

**DOCKETED**

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<b>Filer:</b>	Elisabeth de Jong
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# **PROPOSED SCHEDULE AND PROCESS FOR REVIEW OF THE DRAFT OUTLINE FOR THE REPORT OF THE BLUE-RIBBON COMMISSION ON LITHIUM EXTRACTION IN CALIFORNIA**

Consistent with the [Lithium Valley Commission Report Development Framework](https://efiling.energy.ca.gov/GetDocument.aspx?tn=237989&DocumentContentId=71236) (<https://efiling.energy.ca.gov/GetDocument.aspx?tn=237989&DocumentContentId=71236>), the CEC staff has prepared the attached draft outline for Commission review.

This draft outline is a starting point to organize preparation of the report. The CEC staff will work with each Commission sub-body, teams of two-commissioners assigned by report topic area, to develop relevant report sections (such as sections related to lithium extraction, workforce development, etc.) and ensure all legislative topics and Commission, stakeholder, and public perspectives are adequately considered and reflected in the report.

When the complete draft report is prepared, the draft report will be available for all Commissioners to discuss and provide input on all topics and recommendations included in the Commission report.

The final report will be brought to the Commission for approval.

The CEC staff proposes the following schedule for review of the draft outline:

- August 30, 2021: Draft report outline available for review.
- September 9, 2021: Comments and edits from Commissioners and Commission sub-bodies due to Elisabeth De Jong.
- September 30, 2021: Lithium Valley Commission Public Meeting

# **PROPOSED DRAFT OUTLINE FOR THE REPORT OF THE BLUE-RIBBON COMMISSION ON LITHIUM EXTRACTION IN CALIFORNIA**

First draft. Prepared by CEC staff for Lithium Valley Commission consideration.

[Note: Suggested length of report: about 100 pages with appendices and executive summary]

## **Preface**

The preface of the report will consist of a letter from Chair Paz or the whole Lithium Valley Commission, including a photo of each member of the Lithium Valley Commission.

## **Executive Summary**

[10 pages]

The executive summary will consolidate key points and recommendations of the report.

The executive summary will provide the basis for development of a “highlights” document (formatted by the CEC media graphics team) to accompany the report to the Legislature.

## **CHAPTER 1: Vision, Introduction, and Background**

[<15 pages]

This section will provide a high-level overview of the report purpose, scope, and development process.

### **Vision**

California aims to build a robust and sustainable lithium ecosystem in California as we move beyond fossil fuels. The strategy to develop a sustainable lithium ecosystem includes:

- Recovering lithium from geothermal brines in the Salton Sea known geothermal resource area.
- Efforts to accelerate and scale-up lithium reuse and recycling.
- Investments in innovations driving the most efficient and safe use of lithium to power electric vehicles and to store renewable energy.

### **Introduction**

#### **AB 1657**

AB 1657 (2020) directed creation of the Lithium Valley Commission. AB 1657 requires the Lithium Valley Commission to review, investigate, and analyze certain issues and potential incentives, as described, regarding lithium extraction and use in California.

#### **Lithium Valley Commission**

This section will provide an overview of the composition of the Lithium Valley Commission and meeting history.

- Mission

- Vision
- Structure (sub-bodies)
- The 14 members of the commission represent a broad range of perspectives, as specified by AB 1657 (statutes of 2020).
- Description of how members were selected.
- The Commission began meeting in early 2021 and worked to prepare and provide this report to the Legislature by October 1, 2022.
- Per AB 1657 (statutes of 2020), the commission continues to October 1, 2023.

### **Salton Sea Community**

- Socioeconomic background
  - Demographics
  - Ecological and recreational resources
  - Tribal and sacred lands
  - Major industries/employers
  - Employment and other economic benefits/impacts (e.g., tax revenue) of geothermal power plants
  - Training infrastructure (e.g., community colleges, apprenticeship programs, adult education, etc.)
  - Previous attempts at economic development/diversification
  - Challenges
    - Degradation leading to health issues.
    - Disadvantaged community, as defined by SB 535 based on environmental and economic indicators in CalEnviroScreen.
    - Local unemployment rates.

### **Public Engagement**

This section describes the outreach strategy and implementation. Key points include:

- How the social-economic conditions of the region led to key components of the outreach plan.
- How many people were able to participate in the identification of issues and development of recommendations.
- Where meetings took place and how they were organized (emphasizing any unique methodologies).

In addition, this section provides a summary of main themes public meetings/workshops and public comments informing development of this report, with additional information in the appendices. This section also summarizes collaboration with U.S. Department of Energy (DOE) and U.S. Environmental Protection Agency (US EPA).

- Summary of public workshops, public comments
- Collaboration with US DOE and US EPA

Input from public meetings and written public comments were considered by the Lithium Valley Commission and reflected throughout the report. Further information is in Appendix B.

## Background

### **Lithium from Geothermal Brine is a Key Component of California's Clean Energy Future for All**

This section will provide an overview of the importance of lithium to achieving federal and state clean energy goals. For example,

- Lithium has been designated as a critical mineral "essential to the economic and national security of the United States" (Executive Order No. 13817 titled "A Federal Strategy to Ensure Secure and Reliable Supplies of Critical Minerals.").
- California's SB 100 report calls for rapid scale-up of energy storage in California. Lithium is a core component of many energy storage technologies.
- Geothermal energy is identified by the CPUC to help meet California's mid-term reliability needs and help meet California's SB 100 goals.
- Rapid growth in zero emission vehicles is a pillar of California's greenhouse gas emission reduction goals. Lithium is a core component of batteries used in electric vehicles, which dominate the zero-emission vehicle market.
- Equity considerations and workforce opportunities for Salton Sea area and Imperial Valley.

### **Global Locations of Lithium Resources**

- Location of Lithium Resources: International, US, California

### **Comparison of Lithium Extraction and Recovery Methods**

- Comparison of lithium extraction/recovery methods used around the world, including amount extracted per year and environmental impacts. The comparison will include:
  - Hard-rock mining: description, applicable locations, transportation pathways, land use, water use, waste streams.
  - Recovery of lithium from mining waste rock: description, applicable locations, transportation pathways, land use, water use, waste streams.
  - Lithium Clay formation [in the United States...]
  - Evaporation ponds: description, applicable locations, transportation pathways, land use, water use, waste streams.
  - Extraction/recovery from geothermal brine: description, applicable locations, transportation pathways, land use, water use, waste streams.
    - Li recovery from geothermal brine is generally categorized into adsorption, ion exchange, and solvent extraction techniques; this section will briefly describe these generic processes.
  - Lithium battery reuse and recycling: description, applicable locations, transportation pathways, land use, water use, waste streams.
- Current and projected lithium costs
  - Comparison of current lithium production costs across lithium extraction methods.
  - Projected lithium recovery costs from geothermal brine in the Salton Sea area compared to lithium from other locations.

## The Salton Sea Area

This section will provide an overview and history of the region, including:

- Geographic/geologic history
  - Original flooding
  - The geothermal resource and the chemical composition that led to lithium concentration in the geothermal brine underlying the Salton Sea.
    - Visual map distinguishing Salton Sea and Salton Sea Known Geothermal Resource Area (KGRA).
    - Is this the only KGRA in the general vicinity with feasible lithium concentration for development?
    - Lithium development in the Salton Sea KGRA: existing and planned lithium extraction projects.

## Funding Programs for Lithium Recovery from Geothermal Brine

- CEC
  - GRDA
    - SB 1074
  - EPIC
- Other state funding programs
- Federal funding programs
  - American-Made Geothermal Lithium Extraction Prize

## Chapter 2: Lithium Valley Opportunities and Challenges to Overcome

[<50 pages]

This section describes the Lithium Valley opportunities, as well as the challenges to overcome to realize these opportunities.

### The Lithium Resource Near the Salton Sea

- This section describes the characteristics of the lithium resource in the area near the Salton Sea, including chemistry, concentration/purity of Lithium, spatial distribution, processes to recover lithium, and timeline of projected depletion. Mineral composition of geothermal brine in the known geothermal area near the Salton Sea.
- Spatial distribution of lithium near the Salton Sea
- Is geothermal required to generate lithium from the known geothermal area near the Salton Sea?
  - Lithium is a valuable co-product of geothermal generation in the Salton Sea KGRA
  - Could there be other ways of extracting Lithium in the region other than recovering the brine from geothermal energy?
- Timeline of projected depletion.

This section also includes detail about how and where lithium extraction is occurring near the Salton Sea, including:

- Where the industry is today.
  - Location within the Salton Sea area.

- Status of lithium extraction/recovery activities, including permitting, construction, and operation.
- What may be needed to further development of geothermal power and co-production of lithium extraction.
- Potential benefits of siting geothermal power and lithium extraction together.

### **Lithium Recovery Methods Applicable to the Salton Sea Area**

- This section provides a comparison of lithium recovery methods and identifies which methods can be used to extract lithium from the Salton Sea area. Extraction of lithium from geothermal brine has a lower environmental impact than other methods.
  - AB 1657 topic: Lithium extraction methods. "Safe environmental methods and standards for lithium extraction from geothermal brines and how this compares to other methods for deriving lithium." (AB 1657 of 2020)
  - Lithium recovery techniques and process strategies applicable to the Salton Sea area.
    - CalGEM oversees geothermal well permitting, including the mineral content in the geothermal brine. Do permits include recovery of lithium from wells used for geothermal energy?
    - Challenges and technical needs specific to lithium recovery from geothermal brines.
    - Summary of CEC projects advancing technologies to recover lithium from geothermal brines.
  - Planned co-production facilities for geothermal energy and lithium recovery from geothermal brine, including other facilities to support the process.
    - Pilot projects
    - Description of full-scale facilities under development
    - Visuals
  - Lithium battery manufacturing and recycling could be co-located in the vicinity.

### **Clean Energy Market Opportunities for Lithium**

This section discusses the clean energy market opportunities for lithium, including the current market, projected market growth, opportunities in the lithium supply chain, and job growth opportunities. This section addresses AB 1657 topic: Market Opportunities for Lithium.

- Existing and planned industrial development for geothermal energy and lithium recovery in the Imperial Valley.
  - Jobs
  - Sites
  - Gaps/needs.
- Overview of market value, size, geography, and transportation pathways of the global lithium market today.
- The need for lithium is on an exponential trajectory for use in electric vehicles and energy storage in California and other markets.
- Steps in the lithium ecosystem/supply chain are often separated across continents. Co-locating material extraction, processing, production, and supply chain manufacturing can create synergistic opportunities for innovation, efficiency, and cost savings. A lithium production hub, along with a favorable regulatory environment for innovation

and manufacturing, could attract companies from across the battery supply chain to California.

- Examples include:
  - Battery component, battery, and EV manufacturing.
  - Second use of lithium batteries.
  - Recycling lithium batteries.
    - The advisory group created by AB 2832 (Dahle) convened April 2019 with policy recommendations due April 2022 to the Legislature.
- The clean energy market opportunities for lithium extraction, processing, and production in the Imperial Valley will require a local workforce skilled in chemical processing, hazardous materials management, geothermal energy, and construction and operation of lithium supply chain processing facilities and infrastructure.
- Importance of just transition/high roads jobs
  - Determine scale and scope of labor market demand (such as number of jobs; list of occupations including data on mean/median wages and benefit levels as well as skills, knowledge, and abilities, by occupation. Also, key credentials required (such as certifications, certificates, degrees, licenses).
  - Expansion of apprenticeship and workforce training programs will be essential to realize the potential for developing a clean energy lithium processing and production center in the Salton Sea area.
    - Important to examine existing training infrastructure in the region before calling for expansion of programs. Programs may exist and need to be refined or improved upon to address industry needs.
  - Importance of investing in training partnerships (employers and workers are central; important to include community groups, as well as education and training providers, etc.) to go from modeling to actionable info about labor market demand...who is hiring for what and when, how many, what are the skill needs, etc. and then determine what training solutions are the best fit.

## **Grid Reliability and Resilience: Potential Benefits of Geothermal Plus Lithium**

- Introduction
  - This section discusses the potential benefits of geothermal-plus-lithium plants to energy reliability and resilience.
    - AB 1657 topic: Benefits of/to geothermal plants. “The potential benefits of, and added value to, existing and new geothermal facilities in areas that contain mineral-rich brines for the state, the western energy grid, and the United States, including, but not limited to, grid stability, reliability, and resiliency.” (AB 1657 of 2020)
  - DOE Geovision report. Projected buildout scenario.
- Description of geothermal-plus-lithium extraction.
  - Quantification of the power necessary for lithium extraction from brine.
  - Geothermal can provide power needed to extract lithium from brine onsite.
  - Some lithium extraction facilities and lithium processing facilities will purchase energy from grid.
  - Good match between lithium extraction load shape and geothermal energy production.



- Designed to work at full capacity 24/7 to keep brine flowing in pipes.
    - Lithium production planned to be 24/7.
  - Meeting growth in local energy needs for lithium extraction with local geothermal will help maintain local resource adequacy, reliability, and resilience.
- Assess role for net geothermal production
  - Current geothermal production in California
    - Power purchase agreements to use California geothermal energy in state.
    - Power purchase agreements to export geothermal energy from California.
  - SB 100. Amount of geothermal and general baseload included in scenario planning.
  - New transmission likely to be needed if additional geothermal energy not used locally. Transmission issues are being explored further in the SB 100 resource build process and ISO 20-year plan.
  - CPUC June 2021 decision (in R.20-05-003) includes a requirement for procurement of at least 1,000 MW of long lead-time resources by June 1, 2026.
    - This includes geothermal but may include other resources as well. The resources must meet the following requirements: 1) no on-site emissions or is eligible under the requirements of the renewables portfolio standard program, and 2) has at least an 80 percent capacity factor. The resource must not be use limited or weather dependent. No storage projects shall qualify under this provision.
      - Installed geothermal capacity in California.
      - Installed geothermal capacity in Salton Sea Geothermal field.
      - Potential geothermal in Salton Sea Geothermal field.
  - Power purchase agreements for geothermal energy are prerequisite for geothermal plus lithium production.
  - Will revenue from lithium extraction lead to more competitive pricing of geothermal energy?

## Overcoming Challenges

- Introduction
  - This section describes potential economic and environmental impacts of lithium extraction in the KGRA near the Salton Sea and potential pathways to overcome these challenges.
    - AB 1657 topic: Economic and environmental impacts. "Potential economic and environmental impacts to the state resulting from extraction, processing, and production of lithium and lithium-dependent products from geothermal brines." (AB 1657 of 2020)
    - AB 1657 topic: Furthering Geothermal Development. "Actions that will support the further development of geothermal power that have the potential to provide the co-benefit of lithium recovery from existing and new geothermal facilities." (AB 1657 of 2020)
  - Overcoming challenges to recovery of lithium from geothermal brine can help create conditions for long-term sustainable economic development pathways in the Salton Sea region in the context of lithium resource depletion (e.g., opportunities in geothermal energy and battery recycling and manufacturing;

- opportunities to invest tax revenues into sustainable economic activities, infrastructure, and workforce training)
- Health and safety challenges of lithium extraction process
  - Hazardous materials
  - Fire safety
    - Lithium processing
  - Health and safety (OSHA, chemical processing, regulations)
    - Lithium chloride turned into lithium hydroxide
    - Highly combustible material included
  - Best practices for safeguarding health and safety
    - Workers
    - Surrounding community
    - Transportation
- Environmental impacts resulting from lithium extraction from geothermal brine, lithium conversion to commercial grade quality, and building the needed infrastructure to support a lithium supply chain.
  - Ecology (environmental health, water, wildlife, microbiology)
    - Potential impacts
    - Best practices for mitigating impacts
  - Water
    - Water used for lithium processing
    - Water for geothermal plants (water to supplement geothermal process)
    - Best practices for managing water usage
  - Waste streams (liquid, air, solid, hazardous)
    - CalGEM – permits for geothermal wells (including mineral content of geothermal brine)
    - Water treatment requirements
    - Hazardous waste treatment and disposal (e.g., chemical solvents)
    - Best practices for managing waste streams
  - Air emissions
    - Lithium processing (criteria air emissions, CO2 emissions)
    - Geothermal emissions (criteria air emissions, CO2 emissions deemed zero)
    - Best practices for reducing air emissions
  - Lithium depletion
    - Rate of recovery/depletion
    - Timeline for depletion: Revisit in 20-30 years
    - Planning for post-depletion conditions
  - Environmental mitigation/repair (CEQA, NEPA)
    - Potential funding for environmental mitigation
    - Example funding mechanisms: wetland restoration, etc.
    - Considered as part of county permitting? CalGEM permitting?
- Socioeconomic and environmental justice considerations
  - Community concerns about environmental-related health harms
  - Potential socioeconomic impacts of geothermal plus lithium development on the local area, including private, tribal, federal lands

- Best practices to prevent harm and create benefits for tribes and environmental justice communities
  - Opportunities for local investments through mineral royalties and tax revenues.
  - Opportunities for battery manufacturing in the local area.
- Workforce development
  - Policies (e.g., standards, mandates, incentive programs, etc.) to ensure creation of high-quality, accessible jobs as well as investment in quality workforce development.
  - Current workforce demographics and needs.
  - Job/training resources that can be leveraged/supported.
- Infrastructure needs
  - Local government perspective.
    - Imperial County ordinance (proposed).
    - Build additional physical infrastructure (bridges, roads, broadband, housing, industrial campuses, wastewater treatment, hazardous waste management).
    - Expand social infrastructure for community growth related to lithium extraction and processing, such as schools, police, fire stations, retail, parks, and recreation.
  - Discussion of infrastructure needed for future supply chain build out for lithium processing and battery recycling (locally and/or dispersed across California).
  - Electric and water utility infrastructure: IID, LADWP, IOUs, etc.
- Regulatory challenges and best practices
  - Permitting – federal, state, and local
  - Centralized tracking systems for projects (examples of other mineral-extraction tracking systems; work with CalGEM)
    - Should centralized tracking system include/supplement required waste tracking
    - Example: Resource Conservation and Recovery Act (RCRA) federal requirements
  - ReInjection of waste streams (CalGEM).
    - Chemical solvents used in lithium processing separated from waste stream to be re-injected?
    - Impacts on chemical composition of geothermal reservoir, future lithium extraction?
- Mineral rights and mineral leases
  - Federal lands
  - State lands commission
  - Private land
  - Tribal land
- Technical and Economic Challenges
  - AB 1657 topic: Overcoming challenges to lithium extraction. “Methods of overcoming technical and economic challenges currently limiting lithium

extraction, processing, and production from geothermal brines.” (AB 1657 of 2020)

- Proving and de-risking the technology to encourage capital investments
- De-risking exposure to fluctuations in the price of lithium:
  - Trends, fluctuations
  - Long-term contracts for energy, lithium
  - Co-locating lithium supply-chain processing and production facilities
- Technical challenges needing additional innovation to overcome.
  - Results from CEC-funded research projects (technology readiness levels, commercial readiness levels).
  - Other technical challenges.
- Patents related to Lithium extraction from geothermal brine

## **Incentives**

This section addresses AB 1657 topic: Importance of incentives. As specified in AB 1657, this section addresses:

“The importance of, and opportunities for, the application of local, state, and federal incentives and investments to facilitate lithium extraction from geothermal brines, including, but not limited to, the following:

- Use of enhanced infrastructure financing districts, as defined in Section 53398.51 of the Government Code, or community revitalization investment authorities, as defined in Section 62001 of the Government Code.
- New employment tax credits in former enterprise zones.
- Income or franchise tax credits under agreements approved by the California Competes Tax Credit Committee.
- Sales tax exemptions for new manufacturing equipment.
- Leveraging tax incentives in federally recognized opportunity zones.” (AB 1657)

Quality job creation and access for priority populations:

- Incentive eligibility should be contingent upon commitment to pay workers a certain wage and hire members of priority populations.

## **Chapter 3: Legislative Recommendations and Regulatory Changes**

[<5 pages]

AB 1657 topic: Legislative or regulatory recommendations

As required by AB 1657 (2020), this chapter will provide:

“recommendations for legislative or regulatory changes that may be needed to encourage lithium extraction from geothermal brines, including whether the development of a centralized tracking system for lithium project permitting by state and local regulatory agencies would assist with development of the lithium industry.” (AB 1657)

# APPENDICES

## Appendix A: Sources

[10 pages]

This appendix will provide a literature review in narrative form with sources referenced as footnotes.

## Appendix B: Workshop Summaries

[5-10 pages]

This appendix will provide a summary of each public workshop informing development of this report, including: 1) a summary of the agenda, speakers, and panelists; and 2) themes/issues raised during discussion and public comment.

## Appendix C: Lithium Valley Commission Sub-Bodies for Each Topic Specified in Assembly Bill 1657 and Associated Report Sections

Table \_\_. Lithium Valley Commission Sub-Bodies for Each Topic Specified in Assembly Bill 1657 and Associated Report Sections

AB 1657 Topic	Commissioners Leading Topic Sub-Body	Associated Report Sections
Lithium extraction methods	Jonathan Weisgall Rod Colwell	<ul style="list-style-type: none"> <li>Chapter 1, subsection on comparison of lithium extraction and recovery methods</li> <li>Chapter 2, subsection on lithium recovery methods applicable to the Salton Sea area</li> </ul>
Market opportunities for lithium	Roderic Dolega Arthur Lopez	<ul style="list-style-type: none"> <li>Chapter 2, subsection on clean energy market opportunities for lithium</li> </ul>
Benefits of/to geothermal plants	Manfred Scott James Hanks	<ul style="list-style-type: none"> <li>Chapter 2, subsection on grid reliability and resilience: potential benefits of geothermal plus lithium</li> </ul>
Economic and environmental impacts	Luis Olmedo Miranda Flores	<ul style="list-style-type: none"> <li>Chapter 2, subsection on overcoming challenges</li> </ul>
Furthering geothermal development	Luis Olmedo Ryan Kelley	<ul style="list-style-type: none"> <li>Chapter 2, subsection on overcoming challenges</li> </ul>
Overcoming challenges to lithium extraction	James Hanks Frank Ruiz	<ul style="list-style-type: none"> <li>Chapter 2, subsection on overcoming challenges</li> </ul>
Importance of incentives	Jonathan Weisgall Martha Guzman Aceves	<ul style="list-style-type: none"> <li>Chapter 2, subsection on incentives</li> </ul>

<b>AB 1657 Topic</b>	<b>Commissioners Leading Topic Sub-Body</b>	<b>Associated Report Sections</b>
Economic and environmental impacts (including workforce development)	Silvia Paz Steve Castaneda	<ul style="list-style-type: none"> <li>• Chapter 2, subsection on market opportunities</li> <li>• Chapter 2, subsection on overcoming challenges</li> <li>• Chapter 2, subsection on incentives</li> </ul>
Legislative regulatory recommendations	Rod Colwell Tom Soto	<ul style="list-style-type: none"> <li>• Chapter 3</li> </ul>

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