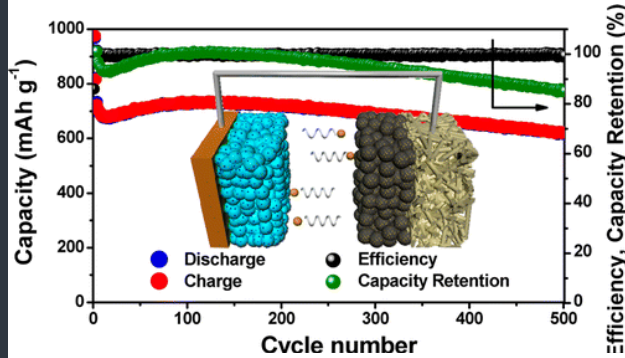


## Li-S

Lithium-sulphur batteries could become an excellent alternative to replace the currently used lithium-ion batteries due to their higher energy density and lower production cost; however, commercialisation of lithium-sulphur batteries has so far been limited due to the low cycle life problems associated with both the sulfur cathode and the lithium-metal anode. These new cells demonstrate a highly reliable lithium-sulfur battery showing cycle performance comparable to that of lithium-ion batteries; the design uses a highly reversible dual-type sulfur cathode (solid sulfur electrode and polysulfide catholyte) and a lithiated Si/SiO<sub>x</sub> nanosphere anode. The lithium-sulfur cell shows superior battery performance in terms of high specific capacity, excellent charge-discharge efficiency, and remarkable (for LiS) cycle life, delivering a specific capacity of ~750 mAh g<sup>-1</sup> over 500 cycles (85% of the initial capacity). These promising behaviors may arise from a synergistic effect of the enhanced electrochemical performance of the newly designed anode and the optimized layout of the cathode.



## Lithium-Sulphur Cells

Good news is coming from the battery front where researchers in South Korea and Italy announced a milestone for lithium-sulfur cells.

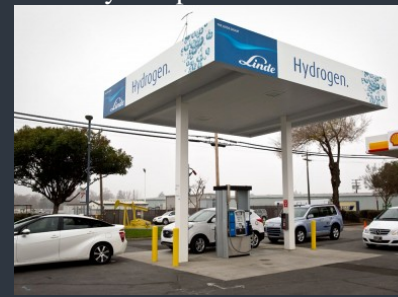
Their new Li-S cells, with energy density over two times higher than lithium-ion (**497 Wh/kg**), ran through 500 cycles with capacity remaining at about 85% (~750 mAh g<sup>-1</sup>).

We believe that the cycles themselves were low-current – there is a value C/3 (3 hours charging/discharging) mentioned in the article in the part about cathodes, which still would be not enough for a car, but efficiency is brilliant.

As this technology is cheaper to produce than other Lithium based batteries, the lower cycle life of approximately 500 cycles (equating to about 80,000km) may prove to be an economical alternative to LiFeP for EV use. You will just have to change your pack more often. LiS is also chemically safer and will not overheat nor catch fire.

## H<sup>2</sup> Highway

Quantum Fuel Systems Technologies Worldwide, Inc. a leader in natural gas storage systems, integration and vehicle system technologies, today announced the receipt of multiple orders from Linde North America, to develop and manufacture additional retail hydrogen fueling dispensers for the further development of hydrogen fueling infrastructure in California. The hydrogen dispensers are targeted to be delivered to and commissioned by Linde North America around the fourth quarter of 2015. This will augment the existing “Hydrogen Highway” system in California and upgrade the refuelling software and hardware that will allow the user experience to be increasingly friendly while enhancing accuracy and performance.



## Toyota Mirai



Toyota’s hydrogen fuel cell vehicle, the Mirai, (Japanese for Future), made its East Coast US debut at the Washington DC Auto Show where a senior executive called for government and industry stakeholders to help kick start the hydrogen infrastructure needed to make fuel cell zero emission vehicles available to more drivers. The all new Toyota Mirai has a range of up to 300 miles, takes about 5 min. to refuel and emits only water vapor. It will go on sale in the US later this year, but so far only in California where Hydrogen refueling infrastructure is available. The Mirai has an 115kW stack fed via two hydrogen containment cells that together hold about 5kg of hydrogen at 10,000 psi. Drive is via a synchronous AC unit capable of 151HP and 247 lb-ft of torque. Mirai will get you to 110mph using its single speed direct drive. A four-phase boost converter brings voltage to 650 volts, in line with Toyota’s existing Hybrid Synergy Drive system. A nickel-metal-hydride battery stores energy from the regenerative braking system and assists during acceleration. 8Yr 160K warranty. Price **US\$58,395 or \$499/Month**

## GolfBoard



If you are looking for that special gift for all the doctors in your life then the GolfBoard might just fit the bill.

Although its been around for a couple of years, the golfboard was voted best new product for 2014 by the PGA. This four-wheel-drive skateboard / snowboard style ride, with a flexible deck and two gear-drive motors, with what they're calling "posi-traction" has begun to take off. The board is set up to lock the wheels when stopped, so it won't wander off unattended. It's running 4" wide "turf tires", and lithium batteries. It has a range of 18 holes of play (which could be a big range, depending on how good a golfer you are), and recharges in an hour. It steers like a snowboard, and has a "unique" steering damper to prevent high-speed wobbles. Top speed is something like 12-14mph, depending on the model. Seems that some golf courses, particularly in US are pushing for motorised transport between holes to get more players through per day, some have already banned walking; thus the interest in this product. The price; starts at US\$6,500.

## Vulcan



I was having fun wandering around the recent Con-nect expo at the Melbourne exhibition Centre and was intrigued by the array of Drones, not toys but true UAV's (Unmanned Aerial Vehicles).

The one above is a Heavy Lift  
The Vulcan Cinematographic unit designed to carry HD movie cameras into action scenes to provide remarkable footage not previously available.

The Vulcan heavy lift is actually an Octocopter as it has full redundancy for drive motors – 2 per arm, as well as 4X22V 16AH battery packs and 8 speed controllers. As to why this unit is called a Heavy Lift, the UAV can carry payloads up to 15Kg. Speaking of payloads the Vulcan can be fitted with multispectral sensors, thermal or Night IR cameras, or even crop spraying equipment.

If you get tired of flying the UAV you can simply flick a switch and the Vulcan will hold station via GPS; or you can preprogram a sequence of waypoints that the A2 flight control system will autonomously follow. When the waypoint sequence is complete the UAV can either hold station or return to its takeoff point and perform a faultless landing; even deploying its retractable undercarriage as its coming in. This unit is not small – it measures 1.2m across the arms, and all up can weigh as much as 25Kg. BTW video is streamed direct from the UAV via a 5.8GHz link in HD. You can even control/watch via video goggles that carry telemetry information to see that all is well in UAV world. One thing; don't break it - RRP \$22,000

## The *SHAPE* of Things to Come?

### Chevrolet FNR



At last week's Shanghai motor show Chevrolet unveiled one of the most radical electric vehicles ever conceived. Chevy says the concept offers "a glimpse at the mobility of the future." It would be great if the future of electric cars were to look like this, all curves and angles and double-bubble cockpit and hollo-center wheels that are outrunner magnetic hubless wheels and high power recharge is done wirelessly to boot. Reading the press release describing the Chevrolet FNR concept is like perusing the spec sheet of a comic book hero's spaceship. Crystal laser head and tail lights? Yep. "Dragonfly" doors! A security system that uses an iris scanner to recognize the driver! Radical! Gesture control! – there is no steering mechanism because a roof-mounted radar and perimeter sensor "maps out the environment to enable driverless operation." And Chevy's Intelligent Assistant software chooses your route so you can just keep on texting. The front seats even swivel around to face the rear passengers while the car is in autonomous mode, so if you trust it, you can make long distance travel an enjoyable social activity. The FNR isn't going to be in your local showroom any time soon but it does point to the possibilities that are feasible in the next generation of EV's.

### This Month's Technology Review



It seems that Elcon not only supply light duty EV chargers, they have a several product ranges of 3, 5, 6, and 8KW. models in each range have Output DC Voltages from 48V to 312V nominal (417V Max) Available for various kinds of batteries chemistries like lead-acid, LiFePO4 battery etc., there units can be configured to charge using the via 10 preprogrammed algorithms. Equipped with a CAN communication interface they can communicate directly with

various BMS units. A bit heavy for an onboard charger at 20 to 30Kg, but you certainly could setup your own high speed DC home charger appliance, with 22 Amps available at 312Volts. See the range at <http://www.evassemble.com/>