Expanding End of Life Management for Large Format Batteries: Recycling and Refurbishing

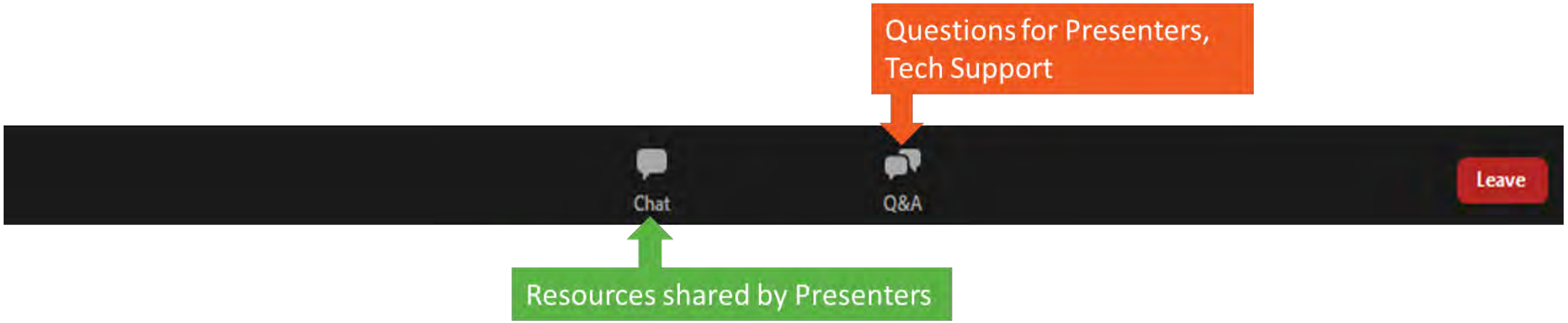
June 17, 2025

U.S. Environmental Protection Agency (EPA)

Logistics and Agenda Review

Pat Tallarico, ERG Team

Webinar Logistics



- **To ask a question:** Type your questions for presenters in the Q&A box. We will answer questions at the end of each presentation. Please limit your comments to questions and resource links.
- **Technical difficulties:** If you are having technical difficulties, please send a message through the Q&A box or email Audrey.Njo@erg.com

Agenda Overview

1. Opening remarks, logistics, and agenda review
2. Transportation Policies and Potential Opportunities for Change
   - **Kevin Leary,** U.S. Department of Transportation (U.S. DOT)
3. EV Battery Collection – Challenges, Best Practices, and Future Opportunities in Auto Salvage
   - **Derick Corbett,** Pull-a-Part
4. Repurposing Large Format Batteries – Acquiring, Refurbishing, Using, and Recycling – Process Challenges and Best Practices
   - **Sumreen Rattan,** Moment Energy
5. Battery Recycling Panel Discussion
   - **Daniel Zotos,** Redwood Materials
   - **Danielle Spalding,** Cirba Solutions
   - **Roger Lin,** Ascend Elements

8. Wrap Up/Next steps

Background

Ellen Meyer, EPA

Powering the Great American Comeback

- Activities are consistent with current administration priorities, including:
  - January 20, 2025, Executive Order "Unleashing American Energy"
  - Administrator Zeldin's Five Pillars to guide EPA's work:

Pillar 1:
Clean Air, Land, and Water for Every American

Pillar 2:
Restoring American Energy Dominance

Pillar 3:
Permitting Reform, Cooperative Federalism, and Cross-Agency Partnership

Pillar 4:
Make the United States the Artificial Intelligence Capital of the World

Pillar 5:
Protecting and Bringing Back American Auto Jobs

EPA's Ongoing Battery-Related Projects

Separate but complementary requirements in the Infrastructure Investment and Jobs Act (IIJA):

Vision for EPA's Resources and Guidelines

- **Battery Collection Best Practices**
  - EPA will develop best practices for Tribal, state, and local governments to recycle batteries in a manner that is:
    - Technically and economically feasible
    - Environmentally sound and safe
    - Optimizing value and use of materials, including critical minerals
  - Anticipated resources published in 2025 and 2026
    - Best practices toolkit
    - Case studies

Vision for EPA's Resources and Guidelines

- **Voluntary Battery Labeling Guidelines**
  - EPA aims to develop guidelines for labels that will:
    - Identify battery collection locations
    - Educate consumers about recycling opportunities
    - Reduce safety concerns from improper disposal
  - Anticipated resources for publication in 2025 and 2026
    - Sets of written guidelines for various battery categories
    - Guidance will build on existing standards, emphasize good ideas, and address inconsistencies

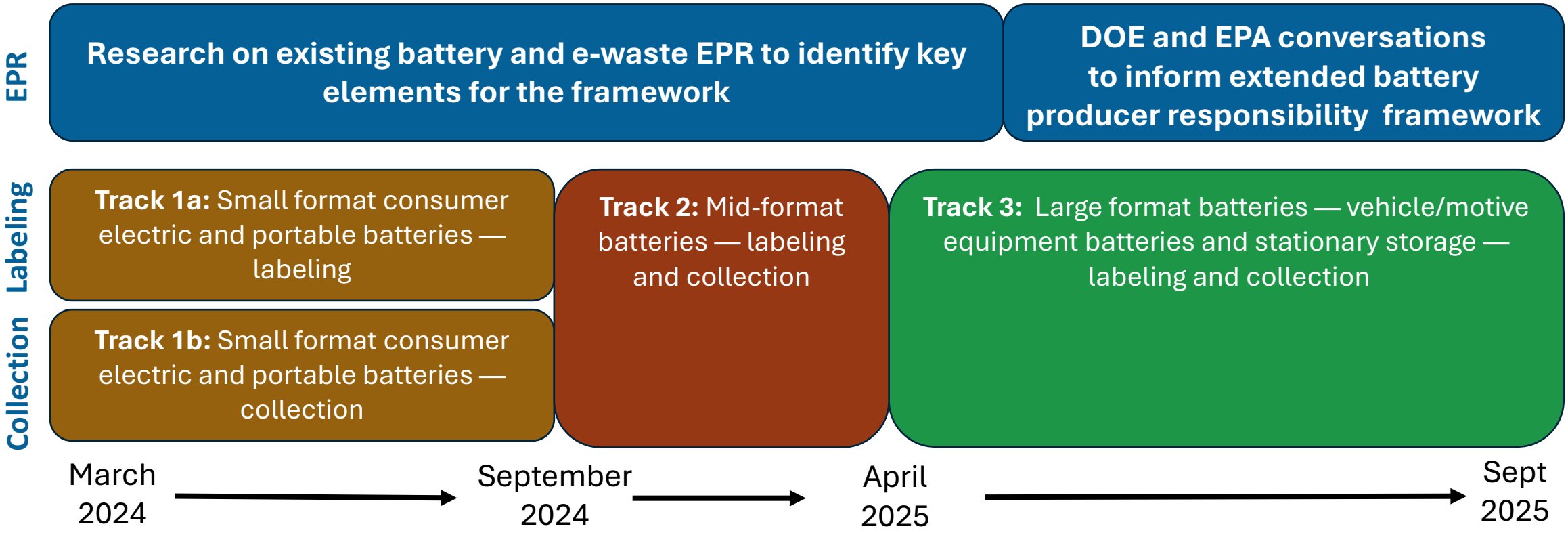
Vision for an Extended Battery Producer Responsibility Framework

- A voluntary EPR framework, not meant to be a model bill, that provides current practices and related options, challenges, and considerations
- Aimed at supporting states in EPR design and implementation and promoting consistency across jurisdictions
- The framework will address, at a minimum, the key elements specified in the IIJA:
  - Battery recycling goals
  - Cost structures for mandatory recycling
  - Reporting requirements
  - Product design
  - Collection models
  - Transportation of collected materials, including safely storing and handling

Scope of Batteries

Category	Small format consumer electric and portable batteries		Mid-format batteries	Large format batteries
Type	Single use (Primary)	Rechargeable (Secondary)	Rechargeable	Rechargeable
Use	Removable or embedded in electronics and electric devices, such as watches, hearing aids, cameras, key fobs, toys, portable radios, flashlights.	Removable or embedded in electronics and electric devices, such as phones, computers, appliances, small uninterruptable power supplies (UPS), power tools, power banks.	E-mobility including e-bikes, e-scooters. Outdoor power equipment. Portable power stations.	All scales of automotive starting and motive vehicle batteries. Materials handling equipment (forklift, crane, etc.) Recreational (golf carts, marine equipment, recreational vehicles, etc.) Stationary storage (residential, grid, commercial, etc.)

Timeline of Battery-Related Conversations



Themes from Work to Date and Implications for Large Format Batteries

Pat Tallarico, ERG Team

Common Themes: Consumer Focus

People need to know that something is/has a battery

People should know how to identify and use labeled and certified batteries/devices

People should know what to do or not do with the battery/device

People should have access to convenient collection locations

There is already a lot of information on a battery, and adding more information may be difficult or ineffective

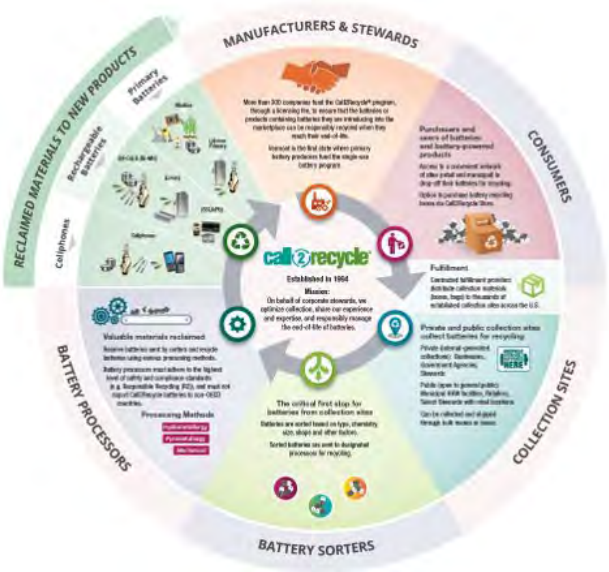
Common Themes: Collection Best Practices for Consumer Batteries

Enhance point of sale information and messaging

Convenient and well-marked collection locations; consistent and wide-spread outreach

Train employees at collection sites; ensure materials are properly packaged and labeled

Partner for program implementation; employ a hub and spoke model of collection for rural areas



Common Themes: Labeling Guidelines

It's a battery!

Do recycle it if you can! Don't put it in your bins!

State/condition

Chemistry

Link to more information

Color?

Common Themes: Challenges for Mid-Format Batteries

- Safety concerns – use/storage/collection
- More complex shipping requirements and reluctance of shippers to take mid-format batteries
  - Remote and island locations are particularly challenging
- Difficult to assess charge and discharge safely
- Most current collection systems are voluntary, and some manufacturers / original equipment manufacturers (OEMs) do not participate
- Product design can limit the ability to extract and recycle batteries

Common Themes: Large Format to Date

- Challenges similar to mid-format batteries – safety, transportation, state of charge/health, design
- Consumers play important but more limited role in EOL management (e.g., proper management post warranty)
- Standardized, visible/available battery label and information are critical for safe, effective, and more cost-effective end of life/next life management
- Low-value or orphan batteries require targeted policy solutions to ensure safe recovery
- Improvements infrastructure and transportation needed for safe management of used and DDR large format batteries

Transportation Policies and Potential Opportunities for Change

Kevin Leary, U.S. Department of Transportation (DOT)

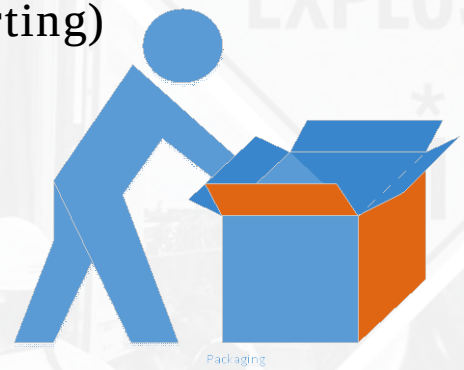
PHMSA in the Lithium Battery Supply Chain

Oversight Over the Transportation Process

Identification and Classification (collection/ sorting)

Packaging and Hazard Communication

Movement



PHMSA in the Lithium Battery Supply Chain

PHMSA establishes regulations for the safe transportation of hazardous materials in commerce by all modes of transportation.

Apply to persons who offers for transport or transport hazardous materials in commerce.

Lithium batteries **are** considered hazardous material in transportation.

PHMSA in the Lithium Battery Supply Chain

Functions **not** subject to regulation by PHMSA:

- Storage prior to or after transport
- Transport by an individual in private motor vehicle for non-commercial purposes
- Transportation of a hazardous material in a motor vehicle, aircraft, or vessel operated by a Federal, state, or local government employee solely for noncommercial Federal, state, or local government purposes

Transport Basics Classification, Packaging, End-of Life, Resources

Classification

- Stand-alone batteries (only batteries no equipment)
  - UN3090 – Lithium metal batteries
  - UN3480 – Lithium ion batteries
- Packed with/contained in equipment
  - UN3091 – Lithium metal batteries packed with equipment / contained in equipment
  - UN3481 – Lithium ion batteries packed with equipment / contained in equipment
- UN3171 – Battery powered vehicle
- UN3166 –Vehicle, flammable gas powered" or "Vehicle, flammable liquid powered,"
  - Includes hybrid electric vehicles
- UN3536, Lithium batteries installed in a cargo transport unit
- UN3556, UN3557, UN3558
  - Coming soon!
  - Vehicle, lithium ion battery powered, vehicle lithium metal battery powered, vehicle, sodium ion battery powered

End-of-Life

Identified damaged or defective batteries liable to produce excessive heat, flame, rapidly disassemble during normal transport. – Forbidden for Transport

Damaged or identified by the manufacturer as being defective for safety reasons, that have the potential of producing a dangerous evolution of heat, fire, or short circuit. – See **49 CFR 173.185(f)**

Batteries transported for disposal or recycling. No known damage or defects. – See **49 CFR 173.185(d)**

Lithium Battery Packaging

Packaging Requirements – See 173.185(d)

- Protect from short circuits
  - Place in inner-non-metallic packaging
  - Prevent shifting that could cause damage
  - Place into strong outer packagings
  - Batteries shipped for disposal or recycling motor vehicle only

Alternative packaging – See 173.185(b)(5)

- Batteries with a mass 12kg or more
  - Employ strong impact resistant outer casing
  - Strong outer packagings, pallets or other handling devices
  - Prevent shifting that could cause damage
  - Terminals must not support the weight of other superimposed elements

Lithium Battery Packaging

Lithium Battery Packaging

Damaged, Defective, or Recalled (DDR) – See 173.185(f)

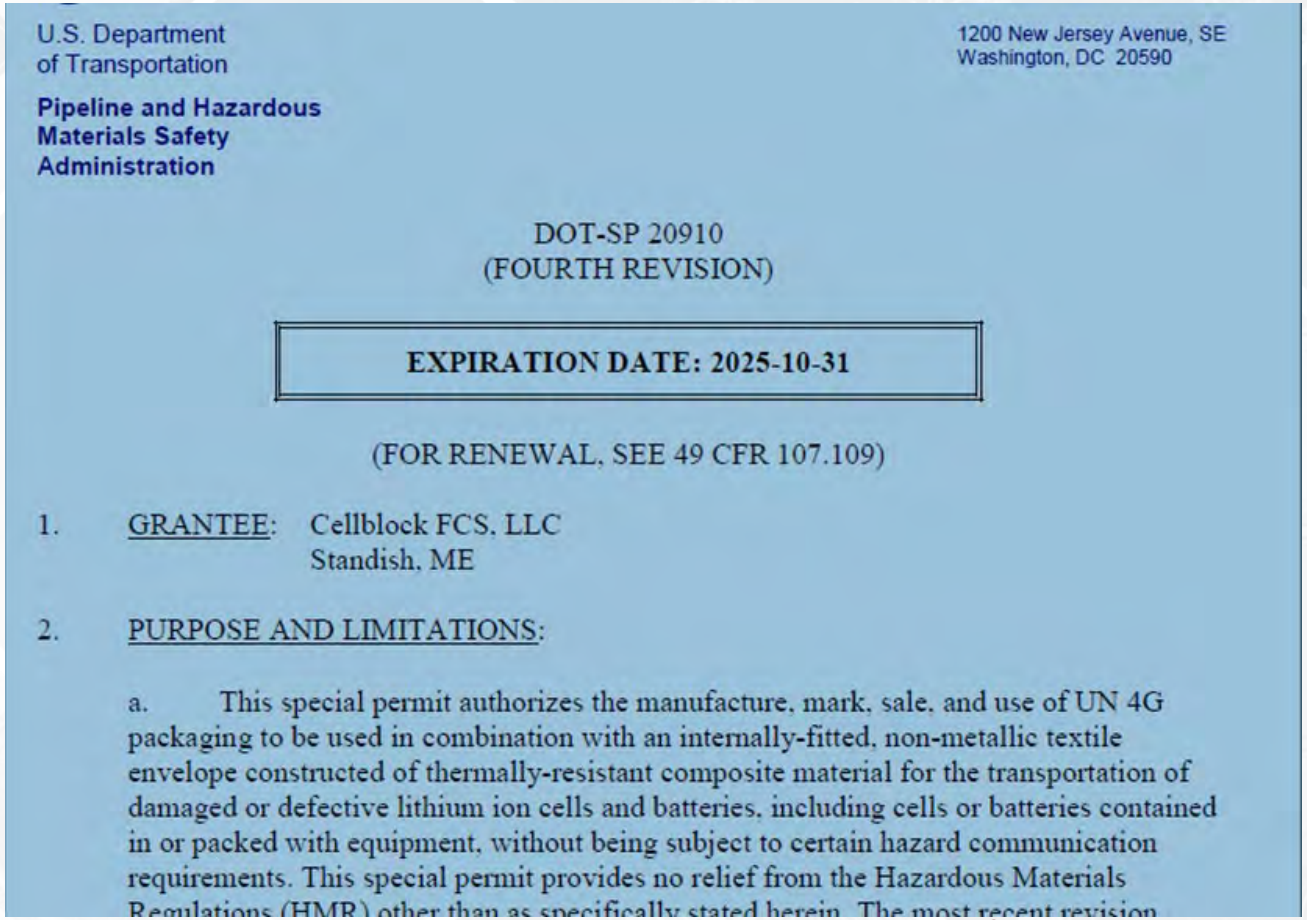
- Place in individual, non-metallic inner packaging that completely encloses the cell or battery.
- Surround with cushioning material that is non-conductive, non-combustible, and absorbent.
- Placed into UN packaging rated to PG I performance level (one battery per packaging).
- Mark package “Damaged/defective lithium ion battery” or “Damaged/defective lithium metal battery” as appropriate.

Alternative Packaging Concepts

Special Permits

- Extension of the regulations for special cases when compliance with regulations not feasible or in the public interest
  - Manufacture, mark, and sell
  - Offer

Email: specialpermits@dot.gov
Phone: 202-366-4535
https://www.phmsa.dot.gov/approvals-and-permits



U.S. Department of Transportation
Pipeline and Hazardous Materials Safety Administration

1200 New Jersey Avenue, SE
Washington, DC 20590

DOT-SP 20910
(FOURTH REVISION)

EXPIRATION DATE: 2025-10-31

(FOR RENEWAL, SEE 49 CFR 107.109)

1. GRANTEE: Cellblock FCS, LLC
Standish, ME

2. PURPOSE AND LIMITATIONS:

a. This special permit authorizes the manufacture, mark, sale, and use of UN 4G packaging to be used in combination with an internally-fitted, non-metallic textile envelope constructed of thermally-resistant composite material for the transportation of damaged or defective lithium ion cells and batteries, including cells or batteries contained in or packed with equipment, without being subject to certain hazard communication requirements. This special permit provides no relief from the Hazardous Materials Regulations (HMR) other than as specifically stated herein. The most recent revision

Resources

The Hazardous Materials Info Center

1-800-HMR-4922

(1-800-467-4922)

E-mail: infocntr@dot.gov

https://www.phmsa.dot.gov

U.S. Department of Transportation
Pipeline and Hazardous Materials Safety Administration

811 SAFETY IS IN YOUR HANDS. EVERY DIG. EVERY TIME.

CHECK THE BOX

Thank you

Kevin Leary- kevin.leary@dot.gov

QUESTIONS

Transportation Policies and Potential Opportunities for Change

Kevin Leary, U.S. Department of Transportation (DOT)

Transportation Policies and Potential Opportunities for Change

Eva McNell, U.S. Coast Guard (USCG)

Resources and Links

- PHMSA's Lithium Battery Guide for Shippers
- USCG Safety Alerts (specifically USCGSA_0123 and USCGSA 0122)
- Hazardous Materials Regulations (49 CFR)
- International Maritime Dangerous Goods (IMDG) Code (not available to the public for free, but available for purchase here) *Newly added UN numbers for dangerous goods are UN3556, UN3557 and UN3558 for lithium ion, lithium metal, and sodium ion battery powered EVs respectively

If there are any vessel-specific questions from attendees, they are welcome to contact our office at HazmatStandards@uscg.mil.

EV Battery Collection – Challenges, Best Practices, and Future Opportunities in the Auto Salvage Industry

Derick Corbett, Pull-a-Part

QUESTIONS

EV Battery Collection – Challenges, Best Practices, and Future Opportunities in the Auto Salvage Industry

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Repurposing Large Format Batteries – Acquiring, Refurbishing, Using, and Recycling – Process Challenges and Best Practices

Sumreen Rattan, Moment Energy

Enabling all retired EV batteries to be repurposed by 2030, to provide worldwide access to clean, affordable, and reliable power.

SUMREEN RATTAN

CO-FOUNDER & COO

ABOUT US

Who Is Moment Energy?

We help EV battery manufacturers unlock new revenue streams by transforming their retired batteries into affordable and reliable battery energy storage systems (BESS).

ABOUT US

A Market Leader in Second-Life Battery Energy Storage

About Us

Founded in

2019

Headquarters

Vancouver

Funnel Projects

178 MWh

Milestones

- Created relationships with Mercedes, Nissan North America and over 20 battery OEMs.
- The first company in North America to secure UL 1974 certification. Aiming for full certification in 2025.
- Deployed 7 second-life projects in North America, additional 89 projects are on the pipeline.
- Vancouver team expanded to 45, with a 14x boost in production.
- Secured $26 M USD from the Department of Energy to establish the first second-life battery Gigafactory.
- Secured $15 M USD from Series A funding.

MAXIMIZING BATTERY POTENTIAL

EV Battery End-Of-Life is Costly, Inconvenient, and Hazardous

Traditional Methods of EV disposal:

- Premature recycling wastes EV batteries' potential decade-long second life.
- Expensive transportation for recycling making recycling unprofitable.
- Inefficient and costly storage in warehouses
- Illegal landfill disposal

ACCELERATING THE CIRCULAR ECONOMY

What is EV Battery Repurposing?

Repurposing EV batteries is good for the planet.

Repurposing retired EV batteries is a critical step towards a circular economy, reducing the overall carbon footprint of EV batteries and enabling affordable energy storage solutions.

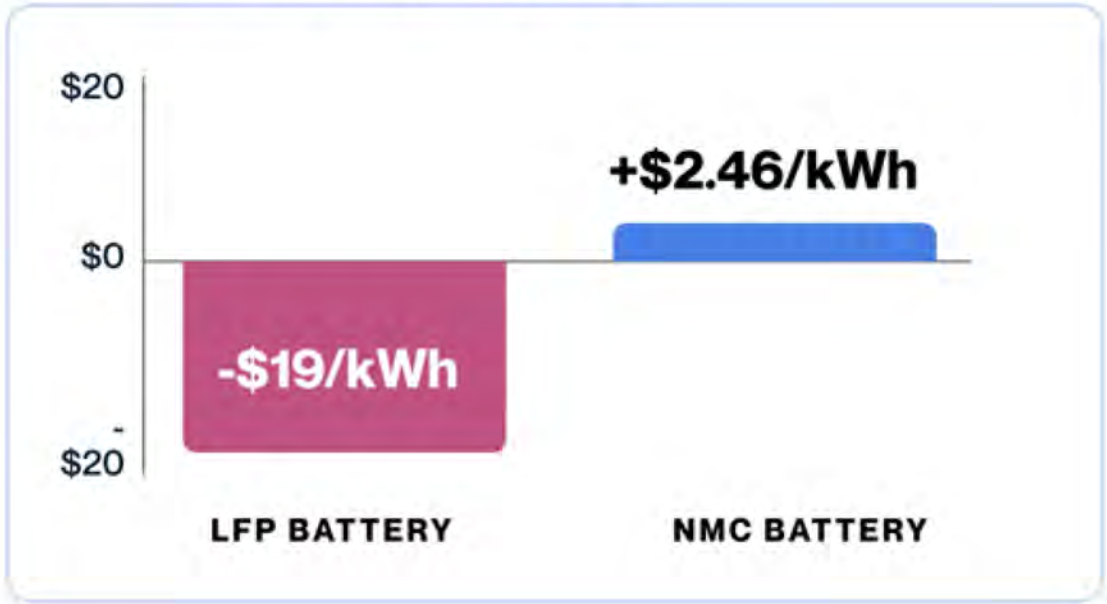
MAXIMIZING BATTERY POTENTIAL

Recycling EV Batteries Isn't Economical, but Repurposing Is

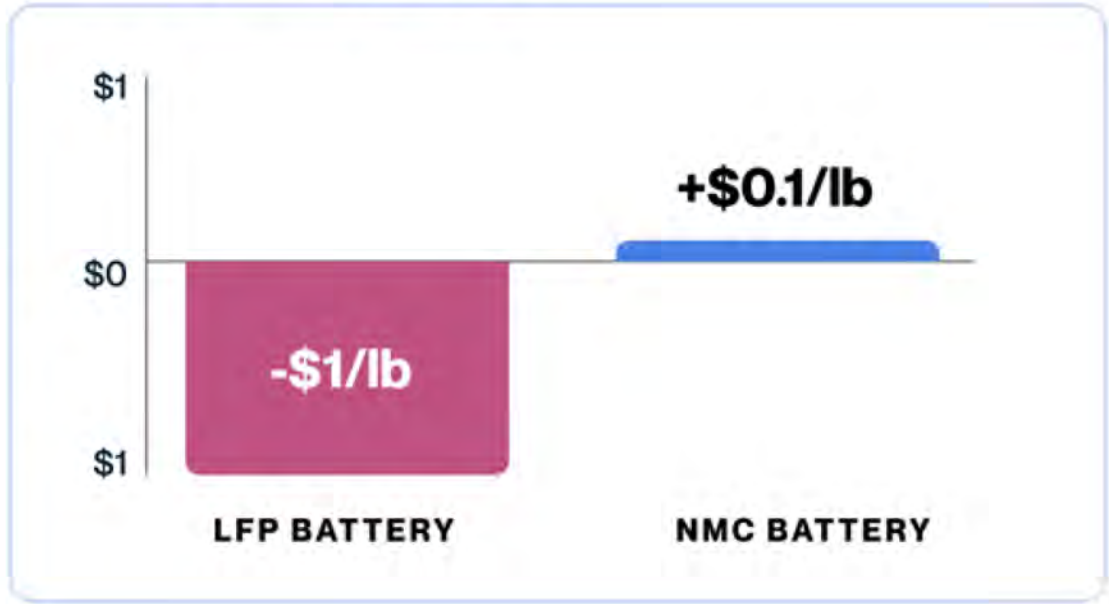
Current Rates for Lithium-Ion Battery Recycling

Recyclers are paying a minimal value for Nickel Manganese Cobalt (NMC) batteries which gets negated by transportation costs. OEMs must pay to recycle Lithium Iron Phosphate (LFP) and other lithium-ion batteries, which can become expensive.

Rate per Kilowatt Hour (USD/kWh)

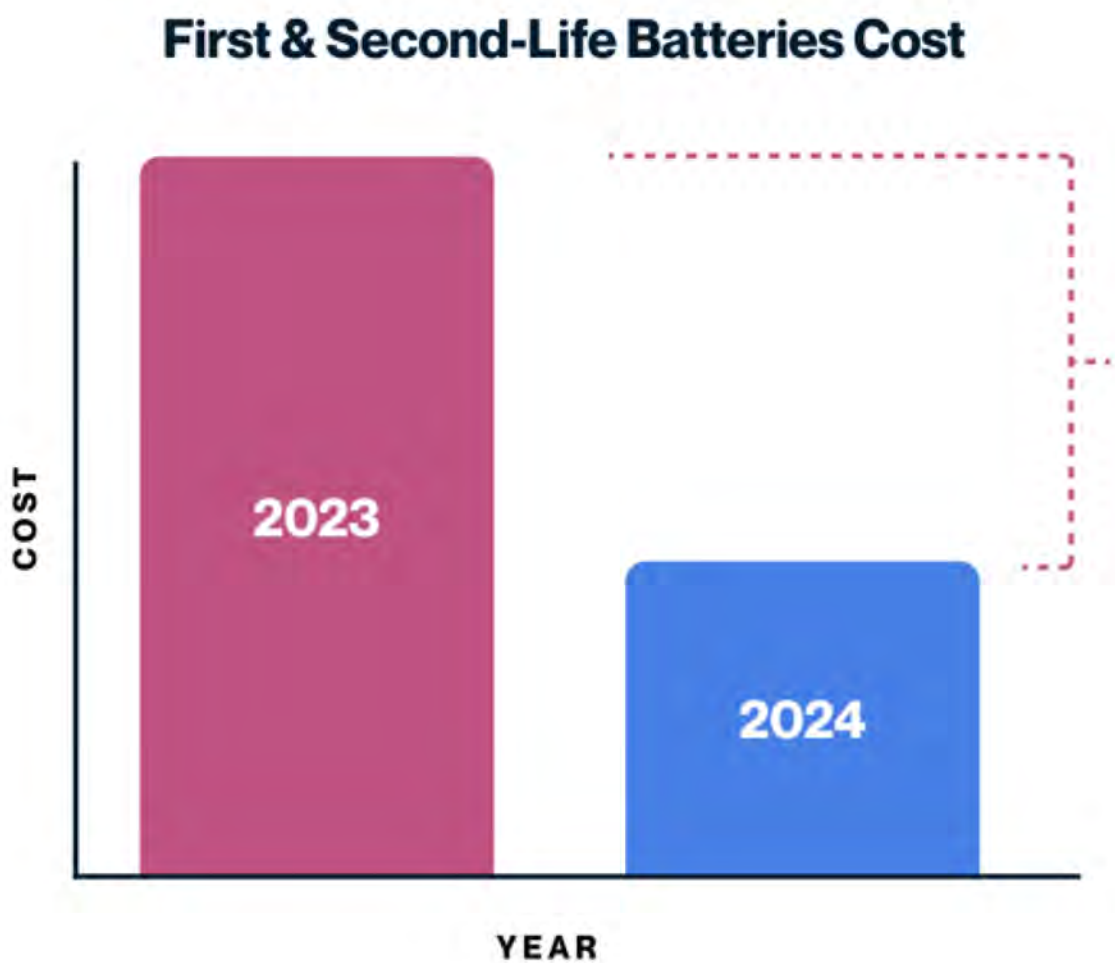


Rate by Weight (USD/lb)



MARKET TRENDS

Battery Cost Trends: First-Life And Second-Life



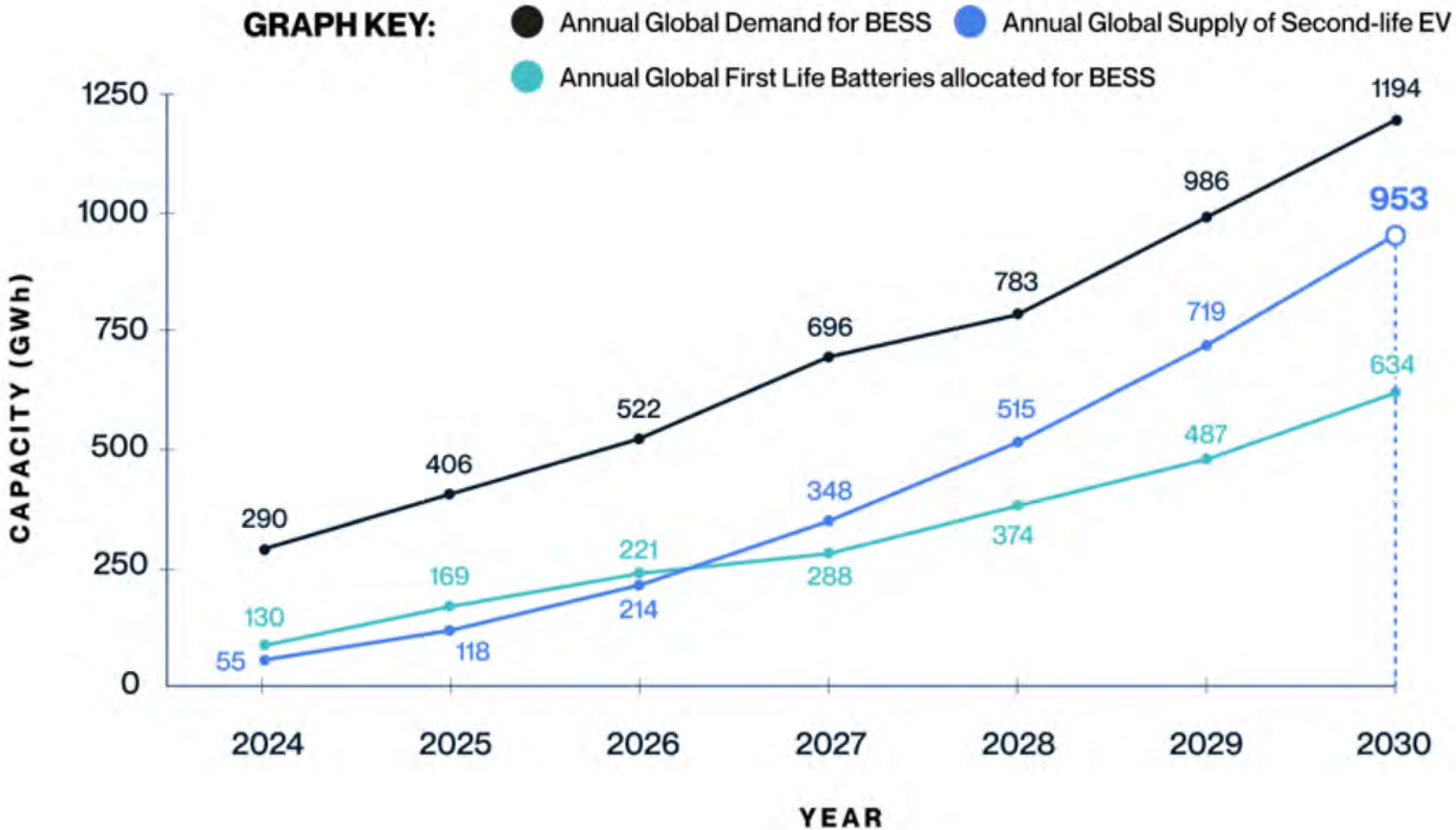
40% ↓

Decrease in cost for first and second-life batteries[1]

1. Energy Storage News, Behind the numbers: BNEF finds 40% year-on-year drop in BESS costs, 2025

MARKET TRENDS

Moment Will Enable 950 GWh to Meet Global BESS Demand



953 GWh - 11,912,500 Retired EV Batteries

Source: Wood Mackenzie, Global Energy Storage Capacity to Grow at CAGR of 31% to 2030, 2024.

Source: Rystad Energy, Global BESS Deployments to Exceed 400 GWh Annually by 2030, 2024.

Source: Statista, Global Second Life Battery Capacity Forecast, 2023.

Source: BloombergNEF, Global Energy Storage Market to Grow 15-Fold by 2030

BATTERY RECOVERY PROCESS

Retired EV Battery Collection for Second-Life Use

BATTERY RETIREMENT

Battery retires from electric vehicle due to reaching 80% state of health, minor BMS fault, or vehicle accident*

BATTERY ANALYSIS

Retired battery is tested on-site or shipped to be tested to divert into a repurposing, remanufacturing or recycling stream

THIRD-PARTY TESTING

Moment acts as the central facility to test, sort, repurpose and distribute all of the retired vehicle batteries

IN-HOUSE TESTING

OEM has a central facility to test, sort and distribute the retired batteries

* If being used for repurposing, UL1974 requires no impact on battery if involved in a vehicle accident

BATTERY RECOVERY PROCESS

Our Process Of Repurposing Retired EV Batteries

02 TEST BATTERIES

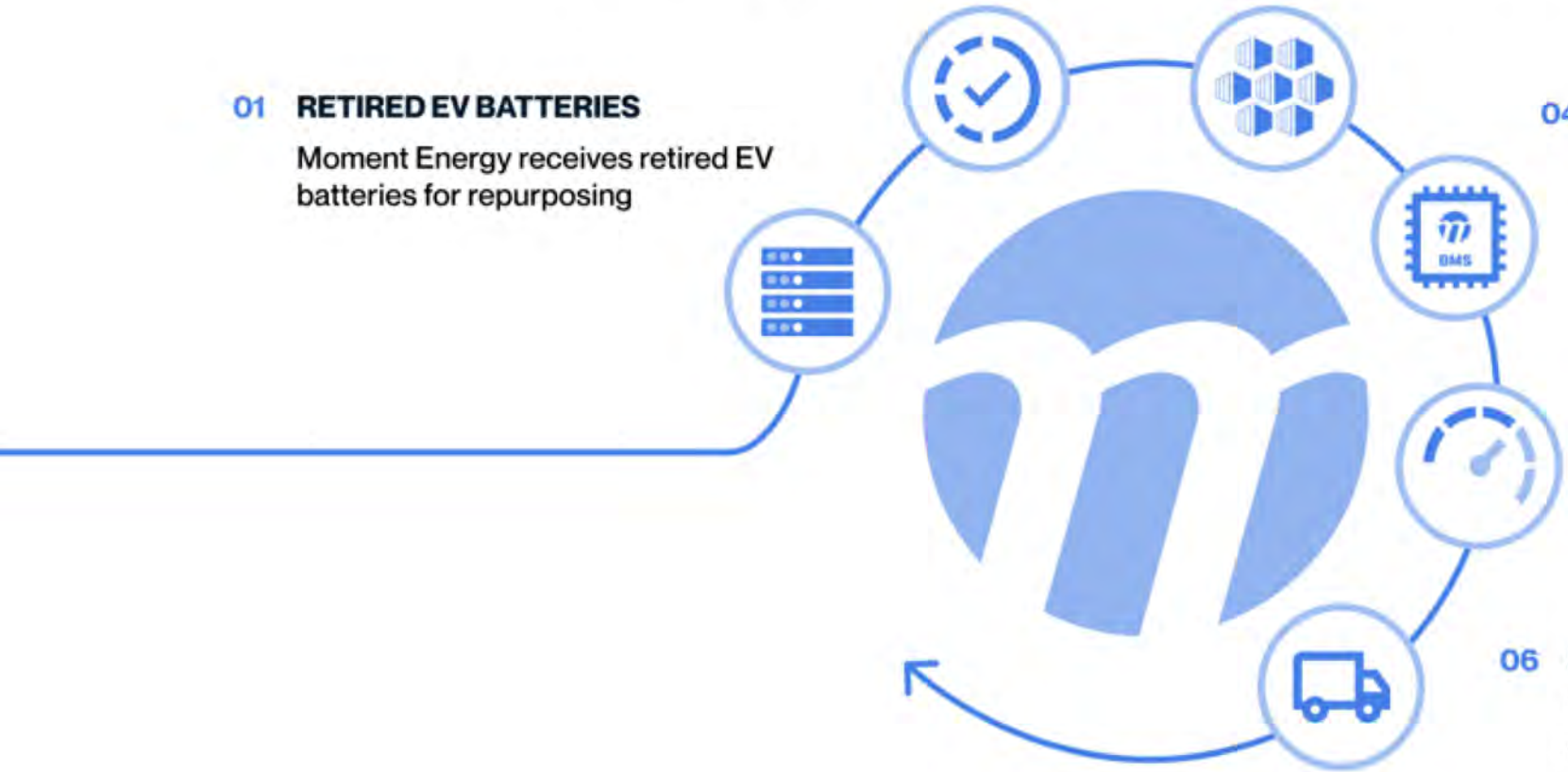
Moment Energy grades and characterizes the batteries according to UL 1974

03 PRODUCT MANUFACTURING

Batteries are assembled into BESS

01 RETIRED EV BATTERIES

Moment Energy receives retired EV batteries for repurposing



04 BMS INSTALLATION

A battery management system (BMS) is installed and configured

05 FULLY TEST SYSTEM

The completed system is tested and prepared for distribution.

06 SHIPPED OUT TO CUSTOMERS

Moment deploys the BESS for use in commercial, industrial and utility applications

Luna Battery Energy Storage System - 400 kWh

Features

- 400 kWh capacity per unit
- 200 kVA max power per unit
- 480 Vac 3-phase input & output
- Scalable up to 10 MWh
- Outdoor rated system
- Modular form factor provides flexibility

System Applications

- Peak Shaving
- EV Charging Support
- Backup Power
- Load Shifting
- Renewable Integration

Luna Battery Energy Storage System - 1 MWh

Features

- 1 MWh max capacity per unit
- 500 kVA max power per unit
- 480 Vac 3-phase input & output
- Scalable up to 10 MWh
- Outdoor rated system
- Modular form factor provides flexibility

System Applications

- Peak Shaving
- EV Charging Support
- Backup Power
- Load Shifting
- Renewable Integration

OUR IMPACT

Delivering Financial and Environmental Success

Reduce operating costs

Reduce peak demand

Reduce GHG emissions

Enable renewable energy

Comply with ESG indicators

Contributes to a circular economy

SUSTAINABLE DEVELOPMENT GOALS

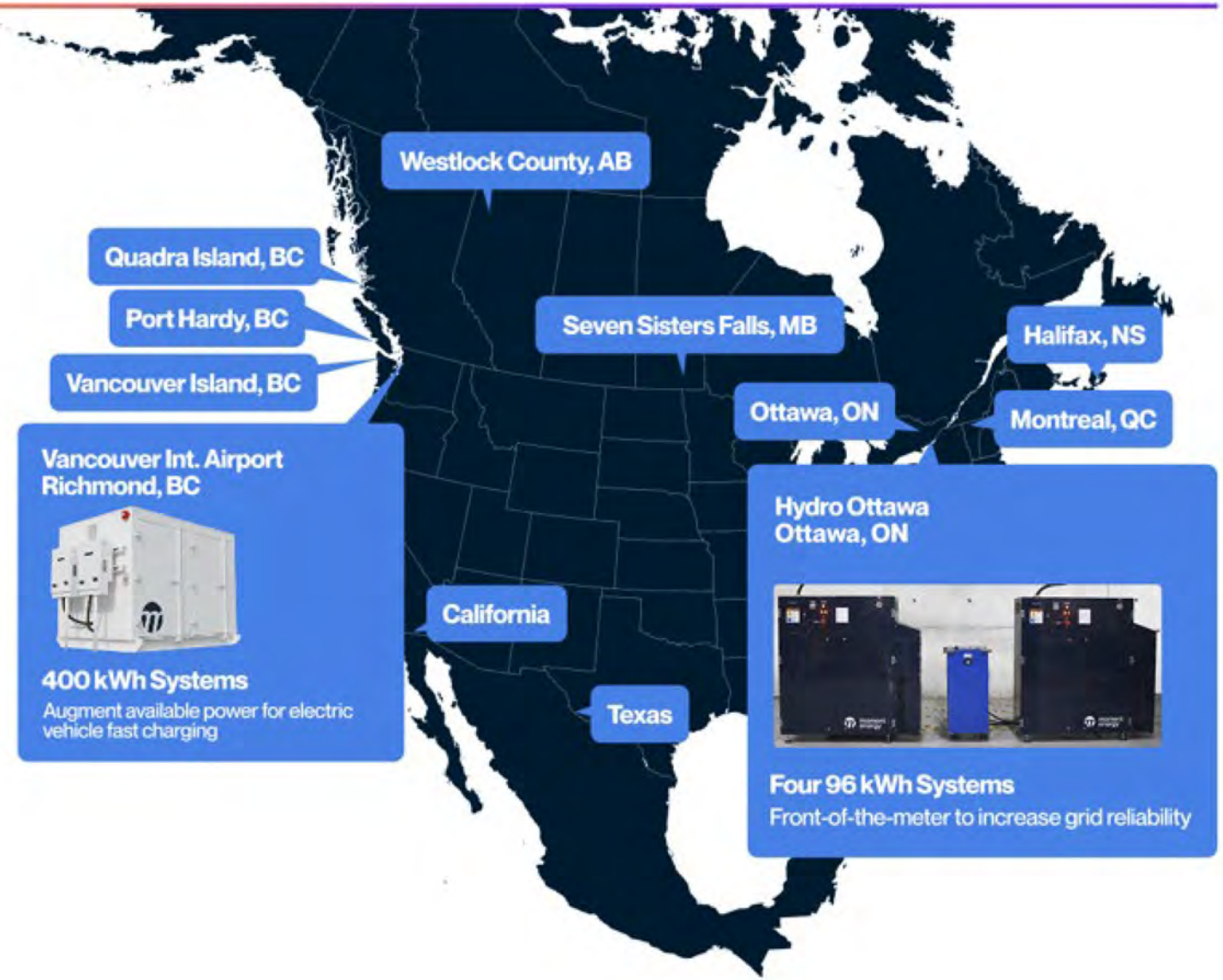
ABOUT US

Leading With a Proven Commercial Track Record

178 MWh

in Qualified Funnel projects deploying in the next 3 years

- 7 Commercial Projects Deployed
- 99.99% Up Time
- 1-5 Full Cycles Per Day



ON-GRID PROJECT

Vancouver International Airport (YVR)

The Problem

YVR's airport fleet is being electrified and will need multiple charging stations and power upgrades

Challenges

- Expensive and time-prohibitive power infrastructure upgrades
- Not enough available power
- Grid is not prepared for increase in EV charging

Our Solution

Our technology facilitates power to EV chargers while maintaining power rating of chargers

Benefits

- Reduce Scope 2 and Scope 3 emissions
- Cost-effective alternatives to upgrading current infrastructure
- Optimize the operation of a high powered charger

moment energy

Let's Connect!

Enable **all EV batteries** to be repurposed by 2030

Provide **worldwide access** to clean, affordable, and reliable power

Creating a **circular economy** to help support energy resilience.

Sumreen Rattan

Co-Founder & COO

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QUESTIONS

Repurposing Large Format Batteries – Acquiring, Refurbishing, Using, and Recycling – Process Challenges and Best Practices

Sumreen Rattan, Moment Energy

Daniel Zotos
Director of State Policy & Public Affairs, Redwood Materials

Danielle Spalding
VP, Communications and Public Affairs
Cirba Solutions

Roger Lin
VP of Government Relations, Ascend Elements

Battery Recycling Panel

Building America's battery supply chain

REDWOOD MATERIALS

Redwood's focus & growing recycling capacity

1. Reduce the cost of batteries
2. Increase the supply of battery materials
3. Reduce the environmental impact of batteries

The current the 50,000+ mile battery supply chain

Redwood recycles:

60,000
Metric tons

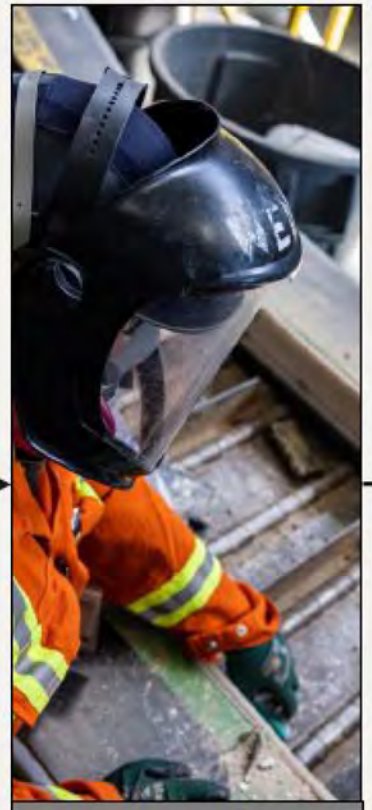
250,000
Electric vehicles

40 GWh
Annually

Redwood's process from Recycling to Cathode Active Material

COLLECTION → RECYCLING → REFINING → MANUFACTURING → BATTERY MATERIALS

Batteries for recycling



Materials specific recycling

Hydrometallurgical refining

Precursor and cathode synthesis

Battery Metal Intermediates

Cathode Active Material

One of the first commercial cathode production facilities in North America

Will produce **100 GWh** of cathode active materials annually

1.3 million electric vehicles

Redwood Tahoe Campus

North America feedstock collection

Focused on service and circularity

VEHICLE OEMs

Volkswagen
Audi
BMW
MINI
Rolls-Royce Motor Cars NA LLC
Volvo
Nissan
Toyota
Porsche
Ford
Isuzu
Caterpillar

CELL MANUFACTURERS

Panasonic
Ultium Cells

CONSUMER ELECTRONICS

amazon
WM Waste Management

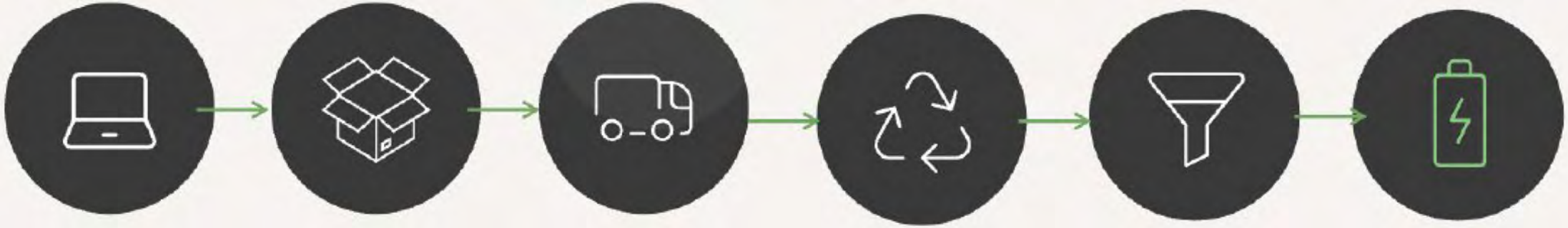
E-MOBILITY

lyft
Lime
Rad Power Bikes

ENERGY STORAGE

Southern Company
Kaua'i Island Utility Cooperative
Your Touchstone Energy® Cooperative

Redwood's end-to-end EV battery management



Get an instant offer for your EV battery packs. Use the form below.

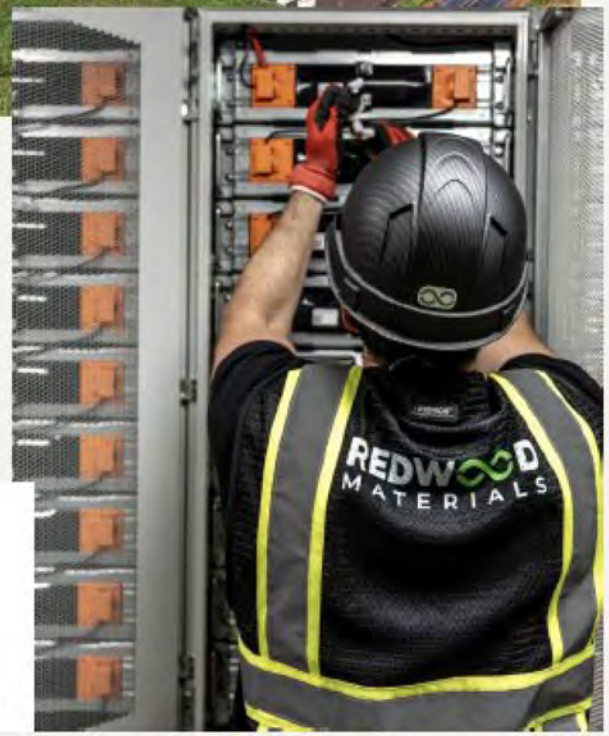
Get started | Learn more

BESS Decommissioning + Recycling

- Nearly half of states have adopted **standards** for stationary energy storage systems (fire code) or **decommissioning plans** (legislative), including SC.

- **Growing urgency for standardized BESS decommissioning**
  - The U.S. installed a record 12.3 GW / 37 GWh of new battery storage capacity in 2024 alone
  - Poorly managed systems pose environmental, economic, and security risks
  - Proper decommissioning enhances energy resilience
  - **Advanced battery recyclers are key to responsible BESS end-of-life management**

- Key difference from EVs – stationary!



NEWS

Redwood Materials to decommission, recycle 4.6MWh BESS on Kaua'i, Hawaii

Emergency and natural disaster response

I-15 Battery Incident

- Truck carrying lithium-ion batteries overturned on I-15, causing a fire and two-day closure.
- Redwood and Graymar Environmental led safe site cleanup.
- Recovered and recycled ~70,000 lbs. of batteries—enough for ~70 EVs.

Maui Wildfires

- Partnered with EPA to manage damaged lithium batteries in Lahaina.
- Recovered tens of thousands of pounds from home storage systems, golf carts, and EVs.

Burned batteries can still be recycled!

EPA processing hundreds of thousands of lithium-ion batteries from Maui fires for recycling in Nevada


Thank You!
Daniel C. Zotos
Director of State Policy & Public Affairs
daniel.zotos@redwoodmaterials.com
REDWOOD
MATERIALS

Cirba® Solutions

Battery Management & Materials

Engineering the *Future* of Critical Minerals

June 2025

Battery Recycling Materials & Management Leader

Cirba Solutions Facilities

Overview

- Founded in 1991 (30+ Years of Experience)
- 7 Strategically Located facilities
- Handle all battery formats and chemistries
- Feedstock EOL batteries, EV batteries, production scrap, portable electronics, post-consumer, energy storage systems, healthcare and more
- Shredding and Hydrometallurgy processing approach
- Returning Critical Minerals (Li, Ni, Co, Mn) back into the Domestic Battery Supply Chain

Large Format

Battery Recycling

- Battery Formats: ESS, EV
- Collection Site
- Packaging & Transport
- Safety & Compliance


Disassembly
Multiple Format Processing
Extraction
Critical Mineral Output


Cirba® Solutions
Battery Management & Materials
The Future is Electrified.
Our standards set us apart.
Our services & technologies move you forward.
Real experience and proven results.
cirbasolutions.com
Standards & Engagement

ASCEND ELEMENTS

Ascend Elements Introduction

The Most Efficient Process

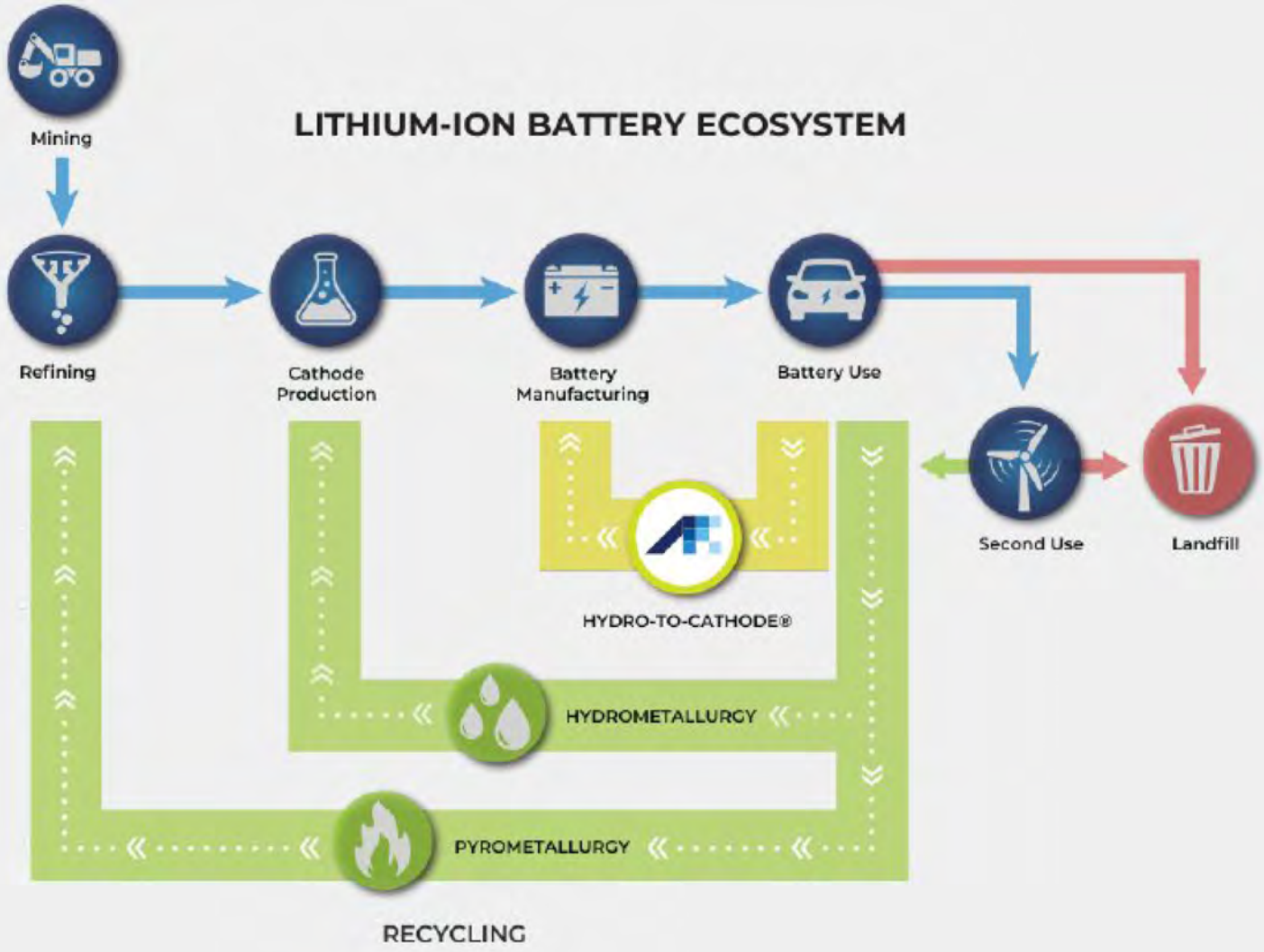
to Return Battery Materials to the Supply Chain

ASCEND ELEMENTS

Hydro-to-Cathode®

A patented process for cathode precursor (pCAM) synthesis without metals extraction.

- Eliminates up to 16 steps in traditional processes
- Fewer intermediate products
- Better economics
- Up to 90% lower carbon emissions

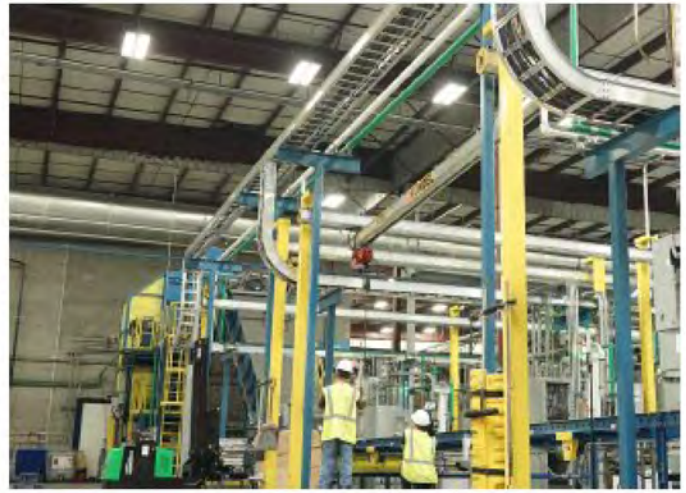


Base 1 Facility

Covington, GA

Shredding scrap batteries into black mass and extracting lithium

- **$50M INVESTMENT**
- **30,000 METRIC TONS / YEAR INPUT CAPACITY**
- **3,000 METRIC TONS / YEAR LITHIUM CARBONATE OUTPUT**
- **100+ HIGH-QUALITY JOBS**
- **OPERATIONAL SINCE 2022**



Apex 1 Facility

Hopkinsville, KY

Transforming black mass into high value materials via **Hydro-to-Cathode®** direct precursor synthesis

- **INITIALLY A $1B INVESTMENT**
- **PRODUCING pCAM AND LITHIUM CARBONATE**
- **300+ HIGH-QUALITY JOBS**
- **OPERATIONAL BY 2027**

Joint Venture

Zawiercie, Poland

AE Elemental is a joint venture of Ascend Elements and Elemental Strategic Metals.

A state-of-the-art facility for shredding scrap batteries into black mass.

- 50/50 OWNED AND OPERATED
- 12,000 METRIC TONS / YEAR INPUT CAPACITY
- UP-TO 5,000 METRIC TONS / YEAR LITHIUM CARBONATE OUTPUT COMING 2026
- CAPABILITIES INCLUDING EV BATTERY DISASSMEBLY, DISCHARGE AND SHREDDING
- OPERATIONAL IN 2024

COMING 2028

Poland pCAM Manufacturing

Location in Poland to be announced soon!

CEO Linh Austin met with Poland's Secretary of State to receive grant offer on 7 May 2025.

POLAND OFFERS USD $320M TO SUPPORT CONSTRUCTION OF PCAM PLANT

SECOND LARGEST GRANT

ASCEND® ELEMENTS

Poland – Apex EU pCAM Plant

Hydro-to-Cathode® pCAM Manufacturing Campus

- Investment: Over €1B
- Employment: 200
- Work Schedule: 4 shifts
- Output: Sustainable, Customized NMC pCAM
- Capabilities:
  - Hydro-to-Cathode® Direct Precursor Synthesis

Strategic expansion in EU:

- Supports existing and global customers w/ regional presence
- Addresses EU recycling requirements with advanced Hydro-to-Cathode® technology

ASCEND ELEMENTS

U.S. DEPARTMENT OF ENERGY

BATTERIES AWARDEE™

Recycling Panel Members

Daniel Zotos
Director of State Policy & Public Affairs, Redwood Materials

Danielle Spalding
VP, Communications and Public Affairs
Cirba Solutions

Roger Lin
VP of Government Relations, Ascend Elements

Wrap Up / Next Steps

Ellen Meyer, U.S. Environmental Protection Agency (EPA)

What's next? - Product Rollout Timeline

Summer 2025: Web-based toolkit with tip sheets, how-to guides, best practices, and case studies

- Topics to cover many best practices in battery collection: fire management and prevention, embedded batteries, e-cigarettes, transportation, and more
- Case studies highlight successful collection programs across urban, rural, and Tribal communities

Late 2025: Draft voluntary battery labeling guidelines

- Labeling guidelines for small, mid, and large format batteries
- Designed to improve consumer understanding and safe battery disposal
- Final voluntary labeling guidelines will be published in 2026

Contact Us:

Email batteries@epa.gov if you have an interesting story to tell about battery collection

Questions and Answers from the Webinar

Kevin Leary, U.S. DOT PHSMA

Does the UN3171 definition of Battery Powered Vehicle cover all vehicles that would be registered by the state DMV?

UN 3171 covers any battery powered vehicle, including bikes, golf carts, etc. beyond what would be registered with a DMV. Refer to 49 CFR 172.102(c), special provision 134, for information about other types of devices.

Do you have any guidance on battery stabilization before transportation?

Discharge the battery. A saltwater immersion can be effective for de-energizing.

How should people get an EV battery off an island if transport was restricted to motor vehicles?

If the battery is still in the vehicle, the vehicle can be shipped under UN3171. Regulations for lithium batteries for recycling have exceptions. If an EV battery is removed from the vehicle, it is excepted from UN testing requirements and requires special packaging. In general, lithium batteries can be transported by vessel if they observe the general transport requirements in 13.185 and simply don't utilize the provisions in 173.185(d). Special permits are also an option.

Questions and Answers from the Webinar

Kevin Leary, U.S. DOT PHSMA

What happens if labels fall off during transport?

Labels must be reapplied and remain visible in transport. Labels can also be printed onto packages.

Can batteries that have been fire damaged be shipped?

Yes, but such batteries should be evaluated to determine whether that damage rendered the battery unstable or otherwise unsafe. A completely burned up battery with no residual energy is generally regarded as okay for transport.

Can damaged EV batteries be shipped over water?

49 CFR 173.185(f) describes the packaging requirements for shipping damaged EV batteries, including by vessel.

Questions and Answers from the Webinar

Kevin Leary, U.S. DOT PHSMA

Once the electrical components of the battery are removed, does it still meet the definition of a battery under the HMR? What if the terminals are still intact, but the other electrical components are removed?

A clarification letter is posted to DOT's website that addresses this issue at https://www.phmsa.dot.gov/regulations/title49/interp/24-0034

Do the DOT-E (exemption) criteria still exist?

DOT exemptions are now called Special Permits. Special permits can only be used by the holder of or a party to the exemption or special permit, unless the special permit authorizes the use of a packaging for the transportation of a hazardous material by any person or class of persons other than or in addition to the holder of the exemption or special permit. See 49 CFR 173.22a.

It was mentioned that Lithium batteries are "hazardous" is that only for the purposes of DOT regulations? What EPA code would apply to batteries shipped for disposal?

I was speaking exclusively for transport. Lithium batteries may also be regulated by EPA when shipped for disposal under the universal hazardous waste requirements in accordance with 40 CFR Part 273. See also this frequently asked questions from EPA on disposal of lithium batteries.

Questions and Answers from the Webinar

Lithium batteries are considered by DOT to be hazardous materials for transportation regulations. Does EPA also consider this material hazardous, and, if so, what code would apply if the batteries were being shipped for disposal?

U.S. EPA has different methods for considering whether batteries being shipped for disposal are considered hazardous waste under the Resource Conservation and Recovery Act. When they are disposed of, most lithium-ion (secondary batteries) and lithium primary batteries in use today are likely to be hazardous waste due to ignitability and reactivity (RCRA hazardous waste codes D001 and D003). There are a wide variety of lithium battery chemistries used in different applications, and this variability may impact whether a given battery exhibits a hazardous characteristic. Some discarded lithium batteries are more likely to have hazardous characteristics if they contain a significant charge, yet such batteries can appear to the user to be completely discharged. It can be difficult for a generator to identify which of its used lithium batteries are hazardous waste when disposed of; therefore, EPA recommends that all lithium batteries be managed with care during use and at end of life and that businesses consider managing all of their used lithium batteries as hazardous waste under the federal "universal waste" regulations in Title 40 of the Code of Federal Regulations Part 273. More information on EPA requirements for lithium batteries can be found on EPA's website. Specific RCRA codes that apply will depend on the characteristics of the material. Lithium batteries that are bound for disposal or recycling may be excepted from some DOT requirements as described in 49 CFR Section 173.185(d).

Questions and Answers from the Webinar

Derick Corbett, Pull-A-Part

Do you need special lifts to remove an EV battery?

Specialized lifts are the most effective and safe way to remove the battery without damaging it, but you can still decouple the battery and lift the vehicle off the battery, although it does present more risk.

Is it correct to tell residents they have to return EV batteries to the dealership? Is there a mandate to refer the residents to?

There are currently no mandates for EV owners to return their vehicles to the dealer for proper battery management. Some states are developing EPR laws for EVs.

Are you aware of any subsidization or relief programs at the federal level planned to help alleviate the cost burden of safe lithium transport?

Not currently. It is something the administration should consider.

Questions and Answers from the Webinar

Derick Corbett, Pull-A-Part

How could future standards help facilitate your work in dismantling cars with lithium-ion batteries, or help ensure the safety of your work?

We identify opportunities to loosen standards in a safe way that promotes cost effective markets – especially in the area of transportation. As our tools for diagnostics and dismantling evolve, we can better assure safe and stable commodities.

What are negative value batteries? Who should take responsibility for these things?

A battery that people don't want to buy for reuse, repurpose, rebuild, or recycled purposes because they won't make money on it. The auto manufacturer should take responsibility for these batteries.

Is there a particular state policy that you think is most helpful to promote EV battery recycling?

The proposed Florida state law HB 1269, which was proposed earlier this year.

Questions and Answers from the Webinar

Derick Corbett, Pull-A-Part

What training do people need to do this safely?

Currently, ReMA and ESA (Energy Security Agency) provide training. Automobile Recycling Association also provides a certification program and training to the industry and provides the entire automotive recycling industry with free tools and guidance for working with batteries containing high voltage vehicle batteries. For more information, https://arauniversity.org/electric-hybrid-vehicle-technology-guide/

People also need tools to diagnose batteries, like thermal readers, which show the flow of energy in a battery. This helps people see the internal problems of a battery. People also need proper PPE and to know how to manage batteries if something happens.

Questions and Answers from the Webinar

Sumreen Rattan, Moment Energy

Does Moment only work with EV batteries?

Moment primarily works with EV batteries, as well as surplus "second-chance batteries" - meaning batteries (EV or ESS batteries) that were never used and are sitting in storage with nowhere to go. Recently, Moment has seen a surplus of batteries in storage that were originally allocated for storage systems, but projects got canceled and are now available as a supply opportunity. We typically use lithium-ion chemistries – LFP or NMC.

Are second-life EV batteries in BESS as safe as new BESS?

They are put through testing to ensure they meet the appropriate standards.

You mentioned “the cost of recycling the repurposed EV battery is accounted for in the business model of the repurposing company.” Can you clarify what that means?

Guidelines are still pending on who is responsible; however, this comes down to individual battery contracts. Momentum accounts for it in the scenario that the responsibility falls on us - especially as we do field replacements of batteries during the warranty period.

Questions and Answers from the Webinar

Sumreen Rattan, Moment Energy

How does the cost of reused battery systems compare with new systems? Do the cost savings make up for a reduced lifetime compared to new systems? What is the lifecycle of a repurposed BESS system?

Yes, we account for that. It can be 15-30% more cost effective to use second life systems at scale. We warranty for 10 years.

Has Moment done any front of the meter grid-scale projects or is your market focused only on behind the meter customer-side solutions?

All behind the meter / microgrid applications so far!

You mentioned batteries are typically used until they are at 80% state of health. Is that standard or an average? What is Moment's limit for the state of health of a battery they're willing to take?

It's an average. For Moment, we typically take batteries above 80% SOH, but we do consider batteries above 70% SOH depending on the chemistry, cycle life and a few other factors.

Questions and Answers from the Webinar

Sumreen Rattan, Moment Energy

How many times can an EV battery be repurposed?

With us, it can be repurposed once - repurposing is a much less stressful application for the batteries than EV use, which is why we can use it for longer outside the vehicle's life.

Lithium ion batteries degrade more quickly as they age past the 75-80% SOH. Do you factor this into your use?

The point of degradation depends on the use, and energy storage can push out this degradation point.

Questions and Answers from the Webinar

Battery Recycling Panel

What are some of the biggest challenges you're facing?

- **Cirba:** Education. Cirba does a lot of education on transporting batteries with high-energy density and handling chemistries. People need to know how to handle the packaging and the battery, and Cirba aims to provide traditional training to partners.
- **Ascend:** Education. Ascend receives different qualities of batteries. Providers often treat batteries as trash and the batteries arrive poorly packaged.
- **Redwood:** For industry, a lot of batteries in vehicles are exported abroad. For domestic recyclers, an integrated approach is important. The U.S. needs to be able to retain critical minerals. EPR could have an impact.

Questions and Answers from the Webinar

Battery Recycling Panel

Are there efforts underway to keep batteries in the U.S.?

- **Redwood:** National Battery Policy Working Group is in the nascent stages of EOL policy. A starting point of discussion is: EV batteries at EOL are valuable commodities. A traditional EPR framework might not be the best approach for EV, instead, it should first be a market-driven principles with guard rails. NJ is the only state with EV recycling laws.
- **Cirba:** We have to evaluate how batteries are leaving borders. They are typically exported in vehicles and mislabeled. This must be evaluated from all sides of EPR. The value of lithium-ion batteries are market driven. Safety and compliance are most important.
- **Ascend:** Federally, there has been talk on export control and black mass exports. Export control should make sure not to burden U.S. manufacturers.

Questions and Answers from the Webinar

Battery Recycling Panel

What type of information do you like to get on the materials that come to you? Labeling? Chemistry?

- **Ascend:** Chemistry, state of the battery (e.g., DDR)
- **Cirba:** Chemistry is essential. A lot of the time, chemistry might be a note on the battery. Communication with partners is essential so they know how to handle the batteries.
- **Redwood:** The more information, the better. How do we adhere to a strict compliance standard?

How are you making sure you're incorporating the best environmental practices into your operations?

- **Cirba:** high recycling efficiency rates leads to less virgin mining. Sustainability comes from sustainable packaging, efficient transportation, minimal chemical use, recirculated water.
- **Redwood:** The more sustainable, the higher the margins for mineral recovery.

Questions and Answers from the Webinar

Battery Recycling Panel

What do people need to hear about large format batteries and what people need to know?

- **Ascend:** Policymakers need to understand the importance of a circular supply chain. What policies do we have in place to keep critical minerals here?
- **Cirba:** Policymakers and teams exist to help educate businesses. Consumers need to know that this technology is available to them. Message: recycling is possible today. There is a lack of understanding that technology can be built domestically, but it is essential for domestic security.
- **Redwood:** Critical minerals are important for national security. We should not overprescribe what needs to happen. We need to harmonize.

Questions and Answers from the Webinar

Battery Recycling Panel

You mentioned Redwood would take any format Lithium battery; are you taking any other chemistry batteries?

- **Cirba:** Cirba Solutions handles all battery formats, as well as processing multiple battery chemistries including lithium-ion, lithium metal, and alkaline.

How are the various companies (Cirba, Redwood, Ascend) dealing with electrolyte? Is it recycled or disposed?

- **Cirba:** At a broad view in the hydro based process Cirba Solutions uses, it is captured in the water and ultimately reaches an equilibrium state.

What are Redwood Materials, Cirba Solutions and Ascend Elements doing to monitor and report on for example PFAS, NMC particles and other emissions in all of the processing facilities? How is this information shared with workers, authorities and frontline communities?

- **Cirba:** Appreciate the focus on the PFAS in this question. This is an area we are working on with our partners. Regarding the NMC part of the question, Cirba Solutions conducts industrial hygiene testing and has an approach for cascading that information.