

Maputo, October 31st 2019

„Current Developments in the Lithium Market“

Michael Schmidt

German Mineral Resources Agency (DERA) at the
Federal Institute for Geosciences and Natural Resources (BGR)



Federal Ministry
for Economic Affairs
and Energy

The Federal Institute for Geosciences and Natural Resources is the central geoscientific authority providing advice to the German Federal Government in all geo-relevant questions. It is subordinate to the Federal Ministry for Economic Affairs and Energy (BMWi).



Source: Fotolia

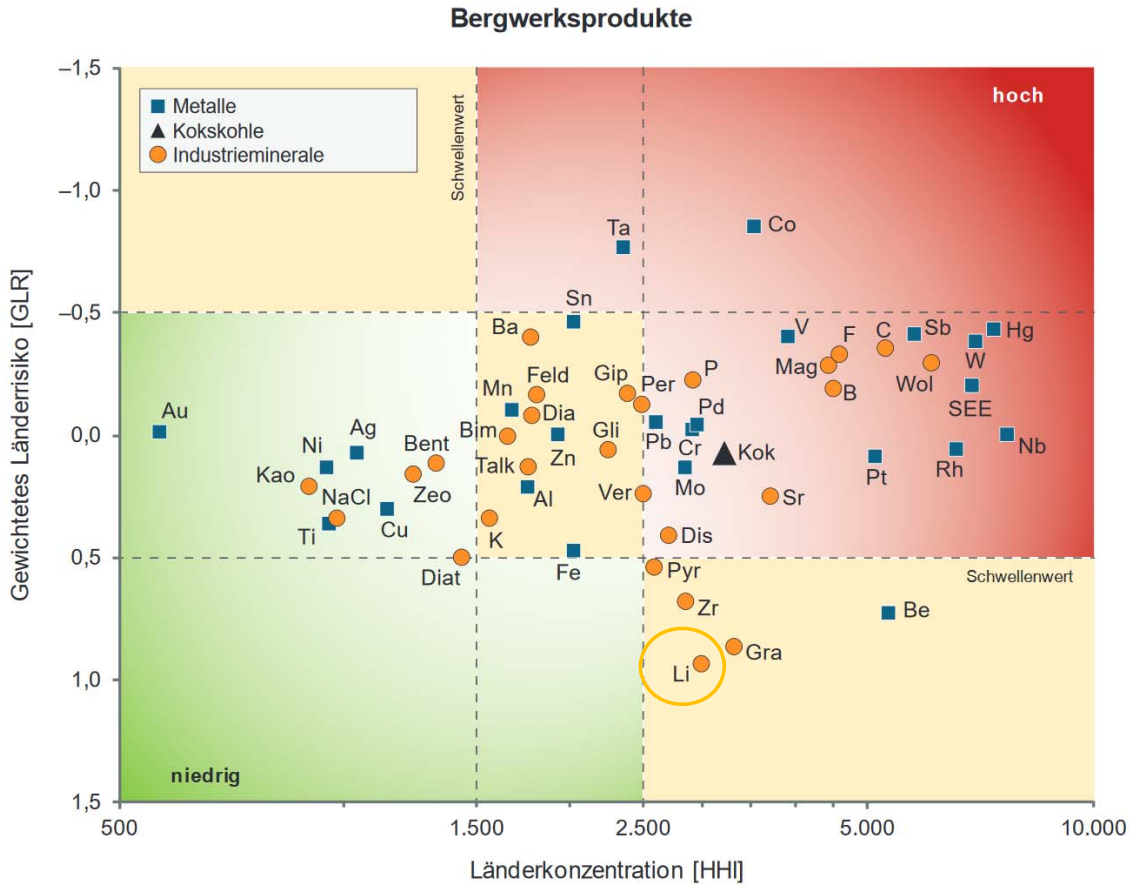
Lithium

„Is the Hype over?“

A lot has changed since 2018!!



DERA Criticality List 2019



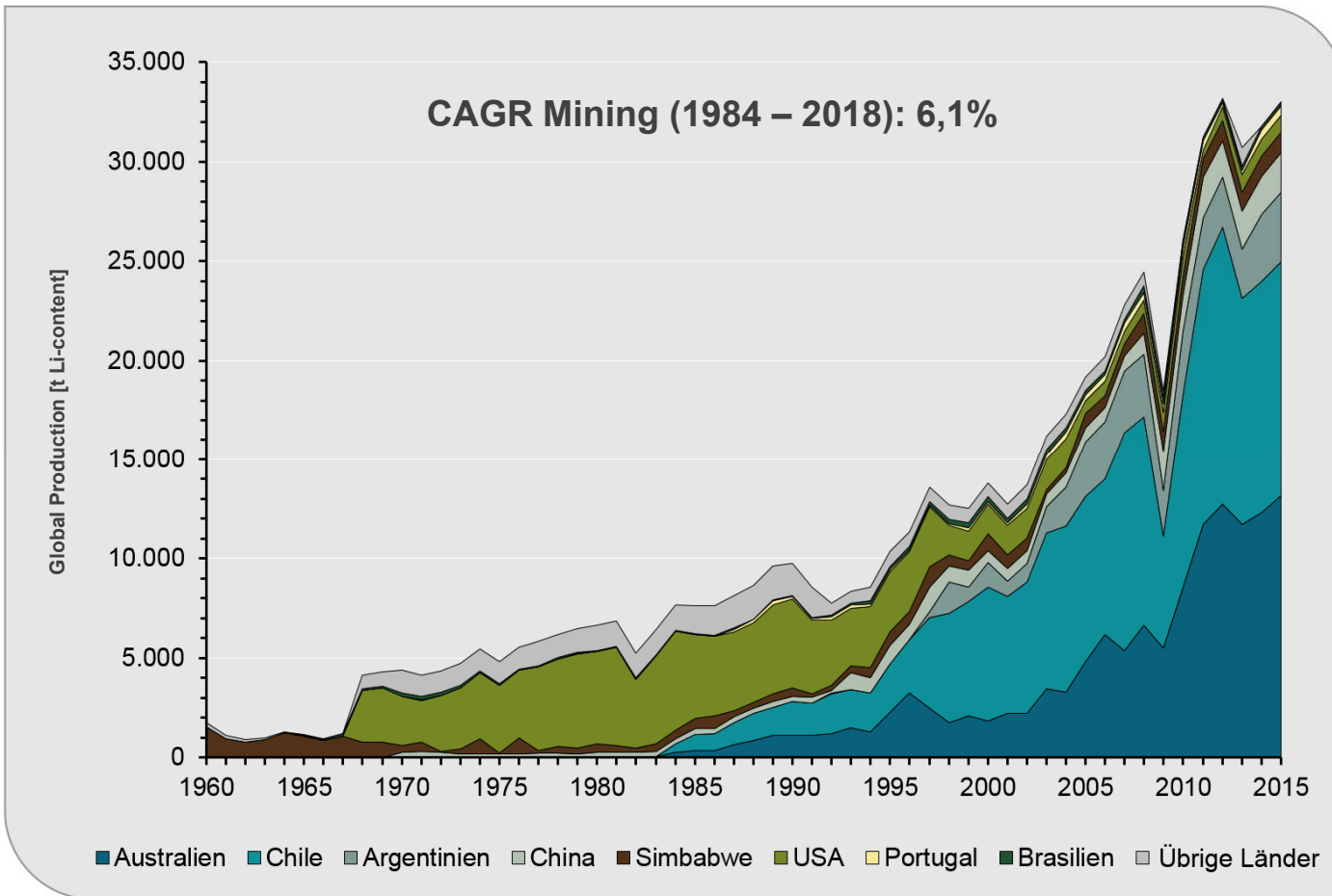
40 DERA Rohstoffinformationen



DERA-Rohstoffliste 2019

Angebotskonzentration bei mineralischen Rohstoffen und Zwischenprodukten – potenzielle Preis- und Lieferrisiken

Supply (1960 – 2018)



Source: BGR 2018

2015: **33.010 t Li-Inh.** (175.710 t LCE)
 2016: approx. 40.000 t Li-Inh. (212.900 t LCE)
 2017*: approx. 49.000 t Li-Inh. (260.000 t LCE)
 2018:* approx. **57.000 t Li-Inh.** (302.000 t LCE)

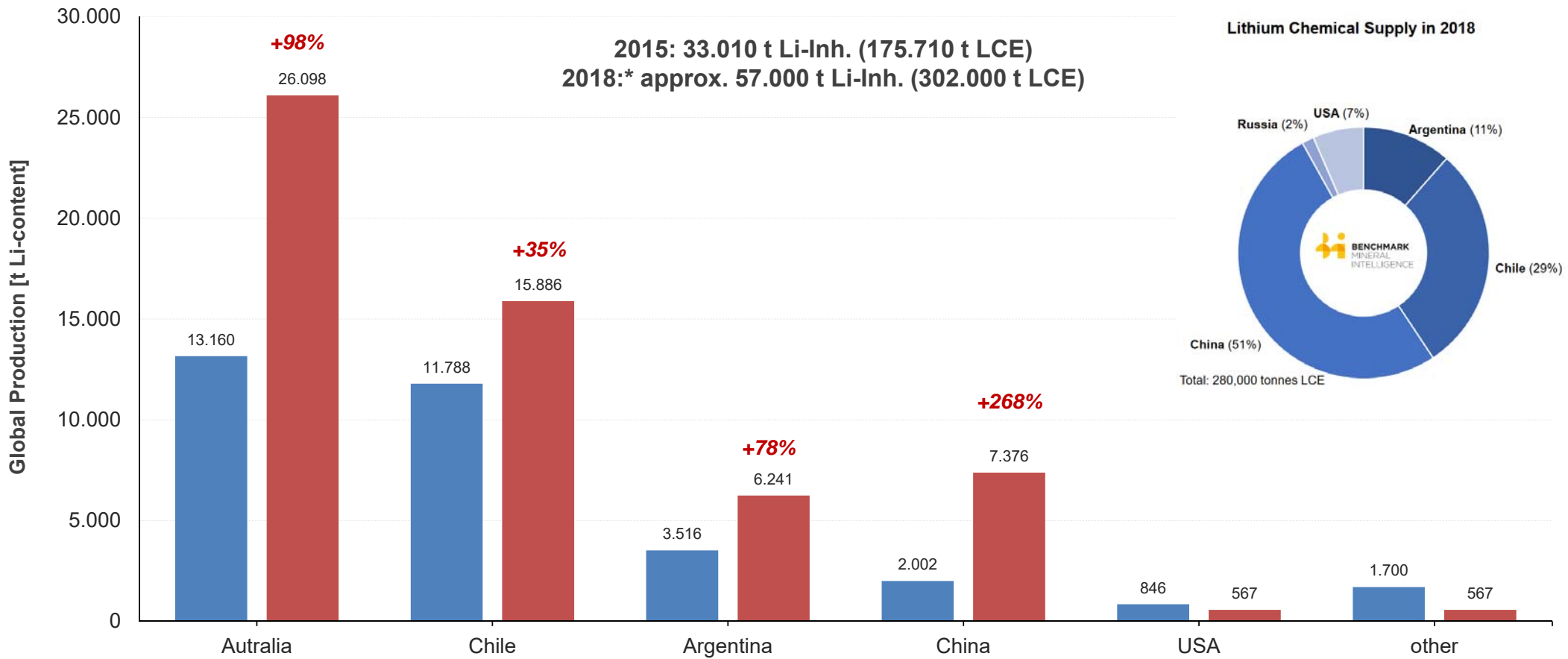
- CAGR
 Argentinien (1984 – 2018): 29,3%
 Share 2018: 11 %

- CAGR
 Chile (1984 – 2018): 11,5%
 Share 2018: 28 %

- CAGR
 Australien (1984 – 2018): 14,3%
 Share 2018: 46 %

*2017 & 2018 data from Benchmark Minerals Intelligence 2018

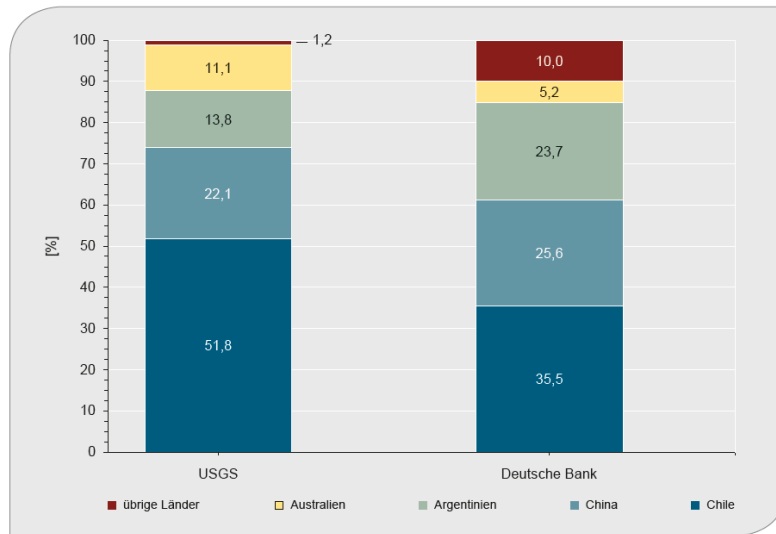
Supply (2015 vs. 2018)



Source: BGR 2018, Benchmark 2019

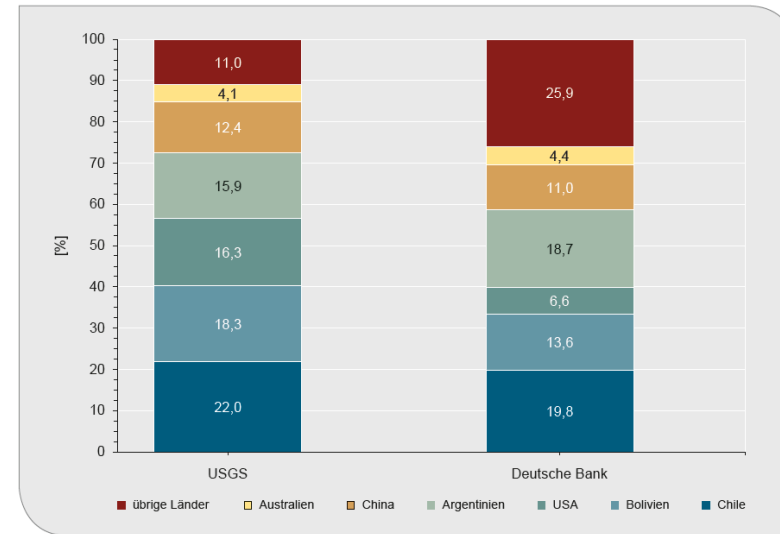
Reserves

Reserves



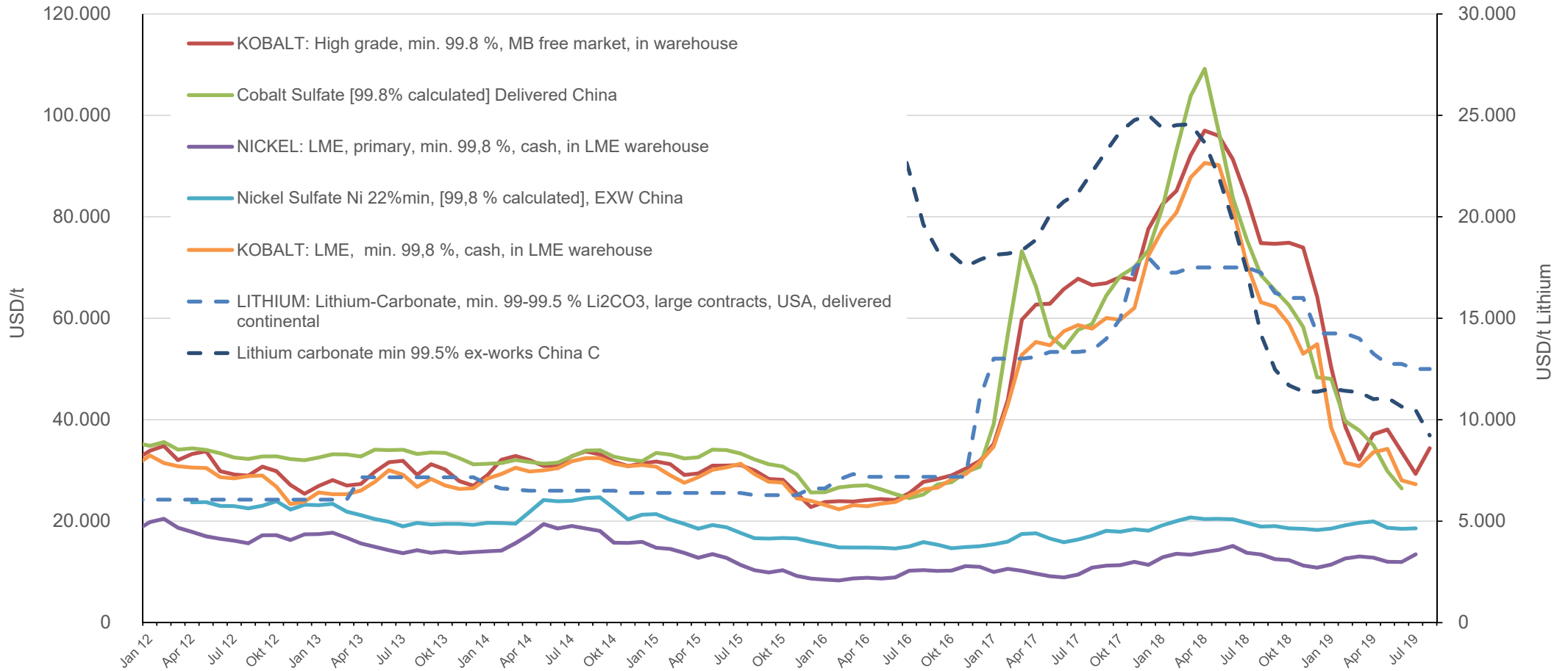
- 14.5 Mio. t (Li-content) [USGS 2017]
- 19 Mio.t (li-content) [Deutsche Bank 2016]
- 7 Mio. t (Li-content) [Roskill 2016]

Resources



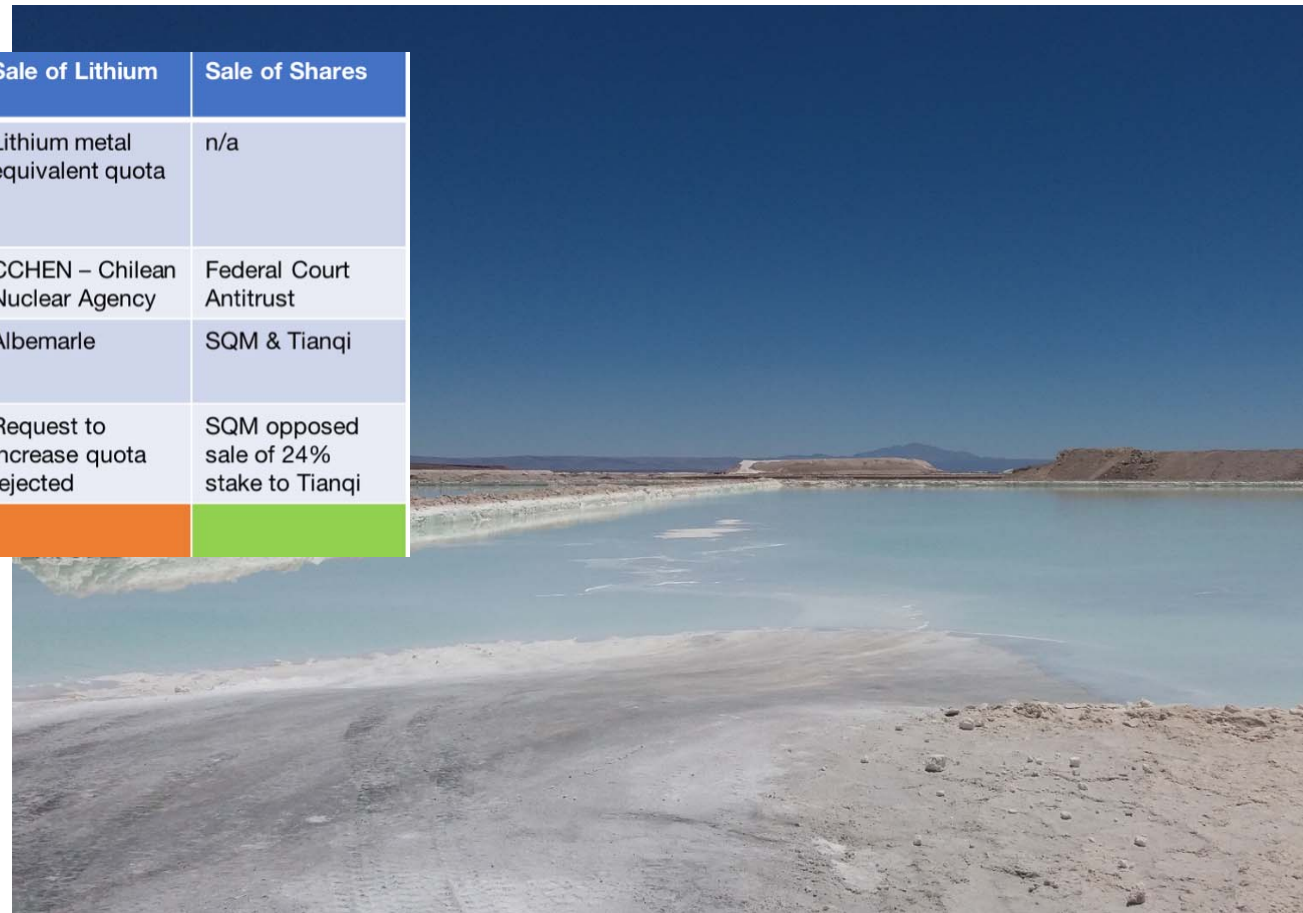
- 41 Mio. t (Li-content) [USGS 2017]
- 51 Mio.t (li-content) [Deutsche Bank 2016]
- 8.5 Mio. t (Li-content) [Roskill 2016]

Price Developments



„Drama in the Atacama“ → Implications

| | Brine Extraction | Fresh Water Access | Lithium Production | Sale of Lithium | Sale of Shares |
|--------------------------|-------------------------------|---|--|------------------------------------|---|
| How it's measured | Volume pumped (liters/second) | Volume, in perpetuity, fully transferable | Lithium metal equivalent quota, battery grade requirements | Lithium metal equivalent quota | n/a |
| Regulatory Entity | Corfo | Ministry of Public Works - Water | Corfo | CCHEN – Chilean Nuclear Agency | Federal Court Antitrust |
| Co's with Drama | SQM & Albemarle | SQM & Albemarle | Albemarle | Albemarle | SQM & Tianqi |
| More info | Affects CCHEN calculations | No new permits will be issued | Arbitration in ICC for contract breach | Request to increase quota rejected | SQM opposed sale of 24% stake to Tianqi |
| Do I care? | | | | | |



Implications for global Lithium Supply
Implications for company strategies??

Brine vs. Hardrock (Implications)

Transition to Nickel Good News for Hard Rock Producers

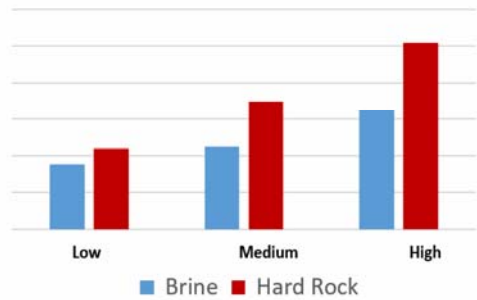
Background

Supply / Demand

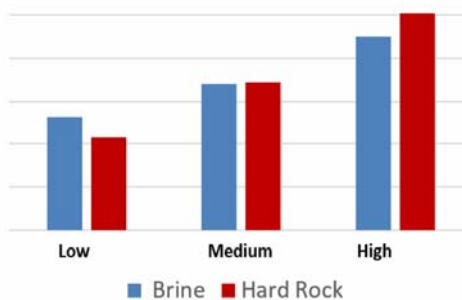
Price

Q & A

Relative Carbonate Cash Costs



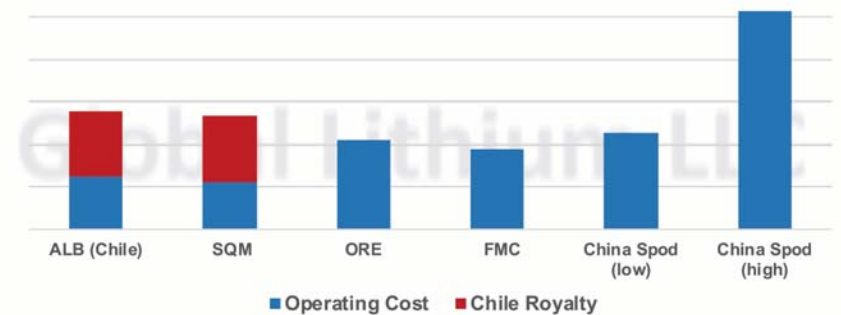
Relative Hydroxide Cash Costs



- **Conventional wisdom: brine is the lowest cost lithium sources**
- **Reality: the best hard rock provides the lowest cost hydroxide**

\$/Kg

Source: Global Lithium LLC



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The Lithium Market 2018 & Beyond:
My Take
Global Lithium LLC

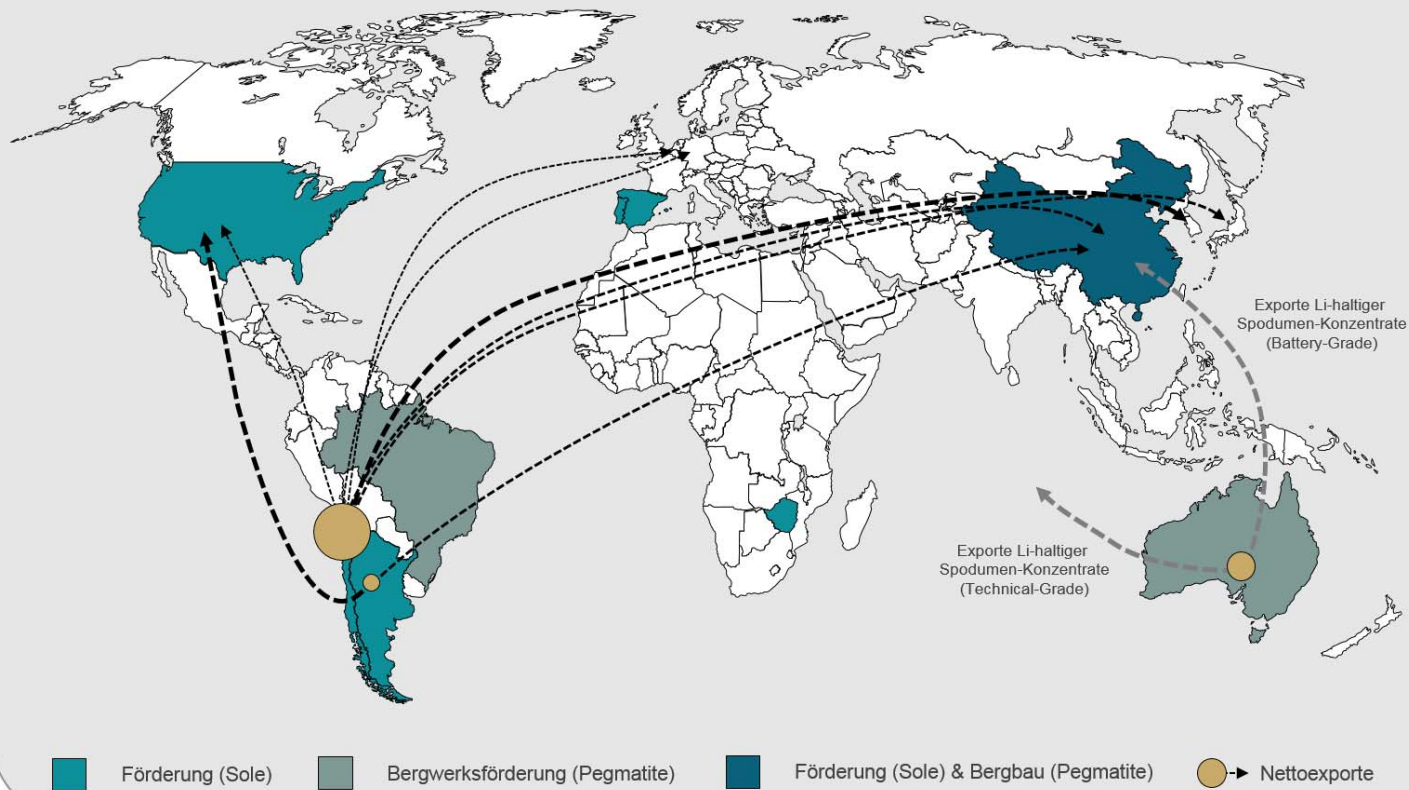
Source: Roskill 2019

Global Trade

International Trade

Lithiumcarbonate (HS 2836.91)

Chinese Spodumene Imports from AUS 2015: **409.232 t**
Chinese Spodumene Imports from AUS 2016: **421.825 t**
Chinese Spodumene Imports from AUS 2017: **3.600.000 t**



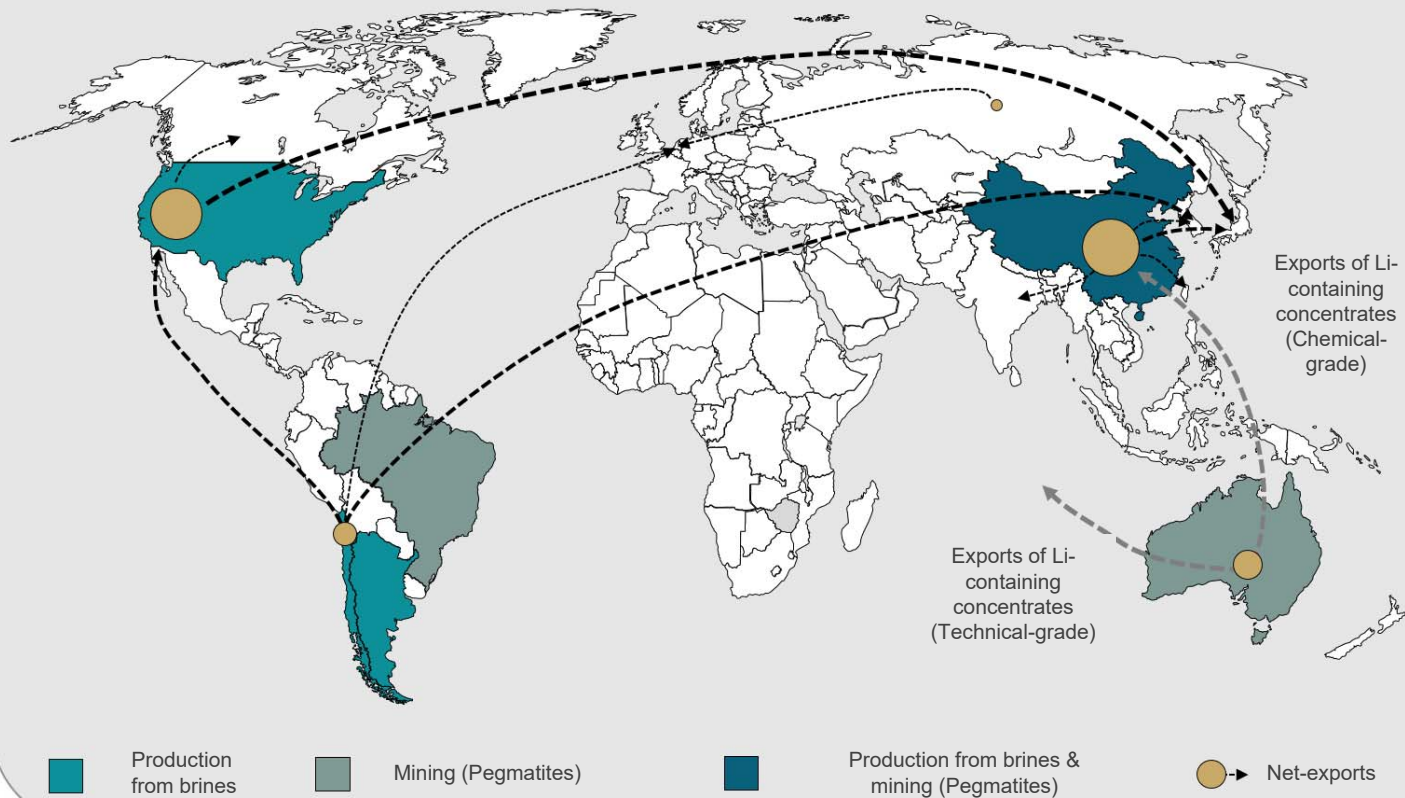
DERA 2017

Global Trade

International Trade

Lithiumoxide & -hydroxide (HS 2825.20)

Chinese Spodumene Imports from AUS 2015: **409.232 t**
Chinese Spodumene Imports from AUS 2016: **421.825 t**
Chinese Spodumene Imports from AUS 2017: **3.600.000 t**



Global Trade (Imports of HS 253090)

Products: 253090 (Mineral Substances, Nesoi)

Quantity: Bi-Annual Series through July 2018

6 ▼ periods to H2 ▼ 2018 

↔ Converted to: T

Primary Quantity

| Reporter | Unit | H1 2016 | H2 2016 | H1 2017 | H2 2017 | H1 2018 ↓ | H2 2018 |
|-------------------------|------|---------|---------|---------|-----------|-----------|-----------|
| Reporting Total | n/a | | | | | | |
| China | T | 188,082 | 233,743 | 747,162 | 2,255,804 | 2,396,010 | 1,677,651 |
| China with HK ReExports | T | 188,082 | 233,743 | 747,162 | 2,255,804 | 2,396,010 | 1,677,651 |
| EU28 (External Trade) | T | 16,336 | 13,195 | 25,168 | 21,048 | 23,646 | 23,176 |
| EU (Exclude UK) | T | 16,292 | 13,173 | 25,106 | 21,046 | 23,595 | 23,132 |



GTIS 2019


DERA 2017


Global Trade (Exports of HS 253090)

Australia Export Statistics

Products: 253090 (Mineral Substances, Nesoi)

Quantity: Annual Series through 2018

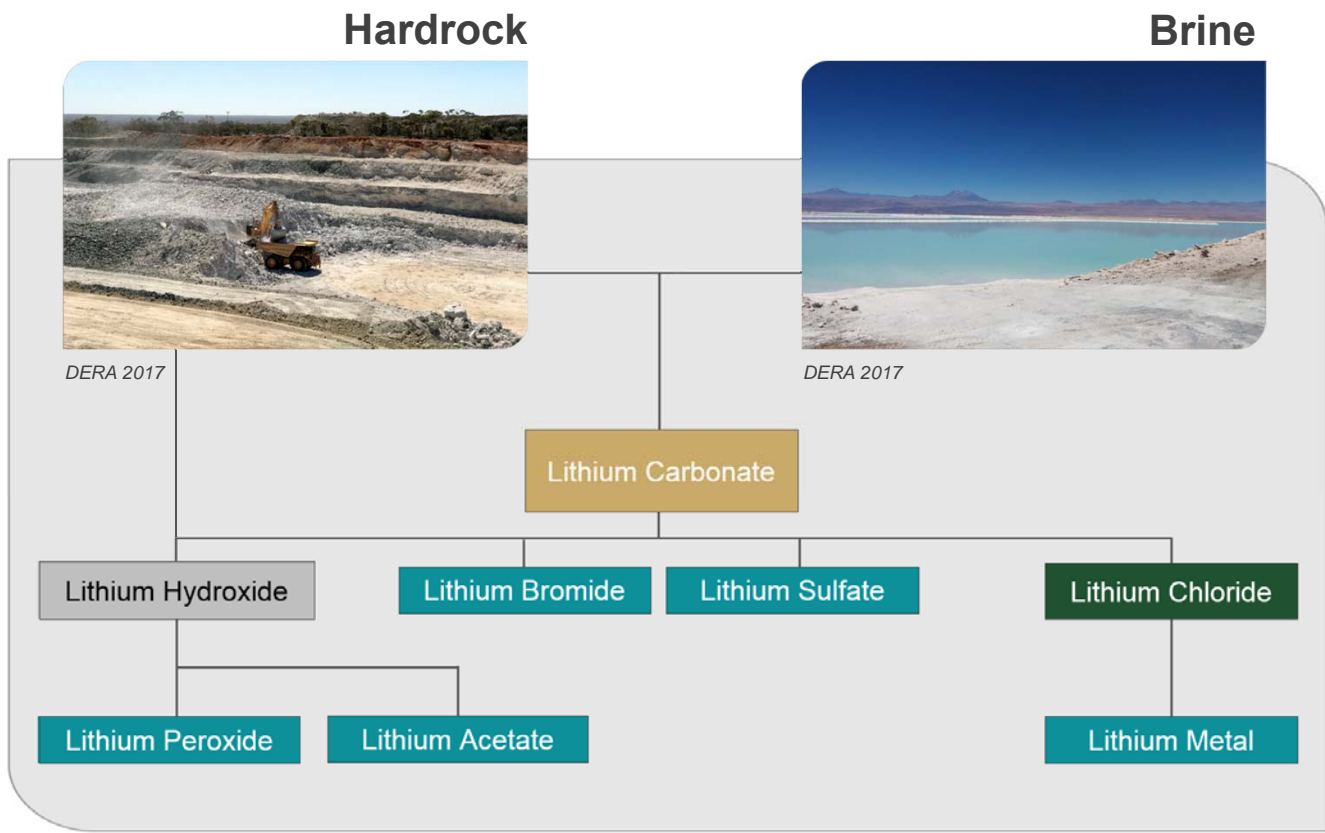
6 ▼ years to 2018 

↔ Converted to: T  Show chart

| Rank | Trade Partner | Unit | Primary Quantity | | | | | |
|------|---------------|------|------------------|---------|---------|---------|-----------|-----------|
| | | | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 ↓ |
| | World | T | 391,310 | 465,251 | 472,414 | 596,535 | 3,606,110 | 3,480,220 |
| 1 | China | T | 327,064 | 376,170 | 350,256 | 463,424 | 3,441,044 | 3,346,731 |
| 2 | Malaysia | T | 13,002 | 32,095 | 50,559 | 71,847 | 88,461 | 46,671 |
| 3 | Belgium | T | 28,411 | 40,231 | 35,610 | 35,183 | 46,622 | 39,797 |
| 4 | United States | T | 13,512 | 10,851 | 24,484 | 13,035 | 10,845 | 19,514 |
| 5 | Korea, South | T | 1,016 | 860 | 2,078 | 5,700 | 8,594 | 18,995 |

GTIS 2019

DERA Risk-Analysis Lithium



DERA Deutsche Rohstoffagentur
Bundesanstalt für Geowissenschaften und Rohstoffe

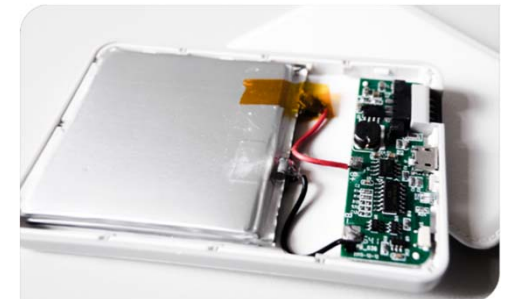
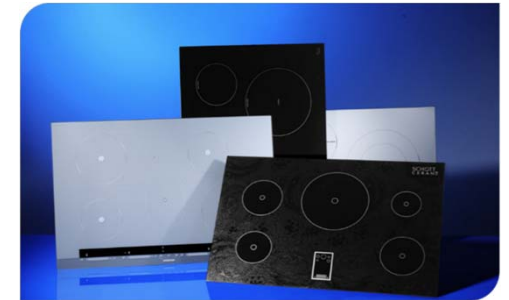
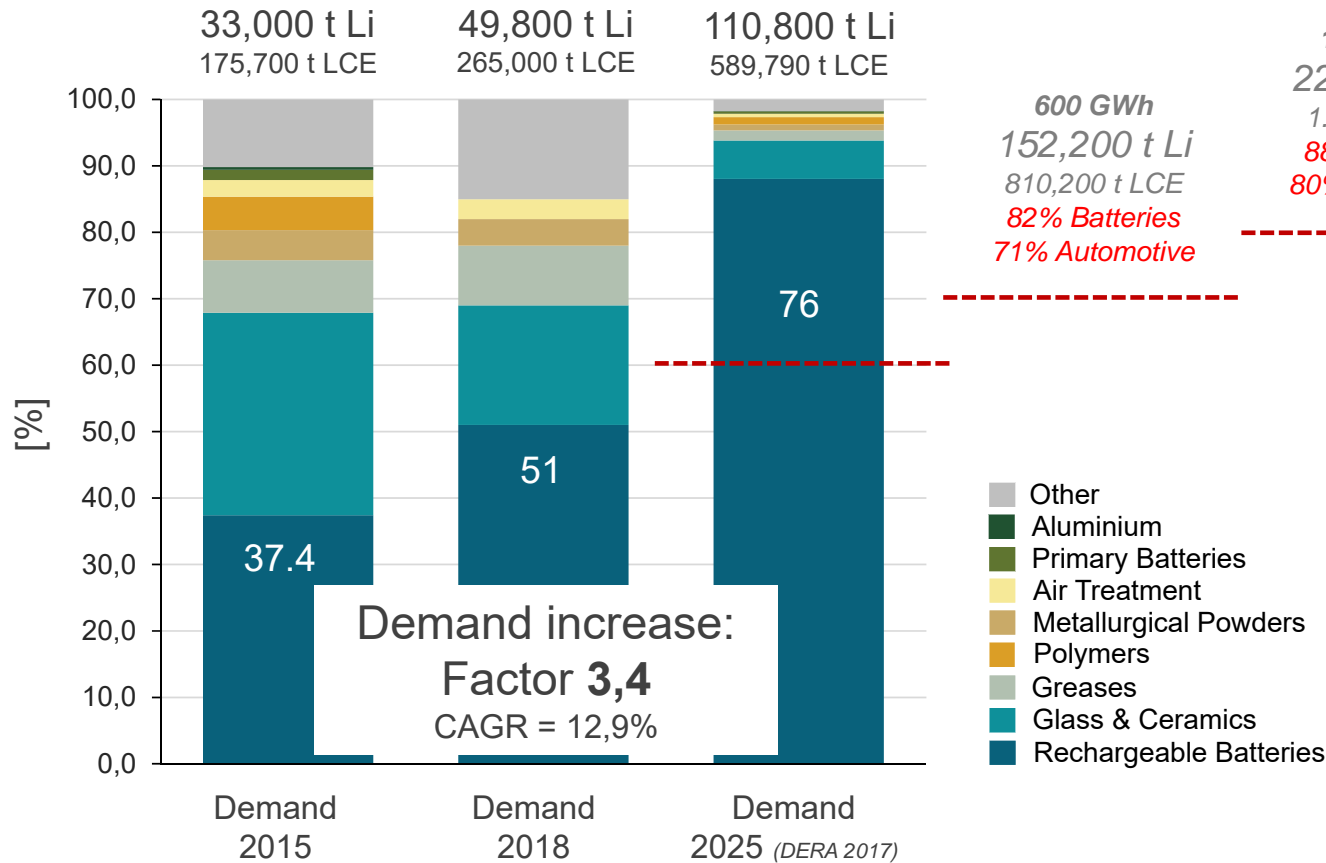
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Rohstoffrisikobewertung – Lithium

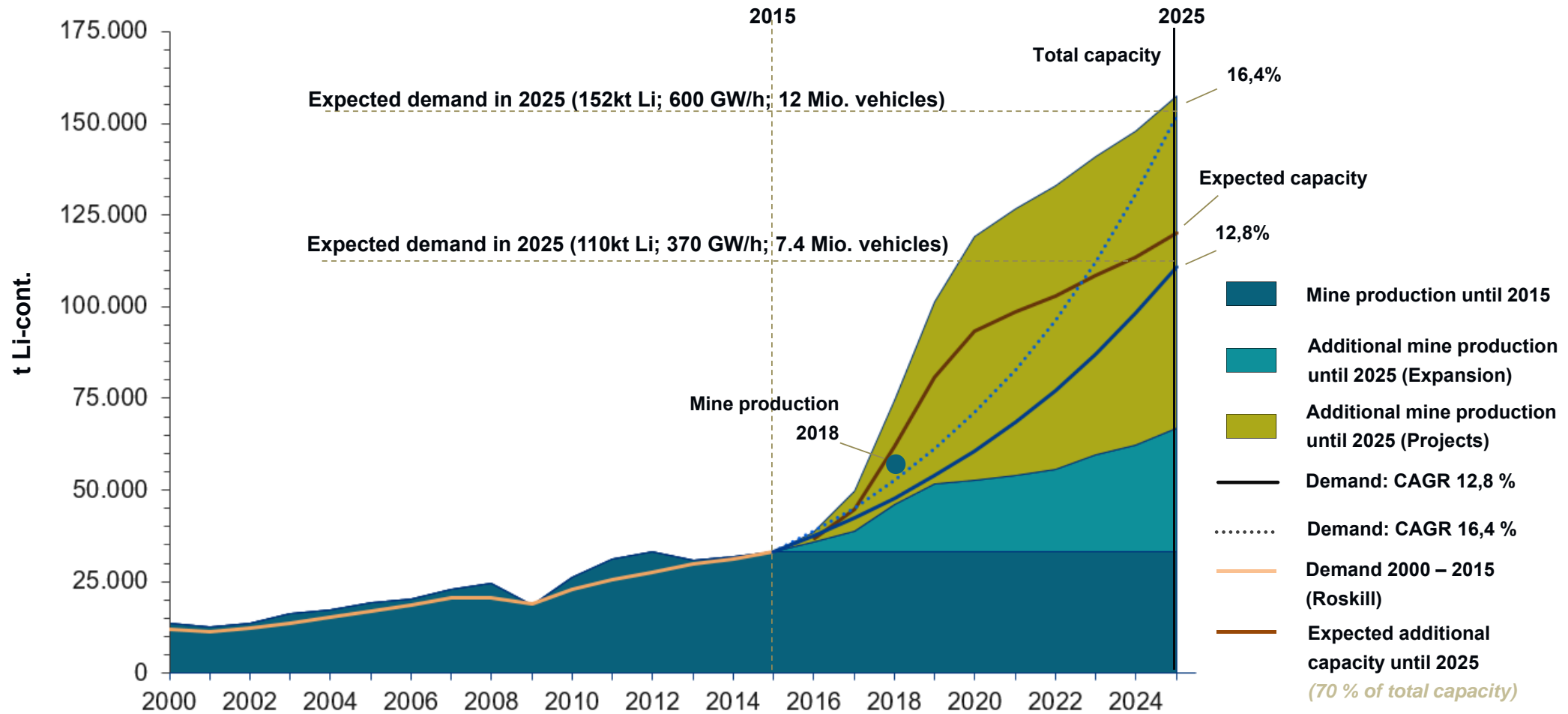
UPDATE Q1 2020

Lithium: No Lithium-Ion Battery without it....

Base case: ~10 Mio. EV Registrations in 2025 (370 GWh)



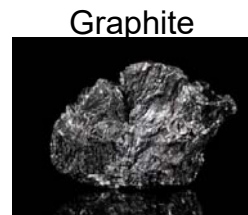
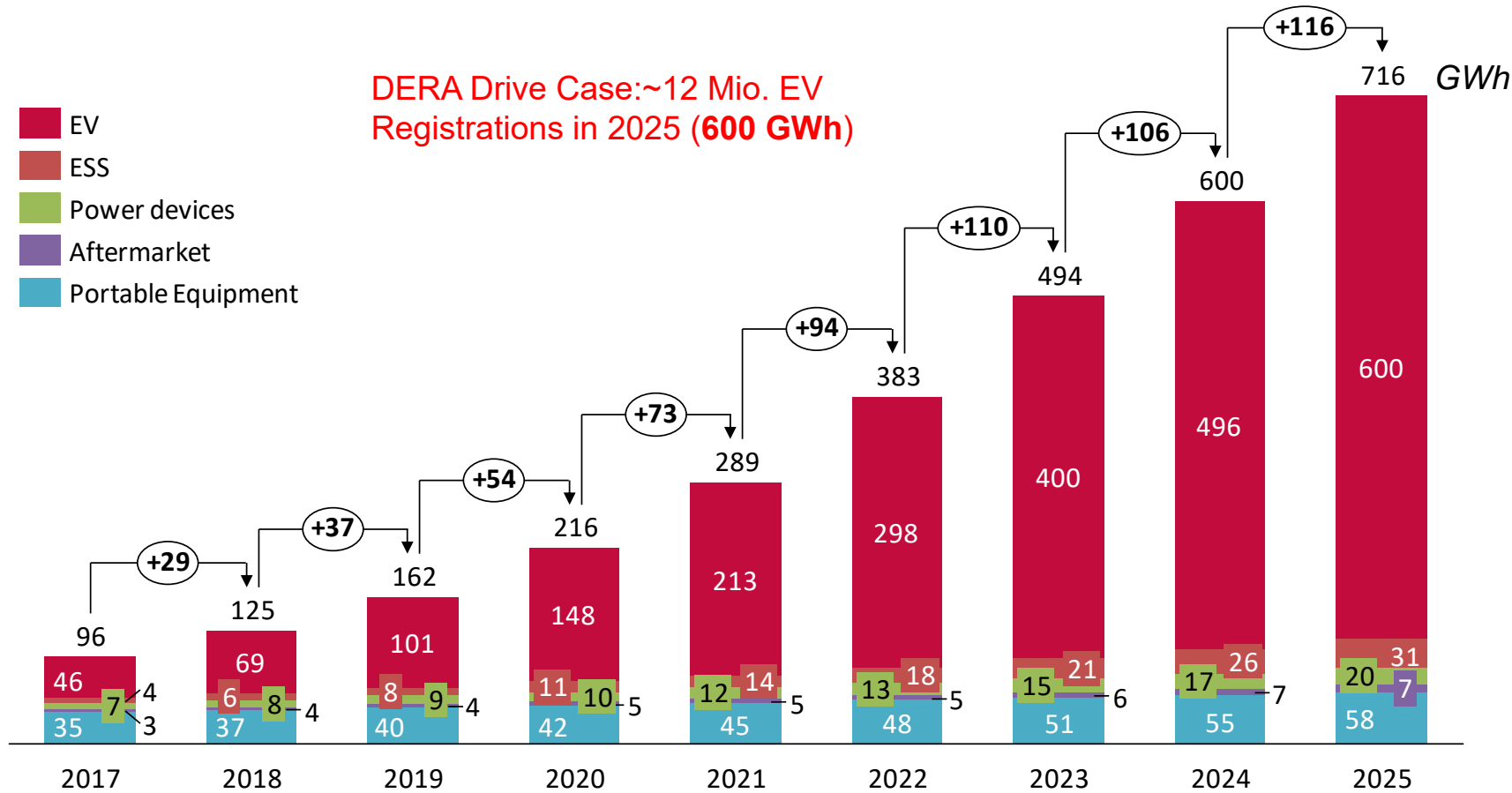
Lithium: No Lithium-Ion Battery without it....



Lithium: No Lithium-Ion Battery without it....

DERA Drive Case: ~12 Mio. EV Registrations in 2025 (600 GWh)

- EV
- ESS
- Power devices
- Aftermarket
- Portable Equipment



LIB-Growth Scenario 2025 – E-Mobility will Change Raw Material Demand

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Thank You

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