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Resourcing a low emissions future through mineral discovery and responsible recovery

Resourcing a low emissions future through mineral discovery and responsible recovery is needed to mitigate the effects of climate change. As global energy demands rise the majority of required growth will be met by renewable energy sources. Widespread electrification will result in increased demands for base and critical metals. In order to meet this demand, the imperative is to respond to manufacturing needs with mineral discovery and mining programs. We need to build, translate and deploy newly created technologies rapidly across the exploration and mining value chain. Electrification and battery technology relies on increased supply of energy metals including lithium, cobalt, nickel and REE's, some by up to 500%. Thus the global transition to clean energy will test the limits of metal supply.

Metal discovery timeframes must be shortened facilitated through effective exploration undercover and ore body characterisation. Assisting will be augmented geophysical imaging and inversion combined with regolith geochemistry technologies. Effective and commercially available indicator or fertility minerals technologies will aid targeting. Fast-tracked characterisation tools for 'on the fly decision support' for field programs and providing more detail for geometallurgical studies will lower costs and risk, with these data fed across the value chain into solutions for mining that includes site- or commodity-tuned ore sorting, and ore processing technologies.

A combination of production of 'green metals', hydrogen-based energy systems, partnered new systems for deep earth imaging, and autonomous sensor technologies, coupled with quantum technologies, on-site carbon abatement or locking, will provide the step changes required to discover new resources and support sustainable and responsible mining operations. This, in addition to new ways of mining and processing and possible on-site carbon abatement will help facilitate the resourcing of a low emissions future.

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Sandra Occhipinti is Research Director for the CSIRO Mineral Resources Discovery Program. A structural geologist with over 20 years of experience she has worked across the government, industry and academia sectors. Her work has bridged the scales from understanding the tectonic development of a region to vectoring to ore deposits at the district and prospect scale using geology, geophysics, mineralogy and geochemistry. Her recent work in mineral systems science includes integrating multi-scale interdisciplinary datasets in order to complete multicommodity analyses that include integrating 4D geological domain knowledge into the analyses. She also worked in project generation within regions throughout Australia, areas in South East Asia and the Americas.