# SEG 2023 Conference: Resourcing the Green Transition

## Challenges Associated with the Future Supply of Battery Minerals and Black Mass

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Civilisation would not exist as we know it without the mineral resources upon which it relies. Minerals were important during Palaeolithic times and underpinned the Bronze Age, Iron Age, Industrial Revolution, and Digital Revolution. As we embark upon the Green Revolution and Battery Revolution, minerals are likely to continue to remain a fundamentally important resource. Globally, society demands a cleaner environment, such as a reduction in the combustion of conventional fossil fuels (i.e., coal, oil, and gas) to reduce rising atmospheric temperatures. This coincides with a projected increase in battery technology, driven in part by the electrification of vehicles in Europe, China, and the USA. However, this "greener" society may ultimately mean more exploration and mining are necessary because batteries contain numerous minerals including lithium, cobalt, nickel, copper, manganese, phosphorous, iron, aluminium, and carbon. From where will these minerals be sourced within the relatively short and optimistic transitional timeframes? Often, these can be located in remote geographical locations and in complex geological settings. Mineral exploration is a high-risk business, with relatively few exploration targets actually becoming a productive mine. What is more, it can take on average 15 to 20 years from exploration to mining and production. The challenges associated with the production of these minerals can be exacerbated by investor confidence variably, economic and market vulnerability, corruption, and increasing illegal and illicit minerals crimes in some countries. Could the emerging circular economy provide part of the solution? End-of-life spent batteries can be shredded and the minerals and metals content recycled via an intermediate product material known as "black mass." But what, specifically, is black mass? Data and information will be presented on the phase characterisation of black mass to demonstrate its textural, chemical, and phase complexity, which might predetermine a hydrometallurgical or pyrometallurgical processing route.