

## Summary:

For the March 12<sup>th</sup> issue of NAATBatt's Advanced Battery Weekly, we highlight the ongoing sector activities. On March 15<sup>th</sup>, we will be hosting our second webinar which will be on "*Standardization of GEV Batteries: Understanding the Process and the Prospects*". In addition, we have included an interview with Stephen Voller, CEO of Bee Automobiles.

The NAATBatt Index declined 4.5% while the U.S. and Asia Battery Indices increased 1.7% and 2.9%, respectively. The S&P 500 and the Russell 2000 increased 2.0% and 3.8%, respectively.

## Key Highlights:

- South Korea has stated that it will be able to commercially extract **lithium from sea water** by 2015. While China has some resources, Japan and South Korea are competing hard for international lithium reserves. Seoul has set aside \$12 billion for acquisitions in the raw materials business this year.
- South Korea has unveiled what is considered the world's first commercial **wireless online electric vehicle (OLEV)**. Power strips, buried 1 foot under the surface and connected to the national grid provide electromagnetic power to the OLEV, wirelessly, charging an on-board battery and powering the bus' electric motor while in operation.
- **Mitsubishi Motors** has finalized a deal to supply EVs to **Peugeot Citroen**. Under the agreement, Mitsubishi will supply about 100,000 vehicles to the French group to sell under the Peugeot and Citroen brands in Europe, with production due to start in October 2010.
- Austin will be the first city in Texas to test a clean energy storage system meant to increase efficiency. **Austin Energy** is piloting the Ice Energy Ice Bear storage system that stores energy during off-peak hours and distributes it in high-usage periods.
- **KB Home** announced that it will begin offering an option to pre-wire its new Built to Order(TM) homes to accommodate charging stations for homeowners' EVs.
- **CALMAC** installed 16 energy storage tanks (IceBank) for a new "EEE" High School campus in Florida, and its neighboring K-8 campus. The central energy plant utilizes the system to cool the buildings on both campuses. The chillers work with the IceBank energy storage tanks to make ice at night when energy costs are significantly lower. The low-cost stored energy aids the chiller the next day to cool the buildings during peak demand.
- **LG Chem** and its U.S. subsidiary **Compact Power** today confirmed their plans to build a \$303-million plant to make lithium-ion battery cells for EVs. The plant is scheduled to be up and running in 2012. The factory will be able to make enough lithium-ion battery cells for between 50,000 and 200,000 vehicle battery packs.

## A Few More Details:

South Korea has stated that it will be able to commercially extract lithium from sea water by 2015. While China has some resources, Japan and South Korea are competing hard for international lithium reserves. Seoul has set aside \$12 billion for acquisitions in the raw materials business this year. Experts are divided on the question of how quickly the world will burn through recoverable lithium reserves -- pegged at 4.1 million tonnes by the US Geological Survey -- excluding Bolivian data.

Source: *Financial Times*

South Korea has unveiled what is considered the world's first commercial wireless electric vehicle (EV). The online electric vehicle (OLEV) was created by Korea Advanced Institute of Science and Technology. The OLEV can run up to 24.8 miles per hour. Power strips, buried 1 foot under the surface and connected to the national grid provide electromagnetic power to the OLEV, wirelessly, charging an on-board battery and powering the bus' electric motor while in operation. Buses account for about 30 percent of Seoul's traffic, with some 56 miles of bus lanes operating throughout the city.

Source: *UPI.com*

Mitsubishi Motors has finalized a deal to supply EVs to Peugeot Citroen. Under the agreement, Mitsubishi will supply about 100,000 vehicles to the French group to sell under the Peugeot and Citroen brands in Europe, with production due to start in October 2010. The manufacturers are also building a joint sports utility vehicle plant in Russia.

Source: *Sydney Morning Herald*

Austin will be the first city in Texas to test a clean energy storage system meant to increase efficiency. Austin Energy is piloting the [Ice Energy](#) Ice Bear storage system that stores energy during off-peak hours and distributes it in high-usage periods. The system uses a built-in smart grid controller that allows units to be remotely monitored and dispatched in real time.

Source: *Austin Business Journal*

KB Home, one of America's premier homebuilders, announced that it will begin offering an option to pre-wire its new Built to Order(TM) homes to accommodate charging stations for homeowners' EVs. This new earth-friendly option is designed to ease the future installation of a station to charge an EV or PHEV conveniently at home. The pre-wire option is now available to KB Home homebuyers nationwide

Source: *KB Home*

CALMAC installed 16 energy storage tanks (IceBank) for a new "EEE" High School campus in Florida, and its neighboring K-8 campus. The central energy plant utilizes the system to cool the buildings on both campuses. The chillers work with the IceBank energy storage tanks to make ice at night when energy costs are significantly lower. The low-cost stored energy aids the chiller the next day to cool the buildings during peak demand. The combined campuses require 2,200 total tons of cooling capacity and by combining the two central cooling plants into one and adding ice storage the chiller capacity was reduced to 1,200 tons.

Source: *CALMAC*

LG Chem and its U.S. subsidiary Compact Power today confirmed their plans to build a \$303-million plant to make lithium-ion battery cells for EVs. The plant is scheduled to be up and running in 2012. The factory will be able to make enough lithium-ion battery cells for between 50,000 and 200,000 vehicle battery packs. The facility is one of four projects under way in Michigan that are using federal grants meant to jumpstart advanced battery production in the U.S.

Source: *Detroit Free Press*

## Interview with Stephen Voller, CEO of Bee Automobile:

### Please describe Bee Automobiles.

Bee is a developer of battery technology for electric and hybrid vehicles. Specifically, we have two battery chemistries under development, one in advanced lithium-ion, and the other in a new non-lithium technology. Bee has sought to produce both the electric vehicles (EVs) and the batteries. However, the funding climate has forced us to abandon vehicle development and primarily focus on battery development.

### What type of material is the company leveraging?

It is a lithium iron-sulphate cathode combined with a unique anode design.

The predicated cell performance characteristics for a 20Ah prismatic cell (as shown in **Exhibit 1**) are:

Bee 20Ah cell	Specifications
Volts	2.4 volts
Amp/Hours	20 amps
Wh	48 Wh
Cell weight (grams)	280g
Wh/g	0.17 Wh/g
Wh/Kg	170 Wh/kg
Maximum discharge rate	80%
Packaging	Prismatic/Flat
Li-ion Chemistry	Iron Sulphate (LFS)
Height (mm)	180mm
Width(mm) - without tabs	100mm
Depth mm	7mm
Wh/Litre of cell	380 Wh/litre

### Exhibit 1: Bee Cell



Source: Bee Automobile

### When do you expect them to become commercially available?

We expect the batteries to be commercially available in 2011.

### **What is the go-to-market strategy and value proposition?**

Our strategy is to provide the safest and lowest cost battery packs solutions to OEM's, all-EVs and hybrids that need batteries. The two big elephants in the room for all battery suppliers are safety and cost. Safety and cost must be considered at both the cell and pack level.

Our cells are designed specifically to go into automotive battery packs. They are not adapted cells from other battery applications. Most lithium-ion battery suppliers quote cell prices today at in the range of \$600kWh to \$1,000kWh. But because of the expensive control electronics and cooling required when the cells are built into a pack, the true cost of an engineered pack to give the desired vehicle range and performance can double the cell prices. A finished, full tested, ruggedized battery pack is still very high (even with government subsidies) and above the cost of a conventional gasoline/diesel engine vehicle. Furthermore, to meet the warranty obligations the packs are being over-engineered with more cells than would normally be required -- adding further to the cost.

By introducing much safer cell designs that are tolerant to overcharging and short-circuiting, battery pack engineering costs can be reduced substantially. In addition, the raw materials we use our lower cost, so the cells themselves are aimed at the lower end of the price range. The controls are designed in to the cells and substantially reduce the complexity and cost of battery packs.

We are also looking longer term, beyond lithium-ion. Even the most optimistic lithium-ion fan would say that it is hard to envision prices at the cell level dropping below \$200kWh. We are working with a leading university to develop non-lithium batteries that can be offered at a price below \$200kWh.

### **Discuss the competitive landscape for the company's target markets.**

Understandably most of the large OEM's and Tier-1's are partnering with the large battery companies to develop their initial battery offerings. Most of these battery chemistries are variants of the standard lithium cobalt oxide (LCO) cells that the large battery companies make in the millions each year. These solutions will require over engineering of the battery packs to make them conform to safety and warranty expectations. Costs will reduce in volume and as more aluminum and manganese are used to replace expensive cobalt and nickel.

The newer cell chemistries designs are required to bring the pack engineering and cell costs to acceptable levels of price performance and safety. We view our main competitors as A123, BYD and Boston Power.

### **How large do you envision the electric vehicle market (including autos and bikes) will be by 2015?**

Between 2010 and 2030, the world population will rise from 6 billion to 9 billion, and the number of vehicle we drive will rise from 1 billion to 2 billion. We expect 2 billion new vehicles to be produced in the next 20 years because most vehicles do not last 20 years.

Oil will not last forever, and the EU has a target of 80% reduction in emissions by 2050 (from 1990).

Even if we assume a 50% improvement in internal combustion engine efficiency and a move towards more economical cars, without a major proportion of these 2 billion vehicles becoming electric or hybrid we cannot hope to meet the emissions reduction figure and produce enough oil.

By 2015 car production is expected to be 60 million a year. I believe that hybrid and EV production must be at least 10% of that or at 6 million units per annum. The key factor in making this possible is Governments delivering on their promises of infrastructure for recharging, priority/HOV lanes for low emission vehicles and City centres that are zero emission zones. Battery costs will mean that EV and hybrids will still be at a premium to conventional vehicles so these incentives are vital for success.

**How large is the stationary opportunity?**

The recent changes to the feed-in tariffs for Solar PV and small scale wind turbines in the EU mean that energy storage will be required to make most domestic scale systems economical. Previously the Utilities bought the electricity whether they needed it or not, this will soon change. This presents a major opportunity for stationary storage in Europe. However the changes are new so it is hard to put a specific figure on the market opportunity.

**Which geographic markets do you believe will evolve the fastest? Why?**

In our opinion, China followed by Japan, Europe, Korea and the USA. The reason is the ongoing efforts to build a charging infrastructure to support electric vehicle adoption.

**What keeps me awake?**

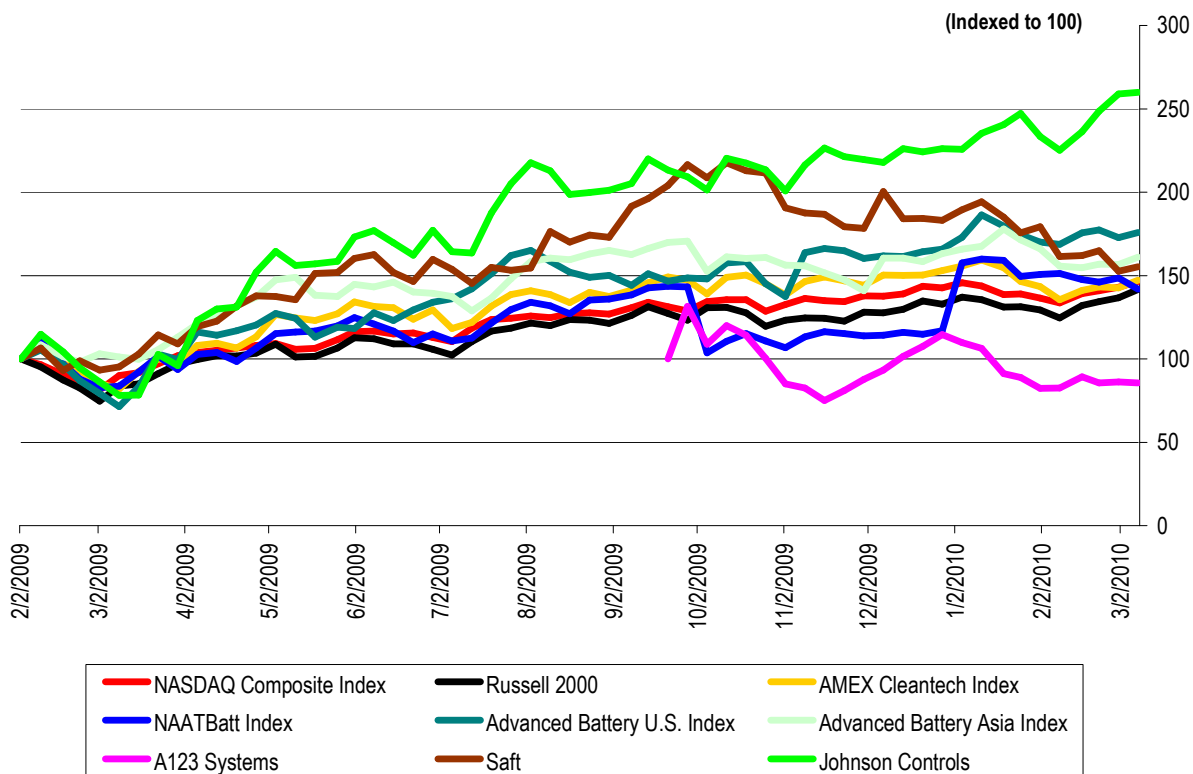
This new and exciting EV and battery industry has a great future. However, the industry must brace itself for its first incident. So far there has been no major incident involving a lithium-ion electric vehicle. But one day it will happen. It will happen in a public place and be on YouTube in seconds. Whosever ever vehicle it is and whosever batteries they are, had better have some contingency in place to deal with the publicity because it will be big and it will be vicious.

If this first incident is not handled well it could set the industry back considerably. When this happens, and I'm afraid it is a case of 'when' not 'if', it is important that the industry sticks together and stresses the positives around the technology. After all gasoline fires are not uncommon.

**Any closing thoughts?**

We are seeking funding at this point and would welcome approaches from interested investors.

## Exhibit 2: Indices Performance (From February 2, 2009)

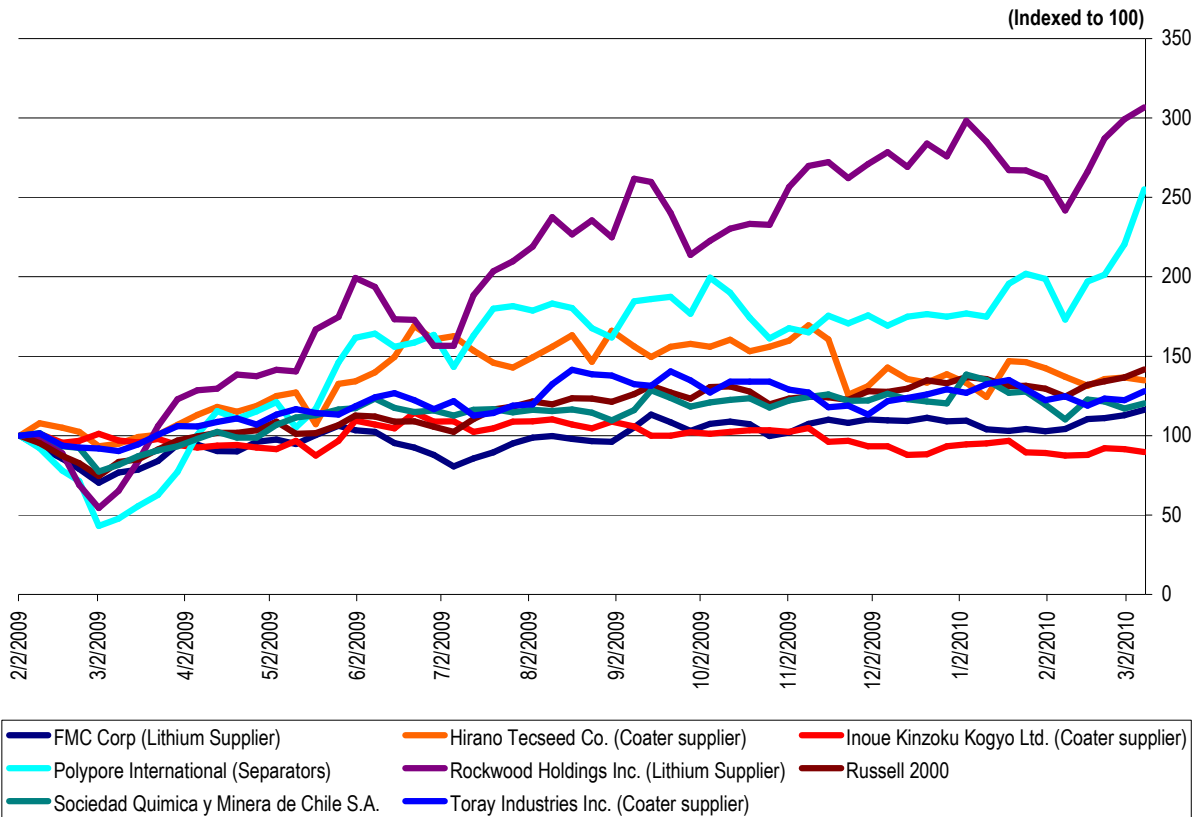


Index	Close on 3/8/2010	52-Wk High	% of 52-Wk High	Performance		
				LTM	YTD	Week
Dow	10,552.5	10,767.2	98.0%	59.3%	1.2%	1.4%
S&P 500	1,138.5	1,150.5	99.0%	67.2%	2.0%	2.0%
NASDAQ	2,332.2	2,326.3	100.3%	81.5%	1.6%	2.6%
Russell 2000	667.1	649.2	102.8%	91.2%	6.2%	3.8%
AMEX Cleantech Index	1,023.0	1,112.5	92.0%	77.9%	(4.1%)	3.3%

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 3: Supplier Performance**  
(From February 2, 2009)



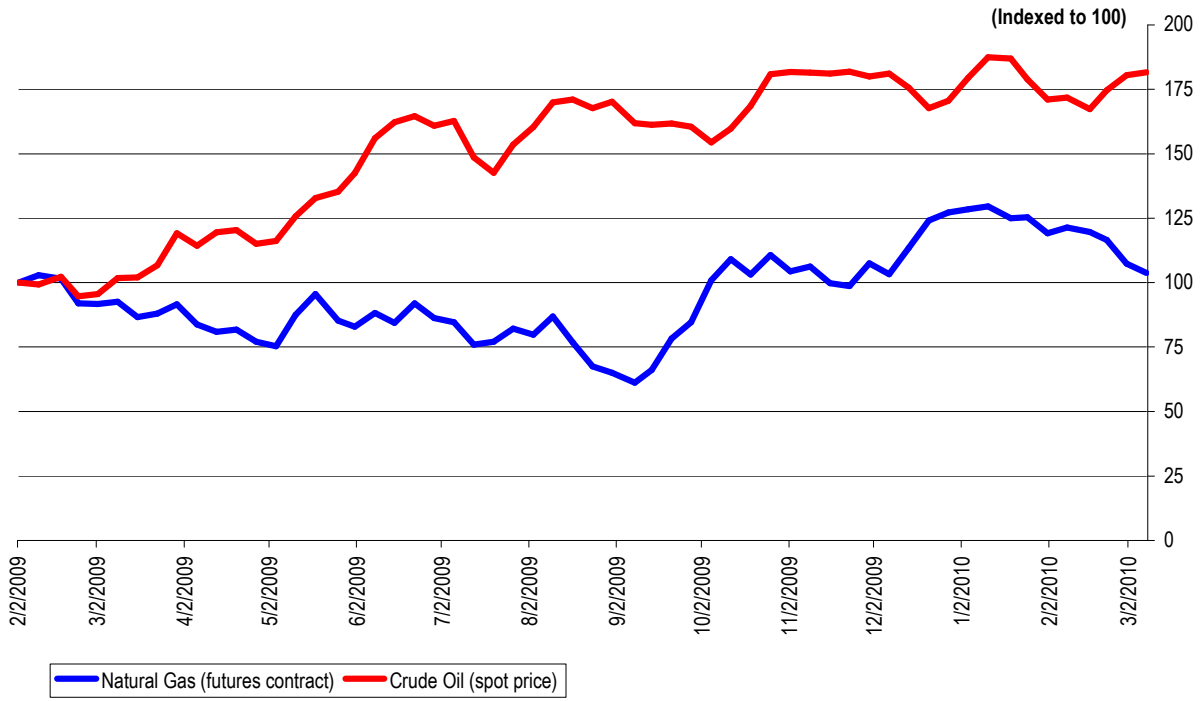
Source: Bloomberg

**Exhibit 4: Commodity Prices**

Commodity	Price on 3/8/2010	Price on 3/1/2010	Price on 2/8/2010	1 Week Change	1 Month Change
LME Nickel (Cash, \$ per tonne)	22,525	21,365	17,030	5.4%	32.3%
LME Lead (cash, \$ per tonne)	2,240	2,151	1,930	4.1%	16.1%

Source: LME

**Exhibit 5: Natural Gas and Crude Oil**  
 (From February 2, 2009)



Source: EIA



### **NEW CAPITAL, NEW OPPORTUNITIES**

It is no secret that 2010 will be a tough year for venture capital in the United States. Although cleantech investments continue to gain traction within the venture sector, with 10 year average IRR for the sector expected to go negative by mid-year, 2010 will be a tough year in which to raise new venture funding.

In the gloom that surrounds the domestic venture capital industry, it was easy to miss some good and interesting news last week out of Arizona. On March 1, Scottsdale-based ECOtality, Inc., a leading provider of EV recharging solutions, announced that it had received a \$300 million credit facility from Shenzhen Goch Investment Limited, the partner of ECOtality's joint venture in China. The credit facility will be used to provide financing to ECOtality's customers in the United States and worldwide. The \$300 million facility is part of a larger Renminbi (RMB)10 billion (US\$1.5 billion) credit facility that the China Construction Bank has made available to Shenzhen Goch Investment in China.

The good news from ECOtality is important for a couple of reasons. First, it illustrates that for whatever their perceived challenges, the financial markets are always changing and that opportunities can arise in the most unlikely places. Who would have thought it possible, just a few years ago, to get a line of credit to build EV recharging stations, let alone that the credit provider would be located in the Peoples' Republic of China?

The ECOtality-Shenzhen Goch deal also signals that investors are getting smarter. As NAATBatt has been saying for some time, the real challenge in the electric drive market is on the demand side. If we cannot develop a customer base for EV's and PHEV's, much of the recently financed battery manufacturing capacity, and much of the technology developed by our best energy storage companies, will go unused. The dedication of Shenzhen Goch's credit line to supporting customer purchases of ECOtality's products seems a wise strategy. Good luck to both ECOtality and Shenzhen Goch Investment on what sounds to be a great deal.

NAATBatt's core mission of growing the North American market for electric drive vehicles and grid-level storage products by helping to reduce their cost depends upon our members finding new and often innovative sources of financing. NAATBatt is a great organization for innovative companies looking to access capital and for providers of capital looking to meet the Who's Who in large format stored energy technology. If you have not yet joined NAATBatt, please send us an inquiry concerning membership by going to <http://naatbatt.org/membership-inquiry/>.



James J. Greenberger  
Executive Director



***Upcoming Company Event***

Jeff Quass, vice president of global operations – industrial and environmental products for MEGTEC Systems, Inc., will host a session at the 27<sup>th</sup> International Battery Seminar & Exhibit in Fort Lauderdale, Florida on March 17. Quass will discuss the “Advances in Battery Electrode Coating, Drying and Solvent Recovery System Design” from 11:30 am - 12 noon at the Broward County Convention Center.



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