As Chair of GMG, I have had the privilege of serving you for the past two years and in the years before as Vice-Chair. These have been tumultuous times for GMG, the industry and the world. Despite the challenges, GMG volunteer members and staff have brought thoughtful insights and shared these with each other and the industry.

First, let me thank all of the members for their time and effort to create an independent, global, industry-spanning, collaborative institution – an institution dedicated to advancing the art and science of mining for the production of materials the world needs. Metals and minerals are fundamental to our quality of life and to the world’s economy and ecology. Ore bodies are becoming harder to find, and when found, have lower grades. These require more energy to extract, putting more pressure on the environment. Practical experience, innovation and the results of experiments must be shared among industry players like never before.

This is a challenging scenario where operators and regulators are seeking practical, non-partisan guidance. This is GMG’s niche. The industry cannot change without the collaboration of miners, OEMs, OTMs, academia, regulators, and the national mining organizations. GMG is not an organization of executives but an organization of doers and makers. We are founded on the principle of sharing non-competitive information. We embrace the entire value chain in the mining industry. It is in this collaborative atmosphere that priorities have emerged and where GMG has put its shoulder to the wheel.

In the next five years, the industry must be realistic about GHG goals and our ability to address these issues. These are systemic issues that cannot be addressed as singular process improvements. What is our approach and how do we share these findings to affect mining operations? Some of our members are already looking at serious changes to their processes. Others are beginning the journey.

On the technology side, we have only scratched the surface of using AI in mining, mostly in the guise of machine learning. There is a burgeoning use of simulation in the industry that has yet to find direction, while drone-based data analysis for both ore body knowledge and dam safety represents a new air force in the making. Robotic inspection and control in potentially unsafe areas such as conveyors or under truck bodies represents another area of latent innovation. We must keep on asking the right questions to find the right solutions.

My view has been, and will continue to be, that GMG must be seen as a source of truth for emerging technologies. It is the GMG community that brings its collective experience to create and illuminate this knowledge for the industry.

It’s been my honour and privilege to serve you. There are many new members on the Board and I expect they will bring fresh perspectives, energy and insights to guide the future. I wish Mark as Chair, and the new Board much joy and success and wish to thank the outgoing GMG board members for their significant contributions. The staff of GMG have been asked to go “above and beyond” in a very uncertain time of independence. They have succeeded. Thank you. And it is the makers and doers that I thank most. You are the carriers of the flame.

Warmest regards,
Kalev Ruberg

FROM THE OUTGOING CHAIR

KALEV RUBERG
CEO AND EXECUTIVE TECHNOLOGY ADVISOR, KARU ADVISORY LTD.
Mark O’Brien is General Manager for Digital Technology & Innovation (CIO) at CITIC Pacific Mining, Australia’s largest magnetite mining and processing operation. His experience in mining technology spans more than 30 years.

Mark was the Inaugural Chair of the GMG AI in Mining Working Group, Chair of the SAP Australia User Group (SAUG) Working Group on AI, as well as a regular contributor to national and international collaborations around mining technology. Alongside his board work, he provides advisory services on leadership, technology, AI, and cybersecurity.

He is currently undertaking PhD research in AI and Machine Ethics.

Why did you want to take on the role of GMG Chair?

GMG has been an amazing source of both learning and fantastic relationships right across the industry. I’ve enjoyed contributing to the workshops and guidelines along the way so it was an easy decision to think about giving back to the organization. I really believe GMG is a unique organization in the industry, much-needed at a time like this, and I feel very honoured to have the opportunity to contribute toward its future.

What do you see as the major issues the industry will face in the next five to 10 years?

Mining has to find a sustainable way to provide what the world needs for its future, and that brings a lot of challenges. We need to be more efficient, safer, be seen as good stewards of our environments rather than exploiters, and to generally be seen as positive contributors to our communities. That’s a lot of challenges, but we have to find a way to make good progress because mining is still vitally necessary to provide the materials for the future.

How can GMG help industry tackle these issues?

GMG is unique in that it is a very open and collaborative community that invites every stakeholder associated with the industry to work together to tackle these problems and propose solutions. GMG also looks to be a great supporter and encourager of other groups tackling innovation, knowledge sharing and expertise to arrive at solutions that improve the industry as a whole. I think our openness and breadth, plus the great track record of effective, positive collaboration, put us in a key role to help shape the future of mining.

What are your priorities for your two-year tenure?

I believe GMG is at a key inflection point in its journey. We’ve seen some great success and impact in our history to this point, and a key part of my focus is to continue that journey. We also know we need to expand our influence in a number of key ways, not just in regions where we currently don’t have a great presence, but also to build influence with other stakeholders such as government, non-government agencies, academia, and others. We will also need to reshape ourselves operationally for that kind of future because at the end of the day we want to ensure we deliver clear value and benefit to all of our members across the board. I think it’s going to be an exciting few years ahead.

We have a great Board, hugely committed staff, and stakeholders who are engaged and active. I’m personally very excited for our future and glad to be a part of it.
GMG’s Working Groups and projects align under three streams of work, including: **Autonomous Mining**, **Harnessing the Power of Data**, and **Decarbonization and Lowering Emissions**. This graphic outlines at-a-glance where they all fit and where they cross over.

### AUTONOMOUS MINING

<table>
<thead>
<tr>
<th>Planning and scoping</th>
<th>Readiness</th>
<th>Implementation</th>
<th>Sustainable operations &amp; optimization</th>
<th>Expansion</th>
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<tr>
<td>Common Language for Mining Technology</td>
<td>Applying Simulation in Mining</td>
<td>Functional Safety</td>
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<td>Small Vehicle Automation</td>
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<td>Autonomous Mining / Underground Mining / Asset Management</td>
<td>AI and Applications of Data / Cybersecurity / Data and Interoperability</td>
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### HARNESSING THE POWER OF DATA

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<td>Applying Simulation in Mining</td>
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<td>Cybersecurity / AI and Applications of Data / Data and Interoperability / Asset Management</td>
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### DECARBONIZATION AND LOWERING EMISSIONS

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<td>Transition from Diesel Equipment in Surface Mining</td>
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WORKING GROUPS AND PROJECTS

ARTIFICIAL INTELLIGENCE AND ADVANCED APPLICATIONS OF DATA

Applying Simulation in Mining
The use of simulation will be an important tool for derisking, planning and optimizing the use of new technologies and processes in mining. Currently, many companies are using simulation to some extent, but there lacks a broad and deep understanding of the potential applications of simulation in the mining industry, including understanding what specific challenges or issues simulation can address and how it can be effectively applied.

Work is underway to determine a clear scope of work to best support its increased and effective use.

Foundations of AI in Mining White Paper V2
This white paper offers an overview of the process of planning for and implementing artificial intelligence (AI) solutions for mining companies. It addresses a variety of concerns, such as the challenge of establishing data infrastructure, apprehensions about the effect on the workforce, and worries about failure after investing substantial time and funds into an AI project. The document provides a realistic strategy for building a foundation for planning, implementing and moving forward with AI.

Version Two will update the white paper with the latest developments and use cases.

AUTONOMOUS MINING

Zero-Entry Mining
Zero-entry mining refers to mining operations in which personnel aren’t physically present in the mining area where autonomous equipment is in operation, allowing the full benefits from autonomy to be realized. To create zero-entry mining, systematic coordination of all mining in a smart, integrated ecosystem must be realized, which will require collaboration between all stakeholders: mining companies, OEMs, third-party suppliers, data system vendors, etc.

This project will define zero-entry mining and its requirements, and detail requirements for designing and developing for zero-entry mining in the future.

Small Vehicle Automation
As the adoption of autonomous systems in mining advances, small vehicle automation is growing more affordable and accessible. Small vehicle automation can be an option for different types of operations (e.g., quarries, small-scale mining operations) that do not use large mining-scale haul trucks, or for large operations looking to automate their smaller or auxiliary equipment. There is a growing diversity in vendors for smaller-scale vehicles, which presents both opportunities and challenges. To enable the successful adoption of these systems, there is a need for a better understanding and awareness of the unique risks and good practices associated with them.

Underground and surface mining have been split into two streams of work for this project

“We believe that collaborative events... are crucial for the growth and development of our industry. They allow us to exchange ideas, share best practices, and collectively address the pressing issues we face. [We are] committed to being at the forefront of innovation and being a part of this forum aligned with our mission to drive progress in the mining sector.”

– Mining OEM
Implementation of Autonomous Systems V2
This guideline provides information on implementing autonomous systems in mining using current industry practices and common terms of reference, and provides guidance and considerations on justifying, planning, preparing, testing, and executing autonomous mining projects. Different levels of autonomous system maturity exist across mining operations and requirements vary depending on the type of operation.

Current activities are focused on identifying common challenges associated with operational technology resilience.

ASSET MANAGEMENT

Asset Management for Electrification White Paper
This white paper will help readers understand the transition to electric fleets while addressing the common asset management and maintenance challenges associated with it.

The paper will focus on risk management, data management and developing the key considerations and methods to implement during the transition to electrification.

Benchmarking Fleet Utilization and Productivity
This project aims to develop an industry-led benchmarking program for fleet utilization and productivity. As more mines adopt the Standardized Time Classification Framework for Mobile Equipment in Surface Mining Guideline, industry benchmarking becomes more viable as companies are collecting comparable data.

Establishing a common industry benchmarking program will enable further optimization as companies will be able to leverage best practices identified through the program.

DATA MANAGEMENT AND INTEROPERABILITY

Common Language for Mining Technologies
This project will determine and provide common terminology and definitions for mining equipment, systems and processes. This is intended to be a first step to establish a common understanding, which can be used to support and identify common system integration areas and issues, where further collaborative efforts are needed.

This common language and reference will help operators, suppliers, and other parties communicate their needs within determined boundaries.

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sharing between mining companies. Taking a use-case approach will help prioritize the development to support industry.

The initial phase will focus on BEVs in underground mining.

THE ELECTRIC MINE

Implementation of Battery Electric Vehicles in Surface Mining
This project aims to recommend best practices for implementing battery electric vehicles in surface mining with a focus on understanding readiness for haulage and auxiliary equipment.

Surface mining has unique considerations specifically with environmental conditions and unique road characteristics that complicate the shift and implementation of battery electric equipment on the surface. Topics to cover will include:
- Safety and Risk Management
- Workforce and Training
- Transition, Change Management and Business Case Creation
- Low Emission Equipment and Energy Management Requirements

This guideline will help address these challenges while considering the evaluation of numerous alternative solutions.

Electric Mobile Equipment KPIs and Definitions
This project aims to establish common language and KPIs to assist the deployment and operations of electric mobile equipment while supporting data and information sharing between mining companies. Taking a use-case approach will help prioritize the development to support industry.

The initial phase will focus on BEVs in underground mining.

UNDERGROUND MINING

Rethinking Mine Design in Underground Mining
This white paper aims to demonstrate to executives, mine designers, and the overall industry that whether the final outcome is increased throughput, improved cost per tonne, or reduced waste, a wide range of benefits can emerge from the unshackled development of underground mine design that enables full value realization from innovation and technology.

The white paper will focus on approaches to derisking new technology and processes that support new approaches to mine design.

Underground Mine Communications Infrastructure
The purpose of this guideline is to provide current best practices for designing underground mine communications, highlighting potential challenges, key decisions, and typical solutions. There is a need to keep the industry up-to-date with best practices for underground communications due to rapid technological advances.

This guideline can enable greenfield mines to make decisions upfront to determine what technology and hardware is best suited for their operation while brownfield operations can refer to the guideline for upkeep and disposal or refresh considerations.
**Time Usage Model for Underground Mining**
The goal of this project is to build a consensus time usage model, KPIs and definitions for underground mining. This guideline will provide a classification framework for operational activity that will enable meaningful performance analysis and industry-wide comparison.

The project will include recommendations for consistent classification of common underground mining operational activities, statuses, and events into standard time categories, and will recommend definitions for common industry operational KPIs for reporting mining asset availability and utilization.

**SUSTAINABILITY**

**Holistic Energy Management Across the Mine Site: Minimizing and Optimizing Energy Consumption**
The purpose of this project is to enable mining companies to optimize energy use by examining how different factors impact energy flow and consumption across the mine. Taking a use-case approach, the project will identify the many potential levers that could be pulled to impact energy requirements and outline key considerations for each.

The resulting white paper will help identify the next phases of this project stream.

**Circularity**
By embracing circular economy strategies, mining cannot only meet current demands but steer the industry toward a sustainable future, aligning business practices with the evolving needs of society. A circular economy results from embracing strategies that minimize, reuse and ultimately eliminate waste.
UPCOMING EVENTS

FORUMS
Built of presentations, case studies, panel discussions, and working sessions, forums are an opportunity to learn from and collaborate with peers. Focused on the critical topics from GMG Working Groups, GMG hosts forums globally to address regional challenges, drive increased knowledge sharing between companies and help members develop productive relationships with colleagues.

May 29-30: Lima, Peru
June 18-19: Sudbury, ON
August 13-14: Perth, Australia
October 8-9: Edmonton, AB
October 22-23: Santiago, Chile
November 19-20: Johannesburg, South Africa

GET INVOLVED!
All employees of member companies are welcome to get involved in Working Groups and projects.

GIVE
Share your expertise
- Contribute to and/or review content of publications
- Present during a forum or workshop on an industry topic
- Present on a GMG-related project during a short course, workshop or other industry events
- Host a webinar
- And more!

AND TAKE
Absorb knowledge you can take back to your operation
- Participate in webinars, courses, forums, roundtables, etc.
- Participate in working group events and workshops
- And more!

“Your work is wide-ranging and appreciated in that it gets people thinking.”
– Minerals Industry Consultant

There are even more events online! Stay tuned at http://gmigroup.org/event

LEADERSHIP SUMMIT
An annual, exclusive event for GMG Leadership and Collaborator-level members. This engaging two-day summit will examine how mining can manage responsible production, tackle decarbonization and be responsible community partners. Formulated for executives only, summits are packed with case studies and presentations built to examine the issues, challenges, opportunities, successes, and failures executives face on a daily basis. More information to be announced.