

Study outlines supply chain challenges for lithium future

September 24 2012

(Phys.org)—As demand increases for lithium, the essential element in batteries for everything from cameras to automobiles, a researcher at Missouri University of Science and Technology is studying potential disruptions to the long-term supply chain the world's lightest metal.

Although the current dominant battery type for hybrid electric vehicles is nickel metal hydride, lithium-ion [battery technology](#) is considered by many to be the "power source of choice for sustainable transport," says Ona Egbue, a doctoral student in engineering management.

"[Lithium batteries](#) are top choices for high-performance rechargeable battery packs," Egbue says. "Batteries make up 23 percent of lithium use and are the fastest growing end use of lithium."

With nearly a dozen different kinds of electric vehicles on U.S. roads this year, more drivers are getting behind the wheel of vehicles powered by advanced lithium power packs.

"A combination of high [fuel costs](#), concerns about petroleum availability and air quality issues related to fossil fuel-based vehicles are driving interest in electric vehicles," says Egbue. "However, there are issues associated with the present supply chain of raw materials for battery production, particularly the security and supply of lithium."

The U.S. is a major importer of lithium. The majority of known lithium reserves are located in China, Chile, Argentina and Australia. Together

these regions were also responsible for more than 90 percent of all lithium production in 2010, not including U.S. production.

"More than 90 percent of lithium reserves - what is economically feasible to extract - are in just four countries," Egbue says. "The geopolitical dynamics of this distribution of lithium supplies has largely been ignored."

Due to political instability, there is a question of U.S. access to materials produced in Bolivia, which holds the world's largest lithium resource and has new production projects in the pipeline, she says.

"The diplomatic relationships between the U.S. and Bolivia had deteriorated during the Evo Morales administration, leading to the dismantling of key partnerships," Egbue adds.

In addition, the emergence of lithium as a strategic resource and the associated geopolitics is troubling, she says.

"As China has demonstrated in recent years with rare-earth elements, a major raw material for [nickel-metal hydride](#) batteries, a country that supplies a resource can greatly affect the country that receives the resource," Egbue says. "China, which controls more than 95 percent of global rare-earth elements supply, recently made a decision to restrict its export quota of this raw material, causing a significant increase in prices. This action by China highlights the risks of global dependence."

Egbue has developed a [supply chain](#) model for lithium that demonstrates the connection between supply and demand and provides a framework with which to investigate the technical, geopolitical and economic factors that could potentially impact the supply of [lithium](#) for [electric vehicles](#). She is working on the research with her advisor, Dr. Suzanna Long, assistant professor of engineering management and systems

engineering at Missouri S&T. Her findings are published in the *Engineering Management Journal's* special issue on transportation management this month.

Provided by Missouri University of Science and Technology

Citation: Study outlines supply chain challenges for lithium future (2012, September 24)
retrieved 24 April 2024 from <https://phys.org/news/2012-09-outlines-chain-lithium-future.html>

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