

Alternative Power Report

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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.

Liebherr Hydrogen Excavator Leads BAUMA Innovation Award Winners

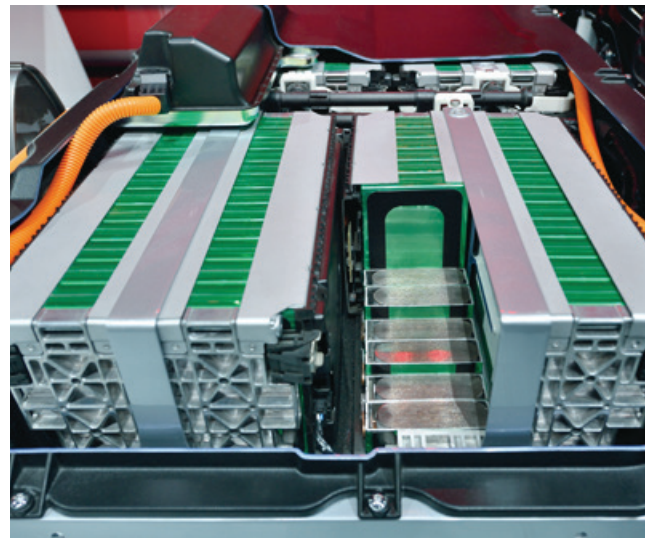
First Liebherr Hydraulic Excavator To Be Powered by Hydrogen Engine

iVT was a major winner at Bauma in Munich when it was recognized in the hotly contested Climate Protection category in the Bauma Innovation Awards. The hydrogen-combustion machine is the first ever Liebherr hydraulic excavator to be powered by a hydrogen engine

The machine's prime power source is the H966 hydrogen combustion engine, which has six cylinders and uses port fuel injection (PFI), which Liebherr employs along with direct injection (DI) for its hydrogen engines

The other four lucky winners who received their accolades Oct. 23 were:

- MiC 4.0, which won in the Digitalization category for its Machines in Construction, which creates one common digital language for construction sites;
- Herrenknecht AG, which earned the prize in the Mechanical Engineering category for its continuous advance tunnelling machine, which can speed operations by 1.6x.



Editor's Note: This material has been reproduced from the Alternative Power Report, written by Guy Youngs which appeared in the November 2022 issue of PowerTALK News. The monthly feature includes news and analysis about EV and power sources such as batteries and fuel cells.

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- Holcim (Germany) GmbH, which narrowly led the field in the Construction category with its new, hugely versatile, patent-pending building material, CPC (Carbon Pre-stressed Concrete)
- Research, Freiberg University of Mining and Technology Mechanical Engineering Institute, won with their Deep Sea Sampling technology – a way to facilitate the mining of sea-bed minerals and resources, with minimal environmental impact.

Source: *iVT International* [Read The Article](#)

PSR Analysis: What is interesting about this award is that it is another example of hydrogen powered machines in our industry. The H966 hydrogen combustion engine is said to match an equivalent diesel machine in power, dynamics and responsiveness, so that an operator will notice no difference. The engine has six cylinders and uses port fuel injection (PFI), which Liebherr employs along with direct injection (DI) for its hydrogen engines.

JCB Unveils Mobile Hydrogen Refueller

JCB has unveiled a mobile hydrogen refueller which it says will allow on site refueling of hydrogen powered machines in the same way that fuel bowsers are used for diesel powered equipment.

The mobile hydrogen refueller is designed to provide an easy way for customers to refuel machines, the vast majority of which have fuel delivered to them while working on site, said the company. JCB said customers are already used to a transportable fuel system.

Source: *International Rental News* [Read The Article](#)

PSR Analysis: A huge number of construction sites and mining sites already deliver fuel to their machines, and this truck concept is a vital part of the hydrogen infrastructure to enable machines using either fuel cells or Hydrogen ICEs to operate. Infrastructure like this is a great enabler for hydrogen machines.

Massive Hydrogen Fuel Truck To Help Decarbonize Mining Industry

A new hydrogen fuel truck is being tested by the mining industry in hopes of helping to decarbonize activities that have been exceptionally challenging to mitigate.



The mining industry contributes 7% of the world's total carbon emissions per year, (according to McKinsey). This represents more than twice the carbon emissions from the global shipping industry, for example.

The hydrogen-powered vehicle is meant to replace typical mining haul vehicles, which pollute heavily.

Source: *Hydrogen Fuel News* [Read The Article](#)

PSR Analysis: The mining industry is taking significant steps toward reducing carbon emissions with the introduction of hybrid-electric, electric, and hybrid-fuel cell vehicles, and this is another step towards this goal. Haul trucks contribute approximately half of all mining carbon emissions (or about 3.5% of global emissions), and trucks of this size can use 0.9 million liters of diesel a year, so some significant savings can be made.

New 50-Ton Battery-Powered Electric Crane

The 653 E Electro Battery from Sennebogen was developed with Dutch dealer Van den Heuvel, and is a new 50-ton battery-powered electric crane. "The new 50-ton battery-powered crane combines the benefits of battery technology with the proven advantages of the telescopic crawler crane design," the company writes. "This means you work completely emission-free and retain maximum flexibility, thanks to the Dual Power Management system."

With a 210 kWh battery, the crane is expected to be able to operate for up to 14 hours.

Source: *CleanTechnica* [Read The Article](#)



PSR Analysis: In Europe there are growing emissions regulations with increasingly stringent requirements, especially in cities, for heavy-duty machinery like cranes, just like there are for passenger cars. While the market for cranes isn't huge in unit terms, especially when compared to Passenger Cars, this is another example of how the industry is moving forward to meet emissions regulations.

World Needs To Mine 25× More Lithium By 2050

The de-carbonization of the transport industry is heavily dependent on the scaling up of electric vehicle production rapidly and massively, and this rests on scaling up battery mineral mining and refining. This means Lithium.

Benchmark Mineral Intelligence is aware of 40 lithium mines that have been in operation and are producing lithium in 2022. But, by 2050, the company sees a need for 234 more lithium mines if there's no battery recycling underway (which, of course, is completely unrealistic but is a place to start from for such an analysis).

“The long term path for lithium is set, yet the supply chain scaling challenge has just begun,” said Simon Moores, chief executive of Benchmark. “What this data shows is that we are at just the beginning of a generational challenge, not one that's going to be solved in the 2020s.”

Source: *CleanTechnica* [Read The Article](#)

PSR Analysis: Benchmark predicts that by 2032 more Lithium will need to be mined per year than was produced in the years 2015 to 2022. This means more mines are needed (with resulting capital investment) and recycling needs to be ramped up significantly. In fact, Benchmark forecasts that in 2040, nearly 20% of lithium chemicals will be produced from recycled batteries or process scrap.

Benchmark Mineral Intelligence actually sees stationary energy storage as the main driver of demand by that time — two-thirds of the 11.2 million tons expected to be needed by 2050, so the market will need to shift towards non-lithium energy storage (such as Flow Batteries and other novel technologies) for grid support and peak shaving.

US Increases EV Battery Recycling Capacity at New AL Facility

A new EV battery recycling plant in Alabama from Li-Cycle, has just come on line. It can process up to 10,000 tons of battery waste per year, enough for about 20,000 EVs per year, and helps the US venture toward a zero-emission economy.

Li-Cycle's processing method is specifically designed as a two-part system recycling battery manufacturing scrap and turns end-of-life batteries into a black mass. The black mass is then processed and used to generate battery minerals such as nickel sulfate, lithium carbonate, and cobalt sulfate, three of the most critical factors for EV batteries. According to the battery recycling company, Li-Cycle believes its new method will enable up to a 95% efficiency rate compared to the industry average of 50%.

More importantly, Li-Cycle's processing method creates a safe way of recycling lithium-ion batteries without any landfill waste while reducing carbon emissions.

Source: *Electrek* [Read The Article](#)

PSR Analysis: As automakers are moving swiftly to lock up critical battery materials, the world needs much more lithium to meet demand. Demand is expected to exceed 11.2m tons of lithium per year by 2050. With battery recycling technology advancing, and investment starting to flow, plants like these will help ease this transition to electric vehicles, but if this emerging trend doesn't continue, there is little prospect of meeting lithium demand.



Penn State Offers Smaller, Faster Charging Batteries

Researchers at Penn State say they have found a way to make batteries for electric cars that can be smaller and faster charging.

“The need for smaller, faster-charging batteries is greater than ever,” said Chao-Yang Wang, the lead author of the research study that was published in the October 12 issue of the journal *Nature*. “Our fast-charging technology works for most energy dense batteries and will open a new possibility to downsize electric vehicle batteries from 150 to 50 kWh without causing drivers to feel range anxiety,” said Wang.

Batteries operate most efficiently when they are hot, but not too hot. Keeping batteries consistently at just the right temperature has been a major challenge for battery engineers. Historically, they have relied on external, bulky heating and cooling systems to regulate battery temperature, but they respond slowly and waste a lot of energy. The team decided to regulate the temperature from inside the battery. The researchers developed a new battery structure that adds an ultrathin nickel foil as the fourth component besides the anode, electrolyte, and cathode. The nickel foil self-regulates the battery’s temperature and reactivity which allows for 10 minute fast charging on just about any EV battery.

Source: *CleanTechnica* [Read The Article](#)

PSR Analysis: Reducing battery packs for electric cars conserves precious resources such as Lithium, which are currently seeing massive price increases and experiencing a potential shortfall in the not too distant future. Smaller, faster charging batteries will dramatically cut down battery cost and usage of critical raw materials such as cobalt, graphite, and lithium, enabling mass adoption of affordable electric cars.

While fast charging is certainly desirable, the elimination of bulky and expensive liquid cooling systems for battery packs could be just as important because it would help lower the cost of electric cars. It could also give a boost to battery swapping, which is being promoted by NIO, CATL, and BYD, because there will be no coolant lines to connect and disconnect. Battery swapping is fast, and it eliminates owner concerns about battery degradation.

Miners Cut CO2 Emissions by Switching To EVs for Extracting Minerals

A new contract to supply battery electric vehicles to the Jansen potash project (potentially the world’s largest potash mine) expects to cut carbon emissions in half compared to its peers. BHP’s Jansen potash project is expected to be the largest of its kind, with initial capacity forecasts of 4.3 to 4.5 Mtpa. Potash is the most commonly used potassium fertilizer, but over 70% is based on conventional underground mining that uses heavy-duty equipment to extract it. Although underground mining releases half the CO2 emissions of open-pit mining, the company is reducing emissions further by introducing several battery electric vehicles.

Source: *Electrek* [Read The Article](#)

PSR Analysis: Almost every automaker plans to scale production of its electric vehicles to meet the growing demand for zero-emission cars, and these numbers are huge. However, getting to these numbers will require mining and traditionally this causes carbon emissions.

A few companies have already begun working to build a sustainable EV supply chain; Snow Lake Lithium outlined its plans in February to develop the world’s first all-electric lithium mine, one of the most critical minerals used to build EV batteries. The mining company’s CEO said at the time if you are going to mine for these resources that will be used to protect the environment, then obtaining them must also be done in a sustainable matter.

Miners using electric vehicles can significantly reduce the heat and carbon exposure they typically experience with diesel-powered equipment. EV mining technology can also cost less as it requires less ventilation and cooling. The importance of this is that as the auto industry transitions to electric vehicles, companies are figuring out ways to reduce carbon emissions. If miners get on board, this will create a completely sustainable EV supply chain. **PSR**



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