

## Summary:

For the July 29th issue of NAATBatt's Advanced Battery Weekly, we highlight the ongoing sector activities.

The NAATBatt and U.S. Battery Indices were flat, while the Asia Index was down 5.5%. The S&P500 and Russell 2000 increased 2.5% and 1.9%, respectively.

Executive Director James Greenberger writes about the importance of residual battery value to the economics of electric vehicles and its implications for advanced battery design. Read "***The Economics of EV Battery Reuse***" in the Executive Director's Notes section of this newsletter below.

## Key Highlights:

- **Polypore International** announced that it has approved additional capital expenditures of approximately \$105 million to expand its lithium-ion (li-ion) battery separator capacity for electric vehicles (EVs). This is the 5<sup>th</sup> expansion announced since August 2009 and is projected to commence operation in late-2013.
- **Odyne Systems** and **Johnson Controls** have completed both an investment agreement and a long-term hybrid master supply agreement. Under the new agreements, Odyne is designating **Johnson Controls-Saft** as a "Preferred Supplier" of advanced lithium-ion battery systems for its plug-in hybrid system.
- The **United States Advanced Battery Consortium (USABC)** has awarded a \$9.62 million li-ion battery development contract to **LG Chem Power**. The company will develop a high-powered, high-capacity li-ion battery for EVs by 2013.
- **Car Charging Group** has been awarded a contract by **Walgreens** to provide charging services at select locations throughout the United States. The company will provide the services through **Coulomb Technologies' ChargePoint Network**.
- **Johnson Controls** opened its state-of-the-art **Battery Technology Center and Battery Test Facility** at its **Power Solutions** headquarters in **Glendale, Wisconsin**. The facility is the largest energy storage technical center in **North America**.
- **THINK Global AS** has been purchased and renamed **Electric Mobility Solutions AS**, registered in **Norway**. The production restart is scheduled to begin in 1Q12.
- **A123 Systems** announced a contract to supply a 500 kilowatt (kW) energy storage solution to **Dongfang Electric Corporation (DEC)**. The system is expected to be installed at DEC's manufacturing facility in **Hangzhou, China Zhejiang Province**, by the end of 2011.
- **Ecotricity** has launched an electric highway in the **United Kingdom**. The national charging network will be free of charge to EV drivers and will consist of 27 charging points at **Welcome Break** service stations.
- **Nesscap Energy** announced that the **China Quality Certification Centre (CQC)** has approved the company's 48V 166F ultracapacitor module for use in automotive applications in **China**. The CQC approval certifies that the company's modules fully comply with the QC/T 741 standard for electrical performance and mechanical durability for UC modules in automotive applications.

- **SolarCity** has partnered with **ClipperCreek** to provide chargers compatible with all new EVs. SolarCity will install ClipperCreek chargers in its 24 operations centers nationwide.
- The “**Source East**” charging rollout scheme has begun on the **East of England**. About 1,200 public charging points will be installed across the region by March 2013.
- **Canadian Electric Vehicles (CEV)** has powered up two of their car charging stations on **Vancouver Island**. The stations are Level 2 which are 240 volt 30 amp units featuring the new regulatory compliant charging coupler (plug) which mates with the inlet (receptacle) found on all new EVs produced by the major auto manufacturers.
- Researchers at **Stanford University** have created a thin, flexible, transparent li-ion battery. The battery was created by making the nontransparent components small enough, too small to be seen by the naked eye.
- **Worcester, Lancaster and Athol** are among 25 communities in the state of **Massachusetts** that will host some of the first charging stations being installed with government funding. Worcester officials plan to install the first charging stations at **Clark University** and **WPI**. Lancaster is planning to put them at the **Lancaster Visitors Center**.
- **Ener1** announced a supply and distribution agreement with **Lightning Motorcycles**. The company will supply Lightning Motorcycles with its automotive-grade, li-ion cells for use in its “**SuperBike**”.
- **Azure Dynamics** announced an agreement with **Ford Motor** whereby Azure will integrate its plug-in hybrid technology into the market leading **Ford F-Series Super Duty** product line. The commercial cab and chassis industry supports approximately 100,000 vehicles per year and could grow by as much as 50% over the next five years.
- **DTE Energy** unveiled plans to install a total of 16 public charging stations in southeast Michigan, including four at **Detroit Metro Airport** and others in **Mount Clemens, Rochester, Auburn Hills, the Village of Rochester Hills** shopping center and the **Automation Alley** technology center in **Troy**. The company is working with **General Motors** through a **U.S. Department of Energy** grant to encourage the use of EVs.

## **A Few More Details:**

Polypore International announced that it has approved additional capital expenditures of approximately \$105 million to expand its lithium-ion (li-ion) battery separator capacity for electric vehicles (EVs). The expansion is expected to be at the facility in Concord, North Carolina pending final approval in early August of proposed local incentives by the City of Concord and Cabarrus County. This is the 5<sup>th</sup> expansion announced since August 2009 and is projected to commence operation in late-2013.

*Source: Polypore International*

Odyne Systems and Johnson Controls have completed both an investment agreement and a long-term hybrid master supply agreement. Under the new agreements, Johnson Controls has made a strategic investment in Odyne to fund expansion and to accelerate wide-scale commercialization of Odyne's hybrid systems for medium and heavy duty work trucks. Odyne is designating Johnson Controls-Saft as a "Preferred Supplier" of advanced lithium-ion battery systems for its plug-in hybrid system.

*Source: Odyne Systems*

The United States Advanced Battery Consortium (USABC) has awarded a \$9.62 million li-ion battery development contract to LG Chem Power. The company will develop a high-powered, high-capacity li-ion battery for EVs by 2013. The 24-month program will utilize cells that incorporate advanced cathode materials and a thermal management system that incorporates refrigerant-based cooling, integrated heating and high efficiency insulation.

*Source: USABC*

Car Charging Group has been awarded a contract by Walgreens to provide charging services at select locations throughout the United States. The company will provide the services through Coulomb Technologies' ChargePoint Network. The stations on Walgreens properties will provide flexible payment options, the ability to make reservations and track usage patterns.

*Source: Car Charging Group and Walgreens*

Johnson Controls opened its newly renovated, state-of-the-art Battery Technology Center and Battery Test Facility at its Power Solutions headquarters in Glendale, Wisconsin. The facility is the largest energy storage technical center in North America. The Battery Test Facility was also re-designed with its size increased by 50% to 9,000 square feet and state-of-the-art equipment was installed for testing of advanced batteries in extreme conditions such as heat, cold and vibrations.

*Source: Johnson Controls*

THINK Global AS has been purchased and renamed Electric Mobility Solutions AS, registered in Norway. A new sales and service structure for THINK will be announced soon. The production restart is scheduled to begin in 1Q12.

*Source: Ener1*

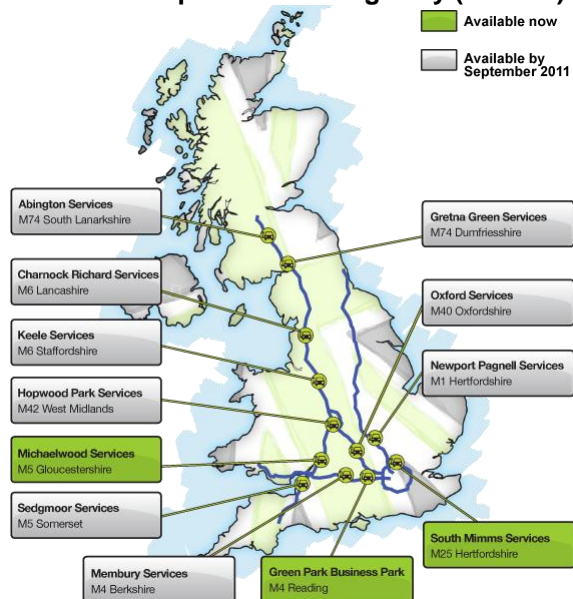
A123 Systems announced a contract to supply a 500 kilowatt (kW) energy storage solution to Dongfang Electric Corporation (DEC). DEC is the 3<sup>rd</sup> largest manufacturer of wind turbines in the People's Republic of China and the country's largest exporter of power equipment. The system is expected to be installed at DEC's manufacturing facility in Hangzhou city, China Zhejiang Province, by the end of 2011.

*Source: A123 Systems*

Ecotricity has launched an electric highway in the United Kingdom. The company will provide charge points at service stations along U.K. motorways. The national charging network will be free of charge to electric vehicle (EV) drivers and will consist of 27 charging points at Welcome Break service stations upon completion. Each charging post will be powered by the company's wind and solar sources. The network is expected to have 12(Phase I) charging points operational by September (as shown in **Exhibit 1**). There are currently 400 charging points in the U.K. -- with 250 located in London.

Source: Ecotricity

### Exhibit 1: Map of Electric Highway (Phase I)



Source: Transport Direct

Nesscap Energy announced that the China Quality Certification Centre (CQC) has approved the company's 48V 166F ultracapacitor module for use in automotive applications in China. The CQC approval certifies that the company's modules fully comply with the QC/T 741 standard for electrical performance and mechanical durability for UC modules in automotive applications. The QC/T 741 was drafted to ensure that the ultracapacitor modules being used for automotive applications meet a certain standard of quality in electrical performance and in mechanical durability.

Source: Nesscap

SolarCity has partnered with ClipperCreek to provide chargers compatible with all new EVs. SolarCity will install ClipperCreek chargers in its 24 operations centers nationwide. The price for home or business installation of a ClipperCreek 240-volt Level 2 charger, including the charger, starts at \$1,500. Charging at Level 2 is roughly five times faster than using a 120-volt wall outlet.

Source: Solar City and ClipperCreek

The "Source East" charging rollout scheme has begun on the East of England. About 1,200 public charging points will be installed across the region by March 2013. By January, it is hoped that customers will also be able to use the Source London network, which will boast 1,300 charging points across the capital within the next two years, taking the country one step closer towards a UK-wide network.

Source: Norfolk Eastern Daily Press

Canadian Electric Vehicles (CEV) has powered up two of their car charging stations on Vancouver Island. The stations are Level 2 (as shown in **Exhibit 2**) — which are 240 volt 30 amp units featuring the new regulatory compliant EV charging coupler (plug) which mates with the inlet (receptacle) found on all new EVs produced by the major auto manufacturers. The Level 2 stations charge four times faster than a Level 1 station. A level 2 fast charge requires an electrical service similar to a clothes dryer plug.

### Exhibit 2: CEV Charger Plugged into an Electric Ford Ranger



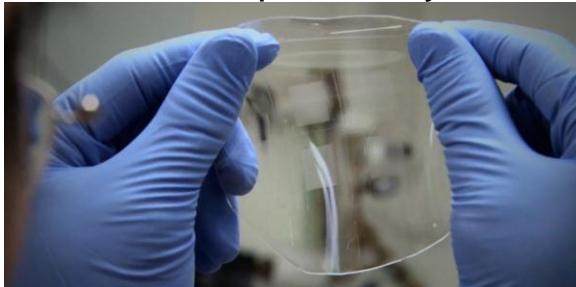
Source: *BCLocalNews*

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Researchers at Stanford University have created a thin, flexible, transparent li-ion battery (as shown in **Exhibit 3**). The battery was created by making the nontransparent components small enough, too small to be seen by the naked eye. Polydimethylsiloxane (PDMS) was used in place of regular materials such as copper or aluminum as the transparent alternative.

Source: *Stanford Report*

### Exhibit 3: The Transparent Battery



Source: *Los Angeles Times*

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Worcester, Lancaster and Athol are among 25 communities in the state of Massachusetts that will host some of the first charging stations being installed with government funding. State officials backing the plan are targeting the cities and towns to put up 105 charging stations on downtown streets, parking garages and other locations where plug-in vehicle owners can park and charge their cars. Worcester officials plan to install the first charging stations at Clark University and WPI. Lancaster is planning to put them at the Lancaster Visitors Center.

Source: *Worcester Telegram & Gazette*

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Ener1 announced a supply and distribution agreement with Lightning Motorcycles. The company will supply Lightning Motorcycles with its automotive-grade, li-ion cells for use in its “SuperBike” (as shown in **Exhibit 4**). Ener1 will also supply cells for Lightning’s commuter motorcycle and scooter that will be developed over the next few years.

*Source: Ener1*

#### **Exhibit 4: The SuperBike**



*Source: Lightning Motorcycles*

Azure Dynamics announced an agreement with Ford Motor whereby Azure will integrate its plug-in hybrid technology into the market leading Ford F-Series Super Duty product line. The Ford F-Series Super Duty (as shown in **Exhibit 5**) has over 50% market share in the North American market. The commercial cab and chassis industry supports approximately 100,000 vehicles per year and could grow by as much as 50% over the next five years.

*Source: Ford Motor*

#### **Exhibit 5: F-Series Super Duty**



*Source: Ford*

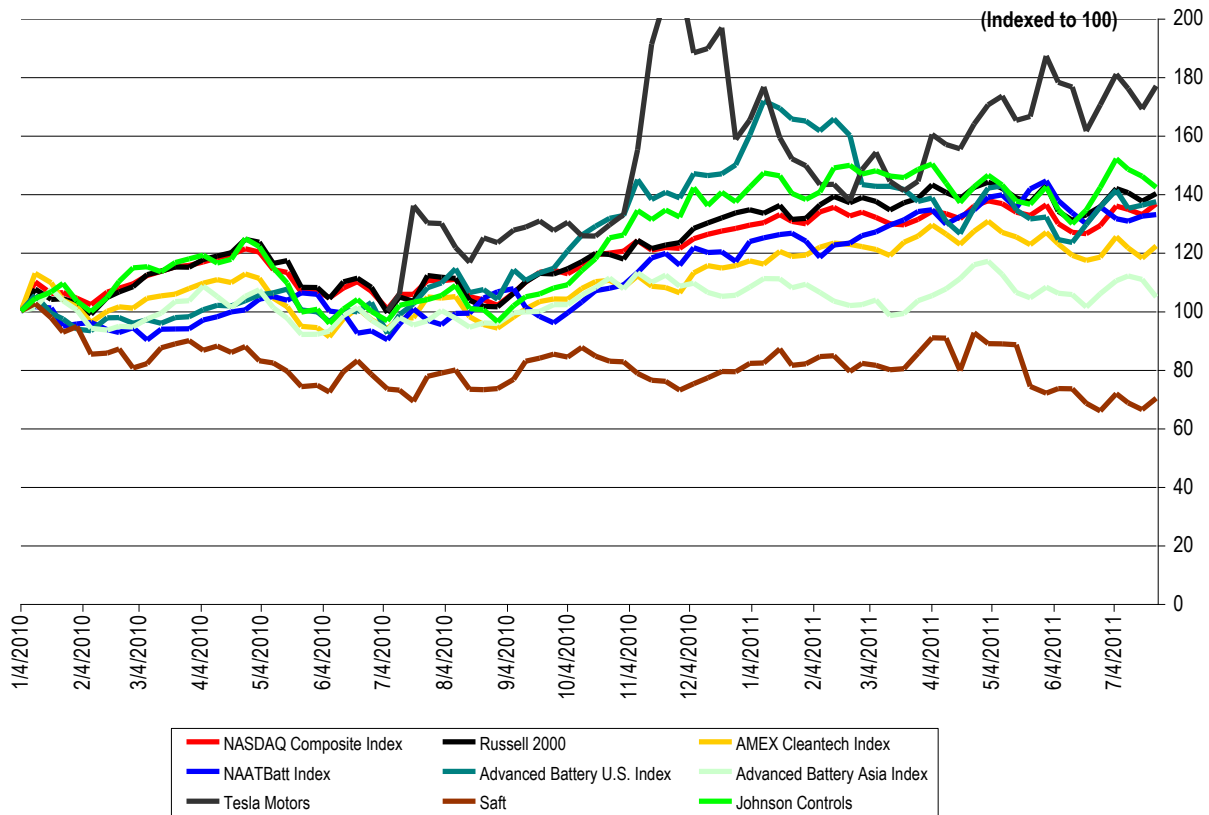
DTE Energy unveiled plans to install a total of 16 public charging stations in southeast Michigan, including four at Detroit Metro Airport (as shown in **Exhibit 6**) and others in Mount Clemens, Rochester, Auburn Hills, the Village of Rochester Hills shopping center and the Automation Alley technology center in Troy. The company is working with General Motors through a U.S. Department of Energy grant to encourage the use of EVs. The plan also includes putting parking meters in front of the free charging stations so other motorists don't park in the designated slots

**Exhibit 6: Free Stations At The Airport**



Source: *Royal Oak Daily Tribune*

**Exhibit 7: Indices Performance  
(From January 4, 2010)**

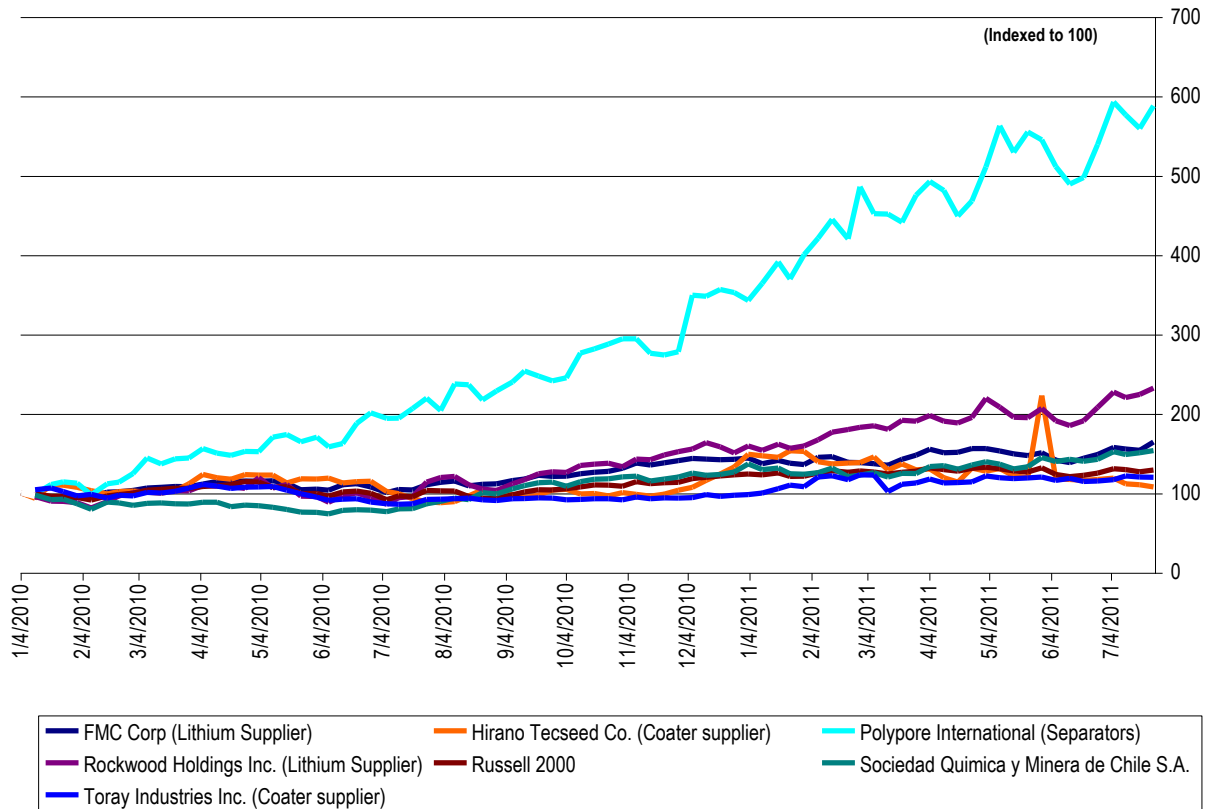


Index	Close on 7/25/2011	52-Wk High	% of 52-Wk High	Performance		
				LTM	YTD	Week
Dow	12,592.8	12,928.5	97.4%	20.8%	7.9%	1.7%
S&P 500	1,337.4	1,370.6	97.6%	21.3%	5.2%	2.5%
NASDAQ	2,842.8	2,887.8	98.4%	25.1%	5.6%	2.8%
Russell 2000	831.4	868.6	95.7%	27.4%	4.1%	1.9%
AMEX Cleantech Index	1,198.5	1,292.4	92.7%	18.4%	4.3%	3.5%

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 8: Supplier Performance**  
(From January 4, 2010)



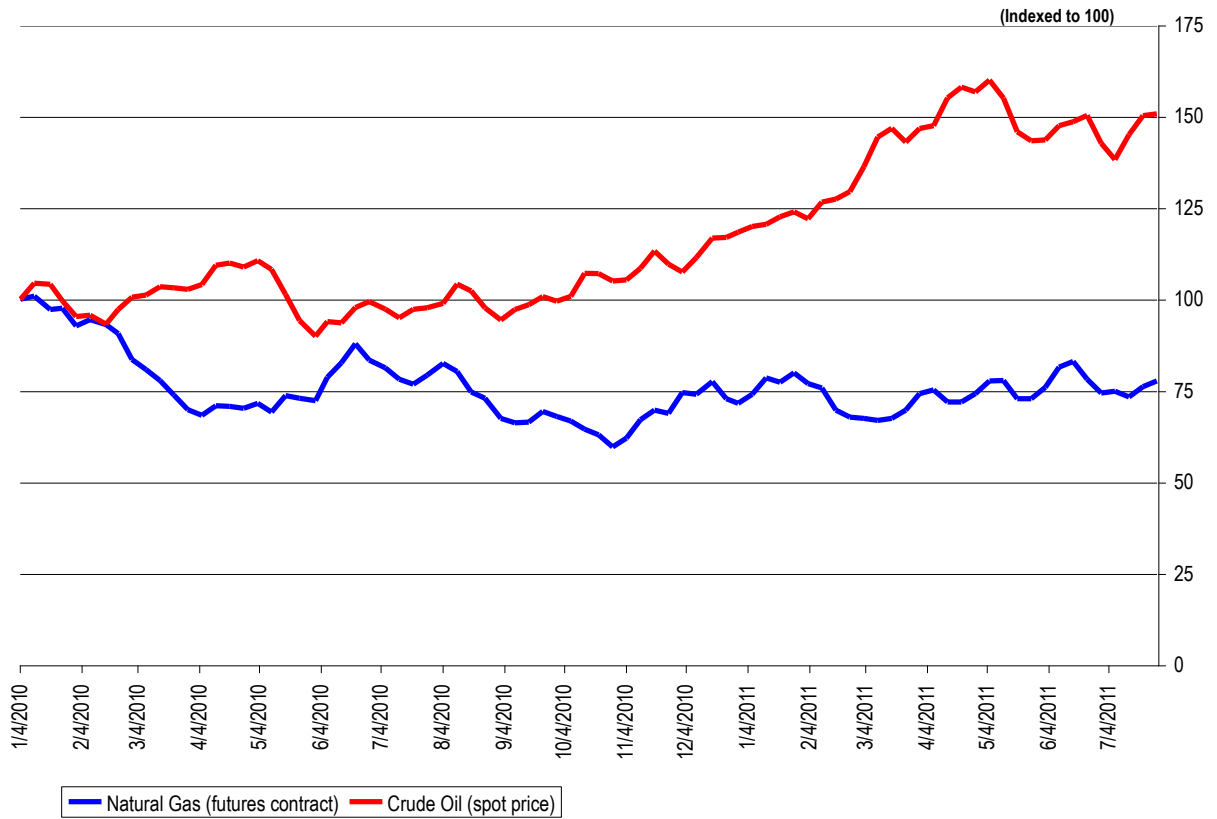
Source: Bloomberg

**Exhibit 9: Commodity Prices**

Commodity	Price on 7/25/2011	Price on 7/18/2011	Price on 6/24/2011	1 Week Change	1 Month Change
LME Copper (Cash, \$ per tonne)	9,615	9,689	9,045	(0.8%)	6.3%
LME Lead (cash, \$ per tonne)	2,665	2,728	2,554	(2.3%)	4.3%
LME Nickel (cash, \$ per tonne)	23,775	23,765	21,925	0.0%	8.4%

Source: LME

**Exhibit 10: Natural Gas and Crude Oil**  
 (From January 4, 2010)



Source: EIA

## Executive Director's Notes



### **THE ECONOMICS OF EV BATTERY REUSE**

Secondary use of electric vehicle (EV) batteries is a topic that has been long discussed, often accompanied by a smirk or a rolling of the eyes. The issue, of course, is what to do with advanced lithium-ion automotive batteries after they have been removed from the vehicle in which they were originally installed. Finding a new use for those batteries is important, since any residual value captured by that reuse effectively reduces the price that a consumer must pay for the original battery.

Most of the discussion about reuse has centered on what the residual uses of the batteries are going to be. Many have talked about (and several are investigating) the repurposing of EV batteries for grid-connected energy storage. Use in residential power back-up and vehicle recharging station applications is also possible. The Chinese have mentioned plans to use repurposed EV batteries in street lights. The highest and best use of repurposed EV batteries is, however, still very much an open question.

Repurposing EV batteries is not straightforward and is fraught with complications (this is where the smirks and rolling eyes come in), some of them not so obvious. Wide variation in the designs of current EV batteries, different duty cycles, different rates of degradation among cells in the same pack, and the expense of repackaging and transporting repurposed units all make capturing the residual value of EV batteries a challenging proposition.

But the challenge of repurposing EV batteries should not blind the industry to the important nature of that challenge. Maximizing EV battery residual value is critical to reducing battery costs and making EV's attractive to the average automobile consumer. Producing a battery that can capture maximum residual value may soon prove to be a field of proprietary competition every bit as important as increasing cycle life and improving energy density of the battery. Residual value will have to factor into the design of every battery cell, pack and module. Advanced battery makers smirk and roll their eyes at their peril.

On September 7-8, 2011, NAATBatt's 2011 Annual Meeting and Conference will devote a portion of its program to discussing the outlook for and challenges of capturing residual value from EV batteries once they leave the vehicle. Representatives from General Motors, Oak Ridge National Laboratory, Argonne National Laboratory, LithChem (Toxco), RSR Technologies and others will talk about the work that is being done on EV battery repurposing and how the need to maximize the value of repurposing and recycling lithium-ion batteries is likely to affect EV battery design. I hope you can join us.



James J. Greenberger  
Executive Director

July 29, 2011



## NAATBatt Membership Applications for 2011

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### **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.

## North American Industry Announcements and Calendar

**NAATBatt 2011 Annual Meeting and Conference:** NAATBatt's 2011 Annual Meeting and Conference will be held on **September 7-8, 2011** in Louisville, Kentucky. The title of the program is "**New Markets, New Innovations: The Next 5 Years in Advanced Batteries.**" The program will take a hard look at near-term market opportunities for U.S. advanced battery manufacturers. The annual meeting will also feature the **Industry-Academic Advanced Battery Summit** with presentations by some of the top university battery research programs in the United States. Attendees will learn who is working on what in advanced battery research programs in the United States. There is more going on than you think. Information about the 2011 conference is posted on the NAATBatt Web site at: [www.naatbatt.org](http://www.naatbatt.org). Please join us in Louisville in September!

**Presentations and Materials from the Workshop on Distributed Energy Storage Posted:** Presentation materials, handbooks, attendee lists and working group discussion summaries from the recently concluded April 21 DOE/NAATBatt Workshop on Issues in Distributed Energy Storage have been posted on the NAATBatt Web site at: [www.naatbatt.org](http://www.naatbatt.org). The materials are available for review to all Workshop registrants and to all NAATBatt members. If you have lost or never received your password to access these materials, please contact Jim Greenberger at [jgreenberger@naatbatt.org](mailto:jgreenberger@naatbatt.org).

**Speaker Presentations from the NAATBatt 2010 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 Jim Greenberger at [jgreenberger@naatbatt.org](mailto: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.

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- **NAATBatt 2011 Annual Meeting and Conference: September 7-8, 2011** in Louisville, Kentucky Registration is now open for the 2011 Annual Meeting and Conference, which will include the 1<sup>st</sup> Industry-Academic Advanced Battery Summit. See the note above for more details, or click [here](#).

- **Battery Power 2011:** Battery Power 2011 will be held on **September 20-21, 2011** in Nashville, Tennessee. The show will highlight the latest capabilities, design issues, trends and market forecasts in batteries and battery-powered products and systems. The conference Web site can be viewed at: [http://www.batterypoweronline.com/bppt-conf11/bp11\\_index.php](http://www.batterypoweronline.com/bppt-conf11/bp11_index.php).
- **4th International EV Battery Tech USA: Global Cost Reduction Initiative:** EV Battery Tech USA will be held on **September 21-22, 2011**, in Detroit, Michigan. The leading automotive OEM's will attend the conference and discuss how to reduce the cost of EV batteries by specifically evaluating near-term advances in energy density, battery life extension, preventative methods for cell degradation and failure, battery safety improvement and testing. NAATBatt is a supporting organization of the conference and NAATBatt members are entitled to a 15% discount on registration. The conference Web site may be viewed at: <http://www.ev-battery-tech.com/>.
- **Developing Grid Storage Projects:** Infocast will produce the Developing Grid Storage Projects conference in Dallas, Texas on **October 5-6, 2011**. The conference will discuss the regulatory drivers and business models for grid storage projects in the United States. NAATBatt will be a supporting organization of the conference.
- **The Business of Plugging In:** The Center for Automotive Research will host The Business of Plugging In conference at the Hyatt Regency in Dearborn, Michigan on **October 11-13, 2011**. The conference will examine the challenges of moving EV's from early adoption to mass market acceptance and will feature a ride-and-drive event highlighting the newest EV's. More information can be found at: [www.bpiconference.com](http://www.bpiconference.com).
- **EESAT 2011:** The biannual international Electrical Energy Storage Applications and Technologies conference (EESAT) will be held at the San Diego Marriott Hotel and Marina in San Diego, California on **October 13-16, 2011**. The conference will highlight specific electrical energy storage applications and technologies, especially as they relate to the electricity grid. More information about EESAT 2011 can be found at: <http://www.sandia.gov/eosat/index.html>.
- **The Battery Show:** The Battery Show conference and exposition will be held in Novi, Michigan on **October 25-27, 2011**. The conference will include a business and a technology track as well as a wide range of exhibits by battery makers and suppliers. Information about the show can be found at: <http://www.thebatteryshow.com/conference-program-2011>.
- **2<sup>nd</sup> Battery Safety Conference:** Knowledge Foundation will host the 2<sup>nd</sup> 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](http://www.knowledgefoundation.com/viewevents.php?event_id=253&act=evt)
- **7<sup>th</sup> Lithium Mobile Power Conference:** Knowledge Foundation will host the 7<sup>th</sup> 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](http://www.knowledgefoundation.com/viewevents.php?event_id=254&act=evt).
- **1<sup>st</sup> North American & Asian Lithium-Ion Technology Conference:** The North American & Asian Lithium-Ion Technology Conference will be held on **January 12, 2012** at the University of Nevada Las Vegas in Las Vegas, Nevada. The conference is co-sponsored by UNLV and an

affiliate of the Lion Battery Industry Association of South China. More information about the conference can be found at: <http://lbian.org/industry-events/>

- **International Electric Vehicle Symposium:** The Electric Drive Transportation Association will produce the 26<sup>th</sup> international Electric Vehicle Symposium and exposition (EVS26) on **May 6-9, 2012** in Los Angeles, California. Information about EVS26 can be found at [www.EVS26.org](http://www.EVS26.org).
- **IEEE PES Transmission and Distribution Conference and Exposition:** The IEEE PES Transmission and Distribution Conference will be held in Orlando, Florida on **May 7-10, 2012**. The conference will focus on innovation in power delivery systems, including storage systems. Information about the conference can be viewed at: <http://www.ieeet-d.org/>.



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