MICA Challenge: Reimagining Material Movement in Underground Mining

Challenge Title: Reimagining Material Movement in Underground Mining
Challenge Issued for: Tier 1 mine operator
Challenge Issued by: MICA Network
Challenge launch date: September 19, 2025
Challenge close date: October 24, 2025

Opportunity Overview:

A MICA mining operator is undertaking a strategic review of how material is hauled, particularly in underground operations, as current methods (primarily truck-based) are increasingly seen as suboptimal in terms of cost, flexibility, and long-term scalability. This initiative aims to identify, evaluate, and eventually pilot **new material movement technologies** that reduce operational cost, improve energy efficiency, and prepare for future high-tonnage demands (e.g., 5,000+ tonnes/day by 2030).

The mine operator is looking for a solution to transfer ore from underground to the surface and/or to the mill, and are open to solutions to reduce OPEX and GHG emissions.

Core Challenges

Status Quo Limitations

- **Overreliance on Trucks**: Mobile haulage is the default, even when better alternatives may exist. This stems from availability, not operational optimization.
- **Legacy Practices**: Equipment is often transferred from existing projects to new ones to reduce CapEx, leading to long-term inefficiencies.
- **High Operating Costs**: Trucks introduce significant OPEX (fuel, maintenance, labor) and have growing logistical limitations underground.

Methodology Constraints

- Optimization of existing truck fleets (automation) is being explored but may not address the fundamental need for alternative haulage methodologies.
- There's a desire to break the reflexive use of trucks and rethink the system from first principles.

Scalability & Infrastructure Pain Points

- Truck haulage does not scale efficiently for emerging underground projects requiring 5,000+ tonnes/day.
- Existing infrastructure presents space and power limitations, making high-density trucking less viable.

Opportunity & Vision

The goal is to use the right tool for the right task.

The operator is seeking:

- **Fit-for-purpose material movement systems**: for repetitive, fixed-path haulage.
- A **hybrid approach**: flexible near-face mobility (LHDs or autonomous scoops) combined with fixed systems (conveyors, pumps).
- **Open innovation** pathways: collaboration with emerging vendors or cross-industry providers to find scalable, efficient, and future-ready alternatives.

Strategic Benefits

- **Operational Efficiency**: Assign the right technology to the right job, flexibility where needed, efficiency where repeatable.
- **Decarbonization Pathway**: Reduce diesel reliance and environmental impact.
- **Future-Readiness**: Align infrastructure with anticipated project needs and production rates.
- **Ecosystem Positioning**: Establish the company as a forward-thinking partner for mining innovation.

Desired Technology Profile

Requirement	Description
TRL Level	Preference for TRL 5+, but open to promising earlier-stage solutions
Capacity Potential	Should be scalable to 5,000+ tonnes/day

Operational Model	Hybrid models preferred, flexible at the face, fixed for long-distance haulage
Cost Objectives	Reduce long-term OPEX
Mine Types	Focus on underground; open to dual application with open-pit sites
Integration Flexibility	Minimal infrastructure constraints preferred; adaptable to various sites

Note: The organization is not yet in a detailed cost modeling phase. The current focus is on identifying available technologies and future potential.