Welcome!

- Thank you for joining today’s webinar: OpenADR Implementation for Commercial and Industrial Facilities

- If you have a question please use the question box located on the right side of your screen.

- Questions for our speakers will be addressed at the end of the presentation.

- This webinar will be recorded for future playback.

- We will begin momentarily.
OpenADR Implementation for Commercial and Industrial Facilities

Webinar: September 30th, 2014

Mark Kerbel
EVP Business Development & Co-founder, REGEN Energy

Patty Solberg
Director of Product Marketing, Powerit Solutions
Agenda

- Demand Response Overview
- OpenADR Introduction
- Commercial and Industrial ADR Participation
  - Considerations for facility participation
  - Sample implementations
- Expanding C&I Load Participation
  - New program development
  - Technology and standardization
Demand Response Overview

- Impact: Effective demand response can help reduce electric price volatility, mitigate generation market power, and enhance reliability.

FERC Definition\(^1\): “Changes in electric usage by demand-side resources from their normal consumption patterns in response to changes in the price of electricity over time, or to incentive payments designed to induce lower electricity use at times of high wholesale market prices or when system reliability is jeopardized.”

NERC Demand Side Management Categories

- Demand-Side Management
  - Demand Response
  - Energy Efficiency
    - Non-Dispatchable
    - Dispatchable
      - Reliable
        - Energy-Voluntary
        - Regulation
      - Economic
        - Energy / Price
          - Spinning Reserves
          - Non-spinning Reserves
          - Emergency
          - Demand Bidding & Buy-Back
            - Time-of-Use (TOU)
            - Critical Peak Pricing (CPP)
            - Real-Time Pricing (RTP)
            - System Peak Transmission Tariff (3CP, 4CP, PLC)

Programs Enabled by OpenADR

- Direct Control Load Management
- Interruptible Load
- Critical Peak Pricing (CPP) with control
- Load as a Capacity Resource
- Spinning Reserves
- Non-spinning Reserves
- Emergency
- Demand Bidding & Buy-Back
- Time-of-Use (TOU)
- Critical Peak Pricing (CPP)
- Real-Time Pricing (RTP)
- System Peak Transmission Tariff (3CP, 4CP, PLC)
OpenADR Vision

- A non-proprietary, open standardized DR interface that allows electricity providers to communicate DR signals directly to customers using a common language and existing communications such as the Internet.

- **Standardize** the interface between electricity markets and customers

- **Automate** the customer resource to fluctuating energy prices and grid instability

- **Simplify** your energy future and maximize the value of your DR capacity
What is the OpenADR Alliance?

Vision: Facilitate the global deployment of OpenADR to reduce the cost of supplying and consuming electricity, while improving energy reliability and reducing environmental impact.

- California based nonprofit 501(c)(6) corporation
- Member based organization comprised of industry stakeholders interested in fostering OpenADR adoption
- Leverages Smart Grid related standards from OASIS, UCA and NAESB
- Supports development, testing, and deployment of commercial OpenADR
- Enables stakeholders to participate in automated DR, dynamic pricing, and electricity grid reliability
<table>
<thead>
<tr>
<th>Operational Impact Consideration</th>
<th>Industrial</th>
<th>Commercial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Notification Timing</td>
<td>Is manual curtailment possible, or must it be automated</td>
<td>Many only use notification as an FYI, but do not want to act on it</td>
</tr>
<tr>
<td>Event Duration</td>
<td>Can the curtailment be absorbed in the manufacturing process, or will it negatively impact throughput</td>
<td>Can curtailment be adjusted to meet comfort issues for long events</td>
</tr>
<tr>
<td>Event Frequency</td>
<td>Will multiple events threaten business commitments</td>
<td>Will multiple events impact comfort</td>
</tr>
<tr>
<td>Participation Levels</td>
<td>Is it possible to participate with ancillary and non-critical loads</td>
<td>What loads exist in the building that can be curtailed, and by how much</td>
</tr>
<tr>
<td>Potential Earnings</td>
<td>Do payments make delaying product worthwhile</td>
<td>Do payments vs. impact on comfort make load shed worthwhile</td>
</tr>
</tbody>
</table>
Factors in end-user participation

kW participation will vary for each site, and may vary based on program. Economic programs allow a specific bid level per hour.

Notification windows will vary based on program. Can range from 24 hours to 10 minutes, to seconds.

Event durations vary from minutes to hours (excluding regulation).

Chart source: Powerit Solutions
Barriers to ADR Adoption

- Facilities managers don’t understand impact and how to participate

<table>
<thead>
<tr>
<th>Barrier*… or Misperception?</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reluctance on part of building owner or facility manager to hand over management and control</td>
<td>Education by OpenADR Alliance, use of flexible solutions to enable customer control</td>
</tr>
<tr>
<td>Majority of existing commercial buildings have simple controls, manual control, or none at all</td>
<td>Strong community of OpenADR certified vendors offer cost effective solutions, other cost savings measures</td>
</tr>
<tr>
<td>Cost of retrofitting a building for ADR can be significant</td>
<td></td>
</tr>
</tbody>
</table>

*Source: Navigant Research report on **Automated Demand Response** OpenADR, Commercial & Industrial ADR, Residential ADR, and DR Management Systems: Global Market Analysis and Forecasts Published 1Q 2014
Benefits to Automation

- Improved reliability
  - Eliminate dependency on specific people
  - Reduce human error

- Enable participation in short response events
  - Some lucrative programs require 10 minute response or less

- Monitor and protect equipment
  - Closed loop controls and facility monitoring allow for a controlled participation in demand response
  - Ensure that equipment and critical temperatures or processes are being protected

- Enables granular participation
  - Choose which equipment participates in DR based on business requirements
## Industrial Examples

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Food and Beverage</th>
<th>Manufacturing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industrial Process</td>
<td>Table grape cooling, storing</td>
<td>Rubber products</td>
</tr>
<tr>
<td>Location</td>
<td>Delano, CA</td>
<td>Orange, CA</td>
</tr>
<tr>
<td>Controlled Loads</td>
<td>Precoolers, compressors, condensers, cold storage equip.</td>
<td>Mill, mixer, injector, and extruder motors, ovens</td>
</tr>
<tr>
<td>Curtailment Strategy</td>
<td>Precool before events, reduce equipment during event while monitoring fruit and room temperatures</td>
<td>Interrupt operator load controls to turn down equipment</td>
</tr>
<tr>
<td>Load Reduction, absolute and % of total</td>
<td>700kW / 80%</td>
<td>900kW / 72%</td>
</tr>
<tr>
<td>DR Program(s)</td>
<td>SCE Demand Response Contracts (DRC)</td>
<td>SCE Demand Bidding Program, and Base Interruptible Program</td>
</tr>
<tr>
<td>Notification Window</td>
<td>1 hour</td>
<td>DBP: Noon the day before BIP: 15 or 30 minutes</td>
</tr>
<tr>
<td>Event Duration</td>
<td>1-6 hours</td>
<td>DBP: 2 hour minimum BIP: 6 hr max.</td>
</tr>
<tr>
<td>Event Frequency</td>
<td></td>
<td>DBP: As bid and accepted BIP: 10 max/mo, 120 hrs max/yr</td>
</tr>
<tr>
<td>Participation Method</td>
<td>AUTOMATED via OpenADR</td>
<td></td>
</tr>
<tr>
<td>Reference info</td>
<td><a href="#">SCE Case Study</a></td>
<td><a href="#">SCE Case Study</a></td>
</tr>
</tbody>
</table>
## Commercial Examples

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Small Commercial</th>
<th>Large Commercial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building type</td>
<td>Multi-cinema Theater</td>
<td>Large Retail Mall</td>
</tr>
<tr>
<td>Location</td>
<td>Kapolei, Hawaii</td>
<td>Brea, California</td>
</tr>
<tr>
<td>Controlled Loads</td>
<td></td>
<td>Rooftop HVAC units</td>
</tr>
<tr>
<td>Curtailment Strategy</td>
<td>Reduced duty cycles, smoothed out across all participating loads</td>
<td></td>
</tr>
<tr>
<td>Load Reduction, absolute and % of total</td>
<td>60 kW / 50% of 25% of total building load</td>
<td>100 kW / ~10% of total building load</td>
</tr>
<tr>
<td>DR Program(s)</td>
<td>HECO Fast DR</td>
<td>SCE CBP Day Of Program + Load Aggregator</td>
</tr>
<tr>
<td>Notification Window</td>
<td>10 minutes</td>
<td>2 hours</td>
</tr>
<tr>
<td>Event Duration</td>
<td>15-60 minutes</td>
<td>1-4 hours</td>
</tr>
<tr>
<td>Event Frequency</td>
<td>Once per day</td>
<td>Once per day</td>
</tr>
<tr>
<td>Participation Method</td>
<td>AUTOMATED via OpenADR</td>
<td></td>
</tr>
</tbody>
</table>
C&I DR Considerations

- Classification of available load for DR participation

<table>
<thead>
<tr>
<th>Business Impact to Load Reduction</th>
<th>Base Load</th>
<th>Critical Load</th>
<th>Flexible Load</th>
<th>Ancillary Load</th>
<th>On-Site Generation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Industrial Load Examples**
- Emergency lighting, product cooling
- Time-sensitive process equipment
- Time insensitive process equipment
- Forklift battery chargers, "normal" office temp. controls
- Participation depends on regulation

**Commercial Load Examples**
- Business dependent
  - HVAC, Lighting, defrost circuits, some food prep equipment
- HVAC, Lighting, defrost circuits, cold storage
- HVAC, Lighting, defrost circuits, cold storage
- Rare due to relative costs
Automated DR increases the availability of C&I loads to participate in different styles of DR programs.

- On-Site Generation
- Ancillary Load
- Flexible Load
- Critical Load
- Base Load - Not Available

The graph shows the reduction in available kW across different reduction hours from low to high.
Program impact on DR Participation

- Participation rules should match business capabilities and needs
  - Generator rules vs. load rules (response time, predictability, availability)
  - Business friendly rules = increased load participation

- OpenADR 2.0 enables DR programs of future
  - Migration to more responsive programs means loads must be automated
    - As traditional or capacity DR moves to economic and ancillary programs
  - Standardized communication protocol accelerates market adoption
    - Robust ecosystem of vendors
    - Common utility programs
    - OpenADR2.0b offers bidirectional metering capability
Automated Load Flexibility = Improved Load Value

- Transactive energy models increase the value of loads
- Business-friendly rules + loads that participate in grid balancing = optimized grid
- Facility managers can capitalize on participation in a hands-free manner

Source: GWAC
Upcoming OpenADR webinars

- **Implementing DR Programs Using an Open Standard**
  - Oct. 28, 2014, 8am-9am PDT. Learn how the OpenADR standard can be used to create cost effective, secure and scalable DR programs for residential, commercial and industrial customers.

- **Electric Vehicles and Automated Demand Response**
  - Nov. 18, 2014, 8am-9am PST. Learn how utilities are using the OpenADR standard to better manage EV programs, while capturing more revenue.

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