<table>
<thead>
<tr>
<th><strong>DOCKETED</strong></th>
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<tbody>
<tr>
<td><strong>Docket Number:</strong></td>
<td>20-LITHIUM-01</td>
</tr>
<tr>
<td><strong>Project Title:</strong></td>
<td>Lithium Valley Commission</td>
</tr>
<tr>
<td><strong>TN #:</strong></td>
<td>237359</td>
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<tr>
<td><strong>Document Title:</strong></td>
<td>Presentation Lithium Valley Commission 3-25-21 Updated</td>
</tr>
<tr>
<td><strong>Description:</strong></td>
<td>Presentation slideshow for March 25, 2021 Lithium Valley Commission meeting.</td>
</tr>
<tr>
<td><strong>Filer:</strong></td>
<td>Elisabeth de Jong</td>
</tr>
<tr>
<td><strong>Organization:</strong></td>
<td>California Energy Commission</td>
</tr>
<tr>
<td><strong>Submitter Role:</strong></td>
<td>Commission Staff</td>
</tr>
<tr>
<td><strong>Submission Date:</strong></td>
<td>4/1/2021 10:20:04 AM</td>
</tr>
<tr>
<td><strong>Docketed Date:</strong></td>
<td>4/1/2021</td>
</tr>
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</table>
Lithium Valley Commission Meeting

March 25, 2021
Housekeeping

• Meeting conducted remotely via Zoom
  • Recorded and transcribed by court reporter
• To participate in public comment:
  • By computer: use the “raise hand” feature in Zoom
  • Over the telephone: dial *9 to “raise hand” and *6 to mute/unmute your phone line
• Written comments:
  • Submit through the e-commenting system at:
Welcome and Roll Call
Welcome and Roll Call
Administrative Items
  - Approval of Past Meeting Action Minutes
  - Consideration of Rules of Order
  - Possible election of Vice Chair
Goal Setting Discussion
Lithium Valley Commission Report
  - General Report Structure
  - Establish Commissioner Workgroups
Guest Presentation on the Global Lithium Market
Panel Discussion by Industry and Academia on Active Lithium Recovery Facilities
Media and Legislation Updates
Determination of Agenda Topics, Speakers, and Presentations for Future Meetings
Public Comment
Adjourn
Administrative Items

• Approval of Past Meeting Action Items
Public Comment

Comment Instructions:

Limited to 3 minutes per comment

By computer: use the “raise hand” feature in Zoom

By telephone: dial *9 to “raise hand” and *6 to mute/unmute your phone line
Administrative Items

• Consideration of Rules of Order
Public Comment

Comment Instructions:

Limited to 3 minutes per comment

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Administrative Items

• Possible election of Vice Chair
Comment Instructions:

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Goal Setting Discussion
Comment Instructions:

Limited to 3 minutes per comment

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By telephone: dial *9 to “raise hand” and *6 to mute/unmute your phone line
Lithium Valley Commission Report

- General Report Structure
- Establish Commissioner Workgroups
Bagley-Keene Open Meeting Act
and
Sub-Bodies

Lithium Valley Commission

March 25, 2021
California Energy Commission
Chief Counsel’s Office
Bagley-Keene Application to LVC:

Applies to any Lithium Valley Commission (LVC) meeting where “a majority of the members congregate to hear, discuss, or deliberate” upon matters within LVC’s jurisdiction.
"An advisory board, advisory commission, advisory committee, advisory subcommittee, or similar multimember advisory body of a state body, if created by formal action of the state body or of any member of the state body, and if the advisory body so created consists of three or more persons."

Gov. Code § 11121(c)
What is “Formal Action?”

• When a body authorizes or directs an individual to create a new body, that new body is deemed to have been created by formal action of the body

• Motion, ordinance, resolution, designation of members, or any similar action
When does Bagley-Keene Apply to Sub-Bodies?

• If LVC formally creates the sub-body — including by motion and vote or perhaps by direction of the chair in her official capacity — AND

• The sub-body has three or more members
When does Bagley-Keene NOT Apply to Sub-Bodies?

• When the sub-body was not formally created by LVC, and has fewer than 7 members, OR

• When the sub-body has less than three members
What’s in a Name?

- It doesn’t matter what the sub-body is called, could be "subcommittee," "advisory committee" or "subgroup"
- If it meets the criteria, the Bagley-Keene open meeting requirements apply
Comment Instructions:

Limited to 3 minutes per comment

By computer: use the “raise hand” feature in Zoom

By telephone: dial *9 to “raise hand” and *6 to mute/unmute your phone line
Guest Presentation on the Global Lithium Market

• Logan Goldie-Scot, Head of Clean Power Research, BloombergNEF
Global Lithium Update

California Lithium Energy Commission

Logan Goldie-Scot

March 25, 2021
Demand
We expect 4.4 million passenger EVs to be sold globally in 2021.
Battery demand will increase tenfold in a conservative scenario by 2030

Source: BloombergNEF, Avicenne for consumer electronics data
Leading to a surge in demand for battery metals over the decade

Source: BloombergNEF. Note: Metals demand occurs at mine mouth, one-year before battery demand. All metals expressed in metric tons of contained metal, except lithium is in lithium carbonate equivalent (LCE).

2H 2020 forecast, Million metric tons

Copper: 7x
Aluminum: 10x
Phosphorus: 10x
Iron: 10x
Manganese: 4x
Graphite: 8x
Nickel: 11x
Cobalt: 2x
Lithium: 8x
Lithium market dynamics
There are our risks facing the high-growth lithium market

Supply control

High costs

High debt

Project delays

Million metric tons LCE

2020 2022 2024 2026 2028 2030

March 25, 2021
Lithium-ion mining nameplate manufacturing capacity

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

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.
Global lithium supply appears in balance in the near-term

Source: BloombergNEF

Supply control
Prolonged low prices give way to signs of a lithium resurgence

Source: Benchmark Mineral Intelligence, Asian Metal Inc, BloombergNEF
Many leading lithium producers accumulated debt, amid low prices

Source: BloombergNEF

March 25, 2021
Strategic investments
The battery production value chain

<table>
<thead>
<tr>
<th>Raw materials</th>
<th>Components</th>
<th>Battery</th>
<th>Recycling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mining</td>
<td>Cathode</td>
<td>Cell</td>
<td>Recycling</td>
</tr>
<tr>
<td>LiOH</td>
<td>NCM</td>
<td>Prismatic</td>
<td></td>
</tr>
<tr>
<td>Li$_2$CO$_3$</td>
<td>Natural graphite</td>
<td>Module</td>
<td></td>
</tr>
<tr>
<td>NiSO$_4$</td>
<td>NCA</td>
<td>Repurposing</td>
<td></td>
</tr>
<tr>
<td>CoSO$_4$</td>
<td>LFP</td>
<td>Pouch</td>
<td></td>
</tr>
<tr>
<td>LiOH</td>
<td>Dry-processed</td>
<td>Pack</td>
<td></td>
</tr>
<tr>
<td>NCA</td>
<td>Wet-processed</td>
<td>Cylindrical</td>
<td></td>
</tr>
<tr>
<td>CoO$_2$</td>
<td>Coated</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MnSO$_4$</td>
<td>NCMA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LFP</td>
<td>Housing materials</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Si-C complex</td>
<td>LTO</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: BloombergNEF. Note: NMC is lithium nickel manganese cobalt oxide. NCA is lithium nickel cobalt aluminum oxide. LFP is lithium iron phosphate. NMCA is lithium nickel manganese cobalt aluminum oxide. LTO is lithium titanium oxide. Si-C complex is silicon-carbide inorganic complex compound.
Cell manufacturing capacity is due to quadruple based on existing announcements.

Source: BloombergNEF
Asia Pacific nations control most cathode processing capacity today

Commissioned cathode processing capacity

- **China**: 53% (818 thousand metric tons)
- **South Korea**: 20% (364 thousand metric tons)
- **Japan**: 21% (170 thousand metric tons)
- **Vietnam**: 2% (100 thousand metric tons)
- **Taiwan**: 2% (60 thousand metric tons)
- **United States**: 1% (50 thousand metric tons)
- **Poland**: 6% (17 thousand metric tons)
- **Sweden**: 3% (13 thousand metric tons)
- **Finland**: 1% (7 thousand metric tons)
- **Germany**: 1% (6 thousand metric tons)
- **Canada**: 1% (6 thousand metric tons)
- **U.K.**: 1% (1 thousand metric tons)

Source: BloombergNEF. Note: As of October 2020
Asia Pacific nations control most anode processing capacity today

Commissioned anode processing capacity

China 78%
South Korea 4%
Japan 16%
India 1%
United States 1%

573 thousand metric tons

Thousand metric tons

China: 940
Japan: 91
South Korea: 90
India: 50
United States: 4

Fully commissioned
Under construction
Announced

Source: BloombergNEF. Note: As of October 2020
Estimated value break-out of a typical battery made in the U.S.

Source: BloombergNEF. Note: Both cost calculations are based on a 60Ah prismatic cell using NMC (622) chemistry. The cells are assumed to be produced at a 10GWh plant, which operates 330 days/year, 24 hours/day. Cell costs include cathode, anode, separator, electrolyte, labor, manufacturing and depreciation.
The U.S. lags APAC in attractiveness as a battery supply chain destination

Global lithium-ion battery supply chain ranking, 2020

<table>
<thead>
<tr>
<th>Rank</th>
<th>Country</th>
<th>Rank</th>
<th>Country</th>
<th>Rank</th>
<th>Country</th>
<th>Rank</th>
<th>Country</th>
<th>Rank</th>
<th>Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>China</td>
<td>6</td>
<td>U.S.</td>
<td>11</td>
<td>Australia</td>
<td>16</td>
<td>India</td>
<td>21</td>
<td>Indonesia</td>
</tr>
<tr>
<td>2</td>
<td>Japan</td>
<td>7</td>
<td>U.K.</td>
<td>12</td>
<td>Brazil</td>
<td>17</td>
<td>Chile</td>
<td>22</td>
<td>Mexico</td>
</tr>
<tr>
<td>3</td>
<td>South Korea</td>
<td>8</td>
<td>France</td>
<td>12</td>
<td>Hungary</td>
<td>18</td>
<td>Vietnam</td>
<td>23</td>
<td>Thailand</td>
</tr>
<tr>
<td>4</td>
<td>Canada</td>
<td>10</td>
<td>Sweden</td>
<td>15</td>
<td>Czech Rep.</td>
<td>19</td>
<td>South Africa</td>
<td>24</td>
<td>D.R.C.</td>
</tr>
<tr>
<td>4</td>
<td>Germany</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Key: AMER, APAC, EMEA

Source: BloombergNEF
Five criteria underpin BloombergNEF’s global battery supply chain ranking

Source: BloombergNEF. Note: Green is first, yellow is second place and red third.
Rapidly growing demand creates opportunities for lithium in the U.S.

Source: BloombergNEF, USGS, company reports. Note: (C) = clay, (G) = geothermal, (O) = oilfield, (R) = hard rock. In Canada, darker dots mean higher lithium.

March 25, 2021
U.S. clay can be competitive on a cash cost basis

Factors to consider:
- Local royalties and taxes
- Environmental permitting
- Best practice on indigenous & community rights
- Job opportunities and labor reconfiguration (as other industries are impacted)

Other routes to consider:
- In-house mining vs. allies and investing abroad
- In-house mining vs. specializing in refining or manufacturing

Source: BloombergNEF Note: LCE = lithium carbonate equivalent; costs estimated with BNEF’s Lithium Cost Calculator
The U.S. appears on track to improve its supply chain ranking

Global lithium-ion battery supply chain ranking, 2025

<table>
<thead>
<tr>
<th>Rank</th>
<th>Country</th>
<th>Rank</th>
<th>Country</th>
<th>Rank</th>
<th>Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>China</td>
<td>6</td>
<td>Germany</td>
<td>11</td>
<td>Australia</td>
</tr>
<tr>
<td>2</td>
<td>Japan</td>
<td>7</td>
<td>Finland</td>
<td>12</td>
<td>Brazil</td>
</tr>
<tr>
<td>3</td>
<td>U.S. (▲3)</td>
<td>8</td>
<td>U.K. (▼1)</td>
<td>13</td>
<td>Poland (▼1)</td>
</tr>
<tr>
<td>4</td>
<td>Sweden (▲6)</td>
<td>8</td>
<td>S. Korea</td>
<td>14</td>
<td>Chile (▲3)</td>
</tr>
<tr>
<td>5</td>
<td>Canada (▼1)</td>
<td>10</td>
<td>France (▼2)</td>
<td>15</td>
<td>Hungary (▼3)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Key: AMER, APAC, EMEA

Source: BloombergNEF
Thank you

Email: lgoldiescot@bloomberg.net

@LoganGoldieScot
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Guest Presentation on the Global Lithium Market

• Logan Goldie-Scot, Head of Clean Power Research, BloombergNEF
Public Comment

Comment Instructions:

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Panel Discussion

• Michael McKibben, UC Riverside
• Jonathan M. Weisgall, Berkshire Hathaway Energy (BHE)
• Rod Colwell, Controlled Thermal Resources (CTR)
Salton Sea geothermal lithium: reserves and comparison with other lithium resources

Michael A. McKibben, Ph.D.
Economic Geologist and Geochemist
Chair, Dept. of Earth and Planetary Sciences
U. C. Riverside
michael.mckibben@ucr.edu

Disclosure: I have been and am a consultant to some commercial parties on metallic resources in SSGF brines
“Bathtub ring” of tufa (limestone) from high stand of ancient Lake Cahuilla.

Hundreds to thousands of such episodes of lake formation and evaporation have occurred over millions of years in the northern part of the Imperial Valley.

Have led to accumulation of a deep basinal NaCl brine pool beneath the Valley.
Hot brines in the Salton Sea geothermal field (SSGF) are relatively shallow and easy to exploit because they have been heated and brought near the surface by igneous processes (magma at depth).
As it ascends, chemical reaction of the hot NaCl brine diapir with the delta and lake sediments results in a Na-Ca-K-Cl metamorphic brine that is spectacularly enriched in valuable metals such as Fe, Mn, Zn, Pb and Li. Other brine diapirs may exist under the Imperial/Brawley areas.

<table>
<thead>
<tr>
<th>Field: Salton Sea</th>
<th>Imperial</th>
<th>Cerro Prieto</th>
<th>East Mesa</th>
<th>Heber</th>
</tr>
</thead>
<tbody>
<tr>
<td>Well: S2–14</td>
<td>L2–28</td>
<td>M-5</td>
<td>6–1P</td>
<td>5</td>
</tr>
<tr>
<td>Temperature (°C):</td>
<td>330</td>
<td>275</td>
<td>300</td>
<td>~190</td>
</tr>
<tr>
<td>Depth (m):</td>
<td>2500–3220</td>
<td>3290–4270</td>
<td>~1200</td>
<td>~2164</td>
</tr>
<tr>
<td>Na</td>
<td>54,800</td>
<td>50,466</td>
<td>5,004</td>
<td>6,362</td>
</tr>
<tr>
<td>Ca</td>
<td>28,500</td>
<td>18,140</td>
<td>284</td>
<td>759</td>
</tr>
<tr>
<td>K</td>
<td>17,700</td>
<td>9,555</td>
<td>1,203</td>
<td>1,124</td>
</tr>
<tr>
<td>Fe</td>
<td>1,710</td>
<td>3,219</td>
<td>&lt;1</td>
<td>NA</td>
</tr>
<tr>
<td>Mn</td>
<td>1,500</td>
<td>985</td>
<td>1</td>
<td>NA</td>
</tr>
<tr>
<td>SiO₂</td>
<td>&gt;508</td>
<td>465</td>
<td>569</td>
<td>257</td>
</tr>
<tr>
<td>Zn</td>
<td>507</td>
<td>1,155</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Sr</td>
<td>421</td>
<td>1,500</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>B</td>
<td>271</td>
<td>217</td>
<td>11</td>
<td>NA</td>
</tr>
<tr>
<td>Ba</td>
<td>~210</td>
<td>2,031</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Li</td>
<td>269</td>
<td>252</td>
<td>13</td>
<td>NA</td>
</tr>
<tr>
<td>Mg</td>
<td>49</td>
<td>299</td>
<td>&lt;1</td>
<td>9</td>
</tr>
<tr>
<td>Pb</td>
<td>102</td>
<td>&gt;262</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Cu</td>
<td>7</td>
<td>&gt;1</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Cd</td>
<td>2</td>
<td>4</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>NH₄</td>
<td>330</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Cl</td>
<td>157,500</td>
<td>131,000</td>
<td>9,370</td>
<td>11,668</td>
</tr>
<tr>
<td>Br</td>
<td>111</td>
<td>NA</td>
<td>31</td>
<td>NA</td>
</tr>
<tr>
<td>CO₂</td>
<td>1,580</td>
<td>30,000</td>
<td>2,400</td>
<td>NA</td>
</tr>
<tr>
<td>HCO₃</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>221</td>
</tr>
<tr>
<td>H₂S</td>
<td>10</td>
<td>&gt;47</td>
<td>180</td>
<td>NA</td>
</tr>
<tr>
<td>SO₄</td>
<td>53</td>
<td>NA</td>
<td>4</td>
<td>51</td>
</tr>
<tr>
<td>TDS</td>
<td>26.5%</td>
<td>25.0%</td>
<td>1.6%</td>
<td>2.2%</td>
</tr>
</tbody>
</table>
What is the volume of the hot SSGF brine reservoir?

Installed capacity: 414 MW

Ultimate capacity: 2330-2950 MW (6 times installed)

Porosity: 10 to 20%

5.5 to 33 km$^3$ of brine

Kaspereit et al., 2016
1 million to 6 million metric tons of lithium equivalent reserves. Far more than total U.S. reserves of Li from traditional sources. Comparable to the reserves of the four major global producers:

**World Mine Production and Reserves:** Reserves for Argentina, Australia, Canada, Chile, China, the United States, Zimbabwe, and other countries were revised based on new information from Government and industry sources.

<table>
<thead>
<tr>
<th></th>
<th>Mine production</th>
<th>Reserves $^a$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2019</td>
<td>2020$^c$</td>
</tr>
<tr>
<td>United States</td>
<td>W</td>
<td>W</td>
</tr>
<tr>
<td>Argentina</td>
<td>6,300</td>
<td>6,200</td>
</tr>
<tr>
<td>Australia</td>
<td>45,000</td>
<td>40,000</td>
</tr>
<tr>
<td>Brazil</td>
<td>2,400</td>
<td>1,900</td>
</tr>
<tr>
<td>Canada</td>
<td>200</td>
<td>—</td>
</tr>
<tr>
<td>Chile</td>
<td>19,300</td>
<td>18,000</td>
</tr>
<tr>
<td>China</td>
<td>10,800</td>
<td>14,000</td>
</tr>
<tr>
<td>Portugal</td>
<td>900</td>
<td>900</td>
</tr>
<tr>
<td>Zimbabwe</td>
<td>1,200</td>
<td>1,200</td>
</tr>
<tr>
<td>Other countries$^7$</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>World total (rounded)</td>
<td>860,000</td>
<td>82,000</td>
</tr>
</tbody>
</table>

**World Resources:** Owing to continuing exploration, identified lithium resources have increased substantially worldwide and total about 86 million tons. Lithium resources in the United States—from continental brines, geothermal brines, hectorite, oilfield brines, and pegmatites—are 7.9 million tons. Lithium resources in other countries have been revised to 78 million tons. Lithium resources are Bolivia, 21 million tons; Argentina, 19.3 million tons; Chile, 9.6 million tons; Australia, 6.4 million tons; China, 5.1 million tons; Congo (Kinshasa), 3 million tons; Canada, 2.9 million tons; Germany, 2.7 million tons; Mexico, 1.7 million tons; Czechia, 1.3 million tons; Serbia, 1.2 million tons; Peru, 880,000 tons; Mali, 700,000 tons; Zimbabwe, 500,000 tons; Brazil, 470,000 tons; Spain, 300,000 tons; Portugal, 270,000 tons; Ghana, 90,000 tons; and Austria, Finland, Kazakhstan, and Namibia, 50,000 tons each.
SSGF has the largest “tonnage” of any known Li brine deposit

Bradley et al. (2017)
SSGF production and depletion scenarios:

Besseling (2018) – Production from CalEnergy/BHE plants:
Current capacity (350 MW)
  17,000 metric tons per year lithium equivalent
Future capacity (700 MW)
  40,000 metric tons per year lithium equivalent

<table>
<thead>
<tr>
<th>Reserves</th>
<th>Annual depletion rate</th>
<th>Years of production</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>350 MW</td>
<td>700 MW</td>
</tr>
<tr>
<td>1 M tons</td>
<td>1.7%</td>
<td>4.0%</td>
</tr>
<tr>
<td>6 M tons</td>
<td>0.28%</td>
<td>0.67%</td>
</tr>
</tbody>
</table>

So Li production appears sustainable, but we need a far more dynamic Li reservoir model that takes into consideration more factors such as reinjection and Li replenishment.
Improved quantification of Li resources for Lithium Valley – A research proposal

Pat Dobson, Eric Sonnenthal, Will Stringfellow (LBNL), Mike McKibben (UC Riverside), Sabodh Garg (Geologica)

Key questions:
1. **How much Li is present** in the Salton Sea geothermal reservoir?
   - Li resource estimates from brine production rates and Li contents
   - Li resource estimates from reservoir volume and Li contents
2. How much Li is **recoverable** (depends in part on extraction technology)?
3. How rapidly will the **Li concentration of the brine decrease** as Li is recovered and spent brine is reinjected (resource sustainability)?
4. Would Li in reservoir rocks **recharge** geothermal brines?
Salton Sea Li can clearly help fill the looming supply gap:

But there will be cost competition, especially from *similar Direct Lithium Extraction (DLE)* brine projects that are coming online.

BMI (2021)

e.g. Clayton Valley, NV - Schlumberger New Energy - DLE pilot plant to replace traditional evaporation/precipitation process by end of 2021.

- Lithium is seeing a huge increase in producing assets
- Not just brine and hard rock, but clays, jadérite and geothermal brines in the pipeline
- Direct lithium extraction via ion exchange and solvent extraction poised to re-shape the industry
DLE as a “bolt-on technology” to existing brine flow operations:

**Smackover Formation, Arkansas**
(Standard Lithium/LAXNESS)
Add-on to existing extraction of bromine from warm oil field brines
Fiberglass tanks, PVC pipes
590,000 tons Li under 150,000 acres
Target production is 13,000 tpa Li

**Alberta oilfield brines**
Clearwater Project
(E3 Metals Corp)
1,300,000 tons Li
Target 25,000 tpa Li

Smackover and Alberta projects are already surrounded by existing oil field and chemical processing infrastructure as well as a skilled workforce population.

R. Mintak (2021)
Lithium Valley Commission
March 25, 2021 Meeting
BHE Renewables Update

Jonathan Weisgall
Vice President, Government Relations
Berkshire Hathaway Energy
CalEnergy Geothermal Plants
Imperial Valley
Status and Timelines

• California Energy Commission grant May 2020
  – $6 million: demonstration project to recover lithium from geothermal brine
  – Match with at least $4 million of corporate funds
  – Groundbreaking April 2021
  – Goal to be in service January 2022

• Department of Energy grant January 2021
  – $14.9 million: (1) demonstration project to convert lithium chloride into battery-grade lithium hydroxide; (2) fund engineering for full-scale commercial operations
  – Match with $14.9 million of corporate funds
  – Sign contract spring 2021
  – Goal to be in service fall 2022
Hard Rock Mining (Western Australia)
Hard Rock Mining
(Western Australia)

Photo credit: John Banagan
Lithium Brine Pools in Atacama Desert, Chile

Photo credit: Matjaž Krivic
Lithium Brine Pools in Atacama Desert, Chile
The POWER of California’s Lithium Valley

4,000+ Jobs

Reliable Clean Energy

Salton Sea Repair

New Lithium Economy
Hell’s Kitchen Lithium and Power

- Located in the largest known geothermal resource in the world.
- The Salton Sea Geothermal Field in Imperial Valley, California represents a proven and defined geothermal power and mineralized brine resource.

Project Snapshot

Hell’s Kitchen Power – Stage 1: 2023
49.9 megawatts

Hell’s Kitchen Lithium – Stage 1: 2023/2024
20,000tpa LCE

Future stages developed to meet market demands

Total Hell’s Kitchen Lithium capacity:
~300,000 tonnes LCE per annum

Total Hell’s Kitchen Power capacity:
~1,100 megawatts

Geothermal operations have operated in this field for over 35 years

Additional mineral resources include potassium, zinc, manganese, iron and rubidium
The power to re-imagine and evolve
A sustainable process, eliminating high impact mining.

**GEOTHERMAL BRINE LITHIUM**
- Small physical footprint
- No open-pit mining
- No evaporation ponds
- Powered by renewable energy
- Ideal for OEM sustainability

**SALARS (EVAPORATION PONDS)**
- Large physical footprint
- Requires evaporation ponds
- Residual salt waste can be toxic
- Large amounts of water lost
- Longer production lead times

**OPEN PIT MINING (SPODUMENE / CLAYS)**
- Large physical footprint
- Permanent environmental effects
- Large amounts of tailings
- Generally processed overseas
- Longer production lead times
Key benefits

- Creates new union project and construction jobs and ancillary jobs for the California economic recovery from the COVID-19 State of Emergency
- Develops Critical U.S. Energy Infrastructure
- Provides Critical U.S. Minerals
- Dust abatement in an area designated as an Imperial County State of Emergency

1,980 Project Jobs + 2,500 Ancillary Jobs*

1,100MW of 24/7 Baseload Renewable POWER

$350+ million Direct Economic Impact*

Working with the community

*Source: Imperial Valley Economic Development Corporation – Hell’s Kitchen Lithium and Power Project: Economic Impact Analysis (Total Capacity)
Hell’s Kitchen Development Timeline

Site Control and Development – COMPLETED:

- Large geothermal leasehold secured including all minerals rights
- Seismic Survey and Geophysical Model
- 43-101 Preliminary Economic Assessment with Hatch
- Interconnection Studies and Queue Position
- Delineation Drilling Permits
- Secured grants from California Energy Commission for mineral extraction

Power Purchase Agreement signed with IID

Power 1 and Lithium 1A Construction

Power 1 and Lithium 1 Operations

Future Expansion
CHALLENGES

 Investment in large scale mining projects is challenging due to the length of time for permitting and approvals.
 California’s complex requirements can create challenges to project timelines, cost efficiencies and future development.
 Incentives to attract manufacturing (which creates thousands of jobs) is highly competitive in other states.
 There is no standardized mechanism for companies to contribute to the Salton Sea mitigation efforts.

SOLUTIONS

 Activate federal support to streamline permitting at the administrative level, including potentially declaring Lithium Valley as “high priority” or “major infrastructure projects.”
 Expand Environmental Leadership Projects to include geothermal power, enabling CEQA streamlining.
 Establish a Lithium Valley “Opportunity” or “Enterprise” zone and actively support Bills – AB 1397 and AB 1161
 Encourage State and Federal support to incentivize the development of cathode and battery manufacturing to create the world’s first Clean Energy & Auto Hub.
CTR is committed to creating a thriving, safe and sustainable future for generations to come.

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Forward looking statements:
Some statements in this presentation contain forward-looking information. These statements address future events and conditions and, as such, involve known and unknown risks, uncertainties and other factors which may cause the actual results, performance or achievements to be materially different from any future results, performance or achievements expressed or implied by the statements. Such factors include without limitation the completion of planned expenditures, the ability to complete development programs on schedule and the success of development programs.
Panel Discussion

- Michael McKibben, UC Riverside
- Jonathan M. Weisgall, Berkshire Hathaway Energy (BHE)
- Rod Colwell, Controlled Thermal Resources (CTR)
Public Comment

Comment Instructions:

Limited to 3 minutes per comment

By computer: use the “raise hand” feature in Zoom

By telephone: dial *9 to “raise hand” and *6 to mute/unmute your phone line
Media and Legislation Updates
Public Comment

Comment Instructions:

Limited to 3 minutes per comment

By computer: use the “raise hand” feature in Zoom

By telephone: dial *9 to “raise hand” and *6 to mute/unmute your phone line
Future Meetings Discussion

• Determination of:
  • Agenda Topics
  • Speakers
  • Presentations
Public Comment

Comment Instructions:

Limited to 3 minutes per comment

By computer: use the “raise hand” feature in Zoom

By telephone: dial *9 to “raise hand” and *6 to mute/unmute your phone line
Adjourn
Thank you!

Webpage: https://www.energy.ca.gov/data-reports/california-power-generation-and-power-sources/geothermal-energy/lithium-valley
List Serv: Lithium Valley Commission

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Break

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