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# **The road to profitability in the North American battery supply chain**

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NAATBatt 2025



# Why the economics matter – key challenges in the global battery industry



**Overcapacity** across the supply chain, resulting in pullback of investments



**Cost reduction** efforts because of shrinking margins and intensifying competition



**Diversification** into new markets, driven by rising protectionism and domestic competition

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# Basics of cost-effectiveness in the battery supply chain

## Upstream: Raw materials

- Resource/reserve feasibility
- Location
- Policy & stakeholder support
- Project execution

## Midstream: Refined chemicals & Electrode materials

- Process control
- Feedstock cost

## Downstream: Battery cells

- Manufacturing excellence
- Location





# After basic prerequisites, differentiators offer additional advantages

## Upstream: Raw materials

- Resource/reserve feasibility
- Location
- Policy & stakeholder support
- Project execution
- Integration

## Midstream: Refined chemicals & Electrode materials

- Process control
- Feedstock cost
- Technical innovation
- Location
- Business model
- Price premium

## Downstream: Battery cells

- Manufacturing excellence
- Location
- Feedstock control
- Technical innovation
- Price premium



# How are incumbent manufacturers achieving cost-effectiveness?

Manufacturing excellence is the basic foundation for all companies



Factory yields & automation



Technical innovation



Vertical integration



Midstream price pressure



Upstream cost reduction



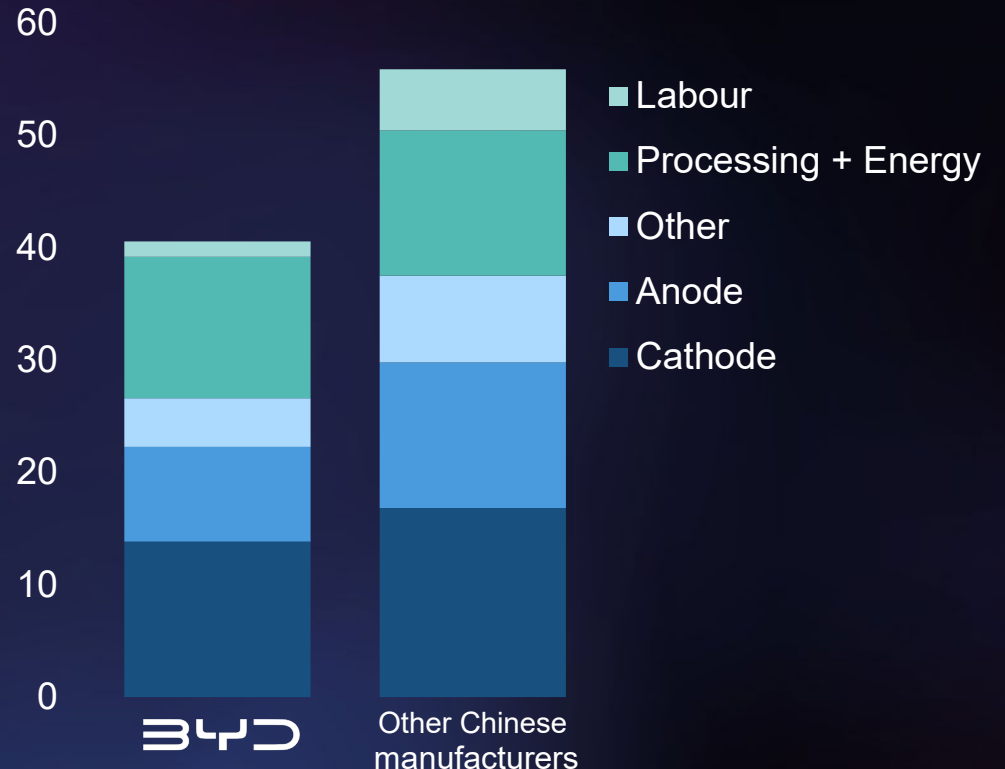
Capex leverage



Industrial ecosystem

Top manufacturers are in a league of their own

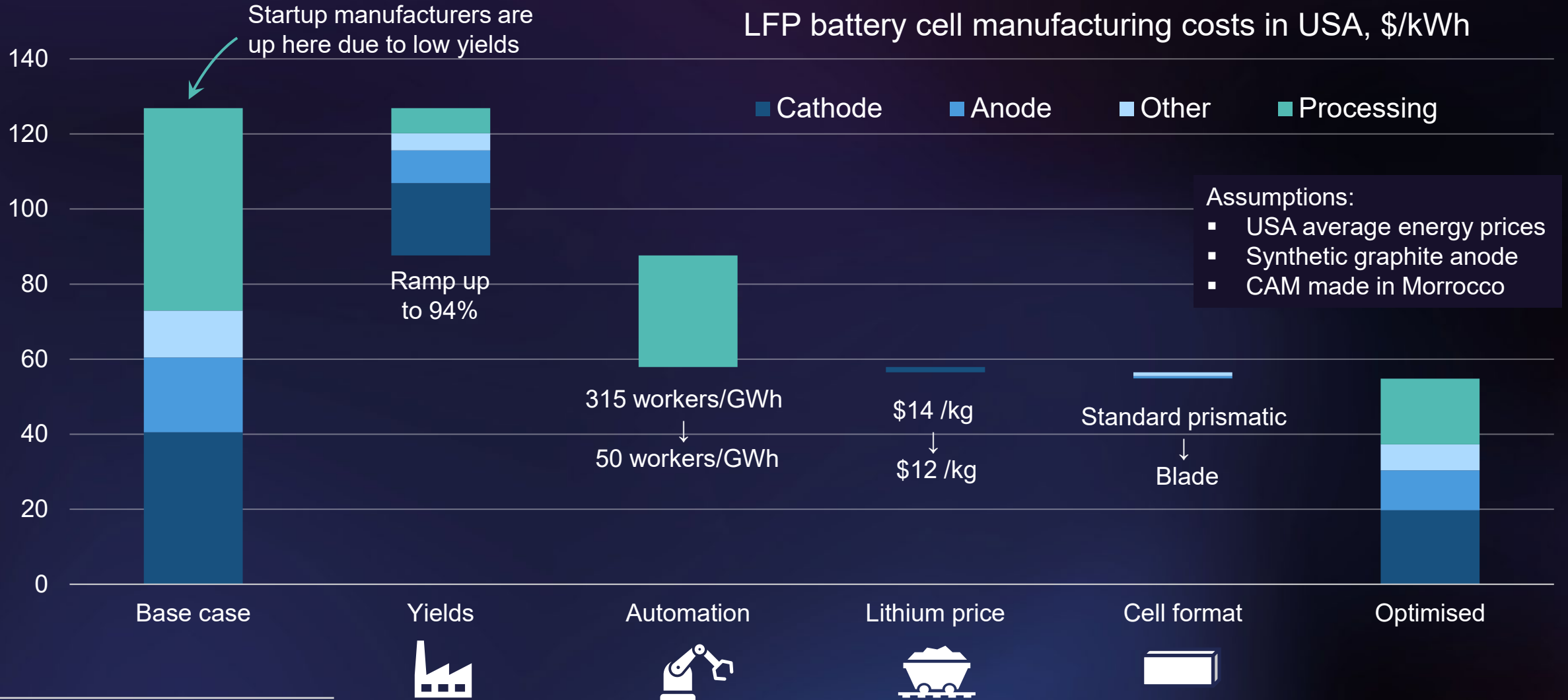
China battery cell production cost, 2024 average, \$/kWh



DATA: CRU Battery Cost Model  
 'Other Chinese' does not include CATL, which has similar costs to BYD.



# Pathways to genuine US cost-competitiveness in battery manufacturing: Focus on automation and yields, leverage advantages in energy costs

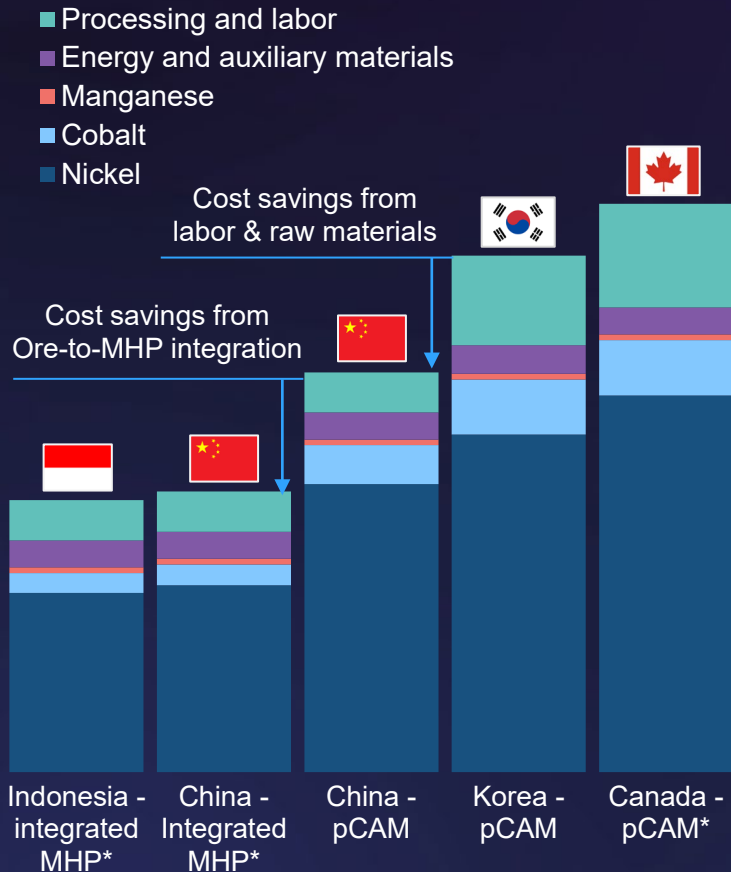




# The 'squeezed middle': NA electrode materials & refined chemicals producers must learn from the strategies of Asian peers

## Location and feedstock cost control

NMC 811 precursor production cost, Dec 2024, \$ /kg

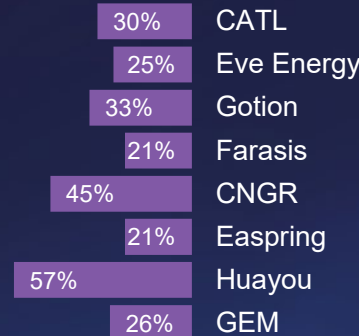


## Technical innovation (process and product), business model, and partnerships

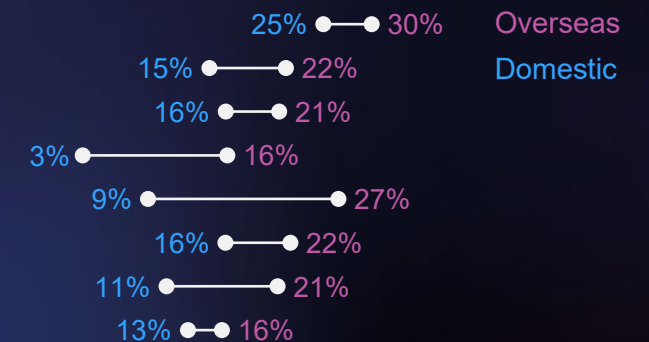
- Deeper technical and investment collaboration with battery manufacturers
- Command a price premium on high-end products:
  - High compaction density LFP
  - Mid-nickel high-voltage NMC
- Tolling arrangements and pre-pay offtake structures

## Costs are higher outside China, but so are margins

Overseas share in total revenue, %



Domestic vs overseas sales GPM in 2024 H1, %







# Yes, US domestic lithium may seem like it has high potential...

Some of the largest resources...

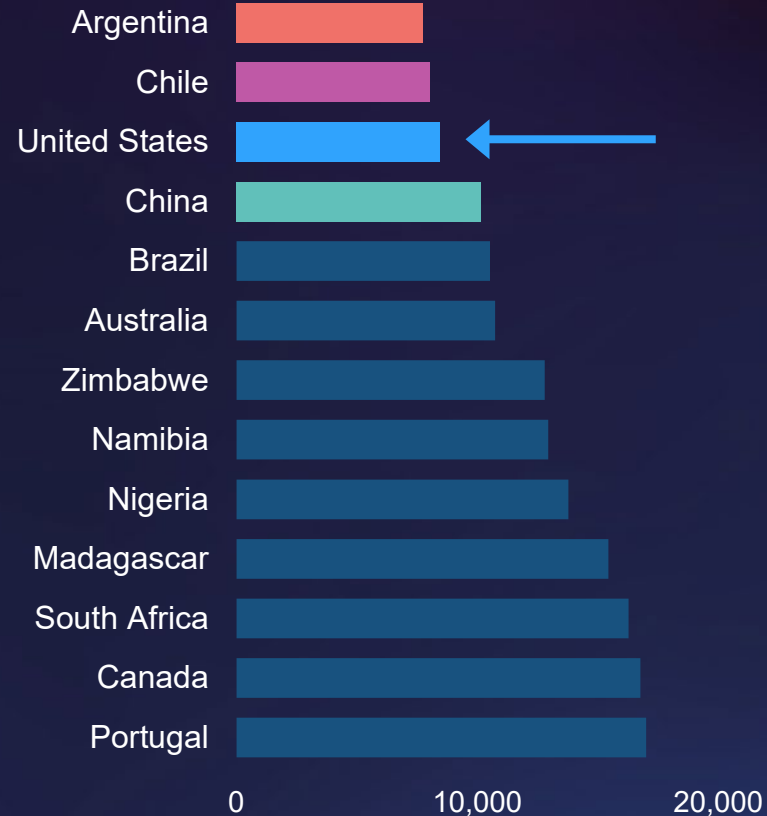
...with low opex costs

...and with low technical barriers

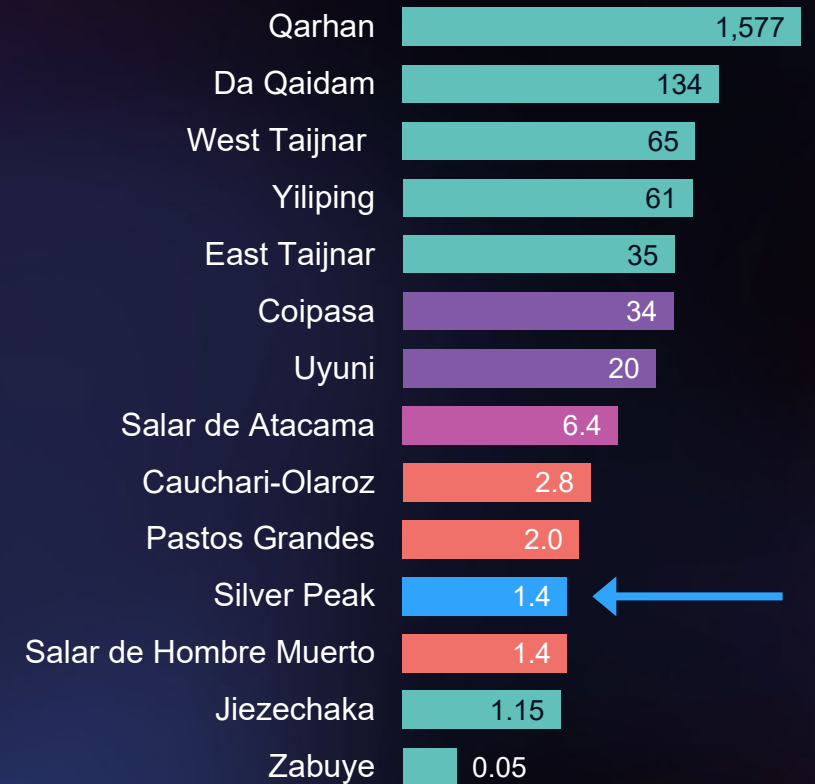
Lithium resources by country, Mt LCE



Value-adjusted business costs, \$ /t LCE, CIF China



Magnesium to lithium ratios in brines, Mg:Li

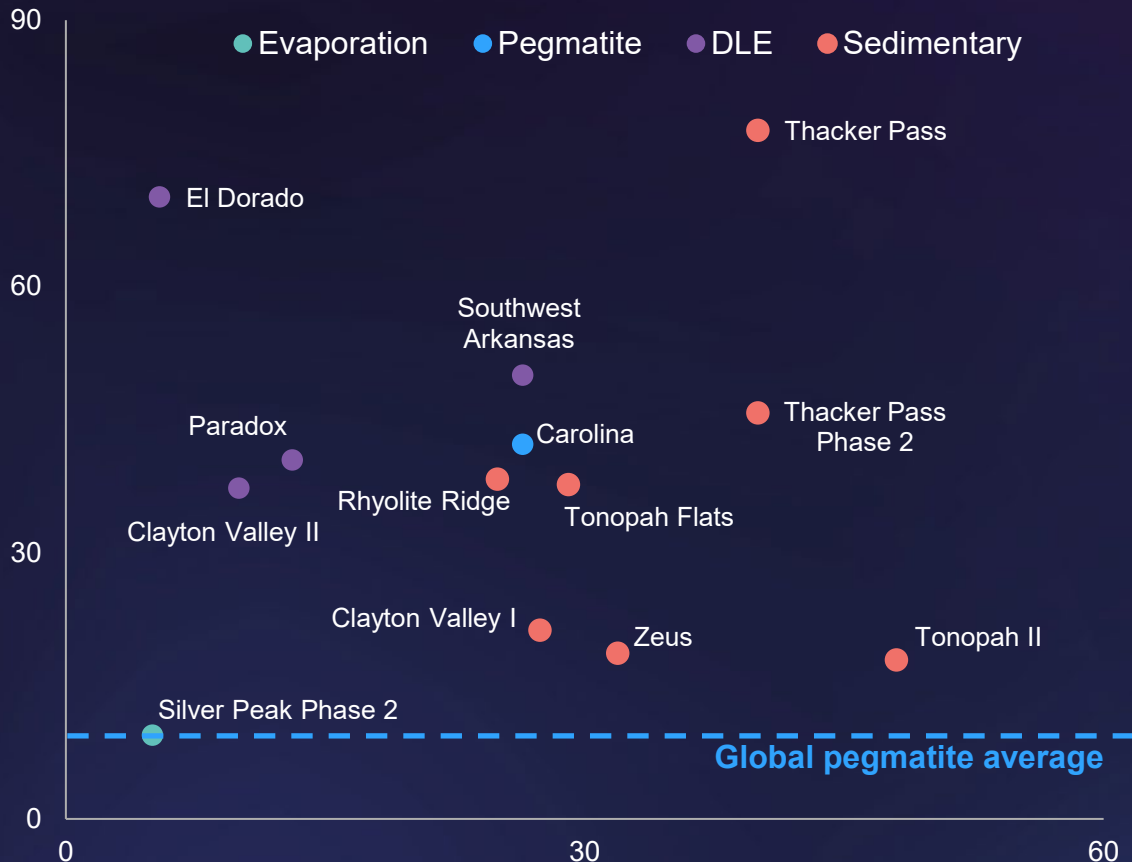




# ..but in reality, it will have a limited role in the medium term

## Capital costs for US projects are *staggering*

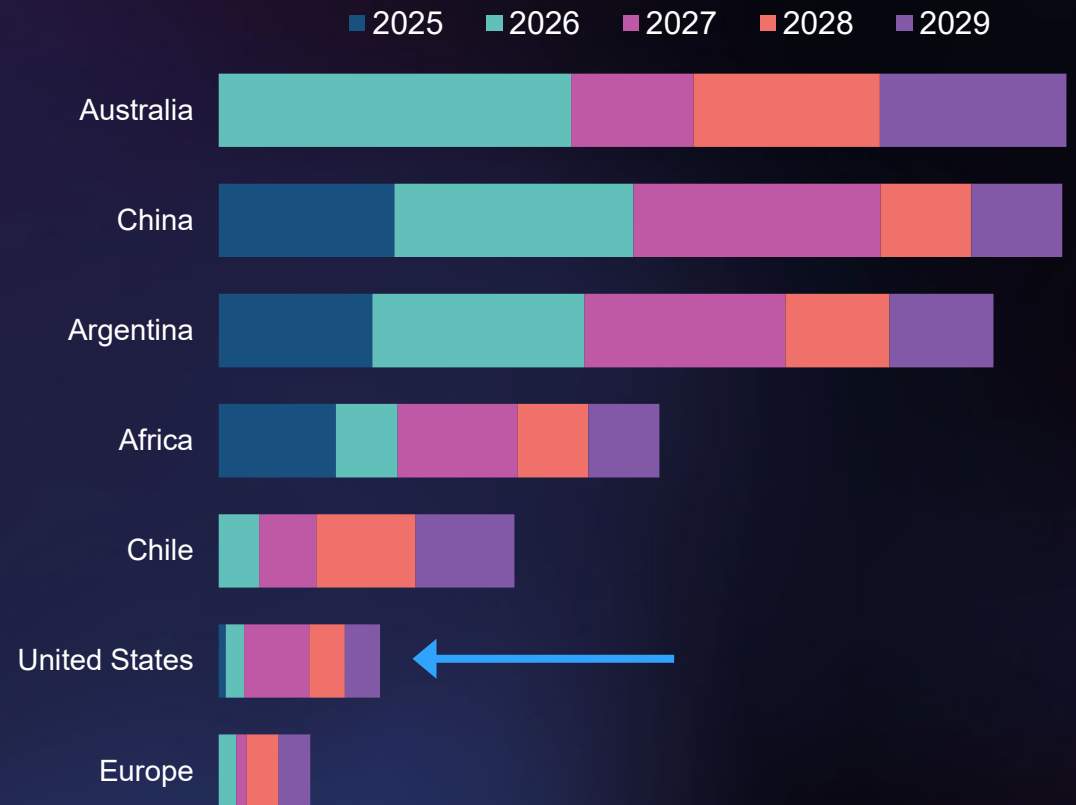
Capital intensity (y-axis) versus capacity (x-axis), thousand \$/t LCE & kt LCE/y



DATA: CRU Lithium Service

## And supply growth expectations are very low

Additional primary lithium production by year, thousand tonnes LCE



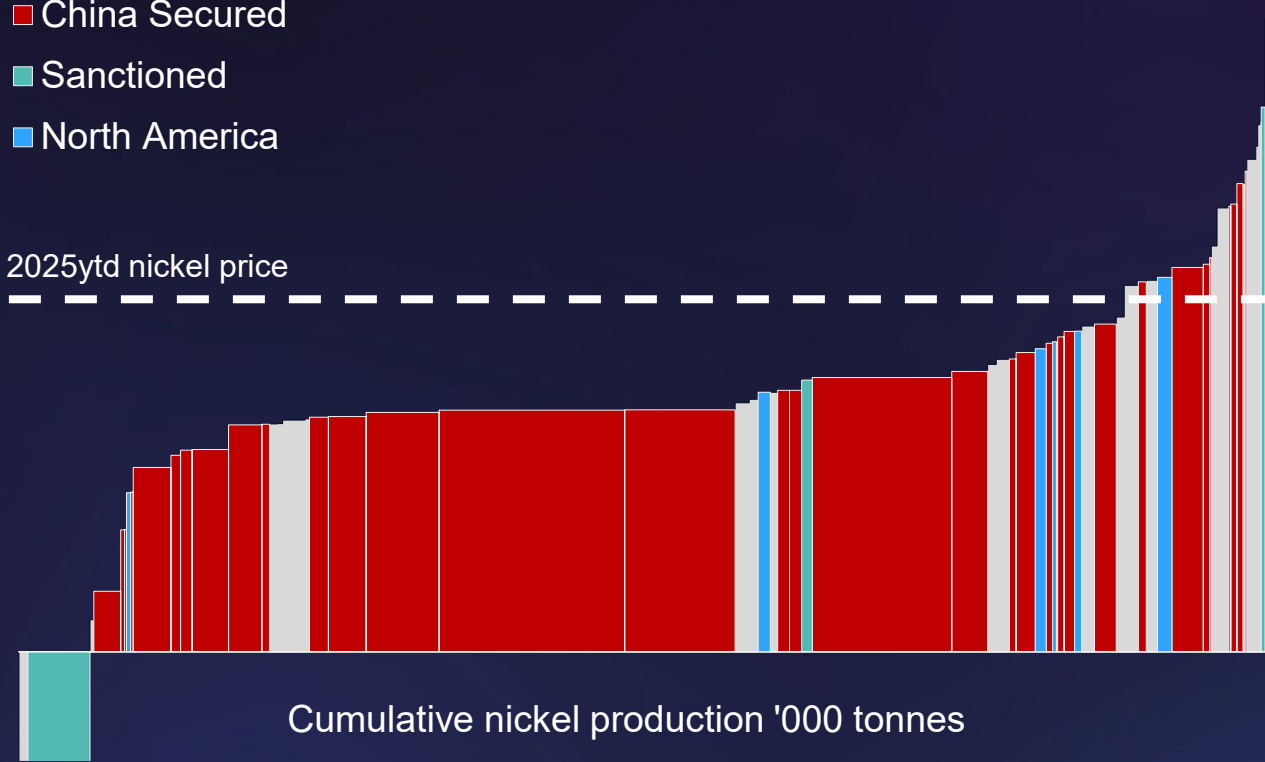


# A harsh look at the nickel industry points to a structural advantage of low-cost, Chinese-secured supply

Nickel: All in Sustaining Costs, \$/t, 2025

- China Secured
- Sanctioned
- North America

2025ytd nickel price



Average Cost of Production (\$/t Ni)

China Secured	10,600
Supply without FEOC concerns	14,000

$\Delta \$3,400/t = +\$200$  on cost of avg. US EV battery

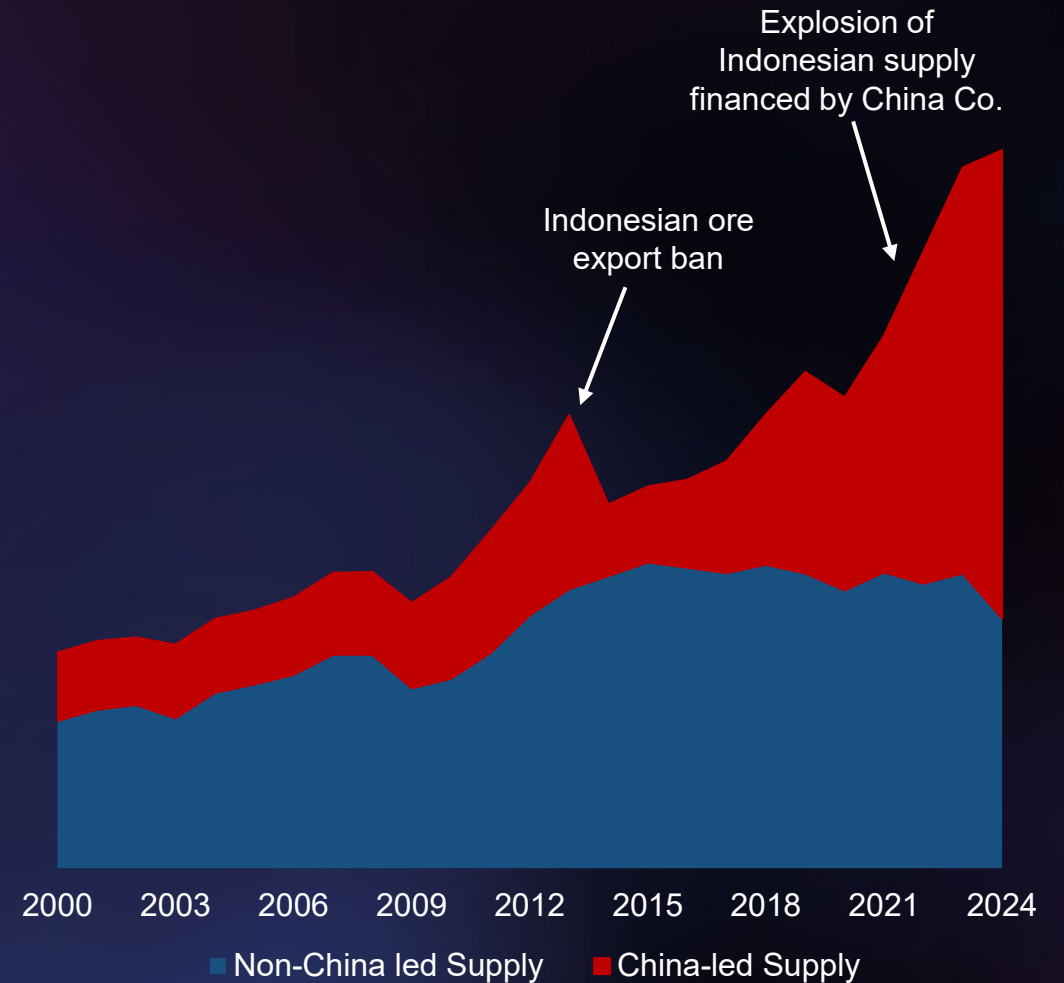
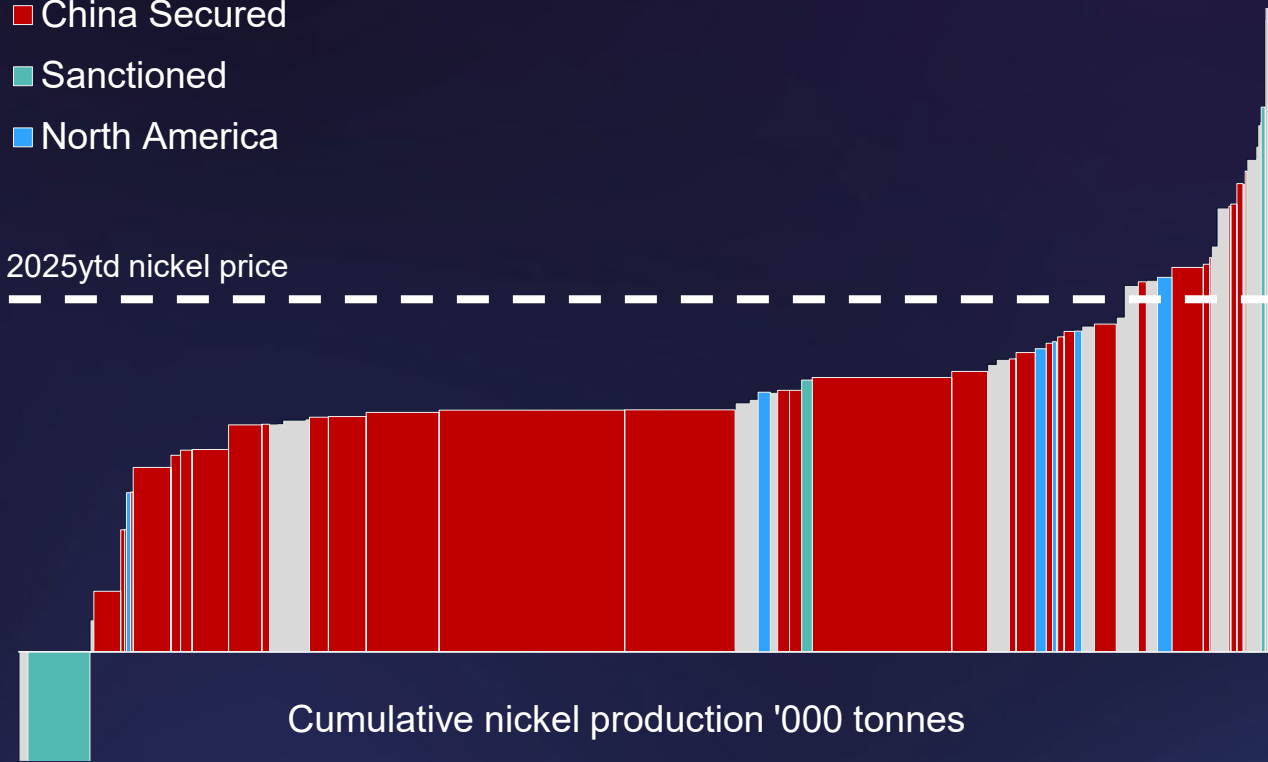


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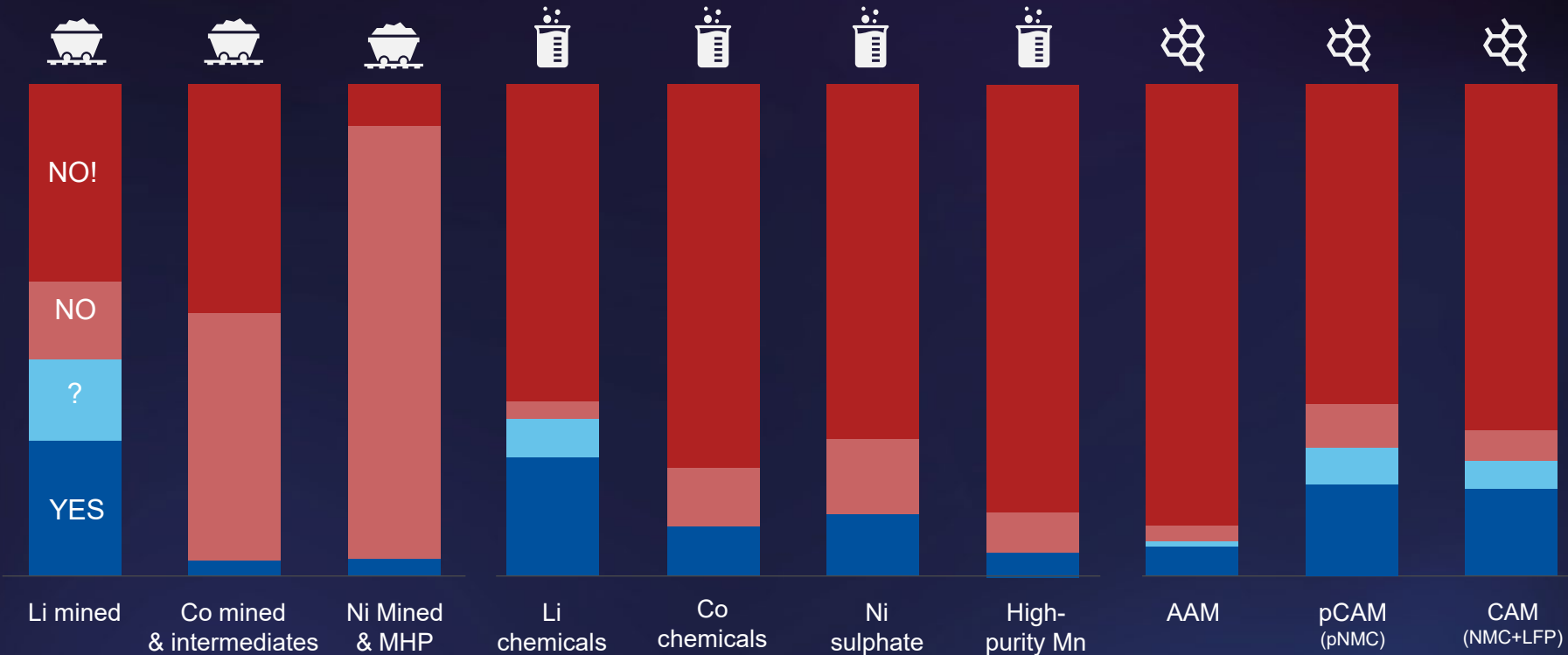




# Vertical integration is strategic imperative more than a cost advantage

Battery supply chain production in 2028, split by IRA 30D tax credit eligibility, %

- Foreign Entity of Concern (FEOC)
- Non-compliant
- Potentially compliant (Chinese ownership)
- Compliant



North American manufacturers have two options:

A) source domestic/ non-China-owned materials at generally higher cost

B) invest in overseas resources

# Key takeaways: the road to profitability



**Evaluating the economics of battery projects can mitigate investment risk**



**Supply chain goes hand in hand with technical know-how to deliver cost-competitiveness**



**It is possible to reach cost-effectiveness, under several realistic pathways, but tough choices must be made**

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CRU provides market intelligence, analysis & strategic consulting covering the full battery value chain



Mining



Refining



Components



Battery cells



End use



Recycling



Supply & demand



Costs & pricing



Asset-level analysis



Technology



Supply-chain mapping



Competitiveness



Policy



Corporate strategy

### Battery Value Chain Service



### Battery Cost Model



### Battery Raw Material Services (Li/Ni/Co/Mn/P/Pb)



### Energy Storage / Solar / Power Transition Services





*Thank you.*

**Sam Adham**  
Head of Battery Value Chain



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