No Demand, No Impact

Why Local Lithium Needs OEM Commitment

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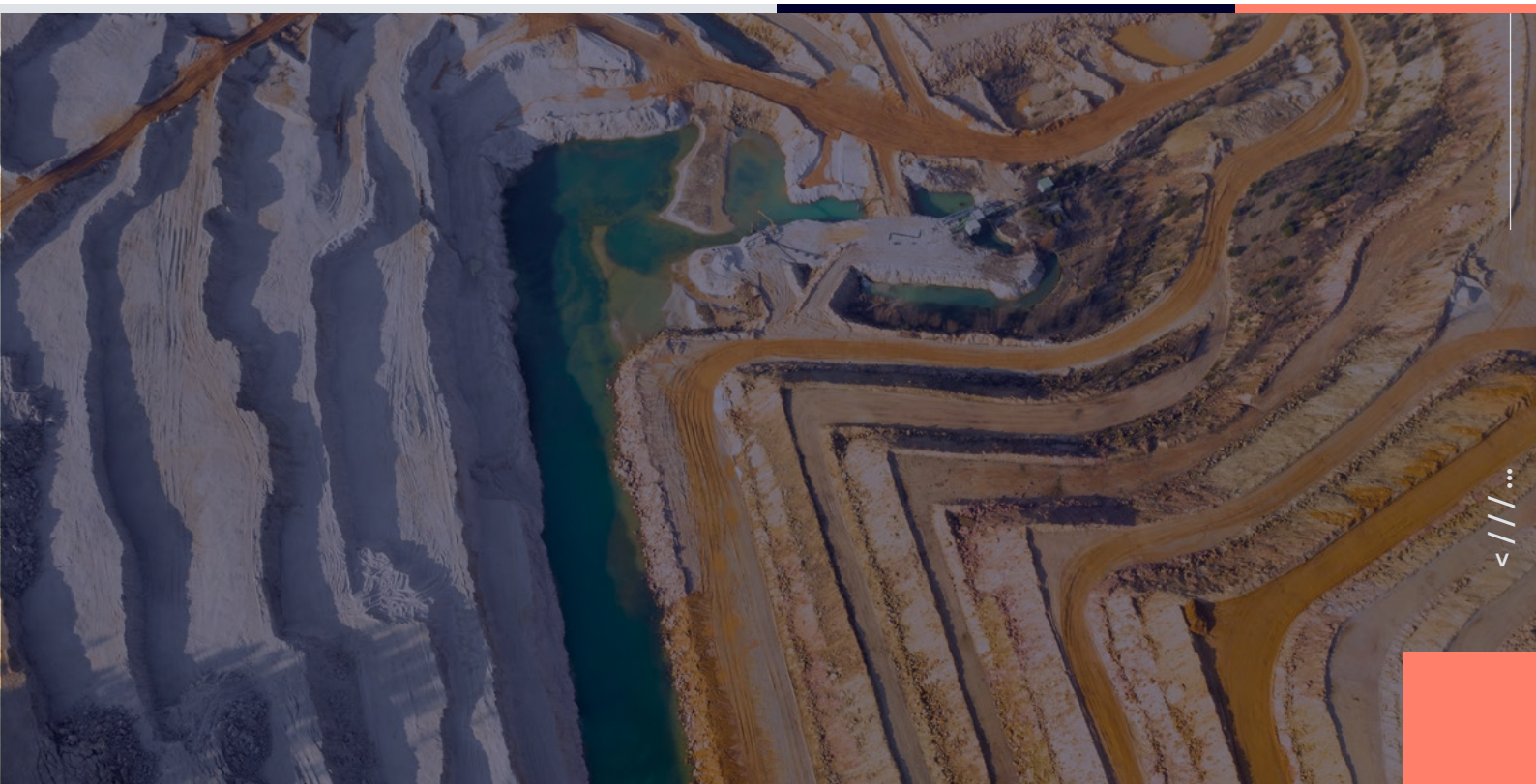
Table of contents

1. Executive Summary

The European battery industry is at a critical crossroads. Amid investment slowdowns and a reorganization of cell production efforts, Europe's ambition to secure a robust and independent battery supply chain has been challenged by delayed upstream development and integration bottlenecks. Although there is no global shortage of lithium reserves, available deposits in Europe are limited. Long project lead times and permitting processes in combination with a slow downstream absorption have additionally hindered the timely build-up of domestic supply chains. To secure local supply, meet ESG standards, and enhance the competitiveness of the entire battery ecosystem, local lithium production in Europe has been pursued in the recent years.

This whitepaper explores the strategic importance of locally sourced lithium in Europe. It provides an overview of the continent's current production landscape, outlines key project developments, and examines the broader structural challenges, including the critical gap in downstream CAM manufacturers, that hinder the seamless integration of lithium into the European battery value chain.



2. The European Battery Industry at a Crossroads

In recent years, Europe's battery cell investments, once heralded as a breakthrough for local production, have experienced unforeseen setbacks. Several high-profile projects have encountered delays, cost overruns, and ramp-up difficulties, prompting the industry to reassess how to structure and scale the full battery value chain.

Key challenges include:

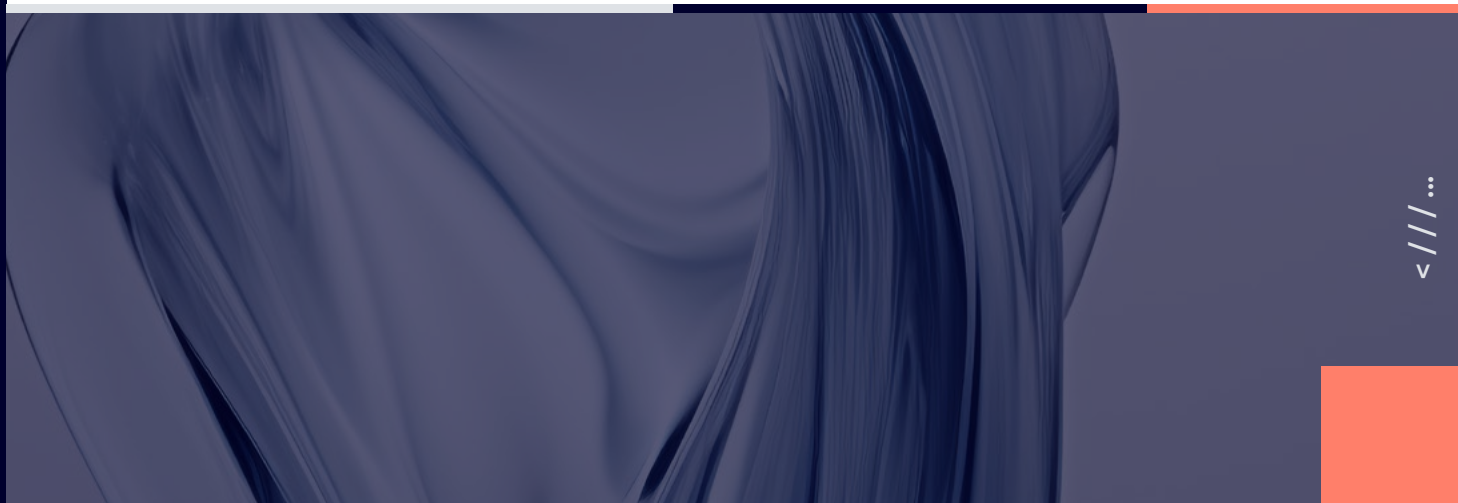
- **Shifting investment dynamics:** While cell manufacturers have secured significant funding, many face delays driven by technological immaturity, production complexity, and difficulties scaling manufacturing operations under cost pressure. This ultimately causes a much lower output efficiency with higher cost in a market where the cell prices continuously fall.
- **Downstream weakness and value chain risk:** The underperformance and uncertainty in the cell segment create a reverse bottleneck - undermining confidence in upstream projects like CAM and lithium production, which lack secure offtake markets.
- **Policy vs. market reality:** Ambitious policy frameworks, including the EU Battery Regulation and the Critical Raw Materials Act, aim to incentivize local production but often clash with cumbersome permitting, environmental regulations, and unclear advantages for the stakeholders along the supply chain .

Rather than a true raw material shortage, the core issue is a misalignment between industrial timelines and market readiness across the whole value chain. Addressing this requires a holistic strategy that synchronizes upstream and downstream development and strengthens the viability of local actors at every stage.

3. The Case for Local Lithium Production in Europe

Local lithium production is not merely a matter of securing resources - it is a multifaceted strategic necessity:

- **Supply resilience:** Reliance on imports creates exposure to geopolitical risks, delays, supply disruption and trade tensions. European lithium projects offer the potential to stabilize supply chains by harnessing resources closer to end-use industries. This aims to support the supply chain required for the EU Green Deal and Clean Energy Transition such as the EV batteries, grid storage and renewable integration.
- **ESG and traceability:** European manufacturers are held to high standards for environmental and social governance. Locally sourced lithium benefits from more transparent monitoring processes and compliance with stringent regulatory frameworks which comply with the local labor and environmental regulations.
- **Industrial policy lever:** The local production of critical raw materials is integral to the broader EU strategy for economic and industrial sovereignty. By investing in mining and refining capabilities, Europe could counterbalance the uncertainties of the global supply market and reduce dependency on external suppliers while creating jobs in the mining areas and encouraging the development of new industries such as geothermal lithium extraction and green refining technologies.



4. The European Lithium Landscape: A Project Overview

Europe's lithium landscape encompasses a diverse array of projects, ranging from hard rock mining to geothermal brine extraction and refining initiatives. These projects can be broadly categorized as follows:

a) Hard Rock Mining Projects

- **Savannah Resources – Barroso Project (Portugal):** Located in northern Portugal, the Barroso Lithium Project is Europe's largest spodumene lithium deposit. Savannah Resources holds 100% ownership and has secured temporary land access to advance drilling operations. The project has been designated as a 'Strategic Project' by the European Commission under the Critical Raw Materials Act.
- **Keliber / Sibanye-Stillwater (Finland):** The Keliber project aims to be Europe's first producer of battery-grade lithium hydroxide derived entirely from its own ore. The project comprises several mining areas, a concentrator, and a lithium hydroxide refinery. It has been awarded 'Strategic Project' status by the European Commission and is close to starting operations.
- **European Lithium – Wolfsberg Project (Austria):** Situated in Carinthia, Austria, the Wolfsberg project is a hard rock lithium deposit with a positive Pre-Feasibility Study supporting planned lithium hydroxide sales into the European battery supply chain. The project is strategically located with access to road and rail infrastructure.
- **Infinity Lithium – San José Project (Spain):** The San José Lithium Project is a fully integrated lithium extraction and conversion project located in Spain. It has been declared a project of regional and general interest by the regional government of Extremadura, potentially streamlining the permitting process.

- **Imerys – EMILI Project (France):** The EMILI project, located in central France, aims to produce 34,000 tons of lithium hydroxide annually, sufficient for approximately 700,000 electric vehicles. It has been recognized as a strategic project by the European Union.
- **Zinnwald Lithium (Germany):** The Zinnwald Lithium Project in Saxony, Germany, is focused on becoming an important supplier of lithium hydroxide to Europe's battery sector. The project has strong support from the Saxon State Government and is strategically located near Europe's chemical and automotive industries.
- **Cornish Lithium – Trelavour Project (UK):** Cornish Lithium's Trelavour hard rock lithium project in Cornwall has been designated as a development of national significance by the UK government. The company is advancing towards delivering an initial feasibility study for the project.
- **Imerys British Lithium (UK):** Imerys has acquired full ownership of British Lithium, aiming to produce enough high-quality lithium carbonate to power 500,000 electric vehicles annually by the end of the decade. The project includes the UK's only dedicated lithium metallurgical research laboratory.
- **Rio Tinto – Jadar Project (Serbia):** The Jadar project is planned as an underground mine capable of producing approximately 58,000 tons of refined battery-grade lithium carbonate annually. The Serbian government has reinstated the project's spatial plan, and Rio Tinto is working to meet stringent environmental requirements in compliance with Serbia and EU regulations. It is the currently largest known Lithium deposit compromising a unique mineralization, which requires a specific refinery flowsheet.

b) Brine & Geothermal Projects

- **Vulcan Energy – Upper Rhine Valley Project (Germany/France):** Vulcan Energy's Lionheart Project, located in the Upper Rhine Valley, aims to produce lithium from geothermal brine using their proprietary VULSORB sorbent. The project has been awarded 'Strategic Project' status by the European Commission under the Critical Raw Materials Act.

- **Eramet / Électricité de Strasbourg – AGELI Project (France):** The AGELI project in Alsace combines geothermal energy production with lithium extraction. Developed by Eramet in partnership with Électricité de Strasbourg, it aims to start production in 2030 and has been classified as a strategic project by the EU.
- **Northern Lithium (UK):** Based in the North East of England, Northern Lithium is exploring lithium extraction from geothermal brines. The company targets commercial production of up to 10,000 tons of battery-grade lithium per year within the next decade, aiming to supply UK gigafactories and the EV industry.

c) Refining & Conversion Projects

- **Tees Valley Lithium (UK):** Tees Valley Lithium is developing the UK's flagship lithium refining facility at the Wilton International Chemicals Park in Teesside. The plant aims to produce battery-grade lithium hydroxide and carbonate, supporting the growing demand across electric vehicles and energy storage systems.
- **AMG Lithium**: Operates the first commissioned industrial scale Lithium refinery in Europe with a nameplate capacity of 20,000 tons of lithium hydroxide. Has secure feedstock from their operated mine in Brasil, an emerging Lithium province.
- **Rock Tech Lithium – Guben Converter (Germany):** Rock Tech is constructing a lithium hydroxide converter in Guben, Germany, with an annual production capacity of 24,000 tons. The project has been designated as a 'Strategic Project' by the European Commission, underscoring its importance to the European battery materials supply chain. It was recently combined within a JV with Arcore's Bosnian Lithium project.
- **Livista Energy (France/Germany):** Livista Energy plans to build Europe's first stand-alone lithium chemical conversion facilities. The company has secured a site in Le Havre, France, aiming to start production in 2028, and is also planning a refinery in Emden, Germany, to process lithium from both primary and recycled sources.

- **Green Lithium (UK):** Green Lithium is constructing the UK's first merchant lithium refinery in Teesside, with an annual production capacity of 50,000 tons of battery-grade lithium. The facility aims to provide crucial supply chain security for the UK and EU markets, enabling the production of over 1 million electric vehicles annually.
- **Viridian Lithium (France):** Founded in 2021, Viridian Lithium is establishing France's first lithium refining and conversion plant in Lauterbourg. The CoRaLi project aims to produce 28,500 tons of lithium per year from 2027, strengthening Europe's battery supply chain with a focus on environmental responsibility.
- **Bondalti / Neometals – Estarreja Project (Portugal):** Bondalti and Neometals are collaborating on a lithium refinery project in Estarreja, Portugal. The planned facility aims to produce 25,000 tons of lithium hydroxide annually, utilizing Neometals' proprietary ELi™ process.
- **Lusorecursos – Romano Project (Portugal):** Lusorecursos Portugal Lithium is developing the Romano mine in Montalegre, northern Portugal. The project includes both mining and a nearby refinery, with construction expected to start in early 2025 and production of lithium hydroxide commencing in late 2027.

While all these projects aim to support a domestic lithium value chain in Europe, their level of maturity as well as their economic viability differ significantly.

5. Strategic Challenges & Success Factors

Despite promising project developments, a significant hurdle remains: the difficulty of fully integrating raw lithium into Europe's battery value chain. the bottleneck for this integration is due to the present scarcity of dedicated CAM manufacturers as key offtakers for Lithium. Currently, only Umicore, and to a lesser extent BASF, are equipped to source and process locally produced lithium here in Europe. However, both companies are facing headwinds and have announced reviews of their battery materials strategies, which signal caution amid market uncertainties.

The challenges include:

- **Downstream absorption:** The lack of established CAM providers means that even if high-quality lithium is produced locally, the final conversion into cathode materials (essential for battery cells) is bottlenecked by limited processing capacity. As of now, most CAM production takes place in Asia, which means that without sufficient European processing capacity, locally mined and refined lithium would paradoxically need to be exported to Asia, undermining the rationale for regional resource independence and increasing logistical complexity and emissions while increasing the cost and reducing the competitiveness due to the additional shipping of the precursors.
- **Evolving business models:** As Umicore and BASF re-examine their portfolios and strategies in response to shifting market dynamics, there is uncertainty regarding their ability to scale and partner consistently with upstream producers. Other newcomers in the CAM sphere such as Axens/LiCo, FMG/Easpring or Orano/XTC are still in early phases without existing production assets and limited market traction.
- **Supply chain discontinuities:** A fragmented value chain creates discontinuities in production timelines and cost structures. Without a steady pipeline from mining to manufacturing, economies of scale remain elusive, undermining competitive positioning. Additionally, mining projects

are investments that require long-term vision and cannot adhere to an uncertain and volatile downstream market.

- **Lacking capital access**: Within the EU there is no easy access to capital for extractive industries, as the experience of the capital markets for such an industry is lacking. The smaller scale and quality detriments of local projects as well as permitting challenges further reduce interest of more experienced mining capital allocators.

Success in addressing these challenges will depend on a coordinated effort among mining companies, refining ventures, technology providers, and the nascent CAM segment. Establishing strategic partnerships, investing in process innovation, and securing policy support will be essential steps in bridging the gap between raw lithium extraction and its ultimate utilization in battery cells.

6. Path forward: From challenge to industrial maturity

Overcoming Europe's lithium value chain bottlenecks requires a multi-pronged and coordinated approach across industry and policy domains. The following success factors are critical:

- **OEM commitment and structured offtake agreements:** Automotive OEMs must play a more proactive and visionary role in stabilizing the upstream ecosystem. Long-term contracts and co-investments in refining or CAM assets could send strong signals to raw material producers and de-risk projects.
- **Incentivizing local material production:** Policy makers need to move beyond cell production subsidies and create comprehensive industrial policies that also reward domestic production of CAM and precursor materials with clear benefits for each supply step. This includes matching support seen under frameworks like the U.S. Inflation Reduction Act (IRA), which has successfully incentivized holistic supply chain development and encouraged global players to localize their production in the US as well
- **Accelerated permitting and administrative clarity:** The average permitting time for lithium mining projects in Europe often exceeds 5–7 years. Streamlining these procedures with clear environmental and social guidelines is essential to shorten project timelines and unlock capital in the European market which is still in infancy and competing with mature Asian supply chains
- **Strategic infrastructure planning:** Investments in supporting infrastructure, such as chemical-grade transport networks, water management, and energy supply integration, are crucial to enable sustainable and scalable operations.
- **Technology & process innovation:** Digital tools, process intensification, and modular refining technologies can help improve economics and reduce environmental footprints.

- **Industry coordination and transparency:** Building trust and data transparency across the value chain—from mining to cell manufacturing—will enable better planning, alignment, and cross-sector investment.

Addressing these enablers in parallel will not only improve individual project bankability but also reinforce Europe's competitive edge across the battery materials landscape.

7. Conclusion: Building a coherent European lithium strategy

The future of Europe's battery industry hinges on the seamless integration of raw material production with end-use manufacturing. Local lithium projects—across a diverse portfolio of hard rock, geothermal, and refining initiatives—offer a promising pathway toward supply security and industrial differentiation. However, the integration challenge, particularly in light of the limited and evolving capacity of downstream CAM manufacturers like Umicore and BASF, remains a critical concern.

A coordinated strategy that fosters collaboration across the entire value chain, supported by robust policy frameworks and strategic investments in both upstream and downstream capacities, is essential. Only then can Europe close the gap from resource extraction to battery cell production and secure its position in the global energy transition.

By strategically aligning mining, refining, and manufacturing efforts, Europe has the opportunity to create a resilient and self-sufficient battery ecosystem—one that capitalizes on regional strengths and paves the way for a sustainable, competitive future.

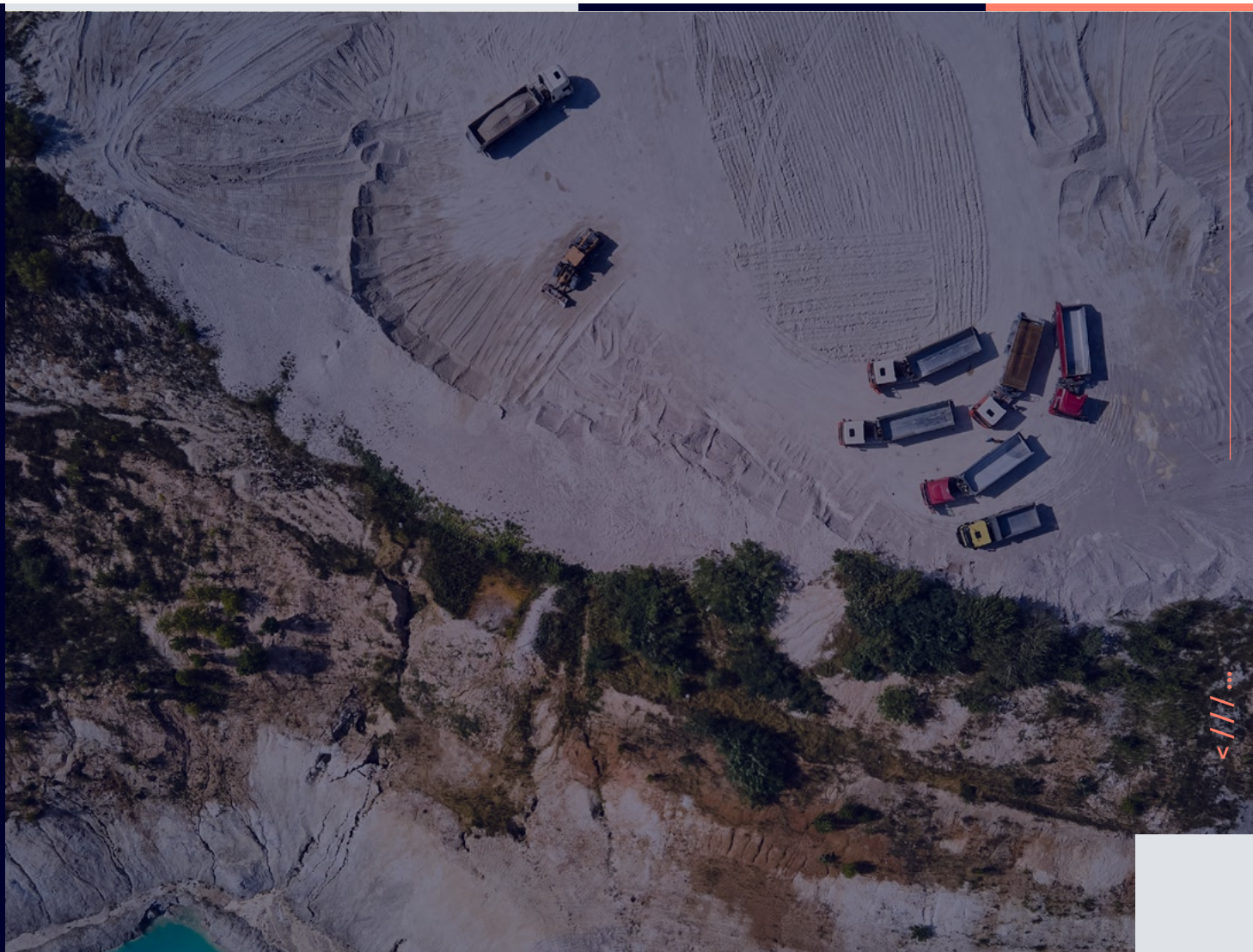
8. How P3 can support players across the value chain

P3 brings extensive experience in battery technology, industrialization, and strategic transformation, offering tailored support to stakeholders throughout the lithium value chain. Our value contribution spans from strategic guidance to operational implementation:

- **Benchmarking of lithium processes and supply chains:** Comparative analysis of production routes and end-to-end supply chains, focusing on cost structures, sustainability metrics, and geopolitical resilience.
- **Raw material strategy development for OEMs:** Design of sourcing strategies that balance cost efficiency, regulatory compliance (e.g. EU Battery Regulation, CRMA), supply security, and independence.
- **Downstream qualification & integration guidance:** Support for lithium producers in understanding and fulfilling technical, ESG, and commercial requirements to qualify for battery-grade markets.
- **Strategic roadmapping & option space definition:** Development of actionable roadmaps, strategic scenarios, and investment pathways for lithium projects and their integration into the broader battery value chain.
- **Industrialization support:** Assistance in scaling processes from pilot to series production, including technology validation, ramp-up planning, and supplier interfacing.
- **CAPEX/OPEX benchmarking and investment decision support:** Evaluation of business cases, sensitivity analyses, and cost competitiveness vs. global peers.
- **Market intelligence & industry insight:** In-depth knowledge of market dynamics, regulatory trends, and competitive positioning to inform investment and partnership decisions.

- **Partnering and integration strategy:** Design of industrial collaboration models and partner ecosystems to accelerate qualification, derisk investments, and improve market access.

With our hands-on, cross-functional approach, P3 is uniquely positioned to enable European lithium stakeholders to transform potential into competitive advantage, across all stages from raw materials to battery cells.



Need support in building a coherent lithium battery strategy?

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