

# National Conference of State Legislators

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# A Leader In Developing Critical Battery Materials



Primary and Secondary Metals Refining

In-house technical, battery metals scientists that evolve, advance, and leverage hydrometallurgical extraction capabilities for recycled and primary battery metals



Recycling of spent lithium-ion batteries utilizing first-of-kind advanced, combined demanufacturinghydrometallurgical process Primary Resource Development

Development of lithium resources owned by American Battery Technology Company

## Surging Demand For Batteries Requires Significant Capacity Expansion

## Lithium-Ion Battery Demand (GWh)

33.6x 9,000 2020 Capacity 8,000 21.8x 7.000 2020 Capacity 6,000 12.2x 2020 Capacity 5.000 5.1x 4,000 2020 Capacity 3,000 2,000 1,000 2017 103<sup>3</sup> 2035 2031 · 2023 00 202 202 202 202 203 Sr. EV ESS Portables

Anticipated 2030 LiB demand is



Current Levels

Source: Benchmark Mineral Intelligence, Roskill, United States Geological Survey, Company Filings 1. Includes USA, Europe, Japan, and South Korea

2030E Processing Capacity at Each Stages of Battery Chain (kt Metal)<sup>1</sup>



Anticipated 2030 battery production capacity is

~**10**x

Precursor Materials Refining Capacity  Surging demand for LiBs driven by new and rapidly growing end uses such as electric vehicle production

 Supply limited by investment in new production capacity at each level of supply chain

 Anticipated Underinvestment in Materials Refining portions of the supply chain relative to battery production

## North American Supply Chains Are Dependent On International Producers Of Critical Materials



- US Currently Produces
   US is highly
   Primary pro
   Of Global Critical Materials
  - US is highly dependent on foreign production of critical materials
  - **Primary production largely overseas and in non-OECD jurisdictions**, introducing higher transportation costs and greater geopolitical risk to domestic battery supply chains

## ABTC: A Circular Economy Solution for Lithium-Ion Batteries



The global market is set to be **flooded with lithium-ion batteries** ("LiBs") over the next decade

The current battery economy has no reliable, scalable and cost-efficient method for **reintroducing spent LiBs into the cycle** 

Primary supply of **virgin materials alone will not be sufficient** to meet demand for new LiBs batteries

With battery production set to boom in the next decade, the **market desperately needs better end of life options** for spent batteries

### American Battery Technology Company's Role In The Circular Economy for Lithium-Ion Batteries



OTCQB:ABML 6





Lithium-Ion Battery Recycling



## Secondary Resource Development Through Recycling

**Treating Batteries as a Resource** 

- Leveraging knowledge of defect mechanisms
  - Increases efficiency of sorting and separation
- Fully automated, hands-free de-manufacturing process
- Deep understanding of raw materials processing
  - Refined materials synthesis
  - Electrode manufacturing
  - Cell/module/pack manufacturing

**R&D driven approach** to developing secondary supply of critical minerals.



# Award Winning Technology

Sole Winner: BASF Circularity Challenge

Global competition to identify the most promising lithium-ion battery recycling technologies in the world

- Entry into BASF's corporate accelerator program, hosted by Greentown Labs in Boston
- Support funds and unlimited access to the BASF wet chemistry development laboratory
- Ongoing partnership between ABTC and BASF

   Cathode R&D, Cathode Manufacturing, Battery Metals Procurement, M&A









**Greentown** Labs

## Closing the Loop in the Battery Value Chain

### \$2 million grant from the United States Advanced Battery Consortium

**Chemical Refiners** 

BASF

The Chemical Company

End Use OEMs

STELLANTIS

**Cell Manufacturers** 

Objective: Challenge the existing recycling business model and Innovate towards a value driven, self sustaining model for large format lithium-ion batteries.

- Recycling of battery packs and extraction of battery metals and refining products to meet rigorous battery cathode feedstock specifications
- Synthesis of new active cathode materials (>500 kg)
- Fabrication of large-format automotive battery cells utilizing active cathode made from recycled battery metal feedstocks
- Performance testing of large format cells made from recycled vs virgin sourced battery metals



# **Pilot Plant**

### Pre-commercial recycling facility in Fernley, Nevada

- 20,000 metric tons / year capacity
  - Ramping operations in 2023
- Onsite analytical and process labs
  - Will leverage existing partnership with UNR
- Access to low-cost electricity and utilities; nearby rail and highway infrastructure
- Opportunity Zone
- Continuous development of sub-systems
  - Allows for adaptation to new battery chemistries
  - Testing facility for deployment of new technologies and systems to commercial-scale facilities

## Scalable and repeatable for future, commercial-scale facilities





Lithium-Ion Battery Recycling



# **US DOE AMO Grant**

## \$4.5M Grant for Critical Materials Innovations Project Initiated October 1, 2021

Field Demonstration of Selective Leaching, Targeted Purification, and Electro-Chemical Production of Battery Grade Lithium Hydroxide Precursor from Domestic Claystone Resources

- Bench-scale validations for lithium extraction from claystone resources
  - First-of-kind technology; Significantly reduced environmental impact from reduced chemical reagent consumption
- Construction of ~5 tonne/day field demonstration system to produce battery grade lithium hydroxide (LiOH)
- Deployed directly on ABTC's Tonopah Flats Lithium Exploration Project in Western Nevada







# **Tonopah Flats**

### Lithium claystone exploration project in Tonopah, Nevada



- 516 unpatented lode claims covering 10,340 acres
- Initial surface sampling completed in early 2022; 16hole initial drill program initiated in February 2022
- Favorable resource development jurisdiction; Access to necessary infrastructure
  - Available labor force and supportive community
  - Power generation and related infrastructure adjacent to site
  - Direct access to transportation / highways

## Optimal location in Nevada's Lithium Valley



# **Primary Metals Refining**

### Increasing recoveries from claystone resources

- Developing 5 tonne/day test facility to validate bench-sale trials
- Utilizes a selective leaching process to extract lithium from claystone sedimentary resources
  - significantly lower consumption of acid
  - lower levels of contaminants in the generated leach liquor
  - lower overall costs of production
- Separates and recovers critical materials, including lithium, nickel and cobalt, from primary resources utilizing a novel process that conserves natural resources

Increases recoverable minerals from Tonopah Flats Scalable to process thirdparty lithium concentrates Potential license opportunities with mining firms





Lithium-Ion Battery Recycling



Development

## Framework for Domestic Critical Mineral Supply

#### **Federal Initiatives**

- Bi-Partisan Infrastructure Bill
  - \$3 billion in competitive grants to accelerate domestic supply chain
  - Competitive grants for battery /battery component manufacturing, including recycling
- National Blueprint for Lithium Batteries
  - Guide for investments in Li-ion value chain focused on clean energy, job creation

#### State-level Support

- Distribution of federal funding initiatives
- Support for local government investments
- Consumer education initiatives

#### Stakeholder Engagement: EPA Stakeholder Report, January 2022

- Transportation and Storage
- Labeling and Material Characterizations
- Safety and Fire Prevention
- Public and Consumer Education
- Incentives and Enforcement





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## Thank You



Kimberly Eckert Chief Financial Officer

www.americanbatterytechnology.com info@batterymetals.com

