| DOCKETED | |
|---|---|
| **Docket Number:** | 20-LITHIUM-01 |
| **Project Title:** | Lithium Valley Commission |
| **TN #:** | 237033 |
| **Document Title:** | Lawrence Berkeley National Laboratory Comments - Further comments of Lawrence Berkeley National Laboratory, Lithium Resource Research and Innovation Center |
| **Description:** | N/A |
| **Filer:** | System |
| **Organization:** | Lawrence Berkeley National Laboratory |
| **Submitter Role:** | Public Agency |
| **Submission Date:** | 3/8/2021 1:16:37 PM |
| **Docketed Date:** | 3/8/2021 |

*Comment Received From: Lawrence Berkeley National Laboratory*
*Submitted On: 3/8/2021*
*Docket Number: 20-LITHIUM-01*

## Further comments of Lawrence Berkeley National Laboratory, Lithium Resource Research and Innovation Center

Dear Ms. De Jong,

Please find enclosed further comments submitted by Michael Whittaker, Project Lead at Berkeley Lab's Lithium Resource Research and Innovation Center, including selected publications and projects that may be of interest to the Commission and contact information for both him and Noel Bakhtian, Executive Director for Berkeley Lab's Energy Storage Center. Please never hesitate to reach out and let us know how we might be helpful.

Jim

*Additional submitted attachment is included below.*

March 5, 2021

Silvia Paz
Chair
Blue Ribbon Commission on Lithium Extraction
c/o California Energy Commission
1516 Ninth Street
Sacramento, CA 95814

ATTN: Elisabeth De Jong

Dear Chair Paz and members of the Commission:

Congratulations on your appointments to the Lithium Valley Commission.

On behalf of Lawrence Berkeley National Laboratory (Berkeley Lab), the national laboratory managed by the University of California for the U.S. Department of Energy's Office of Science, I want to express our support for the mission of the Blue Ribbon Commission and offer expertise on many of the topics that the Commission will address pursuant to AB 1657. To follow up on Noel Bakhtian's verbal comments last week, I am providing a link to some of Berkeley Lab's research on lithium recovery, which includes expanded geothermal recovery, methods of overcoming technical and economic challenges currently limiting lithium extraction from geothermal brines, and safe environmental methods for lithium extraction from geothermal brines [references 1, 2]. This work builds on extensive research and development on geothermal resources and technilogies, including the development of geothermal power for enhanced grid stability, reliability, and resiliency.

Researchers from Berkeley Lab's Lithium Resource Research and Innovation Center (LiRRIC) are participating in four projects in the Salton Sea area, funded through the Energy Commission and the U.S. Department of Energy's Advanced Manufacturing Office (AMO) [projects 1-4]. LiRRIC brings together national experts on geothermal energy recovery from the Salton Sea region, the geothermal reservoirs, recovery/treatment and lithium extraction technologies from Salton Sea brines, and expertise in technoeconomic assessments related to lithium. The results of our ongoing work are regularly updated on our website. We also host a regular seminar series on a broad range of topics in the lithium resource space that is open to the public, and recordings of past seminars are freely available.

Keeping the end goal of domestic battery manufacturing in mind, Berkeley Lab performs extensive work on battery material discovery, characterization, testing, diagnostics and recycling. Each lithium resource is different, and Salton Sea geothermal brines have unique characteristics that must be understood from the perspective of downstream stakeholders in order to assess their value and potential impacts. LiRRIC's geochemists and battery researchers are committed to ensuring that the lithium extraction technologies developed in the Salton Sea will attract leading battery manufacturers by making the value proposition clear: the products will be pure and carry low embodied energy costs.

To further the goal of building a robust Lithium economy, Berkeley Lab is a founding partner with New Energy Nexus of CalCharge, a battery and electrochemical energy storage membership program comprising industry, research institutions, and other key stakeholders. We fulfill a key role in training new generations of scientists and engineers through energy-related workforce development programs. We are also looking to build partnerships with other institutions to address the challenge of extracting Li from geothermal brines, and we hope to expand our informal collaboration with UC Riverside, which has also led some excellent research in this area. Together, we will work to translate innovations into technologies that create jobs and build equity in the Imperial Valley region, and beyond.

Additionally, the Berkeley Lab Energy Storage Center, for which Noel Bakhtian serves as Executive Director, serves as an overarching resource for you as a portal to all Berkeley Lab-related energy storage expertise and capabilities - including materials science, the science of manufacturing, and systems analysis for batteries and across all energy storage types, for end use applications in transportation, buildings, and the grid.

Berkeley Lab has a long history of providing public mission research in support of California's energy and environmental policies and we are excited to support a successful Lithium Valley in support of our nation, state, and the region's security, prosperity, and health in an exciting lithium-rich future. As a public mission-driven DOE laboratory located here in California, we look forward to being a trusted source of information for the commission to support your critical discussions, frameworks, and decision making.

Sincerely,

Michael Whittaker
LiRRIC Project Lead
Lawrence Berkeley National Laboratory
1 Cyclotron Rd. Berkeley, CA 94720
mwhittaker@lbl.gov

**Projects**

1. Electrolytic Production of Battery-Grade $LiOH \cdot H_2O$ from Geothermal Brine. Funding source: Advanced Manufacturing Office, Energy Efficiency and Renewable Energy, Office of Science, US Department of Energy. Project Lead: Berkshire Hathaway Energy. LBNL PIs: Will Stringfellow, Hanna Breunig (**2021**)
2. Demonstration project at an existing geothermal power facility in Calipatria to produce battery-grade lithium carbonate. Funding source: California Energy Commission. Project Lead: Berkshire Hathaway Energy. LBNL PIs: Will Stringfellow, Pat Dobson
3. Design, construction, and operation of a pilot-scale base-metal extraction unit to be operated upstream of a lithium extraction unit. Funding source: California Energy Commission. Project Lead: Controlled Thermal Resources. LBNL PIs: Will Stringfellow, Pat Dobson
4. Retrospective Analysis of Geothermal Mineral Recovery and Domestic Resource Assessment. Funding source: Geothermal Technologies Office, Energy Efficiency and Renewable Energy, US Department of Energy. Project Lead: LBNL. LBNL PIs: Pat Dobson, Will Stringfellow. This project will end March 31, 2021.

**References**


1. **Technology for Lithium Extraction in the Context of Hybrid Geothermal Power**. William T. Stringfellow, Patrick F. Dobson, PROCEEDINGS, 46th Workshop on Geothermal Reservoir Engineering Stanford University, Stanford, California, February 15-17, 2021, SGP-TR-218
2. **Retrospective on Recent DOE-Funded Studies Concerning the Extraction of Rare Earth Elements & Lithium from Geothermal Brines.** William T. Stringfellow, Patrick F. Dobson. LBNL-2001359, (Final Report), Lawrence Berkeley National Laboratory, Energy Geosciences Division, September 23, 2020



Noel Bakhtian Ph.D. (pronunciation)
Executive Director
Berkeley Lab Energy Storage Center
noel@lbl.gov

Jim Hawley
Director, State and External Relations
jchawley@lbl.gov