



**National  
Waste & Recycling  
Association<sup>SM</sup>**  
Collect. Recycle. Innovate.



# Fire Safety & Lithium Batteries

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What's the problem?





## MRF fires

Tulsa's only recycling facility, Mr. MRF caught fire in April 2021

Recyclables from Tulsa were sent to the WTE facility for 11 months while it was rebuilt



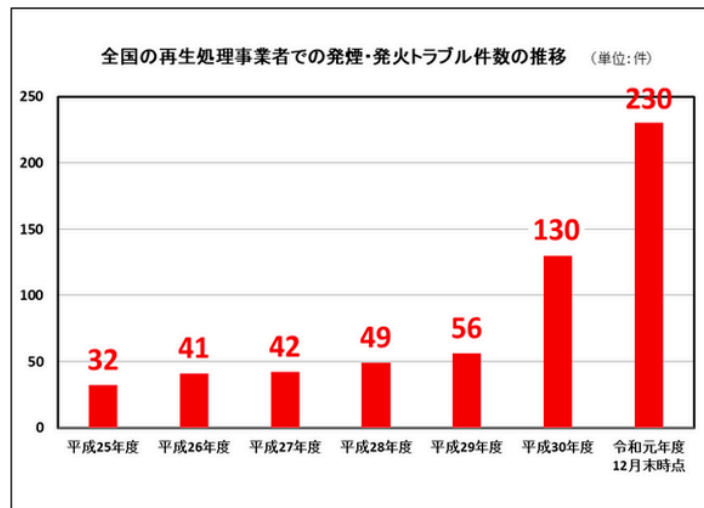
## Truck fires

Sandalwood Fire in 2019 leads to deaths, driver charged with involuntary manslaughter



# A global issue: Lithium Battery Fires in Japan

- Image of lithium-ion battery being crushed, causing short-circuit or firing



For the  
public

The public knows about the dangers of Li+  
batteries

- Airplane requirements
- Hover boards etc

What the public doesn't know (anecdotal)

- That dead batteries are still dangerous
- What to do with batteries at end-of-life

# Lithium-Ion Batteries

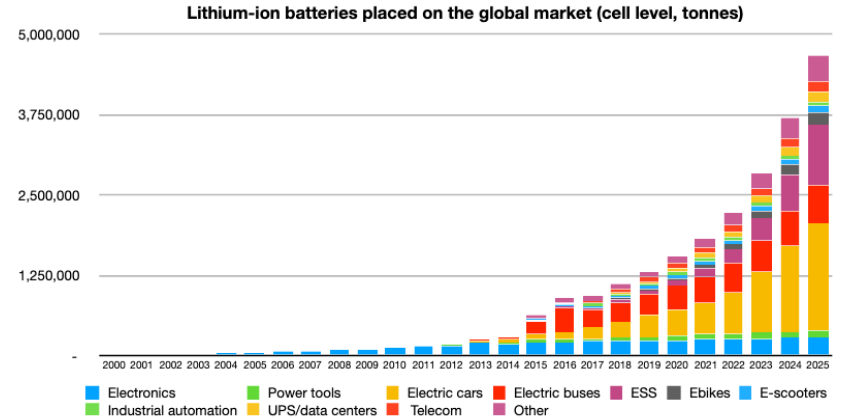
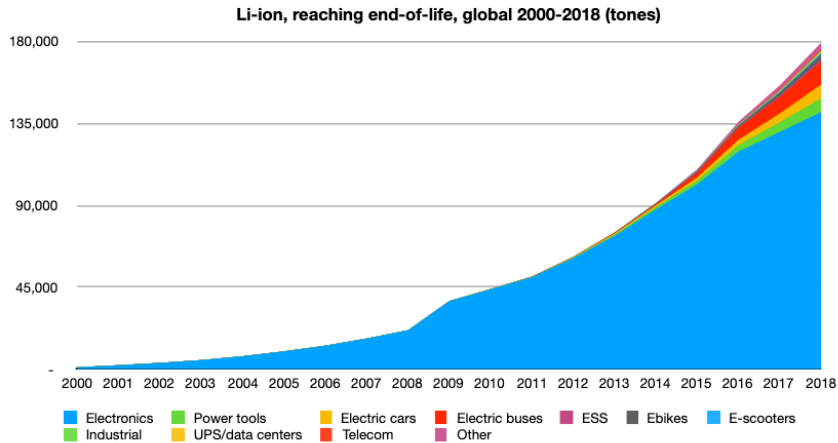


# Lithium-Ion Batteries devices

			
POS	GPS Tracker	Drone	wearable product
			
Talking Pen	bluetooth headset	LED sense light	Mobile Headlight
			
Eye massage	Stereo set	Humidifier	Electric toy



# Li-ion Battery end-of-life vs. market



# Lithium Battery Waste Projections (Australia)

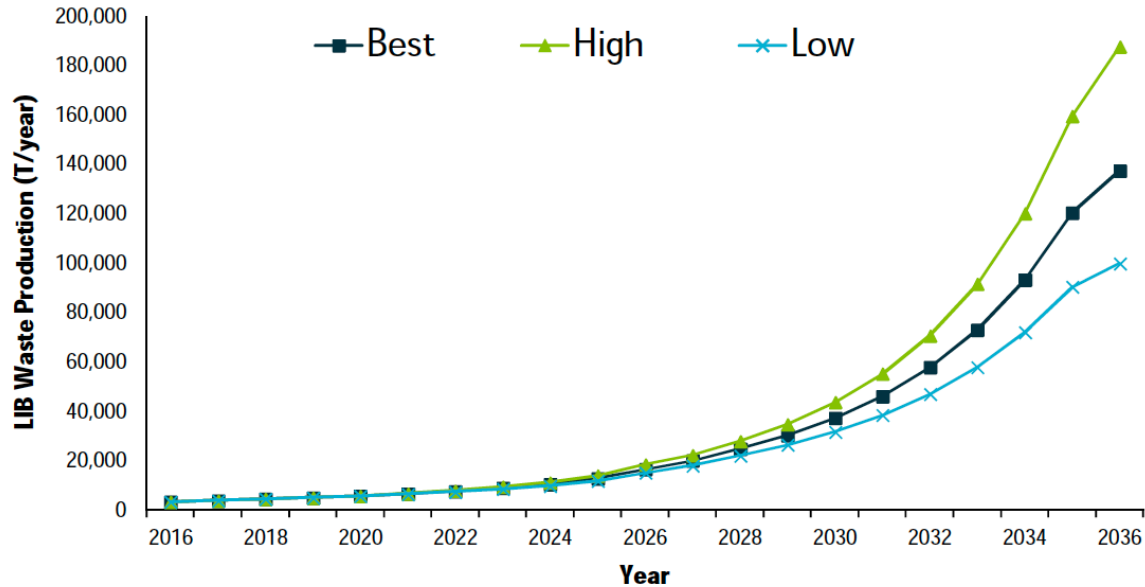


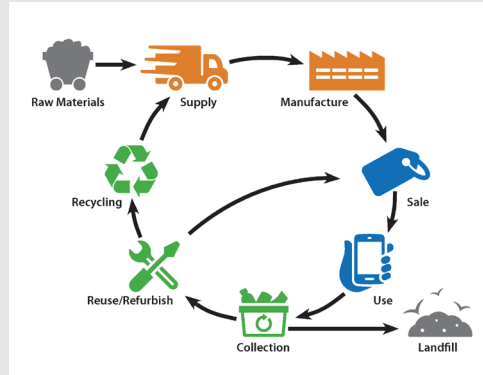
Figure 7 Projected LIB waste production from 2016 to 2036 (modified from Randell et al., 2016).

# EPA's analysis



## An Analysis of Lithium-ion Battery Fires in Waste Management and Recycling

July 2021  
Office of Resource Conservation and Recovery  
EPA 530-R-21-002



## Conclusion:

“This problem is only going to get worse in future years.”

# What's the plan?

01

**Preventing fires at the MRF: Divert batteries away from recycling facilities**

02

**Avoiding fires at the MRF: Spot and remove any lithium batteries before they are a problem**

03

**Fighting fires at the MRF: Upgrade controls to fight fires**

# What do consumers need to know when recycling lithium batteries

1. **A dead battery isn't!** Used lithium batteries can maintain 80% of their original charge
2. **Do not remove embedded batteries.** Lithium polymer batteries do not have hard cases making them vulnerable to damage
3. **Tape or Bag.** Tape the positive terminal or place the battery in a clear, sealable bag
4. **No curbside!** Find a dedicated collection container/site



# Lithium batteries education campaign









**TAKE + CHARGE**

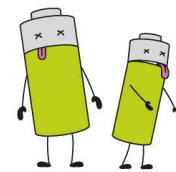


**Recycle Batteries Responsibly**  
Join the fight and help round-up dead batteries

The illustration shows several anthropomorphic batteries with faces and limbs. Some are green with 'X' marks on their heads, representing dead batteries. One is a smartphone with 'X' marks on its screen. A vacuum cleaner is shown sucking up one of the dead batteries. A small spider is also present near the vacuum.

## Stop zombie batteries in their tracks

- 1 Never put batteries in normal rubbish or recycling bins 
- 2 Only recycle batteries using a proper battery recycling service  
- 3 Remove batteries from broken devices if you can and recycle both the battery and device separately 
- 4 If you can't remove the battery from a device, recycle both together using a small waste electrical recycling service 
- 5 Still unsure what to do? Visit [www.takecharge.org.uk](http://www.takecharge.org.uk) 



**TAKE + CHARGE**  
#takecharge

# Lithium batteries education campaign



# Lithium batteries education campaign

**BE A BATTERY**  
**HERO** ⚡

Put batteries in their place.

**Batteries thrown  
in the trash or  
recycling may  
cause fires.**

**Find a drop-off  
site near you.**



Washington  
County

Hennepin

RAMSEY COUNTY

**BE A BATTERY**  
**HERO** ⚡

Put batteries in their place.

**Batteries  
don't belong  
in the trash  
or recycling.**



Washington  
County

Hennepin

RAMSEY COUNTY



HOUSEHOLD RECYCLING BIN.  
PLEASE RECYCLE PROPERLY.



### WHAT IS THE PROBLEM?

Lithium batteries cannot be recycled like paper, plastic, and glass. They cause fires in trucks and recycling facilities.



### WHAT ARE LITHIUM BATTERIES?

Lithium batteries are common in many wireless devices, including laptops, cellphones, Bluetooth headphones, power tools, and games/toys.



### WHAT IS THE SOLUTION?

Lithium batteries need to be recycled separately from other waste material. Home improvement stores often accept lithium batteries for recycling.

We also direct people to check with their local solid waste management districts for options.



# NWRA Lithium batteries infographics

## LITHIUM-ION BATTERIES CAN CAUSE FIRES

Please Recycle Properly.

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## GUIDE FOR DEVELOPING LITHIUM BATTERY MANAGEMENT PRACTICES AT MATERIALS RECOVERY FACILITIES

This guide has been written to assist materials recovery facilities (MRFs) in developing management practices to properly manage and dispose of lithium batteries when spotted, to take precaution in case of a fire and to manage a fire if one does break out.

*October 14, 2020*

# At the MRF

# In general: Batteries at MRFs

- Lithium batteries will explode when punctured or damaged
- Bad batteries should be placed in sand
- No such thing as too much water on batteries on fire
- If necessary, to mitigate damage/loss, keep batteries separate and let them burn



# Contracts

- Batteries not acceptable
- Responsibility and ownership for batteries
- Protocols for proper management and removal
- Material classification system (i.e., household hazardous waste, hazardous, damaged)
- Education program
- Reporting requirements on batteries (i.e., count, tons or pounds for documentation of issue)





# Inbound control

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- Train employees on:
  - battery identification
  - safe removal
  - proper storage
- Provide supplies as appropriate for safe removal (i.e., plastic tongs, bucket w/sand, segregated permanent storage, terminal tape) & PPE (welding gloves, heat/spark masks)
- Include battery management in regular toolbox safety meetings
- Track metrics to raise awareness and identify potential trends such as periodic battery counts (found batteries per hour)
- Manage between sorting and long-term storage (e.g., place batteries in 5-gallon buckets containing vermiculite or sand on the sort lines)
- Establish dedicated temporary short-term and long-term storage options for batteries—include signage, barriers and painted identification of areas (demarcations).
- Batteries are most often recovered at MRFs from the following locations:
  - tip floor
  - manual sorting
  - magnet
  - balers

# Removal & Storage



- Inspect and extract batteries from the inbound material stream
- On the tip floor: Secure tip floor & idle rolling stock when employees remove batteries
- At sorting stations: Idle the conveyor system - inspect the battery for damage
  - If undamaged, tape the battery terminals and place it in a dedicated temporary storage container (e.g. metal, 5-gallon ash can), scoop vermiculite on top of the battery
  - Damaged batteries should be handled separately
- At end of day, batteries should be moved to a long-term storage location
  - Remote location
  - Tape/bag battery terminals to avoid spark or heat from a residual charge
  - Store in a UN Rated steel drum (1A) with a plastic liner or a UN Rated polyethylene drum (1H)
  - Store in a cool, dry location



# Damaged batteries

- Do not store damaged batteries with undamaged batteries
- Treat batteries that are swelling, smoking, leaking or overheating with extreme caution
- Immediately place in an absorbent, non-flammable material in a cool, dry place
- Store outdoors away from structures, vehicles and equipment
- Store in a noncombustible structure
- Store in sand or vermiculite

# Fire prevention

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- Evaluate adequacy of fire protection system and consider upgrades as necessary
- Develop a fire prevention & response plan and train employees
- Inspect storage, handling and transfer areas routinely
- Ensure adequate number of fire extinguishers that are the size and type for the area
- Conduct routine preventative maintenance
- Develop checklists for consistent inspection
- Mark access and egress routes and keep clear at all times
- Implement fire safety and watch procedures during all hot work
- Maintain fire suppression system to NFPA standards
- Check fire extinguishers systematically
- Manage low point drains in dry systems in cold climates





# Fire suppression

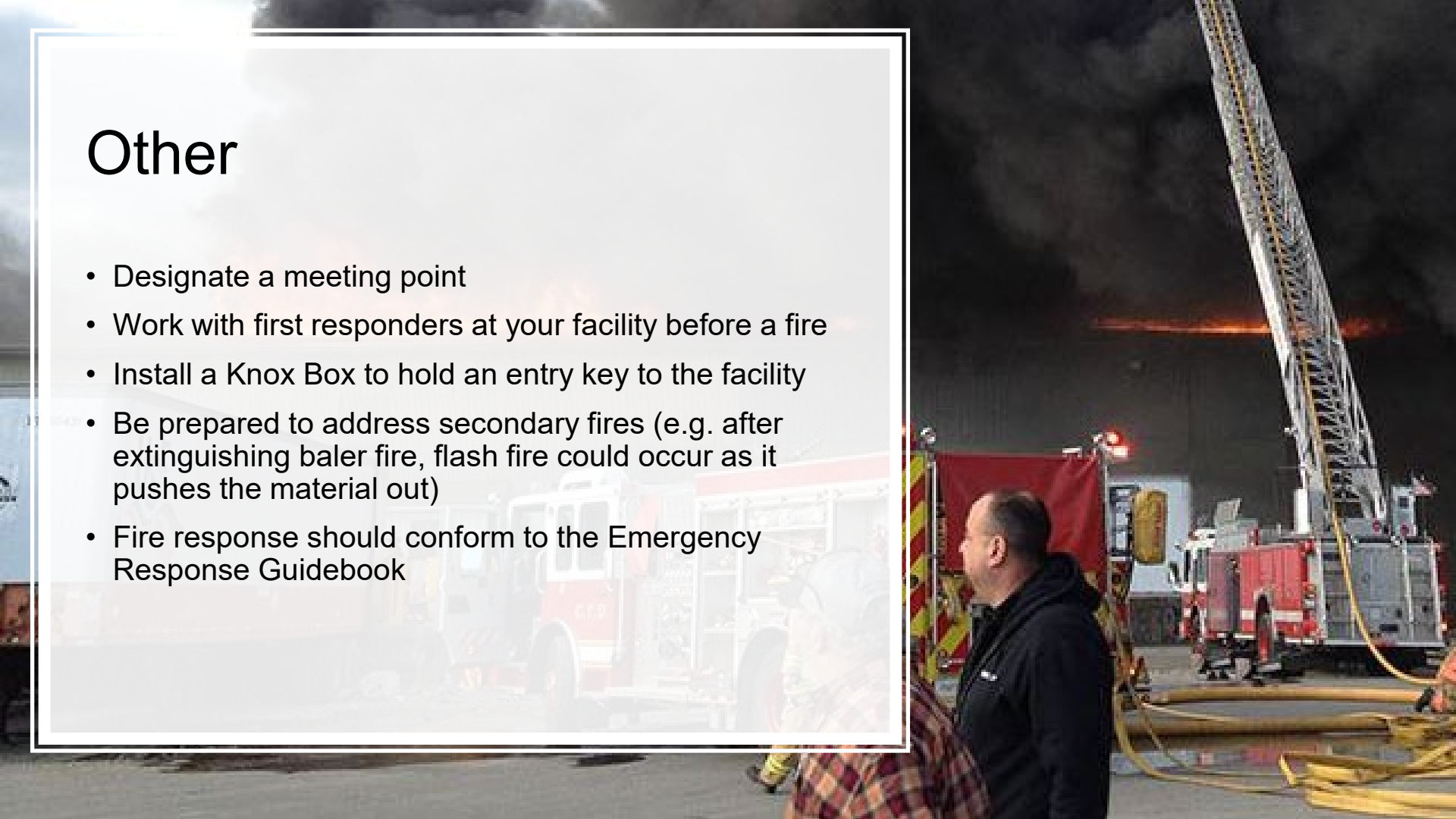
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- Designate responders in your emergency action plan
- Provide responders with site specific training
- Monitoring operations for potential hot spots
- Develop a “one fire extinguisher” attempt, call 911 and evacuate
- Train employees in the PASS (pull, aim, squeeze, sweep) fire extinguisher method
- Be aware of the batteries off-gassing and the dangers of smoke inhalation
- Communicate evacuation plans with employees
- Communicate potential hazards to first responders



# Other

- Designate a meeting point
- Work with first responders at your facility before a fire
- Install a Knox Box to hold an entry key to the facility
- Be prepared to address secondary fires (e.g. after extinguishing baler fire, flash fire could occur as it pushes the material out)
- Fire response should conform to the Emergency Response Guidebook



# After a fire

- Divert materials if necessary
- Ensure safe return of operations
- Work with first responders, insurance company, regulators
- Survey for structural damage
- Evaluate mechanical, electrical, fire suppression & HVAC systems
- Initiate repairs
- Conduct post-mortem & reassess plan





What else?

# Transporting lithium batteries



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

1201 New Jersey Avenue, SE  
Washington, DC 20020

Safety Advisory Notice for the Disposal and Recycling of  
Lithium Batteries in Commercial Transportation  
U.S. Department of Transportation  
Pipeline and Hazardous Materials Safety Administration  
Office of Hazardous Materials Safety

#### Why PHMSA Wrote this Safety Advisory Notice

PHMSA wants to increase the public's overall awareness about the dangers related to shipping lithium batteries for recycling or disposal. Lithium batteries — including both lithium metal and lithium ion batteries — can cause a fire, whether they are new, used, defective, or damaged. Shippers and carriers need to take extra, and sometimes different, precautions when shipping damaged, defective, or recalled lithium batteries, as opposed to new and used lithium batteries or batteries of other chemistries. In addition to complying with the general shipping requirements, anyone offering a lithium battery for commercial transportation should also assess the potential fire hazards in transport. This safety advisory outlines regulatory requirements for proper and safe shipment in commercial transportation for all lithium batteries intended for disposal or recycling and includes specific requirements for lithium batteries that are damaged, defective, or have been recalled.

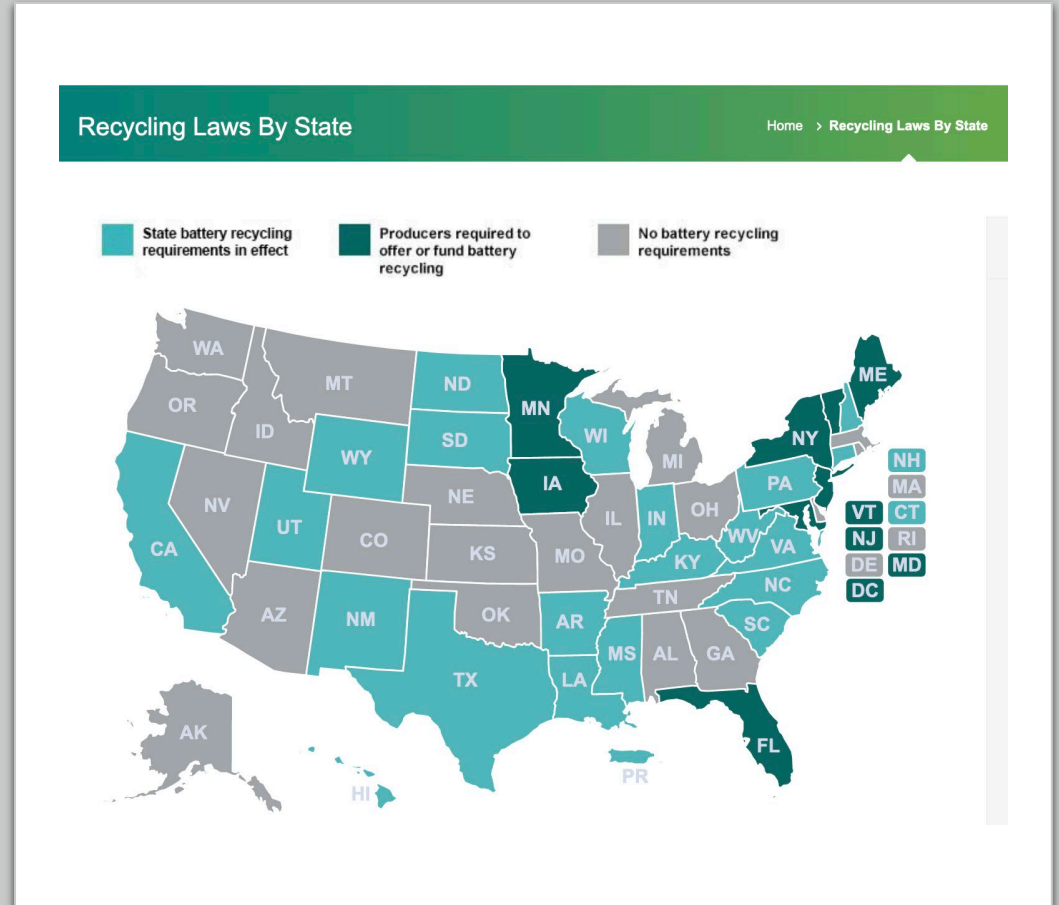
During recent compliance inspections, PHMSA's hazardous materials (HAZMAT) investigators routinely saw shippers and carriers improperly package and ship lithium batteries for disposal or recycling. Such dangerous practices included packaging lithium batteries in a way that did not prevent short circuits, mixing damaged lithium batteries with



1. Check the box: Public education campaign about transportation of hazardous materials
2. May 2022, PHMSA Safety Advisory Notice for Disposal & Recycling of Lithium Batteries in Commercial Transportation

# Laws

- California bills signed by governor 9/16/222
  - AB 2440, Responsible Battery Recycle Act of 2022
  - SB 1215, Electronic Waste Recycling Act of 2003: covered battery-embedded products
- DC
- Vermont
- Minnesota
- NWRA Model bill (under development)





The End