



Decarbonization Workshop | Perth | August 16, 2022

During the decarbonization workshop held in Perth on August 16, 2022, participants discussed priority topics, along with the associated challenges/requirements, and next steps to address them. The priority topics discussed included:

- Emission tracking, measurement, and monitoring
- Mine design and planning for efficient tramming and haulage routes
- How wide do we define the carbon value chain?
- Effective mine planning and design to leverage infrastructure investments for maximum value

ALREADY
HAPPENING

EMISSION TRACKING, MEASUREMENT, AND MONITORING

- Individual mine sites currently tracking energy and diesel consumption.
- Blockchain modelling.
- Individual companies are forming the roadmap to net zero/zero emissions.
- Circular economy and sustaining innovation projects.



- Sharing of best practices (e.g., what is working and what is not).
- 1st party vs 3rd party certification.
- Common reporting platform.
- Government stability in the coming years towards net zero.
- Adjoining industries (e.g., aviation) and their ability to fit into the mining industries aspirations.
- Reporting guidelines are not available.
- Technology viability and scalability.



- Carbon pricing to be included in shareholder reporting on \$/tonne, \$/Oz American Institute of Steel Construction (AISC).
- Refinement of metrics to government for legislative reporting.
- Reporting guidelines needs to be formulated and agreed between the government and industry bodies.
- Commercialization of sustaining innovation.

CHALLENGES/REQUIREMENTS

NEXT STEPS

MINE DESIGN AND PLANNING FOR EFFICIENT TRAMMING AND HAULAGE ROUTES

- Investigating ways to calculate efficiency in tramming heavy vehicles.
- Using digital twin to calculate efficient route modelling for a future state.
- Looking at the end-to-end value chain.
- Engaging OEMs on mine design requirements for PFS.



- A change of mindset to design towards a decarbonization strategy.
- Considerations between a greenfield and brownfields site on ROI.
- Defining immediate value to promote appetite in Markov Decision Process (MDP) changes.
- Different attitudes towards risk and methods of transporting dirt.
- Maturity of how to mine an electric mine (e.g., size, shaft, truck capability).
- OEMs writing the narrative on design requirements.
- Adaptive landscape in heavy vehicles design requirements.



- Redefine MDP's for a future state mine enabling electrification.
- Understanding current state requirements and map out changes needed and their dependencies.
- Knowledge sharing.
- Define the value metrics.
- Look at the end-to-end value chain.
- Industry alignment in fundamental foundations to enable smart mine design.

Note that this document captures some key discussions among a small cross-section of industry participants at a workshop held in Perth, Australia on August 16, 2022. It is intended to be one of many inputs into the working group and is not intended as industry guidance or a formal report.



HOW WIDE DO WE DEFINE THE CARBON VALUE CHAIN?

- How far companies choose to define their remit/commitment.
- Definitions of scope 1 and 2 are set out in regulations.
- National Greenhouse and Energy Regulations.
- Disclosure frameworks - various emerging frameworks on how to meet regulatory requirements.
- Define reporting needs.



- Govern/regulate scope 3.
- How well are the boundaries understood - how does a company select what is in their decarbonization strategy?
- What systems are available to manage cross value chain (multiple entities) carbon management? (E.g., Blockchain, carbon certification?)
- Opting to produce locally can bring more carbon liability and cost.
- Do geopolitical influences have a part?
- Responsibility/accountability of downstream product use - how to manage when outside of operational remit?



- Common understanding of Scope 1 and 2 applied examples to demonstrate relevant compliance to regulations.
- Management frameworks sections criteria/guidelines.

EFFECTIVE MINE PLANNING AND DESIGN TO LEVERAGE INFRASTRUCTURE INVESTMENTS FOR MAXIMUM VALUE

- Reduce cost mindset.
- Planning - geo inputs, product characteristics (e.g., trucks, rail).
- Equip selection/mix.



- Complexity of measurement - emissions of current technology/future technology.
- Speed of change.
- Paris Accord/other commitments.
- Cost of production - commercial viability.
- Ambiguity of success metrics - zero emissions aspirations.
- Operational Technology (OT) uptime.
- Effective mine planning and design to leverage infrastructure investments for maximum value.
- Is a clean energy future factored into mine planning and design?
- How to measure emissions (e.g., what are we trying to achieve and how are we progressing?)?



- Modelling and analysts' capacity.
- Framework of limitations/parameters of operation.
- Determine who defines it.
- Keep OT separate from any other systems.

ALREADY HAPPENING

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