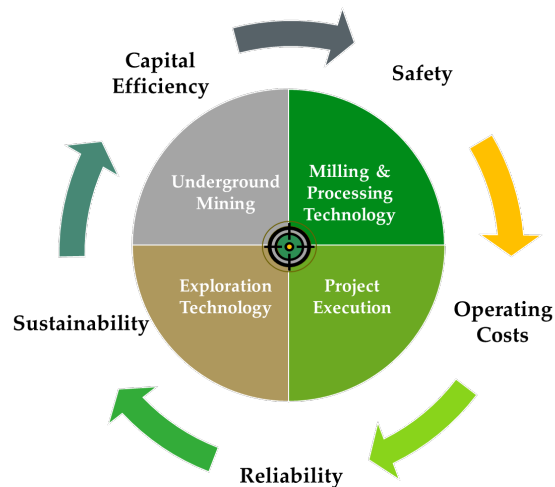


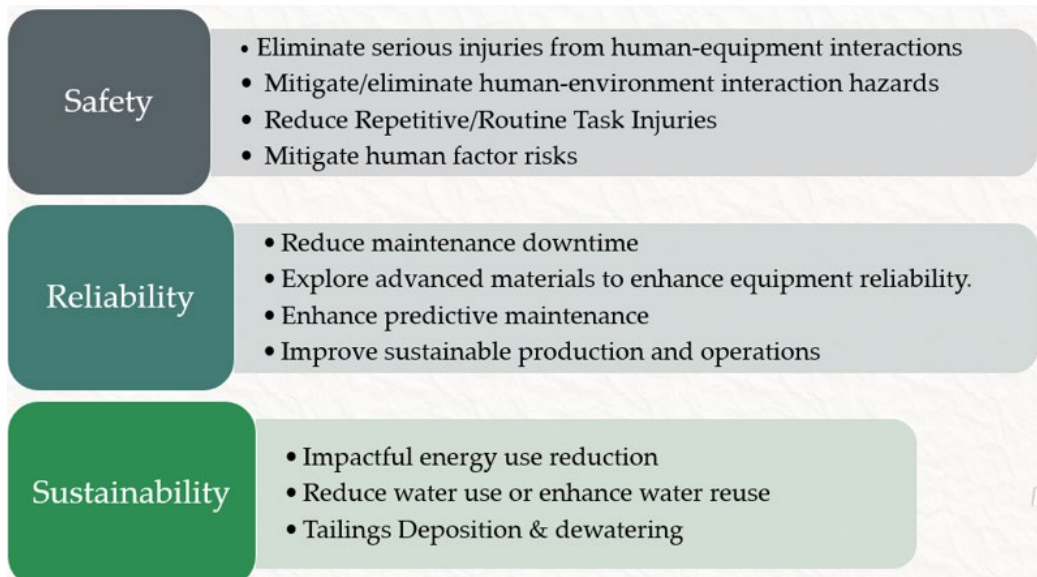
## IMII DEMOday 2026 Technology Needs

IMII's industry member technology needs are driven by the organization's overarching strategy. For the 2025-28 Strategic Plan, IMII is focused on 4 core areas and 5 innovation drivers, as illustrated in the graphic below. The 4 quadrant focus areas define the areas of interest industry is prioritizing in this strategic cycle – essentially, the what. The five innovation drivers/strategic priorities of safety, operating costs, reliability, sustainability and capital efficiency are the why – they are the things that drive why industry is seeking innovation and what will help justify funding support for innovation projects. By addressing these focus areas and drivers, from ideas toward development and demonstration, IMII facilitates projects in the innovation ecosystem that drive growth for the Saskatchewan minerals sector.



DEMOday focuses on addressing practical, on-the-ground challenges within Saskatchewan's mining sector. It offers innovators the opportunity to showcase technologies that have the potential to advance safety, sustainability, productivity, reliability, and operational performance. This document outlines some areas that have been identified by industry as areas of interest for innovation and new technology.

At a high level, IMII's innovation needs across three of IMII's primary drivers are summarized on the graphic below.



Solution providers are encouraged to focus on the overarching goals and challenges outlined within each area of interest and to propose innovative solutions beyond the specific examples provided.

## Innovation Strategic Priorities: Safety

Enhancing mine safety is a number one priority for all of IMII's members. The following summarizes overarching goals and areas of interest in this area:

- 1. Eliminate serious injuries from human-equipment interactions**
  - Reduce human exposure to hazards during maintenance
  - Predictive or inspection tools to anticipate equipment failures
  - Lock out/tag out enhancements
- 2. Mitigate/eliminate human-environment interaction hazards**
  - Proactive hazard management "tech on your shoulder"
- 3. Reduce Repetitive/Routine Task Injuries**
  - Reduce human exposure to accumulative hazards (vibration, noise, heavy lifting)
  - Eliminate poor ergonomics in repetitive tasks (ex. awkward positioning)
- 4. Mitigate human factor risks**
  - "Tech on your shoulder" to enhance situational awareness, fit for duty awareness
  - Training technology (ex. VR)

## Innovation Strategic Priority: Reliability

### 1. Reduce maintenance downtime

- Dust Reduction
- Innovations to allow maintenance shut-down
- Efficient downtime:
  - Enhanced lock-out/tag-out methods
  - Effective planning tools: Drawing Updates

### 2. Enhance predictive maintenance

- Improved hoisting reliability, belt and miner equipment reliability
- New measurement methods for health monitoring of mechanical components

### 3. Enhance Sustainable Production and Operations

- Predictive process control
- Advanced process analytics and measurement
  - New measurement tools: online moisture to dryers, radiation monitoring equipment

## Innovation Strategic Priority: Sustainability

### 1. Impactful energy use reduction

- Potash drying retro-fit
- Energy storage technologies
- Northern mines: Off-grid Energy efficiency

### 2. Reduce water use or enhance water reuse

- Technologies to reduce water use
- Tech to improve circularity of water use:
  - Desalination
  - Contaminant removal

### 3. Tailings Deposition & dewatering

- Increased density of tailings output
- Supernatant treatment after dewatering (ex. sulphate)

## Detailed Examples:

The examples listed under each primary driver below are intended to be illustrative rather than exhaustive. They are provided to help solution providers better understand the types of innovations that may align with each driver.

## Safety Strategic Priority Examples

### Ground Control – Proactive Detection

Limited ability to detect geological anomalies, voids, or adverse stress conditions in advance of mining creates uncertainty and significantly increases the risk of sudden roof failures, unplanned ground falls, and associated safety hazards. Current ground control practices are largely reactive in nature, relying on measures such as sounding, scaling, and established procedures. These practices are supplemented by ground penetrating radar (GPR), which provides only limited and intermittent subsurface imaging and does not offer a continuous or direct means of “seeing” beyond the cutting face.

Examples of areas of interest include, but are not limited to:

- Advanced sensing or imaging technologies capable of characterizing ground conditions ahead of development
- Integrated systems that provide continuous or repeatable forward-looking insight
- Novel approaches that extend beyond traditional GPR capabilities

### Vehicle and People Interactions (Collision Avoidance)

Interaction between mobile equipment and personnel is consistently identified as one of the top risks in underground mining and surface activities. Confined spaces, low visibility and procedural complexity amplify this hazard.

Proximity incidents, especially involving personnel carriers and haulage units remain a high-priority risk area.

Examples of areas of interest include:

- Proximity detection, collision avoidance, or warning systems
- Technologies that enhance visibility or awareness in low-visibility or congested environments
- Tools that support safe traffic management, decision-making, or procedural compliance

### Addressing Physical Ergonomic Challenges to reduce LTIs

Many routine maintenance and operational tasks require workers to access confined or difficult-to-reach areas. Certain tasks—such as manually operating large gate valves or handling heavy or resistant equipment—can be awkward, repetitive, or physically strenuous, leading to

increased risk of musculoskeletal injuries, fatigue, and other ergonomic related injuries which can lead to worker lost time.

Examples of areas of interest include, but are not limited to:

- Remote-operated, automated, or assisted systems
- Mechanical aids, tooling, or actuation technologies
- Solutions that replace manual intervention
- Novel equipment designs or retrofits that improve accessibility and ergonomics

#### Intelligent Workflow Optimization (Efficiency)

Across the mining industry, many frontline and supervisory workflows—such as work planning, task coordination, approvals, reporting, and issue escalation—remain manual or loosely digitized. These processes often rely on paper forms, spreadsheets, emails, and disconnected systems, resulting in fragmented information, delayed decision-making, and inconsistent execution across sites.

As operations grow more complex, geographically dispersed, and time-sensitive, there is a need to improve how work is **planned, monitored, adjusted, and learned from** in real time. Incremental digitization alone is not sufficient. There is a significant opportunity to leverage **intelligent workflow automation** to fundamentally improve workflow efficiency, situational awareness, and proactive decision-making throughout the work lifecycle.

Examples of areas of interest include:

- Anticipate constraints, risks, or inefficiencies before they impact execution
- Adapt workflows dynamically as conditions change
- Reduce administrative burden on frontline workers and supervisors
- AI models that learn from completed work, deviations, delays, and outcomes to continuously improve future workflow recommendations
- Identification of systemic bottlenecks, repeat issues, or inefficiencies across crews, sites, or asset types

## Reliability Strategic Priority Examples

### Corrosion Mitigation/Prevention

Corrosion remains a persistent and costly issue across potash facilities due to the inherently corrosive nature of potash material and the harsh operating environments encountered in both underground and surface systems.

Corrosion impacts the integrity and service life of critical infrastructure—including pipes, ducts, material-handling systems, and process equipment—leading to increased maintenance requirements, unplanned downtime, safety risks, and capital replacement costs

Examples of areas of interest include:

- Advanced corrosion-resistant alloys, composites, polymers, or hybrid materials
- Novel coatings, liners, or surface treatments designed for potash environments
- Innovative manufacturing or fabrication processes that enhance corrosion resistance
- Temporary or semi-permanent patching materials or systems that can be easily applied in the field

### Innovative Solutions to Improve Reliability of Mainline Ore Belts

Mainline conveyor belts are critical to mine production, transporting the combined output of multiple mining sections to the main shaft for hoisting. Because they operate continuously over long distances, any unplanned downtime can halt production across several areas, creating significant operational and financial impacts. Predictive maintenance is essential for ensuring their reliability. Monitoring technologies can detect early signs of belt wear, misalignment, roller failures, and drive system issues, helping prevent unexpected breakdowns and reducing downtime. Belt-vision systems, in particular, offer early warning capabilities by identifying potential splice failures before they occur but there's still room for improvement – to detect roller failures, drive system issues etc.

Examples of areas of interest include:

- Advanced belt monitoring and vision systems
- Sensor-based technologies for roller, idler, or drive system health
- Data analytics, machine learning, or AI-enabled predictive maintenance tools
- Integrated monitoring platforms that provide actionable insights in real time

### Innovative Solutions to Improve Hoist Reliability

Hoisting systems are among the most critical assets in underground mining operations, enabling the transport of people, ore, equipment, and supplies between surface and underground environments. These systems operate continuously under heavy loads and stringent safety requirements, making them essential to both production continuity and worker safety.

Any interruption to hoisting operations can have immediate and far-reaching consequences. Unplanned downtime can halt production, restrict personnel movement, limit access to critical work areas, and compromise emergency response capabilities, significantly increasing both operational and safety risks. Even short periods of hoist downtime can result in substantial production losses, scheduling disruptions, and costly delays.

#### Challenges

- Mechanical Wear & Component Degradation
- Control System & Sensor Failures
- Insufficient real-time condition monitoring
- Environmental and Operational Stressors (temperature fluctuations, moisture etc.)

### Connectivity Challenges for Remote Uranium Mines

Mining operations in Northern Saskatchewan operate in some of the most remote and environmentally challenging conditions in Canada. Reliable, resilient connectivity is critical to maintaining safe, efficient, and compliant uranium mining operations.

These operations rely on connectivity for:

- Core logging and geological interpretation
- Environmental monitoring and reporting
- Worker safety, emergency response, and communications
- Production systems, automation, and remote operations
- Cloud-based applications and data platforms

#### Challenges

- Dependence on a single telecommunications provider or network
- Limited redundancy for critical operations systems
- Growing connectivity needs for AI, automation, and monitoring systems (Increasing bandwidth)

## Sustainability Strategic Priority Examples

### Low-Cost Potash Tailings Deposition Strategy Solutions

Unlike hard-rock tailings, potash tailings are highly soluble and can experience rapid and unpredictable changes in moisture content, strength, and behavior when exposed to precipitation, seepage, or variability in process water conditions. These characteristics make potash tailings particularly susceptible to slope instability, surface erosion, embankment softening, brine migration, and unexpected settlement, presenting ongoing operational, safety, and environmental risks.

Maintaining stable deposition slopes, effectively managing brine movement, and anticipating geotechnical changes over time are critical to ensuring safe operation, minimizing risk, and meeting regulatory and environmental stewardship expectations.

Areas of interest include, but are not limited to:

- Real-time monitoring of moisture, pore pressure, settlement, or slope stability
- Technologies for tracking brine migration and seepage behaviour
- Advanced sensing, instrumentation, or remote-monitoring systems

### Innovative Monitoring Systems for Utility Usage and Leak Detection

Mining operations rely heavily on essential utilities such as compressed air, hydraulic fluids, and glycol-based heating and cooling systems to support production, maintenance, and safe operation. Undetected losses within these systems—whether caused by small leaks, degraded fittings, or equipment failures—can lead to significant operational inefficiencies. These losses often result in increased energy consumption, elevated maintenance costs, unplanned equipment downtime, and heightened environmental or safety risks.

Areas of interest include, but are not limited to:

- Technologies that enable actionable insights without excessive installation or maintenance complexity (i.e. options that do not involve extensive additional instrumentation).

### Potash Water Challenges

In current operations, excess water—including precipitation (rain and snow) collected on-site as well as additional fresh water introduced into the system—is routinely deep-well injected to maintain relatively consistent brine containment levels. As a result, large volumes of co-saturated



brine are injected, representing both a significant operating cost and an environmental management challenge.

In addition, fresh water consumption in mills remains a key focus area. Fresh water is used for a variety of functions, including, grade control processes such as floatation or crystallization, equipment and process cleaning, scrubber systems etc.

Reducing water use or enabling water reuse in any of these areas can significantly lower overall water consumption and improve sustainability performance.

Areas of interest include, but are not limited to:

- Advanced water treatment, separation, or desalination technologies
- Brine concentration, selective recovery, or resource extraction processes
- Process innovations that reduce water intensity in milling operations
- Systems that enable reuse of process or waste water