

## Summary:

For the September 3<sup>rd</sup> issue of NAATBatt's Advanced Battery Weekly, we highlight the ongoing sector activities. In addition, we have included an interview with Thomas Lin, CEO of Caleb Technology.

The NAATBatt Index increased 2.1%, while U.S. Index declined 3.5% and the Asia Battery Index was flat. The S&P 500 declined 1.7%, while the Russell 2000 was flat.






## Key Highlights:

- The **Environmental Protection Agency** and the **Transportation Department** have proposed labeling each new passenger vehicle with a letter grade from A to D based on its fuel efficiency and emissions. The labeling is part of a broader effort by the **Obama administration** to promote electric vehicles (EVs).
- The **Ford Focus Electric** will be using a liquid system to regulate the temperature of the lithium-ion (li-ion) battery system. The EV is expected to have a range of 100 miles before a recharge is required.
- **General Motors** is seeking to trademark the term "**range anxiety**". If approved by the **U.S. Patent and Trademark Office**, the company would use the term to market the **Volt** which uses a range-extender.
- **Car Charging Group** announced a strategic partnership with **Kobi Karp Architecture & Interior Design (KKAID)** to incorporate charging stations into both existing projects and future designs. The KKAID-led **Baylights Condominium** project was recognized by the **U.S. Green Building Council** as the first green residential building in South Florida.
- The first of 500 free EV charging stations are at the headquarters of **NextEnergy** in **TechTown** at **Wayne State University** in **Detroit**. **Coulomb Technologies** is providing the stations as part of a plan to install 4,600 chargers at homes and businesses throughout the U.S. market.
- **SuperPower** is receiving \$2.1 million of funding from the **Advanced Research Projects Agency-Energy (ARPA-E)** to develop a high performance superconducting wire to be used in an energy storage system for the grid. Other partners in the project are **ABB** and **Brookhaven National Laboratory**.
- **Ice Energy** announced its energy storage systems have successfully recorded over 5 million hours of cumulative field run time. The data has been collected across a wide range of climates and geographies throughout the **United States** and **Canada**.
- **EnerSys Energy Products** has won a \$17.8 million supply contract with the **U.S. Navy**. The company will provide back-up batteries for nuclear submarines.
- **Volkswagen** has an EV that is scheduled for rollout in 2013. It could be sooner, except the company is encountering a supply shortage of li-ion batteries. The company is now in discussions with suppliers such as **Toshiba**, **Sanyo** and **BYD**.
- **ClipperCreek** is supplying EV Supply Equipment to support the **Tesla Roadster**. The company will be supplying its UL listed TS -70 that enables the Roadster to charge at the highest continuous rates in the industry (up to 70 Amps at 240 VAC).

## A Few More Details:

The Environmental Protection Agency and the Transportation Department have proposed labeling each new passenger vehicle with a letter grade from A to D (as shown in **Exhibit 1**) based on its fuel efficiency and emissions. The only cars that could receive an A-plus, A or A-minus would be EVs under the new system. The labeling is part of a broader effort by the Obama administration to promote EVs.

### Exhibit 1: The Proposed Grading System

Automotive Report Card   New A-through-D grades would rate vehicles for fuel use and greenhouse-gas emissions.				
				
<b>Nissan Leaf</b> <i>Battery powered</i>	<b>Toyota Prius</b> <i>Gas-electric hybrid</i>	<b>Ford Focus</b> <i>Gas powered</i>	<b>Jeep Grand Cherokee™</b> <i>Gas powered</i>	<b>Ferrari 612 Scaglietti</b> <i>Gas powered</i>
STATS FOR GRADE 117 mpg and up 0-76 CO <sup>2</sup> g/mi *	40-58 mpg 153-229 CO <sup>2</sup> g/mi	24-29 mpg 306-382 CO <sup>2</sup> g/mi	18-19 mpg 450-535 CO <sup>2</sup> g/mi	12 mpg and below 765 CO <sup>2</sup> g/mi and above
MSRP <b>\$32,780</b>	<b>\$22,800</b>	<b>\$17,170</b>	<b>\$30,215</b>	<b>\$304,000</b>
GRADE <b>A+</b>	<b>A-</b>	<b>B</b>	<b>C+</b>	<b>D</b>
<small>Source: EPA and U.S. Department of Transportation; Photos: Bloomberg News; Toyota; Ford; Bloomberg News; Ferrari</small>			<small>* Carbon dioxide emitted in grams per mile; ** Grade is for Jeep Grand Cherokee model with 3.7-liter engine;</small>	

Source: WSJ

The Ford Focus Electric (as shown in **Exhibit 2**) will be using a liquid system to regulate the temperature of the lithium-ion (li-ion) battery system. The EV is expected to have a range of 100 miles before a recharge is required. The liquid-based technology is the same as that being used in the Chevrolet Volt whose batteries are also being manufactured by Compact Power.

Source: Associated Press

### Exhibit 2: The Ford Focus Electric



Source: Gizmag

General Motors is seeking to trademark the term “range anxiety”. The phrase has been used by GM executives in the late-90s based on their work with the EV-1. If approved by the U.S. Patent and Trademark Office, the company would use the term to market the Volt which uses a range-extender that enables the EV to provide over 300 miles of driving range.

*Source: ClipperCreek*

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Car Charging Group announced a strategic partnership with Kobi Karp Architecture & Interior Design (KKAID) to incorporate charging stations into both existing projects and future designs. KKAID specialize in international architecture, planning and interior design. The KKAID-led Baylights Condominium project was recognized by the U.S. Green Building Council as the first green residential building in South Florida.

*Source: Car Charging Group*

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The first of 500 free EV charging stations are at the headquarters of NextEnergy in TechTown at Wayne State University in Detroit. Coulomb Technologies is providing the stations as part of a plan to install 4,600 chargers at homes and businesses throughout the U.S. market. The equipment is free, but those who receive it pay for installation. Home users will pay for the electricity used, while businesses may decide whether to charge for it. The company’s public charging stations coat \$4,000 to \$5,000, while the in-home units coat \$1,700 to \$2,000. Installation coast san additional \$500 to \$4,000 more. However, DTE Energy is providing up to \$2,500 in installation free for 2,500 people in Southeast Michigan.

*Source: Detroit Free Press*

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SuperPower is receiving \$2.1 million of funding from the Advanced Research Projects Agency-Energy (ARPA-E) to develop a high performance superconducting wire to be used in an energy storage system for the grid. The company is a subsidiary of Philips and the University of Houston. Other partners in the project are ABB and Brookhaven National Laboratory.

*Source: The Business Review*

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Ice Energy announced its Ice Bear energy storage systems (ESS) have successfully recorded more than 5 million hours of cumulative field run time. The company along with its utility partners have installed and operated distributed ESS’ that shift building energy use from peak to off-peak hours – when electricity generation is cleaner, more efficient and less expensive. The data has been collected across a wide range of climates and geographies throughout the United States and Canada.

*Source: Solar Thermal Magazine*

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EnerSys Energy Products has won a \$17.8 million supply contract with the U.S. Navy. The company will provide back-up batteries for nuclear submarines. The agreement is expected to be completed by October 2012.

*Source: Washington Examiner*

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Volkswagen has an EV that is scheduled for rollout in 2013. It could be sooner, except the company is facing a supply shortage of li-ion batteries. Volkswagen is now in discussions with suppliers such as Toshiba, Sanyo and BYD. The VW Golf “blue e-motion” uses 180 li-ion cells in 30 compartments. The battery system weighs about 690 pounds.

*Source: Car and Driver*

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ClipperCreek is supplying EV Supply Equipment (EVSE) to support the Tesla Roadster. The company will be supplying its UL listed TS -70 that enables the Roadster to charge at the highest continuous rates in the industry (up to 70 Amps at 240 VAC). The TS-70 incorporates the new SAE - J1772 standard for vehicle to EVSE communications, while remaining backward compatible with the previous standards. The TS -70 is also available at different charge rates to accommodate areas with limited electrical service.

*Source: ClipperCreek*

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## **CALEB TECHNOLOGY CORPORATION**

### **Q&A with Thomas Lin, CEO of Caleb Technology**

#### **What differentiates Caleb Technology from other vendor offerings?**

Caleb's unique lithium-ion polymer technology works by eliminating conventional separator material, replacing it with a micro-encapsulated polymer electrolyte system. This novel process encapsulates the conventional flammable lithium-ion electrolyte, producing a "dry" battery. Caleb also invented a unique cell formation process which forms a highly stable passivation layer, resulting in a further increase in capacity and safety. Caleb projects significant cost reductions in current lithium-ion manufacturing with its technology (see attached brief write-up).

#### **Discuss the competitive landscape. Who would you consider to be your primary competitor(s)?**

Caleb's batteries have more values and benefits than other known batteries on the market:

- Very high energy holding capacities with high voltage per cell
- Flexible shape to address applications for various end products
- Much lower cost than comparable Li-ion or Li-polymer batteries to manufacture due to proprietary materials and processes
- Non-toxic and non-flammable even when abused

The so-called lithium polymer batteries by major Asian manufacturers (including Sony's latest gel technology) are a "hybrid" between a traditional liquid electrolyte design and the solid-state lithium polymer. The manufacturing process is complicated and costly because it requires the lamination step to provide the interfacial contact between electrode-electrolyte layers as well as the activation step after electrodes assembly. The newly developed nano cathode material used by A123 Systems, geared for automotive or power device application, has low average voltage and very low energy density for consumer electronics. It needs electronics to prevent undercharge and also needs new separator to improve safety and cost. In small cells this type of construction offers a safety advantage with a slightly reduced power density, but the advantage disappears for larger cells.

#### **Discuss the pricing strategy for Caleb Technology's products. How much lower do you believe battery costs can be lowered through scale and operational efficiencies?**

The company plans to sell premium lithium-polymer batteries at 200% markup initially, to encourage early sales. This compares very favorably to prices of products from Japan, the market leader, which are still costing 100% to 300% higher than Caleb's while offering lower quality and performance from adopted technology. The company's high profit margin and JV revenues would produce a break-even in the second year after receipt of financing, and a minimum 5-fold return on investment by the third year with a conservative 5% share of the U.S., Asian and European rechargeable battery market.

Battery technology is in a race to improve safety, energy density & power. Cost is always important and Caleb batteries cost less to produce than traditional Lithium Ion batteries due to low material cost, more efficient manufacturing processes and less investment in capital equipment. An estimated cost-saving up to 30% can be achieved when scaling up manufacturing.

**When do you expect to have a commercial product available?**

The company has a 2 stage plan to commercialize its technology and generate near-term revenues.

In stage 1, the Company will finalize its manufacturing process on its small-to-medium size cells production line, while qualifying the product with key customers.

In stage 2, the company will begin subcontract manufacturing for sale to the government while beginning licensing of its technology for consumer portable use to selected major battery manufacturers. Caleb will seek government funding to support its large size cell development for electric drive vehicle applications. The company will also begin initial qualification shipments off its large cell line. This strategy has the benefit of providing multiple sources of revenue.

Caleb is poised to move quickly into Stage 1 production - with the low-volume production line made available from a reputable machine builder to be in operation by fourth quarter 2010. One such production line would enable us to produce 2 million batteries per year with a very compact design. The machine is fully automated and the products are well controlled with high reproducibility. Successful completion of Stage 1 will lead to high-volume productions in Stage 2 targeted in latter part of 2011.

**What is the company's long-term go-to-market strategy?**

Caleb monitors many large and small battery companies worldwide. Battery system manufacturers often focus on certain end markets via long-term supplier agreements due to complex customer requirements. Disadvantage is that this often precludes them from serving a diversified customer portfolio. Caleb is currently an industry agnostic battery technology company that supplies lithium polymer cells to all sectors for all uses. Specific go-to-market strategy in each segment will evolve over time. Caleb ranks its market opportunities by size and margin potential over a long-term horizon. A multi-faceted sales and marketing strategy will be adopted for well-organized entrance of Caleb's battery technology into the world markets: Licensing, strategic partnership, and after market sales channels. Market entrance products include: Rechargeable batteries for consumer electronics of such huge markets in Asia, high capacity large cells for automobiles in North America; application specific batteries for defense, medical, microelectronics, aerospace, solar energy uses and such.

**How do you envision the company's roadmap evolving in upcoming years?**

Valuable pipeline of battery technologies hold further opportunity for the company to the development of: Nano lithium polymer battery technology to offer 5 times improvement, and super-capacitor lithium polymer battery technology for 10 times improvement. Preliminary results of the research and development we have taken, encourage us to enter into larger power applications, particularly EV's, when funds become available. It may take Caleb up to 12 months to prove satisfactorily that products from such technologies can be commercially produced (from our initial research towards this goal, we are confident that such next step would have a high rate of success due to the uniqueness of our electrolyte system and the nano-technology and the super capacitor technology available to us). The whole world is seeking such battery technology in order to produce EV's by high performance, high safety, long cycle life and low cost battery packs.

**How do you see industry demand evolving across the various end-markets over the next 5 years?**

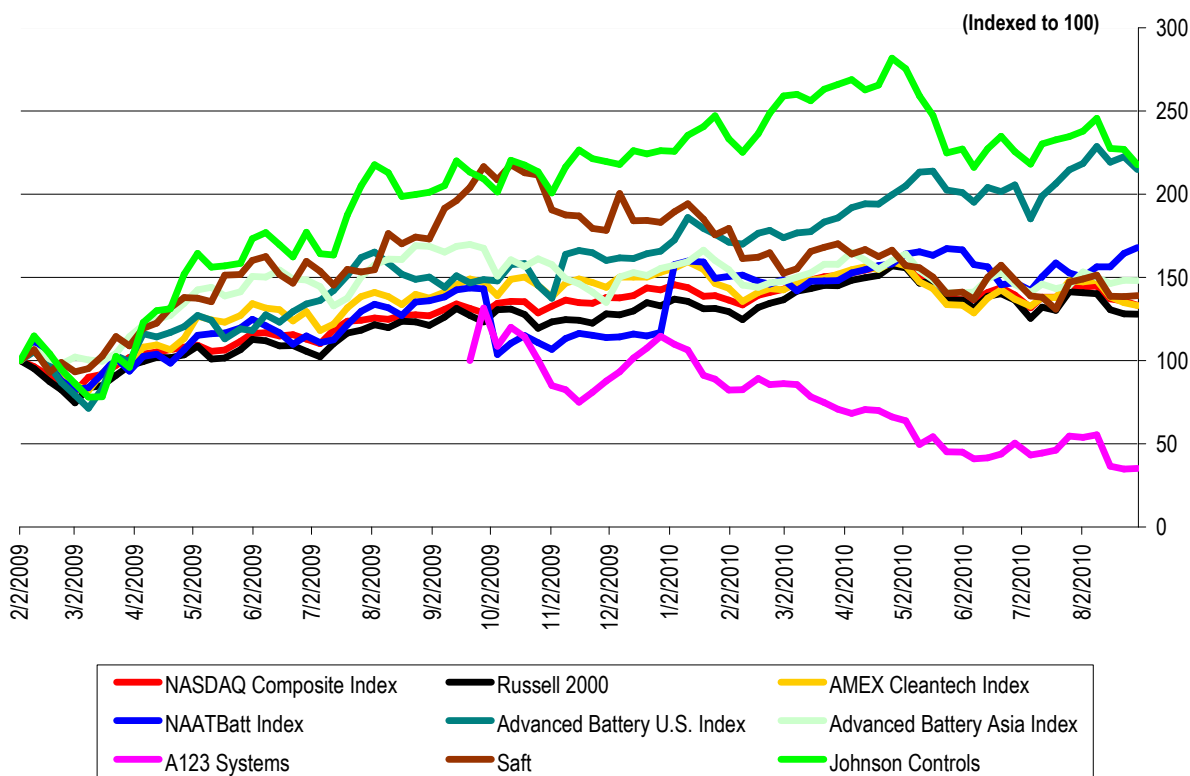
With cellular phone battery market projected to undergo slower growth for the foreseeable future, notebook PCs and automotive will be the growth segments for lithium-ion batteries. Both segments need large format cells. Unfortunately, lithium-ion penetration into PC and automotive markets has been inhibited by safety and cost issues. Caleb's technology represents a breakthrough in both, enabling this huge new market.



**Please highlight the challenges ahead.**

Caleb will start by manufacturing cells and look to carefully outsource all manufacturing over time to focus on core technology advancement. To be successful in this very competitive business, the company must be ready to meet these challenges: Resistance from industries to change existing capital infrastructure; avoid rushing to fill pent-up market demand by supplying sub-quality technology prematurely (brand and PR challenges); managing channel strategy in an industry that traditionally likes exclusive JV or supplier relationships, being able to secure satisfactory legal contracts and insurance to adequately cover risks relative given targeted margins; differentiating Caleb's true Lithium Polymer batteries from widely accepted market terminology for Lithium Ion Polymer packaging batteries.

**Exhibit 3: Indices Performance**  
(From February 2, 2009)

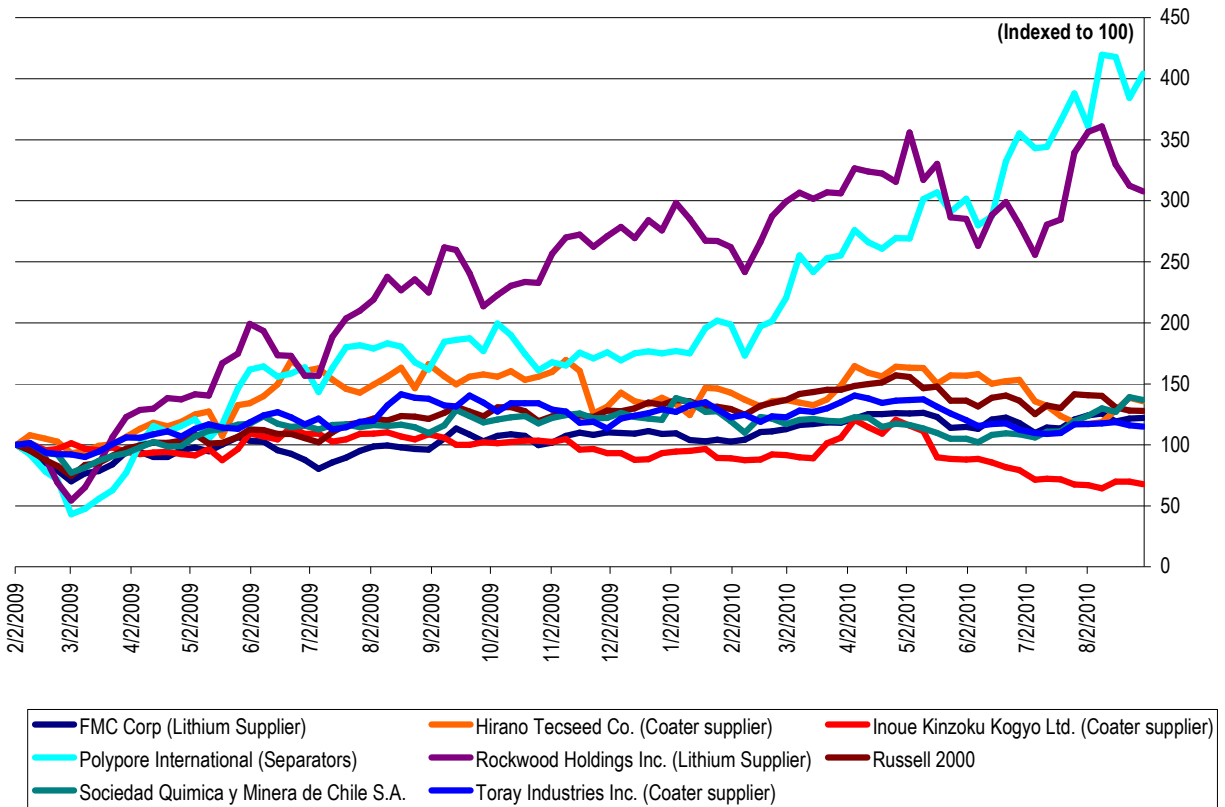


Index	Close on 8/30/2010	52-Wk High	% of 52-Wk High	Performance		
				LTM	YTD	Week
Dow	10,009.7	11,309.0	88.5%	4.9%	(4.0%)	(1.6%)
S&P 500	1,048.9	1,219.8	86.0%	2.3%	(6.1%)	(1.7%)
NASDAQ	2,120.0	2,535.3	83.6%	5.4%	(7.6%)	(1.8%)
Russell 2000	601.7	746.0	80.7%	4.3%	(4.2%)	(0.2%)
AMEX Cleantech Index	923.5	1,112.5	83.0%	(4.2%)	(13.4%)	(1.3%)

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 February 2, 2009)



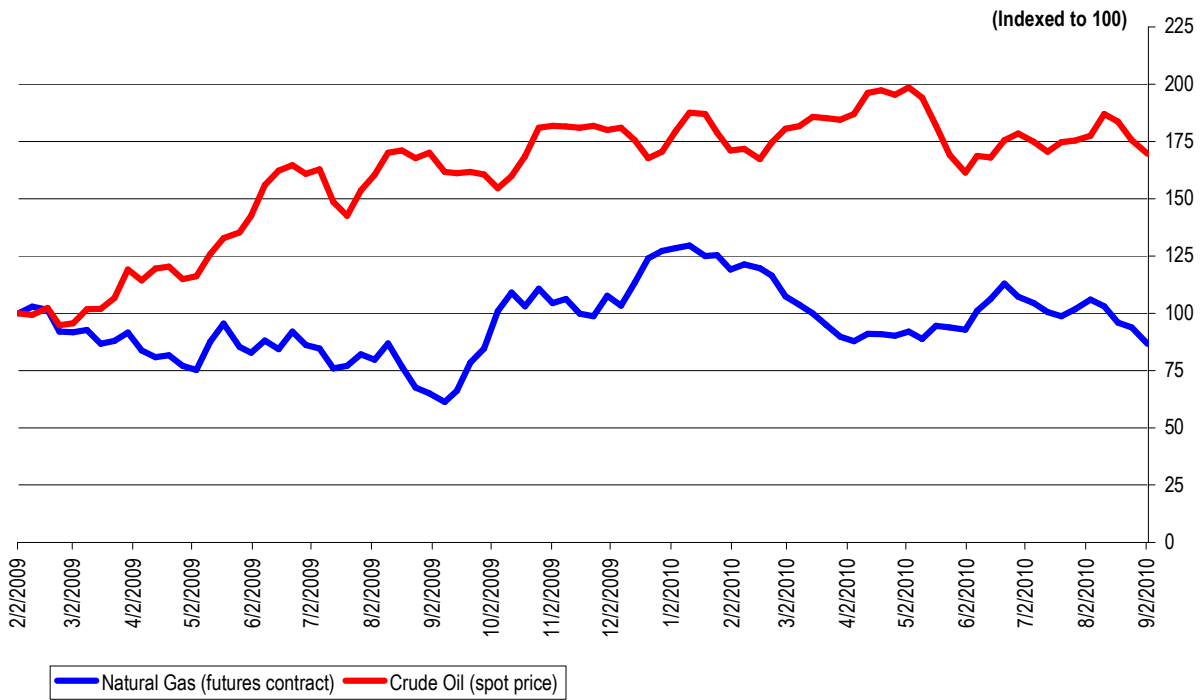
Source: Bloomberg

**Exhibit 5: Commodity Prices**

Commodity	Price on 8/31/2010	Price on 8/23/2010	Price on 7/30/2010	1 Week Change	1 Month Change
LME Nickel (Cash, \$ per tonne)	20,705	21,200	20,555	(2.3%)	0.7%
LME Lead (cash, \$ per tonne)	2,010	2,021	2,060	(0.5%)	(2.4%)

Source: LME

**Exhibit 6: Natural Gas and Crude Oil**  
 (From February 2, 2009)



Source: EIA

## Executive Director's Notes



### **U.S.-CHINA ELECTRIC VEHICLES INITIATIVE OFF TO A GOOD START**

Last November, President Barack Obama of the United States and President Hu Jintao of China announced the formation of a U.S.-China Electric Vehicles Initiative to explore ways of collaborating on advanced battery research for hybrid and electric vehicles. The first meeting of the initiative took place this week at Argonne National Laboratory outside Chicago. I was pleased and honored to attend that meeting at the invitation of the U.S. Department of Energy on behalf of NAATBatt.

The three-day meeting featured an initial plenary assembly followed by three separate roundtable sessions on battery technology roadmapping, battery test procedures, and vehicle demonstrations and infrastructure. The battery roadmapping session, led by Dave Howell of the DOE and Wu Feng of the Beijing Institute of Technology, explored the possibility of promoting shared research in pre-competitive, early-stage battery technologies, such as lithium-air, lithium metal and certain aspects of advanced lithium-ion technology.

The battery test procedures session, led by Jeff Chamberlain of Argonne and Qiu Xinping of Tsinghua University, explored the somewhat different approaches being taken by the U.S. and China to battery testing and considered ways that procedures might be harmonized and results jointly published.

The vehicle demonstrations and infrastructure session, led by Keith Hardy of Argonne, Steve Goguen of the DOE, and Wang Hewu of Tsinghua University, focused on encouraging greater cooperation between standards setting bodies in the U.S. and China, specifically between the SAE and CATARC, and on the compatibility of U.S. and Chinese supporting infrastructure for PEV's. Demonstration session participants agreed to cooperate and coordinate PEV demonstration projects in Los Angeles and Shanghai.

Overall, the meeting was a success. Both delegations appeared to get along well on a personal level and be genuinely interested in ongoing cooperation. Meeting materials should be available for inspection soon at [www.transportation.anl.gov](http://www.transportation.anl.gov). The next meeting will be held in Beijing sometime in early 2011.

As an observer, however, the most interesting part of the meeting was trying to figure out exactly what both sides want out of the joint initiative. The Chinese seemed very interested in the research capabilities of U.S. institutions. Access to facilities, such as the Advanced Photon Source at Argonne and the National Synchrotron Light Source at Brookhaven, were of predictable interest. But more intriguing was the interest expressed in better understanding how the relationships between research institutions, government and private companies are structured in the U.S. Data collection from PEV's deployed in the

U.S. also seemed to be a major interest. Although the Chinese auto market may soon be largest in the world, it will likely be a diffuse and less sophisticated market for many years to come. The U.S. market should be the best source of data on the actual performance of PEV's and advanced batteries in the field for the foreseeable future. The Chinese seemed anxious to secure access to that data.

On the U.S. side, our interest seemed shaped by two facts: First, the Chinese auto market will soon be the largest in the world and, second, because of the sheer function of numbers, the Chinese scientific community is a large and important resource that can be used to help achieve important technology goals. Accordingly, there was great interest and active participation by the U.S. delegation in discussions about standards and infrastructure compatibility since these issues will bear on the ability of U.S. automakers and equipment suppliers to access the Chinese market, and vice versa. In the battery roadmapping session, discussion centered on the potential for joint research in many of the areas in which the ARPA-E program has been trying to direct investment domestically. Chinese cooperation could help leverage DOE investment in, and accelerate the development of, some of these important early stage technologies.

The U.S.-China Electric Vehicles Initiative is off to a good start. Both sides seem to have something to gain from the initiative and will likely keep it moving forward so long as their interests are addressed. The U.S. advanced battery industry should watch the direction of the joint initiative closely.



James J. Greenberger  
Executive Director

September 3, 2010

## North American Industry Announcements and Calendar

- **NiChE Workshop on Materials for Large-Scale Energy Storage:** The Council for Chemical Research will host a NiChE Workshop on Materials for Large-Scale Energy Storage on **September 16-17** at the National Institute for Standards and Technology (NIST) in Gaithersburg, MD. The workshop will delve into the end-use applications and market drivers for large-scale storage, the R&D efforts that are pushing the boundaries, as well as highlighting some near-deployment technologies. Additional information about the program may be found at: <http://www.ccrhq.org/articles/niche-workshop-materials-large-scale-energy-storage>
- **Battery Show 2010:** The Battery Show, a conference and exposition focused on multiple battery chemistries and applications will be held in San Jose, California on **October 5-7**, 2010. Information about the show can be found at: <http://www.thebatteryshow.com/index.php>
- **218<sup>th</sup> Meeting of the Electrochemical Society:** The next biannual ECS meeting will take place on **October 10-15**, in Las Vegas, Nevada. The meeting will feature a wide range of experts throughout the fields of solid-state and electrochemical science and technology, getting together to communicate with both colleagues and a vital market. More information can be found at <http://www.electrochem.org/meetings/biannual/218/218.htm>
- **Advanced Energy Storage 2010:** FullPower, Inc. will be leading a series of exhibits on **October 12-14**, in San Diego, California to showcase the technological capabilities of leading suppliers of advanced batteries, energy storage systems, and ultracapacitors. Seminars will discuss the insights and impacts on these various technologies. Additional information may be found at <http://www.fullpowerinc.com/AES2010/AESHome.html>
- **Battery Power 2010 Conference:** Battery Power 2010, an international conference highlighting the latest developments and technologies in the battery industry, will be held **October 19-20** in Dallas, Texas. The conference, which is in its eighth year, will feature more than 35 presentations on portable, stationary and automotive battery technology, as well as battery manufacturing, materials and research & development. NAATBatt is a supporting organization of the conference and NAATBatt members in good standing are entitled to register for the conference at the discounted rate of \$495.00. Please contact [jgreenberger@naatbatt.org](mailto:jgreenberger@naatbatt.org) for information about how to receive this discount. Information about the conference and registration for it may be found at: [http://www.batterypoweronline.com/bppt-conf10/bp10\\_index.php](http://www.batterypoweronline.com/bppt-conf10/bp10_index.php).
- **U.S. National Electric Vehicles Safety Standards Summit:** On **October 21-22**, in Detroit, Michigan, the National Fire Protection Association (NFPA) will be holding a safety summit along with co-sponsor SAE International in order to ensure standards on electric cars. The summit will focus on how to implement such standards on a rapidly growing industry, in which technology is swiftly improving. To find out more about the summit visit [http://www.nfpa.org/newsReleaseDetails.asp?categoryId=488&itemId=46997&cookie\\_test=1](http://www.nfpa.org/newsReleaseDetails.asp?categoryId=488&itemId=46997&cookie_test=1)
- **Rare Earth Metals Summit III:** Infocast's Rare Earth Metals Summit III will be held in Washington, D.C. on **October 25-27**, 2010. The conference will examine the supply and value chains for rare and strategic metals, including lithium. NAATBatt is a supporting organization of

the conference and NAATBatt members will be entitled to a 10% discount on registration. Additional details will follow.

- **Annual DOE Program Update Conference – Energy Storage R&D Programs:** Sandia National Laboratory's U.S. DOE Energy Storage Systems Research Program (ESS) will be held on **November 2-4**, in Washington D.C. The program will review the latest DOE sponsored research in advanced battery technology, power conditioning and others topics relating to advanced energy storage. Registration for the conference can be found here: <http://www.sandia.gov/ess/About/newsevents.html#conf>
- **Battery Safety 2010:** Knowledge Foundation will hold a conference focusing on advancements in systems design, integration and testing for lithium-ion battery safety and reliability in Boston, MA on **November 3**, 2010. Additional information about the conference can be found at: <http://www.knowledgefoundation.com>
- **Battery Lithium Mobile Power 2010:** Knowledge Foundation will hold a conference focusing on new lithium-ion battery chemistries, novel electrode and electrolyte materials, and system integration for a vast array of mobile and portable applications in Boston, MA on **November 4-5**, 2010 in conjunction with the Battery Safety 2010 Conference referenced above. Additional information about the conference can be found at: <http://www.knowledgefoundation.com>
- **Future of Electric Vehicles Conference:** The Future of Electric Vehicles Conference will be held in San Jose, California on **December 7-8**, 2010. The conference will have representatives for all electric vehicle types, components, and uses. The conference will permit attendees to learn more about electric vehicles in each and every form. Information and registration for the conference can be found on the website at: <http://www.idtechex.com/electric-vehicles-usa-10/>
- **Advanced Automotive Batteries Conference & Symposium 2011:** The Advanced Automotive Batteries 2011 Conference (AABC) will be held on **January 24-28 2011**, in Pasadena, California. This is the next domestic program in the series of conferences on automotive batteries sponsored by Dr. Menahem Anderman and Total Battery Consulting. The conference Web site can be found at: <http://www.advancedautobat.com/automotive-battery-conference-2011/index.html>.
- **NAATBatt Membership Information.** NAATBatt is taking applications for 2010 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, committees and the upcoming roadmap project 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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