Lithium is crucial for the transition to electric vehicles (EVs). However, its mining and processing are mostly concentrated in a few countries. For expanding its EV manufacturing, the United States must secure its lithium sources. Moreover, in developed nations, it's important to ensure that lithium production adheres to fair labor and environmental standards, while also being cost-effective. In the U.S., Lithium Americas stands out as the only significant lithium miner and refiner. They have developed a process that is efficient, minimizes waste and energy use, is environmentally friendly, and economically viable. Consequently, Lithium Americas is on track to become a key figure in the lithium market, ready to meet the increasing demand for this mineral. Our aim is to build on their achievements, emphasize their sustainable and positive contributions, and establish a standard for future mining and processing operations.

Although Lithium Americas is sitting on one of if not the largest lithium reserves in the world (120 million tons) many other mines and processing plants will need to be developed to meet skyrocketing demand. Developed countries will want to ensure that they are as sustainable as Lithium America’s process. Therefore, we are evaluating and validating the life cycle (LCA), techno-economic (TEA), and thermodynamic analysis (TDA) of Lithium America’s process and setting that as a benchmark for future endeavors.

Lithium America’s process can be broken up into five parts see Figure 1: 1) Mineral Beneficiation, a process used in the phosphate industry; 2) Clay Dewatering, a standard mining operation; 3) Traditional Hydrometallurgy; 4) Magnesium Crystallization; 5) Hard rock conversion to lithium chemicals. Each of these five steps can and has been evaluated for economic efficiency, life cycle emissions, and environmental impact.
We propose gathering material at each stage to characterize and perform TDA, TEA, and LCA of each of these steps in a laboratory environment. Furthermore, we also propose testing and evaluating the potential of the rock scrap that contains other critical minerals to determine if it is economical and environmentally advantageous to further process those as well.

Our final result will serve as a benchmark for lithium mining and processing's economics, environmental impact, material use, recovery rates, and process flow. This benchmark will provide a comprehensive evaluation of the industry and will help us make informed decisions about the best path forward. It will also allow us to compare different mining and processing methods to determine which one is the most sustainable and economical. We believe that by highlighting the best in class even if other separation processes are needed to meet lithium demand, it sets a standard for future processors to meet. Since lithium at this scale and in developed countries is relatively new these standards and benchmarks will be important as technology progresses and new opportunities arise.

References

