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Battery Council International's SB 100 Joint Agency Report Comments

Additional submitted attachment is included below.

March 9, 2020

California Energy Commission
1516 Ninth Street
Sacramento, CA 95814
Docket Number: 19-SB-100

Subject: Battery Council International's SB 100 Joint Agency Report Comments.

Battery Council International (BCI) appreciates the opportunity to comment on the SB 100 process. BCI is a not-for-profit trade association formed to promote the interests of the international battery industry. BCI has member companies worldwide engaged in every facet of the industry: lead battery manufacturers and recyclers, marketers and retailers, suppliers of raw materials and equipment, and expert consultants.

California's path to meeting SB 100's goal of 100% carbon-free energy must include robust expansion of energy storage. The February 24 workshop rightfully dedicated a panel to discussion of reliability considerations for various energy storage technologies. Solar and wind already play a major role in California's renewable energy resource mix and will need to be expanded in order for the state to reach the statutory 60% target by 2030. However, for purposes of baseload generation, solar and wind are both limited by their dependence on inherently variable natural systems. In order to fully realize the potential of these technologies while also maintaining grid reliability, a corresponding expansion of energy storage capacity is necessary. Furthermore, California continues to suffer the effects of devastating wildfires, including pre-emptive deenergization events that have left millions of Californians without power for extended periods of time. These challenges require solutions that can implemented immediately, and battery energy storage systems (BESS) are the most cost-effective, fit-for-purpose technologies currently available.

While all energy storage technologies should play a role in the evolving 21st century electric system, no other technology can match batteries in terms of range of scale and application adaptability. In particular, the lead battery has dominated established markets with nearly 10,000 GWH of installed capacity. However, the SB 100 process does not appear positioned to consider lead batteries as part of California's demand response planning despite their proven track record. During the February 24 workshop, a question was posed about whether lead batteries would be considered during the modeling process. Representatives from E3 and the California Energy Commission stated their belief

that lead batteries would fall within the "flow" battery category which is being considered along with lithium-ion batteries. This response demonstrates a basic misunderstanding of lead battery technology[1] and the current state-of-the-industry for stationary energy storage systems already in use. For example, more than 90% of telecommunications infrastructure battery backup systems already utilize lead batteries.[2] The planners' failure to include the world's dominant energy storage technology in the model planning is worrying, but we expect this will be corrected shortly. If the SB 100 process does not consider lead batteries in its modeling exercise, then California will be overlooking a viable, shovel-ready technology that likely would form the backbone of a well-planned energy storage deployment. Without lead batteries, the state's ambitious renewable and zero carbon energy goals may be impossible to achieve within the prescribed timeframes.

When considering the optimal battery storage technology, there are various considerations that must be taken into account, including: 1. Performance; 2. Affordability; 3. Safety; 4. Environmental Impacts; 5. Innovations.

Performance

Lead batteries play an important role in providing carbon free energy in various applications. Lead batteries are the most widely used electricity storage system on earth, comprising more than 70% of the worldwide rechargeable battery market share.[3] Further, lead batteries are the leading battery storage technology for various critical infrastructure facilities such as telecommunication stations and data centers. The need for reliable emergency power in critical infrastructure applications has never been greater in California given the increasing frequency of catastrophic wildfires and increasing reliance by electric utilities on deenergization events as a fire prevention measure.

Automobiles, including fossil fuel powered and electric, rely on lead batteries to provide key functions ranging from the powering of vital safety processes to high power discharges necessary to start internal combustion engines. Furthermore, lead batteries provide cost-effective pathways to hybridization with start-stop lead batteries mitigating 4.5 million tons of carbon dioxide from automotive emissions currently and that number growing every year. In the industrial sector, lead batteries provide energy storage for the telecom industry that in many cases lasts for decades with only two recorded lead battery related incidents in the last 50 years. The U.S. military utilizes lead batteries in every vehicle, submarine, and base due to its flexibility in deployment, reliable performance across a broad spectrum of environments, and ease of use. Energy storage applications for the electrical grid and lead batteries provide a low acquisition cost solution capable of meeting the needs of industry, residential, and utilities. Not only has the lifetime of lead batteries improved 35% in the last 20 years, but major increases in specific power and energy have occurred and are being shifted into the market presently.

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[1] Lead batteries feature solid electrodes enclosed with electrolyte. This electrolyte serves as the source for the reaction necessary for the entire length of the battery life, resulting in portable contained energy storage. Flow batteries are classified as energy storage (vanadium redox and other chemistries are utilized in these applications) and pull from an electrolyte reservoir that modulates performance. These reservoirs are typically separated from the electrodes, rendering the battery stationary.

[2] 2019 CBI Market Assessment, Consortium for Battery Innovation, August 2019.

[3] *The Rechargeable Battery Market and Main Trends 2018-2030,* Avicenne Energy, May 2019

Throughout the SB 100 process and in the California legislature, there is an emerging focus on moving toward a more decentralized energy market. Part of this approach would necessarily include the rapid expansion of microgrids. Lead batteries have proven to work well in this application. Microgrid storage provides the resiliency and energy security necessary for many different areas of the US society. In California, China Lake in Ridgecrest utilized solar arrays, generators, and batteries to power key purposes for renewable energy functions and for energy shifting. Another example is the microgrid established at Otis Air Force Base using lead batteries.[4] This system provides resiliency and secure energy of critical loads and demonstrates that lead batteries are contributing to national security. To continue to improve in this area, in 2018 the Consortium for Battery Innovation (CBI) joined a collaborative research alliance at Missouri University of Science and Technology to provide resources for construction of advanced lead battery microgrids. The goal of the project is to unlock the full potential of this technology to supply reliable, affordable, and environmentally sustainable energy to the residential market.

Affordability

The cost of energy storage has the potential to be a major rate limiting factor in the rapid deployment of BESS. To avoid this outcome, policy decisions must be informed by the best available information on the total cost of ownership (TCO) for each technology. The TCO for energy storage generally includes initial capital investment, system operating and maintenance costs and end-of-life management costs. The individual factors vary between battery chemistries because of different raw material costs, production costs, system requirements, maintenance procedures and the state of infrastructure and markets for recovery and reuse of secondary materials. A TCO that uses current data for relevant technologies, and which accounts for all of these factors would show that lead batteries are a competitive, if not superior, technology.

LAZARD has developed the concept of Levelized Cost of Energy Storage (LCOS) intended to provide a comparative analysis of different energy storage technologies. The LCOS concept and annual reports, while directionally instructive, can be misleading in specific cases due to inaccurate or obsolete data incorporated into the assumptions. The lead battery industry in particular has been slow to provide accurate information for lead battery costs and performance. Consequently, LAZARD has used 25-year-old data for lead batteries in its LCOS analysis. When completing the LCOS with updated information on lead batteries, it becomes clear that lead is not only competitive with other storage technologies, but superior in some regards.[5]

Safety

The safety of the general public and site/facility personnel during normal operations and for first responders during emergency situations is a growing concern that is, rightly, driving increased caution in the deployment of BESS systems, development of more stringent standards, and raising overall awareness of the hazards of specific battery chemistries. Lead batteries have a very low risk of fire or

[4] East Penn Press Release: http://essentialenergyeveryday.com/wp-content/uploads/2018/10/Otis-air-national-guard-base-microgrid-10-15-18.pdf

[5] The most recent LAZARD report was released November 2019. However, all of the data related to the cost of any battery has been left out for now on the basis that an amendment will be later released. BCI will provide the updated data as soon as it becomes available.

explosion from overcharge, heat exposure, mechanical damage and short-circuiting.[6] This is because lead batteries have an intrinsically non-flammable electrolyte[7] and active material compared to other chemistries with volatile electrolytes. As battery installations increase, particularly in fire-prone areas, the flammability of battery chemistries must be taken into account when selecting battery technologies.

Environmental Impacts

Lead batteries are a proven and established technology in widespread consumer use and are subject to comprehensive environmental, health and safety-based regulatory standards covering every aspect of the lead battery lifecycle. When considering the entire lifecycle from raw material extraction to end-of-life management, lead batteries are the most sustainable energy storage technology available to the market. Unlike other battery chemistries, lead batteries have a highly efficient, closed loop recovery system that is widely recognized and readily accessible to consumers as well as the World Economic Forum and the MIT Center of Transportation. Lead is also the most efficiently recycled commodity metal. For these reasons, lead batteries have achieved a national recycling rate in excess of 99%. No other battery chemistry even comes close to this achievement.

The Sustainability Consortium (TSC) annual report[8] evaluates key performance indicators (KPIs) for over 180 different product categories. Lead batteries regularly rank among the top five most sustainable consumer products. Dr. Carole Mars, TSC Director of Technical Development & Innovation, stated:

> *"Lead batteries close the loop more effectively than any other product in the consumer goods space. We'd like to leverage the lessons of this industry to help others reach the same type of performance for their end-of-life products."*

Innovation

Despite being the oldest and most established battery technology, lead batteries still have untapped performance potential, and the lead battery industry continues to invest in technology research and development. Partnerships between manufacturers and universities are improving lead battery performance in the most demanding applications, including renewable energy storage. In addition, cutting-edge, pre-competitive research initiatives are underway to harness the full capability of lead batteries in response to rapid growth in demand for energy storage systems. One example is a three-year research initiative comprised of more than a dozen U.S. lead battery companies and suppliers, in collaboration with the Department of Energy's Argonne National Laboratory.[9] The results are expected to establish a data foundation to create the next generation of high-performance

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[6] Essential Energy Everyday Energy Brief. https://essentialenergyeveryday.com/wp-content/uploads/2018/07/EEE_Energy_Brief.pdf

[7] The lead battery electrolyte is water based and is completely nonflammable.

[8] The Sustainability Consortium, "2017 Impact Report - The Call for Collective Action Across Supply Chains," July 2017. [Online]. Available: https://www.sustainabilityconsortium.org/downloads/the-call-for-collective-action-across-supply-chains/.

[9] There are a number of other innovations that can be found at: https://advancedbatteryconcepts.com/ - industrial
http://ultrabattery.com/ - ESS/automotive
https://www.arcactive.com/ - automotive
https://www.gridtential.com/silicon-joule - industrial

advanced lead battery technology. Additionally, the U.S. lead battery industry invested more than $100 million in research and development in 2018.

Conclusion

Thank you for your consideration of the role of lead batteries in California's clean energy future. SB 100 sets out aggressive renewable and zero carbon energy targets. It is critical that the responsible agencies consider not only what can be accomplished over the long-term, but also what is necessary in the short term. Climate change has already had devastating effects on California as evidenced by recent wildfires. Lead batteries are a viable technology that can be implemented immediately to meet short term demand. Further, lead batteries are continually being developed to meet California's long-term energy needs.

Sincerely,

Roger Miksad
Executive Vice President and General Counsel

cc: David Hochschild - Chair, California Energy Commission
Ken Rider – Advisor to Commissioner Hochschild
Terra Weeks – Advisor to Commissioner Hochschild