DECARBMINE
[CHALLENGE]

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Technical Data Sheet DecarbMine Challenge **Lithium**

Challenge 1

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Critical Inputs and Circular Materials for Lithium Mining

Reagents, consumables, and circular materials for Scope 3 decarbonization

Background

Lithium is a strategic resource for the global energy transition, essential for the production of lithium-ion batteries used in electric mobility, renewable energy storage, and low-carbon technologies. Demand for lithium is directly linked to global climate commitments, and its supply has become central to international resource security strategies.

Lithium mining and processing involve emissions distributed across Scope 1, Scope 2, and Scope 3, with Scope 3 potentially accounting for more than 50% of total emissions. These emissions are mainly associated with the production of inputs and reagents, transportation, supply chains, and the manufacturing of derivative materials.

In addition, as in other critical minerals industries, there remains significant untapped potential to apply circular economy approaches and the valorization of waste and by-products to reduce reliance on virgin raw materials and mitigate overall carbon emissions.

In this context, adopting low-carbon and circular management models for critical inputs, component reuse, and industrial waste valorization within the lithium sector can substantially contribute to reducing the carbon footprint of the value chain while increasing the resilience and competitiveness of key industry stakeholders.

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Objective

To promote Scope 3 decarbonization in lithium mining through the development, validation, and adoption of solutions that transform the use of critical inputs and strategic materials toward lower environmental footprint models, integrating efficient resource use, circularity, and closed-loop systems across the lithium value chain.

Scope

The challenge considers solutions applicable to inputs, reagents, and strategic materials used in the extraction, processing, and refining of lithium in brine-based operations, including, but not limited to:

- **Critical Lithium Process Reagents** with particular emphasis on **sodium carbonate (soda ash)** used in the **chemical conversion of lithium chloride into lithium carbonate**, a key stage of the process and one of the **main sources of Scope 3 emissions** due to the **high energy intensity of soda ash production**.
- **Other Strategic Reagents and Inputs** used in **purification, chemical adjustment, and conversion stages**, such as **lime (calcium oxide or calcium hydroxide), hydrochloric acid, and sulfuric acid**, which are applied for **impurity control, pH regulation, chemical reactions, and conditioning of process streams**. Their consumption and origin can have a **significant impact on the environmental footprint of the final lithium product**.
- **Conventional Materials Generating High-Impact Industrial Waste,** such as tires, conveyor belts, ferrous scrap, and other relevant industrial materials, whose management, replacement, and disposal represent opportunities to reduce Scope 3 emissions through optimization, reuse, or circularity approaches.

Proposed solutions may address one or more of the following action areas:

- **Reduction of carbon footprint and other environmental impacts** associated with the production, manufacturing, transportation, and logistics of reagents, inputs, and strategic materials used in the lithium value chain.
- **Process and operational optimization,** aimed at reducing the specific consumption of critical reagents and inputs—such as soda ash, lime, and industrial acids—in both purification stages and the chemical conversion of lithium chloride into final products, through improvements in process control, operational efficiency, stage integration, and loss reduction.
- **Reduction in specific consumption or extension of the service life of materials** through improvements in process design, maintenance practices, asset management, or enhanced operational stability.
- **Substitution of conventional materials with lower environmental footprint or more circular alternatives,** while maintaining or improving technical performance, lithium product quality, and process stability.
- **Reuse, advanced recycling, and the development of closed-loop systems** that enable the recovery and reintegration of materials, by-products, or process streams, reducing the demand for virgin raw materials and associated emissions..

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General Requirements

Proposed solutions should generally meet the following requirements:

1. **Decarbonization Impact and Scope 3 Emissions Management:** Demonstrate a potential or proven reduction in carbon footprint associated with the production, supply, and use of reagents, inputs, or strategic materials within the lithium value chain, ideally supported by Life Cycle Assessment (LCA), product carbon footprint analysis, or other verifiable environmental indicators. Solutions should also enable measurement, monitoring, and traceability of environmental and operational benefits to facilitate integration into corporate sustainability and decarbonization reporting systems.
2. **Operational Compatibility:** Be technically compatible with typical lithium brine mining and refining processes, including pH ranges, ionic concentrations, temperatures, residence times, and operational continuity, without introducing significant risks to process stability or final product quality.
3. **Process Performance and Product Quality:** Maintain or improve key lithium process performance indicators, such as purification efficiency, chemical conversion yield (e.g., lithium chloride to lithium carbonate), specific reagent consumption, operational stability, and compliance with product quality specifications.
4. **Scalability and Technological Maturity:** Have a technology readiness level that allows validation in industrial or semi-industrial (pilot) environments, with a clear pathway toward commercial-scale implementation, including a well-founded estimate of time-to-market (TTM) for effective deployment in mining operations.
5. **Safety and Regulatory Compliance:** Comply with occupational health and safety standards and applicable environmental regulations, including aspects related to handling, storage, transportation, and end-of-life management.
6. **Social Approach and Local Development (desirable but not mandatory):** Incorporate an approach that contributes to local supplier development and shared value creation with surrounding communities, through productive linkages, capability transfer, local employment, or collaborative models that strengthen the positive social impact of the project.

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Process Timeline

SCOUTING
March, 19 – April, 20

Search and reception of applications through the Expande platform

ELIGIBILITY ASSESSMENT
1 week

The Expande expert team evaluates applicant solutions to determine whether they meet the exclusion criteria established by the mining company

SOLUTION EXPLORATION
4 weeks

The Expande expert team gathers additional information from solution suppliers whose solutions meet the challenge's eligibility criteria

RECOMMENDATION & SELECTION
3 weeks

The solutions are presented to the mining company, ranked according to the agreed evaluation. Expande notifies suppliers whether their solutions have been selected or not

DEMO DAY
MILESTONE

Selected suppliers showcase their solutions to the mining company, who evaluate them during the event

NEXT STEPS
MILESTONE

The mining company defines the next steps

CONFIDENTIALITY:

The submission of personal data for registration in the database, as well as information related to technological solutions for participation in open innovation processes managed by Expande, is strictly confidential. The same applies to information provided through contact forms to receive updates on subsequent stages of these processes.

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Participating Companies:

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