Alternative Power Report

September 25, 2023

News on Alternative Power Sources

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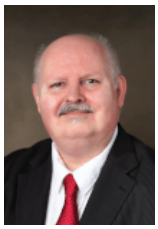
Moving from ICE To Alternative Power

As manufacturers continue to shift their equipment production from ICE to alternative power sources, they need the latest information. That's why analysts at Power Systems Research continue to revise our global data and forecasts to provide the freshest picture available.

Why Is California Building a Refueling Network for Hydrogen Cars Nobody Uses? Only 12,000 hydrogen cars on the road in California



By Guy Youngs, Forecast & Adoption Lead

California is essentially the only state in the USA that has any hydrogen cars to speak of, but even in that state, there are only about 12,000 of them on the roads. Despite this, the state intends to spend hundreds of thousands of dollars per year (or more) to build a refueling network for those vehicles.

California lawmakers are now debating how much money to pour into a fueling station network for hydrogen cars.

A lobbying group for suppliers and supporters of H2 includes Shell, Chevron and Toyota is aiming for a designated 30% of the Clean Transportation Program money, which would represent about $300 million spent over the next 10 years.

Today, there are only two H2-powered models available in California, the Toyota Mirai and the Hyundai Nexo. Of those, only 1,767 have been sold in the state. There has already been a 20% decline in sales from last year to this year, though the summer did see an uptick.

Source: *Hydrogen Fuel News* **Read The Article**

PSR Analysis: Hydrogen is a light and leaky gas that many worry should not be used for fuel, and especially not for domestic heating. You can find more information about this by searching for Michael Barnard's "hydrogen ladder." If you compare the growth of hydrogen v's EV chargers, there are accusations that the state is being asked to set up the refueling infrastructure while EV chargers were mostly established by private companies.

Editor's Note: This monthly report includes news and analysis about EV and alternative power sources such as batteries and fuel cells from analysts at Power Systems Research.

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Redesigned Zinc-Air Batteries 'Better' than Lithium, say Researchers

Researchers at Edith Cowan University in Australia have redesigned zinc-air batteries and have found the technology to be preferable to lithium-ion batteries – even for electric vehicles, and they claim to have overcome the technology's notorious power output limitations.

Zinc-air batteries consist of a zinc negative electrode and an air positive electrode. The chemistry holds promise and is significantly more sustainable than lithium-based counterparts, but the poor performance of air electrodes and short lifespan has limited the technology's power output.

However, the Edith Cowan team says it has made a breakthrough in the technology which has enabled engineers to use a combination of new materials, such as carbon, cheaper iron and cobalt based minerals, to overcome these issues.

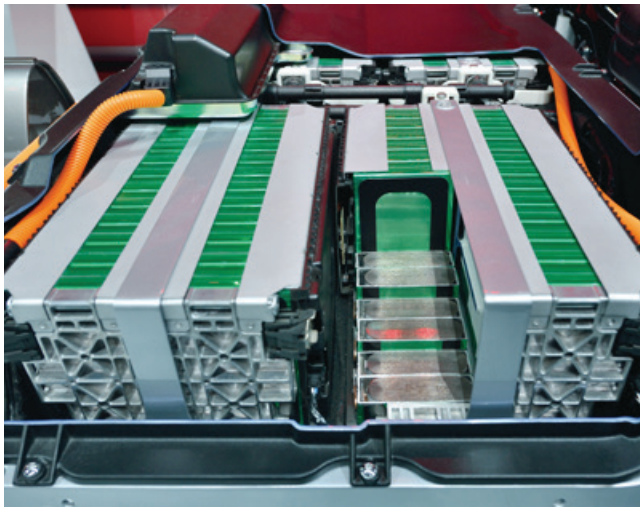
Source: *PV Magazine* **Read The Article**

PSR Analysis: Rechargeable zinc-air batteries (ZABs) have a higher energy density than lithium-ion batteries, meaning that they can store more energy in a smaller space. This makes them more efficient and capable of powering EVs for longer distances. They're also less expensive to produce than lithium-ion batteries, have a longer lifespan and are safer. The study is still in its early stages, but the Edith Cowan researchers are optimistic that it could lead to the development of commercially viable zinc-air batteries for EVs.

Black Mass, Black Gold, And the Truth About EV Battery Recycling

"Black mass" is a term used to refer to the residual compound formed by shredding of li-ion batteries that have reached the end of their usable life cycle. It is a huge task and challenge to recover the valuable cathode elements (lithium, nickel, manganese, and cobalt) entwined within the battery and upcycling them into usable battery materials.

RecycLiCo is among the first companies to turn that black mass into what is referred to as "black gold." They do this by recovering almost all of the cathode materials within black mass and upcycling them into battery-grade precursor cathode active material (pCAM) and lithium that can be used again in the battery manufacturing process.



Source: *CleanTechnica* **Read The Article**

PSR Analysis: EV detractors are quick to point out the massive cost of mining the battery metals (lithium, nickel, cobalt, and manganese) that make up the core of modern li-ion car batteries. This is a cost that may take tens of thousands of miles to get ahead of. But those detractors are missing a critical bit of information: battery recycling, and if it can be done effectively and in a low cost manner, it will go some way to alleviating the shortages of these materials.

Australian Mining — Can It Power All The New EVs?

Australia is already the largest exporter of lithium in the world and has the largest lithium mine in the world. Each quarter, the Australian government produces a report from the Department of Industry Science and Resources which discusses Lithium and most of the other minerals needed to support the EV revolution.

The report is 175 pages long and this article focusses on the sections dealing with copper, nickel, zinc, and lithium.

The worldwide EV battery supply chain relies heavily on China, which makes 75% of all lithium-ion batteries, and holds about 70% of cathode production capacity and 85% of anode output. And, over half of lithium, cobalt and graphite processing/refining capacity is located in China. As countries look to cut their dependency on Chinese imports and develop their own lithium and battery production, export opportunities will rise for Australian producers.

Source: *CleanTechnica* **Read The Article**

PSR Analysis: There is a lot of detail in this article, and even more in the Australian Government's report, but is does suggest that Australia can, and is ramping up mineral production to meet this demand. It also suggests that there is, as a result, a bright future for Australian mining.

Zepp Gets Financial Boost To Build State-of-the-Art Fuel Cell Systems Factory

Dutch company Zepp.Solutions, one of Europe's leading hydrogen fuel cell system suppliers, has secured €1.98 million ($2.16 million) grant funding from the European Just Transition Fund (JTF) to develop a cutting-edge fuel cell systems factory in the Netherlands.

Zepp's goal is to speed up the energy transition and foster reliance in the labor market with support from the Ministries of Economic Affairs and Climate and Social Affairs and Employment, and the municipalities in the Dutch Greater Rijnmond area.

Once operational, the fuel cell systems factory will allow Zepp to produce 1,000 systems every year. This scale up in production is expected to result in the creation of an estimated 100 sustainable jobs in the region's hydrogen sector.

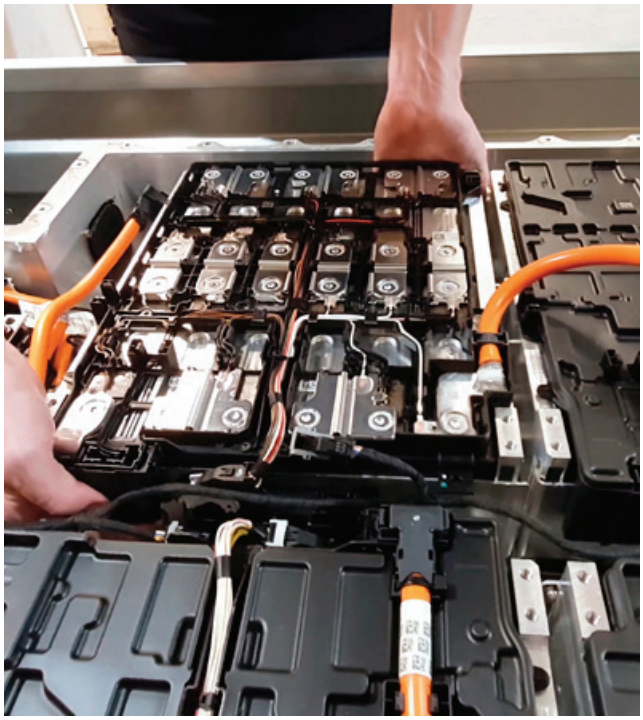
Source: *Hydrogen Fuel News* **Read The Article**

PSR Analysis: Zepp is a small, relatively new (founded in 2017) fuel cell company who over several turnkey fuel cells and were present at the recent World Hydrogen show in Rotterdam in May of this year. There, solutions were impressive, with one model on display giving 150kw of power.

Daimler's RIZON Electric Truck Feels like Driving a Car

Daimler recently launched a class 4-5 medium-duty electric truck brand, RIZON, and Electrek got a chance to kick the tires and drive one around. They were impressed at how well it drives (for an 18k GVWR vehicle) and how comfortable it feels like it would be on long shifts.

Rizon is a new brand from Daimler Trucks focusing entirely on zero-emissions in the class 4-5 space. Trucks of this size don't require commercial driver's licenses, and you're more likely to see them around your neighborhood, doing



local delivery tasks, equipment rentals, moving businesses, and the like. So, it's nice to have clean, quiet operation instead of noisy and stinky diesel vehicles.

Rizon says that the trucks will "usually spec out in the $150k range." This is more expensive than the diesel trucks they replace, but government incentives are available to get that price down by quite a bit – with up to $40,000 in incentives from the Inflation Reduction Act and additional incentives available in some states like California. And of course, you save money on fuel and maintenance over the duty period.

Source: *Electrek* **Read The Article**

PSR Analysis: This truck represents a nice step forward for medium-duty commercial vehicles, with smooth and quiet operation, a focus on providing a BEV for local area commercial deliveries, and significant focus on driver comfort which should make this an easy sell for drivers and fleet operators.

The Hydrogen Stream: Hydrogen Buses Less Efficient than Battery Models

Eurac Research scientists have analyzed data from 21 fuel cell electric buses (FCEB) and battery electric buses (BEB) in Italy, comparing efficiency, consumption, temperature

sensitivity, distances, and cost, and they discovered that Hydrogen buses' tank-to-wheel (TTW) efficiency is lower than battery electric buses, indicating higher consumption variation for BEBs.

Source: *PV Magazine* **Read The Article**

PSR Analysis: This is a very short article from Eurac (an Italian research organization founded in 1992) which confirms that FCEV (buses specifically) are less efficient than EVs. However, the report doesn't look at the efficiency of the fuel generation process (raw material to fuel tank/battery) which would magnify the result, and the report doesn't look at the source of the fuel (over 90% of hydrogen is currently not green).

Two New Approaches To Wind-Powered Ships

Ships haven't had sails for generations, but the idea is gaining new supporters as shipping companies work to lower their carbon emissions.

Globalization has spawned a tremendous increase in the number of ships crossing the world's oceans. Ships the size of small cities haul thousands of containers and tankers as large as aircraft carriers transport millions of gallons of oil from one continent to another. Many of them run on bunker oil — a gelatinous mass of whatever is left over after the refining process is over. The stuff is so thick, it needs to be heated in order to flow and when it is burned, it leaves behind sulfurous clouds of carbon dioxide so thick they can be tracked by satellites.

The shipping industry agreed in July to reduce its greenhouse gas emissions to net zero "by or around, i.e., close to, 2050."

Source: *CleanTechnica* **Read The Article**

PSR Analysis: With global shipping contributing around 3% of all carbon emissions, ideas like these can deliver between 10% and 40% reduction in shipping's carbon emissions, saving the shippers money and reducing emissions at the same time – a "win-win" situation. However, they must be proven, and this takes time and investment.

A Final Note

How the world's biggest **EV battery gigafactories** are being built so quickly– **Click Here**… **Fraunhofer ISE** integrates solar cells into car hood– **Click Here**… The case for **hard carbon-based sodium-ion batteries**– **Click Here**… **Aluminum** shows promising performance for safer, cheaper, more powerful batteries– **Click Here**. **PSR**

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