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Proposed Revised Draft for Consideration
and Discussion

Report of the Blue Ribbon Commission
on Lithium Extraction in California
Pursuant to Assembly Bill 1657 (E. Garcia, Chapter
271, Statutes of 2020)

BLUE RIBBON COMMISSION ON LITHIUM EXTRACTION IN CALIFORNIA

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¹ Martha Guzman Aceves, former California Public Utilities Commission (CPUC) commissioner, served as a Blue Ribbon Commission commissioner from January 2021 to December 2021. CPUC President Alice Reynolds was appointed by the CPUC in April 2022 to succeed commissioner Guzman Aceves on the Blue Ribbon Commission.

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Executive Summary

Assembly Bill 1657, (AB 1657, E. Garcia, Chapter 271, Statutes of 2020)¹ was drafted and signed with the vision to increase possibilities for the Salton Sea region, with both the potential for the area becoming a competitive source of lithium supply that could satisfy more than one-third of the worldwide demand and investing in local and regional economic and community investment opportunities. AB 1657 took effect on January 1, 2021, and required the California Energy Commission (CEC) to convene and establish a Blue Ribbon Commission on Lithium Extraction in California (Blue Ribbon Commission or Commission), commonly referred to as the Lithium Valley Commission, composed of 14 representatives and experts, to review, investigate, and analyze specific topics relating to lithium extraction in California and submit a report to the Legislature, documenting its findings and any recommendations developed after conducting the required review and analyses.

This report was developed to meet the requirements of AB 1657. The Blue Ribbon Commission held its first meeting on February 25, 2021, and since that time, held over 20 public meetings over a nearly two-year period. These publicly noticed and conducted meetings provided the Commission an opportunity to learn from representatives of industry, academia, community-based organizations, and public agencies, as well as members of communities and California Native American tribes (Tribes) living nearby or culturally affiliated with land areas in Imperial County, California under consideration by developers for lithium extraction.

AB 1657

Four statutory findings and declarations explain the state's interest in lithium recovery in California and provide context for why AB 1657 was enacted:

- World demand for lithium is expected to grow as much as tenfold in the next decade, but virtually none is produced in the United States. Almost all of the global lithium supply is mined in Argentina, Chile, China, and Australia.
- The Salton Sea geothermal resource area² is well-positioned to become a competitive source of lithium that could satisfy more than one-third of today's worldwide lithium demand, but investment in this resource requires that the technology to recover lithium from geothermal brine on a commercial scale can occur without certain risks and uncertainties.
- There is a national security rationale for developing a domestic supply of lithium. Lithium was listed in the Federal Register as a critical mineral "essential to the economic and

¹ Assembly Bill 1657 (Garcia, E., Chapter 271, Statutes of 2020), https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201920200AB1657.

² The "Geothermal Steam Act of 1970" defines a known geothermal resource area as "...an area in which the geology, nearby discoveries, competitive interests, or other indicia would, in the opinion of the Secretary [Secretary of the Interior], engender a belief in men who are experienced in the subject matter that the prospects for extraction of geothermal steam or associated geothermal resources are good enough to warrant expenditures of money for that purpose." The Salton Sea Known Geothermal Resource Area (Salton Sea KGRA) refers to a geothermal resource on the southeastern side of the Salton Sea near Calipatria (Imperial County). <https://www.govinfo.gov/content/pkg/USCODE-2017-title30/html/USCODE-2017-title30-chap23.htm>

national security of the United States” pursuant to the 2017 presidential Executive Order Number 13817 titled “A Federal Strategy to Ensure Secure and Reliable Supplies of Critical Minerals.”

- The opportunity for lithium production in California has the potential to unleash billions of dollars of new economic infrastructure development.

These findings and declarations explain why the Blue Ribbon Commission is tasked to review, investigate, and analyze the following eight topics:

- Actions that will support the further development of geothermal power that have the potential to provide the cobenefit of lithium recovery from existing and new geothermal facilities.
- Market opportunities for lithium.
- 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.
- Methods of overcoming technical and economic challenges currently limiting lithium extraction, processing, and production from geothermal brines.
- Safe environmental methods and standards for lithium extraction from geothermal brines and how this compares to other methods for deriving lithium.
- Potential economic and environmental impacts to the state resulting from extraction, processing, and production of lithium and lithium-dependent products from geothermal brines.
- The importance of, and opportunities for, the application of local, state, and federal incentives and investments to facilitate lithium extraction from geothermal brines.³
- 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.

The Work of the Blue Ribbon Commission, California’s Climate Goals and “Lithium Valley” Development

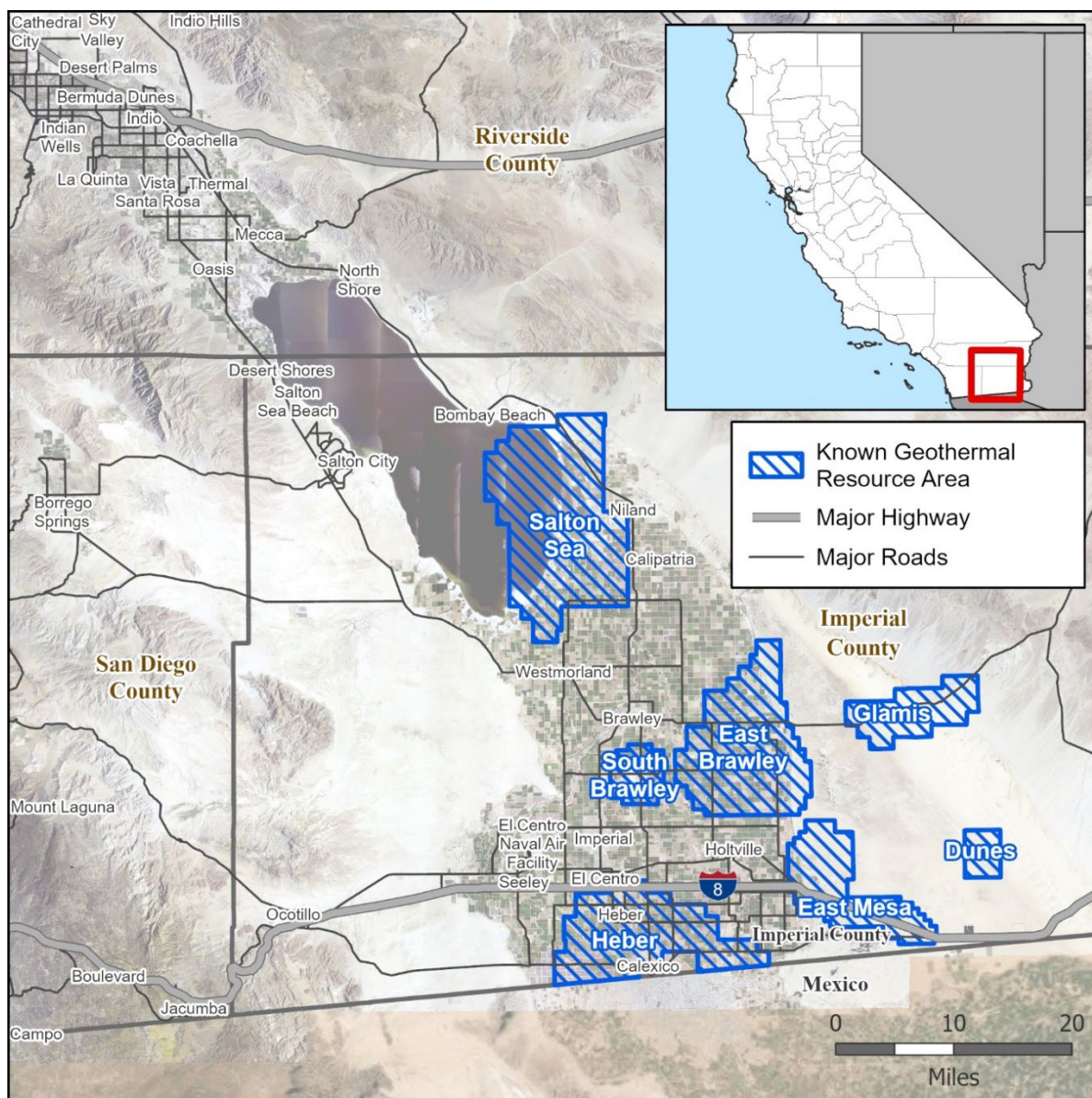
Community engagement is a priority for the Commission, and AB 1657 authorized the Blue Ribbon Commission to obtain and consider public input to develop findings and recommendations on the eight topics. The Commission’s work also intersects with other important policy initiatives in the region. These include the state’s efforts to implement the Salton Sea Management Plan and its broader policy goals to strengthen climate change resilience, advance zero-carbon and renewable energy technologies, and reduce greenhouse

³ Assembly Bill 1657 states this topic includes, but is not limited to 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; and leveraging tax incentives in federally recognized opportunity zones.

gas emissions economywide. A key element of California’s clean energy future includes pursuit of the development of “Lithium Valley,” which is a term used to describe a world-class lithium industry in California centered on recovery of lithium from geothermal brine in the Salton Sea region and the expansion of geothermal energy production, along with creating direct and related economic and community development opportunities.

These topics were of great interest and concern to Tribes and residents of communities nearby or culturally affiliated with the Salton Sea Known Geothermal Resource Area (Salton Sea KGRA). The Salton Sea KGRA is located at the southern end of the Salton Sea, over a half mile below the sea floor; the Salton Sea KGRA is believed to have the highest concentration of lithium contained in geothermal brine in the world. It is rich in many naturally occurring minerals including manganese, zinc, and lithium.

Figure 1: Map of the Salton Sea and Surrounding Region with Nearby Known Geothermal Resource Areas



Source: CEC Staff

The region surrounding the Salton Sea – the Salton Sea region – as defined by the Commission, consists of Coachella and Imperial Valleys. It includes all of Imperial County and most of Riverside County, extending from the Palm Springs area to Coachella and unincorporated communities near the Salton Sea, and then farther east to the California-Arizona border. This large area is notably economically distinct with approximately 150,000 people living and working in its communities. Major employment sectors across the area include agriculture and tourism, making these communities more similar to each other than they are to the economies of the Inland Empire and San Diego.⁴ The area is rich in cultural history, and it has a high percentage of households where English is not the primary language.⁵

As more fully discussed later in this report, while there is potential for an economic transformation of the Salton Sea region and communities near the Salton Sea KGRA – including [Imperial](#), Brawley, [Westmorland](#), Calipatria, Niland, North Shore, Mecca, Desert Shores, Bombay Beach, [and Salton City](#) – residents and Tribes in and culturally affiliated with these communities have expressed that their past experiences make them skeptical about “Lithium Valley” development efforts—and whether and how such development will benefit them instead of worsening existing conditions or creating new harms. Existing conditions include health impacts related to dust and air quality impacts from the receding Salton Sea.

Many indicators demonstrate the existing pollution and health burdens of the communities near the Salton Sea. Most of the census tracts in the region are identified by the California Environmental Protections Agency’s CalEnviroScreen mapping tool as disproportionately burdened by multiple sources of pollution.⁶ The region also faces unique economic challenges different than those faced by other regions in the state. In July 2022, the unemployment rate in Imperial County was 14.4 percent, the highest of any county in California and more than three times higher than the state average of 3.9 percent.⁷ According to the United States (U.S.) Census Bureau’s latest five-year estimate, for 2016 to 2020, the median household income in Imperial County was \$46,222 (in 2020 dollars) compared to the statewide average of \$78,672, and 18.1 percent of the population of Imperial County is living in poverty, significantly higher than the state average of 11.5 percent.⁸ Imperial County has a high percentage of adults without a high school education.

The record of Commission proceedings underscores that while the development of a geothermal and lithium based economic hub can lead to new industry and businesses, [-and individual projects may be subject to the rigorous requirements of the California Environmental](#)

4 Blue Ribbon Commission. 2022. “Final Letter Regarding Community Economic Resilience Fund (CERF) Recommendations for Salton Sea Region.” <https://efiling.energy.ca.gov/GetDocument.aspx?tn=242292&DocumentContentId=75794>.

5 U.S. Census Bureau, *QuickFacts: Imperial County, California*. <https://www.census.gov/quickfacts/fact/table/imperialcountycalifornia/PST045219>.

6 CA Office of Environmental Health Hazard Assessment. <https://oehha.ca.gov/calenviroscreen>.

7 State of California. August 19, 2022. *Monthly Labor Force Data for Counties (July 2022)*. Employment Development Department of the Labor Market Information Division. Report 400 C. <https://www.labormarketinfo.edd.ca.gov/file/lfmonth/2207rcou.pdf>

8 U.S. Census Bureau, *QuickFacts: Imperial County, California*. <https://www.census.gov/quickfacts/fact/table/imperialcountycalifornia/PST045219>.

[Quality Act](#), ~~it can~~ [there remains outstanding questions and public concern about potential for also lead to](#) adverse impacts, environmental or otherwise, on the [existing](#) overburdened communities in the region that suffer from poor air quality and a lack of infrastructure. [Existing infrastructure gaps include, including](#) a lack of roads or roads in need of maintenance, adequate streetlights and sidewalks, public transportation and effective mobility options, and communication infrastructure, for example, access to high-speed internet (broadband).

Report Findings and Recommendations

The report provides foundational information about lithium, its role in the global economy and California’s clean energy transition, standard methods of extraction and an overview of the recovery of lithium from geothermal brine. It also offers background and context for recovery of lithium from geothermal brine in the Salton Sea KGRA in Imperial County and presents issues of concern raised by community members and Tribes.

For each of the eight topics the Commission was required to consider, the report presents findings and recommendations for consideration to the Legislature, state and local agencies, and lithium recovery project developers.

Key Findings

- Lithium is a core component of lithium-ion batteries that can store and discharge high amounts of energy. Many consumer products use lithium-ion batteries, as do most electric vehicles (EVs) and energy storage technologies. Both EVs and energy storage are important to achieving California’s air quality and climate change targets. EVs offer a transportation option that does not emit air pollutants or greenhouse gas emissions from vehicle tailpipes, and energy storage supports grid stability and the broader growth of renewable energy technologies like wind, solar, and geothermal power.
- Due to the high demand for and reliance on lithium-ion batteries in the [United States](#) ~~U.S.~~ and the world, lithium is seen as a critical mineral important to national security and economic prosperity. Federal and state policies aim to enhance U.S. lithium supply capabilities to meet this demand.
- The Salton Sea KGRA is believed to have the highest concentration of lithium contained in geothermal brines in the world. Geothermal brine is a super-heated naturally occurring underground fluid, enriched with minerals including manganese, zinc and lithium.
- The two prevalent commercial methods for extracting lithium are hard rock mining and evaporation ponds. Mining is environmentally harmful — it scars landscapes, adversely affects ecosystems and habitat, is water- and energy-intensive, and can pollute air and

water resources.⁹ Evaporation ponds are water-intensive, can require thousands of square miles of land, and are environmentally destructive.^{10,11}

- The environmental impacts of the lithium recovery technologies proposed for use in Imperial County, direct lithium extraction (DLE) from geothermal brine, have a much lower environmental impact than hard rock mining and evaporation ponds. DLE is a more sustainable and environmentally beneficial approach to lithium recovery in terms of factors such as land use, water use, time to market, and carbon intensity.¹²
- Although the [United States U.S.](#) has large reserves of lithium in all forms, in January 2022 the only operational U.S. supply of lithium is a brine facility in Nevada using lithium evaporation ponds.¹³
- Interest in, and support for, the development of domestic lithium sources -- specifically lithium recovery from geothermal brine in Imperial County-- are occurring at the local, state, and national level.
- California's 2022-2023 budget¹⁴ provisions (including [the newly adopted Lithium Extraction Tax Law](#)) and opportunities under the federal Inflation Reduction Act of [2022](#)¹⁵ and Infrastructure Investment and Jobs Act¹⁶ and other state and federal programs can provide financial incentives for development of renewable energy, lithium recovery, and a related economic hub near the Salton Sea.
- Members of communities and Tribes near and culturally affiliated with the Salton Sea and Salton Sea KGRA are deeply interested in and concerned about possible impacts to the environment, cultural resources, and public health due to increased development of geothermal power plants and lithium recovery. They have many questions about

9 Parker SS, Franklin BS, Williams A, Cohen BS, Clifford, MJ, Rohde MM, 2022. Potential Lithium Extraction in the United States: Environmental, Economic, and Policy Implications. <https://www.scienceforconservation.org/products/lithium>.

10 Lineen, N., Bhavne R., & Woerner, D. 2018. "Purification of Industrial Grade Lithium Chloride for the Recovery of High Purity Battery Grade Lithium Carbonate." *Separation and Purification Technology*, 214, 168-173. <https://doi.org/10.1016/j.seppur.2018.05.020>.

11 Bradley, D.C., Stillings, L.L., Jaskula, B.W., Munk, L., and McCauley, A.D. 2017. "Lithium, chap. K of Critical mineral resources of the United States—Economic and environmental geology and prospects for future supply." *U.S. Geological Survey, Professional Paper 1802-K*. <https://doi.org/10.3133/pp1802K>

12 DLE technologies are designed to recover lithium and other minerals as the geothermal brine flows through pipelines and tanks and over a surface or substance that removes the lithium and other minerals before returning the brine deep underground.

13 U.S. Geological Survey, 2022. Mineral Commodity Summaries 2022: U.S. Geological Survey, 202 p., <https://doi.org/10.3133/mcs2022>.

14 State of California. 2022. *2022–2023 state budget*. <https://www.ebudget.ca.gov/2022-23/pdf/Enacted/BudgetSummary/FullBudgetSummary.pdf>.

15 U.S. Congress. 2022. "Inflation Reduction Act of 2022." H.R. 5376 – 117th Congress. <https://www.congress.gov/bill/117th-congress/house-bill/5376/text?q=%7B%22search%22%3A%5B%22inflation+reduction+act%22%2C%22inflation%22%2C%22reduction%22%2C%22act%22%5D%7D&r=1&s=2>

16 U.S. Congress. 2021. "Infrastructure Investment and Jobs Act." H.R. 3684 – 117th Congress. <https://www.congress.gov/bill/117th-congress/house-bill/3684/text>

potential impacts as well as how they will benefit from and not be harmed by this development.

Key Recommendations

There are [XX44](#) recommendations in the report for consideration by the California State Legislature and policy makers. A summary of the key recommendation are outlined in the table below, addressing the topics and issues required under AB 1657. The issues discussed by the Commission were often broader than any one distinct statutory topic, which led to similar recommendations for a few topics or recommendations that address multiple topics.

The requirements of AB 1657, including the convening of the Blue Ribbon Commission, remain operative until October 1, 2023.

[Proposed Recommendations Have Been Temporarily Removed due to Commissioners' Request and Consideration of Consolidated Recommendations at the Upcoming October and November Commission Meetings](#)

[Proposed Consolidated Recommendations can be Found in accompanying document on the Docket.](#)

CHAPTER 1:

Introduction and Background

In 2020, Governor Gavin Newsom signed into law Assembly Bill 1657 (AB 1657, E. Garcia, Chapter 271, Statutes of 2020),¹⁷ which found and declared that:

- World demand for lithium is expected to grow as much as tenfold in the next decade, but virtually none is produced in the United States. Instead, almost all the global lithium supply is mined in Argentina, Chile, China, and Australia.
- The Salton Sea geothermal resource area is well-positioned to become a competitive source of supply that could satisfy more than one-third of today's worldwide lithium demand. But no mining companies will invest in this resource until the technology to recover lithium from geothermal brine on a commercial scale is proven and can occur without certain risks and uncertainties.
- There is a national security rationale for developing a domestic supply of lithium. Lithium was listed in the *Federal Register* as a critical mineral "essential to the economic and national security of the United States" the 2017 presidential Executive Order No. 13817 titled "A Federal Strategy to Ensure Secure and Reliable Supplies of Critical Minerals."
- The opportunity for lithium production in California has the potential to unleash billions of dollars of new economic infrastructure development.

To enable the state to better understand the opportunities and potential challenges of lithium recovery in California, AB 1657 tasked the California Energy Commission (CEC) to convene and establish a Blue Ribbon Commission on Lithium Extraction in California (Blue Ribbon Commission or Commission) to (1) review, investigate, and analyze eight pertinent topics relating to lithium extraction and use in California and (2) submit a report to the Legislature by October 1, 2022, documenting the Commission's findings and recommendations. The eight topics are:

- Actions that will support the further development of geothermal power that have the potential to provide the cobenefit of lithium recovery from existing and new geothermal facilities.
- Market opportunities for lithium.
- 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.
- Methods of overcoming technical and economic challenges currently limiting lithium extraction, processing, and production from geothermal brines.

¹⁷ Assembly Bill 1657 (Garcia, E., Chapter 271, Statutes of 2020), https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201920200AB1657.

- Safe environmental methods and standards for lithium extraction from geothermal brines and how this compares to other methods for deriving lithium.
- Potential economic and environmental impacts to the state resulting from extraction, processing, and production of lithium and lithium-dependent products from geothermal brines.
- The importance of, and opportunities for, the application of local, state, and federal incentives and investments to facilitate lithium extraction from geothermal brines.¹⁸
- 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.

Report Development and Content

This report reflects nearly two years of review, analysis, and investigation by the Blue Ribbon Commission conducted through noticed public meetings. AB 1657 explicitly authorized the Commission to take public input for recommendations. As this report explains, the Commission invited, welcomed, and received extensive questions and comments from community-based organizations, Tribes and residents of nearby communities about the Commission’s obligations under AB 1657 and the state’s parallel activities for “Lithium Valley” development and implementation of the Salton Sea Management Program.

The report provides foundational information about lithium, the role of lithium in the global economy and California’s clean energy transition, a review of the most common methods of lithium extraction – mining lithium from hard rock and extraction from evaporation ponds used in other places – and recovery of lithium from geothermal brine. It then offers background and context for recovery of lithium from geothermal brine in the Salton Sea KGRA, and presents issues of concern raised by community members and tribalTribal representatives¹⁹. For each of the eight topics the Commission was required by AB 1657 to consider, the report presents findings and recommendations for consideration by the Legislature, state and local agencies, and DLE project developers.

The discussion in this chapter provides context about the development of the report, with a focus on:

- the state’s efforts to achieve its climate and clean energy goals

18 Assembly Bill 1657 states this topic includes, but is not limited to 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; and leveraging tax incentives in federally recognized opportunity zones.

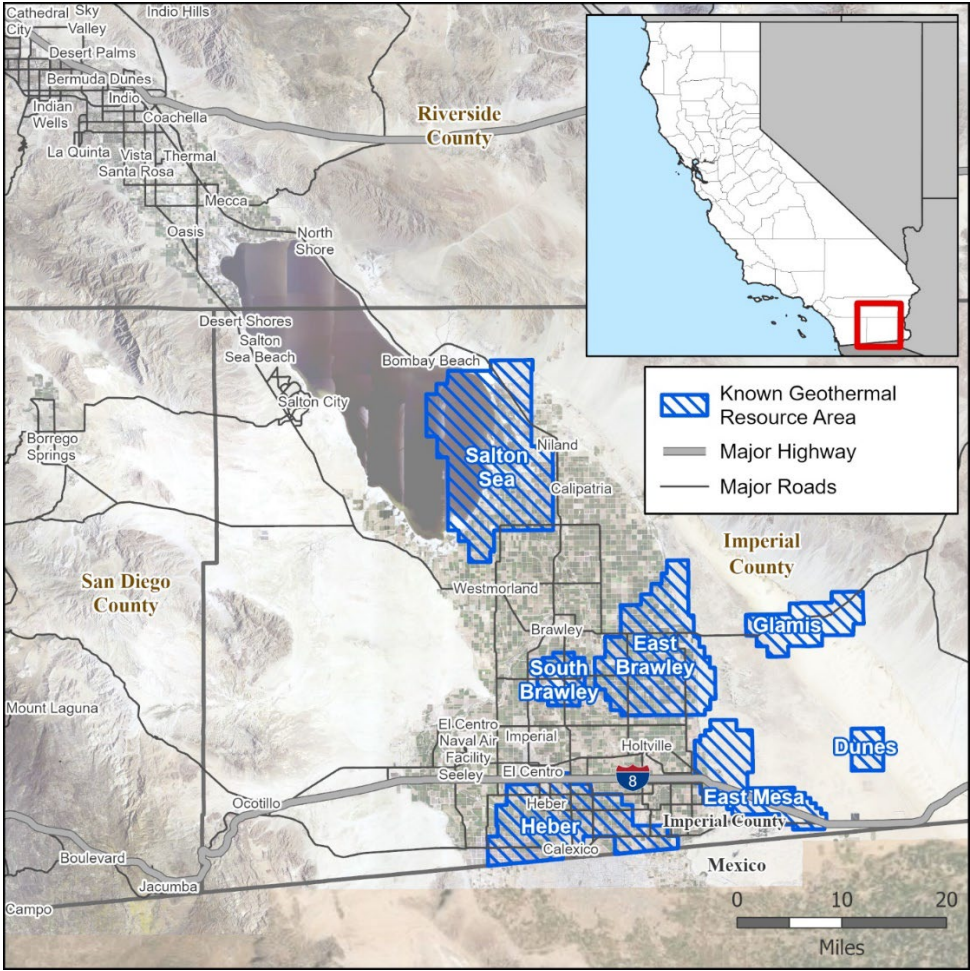
19 Technical materials from public meetings and meetings’ transcript can be found at Lithium Valley Commission meeting webpage at <https://www.energy.ca.gov/data-reports/california-power-generation-and-power-sources/geothermal-energy/lithium-valley/lithium>, and technical fact sheets can be found at <https://www.energy.ca.gov/data-reports/california-power-generation-and-power-sources/geothermal-energy/lithium-valley>

- the meaning of the phrase “Lithium Valley” and state efforts to support and advance “Lithium Valley” development
- the demographics of the surrounding counties and communities nearby the Salton Sea KGRA
- the state’s ongoing activities to implement the Salton Sea Management Program, and
- the public process undertaken by the Commission, including engagement with community-based organizations, local residents, and Tribes, to develop the report.

This chapter provides context and discussion of California’s climate and clean energy goals, the state’s efforts to support the development of lithium extraction in California, lithium supply in the Salton Sea KGRA, demographics of the region near the Salton Sea, the state’s efforts to implement the Salton Sea Management Program, and the public process, community engagement, and engagement with Tribes undertaken by the Commission.

Figure 1 below shows the location of the Salton Sea in Imperial and Riverside Counties as well as the general location of this region in relationship to other county and state borders.

Figure 1: Map of the Salton Sea and Surrounding Region with nearby Known Geothermal Resource Areas



Source: CEC Staff

Achieving California's Climate and Clean Energy Goals

California is a leader in climate policy and transitioning the state's economy to clean electricity and transportation systems. The 100 Percent Clean Energy Act of 2018, commonly referred to as Senate Bill 100 (SB 100, De León, Chapter 312, Statutes of 2018), is a pillar of the state's clean energy policy. SB 100 increased the state's Renewables Portfolio Standard to ensure that at least 60 percent of the state's electricity comes from eligible renewable energy resources by 2030 and that eligible renewable energy resources and zero-carbon resources supply 100 percent of all retail sales of electricity to California customers and 100 percent of electricity procured to serve all state agencies by December 31, 2045.²⁰

In addition to the renewable and zero-carbon energy goals of SB 100, Senate Bill 32 (Pavley, Chapter 249, Statutes of 2016) set an economywide target of reducing greenhouse gas (GHG) emissions to 40 percent below 1990 levels by 2030 and Governor's Executive Order B55-18 established the broader goal for economy wide carbon neutrality by 2045.^{21, 22}

The state is taking bold action to meet these greenhouse gas reduction targets, including implementing aggressive zero-emission transportation goals such as the following:²³

- All new passenger vehicles sold are to be zero-emission by 2035.²⁴
- Transition all drayage trucks to be zero-emission by 2035.²⁵
- All medium- and heavy-duty vehicles in California are to be zero-emission by 2045 where feasible.

Reducing greenhouse gas (GHG) emissions from the transportation and building sectors through electrification relies on batteries for electric vehicles and storage systems paired with clean sources of electricity to serve the energy demand of buildings. Lithium-ion technologies dominate the markets for batteries and storage systems, which means the state's success in decarbonizing the economy and combating the climate crisis relies on lithium.

In enacting AB 1657, the Legislature found that "[t]he Salton Sea geothermal resource area is well-positioned to become a competitive source of supply that could satisfy more than one-third of today's worldwide lithium demand." This finding is supported by the fact that Salton Sea KGRA has a ~~subsurface~~-reservoir -- that starts at least ~~half a mile~~1,500 feet underground -- of super-heated naturally occurring fluid (geothermal brine) is very rich in many naturally

20 Senate Bill 100 (De León, Chapter 312, Statutes of 2018) (SB100), https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180SB100

21 Senate Bill 32 (Pavley, Chapter 249, Statutes of 2016) (SB 32). https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=202120220SB32

22 California, Office of the Governor. 2018. "Executive Order B-55-18 to Achieve Carbon Neutrality of September 10, 2018". <https://www.ca.gov/archive/gov39/wp-content/uploads/2018/09/9.10.18-Executive-Order.pdf>

23 California, Office of the Governor. 2020. "Executive Order N-79-20 of September 23, 2020." <https://www.gov.ca.gov/wp-content/uploads/2020/09/9.23.20-EO-N-79-20-Climate.pdf>.

24 California Air Resources Board. 2022. "Final Regulation Order: Adoption of new Section 1961.4, Title 13, California Code of Regulations." Accessed on August 31, 2022: <https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2022/accii/accii1961.4.pdf>

25 Drayage trucks transport containers and bulk goods to and from ports and intermodal railyards.

occurring minerals including manganese, zinc, and lithium. The Salton Sea KGRA is believed to have the highest concentration of lithium contained in geothermal brines in the world.

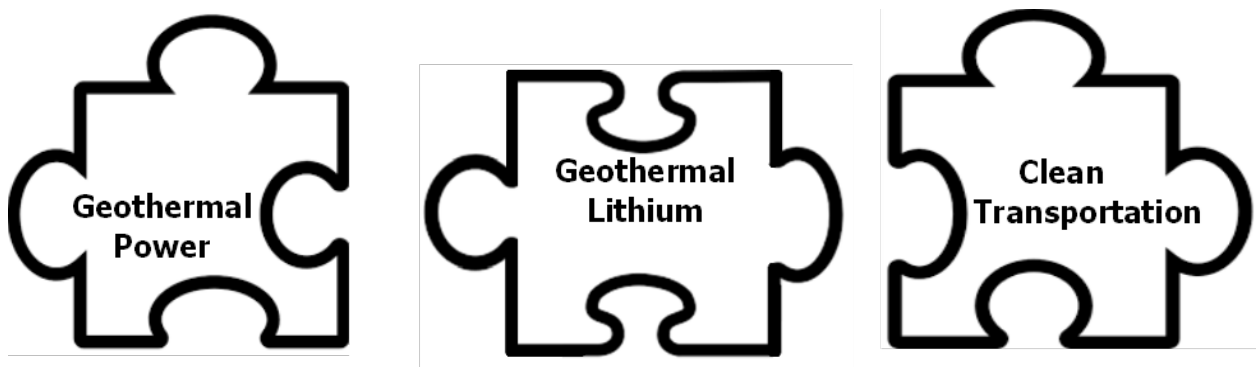
“Lithium Valley” Development

The term “Lithium Valley” has been used by state leadership and others to describe the development of a world-class lithium industry in California centered on recovery of lithium from geothermal brine in the Salton Sea KGRA and the expansion of geothermal energy production, along with local economic and community development opportunities.

Beginning in 2018, the CEC hosted public meetings on lithium recovery from geothermal brine in California.^{26, 27} By February 2020, when the CEC co-hosted a symposium with the Governor’s Office of Business and Economic Development (GO-Biz) to facilitate presentations and panel discussions on this topic, the state first introduced “California’s ‘Lithium Valley’ vision of establishing a world-class lithium industry in the state,” to support California’s clean energy future.

The term “Lithium Valley” is intended to draw a comparison to the term “Silicon Valley,” which is recognized as “a region in Northern California that serves as a global enter for high technology and innovation” whose economy has been centered around the material silicon.²⁸ Silicon Valley is viewed globally as setting a standard of success for technology innovation and thriving economic technology hubs. The state sees potential for “Lithium Valley” to be an economic hub (economic ecosystem) centered by **clean**-geothermal power and lithium recovered from geothermal brine, and a lithium battery supply chain.²⁹

Figure 2: Key Elements of Lithium Valley Development (Revised)



26 California Energy Commission. 2018. “Lead Commissioner Workshop on Lithium Recovery from Geothermal Brine Agenda”. <https://efiling.energy.ca.gov/GetDocument.aspx?tn=225888&DocumentContentId=56565>

27 California Energy Commission. 2018. “Transcript of the 11/15/2018 Lead Commissioner Workshop on Lithium Recovery from Geothermal Brine.” <https://efiling.energy.ca.gov/GetDocument.aspx?tn=226069&DocumentContentId=56810>

28 Wikipedia. 2022. “Silicon Valley”. Last modified on August 26, 2022. https://en.wikipedia.org/wiki/Silicon_Valley

29 The term “economic ecosystem” is defined as “a dynamically stable network of interconnected firms and institutions within bounded geographical space.” From: Auerswald, Philip Edgar and Dani, Lokesh, Economic Ecosystems (August 7, 2017). in Gordon L. Clark, Maryann P. Feldman, Meric S. Gertler, and Dariusz Wójcik (eds), The New Oxford Handbook of Economic Geography, New York, NY: Oxford University Press, chapter 13, 2017, Available at SSRN: <https://ssrn.com/abstract=3494495>

Since 2020, Lithium Valley development has been a significant topic of interest for both Governor Newsom and the Legislature. For example, in 2021, the California State Assembly established the Select Committee on California’s Lithium Economy, led by Assemblymember Eduardo Garcia, and held hearings to explore lithium opportunities to realize a California lithium economy.³⁰

On January 10, 2022, Governor Newsom presented his proposed fiscal year 2022–2023 state budget, the California Blueprint, that included proposed actions to support Lithium Valley development and realize state clean energy goals. As the summary for the proposed fiscal year 2022–2023 state budget explained, “[t]he state also plans to develop naturally occurring resources of lithium — a critical component of advanced battery technology — to improve the state’s ability to store renewable energy while creating high-paying jobs and generating benefits for surrounding communities and all Californians.”³¹

The May Revision to the Governor’s proposed fiscal year 2022–2023 state budget maintained focus on creating a strategy for Lithium Valley development,³² and in June 2022, the California Legislature approved, and Governor Newsom signed a budget and related bills that contained provisions specific to geothermal and lithium extraction development, informed in part by the work of the Blue Ribbon Commission.³³

Specifically, the fiscal year 2022–2023 state budget includes significant financial provisions relating to Lithium Valley development:³⁴

- A newly created volume-based tax on lithium extraction that will take effect on January 1, 2023.
 - The tax rate of \$400 per metric ton for the first 20,000 tons of lithium carbonate equivalent extracted, \$600 per metric ton extracted over 20,000 up to 30,000 metric tons, and \$800 per metric ton for lithium carbonate equivalent extracted over 30,000 metric tons
 - Eighty percent of the moneys collected will go to counties where the extraction is occurring, in the same proportion as the tax was collected from those counties. Imperial County is required to distribute no less than 30 percent of the funds it

30 Select Committee on California’s Lithium Economy. 2021. “Informational Hearing of October 6, 2021: Financing Opportunities and Challenges in Building California’s Batter Supply Chain.” <https://www.assembly.ca.gov/asccle>

31 State of California. 2022. *2022–2023 state budget*. <https://www.ebudget.ca.gov/2022-23/pdf/Enacted/BudgetSummary/FullBudgetSummary.pdf>, p. 5, 72.

32 State of California. 2022. *2022-23 May Revision to the Governor’s Budget*. <https://www.ebudget.ca.gov/budget/2022-23MR/#/Home>.

33 Senate Bill 125 (Committee on Budget and Fiscal Review, Chapter 63, Statutes of 2022), https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=202120220SB125

34 Senate Bill 154 (Skinner, Chapter 43, Statutes of 2022). Budget Act of 2022, https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=202120220SB154.

receives to Imperial County communities directly and indirectly impacted by lithium extraction.³⁵

- Twenty percent of the moneys collected must be deposited into a newly created Lithium Subaccount within the Salton Sea Restoration Fund administered by the California Natural Resources Agency and allocated for:
 - Operations and maintenance of restoration projects or other public works projects in existence on January 1, 2023 or developed by the state under the Salton Sea Management Plan or an applicable State Water Resources Control Board order.
 - Restoration projects required to meet the state’s obligations in any state plan or order related to the management of the Salton Sea.
 - Grants for community engagement, public amenity, capital improvement, or community benefit projects, including projects to help build capacity for meaningful public participation and outreach, at and around the Salton Sea and those communities impacted by the Salton Sea’s restoration and development.

[The law also requires that by December 31, 2023, the Department of Tax and Fee Administration, in consultation with the Department of Finance, to prepare a study of replacing the volume-based tax on the extraction of lithium with an equivalent tax based on gross receipts.](#)

\$5 million of general fund monies allocated to Imperial County for specified activities related to the development of lithium recovery were directed to be used as follows:

- \$3.8 million to prepare the county’s programmatic environmental impact report (EIR) and a health impact assessment and support community outreach for geothermal energy development and lithium extraction, processing, production, and related manufacturing activities within the county.
- \$800,000 to distribute grants for engagement by community-based organizations in the county on the programmatic EIR created by the county for lithium and geothermal energy development efforts in the county.
- \$350,000 to support the activities of an ombudsperson to engage with stakeholders on lithium extraction, rare-earth minerals mining, and renewable energy generation to provide enhanced communication by and between internal departments within the county and assistance in communication with state and federal agencies.
- \$80 million in general fund monies for the San Diego State University Brawley Center to support a local workforce pipeline to aid the state’s goals for Lithium Valley.

As more fully discussed in this report, the Commission sees an opportunity for Imperial County to initiate public processes and meaningfully engage with community members and Tribes on

³⁵ [The law identifies the directly affected communities as Bombay Beach, City of Brawley, City of Calipatria, Niland, city of Westmorland and the indirectly affected communities as Bard, City of Calexico, Desert Shores, City of El Centro, Heber, City of Holtville, City of Imperial, Ocotillo, Palo Verde, Salton City, Salton Sea Beach, Seeley, Winterhaven, and Vista Del Mar.](#)

its planned implementation of the budget provisions and importantly, align its implementation of the budget with Commission recommendations for County implementation of the “Imperial County Lithium Valley Economic Opportunity Investment Plan and provide public process for community members and Tribes to engage with the County implementation of the Plan.”³⁶

As stated in a June 2, 2022, letter of support from the Commission on elements of the County Plan to Governor Newsom, Senator Ben Hueso, and Assemblymember Eduardo Garcia, “Imperial County includes several disadvantaged communities and is one of the poorest counties in the state. We believe many elements of the Lithium Valley Economic Opportunity Investment Plan, among other efforts, enable an efficient, secure, and fair development of an industry that has the potential to propel and improve the economic and environmental future of Imperial County residents for generations.”³⁷ To this end, the Commission’s June 2 letter supported specific elements of the County Plan, including, but not limited to \$5 million for the creation of a Lithium Valley Specific Plan and Programmatic Environmental Impact Report to assist with providing industry with a clear timeline for project delivery and funding for a higher education campus in Imperial County.

Salton Sea Region: Lithium Supply and Regional Context

As more fully discussed later in the report, while there is potential for an economic transformation of the Salton Sea region, [the experiences of the](#) residents and Tribes in these communities ~~have lived experiences that~~ make [some of](#) them skeptical about Lithium Valley development efforts and whether and how such development will benefit them instead of worsening existing conditions or creating new harms.

Residents in communities including ~~Imperial~~, Brawley, [Westmorland](#), Calipatria, Niland, North Shore, Mecca, Desert Shores, Bombay Beach, [Salton City](#), and others currently experience [adverse](#) health impacts related to dust and air quality impacts from the receding Salton Sea. Local regional residents are particularly concerned with the potential for lithium extraction to worsen existing public health conditions or create new harms.

Many indicators demonstrate the existing pollution and health burdens of the communities near the Salton Sea. Most of the census tracts in the region are identified by the California Environmental Protections Agency’s CalEnviroScreen mapping tool as disproportionately burdened by multiple sources of pollution.³⁸ Representatives of local community-based organizations shared statistics with the Blue Ribbon Commission that show that Imperial County is in the bottom 2 percent of healthy community conditions statewide, in other words, more than 98 percent of other California counties rank higher than Imperial.³⁹

36 Imperial County. 2022. “Lithium Valley Economic Opportunity Investment Plan.” <https://lithiumvalley.imperialcounty.org/wp-content/uploads/2022/02/LithiumValleyInvestmentPlanLVIP-FINAL-Watermark.pdf>

37 Blue Ribbon Commission on Lithium Extraction in California. 2022. “Letter of support from the Lithium Valley Commission.” CEC Docket 20-LITHIUM-01, TN#: 243533. <https://efiling.energy.ca.gov/GetDocument.aspx?tn=243533&DocumentContentId=77369>

38 CA Office of Environmental Health Hazard Assessment. <https://oehha.ca.gov/calenviroscreen>

39 Blue Ribbon Commission. 2022. “Transcript of the May 12, 2022, Blue Ribbon Commission meeting.” Page 105. <https://efiling.energy.ca.gov/GetDocument.aspx?tn=243477&DocumentContentId=77306>

The region also faces economic challenges different than those faced by other regions in the state. In June 2022, the unemployment rate in Imperial County was 14.2 percent, the highest of any county in California and more than three times higher than the state average of 3.9 percent.⁴⁰ According to the U.S. Census Bureau's latest five-year estimate, from 2016 to 2020, the median household income in Imperial County was \$46,222 (in 2020 dollars) compared to the statewide average of \$78,672 and 18.1 percent of the population of Imperial

County is living in poverty, significantly higher than the state average of 11.5 percent.⁴¹ Imperial County has a high percentage of adults without a high school education.⁴²

~~And the~~The record of Commission proceedings underscores that while the development of a geothermal and lithium based economic hub can lead to new industry and businesses, and individual projects may be subject to the rigorous requirements of the California Environmental Quality Act, there remains public concern about potential for development of this economic hub will require mitigation of any environmental impacts due to industrial growth. Local residents have concern over potential it can also lead to adverse impacts, environmental or otherwise, on the overburdened and underserved communities in the region who suffer from poor air quality, and a lack of infrastructure, including a lack of roads or roads in need of maintenance, adequate streetlights and sidewalks, public transportation and effective mobility options, and communication infrastructure, for example, access to high-speed internet (broadband).^{43, 44}

Salton Sea Management Program

The California Natural Resources Agency, the California Department of Water Resources, and the California Department of Fish and Wildlife (CDFW) are implementing the Salton Sea Management Program (SSMP) to address air quality and ecological threats at the Salton Sea.

The SSMP 10-year plan (Phase 1: 10-Year Plan) aims to improve conditions around the Salton Sea by constructing projects that create habitat and reduce dust from exposed lakebed on 30,000 acres.⁴⁵

A major project from the Phase 1: 10-Year Plan currently under construction is the 3,770-acre Species Conservation Habitat (SCH) Project, which will create a network of ponds with islands and areas of varying water depths to provide important fish and bird habitat and suppress

40 State of California. August 19, 2022. *Monthly Labor Force Data for Counties (July 2022)*. Employment Development Department of the Labor Market Information Division. Report 400 C. <https://www.labormarketinfo.edd.ca.gov/file/lfmonth/2207pcou.pdf>

41 U.S. Census Bureau, *QuickFacts: Imperial County, California*. <https://www.census.gov/quickfacts/fact/table/imperialcountycalifornia/PST045219>.

42 U.S. Census Bureau, *QuickFacts: Imperial County, California*. <https://www.census.gov/quickfacts/fact/table/imperialcountycalifornia/PST045219>.

43 Blue Ribbon Commission. 2021. "Transcript for November 17, 2021, Lithium Valley Commission Community Forum." CEC Docket 20-LITHIUM-01 TN#: 240766. <https://efiling.energy.ca.gov/GetDocument.aspx?tn=240766&DocumentContentId=74208>

44 Blue Ribbon Commission. 2022. "Transcript from July 21, 2022, Blue Ribbon Commission Meeting." <https://efiling.energy.ca.gov/GetDocument.aspx?tn=245784&DocumentContentId=79989>

45 California Natural Resources Agency. 2018. "Salton Sea Management Program Phase I: 10-Year Plan." <https://resources.ca.gov/CNRALegacyFiles/wp-content/uploads/2018/10/SSMP-Phase-1-10-Year-Plan.pdf>

dust emissions to improve regional air quality. According to the 2020 Annual Report on the SSMP, several other community-oriented restoration projects around the Sea have moved forward with local partners, vegetation management work on exposed lakebed progressed, and the state authorized an additional \$220 million in funding.⁴⁶

The SSMP team is also working on long term planning for the Salton Sea and is conducting activities including a series of public workshops to inform the development of the Long-Range Plan.⁴⁷

Blue Ribbon Commission Public Process and Community and Tribal Engagement

The CEC convened the Blue Ribbon Commission, commonly referred to as the Lithium Valley Commission, in December 2020 while the state and world were contending with a pandemic. With the support of the CEC due to the Commission not having allocated funding or its own dedicated staff, the Blue Ribbon Commission conducted more than 20 public meetings (almost all conducted remotely through meeting platforms due to the pandemic), including a community forum, and performed the AB 1657-required review, investigation, and analysis relying on CEC staff to provide administrative and technical support.

The CEC created a webpage and docket for the Blue Ribbon Commission to ensure a centralized depository for information and activities — from fact sheets to meeting information and workshop presentations — that was easily accessible to the public, with notices and pertinent documents translated into Spanish. Select documents have also been provided in Purépecha.

Beginning in May 2022, the Blue Ribbon Commission conducted hybrid public meetings that allowed for in-person and virtual participation by Commissioners and the public. The primary in-person locations were held in the communities of Calipatria, Westmorland, Thermal, and Imperial with interpretation services provided.

With a targeted focus on ensuring public and community engagement in the region, the Blue Ribbon Commission held a community forum on November 17, 2021, with participation by Assemblymember Eduardo Garcia. The forum was conducted with virtual and in-person attendance at four locations in the region. Interpretation services were provided. The Commission also worked with local community-based organizations to get input on how to best approach community engagement. On July 21, 2022, the Blue Ribbon Commission, recognizing the need for additional **tribalTribal** and community engagement before issuing its draft report to the Legislature, hosted an all-day meeting with virtual and in-person attendance at two sites, one at the Westmorland Union Elementary School in Westmorland and another at the Torres Martinez Desert Cahuilla Indians Tameka Gym in Thermal. The meeting focused on listening to and learning from **tribalTribal** perspectives and community resident perspectives.

Chapter 3 provides additional information on community and **tribalTribal** perspectives, including those presented during the July 21, 2022, meeting.

46 California Natural Resources Agency. 2022. "Annual Report on the Salton Sea Management Program." https://saltonsea.ca.gov/wp-content/uploads/2022/02/2022-Annual-Report_English_Feb-24-2022_Final.pdf

47 State of California. 2022. "Salton Sea Management Program." <https://saltonsea.ca.gov/program/>.

CHAPTER 2:

Lithium Demand, Supply, Recovery, and Processing

The initial efforts of the Blue Ribbon Commission centered on building a foundational understanding of lithium and where it occurs, the importance of lithium nationally and for California, prevalent lithium extraction methods including hard rock mining and evaporation ponds used in other places, and the technologies proposed to recover lithium from geothermal brine in the Salton Sea KGRA. This chapter summarizes the foundational information that informed the Commission’s investigation and analyses under AB 1657.

Lithium and Today’s Market

Lithium is a soft, silvery-white metal that can be found in many places throughout the world, typically in mineral compounds in hard rock, sediments, and certain water sources. It occurs naturally and abundantly in the earth and is generally found in three sources — pegmatites or hard rock, sedimentary deposits often referred to as clay, and waters with high concentrations of dissolved salts referred to as *brines*. Salar brines are close to the surface, in contrast, geothermal brines are high-temperature, high-pressure formations deep underground.⁴⁸

Lithium is a core component of lithium-ion batteries that can store and discharge high amounts of energy. Many consumer products use lithium-ion batteries, as do most electric vehicles (EVs) and energy storage technologies. Both EVs and energy storage are important to achieving California’s air quality and climate change targets. EVs offer a transportation option that does not emit air pollutants or greenhouse gas emissions from vehicle tailpipes, and energy storage supports additional use of renewable energy technologies like wind, solar and geothermal power. Due to the high demand for and reliance on lithium-ion batteries in the United States (U.S.) and the world, lithium is seen as a critical mineral important to national security and economic prosperity. To meet this demand, federal and state policies aim to enhance U.S. lithium supply capabilities.

The [U.S. United States](#) has designated lithium as a critical mineral that is essential to the economic and national security of the [U.S. United States](#) and has a supply chain vulnerable to disruption.⁴⁹ Since lithium is predominantly produced in other countries, the U.S. dependence on foreign sources creates critical risk for state and national efforts.⁵⁰ On February 24, 2021,

48 Blue Ribbon Commission. 2021. “Transcript of the July 29, 2021, Blue Ribbon Commission meeting.” page 35. <https://efiling.energy.ca.gov/GetDocument.aspx?tn=239800&DocumentContentId=73245>

49 U.S. President, Executive Order, “Addressing the Threat to the Domestic Supply Chain From Reliance on Critical Minerals From Foreign Adversaries and Supporting the Domestic Mining and Processing Industries, Executive Order 13953 of September 30, 2020,” *Federal Register* 85, no. 193 (October 5, 2020): 62539. <https://www.govinfo.gov/content/pkg/FR-2020-10-05/pdf/2020-22064.pdf>

50 U.S. President, Executive Order, “A Federal Strategy to Ensure Secure and Reliable Supplies of Critical Minerals, Executive Order 13817 of December 20, 2017,” *Federal Register* 82, no. 246 (December 26, 2017): 60835. <https://www.govinfo.gov/content/pkg/FR-2017-12-26/pdf/2017-27899.pdf>

President Joseph Biden issued Executive Order 14017 (which builds on prior presidential executive orders), making plain that:

The United States needs resilient, diverse, and secure supply chains to ensure our economic prosperity and national security. Pandemics and other biological threats, cyber-attacks, climate shocks and extreme weather events, terrorist attacks, geopolitical and economic competition, and other conditions can reduce critical manufacturing capacity and the availability and integrity of critical goods, products, and services. *Resilient American supply chains will revitalize and rebuild domestic manufacturing capacity, maintain America's competitive edge in research and development, and create well-paying jobs. They will also support small businesses, promote prosperity, advance the fight against climate change, and encourage economic growth in communities of color and economically distressed areas.*⁵¹ (Italic added)

The legislative findings for AB 1657, and AB 1657 itself, are aligned with this national policy around lithium, including the *National Blueprint for Lithium Batteries 2021–2030*.⁵²

Interest in, and support for, the development of domestic lithium sources -- specifically lithium recovery from geothermal brines in Imperial County, are occurring at the national level. In February 2022, President Biden hosted a roundtable discussion, in which Blue Ribbon Commission Chair Silvia Paz participated, and during which he announced major investments in domestic production of minerals critical for modern technologies. President Biden also asked the Secretary of Energy, Jennifer Granholm, to visit the Salton Sea region to hear directly from local residents and community and government leaders about the opportunities and challenges of advancing a lithium-based economy in the region. Secretary Granholm, White House officials, and Congressman Raul Ruiz, visited the region on April 20, 2022, holding a community listening session in North Shore focused on public health near the Salton Sea. A later meeting was held that day in Calipatria with local community leaders and elected officials to discuss the potential economic effects of lithium development on quality of life, workforce development, and education.⁵³

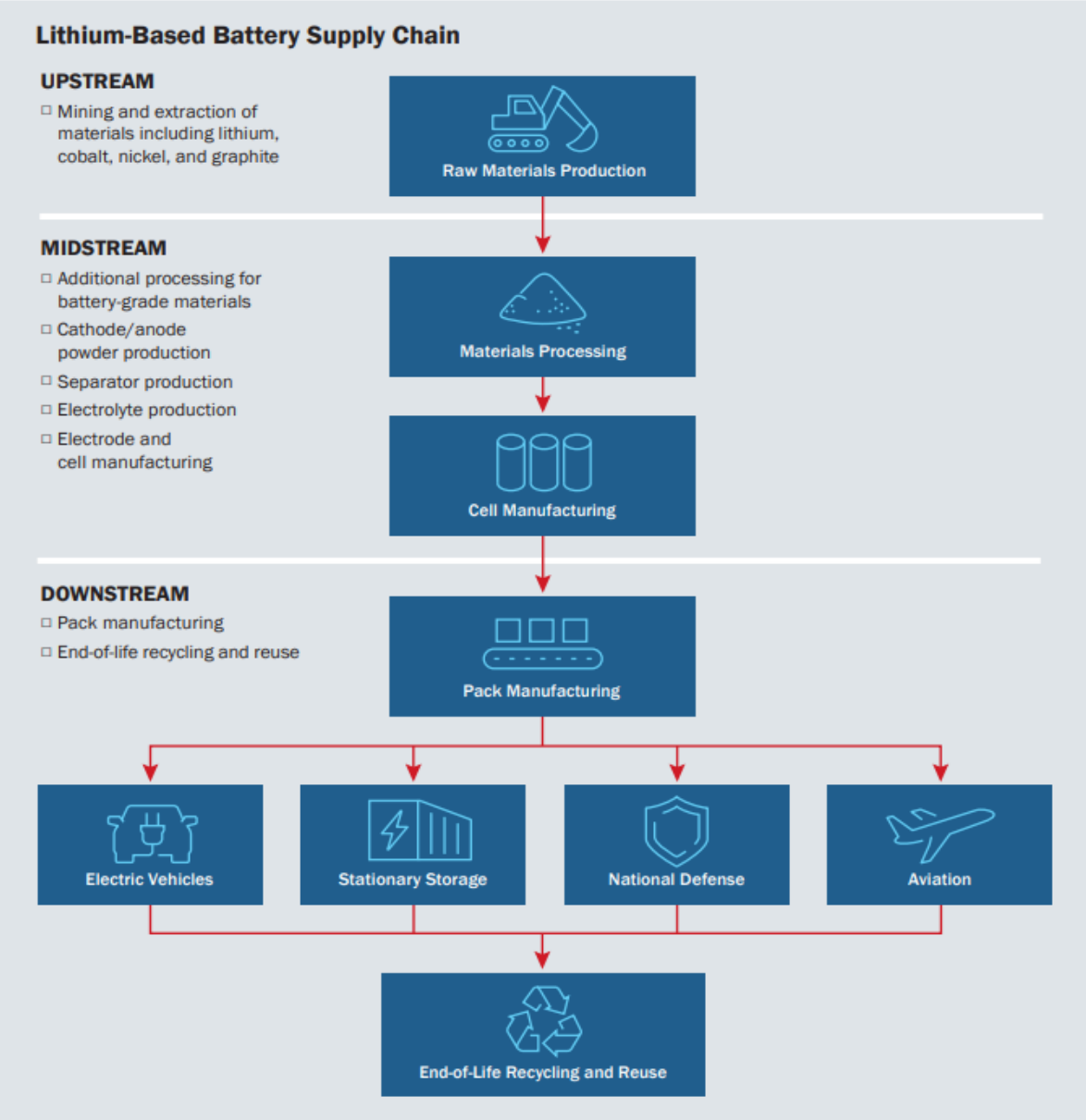
51 U.S. President, Executive Order, "America's Supply Chains, Executive Order 14017 of February 24, 2021," *Federal Register* 86, no. 38 (March 1, 2021): 11849. <https://www.govinfo.gov/content/pkg/FR-2021-03-01/pdf/2021-04280.pdf>

52 Federal Consortium for Advanced Batteries. 2021. "National Blueprint for Lithium Batteries 2021-2030: Executive Summary." U.S. Department of Energy. DOE/EE-2348. https://www.energy.gov/sites/default/files/2021-06/FCAB%20National%20Blueprint%20Lithium%20Batteries%200621_0.pdf.

53 US Department of Energy. 2021. <https://www.energy.gov/articles/icymi-secretary-granholm-visited-california-highlight-president-bidens-investments>

Figure 3 shows the lithium-based battery supply chain, which illustrates the various stages for potential end-products of this essential resource, as well as the broader scope of the potential regional economic cluster of lithium-related industries.⁵⁴

Figure 3: Lithium-Based Battery Supply Chain



Source: Federal Consortium for Advanced Batteries⁵⁵

54 Federal Consortium for Advanced Batteries. 2021. "National Blueprint for Lithium Batteries 2021-2030: Executive Summary." U.S. Department of Energy. DOE/EE-2348. https://www.energy.gov/sites/default/files/2021-06/FCAB%20National%20Blueprint%20Lithium%20Batteries%200621_0.pdf.

55 Federal Consortium for Advanced Batteries. June 2021. "National Blueprint for Lithium Batteries 2021-2030: Executive Summary." U.S. Department of Energy. DOE/EE-2348. Page 17. https://www.energy.gov/sites/default/files/2021-06/FCAB%20National%20Blueprint%20Lithium%20Batteries%200621_0.pdf.

Global Lithium Supply

It is estimated that potential global supply of lithium is about 86 million tons. Lithium resources are present in more than 20 countries, including the “Lithium Triangle” countries of Bolivia, Argentina, and Chile (estimated at 50 million tons); the [United States U.S.](#) (7.9 million tons); Australia (6.4 million tons); and China (5.1 million tons).⁵⁶ The 7.9 million tons of lithium reserves identified in the [United States U.S.](#) exist primarily in California, Nevada, Utah, Arkansas, and North Carolina in ore, sediment, and brine forms, depending on the location.⁵⁷

Although the [United States U.S.](#) has large reserves of lithium in all forms, the only operational U.S. supply of lithium is a brine facility in Nevada using lithium evaporation ponds.⁵⁸ Two new lithium mining operations are in development in Nevada and another in North Carolina. Additional facilities to recover lithium from oil field brines are in development and potentially will use DLE methods.⁵⁹

Although many countries have lithium reserves, Australia, Argentina, Chile, and China accounted for the majority of world lithium supply in 2021.⁶⁰ Figure 4 summarizes third quarter 2020 global lithium mining, extraction and recovery capacity.

56 U.S. Geological Survey. 2021. “Mineral commodity summaries 2021: U.S. Geological Survey.” <https://pubs.usgs.gov/periodicals/mcs2021/mcs2021.pdf>.

57 California Energy Commission. 2021. “Presentation for March 21, 2021, Blue Ribbon Commission Meeting.” <https://efiling.energy.ca.gov/getdocument.aspx?tn=237359>. Slide 19.

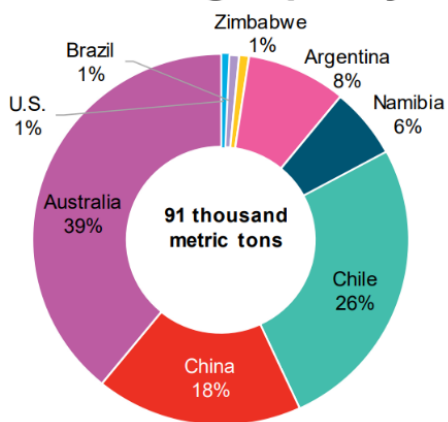
58 U.S. Geological Survey. 2021. “Mineral Commodities Summaries 2021.” <https://pubs.usgs.gov/periodicals/mcs2021/mcs2021.pdf>.

59 Blue Ribbon Commission. 2022. “Transcript of the June 16, 2022, Blue Ribbon Commission meeting.” <https://efiling.energy.ca.gov/GetDocument.aspx?tn=243846&DocumentContentId=77784>. Page 102.

60 USGS. 2022. “Mineral Commodity Summaries 2022 — Lithium.” <https://pubs.usgs.gov/periodicals/mcs2022/mcs2022-lithium.pdf>.

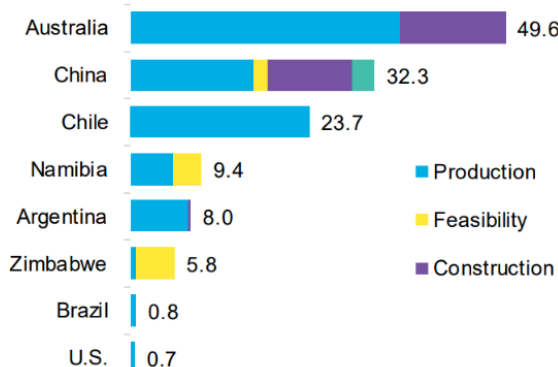
Figure 4: Global Lithium Mining and Recovery Capacity (Third Quarter 2020)

Lithium-ion mining nameplate manufacturing capacity



Source: BloombergNEF. Note: Figure reflect global totals as of October 20, 2020.

Thousand metric ton lithium metal



Source: BloombergNEF. Figures reflect global lithium mining capacity as of 3Q 2020. Note: Production is when the project is operating, feasibility is when it has published a definitive feasibility study, development follows feasibility and is when contracts are issued

Source: BloombergNEF⁶¹

Hard Rock Mining and Evaporation Ponds

Hard rock mining and evaporation ponds are used in other places to extract lithium but are not proposed for use in recovering lithium from the brine used in geothermal power plants in Imperial County.

More than half of all lithium recovered globally, comes from hard rock mining, most of which occurs in Western Australia and China. Hard rock mining essentially follows a traditional mining process that uses heavy equipment to remove soil and rock to find lithium-rich deposits within hard rock.⁶² The mining is then followed by additional physical and chemical processing to make lithium products that are sold to product manufacturers.⁶³ Nature Conservancy noted in their August 2022 report, *Potential Lithium Extraction in the United States: Environmental, Economic, and Policy Implications* that, "Lithium mined from hard rock and clay may result in impacts that are well-documented for strip mining and open-pit mining, including physical disturbance of soils and vegetation (Kosai et al. 2020);⁶⁴ air emissions and deposition

61 Logan Goldie-Scot (BNEF). 2021. Global Lithium Update. "Presentation for March 25, 2021, Blue Ribbon Commission meeting." <https://efiling.energy.ca.gov/GetDocument.aspx?tn=237359&DocumentContentId=70545>.

62 This processes generally involves drilling and blasting into hard rock areas to mine the rock (spodumene) then the ore is sorted, crushed, ground, separated, separated, then washed, filtered and dried to produce a spodumene concentrate.

63 Warren, Ian. 2021. *Techno-Economic Analysis of Lithium Extraction from Geothermal Brines*. National Renewable Energy Laboratory. NREL/TP-5700-79178. <https://www.nrel.gov/docs/fy21osti/79178.pdf>. Page 3.

64 Kosai, S., Takata, U., & Yamasue, E. 2021. "Natural resource use of a traction lithium-ion battery production based on land disturbances through mining activities." *Journal of Cleaner Production*, 280, 124871. DOI:10.1016/j.jclepro.2020.124871 (as cited by Nature Conservancy)

(Rodrigues et al. 2019);⁶⁵ stream sedimentation; potential contamination of soils, sediments, and ground and surface waters (Kaunda 2020);⁶⁶ and groundwater and surface water depletion (Schomberg et al. 2021).⁶⁷

The largest hard rock mining operation in the world is the Greenbushes mine in Western Australia (Figure 5), which has a capacity to supply 1.27 million tons of lithium per year. This mine is expanding to add another 800,000 tons per year capacity and additional expansion is being considered.⁶⁸

Figure 5: Hard Rock Lithium Ore Mine in Greenbushes, Australia



Photo credit: Albermarle⁶⁹

Almost all other lithium is recovered from salar brines through evaporation ponds, particularly in the “Lithium Triangle” countries of Argentina, Bolivia, and Chile. Lithium is produced by drilling wells into underground reservoirs and pumping brine into large open pond areas on the surface where it is exposed to the sun. As water evaporates, other minerals and contaminants are typically removed until a concentrated solution of lithium chloride remains, which is

65 Rodrigues, P. M., Antão, A. M., & Rodrigues, R. 2019. “Evaluation of the impact of lithium exploitation at the C57 mine (Gonçalo, Portugal) on water, soil and air quality.” *Environmental Earth Sciences*, 78(17), 1-14. <https://doi.org/10.1007/s12665-019-8541-4> (as cited by Nature Conservancy)

66 Kaunda, R. B. 2020. “Potential environmental impacts of lithium mining.” *Journal of Energy & Natural Resources Law*, 38(3), 237–244. <https://doi.org/10.1080/02646811.2020.1754596> (as cited by Nature Conservancy)

67 Schomberg, A. C., Bringezu, S., & Flörke, M. 2021. “Extended life cycle assessment reveals the spatially-explicit water scarcity footprint of a lithium-ion battery storage.” *Communications Earth & Environment*, 2(1), 1-10. <https://doi.org/10.1038/s43247-020-00080-9> (as cited by Nature Conservancy)

68 Macmillan, Angus. 2022. “Australia’s Greenbushes Mine Expands Lithium Capacity.” News article. *Argus Media Group*. <https://www.argusmedia.com/en/news/2328828-australias-greenbushes-mine-expands-lithium-capacity>.

69 Photo credit: Albemarle. As cited in Treadgold, Tim. 2016. “Window Opens for Lithium Hopefuls.” *Businessnews*. <https://www.businessnews.com.au/article/Window-opens-for-lithium-hopefuls>.

pumped to facilities for further processing to develop the desired lithium compounds. The process can take months or years, is water-intensive and can require thousands of square miles of land. Figure 6 shows lithium evaporation ponds in San Pedro de Atacama, Chile.^{70,71}

Figure 6: Lithium Evaporation Ponds in San Pedro de Atacama, Chile



Source: Sociedad Quimica Mineral de Chile

As discussed in detail in Chapter 4 of this report, extracting lithium using direct lithium extraction (DLE) technologies proposed for use in Imperial County is a more sustainable and environmentally superior approach as compared to methods predominantly used in other places.

Direct Lithium Extraction (DLE) Technologies

DLE is the process of recovering lithium from brine, typically using engineered material such as sorbents or something that attracts lithium ions.⁷² DLE technologies are grouped into three main types: adsorption, ion exchange, or solvent extraction.⁷³ In Imperial County, EnergySource Minerals, CTR, and BHE Renewables are planning to develop DLE facilities. Each of these projects, described in more detail later in this report, is being designed to recover lithium from geothermal brine after it moves through pipelines and tanks at a geothermal

70 Lineen, N., Bhave R., & Woerner, D. 2018. "Purification of Industrial Grade Lithium Chloride for the Recovery of High Purity Battery Grade Lithium Carbonate." *Separation and Purification Technology*, 214, 168-173. <https://doi.org/10.1016/j.seppur.2018.05.020>.

71 Bradley, D.C., Stillings, L.L., Jaskula, B.W., Munk, L., and McCauley, A.D. 2017. "Lithium, chap. K of Critical mineral resources of the United States—Economic and environmental geology and prospects for future supply." *U.S. Geological Survey*, Professional Paper 1802-K. <https://doi.org/10.3133/pp1802K>

72 A *sorbent* is a solid material used to isolate liquids or gases. Sorbents such as aluminum hydroxide are used in direct lithium extraction to separate lithium from geothermal brine.

73 Warren, Ian. 2021. "Techno-Economic Analysis of Lithium Extraction from Geothermal Brines." *National Renewable Energy Laboratory*. NREL/TP-5700-79178. <https://www.nrel.gov/docs/fy21osti/799178.pdf>.

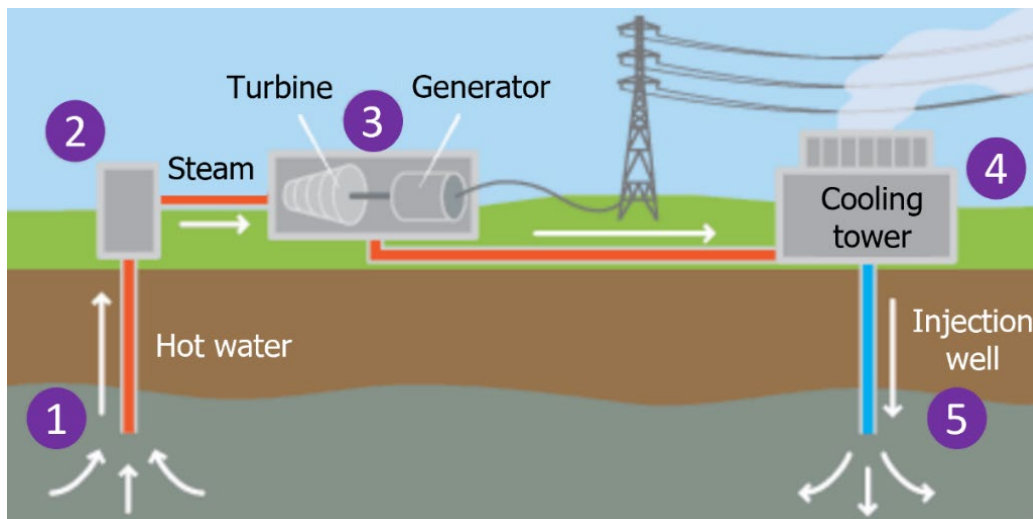
power plant.⁷⁴ The DLE facilities currently proposed in Imperial County will not use evaporation ponds or hard rock mining.

This report generally refers to hard rock mining and evaporation ponds as *extraction*, and DLE as recovery [to distinguish DLE from the unsustainable and environmentally harmful processes](#), ~~but there are instances in AB 1657 and related references in this report that use the term lithium extraction and mining to more generally describe all three methods.~~

A DLE system can be added to an existing geothermal power plant or built into the design of a new geothermal power plant. Geothermal power plants produce electricity from the heated fluid in a geothermal reservoir that is brought to the surface. The Earth's internal thermal energy is extracted as heated steam or brine and used to heat water or another working fluid to turn a turbine of a generator, producing electrical power. When geothermal power plants and lithium recovery facilities are ~~collocate~~[colocated](#), recovery of lithium from geothermal brines can take advantage of on-site renewable power generated by the geothermal power plants, as well as the brine handling and treatment equipment.⁷⁵

As shown in Figure 7, flash steam geothermal power plants, like the geothermal power plants in the Salton Sea KGRA, use a multistep process that begins with drilling production wells deep into an underground geothermal reservoir to ~~flow pump~~ either a mixture of steam and hot brine ~~or hot brine alone~~ to the surface under high pressure. When the brine reaches the surface, the pressure is dropped producing steam that a turbine connected to a generator to produce electricity. The steam and brine are then cooled and moved to an injection well, which pumps the brine back into the geothermal reservoir, where it is naturally reheated.

Figure 7: Flash Steam Geothermal Power Plant



Source: U.S. Environmental Protection Agency.⁷⁶

74 Blue Ribbon Commission. 2021. "Presentation at the Blue Ribbon Commission Meeting of July 29, 2021." <https://efiling.energy.ca.gov/GetDocument.aspx?tn=239214&DocumentContentId=72666>. Slides 43-45.

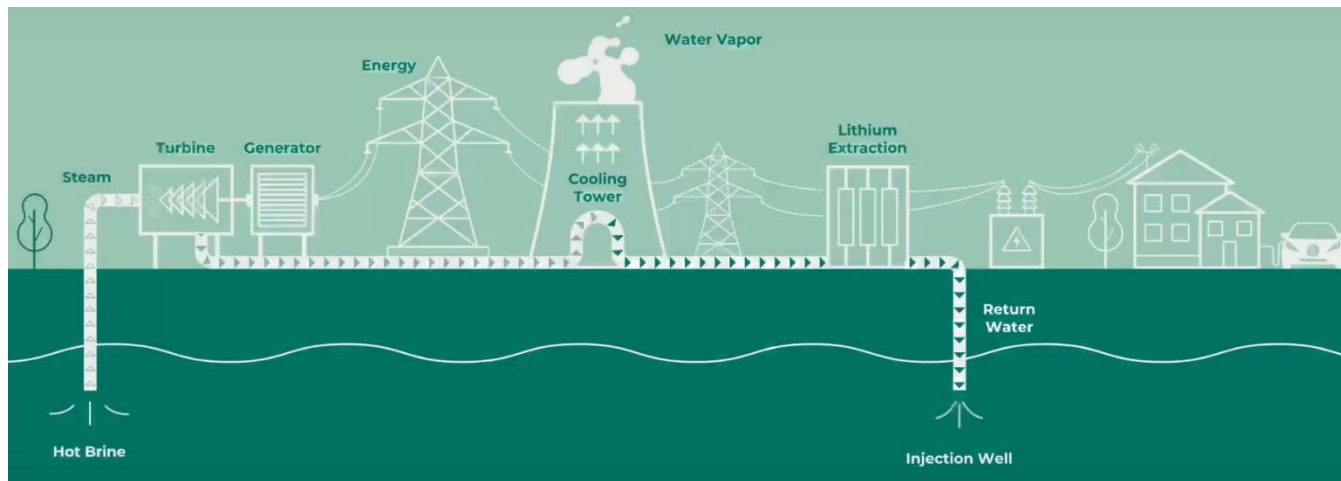
51 Blue Ribbon Commission. 2021. "Transcript of the August 26, 2021, Blue Ribbon Commission Meeting." <https://efiling.energy.ca.gov/GetDocument.aspx?tn=240014&DocumentContentId=73462>. Page 105.

76 U.S. Environmental Protection Agency. 2017. *A Student's Guide to Global Climate Change: Geothermal Energy*. <https://archive.epa.gov/climatechange/kids/solutions/technologies/geothermal.html>

As noted above, DLE technologies are designed to recover lithium and other minerals as the geothermal brine flows through pipelines and tanks and over a surface or substance that removes the lithium and other minerals before returning the brine deep underground.^{77, 78}

As an example, Figure 8 shows a diagram of the EnergySource Minerals Project ATLiS, which is under construction to add a DLE facility to an existing geothermal power plant. The geothermal brine will move through pipelines to the DLE facility before it enters the injection well and is pumped back to the underground geothermal reservoir.

Figure 8: Illustration of the EnergySource Minerals Project ATLiS



Source: EnergySource Minerals, <https://www.esminerals.com/iliad>.

Proposed Use of DLE Technologies in the Salton Sea KGRA

This section discusses the location, potential for additional geothermal power plant capacity, and the estimated amount of lithium in the Salton Sea KGRA.

Salton Sea Known Geothermal Resource Area

The "Geothermal Steam Act of 1970" directed the Secretary of the Interior to designate, in summary, areas known to have geothermal resource potential as "known geothermal resource areas", or "KGRAs".⁷⁹ KGRAs are typically given a specific name. According to CEC and as shown in Figure 9, there are 20 KGRAs in California, with 7 in the Imperial Valley region.⁸⁰ At first glance, Figure 9 appears to show that the Salton Sea and the KGRA intersect or overlap, but in reality, the KGRA is far below the floor of the Salton Sea. The geothermal reservoir **is**

77 Blue Ribbon Commission. 2022. "Discussion and Presentations by Derek Benson (EnergySource Minerals), Mike McKibben (UC Riverside), and Jim Turner (Controlled Thermal Resources). CEC Docket 20-LITHIUM-01 TN#: 243846. <https://efiling.energy.ca.gov/GetDocument.aspx?tn=243846&DocumentContentId=77784>

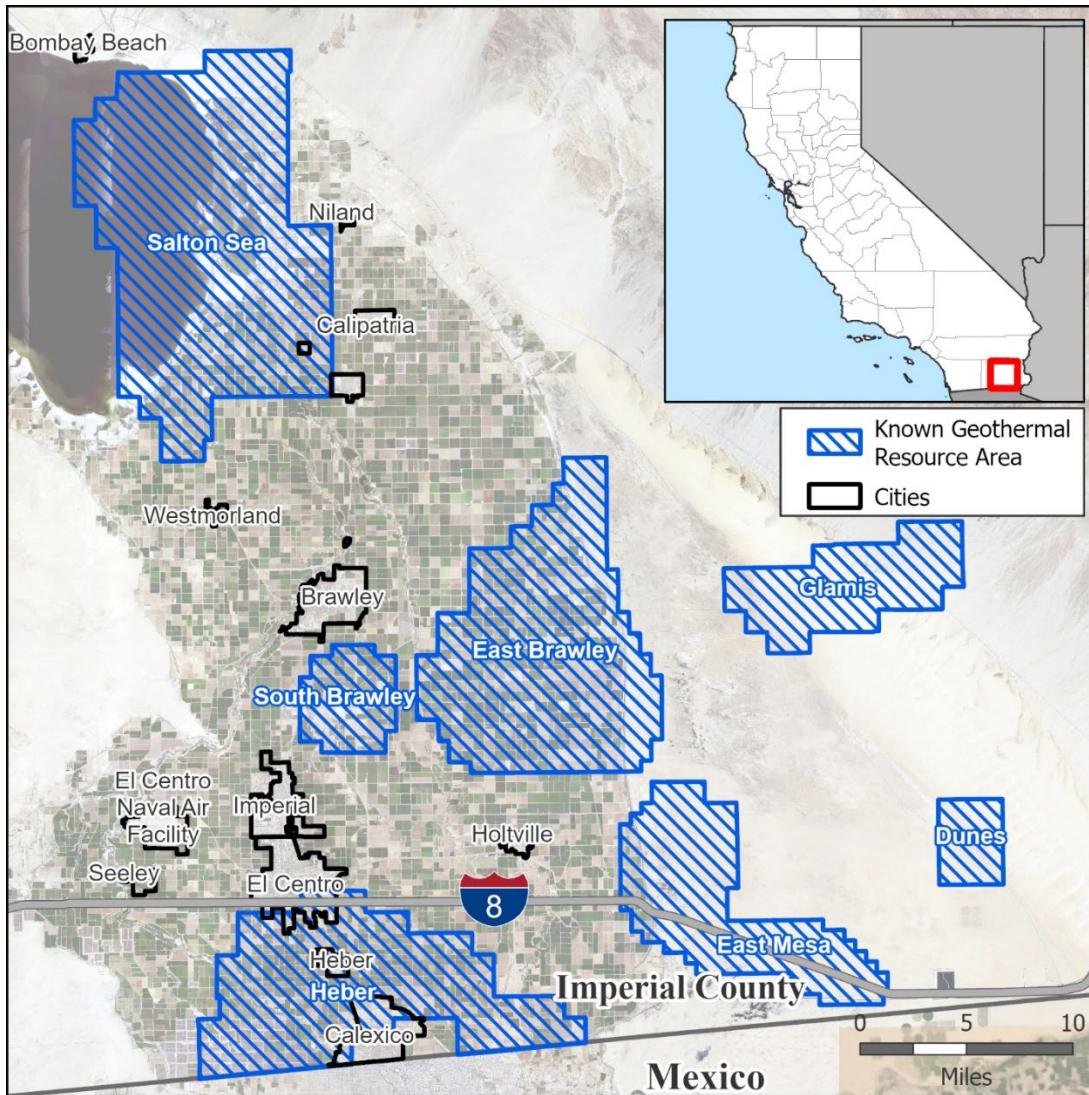
78 Blue Ribbon Commission. 2022. "Transcript of the June 30, 2022, Blue Ribbon Commission Meeting." <https://efiling.energy.ca.gov/GetDocument.aspx?tn=244229&DocumentContentId=78154>.

79 "Geothermal Resources" 30 U.S.C. § 1001 (e). <https://www.govinfo.gov/content/pkg/USCODE-2017-title30/html/USCODE-2017-title30-chap23.htm>

80 California Energy Commission. January 23, 2022. <https://cecgis-caenergy.opendata.arcgis.com/documents/CAEnergy::known-geothermal-resource-areas/explore>

starts at 1,500 feet ~~least a half a mile below the sea~~ underground and the depth where geothermal wells draw fluid is typically between ~~0.5-1.5~~ and 2 miles below ground level.

Figure 9: Known Geothermal Resource Areas in Imperial County, California



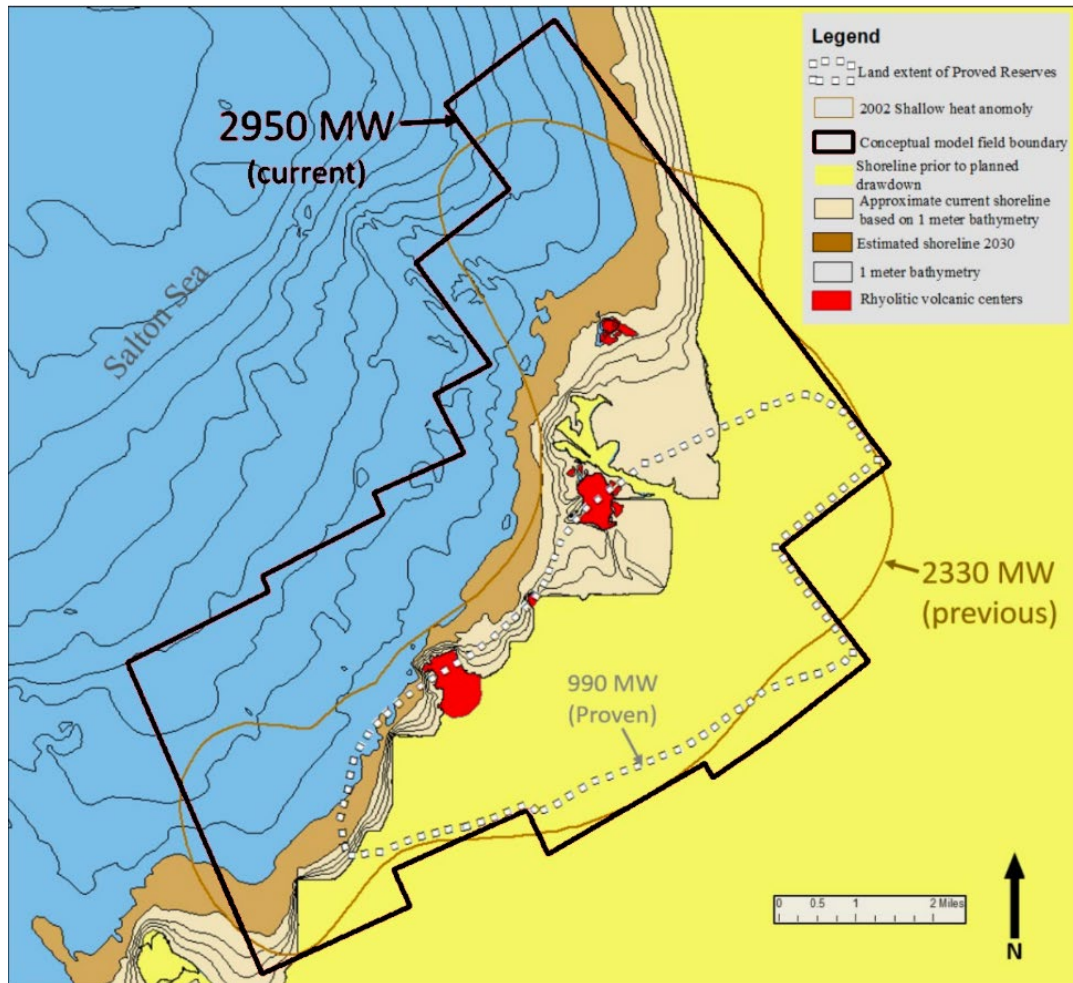
Source: California Energy Commission staff based on data from California Department of Conservation, Geologic Energy Management Division (CalGEM, formerly DOGGR) from 2002

Focusing on the Salton Sea KGRA, according to CEC data, there are currently ~~11~~10 geothermal power plants producing electricity from the geothermal brine in the Salton Sea KGRA with an installed nameplate capacity for these facilities of approximately 414 megawatts (MW).⁸¹ Experts estimate the geothermal resource of the Salton Sea KGRA is robust enough to support development of between 2,330 and 2,950 MW of additional geothermal power plants, 6 times

⁸¹ California Energy Commission. January 23, 2022. <https://cecgis-caenergy.opendata.arcgis.com/documents/CAEnergy::known-geothermal-resource-areas/explore>

the current installed capacity.^{82, 83} Figure 10 shows the estimated location and geothermal power potential of the Salton Sea KGRA. As noted previously and shown on this map, a portion of the KGRA lies deep underground under the existing footprint of the Salton Sea.

Figure 10: Salton Sea KGRA



Source: Kaspereit et al. 2016.⁸⁴

The amount of lithium in each KGRA also varies as each geothermal reservoir has a unique depth, temperature, and composition. In the Salton Sea KGRA, the brine is rich in many minerals including manganese, zinc, and lithium. It is conservatively estimated that there are 2 million metric tons of lithium available in the reservoir at a depth of up to 1.2 miles deep [from](#)

82 Kaspereit, Dennis, Mary Mann, Subir Sanyal, Bill Rickard, William Osborn, and Jeff Hulen. 2016. *Updated conceptual model and reserve estimate for the Salton Sea geothermal field, Imperial Valley, California*. Geotherm. Res. Council Trans. 40, 57-66.

83 California Energy Commission. 2021. "Presentation for the March 25, 2021, Blue Ribbon Commission Meeting." <https://efiling.energy.ca.gov/getdocument.aspx?tn=237359>. Slide 56.

84 Kaspereit, Dennis, Mary Mann, Subir Sanyal, Bill Rickard, William Osborn, and Jeff Hulen. 2016. "Updated conceptual model and reserve estimate for the Salton Sea geothermal field, Imperial Valley, California." *Geotherm. Res. Council Trans* 40, 57-66.

[ground level](#),⁸⁵ with a reasonable expectation that the amount is at least three times higher.⁸⁶ A CEC funded research project conducted by SRI International, found that the Salton Sea KGRA can produce more than 600,000 tons per year of lithium carbonate if fully developed.⁸⁷ Since DLE technologies for the recovery of lithium from geothermal brine rely on a geothermal power plant to bring the brine to the surface, the amount of lithium recovered corresponds to the amount of brine flowing through the power plants. Some estimates indicate that Current geothermal power capacity at the Salton Sea KGRA is able to support recovery of roughly 127,000 metric tons of Lithium Carbonate Equivalent (LCE).^{88,89} For comparison, current global production of lithium primarily through mining and evaporation ponds in 2020 was less than 100,000 tons but is expected to increase significantly.⁹⁰ Current and projected markets for lithium are discussed in more detail later in Chapter 4.

A current project among Lawrence Berkeley National Laboratory (Berkeley Lab), UC Riverside, and Geologica Geothermal Group, Inc. seeks to better quantify and characterize the quantity of lithium in the Salton Sea KGRA.⁹¹

Current Proposals for Imperial County DLE Facilities

Three developers (EnergySource Minerals, BHE Renewables, and CTR) are in the process of developing projects to recover lithium from geothermal brine at existing or new geothermal power plants in Imperial County using DLE technologies.⁹²

EnergySource Minerals Project ATLiS.⁹³ According to EnergySource Minerals, the project is a “development initiative to extract and produce battery-spec lithium products utilizing

85 McKibben, M.A., Elders, W.A., and Raju A.S.K. 2020. “Lithium and other geothermal mineral and energy resources beneath the Salton Sea.” Chapter 7. In *Crisis at the Salton Sea: Research Gaps and Opportunities*. University of California, Riverside Salton Sea Task Force. https://www.researchgate.net/publication/346088705_Lithium_and_other_geothermal_mineral_and_energy_resources_beneath_the_Salton_Sea. (pre-publication). Page 112.

86 Blue Ribbon Commission. 2021. “Transcript of the March 25, 2021, Blue Ribbon Commission Meeting.” <https://efiling.energy.ca.gov/GetDocument.aspx?tn=237478&DocumentContentId=70677>. Pages 107-108.

87 Ventura, Susanna, Srinivas Bhamidi, Marc Hornbostel, Anoop Nagar. 2020. *Selective Recovery of Lithium from Geothermal Brines*. California Energy Commission. Publication Number: CEC500-2020-020. <https://www.energy.ca.gov/sites/default/files/2021-05/CEC-500-2020-020.pdf>

88 Warren, Ian. 2021. *Techno-Economic Analysis of Lithium Extraction from Geothermal Brines*. National Renewable Energy Laboratory. NREL/TP-5700-79178. <https://www.nrel.gov/docs/fy21osti/79178.pdf>.

89 LCE is the industry standard used for comparison of quantities since lithium can be produced in a number of forms, including lithium carbonate and lithium hydroxide.

90 Logan Goldie-Scot (BloombergNEF). March 25, 2021. Global Lithium Update. Presentation. Blue Ribbon Commission Meeting. <https://efiling.energy.ca.gov/GetDocument.aspx?tn=237359&DocumentContentId=70545>.

91 U.S. Department of Energy, Geothermal Technologies Office. 2022. “GTO Funds Berkeley Lab in Partnership with UC Riverside to Assess and Characterize Lithium Resources.” Press Release. <https://www.energy.gov/eere/geothermal/articles/gto-funds-berkeley-lab-partnership-uc-riverside-assess-and-characterize>.

92 BHE Renewables is one of a family of companies and a subsidiary of Berkshire Hathaway Energy. BHE Renewables is also generally used to refer to BHE Renewables, LLC and its subsidiaries. The names of some of these related entities have changed over time. BHE Renewables’ geothermal facilities in Imperial County previously operated as CalEnergy Operations, or CalEnergy.

93 EnergySource Minerals, Project ATLiS, <https://www.esminerals.com/atlis>.

geothermal brines from the Salton Sea geothermal resource area.” The lithium recovery project is currently anticipating the start of construction at the existing John L. Featherstone Plant in Calipatria, California in quarter 4 of 2022, with commercial operations scheduled to begin in 2024. The facility anticipates production of 17,600 metric tons per year of LCE. The project received a use permit from Imperial County in 2021,⁹⁴ after the County certified an EIR prepared to meet the requirements of the California Environmental Quality Act (CEQA).⁹⁵

BHE Renewables Demonstration Projects.^{96, 97} BHE Renewables started operation of a lithium recovery demonstration project at one of their 10 geothermal power plants on the Salton Sea KGRA in the second quarter of 2022. The project will demonstrate the recovery of lithium from geothermal brine as one step in the company’s plans to develop commercial scale facilities. The project is receiving support from a CEC grant and was permitted by Imperial County and found to be exempt from CEQA.^{98, 99} BHE Renewables is also in the process of developing a demonstration project to process lithium chloride into battery-grade lithium compounds and anticipates this second demonstration project could be operational in 2023.¹⁰⁰ BHE Renewables is further exploring the development of ~~377~~339 MW net of additional geothermal power capacity in Imperial County.

CTR Hell’s Kitchen PowerCo1 and LithiumCo1 Project.¹⁰¹ CTR is planning and completing engineering and permitting for a proposed new 49.9 MW geothermal power plant with a ~~collocate~~colocate minerals recovery and processing facility near the eastern shore of the Salton Sea in Imperial County approximately 3.6 miles west of the town of Niland. CTR anticipates power production will be operational in late 2023 and lithium production in 2024. CTR plans for future project phases to increase power generation and lithium recovery. CTR, through project subsidiaries, submitted applications to Imperial County in December 2021 for conditional use permits for PowerCo1 and LithiumCo1 Projects. The permit applications are currently under review and CEQA processes for the combined project including both

94 Imperial County, Planning & Development Services Department. 2021. “Project Report.” <https://www.icpds.com/assets/hearings/02.-WSA,FIER,-MMRP,-CUP20-0008,-PM02485-Energy-SourceMineral-ATLiS-PC-Pkg.pdf>.

95 The laws and rules governing the CEQA process are contained in the CEQA statute (Public Resources Code Section 21000 and following), the CEQA Guidelines (California Code of Regulations, Title 14, Section 15000 and following), published court decisions interpreting CEQA, and locally adopted CEQA procedures.

96 BHE Renewables. 2022. BHE Renewables Webpage. <https://www.brkenenergy.com/our-businesses/bherenewables.aspx>

97 BHE Renewables is one of a family of companies including BHER Minerals, LLC which is the official recipient of the CEC grant. CalEnergy is the former name of the BHE Renewables entity operating the geothermal facilities and this name appears in certain permitting and CEQA documents.

98 California Energy Commission staff. 2020. “Grant Request form.” California Energy Commission. Publication Number: EPC-19-020. <https://www.energy.ca.gov/filebrowser/download/293>.

99 County of Imperial, Planning & Development Services. 2021. “Notice of Exemption.” <https://www.icpds.com/assets/planning/notices/2021/IS21-0018-Cal-Energy-Notice-of-Exemption-09-03-21.pdf>.

100 Blue Ribbon Commission. 2022. “Transcript of June 30, 2022, Blue Ribbon Commission Meeting.” Page 15. <https://efiling.energy.ca.gov/GetDocument.aspx?tn=244229&DocumentContentId=78154>.

101 Controlled Thermal Resources. website. <https://www.cthermal.com/>.

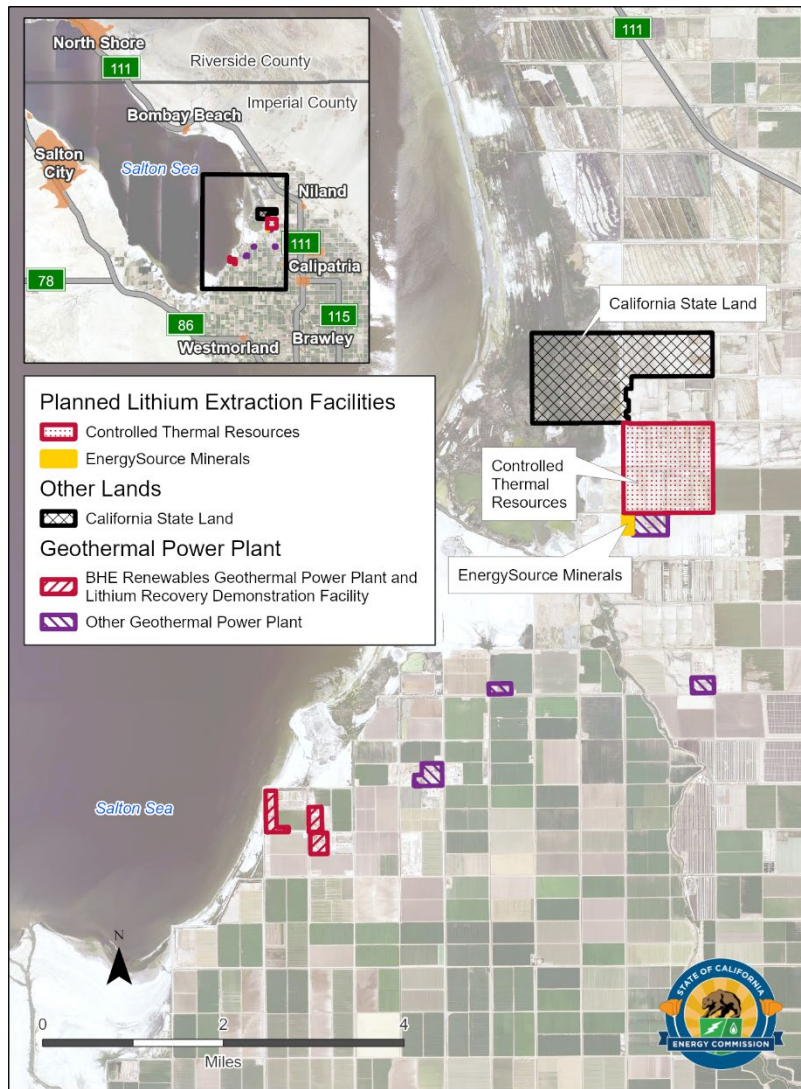
applications is being completed by the Imperial County Planning & Development Services Department.¹⁰²

Figure 11 shows the locations of the projects in proximity to one another, as well as to other existing geothermal power plants, the “fence line” communities of Calipatria and Niland, and to other communities in the Salton Sea region. Again, while the Salton Sea is a dominant water feature in this map, it is important to note that the Salton Sea KGRA – which is the source of geothermal brine for geothermal power and lithium recovery – lies deep underground and is not connected physically to the Salton Sea.¹⁰³ The common misperception that the two are connected, due in part to the common naming, has been a point of confusion for many people.

102 Imperial County, Planning & Development Services Department. 2022. “Notice of Preparation of Draft EIR for Hell’s Kitchen Powerco 1 and Lithiumco 1 Project and Notice of Public EIR Scoping Meeting.” <https://www.icpds.com/assets/Notice-of-Preparation-1648825659.pdf>.

103 Blue Ribbon Commission. 2021. “Transcript of the November 17, 2021, Blue Ribbon Commission Meeting Community Forum.” <https://efiling.energy.ca.gov/GetDocument.aspx?tn=240766&DocumentContentId=74208>. Pages 118, 132-133, 140.

Figure 11: Current Geothermal Power Plants and Proposed Locations of Facilities to Recover Lithium from Geothermal Brine in Imperial County [\(Revised\)](#)



Source: CEC staff, EnergySource, CTR, and BHE Renewables

While Figure 11 identifies the general location of the projects that are under construction or planned at this time, it does not fully display the broader area that will be impacted by the anticipated development of economic activity anchored in sustainable geothermal power production and lithium recovery in the Salton Sea KGRA.

The next chapter summarizes perspectives from communities and Tribes regarding the plans for DLE facilities and geothermal power plants in Imperial County.

CHAPTER 3:

Community and Tribal Priorities and Perspectives

This chapter provides context for, and discussion of, community and ~~tribal~~Tribal perspectives shared with the Blue Ribbon Commission to guide federal, state, and local efforts focused on the development of “Lithium Valley”.

Regional Background: Existing Socioeconomic and Environmental Factors

For the purposes of this report, the Salton Sea region includes all of Imperial County and much of Riverside County, extending from the Palm Springs area to Coachella and unincorporated communities near the Salton Sea, and then farther east to the California-Arizona border.¹⁰⁴ About 150,000 people live and work in its communities. Major employment sectors across the area include agriculture and tourism.¹⁰⁵ The Salton Sea region is a leading area for California renewable energy production, especially solar and geothermal energy.¹⁰⁶

The region is a desert characterized by high temperatures and low average rainfall. However, the economy is heavily based on agriculture due to the long history of agricultural development, robust irrigation systems, and mild winter weather.^{107, 108} As noted previously, the region also faces some of the most severe economic challenges in the state. Median household income in Imperial County is roughly 60 percent of the statewide average with 18.1 percent of Imperial County residents living in poverty.¹⁰⁹ The unemployment rate in Imperial County is the highest of any county in California and more than three times higher than the state average.¹¹⁰ Education and language data indicates additional barriers for residents with a high percentage of households primarily non-English speaking and high rates of adults without

104 Blue Ribbon Commission. 2022. “Final Letter Regarding Community Economic Resilience Fund (CERF) Recommendations for Salton Sea Region.”
<https://efiling.energy.ca.gov/GetDocument.aspx?tn=242292&DocumentContentId=75794>.

105 Blue Ribbon Commission. 2022. “Final Letter Regarding Community Economic Resilience Fund (CERF) Recommendations for Salton Sea Region.”
<https://efiling.energy.ca.gov/GetDocument.aspx?tn=242292&DocumentContentId=75794>.

106 California Energy Commission. 2022. “Utility-Scale Renewable Electrical Generation Totals by County.”
<https://cecgis-caenergy.opendata.arcgis.com/documents/CAEnergy::utility-scale-renewable-electrical-generation-totals-by-county/explore>.

107 Coachella Valley Resource Conservation District. “Coachella Valley.” <https://www.cvrcd.com/coachella-valley>. Accessed August 2, 2022.

108 Imperial County. 2021. “Economic Contributions of Imperial County Agriculture.”
<https://agcom.imperialcounty.org/wp-content/uploads/2021/08/2021-Economic-Contribution-of-Imperial-County-Ag.pdf>.

109 U.S. Census Bureau. “QuickFacts: Imperial County, California.”
<https://www.census.gov/quickfacts/fact/table/imperialcountycalifornia/PST045219>.

110 State of California. 2022. “Monthly Labor Force Data for Counties (July 2022).” Employment Development Department of the Labor Market Information Division. Report 400 C.
<https://www.labormarketinfo.edd.ca.gov/file/lfmonth/2207pcou.pdf>

a high school education.¹¹¹ As described in other areas of this report, infrastructure further complicates daily life and career opportunities as the region has large areas without public transportation, broadband access and low rates of computer ownership.^{112 113, 114}

Much has been written about the physical history of the Salton Sea region, and the report of the state's Legislative Analyst's Office, *The Salton Sea: A Status Update*, dated August 2018, provides a comprehensive discussion of the Salton Sea and conditions that affect the surrounding communities and broader region.¹¹⁵ According to this report, the Salton Sea is California's largest inland lake, located in Riverside and Imperial Counties, with a surface area roughly twice that of Lake Tahoe.¹¹⁶

The Salton Sea sits west of Anza Borrego Desert State Park and about 40 miles north of the border with Mexico. The sea lies more than 200 feet below sea level within the boundaries of ancient Lake Cahuilla.¹¹⁷ Throughout history, the Salton Sea has intermittently filled and dried. An accidental event in 1905 sent large amounts of water from the Colorado River into the lakebed area for two years, creating high water levels attracting outdoor recreation enthusiasts.^{118, 119} The Salton Sea was once a rich site of marine life and also provided critical food, rest, and nesting habitat for at least 270 to, according to some sources, as many as 400 bird species, including threatened and endangered species.^{120, 121} However the current lake conditions are dramatically different than the lake that drew tourists and wildlife in earlier decades.

111 U.S. Census Bureau. "QuickFacts: Imperial County, California."
<https://www.census.gov/quickfacts/fact/table/imperialcountycalifornia/PST045219>.

112 Blue Ribbon Commission. 2022. "Transcript from July 21, 2022, Blue Ribbon Commission Meeting."
<https://efiling.energy.ca.gov/GetDocument.aspx?tn=245784&DocumentContentId=79989>

113 U.S. Census Bureau. "QuickFacts: Imperial County, California."
<https://www.census.gov/quickfacts/fact/table/imperialcountycalifornia/PST045219>.

114 CA Public Utilities Commission. <https://www.cpuc.ca.gov/industries-and-topics/internet-and-phone/broadband-mapping-program/cpuc-annual-collected-broadband-data>

115 Taylor, Mac (Legislative Analyst's Office). 2018. "Salton Sea: A Status Update."
<https://lao.ca.gov/reports/2018/3879/salton-sea-082918.pdf>.

116 Taylor, Mac (Legislative Analyst's Office). 2018. "*Salton Sea: A Status Update*."
<https://lao.ca.gov/reports/2018/3879/salton-sea-082918.pdf>.

117 Phukan, Anjali, Todd J. Braje, Thomas K. Rockwell, and Isaac Ullah. 2019. "Shorelines in the Desert: Mapping Fish Trap Features Along the Southwest Coast of Ancient Lake Cahuilla, California," *Advances in Archaeological Practice*. DOI: 10.1017/aap.2019.31.

118 California State Parks. 2017. "Salton Sea State Recreation Area."
https://www.parks.ca.gov/pages/639/files/SaltonSeaSRA_FinalWebLayout0501017.pdf. Also,

119 The Salton Sea Authority. 2017. "Timeline of Salton Sea History." <https://saltonseaauthority.org/get-informed/history/>. Accessed August 16, 2022.

120 Taylor, Mac (Legislative Analyst's Office). 2018. *Salton Sea: A Status Update*.
<https://lao.ca.gov/reports/2018/3879/salton-sea-082918.pdf>.

121 Jones, A., D. Orr, and D. Cooper. 2019. *The Status of Birds at the Salton Sea*. National Audubon Society. New York, NY. USA. https://ca.audubon.org/sites/default/files/salton_sea_bird_status_042419_final.pdf.

The Imperial Irrigation District (IID) notes that due to evaporation and decreased inflows of water, the Salton Sea has been shrinking.¹²² And according to the California Natural Resources Agency, the Salton Sea has become significantly more saline, leading to negative impacts on people and wildlife.¹²³ As the lake decreases, areas previously covered with water become exposed. When high winds blow over these areas, airborne dust levels reach unhealthy levels. The particulate matter in the dust can contain toxic elements [due to decades of agricultural runoff](#)¹²⁴ and particulate matter that can become trapped in the lungs and cause asthma attacks, bronchitis, and lung diseases. Concerned about the increasing salinity of the Salton Sea, experts have called for additional research and monitoring of potential ecological and public health impacts.¹²⁵

Public health experts and community representatives provided the Blue Ribbon Commission with information on the existing exposures and poor health indicators in the Coachella and Imperial Valleys noting historically poor health outcomes and high rates of emergency department visits due to asthma and other air pollution-related conditions.¹²⁶ Additional data sources provide further documentation of these conditions. Referring to data and statistics for Imperial County, which are used in this report as representative of the overall region, the rates of hospitalization have been 50 — 100 percent higher for asthma in the area compared to statewide averages.¹²⁷ As noted in this report, many of the census tracts in the area are identified by Cal/EPA's CalEnviroScreen as disproportionately burdened by multiple sources of pollution.¹²⁸

As noted, the Salton Sea Management Program is constructing projects to address air quality and ecological threats from the declining amount of water in the Salton Sea. From 2018 to 2028, the program plans to reduce health and ecological risks from 30,000 acres of exposed

122 The Imperial Irrigation District prepared a Salton Sea animation video showing the amount and location of exposed areas (known as playa) previously covered by the Salton Sea. The amount of exposed play increased from 10,600 acres in 2012 to 34,700 acres in 2022 due to the transfer of conserved water to other Southern California water districts. Source: Imperial Irrigation District, Graphic representation of the Quantification Settlement Agreement (QSA) water transfer on the Salton Sea. Salton Sea Animation Video. <https://youtu.be/Sua-gQyTScU>.

123 California Natural Resources Agency. 2021. *Updated Draft Salton Sea Management Program Phase 1: 10-Year Plan Project Description*. <https://saltonsea.ca.gov/wp-content/uploads/2021/03/Updated-Draft-Salton-Sea-Management-Program-Phase-I-10-Year-Plan-Project-Description-March-2021.pdf>.

124 Johnston JE, Razafy M, Lugo H, Olmedo L, Farzan SF. *The disappearing Salton Sea: A critical reflection on the emerging environmental threat of disappearing saline lakes and potential impacts on children's health*. *Sci Total Environ*. 2019 May 1;663:804-817. doi: 10.1016/j.scitotenv.2019.01.365. Epub 2019 Jan 29. PMID: 30738261; PMCID: PMC7232737.

125 Bradley T., H. Ajami, and W. Porter. 2022. "Ecological Transitions at the Salton Sea: Past, Present and Future." *Calif. Agr.* 76(1):8-15. <https://doi.org/10.3733/ca.2022a0004>.

126 Blue Ribbon Commission. 2022. "Presentation for the March 24, 2022, Blue Ribbon Commission Meeting." Accessed at <https://efiling.energy.ca.gov/GetDocument.aspx?tn=242466>.

127 Taylor, Mac (Legislative Analyst's Office). 2018. *Salton Sea: A Status Update*. <https://lao.ca.gov/reports/2018/3879/salton-sea-082918.pdf>.

128 Blue Ribbon Commission. 2022. March 24, 2022. Meeting Presentation. Accessed at <https://efiling.energy.ca.gov/GetDocument.aspx?tn=242466>.

lakebed by creating habitat and building dust suppression projects in collaboration with landowners.¹²⁹

Community Perspectives

Residents from throughout the region and representatives of community-based organizations participated in the proceedings of the Blue Ribbon Commission and provided input that informed the development of this report. Throughout the report, community input is incorporated in the information, findings, and recommendations. This section, however, provides an overarching summary of the Blue Ribbon Commission's outreach and engagement learnings.

The Blue Ribbon Commission learned a great deal about ways that the local communities wish to be meaningfully included in the permitting and consideration of geothermal power plants, lithium recovery projects, and the development of related manufacturing projects in the region. The Commission also heard consistent requests that state and local government agencies acknowledge historic, systemic, and disproportionate environmental harms [-- in forms of structural, procedural, distributional, and generational inequity --](#) caused to and experienced by low-income communities and communities of color. It also heard requests to go beyond standard procedures and instead proactively work to increase community voice and address and decrease potential negative impacts to the communities and region.

There is no "one size fits all" method to reach local and regional residents and communities and provide meaningful opportunity for participation and engagement in decision-making. Factors such as culture, language, education, and trust must be considered. For example, in these communities, since residents have less access to computers or wide access to technology and information, information should be provided at in-person meetings that are held at times convenient for those that work and in languages and terms that are appropriate for the education level of the community. The Commission also received requests for early and continuous consultation so that community members learn about -- and can provide feedback on proposed projects and local decision making in a timely manner throughout the anticipated development of the region, from early project permitting through eventually decommissioning.

Several issues raised by community members — not in order of priority — include:

- The need for additional in-person community information and question-and-answer sessions in the communities throughout the Salton Sea region related to both the work of the Blue Ribbon Commission and state and local government decision-making.
- The need for informational material using accessible language, including simple terms and translated into languages widely used and customized for the residents near the planned projects.
- Pathways for community influence in project approval, specific to new DLE facilities and broader investment and development in the region.
- Consideration of the existing public health issues for residents and workers.

129 State of California. "Salton Sea Management Program." <https://saltonsea.ca.gov/program/>.

- Consideration of existing environmental issues, such as the shrinking of the Salton Sea and reductions in the water supply, as identified by IID, when evaluating the impacts of new development.
- Consideration of the communities' existing workforce and skills, and appropriate training opportunity to ensure that anticipated jobs benefit residents.
- Lack of information and skepticism of the oversight of potential impacts to public health, water, air, and land (including potential earthquakes).
- Lack of existing infrastructure in the region (roads, sidewalks, broadband, housing), and the need for local infrastructure investment to happen in advance of, or concurrent with, industrial and economic development in the region.
- Requests for information on potential worst-case scenarios (such as a burst geothermal brine pipe) and emergency response plans to limit negative impacts.
- Concerns of the battery life cycle and planning as to how used batteries will be handled as the number of electric vehicles increases.
- Concerns about access to education, workforce training, and career opportunities.
- Need for community cobenefit agreements to ensure the community rises along with the industry, as well as oversight and accountability to ensure funding is allocated to local priorities for community-grounded projects.
- Need for additional time for deliberation and discussion, and funding to support meaningful community and ~~tribal~~[Tribal](#) engagement around specific projects, longer-term planning and development, and the work of the Blue Ribbon Commission.

Recommendations

[Proposed Recommendations Have Been Temporarily Removed due to Commissioners' Request and Consideration of Consolidated Recommendations at the Upcoming October and November Commission Meetings](#)

[Potential Consolidated Recommendations can be Found in accompanying document on the Docket.](#)

Tribal Perspectives

The Blue Ribbon Commission also invited and heard from Tribes regarding their priorities and concerns related to development of lithium production in the region. Tribal representatives participated in public meetings and provided correspondence to the Commission (received in the docket). The July 21, 2022, public meeting offered a specific opportunity for tribal perspectives to be presented. During this meeting, significant concern and questions were raised by tribal representatives conveyed that their communities lack sufficient information to engage on the topic of lithium recovery and noted that additional information and improved tribal consultation was necessary. Jesus Arguelles serving as the Torres Martinez Desert Cahuilla Indians Economic Development Director shared, “the impact of lithium recovery must be addressed more aggressively on how this actively will affect the cultural, economic, technological, health, and wellness, governance status and the fabric of surrounding communities.”¹³⁰

Issues identified by tribal representatives during the July 21, 2022, meeting, not in order of priority and summarized, include:

- The historical lack of timely and accessible information on proposed development in the region, and specific to the proposed lithium production development, tribal communities require more information presented in accessible formats.
- Requests for meaningful tribal consultation related to geothermal power development, lithium extraction activities and other topics of interest.
- Concern, and some opposition, from tribal leaders, elders, representatives, and members regarding the impacts of the proposed lithium recovery projects near the Salton Sea due to the potential cumulative impacts to the environment and cultural landscapes.
- The need for complete identification and protection of cultural resources that may be impacted by all proposed new development and consideration of cumulative impacts to cultural landscapes, such as Obsidian Butte. [A 2010 document titled *Ethnographic Assessment of the Importance of Obsidian Butte to the Native American Community, Imperial County, California* was prepared for the California Energy Commission and contains pertinent findings and recommendations.](#)¹³¹
- The need for additional and accessible information about potential negative impacts on public health, water, air, and land including potential earthquake activity provided in words and terms that are more understandable by the community.
- The importance of working to restore the balance of nature and preserving ecosystems.

130 Blue Ribbon Commission. 2022. “Transcript from July 21, 2022, Blue Ribbon Commission Meeting.” <https://efiling.energy.ca.gov/GetDocument.aspx?tn=245784&DocumentContentId=79989>

¹³¹ [California Energy Commission “Ethnographic Assessment of the Importance of Obsidian Butte to the Native American Community, Imperial County, California.”](#)
<https://efiling.energy.ca.gov/GetDocument.aspx?tn=55719&DocumentContentId=50356>

- The need to address unanswered questions about state and local planning for the recycling of batteries to ensure a thoughtful approach to battery industry development that considers the cradle-to-cradle lifecycle.
- Consideration of a ~~tribal~~Tribal vision for regional planning or a more comprehensive plan for the Salton Sea region and establishment of a fund led by Tribes to finance sustainable development and infrastructure development. The fund should focus on ~~tribal~~Tribal needs and priorities, such as water, improved digital connectivity, respiratory health and diabetes management, businesses of tomorrow, modernized roads, and community recreational facilities.

In addition, ~~tribal~~Tribal representatives provided additional correspondence (received in the docket) supporting Commission activities, outlining certain concerns, and stating opposition to proposed development.¹³²

Recommendations

Proposed Recommendations Have Been Temporarily Removed due to Commissioners' Request and Consideration of Consolidated Recommendations at the Upcoming October and November Commission Meetings

Potential Consolidated Recommendations can be Found in accompanying document on the Docket.

¹³² Information provided on the docket can be found here
~~<https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=20-LITHIUM-01>~~
<https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=20-LITHIUM-01>

CHAPTER 4:

AB 1657 Topic Areas: Findings and Recommendations

As discussed above, to enable the state to better understand the opportunities and potential challenges of lithium recovery in California, AB 1657 tasked CEC to convene and establish the Blue Ribbon Commission on Lithium Extraction in California. The Commission was authorized to (1) review, investigate, and analyze eight pertinent topics relating to lithium extraction and use in California and (2) submit a report to the Legislature by October 1, 2022, documenting the Commission’s findings and recommendations.

The Blue Ribbon Commission’s findings and recommendations are presented in this chapter on each of the following topics:¹³³

- A. Actions that will support the further development of geothermal power that have the potential to provide the cobenefit of lithium recovery from existing and new geothermal facilities.
- B. Market opportunities for lithium.
- C. 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.
- D. Methods of overcoming technical and economic challenges currently limiting lithium extraction, processing, and production from geothermal brines.
- E. Safe environmental methods and standards for lithium extraction from geothermal brines and how this compares to other methods for deriving lithium.
- F. Potential economic and environmental impacts to the state resulting from extraction, processing, and production of lithium and lithium-dependent products from geothermal brines.
- G. 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:
 - a. 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.
 - b. New employment tax credits in former enterprise zones.
 - c. Income or franchise tax credits under agreements approved by the California Competes Tax Credit Committee.
 - d. Sales tax exemptions for new manufacturing equipment.
 - e. Leveraging tax incentives in federally recognized opportunity zones.

- H. 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 developing the lithium industry.

The issues discussed by the Commission often overlapped across the distinct statutory topics, leading to similar recommendations for a few topics, or a recommendation addressing multiple topics. A single list of all of recommendations in this report is provided in the appendices.

A. Actions that Will Support the Further Development of Geothermal Power that have the Potential to Provide the Cobenefit of Lithium Recovery from Existing and New Geothermal Facilities

Development of the Salton Sea geothermal resource has been particularly difficult and costly, even when compared to other geothermal fields in California, due to the high salinity and mineral content of the brines, which can damage and corrode equipment and create more solids to be managed during power generation. This problem, which has now become an opportunity, ~~requires~~^{required} chemical engineering and advanced facility designs at the existing power plants.¹³⁴ The addition of other mineral recovery will add another source of revenue for the facilities. But representatives from CTR, EnergySource Minerals, and BHE Renewables have stated on numerous occasions that the two components of the facilities must stand on their own — in other words, both the lithium component must be independently viable, and the geothermal component must be independently viable to proceed with additional development.

Beyond costs, other considerations that will affect the ability to expand geothermal development in Imperial Valley are based on infrastructure limitations, primarily due to availability of transmission and water.

More than 900 MW of new geothermal power plants within Imperial Valley have been proposed to the IID interconnection queue. IID is studying the amount of new geothermal energy that can be added to the existing transmission system and additional transmission infrastructure needs to send the energy to other parts of California and the western [U.S. United States](#).¹³⁵

Among the mechanisms that support geothermal development are state mandates for overall renewable energy procurement, as well as mandates specific to procurement of baseload renewable resources and assuring broader systemwide reliability. In June 2021, the CPUC ordered the load-serving entities they regulate to procure 11.5 gigawatts (GW) of new electricity resources to come on-line between 2023 and 2026, with at least 1,000 MW coming from clean, firm resources, such as geothermal. The due date can be extended to June 1, 2028, if load-serving entities (regulated by the CPUC) demonstrate a good faith effort, such as

134 Blue Ribbon Commission. 2022. "Transcript of the June 16, 2022, Blue Ribbon Commission Meeting." <https://efiling.energy.ca.gov/GetDocument.aspx?tn=243846&DocumentContentId=77784>. Pages 95–96.

135 Blue Ribbon Commission. 2022. "Transcript of the June 16, 2022, Blue Ribbon Commission Meeting." <https://efiling.energy.ca.gov/GetDocument.aspx?tn=243846&DocumentContentId=77784>. Pages 27–32.

an executed contract. Planning for and developing new transmission are needed to enable this growth.¹³⁶ The need for transmission infrastructure is further explored in the report below. In addition, the recent state budget included authority for the IBank to finance clean energy transmission infrastructure investments.¹³⁷

Identification of available water resources for industrial use will support the further development of existing and new geothermal power plants that could provide the cobenefit of lithium recovery. IID has about 20,400 AFY of water available for contracting to new nonagricultural development, including industrial use.¹³⁸ This water comes from IID's interim water supply policy. IID is looking at ways to conserve additional water for industrial use, as further described below.

In addition to planning for new transmission, and identifying additional water resources available for industrial use, streamlining processes for project permits, while continuing to provide environmental, public health, and community benefits, can help further goals to begin bringing new geothermal power plants online with the cobenefit of lithium recovery by 2024, with environmental monitoring and reporting continuing throughout the life of a project.

Recommendations

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Potential Consolidated Recommendations can be Found in accompanying document on the Docket.

B. Market Opportunities for Lithium

As previously noted, lithium is a core component of the batteries and storage systems critical for decarbonizing the electricity and transportation sectors, as well as other uses, including batteries and other consumer products, including electronics, ceramics, glass products, and pharmaceuticals. Furthermore, the demand for lithium is increasing across the globe. Many experts provided information to the Blue Ribbon Commission regarding projections for global lithium demand, as well as national needs and the many benefits to developing a domestic source to serve this demand. During several workshops, the Commission received information from financial market experts, researchers, and project developers about the growth in the demand for lithium, impacts on prices, and ways that current and planned sources of lithium

136 Blue Ribbon Commission. 2022. "Transcript of the June 16, 2022, Blue Ribbon Commission Meeting." <https://efiling.energy.ca.gov/GetDocument.aspx?tn=243846&DocumentContentId=77784>. Pages 27–32.

137 Assembly Bill 209 https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=202120220AB209.

138 Blue Ribbon Commission. 2022. "Transcript of June 16, 2022, Blue Ribbon Commission Meeting." <https://efiling.energy.ca.gov/GetDocument.aspx?tn=243846&DocumentContentId=77784>. Pages 143-144.

are expected to respond to increasing demand. The Commission also heard from battery manufacturers and EV industry representatives about how they source lithium and enter into agreements for this critical component of their products.

Global EV sales totaled 6.6 million vehicles in 2021, double the amount in 2020, and 2 million were sold in the first quarter of 2022. ~~are projected to include more than 4 million passenger vehicles sold globally in 2021 and ZEV sales rising more than 150 percent from 2019 to July 2021 and further increases expected as the economy recovers from pandemic impacts.~~¹³⁹

Projections for overall lithium-ion battery demand, including commercial and passenger EVs, buses, and other e-vehicles; stationary storage, and consumer electronics, estimate a tenfold increase in demand between 2020 and 2030, with passenger electric vehicles expected to be the largest source of lithium-ion battery demand.¹⁴⁰ Market information through September 2021 indicates around 240 battery "mega factories"¹⁴¹ are in the pipeline worldwide, which is up from 10 mega factories in recent years.¹⁴²

To keep pace with skyrocketing growth in EV production and sales, market analysts anticipate that lithium demand will increase from current levels of less than 100,000 metric tons LCE per year to over 3 million tons per year in 2030. Actual forecasts vary among analysts and have adjusted over time however all forecasts indicate substantial growth in demand during this period, primarily due to the increase in EV manufacturing. Growth in demand for lithium is outpacing growth in supply.¹⁴³ Market analysts further anticipate there will be a lithium deficit from 2022 onwards if more lithium production does not come on-line.¹⁴⁴ Until recently, prices for lithium have been relatively low. Based on graphs available on the Benchmark Minerals Intelligence webpages, Lithium prices began to increase slowly in early 2021, significantly in late 2021, and have shown nearly 350% increase over the last year.¹⁴⁵ Until the recent increase in prices, there was not much investment in developing new sources.¹⁴⁶

139 [International Energy Agency \(IEA\). May 23, 2022. "Global electric car sales have continued their strong growth in 2022 after breaking records last year." Press Release for *Global Electric Vehicle Outlook 2022*. <https://www.iea.org/news/global-electric-car-sales-have-continued-their-strong-growth-in-2022-after-breaking-records-last-year>. Logan Goldie-Scot \(BloombergNEF\), *Global Lithium Update. 2021. "Presentation for the March 25, 2021, Blue Ribbon Commission Meeting."* <https://efiling.energy.ca.gov/GetDocument.aspx?tn=237359&DocumentContentId=70545>.](https://www.iea.org/news/global-electric-car-sales-have-continued-their-strong-growth-in-2022-after-breaking-records-last-year)

140 Logan Goldie-Scot (BloombergNEF), *Global Lithium Update. 2021. "Presentation for the March 25, 2021, Blue Ribbon Commission Meeting."* <https://efiling.energy.ca.gov/GetDocument.aspx?tn=237359&DocumentContentId=70545>.

141 A mega factory is a large-scale manufacturing facility, such as a large lithium-ion battery manufacturing facility.

142 Blue Ribbon Commission. 2021. "Transcript for the September 30, 2021, Blue Ribbon Commission Meeting." <https://efiling.energy.ca.gov/GetDocument.aspx?tn=240135&DocumentContentId=73590>. Page 63.

143 Blue Ribbon Commission. 2021. "Transcript for the September 30, 2021, Blue Ribbon Commission Meeting." <https://efiling.energy.ca.gov/GetDocument.aspx?tn=240135&DocumentContentId=73590>. page 64.

144 EV Reporter. 2021. "Lithium market might go into deficit from 2022, says Benchmark Mineral Intelligence." Accessed on September 1, 2022. <https://evreporter.com/lithium-market-might-go-into-deficit-from-2022/>

145 "Lithium Price Assessments". Benchmark Mineral Intelligence. Accessed on August 31, 2022. <https://www.benchmarkminerals.com/lithium-prices/>

146 Blue Ribbon Commission. 2021. "Transcript for the September 30, 2021 Blue Ribbon Commission Meeting." <https://efiling.energy.ca.gov/GetDocument.aspx?tn=240135&DocumentContentId=73590>. Page 65.

Lithium prices are seeing the impact of market projections for increases in demand. When information was provided to the Commission in September 2021, lithium had seen a 100 percent year-to-date increase in prices,¹⁴⁷ and at the time of this report, the year-over-year change in prices showed more than 350 percent increase in price.¹⁴⁸ With prices rising quickly and growing confidence in the projections for increased demand, there is now a great deal of investment in developing additional supplies, but this will take time to develop.¹⁴⁹ Experts noted that it is not just the quantity of lithium that matters, but also the quality, with any new sources needing to prove that they can develop a product of the necessary quality required by product manufacturers.¹⁵⁰

Additional considerations when evaluating the markets for lithium are the technical specification requirements for lithium products that are set by end users, such as battery component and battery manufacturers. As noted in Chapter 2, lithium is typically produced for battery manufacturing, as lithium carbonate or lithium hydroxide monohydrate. Since the battery and battery component manufacturers set the final specifications specific to their products and require commitments well in advance of production to ensure their product will not be disrupted, lithium producers must enter into agreements before actually recovering and producing lithium. With lithium recovery from geothermal brines in Imperial Valley still in early stages, there is greater uncertainty, which can make establishing the necessary agreements more difficult. However, at the time of this report, CTR and EnergySource Minerals have both entered into agreements for the sale of lithium from their proposed DLE facilities.

The location of lithium end users, procurement policies that favor the most environmentally responsible production methods, and competition from other sources of lithium are other factors the Blue Ribbon Commission considered in exploring market opportunities. During public meetings, numerous speakers recognized that there is opportunity for developing Lithium Valley in ~~in~~ the Salton Sea region instead of sending the battery feedstock overseas for further processing or manufacturing of battery and battery components. Development of component and product manufacturing in the same region of the lithium supply would also support domestic supply and minimize the environmental impacts of lithium-dependent products on a life-cycle basis. Minimizing environmental impact or conversely optimizing for environmental benefit is a growing priority for procurement policies in many organizations, including those that procure ~~electric vehicles~~EVs and energy storage. Modern companies and agencies evaluate performance across sustainability initiatives, including the impacts of procurement that can definitely position lithium produced from geothermal brines at an advantage over lithium produced through methods with significant environmental impact and its proximity to the California and national market.

147 Blue Ribbon Commission. 2021. "Presentation for the September 30, 2021, Blue Ribbon Commission Meeting." <https://efiling.energy.ca.gov/GetDocument.aspx?tn=239862&DocumentContentId=73302>. slide 49.

148 Benchmark Mineral Intelligence. 2022. "Lithium Price Trends." <https://www.benchmarkminerals.com/lithium-prices/>. Accessed August 4, 2022.

149 Blue Ribbon Commission. 2021. 2021. "Presentation for the September 30, 2021, Blue Ribbon Commission Meeting." <https://efiling.energy.ca.gov/getdocument.aspx?tn=239862>. Pages 65–68.

150 Blue Ribbon Commission. 2021. "Presentation for the September 30, 2021, Blue Ribbon Commission Meeting." <https://efiling.energy.ca.gov/getdocument.aspx?tn=239862>. Page 66.

Experts also provided information about the competition that is developing from other sources, often at a cheaper price and with lower labor and environmental standards, and recognize the opportunity in current markets for lithium, driven by increasing demand and the anticipated shortfall in supply. At the June 2022 public meeting, project developers discussed competition coming from other potential lithium sources, including mining activities in other states ([such as Nevada](#)), that could have an advantage to developing lithium due to having an experienced mining workforce and a history with minerals mining.¹⁵¹ Suppliers coming into the marketplace quickly and with the lowest costs of production have a competitive advantage.

The Blue Ribbon Commission finds that there are tremendous market opportunities for lithium that can be produced competitively and through an environmentally favorable method such as the proposed recovery of lithium from geothermal brines using DLE technologies. The Commission further finds that developing a domestic source for lithium will support state and national priorities, and that locating the processing and manufacturing of products near the source of lithium would be meaningful in realizing the full value and potential environmental benefit of this resource. Timing is critical, and the early commitments for the purchase of lithium from planned facilities are important milestones in supporting the development of the facilities. While lithium recovery and production enterprises must compete within a global market, the state should continue to support the success of environmentally preferable, California-based lithium recovery facilities.¹⁵²

[We recognize industry perspective that -urgent action is needed to meet state and national mandates for emission free mandate to avoid missing this unique opportunity presented by lithium recovery at the Salton Sea KGRA. The year 2024 has been identified by the auto industry as a critical deadline for Lithium Valley DLE facilities to be operational.](#)

[We also understand that due to the complexity of the lithium production supply and production chain, the need for considerable coordination between those state, local and federal agencies cannot be underestimated.](#)

Recommendations

[Proposed Recommendations Have Been Temporarily Removed due to Commissioners' Request and Consideration of Consolidated Recommendations at the Upcoming October and November Commission Meetings](#)

151 Blue Ribbon Commission. 2022. "Transcript of the June 30, 2022, Blue Ribbon Commission Meeting." <https://efiling.energy.ca.gov/GetDocument.aspx?tn=244229&DocumentContentId=78154>

152 The Blue Ribbon Commission also learned that product manufacturers are implementing sustainability initiatives that further support demand for lithium that was produced in a manner with the lowest possible environmental footprint. For instance, Ford joined a number of other vehicle manufacturers as members of the Initiative for Responsible Mining Assurance (IRMA) to ensure materials in the supply chain for their products meet high quality standards for environmental and social responsibility.

C. 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

Geothermal energy is a clean, firm, renewable resource. Electricity system benefits of geothermal power plants include:¹⁵³

- Grid stability. The rotating mass of steam-powered electricity generators in geothermal power plants helps the local electricity system absorb short-term fluctuations, such as sudden stops and starts of intermittent electricity resources.
- Grid reliability. Geothermal power plants provide a sustainable and stable source of electricity and are characterized as a baseload renewable resource. Salton Sea KGRA geothermal power plants are designed to operate best at a constant level rather than ramping up and down to follow load.
- Grid resiliency. If the electricity grid goes down, geothermal power plants in Imperial Valley are designed so that they do not turn off completely. The geothermal heat is still there and can keep generating electricity, even if the grid goes down, which enables geothermal power plants to help restart the grid.

The Salton Sea KGRA is in the IID balancing authority area, but much of the electricity generated from new geothermal power plants is expected to be exported outside IID to the California Independent System Operator (California ISO or ISO) balancing authority area and the western electricity grid.¹⁵⁴ Resource and transmission planning processes at the California Air Resources Board (CARB), CEC, California Public Utilities Commission (CPUC), and ISO, as well as IID are taking the potential for new geothermal power plants in Imperial Valley into consideration.

The CPUC conducts integrated resource planning (IRP) for load-serving entities that serve about 75 percent of California's electricity load. The remaining load is served by publicly owned electric utilities, such as IID. The latest IRP cycle was guided by the state's SB 32 goal of reducing GHG emissions 40 percent by 2030 and achieving the deep decarbonization goals of SB 100. The IRP process relies on key policy guidance from the CARB scoping plan for California's greenhouse gas emission reductions, joint agency analysis for SB 100, and load assumptions taken from the CEC demand forecast. The IRP process identifies a preferred

153 Blue Ribbon Commission. 2022. "Transcript of the June 16, 2022, Blue Ribbon Commission Meeting." <https://efiling.energy.ca.gov/GetDocument.aspx?tn=243846&DocumentContentId=77784>. Pages 32–33, 41, 53–55.

154 Blue Ribbon Commission. 2022. "Transcript of the June 16, 2022, Blue Ribbon Commission Meeting." <https://efiling.energy.ca.gov/GetDocument.aspx?tn=243846&DocumentContentId=77784>. Pages 30–32.

system plan. The preferred system plan is used by the ISO in its transmission planning process.¹⁵⁵

Based on information from the CPUC's most recent IRP preferred system plan, the ISO will study transmission for 1,100 MW of new geothermal capacity by 2032 in its transmission planning process for 2022–23. This includes 600 MW of new geothermal capacity from the Imperial Valley.¹⁵⁶

In addition, the CEC, CPUC, and California ISO coordinate analysis to inform long-term planning. To inform the ISO's 20-year transmission outlook, the CEC, CPUC, and ISO published a document in 2021 called the 2040 Starting Point Scenario.¹⁵⁷ The 2040 Starting Point Scenario is designed to provide information for a wide range of potential transmission needs driven by a diverse combination of potential renewable and zero-carbon resource opportunities. This scenario includes more than 2,300 MW of new geothermal in California and is being used to study transmission requirements for integrating the portfolio of resources assumed in 2040 in the starting point scenario, including transmission that would integrate t possible future geothermal power plants in Imperial County.¹⁵⁸

The Imperial Valley needs robust transmission capability to move electricity from new geothermal power plants to areas with energy demand. Existing transmission paths from the Imperial Valley to other parts of the state and western grid do not have the capability to deliver significant new geothermal energy.¹⁵⁹

Imperial Valley is rural, so it cannot use all the power locally due to the lack of local demand. Not only does IID provide electricity to about 158,000 retail customers – in Imperial County, and in portions of Riverside and San Diego Counties, it is also its own balancing authority. The highest hourly demand for electricity IID experiences, IID's "peak load," is 1,185 MW.¹⁶⁰ The IID system is ready to export 750 MW and has the ability to double exports. IID has proposed new transmission lines for new installed capacity, including an interim solution (up to 1,750 MW of export) and a long-term solution (up to 3,000 MW) to support export of geothermal energy from the IID electricity system.¹⁶¹

155 Blue Ribbon Commission. 2022. "Transcript of the June 16, 2022, Blue Ribbon Commission Meeting." <https://efiling.energy.ca.gov/GetDocument.aspx?tn=243846&DocumentContentId=77784>. Pages 22–25.

156 Blue Ribbon Commission. 2022. "Presentation — Convening of the Blue Ribbon Commission." <https://efiling.energy.ca.gov/GetDocument.aspx?tn=243673&DocumentContentId=77497>. Slide 25.

157 Blue Ribbon Commission. 2022. "Transcript of the June 16, 2022, Blue Ribbon Commission Meeting." <https://efiling.energy.ca.gov/GetDocument.aspx?tn=243846&DocumentContentId=77784>. Page 61.

158 California Energy Commission. 2021. "SB 100 Starting Point for the CAISO 20-Year Transmission Outlook" CEC Docket 21-SIT-01, TN#: 239685.

<https://efiling.energy.ca.gov/GetDocument.aspx?tn=239685&DocumentContentId=73101>

159 Blue Ribbon Commission. 2022. "Transcript of the June 16, 2022, Blue Ribbon Commission Meeting." <https://efiling.energy.ca.gov/GetDocument.aspx?tn=243846&DocumentContentId=77784>. Pages 42.

160 Blue Ribbon Commission. 2022. "Transcript of the June 16, 2022, Blue Ribbon Commission Meeting." <https://efiling.energy.ca.gov/GetDocument.aspx?tn=243846&DocumentContentId=77784>. Pages 28.

161 Blue Ribbon Commission. 2022. "Transcript of the June 16, 2022, Blue Ribbon Commission Meeting." <https://efiling.energy.ca.gov/GetDocument.aspx?tn=243846&DocumentContentId=77784>. Pages 28–32.

The 2022-23 budget package specifically authorizes the IBank to finance clean energy transmission projects under its Climate Catalyst Revolving Loan Fund, which can support development of transmission for the region.¹⁶²

Recommendation

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Potential Consolidated Recommendations can be Found in accompanying document on the Docket.

D. Methods of Overcoming Technical and Economic Challenges Limiting Lithium Extraction, Processing, and Production from Geothermal Brines

DLE is not a new technology. Rather, it has been studied for decades and is used now in certain applications that recover minerals. DLE is being considered more broadly due in large part to the associated environmental benefits compared to other lithium extraction methods. The Blue Ribbon Commission heard from current project developers and experts that there is confidence that the technologies planned and in development have a high likelihood of success. But supply chain issues and the impact of inflation on cost of equipment, metals, and materials pose the greatest risk.¹⁶³ Technological challenges working with the brines, due to the composition and conditions, were identified as areas to look for innovation in the future.¹⁶⁴

Representatives from EnergySource Minerals, BHE Renewables, and CTR, as well as other experts, conveyed that while the DLE technologies being developed are similar, each project is unique in terms of engineering, process, and the specific technology, which are each proprietary designs. An independent industry researcher described the technologies as the selective removal of lithium using engineered materials such as fabricated micro- or nanomaterials.¹⁶⁵ So, any technological challenge is not necessarily with the lithium recovery step, but there can be technological challenges in applying these technologies to the Salton Sea geothermal brines and the steps that precede the actual lithium recovery. These challenges have to do with pretreating the brines, removing components that interfere with

162 Assembly Bill 209 (2022),
https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=202120220AB209

163 Blue Ribbon Commission. 2022. "Transcript of the June 16, 2022, Blue Ribbon Commission Meeting."
<https://efiling.energy.ca.gov/GetDocument.aspx?tn=243846&DocumentContentId=77784>. Page 85, 92-93.

164 Blue Ribbon Commission. 2022. "Transcript of the June 16, 2022, Blue Ribbon Commission Meeting."
<https://efiling.energy.ca.gov/GetDocument.aspx?tn=243846&DocumentContentId=77784>. Page 98.

165 Blue Ribbon Commission. 2022. "Transcript of the June 16, 2022, Blue Ribbon Commission Meeting."
<https://efiling.energy.ca.gov/GetDocument.aspx?tn=243846&DocumentContentId=77784>. Page 95.

the process, keeping solutions in the proper form throughout the process, ensuring that only the targeted components are removed and that the other components of the brines do not damage equipment. For instance, some speakers noted that there are questions about how stable the adsorbents are at high temperature and the pH values of these brines and questioned how many cycles an adsorbent can be used before it must be replaced.¹⁶⁶ While there do not appear to be technology ~~challenges-carriers~~-limiting development at this time, this is a new enterprise that will require adjustment as facilities reach commercial scale and present opportunities for innovation and improvement over time.

When exploring the economic factors that could limit lithium recovery and production from geothermal brines, the Blue Ribbon Commission notes that this topic was covered in prior sections of this report titled "Market Opportunities for Lithium" and "Potential Economic and Environmental Impacts to the State Resulting from Extraction, Processing, and Production of Lithium and Lithium-Dependent Products From Geothermal Brines." The facilities are being developed at a dynamic time in the market. Early commitments for purchase of lithium from these facilities are essential to development, and the economics factored into those decisions are sensitive to change. The state can take certain action to lower risk and improve the market conditions for domestic lithium produced in an environmentally preferable method.

The Blue Ribbon Commission finds that technological issues can be addressed to enable the recovery of lithium from geothermal brines, but also notes that there are no commercial-scale facilities operating to contribute to this evaluation. As demonstration, pilot, and commercial-scale projects reach operations, the developers will continue to learn and adjust to optimize facilities. Furthermore, research and development continue in the area of minerals recovery technologies, and the efforts of state and national agencies to support these efforts financially – both directly and by facilitating private capital investments – will contribute to the long-term success of the industry and related product manufacturing efforts. The Commission also notes that clean energy technologies are an area of constant innovation and that the end users of lithium dictate the products and product specifications needed for their technologies. As end uses advance and change over time, additional technological improvements may be needed to meet evolving needs.

An area the Commission explored that indirectly presents barriers to lithium development and the ability to attract additional economic activity is infrastructure investment and improvement needed throughout the region. Many speakers and comments noted the need for road and bridge improvements limited transportation options in some locations and updates needed to water systems. Moreover, the Blue Ribbon Commission experienced firsthand while conducting meetings in communities around the region the challenges of inconsistent internet access, which is critical to modern business development. The Commission recognizes the challenge developers and local governments face when making significant investments in infrastructure to support uncertain future activity without confidence that future revenue can repay the investment. In cases where it is necessary to recoup the costs of infrastructure development, the Commission encourages developers and local agencies to seek state and federal funding and consider creative solutions that draw on other successful projects and financing structures that can support these critically necessary improvements.

¹⁶⁶ An *adsorbent* attracts molecules to its surface.

[The 2022-23 state budget established lithium excise tax and requires a study to evaluate whether to use a different structure for the tax. If the price declines, the current tax could create economic problems for lithium producers. The study is due by the end of 2023. As part of this study, one option to consider is indexing the volume-based tax and track with the market price.](#)

Recommendations

[Proposed Recommendations Have Been Temporarily Removed due to Commissioners' Request and Consideration of Consolidated Recommendations at the Upcoming October and November Commission Meetings](#)

[Potential Consolidated Recommendations can be Found in accompanying document on the Docket.](#)

E. Safe Environmental Methods and Standards for Lithium Extraction from Geothermal Brines and How This Compares to Other Methods for Deriving Lithium

Chapter 2 described the two prevalent commercial methods for recovering lithium: hard rock mining and evaporation ponds. Mining is environmentally harmful. It scars landscapes, adversely affects ecosystems and habitat, is water- and energy-intensive, and can pollute air and water resources. Evaporation ponds are water-intensive, can require thousands of square miles of land, and is environmentally destructive. In contrast, the environmental impacts of the DLE technologies proposed for use in the Imperial Valley allow a lower-impact and more sustainable and environmentally beneficial approach to lithium recovery in terms of factors such as land use, water use, time to market, and carbon intensity.

The Blue Ribbon Commission recognizes that the DLE technologies would be deployed for specific projects and that the projects will likely be ~~collocate~~[colocate](#) with existing or new geothermal power plants. This section discusses the existing standards that would apply to these projects, recognizing that Imperial County would have primary permitting jurisdiction for DLE projects in Imperial County, as well as primary permitting jurisdiction for a geothermal power plant with a generating capacity less than 50 MW. Geothermal power plants with a generating capacity of 50 MW or more are within the exclusive permitting jurisdiction of the CEC.¹⁶⁷ The permitting agencies are also typically CEQA lead agencies principally responsible

¹⁶⁷ The Blue Ribbon Commission is aware that the law allows the CEC to delegate its permitting authority to counties for geothermal powerplants with a generating capacity of 50 MW or more. (Public Resources Code, § 25540.5.) To date, this authority has not been so delegated. But on July 13, 2022, amendments to the CEC's regulations relating to delegation took effect. The amendments streamline the process for the CEC to make this delegate full authority for the certification of geothermal power plants.

for determining if CEQA applies to a project and, if so, whether an EIR, mitigated negative declaration, or negative declaration will be required.

Approvals are also required from the local air and water quality control districts.¹⁶⁸ Also, approval may be required from the CDFW, which is concerned with how a project will impact species and habitat, and other state and local agencies. If wells will be drilled, approval is required from the California Department of Conservation's Geologic Energy Management Division. Furthermore, if projects are on federal land, federal agency approvals are required, as well as compliance with the National Environmental Policy Act. For instance, if a project impacts exposed lakebed of the Salton Sea, it will also require a permit from the U.S. Army Corps of Engineers. For complex projects with more than minimal impacts to water resources, the U.S. Army Corps of Engineers conducts a project-specific environmental justice evaluation.¹⁶⁹

The California Environmental Quality Act

CEQA and its implementing CEQA Guidelines require lead agencies to review the environmental impacts of proposed projects and, if those impacts may be significant, consider feasible alternatives or mitigation measures that would substantially reduce the effect to less than significant, if possible.^{170, 171, 172} Among other things, the CEQA Guidelines explain how to determine whether an activity is subject to environmental review, what steps are involved in the environmental review process, and what are the required content of environmental documents. The CEQA Guidelines apply to public agencies throughout the state, including local governments, special districts, and state agencies.

The review of projects under CEQA requires an evaluation of topics, as identified, and further described in the CEQA Guidelines. The topics required to be considered are:

- Aesthetics
- Biological Resources
- Geology/Soils
- Hydrology/Water Quality
- Noise
- Recreation
- Land Use/Planning
- Population/Housing
- Transportation/Traffic
- Wildfire
- Air Quality
- Energy

168 Imperial County Air Pollution Control District. 2020. "Rule 201. Permits Required." <https://apcd.imperialcounty.org/wp-content/uploads/2020/01/1RULE201.pdf>.

169 Blue Ribbon Commission. 2021. "Transcript of the October 28, 2021, Blue Ribbon Commission Meeting." Pages 110-113 and 119. <https://efiling.energy.ca.gov/GetDocument.aspx?tn=240735&DocumentContentId=74139>.

170 California Public Resources Code, beginning with Section 21000.

171 California Code of Regulations, Title 14, Division 6, Chapter 3.

172 The term "project" under CEQA means an activity which may cause either a direct physical change in the environment, or a reasonably foreseeable indirect physical change in the environment, and which is any of the following: (a) an activity directly undertaken by any public agency, (b) an activity undertaken by a person which is supported, in whole or in part, through contracts, grants, subsidies, loans, or other forms of assistance from one or more public agencies, and (c) an activity that involves the issuance to a person of a lease, permit, license, certificate, or other entitlement for use by one or more public agencies (California Public Resources Code Section 21065).

- Utilities/Service Systems
- Agriculture and Forestry Resources
- Cultural Resources
- Greenhouse Gas Emissions
- Hazards and Hazardous Materials
- Mineral Resources
- Public Services
- Mandatory Findings of Significance
- Tribal Cultural Resources

CEQA requires project monitoring and reporting requirements throughout the life cycle of a project. Standards are in place to assess cumulative impacts as well. In addition, CEQA specifies requirements for lead agency consultation with Tribes as part of the project permitting process. CEQA also includes requirements that the public must have opportunities to review and comment on environmental documents and decision making.

Throughout this work, the Blue Ribbon Commission consistently heard concerns and fears from local residents and representatives of community organizations about potential negative impacts on public health in this region, which already experiences a high level of pollution and associated negative health outcomes. During the March 24, 2022, meeting, the Commission learned that health impact assessments would provide additional information on potential distributional impacts of a proposed project.

The CEC’s Exclusive Permitting Jurisdiction

As mentioned above, power plants with a generating capacity of 50 MW or greater are under the exclusive permitting jurisdiction of the CEC. For these projects which can include geothermal power plants, the Application for Certification (AFC) is the standard licensing process. The CEC's power plant site certification program is a certified regulatory program under CEQA and analyzes whether the power plant will have significant environmental impacts. In addition, the CEC analyzes the public health and safety, engineering, reliability and sustainability of the project. As a one-stop shop, the CEC’s process incorporates all state, local, and regional agencies’ requirements necessary for a plant to be constructed and operated, including the requirements for the state and local additional permits described above, unless the CEC adopts overriding findings that the facility is required for public convenience and necessity and there are no more prudent or feasible means of achieving public convenience and necessity. The CEC also coordinates its review with federal agencies that will be issuing permits.

The Blue Ribbon Commission is aware that the law allows the CEC to delegate its exclusive permitting authority to counties for geothermal powerplants with a generating capacity of 50 MW or more. (Public Resources Code, § 25540.5.) For counties to qualify, the county must have a geothermal element in its general plan. The county must then petition the CEC and demonstrate that the county can implement an equivalent certification program. To date, this authority has not been delegated. On July 13, 2022, amendments to the CEC’s regulations relating to delegation took effect. The amendments streamline the process for the CEC to approve this delegation of authority for the certification of geothermal power plants, while maintaining the requirement that qualifying counties implement robust environmental review and public participation while considering applications for new geothermal power plants.

The Three Projects in Development in Imperial County

As discussed above, each of the planned DLE projects in Imperial County will use specific, proprietary technologies, but there are common features to this type of mineral recovery. Considering only the lithium recovery component and not the geothermal power plant, the amount of land needed is small when compared to large mining areas and evaporation ponds. The EnergySource Minerals Project ATLiS is described as covering less than 100 acres. For comparison, 100 acres is about 80 American football fields.

Water will be needed for DLE facilities, but far less than the amount needed for mining or evaporation ponds. For example, BHE Renewables plans to limit freshwater usage to 50,000 gallons per metric ton of lithium carbonate, which is 90 percent less than the amount used in lithium evaporation ponds in South America.¹⁷³ There will be GHG emissions associated primarily with the energy demands for the facility and energy needed to pump water used at the facility. Due to the state's Renewables Portfolio Standard requirements, however, the utility will reduce GHGs through the adoption of increasing amounts of renewable resources, and geothermal is a renewable low-carbon resource.

IID is a local utility that provides public power to most of Imperial County and sections of Riverside County and San Diego County. The utility it is also a major supplier of water to the region, providing Colorado River water to farmland and nine communities in Imperial County.

The permitting and CEQA review statuses of projects planned by EnergySource Minerals, CTR, and BHE Renewables are summarized below.

EnergySource Minerals: Project ATLiS

The EnergySource Minerals Project ATLiS received a conditional use permit from Imperial County in 2021.¹⁷⁴ The project activities evaluated in an EIR for the project included:

- Construction and operation of brine supply and return pipelines and other associated interconnection facilities with the Hudson Ranch 1 power plant.
- Construction of a primary access road from McDonald Road (about 500 feet west of the HR 1 entrance), a second primary access about 800 feet west, and an emergency access entrance only from Davis Road.
- Paving of McDonald Road from State Route 111 (Highway 111) to English Road (about 2 miles).
- Construction of a power interconnection line from the IID and Hudson Ranch 1 switchyard located at the northeast corner of the Hudson Ranch 1 site.
- Construction of associated facilities between Hudson Ranch 1 and the project site to facilitate the movement of brine and other services.

173 Blue Ribbon Commission. July 29, 2021. "Transcript of the July 29, 2021, Blue Ribbon Commission Meeting." Page 97. <https://efiling.energy.ca.gov/GetDocument.aspx?tn=239800&DocumentContentId=73245>.

174 Imperial County, Planning and Development Services Department. 2021. "Project Report." <https://www.icpds.com/assets/hearings/02.-WSA,FIER,-MMRP,-CUP20-0008,-PM02485-Energy-Source-Mineral-ATLiS-PC-Pkg.pdf>.

- Construction of a yard for storing materials and equipment (laydown yard) that will also support temporary offices during construction as well as serve as a truck management yard during operations.
- Construction of offices, repair facilities, shipping and receiving facilities, and other infrastructure, including the relocation of the IID structures and road improvements at Highway 111.
- Aesthetic considerations were limited to the temporary construction period and were determined not to substantially degrade the existing visual character or public views of the site or surroundings.¹⁷⁵

Based on comments received in response to the initial study, the notice of preparation of an EIR, and public meetings, the county determined that the draft EIR would analyze project-related impacts relative to 14 substantive potential impact areas: air quality, biological resources, cultural resources, energy, geology and soils, greenhouse gas emissions, hazards and hazardous materials, hydrology and water quality, noise, transportation, and utilities and service systems.¹⁷⁶ The EIR for this project determined that the project would result in less than significant impacts with incorporation of mitigation requirements for the following identified potentially significant impacts:¹⁷⁷

- Biological resources (potential impact to species)
- Geology and soils (potential impacts resulting from seismic ground shaking, potential impacts to paleontological resources)
- Transportation (vehicle miles traveled, road intersection improvement)
- Water supply

Regarding water supply, the EIR stated in pertinent part:¹⁷⁸

The Project represents 14 percent of the unallocated supply set aside in the [Interim Water Supply Policy] IWSP for nonagricultural projects and approximately 14 percent of forecasted future nonagricultural water demands planned in the Imperial [Integrated Regional Water Management Plan] IRWMP through 2055. The amount of water available and the stability of the [Imperial Irrigation District] IID water supply along with on-farm and system efficiency conservation and other measures being undertaken by IID and its customers

¹⁷⁵ Imperial County, Planning and Development Services Department. 2021. "Project Report." <https://www.icpds.com/assets/hearings/02.-WSA,FIER,-MMRP,-CUP20-0008,-PM02485-Energy-Source-Mineral-ATLiS-PC-Pkg.pdf>.

¹⁷⁶ CEQA Findings for the EnergySource Mineral ATLiS Project, page 4. In Imperial County, Planning & Development Services Department. 2021. "Project Report." <https://www.icpds.com/assets/hearings/02.-WSA,FIER,-MMRP,-CUP20-0008,-PM02485-Energy-Source-Mineral-ATLiS-PC-Pkg.pdf>.

¹⁷⁷ Final Environmental Impact Report for the EnergySource Mineral ATLiS Project. In Imperial County, Planning & Development Services Department. 2021. "Project Report." <https://www.icpds.com/assets/hearings/02.-WSA,FIER,-MMRP,-CUP20-0008,-PM02485-Energy-Source-Mineral-ATLiS-PC-Pkg.pdf>.

¹⁷⁸ Final Environmental Impact Report for the EnergySource Mineral ATLiS Project, page 21. In Imperial County, Planning and Development Services Department. 2021. "Project Report." <https://www.icpds.com/assets/hearings/02.-WSA,FIER,-MMRP,-CUP20-0008,-PM02485-Energy-Source-Mineral-ATLiS-PC-Pkg.pdf>.

ensure that the Project's water needs will be met for the next 30 years. When drought conditions exist within the IID water service area, as has been the case for the past decade or so, the water supply available to meet agricultural and nonagricultural water demands remains the same as normal year water supply because IID continues to rely on its entitlement for Colorado River water. Due to the priority of their water rights and other agreements, drought affecting Colorado River water supplies causes shortages for Arizona, Nevada, and Mexico, not California or IID. Therefore, the likelihood that IID will not receive its annual 3.1 million AF apportionment under the Quantification Settlement Agreement obligations of Colorado River water is low due to the high priority of the IID entitlement relative to other Colorado River contractors (see Appendix I for further details on the IID's water rights). If such reductions were to come into effect within the life of the 30-year Project, a significant impact would occur. If such reductions do occur, Mitigation Measure (MM) UTIL-1 would be implemented, requiring the Applicant to work with IID to ensure any reduction in water availability during the life of the Project can be managed. Therefore, with implementation of MM UTIL-1, impacts would remain less than significant.

Given the uncertainty of water supply to the region as a result of the current drought and impacts of global warming, the project developers will need to work with IID to address their plans for water use.

CTR: Hell's Kitchen Project (Phase 1)

In December 2021, subsidiaries of CTR¹⁷⁹ submitted conditional use permit applications to Imperial County for the Hell's Kitchen PowerCo 1 (geothermal power plant) and LithiumCo 1 (DLE facility) projects. . Imperial County posted a notice of preparation and an initial study and environmental analysis in March 2022 for a single combined geothermal power plant and lithium recovery project, the Hell's Kitchen PowerCo1 and LithiumCo1 Project, and held a public EIR scoping meeting in April 2022. Imperial County received comments from the Native American Heritage Commission in April 2022 and CDFW in May 2022.¹⁸⁰

The initial study and environmental analysis identified the following areas with potentially significant impacts that will be analyzed and discussed in the EIR: aesthetics, air quality, biological resources, cultural resources, energy, geology and soils, greenhouse gasses, hazards and hazardous materials, hydrology and water quality, noise, transportation, utilities and services systems, and wildfire.¹⁸¹

179 As described in the cover letter to the Conditional Use Permit Applications, dated December 10, 2021, Hell's Kitchen Powerco 1, LLC and Hell's Kitchen LithiumCo 1 LLC are subsidiaries of Hell's Kitchen HoldingCo 1 LLC and Controlled Thermal Resources.

180 Imperial County. 2022. "Hell's Kitchen PowerCo1 and LithiumCo1 Project." In California Governor's Office of Planning and Research. California Environmental Quality Act CEQAnet Web Portal. <https://ceqanet.opr.ca.gov/2022030704>.

181 Imperial County. 2022. *Initial Study and Environmental Analysis for Hell's Kitchen PowerCo 1 and LithiumCo 1 Project*. https://files.ceqanet.opr.ca.gov/277330-1/attachment/umqX2ZYUYgPDPnQmJ1zkDyRyVLAng5T8MBZGSmrgzFDiB8GLtk0M8WcbNqVXIZ8U6A4g_EZEGzbWm6l_0.

BHE Renewables: Demonstration Projects, Plans for Commercial DLE Facilities, and Plans for New Geothermal Power Plants

The first BHE Renewables DLE demonstration project to recover lithium from geothermal brine received a permit from Imperial County and was categorically exempt from CEQA.¹⁸² The project uses brine from an existing geothermal power plant. BHE Renewables is also developing a second demonstration project at 1/10th of commercial scale to additionally demonstrate the processing of lithium recovered from geothermal brine into battery grade compounds.¹⁸³ Depending on the results of its demonstration projects, BHE Renewables plans to build commercial-scale DLE facilities that use geothermal brine from its existing geothermal power plants and is considering expanding existing geothermal production and building new geothermal power plants with DLE facilities.¹⁸⁴ BHE Renewables representatives stated at the June 30, 2022 public meeting, they are looking at developing an additional [377 MW net 339 MW](#) in geothermal power capacity in the Imperial Valley.¹⁸⁵ Additional information on potential environmental impacts and mitigation associated with future facilities will be available as BHE Renewables projects apply to Imperial County for required permits.

Recommendations

[Proposed Recommendations Have Been Temporarily Removed due to Commissioners' Request and Consideration of Consolidated Recommendations at the Upcoming October and November Commission Meetings](#)

[Potential Consolidated Recommendations can be Found in accompanying document on the Docket.](#)

F. Potential Economic and Environmental Impacts to the State Resulting from Extraction, Processing, and Production of Lithium from Geothermal Brines and Lithium-Dependent Products

182 CEQA allows for categorical exemptions of classes of projects that generally are considered not to have potential impacts on the environment. Categorical exemptions are defined in the CEQA Guidelines (14 CCR Section 15300-15331).

183 Blue Ribbon Commission. 2022. "Transcript of the June 16, 2022, Blue Ribbon Commission Meeting." <https://efiling.energy.ca.gov/GetDocument.aspx?tn=243846&DocumentContentId=77784>. Page 100.

184 Blue Ribbon Commission. 2022. "Transcript of the March 24, 2022, Blue Ribbon Commission Meeting." <https://efiling.energy.ca.gov/GetDocument.aspx?tn=242568&DocumentContentId=76086>. Page 26.

185 Blue Ribbon Commission. 2021. "Transcript of the August 26, 2021, Blue Ribbon Commission Meeting." <https://efiling.energy.ca.gov/GetDocument.aspx?tn=240014&DocumentContentId=73462>. Page 78.

This section is structured on three subtopics: environmental impacts, economic impacts, and workforce considerations, with recommendations on all three subtopics provided at the end of the section.

Environmental Impacts and Public Health

Recovery of lithium from geothermal brines has the potential to help California reduce greenhouse gases and improve air quality by supplying battery-grade lithium compounds needed to produce batteries for clean energy and transportation products such as electric vehicles and trucks and battery storage systems. As a new industry potentially develops to recover and process lithium from geothermal brine, care is needed to identify, avoid, reduce, and mitigate potential negative impacts from these new activities.

The report previously discussed the permitting process and ways that CEQA applies to individual geothermal power plant and DLE facility projects. This report also describes the EIR that was certified by Imperial County for the EnergySource Minerals Project ATLiS, as well as Imperial County’s environmental review for CTR’s proposed geothermal power plant and DLE facility. The permitting documents for the EnergySource Minerals Project ATLiS are extensive, so this report provides a summary of topics that were elevated during public meeting to be of particular interest to the Blue Ribbon Commission and the community: traffic, air quality, chemical use, waste streams, water use and wastewater. While the Commission recognizes that each project that is considered by a state agency or county is subject to review on the merits and based on project design and location, the following information from the EnergySource Minerals Project ATLiS EIR provides a foundation for reasonable inferences about other potential projects.

Traffic

Traffic will increase during the construction and operations of each facility. Specific to the EnergySource Minerals Project ATLiS alone, once operational, the plant will run 24 hours per day, seven days a week, generating an estimated 24 trucks per day (in and out), transporting outgoing products, delivering chemicals and materials, and managing wastes. All transportation activities must comply with existing legal requirements for safety and addressing environmental impacts. The Imperial County Transportation Commission is preparing an update to the *Long Range Transportation Plan* that will provide a detailed roadmap of the regional transportation system of Imperial County for the next 30 years. The update, which is underway and anticipated to be complete by Summer of 2023,¹⁸⁶ will identify transportation priorities, funding, and policies necessary to move Imperial County forward, including those that would result from lithium recovery development.

Air Quality

Air quality is a key concern of residents around the Salton Sea, and the Blue Ribbon Commission carefully considered the descriptions of current conditions, information regarding potential air emissions from the anticipated new facilities, and residents’ concerns regarding

186 Imperial County Transportation Commission. 2022. “Update to the Long Range Transportation Plan”. <https://www.imperialctc.org/projects/long-range-transportation-plan-update>

the current and future levels of dust and particulate matter from the nearby exposed playa and these facilities.

According to the EIR for the EnergySource Minerals Project ATLiS, the facility will be located within the central portion of Imperial County, which is part of the Salton Sea Air Basin. The Salton Sea Air Basin includes the central portion of Riverside County and all of Imperial County. Different agencies oversee air quality within this basin with the Riverside County portion regulated by the South Coast Air Quality Management District, and the Imperial County portion regulated by the Imperial County Air Pollution Control District (ICAPCD). Federal and State laws also regulate the air pollutants emitted by stationary and mobile sources.

The EnergySource Minerals project will be required to obtain air permits and to adhere to ICAPCD rules and regulations. Emission from the construction and operation are required to be within the allowable thresholds established to protect public health and standard mitigation measures including dust control measures have been incorporated into the project design. In summary, air emissions will be reduced, mitigated, or eliminated as required to obtain all required permits from the ICAPCD.

In addition, air monitoring activities are occurring in the region through the efforts of state agencies such as the California Air Resources Board^{187, 188} and local agencies and community organizations.^{189, 190}

Chemical Use

Chemical use and the transportation of materials into the facilities were identified to be similar to the chemicals used for the geothermal operations that have been in operation in the area for the last 40 years.¹⁹¹ While exact processes and chemical use will be specific to the technologies used at each facility for recovery and final processing of lithium products, generally speaking, DLE is described by experts as requiring sodium carbonate and hydrochloric acid. The EnergySource Minerals Project ATLiS EIR noted hydrochloric acid and bulk reagent chemicals will be brought on site and used for lithium recovery and processing. As discussed in the section on traffic, materials will be transported to and from the projects in trucks. All transportation activities must comply with existing legal requirements for safety and addressing environmental impacts. Also, scientists and project developers providing

187 California Air Resources Board. Community Air Monitoring Plan and Community Emissions Reduction Program. 2018. "Calexico, El Centro, Heber." <https://ww2.arb.ca.gov/our-work/programs/community-air-protection-program/communities/calexico-el-centro-heber>.

188 California Air Resources Board. Community Air Monitoring Plan and Community Emissions Reduction Program. 2019. "Eastern Coachella Valley." <https://ww2.arb.ca.gov/our-work/programs/community-air-protection-program/communities/eastern-coachella-valley>.

189 Comite Civico Del Valle and Imperial County Air Pollution Control District. 2019. "Imperial County Community AB617 Self Nomination Imperial County Northern Corridor." <https://ww2.arb.ca.gov/sites/default/files/2019-11/2019%2010%2023%20ICAPCD%20CCV%20Northend%20Nomination.pdf>.

190 Imperial County, Planning & Development Services Department. 2021. "Project Report." <https://www.icpds.com/assets/hearings/02.-WSA,FIER,-MMRP,-CUP20-0008,-PM02485-Energy-SourceMineral-ATLiS-PC-Pkg.pdf>.

191 Blue Ribbon Commission. 2022. "Transcript of the June 30, 2022, Blue Ribbon Commission Meeting." Pages 44–45. <https://efiling.energy.ca.gov/GetDocument.aspx?tn=244229&DocumentContentId=78154>.

information during Blue Ribbon Commission meetings explained geothermal brine processing will occur within pipelines and tanks.^{192, 193, 194}

Waste Streams

Waste streams are another topic of particular interest to the community. Again, the Commission relied on information in the EnergySource Minerals Project ATLiS EIR and information presented at Commission meetings to explore the waste streams from the DLE facilities as well as any risks to the community.^{195, 196} From all information received, the Blue Ribbon Commission understands that the existing regulatory frameworks provide for proper handling and management of wastes with the oversight of local and state agencies to monitor and verify compliance.^{197, 198, 199} At the local level, Imperial County Agencies and Departments oversee solid waste facilities and haulers and at the state level the California Department of Resource, Recycling and Recovery oversees solid waste management and the Department of Toxic Substances Control is the authority for hazardous waste regulations and compliance activities. Nonhazardous solid waste is expected to be nominal and will be picked up by local contractors and transported to local waste disposal facilities. Iron-silica material in the form of filter cakes will also be generated from the facility, tested for toxicity, and properly managed.²⁰⁰ Comments received during public meetings emphasized the need to ensure that new facilities adopt a circular economy (cradle-to-cradle) approach when considering operations and wastes. Experts on DLE technologies noted there may be additional recycling and reuse opportunities when considering all the products, by-products, and wastes produced through the operation of lithium recovery and geothermal facilities and encouraged project developers to continue to innovate and research potential improvements. The Blue Ribbon Commission agrees that developers should implement best practices for all materials and waste management and that the agencies tasked with overseeing the wastes from lithium recovery facilities should ensure the best practices are employed at each facility.

192 Blue Ribbon Commission. 2021. "Transcript of the November 17, 2022 Blue Ribbon Commission Meeting Community Forum." Page 85.

<https://efiling.energy.ca.gov/GetDocument.aspx?tn=240766&DocumentContentId=74208>.

193 Blue Ribbon Commission. 2022. "Transcript of the June 30, 2022, Blue Ribbon Commission Meeting." Page 26. <https://efiling.energy.ca.gov/GetDocument.aspx?tn=244229&DocumentContentId=78154>.

194 Blue Ribbon Commission. 2021. "Presentation for the July 29, 2021, Blue Ribbon Commission Meeting." Slides 43-45. <https://efiling.energy.ca.gov/GetDocument.aspx?tn=239214&DocumentContentId=72666>.

195 Blue Ribbon Commission. 2022. "Transcript of the June 30, 2022 Blue Ribbon Commission Meeting." <https://efiling.energy.ca.gov/GetDocument.aspx?tn=244229&DocumentContentId=78154>.

196 Blue Ribbon Commission. 2021. "Transcript of the July 29, 2021 Blue Ribbon Commission Meeting." <https://efiling.energy.ca.gov/GetDocument.aspx?tn=239800&DocumentContentId=73245>.

197 Blue Ribbon Commission. August 26, 2021. "Transcript of the August 26, 2021 Blue Ribbon Commission Meeting." <https://efiling.energy.ca.gov/GetDocument.aspx?tn=240014&DocumentContentId=73462>.

198 Blue Ribbon Commission. 2021. "Transcript of the October 28, 2021 Blue Ribbon Commission Meeting." <https://efiling.energy.ca.gov/GetDocument.aspx?tn=240735&DocumentContentId=74139>.

199 Blue Ribbon Commission. 2022. "Transcript of the March 24, 2022 Blue Ribbon Commission Meeting." <https://efiling.energy.ca.gov/GetDocument.aspx?tn=242568&DocumentContentId=76086>.

200 Blue Ribbon Commission. 2022. "Transcript of the June 30, 2022 Blue Ribbon Commission Meeting." Pages 53-54. <https://efiling.energy.ca.gov/GetDocument.aspx?tn=244229&DocumentContentId=78154>

Water Use and Wastewater

Water use and wastewater associated with the construction and operation of lithium recovery facilities planned and under construction were also explored, including consideration of the brine usage and any additional water delivered to the site for project operations. No water from the Salton Sea will be used for the projects proposed by EnergySource Minerals, CTR, or BHE Renewables.^{201, 202, 203}

Geothermal Brine

As discussed above, Imperial Valley has a long history of geothermal power production, and the addition of lithium recovery to existing facilities adds additional steps that removes minerals from the brine, but otherwise does not alter the process employed in existing geothermal facilities to bring the brine to the surface and return the brine to the geothermal reservoir. Scientists have studied and continue to study the geothermal reservoir volume, potential energy, and mineral resources. Based on previous studies, experts estimate that the reservoir can sustainably support the planned addition of new lithium recovery and geothermal facilities.²⁰⁴ As mentioned earlier in this report, with support from DOE's Geothermal Technologies Office, scientists from Lawrence Berkeley National Laboratory (Berkeley Lab), UC Riverside, and Geologica Geothermal Group, Inc. are collaborating to quantify and characterize the lithium in the Salton Sea geothermal reservoir.²⁰⁵

Delivered Water

Water use is a primary concern for the region and the state, particularly during the current drought and water supply, water quality concerns, and the regional impacts of the receding Salton Sea. During public meetings, IID representatives described the unprecedented conditions the district is facing and the updated water management planning that has begun to address the shortages and impacts due to prolonged drought conditions.²⁰⁶ While necessary planning is not complete, it was clear that all new projects seeking water allocations and current water users will be involved in any solutions needed to address limited supplies. IID completes water supply assessment when certain new projects seek an allocation of water in

201 Final Environmental Impact Report for the EnergySource Mineral ATLiS Project. In Imperial County, Planning & Development Services Department. 2021. Project Report. <https://www.icpds.com/assets/hearings/02.-WSA,FIER,-MMRP,-CUP20-0008,-PM02485-Energy-Source-Mineral-ATLiS-PC-Pkg.pdf>.

202 Blue Ribbon Commission. 2021. "Transcript of the November 17, 2021 Blue Ribbon Commission Meeting Community Forum." Pages 132–133. <https://efiling.energy.ca.gov/GetDocument.aspx?tn=240766&DocumentContentId=74208>.

203 Imperial County. 2021. Project Report. Planning & Development Services Department Water Supply Assessment, page 59-61. <https://www.icpds.com/assets/hearings/02.-WSA,FIER,-MMRP,-CUP20-0008,-PM02485-Energy-Source-Mineral-ATLiS-PC-Pkg.pdf>.

204 McKibben, Michael and Patrick Dobson. 2022. "Lithium Resources beneath the Salton Sea Presentation for the Salton Sea Summit." CEC Docket 20-LITHIUM-01. TN#: 239363. <https://efiling.energy.ca.gov/GetDocument.aspx?tn=239363&DocumentContentId=72808>

205 Julie Chao. "Quantifying California's Lithium Valley: Can It Power Our EV Revolution?" Berkeley Lab News Center. February 16, 2022. <https://newscenter.lbl.gov/2022/02/16/quantifying-californias-lithium-valley-can-it-power-our-ev-revolution/>

206 Blue Ribbon Commission. 2022. "Transcript of the June 16, 2022, Blue Ribbon Commission Meeting." <https://efiling.energy.ca.gov/GetDocument.aspx?tn=243846&DocumentContentId=77784>. Page 110 -124.

coordination with local permitting for construction and operation.^{207, 208} IID's Integrated Water Resources Management Plan provides relevant information for consideration in a water supply assessment, and IID provides water to new nonagricultural projects under the terms of the Equitable Distribution Plan and the *Interim Water Supply Policy for Non-Agricultural Projects*.²⁰⁹

IID has set aside 25,000 acre-feet per year (AFY) for new, nonagricultural uses, which includes new lithium recovery and geothermal projects. Through September 2021, the EnergySource Minerals Project ATLiS and one other project have received allocations from this set-aside.²¹⁰ The EnergySource Minerals Project ATLiS EIR identified that roughly 90,000 gallons per hour or about 3,400 AFY of water will be purchased from IID for cooling water and additional process water. One addition non-lithium project has received an allocation of 1,200 AFY , leaving 20,400 AFY for future lithium recovery and geothermal projects from the 25,000 AFY set aside under the *Interim Water Supply Policy for Non-Agricultural Projects*.²¹¹

Water demand will vary depending on the project; however, the Blue Ribbon Commission understands that if the 3,400 AFY water use of the EnergySource Minerals Project ATLiS were used as a representative amount of the water demand required for the production of 20,000 metric tons of lithium products, the entire remaining balance of the IID nonagricultural set-aside could support roughly 120,000 metric tons of lithium recovery and production per year. Planned facilities have projected as much as 210,000 metric tons of recovery and production with expansions in the future. This rough comparison indicates the potential new project requirements for water are greater than the water available for new uses and if actual demand for water for new development exceeds that set aside for these uses, water availability could present limitations for the amount of new lithium recovery and geothermal development approved. However, this rough comparison assumes that water use in all new facilities would be comparable to that identified for the EnergySource Minerals Project ATLiS which may not be an accurate assumption. The comparison provides a potential scenario and actual water use will be better understood when each project completes permitting and CEQA activities.

Wastewater

Information provided to the Commission demonstrated that there will be minimal wastewater produced from lithium recovery operations and that wastewater will be managed either on site or through municipal systems with oversight from appropriate local and state agencies. The Commission heard that there may be opportunities for water efficiency improvements in

207 Projects that meet the criteria of Water Code Sections 10910-10915, as described in the *IID Interim Water Supply Policy for Non-Agricultural Projects*

208 Imperial Irrigation District. 2022. "IID Interim Water Supply Policy for Non-Agricultural Projects." <https://www.iid.com/home/showpublisheddocument/9599/637781018574030000>

209 Imperial Irrigation District. 2012. "Imperial Integrated Regional Water Management Plan." <https://www.iid.com/water/water-supply/water-plans/imperial-integrated-regional-water-management-plan>.

210 Water Supply Assessment, pages 59–60. In Imperial County, Planning & Development Services Department. 2021. "Project Report." <https://www.icpds.com/assets/hearings/02.-WSA,FIER,-MMRP,-CUP20-0008,-PM02485-Energy-Source-Mineral-ATLiS-PC-Pkg.pdf>.

211 Water Supply Assessment, page 32. In Imperial County, Planning & Development Services Department. 2021. "Project Report." <https://www.icpds.com/assets/hearings/02.-WSA,FIER,-MMRP,-CUP20-0008,-PM02485-Energy-Source-Mineral-ATLiS-PC-Pkg.pdf>.

facility design and encourages all efforts to capture and reuse or recycle any wastewater produced at geothermal and lithium recovery facilities.²¹²

In summary, the Blue Ribbon Commission explored a wide range of potential environmental impacts associated with planned lithium recovery facilities, a portion of which are described here, and generally found that requirements of CEQA and other assessments that are required for permitting new facilities will provide information about potential impacts, require mitigation of potentially significant impacts, and offer an opportunity for the community to understand and comment on the specific details of each planned facility.

The Blue Ribbon Commission finds that while the topics required to be considered under CEQA are intended to support a robust review of proposed projects, CEQA also offers an opportunity to expand evaluations. CEQA should be considered the floor and not the ceiling when it comes to ensuring a comprehensive review of project impacts and providing a transparent and inclusive process for community participation. In addition, the current and historical context and conditions of the region are critical for project developers and permitting agencies to consider for future geothermal and lithium-related development projects. Furthermore, the Commission has identified that water availability is a consideration for future project development that could present limitations on future development but requires additional project specific details to fully evaluate. The Commission further finds that health impact assessments provide a deeper evaluation of a project's impact on the community. Consistent with findings noted earlier in this report, the discussion of environmental impacts should be coupled with meaningful community engagement.

Economic Impacts

The recovery of lithium from geothermal brine using DLE, and the growth of a regional economic hub or cluster that includes additional lithium processing, and production of mineral compounds in developing Lithium Valley could lead to substantial economic growth in the region. There may also be additional economic activity associated with the recovery of other minerals from geothermal brine and the development of manufacturing plants that use Imperial County lithium and other minerals recovered from geothermal brine. However, this analysis focuses on impacts anticipated from DLE from geothermal brine and related processing and production. The three DLE projects in planning and development may generate millions of dollars each year in new revenue, which would lead to increases in funds from royalties, taxes, and service fees that directly benefit state and local governments, landowners, and IID.

According to the Imperial Valley Economic Development Corporation's (IVEDC) Economic Impact Assessment, every \$1 spent on payroll at the ~~collocate~~collocated geothermal power plants and lithium recovery facilities proposed by CTR would generate an additional \$1.23 for

212 Blue Ribbon Commission. 2022. "Transcript of June 30, 2022 Blue Ribbon Commission Meeting." <https://efiling.energy.ca.gov/GetDocument.aspx?tn=244229&DocumentContentId=78154>. Pages 55, 64–66.

the community in local taxes and earnings. If all planned phases are completed, the estimated local impact would be 4,285 jobs created and \$359.3 million in annual earnings and taxes.²¹³

In May 2022, Imperial County estimated the combination of geothermal energy and recovery of minerals from geothermal brine could double Imperial County's gross domestic product in the next 5–10 years.²¹⁴

As noted above, the fiscal year 2022–2023 state budget, enacted in June 2022, created a new, tiered excise tax on lithium recovery in California starting at \$400 per ton for 20,000 tons or less, \$600 per ton for 20,000 to 30,000 tons, and \$800 per ton for more than 30,000 tons with requirements that 80 percent of the revenues from this tax are distributed to the communities where the lithium was extracted. Based on DLE facility lithium recovery and production estimates, this tax could lead to new revenues in Imperial County of up to \$19 million per year starting in 2024 and increasing over time with dramatic increases possible if all planned facilities are ultimately developed. In addition, this new authority requires that no less than 30 percent of the funds provided to Imperial County from moneys collected under the new tax be distributed to the communities in Imperial County that are most directly and indirectly impacted by lithium recovery activities.

Although the actual amount of new investment and revenue created for the region is unknown, the region can expect new jobs directly associated with lithium recovery and geothermal power production, new tax revenue, new service jobs, and business opportunities from the overall increase in economic activity as well as infrastructure investments. Anticipated growth in the economy and individuals' income levels will lead to additional economic growth for both existing and new businesses throughout the region, as well as tax revenues for local governments and the state.

The Blue Ribbon Commission finds that effective and inclusive budgeting and planning for future economic growth is imperative to ensuring local hiring and education and skills readiness for residents to take advantage of the anticipated economic opportunities. The *Lithium Valley Economic Opportunity Investment Plan*,²¹⁵ approved by the Imperial County Board of Supervisors in February 2022, provides, in part, the county's summary of anticipated local benefits of lithium recovery activities. Moreover, the plan includes specific actions requested of the State of California including providing direct funding to Imperial County to develop a *Lithium Valley Specific Plan* and Programmatic EIR, which was included in the fiscal year 2022–2023 state budget.

Imperial County describes in the *Lithium Valley Economic Opportunity Investment Plan*, that the Specific Plan's goal is to expand renewable energy development opportunities including

213 IVEDEC: Controlled Thermal Resources Hell's Kitchen Lithium and Power Project — Economic Impact Analysis. As cited in New Energy Nexus. 2020. *Building Lithium Valley*. https://www.newenergynexus.com/wp-content/uploads/2020/10/New-Energy-Nexus_Building-Lithium-Valley.pdf. Pages 22–23.

214 Rebecca Terrazas, Director, Imperial County Intergovernmental Relations. 2022. "Presentation for the Economic Impacts Workshop. In Blue Ribbon Commission. "Transcript of the May 12, 2022, Meeting." <https://efiling.energy.ca.gov/GetDocument.aspx?tn=243477&DocumentContentId=77306>. Page 144.

215 Imperial County. 2022. "Lithium Valley Economic Opportunity Investment Plan." Imperial County. <https://lithiumvalley.imperialcounty.org/wp-content/uploads/2022/02/LithiumValleyInvestmentPlanLVIP-FINAL-Watermark.pdf>

geothermal energy, mineral recovery, and renewable manufacturing facilities such as cathode, battery, and electric vehicle facilities.²¹⁶ They further note that the Programmatic EIR would ensure CEQA requirements and environmental impacts are considered over the large project area and would assist developers by avoiding duplication in CEQA ~~requires~~ requirements by individual projects. A Programmatic EIR is an EIR prepared for a series of actions that can be characterized as one large project, and The actions are related either: 1) geographically; 2) as logical parts in the chain of contemplated actions; 3) in connection with issuance of rules, regulations, plans, or other general criteria to govern the conduct of a continuing program; or 4) as individual activities carried out under the same authorizing statutory or regulatory authority, and having generally similar environmental effects which can be mitigated in a similar way.²¹⁷ California Code of Regulations, Section 15168(b) states the advantages of a Programmatic EIR can be:

- “(1) Provide an occasion for a more exhaustive consideration of effects and alternatives than would be practical in an EIR on an individual action,
- (2) Ensure consideration of cumulative impacts that might be slighted in a case-by-case analysis,
- (3) Avoid duplicative reconsideration of basic policy considerations,
- (4) Allow the lead agency to consider broad policy alternatives and program wide mitigation measures at an early time when the agency has greater flexibility to deal with basic problems or cumulative impacts,
- (5) Allow reduction in paperwork.”

As noted above, the fiscal year 2022–2023 state budget provides Imperial County with \$5 million, of which \$3.8 million is provided to the county for a Programmatic EIR and a health impact assessment. State budget funding also supports community outreach for geothermal energy development and lithium recovery, processing and production, and related manufacturing activities within the county.

On July 26, 2022, the Imperial County Board of Supervisors approved a contract with Dudek Consulting to prepare the Salton Sea Renewable Resource Specific Plan and Programmatic EIR and the Lithium Development Infrastructure Assessment. The intent of these planning documents is described consistently with the descriptions in the *Lithium Valley Economic Opportunity Investment Plan*. The infrastructure assessment was also described, as detailed below:

The Salton Sea Renewable Resource Specific Plan will develop an infrastructure plan. The goal is [to] develop both a macro and micro utility plan. Due to the vast area of the Specific Plan micro grids (campus power), utilizing onsite/adjacent power generation as the primary source reduces the demand for larger power grids, reducing development costs. A linking macro grid will also be developed providing both export and import of

²¹⁶ Imperial County. 2022. “Lithium Valley Economic Opportunity Investment Plan.” Imperial County. <https://lithiumvalley.imperialcounty.org/wp-content/uploads/2022/02/LithiumValleyInvestmentPlanLVIP-FINAL-Watermark.pdf>

²¹⁷ California Code of Regulations, Section 15168.

power to the micro grid. Potable water, bulk water, onsite, micro, and regional wastewater treatment facilities.²¹⁸

The county has taken initial steps to establish an enhanced infrastructure finance district and plan to support infrastructure projects, including transportation infrastructure, community economic development, and climate adaptation projects.²¹⁹ Community members have expressed the need for more robust community conversations and engagement by project developers and Imperial County. The Blue Ribbon Commission finds that additional community engagement and ~~tribal~~Tribal consultation are essential to better ensure realization of community benefits and priorities from private and public local and regional investment. Furthermore, the Commission finds that community-based organizations play a critical role in cultivating community capacity to participate in and inform decision-making processes that meet community needs.

The Blue Ribbon Commission learned that community benefits agreements between community organizations and project developers are an effective tool to address community priorities, reduce impacts, and ensure that economic gains from these projects are shared with the residents of the region by dedicating funds to address community-identified priorities.²²⁰ The Commission finds successful community benefits agreements are legally enforceable, contain clear commitments in a governing document, have ongoing monitoring mechanisms, community oversight and accountability, and provide a forum for collaborative problem-solving and durability.²²¹

Workforce

Developing a local workforce was a high-priority topic of exploration for the Blue Ribbon Commission. CTR and BHE Renewables each provided information about the hiring goals and anticipated workforce needs for their planned facilities and EnergySource Minerals workforce estimates were provided in the final EIR prepared for the EnergySource Minerals Project ATLiS.^{222, 223} During the Blue Ribbon Commission meetings, representative of these developers have all conveyed their commitment to supporting development of a local workforce and

218 Imperial County. 2022. Board Agenda Fact Sheet (specific to request to consider and award contract to Dudek [continuing]. Identified by Agenda as Item 17). Accessed at: https://imperial.granicus.com/MetaViewer.php?view_id=2&clip_id=2184&meta_id=367021. Select portions Page 80-83.

219 California Energy Commission. 2022. Workforce Development Workshop Draft Proposed Findings and Recommendations. Accessed through Blue Ribbon Commission. Docket 20-LITHIUM-01, TN# 242291. <https://efiling.energy.ca.gov/GetDocument.aspx?tn=242291&DocumentContentId=75795>.

220 Blue Ribbon Commission. 2022. "Draft Preliminary Proposed Economic Impact Findings and Recommendations." <https://efiling.energy.ca.gov/GetDocument.aspx?tn=243298&DocumentContentId=76987>.

221 Blue Ribbon Commission. 2022. "Transcript of May 12, 2022, Blue Ribbon Commission Meeting." <https://efiling.energy.ca.gov/GetDocument.aspx?tn=243477&DocumentContentId=77306>.

222 Blue Ribbon Commission. February 24, 2022. "Presentation – Convening of the Lithium Valley Commission 02-24-22." <https://efiling.energy.ca.gov/GetDocument.aspx?tn=241964&DocumentContentId=75644>.

223 Imperial County, Planning and Development Services Department. 2021. Project Report. <https://www.icpds.com/assets/hearings/02.-WSA,FIER,-MMRP,-CUP20-0008,-PM02485-Energy-Source-Mineral-ATLiS-PC-Pkg.pdf>.

emphasized that the success of their facilities depends on building and maintaining a local workforce.

The Blue Ribbon Commission heard from workforce development, labor, and academic professionals that coordination, commitment, and investment are needed to support development of a "High Road Jobs and Careers." At the December 16, 2021, meeting, we learned that the California Workforce Development Board is advancing the "High Road," which is a set of economic and workforce development strategies to achieve economic growth, economic equity, shared prosperity, and a clean environment. The California Workforce Development Board's High Road approach focuses on High Road Training Partnerships and High Road Construction Careers. High Road Construction Careers use established preapprenticeship training, offer support services, and provide career placement.²²⁴ -In addition, ~~At the February 24, 2022, Blue Ribbon Commission meeting, learned that the California Workforce Development Board~~ xxxCarol Zabin further explained that "a High Road Job" is one that provides job quality, wages sufficient to support a family, high health and safety standards, career pathways, and worker protections.²²⁵ Also, the Blue Ribbon Commission heard that creating High Road Jobs for local residents will require sustained communication with local community organizations, labor groups, academic institutions, and public agencies.

At Commission meetings, residents from communities in the Salton Sea region have expressed concern that they will be left behind or excluded from participating in educational and employment opportunities and economic growth that results from lithium development.²²⁶ Community representatives also shared interest in ensuring ~~concerns~~ that training programs result in real jobs for local residents.

Local educational institutions, such as Imperial Valley College, have started to develop classes and training to prepare local residents for the anticipated hiring for these projects, including increasing science, technology, engineering, and mathematics programs at all grade levels and developing new vocational and certificate programs. The project developers:

- Have established relationships with the schools in the area to guide and support new program development.
- Are working with labor unions to establish project labor agreements and apprenticeship programs.
- Are working with training and development agencies to develop programs and provide funding to train residents in the vocational skills needed for geothermal and lithium recovery related jobs.

For example, Imperial Valley College is launching three certificate programs in fall 2023 to prepare students for jobs using DLE technologies. Also, Imperial County school districts are

²²⁴ Blue Ribbon Commission. 2022. "Transcript of the December 16, 2021, Blue Ribbon Commission Meeting." <https://efiling.energy.ca.gov/GetDocument.aspx?tn=241527&DocumentContentId=75491>.

~~²²⁵ Blue Ribbon Commission. 2022. "Transcript of the February 24, 2022, Blue Ribbon Commission Meeting." <https://efiling.energy.ca.gov/GetDocument.aspx?tn=242478&DocumentContentId=75981>.~~

²²⁶ Blue Ribbon Commission. 2022. "Transcript of the February 24, 2022, Blue Ribbon Commission Meeting." <https://efiling.energy.ca.gov/GetDocument.aspx?tn=242478&DocumentContentId=75981>.

developing regional occupational programs and other programs to develop pathways for students to have the skill sets necessary to work in DLE facilities, such as dual enrollment for students to enroll in a certification program at Imperial Valley College while still in high school.²²⁷

The fiscal year 2022–2023 state budget also provided \$80 million to support development of the San Diego State University, Brawley Center, to expand academic opportunities for the region. At the federal level, the U.S. Department of Energy, U.S. Department of Labor, and the AFL-CIO are partnering on pilot programs to train battery manufacturing workers.²²⁸

The Blue Ribbon Commission finds it is imperative that new geothermal lithium recovery and related projects prioritize development and hiring of a local workforce, provide resources to support development of necessary training and educational opportunities, and commit to requirements for strong workforce and labor standards that produce high-quality jobs and careers. The Commission further finds that educational programs and initiatives have begun. However, more work must be done to have a thorough understanding of the anticipated job opportunities and develop local residents to fill job opportunities now and in the future. The Commission also recognizes that training means good academic programs at all levels, including vocational training and apprenticeship programs. Further, the Commission finds that equitable access to education and training requires more than creating a supply of classes and training programs, but also ensuring access by providing childcare services, public transportation, infrastructure improvements, investments in technology, and development of various methods to deliver courses, training, and educational programs. Finally, project labor agreements as a parallel to community benefits agreements are an effective tool to ensure necessary programs are developed and maintained.

Recommendations

Based on several of the findings noted in this section, the Blue Ribbon Commission offers several recommendations related to the potential environmental and economic impacts of lithium recovery projects near the Salton Sea.

[Proposed Recommendations Have Been Temporarily Removed due to Commissioners' Request and Consideration of Consolidated Recommendations at the Upcoming October and November Commission Meetings](#)

[Potential Consolidated Recommendations can be Found in accompanying document on the Docket.](#)

227 Simon Canales (Brawley Union High School District). 2022. "Community Session of the July 21, 2022, Blue Ribbon Commission Meeting." https://energy.zoom.us/rec/play/PWga9g333nMtx1EHaD-ZiK_IaC1xuCZcsQ9fwzq6JxdtXxY1iMzcTQSGI-Xg3YjJZ8bj-DIv2mKmnNOI.tDuCEmqVwhXL5cez.

228 U.S. Department of Energy. 2022. "DOE Announces \$5 Million to Launch Lithium-Battery Workforce Initiative." <https://www.energy.gov/articles/doe-announces-5-million-launch-lithium-battery-workforce-initiative>.

G. The Importance of, and Opportunities for, the Application of Local, State, and Federal Incentives and Investments to Facilitate Lithium Extraction from Geothermal Brines

We are aware that the lithium industry is ready to deploy and could meet ambitious timelines, and from an industry perspective, it is imperative that government prioritizes development activities in -the same way that other green energy industries like solar and wind projects have been prioritized for many years. Local, state, and federal assistance is necessary to support the growth of DLE from geothermal brines in the Salton Sea KGRA⁷ and the development of the Salton Sea region to support the growth of lithium recovery.

The CEC has provided research and demonstration grant funding to all three of the current lithium recovery project developers working on facilities in Imperial County, as well as others that have explored minerals recovery from geothermal brine. For example, the CEC previously provided grant funding as follows:

- Approximately \$4.5 million to Hell’s Kitchen Geothermal, LLC²²⁹, for projects to develop and demonstrate improved processes to remove silica and heavy metals and prepare geothermal brine for recovery of lithium;
- \$6 million to BHE Renewables²²⁹, LLC²²⁹, to demonstrate an integrated system that includes geothermal brine pretreatment and lithium recovery; and,
- \$2.5 million to EnergySource Minerals, LLC, to develop a robust engineering package and accurate capital budget for a facility to recover lithium and other minerals from geothermal brine, using processes and equipment previously used in the water treatment, metal processing, and chemical processing industries.²³⁰

In addition, the CEC has awarded Electric Program Investment Charge and Clean Transportation Program funding for projects on vehicle and battery manufacturing, battery efficiency and safety, lithium-ion battery recycling, and lithium-ion battery reuse.²³¹ Looking ahead, as projects move from demonstration into commercial-scale operations, necessary financial support could include funding critical areas of additional research, as well as incentives and investments that support the launch, adoption, and growth of lithium recovery facilities.

The state acts through many agencies and offices to implement a large array of economic, business and employment development programs that can contribute to building a hub of economic activity centered in the Imperial Valley. Among these are the Governor’s Office of

229 BHER Minerals is the party identified as the grant recipients on CEC documents. BHER Minerals is a closely related entity to BHE Renewables and to avoid confusion, the more general, affiliated company reference has been used in this report.

230 Blue Ribbon Commission. 2021. “Resource List for July 29, 2021, Blue Ribbon Commission Meeting.” <https://efiling.energy.ca.gov/GetDocument.aspx?tn=239033&DocumentContentId=72467>.

231 Blue Ribbon Commission. 2021. “Project List for September 30, 2021, Blue Ribbon Commission Meeting.” <https://efiling.energy.ca.gov/GetDocument.aspx?tn=239860&DocumentContentId=73299>.

Business & Economic Development (GO-Biz), which supports businesses and economic development practitioners to understand and navigate resources and programs, and the California Infrastructure Bank (IBank), which provides loans for infrastructure projects, issues bonds, and provides loan guarantees that support small business. Representatives from these and other agencies assisted the Blue Ribbon Commission in building an understanding of existing opportunities and potential new funding and tax mechanisms that will advance lithium recovery from geothermal brines.

In addition to state programs, federal funding is also available to support activities related to the development of lithium recovery and lithium dependent manufacturing businesses. While there are many opportunities, one example is U.S. Department of Energy (U.S. DOE) grants available for battery material processing and battery manufacturing and recycling. Scoring criteria for these and other federal funding programs emphasize community impact and U.S. DOE is working to be responsive to comments from underserved and overburdened communities. The Federal Interagency Working Group on Coal and Power Plant Communities and Economic Revitalization created an online clearinghouse for information on federal funding opportunities for communities. The funding clearinghouse is available online at <https://energycommunities.gov/>. In addition, the recently federally approved Inflation Reduction Act of 2022 (H.R. 5376), and the Infrastructure Investment and Jobs Act of 2021 (H.R. 3684), include opportunities for both infrastructure and clean energy investment in the Salton Sea region.^{232 233}

[Through the Inflation Reduction Act of 2022 \(IRA\), the federal government continues to take action to incentivize increased commercial scale development of renewable energy projects. The investments under the IRA are expected to have far-reaching impacts to advance California’s and the nation’s climate and clean energy goals. Most pertinent to the work of this Commission is the IRA extension of the investment tax credit \(ITC\) for specified electricity generating facilities, including geothermal power plants. Equally pertinent are the new clean vehicle credit eligibility requirements. To be eligible for the credit, electric vehicles must contain a specified percentage of critical minerals, such as lithium, and battery components from the United States or other eligible countries.^{234, 235} A state commitment, through policies and related administrative action, to provide a timely and efficient permitting pathway for development of geothermal power plants and DLE facilities in the Salton Sea KGRA region, can position the region and state to significantly benefit from the IRA.](#)

232 U.S. Congress. 2021. “Infrastructure Investment and Jobs Act.” H.R. 3684 – 117th Congress. <https://www.congress.gov/bill/117th-congress/house-bill/3684/text>.

233 U.S. Congress. 2022. “Inflation Reduction Act of 2022.” H.R. 5376 – 117th Congress. <https://www.congress.gov/bill/117th-congress/house-bill/5376/text?q=%7B%22search%22%3A%5B%22inflation+reduction+act%22%2C%22inflation%22%2C%22reduction%22%2C%22act%22%5D%7D&r=1&s=2>

²³⁴ [H.R.5376 - Inflation Reduction Act of 2022. 117th Congress \(2021-2022\). Section 45X\(c\)\(6\) lists the critical minerals subject to this requirement, such as lithium carbonate and lithium hydroxide.](#)

²³⁵ [Regarding critical materials, the percentages apply to 1\) critical minerals extracted/processed in the United States, or in a country that has a free trade agreement with the United States in effect; or 2\) critical minerals recycled in North America.](#)

The Blue Ribbon Commission finds there is a broad array of existing programs and financing structures that could assist economic development in the Imperial Valley. To properly access these tools, an experienced, local representative needs to be engaged with state and federal agencies. The inclusion of funding in the fiscal year 2022–2023 state budget for Imperial County to create an ombudsman position is an initial step to help local, lithium-related entrepreneurs and businesses identify potential incentives and competitive funding opportunities from state and federal government.

The Blue Ribbon Commission also finds that infrastructure investments are being prioritized by Imperial County because strong infrastructure is needed to support development of lithium recovery and processing, as well as related industrial development. Local entities including the newly funded county ombudsman can identify and seek support from existing state and federal funding programs, but these efforts will require maintaining a strong collaboration between the county and state. Investments and incentives to encourage lithium-related product manufacturing to locate near the Imperial Valley source of lithium will support long-term viability of local lithium recovery and production. Furthermore, establishing a financial structure that invests in developing circular economy opportunities and provides incentives for participation by product owners would benefit the overall lithium-based economy in California.

The Commission also notes that providing access to existing resources and programs is critical to encouraging the indirect growth opportunities for local economies in the Salton Sea region. Moreover, consistent with the report recommendations, the design of any state incentive and investment program that supports the development of lithium recovery and related businesses should include requirements that funding recipients and projects provide direct community benefits, encourage inclusive community engagement, and support local hiring and educational opportunities.

Recommendations

[Proposed Recommendations Have Been Temporarily Removed due to Commissioners' Request and Consideration of Consolidated Recommendations at the Upcoming October and November Commission Meetings](#)

[Potential Consolidated Recommendations can be Found in accompanying document on the Docket.](#)

H. 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 directed the Blue Ribbon Commission to explore the need for a centralized tracking system for lithium project permitting by state and local regulatory agencies to assist with development of the lithium industry.

The Commission found that the environmental review, permitting, mitigation, and monitoring data related to geothermal/lithium projects are not located in a single, easily accessible location. Moreover, several participants indicated that having a centralized location for information related to the development of Lithium Valley would be helpful to the community.

Recommendations

[Proposed Recommendations Have Been Temporarily Removed due to Commissioners' Request and Consideration of Consolidated Recommendations at the Upcoming October and November Commission Meetings](#)

[Potential Consolidated Recommendations can be Found in accompanying document on the Docket.](#)

CHAPTER 5:

Conclusion and Next Steps

There is a sustained effort underway to seed a high-road economy centered on inclusive, sustainable, and equitable use of lithium and other minerals in the Salton Sea’s known geothermal resource area. If done correctly, this effort will be a once-in-a-generation opportunity with tremendous potential for transformative economic growth that could bring family-sustaining jobs and real economic opportunities to California’s most underserved residents.

The Blue Ribbon Commission held more than 210 public meetings as part of its work to review, investigate, and analyze issues relating to plans for geothermal lithium recovery near the communities of Calipatria and Niland in Imperial County. This report to the Legislature provides findings and recommendations for resources, research, health impact assessments, information sharing, planning, procurement, infrastructure, high-road job and career approaches, project labor agreements, community benefits agreements, oversight, monitoring, technical assistance, and Tribal and community engagement.

While there are dedicated resources in the form of grants and investment for Imperial County, the recovery of lithium from geothermal brine by itself will not create the transition to a sustainable, more equitable, high-road economy for the Salton Sea region. To have a chance at capturing the benefits of lithium recovery, the region needs continued engagement and investment aligned with the needs of residents and assets of this region.

The requirements of AB 1657, including the convening of the Blue Ribbon Commission, remain operative until October 1, 2023.

GLOSSARY OF TERMS

Term	Definition
Acre-foot	The volume of liquid that would cover one acre to a depth of one foot. One acre-foot equals about 326,000 gallons. For better understanding, one acre of land is roughly the size of a football field.
Assembly Bill 1657 (AB 1657)	Enacted in 2020, this bill added Section 25232 to the Public Resources Code, requiring the CEC to establish and convene the Blue Ribbon Commission on Lithium Extraction in California, and identifies topics related to lithium extraction for the Blue Ribbon Commission to review, investigate, and analyze. The bill requires the Blue Ribbon Commission to submit a report of their findings and recommendations to the Legislature.

Balancing Authority	The responsible entity that integrates energy resource plans ahead of time, maintains load-interchange generation balance within a balancing authority area, and supports interconnection frequency in real time. ²³⁷
Circular Economy	Circular economy, or cradle-to-cradle, transitions beyond today's take-make-waste linear pattern of production and consumption to a circular system in which the societal value of products, materials, and resources is maximized over time. The circular economy is based on three principles, driven by design: 1. Eliminate waste and pollution. 2. Circulate products and materials at their highest value. 3. Regenerate nature. ²³⁸

²³⁷ California Public Utilities Code Article 16 Section 399.12.
https://california.public.law/codes/ca_pub_util_code_section_399.12

²³⁸ <https://ellenmacarthurfoundation.org/topics/circular-economy-introduction/overview>

Clean Transportation	Clean transportation describes the development of alternative fuels and advanced transportation technologies and the expansion of traditional public sector transportation services that results in lower emissions, greater efficiency of transportation per unit of energy, or a more accessible and usable transportation system. ²³⁹
Coachella Valley	The Coachella Valley, is part of the Colorado Desert, extending northwestward for 45 miles from the Salton Sea through Riverside County to the San Gorgonio Pass between the Little San Bernardino Mountains to the east and the San Jacinto and Santa Rosa mountains to the west. ²⁴⁰
Commercial Scale	Operating a facility or business at a production level sufficient to provide a material or product to market.
Direct lithium extraction (DLE) technologies	Direct lithium extraction (DLE) describes technologies that recover lithium from brine typically through the processes of adsorption, ion exchange, or solvent extraction, which are different from and unrelated to hard rock mining or use of evaporation ponds. The DLE from geothermal brine currently proposed for use in the Salton Sea Known Geothermal Resource Area will be collocate colocated with new or existing geothermal power plants.
DLE facility	A facility using DLE technologies.

²³⁹ Clean Energy Solutions Center. Accessed on August 31, 2022.

<https://cleanenergysolutions.org/resources/clean-transport#:~:text=Clean%20transport%20describes%20the%20development,accessible%20and%20usable%20transportation%20system.>

²⁴⁰ Britannica, The Editors of Encyclopaedia. "Coachella Valley". Encyclopedia Britannica, 16 Mar. 2018, <https://www.britannica.com/place/Coachella-Valley>. Accessed 1 September 2022.

Environmental justice	The fair treatment and meaningful involvement of people of all races, cultures, incomes, and national origins, with respect to development, adoption, implementation, and enforcement of environmental laws, regulations, and policies. ²⁴¹
Evaporation ponds	Large ponds used to evaporate water from lithium-rich salar brines in a common method of lithium extraction in some areas of the world. This process is water-intensive and can require thousands of square miles of land. DLE technologies currently proposed and being evaluate for use in Imperial County will not use evaporation ponds.
Geothermal brine	Geothermal brine is a naturally occurring concentrated underground saline solution that has circulated through very hot rocks and become enriched with elements.
Geothermal energy	Energy that is continually created from naturally occurring heat from within the earth. This energy is used for many purposes including generating electricity.
Geothermal power plant	Geothermal power plants generate electricity through the use of geothermal energy (heat from the Earth). Geothermal power plants extract steam or hot water – or brine – found below the earth’s surface which is used to turn steam turbines and produce electrical power. The cooled condensed steam or brine is then injected back into the geothermal reservoir to be reheated and continue the renewable power generation cycle.
Geothermal reservoir or geothermal resource	Geothermal resources are reservoirs of hot water that exist at varying temperatures and depths below the Earth’s surface. Wells can be drilled into these underground reservoirs to make use of steam and very hot water that can be brought to the surface for a variety of uses. ²⁴²

241 State of California. Government Code Section 65040.12(e).
https://leginfo.legislature.ca.gov/faces/codes_displaySection.xhtml?lawCode=GOV§ionNum=65040.12

242 <https://www.energy.gov/eere/forge/geothermal-basics>

Hard rock mining	Hard rock mining removes ore from the earth and is a common method of lithium extraction in some areas of the world. This process generally involves drilling and blasting into hard rock areas to mine the ore, which is then sorted, crushed, ground, separated, washed, filtered, and dried. DLE technologies currently proposed and being evaluated for use in Imperial County will not use hard rock mining.
Hydrothermal resource	An underground reservoir with water, heat and permeability (the ability for liquids to gases to pass through it).
Imperial Irrigation District	The Imperial Irrigation District (IID) is a local publicly-owned utility providing electricity and water services. IID's energy services provide power to all of Imperial County and portions of Riverside County and San Diego County. IID is also the nation's largest irrigation district, providing water for agricultural, municipal, commercial and industrial uses primarily in Imperial County.
Imperial Valley	The Imperial Valley has commonly been identified to include the intensively irrigated part of the Colorado Desert, mainly in Imperial County extending southward from the southern end of the Salton Sea to Mexico. ²⁴³ The Imperial Valley includes portions of Imperial County and Riverside County.
Known Geothermal Resource Area	The "Geothermal Steam Act of 1970" defines a known geothermal resource area as "...an area in which the geology, nearby discoveries, competitive interests, or other indicia would, in the opinion of the Secretary [Secretary of the Interior], engender a belief in men who are experienced in the subject matter that the prospects for extraction of geothermal steam or associated geothermal resources are good enough to warrant expenditures of money for that purpose." ²⁴⁴
Lithium carbonate	Lithium carbonate (Li ₂ CO ₃) is a chemical compound used in manufacturing lithium-ion batteries as well as medicines and glassware, glazes for ceramics and other industrial uses.
Lithium carbonate equivalent	Lithium carbonate equivalent (LCE) is the industry standard term used for comparison of the lithium quantity in different lithium compounds. For example, to convert from lithium (Li) to LCE, multiply by 5.323.

243 Britannica, The Editors of Encyclopaedia. "Imperial Valley". *Encyclopedia Britannica*, 10 Apr. 2018, <https://www.britannica.com/place/Imperial-Valley>. Accessed 24 August 2022.

244 "Geothermal Resources" 30 U.S.C. § 1001 (e). <https://www.govinfo.gov/content/pkg/USCODE-2017-title30/html/USCODE-2017-title30-chap23.htm>

Lithium chloride	Lithium chloride (LiCl) is a chemical compound. This is the form of lithium that typically results from the application of DLE methods to geothermal brine.
Lithium extraction	The removal of lithium from a naturally occurring state. In this report, lithium extraction refers to multiple approaches, including mining, evaporation ponds, and direct lithium extraction (DLE) from brine. In AB 1657 and when AB 1657 is referred to in this report, lithium extraction refers to DLE from geothermal brine.
Lithium recovery	The term lithium recovery is used in this report to describe the removal of lithium from a naturally occurring state using “DLE” technologies. Lithium recovery can also be used to describe any process to reclaim lithium from products or waste streams for reuse.
Lithium-ion battery	A lightweight, rechargeable battery often used in electric vehicles, as well as stationary energy storage. In the batteries, lithium ions move from the negative electrode (anode) to the positive electrode (cathode) during discharge and back when charging.
Lithium hydroxide	Lithium hydroxide (LiOH) is a lithium compound used in lithium-ion battery manufacturing.
Lithium processing or production	In this report, lithium processing or production refers to the additional actions taken to convert lithium chloride into battery-grade lithium compounds, such as lithium carbonate or lithium hydroxide monohydrate.
Lithium Valley	Lithium Valley is a term used by state leaders and others to describe a world-class lithium industry in California centered on recovery of lithium from geothermal brine in the Salton Sea KGRA and the expansion of geothermal energy production.
Ore	Rock or other solid material containing a valuable mineral that can be mined.

Renewables Portfolio Standard	The Renewables Portfolio Standard, established by law in 2002, has been a primary driver for increasing clean energy generation in California and requires the state’s electric utilities to ensure that their procurement of electricity products from eligible renewable energy resources achieves 44 percent of retail sales by December 31, 2024, 52 percent of retail sales by December 31, 2027, and 60 percent of retail sales by December 31, 2030.
Salt flat or salar	A salt-encrusted geological formation rich in salt and minerals, such as a dry lakebed. Some salars sit above shallow underground basins with salar brine that is rich in lithium.
Salar brine	Salar brine is found in shallow underground reservoirs beneath salt flats (also known as salars). Some salar brine is rich in lithium. Evaporation ponds are commonly used to separate lithium from salar brines.
Salton Sea Known Geothermal Resource Area	The Salton Sea Known Geothermal Resource Area (Salton Sea KGRA) refers to a geothermal resource on the southeastern side of the Salton Sea near Calipatria (Imperial County). There are 11 geothermal power plants that currently use this resource for energy production.
Salton Sea Region	As defined by the Commission, the Salton Sea Region, includes Coachella and Imperial Valleys. It includes all of Imperial County and much of Riverside County, extending from the Palm Springs area to Coachella and unincorporated communities near the Salton Sea, and then farther east to the California-Arizona border. This large area is notably economically distinct with approximately 150,000 people living and working in its communities. Major employment sectors across the area include agriculture and tourism, making these communities more similar to each other than they are to the economies of the Inland Empire and San Diego. ²⁴⁵
The 100 Percent Clean Energy Act of 2018 or Senate Bill 100 (SB 100)	The 100 Percent Clean Energy Act of 2018 was created by Senate Bill 100 (SB 100) (De León, Chapter 312, Statutes of 2018). SB 100 set new clean energy goals for the state, including that by December 31, 2045, eligible renewable energy resources and zero-carbon resources will supply 100 percent of all retail sales of electricity to California end-use customers and 100 percent of electricity procured to serve all California state agencies.

245 Blue Ribbon Commission. 2022. “Final Letter Regarding Community Economic Resilience Fund (CERF) Recommendations for Salton Sea Region.”
<https://efiling.energy.ca.gov/GetDocument.aspx?tn=242292&DocumentContentId=75794>.

Appendices

The full report and appendices are available online in the Blue Ribbon Commission docket, 20-LITHIUM-01 (<https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=20-LITHIUM-01>), which is administered by the CEC. A list of the appendices is provided below.

- List of Recommendations by Topic
- List of Workshops Held
- Acknowledgement of Guest Speakers
- Public Comments on Draft Report (Placeholder, To Be Developed)

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List of Recommendations by Topic

Proposed Recommendations Have Been Temporarily Removed due to Commissioners' Request and Consideration of Consolidated Recommendations at the Upcoming October and November Commission Meetings

Potential Consolidated Recommendations can be Found in accompanying document on the Docket.

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List of Blue Ribbon Commission Workshops

The Blue Ribbon Commission held the following public meetings to inform development of this report.²⁴⁶ As noted below, many of the public meetings included a public workshop:

1. 2021, February 25. Kickoff of Blue Ribbon Commission
2. 2021, March 25. Guest presentation on global lithium market and panel discussion by industry and academia on active lithium recovery facilities.
3. 2021, April 29. Panel on global lithium perspective
4. 2021, May 27. Administrative meeting (discussion of report topics)
5. 2021, June 24. Administrative meeting (discussion of report topics)
6. 2021, July 29. Lithium extraction methods workshop
7. 2021, August 26. Developing geothermal and lithium co-production workshop
8. 2021, September 30. Lithium market opportunities workshop
9. 2021, October 28. Environmental impacts workshop
10. 2021, November 17. Community forum
11. 2021, December 16. Administrative meeting (follow-up to community forum)
12. 2022, January 27. Administrative meeting (potential recommendations for report)
13. 2022, February 16. Administrative meeting (proposed fiscal year fiscal year 2022–2023 state budget and CERF letter)
14. 2022, February 24. Workforce development workshop
15. 2022, March 24. Continuation of environmental impacts workshop
16. 2022, May 12. Economic impacts workshop.
17. 2022, May 26. Workshop on incentives and investments to facilitate lithium extraction from geothermal brines and development of lithium-dependent products and businesses.
18. 2022, June 16. Workshop on the role of existing and new geothermal facilities in Imperial Valley to support reliability, grid stability, resiliency, and clean energy goals. Also, workshop on overcoming challenges to extraction, processing, and production of lithium from geothermal brine.
19. 2022, June 30. Continuation of environmental impacts workshop
20. 2022, July 21. Tribal session and community session

Additional meetings are planned in 2022 for August and September. The Blue Ribbon Commission has discussed the possibility of meeting in October 2022 as well.

²⁴⁶ A transcript for each Blue Ribbon Commission meeting is posted to the docket for the Lithium Valley Commission: 20-LITHIUM-01. <https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=20-LITHIUM-01>.

Acknowledgement of Guest Speakers

The Blue Ribbon Commission acknowledges the contributions of guest speakers to share their expertise and experience at public meetings and workshops from February 2021 through July 2022 to inform development of this report. Their input is deeply appreciated.

The following list includes guest speakers from one or more meetings or workshops through June 2022. Guest speakers for the [tribalTribal](#) session and the community session held during the July 21, 2022, Blue Ribbon Commission meeting are listed separately.

Daniel Adler, California Infrastructure and Economic Development Bank

Rafael Aguilera, California Workforce Development Board

Mary U. Akens, Attorney IV, Department of Water Resources

Rizaldo Aldas, California Energy Commission

Jamie Asbury, Imperial Irrigation District

Lisa Belenky, Center of Biological Diversity

Chris Benner, Ph.D., UC Santa Cruz

Derek Benson, EnergySource

Trelynd Bradley, Governor's Office of Business and Economic Development

Erica Brand, California Energy Commission

Jose T. Bravo, Just Transition Alliance

Marc Cowan, California Workforce Development Board

Kyle J. Dahl, US Army Corps of Engineers

Elisabeth DeJong, Renewable Energy Division, CEC

President Adela de La Torre, San Diego State University

Kim Delfino, Earth Advocacy

Roderic Dolega, Ford EV Purchasing

Karen Douglas, California Energy Commission

Melinda Dorin, Department of Water Resources

Deborah Dyer, California Energy Commission

Dr. Paul English, Public Health Institute

Cecilia Estolano, Better World Group

Jared Ferguson, California Public Utilities Commission

Daniela Flores, Imperial Valley Equity and Justice Coalition

Sarah Friedman, Better World Group

Noemí Gallardo, California Energy Commission

John Gay, County of Imperial

Logan Goldie-Scot, BloombergNEF - Head of clean power research

Alex Grant, Jade Cove Partners - Principal

Susanne Heim, Panorama Environmental, Inc.

John Hernandez, Our Roots Multicultural Center

Sahara Huazano, Alianza Coachella Valley

Shrayas Jatkar, California Workforce Development Board

Danny Kennedy, New Energy Nexus and CalCharge

Eric Knight, California Energy Commission

Professor Fernando Leiva, UC Santa Cruz

Marco Lizarraga, La Cooperativa Campesina

Dr. Jonathan London, University of California, Davis Department of Human Ecology and the Community and Regional Department of Environmental Health Science Center

Priscilla Lopez, Imperial County Workforce and Economic Development Office

Danny Machain, International Brotherhood of Electrical Workers (IBEW) Local 569

Lina Malova, Assemblymember Eduardo Garcia's Office

Tonya Marshall, Department of Fish and Wildlife

Henry Martinez, Imperial Irrigation District

Michael McKibben, University of California, Riverside

Jim McKinney, Fuels and Transportation Division, CEC

Robert Meyer, Employment Training Panel

Hector Meza, IBEW 569

Jim Minnick, Imperial County Planning and Department Services

Anthony Ng, Energy Research and Development Division, CEC

Angelita Ortiz, Calipatria [Unified School District](#) ~~Highschool~~ Interim Superintendent

Dr. Rebecca Paisley, Cornish Lithium - Exploration Geochemist

Adam Panayi, Rho Motion

Cameron Perks, Senior Analyst, Benchmark Minerals Intelligence

Thea N. Riofrancos, Providence College

Abby Rodriguez, Sparkz

Burt Short, BHE Renewables

Tina Shields, Imperial Irrigation District

Efrain Silva, Imperial County College
Jordan Sisson, Comite Civico del Valle
Karen Skelton, U.S. Department of Energy
Meg Slattery, University of California, Davis and Lawrence Berkeley National Lab
Eric Smith, Berkshire Hathaway Energy
Peter Streit, California Organized Investment Network
Rebecca Terrazas-Baxter, Imperial County
William Thomas, BHE Renewables
Jon Trujillo, BHE Renewables
Jim Turner, CTR
Charlene Wardlow, CalGEM
Ian Warren, National Renewable Energy Laboratory
Renee Webster-Hawkins, California Energy Commission
Jonathan Weisgall, Berkshire Hathaway Energy
Michael Whittaker, Lawrence Berkeley National Laboratory
Dr. Carol Zabin, University of California, Berkeley

Guest Speakers From the Tribal Perspectives Session of the July 21, 2022, Blue Ribbon Commission Meeting

In addition, the Blue Ribbon Commission would like to thank the California Native American Tribes that organized the [tribalTribal](#) session held during the July 21, 2022, Blue Ribbon Commission meeting. A recording of this session is available online and a transcript of the July 21, 2022, Blue Ribbon Commission meeting will be available online in a few weeks.^{247, 248} The following speakers participated in the session:

Jordan Joaquin, President of Quechan (Kwatsáan) Tribe of the Fort Yuma Indian Reservation
Thomas Tortez Jr., Chair of the Torres Martinez Desert Cahuilla Indians
Jesus Arguelles, Torres Martinez Desert Cahuilla Indians
Preston Arrow-weed, Quechan (Kwatsáan) Tribe of the Fort Yuma Indian Reservation
Lorey Cachora, Quechan (Kwatsáan) Tribe of the Fort Yuma Indian Reservation

247 Blue Ribbon Commission, 2022. "Blue Ribbon Commission Meeting Recording 1 – Zoom."
https://energy.zoom.us/rec/play/oisASCuo4nXQu_hC6Twh9yYWzu54yUdKmx4hxWfoRRnU81i9mftytBXAw_0fTPfnk v7uXgt-LYC2apE7I._ThIHwzHSobhIdkG.

248 A transcript for each Blue Ribbon Commission meeting is posted to the docket for the Blue Ribbon Commission, 20-LITHIUM-01. <https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=20-LITHIUM-01>.

Courtney [Ann](#) Coyle, Counsel for Carmen Lucas

Alan Hatcher, Quechan (Kwatsáan) Tribe of the Fort Yuma Indian Reservation

Carmen Lucas, Kwaaymii, Laguna Band of ~~Mission~~-Indians

Gloria McGee, Quechan (Kwatsáan) Tribe of the Fort Yuma Indian Reservation

Faron Owl, Quechan (Kwatsáan) Tribe of the Fort Yuma Indian Reservation

Bobby Wallace, Barona Band of Mission Indians

Guest Speakers from the Community Perspectives Session of the July 21, 2022, Blue Ribbon Commission Meeting

A recording of this session is available online and a transcript will be available online in a few weeks.^{249, 250}

Cecilia Armenta

Simon Canales (Brawley Union High School District)

Richard Cordero (Westmorland)

Angel De Dios

Carlos Gonzalez (Imperial County)

Elizabeth Jaime (North Shore)

Adriana Torres

Monique Ureña

249 Blue Ribbon Commission. 2022. "Blue Ribbon -Commission Meeting Recording 2 – Zoom." https://energy.zoom.us/rec/play/PWga9g333nMtx1EHaD-ZiK_IaC1xu CZcsQ9fwzq6JxdtXxY1iMzcTQSGI-Xg3YjJZ8bj-D1v2mKmnNOI.tDuCEmqVwhXL5cez.

250 A transcript for each Blue Ribbon Commission meeting is posted to the docket for the Blue Ribbon Commission, 20-LITHIUM-01. <https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=20-LITHIUM-01>.