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## Lithium battery developments step forward for electric vehicles, more

A team of scientists at the U.S. Department of Energy's Pacific Northwest National Laboratory has created a lithium-metal battery that lasts for 600 cycles, far longer than other reported results. It can be fully charged and discharged 600 times before it dies.Researchers have increased the lifetime of a promising electric vehicle battery to a record level, an important step toward the goal of lighter, less expensive and long-lasting batteries for future electric vehicles. These batteries are seen as an important part of the solution to reduce the effects of climate change, and scientists are exploring a dizzying array of options.

One solution on the horizon is a lithium-metal battery for electric vehicles. These batteries hold almost twice the energy of their widely used lithium-ion counterparts, and they're lighter. That combination offers the enticing prospect of an electric vehicle that would be lighter and go much farther on a single charge. The problem has been lithium-metal batteries in the laboratory have been plagued by premature death and last only a fraction of the time of today's lithium-ion batteries.

It's a big step forward for a promising technology, but lithium-metal technology is not yet ready for commercial use. While the lithium-ion batteries used in electric vehicles today hold less energy and last at least 1,000 cycles. Vehicles won't go as far on one charge as they would with an effective lithium-metal battery.The research was done through DOE's Innovation Center for Battery500 Consortium, a multi-institution effort led by PNNL to develop electric vehicle batteries that are lighter, more energy intensive and less expensive than those currently used. PNNL leads the consortium and is responsible for integrating the latest advances from partner institutions into devices known as high-energy pouch cells and demonstrating improved performance under realistic conditions.

## Lithium metal: thin strips of lithium translate to longer lifetime


The PNNL team found a way to increase the battery's lifetime by taking a surprising approach. Instead of using anodes with more lithium, the team used incredibly thin strips of lithium, just 20 microns wide, far thinner than the width of a human hair.

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The lithium-metal battery created by the Battery500 team has an energy density of 350 watt-hours per kilogram (Wh/kg). The value of the new findings has more to do with the battery's lifetime. After 600 cycles, the battery retained 76 percent of its initial capacity.

Just four years ago, an experimental lithium-metal battery could operate for 50 cycles. That has increased rapidly; two years ago the PNNL team achieved 200 cycles—and now 600. Moreover, the PNNL battery is a pouch cell, which more closely mirrors real-world conditions than does a coin cell, a less realistic type of device used in many battery research projects.It's an important issue, especially in realistic batteries like pouch cells, where the amount of electrolyte available is 20 to 30 times less than that used in experimental coin cells.

Consider how a frying pan gradually builds up a layer of grease if not cleaned thoroughly after each time it is used. Over time, the layer builds up and acts as a barrier, reducing the flow of energy and making the surface less effective. In the same way, an unwanted, dry SEI layer prevents the effective transfer of energy needed inside a battery.

The progress on lithium-metal batteries has been substantial and the goal is to increase the amount of energy packed into a long-duration, safe, affordable battery. More energy per pound of material translates to a lighter vehicle that can go farther on one charge. Today's electric vehicle batteries are in the neighborhood of 200-250 Wh/kg; Battery500 is aiming for a cell level of 500 Wh/kg.

"The Battery500 Consortium has made great progress in increasing the energy density and extending the cycle life," said Distinguished Professor M. Stanley Whittingham of Binghamton University, the 2019 Nobel Prize laureate in chemistry and a co-author of the paper. "But much more needs to be done. In particular, there are safety issues with lithium-metal batteries that must be addressed. That's something that the Battery500 team is working hard to resolve."

## World's largest Wind Turbine

MingYang Smart Energy has released details of a huge new offshore wind turbine, with the Chinese company aiming to install a prototype in 2023 before starting commercial production the year after.With a height of 264 meters (866 feet), a rotor diameter of 242 meters and a blade length of 118 meters, the scale of the MySE 16.0-242, as it's known, will be considerable.In a statement at the end of last week, MingYang said the turbine would have a capacity of 16 megawatts and be able to produce 80,000 megawatt hours of electricity per year, which it claimed would be enough to power over 20,000 households.

MingYang is one of several companies attempting to scale-up the size of offshore wind turbines. GE Renewable Energy's Haliade-X turbine, for example, will have a tip-height of 260 meters, 107-meter long blades and a 220-meter rotor.Its capacity will be able to be configured to 12, 13 or 14 MW. A prototype of the Haliade-X, in the Netherlands, has a tip-height of 248 meters.

Elsewhere, Vestas has revealed plans for a 15 MW turbine, while Siemens Gamesa Renewable Energy is working on a 14 MW model, the SG 14-222 DD, which can also be boosted to 15 MW if required.As technology develops, the size of turbines is increasing. In a report published earlier this year, industry body WindEurope said the average rated capacity of turbines installed in Europe last year was 8.2 MW, a 5% increase on 2019. Capacity refers to the maximum amount a turbine can produce, not necessarily what it's currently generating.

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China remains heavily reliant on fossil fuels but it is also becoming a powerhouse in offshore wind. According to data from GWEC Market Intelligence, China installed more than half the planet's offshore wind capacity last year. With the scale of both turbines and offshore wind farms increasing, attempts are also being made to gain insight into how they interact with the marine environment. A £7 million ($9.58 million) research program called ECOWind was launched in a bid to expand knowledge on the issue.The four-year initiative is being headed up by the U.K.-based Natural Environment Research Council in partnership with The Crown Estate and the U.K. government's Department for Environment, Food and Rural Affairs.

In a statement The Crown Estate, which is owned by the Queen and manages a huge portfolio of land, said ECOWind would "fund leading edge research into how offshore windfarms affect the marine environment alongside other growing pressures on UK ecosystems including climate change and human activities such as fishing."Susan Waldron, who is the NERC's director of research and skills, added that the collaborative program would "analyse the ecological consequence of large-scale expansion of offshore windfarms to inform future policy decisions throughout UK waters."

## Department News

**Congratulations.**

Soorya Narayan (2016-20) Mechanical batch has awarded the prestigious United Kingdom Commonwealth Scholarship and Fellowship Plan Scholarship, which will cover all fees, to-and-fro travel, visa expenses and also provide monthly stipend, worth over Rs 3.5 million, during the 12 months Masters programme and research to be undertaken at Newcastle University from September 2021.

Commonwealth Scholarships are given to talented individuals with the potential to make a positive impact on the global stage. This historic award is the UK's primary scholarship scheme focused on supporting British international development goals. It is designed to attract outstanding talent to UK universities whilst also supporting sustainable development overseas.

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Team ASTRA represented our college in the SAE BAJA 2021 event organized by SAEINDIA under the aegis of Chitkara University, Chandigarh (21-25 April 2021. The event was conducted in virtual mode in view of the ongoing COVID19 pandemic.

BAJA SAEINDIA 2021

Congratulations to Mr. Joel C Koshy for earning top position in the 2021 batch by securing a cumulative GPA of 9.58.

Congratulations to Mr. Sreekanth S for securing first rank in M.Tech (Thermal Engineering) from among the colleges in the Pathanamthitta& Alappuzha cluster of the APJ Abdul Kalam Technological University for the academic year 2020-'21 with a cumulative GPA of 9.65.