

From Ore to PV: A Sustainable Tellurium Value Chain for Net-Zero Goals

Homay Fath¹, Simon Jowitt

¹Nevada Bureau of Mines and Geology, United States

A global shift to renewable energy depends on securing a sustainable supply of critical metals and minerals, but the mining industry, essential for providing these materials, faces escalating environmental, economic, and social challenges. We highlight the role of critical materials in low and zero-CO₂ energy storage and generation technologies using the example of tellurium in solar photovoltaic technologies, emphasizing the importance of building a resilient and agile supply chain in delivering critical materials and achieving decarbonization. Thin-film cadmium-telluride (CdTe) photovoltaics have emerged as a promising alternative to conventional silicon solar panels. However, the cadmium and tellurium required to produce these modules are almost entirely obtained as byproducts from base and precious metal mining operations. This study presents a proxy-based approach to estimate the hidden and unrealized tellurium potential in some active gold and base metals mining operations. We emphasize that improved knowledge from studies of existing ore deposits containing tellurium, followed by coordinated actions by governments, industry players, and other stakeholders, are crucial to ensure a reliable supply of materials vital for decarbonizing mining energy systems. Enhanced domestic recovery efforts can markedly decrease import reliance, strengthen supply-chain resilience, and accelerate the global energy transition. Moreover, the proxy-based methodology introduced here provides a versatile framework for assessing the recovery potential of other critical byproduct metals across diverse mining operations.