The Progressive Mining Agenda
Position Piece #2

Metal Mining Innovation and Productive Capacity.

The metal mines of today are confronted by three challenges; economic and environmental performance, and demographics. Over the last 30 years, underground metal mines have adopted innovations that have dramatically improved mine safety, but they have also eroded operational productivity. The current production platform was established by 1985 and it has evolved to be safer and more efficient, using economies of scale, but it has not made mines more productive or profitable.

The last technology transition in underground metal mines adopted the type of equipment used in mines and construction on surface. The huge increase in productivity camouflaged the decrease in effectiveness; equipment that has to make a three-point turn to travel in the opposite direction is cost-effective on surface. Underground mines have to create the extra space the equipment needs to turn around, and creating accesses is one of the most expensive things mines do. Larger equipment needs larger tunnels that are slower and more expensive to create and produce more waste-rock. Mines have focused improving the efficiency of individual activities required to produce ore, rather than on the effectiveness of the production system as a whole. Ultimately, mining is all about material logistics.

Technological developments that have successfully reduced production costs have, at most, just offset the cost increases caused by mines getting older, deeper and hotter. Essentially the productivity gains created by the original transition to the current technology platform have been consumed by the increasing demands of logistics and heat management. Some mines are now beginning to introduce battery-electric equipment to reduce the ventilation cost, the second-largest cost after labour, but changing to electric power does not drill faster or haul more ore. The challenge of the climate crisis is to produce more ore at lower cost and achieve this with fewer experienced staff. The education systems for mining professionals can produce only a quarter of the experienced staff that are about to retire.

Climate scientists agree that significant reductions in GHG in the atmosphere are needed within the next two decades if the rate of global climate change is to avoid an irrecoverable tipping point. Delivering more of the metals needed for rapid electrification of the economy is essential, but newly discovered mineral deposits take 15-20 years to bring into production. This means they cannot make a contribution in the short term and the additional metal production needed to address the climate crisis must come from existing mines with fewer employees.

Implementing autonomous, continuous ore transport systems that significantly reduce both the labour and energy cost inherent in the current production system is essential and urgent. Fortunately, decreasing these two line-item costs significantly, by more than half, changes the minimum cut-off grade and re-defines the volume of ore, or profitable mineralization. Increasing the volume of ore that can be mined profitably will extend the life of existing mines long enough to bring new discoveries into production for the long term and sustain the transition to a low-carbon future.

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