

Summary:

For the September 9th issue of NAATBatt's Advanced Battery Weekly, we highlight the ongoing sector activities.

The NAATBatt, U.S. and Asia Battery Indices declined 16.4%, 7.2% and 7.8%, respectively. The S&P500 and Russell 2000 dropped 3.7% and 6.0%, respectively.

The 2011 NAATBatt Annual Meeting and Conference was held in Louisville, Kentucky on Wednesday and Thursday of this past week. 45 speakers made presentations at the conference. A summary of some of the highlights appears in this newsletter below.

Executive Director James Greenberger identifies three important points about the future of grid-connected energy storage made at the 2011 NAATBatt Annual Meeting and Conference dinner by keynote speaker David Mohler, Chief Technology Officer of Duke Energy. Read "**Duke Energy and the Outlook for Energy Storage**" in the Executive Director's Notes portion of this newsletter below.

Key Highlights:

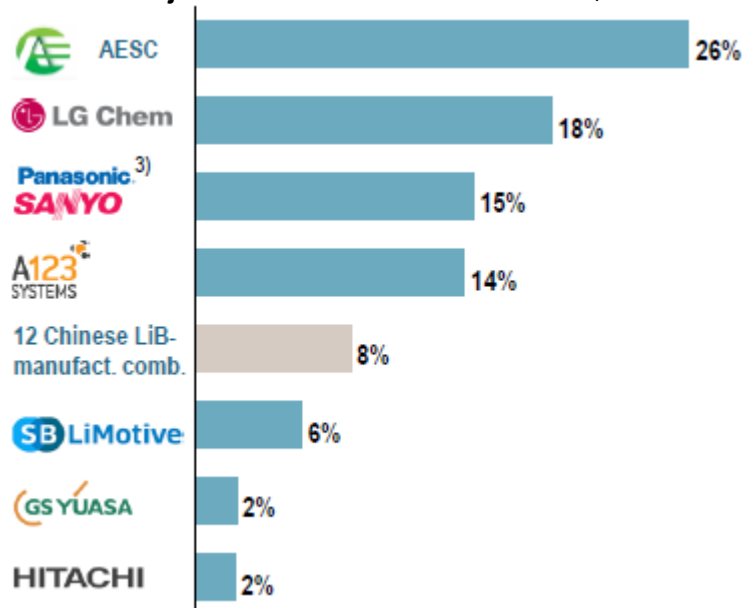
- **Roland Berger Strategy Consultants** reports that the market for lithium-ion (li-ion) batteries for electric vehicles (EVs) will reach almost \$9 billion by 2015. The five frontrunners – **AESC, LG Chem, Panasonic/Sanyo, A123** and **SB LiMotive** – can, between them, be expected to control almost 80% of the market by 2015.
- **British Airways (BA)** became the first airline at **Heathrow Airport** to introduce an electric bus (ebus) service between **Terminal 5** and the company's headquarters at **Waterside**. The ebus is powered by li-ion batteries from **Valence Technology**.
- **Toyota Motor** is considering shifting production of key components used to make its fuel-efficient hybrids and other alternative-energy vehicles to **China**. However, the company is unlikely to shift production of components it is developing for its next generation of EVs.
- The city of **Atlanta** opened its first public solar-powered charging station at **Atlantic Station**. The parking spots at the charging stations will be free to use until January and then will cost users \$3 per hour to charge a Volt or a Leaf.
- **Volkswagen** has unveiled the one-seat pod-like **NILS**. The EV is the company's vision of a commuter device for the future and is built entirely from aluminum. The li-ion battery pack can be recharged in two hours and delivers a range of 65 kilometers (or 40 miles).
- Over 200 new energy vehicles were rolled onto the streets of **Haikou**, capital of **South China's Hainan Province**. The EV fleet is comprised of 30 electric buses, 170 hybrid buses and 27 electric cabs.
- **Houston** has announced it will have a charging network. The "**Freedom Station**" operated by **NRG Energy's eVgo** subsidiary will be located at the **H-E-B Buffalo market** at the intersection of **Buffalo Speedway** and **Bissonnet Street**. It will feature two different types of chargers. A 240-volt Level 2 charger that can charge an EV at the rate of 25 miles of range per hour and a 480-volt DC charger that can provide a vehicle with 160 miles of driving range per hour of charge.

- Scientists from the **Precursory Research for Embryonic Science and Technology (PRESTO)** in **Tokyo** and the **National Institutes of Natural Sciences** in **Okazaki** have introduced a new material that may have supercapacitor properties ideal for exploiting in high-energy density devices. The material has a special microporous, framework-like, organic polymers, which contain regions of conjugated double bonds.

A Few More Details:

The market for lithium-ion (li-ion) batteries for electric vehicles (EVs) will reach almost \$9 billion by 2015 and could exceed \$50 billion by 2020 in a best case scenario. However, growth will be accompanied by massive overcapacity and will drive market consolidation. The five frontrunners – AESC, LG Chem, Panasonic/Sanyo, A123 and SB LiMotive – can, between them, be expected to control almost 80% of the market by 2015 (as shown in **Exhibit 1**).

Exhibit 1: Projected 2015 Share Distribution of \$8.9 Billion EV Market



Source: Roland Berger Strategy Consultants

British Airways (BA) became the first airline at Heathrow Airport to introduce an electric bus (ebus) service between Terminal 5 and the company's headquarters at Waterside. Flights Hallmark, which operates the service for British Airways, purchased an Optare Solo EV battery-powered bus for the BA 5 service. The ebus is powered by li-ion batteries from Valence Technology.

Source: British Airways

Toyota Motor is considering shifting production of key components used to make its fuel-efficient hybrids and other alternative-energy vehicles to China. However, the company is unlikely to shift production of components it is developing for its next generation of electric vehicles (EVs). The move comes ahead of expected new rules from the Chinese government that will stipulate that auto makers expecting to sell green-car technology in China must make certain components there. Nissan Motor Co., among others, has already indicated it expects to comply.

Source: WSJ

The city of Atlanta opened its first public solar-powered charging station at Atlantic Station. The station is partially powered by overhead solar panels and will be available to motorists with EVs for 24 hours a day. The three parking spots at the charging stations will be free to use until January and then will cost users \$3 per hour to charge a Volt or a Leaf.

Source: *The Atlanta-Journal Constitution*

Volkswagen has unveiled the one-seat pod-like NLS (as shown in **Exhibit 2**). The EV is the company's vision of a commuter device for the future and is built entirely from aluminum. The li-ion battery pack can be recharged in two hours and delivers a range of 65 kilometers (or 40 miles). According to VW's research, based on German commuters, 74% drive less than 50km (or 31 miles) daily and 90% travel to work alone.

Exhibit 2: The VW Pod-like EV



Source: *New Zealand Herald*

Over 200 new energy vehicles were rolled onto the streets of Haikou, capital of South China's Hainan Province. The EV fleet is comprised of 30 electric buses, 170 hybrid buses and 27 electric cabs. The Haikou municipal government plans to expand the EV fleet to 1,050 by the end of 2012. Over the past five years, the municipal government has pumped more than 80 million yuan (\$12.5 million) into the city's public transport system.

Source: *China Daily*

Exhibit 3: New Ebus Put Into Use



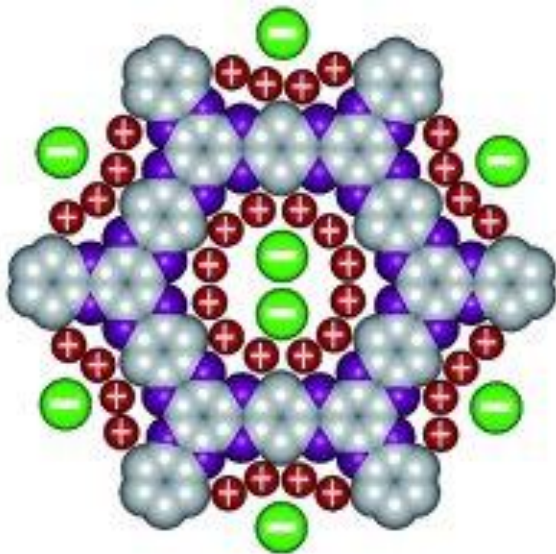
Source: *Xinhua*

Houston announced it will have a charging network. The "Freedom Station" operated by NRG Energy's eVgo subsidiary will be located at the H-E-B Buffalo market at the intersection of Buffalo Speedway and Bissonnet Street. The station allows for two cars to charge simultaneously. It will feature two different types of chargers. A 240-volt Level 2 charger that can charge an EV at the rate of 25 miles of range per hour and a 480-volt DC charger that can provide a vehicle with 160 miles of driving range per hour of charge. Three additional Freedom Stations will open in the next two weeks. A total of 25 Freedom Stations are expected to be operating by the end of the year with 25 more to be installed in 2012.

Source: CSNews Online

Scientists from the Precursory Research for Embryonic Science and Technology (PRESTO) in Tokyo and the National Institutes of Natural Sciences in Okazaki have introduced a new material, which may have supercapacitor properties ideal for exploiting in high-energy density devices. The material has a special microporous, framework-like, organic polymers (as shown in **Exhibit 4**), which contain regions of conjugated double bonds. This arrangement allows electrons to move freely through the framework, making the material a conductor. The materials known as "Aza-CMPs" were ionothermally synthesized by the condensation reaction of 1,2,4,5-benzenetetramine with triquinoyl hydrate at 300, 350, 400, 450, and 500 Celsius to generate aza-CMP@300, Aza-CMP@350, Aza-CMP@400, Aza-CMP@450, and Aza-CMP@500.

Exhibit 4: A Schematic Structure of The New Material



Source: SpectroscopyNow.com

A Few Highlights From The 2011 NAATBatt Annual Meeting and Conference:

- Ford is choosing higher volume platforms (greater than 3 million units annually) to electrify in order to keep base costs low. The company expects about 2% to 5% EV (HEV & BEV) penetration by 2015.
- General Electric is purchasing 25,000 EVs for its fleet by 2015. The cost of li-ion batteries is under \$700 per kilowatt-hour (kWh) and is forecasted to drop to sub-\$500 per kWh by 2015. Leasing the battery alone does not reduce cost, as it is important to define and monetize a secondary life application.
- The General Motors Volt battery should have about 70% of capacity left after 10 years of usage. The company is designing EV battery systems with the intent for secondary re-use.
- There is an abundant supply of lithium to support end-market demand to 2050.

Exhibit 5: Lithium Supply Status

	Cumulative demand to 2050 (Contained lithium, 1000 Metric tons)
Large batteries, no recycling	6,474
Smaller batteries, no recycling	2,791
Smaller batteries, recycling	1,981
Reserve Estimates	
USGS Reserves*	13,000
USGS World Resource*	29,000
Other Reserve Estimates	30,000+

Source: USGS (Jan 2011)

- Nissan is planning to reuse batteries to store energy from PV panels or to store back-up power.
- RSR Technologies indicated it may not be economically sustainable to recycle li-ion as battery value (structure & properties) vs. smelter value (base element) needs to be considered.

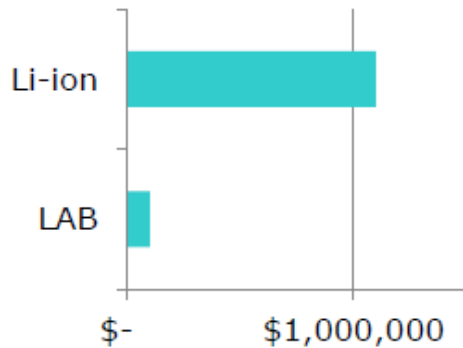
Exhibit 6: Future Scrap Value May = \$0 or Negative

Material	\$/ lb	\$/ Kg
LiCoO ₂	\$11.97	\$26.38
Li(Ni 0.3, Co 0.3, Mn 0.3) O ₂	\$7.72	\$17.02
LiMnO ₂	\$2.91	\$6.40
LiFePO ₄	\$1.25	\$2.75
Pb	\$1.08	\$2.38

Source: RSR Technologies

- Applied Intellectual Capital views lead acid as the optimal solution over li-ion as capex costs for new capacity is significantly lower.

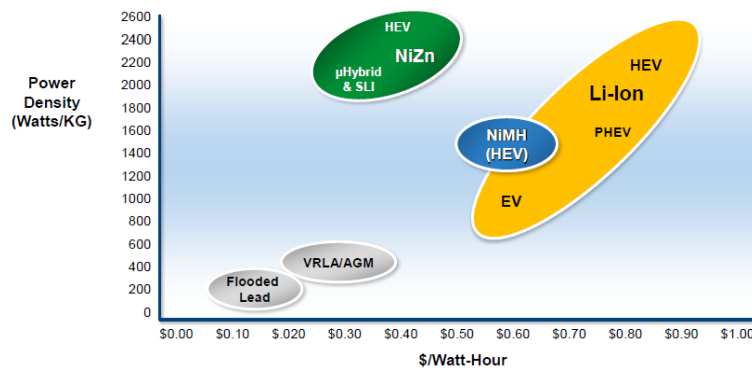
Exhibit 7: Cost of New Capacity (\$/MWh/year)



Source: Applied Intellectual Capital

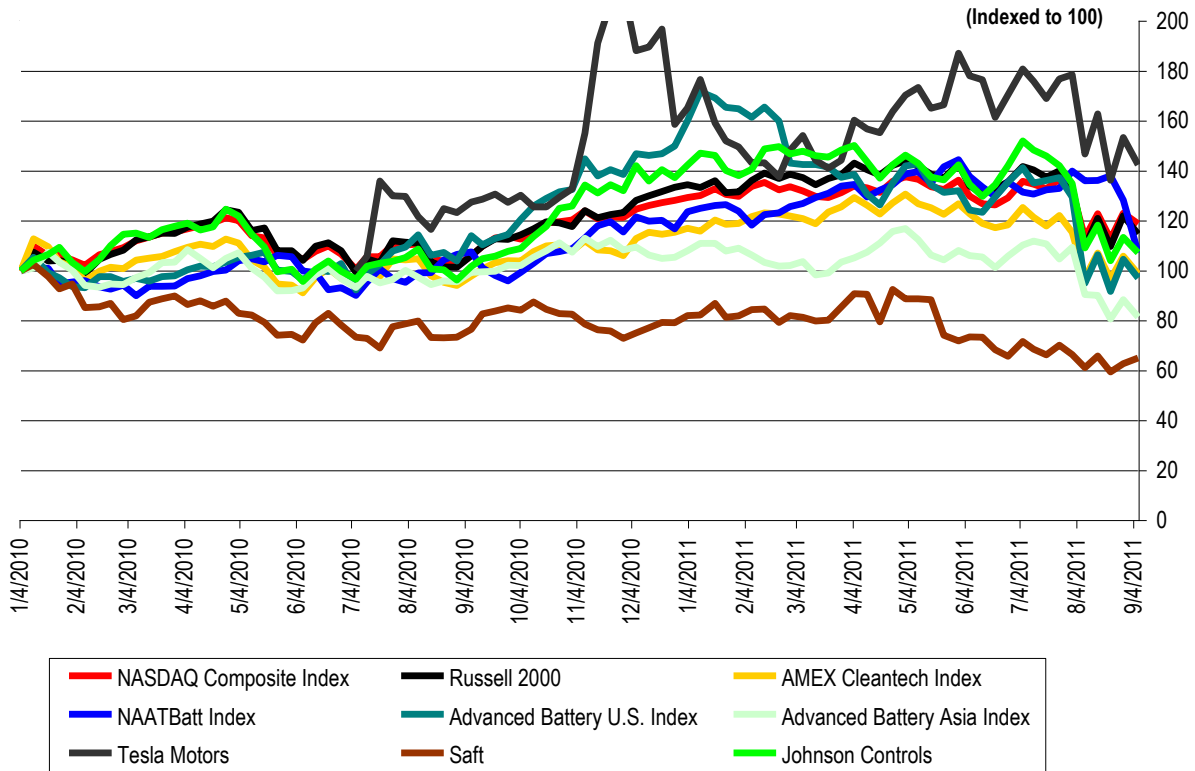
- PowerGenix's nickel-zinc technology could provide a more efficient and economical complement to the lead acid (PbA) battery for Start-Stop.

Exhibit 8: Ni-Zn May Be a More Cost Effective Complement For Start-Stop



Source: PowerGenix

Exhibit 9: Indices Performance
(From January 4, 2010)

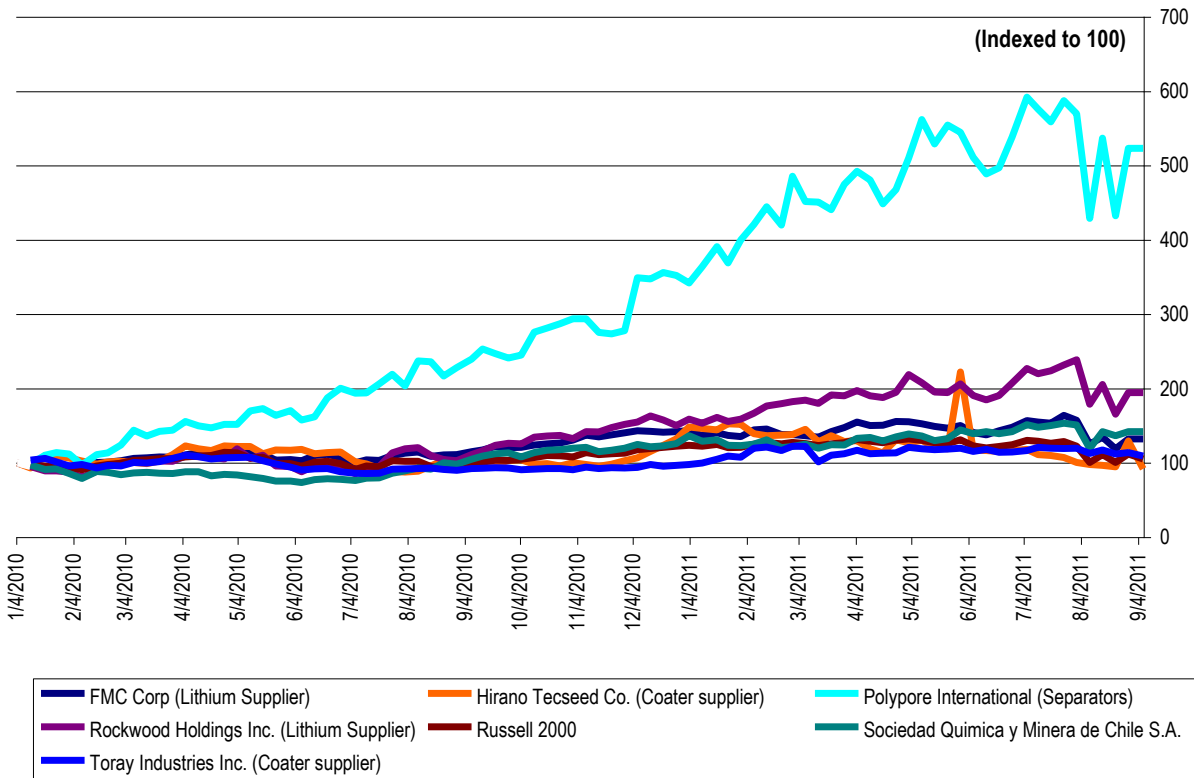


Index	Close on 9/6/2011	52-Wk High	% of 52-Wk High	Performance		
				LTM	YTD	Week
Dow	11,139.3	12,928.5	86.2%	6.6%	(4.6%)	(3.5%)
S&P 500	1,165.2	1,370.6	85.0%	5.7%	(8.4%)	(3.7%)
NASDAQ	2,473.8	2,887.8	85.7%	11.1%	(8.1%)	(3.4%)
Russell 2000	680.9	868.6	78.4%	6.2%	(14.7%)	(6.0%)
AMEX Cleantech Index	969.5	1,292.4	75.0%	(0.3%)	(15.6%)	(6.7%)

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 10: Supplier Performance
(From January 4, 2010)



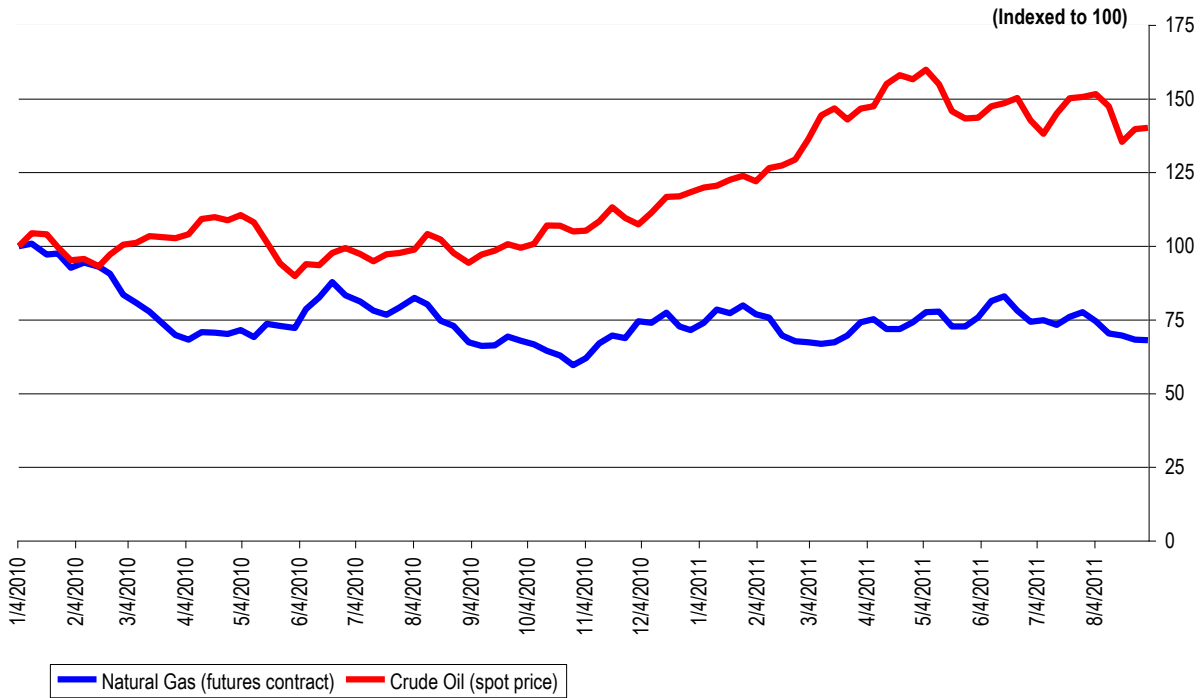
Source: Bloomberg

Exhibit 11: Commodity Prices

Commodity	Price on 9/6/2011	Price on 8/30/2011	Price on 8/8/2011	1 Week Change	1 Month Change
LME Copper (Cash, \$ per tonne)	8,919	9,126	9,038	(2.3%)	(1.3%)
LME Lead (cash, \$ per tonne)	2,424	2,497	2,345	(2.9%)	3.4%
LME Nickel (cash, \$ per tonne)	20,620	21,800	22,295	(5.4%)	(7.5%)

Source: LME

Exhibit 12: Natural Gas and Crude Oil
 (From January 4, 2010)



Source: EIA

Executive Director's Notes



DUKE ENERGY AND THE OUTLOOK FOR ENERGY STORAGE

The 2011 NAATBatt Annual Meeting and Conference concluded last Thursday in Louisville. The program was a great success. A wide range of speakers and panels touched on issues of great importance for the industry, including secondary use of EV batteries, distributed energy storage, battery recycling, new technologies in traction batteries and distributed energy storage systems, and export incentives for U.S. battery manufactures. The Industry-Academic Advanced Battery Summit portion of the program was also extremely successful, with many new contacts made and important information exchanged.

The most memorable part of the conference for me, however, was the keynote address by David Mohler, Chief Technology Officer of Duke Energy. David's credentials as an expert in the electric power business and technology are unequaled and his remarks were superb. Among other aspects of his presentation, David made three points that were particularly insightful and important for those interested in understanding the future of electricity storage on the grid.

David's first point was made in the form of an amusing story about Thomas Edison. Apparently, early on in his career, Edison was trying to raise money for his light bulb project from late Nineteenth Century versions of what we now call venture capitalists. After one dog-and-pony show, a VC came over to Edison, put his arm around him and said something like: "Tom, that light bulb is an amazing piece of technology. But for it to be successful, wires would have to be run to every house in the country, and that is clearly never going to happen."

The point of the story, of course, is that when you have a potentially transformative technology, such as a light bulb or a way to store electricity on the grid, it is a mistake to lose sight of the forest through the trees. If the forest is real, the barriers to adoption may be far less daunting than they seem. As we think about grid-connected energy storage and other smart grid technologies, and worry about the large costs and complicated regulatory schemes that seem to constrain their adoption, David's story is important to remember.

David's second memorable point was his stated expectation that grid-connected energy storage technology will become economically viable by 2015. That was quite a prediction, given that three white papers published in the last year by Sandia National Laboratory, Southern California Edison and EPRI all seem to show that storage technology is today not economic for utilities to deploy. The basis for David's prediction was a little unclear and one could dismiss it. But given that David is the chief technology officer for what will soon be the largest electric utility in the country, his prediction must be taken seriously.

Third and finally, David made an interesting remark about the ownership of energy storage systems on the grid. David said that many questions about energy storage technology still need to be resolved, including who will own the assets. In posing the question about ownership, David answered his own question, saying, "I hope I (i.e., Duke Energy) will." He said this at least twice. I was counting.

That statement really caught my attention. I have talked for some time about my view that utilities will invest in storage as much as a defensive strategy as for immediate return. The long term value of most electric utility companies lies less in the value of their assets than in their close relationship with electricity customers. That relationship is the legacy of a historic monopoly market structure. Energy storage is potentially transformational to the utility industry because of storage's ability to change, or, at a minimum, significantly to affect, that relationship. Distributed energy storage is a technology that is coming to the grid; the only question is when. Electric utilities that fail to be first movers in deploying this technology and instead let it be deployed and developed on the customer side of the meter or under the control of third parties will forfeit a significant market advantage and seriously impair their long-term equity value.

So it was interesting for me to hear David Mohler, one of the most respected thinkers in the electric utility business, hint at the importance of electric utilities owning energy storage assets. If Duke believes that its ownership of the energy storage assets that serve its customer is important, the rest of the industry cannot be far behind. Perhaps this is what accounts for David's prediction that energy storage will become economically viable by 2015?



James J. Greenberger
Executive Director

September 9, 2011



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.

North American Industry Announcements and Calendar

Presentations from the NAATBatt 2011 Annual Meeting and Conference Now Available:

Speaker presentations, speaker bios and attendee lists from the just concluded NAATBatt's 2011 Annual Meeting and Conference are now available on the NAATBatt Web site. Go to www.naatbatt.org and navigate to the 2011 Annual Meeting and Conference link to view them. The links are password protected, and the password is available to NAATBatt members and conference attendees for no charge. Others may purchase access to the presentations for \$250. Please contact Jim Greenberger at jgreenberger@naatbatt.org for your password. Photos from the conference will be posted shortly.

Presentations from the Workshop on Distributed Energy Storage Posted: Presentation materials, handbooks, attendee lists and working group discussion summaries from the April 21, 2011 DOE/NAATBatt Workshop on Issues in Distributed Energy Storage have been posted on the NAATBatt Web site at: www.naatbatt.org. The materials are available for review to all Workshop registrants and to all NAATBatt members. Please contact Jim Greenberger at jgreenberger@naatbatt.org for your password.

Presentations from the NAATBatt 2010 Annual Meeting and Conference are 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 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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- ***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.
 - ***4th International EV Battery Tech USA: Global Cost Reduction Initiative:*** EV Battery Tech USA will be held on **September 21-22, 2011**, in Troy, 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/>.

- **Utility Scale Flexible Power Summit:** The Utility Scale Flexible Power Summit will be held on **September 27-28, 2011** in Denver, Colorado. The utility power conference will examine issues currently limiting optimal generation and transmission flexibility, as well as exploring the potential of future storage and financing options. Information about the Summit can be found at: <http://www.greenpowerconferences.com/EF/?sSubSystem=Prospectus&sEventCode=RE1109US&sSessionID=5151b42fadaadaeda7c8206f42773de2-4205310>.
- **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.
- **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 16-19, 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 Battery Show is North America's largest free to attend exhibition for advanced batteries. The exhibition showcases the latest battery technologies and solutions, ranging from electric vehicle applications to raw material suppliers. Its two-track business and technology conference examines battery market development and opportunities, including how technical advances are likely to impact performance, safety and cost. For more information on The Battery Show or to register, visit www.thebatteryshow.com.
- **Lithium Battery Power:** Knowledge Foundation will host the 7th Annual International Conference on Lithium Battery Power on **November 7-8, 2011** in Las Vegas, Nevada. The conference will examine advances in lithium-ion battery technology. The conference Web site can be accessed at: http://www.knowledgefoundation.com/viewevents.php?event_id=254&act=evt
- **7th Lithium Mobile Power Conference:** Knowledge Foundation will host the 7th Lithium Mobile Power Conference on **November 7-8, 2011** in Las Vegas, Nevada 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.
- **2nd Battery Safety Conference:** Knowledge Foundation will host the 2nd Battery Safety Conference on **November 9-10, 2011** in Las Vegas, Nevada. 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

- **1st 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://lbiana.org/industry-events/>
- **2012 International Advanced Automotive Battery Conference:** The 2012 International Advanced Automotive Battery Conference (AABC) will be held on **February 6-10, 2012** in Orlando, Florida. The program will feature five days of intensive meetings, symposia and tutorials. Information about the program can be found at: <http://www.advancedautobat.com/>.
- **International Electric Vehicle Symposium:** The Electric Drive Transportation Association will produce the 26th 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.
- **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.ieseet-d.org/>.
- **5th Symposium on Energy Storage: Beyond Lithium Ion:** The 5th Symposium on Energy Storage: Beyond Lithium Ion will be held in Berkeley, California on June 5-7, 2012. The Symposium will focus on next generation battery technologies, such as silicon anode technology, lithium sulfur batteries and lithium air. More information can be found at: <http://bestar.lbl.gov/bli5/program/>.



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