

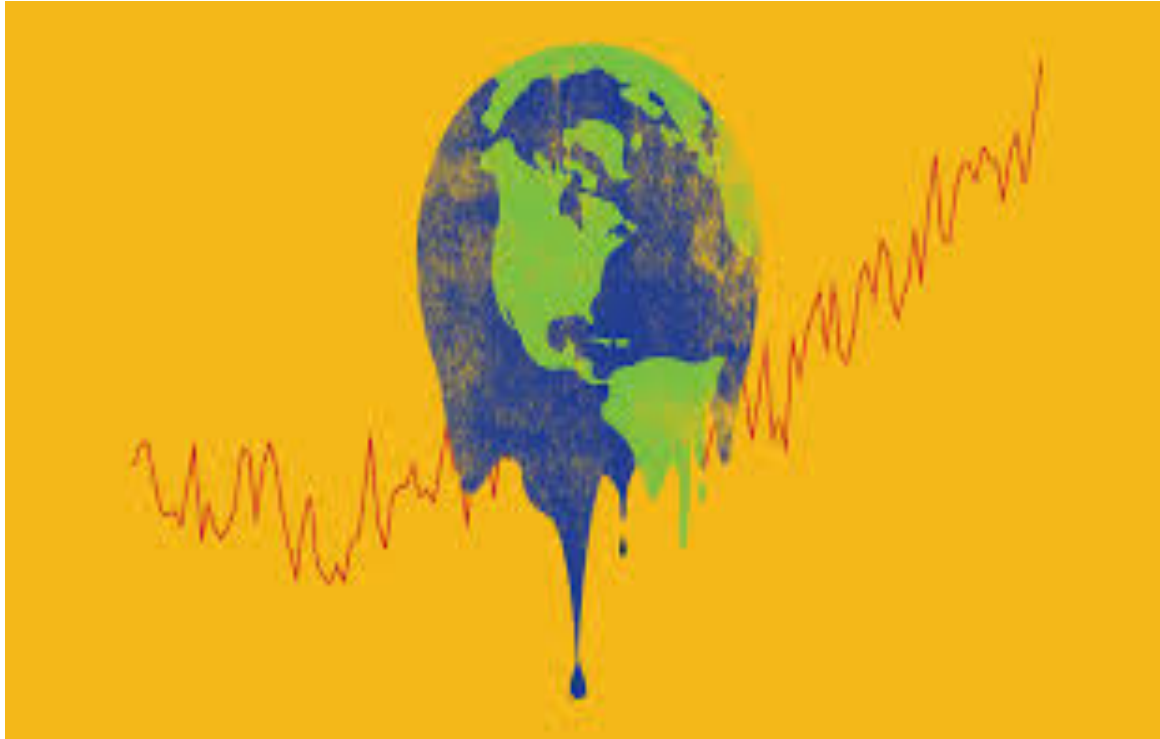
Lithium, its geopolitics and the low-carbon energy transition

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at 10th anniversary Cleanpower Smart
Grids Conference 2019
www.cir-strategy.com/events



I. Climate change and the urgent call for a low-carbon transition

To achieve the 1.5 degrees the world should eliminate by 2050, 42 billion tonnes of carbon dioxide



Renewables should increase their share in energy from 25% today to 70–85% by 2050

Fossil-fuel combustion engines should practically disappear and be replaced by electric vehicles.



II. lithium is an strategic resource at global level



Traditional lithium applications

Ceramics

Pharmaceutical industry

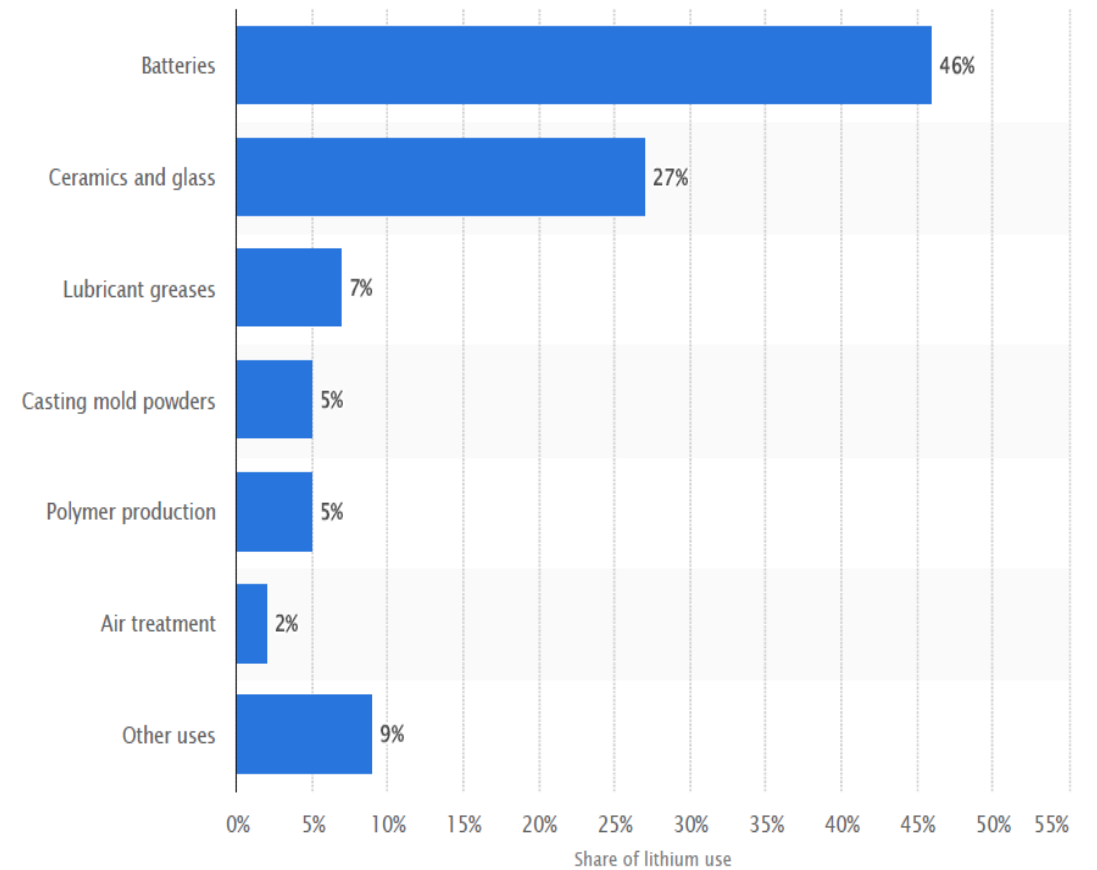
Glass

Non-Traditional applications - Lithium-ion battery

Consumer Electronics

Electric Vehicles

Stationary Energy Storage

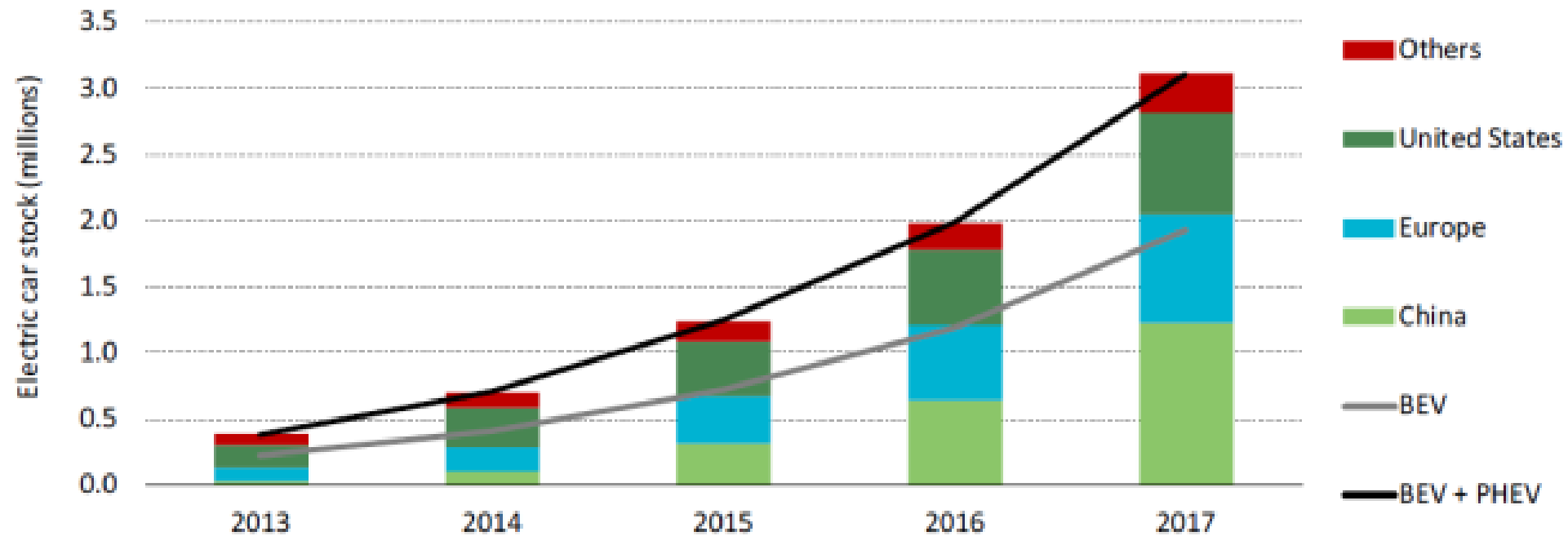


Source: Statista

Global demand of lithium for batteries has increased from 20% in 2008 to 46% in 2017.

Potential market value of 40 billion dollars over the next decade.

Electric Vehicles

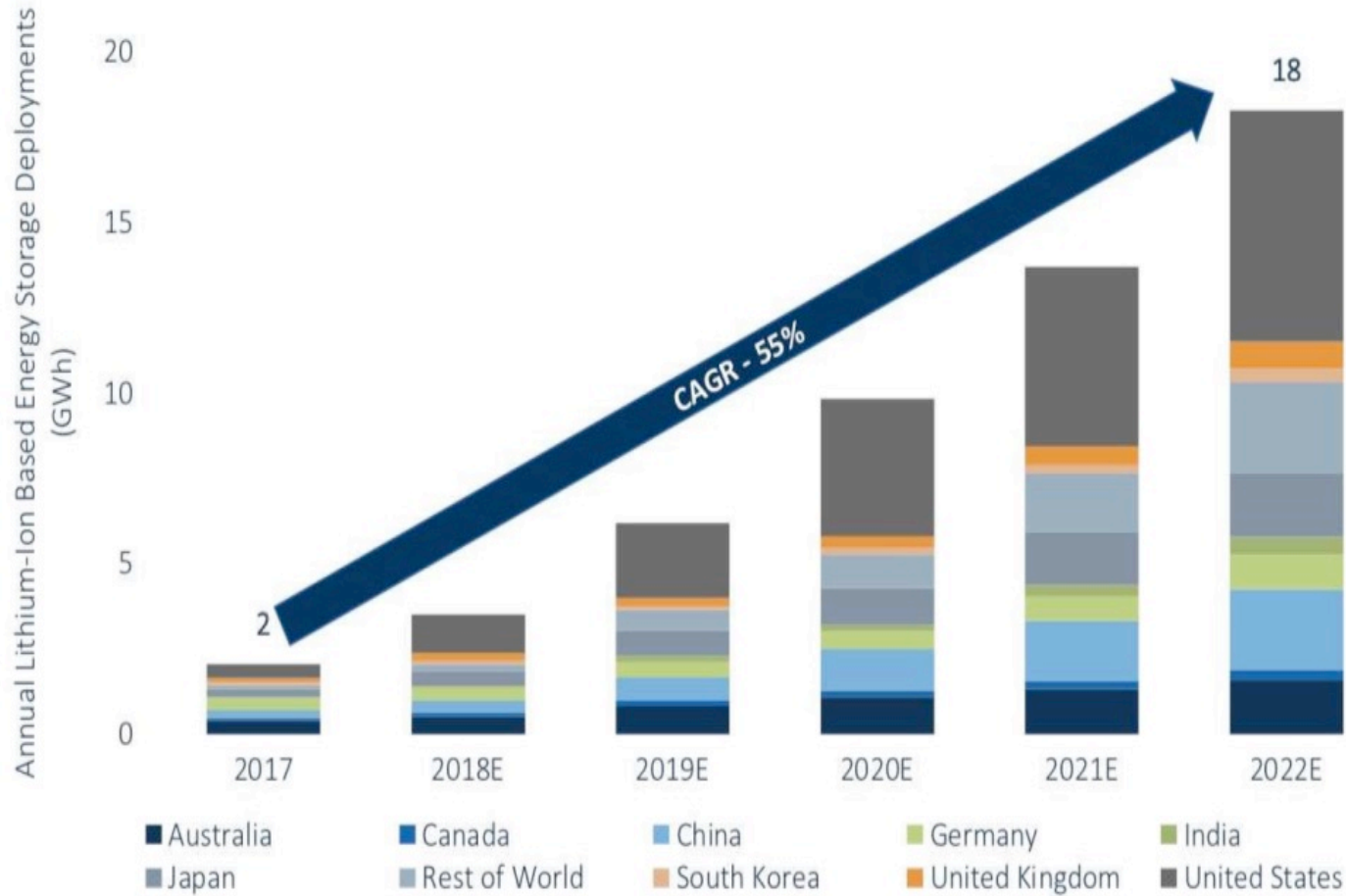


Notes: The electric car stock shown is primarily estimated on the basis of cumulative sales since 2005. Where available, stock numbers from official national statistics have been used (provided that the data can be shown to be consistent with sales evolutions).

Sources: IEA analysis based on country submissions, complemented by ACEA (2018); EAFO (2018a).

Battery Energy Storage Systems (BESS's)

Annual Lithium-Ion Energy Storage Deployment Forecast, 2017-2022E (GWh)



Source: GTM Research Data Hub, Energy Storage Data Hub

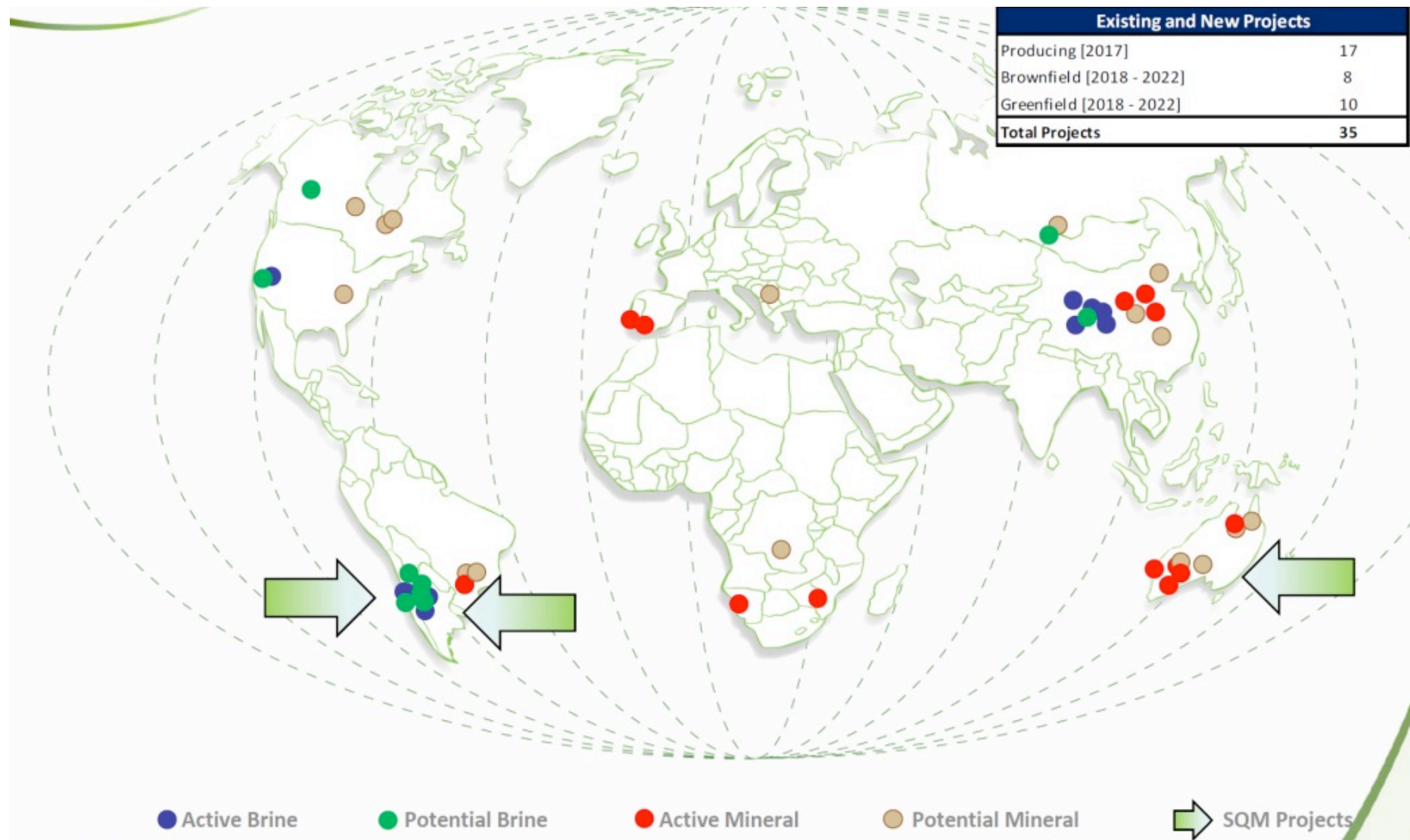


The world's largest lithium ion battery dispensing power into an electricity grid
Jamestown, South Australia



III. Reshaping the geopolitical map and the emergence of China as a renewable superpower

Geographic, corporate and manufacturing concentration



- ✓ Geographic concentration (Australia, Chile Argentina).
- ✓ Corporate concentration of extraction: Tianqui, SQM FMC, Albermarle.
- ✓ Battery manufacturing concentration: Asia (China, Japan and Korea).

The lithium triangle in South America



- ✓ The links between technological and geopolitical drivers for accessing strategic resources
- ✓ “Renewable superpowers” such as China.



- YLB – Salar de Uyuni
- Public-private partnership: YLB-ACI Systems GmbH

% of world production (2018) Bolivia: 0% - Estimated production to date: 60 tonnes of LCE

- SQM – Salar de Atacama
- Albemarle – Salar de Atacama
- Proyecto Codelco (Maricunga)

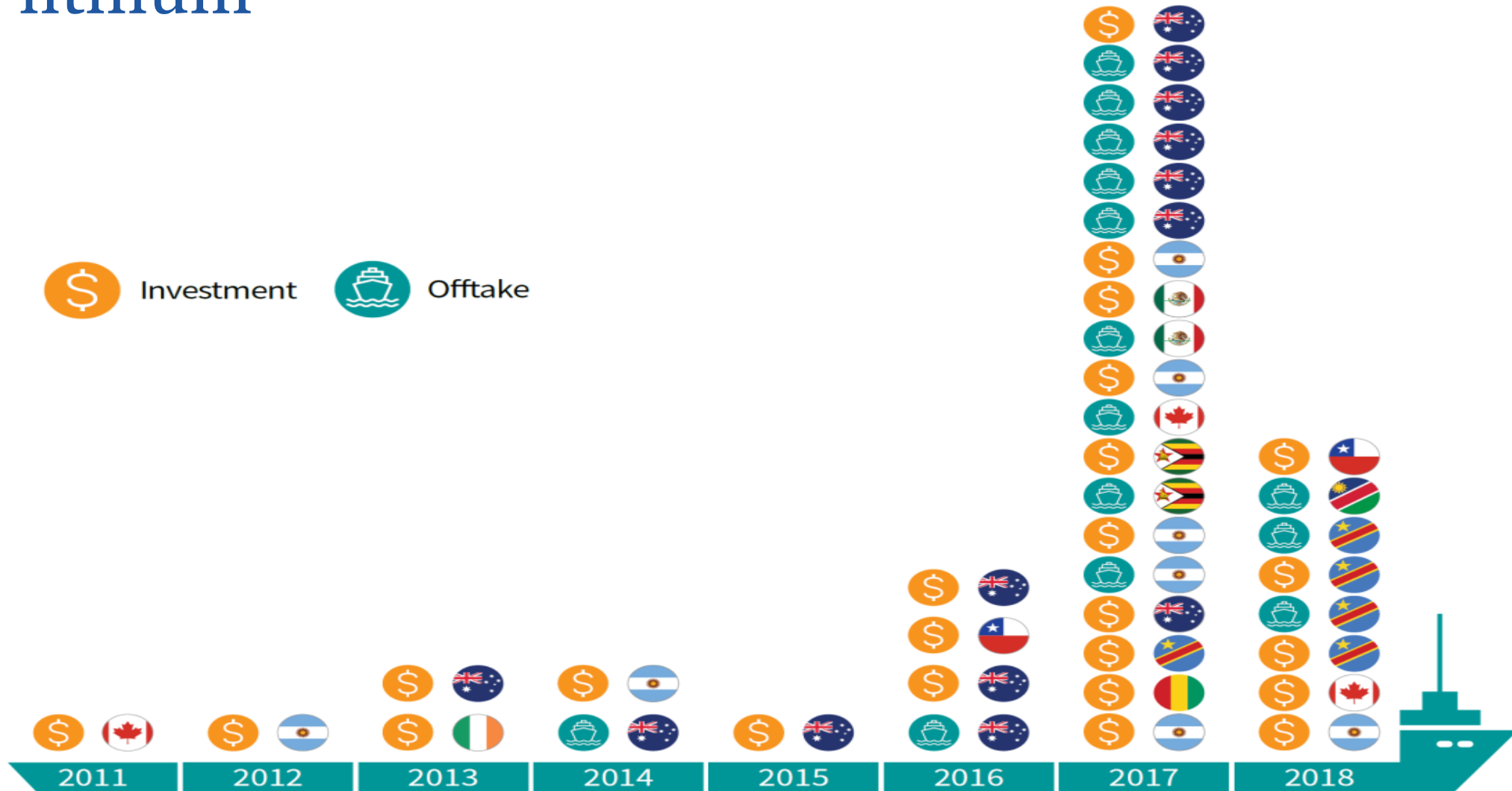
- FMC – Salar de Hombre Muerto
- Orocobre - Salar Olaroz
- New projects:
 - Lithium Americas/SQM/JEMSE – Salar Cauchari
 - Galaxy Resources – Salar de Hombre Muerto
 - Enirgi Group – Salar del Rincon
 - 5 projects in advanced exploration.
 - 12 projects in initial exploration
 - 17 projects in prospection

% of world production (2018) Argentina: 14% - 37,500 tonnes LCE

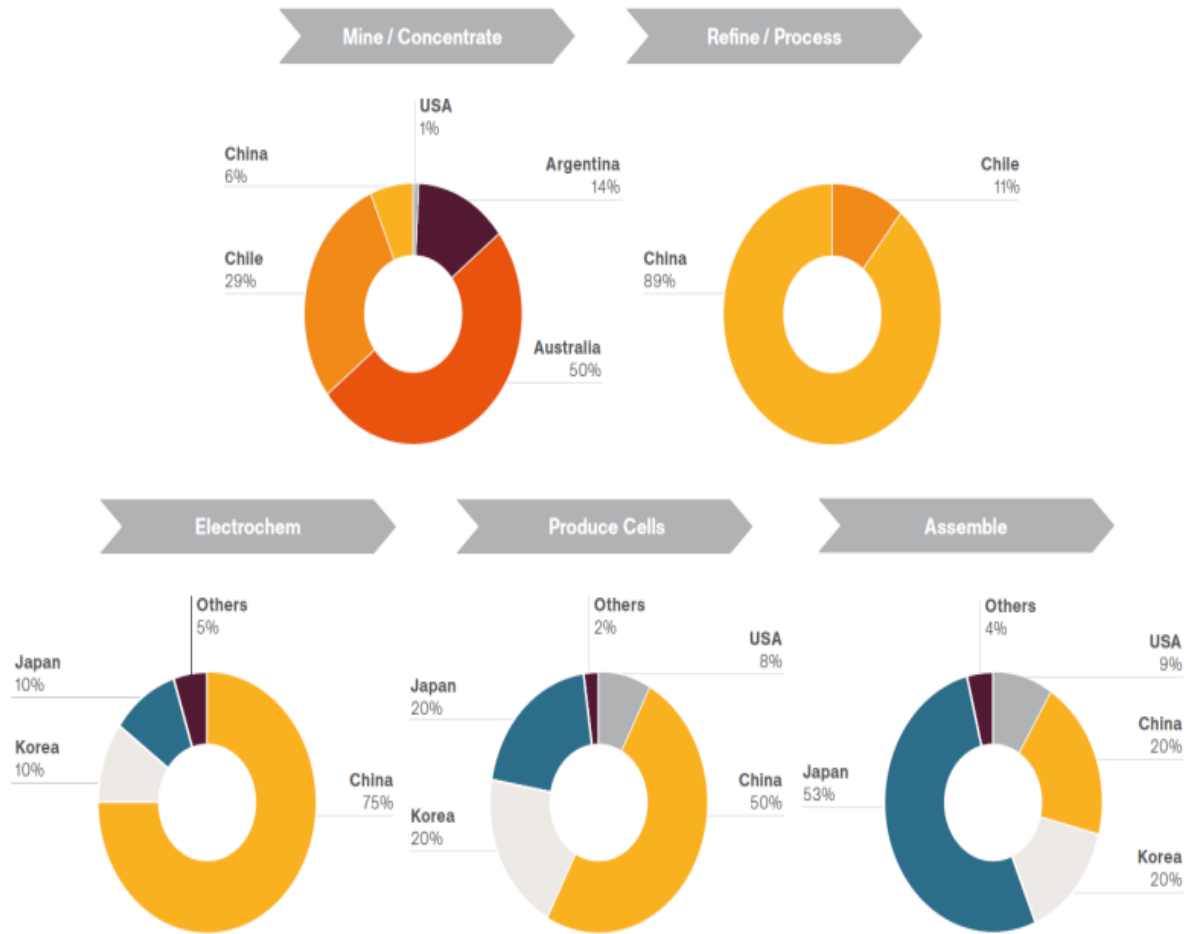
% of world production (2018) Chile: 37% - 98,000 tonnes LCE

Transnational links:
USA, China, Australia, Germany, Canada

China's strategy: securing existing and future sources of lithium



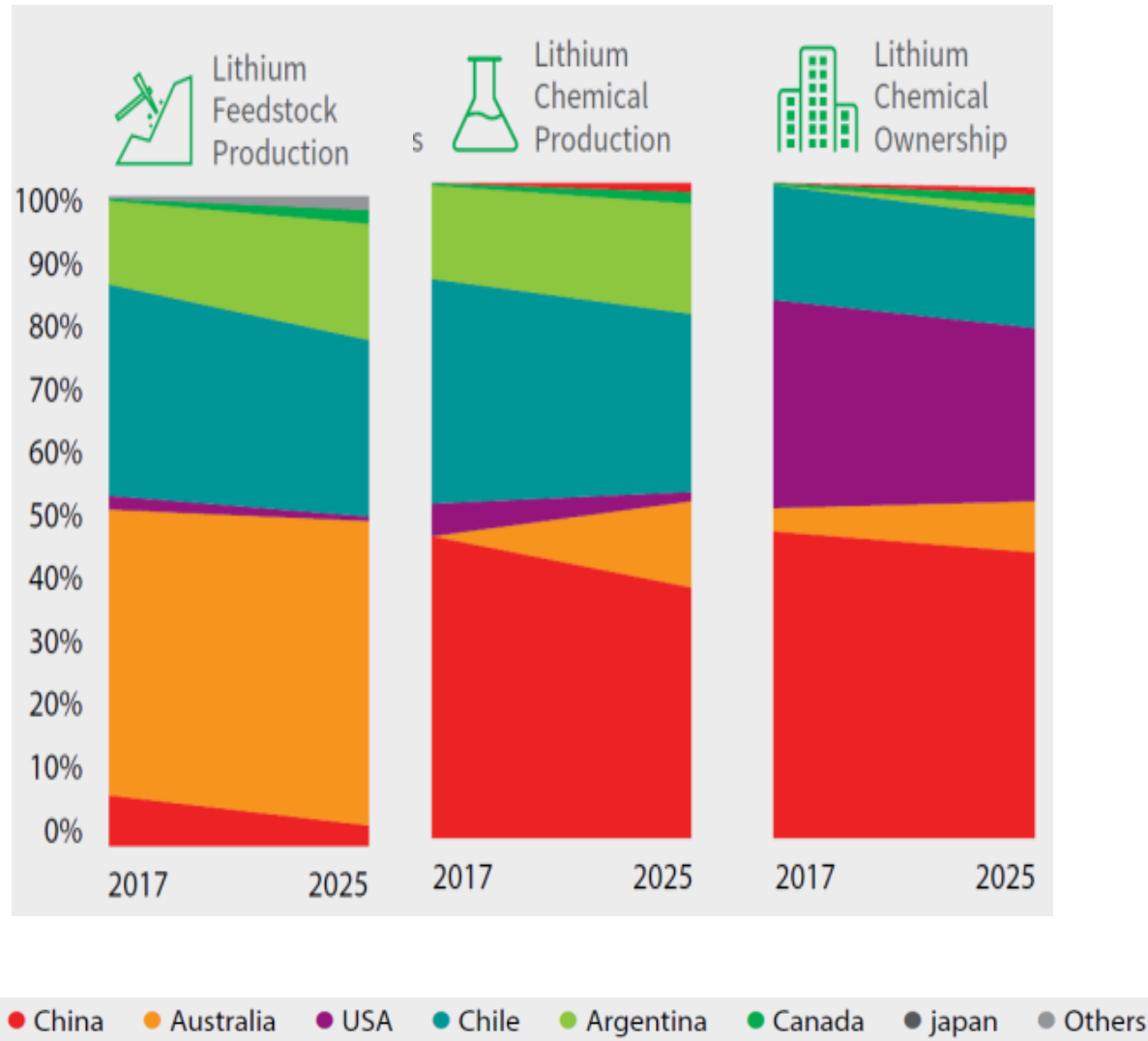
The global leadership of China



Raw material	Main producers (2014-2015)	Main sources of imports into the EU (mainly 2012)	Substitutability index	End-of-life recycling input rate
Critical raw materials used in Li-ion batteries				
Cobalt	Democratic Republic of Congo: 51 % China: 6 % Russia: 5 % Canada: 5 % Australia: 5 %	Russia: 96 % (cobalt ores and concentrates) USA: 3 % (cobalt ores and concentrates)	0.71	16 %
Natural graphite	China: 66 % India: 14 % Brazil: 7 %	China: 57 % Brazil: 15 % Norway: 9 %	0.72	0 %
Silicon metal	China: 68 % Russia: 8 % USA: 5 % Norway: 4 %	Norway: 38 % Brazil: 24 % China: 8 % Russia: 7 %	0.81	0 %
Non-critical raw material used in Li-ion batteries				
Lithium	Australia: 41 % Chile: 36 % Argentina: 12 % China: 7 %		n.a.	n.a.

Source: Lebedeva et al (2016)

Who really controls lithium?

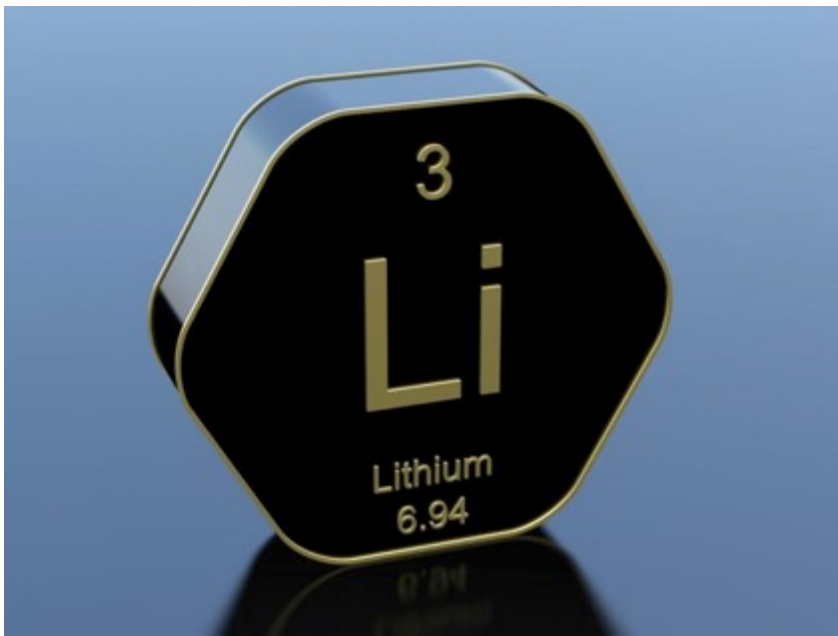


China accounts for only 7% of lithium extraction, but controls 48% of lithium chemical production and 62% of lithium-ion battery capacity

China is also the largest EV producer today.



IV. Towards a geopolitical ecology of lithium



The South American lithium triangle is now a strategic location with different actors interested in extracting its lithium with socio-environmental effects at local levels.

How will the geopolitical map change as lithium starts to replace oil as the world's most coveted energy commodity?

The rise of China and a non-Western global power structure



THANK YOU!



Dissimilar contexts and governance frameworks

	Chile	Bolivia	Argentina
Human Development Index	Very High human development (0.843)	Medium Human development (0.693)	Very High human development (0.825)
GDP	271 billion (US\$)	28 billion (US\$)	460 billion (US\$)
Share of manufactured exports	67%	29%	76%
Competitive Industrial Performance	51/150	98/150	50 /150

Source: UNIDO data base

Chile

Bolivia

Argentina