



# EEVC NEWSLETTER

Published by the Eastern Electric Vehicle Club

Peter Cleaveland, Editor

Vol 37 No 9  
SEPTEMBER, 2017

email: [easternev@aol.com](mailto:easternev@aol.com). Web site: [www.eevc.info](http://www.eevc.info)  
President: Oliver Perry, 5 Old Stagecoach Turn  
Shamong, NJ 08088, (609) 268-0944

Copyright © 2017, Eastern Electric Vehicle Club, all rights reserved

  
Affiliated with EAA

## MERCEDES MAKES SPARKS AT FRANKFURT

Mercedes Benz is showing a number of interesting electric concept cars at the Frankfurt auto show, including the autonomous smart vision EQ fortwo, the Concept EQA, and the Mercedes-Benz GLC F-CELL “More than ten new electric cars are set to go into series production at Mercedes-Benz Cars by 2022,” the company says.

Perhaps the furthest out is the autonomous concept car smart vision EQ fortwo (shown), which is more a service than a car. It’s built around autonomous electric smart fortwo EVs that lack steering wheels and pedals, and are summoned using a mobile device. Because of swarm intelligence and autonomous driving, the company says, users do not have to look for the next available car — it will find them and collect the passengers directly from their



*The Autonomous concept car smart vision EQ fortwo*

chosen location. Once inside, the vehicle functions are controlled via personal mobile device or voice input, an arrangement, say the company, “that is intuitive, convenient and hygienic.”

### EQ concept EV

The Concept EQA is the company’s first all-electric EQ concept vehicle in the compact segment.

The vehicle has two electric motors with a system output that can be increased to over 200 kW by way of scalable battery components. Two drive programs, “Sport” and “Sport Plus,” offer a choice of individual drive characteristics. Range is about 400 km (250 miles), depending on battery capacity. The vehicle can be charged via induction or wallbox and is also ready for rapid charging.



*The Concept EQA*

### Fuel cell PHEV



Mercedes-Benz is also showing preproduction models of its GLC F-CELL fuel cell plug-in hybrid. In addition to hydrogen, the all-electric variant of the popular SUV will also run on electricity. With 4.4 kg of hydrogen on board, the preproduction model produces enough energy for a range of up to 437 km (273 miles) in the NEDC, plus up to 49 km (27 miles) of all-electric range using its 13.8 kWh lithium-ion battery. Total output is 147 kW (197 hp) and top speed is electrically governed at 99 mph.

### HONDA CLARITY GETS MORE EV RANGE

Honda Motor has announced that the 2018 Clarity Plug-in Hybrid, unveiled in April, has received an EPA all-electric range rating of 47 miles on a full charge<sup>1</sup>. Launching at dealerships nationwide later this year, the car also received an EPA fuel economy rating of 110 combined MPGe and a gasoline-only 44/40/42 MPG rating (city/highway/combined).

### BRABUS ULTIMATE E



Also on display at the Frankfurt Auto Show is the Brabus Ultimate E. Brabus GmbH, based in Germany, is a tuning house that produces high-performance versions of ordinary vehicles, primarily based on those from Mercedes-Benz.

It's rather like the way John Cooper, of the Cooper Car Company in England, race-tuned the Austin Mini back in 1961 to create the original Mini Cooper (the Brits will race anything, given the chance).

Brabus modified the electric smart fortwo to create the Ultimate E concept car, which features 150 kW (201 bhp) and 350 Nm (258 lb-ft) of torque from the motor, acceleration from 0 to 100 km/h in 4.5 seconds and a top speed of 180 km/h (112 mph). Power comes from a 22 kWh lithium-ion battery pack installed in the vehicle floor that delivers a maximum range of 160 kilometers (100 miles) in the NEDC standard cycle.

The car is currently in the road-testing phase, according to the company. "If there is sufficient customer interest, the equally innovative and attractive electric city sports car could be built in small-series production in the near future."

### NEWS UPDATE

#### Firebricks for energy storage?

A September 6 article by David L. Chandler of the MIT News Office reports that researchers are looking to revive an ancient technology: storing excess energy as heat. The idea is to use electrical resistance heaters to heat firebrick during times when lots of energy is available — when the sun is shin-

ing on solar panels, or the wind is spinning turbines, for example — and use it later, when electricity is more expensive, to make steam for generators or provide heat for industrial processes.

“The system, which Charles Forsberg, a research scientist in MIT’s Department of Nuclear Science and Engineering and lead author of a research paper describing the plan, that appears this week in the *Electricity Journal*, calls FIRES (for FIrebrick Resistance-heated Energy Storage), would in effect raise the minimum price of electricity on the utilities market,” say the article, “which currently can plunge to almost zero at times of high production, such as the middle of a sunny day when solar plant outputs are at their peak.”

The way that prices for electricity are set is key to the system; there are times when the cost to provide heat are almost zero, which hurts the supplier: “But by diverting much of that excess output into thermal storage by heating a large mass of firebrick, then selling that heat directly or using it to drive turbines and produce power later when it’s needed, FIRES could essentially set a lower limit on the market price for electricity, which would likely be about the price of natural gas. That, in turn, could help to make more carbon-free power sources, such as solar, wind, and nuclear, more profitable and thus encourage their expansion.”

“Once the amount of generating capacity provided by solar power reaches about 15 percent of the total generating mix, or when wind power reaches 30 percent of the total, building such installations can become unprofitable unless there is a sufficient storage capacity to absorb the excess for later use.”

“At present, the options for storing excess electricity are essentially limited to batteries or pumped hydroelectric systems. By contrast, the low-tech firebrick thermal storage system would cost anywhere from one-tenth to one-fortieth as much as either of those options, Forsberg says.”

There are significant challenges, of course. One is that the system doesn’t work economically unless the firebrick can be heated to temperatures that are now impractical. Another is that the energetics seem problem-

atic: converting heat to electric power is inherently inefficient, unless it can be done at extremely high temperatures (which is why the steam entering the power turbines at a power plant is superheated, yet the overall efficiency of the plant is generally less than about 60 percent. According to the second law of thermodynamics, the maximum possible efficiency is 1 minus the ratio of the hottest temperature in the system (the temperature at which heat goes in) to the lowest temperature in the system (the temperature at which heat goes out — to exhaust, condenser, etc). But here’s the kicker: both temperatures are absolute, so the ratio is never that good.

### **A lithium battery that won’t explode**

(Source: *U.S. Army Research Laboratory*)

Researchers at the U.S. Army Research Laboratory and the University of Maryland have developed for the first time a lithium-ion battery that uses a water-salt solution as its electrolyte and reaches the 4.0 volt mark desired for household electronics, such as laptop computers, without the fire and explosive risks associated with some commercially available non-aqueous lithium-ion batteries.

Their work appears Sept. 6, 2017, in *Joule*, Cell Press’s new interdisciplinary energy journal.

This technology will bring the soldiers a “completely safe and flexible Li-ion battery that provides identical energy density as the SOA Li-ion batteries. The batteries will remain safe — without fire and explosion — even under severe mechanical abuses,” said co-senior author Dr. Kang Xu, ARL fellow who specializes in electrochemistry and materials science.

“In the past, if you wanted high energy, you would choose a non-aqueous lithium-ion battery, but you would have to compromise on safety. If you preferred safety, you could use an aqueous battery such as nickel/metal hydride, but you would have to settle for lower energy,” Xu said. “Now, we are showing that you can simultaneously have access to both high energy and high safety.”

The research follows a 2015 study in *Science* (doi: 10.1126/science.aab1595) that produced a similar 3.0 volt battery with an aqueous electrolyte but was stymied from achieving higher voltages by the so-called “cathodic

challenge,” in which one end of the battery, made from either graphite or lithium metal, is degraded by the aqueous electrolyte. To solve this problem and make the leap from three volts to four, the first author, University of Maryland assistant research scientist Chongyin Yang, designed a new gel polymer electrolyte coating that can be applied to the graphite or lithium anode.

This hydrophobic coating expels water molecules from the vicinity of the electrode surface and then, upon charging for the first time, decomposes and forms a stable interphase—a thin mixture of breakdown products that separates the solid anode from the liquid electrolyte. This interphase, inspired by a layer generated within non-aqueous batteries, protects the anode from debilitating side reactions, allowing the battery to use desirable anode materials, such as graphite or lithium metal, and achieve better energy density and cycling ability.

“The key innovation here is making the right gel that can block water contact with the anode so that the water doesn’t decompose and can also form the right interphase to support high battery performance,” said co-senior author Chunsheng Wang, Professor of Chemical & Biomolecular Engineering at the University of Maryland’s A. James Clark School of Engineering. The addition of the gel coating also boosts the safety advantages of the new battery when compared to standard non-aqueous lithium-ion batteries and boosts the energy density when compared to any other proposed aqueous lithium-ion batteries. All aqueous lithium-ion batteries benefit from the non-flammability of water-based electrolytes as opposed to the highly flammable organic solvents used in their non-aqueous counterparts. Unique to this one, however, is that even when the interphase layer is damaged (if the battery casing were punctured, for instance), it reacts slowly with the lithium or lithiated graphite anode, preventing the smoking, fire, or explosion that could otherwise occur if a damaged battery brought the metal into direct contact with the electrolyte.

Though the power and energy density of the new battery are suitable for commercial applications currently served by more hazardous non-aqueous batteries, certain

improvements would make it even more competitive. In particular, the researchers would like to increase the number of full-performance cycles that the battery can complete and to reduce material expenses where possible. “Right now, we are talking about 50–100 cycles, but to compare with organic electrolyte batteries, we want to get to 500 or more,” Wang said.

The researchers also note that the electrochemical manipulations behind the jump to four volts have importance within battery technology and beyond. “This is the first time that we are able to stabilize really reactive anodes like graphite and lithium in aqueous media,” says Xu. “This opens a broad window into many different topics in electrochemistry, including sodium-ion batteries, lithium-sulfur batteries, multiple ion chemistries involving zinc and magnesium, or even electroplating and electrochemical synthesis; we just have not fully explored them yet.”

Xu said the interphase chemistry needs to be perfected before it can be commercialized. He also said more work needs to be done on scaling up the technology in big cells for testing. With enough funding, the 4-volt chemistry could be ready for commercializing in about five years, he said.

This work was supported by the U.S. Department of Energy, Advanced Research Program Agency – Energy.

### **Giving away our technology**

A September 10 *New York Times* article by Keith Bradsher discusses the dangers that Western auto companies — American companies in particular — are ignoring their fears and acceding to the Chinese government’s demands that they must transfer not only production capacity, but proprietary technology to China in order to sell EVs there. The Western companies — Volkswagen General Motors, Renault-Nissan and Ford — are setting up all sorts of R&D facilities there, even through “[f]rom high-speed trains to wind turbines, China has long prodded American, European and Japanese companies to hand over their know-how in exchange for access to its exciting new market. Then Chinese companies have used that knowledge and lavish government support to take on foreign rivals.”

Has the prospect of that huge market blinded them to the inevitable result? Probably not. But the bump in quarterly sales, stock price and executive compensation are an awfully strong incentive to plow ahead.

## GETTING READY FOR THE FLOOD By California Pete



San Francisco Bay has had its ups and downs. At one time it was essentially an open sewer, with all the dumping from communities along its shores. And millions of cubic yards of dirt, rock and mine tailings from gold workings upstream has gone into the Bay since the gold rush; so much, in fact, that shipping can continue only by dredging.

In the 1940s there was actually a plan to fill the whole thing, leaving ship channels to connect the ports to the sea, and the river diverted to freshwater lakes that would supply domestic and irrigation water. Save The Bay was organized in response, and put a stop to that plan, and in subsequent years sewage treatment plants were built, reducing the Bay's awful stench.

And over the years the salt marshes and estuaries that lined the shore have been filled — for agriculture first, then for industry and housing. In fact, I live in just such an area (which is why I and my neighbors must worry about liquefaction in the the big earthquake). But efforts are under way to bring back some of the lost marshland.

Now the Bay appears cleaner, although in some ways that is an illusion: "Oil and gas spilled on streets, pesticides from farm fields and backyard lawns, polychlorinated biphenyls and dioxin buried in soil at thousands of small, contaminated sites — they all flow downhill with the winter rains, ending up in estuaries and the ocean," said a 1999 article in the *San Francisco Chronicle*.

Since then cleanup efforts have continued, but I still wouldn't eat fish taken from the Bay.

But the Bay will have its revenge (as will the sea on the other side of San Francisco). A 2012 study by the National Research Council predicts that tides in the Bay will increase by

somewhere between 18 and 66 inches by 2100 (as they will also on the East Coast, in places like Miami).

Can anything be done? The *Chronicle's* John King reports that a design competition organized by a local nonprofit has brought in design teams from around the world to come up with ways to cope with the rising water. Let's hope they succeed, but aside from using dikes (the Dutch have offered their expertise to the United States, which has ignored it).

### Clean air bonanza?

California's cap-and-trade law has generated billions of dollars in funds that the state is now trying to figure out how to spend. Given a pot of cash, most politicians will immediately jump on it like a dog on a bone to fund their own pet programs, or anything they think will help them get re-elected. But in this case the money has to be spent on things that will improve the environment (and no, a new shopping center in Rep X's district does not meet those criteria): "A big chunk of the revenue each year is spoken for, set aside for the state's high-speed rail plan, affordable housing and a host of transit projects. The discretionary portion amounts to about 40 percent of the total and must go toward projects that lower greenhouse gas emissions or assist low-income areas." This means that a jostling crowd of local officials and organizations has formed to compete for the money, each making a pitch, according to a September 10 *Chronicle* article by Julie Cart. You can get a flavor of it at [www.sfchronicle.com/science/article/Greengroups-line-up-for-state-s-cap-and-trade-12186874.php](http://www.sfchronicle.com/science/article/Greengroups-line-up-for-state-s-cap-and-trade-12186874.php).

### Free speech comes to Berkeley

The People's Republic of Berkeley had another opportunity to show how well it tolerates political speech that does not hew to the far left's line, or maybe it's just looking for a fight — certainly the Antifa and Black Bloc folks, black-clad anarchists who show up to smash windows wherever they can find an excuse, as well as the BAMN (By Any Means Necessary) was getting ready, and the University already offers counselling to any student who finds his or her psyche disturbed by the presence of someone with differing

views. And for what? It appears a moderate conservative (not a bomb-thrower or provocateur) had been invited to speak. Riot police prepared.

And what happened? Order broke out. The police formed lines. Demonstrators milled about and chanted. A few people showed weapons and were arrested, but there was no storming of the city, no smashing of windows, and no tear gas.

It was pointed out that if the counter-demonstrators had stayed home no one would have noticed or cared about the speaker. Reminds me of what researchers discovered about British soccer hooligans: They go to soccer games entirely to participate in violence, and don't much care which team wins or loses the game.

But ... civility? Who'd have thunk it?

### **Are we rich yet?**

The Bay Area (San Francisco and four neighboring counties) now has the highest median income of the 25 largest metropolitan areas in the country, exceeding both New York (where finance is king) and Washington (where lobbying and bribery are the biggest industry). According to the *Chronicle*, "In the San Francisco metro area, where Salesforce, Oracle and Facebook are among the major employers, median income was estimated at \$96,677 in 2016 compared with \$88,518 in 2015, according to the new statistics. Were the Census Bureau to include Santa Clara County, home to Apple and Google, the numbers would be even higher: Median income in that smaller census division rose about \$9,000 over the past year to \$110,040.

"According to the Census Bureau, the national median income rose to \$59,039 in 2016, a 3.2 percent increase from 2015."

What's startling is that that \$100k figure is the median, not the average: as many people make more than that as make less. Goodness knows what the average would be. The highest incomes go to whites and Asians, while the lowest to blacks.

But is that enough? According to the Department of Housing and Urban Development, in San Francisco and San Mateo counties "[a] family of four with an income of \$105,350 per year is considered "low income," according to the *Mercury News*.

I look at my oldest son's family income and am astounded; who said kids today don't make more than their parents?

### **COMING EVENTS**

#### **Solar Decathlon 2017**

Oct 5-15, Denver, CO. [www.solardecathlon.gov](http://www.solardecathlon.gov)

#### **2017 Bridgestone World Solar Challenge**

Oct 8-15, Darwin to Adelaide, Australia. Go to [www.worldsolarchallenge.org](http://www.worldsolarchallenge.org)

#### **SAE 2018 Hybrid & Electric Vehicle Technologies Symposium**

Feb 20-22, San Diego-Mission Valley, CA. [www.sae.org/events/hybridev/](http://www.sae.org/events/hybridev/)

#### **WCX: SAE World Congress Experience**

April 10-12, Detroit, MI. <http://wcx18.org/>

#### **Movin'On, the international summit on sustainable mobility (successor to the Michelin Challenge Bibendum)**

May 30-June 1, Montréal. <https://movinon.michelin.com/en/>

#### **Intersolar North America 2018**

July 9-12, San Francisco. [www.intersolar.us/en/home.html](http://www.intersolar.us/en/home.html)

#### **SAE Range Extenders for Electric Vehicles Symposium**

Nov 14-15, Dearborn, MI. [www.sae.org/events/rex/](http://www.sae.org/events/rex/)

### **NOTICE ON DUES**

Annual dues are \$20 with electronic delivery of the Newsletter, or \$25 for a printed copy. Make checks payable to EEVC and mail to James Natale, 3307 Concord Dr, Cinnaminson NJ, 08077, or pay via PayPal to [www.paypal.me/EEVC](http://www.paypal.me/EEVC).

### **MEETING SCHEDULE**

Meetings are held in Room 49, Plymouth-Whitmarsh High School, 201 East Germantown Pike in Plymouth Meeting, PA, and begin at 7:00 p.m.

October 11

November 8

December 13