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Lithium Market
Overview

California Energy Commission workshop

Logan Goldie-Scot

November 15, 2018
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Lithium supply and demand dynamics 10
Lithium pricing dynamics 16
# The supply chain

You can no longer view the world in silos

### Clean energy
- Solar
- Wind
- Storage
- Decentralized energy
- Frontier power
- Impact on power & utilities

### Advanced transport
- Electrified transport
- Autonomous driving
- Shared mobility
- Impact on transport
- Impact on oil & power

### Digital industry
- Internet of things
- Automation & advanced analytics
- Asset mgmt, digital manufacturing, logistics
- Connected customer, “as a service” business models
- Impact on industrials, utilities, healthcare

### Advanced materials
- Bioplastics, biomaterials
- Composites, New Materials
- 3D Printing, Lightweighting, Recycling, End-of-life
- Impact on industrials, materials and energy

### Commodities
- Carbon
- Power
- LNG & gas
- Oil & products
- Metals
- Chemicals
Demand outlook
Cars (and stationary storage) will drive battery demand

Annual GWh demand

Source: Bloomberg NEF
Demand outlook

Cell manufacturing capacity will over triple by end of 2021. Lots in China!

2018 commissioned cell manufacturing capacity

- **175GWh/year**
  - China: 65%
  - Other: 10%
  - Japan: 18%
  - Germany: 5%
  - South Korea: 1%

Capacity due to be commissioned by 2021

- **627GWh/year**
  - China: 61%
  - United States: 19%
  - Other: 8%
  - Japan: 4%
  - Germany: 4%
  - South Korea: 3%
  - Thailand: 1%
  - Other: 1%

Source: Bloomberg NEF
Demand outlook

There will be a range of specifications within each segment

Passenger electric vehicles

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<tr>
<th>Year</th>
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<th>NCA</th>
<th>NMC (811)</th>
<th>NMC (622)</th>
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<td>24%</td>
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Utility-scale stationary energy storage

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<th>Year</th>
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<td>20%</td>
<td>20%</td>
<td>8%</td>
<td>15%</td>
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Source: Bloomberg NEF. Taken from “2018 New Energy Outlook”
And different chemistries require different metals

<table>
<thead>
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<th>Chemistry</th>
<th>Aluminum</th>
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<td>2%</td>
<td>82%</td>
<td>2%</td>
<td>11%</td>
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Source: Bloomberg NEF. Taken from “2018 New Energy Outlook”
Demand outlook

Supply is becoming an issue of national importance

“We wanted to set up a stable lithium supply system for domestic battery makers, which so far have had to rely entirely on imports,”

Kwon Oh-joon, chief executive of Posco, April 2018
Demand outlook

Which could create a role for more local development?

Selected investments, partnerships and supply agreements for Northvolt

Source: Regional Development Australia
Lithium supply and demand dynamics
The market is currently tight but there should be sufficient supply in near-term.

thousand metric tons lithium carbonate equivalent/year

Source: Bloomberg NEF, Avicenne, Deutsche Bank. Note: Lithium demand from batteries will require lithium to be mined 12 months earlier. LCE refers to lithium carbonate equivalent.
Investors remain apprehensive on lithium stocks

Lithium market supply and demand balance and performance of stock listings

Thousand metric tons LCE

Performance against average guide price

Oversupply

Undersupply

Ganfeng, secondary offering

Altura, secondary offering

Livent IPO

Ganfeng, Hong Kong IPO

metric tons LCE/ year

Share offering

Source: Bloomberg NEF, Bloomberg Terminal. Note: 0% represents the average guide price
Lithium supply and demand dynamics

A small number of countries dominate current and future supply

Source: Bloomberg NEF, Company reports
Lithium supply and demand dynamics

A small number of miners control production

2018 expected market share of mined production

- Albemarle: 26%
- Other: 37%
- SQM: 16%
- Tianqi: 11%
- FMC: 6%
- Orocobre: 4%

Refined lithium market shares, 2017

- Albemarle: 24%
- Other: 31%
- SQM: 17%
- FMC: 3%
- Tianqi: 12%
- Ganfeng: 13%

Source: BloombergNEF
Lithium mining control, 2017 & 2025

Source: Bloomberg NEF, Company reports
Note: Mine investment in 2025 assumes Tianqi’s 24% investment in SQM is approved. Mine investment excludes investments from non-miners.
Lithium pricing dynamics
The lithium price spike has begun to level off.

Source: Benchmark Mineral Intelligence, Bloomberg NEF
Where does that leave geothermal brines?

John L. Featherstone Geothermal Power Plant on the Salton Sea in California’s Imperial Valley
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