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Electrification as a Structural Demand Driver for Critical Minerals: Infrastructure Deployment and the Material Intensity of the Energy Transition

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Rapid electrification of buildings and energy infrastructure is reshaping demand for critical minerals essential to the global energy transition. While economic geology research traditionally focuses on ore genesis, resource discovery, and extraction dynamics, less attention has been given to how large scale electrification deployment generates upstream material demand signals that influence mineral supply chains and exploration priorities.

This presentation examines how expanding electrification across the built environment and power systems is increasing demand for mineral intensive technologies including heat pumps, grid modernization equipment, power electronics, and transmission infrastructure. These systems rely heavily on copper, aluminum, rare earth elements, and other critical materials whose demand profiles are changing as electrification accelerates.

Drawing on research and policy implementation work related to building electrification and energy infrastructure deployment, this study explores how policy frameworks, capital investment flows, and infrastructure planning decisions shape the scale and timing of mineral demand. Electrification technologies are significantly more material intensive than the fossil fuel systems they replace, meaning that infrastructure deployment pathways can generate substantial shifts in mineral demand across supply chains.

Understanding these dynamics is increasingly important for economic geologists, as mineral demand is now being influenced not only by traditional industrial growth but also by structural changes in energy systems. Electrification policy, infrastructure investment, and technology deployment are becoming key drivers shaping long term demand for metals central to the energy transition.