Integrating Energy Efficiency and Demand Response for Commercial Customers

November 2010
Introduction
EnerNOC at a Glance

Market Leader in C&I Demand Response
- More than 5,100 MW under management across 8,200 C&I sites in US, Canada, and UK
- Proven, consistent resource reliability and exceptional customer satisfaction

Innovative Energy Management Applications Including Energy Efficiency

Strong Financial Track Record
- Publicly traded on NASDAQ (ticker ENOC)
- Projected 2010 revenues of $273-285M and profitable
- 460+ full-time employees

(all figures as of 9/30/10)
Select EnerNOC Utility Partnerships

In addition, EnerNOC provides capacity, energy and ancillary services in the following wholesale markets: the Electric Reliability Council of Texas (ERCOT), ISO New England, New York ISO, the PJM Interconnection, and National Grid (UK).

<table>
<thead>
<tr>
<th>Utility</th>
<th>Application</th>
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<tbody>
<tr>
<td>Allegheny Power</td>
<td>DemandSMART</td>
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<td>Baltimore Gas &amp; Electric</td>
<td>DemandSMART</td>
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<td>Burlington Electric Dept (VT)</td>
<td>DemandSMART</td>
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<td>Commonwealth Edison</td>
<td>SiteSMART</td>
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<td>Delmarva Power</td>
<td>DemandSMART</td>
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<td>Idaho Power</td>
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<td>National Grid</td>
<td>SiteSMART</td>
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<td>NStar</td>
<td>SiteSMART</td>
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<td>NYSERDA</td>
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<td>Pacific Gas &amp; Electric</td>
<td>DemandSMART &amp; SiteSMART</td>
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<td>Pepco</td>
<td>DemandSMART</td>
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<td>Public Service Company of New Mexico</td>
<td>DemandSMART</td>
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<td>Puget Sound Energy</td>
<td>DemandSMART</td>
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<td>Salt River Project</td>
<td>DemandSMART</td>
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<td>San Diego Gas &amp; Electric</td>
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<td>Southern California Edison</td>
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<td>Tampa Electric Company</td>
<td>DemandSMART</td>
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<td>Tennessee Valley Authority</td>
<td>DemandSMART</td>
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<tr>
<td>Tucson Electric Power</td>
<td>DemandSMART</td>
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<td>Xcel Energy (Colorado)</td>
<td>DemandSMART</td>
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The Holy Grail of the Smart Grid: Integrated Energy Efficiency and Demand Response

C&I sector’s EE potential is ~285 TWh and DR potential is 68 GW by 2030\(^1\)

Less than 5 percent of DSM programs have dual-purpose or integrated DR and EE components\(^2\)

The potential is there -- so what is holding us back???

\(^1\) Source: Electric Power Research Institute, 2009  
\(^2\) Source: Environmental Protection Agency, 2010
Approaches to Integrating EE and DR

Approach 1
- A common technology platform delivers both DR and EE.

Approach 2
- DR incentives are used to fund the cost of EE measures.

Approach 3
- The data provided by DR program participation can drive customers to optimize and reduce energy usage.
Approach 1: A common technology delivers both EE and DR.
Integrated Demand Side System Architecture

Energy data is collected from the customer’s electric meter and building management systems in real-time, which enables demand response and energy efficiency applications.
A Robust Platform Can Provide Both DR & EE

Monitor real-time DR performance.

Generate energy efficiency through continuous monitoring based commissioning by filtering and analyzing data for anomalous consumption.

View energy information to monitor usage, benchmark facilities, optimize EE investments.

Present energy savings opportunities in a monthly report, allowing the customer to focus on the highest value measures.
Case Study: CSU Monterey Bay
Monterey Bay, CA

Key Technologies Employed On-Site:
BMS: Johnson Controls Metasys 4.1
BMS Gateway: Gridlogix
Meter Gateway: Echelon iLon

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<tr>
<th>Building</th>
<th>Sq. Ft</th>
<th>Points</th>
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<tr>
<td>University Center</td>
<td>32,000</td>
<td>152</td>
</tr>
<tr>
<td>Sports Center</td>
<td>25,600</td>
<td>147</td>
</tr>
<tr>
<td>Media Learning Center</td>
<td>30,000</td>
<td>614</td>
</tr>
<tr>
<td>Student Center</td>
<td>29,000</td>
<td>53</td>
</tr>
<tr>
<td>Classrooms</td>
<td>15,000</td>
<td>110</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>131,600</strong></td>
<td><strong>1,076</strong></td>
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Case Study: CSU Monterey Bay, cont’d

**Energy Efficiency**
Total Savings: (2009) 535 MWh & 165 therms
$62,000

- **Participation Start**: 2005
- **Programs**:
  - UC/CSU IOU EE Partnership
  - EnerNOC SiteSMART
- **Example Energy Efficiency Measures**:
  - Enable summer schedule on BMS
  - Correct false discharge air temperature (DAT) reading on air handler (AHU)
  - AHU is running when no occupants
- **Noteworthy**: As of 2009, the combined results of these projects have reduced CSUMB’s annual energy intensity from 12.5 kWh/sq ft to 9.57 kWh/sq ft (a 24% decrease) and from 0.54 therms/sq ft to 0.40 therms/sq ft (a 26% decrease).

**Demand Response**
Total Savings: 55 kW
$1,000

- **Participation Start**: 2009
- **DR Program**: PG&E / EnerNOC Aggregator Managed Program
- **Curtailment load**: lighting and HVAC
- **Response type**: Automated
- **Technology**: Load control strategy is programmed directly into the BMS sequence of operation using standard Demand Limiting Load Rolling (DLLR) features
- **Notification**: Facilities managers are notified via text message of each dispatch – no further action required.
Approach 2: DR incentives are used to fund the cost of EE measures.
The Concept: Commercial Bakery Example

Demand Response
- DR measure: partially curtail freezers, air conditioning and mixers across 4 sites
- Reduction: ~500 kW
- Contract length: 5 years
- Total annual incentive: $20,000

Energy Efficiency
- EE measure: high performance oven
- Discount rate: 10%
- Total DR incentive that can be applied to EE: $75,000
Case Study: Northwest Community Hospital
Arlington Heights, IL

Energy Efficiency
Total Savings Identified to Date: $300,000

- **Participation Start:** 2009
- **EE Program:** EnerNOC SiteSMART
- **Key Technologies Employed**
  - BMS: Johnson Controls
  - BMS Gateway: Tridium JACE
  - Meter device: Echelon iLon
- **End-Use Data Points Collected**
  - Approximately 5,000
- **Example Energy Efficiency Measures:**
  - Reduce air handler run time when the surgery room is not in use.
  - Turn off 125 outdoor alcove spotlights when there is adequate daylight.
  - Reduce lighting in day-lit areas like the cafeteria, the main lobby, and various hallways

Demand Response
Total Savings: 4.2 MW $129,000 / year

- **Participation Start:** 2008
- **DR Program:** PJM Emergency Load Response Program
- **Key Technologies Employed:**
  - Four 1.1 MW combined heat and power units
- **Curtailment load:** Shift load onto onsite generators
- **Response type:** Manual
Approach 3: The data provided by DR program participation can drive customers to optimize and reduce energy usage.
Online Energy Management for C&I Customers
Case Study: MGM Industries

Hendersonville, TN

“By having visibility into our energy usage, we ended up saving about three times the amount of our DR payments. We know a lot more about how we use energy, such as how many amps each piece of equipment draws. This knowledge helps us time our production schedule better and use the right equipment at the right time.”
How Do C&I Customers Use Energy Data?

- Avoiding a new peak demand
- Monitoring weekend energy usage
- Responding to dynamic pricing signals
- Monitoring usage when management is offsite
Can Energy Data be a New EE Marketing Strategy?

Note: This is a mock-up for illustrative purposes only.
A Few Considerations and Recommendations

Interoperability is key.

Human beings can only process so much data!

DR and EE are compliments, but programs need to be structured correctly.
Questions?

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