

# STORAGE WEEK

## 3 Connected Meetings Covering Opportunities in the Fundamental Reshaping of the Power Industry via Energy Storage

July 13-16, 2009  
San Diego Marriott La Jolla, La Jolla, CA

MONDAY-TUESDAY, JULY 13-14  
**STORAGE SUMMIT: POLICIES, MARKET DESIGN AND BUSINESS MODELS**

### Monday, July 13

8-8:15

*Chairman's Introduction*

**Kenneth S. Culotta**, *Partner*, KING & SPALDING LLP

8:15-8:45

*Keynote Address*

**R. James Woolsey**, *Venture Partner and Senior Advisor*, VANTAGEPOINT VENTURE PARTNERS; *Annenberg Distinguished Visiting Fellow*, HOOVER INSTITUTE AT STANFORD UNIVERSITY; *Senior Executive Advisor*, BOOZ ALLEN HAMILTON; *Former Director*, CENTRAL INTELLIGENCE AGENCY

### Session I: Regulatory Initiatives and Market Design

8:45-10:00

*Panel Discussion:*

#### **Bringing Energy Storage to the Power Grid**

- The role of storage in helping to meet RPS goals, and status of the two federal RPS bills
- Storage vis-à-vis efficiency from a system-wide and timing perspective; can off-peak storage be monetized for system-wide efficiency benefits?
- Should storage be rate-based for its contributions to load-level, carbon reduction, demand response and grid reliability?
- The role of storage in Smart Grid deployment, islanding and microgrids (and vice-versa)
- Policies and incentives for bulk storage (CAES and pumped hydro) as distinct from distributed storage
- Storage conceptualized as generation rather than transmission

*Moderator:*

**Dave Marchese**, *Vice President*, HADDINGTON VENTURES, L.L.C.

*Panelists:*

**Ed Cazalet**, *Vice President/CoFounder*, MEGAWATT STORAGE FARMS, INC.;  
*Founder*, APX, Inc.

**Bob Lane**, *Manager - Corporate Regulatory Policy*, SEMPRA ENERGY

**Brad Roberts**, *Executive Director*, ELECTRICITY STORAGE ASSOCIATION

10:00-10:30

*Networking Break*

10:30-11:30

*Panel Discussion:*

**State Regulatory Policy**

- Exploring the system-wide benefits of storage
- Enabling role for meeting renewables standards
- Should investments in storage by IOUs be rate-based?
- How can power markets be better structured to monetize storage services?

*Moderator:*

**Michael Oldak**, *Senior Director, State Competitive & Regulatory Policies*, EDISON ELECTRIC INSTITUTE

*Panelists:*

**Brett A. Perlman**, *Vice President, Strategy and Development*, ATREIDES CAPITAL LLC; *Former Commissioner*, PUBLIC UTILITY COMMISSION OF TEXAS

**Andrew Campbell**, *Advisor*, CALIFORNIA PUBLIC UTILITIES COMMISSION

**David Lott Hardy**, *Chairman*, INDIANA UTILITY REGULATORY COMMISSION

11:30-1:00

*GROUP LUNCHEON*

**LUNCHEON ADDRESS:**

**Hermann Scheer**, *Member*, GERMAN PARLIAMENT; *Chair*, THE INTERNATIONAL PARLIAMENTARY FORUM FOR RENEWABLE ENERGIES.

1:00-2:00

*Panel Discussion:*

**Revising Regional Market Designs to Facilitate Storage: System Operators Views**

- Benefits of storage for grid efficiency, reliability and security
- How storage is currently valued for different niches in the regional market
- How to quantify the value of improved transmission and generation efficiency derived from storage charging off-peak
- At what level does a storage facility warrant its own node?
- The inapplicability of traditional resource planning models to storage
- Impacts on operating priorities: what are we trying to optimize? Least cost or GHG reductions or reliability?

*Moderator:*

**David G. Tewksbury**, *Partner*, KING & SPALDING LLP

*PANELISTS:*

**Todd Hillman**, *Executive Director, Strategic Business Development*, MIDWEST ISO

**Shaun Johnson**, *Manager – Energy Market Products*, NEW YORK ISO

**Don Tench**, *Director, Market Evolution*, INDEPENDENT ELECTRICITY SYSTEM OPERATOR (IESO)

2:00-2:30

*Networking Break*

*SESSION II: STORAGE USERS' AND VENDORS' PERSPECTIVES*

2:30-3:30

*Panel Discussion:*

**UTILITY PERSPECTIVES ON IMPLEMENTING ENERGY STORAGE**

- Experience to date with storage pilot projects
- What utilities are looking for in storage performance, technology risk and price:
  - For load-level applications
  - For demand-response
  - For ancillary services
  - For substation asset deferral
- How important is the capitalization and likely longevity of storage suppliers?
- Will utilities sign PPA-equivalents from possible IPP/merchant storage developers? If so what might they look like?
- How does storage cost for renewables firming compare to the cost of spinning reserve?

*Moderator:*

**Kenneth S. Culotta**, *Partner*, KING & SPALDING LLP

*Panelists:*

**Michael Matheson**, *Senior Engineer, Generation Strategies*, NEBRASKA PUBLIC POWER DISTRICT

**Ali Nourai**, *Distributed Energy Resources*, AMERICAN ELECTRIC POWER (AEP)

**Anuja Ratnayake**, *Manager, Strategic Initiatives*, DUKE ENERGY

**Jeffrey Reed**, *Director, Market Development & Emerging Technology*, SAN DIEGO GAS & ELECTRIC

3:30-4:30

*Panel Discussion:*

**Storage Suppliers Respond: What Policy and Market Change Are Needed to Stimulate a Robust Storage Market?**

- How do vendors see the impact of the Stimulus bill and inclusion of storage in a Federal RPS?
- How do vendors see the overall market potential?
- What are the biggest obstacles they find in commercializing their solutions?
- Where do they see the price points to meet for various applications
- What further market regulatory changes are wished for?

*Moderator:*

**Peter Mostow**, *Partner*, WILSON, SONSINI GOODRICH & ROSATI

*Panelists:*

**Bill Capp**, *Chief Executive Officer*, BEACON POWER

**Terry Copeland, Ph.D.**, *President/Chief Executive Officer* ALTAIRNANO

**Ric Fulop**, *Founder, Vice President of Marketing/Business Development*, A123 SYSTEMS

**Chris Hickman**, *Senior Vice President, Utility Solutions*, ICE ENERGY

**Ben Rogers**, *President and Chief Operating Officer*, GRID STORAGE TECHNOLOGIES LLC

5:00-6:00

**Networking Reception Hosted By Haddington Ventures, L.L.C.**

Hosted by HADDINGTON VENTURES, L.L.C.



STORAGE SUMMIT  
TUESDAY, JULY 14

8:00-8:30

*Plenary Presentation:*

**The Federal Energy Storage Initiative and ARRA Stimulus Funding**

A review of DOE Energy Storage work with utilities and state energy agencies:

- Future DOE research directions
- Prospects for Stimulus funding by the states
- Outline of ARRA funding for DOE Energy Storage demonstrations within the Smart Grid framework

*Presenter:*

**DR. IMRE GYUK**, *Program Manager, Energy Storage Research,*  
U.S. DEPARTMENT OF ENERGY

8:30-9:00

*Plenary Presentation:*

**Financing Storage Projects after the Stimulus**

Renewable energy-related markets are heavily influenced by government policy, and even small changes in policy can make winners and losers. This presentation will address what sort of help the federal government is providing the energy storage business and how to tap into it, and what "pivot points" are possible in the foreseeable future in the market.

*Presenter:*

**John J. Marciano III**, *Associate, CHADBOURNE & PARKE LLP*

TRACK ONE:  
GRID-SCALE STORAGE BUSINESS MODELS AND FINANCE (>20MW)

9:00-9:15

*Chairman's Introduction*

**Kenneth S. Culotta**, PARTNER, KING & SPALDING LLP

9:15-10:15

*Panel Discussion:*

**Developing New Large Scale Storage: What Will It Take?**

- How has the economic downturn and the credit crisis changed the likely sources of construction stage equity financing for new projects?
- Are the infrastructure funds interested and ready to provide capital to energy storage projects?
- Where can developers turn to find debt financing for their projects?
- What role can the capital markets play in the coming twelve months?
- Revisiting the natural gas storage analogy and economics of energy arbitrage, update on announced compressed air projects
- A new wave of pumped hydro?
- Lender views of technology risk for energy storage project development and valuation
- Impact of ARRA Stimulus money for large storage projects

*Moderator:*

**Kenneth S. Culotta**, Partner, KING & SPALDING LLP

*Panelists:*

**Stephen Byrd**, Chief Executive Officer, ENERGY STORAGE AND POWER LLC

**Peter Donalek**, Power System Studies – Manager, MWH

**Jim Heid**, Vice President Global Business Solutions, DRESSER-RAND

**Kim L. Johnson**, Executive Vice President, Commercial, SYMBIOTICS LLC

**Dave Marchese**, Vice President, HADDINGTON VENTURES, L.L.C.

10:15-10:45

*Presentation:*

**The Comparative Value of Grid-scale Energy Storage Assets**

The presentation will compare four popular grid-scale energy storage assets (flywheel, CAES, hydro and battery) based on the incremental contribution (measured in \$/MW equivalent) in the PJM market. The presentation tries to answer the basic question of what grid-scale energy technology currently has the best marginal return and what are the main drivers of the comparative value.

*Presenter:*

**Ruben Moreno**, Senior Director, R.W. BECK, INC.

10:45-11:00

*Networking Break*

11:00-11:30

*Presentation:*

**General Compression**

The General Compression Advanced Energy Storage (GCAES) system is designed to make intermittent windfarms as reliable and dispatchable as conventional generators. The system features a modular 1.5 MW near-isothermal hydraulic compressor/expander enabling 20 to 1,000 MW, 8 to 300 hour, compressed air energy storage projects with no fuel requirement when generating power.

*Presenter:*

**David Marcus**, Chairman and Founder, GENERAL COMPRESSION

11:30-12:00

*Presentation:*

### **Valuation Drivers For Large Scale Energy Storage Projects**

The value proposition for large scale energy storage is very much a function of the market and location where the facility is placed into service. Increases in wind generation resources, as an example, create integration issues in markets such as ERCOT, WECC and MISO that can be mitigated with large scale energy storage. The presentation will discuss key valuation drivers, and the interplay of these drivers associated with large scale energy storage including:

- Arbitraging energy prices
- Providing ancillary services
- Firming of capacity
- Optimization of infrastructure requirements

*Presenter:*

**Mark Griffith**, *Managing Director*, BLACK & VEATCH CORPORATION

12:00-1:30

*Group Luncheon*

1:30-2:30

*Panel Discussion:*

- **How Will Bulk Storage Projects Be Financed? Debt and Equity Perspectives**
- How will the relative percentage of debt vs. equity, and terms, be affected by the DOE loan guarantees for large projects
- CAES versus pumped hydro: comparative costs and timing for ROI
- Can Investor-Owned Utilities access loan guarantees for large storage? Will they be interested in PPAs or build/transfer agreements?
- Locational trade-offs for bulk storage projects
- Perceptions of risk factors: technical, siting, permitting, operational

*Moderator:*

**Chuck Zabriskie**, *Principal*, ACQUEST ADVISORS LLC

*Panelists:*

**Michael Casey**, *Managing Director, Power & Utilities and Alternative Energy*, ROYAL BANK OF CANADA CAPITAL MARKETS

**Jeremy Dockter**, *President*, THE KINETIC GROUP

**Scott Gardner**, *Managing Director*, US RENEWABLES GROUP

**Stuart J. Murray**, *Director Infrastructure & Energy Finance*, CITIBANK

**Raymond Wood**, *Managing Director*, CREDIT SUISSE

2:30-3:00

*Presentation:*

### **An Introduction to Siting and Technical Factors in Compressed Air Energy Storage Projects**

This presentation will offer a background on the different technical and geological considerations involved in creating underground compressed air projects, spanning four different types of reservoirs from recent consulting work: salt cavities, excavated mines (Norton Project), aquifer structures (Iowa Stored Energy Park), and depleted gas fields (Gaiaelectric). Mr. King will also explore how the different geological constraints translate into risk factors from an investment perspective, and mitigation strategies for such risks.

*Presenter:*

**Michael King**, *Principal*, The Hydrodynamics Group

3:00-3:30

*Networking Break*

3:30-4:00

*Presentation*

**Linking Environmental Considerations into Energy Project Development: Save Years and Millions**

By considering environmental constraints in the earliest phases of project development, energy developers are streamlining their permitting requirements by years, saving millions of dollars. Even before the project concepts have been finalized, incorporating environmental considerations into project planning can streamline all phases of project development. Proactive permitting considerations to be discussed include:

- Describing and sequencing project development to streamline permitting
- Anticipating and addressing critical path permits
- Hot button environmental permitting issues affecting energy developers
- Take the lead identifying your lead agency

*Presenter:*

**Tisha Schuller**, *Vice President*, TETRA TECH

4:00-5:00

*Presentations and Panel Discussion:*

**Pumped Storage Today and Tomorrow**

- Traditional model of long term demand side planning coincident with long term supply and transmission planning has been changed. The industry's 80-100 years of experience is less applicable going forward.
- Individual state RPS policies, in the absence of a clear and consistent federal policy has yielded an energy only policy.
- The emergence of variable generation technologies has evolved in the absence of transmission planning along with the absence of energy storage and capacity planning.
- Compare Denmark's experience of significant wind penetration and strong interconnects with Norway and Germany with California experience – and what is their price for electricity to make that work?

*Panelists:*

**Rick Miller**, *Senior Vice President*, Hydropower Services, HDR|DTA  
*President*, NATIONAL HYDROPOWER ASSOCIATION

**Gil Tam**, *Principal Consultant*, ELECTRIC POWER GROUP, LLC (Eagle Mountain Pumped Hydro)

**David Kates**, *Director*, THE NEVADA HYDRO COMPANY (LEAPS – LAKE ELSINORE PUMPED STORAGE)

TRACK TWO:

GRID-CONNECTED MARKETS AND SOLUTIONS (<20MW )

*Chairman's Introduction*

**Dan Rastler**, Program Manager, ELECTRIC POWER RESEARCH INSTITUTE

9:00-9:15

*Presentation:*

**17 Electric Utility-related Energy Storage Benefits**

This presentation includes high level characterizations of potential benefits from energy storage used for electric utility-related applications. Also discussed is the concept of combining applications/benefits into value propositions including use of distributed and/or modular energy storage.

*Presenter:*

**Jim Eyer**, Senior Analyst, DISTRIBUTED UTILITY ASSOCIATES

9:15-9:30

*Presentation:*

**"Free Storage" - Is Ice the Key to Exploiting Wind Power?**

Many industry veterans miss the connection between wind power, thermal storage for air conditioning and demand response. This talk outlines the use of hot water and ice as the missing battery for intermittent renewable energy sources, such as wind power. Thermal storage systems are almost always "free," paying for themselves by reducing utility bills, while simultaneously enabling utilities to use wind power.

*Presenter:*

**Elton Sherwin**, Senior Managing Director, RIDGEWOOD CAPITAL

9:30-9:45

*CASE STUDY 1:*

**Lead Acid Storage Facility (1.2MW)**

In 1996, GNB Industrial Power in collaboration with GE, DOE and Sandia, designed and installed a 1MW/1.4MWh Battery Energy Storage System at the Alaskan facilities of Metlakatla Power and Light. The purpose of this installation was to stabilize the island community's power grid, and to demonstrate the viability and economic justification for a lead acid battery in a large energy storage application. The operational history of the BESS installation over the past 12 years will be summarized.

*Presenter:*

**Mike Berger**, Director of Engineering, EXIDE TECHNOLOGIES

10:00-10:30

Networking Break

10:30-11:00

*Case Study 2*

**ALTAIRNANO'S 1MW FREQUENCY REGULATION COMMERCIAL DEPLOYMENT**

In November of 2008 independent power producer AES launched its one megawatt (MW), 250 kilowatt-hour battery storage system, selling grid regulation services into the PJM market region. The installation used Altair Nano's Lithium-Titanate batteries to provide grid regulation services, and followed on the heels of an earlier one megawatt test project in Indiana. The unit is now available for commercial operation as a qualified market participant for regulation service by AES Energy Storage.

*Presenter:*

**Chet Sandberg**, Chief Applications Engineer, ALTAIR NANOTECHNOLOGIES

11:00-11:30

*Presentation:*

**Economic Valuation of Utility-scale Distributed Energy Storage**

This presentation will address the economics of three storage applications with high value potential when the combined value elements can be accrued to the owner: T&D upgrade deferral, regulation control, wind generation and distribution. The presentation will summarize market and "SmartGrid" conditions associated with these applications for a generic energy storage technology and describe a lifecycle cost analysis methodology to quantify costs and benefits. Results will be presented in terms of net present value (NPV) for representative case studies in each category.

*Presenter:*

**Dan Mears**, *President*, TECHNOLOGY INSIGHTS

11:30-12:00

*Case-study 3:*

**Assessing Storage Options for Tehachapi II Wind Farm**

As far back as 1992 Mr. Romanowitz pioneered a 2.88MW, 17,280 KWH battery storage project integrated with wind to meet Firm Capacity PPAs. Mr. Romanowitz is currently managing the Tehachapi Wind Expansion and related transmission projects. In that capacity, he has been studying the different storage solutions currently available to determine the best fit. In this presentation Mr. Romanowitz will discuss the pros and cons of different storage products and methods, providing representative insight into the needs and concerns of large wind farm developers.

*Presenter:*

**Hal Romanowitz**, *President & Chief Operating Officer*,  
OAK CREEK ENERGY SYSTEMS

12:00-1:30

*Group Luncheon*

1:30-2:30

*Panel Discussion:*

**Renewable Energy Developer Perspectives on Energy Storage**

Storage can help renewable energy resources overcome some current issues. First, island grids that do not have significant system inertia cannot accept high penetrations of wind without some type of balancing technology—storage can and has been proven to be useful here. Secondly, the economics of some renewable energy projects is sub-optimal due to transmission issues. Large scale energy storage technologies could provide some of these installations with flexibility to improve their project economics. Finally, energy storage will be useful to provide time-shifting of these resources.

- Experience to date with storage pilots
- What are wind and solar developers looking for in storage capability, technology risk and price?

*Panelists:*

**Joe Borkowski**, *Development Manager*, E.ON RENEWABLES

**Michael King**, *Principal*, THE HYDRODYNAMICS GROUP

**Kim Smith**, *Vice President Construction and O&M Services*,  
ACCIONA ENERGY NORTH AMERICA

**Praveen Kathpal**, *Director, Market Affairs*, AES ENERGY STORAGE LLC

2:30-3:00

*Presentation:*

### **Critical Factors for Developing Economically Viable Electricity Storage Projects**

This presentation will draw on insights from studies conducted over the past 5 years evaluating different electricity storage technologies in competitive markets. It will provide an overview of competitive electricity markets and recent policy changes implemented in various ISO/ RTO markets to remove barriers for electricity storage participation. The presentation will cover various factors that need to be considered by investors / project developers / technology providers to ensure the commercial viability of electricity storage projects. These factors include:

- Storage design, performance & capabilities
- Market design and rules
- Financing
- Other factors

The presentation will cover these factors independent of specific technologies, but will draw on examples of advanced batteries, flywheel and CAES to illustrate the importance of some of these factors.

*Presenter:*

**Rahul Walawalkar**, *Senior Energy Consultant*,  
CUSTOMIZED ENERGY SOLUTIONS (CES)

3:00-3:30

*Networking Break*

3:30-4:30

*Panel Discussion:*

### **INTEGRATING DISTRIBUTED RESOURCES: DEMAND RESPONSE, ELECTRIC AND THERMAL STORAGE, ELECTRIC VEHICLES**

Currently ESCOs, demand response providers, and smart grid tech vendors are carving out "third party" spaces between the utility and the end energy customer. Vehicle and distributed storage (whether electric or thermal) further thickens the soup. This panel will provide a cross-section of R&D, smart grid and investor perspectives on the evolving business and technology environment into which storage will be incorporated.

*Moderator:*

**Buz Barclay**, *Partner*, DICKSTEIN SHAPIRO LLP

*Panelists:*

**Elliot Boardman**, *Executive Director*, PEAK LOAD MANAGEMENT ALLIANCE

**Richard Drake**, *Program Manager*, Transportation & Power Systems R&D, NYSERDA

**John L. Petersen**, *Partner*, FEFER PETERSEN & CIE

**Jeff Tolnar**, *Chief Technology Officer*, BPL GLOBAL

**Bill Vogel**, *Founder*, Senior Vice President Strategic Development,  
TRILLIANT INC.

4:30-5:00

**Compressed Air Energy Storage (“CAES”) and Its Roles in Distributed Generation and the Smart Grid.**

Second generation compressed air energy storage (“CAES2”) provides load management and ancillary services for “smart grids” with unit capacities ranging from 2-3 MW to 15-20 MW. They provide ~70% of a unit’s capacity with practically instant load fluctuations and synchronous reserve functions. These units consist of standard components - combustion turbine, compressors and expanders with the compressed air storage in the piping/pressure vessels i.e. without any restrictions to unit locations.

*Presenter:*

**Royal Daniel**, *Chief Executive Officer*, ENERGY STORAGE AND POWER

5:00-6:00

**Networking Reception**

Hosted by A123 SYSTEMS

