

# LiB Supply Chain Key Bottlenecks

Why recycling matters.

Joe Bush, PhD

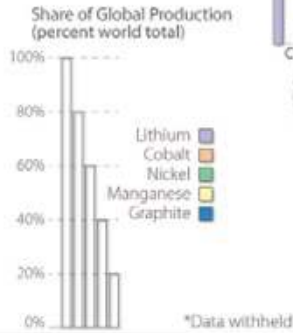
Vice President of Business Development



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# One Earth



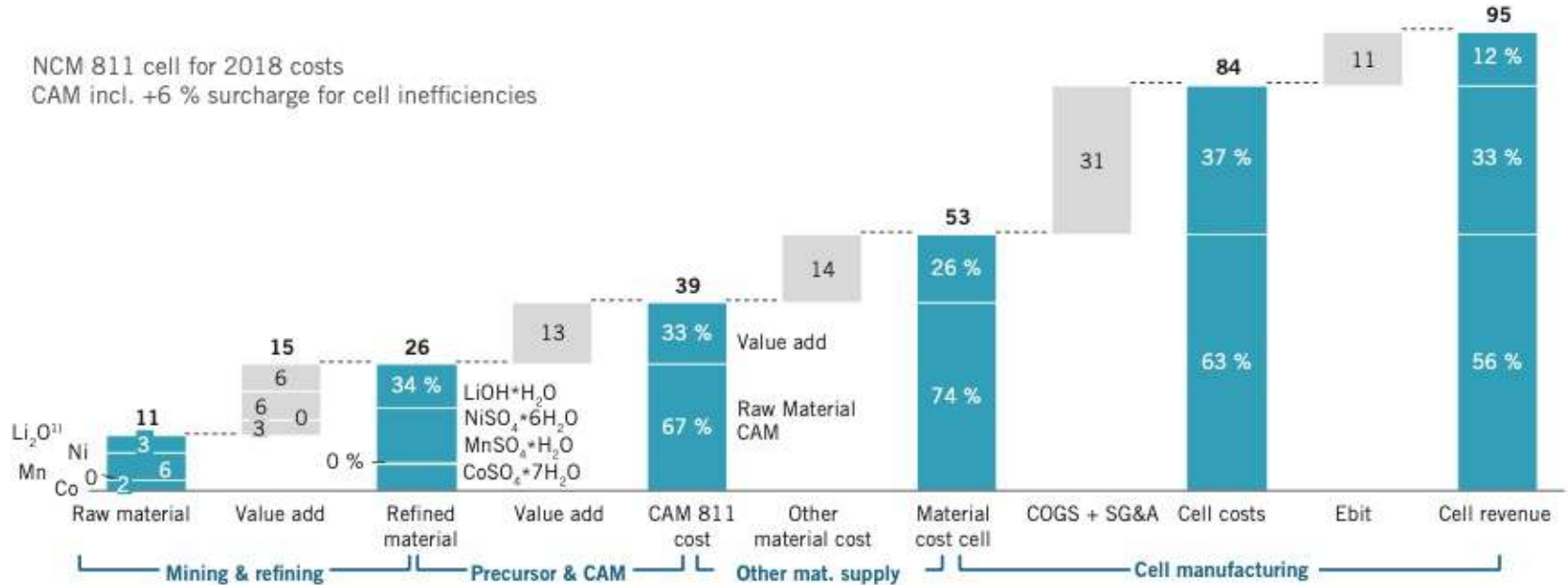
In 2016, 32 countries accounted for all global production of key NMC materials

- **35,000 tonnes of lithium:** 41% Australia 34% Chile
- **1.2 million tonnes of natural graphite :** 65% China, 14% India
- **2.25 million tonnes of nickel:** 22% Philippines, 11% Russia, 11% Canada, 9% Australia
- **18,000 tonnes of manganese:** 34% South Africa, 17% China, 16% Australia
- **123,000 tonnes of cobalt:** 54% Democratic Republic of Congo

Source:  
*The Case for Recycling: Overview and Challenges in the Material Supply Chain for Automotive Li-ion Batteries, National Renewable Energy Laboratory, 2018*

# Focus on the Value

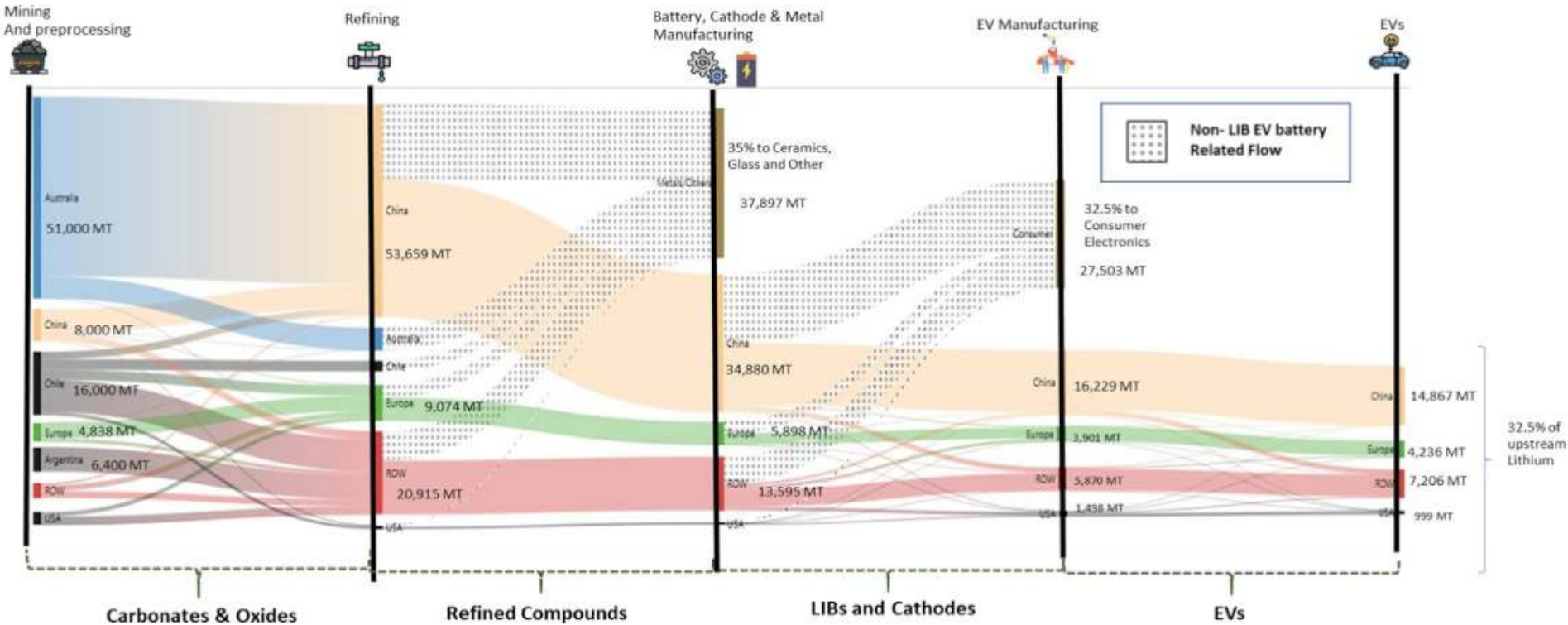
NCM 811 cell for 2018 costs  
CAM incl. +6 % surcharge for cell inefficiencies



<sup>1)</sup> Lithium Spodumene Concentrate 6 %

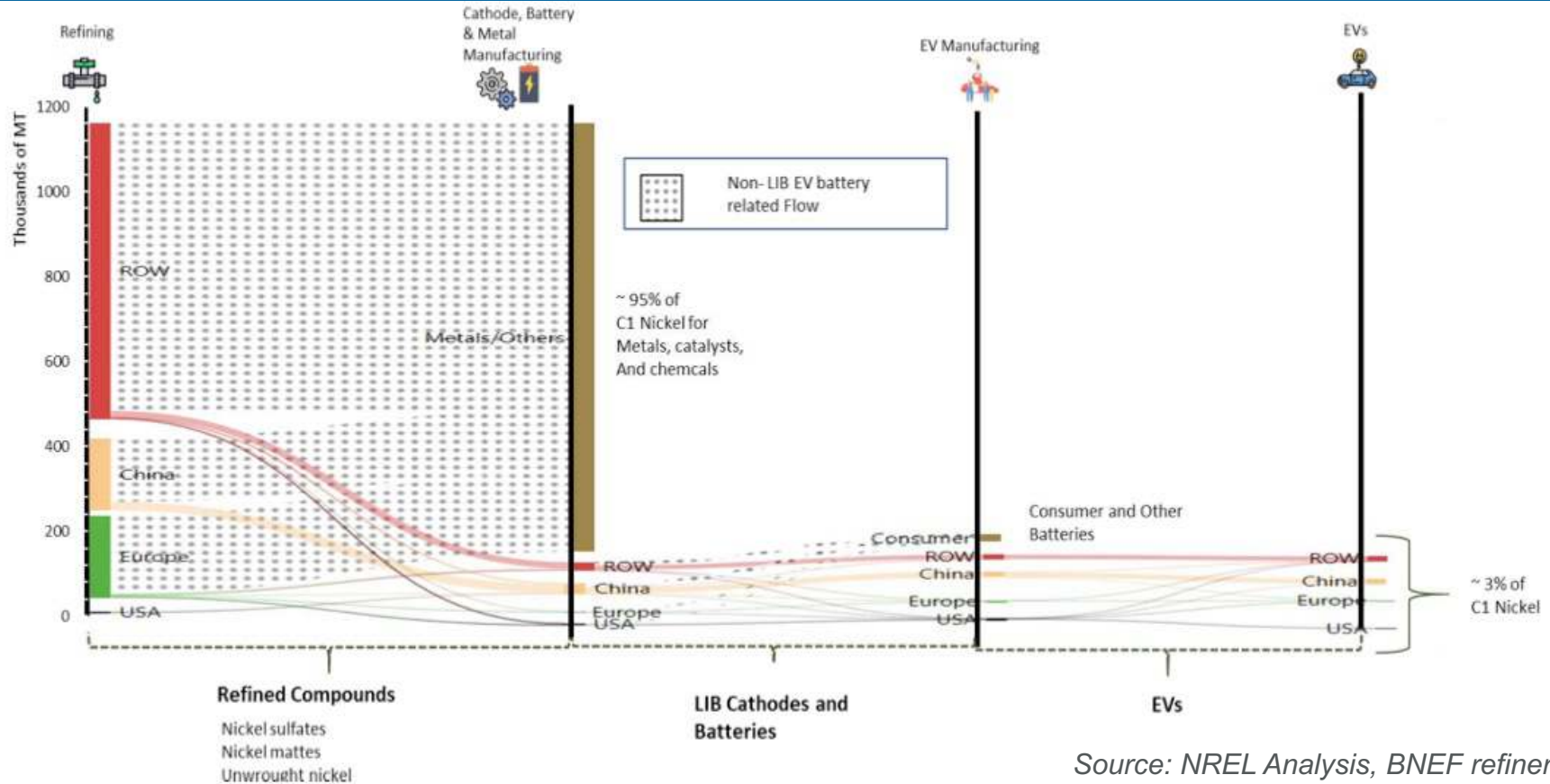
COGS = Cost of Good Solds; SG&A = Selling, General and Administrative Expenses; CAM = Cathode Material

# Lithium Refining

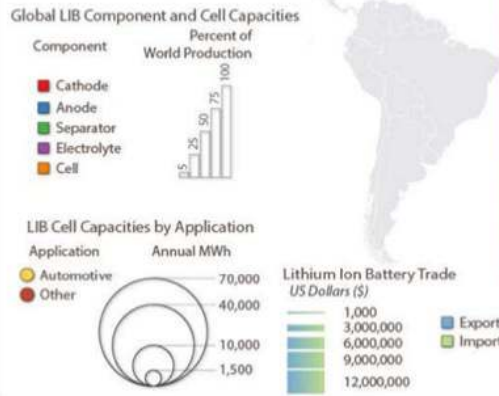
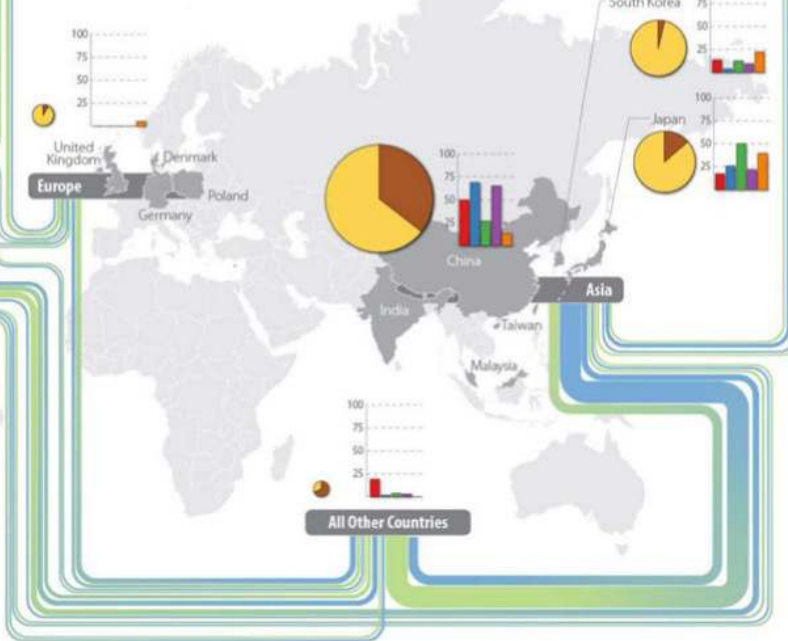


Source: NREL Analysis, BNEF refineries

# Nickel Refining



# Active Material



	LIB Cell Capacities by Application			
	Total LIB Manufacturing Capacity (MWh)	Share of Total Capacity	Automotive LIB Manufacturing Capacity (MWh)	Share of Total Capacity
China	118,234	62.3%	50,670	44.3%
Japan	22,479	11.8%	19,414	17.0%
S. Korea	18,547	9.8%	17,874	15.6%
U.S.	24,766	13.1%	22,016	19.2%
E.U.	2,626	1.4%	2,400	2.1%
Rest of World	3,110	1.6%	2,110	1.8%
<b>Total</b>	<b>189,762</b>	<b>100%</b>	<b>114,484</b>	<b>100%</b>

Note: Automotive manufacturing capacities were calculated based on the total production capacity of the studied facilities that make batteries for autos. Some of these facilities make batteries for autos and other applications.

Source: BNEF 2015, International Trade Center 2015



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