

Advanced Energy Storage for Load Management

**2008 Rulemaking on Load Management Standards
Efficiency Committee Workshop**

March 3, 2008

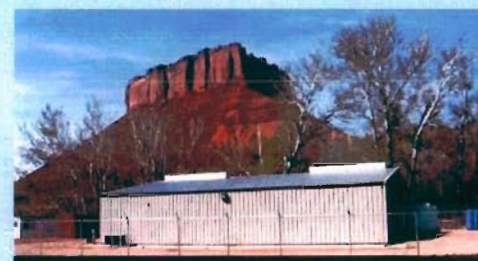
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08-DR-1	
DATE	MAR 03 2008
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energy
storage
systems are
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commercially
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www.electricitystorage.org



Load Management – Energy Application

Storage Technologies	Main Advantages (relative)	Disadvantages (Relative)	Power Application	Energy Application
Pumped Storage	High Capacity, Low Cost	Special Site Requirement		●
CAES	High Capacity, Low Cost	Special Site Requirement, Need Gas Fuel		●
Flow Batteries: PSB VRB ZnBr	High Capacity, Independent Power and Energy Ratings	Low Energy Density	◐	●
Metal-Air	Very High Energy Density	Electric Charging is Difficult		●
NaS	High Power & Energy Densities, High Efficiency	Production Cost, Safety Concerns (addressed in design)	●	●
Li-ion	High Power & Energy Densities, High Efficiency	High Production Cost, Requires Special Charging Circuit	●	○
Ni-Cd	High Power & Energy Densities, Efficiency		●	◐
Other Advanced Batteries	High Power & Energy Densities, High Efficiency	High Production Cost	●	○
Lead-Acid	Low Capital Cost	Limited Cycle Life when Deeply Discharged	●	○
Flywheels	High Power	Low Energy density	●	○
SMES, DSMES	High Power	Low Energy Density, High Production Cost	●	
E.C. Capacitors	Long Cycle Life, High Efficiency	Low Energy Density	●	◐

www.Utility-Savings.com

CAISO Opinion

- **Storage facilities can provide a number of benefits that will help with the integration of large amounts of renewable resources.**
- **Storage provides a mechanism for saving off-peak energy production from wind generation and delivering the energy during on-peak periods.**
- **Some storage technologies can also provide Ancillary Services such as regulation and contingency reserves and reactive power for voltage support**
- **The major barrier for construction of new storage facilities is not the technology but the absence of market mechanisms that recognize the value of the storage facilities and financially compensate the owners for the services and benefits they can provide.**

Integration of Renewable Resources – CAISO report Nov. 2007 231 pages
<http://www.caiso.com/1ca5/1ca5a7a026270.pdf>

6 MW VRB-ESS Tomamae Wind Farm, Japan Grid-Connected Wind Farm Output Smoothing

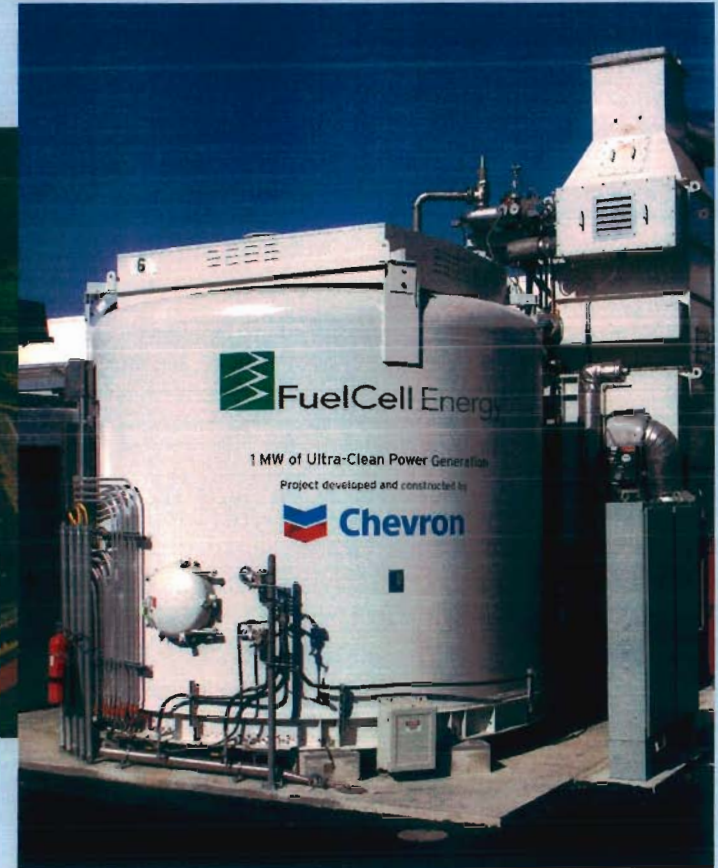


VRB Power Systems Inc.
Energy Storage & Power Quality Solutions

Santa Rita 'Energy Center' – Alameda County

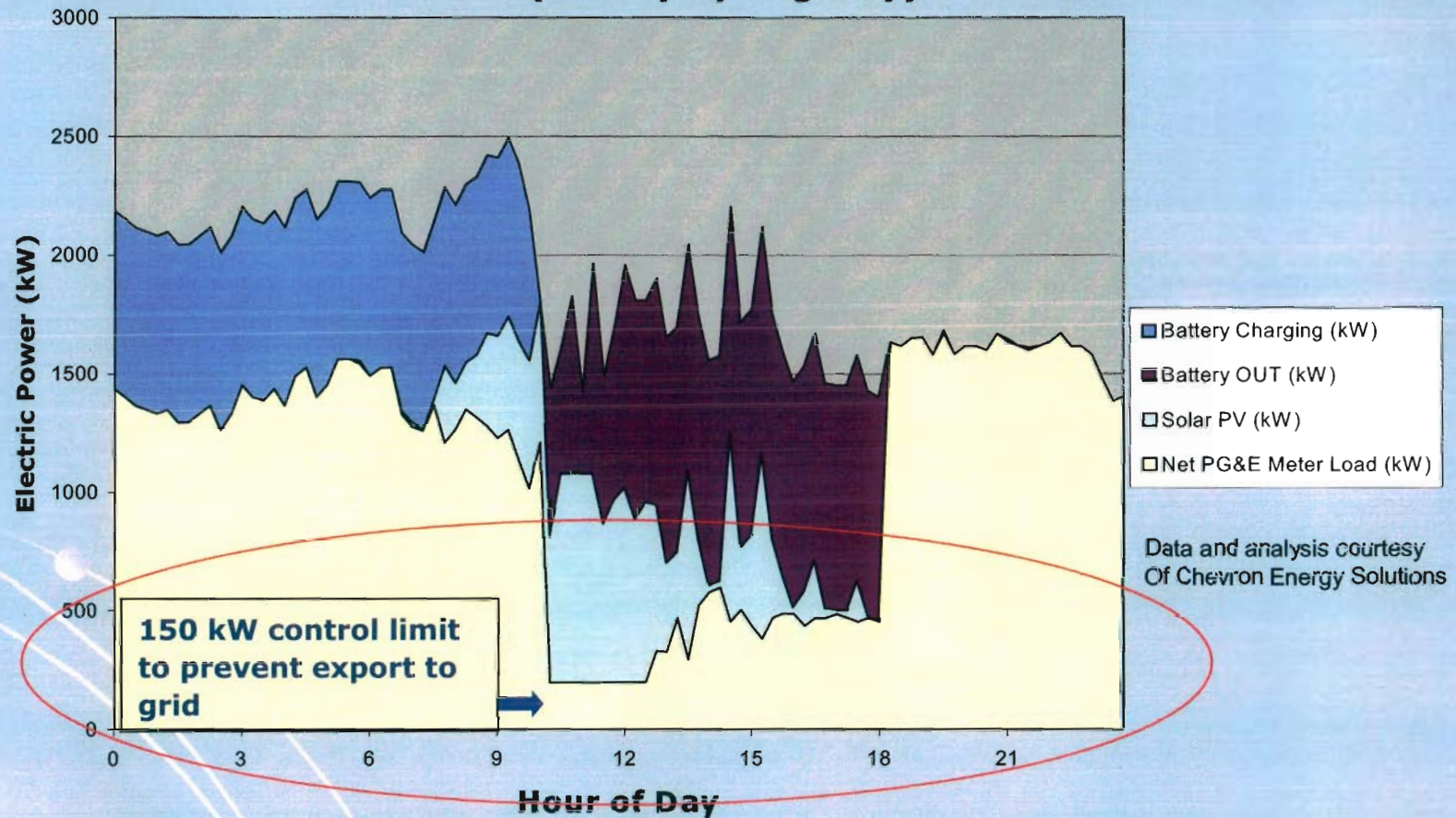


Photos courtesy of CES



Case Study: Santa Rita Jail, Alameda County

1 MW Battery Application with PV + Load Shift (Cloudy Spring Day)



The potential impact of AES to SRJ's peak demand is dramatic

AES Benefits at Energy User Site

- Increased demand response – without interruption.
- Permanent load shift.
- Uninterruptible power supply.
- Emergency power – no emissions.
- Local grid support – reactive power, voltage support, conditioning.
- Defer generation and transmission-distribution expense.

Recommendations

- Evaluate Advanced Energy Storage Solutions for Load Management.
- Avoid limited view of potential applications.
- Benefit from variety of AES technologies for diverse applications.
- Value multiple benefits of AES beyond demand response/peak shaving.

CALIFORNIA ENERGY COMMISSION

1516 Ninth Street

Sacramento, California 95814

Main website: www.energy.ca.govConsumer Website: www.ConsumerEnergyCenter.orgChildren's Website: www.energyquest.ca.gov

In the matter of: 2008 Rulemaking on Load)	Docket No. 08-DR-01
Management Standards)	
)	NOTICE OF EFFICIENCY
Implementation of –)	COMMITTEE WORKSHOP
Public Resources Code § 25403.5.)	

Notice of Efficiency Committee Workshop

The California Energy Commission's Efficiency Committee, comprised of Chairman Jackalyne Pfannenstiel, presiding member, and Commissioner Arthur Rosenfeld, associate member, will conduct a workshop to receive input from interested parties regarding the scope of a rulemaking to develop and implement load management standards. The rulemaking will be coordinated with the Energy Commission's Electricity and Natural Gas Committee. Other Commissioners may attend and participate in these hearings. In addition, Commissioners from the California Public Utilities Commission have been invited to participate.

MONDAY, MARCH 3, 2008

10 a.m.

CALIFORNIA ENERGY COMMISSION

1516 Ninth Street

First Floor, Hearing Room A

Sacramento, California

(Wheelchair Accessible)

Audio from this meeting will be broadcast over the Internet.

For details, please go to:

www.energy.ca.gov/webcast/

To participate in the meeting by phone,
please call 888-469-0487 by 10:00 a.m.
Passcode: LMSTD Call Leader: Al Garcia

Purpose

On January 2, 2008, the Energy Commission approved an Order Instituting Informational and Rulemaking Proceeding (OII/OIR) on demand response equipment, rates, and protocols.¹ The purpose of the OII/OIR is to:

- (1) Assess which rates, tariffs, equipment, software, protocols, consumer information and other measures would be most effective in achieving demand response, and
- (2) adopt regulations and take other appropriate actions to achieve a voluntary, price-responsive electricity market.²

The OII/OIR recognizes the importance of work being done at the California Public Utilities Commission (CPUC) and the California Independent System Operator (California ISO) on demand response in California, and indicates that this proceeding will be very closely coordinated with these entities. The OII/OIR delegates the authority to proceed with the rulemaking to the Energy Commission's Efficiency Committee (Committee).

The purpose of the Committee scoping workshop is to obtain public input on the development and possible adoption of new load management standards. The Committee anticipates that the rulemaking will address the following topic areas:

- The functional capabilities of the advanced meters being installed and/or proposed by the utilities;
- Electricity rate design;
- The development of information, education and implementation strategies that will inform voluntary customer participation;
- The functional design, communication capabilities and dispatch logistics of technologies that allow customers to automate their voluntary response to price and reliability signals; and
- Opportunities for capturing the peak load reduction and conservation potential of energy storage and permanent load-shifting technologies.

¹ Demand response refers to mechanisms to manage the demand from customers in response to supply conditions, for example, having electricity customers reduce their consumption at critical times or in response to market prices. Demand response is generally used to refer to mechanisms used to encourage consumers to reduce demand, thereby reducing the peak demand for electricity.

² In price (demand) response electricity prices reflect either wholesale market or system operating conditions or customers respond voluntarily by reducing consumption during higher-price periods. A fundamental element of price-response is the allocation of procurement costs by time, resulting in rates that rise or fall with demand, providing incentives for customers to conserve on-peak or shift load from higher to lower-price periods.

Background

2007 Integrated Energy Policy Report

The *2007 Integrated Energy Policy Report (2007 IEPR)*³ recommended that the Energy Commission initiate a rulemaking involving the California Public Utilities Commission (CPUC) and the California ISO to pursue the adoption of load management standards under the Energy Commission's existing authority. The *2007 IEPR* notes that demand response can play a critical role in California's electricity mix, cost-effectively avoiding incremental generation and environmental costs while helping to ensure the reliability of California's electrical grid. In the *Energy Action Plan II*, the Energy Commission and the CPUC endorsed a goal that 5 percent of California's peak demand would be met by price induced demand response, and California has not achieved that goal. The *2007 IEPR* notes that the Energy Commission's load management authority is a valuable policy tool for the state to bridge the gap between the current level of demand response and its full cost effective potential.

Load Management Standards Authority

The Energy Commission has had authority to adopt load management standards since 1976. Public Resources Code 25403.5 directs the Energy Commission to: "... adopt standards by regulation for a program of load management for each utility service area." The standards were established to provide the Energy Commission with the ability to develop programs for reducing peak demand and reshaping utility load duration curves.⁴ Three areas are specifically called out in Public Resources Code 25403.5:

- Adjustments in rate structure to encourage the use of electrical energy at off-peak hours or to encourage control of daily electrical load;
- End use storage systems which store energy during off-peak periods for use during peak periods; and
- Mechanical and automatic devices and systems for the control of daily and seasonal peak loads.

³ The 2007 IEPR and two Energy Commission consultant reports written in support of the 2007 IEPR proceeding are available on the Energy Commission website:

<http://www.energy.ca.gov/2007publications/CEC-100-2007-008/CEC-100-2007-008-CMF.PDF>

<http://www.energy.ca.gov/2007publications/CEC-200-2007-003/CEC-200-2007-003-F.PDF>

<http://www.energy.ca.gov/2007publications/CEC-200-2007-007/CEC-200-2007-007-F.PDF>

⁴ A load duration curve illustrates the electric load for each hour of a year in order of magnitude. An example appears as Figure 1 on page 7 of report CEC-200-003-F, *The State of Demand Response in California*. A link to that report appears in the preceding footnote.

The Energy Commission may also consider load management standards that do not fall within these three specific areas. Standards adopted must be cost-effective and technologically feasible.

The Energy Commission adopted load management standards in 1982, requiring utilities to develop and implement residential peak load cycling programs (cycling air conditioners and electric water heaters), marginal cost rates, swimming pool filter pump programs, and electrical use surveys of large customers. More recently, in response to the 2000 – 2001 electricity crisis, the Energy Commission implemented an emergency program that provided over 1,000 California businesses with metering and control systems. In addition, the Energy Commission directed the implementation of Assembly Bill 29x of 2001, which provided \$35 million to install 23,000 real-time meters for customers with loads above 200 kilowatts – customers whose loads comprise 30 percent of California's peak electricity demand.

California Public Utilities Commission and California ISO Proceedings

In 2002, the CPUC opened proceedings focused on demand response "to enhance electric system reliability, reduce power purchase and individual consumer costs, and protect the environment." (R. 02-06-001, Order Instituting Rulemaking, June 6, 2002 (CPUC OIR), p. 1.) The CPUC has approved a number of investor owned utility applications for advanced metering infrastructure (AMI) development and demand response programs and directed that demand response be included in procurement planning.

Current CPUC proceedings include the development of demand response measurement and evaluation protocols, revision and refinement of the demand response goals (currently 5 percent of annual system peak demand) and review of AMI applications from Pacific Gas and Electric (PG&E), San Diego Gas and Electric (SDG&E) and Southern California Edison (SCE). Of particular relevance to this proceeding are two proceedings related to the development of dynamic pricing⁵ for all customers. First, in A.06-03-005, the CPUC is developing a year-by-year work plan for PG&E to develop and integrate dynamic pricing for all customers.⁶ SCE and SDG&E are also active participants in A.06-03-005. Second, in A.07-01-047 the CPUC is considering specific dynamic pricing rate proposals from SDG&E. Also, the California ISO has conducted a series of workshops on the inclusion of demand response in wholesale markets as part of its Market Redesign and Technology Upgrade project.

⁵ "Dynamic pricing" reflects temporal variation in wholesale energy costs in retail electricity prices. While static time-of-use rates reflect average peak/off-peak variation, dynamic pricing is distinguished by hourly or time-of-use block rate price changes reflecting wholesale market prices and/or system conditions and communicated on a day-ahead or even hour-ahead basis.

⁶ On January 23, 2008 the CPUC issued an Assigned Commissioner's Ruling that contains a draft timetable and rate design principles for PG&E. See <http://docs.cpuc.ca.gov/efile/RULINGS/77986.pdf>

Rates, Metering, and Enabling Technologies

The Energy Action Plan II (EAP II)⁷ envisions a transformation of the electric utility grid to “an intelligent, integrated network enabled by modern information and control system technologies” in which all customer classes can be served under “well-designed dynamic pricing tariffs and demand response programs” to achieve the goal of lowering consumer costs and increasing system reliability. Achieving this vision requires coordinated, parallel initiatives across the public and private sectors to design, develop and install an advanced metering infrastructure; design cost-based, equitable dynamic rates; and bring to market cost-effective technologies that enable customers to maximize their savings under those rates.

Programmable communicating thermostats (PCTs) will be considered in this OII/OIR to assess their value as one element of a broader demand response program that includes advanced meters, dynamic rates, and other technology options.

Written Comments

Proposals or other written comments submitted prior to the workshop are requested by 5:00 p.m. on February 29, 2008. Proposals or other written comments to be considered after the workshop must be submitted by 5:00 p.m. on March 14, 2008. Please include the docket number 08-DR-01 and indicate Load Management Standards in the subject line or first paragraph of your comments. Please hand deliver or mail an original plus 10 paper copies to:

California Energy Commission
Dockets Office, MS-4
Re: Docket No. 08-DR-01
1516 Ninth Street
Sacramento, CA 95814-5512

The Energy Commission encourages comments by e-mail. Please include your name or organization's in the name of the file. Those submitting comments by electronic mail should provide them in either Microsoft Word format or as a Portable Document (PDF) to [docket@energy.state.ca.us]. **One paper copy** must also be sent to the Energy Commission's Docket Unit.

Participants may also provide an original and 10 copies at the beginning of the workshop. All written materials relating to this workshop will be filed with the Dockets Unit and become part of the public record in this proceeding.

⁷ http://www.energy.ca.gov/energy_action_plan/2005-09-21_EAP2_FINAL.DOC

Public Participation

The Energy Commission's Public Adviser's Office provides the public assistance in participating in Energy Commission activities. If you want information on how to participate in this forum, please contact the Public Adviser's Office at (916) 654-4489 or toll free at (800) 822-6228, by FAX at (916) 654-4493, or by e-mail at [\[pao@energy.state.ca.us\]](mailto:pao@energy.state.ca.us). If you have a disability and require assistance to participate, please contact Lou Quiroz at (916) 654-5146 at least five days in advance.

Please direct all news media inquiries to Suzanne Garfield-Jones at (916) 654-4989, or by e-mail at [\[mediaoffice@energy.state.ca.us\]](mailto:mediaoffice@energy.state.ca.us). If you have questions on the technical subject matter of this forum, please call E. V. (Al) Garcia, Project Manager, 916-654-4045 or [\[LoadManagementOIR@energy.state.ca.us\]](mailto:LoadManagementOIR@energy.state.ca.us).

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If you wish to continue receiving e-mail notices pertaining this proceeding, please sign up your e-mail on the list server located on the [load management proceeding page](#) on the energy commission website at www.energy.ca.gov.

Signed
JACKALYNE PFANNENSTIEL
Commissioner and Presiding Member
Efficiency Committee

Signed
ARTHUR ROSENFELD
Commissioner and Associate Member
Efficiency Committee

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Note: California Energy Commission's formal name is State Energy Resources Conservation and Development Commission.