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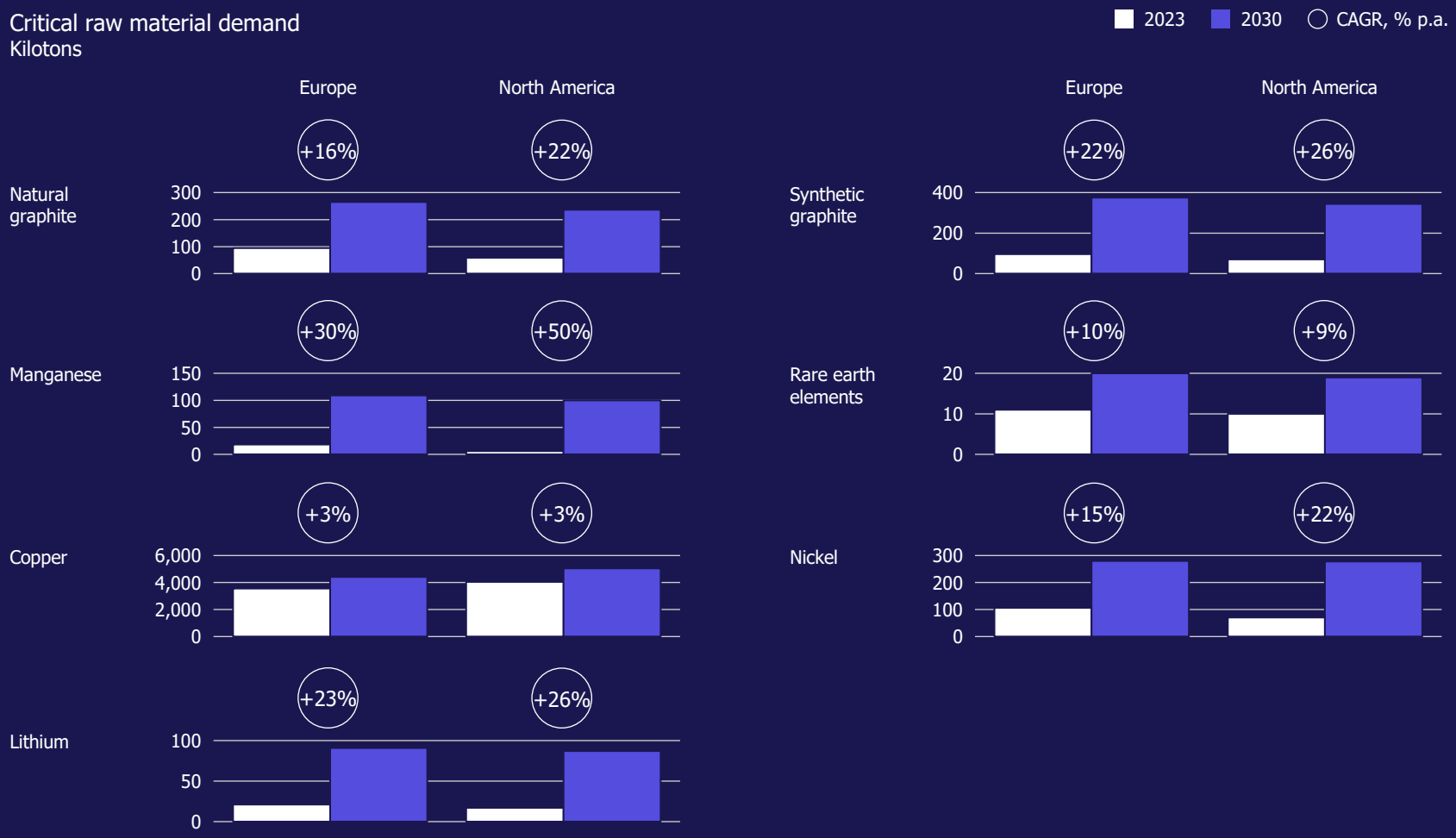
Bridging supply-demand gap for Critical Raw Materials

August 2025

Demand for 6 materials will grow rapidly to keep pace with the growth in strategic industries



Note: Current trajectory scenario – description available in the methodology section of the report

Source: MineSpans

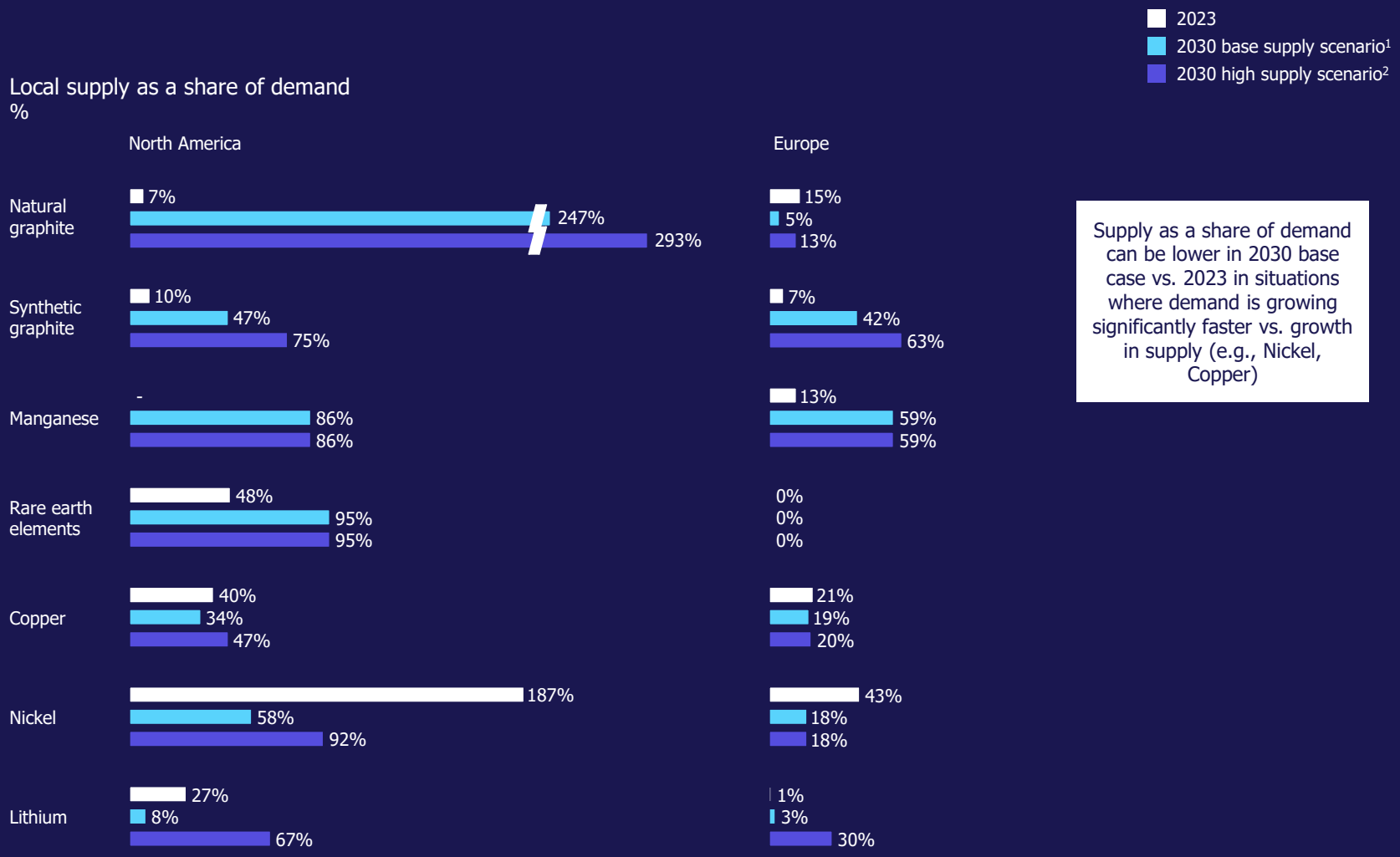
Key insights

Demand for these materials in Europe and North America is expected to **grow rapidly to keep pace with development across the strategic industries**:

- Both regions are working to incentivize **local manufacturing** while de-risking supply chains
- **Energy transition** is expected to fuel widespread deployment of renewable energy sources, development of transmission and distribution infrastructure and electrification of industry, household heating, and transport
- **Growth in semiconductor** industry combined with wider deployment of domestic semiconductor manufacturing capacity
- Increasing spend on **defense industry**

As a result, **demand for all CRMs is expected to grow significantly**, with demand for manganese, lithium, and synthetic graphite likely to increase more than 20 percent a year between 2023 and 2030.

European and North American supply is unlikely to keep up with the growing demand



Supply as a share of demand can be lower in 2030 base case vs. 2023 in situations where demand is growing significantly faster vs. growth in supply (e.g., Nickel, Copper)

1. Base supply scenario: Projects in construction or projects with feasibility confirmed
2. High supply scenario: Feasibility not yet confirmed; announced early-stage projects

Source: MineSpans – Current trajectory demand scenario

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Key insights

European and North American **supply is unlikely to keep up with this growing demand**. Development of new projects faces many challenges, including:

- Historical challenges with project execution (significant delays and budget over-runs)
- Local opposition to new mining projects
- Limited availability of talent
- Additionally, some minerals, like rare earth minerals, have no existing production in Europe to begin with

As a result, Europe and North America are **expected to see significant gaps** between local supply and demand for the six CRMs by 2030

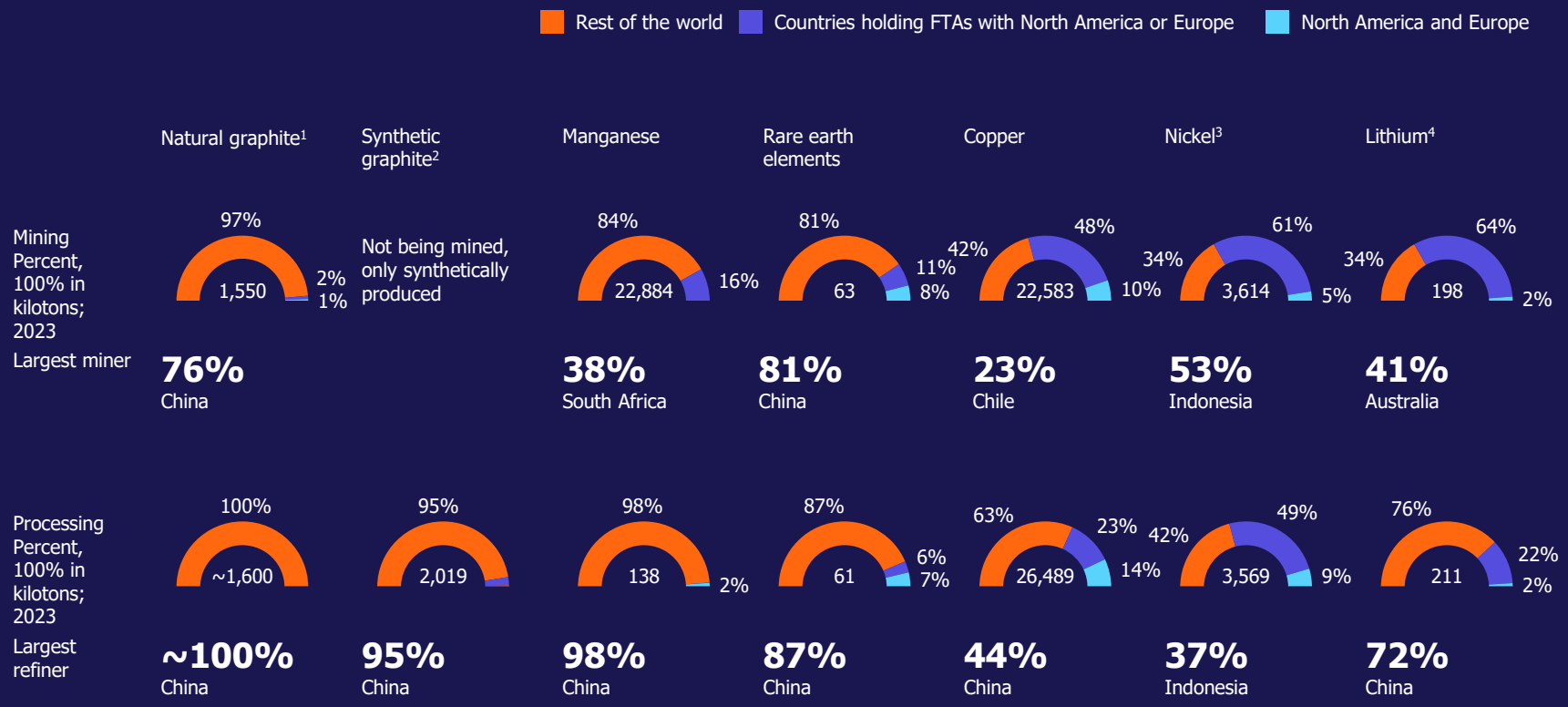
- The gaps are forecasted to be particularly **large in Europe**, where local supply will meet **less than 20 percent** of the demand for most materials
- **North America is expected to be in a better position**, with local supply representing more than 50 percent for most materials

Recent developments

Feb 5.
Canada is fast-tracking 18 mining and energy projects worth USD ~20 billion to diversify the economy amid global supply chain developments

Financial Post

Significant supply chain concentration creates additional long-term risk exposure



1. kt carbon contained
2. Another big challenge for synthetic-graphite production is to secure suitable supplies of mesocarbon microbeads, a precursor to produce high-quality needle coke, which in turn is essential to produce high-quality synthetic graphite
3. kt metal contained
4. kt Li refined

Source: MineSpans

Key insights

Supply risks created by these imbalances are **exacerbated by significant geographic concentration** of mining and processing in just a few countries. Regions with high concentrations of mining and processing owe their dominance to:

- **Accessible mineral resources**, often combined with state subsidies
- Commitment to infrastructure **build-out**
- **Cost advantages** attributable to scale and low energy costs
- **Deep expertise** developed over many decades
- **Lower levels of local opposition** to material extraction

Notably, **China dominates the refining sector**, housing more than 70 percent of the processing capacity for four of the six CRMs

Despite significant cost advantages unlocked through scale, **strong supply chain concentration creates vulnerability** in the event of unexpected market developments or country export restrictions, such as Indonesia's 2020 nickel export ban, Zimbabwe's 2022 export ban on unprocessed lithium, and China's 2024 and 2025 restrictions on gallium, germanium, tungsten, antimony and others

These gaps can be addressed through a group of innovative supply and demand-side levers

Detailed next

Category	Lever	Description
Supply-side	New and expanded sites	Expanding existing sites and accelerating projects currently in the pipeline (development of greenfield projects by 2030 would likely be challenging)
	Primary supply innovation	Improving mining material yield through AI-enabled process optimization, innovative chemical processes like direct lithium extraction, and recovery of metals from overlooked waste resources, such as mining tailings
	Secondary supply from recycling	Reusing materials, especially from end-of-life batteries , scrap and waste electrical equipment
Demand-side	Technology mix shift	Adopting alternative technologies — for example, in battery chemistries such as Na-ion batteries that would require less critical material than lithium-ion batteries
	Material substitution	Leveraging alternative materials for common use cases, such as deploying alternative EV motor technologies that have lower demand for rare earth elements
	Efficiency improvements	Leveraging innovative technology to rely less on CRMs, without sacrificing performance, such as using silicone blending in battery anodes to reduce demand for graphite, while maintaining battery performance

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Key talking points

Innovation across the value chain, in both supply and demand, could be **critical to closing the gap** between demand and local supply in Europe and North America.

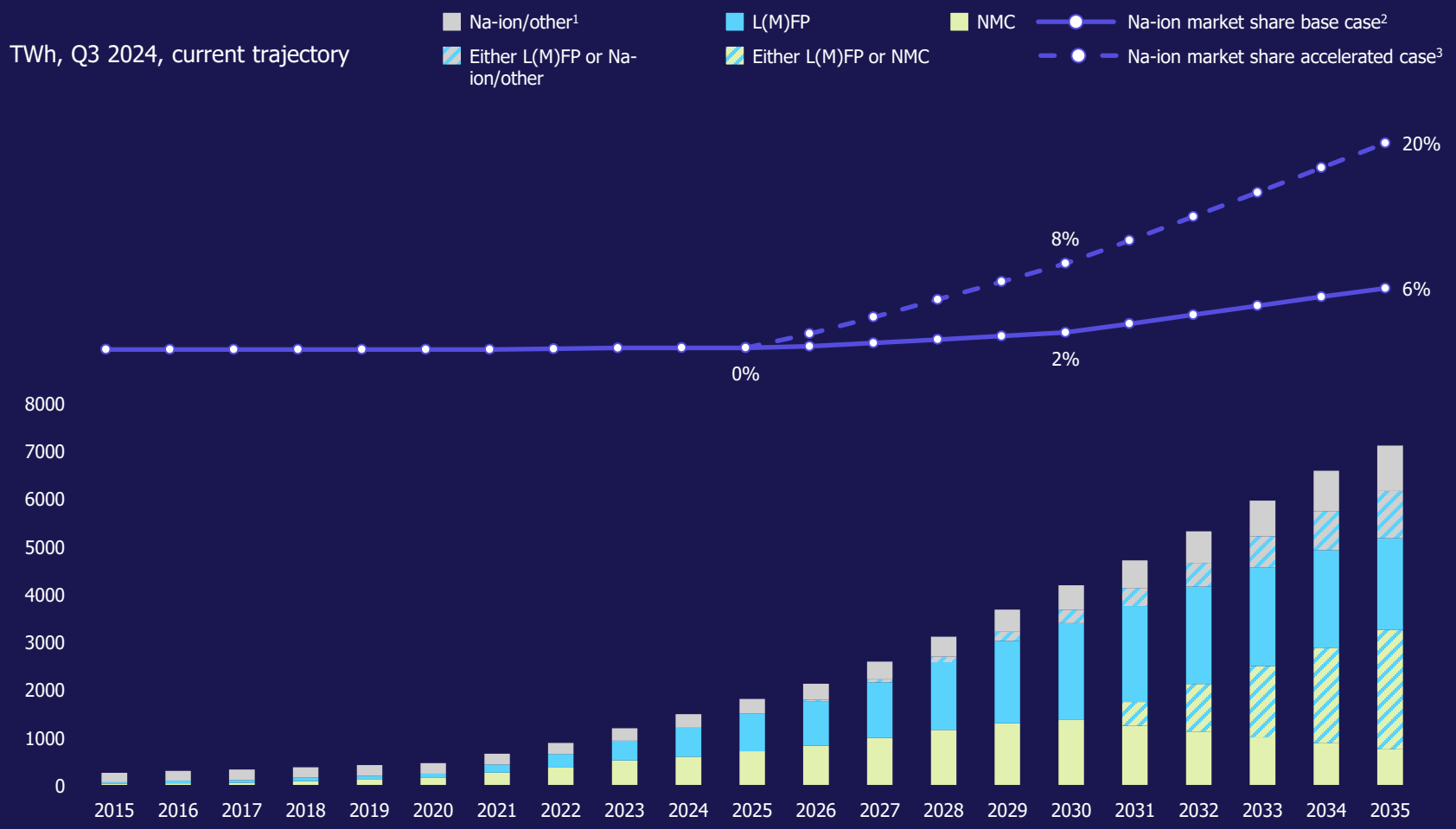
We identified three categories of supply-side approaches and three categories of demand-side approaches that could yield significant improvement

Recent developments

Feb 17.
Chinese company has stopped exporting a piece of equipment (sorbents) used to process the electric vehicle battery metal lithium – implementation of export restrictions China announced in the past weeks

Reuters

Detail: Na-ion batteries could capture 6-20% market share by 2035



1. Includes LCO, LMNO, LMO, Ni-MH, Li-S. Pb-acid, Vanadium-RF
2. Current technology evolution scenario
3. More rapid Na-ion technology evolution and value chain build-up

Source: McKinsey Battery Insights

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Key insights

Today, **two Li-ion technologies lead the market** (in addition to technologies such as Lead acid batteries):

- **Lithium iron phosphate (LFP) battery** that can be supplemented with manganese to create LMFP battery
- **Nickel manganese cobalt (NMC) battery**

Li-ion batteries (NMC and L(M)FP) are **stoking demand for critical raw materials**, such as nickel, lithium, graphite, manganese, and copper

Technology **shift toward a new battery mix** (e.g., with Na-ion penetration) could **reduce demand for some of the CRMs**

Na-ion batteries could capture 6-20% market share by 2035, dependent on the speed of technology and value chain development of these batteries

If stakeholders double-down on Na-ion development, **CRM demand could drop approximately 10 percent for lithium, graphite, and copper and 3 percent for nickel by 2030**

Recent developments

Feb 16.
BYD confirms plans for EVs with all-solid-state batteries to begin rolling out in 2027 – in 2030 BYD expects to launch mass production of the new battery technology

Electrek

Key active public funding schemes authorized for critical materials projects within 2030 horizon

1. List of analyzed policies is not exhaustive – only key funding schemes included for selected economies. Details available in methodology section
2. Average 2024 FOREX rates used – USD : AUD at 1.52, USD : EUR at 0.93, USD : CAD at 1.37

Source: International Energy Agency critical mineral policy tracker, World Bank, European Commission, US Department of Defense, Congress.gov, European Investment Bank, Gov.uk, Government of Canada, Bloomberg

Key takeaways

Financial support to encourage domestic supply of critical materials **varies significantly across countries** in amount and type of support

Australia and the US lead in terms of financial allocation for CRM projects (0.39% and 0.19% of nominal GDP respectively)

The EU and the UK allocates **0.05% of GDP** to CRM projects

On top of financing, **effective permitting processes** are critical for the timely development of new mines

Permitting timelines **in the US** (7-10 years) **and the EU** (up to 15 years) can take **2-3 times longer** than in Canada and Australia (~2 years)

While the potential for a **direct comparison with China is limited**, due to different permitting regimes, estimates put the duration of **permitting in the order of months**

Both the EU and the US have recently unveiled policies that aim to **shorten the duration of permitting processes**

Recommendations going forward

- **Invest where Europe can lead**:
  - Focus R&D and industrial policy on breakthrough chemistries, recycling, and rare-earth alternatives.
- **Deploy smart incentives**:
  - Use demand-side rules, procurement, and price guarantees. Incentivize adoption of low-CRM technologies
- **Deploy more capital**:
  - Significantly increase investments in CRM projects, alternative battery concepts, and material substituion
- **Secure supply abroad**:
  - Deepen partnerships and co-invest in mining/refining projects in resource-rich democracies and the Global South.
- Streamline domestic production:
  - Support viable EU projects with faster permitting, political backing, and financial guarantees. Utilize tailings
- **Build credible fallback capacity:**
  - Maintain reserves and some domestic production so Europe can cope if China cuts supplies.
- **Integrate CRMs in defense frameworks**

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Thank you