Global Critical Metal Resources: Current and Future Scenarios and Implications for the Energy Sector

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Abstract

The critical metals are vital to modern life and are used in a variety of domestic, green and military high technology applications but have supplies that are inherently insecure for a number of different reasons. These metals are also becoming increasingly important to the energy sector as their unique properties are vital in the manufacturing of end-products for use in clean, green and/or increased efficiency energy production, storage, and usage. This importantly includes the technologies that enable the development of advanced batteries, wind turbines, solar panels, electric vehicles, and energy-efficient lighting. This presentation provides an overview of the concept of criticality and what we mean by the term critical, the use of the critical metals in green and clean energy technologies, and what may influence future changes in the supply and demand of these critical commodities. Although increasing amounts of research has been devoted to the critical metals, significant knowledge gaps remain that mean key issues around their security of supply remain unresolved. The methods used to quantify the criticality of critical metals have advanced over time and we know that some metals are more strategically important than others depending on the sector (e.g., energy, defense) being considered. However, global resources and reserves of a number of critical metals as well as their production statistics remain unclear. Methods exist to quantify critical metals resources with reasonable accuracy but these methods rely on information provided by the mining industry, indicating that better reporting practices would improve our knowledge of the global resources and cycling of these key commodities. Both the criticality and the security of existing and future supply of the critical metals will also be controlled by known mine supply chains that can be adapted to enable

the economic extraction of critical metal by-products, the determination of the critical metal prospectivity of mining/mineral processing wastes (given a significant amount of critical metals currently deport to waste) and increased amounts of recycling intermediates or end-use products containing critical metals. However, all of these approaches require more information in terms of mineral resource accounting, mineral economics, material flow analysis and mineral processing. Without this information, significant parts of our knowledge base on the supply (and the security of this supply) of the critical metals will remain opaque. Further quantification of our knowledge of global critical metals resources will not only provide key insights into any potential supply issues that the energy industry may encounter, what may cause these issues, and how these could be overcome, but could also present opportunities for investment in terms of targeting critical metal sectors that could undergo transformational growth.