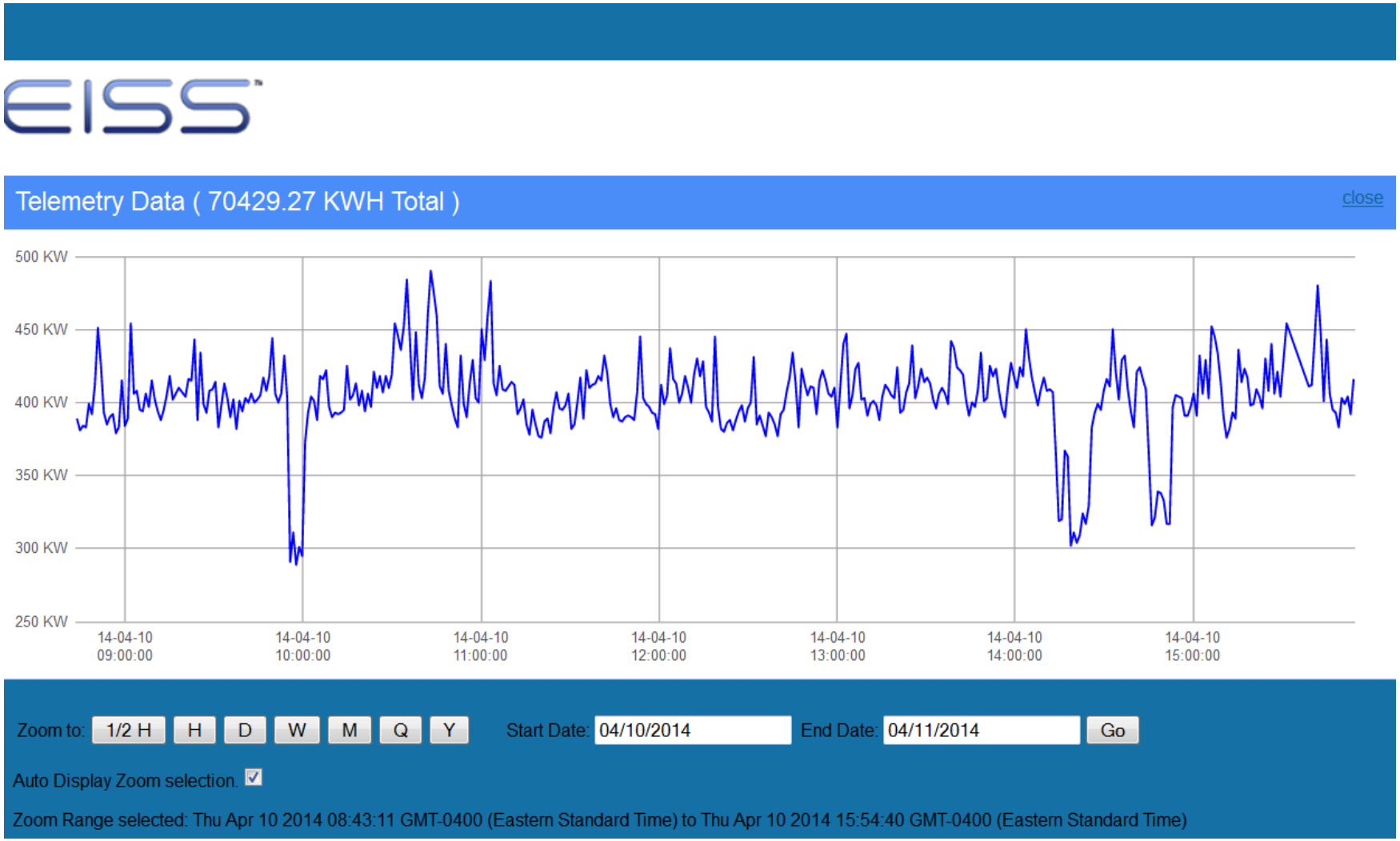
- Capacity Pilot
  - Demand Response Event
  - Price Based Demand Response
  - Verification with Telemetry
  - Event and price based load shed verified with meter telemetry



Synchronized Reserves

- Short duration <30min
- No notice
- SOAP or REST translation required
- Full response in 10min
- Paid for being available
- Penalties for non performance
- 1min granularity meter data reported 24hrs later

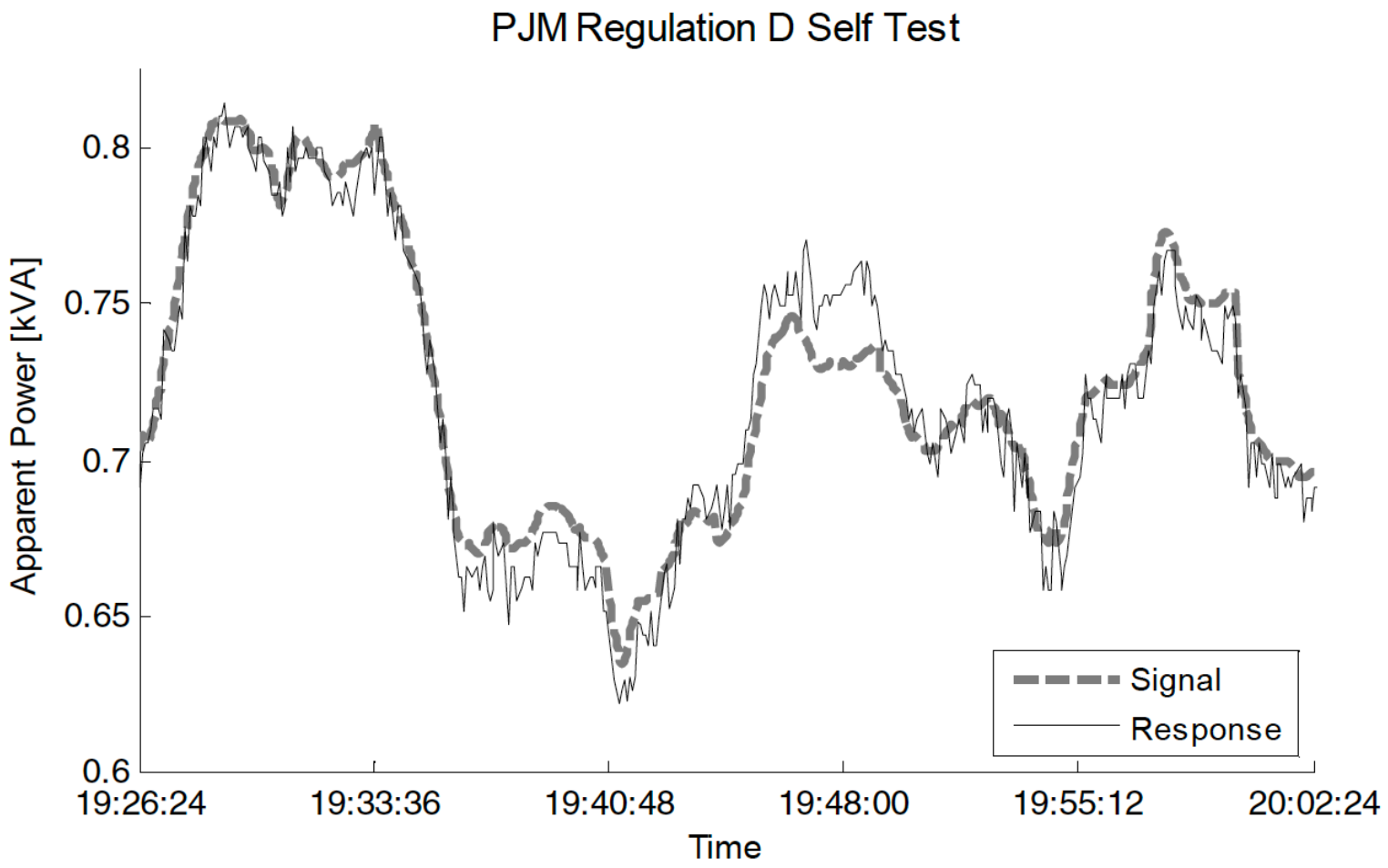
PJM Sync Reserve - Lighting



Regulation Services

- 4 second signal
- Meter feedback required
- DMP3 or ICCP translation required
- Performed for long durations
- Paid based on the ability to follow the regulation signal
- Paid for performance
- Up reg/down reg is typically required
- PJM REG D 5min energy neutral

PJM Regulation



PJM REG D VFD Score

- The precision metric described in PJM's Manual for Balancing Operations was used to evaluate the performance of the system. Precision is the probabilistic inverse of error. Error is described as the average of the absolute value of the difference between the energy of the regulation signal and the response, measured in 10s increments. This is then divided by the average regulation signal over the interval (PJM 2013a). For the response shown in Figure 6, the
- VFD response's performance was 90%. The target for certification as a resource is 75% performance or better, so by this metric of performance the VFD load response is a success.

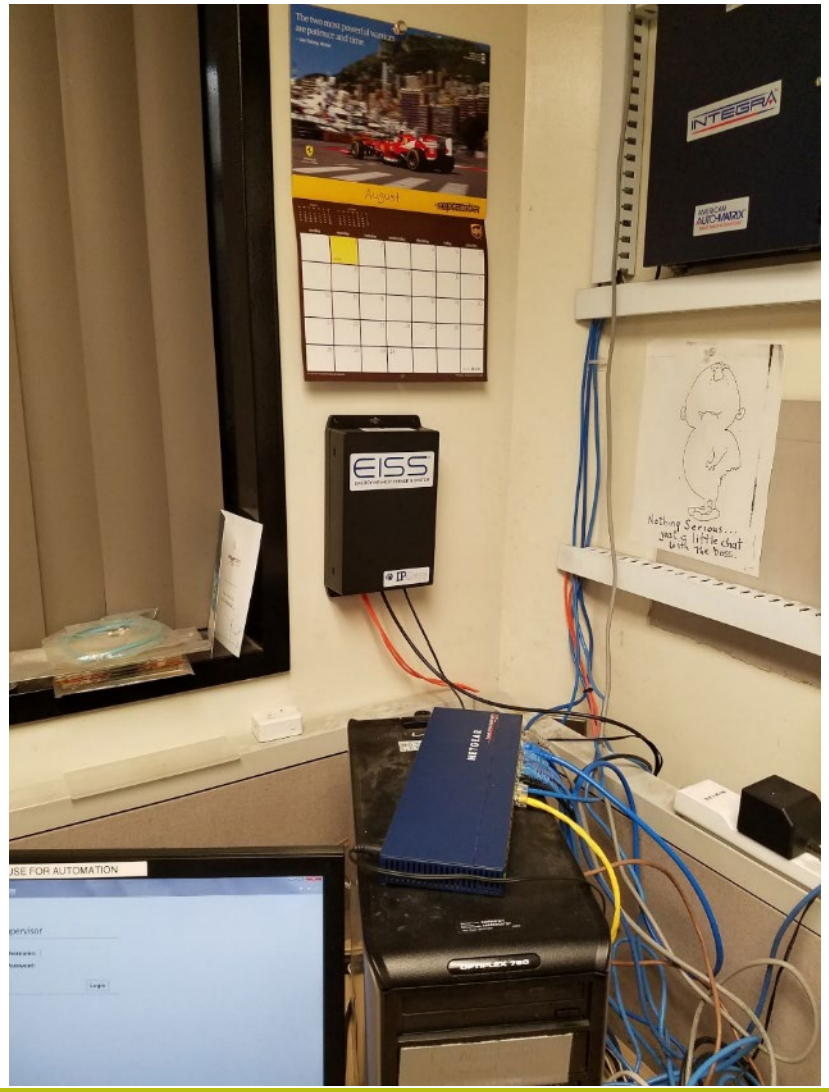
California PG&E BIP - TOU

ERCOT - ERS 10


COMP #3
HIGH VOLTAGE
SWITCHBOARD MSB
480Y/277V 3Ø-4W
1200 AMPERES
DANGER

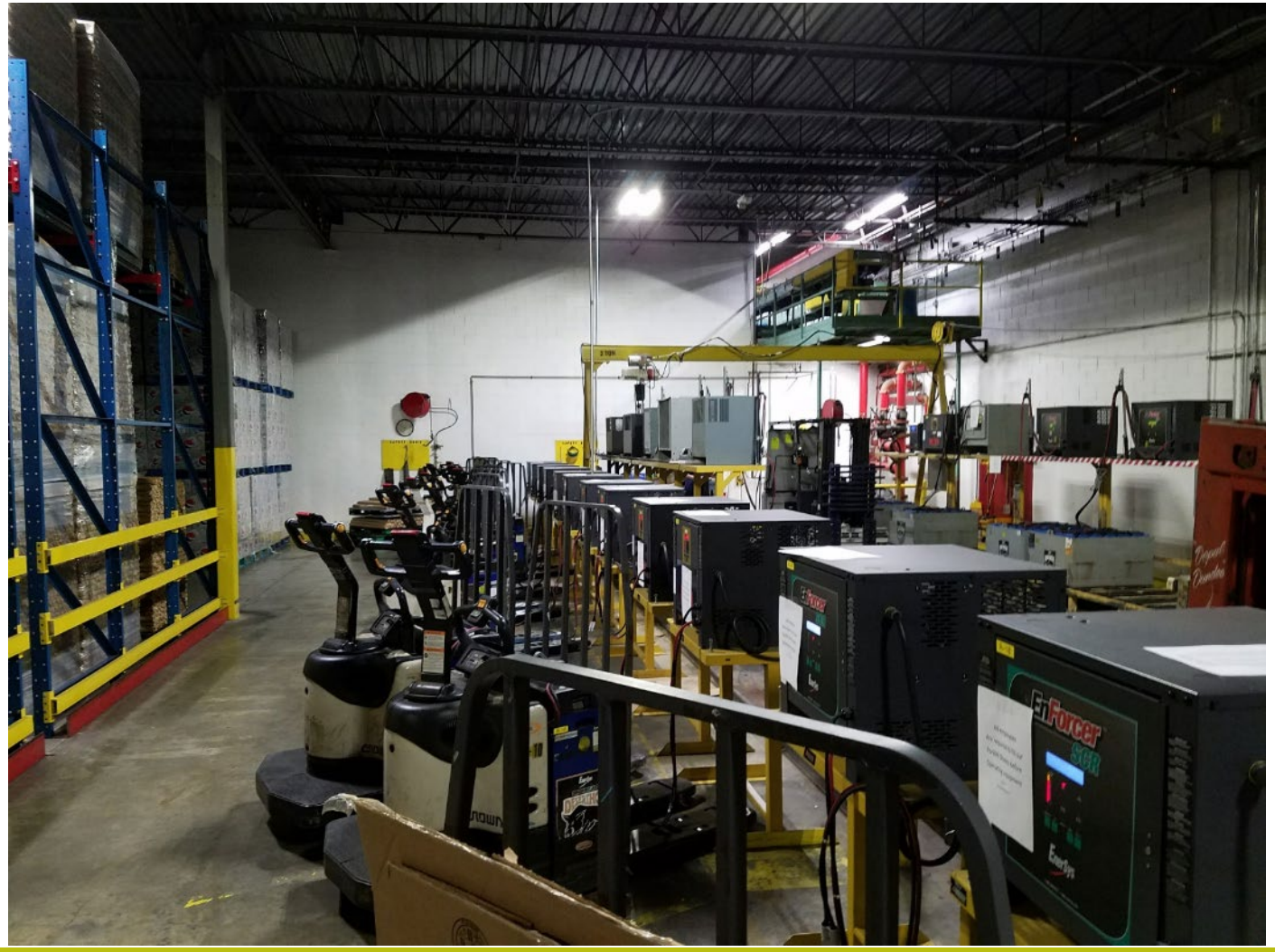
HECO FAST DR

PJM Sync Reserves and Capacity



DOE Shines – Buildings as Batteries – Grain Mill

DOE Shines – Buildings as Batteries - Canner



NGRID GAS DR

Publications


Guest Editorial

Latest Auto DR Platform Empowers Customers

New Energy Market Incentives & Advanced Management Opportunities

By Robert Nawy and Jason MacDonald

Introduction

The new, highly-secure automated Demand Response (DR) platform, OpenADR 2.0b, opens up the next generation of markets for DR and energy market program participants. Recent OpenADR 2.0b pilots focused on Ancillary Services, including Synchronous Reserve and Regulation, at PJM Interconnection, LLC eclipses historical viewpoints that DR may not be relied upon to deliver the easily measured and verified performance required in the small intervals necessary for program participants to receive best treatment valuation and market incentives. The pilots have shown that DR resources show great promise as a provider of ancillary services.

Changing supply paradigm and new regulations requires new resources!

EPA driven coal plant shuttering, nuclear energy facility closures, shale production, and related energy market price reductions all coupled with unpredictable climate create the need for critical planning by grid operators to meet ever growing and changing energy supply needs. The OpenADR 2.0b pilots successfully demonstrate that proactive demand and load management may be relied upon as an efficient and cost effective method of meeting today's changing supply, regulation and price reductions.

What is OpenADR 2.0b?

OpenADR is a standardized method for electricity providers and system operators to communicate DR signals with each other and with their customers using a common language over any existing secure IP-based communications network, such as the Internet. It is designed for sophisticated devices supporting most DR services and markets, with flexible capabilities for generating past, current, and future data reports.

Characteristics of the 'New DR'

'New' DR programs are more granular in several ways:

- Some existing programs are locational forms of Emergency DR Programs. These programs, enabled by GIS systems, permit a utility to 'turn-off' participants located on an overloaded feeder line, rather than turning off program participants throughout their operating area.
- New DR programs, enabled by the new OpenADR 2.0b autoDR standard, enables programs to be called piecemeal or incrementally – some examples include:
  i) A shed request might be for twenty percent (20%) against a committed shed level
  ii) Setting a thermostat controlling a HVAC up three (3) degrees on a hot day
  iii) Dispatching participants in certain ancillary services programs, described in more detail, below.

In each use case listed above, the 'new' DR programs provide participants new monetization incentives too, often at minimal inconvenience to the facility, while enabling continued evolution of grid reliability and stability. The protocol pilots have successfully demonstrated the ability to make demand side load available in an efficient and cost effective manner for a variety of markets such as:

- Capacity
- Energy

And further enable such ancillary services as:

- Regulation
- Synchronous Reserves

Over the past year, the company participated in and led trials of the use of OpenADR 2.0b in certain ancillary services programs. The results and 'lessons learned' from that trial are discussed in the rest of this article.

Commercial Building Loads Providing Ancillary Services in PJM

Jason MacDonald and Sila Kiliccote, Lawrence Berkeley National Laboratory
Jim Bock, Jonathan Chen and Robert Nawy, IPKeys Technologies, LLC

ABSTRACT

The adoption of low carbon energy technologies such as variable renewable energy and electric vehicles, coupled with the efficacy of energy efficiency to reduce traditional base load has increased the uncertainty inherent in the net load shape. Handling this variability with slower, traditional resources leads to inefficient system dispatch, and in some cases may compromise reliability. Grid operators are looking to future energy technologies, such as automated demand response (DR), to provide capacity-based reliability services as the need for these services increase. While DR resources are expected to have the flexibility characteristics operators are looking for, demonstrations are necessary to build confidence in their capabilities. Additionally, building owners are uncertain of the monetary value and operational burden of providing these services. To address this, the present study demonstrates the ability of demand response resources providing two ancillary services in the PJM territory, synchronous reserve and regulation, using an OpenADR 2.0b signaling architecture. The loads under control include HVAC and lighting at a big box retail store and variable frequency fan loads. The study examines performance characteristics of the resource: the speed of response, communications latencies in the architecture, and accuracy of response. It also examines the frequency and duration of events and the value in the marketplace which can be used to examine if the opportunity is sufficient to entice building owners to participate.

Introduction

The adoption of low carbon energy technologies, such as variable renewable energy generation and electric vehicles, coupled with the effectiveness of energy efficiency at reducing traditional base load, has increased the uncertainty inherent in the net electricity load shape. This uncertainty can create reliability issues and market instability when attempting to balance load with generation through typical unit commitment and dispatch mechanisms (Helman 2010). Questions remain among electricity system operators and regulators as to which method to manage this uncertainty is best. One proposed solution is to increase either the amount or efficacy of operating reserve-based ancillary services (Helman 2010). Federal Energy Regulatory Commission (FERC) rules have attempted to open the markets to new resources, reduce uncertainty, and established market incentives for fast and accurate performance of frequency regulating reserve in response to these growing issues (FERC 2008, 2011, 2012).

Ancillary services (AS) are the non-energy products and services required to maintain reliability in the electricity system. FERC defined six required AS in their landmark rule 888 (1996), two of which were allowed to be market-based reserve products: operating reserve and frequency regulating reserve. Operating reserves are capacity held in reserve to be used in contingency events to balance the loss of transmission or generation on the system. These are classified into synchronous (or spinning), non-synchronous, and supplemental reserves. Synchronous reserves are the unloaded synchronized capacity of generation and sheddable load that can be fully dispatched within ten minutes and are the most valuable and highest quality of

Jim Boch
Chief Engineer
IPKeys Technologies
jboch@ipkeys.com
www.ipkeys.com