NAATBatt
Advanced Battery Weekly

Summary:

For the March 25th issue of NAATBatt's Advanced Battery Weekly, we highlight the ongoing sector activities.

The NAATBatt Index increased 1.4% while the U.S. and Asia Indices were flat. The Russell 2000 increased 1.9% while the S&P 500 was flat.

Executive Director James Greenberger addresses skepticism about whether dual use automotive/grid-connected batteries are feasible and speculates about a market opportunity for the development of what could be a game-changing energy storage application. Read "***Dual Use Batteries: How They May Happen***" in the Executive Director's Notes section of this newsletter below.

Key Highlights:

- **Ford Motor** and **AT&T** announced an agreement to wirelessly connect the **Ford Focus Electric**. Using the MyFord Mobile smartphone app, Electric vehicle (EV) owners will have the ability to send and receive data about their car providing command and control of vehicle settings while away from it. **Compact Power** is the lithium-ion (li-ion) battery supplier for the Focus Electric.

- The **Tesla Model S** EV will support third party apps in the same manner as a **smartphone**. The inclusion of an app ecosystem enables the passenger to do everything from updating **Twitter** and **Facebook** to displaying the weather.

- **Better Place** has unveiled the infrastructure deployment roadmap for **Israel**. The company revealed the locations for the first 9 of 40 Battery Switch Stations that will be in operation year end; including **Hadera**, **Modi'in**, **Mahanaim**, **Mitzpeh Ramon**, **Be'er Sheva**, **Yavne**, **Beit Shean** and **Bilu Junction**.

- **International Battery** has entered into a collaboration and license agreement with **Hydro-Québec** to further develop water-based manufacturing processes of li-ion batteries. As part of the joint collaboration, the companies plan to expand water-based manufacturing processes for additional lithium chemistries.

- The **Chevrolet Volt** will go on sale in **China** later this year. The EV traveled 248 kilometers (or 154 miles) in over 5 hours from **Shanghai** to **Hangzhou** without needing an additional electrical charge.

- The **State Grid Corp of China** (**SGCC**) and the parent of **China National Offshore Oil Corp** (**CNOOC**) are seeking cooperative opportunities to tap China's fledgling EV market. SGCC has been building charging facilities and battery swap stops nationwide, while CNOOC has invested heavily in battery technologies, hoping to gain entry to the green car business.

- **FastCAP Systems** plans to begin selling its **carbon nanotube**-enhanced energy storage system (or ultracapacitor) for industrial applications in the next two months. The company is in talks with automakers about putting its ultracapacitors into hybrid EVs by 2013.

- The **City of Chattanooga** has installed its first public charging station. The station is located at the downtown **Doubletree Hotel**. The national EV Project will eventually place 100 public units in Chattanooga and about another 100 residential units.

- Scientists at the **University of Illinois** have developed a three-dimensional nanostructure for battery cathodes that allows for dramatically faster charging and energy storage. The new battery

electrodes can charge or discharge in a few seconds at 10 to 100 times faster than existing electrodes -- yet can perform normally in existing devices.

- **Daimler** has chosen **ClipperCreek** as the preferred supplier of charging cords for the **smart fortwo** EV. The cord is one of the few that come with **UL certification** (**Underwriters Laboratories**). Daimler is planning to deploy 250 smart fortwo EVs this year across the U.S.

- **Tata** has begun production of **Vista** EVs in Coventry, UK. The EV has a range of up to 120 miles (200km), and can accelerate from 0 to 60 kmph (37 mph) in under 10 seconds.

A Few More Details:

Ford Motor and AT&T announced an agreement to wirelessly connect the Ford Focus Electric. Using the MyFord Mobile smartphone app. the embedded AT&T wireless connection, EV owners will have the ability to send and receive data about their car providing command and control of vehicle settings while away from it. The technology enables owners in North America with a powerful tool to stay connected, monitor and control their vehicle. Compact Power is li-ion battery supplier for the EV.
Source: Ford

The Tesla Model S will support third party apps in the same manner as a smartphone. The company will join other brands such as Ford, General Motors and Toyota that have all recently launched systems that allow users to download 3rd party software to their vehicles. The inclusion of an app ecosystem enables the passenger to do everything from updating Twitter and Facebook to displaying the weather. GM has also revealed that consumer use of mobile apps for its OnStar telemetric system had surged.
Source: Times Live

Better Place has unveiled the infrastructure deployment roadmap for Israel. The company revealed the locations for the first 9 of 40 Battery Switch Stations (an example shown in **Exhibit 1**) that will be in operation year end; Hadera, Modi'in, Mahanaim, Mitzpeh Ramon, Be'er Sheva, Yavne, Beit Shean and Bilu Junction. Better Place has already signed 400 agreements with parking lot owners across the country to deploy thousands of charge spots with the first 200 sites already under construction. In addition, 27 municipalities have signed agreements to ensure that Better Place charge spots are deployed in central locations in their respective cities.

Exhibit 1: Battery Switch Station Being Deployed

Source: Better Place

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International Battery has entered into a collaboration and license agreement with Hydro-Québec to further develop water-based manufacturing processes of lithium-ion batteries. As part of the joint collaboration, the companies plan to expand water-based manufacturing processes for additional lithium chemistries. International Battery is the first company in North America to produce commercial li-ion products using a water-based manufacturing process and Hydro-Québec has an intellectual property (IP) for aqueous electrode technology.
Source: International Battery

The Chevrolet Volt will go on sale in China later this year. The EV traveled 248 kilometers (or 154 miles) in over 5 hours from Shanghai to Hangzhou without needing an additional electrical charge. The Volt can travel 80 kilometers (or 49 miles) in electric mode. When the battery is running low, it will switch to the "extended range" mode, which allows the car to run 490 kilometers (or 304 miles) more on its gasoline-powered generator.
Source: Xinhua

The State Grid Corp of China (SGCC) and the parent of China National Offshore Oil Corp (CNOOC) are seeking cooperative opportunities to tap China's fledgling EV market. SGCC has been building charging facilities and battery swap stops nationwide, while CNOOC has invested heavily in battery technologies, hoping to gain entry to the green car business. The Central Government's goal is to increase EV output to 1 million units by 2020.
Source: Reuters

FastCAP Systems plans to begin selling its carbon nanotube-enhanced energy storage system (or ultracapacitor) for industrial applications in the next two months. The company is in talks with automakers about putting its ultracapacitors into hybrid EVs by 2013. FastCAP's product benefits include higher energy density over existing ultracapacitors and higher power density than both existing ultracapacitors and batteries. Plus the ability to withstand hundreds of thousands to millions of charge-and-discharge cycles.
Source: Boston Herald

The City of Chattanooga has installed its first public charging station. The station is located at the downtown Doubletree Hotel. Use of the station is free and can provide a full charge in 4 to 6 hours. The national EVProject will eventually place 100 public units in Chattanooga and about another 100 residential units.
Source: The Republic

Scientists at the University of Illinois have developed a three-dimensional nanostructure for battery cathodes that allows for dramatically faster charging and energy storage. The breakthrough could lead to cellphones that charge in seconds or laptops that charge in minutes, as well as high-power lasers and defibrillators that don't need time to power up before or between pulses. The new battery electrodes can charge or discharge in a few seconds at 10 to 100 times faster than existing electrodes -- yet can perform normally in existing devices. The system provides capacitor-like power with battery-like energy.
Source: UPI

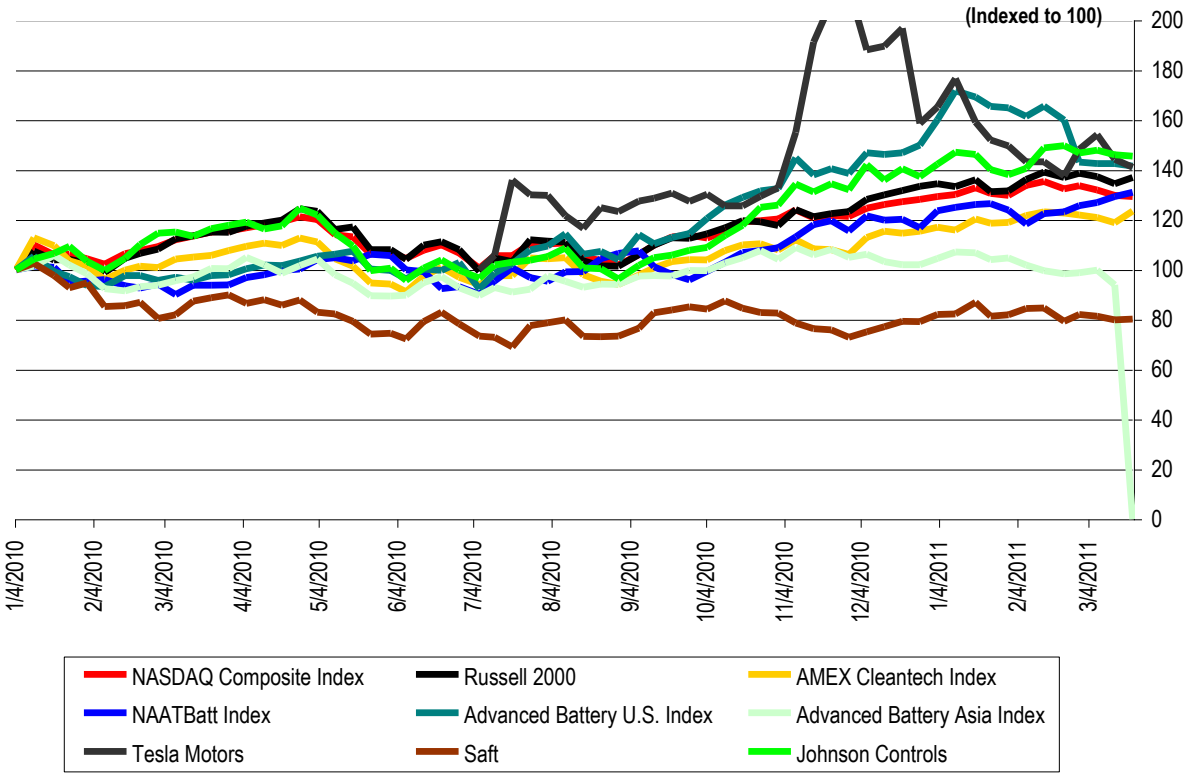
Daimler has chosen ClipperCreek as the preferred supplier of charging cords (as shown in **Exhibit 2**) for the smart fortwo EV. The cord ClipperCreek is making is one of the few that come with UL certification (Underwriters Laboratories). The PCS-15 cord acts as a portable charging station that can be plugged in any UL listed Level 1, Level 2 EV stations available. Daimler is planning to deploy 250 smart fortwo EVs this year across the U.S.

Exhibit 2: Clipper Creek Charging Cord

Source: AutoEvolution

Tata has begun production of Vista EVs in Coventry, UK. The EV has a range of up to 120 miles (200km), and can accelerate from 0 to 60 kmph (37 mph) in under 10 seconds. It will cost between £25,000 (or $40,300) to £30,000 (or $48,360) with a £5,000 (or $8,060) reduction on top through a government grant.
Source: BBC

Exhibit 3: Indices Performance
(From January 4, 2010)

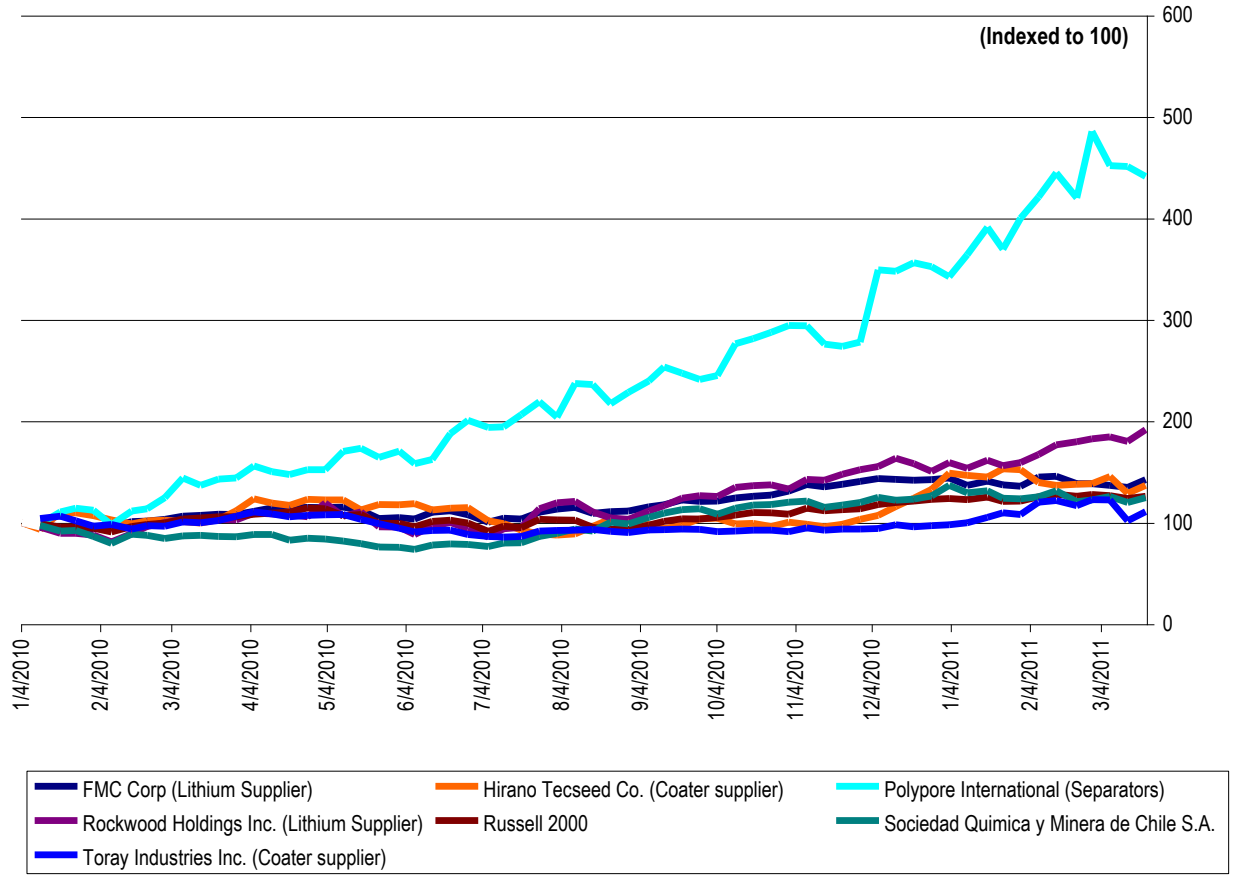


Index	Close on 3/21/2011	52-Wk High	% of 52-Wk High	Performance LTM	YTD	Week
Dow	12,036.5	12,418.0	96.9%	12.1%	3.1%	0.4%
S&P 500	1,298.4	1,344.1	96.6%	12.2%	2.1%	0.2%
NASDAQ	2,692.1	2,840.5	94.8%	14.1%	0.0%	(0.3%)
Russell 2000	813.0	838.0	97.0%	21.4%	1.8%	1.9%
AMEX Cleantech Index	1,211.3	1,236.8	97.9%	16.6%	5.5%	3.8%

Source: Bloomberg and ThomsonOne

Note: The select NAATBatt Index is a market-value-weighted average and includes ALTI, BASF, COP, ENS and XIDE. The Advanced Battery U.S. Index is a market-value-weighted average and includes HEV, MGA, MXWL, UQM and VLNC. The Advanced Battery China Index is a market-value-weighted average and includes BYD, CBAK, GS Yuasa, LG Chem and Panasonic.

Exhibit 4: Supplier Performance
(From January 4, 2010)



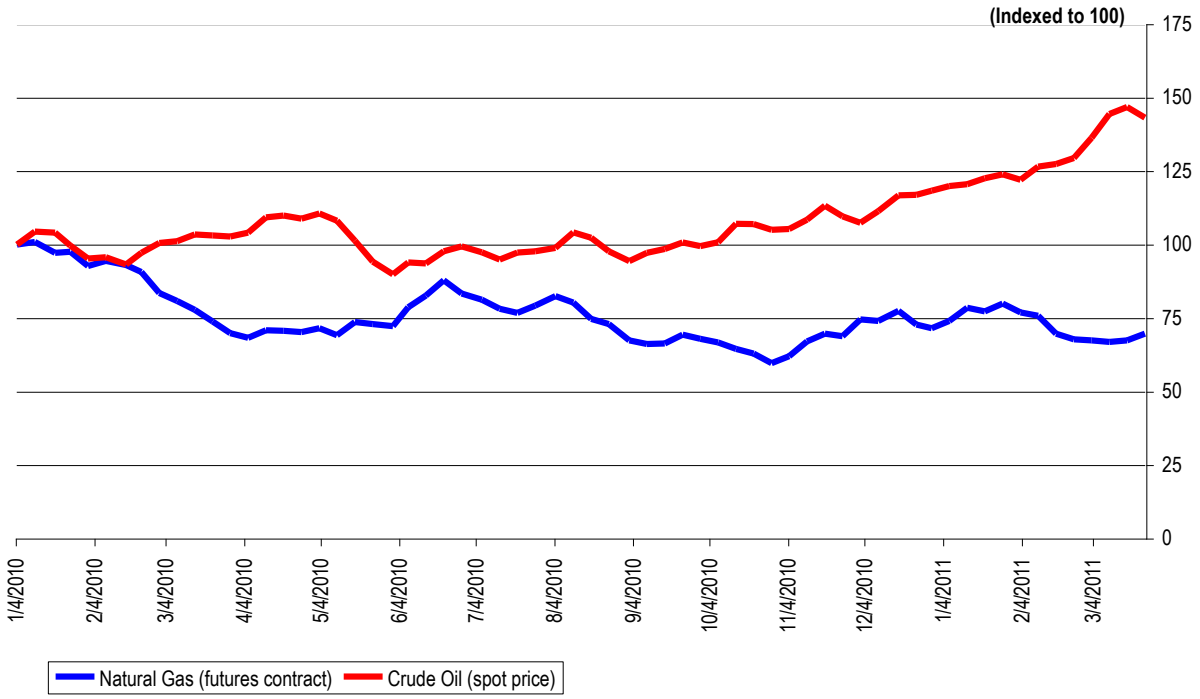
Source: Bloomberg

Exhibit 5: Commodity Prices

Commodity	Price on 3/21/2011	Price on 3/14/2011	Price on 2/21/2011	1 Week Change	1 Month Change
LME Copper (Cash, $ per tonne)	9,518	9,205	9,829	3.4%	(3.2%)
LME Lead (cash, $ per tonne)	2,712	2,506	2,657	8.2%	2.1%
LME Nickel (cash, $ per tonne)	26,760	25,995	29,025	2.9%	(7.8%)

Source: LME

Exhibit 6: Natural Gas and Crude Oil
(From January 4, 2010)



Source: EIA

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Executive Director's Notes

DUAL USE BATTERIES: HOW THEY MAY HAPPEN

Several weeks ago I wrote about the need to develop a standard dual use battery for both automotive and grid-connected storage applications. The advantage of a dual use battery is that it can leverage two different markets to achieve the economies of scale necessary to bring down battery costs in plug-in electric vehicles (PEV's). The high cost of PEV batteries is the greatest single barrier to meaningful electrification of our national vehicle fleet.

Certain automobile OEM's already use a kind of dual use battery to hold down the cost of their vehicles. Tesla Motors, for example, uses the same 18650 lithium-ion battery cells that are used in consumer electronics. Those off-the-shelf cells provide the Tesla Roadster will a relatively low cost per kilowatt for power (though no one would accuse the Roadster itself of being low priced). For large format advanced batteries, of the type more likely to be manufactured domestically, grid-connected storage is the most probable secondary market that can be leveraged.

As many noted in response to my article, the concept of a standard dual use utility/automotive battery does not account for the fact that cars and utilities need different types of energy storage. Electric energy storage consists of two basic components: power and energy. By analogy to a water can, energy is the size of the can and power is the size of the spigot. Automotive batteries require a lot of power, especially hybrid vehicle batteries, which have a power-energy ratio of >20:1. The batteries in pure electric vehicles have power-energy ratios of between 2:1 and 4:1.

The requirements of grid-connected energy storage are different. Since a community energy storage unit does not have to accelerate from 0 to 60 mph in six seconds, energy is much more important than power. Accordingly the specifications for community energy storage developed by AEP envision a power-energy ratio of somewhere between 1:1 and 1:3. Skeptics often point to this mismatch between the optimal power-energy configurations of automotive and grid-connected applications as the reason why a dual use battery will never be developed and why aftermarket automotive batteries will never find widespread secondary use in grid-connected applications.

While the skeptics have the technical problem right, they may have the future wrong. Today, as far as I am aware, all major automotive OEM's producing PEV's use a single type of high power battery cell in their battery packs. But this does not necessarily have to be the case. On July 21 of last year, NAATBatt produced a webinar on hybrid battery-capacitor systems (see http://naatbatt.org/publications/webinars/), exploring the possibility of using a combination of high energy batteries and high power ultracapacitors to power electric vehicles. These hybrid systems are possible, and even have some advantages over

battery packs using a single type of battery cell. The reason they are not used today in PEV's turns largely on the fact that the advantages of a hybrid power pack do not, in the minds of OEM's, outweigh the risks of additional system complexity.

But the OEM's cost/benefit analysis is based on current market conditions. In the current market, energy and power cost pretty much the same, and they both cost a lot since the market for both high energy batteries and high power batteries is incipient and very small. Different market conditions might yield a different answer. What if, for example, high energy advanced batteries were produced in gigawatt quantities for use by electric utilities in electricity distribution systems around the country? High energy advanced batteries might become commoditized by such high production volumes and their costs could fall dramatically. It is relatively easy to envision under such circumstances automotive OEM's abandoning the single cell battery pack design for some sort of hybrid system. Such systems, combined with low priced high energy batteries, would permit OEM's to reduce the cost of PEV's—and permit more consumers to buy them.

We are still in the earliest stages of the markets for PEV's and advanced battery technology and there is no telling how those market will evolve. But deploying advanced batteries in grid-connected applications shows great promise, not just for making the grid smarter, but also for reducing the cost of PEV's and reducing reliance on imported petroleum. Developing a true dual use battery for both automotive and smart grid applications is be one of the best and fastest ways to achieve both goals. Government and industry must jump on the chance to develop this technology by encouraging the rapid deployment of distributed energy storage systems. And don't write-off ultracaps just yet either.

James J. Greenberger
Executive Director

March 25, 2011

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NAATBatt Membership Applications for 2011

2011 Membership Applications and Dues Structure

NAATBatt is accepting applications for membership for the 2011 calendar year. Membership dues for 2011 are $10,000 for Corporate Members, $10,000 for OEM Members, $10,000 for Utility Members, $5,000 for Associate Members, $1,000 for Individual Members, and $500 for Non-Profit/Government Members. Please click on http://naatbatt.org/membership-inquiry/ and indicate that you are interested in a 2011 membership.

Why Join NAATBatt?

NAATBatt's mission is to grow the market for advanced electrochemical energy storage technology in North America. NAATBatt provides regular educational programming on topics of interest to the advanced battery community, a weekly newsletter chronicling developments in the North American advanced battery market, networking opportunities for industry participants and their customers, including our recently concluded conference on PEV's and the grid, and public policy initiatives, such as the recent NAATBatt-sponsored meeting with Chairman Jon Wellinghoff of FERC and production of written comments to FERC in support of distributed energy storage technology.

NAATBatt recently concluded the highly successful meeting and conference entitled "The Impact of PEV's on T&D Systems: Challenges and Solutions", in Louisville, Kentucky. The conference was the largest cross-industry event to date focused on the impact of plug-in electric vehicles on the grid. The conference outlined the improvements and upgrades that utilities must make to the grid in order for it to accommodate mass-market electric vehicles. The conference emphasized the critical role that grid-connected energy storage can play in promoting vehicle electrification in the United States. Emphasizing the necessary relationship between grid-connected storage and electric vehicles is one of NAATBatt's primary missions.

NAATBatt is a not-for-profit trade association qualified under Section 501(c)(6) of the Internal Revenue Code that is working for the benefit of the entire industry. **Every dollar spent on NAATBatt memberships and programs goes to recouping program costs and to supporting activities intended to benefit the entire advanced battery industry**. At a time when it seems that the only people making money on advanced lithium-ion technology are professional conference organizers, the advanced battery industry should take control of its own market and its own future. NAATBatt exists to market for the industry, not to the industry. But NAATBatt needs your support to do it. Please join us.

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North American Industry Announcements and Calendar

Get More Information!

NAATBatt Workshop on Problems in Utility Deployment of Distributed Energy Storage Systems: On **April 21, 2010**, NAATBatt and the U.S. Department of Energy will co-host in Chicago an interactive workshop examining the issues, problems and challenges that electric utilities face in deploying distributed energy storage systems on the grid. Although DES systems have many benefits, profitably deploying DES systems and adding them to rate base continues to be a major challenge for utilities. The NAATBatt/DOE workshop will encourage utility and battery executives to sit together and have a frank discussion about those challenges and how they might be addressed. The workshop is by invitation only. For more information about the workshop, please click here.

Save the Date!

NAATBatt 2011 Annual Meeting and Conference: NAATBatt has announced that its 2011 Annual Meeting and Conference will be held on **September 7-9, 2011** in Louisville, Kentucky. The annual meeting will feature a Battery Industry-Academic Summit and a survey of the next five years of advanced battery technology development. More information about the 2011 conference will be posted soon on the NAATBatt Web site at: www.naatbatt.org. Visit the NAATBatt Web site for information about the 2010 conference. Please save the date for 2011!

Speaker Presentations from the NAATBatt 20101 Annual Meeting and Conference are Now Available! NAATBatt's 2010 Annual Meeting and Conference entitled "The Impact of PEV's on T&D Systems: Challenges and Solutions" was a great success. More than 40 industry experts presented and the conference on topics relating to how the grid was going to accommodate the new load that will be generated by plug-in electric vehicles. Copies of the speaker presentations are available on a secured portion of the conference Web site. Access to the Web site is free to NAATBatt members and conference attendees. Access to the presentations is now available to all other for the price of $250. Please contact James Greenberger at jgreenberger@naatbatt.org for more information about accessing the presentations.

NAATBatt Membership Information. NAATBatt is taking applications for membership from well qualified industry participants and supporters. Membership in NAATBatt is a great way to keep abreast of developments in advanced technology batteries and to support the growth of a market for products that could change the world. Your support for NAATBatt programs, newsletters, and committees is essential to the success of our organization and our industry. To inquire about membership, please complete the following inquiry form: http://naatbatt.org/membership-inquiry/. NAATBatt will respond with additional information about membership.

- ***4th Annual Energy Storage Summit:*** The 4th Annual Energy Storage Summit will be on **March 28-30, 2011** in San Francisco, California. The Summit will focus on grid-connected energy

storage technologies. The Summit's Web site can be found at: http://www.energystoragesummit.com/Event.aspx?id=434682.

- ***Plug-In Electric Vehicle Infrastructure USA 2011***: The Plug-In Electric Vehicle Infrastructure USA 2011 conference will examine five key areas of interest to those working with PEV's and their supporting infrastructure. The conference will be held **March 31-April 1, 2011**, at the Hilton Mission Bay in San Diego California. The conference Web site is: http://www.evupdate.com/electricvehicleusa/index.shtml.

- ***2011 Battery Conference***: The 2011 Battery Congress will be held at the University of Michigan – Michigan League in Ann Arbor, Michigan on **April 11-12, 2011**. Information about the Congress can be found at: http://batterycongress.org/about-2/

- ***Electric Drive Vehicle Association 2011 Meeting and Annual Conference:*** The EDVA 2011 Meeting and Annual Conference will be held on **April 19-21, 2011** in Washington, D.C. The Web site for the meeting can be viewed at: http://www.edtaconference.org/ht/d/sp/i/18736/pid/18736.

- ***Workshop on Problems in Utility Deployment of Distributed Energy Storage Systems***: NAATBatt will sponsor a special workshop and roundtable discussion among utility and battery executives in Chicago on **April 21, 2011**. The purpose of the workshop is to identify the specific challenges that utilities face in evaluating, procuring, deploying and adding to their rate base advanced battery systems for storing electrical energy in the distribution portion of the grid. Attendance at the workshop is by invitation only. Please direct inquiries to: jgreenberger@naatbatt.org

- ***The Council for Chemical Research Annual Meeting:*** The Council for Chemical Research will hold its annual meeting on **May 1-3, 2011** in Dearborn, Michigan. The title of the meeting is "Advanced Materials: Driving Transformative Research in Transportation and Automobiles". The conference Web site may be viewed at: http://www.ccrhq.org/2011-annual-meeting.

- ***The Battcon™ International Stationary Battery Conference***: The Battcon™ International Stationary Battery Conference is a three day, noncommercial, technical event for storage battery users from a broad range of industries. The conference will be held from **May 16 to 18, 2011** at the Swan and Dolphin Resort, Orlando, Florida. The conference Web site is: http://www.battcon.com/

- ***21st Annual ESA Meeting***: The 21st annual meeting of the Electricity Storage Association will be held on **June 6-8, 2011** at the Fairmont Hotel in San Jose, California. Information about the meeting can be found on the meeting Web site at: http://www.electricitystorage.org/ESA/calendar/21st_esa_annual_meeting_-_save_the_date/.

- ***4th Symposium on Beyond Lithium-Ion***: Beyond Lithium-Ion IV will be held **June 7-9, 2011**, at Pacific Northwest National Laboratory in Richland, Washington. The goal of the Symposium is to advance understanding on the directions and challenges in present-day vehicle batteries and the future of storage technologies. The meeting is one of a series of Symposia organized by a consortium of IBM Research and U.S. National Laboratories. The meeting website is http://beyondli-ioniv.labworks.org/.

- ***Storage Week 2011***: Infocast will host Storage Week 2011 in San Diego on **July 11-14, 2011**. The program, now in its third year, will cover a range of storage policies, markets, project applications and technologies involved in the integration of storage onto the grid. NAATBatt is a

Supporting Organization of the program and NAATBatt members will be entitled to a 15% discount on admission.

- ***Plug-In 2011 Conference and Exhibition***: The Plug-In 2011 Conference and Exhibition will be held on **July 18-21, 2011** in Raleigh, North Carolina. The Conference Web site can be viewed at: http://www.plugin2011.com/.

- ***NAATBatt 2011 Annual Meeting and Conference***: **September 7-9, 2011** in Louisville, Kentucky (see note above).

- ***2nd Battery Safety Conference***: Knowledge Foundation will host the 2nd Battery Safety Conference on **November 7-8, 2011** in Boston, Massachusetts. The conference will discuss safety incidents and product recalls regarding lithium-ion batteries. The conference Web site can be accessed at: http://www.knowledgefoundation.com/viewevents.php?event_id=253&act=evt

- ***7th Lithium Mobile Power Conference***: Knowledge Foundation will host the 7th Lithium Mobile Power Conference on November 9-10, 2011 in Boston, Massachusetts immediately following the battery safety conference. The conference will provide a general survey of the lithium-ion battery industry. The conference Web site can be accessed at: http://www.knowledgefoundation.com/viewevents.php?event_id=254&act=evt.

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