

Program
**Massive Energy Storage
for the Broader Use of Renewable Energy Sources**

An ECI Conference

June 23 - 26, 2013

Newport Beach, California, USA

Conference Chairs

Professor **Sudhakar Neti**
Lehigh University, USA

Professor **Trung Van Nguyen**
University of Kansas, USA



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Sunday, June 23, 2013

16:30 – 18:00	Registration (Bay Laurel North Foyer)
18:30 – 19:00	Welcome Reception (Garden Gazebo)
19:00 – 20:30	Welcome Dinner (Orchid Terrace) Welcome remarks by ECI Liaison John Chen and the Conference Chairs

NOTES

- Audiotaping, videotaping and photography of presentations are strictly prohibited.
- Please do not smoke at any conference functions.
- Turn your mobile phones to vibrate or off during technical sessions.
- Technical Sessions will be in Bay Laurel 1, 2 and 3.
- The poster session will be in Sequoia 1, 2, and 3.
- Breakfasts and lunches will be in the Bamboo Garden, with exception of lunch on Wednesday which will be in Sequoia 1, 2 and 3.
- Dinners will be in the Orchid Terrace.
- Be sure to check your contact information on the Participant List in this program and make any corrections to your name/contact information online. A corrected copy will be sent to all participants after the conference.
- Speakers – Please leave at least 5 minutes for questions and discussion. Be available for discussion during meals and social periods

Monday, June 24, 2013

07:00 – 08:00

Breakfast

08:00 – 08:10

Welcome and Introduction by Conference Chairs and ECI Technical Liaison

Conference Keynote Address

08:10 – 08:40

Keynote: **James Klausner**, Director, ARPA-E
Solar to Fuel Storage

Session 1: Electrical Energy Storage (EES)

Session Chairs: William Torre (UCSD) and Tim Mueller (Johns Hopkins)

08:40 – 09:10

Keynote: **Sri Narayan** (University of Southern California)
Opportunities and challenges for large-scale electrical energy storage in robust, inexpensive and efficient rechargeable batteries

09:10 – 09:40

Keynote: **Jun Liu** (Pacific Northwest National Laboratory)
Large scale energy storage: From nanochemistry to large systems

09:40 – 10:05

Kwong-Yu Chan, Vanessa C.Y. Li, and Guoming Weng
(University of Hong Kong)
Boosting cell voltage via a pH differential: Preliminary studies of a metal hydride-vanadium semi-flow battery

10:05 – 10:30

Shirley Meng (University of California - San Diego)
Achieving high cyclability in inexpensive soluble lead flow batteries

10:30 – 11:00

Coffee break

11:00 – 11:25

Michael J. Aziz, Brian Huskinson, Saraf Nawar (Harvard University)
Novel quinone-based couples for flow batteries

11:25 – 11:50

Jay Whitacre (Carnegie Mellon University)
A scaled low cost energy storage system: The aqueous hybrid ion battery

11:50 – 12:15

Wanjun Cao and Jim P. Zheng (Florida State University)
High energy density lithium capacitors using carbon-carbon electrodes

12:15 – 12:40

Moderated Workshop/Discussion

12:40 – 14:00

Lunch

Session 2: Electrical Energy Storage (EES)

Session Chairs: Graham Fischer (MEMC) and Sri Narayan (USC)

14:00 – 14:25

Huamin Zhang (Dalian Institute of Chemical Physics, Chinese Academy of Science)
R&D status of vanadium flow battery: Materials and demonstration

14:25 – 14:50

Graham Fisher (MEMC Electronic Materials, Inc.)
Perspectives on large scale integration of energy storage systems with PV

Monday, June 24, 2013 (continued)

- 14:50 – 15:15 **Bernard Jan Bladergroen** (University of Western Cape)
Large scale energy storage: Application pull and technology push in a South African context
- 15:15 – 15:45 **Coffee break**
- 15:45 – 16:20 **Chris Dennison and Emin Caglan Kumbur** (Drexel University)
The electrochemical flow capacitor: grid scale capacitive energy storage
- 16:20 – 16:45 **Babu Chalamala, Graham Fisher, and Bob Blackstock**
(MEMC Electronic Materials, Inc.)
Energy storage requirements for commercial roof top PV plants: A case study
- 16:45 – 17:35 **Moderated Workshop/Discussion**
- 18:00 – 19:30 **Dinner**

Tuesday, June 25, 2013

- 07:00 – 08:00 **Breakfast**
- 08:00 – 08:10 **Introduction by Conference Chairs**
- Session 3: Thermal Energy Storage (TES)**
Session Chairs: Farid Mohammed (Auckland) and Halime Paksoy (Cukurova, Turkey)
- 08:10 – 08:40 Keynote: **Yogi Goswami** (University of South Florida)
Thermal energy storage technologies and systems for concentrating solar power plants
- 08:40 – 09:10 Keynote: **Markus Eck, Doerte Laing, Stefan Zunft, Wolf-Dieter Steinmann**
(German Aerospace Center, DLR)
High temperature thermal energy storage development at the German aerospace center
- 09:10 – 9:35 **Weihuan Zhao, Alparslan Oztekin, Sudhakar Neti, John Chen, and Kemal Tuzla** (Lehigh University)
Effects of void in encapsulated phase change material capsules for thermal energy storage
- 09:35 – 10:00 **Dileep Singh, Sreeram Cingarapu, Elena Timofeeva, and Michael Moravek** (Argonne National Laboratory)
Use of dual-purpose hybrid nanoparticles for energy storage and efficient heat transfer in concentrated solar power (CSP)
- 10:00 – 10:25 **Yukitaka Kato** (Tokyo Institute of Technology)
Contribution of thermal energy storage technologies on vehicle's thermal energy storage (VTES)
- 10:25 – 10:55 **Coffee break**
- 10:55 – 11:20 **Hugo Caram & Fan Ni** (Lehigh University)
Analysis of pumped heat energy storage process using explicit exponential matrix solutions
- 11:20 – 11:45 **Odtsetseg Myagmarjav & Yukitaka Kato** (Tokyo Institute of Technology)
Reaction rate enhancement of chemical heat storage by lithium bromide for chemical heat pumps
- 11:45 – 12:10 **Ying Zheng, Weihuan Zhao, Kemal Tuzla, John Chen, Sudhakar Neti, Alp Oztekin, Wojtek Misiolek and J.C. Sabol** (Lehigh University)
Thermal Energy Storage using EPCM for CSP and other Application
- 12:10 – 12:40 **Massimiliano Zamengo, Junichi Ryu, and Yukitaka Kato**
(Tokyo Institute of Technology)
Magnesium hydroxide pellets for the storage of industrial waste heat
- 12:40 – 14:00 **Lunch**

Tuesday, June 25, 2013 (continued)

Session 4: Energy Storage – General

Session Chairs: Dileep Singh (Argonne) and Yukitaka Kato (Tokyo Inst. Tech)

- 14:00 – 14:25 **Qian Shao & Michael Schuller** (Texas A&M University)
Effect of nanoparticles mass fraction on thermophysical properties of alumina-nitrate nanofluid
- 14:25 – 14:50 **York Ostermeyer & Bijan Adl Zarrabi** (Chalmers University of Technology)
Retail supermarkets as next generation thermal energy buffer for the electrical grid in renewable energy systems
- 14:50 – 15:15 **Frithjof Clauss & Rolf Katzenbach** (Technische Universität Darmstadt)
Geothermal energy supply and storage with enhanced geotechnical structure
- 15:15 – 15:40 **William Torre & Byron Washom** (University of California -San Diego)
Planned energy storage for integration of renewable generation at the University of California - San Diego
- 15:40 – 16:10 **Coffee break**
- 16:10 – 17:30 **Moderated Workshop/Discussion – Energy Storage for Industry**
Moderated by Arun Muley (Boeing)
Panel Members: Farid Mohammed (Auckland), **Yukitaka Kato** (Tokyo Inst. Tech), **Marcus Eck** (DLR, Germany), **Joe Breit** (Boeing)
- 18:45 **Reception (Garden Gazebo)**
- 19:15 **Conference Banquet**
- 21:00 – 22:00 Meeting of Conference Organizing Committee

Wednesday, June 26, 2013

- 07:00 – 08:00 **Breakfast**
- 08:00 – 08:10 **Introduction by Conference Chairs**
- Sessions 5: Computations and Other issues in Energy Storage**
Session Chairs: Jun Liu (PNNL) and Babu Chalamala (MEMC)
- 08:10 – 08:40 Keynote: **Tim Mueller** (Johns Hopkins University)
Materials informatics for energy storage
- 08:40 – 09:05 **Venkat Ramadesigan, Paul Northrop and Venkat Subramaniam**
(Washington University at St. Louis)
Multiscale modeling of lithium ion batteries
- 09:05 – 09:30 **Halime Omur Paksoy, Beyza Beyhan, Bekir Turgut, Hunay Evliya, Saziye Bozdog, Yildiz Dasgan, and Kazim Abak** (Cukurova University)
Next generation thermal energy storage designs for greenhouses
- 09:30 – 09:55 **William F. Pickard** (Washington University – St. Louis)
How late is too late for the United States to launch a crash program of massive electricity storage?
- 09:55 – 10:30 **Coffee break**
- 10:30 – 10:55 **Mohammed Farid & Ryan Zhu** (University of Auckland)
Using Energyplus to evaluate the use of phase change material in buildings in different climates
- 10:55 – 11:20 **Junichi Ryu, Hirokazu Ishitobi & Yukitaka Kato**
(Tokyo Institute of Technology)
Durability of chemically modified magnesium oxide for chemical heat storage
- 11:20 – 12:20 **Poster Session**
- 12:20 – 14:00 **Lunch**
- 14:00 – 14:40 **Overall review of EES, TES and MES and Future of MES**
- 14:40 – 15:00 **Closing remarks and conference closure**

Poster List

1. **Prediction and mitigation of capacity fade in vanadium redox flow batteries**
Chris Dennison, Drexel University
2. **Characterization of encapsulated phase change materials for high-temperature energy storage by calorimetry**
Ying Zheng, Lehigh University
3. **Energy of pellets of biomass wastes in a novel spouted bed technology**
Maria J. San Jose, University of the Basque Country
4. **Solar energy storage by mixing and separation of water and ammonia**
William E. Schenewerk
5. **Vanadium redox flow battery with on-line monitoring of electrolytes**
Juraj Kosek, Institute of Chemical Technology Prague
6. **Fine metal-oxide nanoparticles prepared by electrospraying method: Applications in energy storage**
Juraj Kosek, Institute of Chemical Technology Prague
7. **Tin oxide nanowires as high energy density anode for lithium-ion batteries**
Tu Q. Nguyen, University of Louisville
8. **Hydrogen-Bromine fuel cells for large scale electrical energy storage**
Venkata Raviteja Yarlagadda, University of Kansas