

Recovery and Recycle of Electric Vehicle Battery Materials

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Introduction

Despite the growing number of electric vehicles on the road today, there are few facilities in the United States to recycle the batteries utilized by these vehicles. With an expected growth in future electric vehicle sales, there is great economic opportunity in this market.

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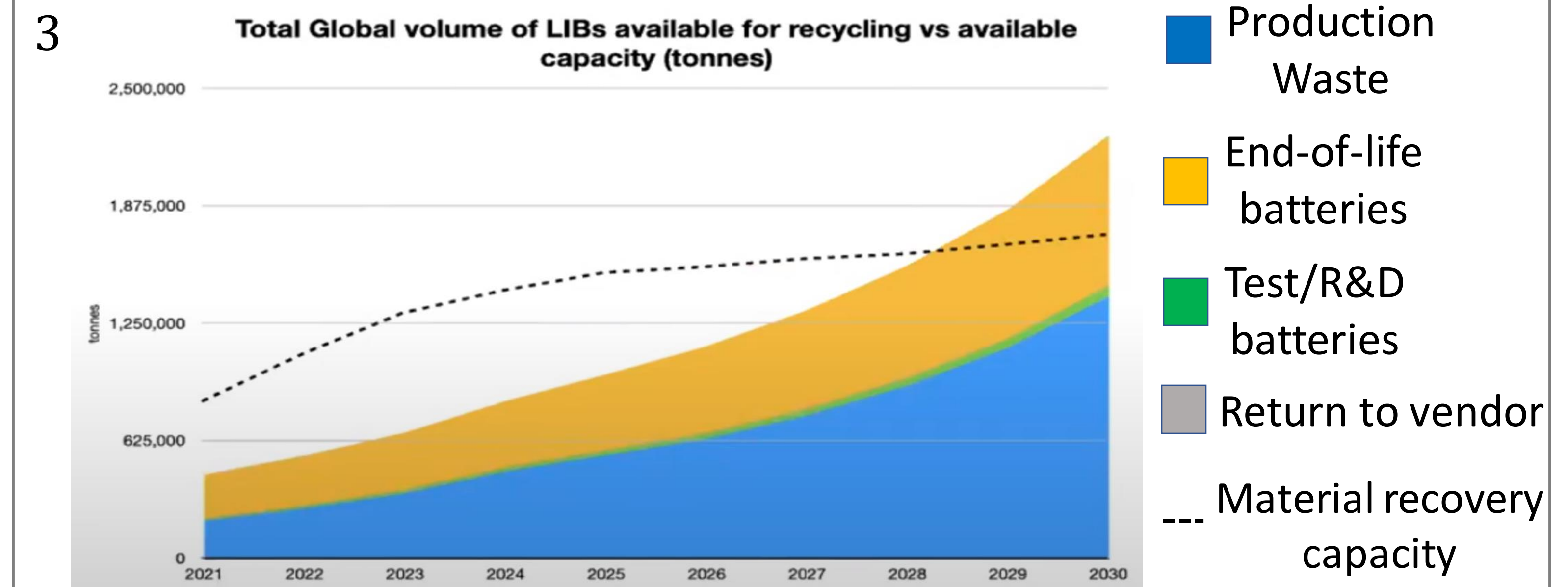


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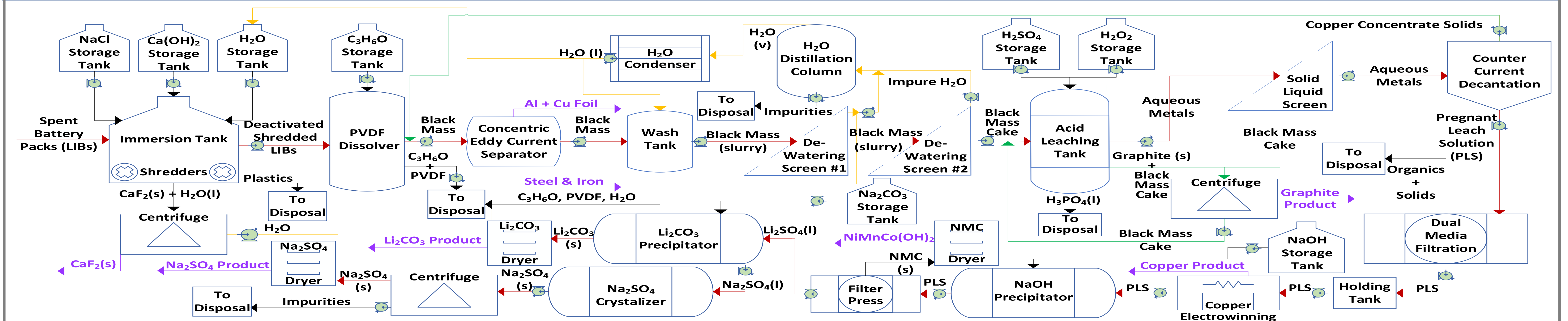
Objectives

- Assessment of market and growth for EV battery recycling
- Design of a greenfield battery recycling plant with defined unit operations
- Technoeconomic analysis to determine if a yield of 20% return on investment would be feasible over a 20-year lifetime

Market Growth Analysis

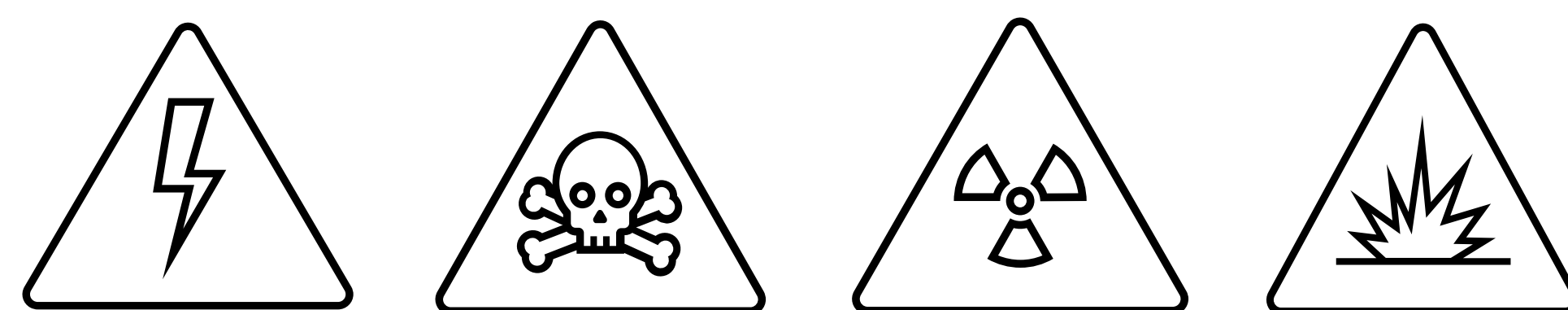


Process Overview



Environmental/Safety

- Dust explosion risk
- Hydrofluoric acid produced from electrolyte
- Exothermic reactions during battery deactivations
- No wastewater produced
- EPA and OSHA compliant
- Compliant with all local, state, and federal regulations for transportation and storage



Conclusions

EV batteries processed per hour	22
Estimated initial investment	\$410 million
Estimated operating costs per year	\$330 million
Estimated revenue generated per year	\$790 million
Estimated profit over 20 years	\$6 billion
20% ROI Achieved By	End of Year 4

Acknowledgments

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References

1. Electric Vehicle Battery: Gatton, Bryce. *The Driven*, 23 July 2021.
2. Charging Electric Vehicle: Braithwaite-Smith, Cameron. *Motoring Research*, 11 March 2019.
3. LIB Growth Volume vs. Available Capacity Graph: Lynch, Ayanna. *National Academies*, 2 March 2023.