

I **INNOVATION** **L** **FORUM** **MINING THE GAP**



ACKNOWLEDGEMENT OF COUNTRY

Mining3 acknowledges the Traditional Owners and their custodianship of the lands on which we meet.

We pay our respects to their Ancestors and their descendants, who continue cultural and spiritual connections to Country.

We recognise their valuable contributions to Australian and global society.



HOUSEKEEPING INFORMATION

W Brisbane has a two tone alert system for evacuation; if there is an emergency a beep alert will be sounded throughout the effected area, whilst we investigate the cause of the alarm. In the event our guests are required to evacuate, the alert tone alarm will change to a whooping noise with a “please evacuate” instruction.

W Brisbane staff will take control of proceedings; the staff will then direct you to the closet evacuation rout and escort you to the fire assembly area located at the Reddacliffe place, located between the Treasury Casino and the Suncorp Tower. You will be requested to follow their directions towards the green illuminated evacuation route signs as quick and calmly as possible.

There are 2 sets of toilets on Level 3

1. Exit the lifts and directly to the left before walking through the Atrium
2. Proceed through Atrium and follow either corridors with abstract art walls

W Brisbane is a non-smoking hotel. The allocated smoking area for guests is located on the corner of North Quay and Ann Street. Exit hotel via main driveway, turn right and proceed down to the corner where the motorbikes are parked.

ACCESS THE TECHTALK QUIZ

Also included in your booklets



BREAKFAST

9:05 – 9:30AM



GET CONNECTED

Need Wi-Fi?

Internet access is complimentary for guests.

Connect to '**MarriottBonvoy**' network in your device settings.

Wait for the pop up window and click 'Connect For Free'

OUR PARTNER ECOSYSTEM

BHP

KOMATSU



THIESS

CATERPILLAR

DYNO
Dyno Nobel

OPENING REMARKS

9:30 – 10:00AM

DR JACQUI COOMBES

Chairperson

Mining3







AVAILABLE FOR DIGITAL DOWNLOAD



Also included in your booklets

DR NEVILLE PLINT

Chief Executive Officer

Mining3





Tongariro Alpine Crossing

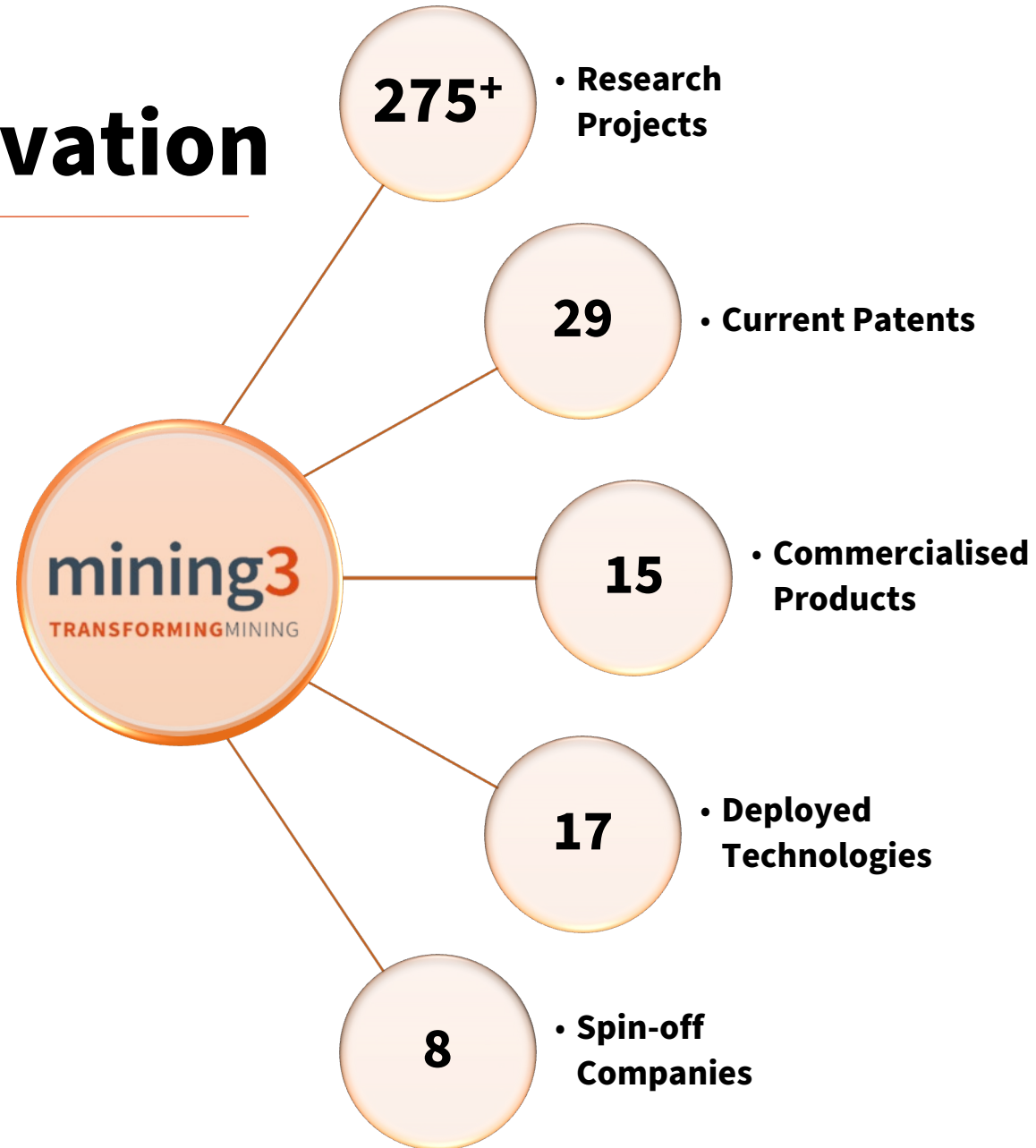


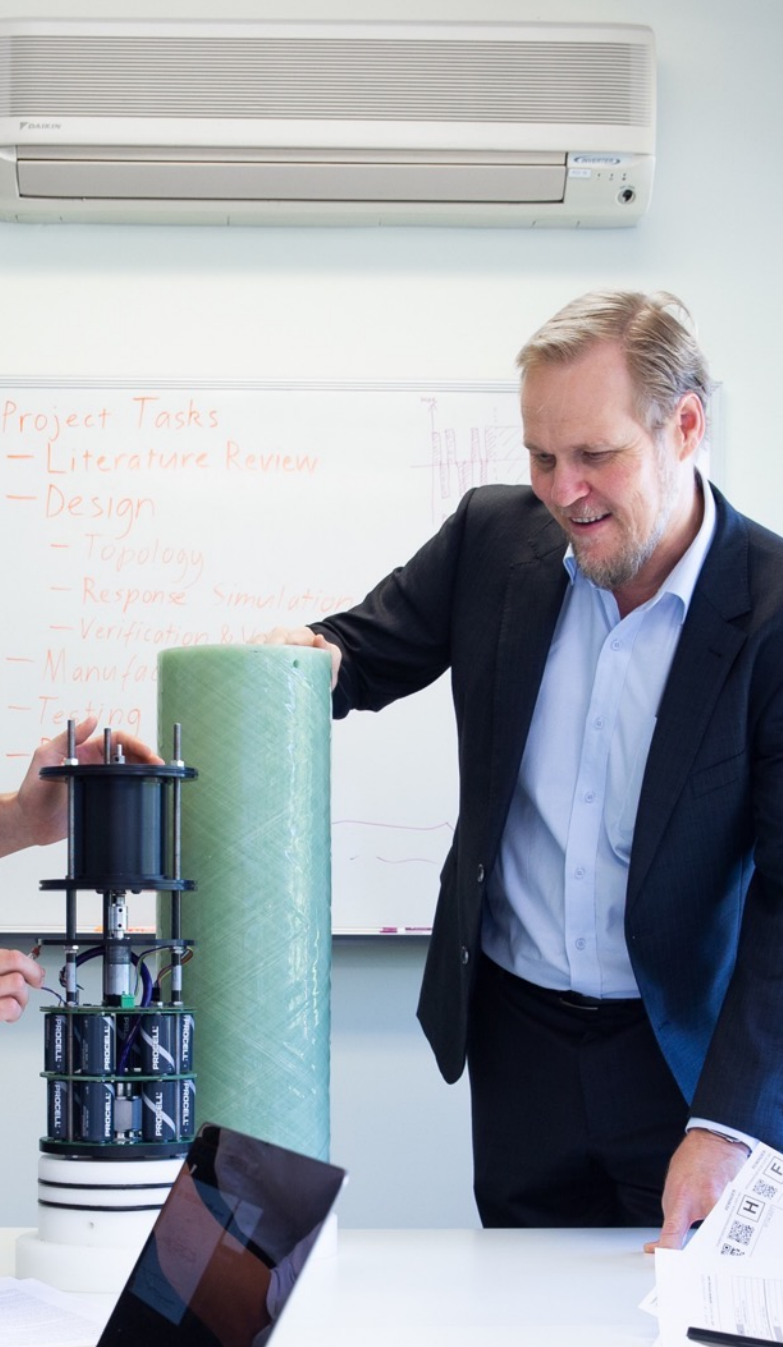
Tongariro Alpine Crossing

As a consortium of companies our purpose is to **transform** mining

by leveraging our knowledge as mining companies, innovators and technology suppliers to accelerate the deployment of world-class innovations to make our companies safe, sustainable and profitable.

30 years of innovation





Commercialisation

Mineware – Dragline/shovel monitoring

SmartCap – Operator fatigue management

Elexon Mining – Cave Tracker

AVA – DAS for conveyor condition monitoring

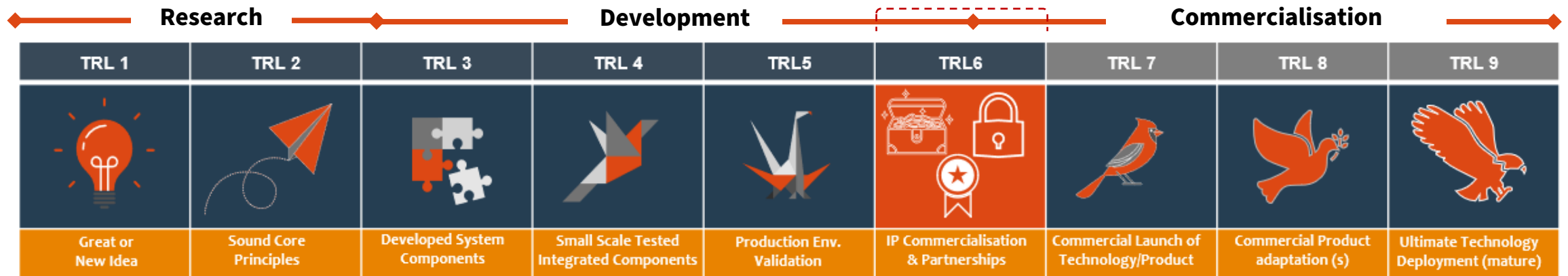
Acumine – Collision avoidance: EMERST

UniDig – Dragline cable and automation system

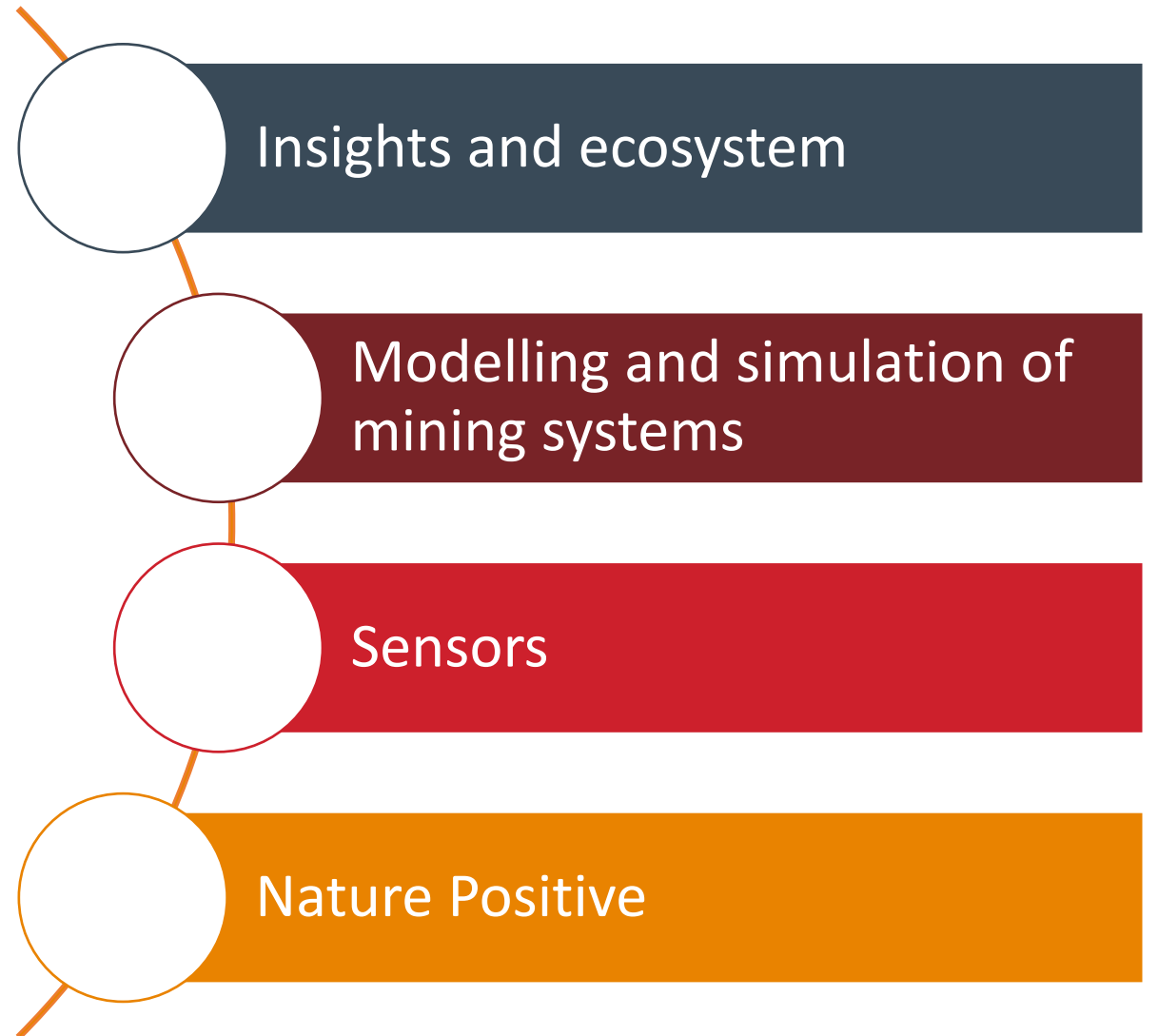
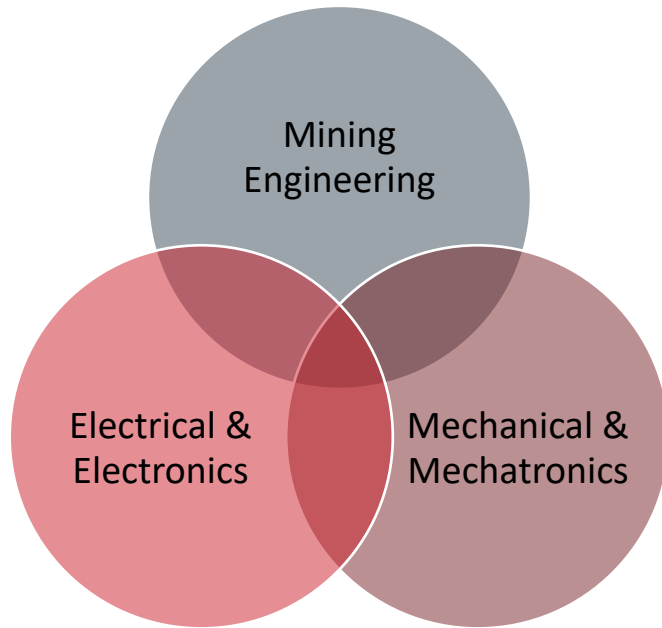
EzyMine – Payload monitoring, Trackshield, and shovel automation for rope shovels

Robit – Drill hole deviation

Idea to market journey



Mining3 Team



Our members

Bringing the mining industry and research together

1

Mining companies



BHP

THIESS

2

Original equipment manufacturers



DYNO
Dyno Nobel

KOMATSU

3

Research Partners



Fresh thinking and renewed purpose

Mining3 has always been about **transforming mining**

We are focused on what's important to our stakeholders now and into the future.

We are looking to expand our partnerships





Partnerships are our future

TECHTALKS

Session 1

10:00 – 10:45AM



RUDIE BOSHOFF

Global Director

Komatsu

TECHTALK

Industry Talk



BRETT TRIFFETT

Innovation Practice Lead

BHP

TECHTALK

Think & Act Differently at BHP



**OPEN
HOUSE**

We are open to all
innovative mining
ideas!

GET INVOLVED NOW



**Think & Act
Differently**

Powered by **BHP**

The Open House is Always Open

- The Think & Act Differently Open House is always open.
- We invite you to share your innovative ideas, solutions, and seek our support and funding to trial untested ideas in a supportive environment.
- Collaboration is key to our success, and we want to work with you to Think & Act Differently and change the future of mining.
- Join our ecosystem at
- thinkactdifferently.com.au

**Think & Act
Differently**
Powered by **BHP**



DIRK VAN SOELEN

Vice President

Dyno Nobel

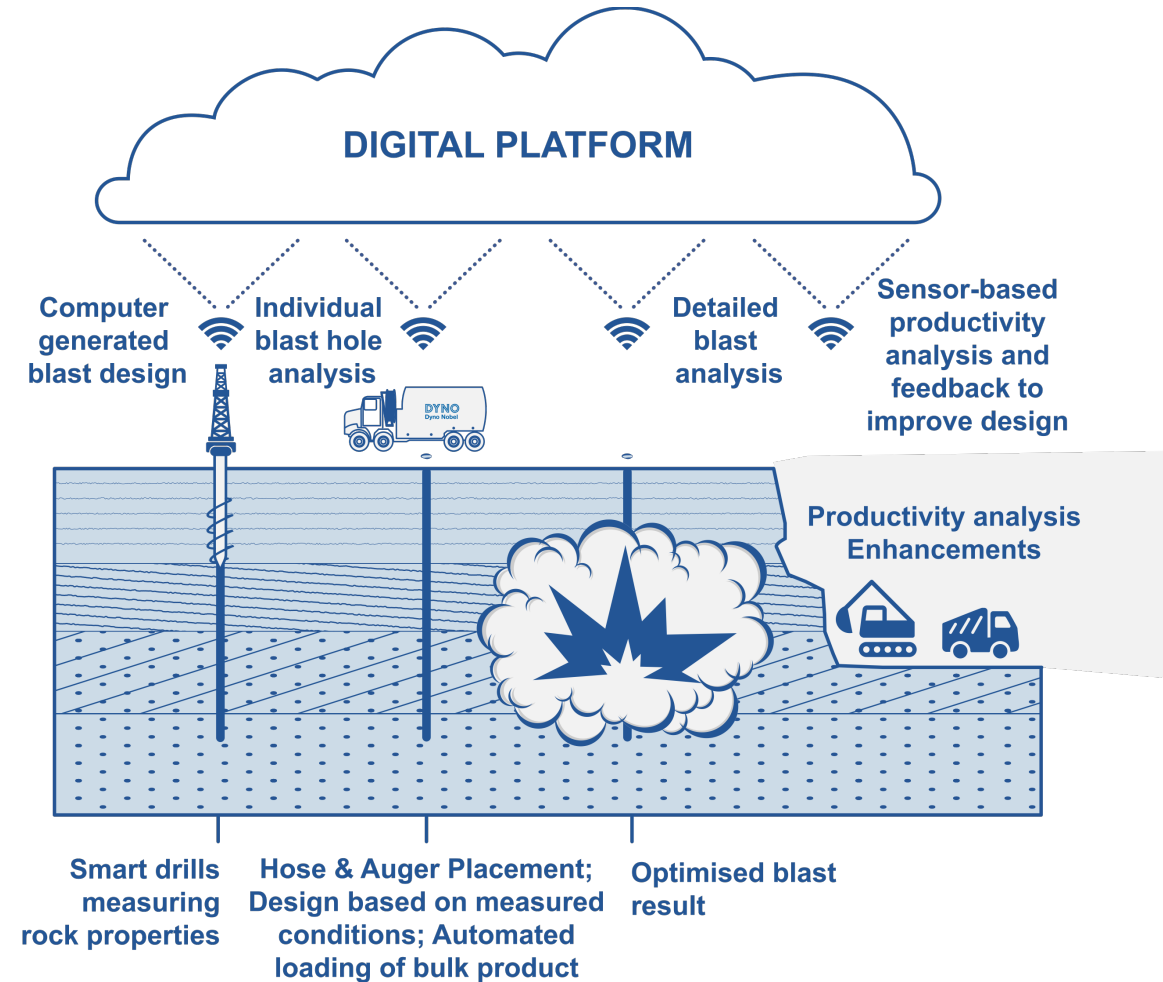
TECHTALK

Industry Talk

The Connected Bench

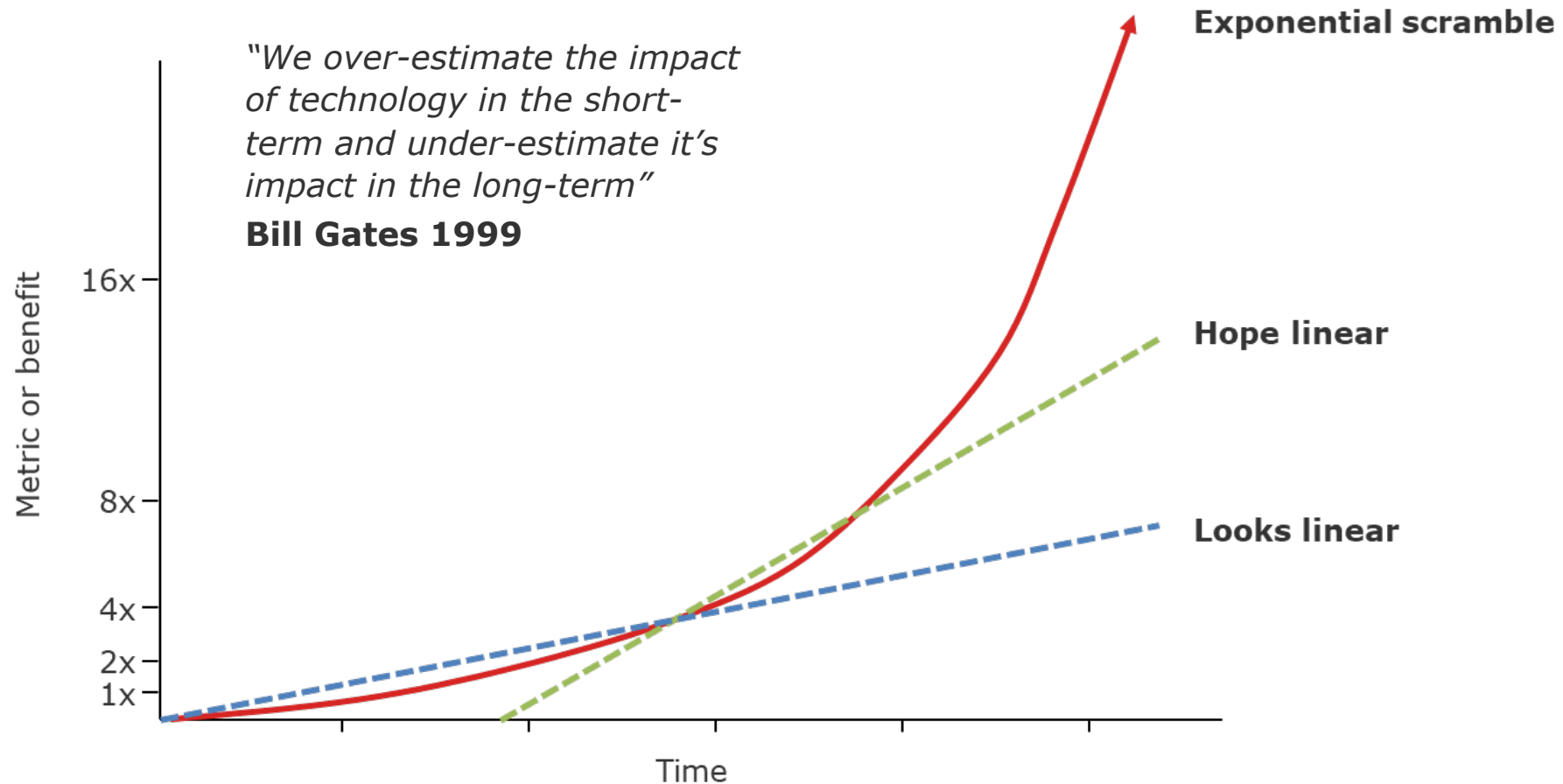
The value of digitisation is in the information derived from the data thereby enhancing;

- Safety
- Quality - through repeatability
- Operational Efficiency – through blast optimisation



The deceptive nature of exponential change

The increased need for minerals & metals to facilitate the energy transition will drive the need for improved efficiency and growth in the mining sector



The future is unpredictable, but we can identify important influencing factors



Facilitate an environment required for exponential growth

Left brain
order, control, stability

Adapt a growth mindset

- Extend the organisation

Move from reactive to predictive

- Real time visualisation
- Predictive algorithms

Systems of engagement

- Both virtual & social
- Quicker route between information gathering and decision making



Right brain
creativity, growth, uncertainty

Core-edge integration

- External growth factors & internal stabilising factors

Simulation & Rapid prototyping

- Aligned with rapidly changing externalities – time to market

Structural change

- Network rather than hierarchy
- Self-organising & multi-disciplinary teams



JAYDE WEBB

Practice Lead Mining Technology
South32

TECHTALK

South32: Next Generation Mine



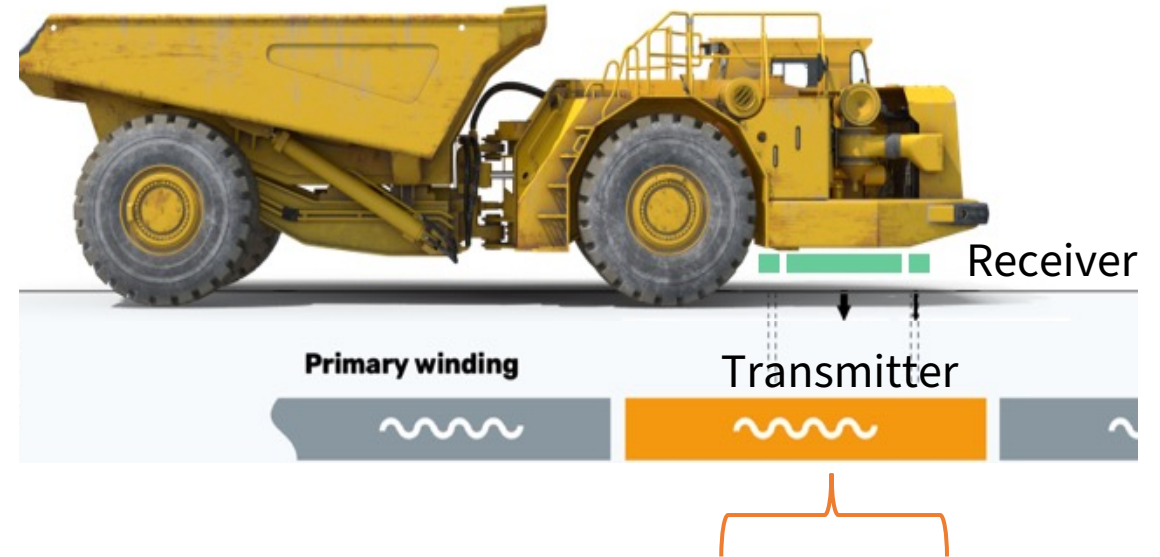


DR ERIK ISOKANGAS

Research Director
Mining3

TECHTALK

Solving Battery's Problems with Wireless Power Transfer



Technology Demonstrator





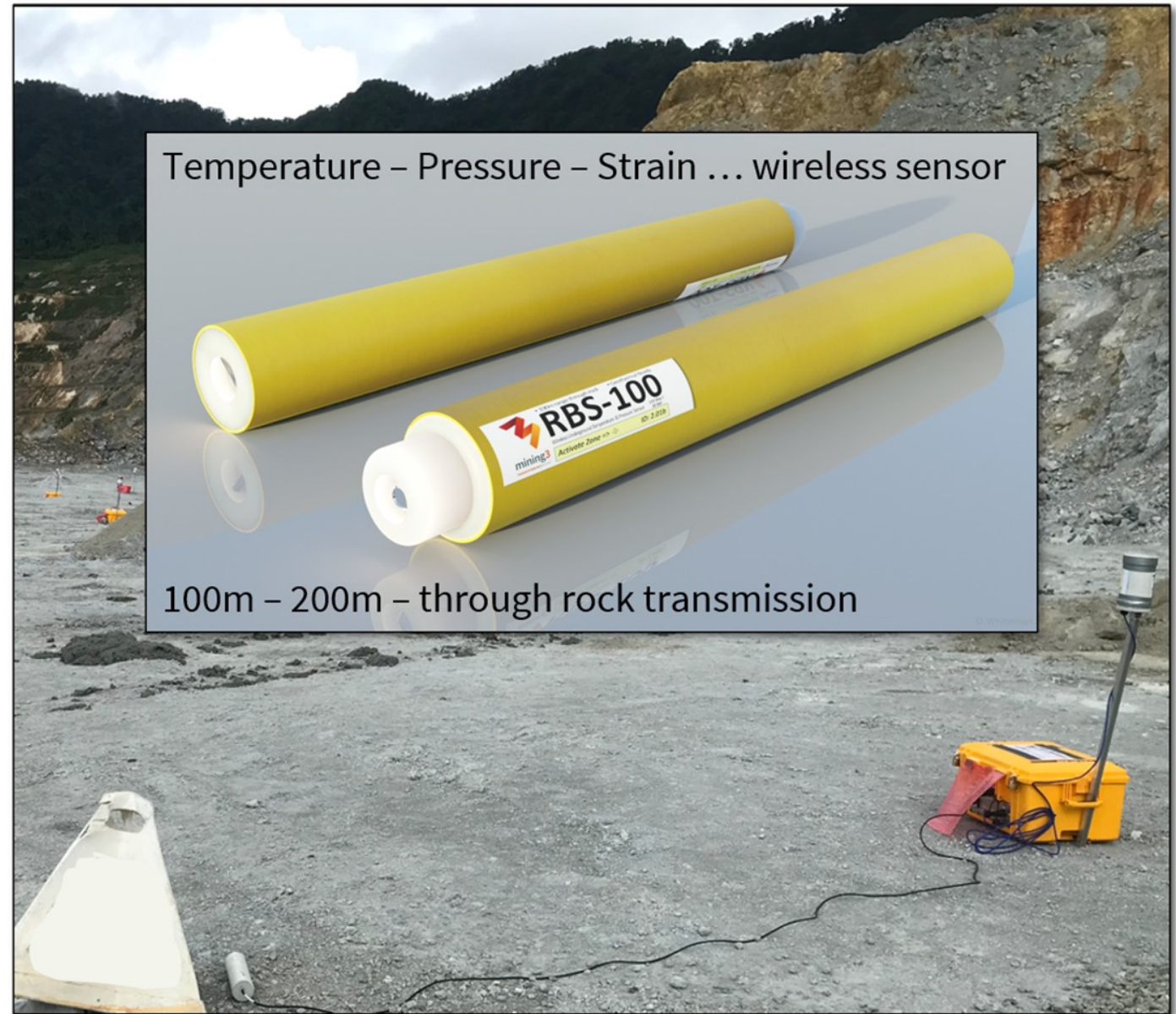
DYLAN WHITEMAN

Technology Leader

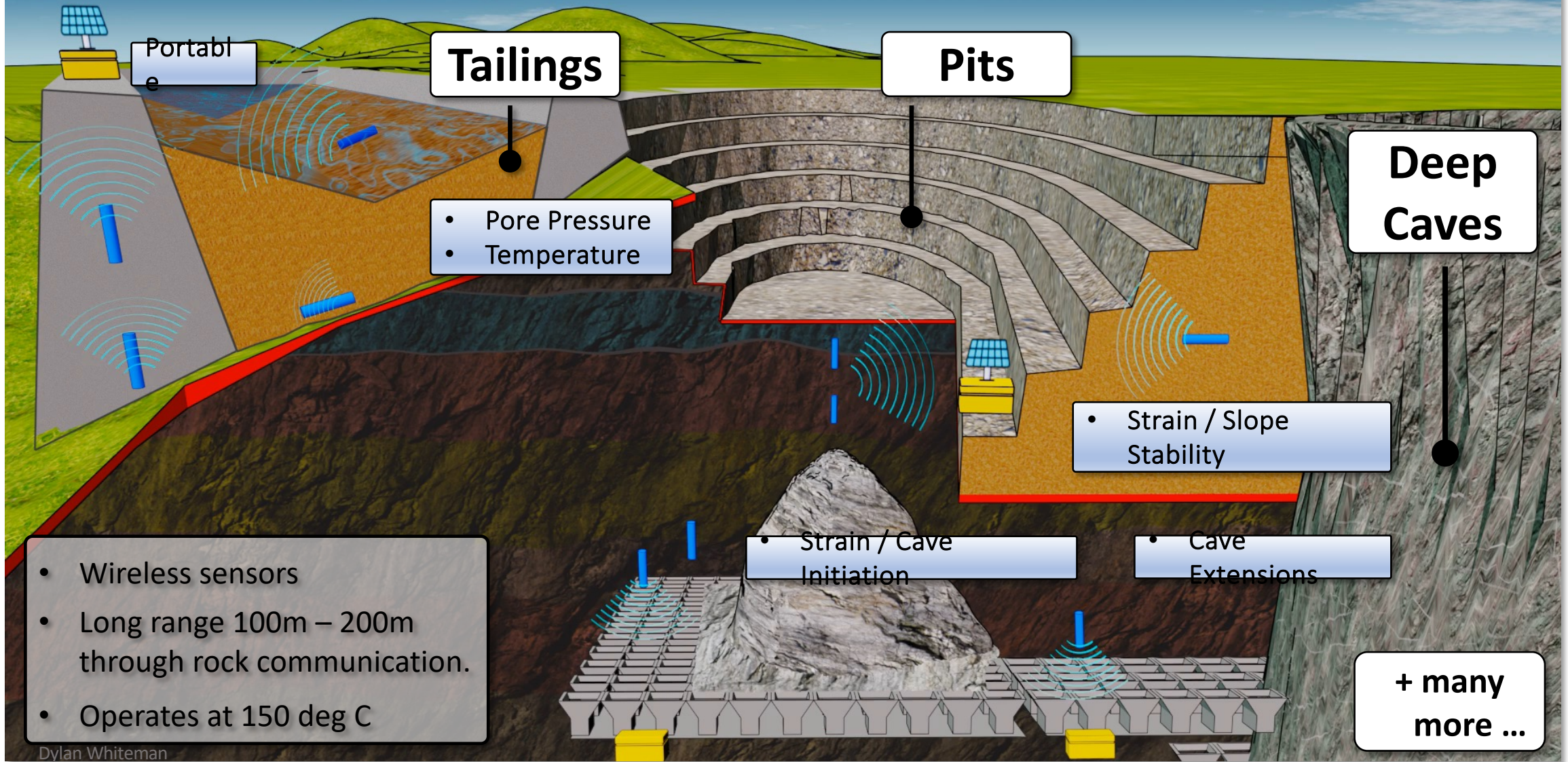
Mining3

TECHTALK

The Rock Modem:
Through-Rock Data Transmission Sensors

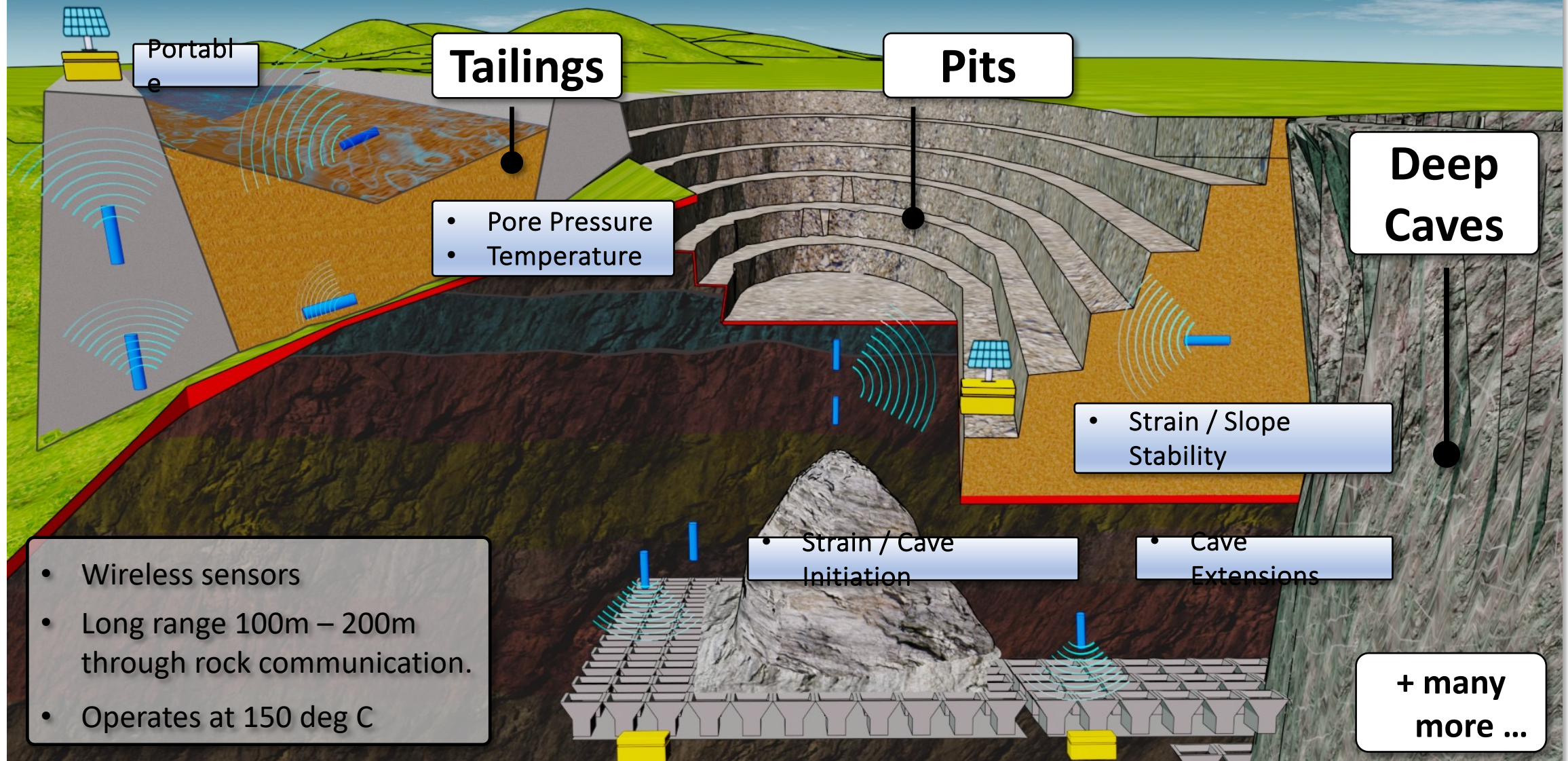


Wireless Underground Sensors :Rock Modem



Dylan Whiteman

Wireless Underground Sensors :Rock Modem





EDWARD PROCHON

Technology Leader

Mining3

TECHTALK

Mission Critical Sensing for Tramp Metal
Detection & Methane Drainage



Mission Critical Sensors – Tramp Metal Detection

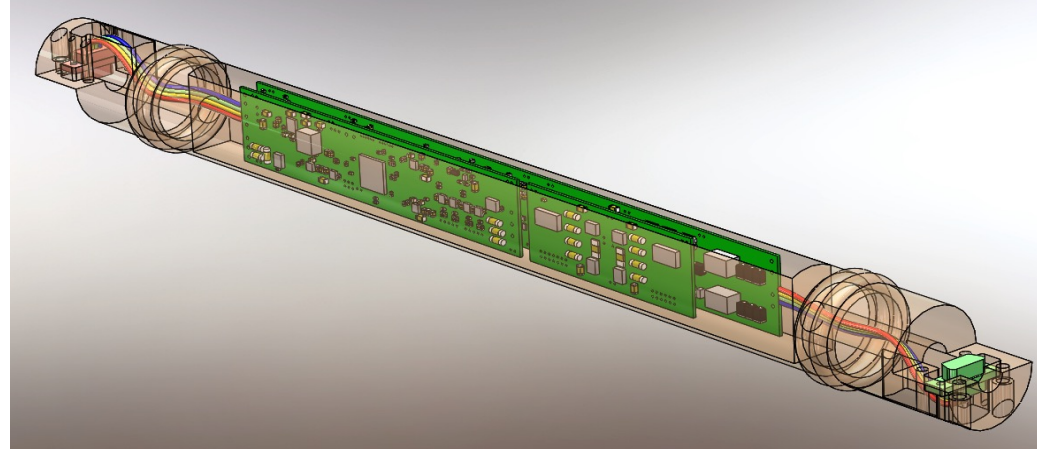


Mission Critical Sensors - Measurement Whilst Drilling

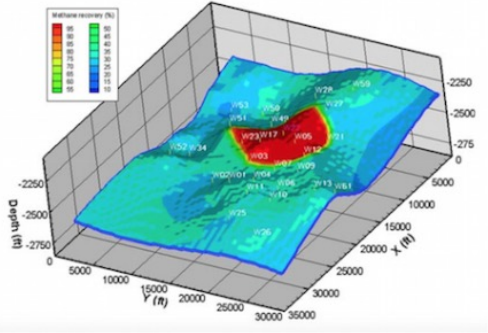
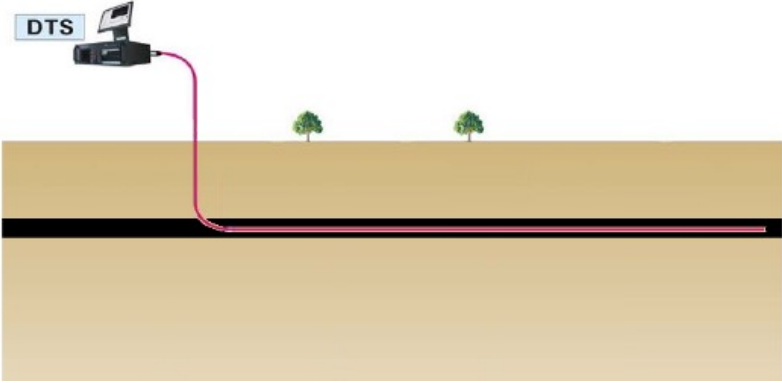
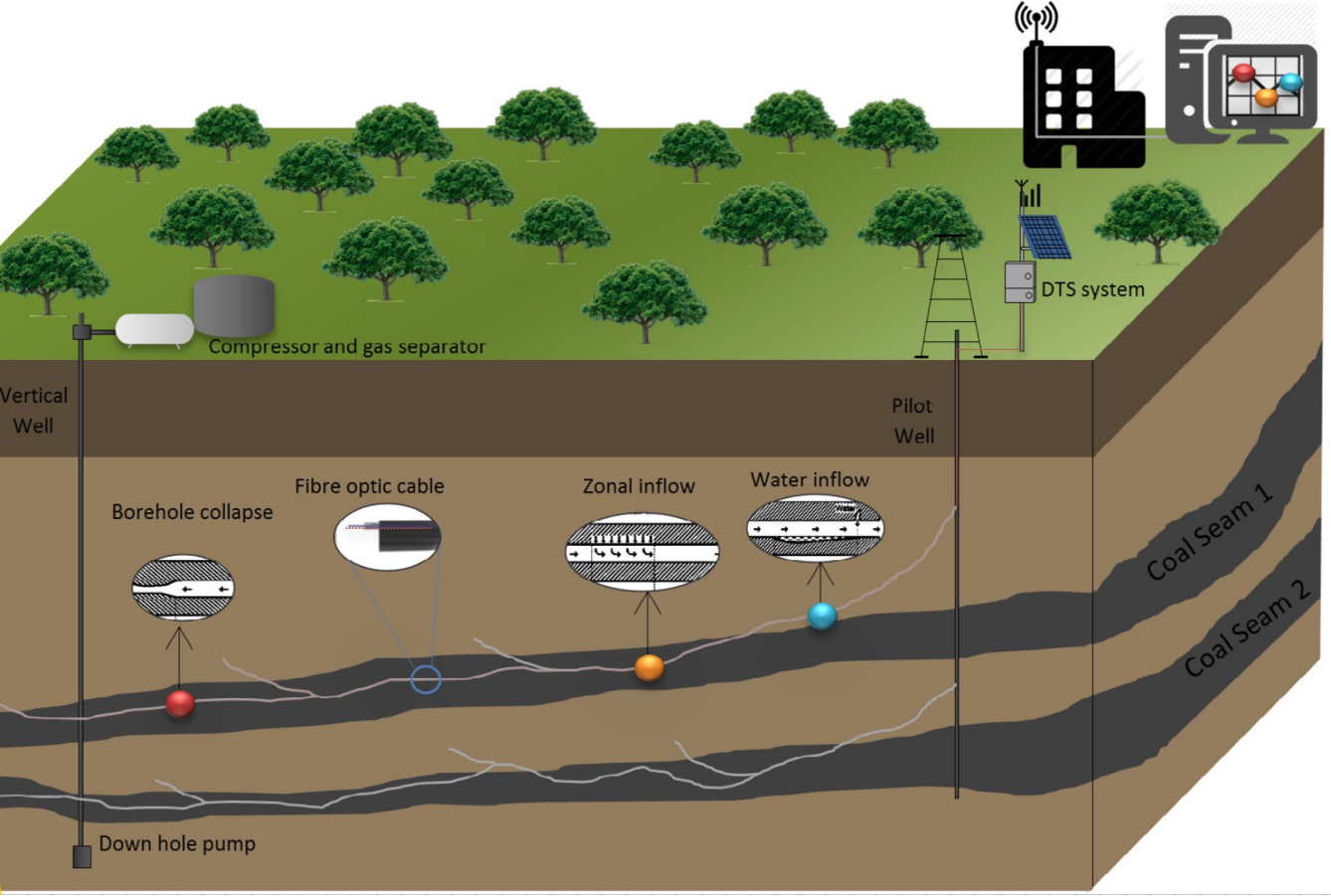
Improved drilling and methane drainage.

Provide

- Realtime data for steering
- Understanding of the resource ahead of mining



Mission Critical Sensors – Gas Emissions Monitoring



4D model of drainage



DAVID JOHN

Senior Research Engineer

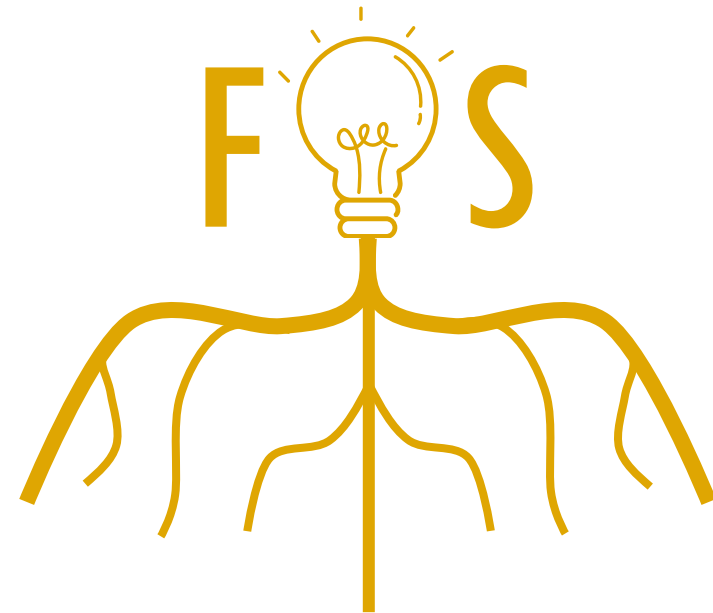
Mining3

TECHTALK

Innovation in Strata-support

Fibre Optic Sensing: A New Era of Mining Intelligence

CARBOLT™



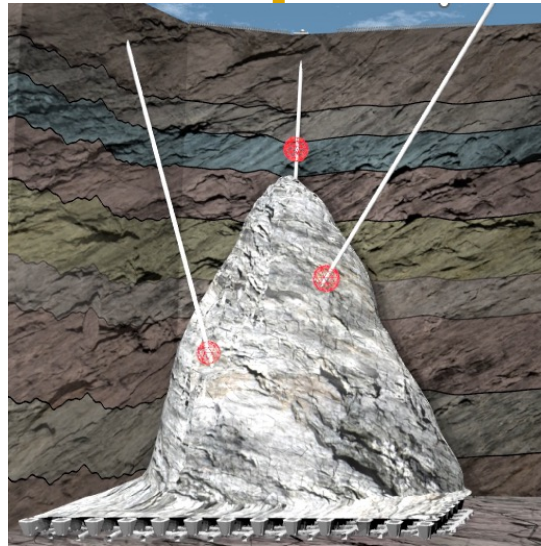


CARBOLT™

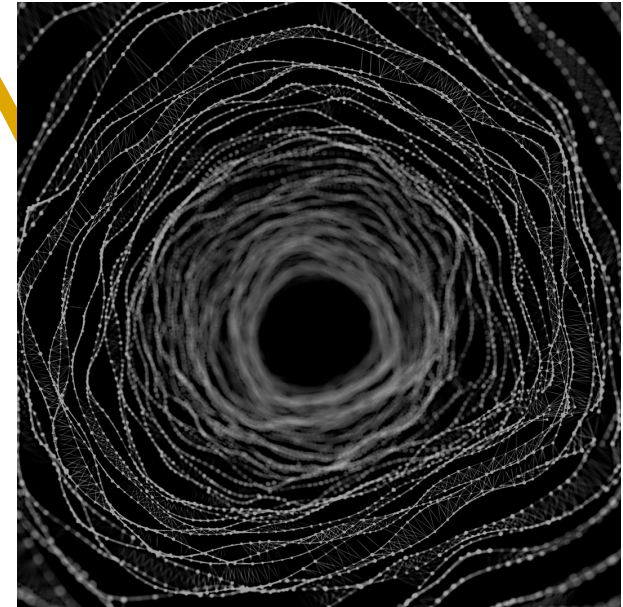
F I S



Conveyor Belt Monitoring



Ground Monitoring



Bore Hole Sensing

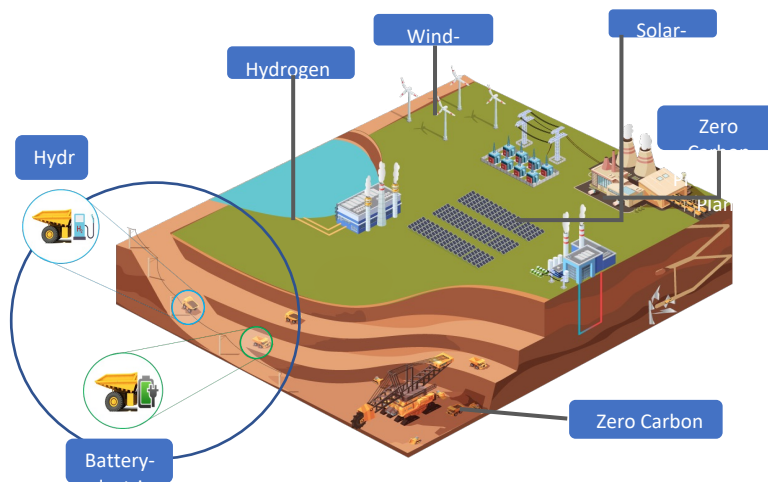


LUIS MARÍN

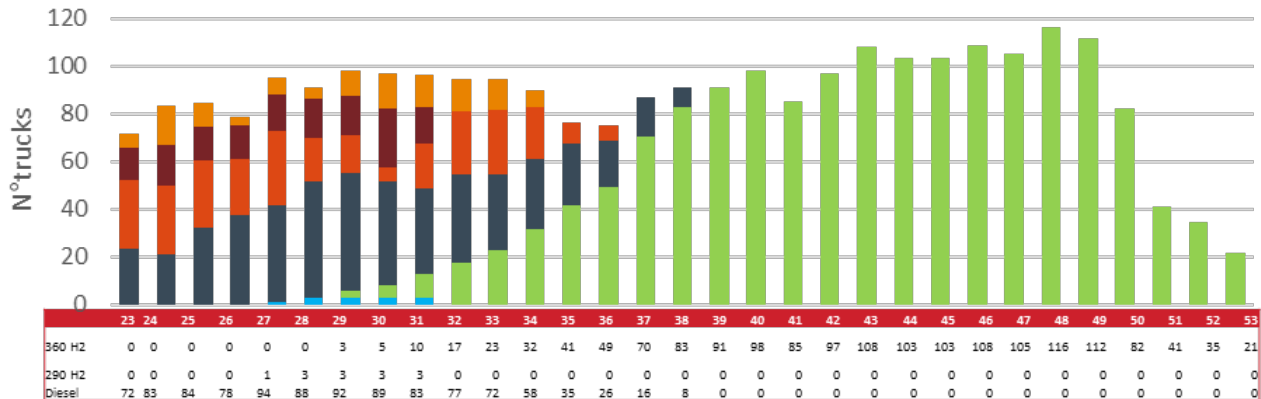
Technology Leader
Mining3

TECHTALK

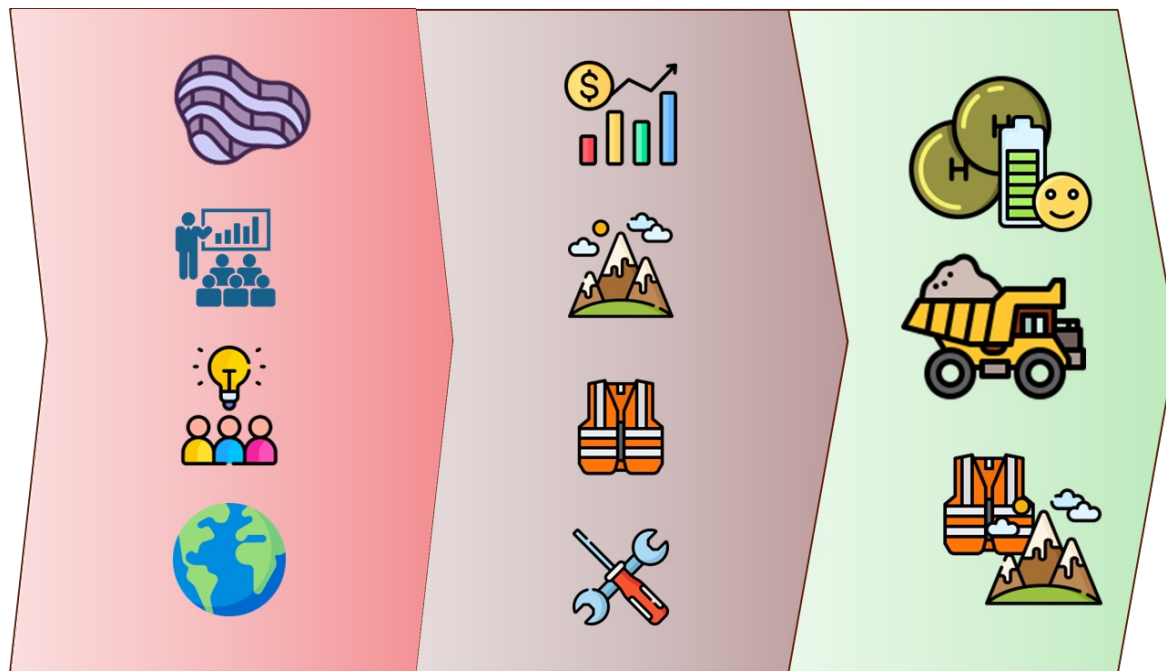
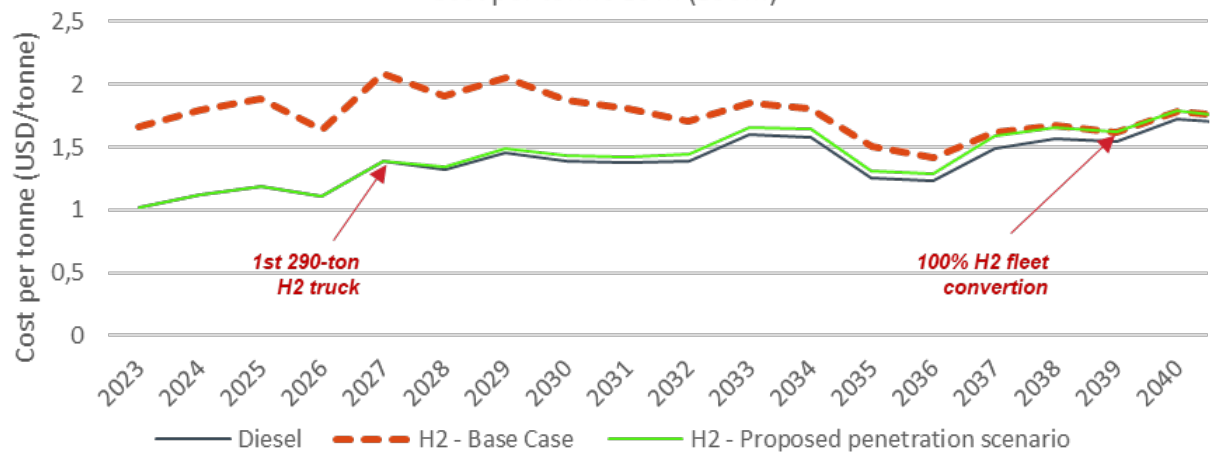
Green Mobility Solutions



Transition to HFC trucks



Cost per tonne LOM (zoom)





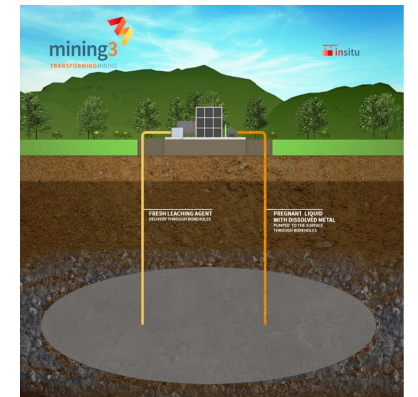
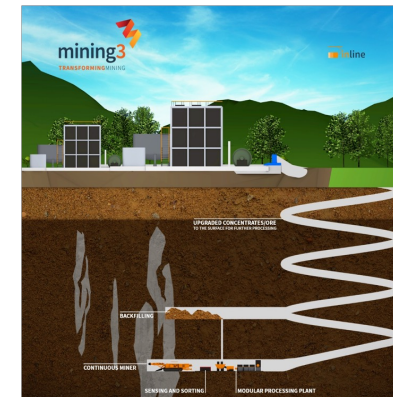
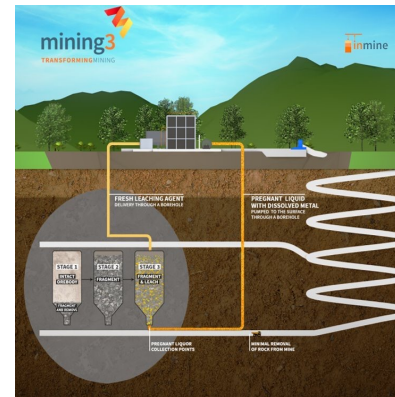
DR AMIN MOUSAVI

Mine Planning Engineer

Mining3

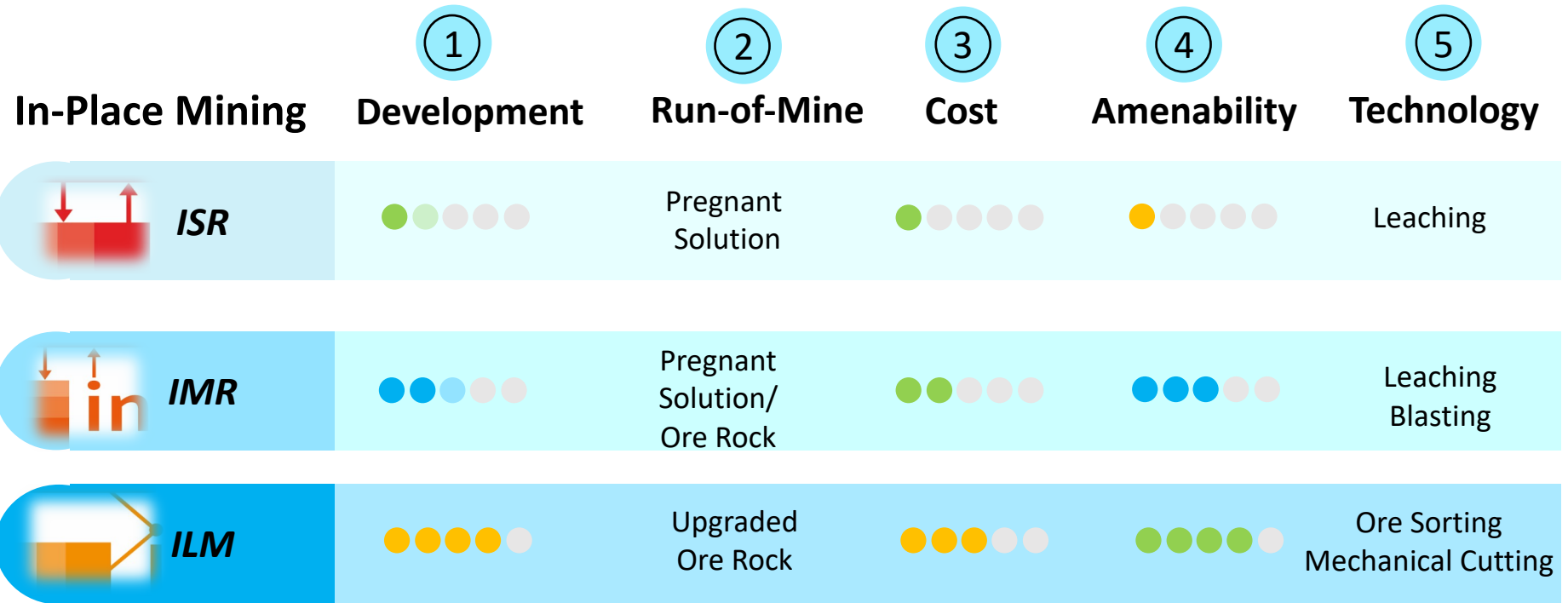
TECHTALK

In-Place Mining – Addressing the Mine Design Problem



The Holistic Solution:

Alternative Mining Methods



Option Studies

Verification & Sensitivity

Costing & Optimisation



DR ANDREW KETTLE

Technology Leader

Mining3

TECHTALK

New Opportunities in Alternative Explosives



Figure 1: Video images from a series of instrumented, unconfined 40 -50 kg blasts of a stabilised H_2O_2 / mineral oil-based emulsion explosive (Rurex).



The **Benefits:** H₂O₂-based emulsion explosives



* Some attributed benefits are speculative, requiring further research.

MORNING TEA

10:45 – 11:15AM

TECHTALKS

Session 2

11:15 – 12:30PM



DR DOUG AITKEN

Executive Director

Sustainable Minerals Institute International Centre of Excellence Chile

TECHTALK

Innovation, culture change and feedback loops: working towards a sustainable mineral supply chain in Latin America



DR GUY BOGGS

Chief Executive Officer

CRC TIME

TECHTALK

Innovation in the mine closure supply chain



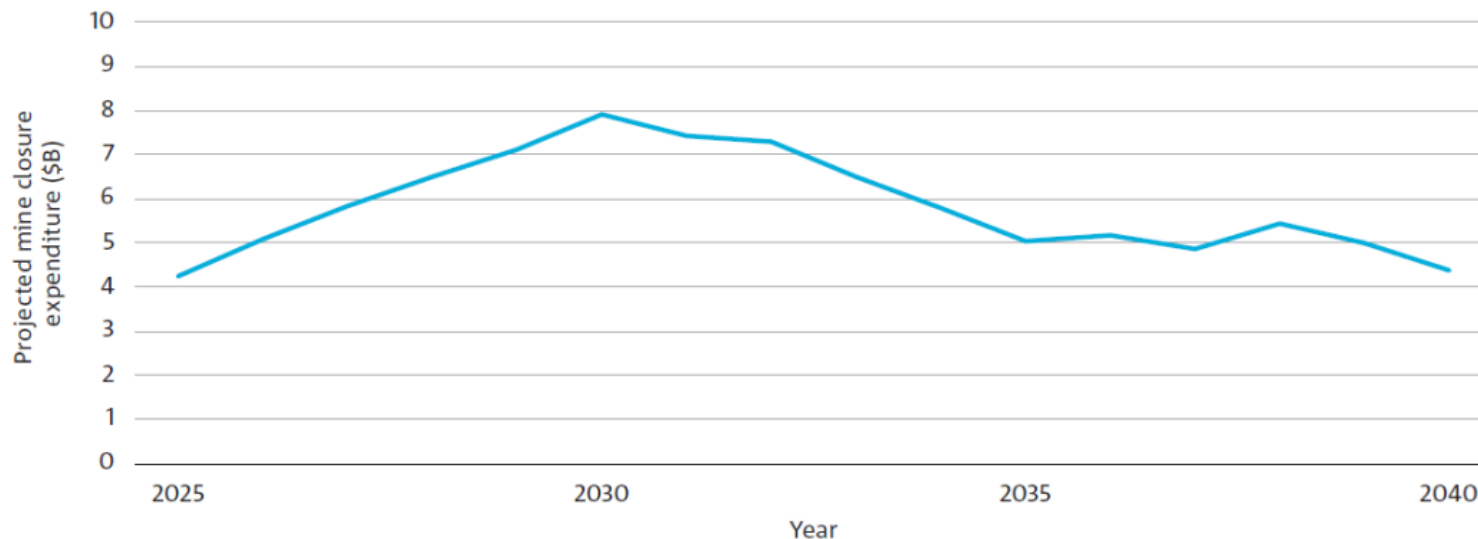
INNOVATION IN THE MINE CLOSURE SUPPLY CHAIN

DR GUY BOGGS CEO | 31 JANUARY 2024

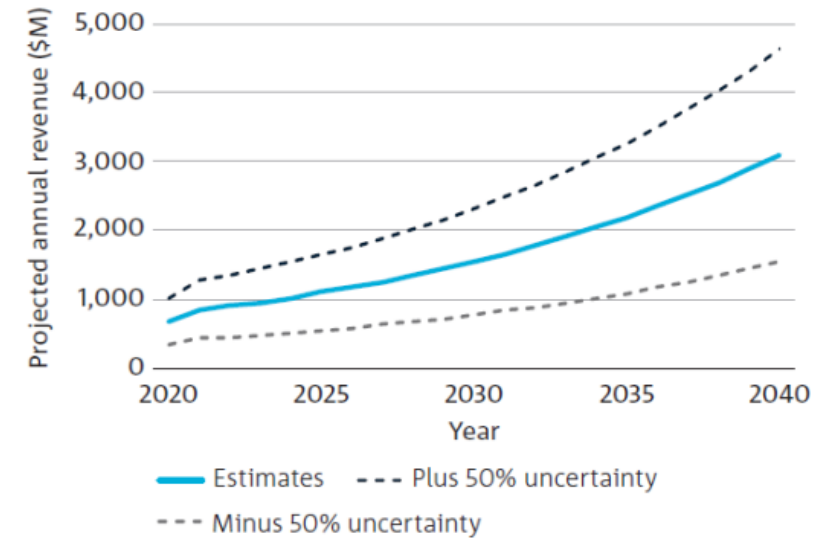
The value of the mine closure solutions industry

- Almost 240 existing mines expected to close around Australia by 2040.
- Expenditure on mine rehabilitation and closure activities could exceed \$4 billion each year; on-going and sustained expenditure on environmental remediation
- Significant opportunities for the existing METS industry, plant nurseries, drone operators, software developers, and so forth.
- Creation of business and employment opportunities for Indigenous and regional communities.

Projected expenditure on mine rehabilitation and closure activities



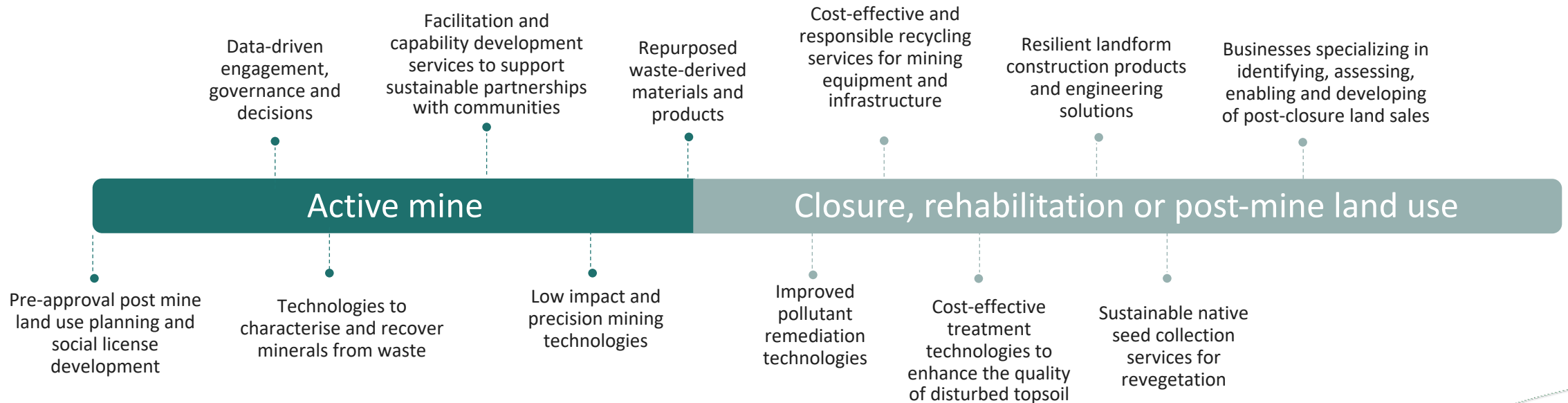
Projected annual revenue for Australia's mining environmental remediation market



Categories of mine closure solutions



Incorporating mine closure solution innovation into the life of mine





THANK YOU

guy.boggs@crctime.com.au

www.crctime.com.au



GEOFF DUNSTAN

Technical Director
Caveman Consulting

TECHTALK

Cave Mining 2040



SHARNA GLOVER

Co-Founder

Imvelo

TECHTALK

Systems Approach to Remote Operations Support Systems
Approach to Remote Operations Support

THE OPPORTUNITY

Operational Technologies are required to maintain safe and predictable production systems at the operation.

Not maintaining and monitoring operational technology and operational equipment results in increased operating instability.

This drives reactivity at the operation and increases cybersecurity vulnerability. The underlying OT causes are not obvious to mining operators and can heavily impact operational performance.

Experience has shown that the performance of Autonomous Systems is compromised when operational technologies are not effectively integrated into the mining operating and control system.



Disciplined Approach to Locking In Performance At A Higher Level

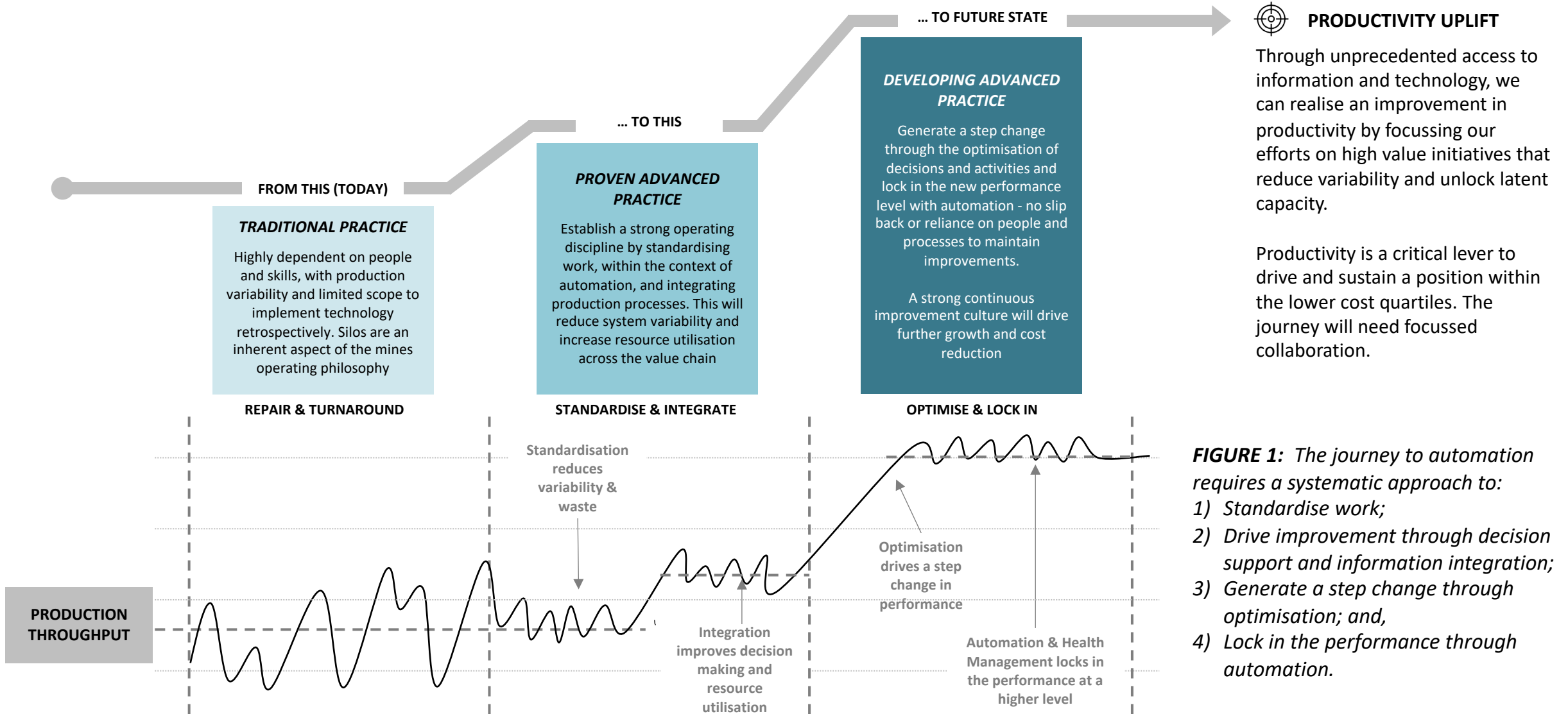


FIGURE 1: The journey to automation requires a systematic approach to:

- 1) Standardise work;
- 2) Drive improvement through decision support and information integration;
- 3) Generate a step change through optimisation; and,
- 4) Lock in the performance through automation.

The Remote Operations Support Hub

Core System Health



System Constraints

- Understand the constraints of the system
- Closely monitor constraints like network and device limits



Core Infrastructure

- Introduce monitoring and maintenance of core infrastructure like servers, switches



On Board & Wireless

- Introduce monitoring and maintenance of on-board and wireless



Major Incident Management

- Manage major incidents to help reduce Mean Time To Repair (MTTR) and maximise Mean Time Between Failure (MTBF)

Service Management



Change Management

- Adopt Management of Change best practices to support changes and maintenance activities to minimise business impact



Single Interface

- Introduce a single interface to support incident management, problem management, change management and continuous improvement. This is critical as OT is a multi-vendor sport.

Leveraged Capability



24 x 7 access to capable resources

- Access to competent Autonomous Equipment System technical experts to help resolve incidents.
- Issues communicated early stops production from stopping.

Integrate with Production and Control Room Department

Integrate with Mine Planning Department

Integrate with Maintenance Department



ANDREW GRABSKI

Executive Director

Department of Resources

TECHTALK

Priorities for the management of Abandoned Mines in Queensland



FR
CP



DR SUE KEAY

Partner

Future Work Group

TECHTALK

Where are all the Robots?



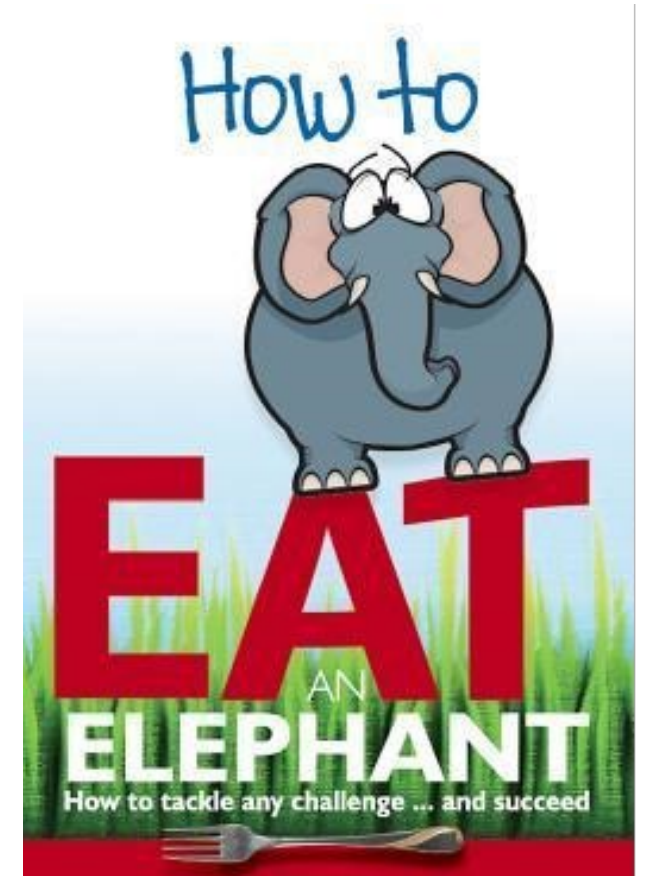
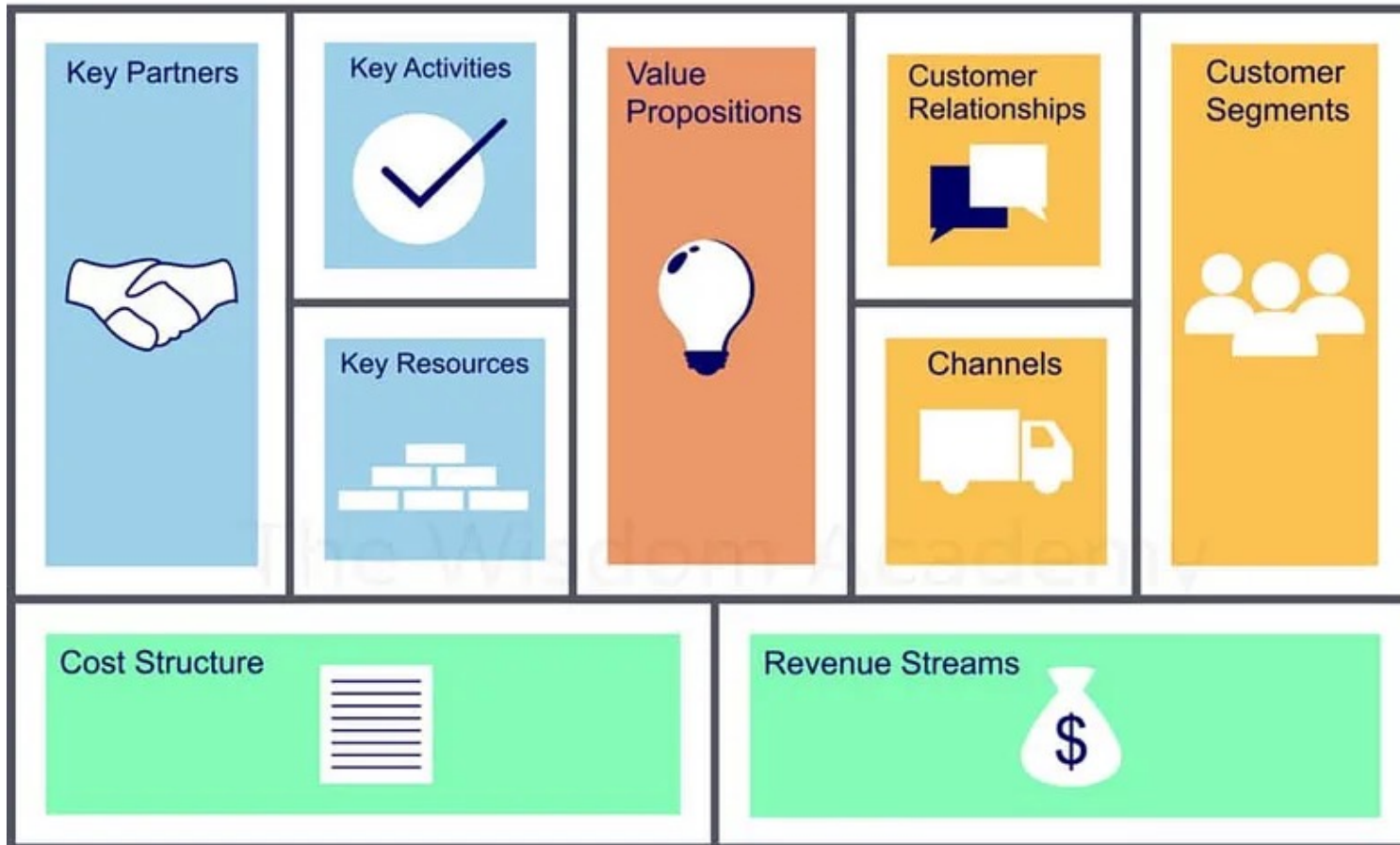
ANDREW LOGAN

Head of Directional Studies and Innovation
Newmont

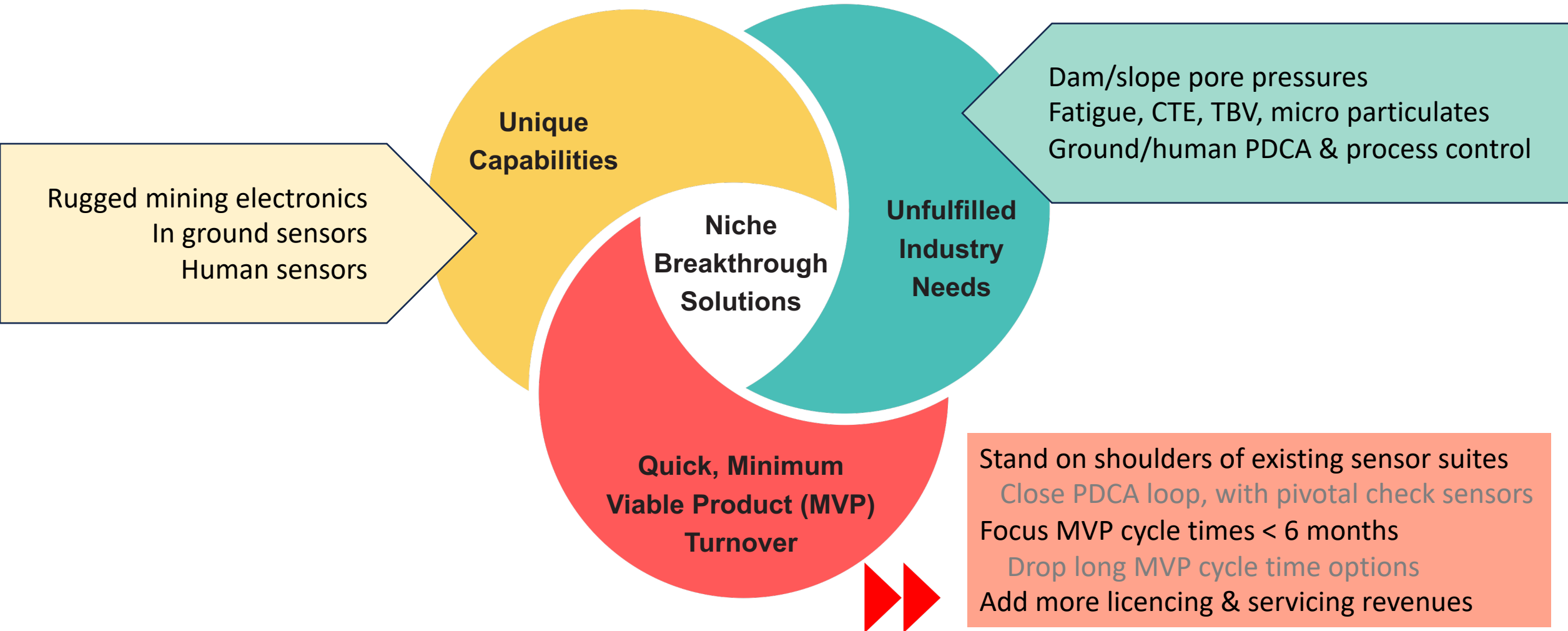
TECHTALK

How to eat an elephant?

Mining3 Business Model ?



Value Proposition Pieces



Commercialised technologies with significant impact

Mining3 has an overarching focus on shortening the innovation cycle to deliver benefits to the mining industry. World-class researchers work with the mining industry to identify grand challenges and produce revolutionary solutions. Some of our spinoff companies, patented technologies and specialist consulting services are showcased below.

- Featured
- Drill
- Extraction
- Material handling
- Automation
- Safety
- SM
- UG
- Coal
- All Solutions



Advanced logging tool +

Acumine - Collision avoidance +

Argus shovel monitor +

>5 Years
Cave Tracker +

~2 Years
In Ground High Temp Sensors +

>10 Years
DynaCut™ +

Borehole radar +

Pegasys dragline monitor +

Semi-autonomous bulldozer +

Shovel Load Assist Program (SLAP) +

>5 Years
SmartCap +

Wireless charge electric LHD +

More of these ?



~2 Years

Less of these ?





SIMON STEFFEN

Senior Monitoring Specialist

Elexon Mining

TECHTALK

Cave Tracker, how successful collaboration between mining companies, Mining3 and Elexon Mining led to improved monitoring capabilities for managing caves.

**INNOVATION
FORUM** MINING THE GAP

31 January 2024 | W Brisbane



Successful Collaboration with Mining3, Rio Tinto and Newcrest led to a transformative Cave Monitoring System.





EARTHEYE SPACE



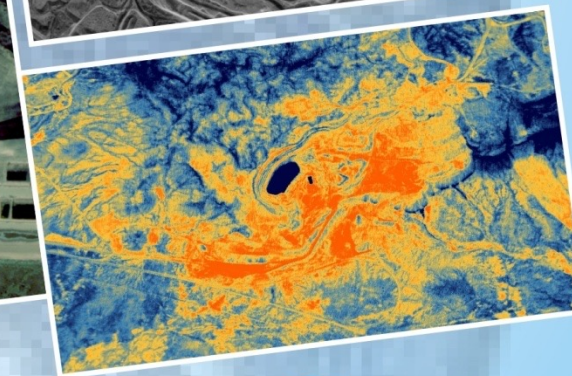
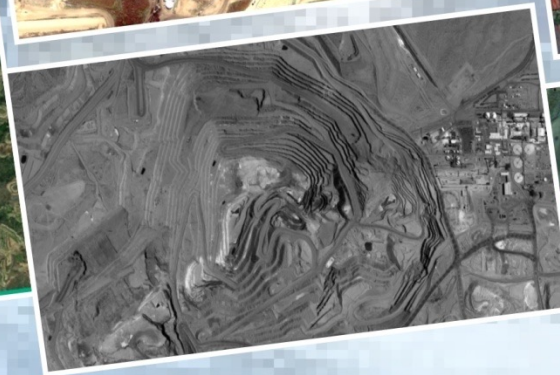
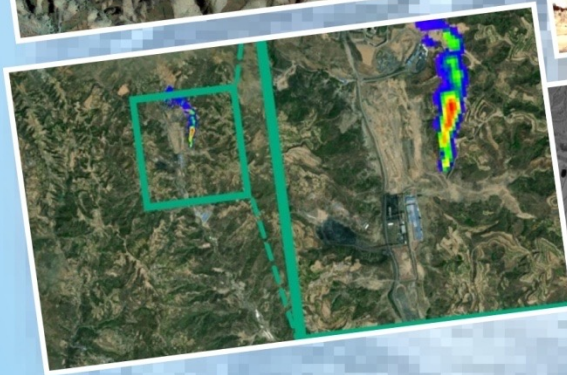
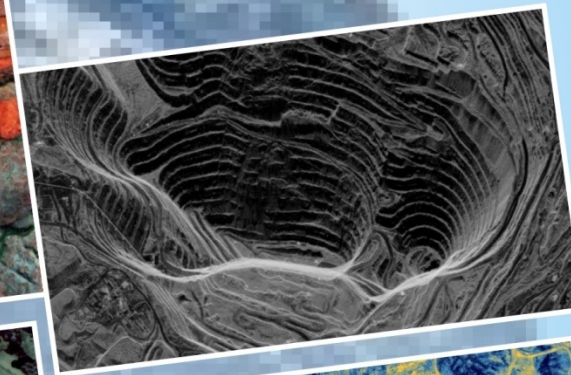
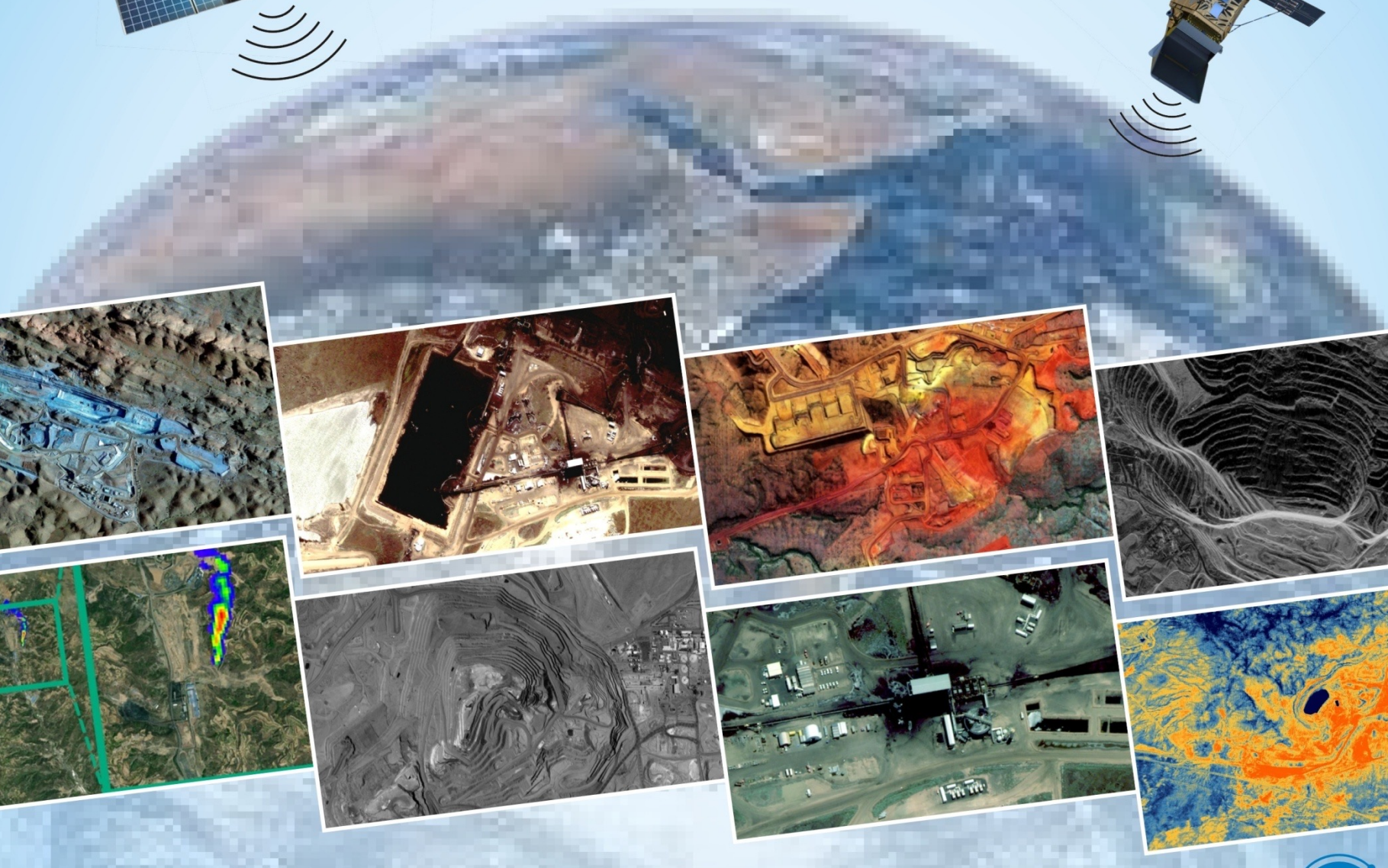
SHANKAR SIVAPRAKASAM

Founder

Eartheye Space

TECHTALK

Sustainable and risk-managed mining with space-based data





WENDY TYRRELL

Managing Director

The Long View Consulting

TECHTALK

The joy and value of Collaborative Innovation



MARK NOPPÉ

Director

Sustainable Minerals Institute
The University of Queensland

TECHTALK

Fast tracking new mine developments, from studies to commissioning



SARA COUPERTHWAITE

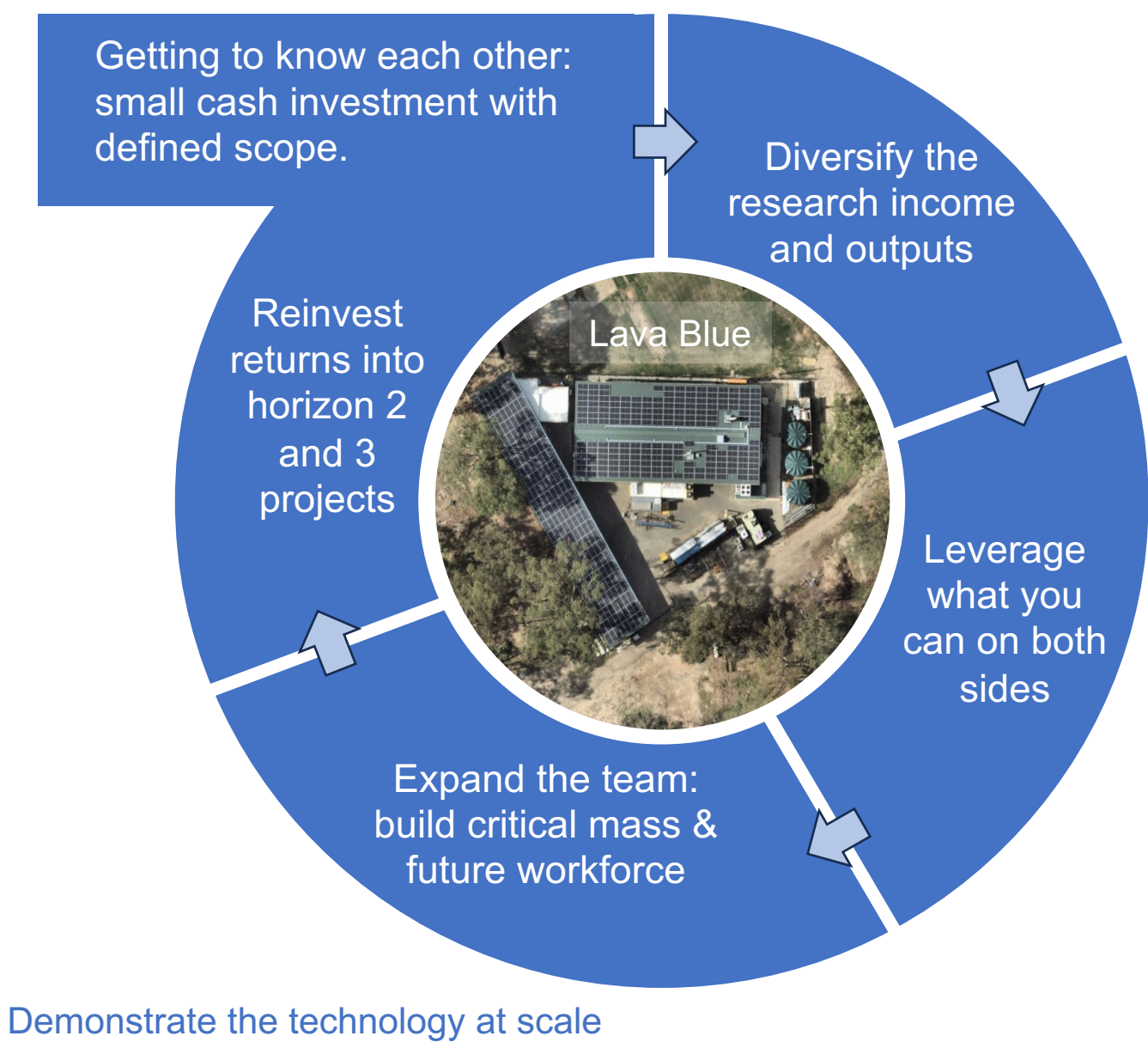
Professor of Industrial Chemistry and Mineral Processing
Queensland University of Technology

TECHTALK

Building a Sustainable University Commercial Research
Ecosystem

Building a sustainable university commercial research ecosystem

- Know each other's drivers and business models
- Match the funding investment with your desired outcomes
- Know how you want to use the IP and ensure you start with the right agreement
- Find all opportunities both parties can leverage
- Treat it like a partnership with a shared vision
- Know each other's responsibilities when it comes to R,D,D,C





VERONICA GRAY

Lecturer – Mechanical Engineering
Queensland University of Technology

TECHTALK

Getting Engineering Graduates into Mining



Engineering for Sustainable Industries and Startups

ESIS is about linking industry to 4th year engineering students through the Engineering Honours or Capstone Project.

It is an initiative by Dr Veronica Gray, Faculty of Engineering, Queensland University of Technology (QUT).

Contact

ESIS@qut.edu.au

Flyer available, see Dr Gray at the break.

The **PROBLEM**

Difficulty attracting graduate engineers into mining: “73% of Generation Z believe mining does more harm than good” – “What Gen Zs Think of mining” AUSMEA

The **OLD ANSWER that no longer works**

To attract graduates in the past you relied on their curiosity to attend guest lectures and look up your company. You also offered them money, adventure and/or a challenge. It no longer works.

The **NEW ANSWER that does work...ESIS**

Since 2018 through Dr Gray (ESIS) has supervised over 70 honours students in collaboration with the Royal Australian Army.

- Currently **3.3%** of engineers work in the Defence sector.
- As of 2024, **36%** of the graduate engineers that went through ESIS currently work in the Defence sector.

Do an honours project through ESIS.





Engineering for Sustainable Industries and Startups

ESIS is about linking industry to 4th year engineering students through the Engineering Honours or Capstone Project.

It is an initiative by Dr Veronica Gray, Faculty of Engineering, Queensland University of Technology (QUT).

Contact

ESIS@qut.edu.au

Flyer available, see Dr Gray at the break.

The COST

Each student on an ESIS project costs \$6,500 + GST
(may be eligible for 34-43% R&D tax incentive)

The student receives ~\$4,000 and the rest goes to consumables, instrument fees, small equipment, expert support and some manufacturing.

The project topic is scoped by industry and Dr Gray to ensure realistic achievable outcomes. The default position is to License the IP to the industry partner but is negotiable.

The DATES

- Expression of interests by Wednesday 7th February 2024.
- Projects locked in by Wednesday 14th February 2024.
- Students start Monday 26th February 2024.





CRAIG SHELTON

National Manager - Asset Management

SMEC

TECHTALK

Asset Management and its part in Energy Transition

FINAL REMARKS

Dr Neville Plint



TECHTALK QUIZ WINNER

Tony Egan

Glencore

Congratulations and thank you to all those who participated!

Please join us

NETWORKING LUNCH

12:40 – 1:30PM