

Senate Committee on Energy and Natural Resources

Hearing on Opportunities and Challenges in Deploying Innovative Battery and Non-Battery Technologies for Energy Storage

Hearing Highlights

Chairman Joe Manchin (D-WV) outlined the agenda for the hearing stating that they would be discussing the challenges and opportunities in deploying innovative battery storage. He spoke about the need for innovative battery storage technologies to meet our energy storage needs without having to rely on traditional battery technologies, most notably lithium-ion batteries. He argued that depending solely on lithium-ion batteries for our energy storage needs leaves the U.S dependent on China as China is responsible for 75% lithium-ion battery production, 60% of the world's cathode production and 80% of the world's anode production. He discussed the need to rely on and develop other battery technologies such as solid-state batteries and non-battery technologies that can be produced domestically.

Ranking Member John Barrasso (R-WY) spoke about the need for long-term energy storage technologies that could reduce U.S. dependency on China for the critical minerals necessary for traditional energy storage. He additionally called for mining regulation reform to increase domestic production of critical minerals and criticized the Biden administration for being hostile towards the mining industry.

Chairman Manchin asked **Mr. Spencer Nelson** who serves as a Managing Director for Renewable Energy Development for Pacific Corp and **Mr. Ted Wiley** who serves as the President and CEO of Form Energy to discuss how the Solar Investment Tax Credit and the Inflation Reduction Acts tax credits have been spurring development in the energy storage industry. Mr. Nelson and Mr. Wiley both agreed on the importance of the tax credits and incentives to encourage investment into the industry and to allow early-stage firms to scale operations. Mr. Nelson discussed the importance of politically sustainable tax incentive policies given the long timelines for research and development in the energy storage industry.

Chairman Manchin asked **Mr. Tim Hemstreet** who serves as a Managing Director for Renewable Energy Development for PacifiCorp if the permitting process surrounding hydropower pump storage needed to be updated to reflect the US' expected increased energy needs. Mr. Hemstreet agreed and argued that the current licensing process for hydropower pump storage was overly burdensome and needed to be streamlined to meet future consumer electricity demand.

Ranking Member Barrasso asked why Pacific Corp was pursuing pump storage hydropower. Hemstreet spoke about the importance of pump storage hydropower as a backup energy source as other renewable resources renewable ramps up. He asked about the licensing process through the Federal Energy Regulatory Commission (FERC). Mr. Hemstreet answered that the licensing process through FERC takes seven to ten years and called for regulatory reform to expedite the process. Ranking Member Barrasso discussed the plans that Pacific Corp and TerraPower have to build an atrium reactor in Wyoming that would include a liquid salt-based energy storage system and then asked Wiley how this project would benefit Wyoming and their neighboring states. Mr. Hemstreet answered that it would be the firms partnering the project to meet customer's energy needs even if demand rises or other forms of energy production dip temporarily. The Ranking Member then asked how a liquid salt-based energy storage system compares to other battery storage systems. Mr. Hemstreet responded that the storage system is integrated fully in the plant which allows the plant to meet customer's needs.

Ranking Member Barrasso continued by asking the three witnesses to comment on the public safety concerns with the use of lithium-ion batteries. Mr. Hemstreet prefaced his response by stating that he wasn't too well informed on the issue and went on to argue that diversity in sources of energy production and storage was crucial for a robust system. **Mr. Nelson** pointed out the pitfalls in using lithium-ion batteries for grid scale energy storage and called for alternatives forms of large-scale energy storage to be considered. **Mr. Wiley** promoted his firm's energy battery storage product, Iron Air, and spoke about how safety was a key concern in the development process.

Senator Martin Heinrich (D-NM) asked the witnesses to discuss the importance of setting politically sustainable tax policy incentives and the impact of the decadal tax incentives included in the Bipartisan Infrastructure Bill. Mr. Wiley spoke of the importance of long-term tax incentives to ensure that firms feel confident in scaling their operations and investing in R&D without worrying if their business plan would no longer be viable because a new administration came into office.

Senator Heinrich then asked the witnesses what advice they would give the Treasury Department as they begin to develop regulations regarding 45X battery manufacturing credits and 48c advanced manufacturing credits. **Mr. Hemstreet** answered that he would advise Treasury to consider all parts of a pump storage project as part of that energy storage facility. Mr. Hemstreet added that this would allow the firm to pass on cost savings to consumers. **Mr. Nelson** argued for strong private sector engagement with Treasury to maximize transparency and to ensure that firms are operating with full information. **Mr. Wiley** advocated for broad interpretations of the technologies included in the tax credits and clear definitions of guidelines and standards.

Senator Bill Cassidy (R-LA) asked **Mr. Nelson** to comment on whether he believed that alternative forms of energy storage would be crowded out of the market by lithium-ion batteries. Mr. Nelson acknowledged the risk of that occurring and praised the Department of Energy programs that help fund the research and development of innovative energy storage technologies.

Senator Cassidy then asked Mr. Nelson to comment on the problems with integrating battery energy storage to the existing electrical grid. Mr. Nelson responded that that a pre-analysis review is conducted prior to a battery energy storage project is connected to the electrical grid. Senator Cassidy and Mr. Nelson discussed the problems arising from a long interconnection queue given the expected increased demands on the electrical grid as states phase out gas powered cars. He asked for Mr. Nelson if California was on track to have the capacity to deal with a significant increase in electrical car ownership by 2035. Mr. Nelson responded that they currently weren't on track to meet that expected demand because of burdensome state regulation that slows down the process of connecting energy storage batteries to the electrical grid.

Senator Mazie Hirono (D-HI) asked Mr. Nelson how energy storage technologies can help Hawaii meet their goal to run on 100% renewable energy by 2045. Mr. Nelson responded that the development and deployment of long duration energy storage technologies such as metal air batteries or flow batteries were key for Hawaii to hit its goal.

Senator Hirono then asked **Mr. Wiley** about the viability of Form energy's Iron Air batteries and proposed the University of Hawaii's Natural Energy Institute as a potential test site. Mr. Wiley confirmed that his firm's batteries had over a hundred hours of storage and answered that Form Energy was currently identifying potential test sites.

Senator Hirono continued, asking **Mr. Nelson** about the role that long-term energy storage can play in the development of microgrids, which help deliver power if the main grid is out of commission due to a severe weather event. Mr. Nelson spoke about the promise that microgrids have been showing in Alaska, Maine, and Hawaii. He additionally added that it would be crucial for energy storage to have Black Start capabilities in order to potentially integrate into a microgrid.

Senator Lisa Murkowski (R-AK) asked Mr. Nelson and **Mr. Wiley** about the possibility of using long term battery storage technology in remote locations in Alaska. **Mr. Nelson** doubted the feasibility of 100-hour battery storage systems in remote locations in Alaska due to environmental concern. **Mr. Wiley** was optimistic about the viability of the Iron Air system in extreme cold conditions and spoke about how they designed the system with extreme weather conditions in mind as an energy firm in Minnesota was one of their first clients.

Senator Murkowski discussed the difficulties in incorporating energy storage technologies into the existing grid and highlighted that the current domestic production of lithium and other critical minerals isn't enough to meet future expected consumer demand. She then called for the permitting process for the integration of these long-term energy storage technologies into the power grid to be expedited.

Senator August King (I-MA) asked Mr. Wiley about the disadvantages of the Iron Air batteries. Wiley responded that his firm's design plan was to trade price for efficiency, so while Iron Air batteries are 50% efficient compared to lithium-ion batteries (which are 95% efficient) they're much less expensive.

Senator King also discussed regulation reform in the pump storage space and in terms of liberalizing lithium mining in the US. He argued that the reliance on foreign [contentious] nations for critical supplies represented a significant concern and then stated that the U.S. is currently not at capacity for lithium production, but it should move into doing so.

Senator Steve Daines (R-MT) discussed how China currently controls 31 of the 50 minerals of the 50 minerals designated as critical by USGS and criticized environmental regulations that limit mining operations in the U.S. Senator Daines then asked **Mr. Hemstreet** how the U.S. could close the critical mineral gap with China. Mr. Hemstreet explained that China doesn't produce many of the minerals it controls and simply processes them, thus expanding domestic production and processing capacity as well as encouraging allied "initial source" nations such as Australia and Canada to steer away from sending critical minerals to China for processing would help combat the current deficit.

Senator Cortez-Masto (D-NV) asked the witnesses whether standard and emerging energy storage technologies could work alongside each other. **Mr. Nelson** responded that the technologies could work in tandem as they often fulfill different roles for a power grid. Mr. Nelson explained that a lithium-ion battery is an excellent option when responding to a power fluctuation or dealing with voltage regulation while a long-term energy storage technology is better for seasonality issues. **Mr. Wiley** discussed the importance of having both on hand in the context of a grid reliant on renewable energy. **Mr. Hemstreet** spoke about how both having allows utility firms to maintain reliability for their clients.

Senator Cortez-Masto (D-NV) asked what steps need to be taken for the US workforce to be ready to work in the long-term energy battery industry. **Mr. Wiley** called for incentives and training programs to be put in place to incentivize students to join the industry and to retrain the existing workforce, so they have the skills to work in the industry.

Senator John Hoeven (R-ND) asked the witnesses how long-term energy storage can help stabilize the power grid. **Mr. Hemstreet** answered that having deployable long term energy

storage technologies will help stabilize the power grid as renewable energy sources that are occasionally prone to seasonality issues are used more frequently for power generation.

Senator Cindy Hyde-Smith (R-MS) discussed an initiative in Mississippi seeking to develop a clean hydrogen energy and production hub and asked **Mr. Nelson** about the prospect of hydrogen battery energy storage. Mr. Nelson responded saying that technology showed promise in absorbing excess power produced from traditional and renewable source. Senator Hyde-Smith additionally discussed the need for increased production and processing of critical minerals in the U.S. and asked Mr. Nelson to comment on the issue. Mr. Nelson agreed that increasing domestic processing and producing of critical minerals was necessary however he argued that lithium-ion batteries were best suited for consumer and transportation electronics and that technologies such as pump storage and metal air batteries showed more promise for long-term grid level storage.