US&R Power Grid Partners

Clean Technology for the Nations Power Grid

Friday, February 29, 2008

VIA email to docket@energy.state.ca.us and hand delivered at March 3, 2008 Workshop, Hearing Room "A".

California Energy Commission
Dockets Office, MS-4
RE: Docket No. 08-DR-01
1516-9t Street
Sacramento, CA 95814-5512

Efficiency Committee Workshop
March 3, 2008

Thank-you for the opportunity to provide written comments for the Load Management Standards Workshop.

I would appreciate the opportunity to expand on my comments during the Public Comments portion of the workshop. I have attached several slides for illustration. I will include a PDF and Power Point file in my email.

We submit that Advanced Energy Storage (AES) technology should be included in the development of load management standards. Several diverse technologies are commercially available and there are multiple applications where such technologies can have a significant impact.

We have been a sales affiliate for VRB Power Systems, a manufacturer of a flow battery advanced energy storage system, for nearly two years. We have learned the value of energy storage for wind energy integration, grid support, load leveling, demand response, and a number of other applications. We have also learned that energy storage comes in many styles and applications. Hydro, pumped storage, compressed air and thermal storage, among others, have been widely utilized. Each has benefits and shortcomings. Large, centralized applications like pumped storage and compressed air are difficult to site and build although they provide large amounts of energy when needed. Thermal storage can be distributed and implemented much easier but may be limited in application and season.

A variety of AES technologies are available to supplement the current portfolio of options and provide additional flexibility and value. The Electricity Storage Association has identified a number of technologies, with extended energy storage, that could be used for load management. Some of these technologies are commercial and could be deployed much more quickly than the traditional centralized applications, with less impact to the environment, and with the benefits that are associated with distributed resources.

The potential applications of AES are numerous and creative. I have attached examples of AES at a wind farm (6 MW) and at a distributed application – the Santa Rita Jail (1 MW). Energy storage for wind can avoid the need to ramp power plants up and down to compensate for the intermittent nature of wind. This allows natural gas and coal power plants to operate more efficiently, provide more capacity, and reduce greenhouse gas emissions up to 70%.

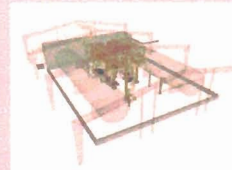
At Santa Rita, the combination of solar and AES reduced peak energy usage from PG&E to a small fraction of normal. Siting a large AES at an energy user would increase the amount of energy that could be curtailed in an emergency, creating demand response where none was available before. A large industrial could curtail many megawatts of consumption without actually suffering an interruption – the AES would supply the necessary power. In addition, the host would benefit from a large UPS and emergency power and the local utility distribution circuit could benefit from the power conditioning of the AES and the deferral of capital expense to upgrade substations.

We recommend that the commission consider the benefits of AES for load management. Future workshops should explore how to optimize the multiple benefits of AES to achieve demand response and encourage a price responsive electricity market.

Sincerely,

Charles R. Toca
Manager

Energy Procurement Services - Electricity, Natural Gas, Utility Negotiation
1100 Quail Street, Suite 217, Newport Beach, CA 92660
TEL (949) 474-0511 FAX (949) 474-0516



Advanced Energy Storage for Load Management

2008 Rulemaking on Load Management Standards
Efficiency Committee Workshop
March 3, 2008

Charles R. Toca
US&R Power Grid Partners
(949) 474-0511 x203
ctoca@utility-savings.com

US&R

Load Management – Energy Application

Advanced energy storage systems are now commercially available

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	●	◐

ESA ELECTRICITY STORAGE ASSOCIATION
www.electricitystorage.org

www.Utility-Savings.com

US&R

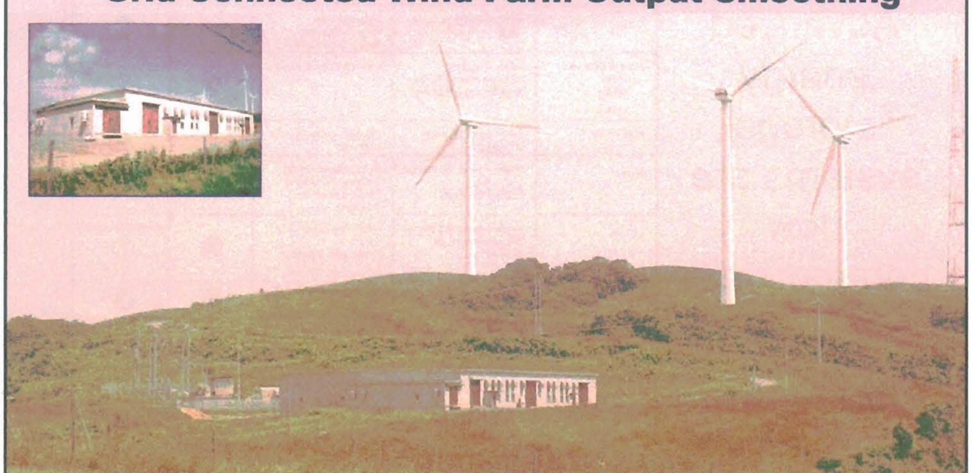
CAISO Opinion

- **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

US&R www.Utility-Savings.com 3

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



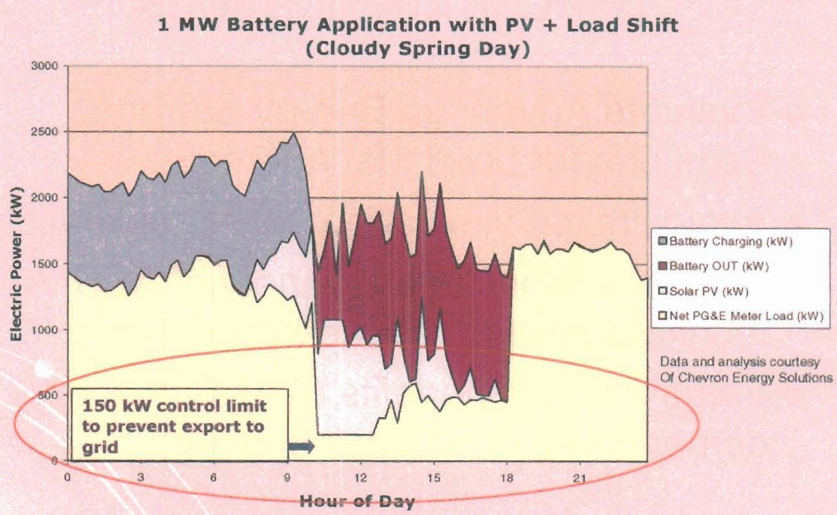
VRB Power Systems Inc.
Energy Storage & Power Quality Solutions

Santa Rita 'Energy Center' – Alameda County

Photos courtesy of CES

www.Utility-Savings.com 5

Case Study: Santa Rita Jail, Alameda County



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

www.Utility-Savings.com 6

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.

US &R www.Utility-Savings.com 7

Recommendations

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

US &R www.Utility-Savings.com 8