



## **Demand Response – Using Technology to Provide Ancillary Services**

April 12, 2011

# EnerNOC at a Glance

## Quick Facts

Market Leader in C&I and Ag Demand Response

- C&I DR: Over 5,300 MW under management across 8,600 C&I sites
- Ag DR: Over 800 MW enabled across over 10,000 devices
- Proven, consistent resource reliability; full or partial-turnkey solutions

Strong Financials and Corporate Capabilities

- Publicly traded on NASDAQ (ticker: ENOC)
- Profitable, 2010 revenues of \$280M
- 500+ full-time employees

High Customer Satisfaction

- On a scale of one to ten, with 10 being “very satisfied,” utilities rank their satisfaction an average of 8.7

## Products and Services

Demand Response

 DemandSMART

- C&I DR expert, including AutoDR
- Specialist in agriculture DR (hardware, software and services)
- Offerings include turnkey firm DR resource and full program implementation

Energy Efficiency

 EfficiencySMART

- Industrial EE implementation
- Commissioning (new building and retro-commissioning)
- Energy audits

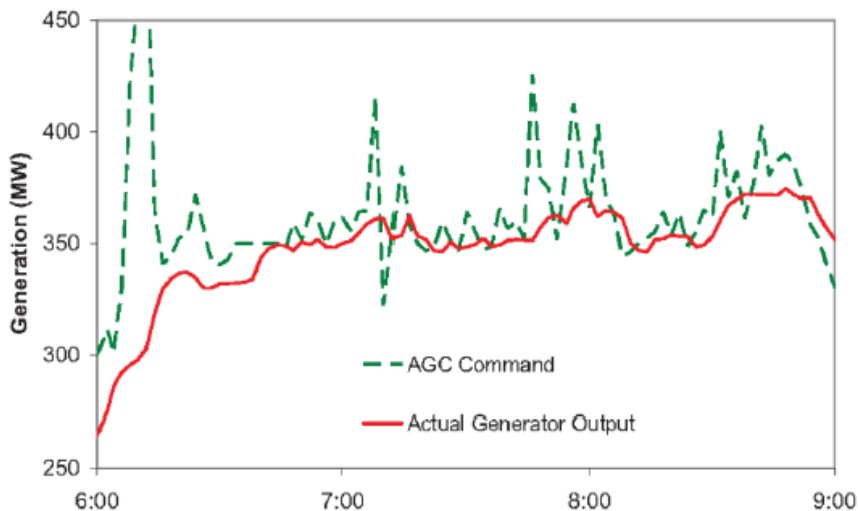
Demand Side Management Expertise

- Objective program evaluation
- Energy analysis, planning and evaluation
- Broad array of advisory services

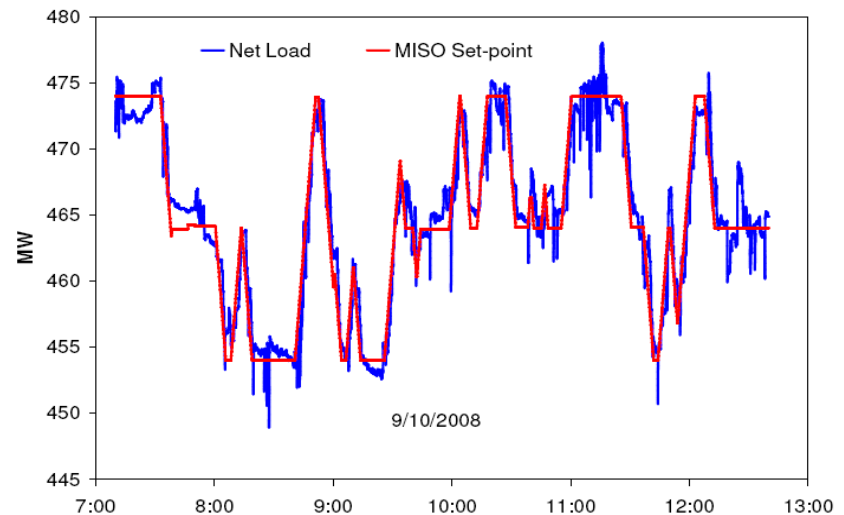
# DR: a Cost-effective and High-Quality A/S Resource

- DR is a clean and cost-effective resource for providing A/S
  - Quick start CTs are more expensive than peaking units that can respond in 30 minutes
  - DR can provide ancillary services or qualify as a non-spin reserve resource
- DR resources can be dispatched more quickly and controlled more precisely than typical generator resources, providing greater value to grid operators.

Generator A/S Load Profile<sup>1</sup>



Demand Response A/S Load Profile<sup>2</sup>



<sup>1</sup> Beacon Power company materials, "Smart Grid Rulemaking and Integration of Renewables and Energy Storage"

<sup>2</sup> Alcoa company materials, "Demand Response in the A/S Market," January 2009

# DR Can Provide Quick and Frequent Dispatch

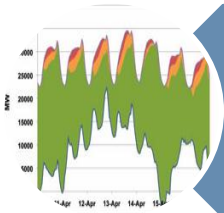
- EnerNOC has extensive experience bringing quick and frequent dispatch DR resources to market
- Some resources provide ancillary services or qualify as spinning/non-spin reserves
- Approximately 1,900 sites in our portfolio feature automated remote dispatch

Program		Notification	Max Event Length	EnerNOC Portfolio
Restructured Market	ERCOT Emergency Interruptible Load Service (EILS)	10 min	Up to 8 hours	<b>750+ Sites</b> <b>380+ MW</b>
	ERCOT Load acting as a Resource (LaaR) - Responsive and Non-Spinning Reserves	Instantaneous to 10 min	No maximum	
	National Grid (UK) Short-Term Operating Reserves Market (STOR)	20 min	Up to 4 hours Average 45 minutes	
	PJM Synchronized Reserves Market (SRM)	10 min	Max 30 min. / Avg. ~23 min.	
Utility Bilateral	San Diego Gas & Electric Clean Gen	10 min	Up to 8 hours	
	PNM Peak Saver	10 min	Up to 6 hours	
	Salt River Project Power Partner	10 min	Up to 6 hours	

# Innovations In Demand Response Resources



Increasingly fast response times



Balancing both spikes AND dips



Integrating DR into the control room

# Increasingly Fast Response Times

## Case Study: Developing ERCOT Load Response Capabilities



DR can provide cost-effective and reliable Responsive Reserve Services (RRS) and Non-spinning Responsive Reserve Services (NSRS)

### Demand Response as Responsive Reserves

#### Technology Requirements

- Under frequency relay (UFR)
- Real-time telemetry

#### Event Triggers

- Grid frequency drops below 59.7 Hz
- ERCOT operator discretion

#### Advance Notice

- Instantaneous when tripped by UFR
- 10 minute when dispatch by phone

#### Event Details

- 24/7/365 resource availability
- No minimum or maximum event duration
- Performance must be maintained, on a second-by-second basis, throughout the entire duration of the event

# Balancing Both Spikes AND Dips

## Case Study: Bonneville Power Administration (BPA) Wind Integration Pilot



EnerNOC is helping BPA use aggregated C&I end-use loads to providing a load following resource to mitigate the intermittency of wind power

### Pilot Background

- Pace of wind power development in the Pacific Northwest is exceeding BPA's expectations
- BPA has 3,000 MW of wind interconnected today, with 6,000 MW of requests 'in-process' and another 15,000 MW of requests 'in-discussion'
- Given that BPA has a total of 40,500 MW of capacity, this is dramatic penetration for the region

### Pilot Parameters

- Direct load control, although customer will have manual override capability, as well as the ability to set specific temperature boundaries
- Loads controlled both up and down
- 24/7/365 resource availability
- Dispatch upon 10 minutes notice
- Maximum 30 minutes per event and 2 events per day
- Minimum 3 hours between events
- Other event limitations may be employed, subject to customer and utility needs

# Integrating DR into the Control Room

## Case Study: ISO-NE and National Grid UK STOR



Real-time visibility into the availability and performance of assets

Dedicated line directly connecting the DR resource control room, in case there are any questions or urgent messages

At the click of a mouse, ability to dispatch DR by zone, dispatch resources partially, and dial-up or dial-down the DR resource according to real-time grid conditions



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