



Venture Capital Forum

PIER Case Study -- Akuacom

Clay Collier
Co-Founder and CEO, Akuacom
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Agenda

- Akuacom mission and product
- LBNL DRRC (PIER funded) partnership
- Job creation and ongoing collaboration

Energy...A Balancing Act



Supply

Utility

Demand



Utility Grid Balancing Issues

Daily peak management

Ramp Smoothing

Load Shifting & Ancillary Services

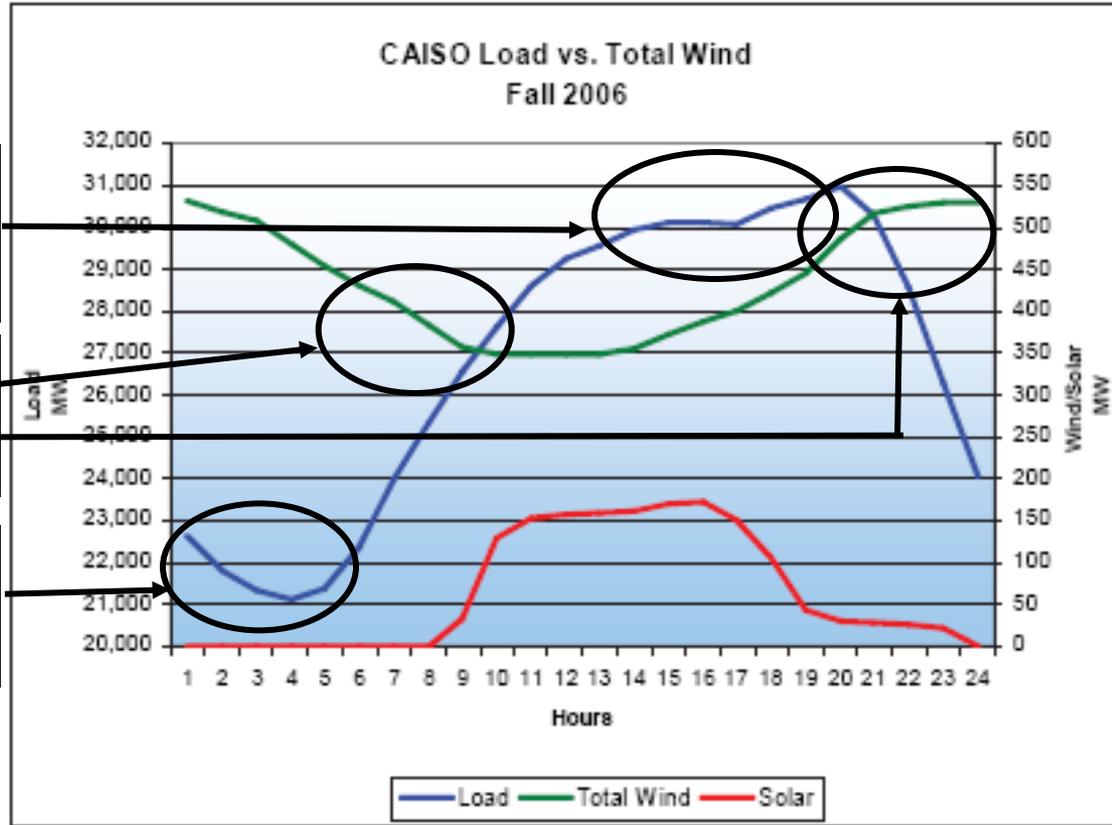


Figure 5-9: Actual System Load, Wind Generation and Solar Generation for Fall 2006

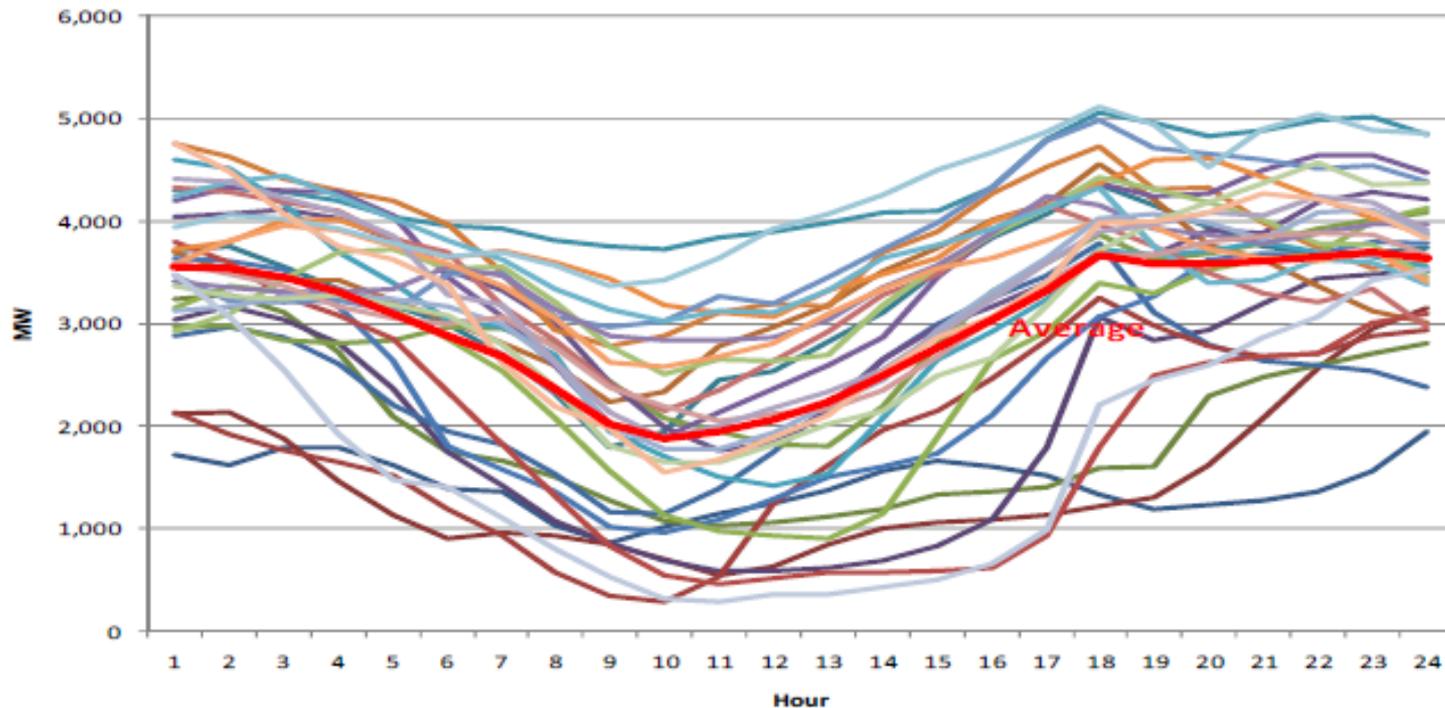
Diagram courtesy of LBNL DRRC

Renewable Energy Variability

California ISO

Daily Wind Energy (MW)

Each color line is a different day

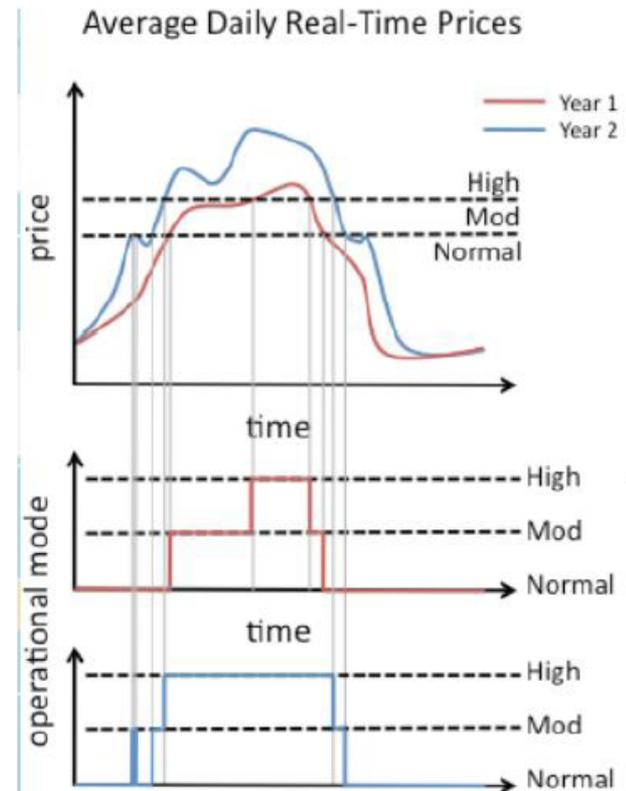
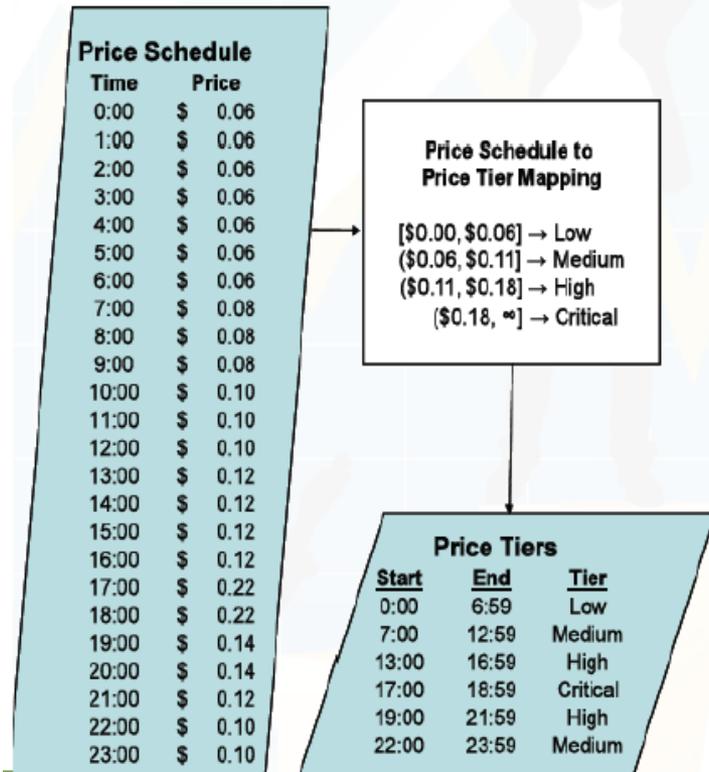


Source: Integration of Renewable Resources, California ISO
<http://www.caiso.com/2804/2804d036401f0.pdf>

Tiered Energy Pricing Tariffs

Absolute Price Mapping

- ❑ Price Multiplier – Critical Peak Pricing
- ❑ Residential Hourly TOU rates



Demand Response & the DRRC

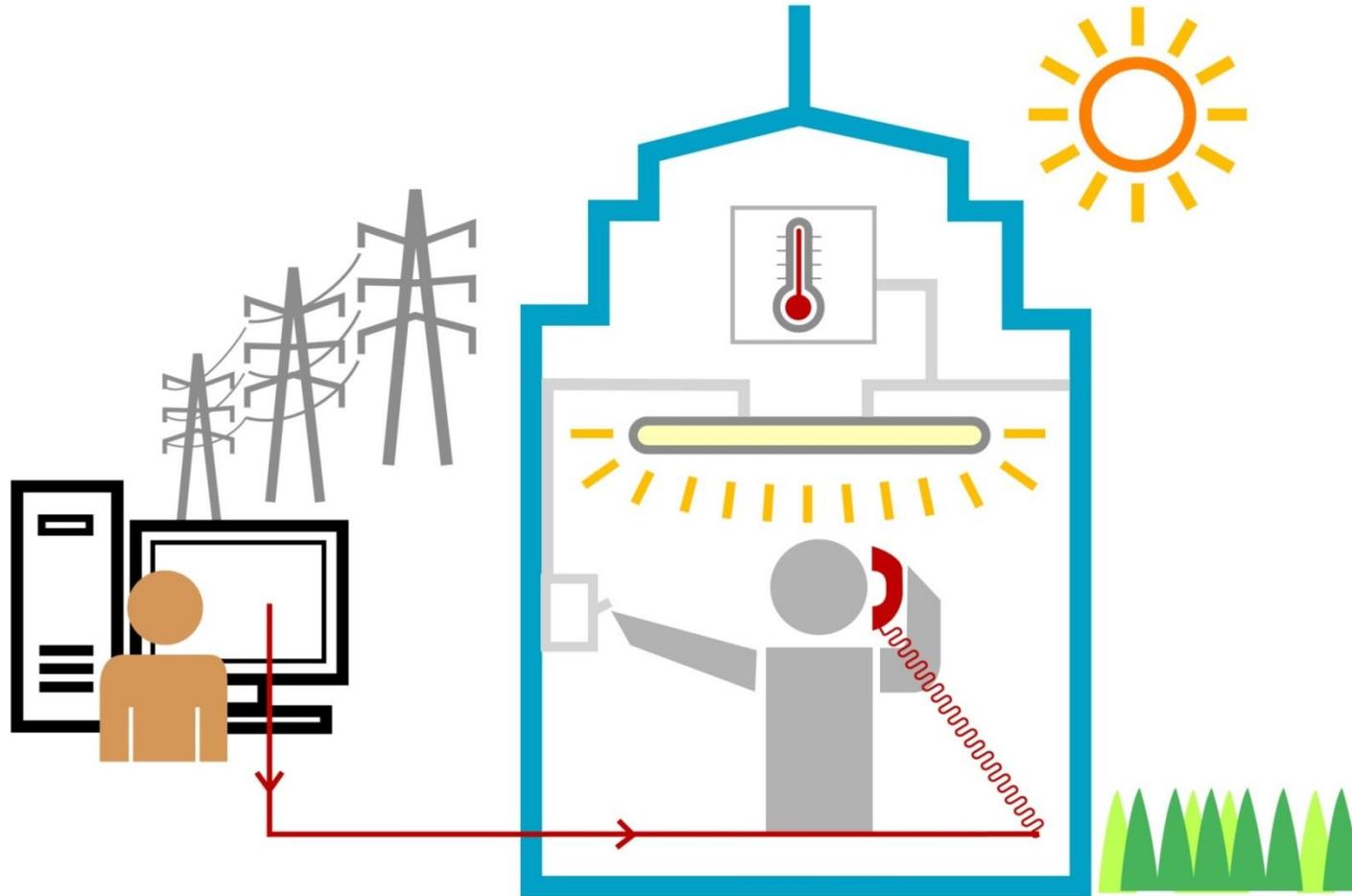
- Demand Response¹:
 - Changes in electric usage from normal consumption patterns
 - in response to changes in the price of electricity over time, or
 - to incentive payments
 - Avoid high market prices or enhance system reliability
- The Demand Response Research Center (DRRC)
 - Established in Spring 2004 by the California Energy Commission Public Interest Energy research (PIER) program
 - Located at the DOE's Lawrence Berkeley National Lab (LBNL)
 - Conducts research that advances the near-term adoption of demand response technologies, policies, programs, strategies and practices
 - Began partnership with Akuacom in 2004

¹ Federal Energy Regulatory Commission (FERC)

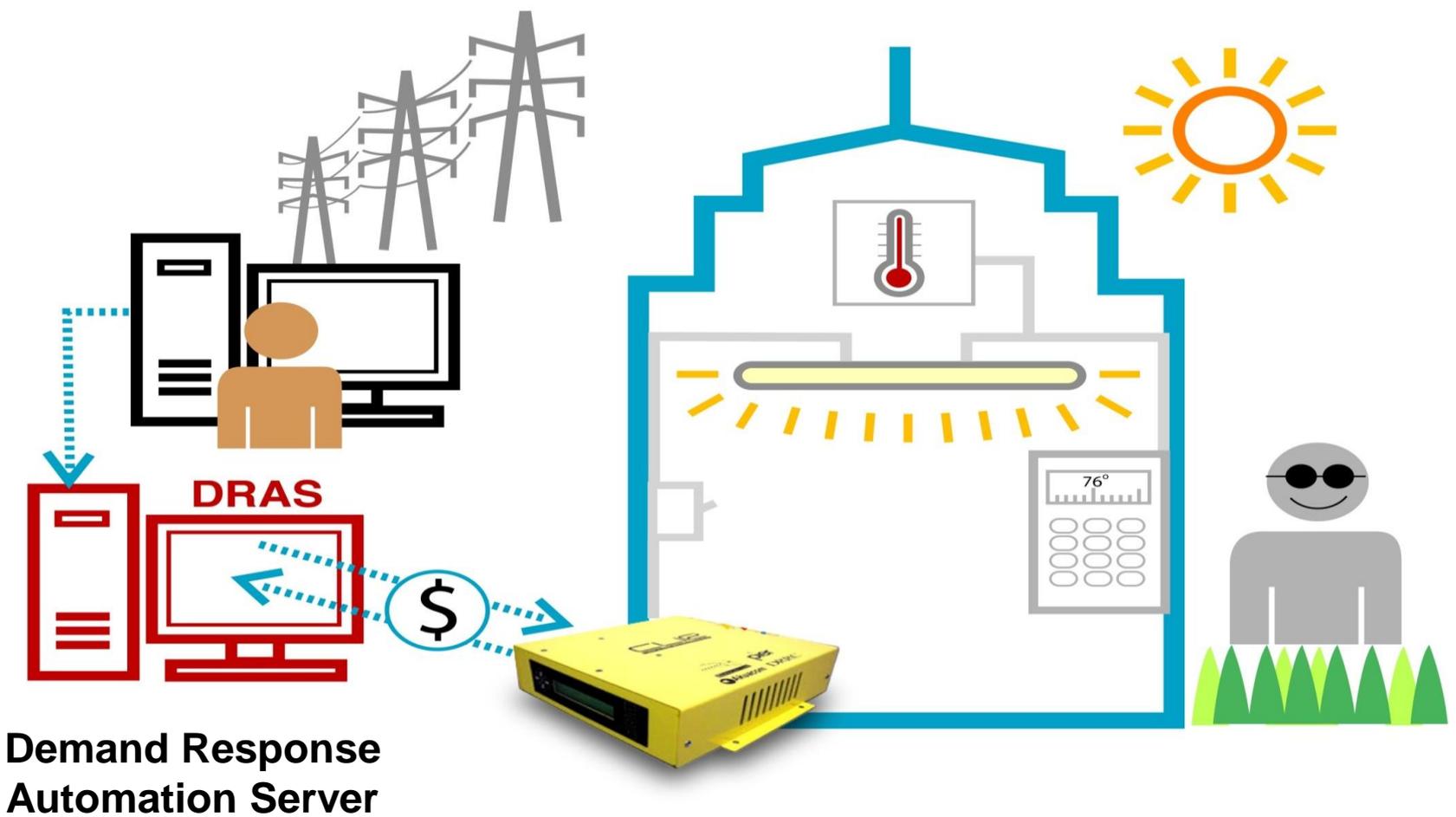
National Assessment & Action Plan on Demand Response

<http://www.ferc.gov/industries/electric/indus-act/demand-response/dr-potential.asp>

Manual Demand Response



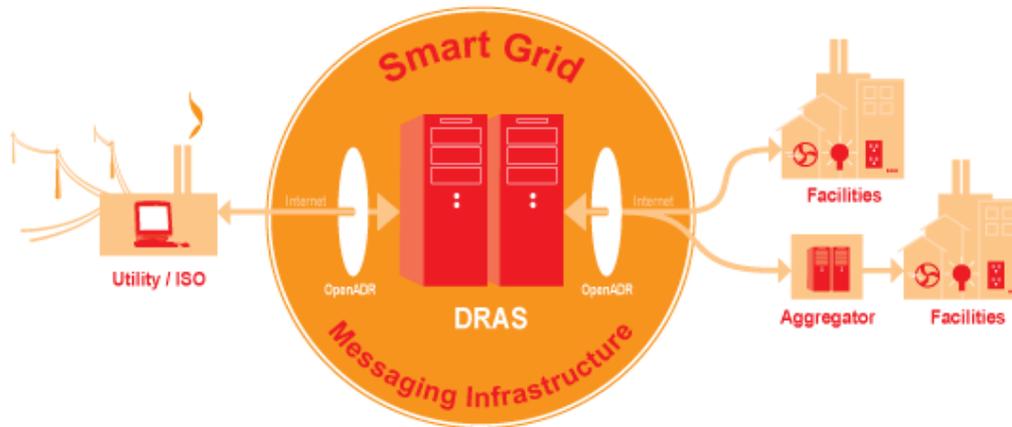
Automated Demand Response (Auto-DR)



**Demand Response
Automation Server**

Auto-DR Communications Engine

Akuacom Automated Demand Response Server (DRAS) Software



- **Automated Demand Response messaging infrastructure**, developed in partnership with the DOE's Lawrence Berkeley National Lab (LBNL)
- A turnkey Software as a Service (SaaS) which **issues event and pricing signals** using the OpenADR protocol over the internet
- **Control systems** (electrical, building, process) receive these signals and **respond in a preprogrammed manner** to reduce energy demand

Provides DR Tools for Energy Savvy Buildings

- Program Participation
- Event status
- System communication status
- Real-Time and baseline energy usage
- Event and shed history reporting

The screenshot displays the DR Automation Server interface, which includes a 'Demand Response Automation Server' dashboard. A 'DRAS Customer Interface' is overlaid, showing a table of energy usage data and a line graph of power consumption over a 24-hour period.

	Base	Actual	Shed
	Avg	Total	Avg
Max			
Min			
Max Duration			
Pending			
Notification P			

The graph shows power usage in kW over 24 hours, with a peak around 8am and another peak around 2pm. The y-axis ranges from 0kW to 90kW, and the x-axis shows hours from 0am to 0am.

Helping Standardizing the Smart Grid



- **OpenADR 1.0 specification¹** released by California Energy Commission (CEC) and LBNL
- **Identified as key standard** by National Institute of Standards and Technology (NIST) in National Smart Grid Initiatives.² Adopted by industry and being developed as a formal standard by OASIS & UCAIug.
- Standardization **reduces the risk of technology obsolescence** and stranded assets
- U.S. Federal Energy Regulatory Commission (FERC) recognizes that **standardizing demand response signaling could enable broader participation³**
- **OpenADR Alliance** founded in Oct 2010 to **foster industry collaboration** to lower the cost, improve the reliability, and accelerate the speed of Auto-DR and Smart Grid implementations

Green Job Creation & Knowledge Sharing

- **Job Creation**

- Akuacom team: 5x increase in staff since Honeywell acquisition
- HUS Auto-DR CA SGIG deployment team: +10
- HUS Auto-DR COT SGIG deployment team: +2
- International Deployments with US product and support (Australia, China, Scotland, India)

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- **Ongoing Research, Extensive Publications**

- Currently partnering on small commercial Auto-DR pilot
- Co-authored research is available at:
<http://drrc.lbl.gov/publications>
- Development of OpenADR 2.0 specification

Bottling Plant Auto-DR Implementation Success Story

Challenge

- Save money and reduce energy costs during SCE's Peak Pricing events
- Automate existing manual shed measures to improve shed response reliability while reducing impact on customer's facility management team
- Identify and implement measures that meet food quality and safety concerns

Shed Schema

- Curtail ammonia compressors (681 kW)
- Reduce to minimum cooling requirement to support three product tanks (137 kW)
- Curtail approximately 200 hp worth of motors in mixing/filling stations (192 kW)

Benefits

- Saves approx \$50K in energy costs during Summer Peak energy season
- Automation controls eliminate dependency on human intervention to initiate energy reduction
- Robust controls system have enterprise wide functionality
- Path forward for future controls plant expansion



Appendix

OpenADR References

¹ California Energy Commission and Lawrence Berkeley National Labs

Open Automated Demand Response Communication Specification, version 1.0:

<http://www.energy.ca.gov/2009publications/CEC-500-2009-063/CEC-500-2009-063.PDF>

² National Institute of Standards and Technology (NIST)

NIST Special Publication 1108: NIST Framework and Roadmap for Smart Grid Interoperability Standards, Release 1.0

http://www.nist.gov/public_affairs/releases/upload/smartgrid_interoperability_final.pdf

³ Federal Energy Regulatory Commission Staff

National Action Plan on Demand Response

<http://www.ferc.gov/legal/staff-reports/06-17-10-demand-response.pdf>