**Computational Economics Final Project Proposal  
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**Course:** Computational Economics EBGN-654

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This project explores the techno-economic potential of recovering low-temperature geothermal heat from mine waste in a region of the Western United States. Historically regarded as a liability, mine tailings can carry residual thermal, chemical, or biological energy that can be tapped by innovative processes. Given the increasing attention for sustainable resource management, it is of interest to demonstrate whether energy recovery from tailings is technically viable and economically profitable with a positive environmental impact.

The primary research question of the proposed project is: **What is the feasibility in the Western US to develop low-temperature geothermal recovery systems with mine tailings?** This question should consider the constraints of the engineer, economically and environmentally. This project will address one need from a quantitative standpoint as well as inform future energy recovery decision-making.

The research begins with a literature review on energy recovery existing research, including integrated techno-economic models tailored to tailings-based geothermal systems, and economic aspects separately, and a few incorporate GIS-based resource mapping or environmental trade-offs, and mineral recycling, with reference to sources including USGS Mineral Resources Data System, NREL geothermal datasets, and EPA mining site reports, as well as academic literature on low-enthalpy geothermal systems and mining reclamation few papers likes [SICMRecovery2022](https://www.sciencedirect.com/science/article/pii/S221334372200495X), [REEValorization2024](https://www.sciencedirect.com/science/article/pii/S221334372401248X), and [MiningRE2024](https://www.sciencedirect.com/science/article/pii/S2211467X24003067). This summary will inform any technology choices appropriate for Western U.S. locations, according to mineral composition, climate, and infrastructure characteristics. Tailings characteristics at site-specific tenors will be characterized in support of simulation modeling.

The data collection will include the identification of the appropriate mine sites in the Western U.S., characterization of tailings properties (i.e., thermal conductivity, porosity), and obtaining relevant economic inputs, including capital costs, operating costs for site services, electricity rate forecasts,t displacement competition with clean energy sources pricing forecasts, and a representation of discount rates. Geographic Information Systems (GIS) will be utilized to map the tailings deposits and evaluate their site suitability for mineral recovery.

The main output is a GAMS and Python model that combines heat transfer, cogeneration, and economic assessment. Key results will be NPV and IRR, sensitivity to energy prices or policy incentives. The final report will include technical studies and actionable guidance to mining companies and regulators, as part of a broader work on sustainable mining and low-carbon innovations.