



Lithium market: opportunities and challenges for Chile

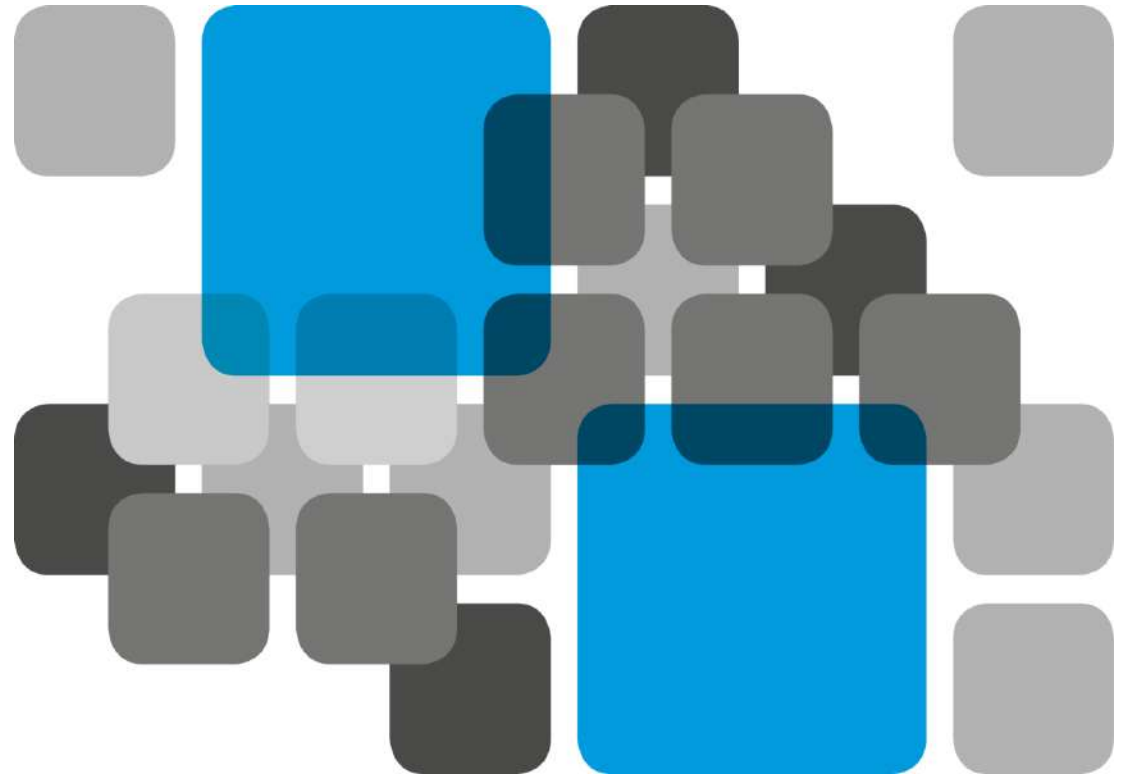
**Seminario Tecnologías Emergentes de
Extracción y Procesamiento de Litio**

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10 Octubre 2019



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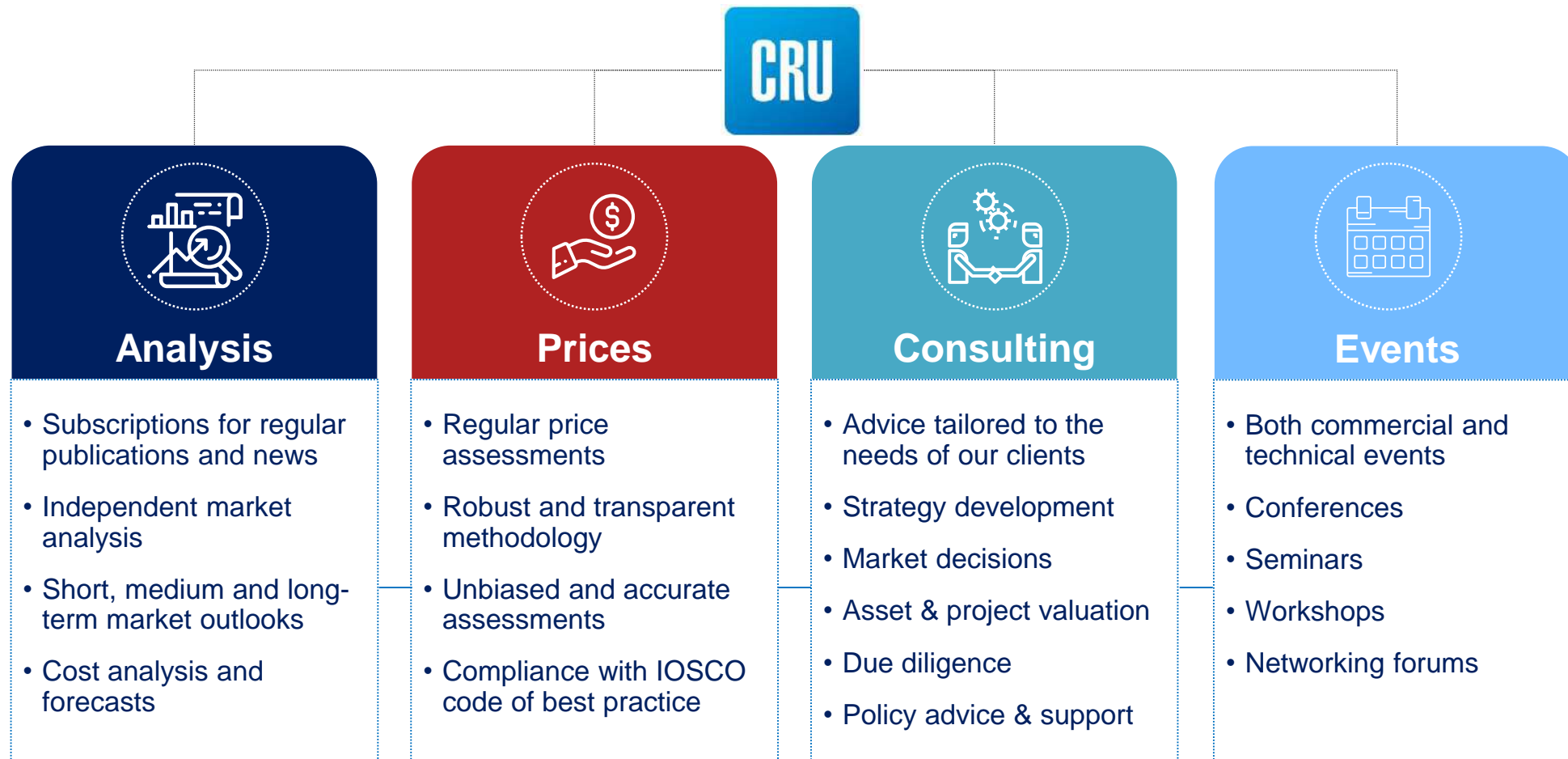
CRU – big enough to deliver, a high quality service, small enough to care about all our customers.

CRU's office locations



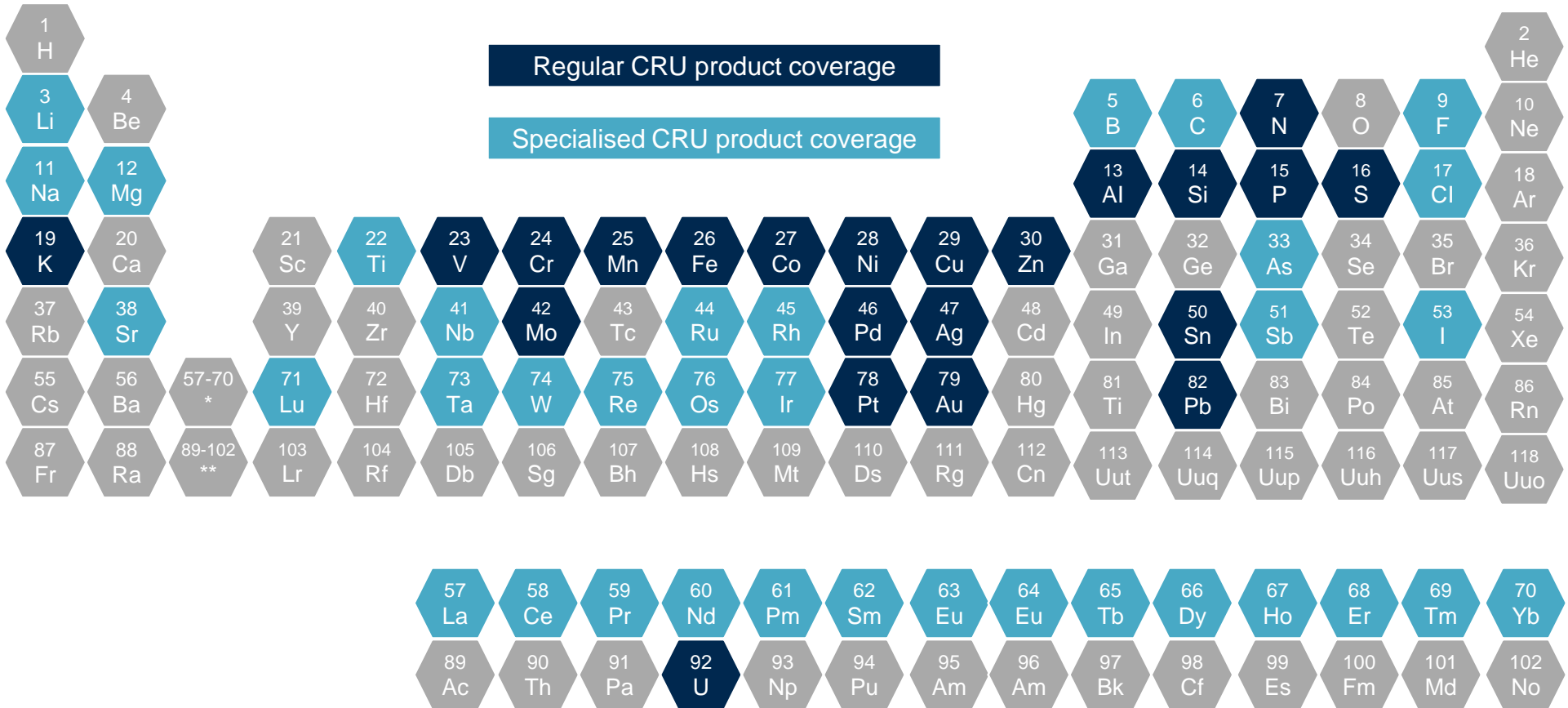
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CRU specialises in mining, metal, and fertilizer commodities delivering business intelligence through analysis, consulting, and events



CRU's multi-commodity expertise

CRU have regular and specialised coverage of a wide range of commodities, and through our Consulting team are able to undertake research into more niche sectors.



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Why are we here today?

Lithium consumption by end use, t LCE

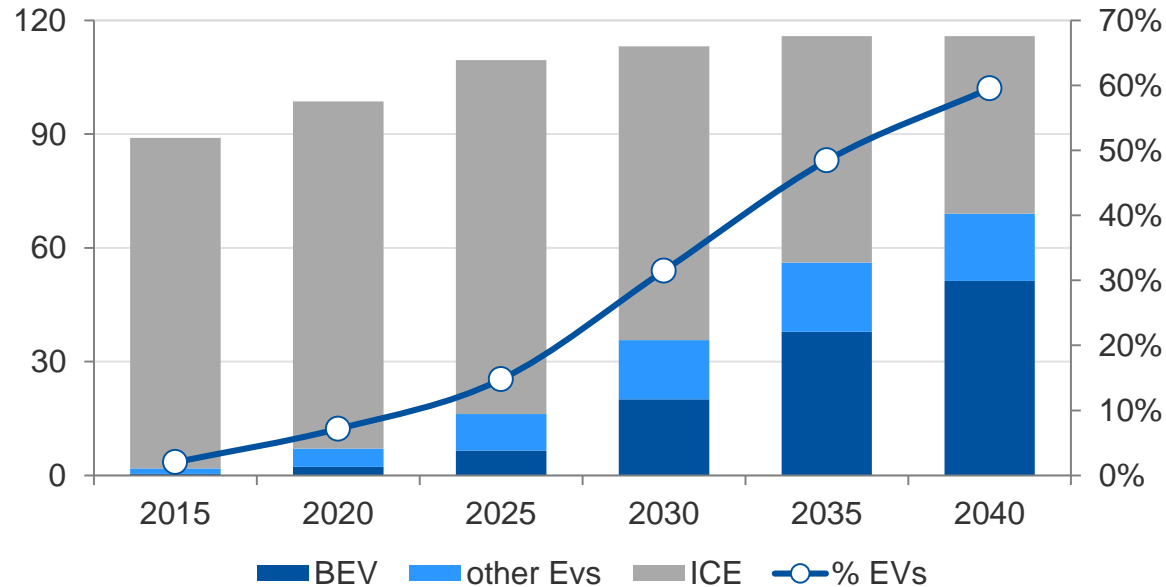
Legend: Glass & Ceramics, Al Smelting, Continuous Casting, Polymer, Lubricants, Air Treatment, Others industrial, xEVs, Portable devices, Other battery, Energy storage



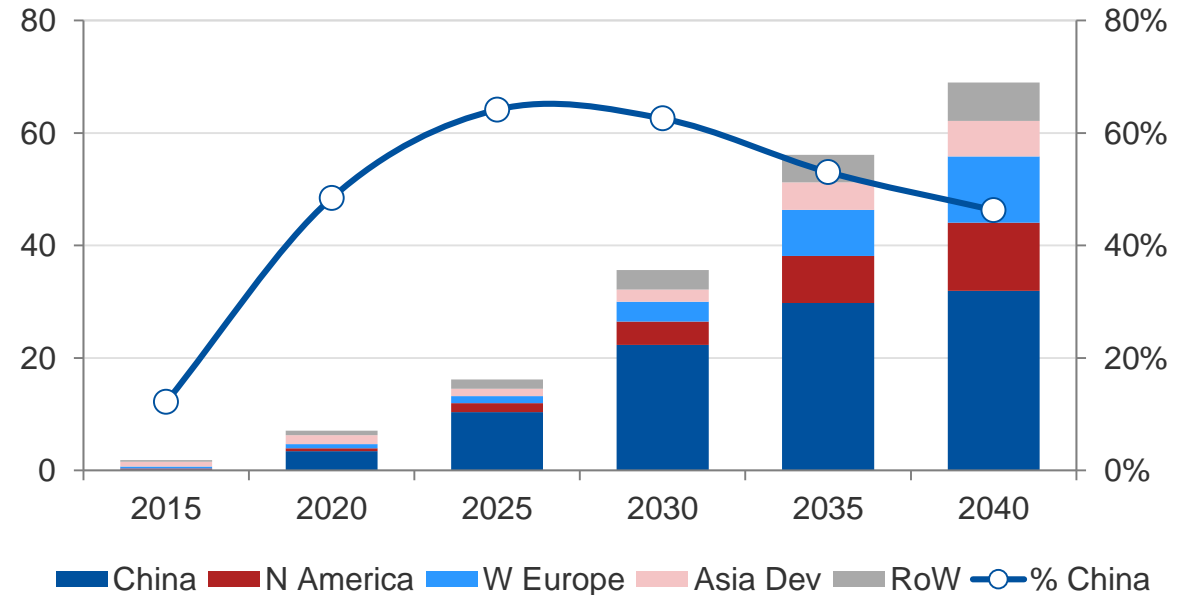
Large scale ramp up in EV adoption expected in mid-2020s

- From mid-2020s total cost of ownership begins to strongly favor EVs in most regions due to battery manufacturing cost declines – in the near term subsidies and other policies are crucial to EV sales
- EV availability remains key barrier to adoption in the short term as evidenced by long wait times for buyers, this will diminish as OEM investments ramp up
- Outlook for EVs highly dependent on China, especially in the short term (weak sales in 2019)

Light vehicle sales by powertrain, global
 Million units (LHS, bar), Market share (RHS, line)

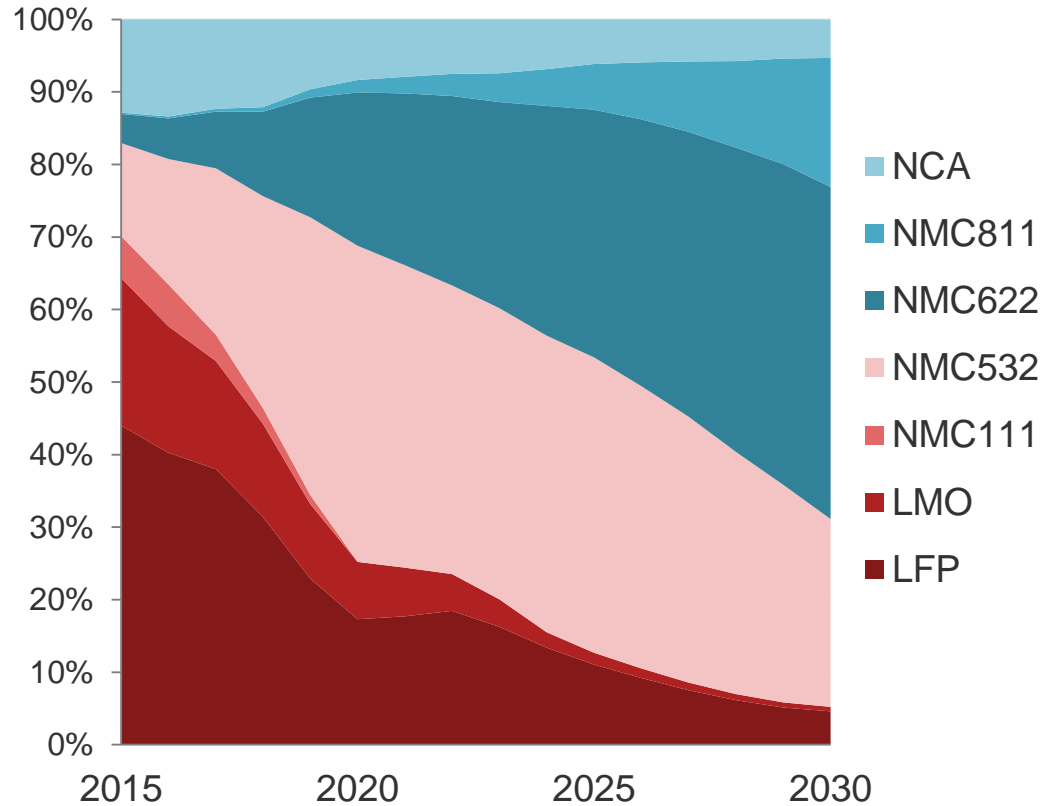


xEVs sales by region
 Million units (LHS, bar), Market share (% China) (RHS, line)

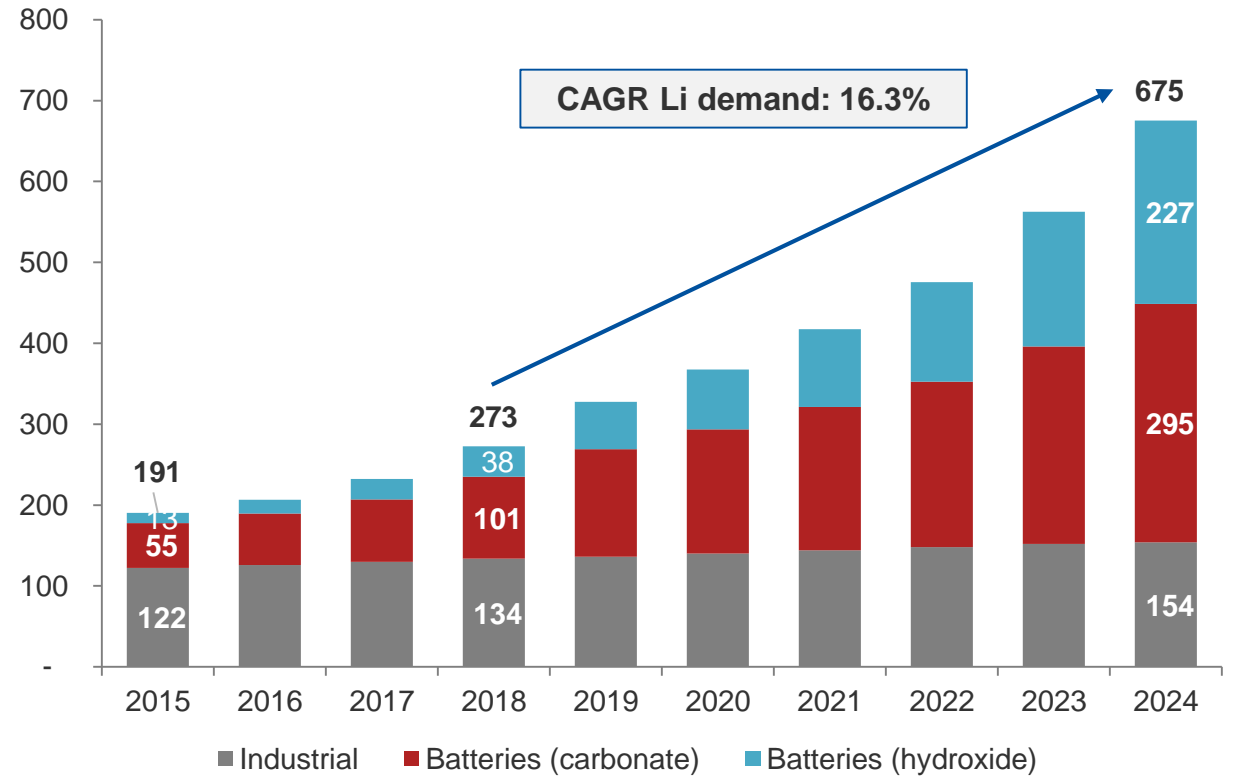


Higher nickel intensity batteries is changing lithium product selection

LDV/HDV/Bus battery demand by cathode type, Percent market share



Lithium demand by application and production type
Thousand tonnes LCE



Hydroxide market to grow >500% by 2024 & could overtake carbonate longer term

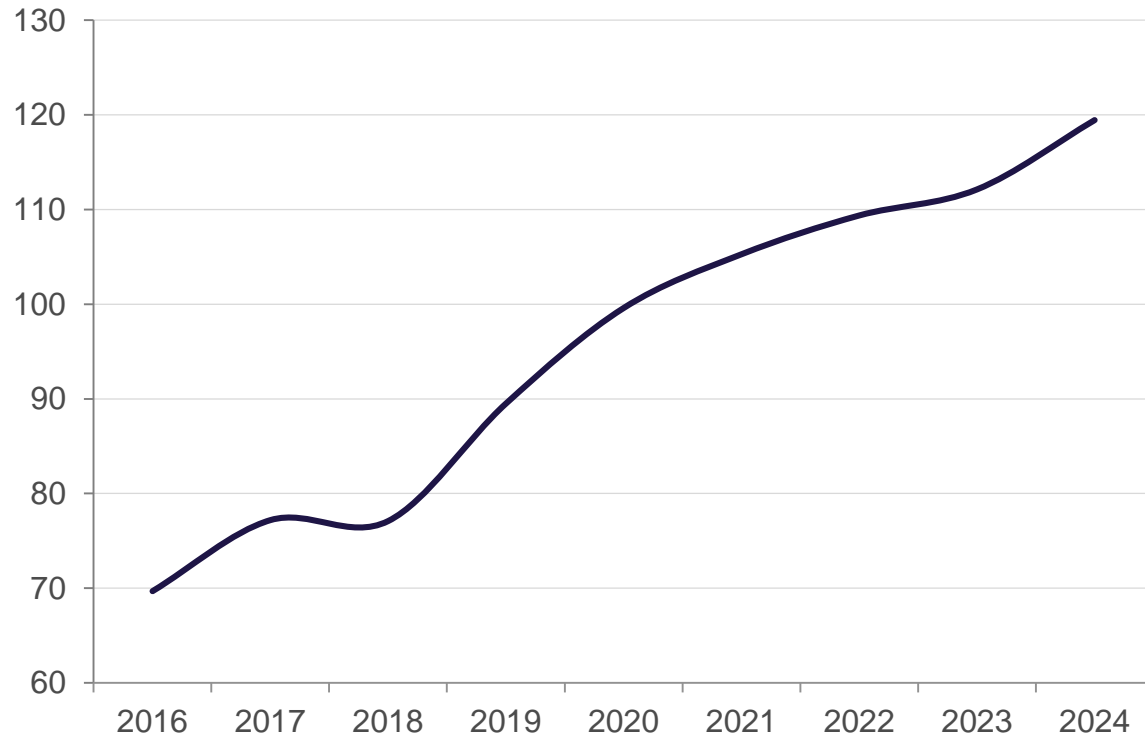
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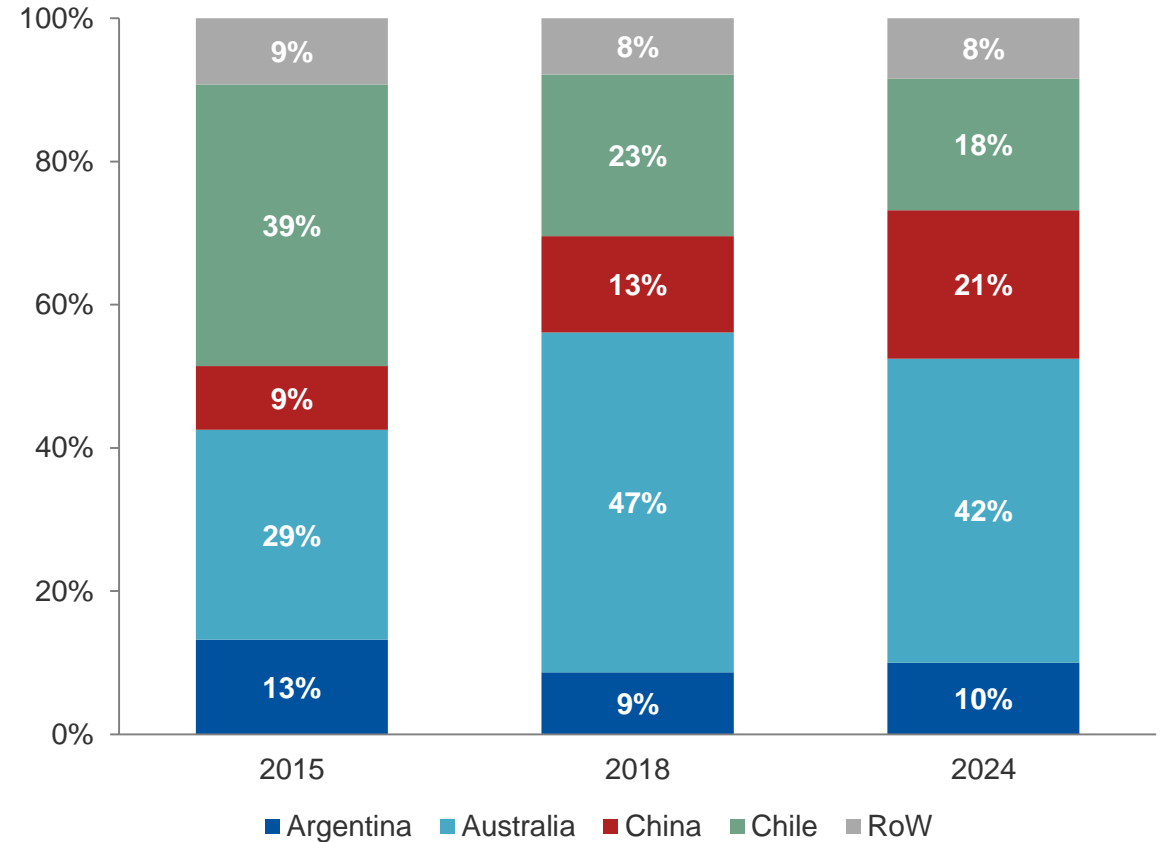
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Chile to increase lithium production by 55% from 2018 till 2024

Chilean mine supply
Thousand tonnes LCE



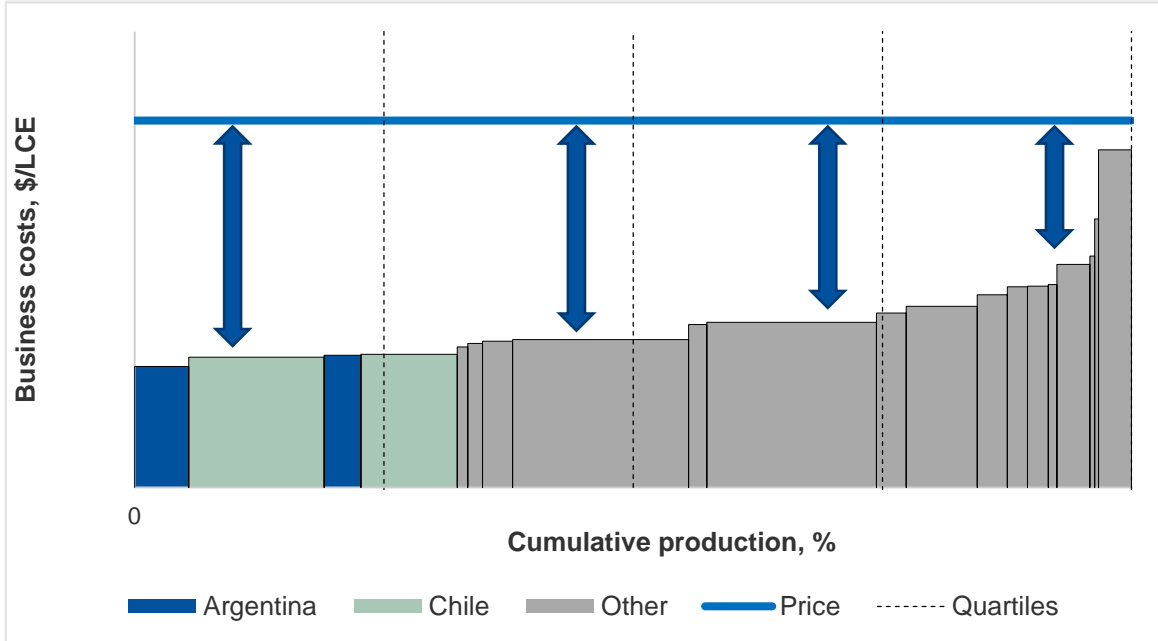
Proportion of mine production by country, selected years
Percent market share



Large expansions in other countries will see Chile's share of mine production decrease though the country remains a leading source of lithium chemical supply

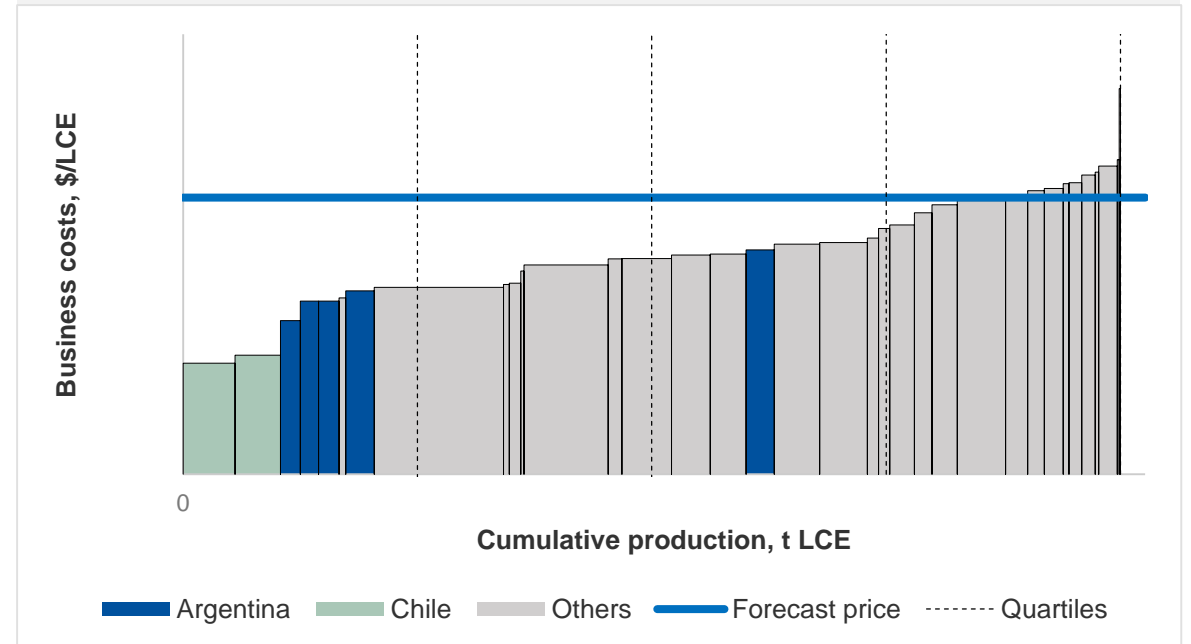
Chilean producers are and will remain highly competitive in carbonate

2018 Lithium carbonate production costs by asset
\$ per tonne, LCE



Unsustainable high margins!

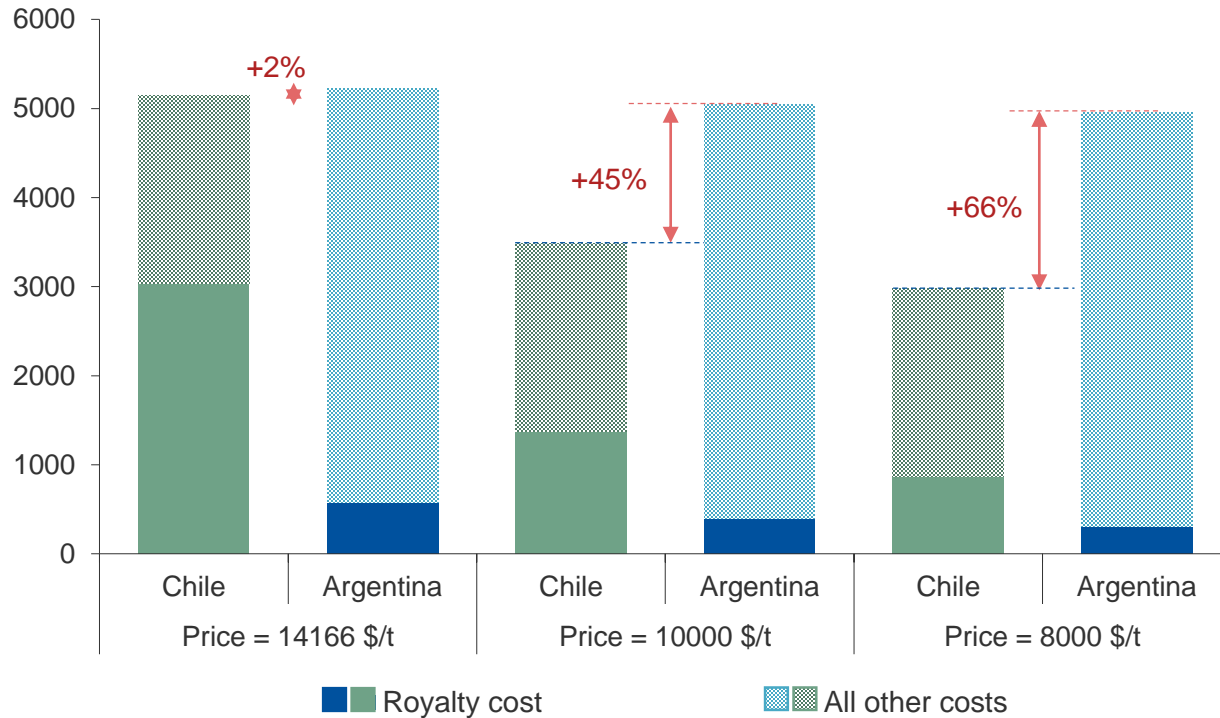
2024 Lithium carbonate production costs by asset
\$ per tonne, LCE



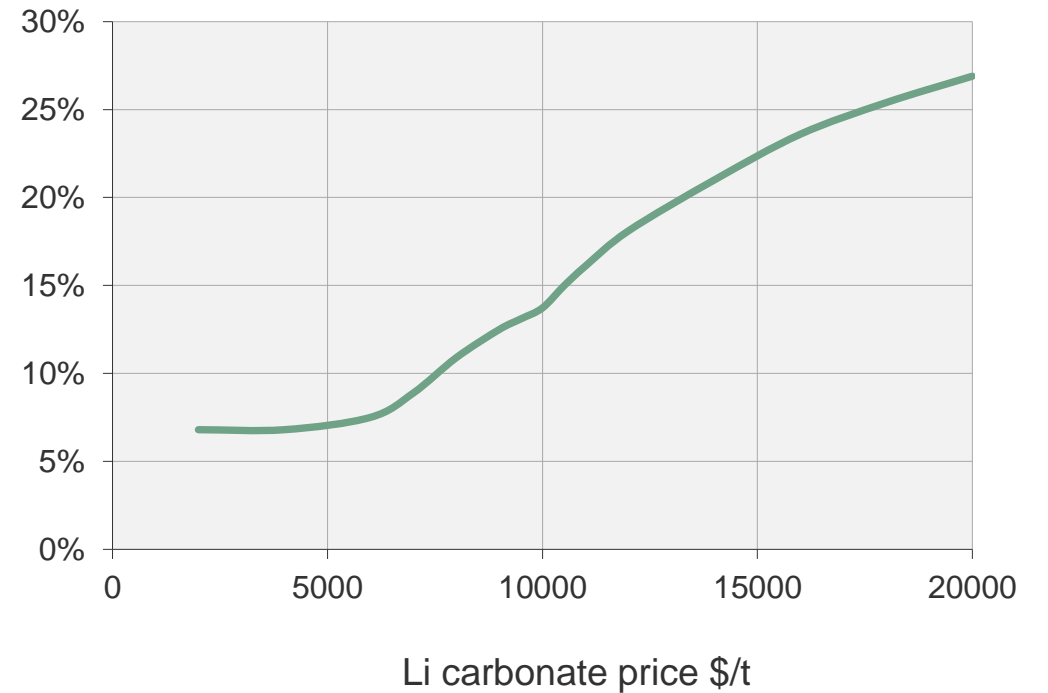
Royalties form a large part of current Chilean operating costs

- The new regime is progressive. As royalties scale with prices **they do not threaten the operations in a weaker price environment** – they will always be at the lower cost end of the cost curve.

Carbonate production costs, US\$/t LCE

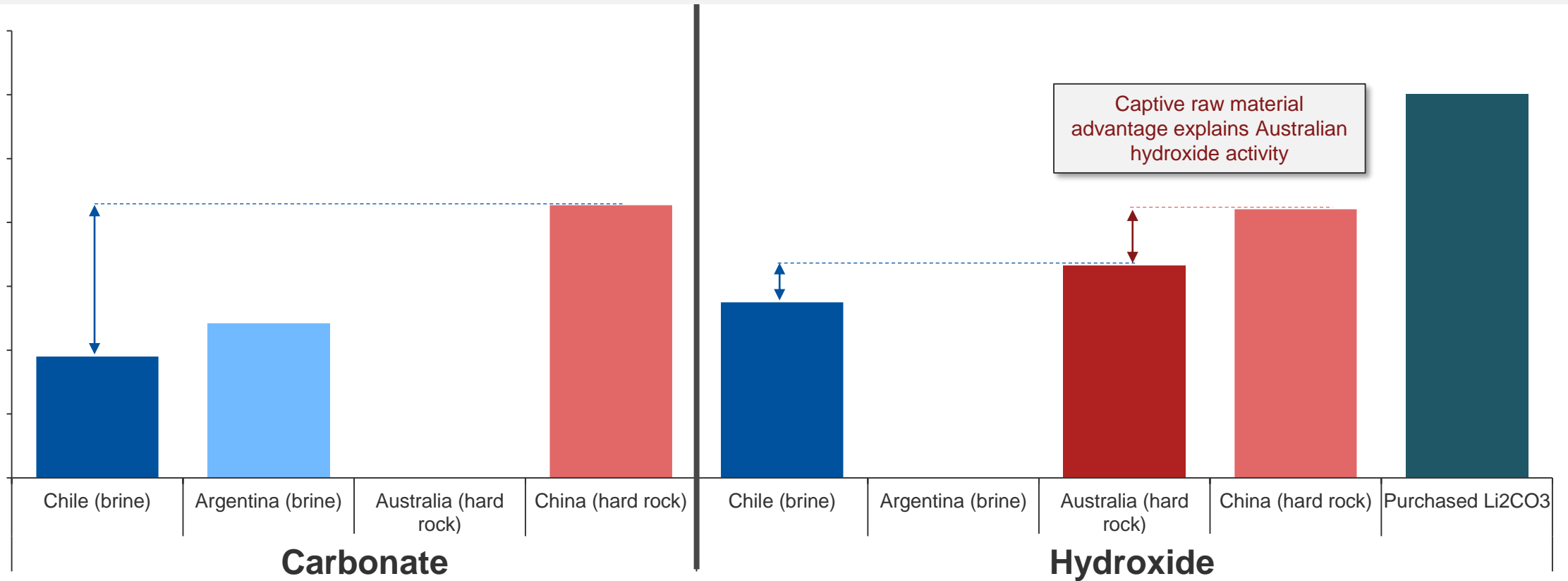


Effective Chilean royalty rate



Brines advantage over hard rock for hydroxide production is far less clear cut

Lithium carbonate and hydroxide processing costs by raw material source (2019)
US\$/t LCE

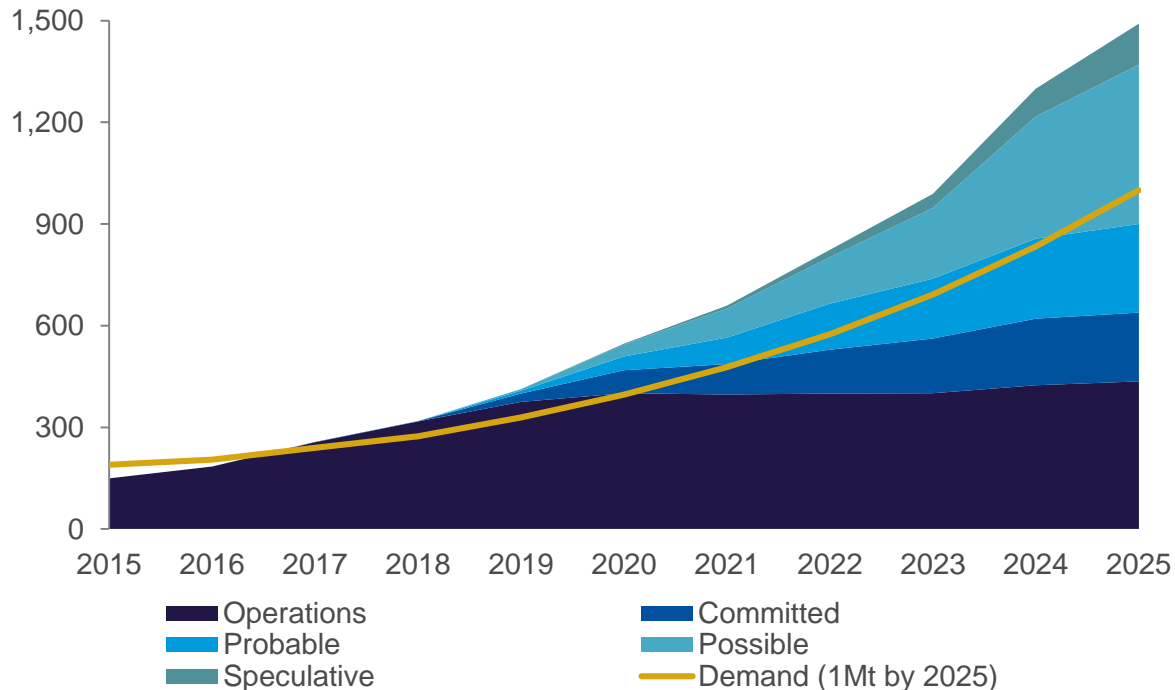


Incremental hydroxide processing costs lower from hard rock compared to brines

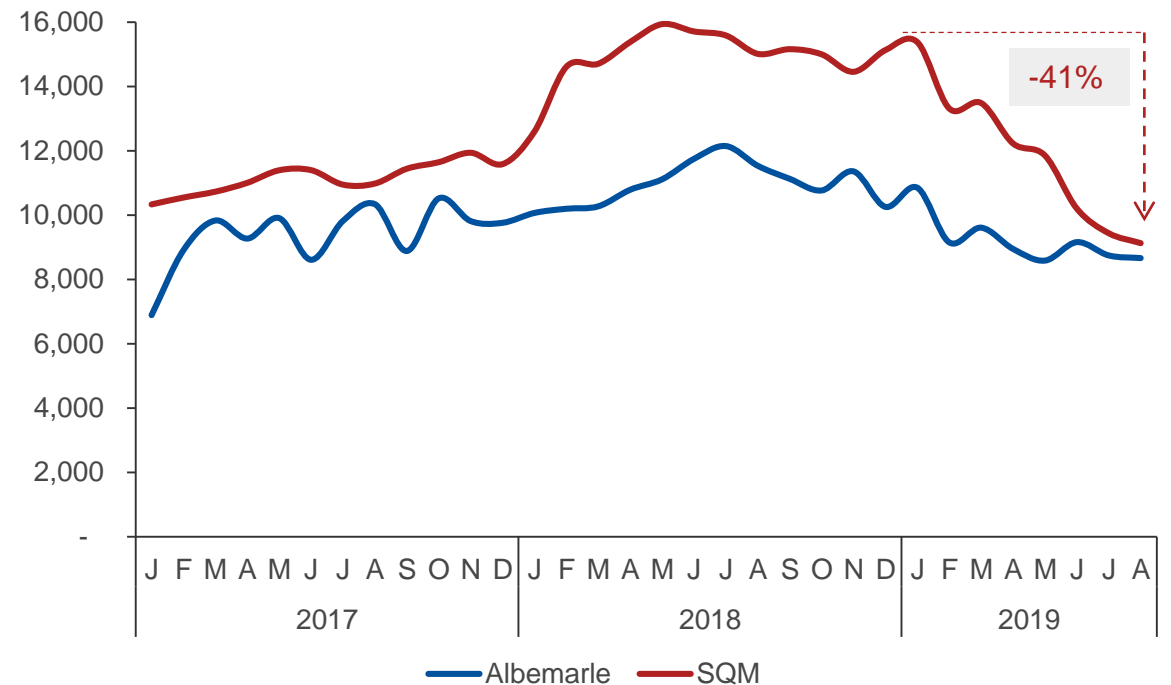
Oversupply could lead to re-prioritization of value over volumes

- Favor lower cost Chilean projects over those elsewhere
- Market size still expected to grow rapidly; would expect to see consumers still looking to secure supplies
- Well-established reputation and reliability are key differentiators

Lithium demand (high scenario) and unweighted supply
Thousand tonnes LCE



Lithium carbonate FOB export prices, Chile
\$ per tonne

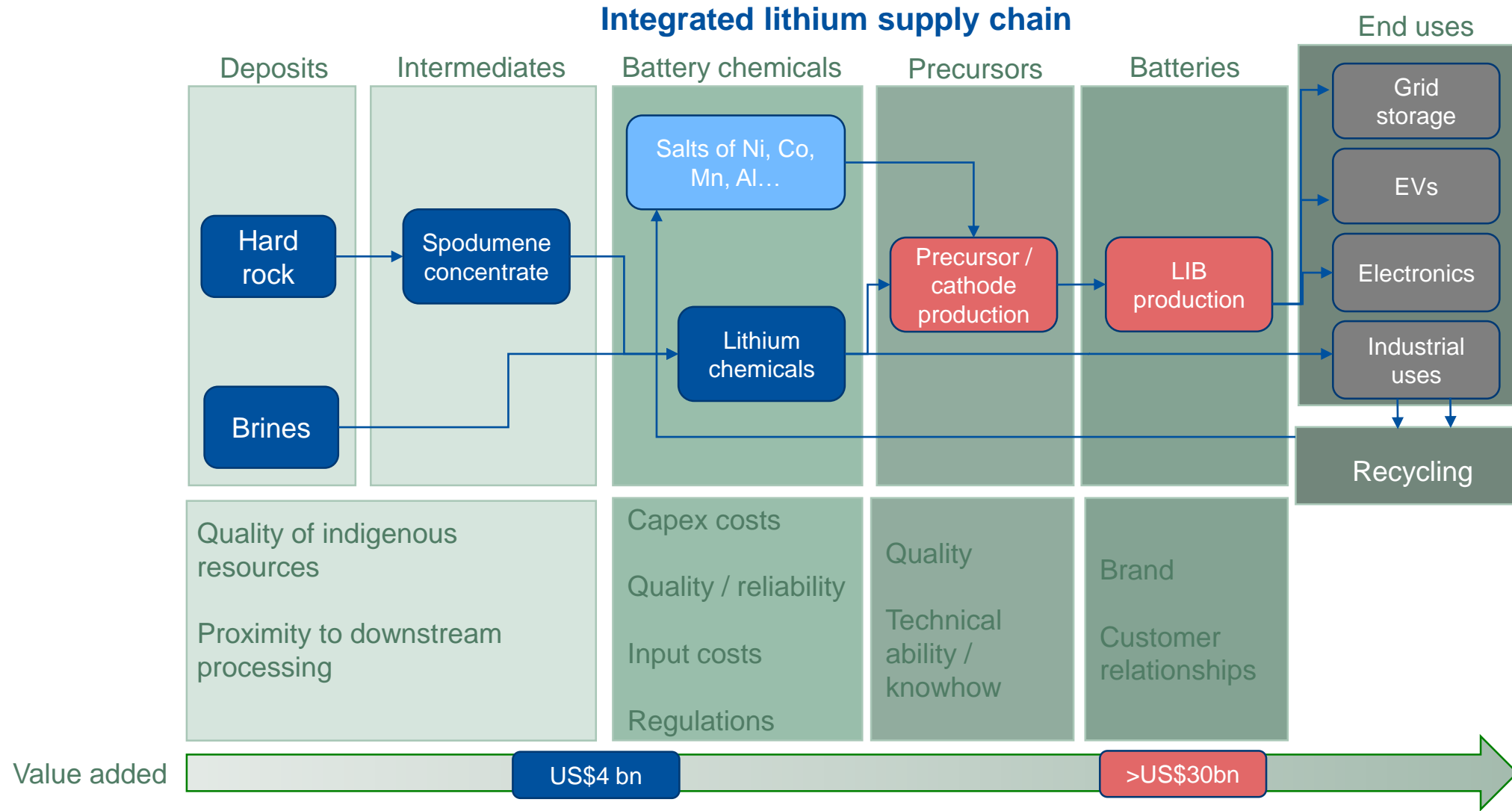


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Downstream investment appealing to producers and governments

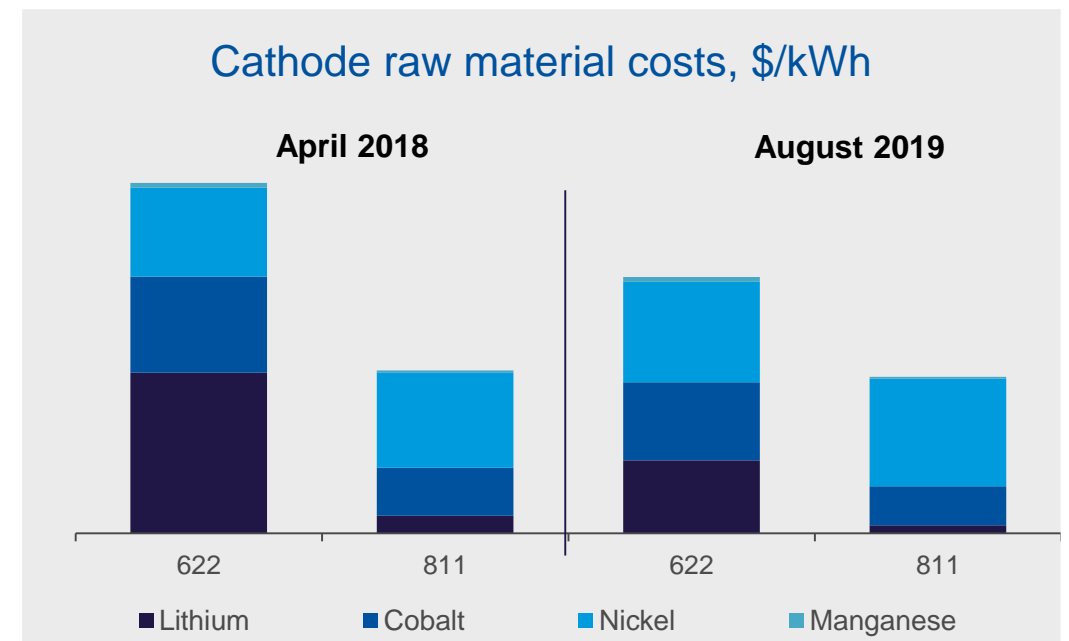


Case study: Chile promoting domestic lithium discounts to encourage downstream investment

- Part of SQM and Albemarle quota expansion agreement involved **obligation to sell lithium carbonate at reduced rates to any producers of battery cathode materials** or other components within Chile.
- Numerous **challenges** remain for downstream investment
 - Lithium is only a relatively small proportion of battery raw material costs (~30% at current prices)
 - Local / low cost access to nickel and cobalt stronger drivers from a cost perspective
 - Competing well-established East Asian supply chain
 - Availability of skilled labor
 - Lack of significant end consuming markets
 - Increasing demand for hydroxide

Outcome

- It will take more than discounted lithium to attract downstream investment in Chile
- Supportive public policy is a necessary condition
- Chile may have an opportunity in Innovation and R&D (e.g. brine processing) – great wealth of experience



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Summary



Market demand buoyant and expected to accelerate in long term, due to EV mass marketisation

Higher nickel intensity batteries favoring lithium hydroxide feedstocks

Latin American dominance in upstream being challenged by supply growth in Australia and China. Chile in good position to expand production.

Potential oversupply and price pressures could restore the competitive advantage for low cost brine producers in the longer term, as could some innovative processing technologies

Value creation opportunities downstream: a complex mix of market, technical and policy conditions required to realize potential. Chile to leverage on existing know-how and experience.



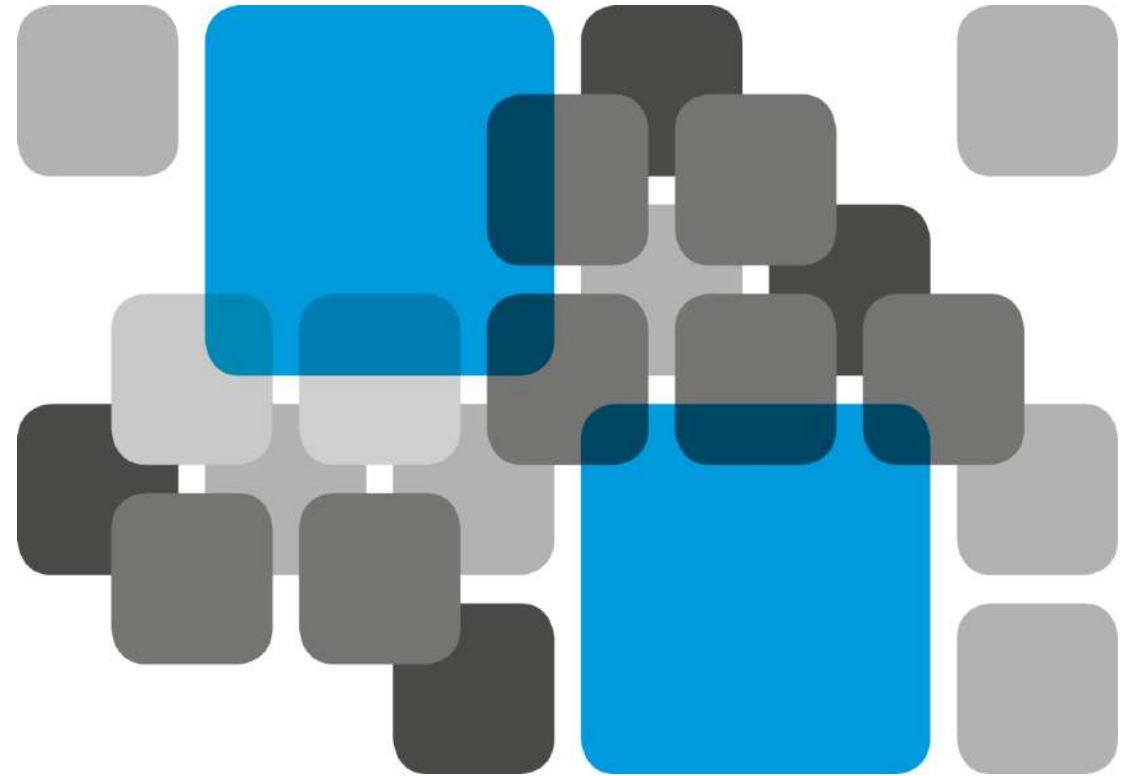
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