

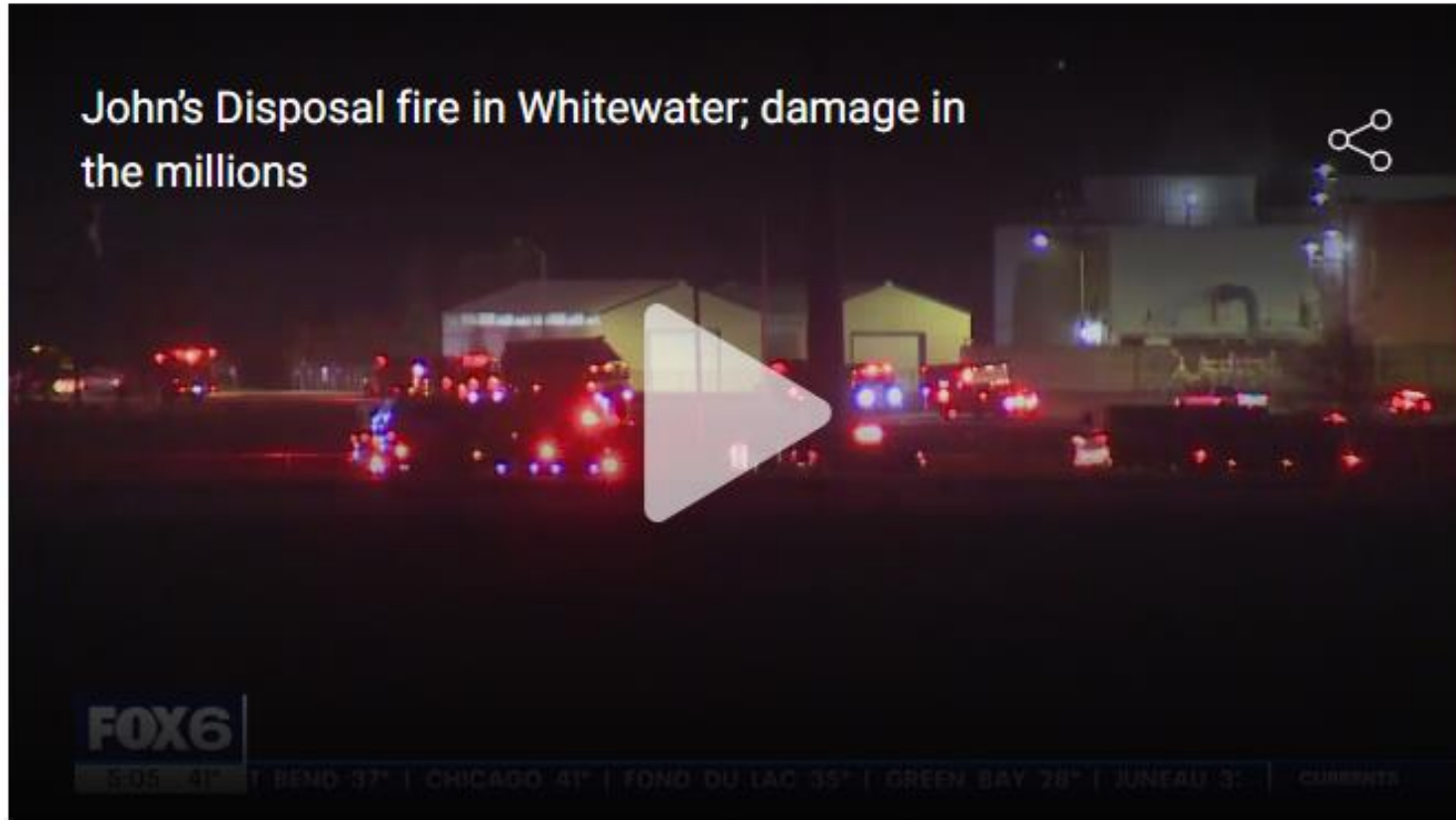


Battery Issues & The Waste Industry

A Brief Summary on the Issues of: Battery Fires, Conserving Resources & Regulatory Compliance

Fires

John's Disposal fire in Whitewater; damage in the millions






John's Disposal fire in Whitewater; damage in the millions

Firefighters responded to a fire at John's Disposal Services in Whitewater late Sunday, Jan. 8. The call came in shortly before 10 p.m. – and officials say damage could be in the millions.

Wednesday, May 31, 2023 3:01:11 PM

Wisconsin Department of Transportation cameras shows a fire at Materials Recovery Facility in Menomonee Valley on Wednesday. Wisconsin Department Of Transportation

Cascade Asset Management, Madison, WI		64
2016		
Likely or Definite	Definite	Details and Impacts: None or unknown
Battery Type	Cell phone battery	An LIB began smoking and then burst into flames after an employee opened a phone to remove it at this electronics recycler (Fowler, 2018).
Fire Count	1	
Facility Type	Electronic scrap processor	
2017		

Likely or	John's Disposal, Norway, WI		22
Battery T	7/1/2018		
Fire Coun	Likely or Definite	Likely	Details and Impacts:   
Facility T	Battery Type	Unknown LIB	This large fire was possibly started from an LIB in a bale. Firefighters from four counties used almost 2 million gallons of water. and

Fire	Outagamie County Recycling & Solid Waste, Appleton, WI		23
	9/13/2019		
	Likely or Definite	Definite	Details and Impacts: None or unknown
	Battery Type	Unknown LIB	An LIB started a fire in a trash compactor at this recycling facility. Staff quickly

Fire Cou	Eau Claire Garbage Truck, Eau Claire, WI		36
	Unknown		
	Likely or Definite	Definitely	Details and Impacts: None or unknown
	Battery Type	Cell phone battery	An LIB ignited in a recycling truck, whose operator then put out the fire with a water bottle (Warning issued after discarded battery starts truck on fire, 2018).
	Fire Count	1	



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



June 2017 -
December 2020*Likely or Definite*

Definite

Details and Impacts:*Battery Type*Cell phone battery: 17
Hoverboard size battery: 1
Laptop battery: 6
Remote control airplane battery: 1
Tablet battery: 6
Watch battery: 1
DVD player battery: 1
Unknown LIBs: 91

One landfill consulted for this report noticed an increasing number of LIBs causing fires, so a supervisor began keeping a record of each LIB-caused fire. Over roughly three years, the facility experienced 124 fires known to be caused by LIBs from a variety of devices. Most were extinguished by staff, but a few fires required assistance from firefighters. A representative from the facility indicated that this number of fires is not abnormal for landfills (landfill supervisor, personal communication, 2021).

Fire Count

124

⁶⁰ See [Industry Experience 2](#) for more detailed information. The landfill supervisor who provided data for this facility requested that the facility remain anonymous, given negative public perceptions regarding landfill fires. We believe that the public benefit of including the detailed data this landfill provided justifies withholding the name of the landfill.

Fear of Perception Leads to Silence:

- ▶ Why is no one talking? Comes down to Perception.
 - ▶ Public Perception: A facility fire equates to a poorly run facility – stigma.
 - ▶ Insurance Provider Perception: High fire risk means increased insurance premiums
 - ▶ Regulatory Perception: Increased Regulatory Visits

Silence: The ‘Unspoken’ Issue That Adds “Fuel to the Fire”

Battery fires are becoming such a growing problem that more operations are willing to talk about the issue. Although, some under conditions of anonymity.

What are Facilities Experiencing?

- ▶ Waste Facility 1:
 - ▶ “We have fires on average 2-3 times per month... The majority coming from the recycle facilities”.
- ▶ Waste Facility 2:
 - ▶ “...one a week has been our experience as of lately...”
 - ▶ “...we dump hot loads...about once a quarter...Clean up cost around 5k-15k per incident...”
- ▶ Waste Facility 3:
 - ▶ “once every 2 weeks...they come in spurts. We will have two to three a day for a two to three days a week then nothing for a while.
- ▶ Waste Facility 4:
 - ▶ “...usually 1-2 a month...”
- ▶ Waste Facility 5:
 - ▶ “...average once a month”.

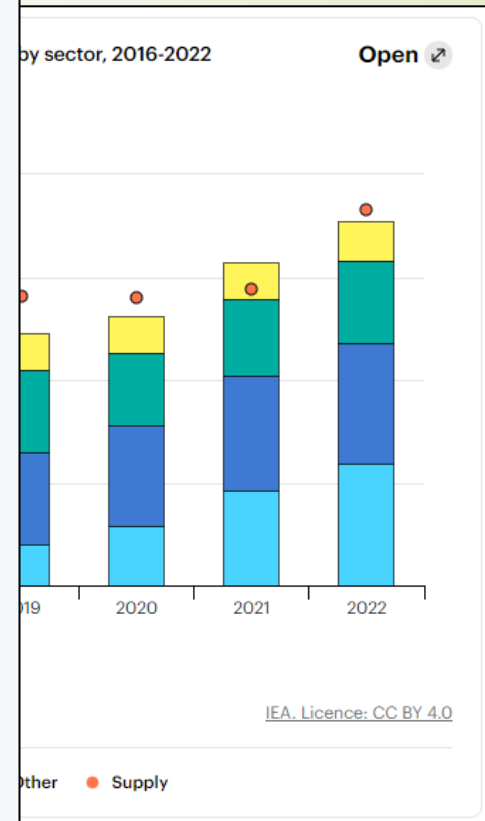
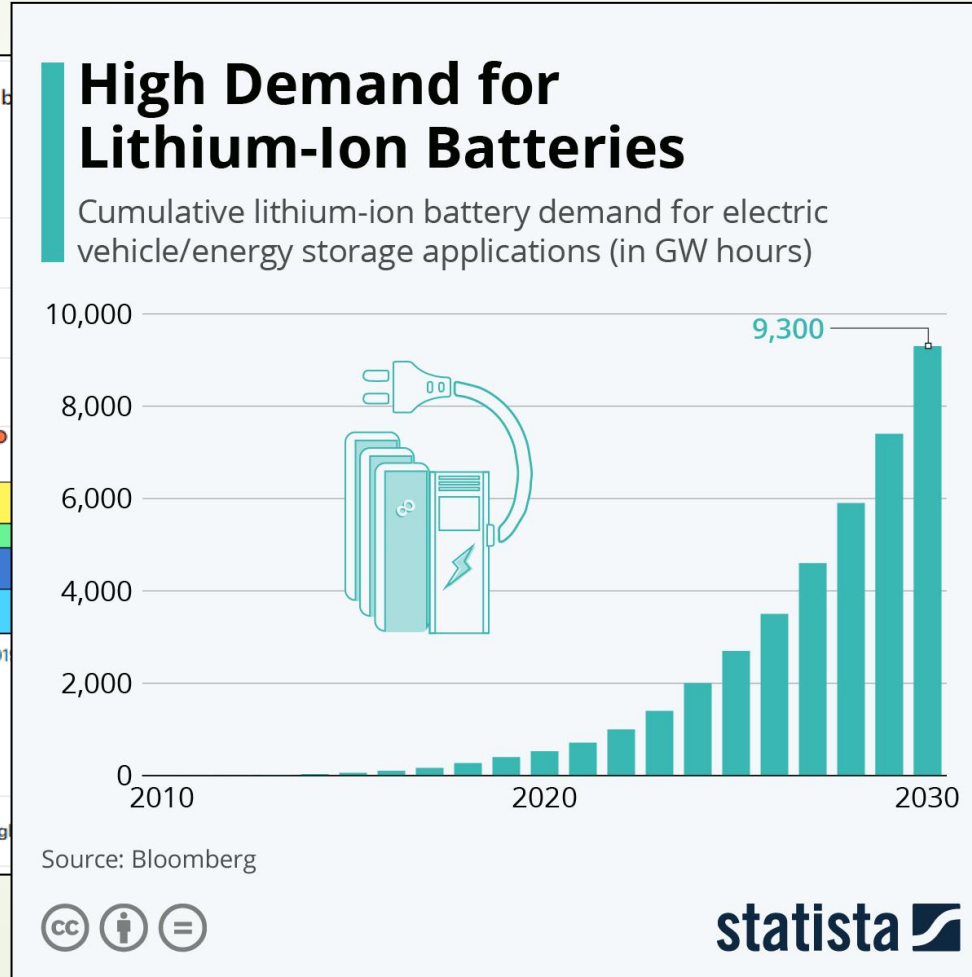
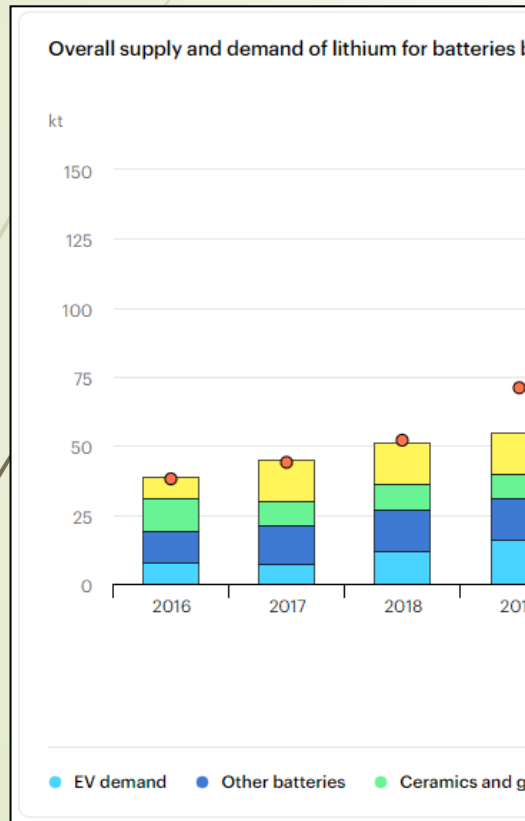
Changes in landfill practice. Mound of clay near landfill working face for WHEN a battery fire happens.





Conserving Critical Mineral Resources

Supply & Demand of Minerals Critical for Battery Manufacturing



Draft Critical Mineral List—Summary of Methodology and Background Information—U.S. Geological Survey Technical Input Document in Response to Secretarial Order No. 3359

Table 2.1. Critical mineral commodity summaries.—Continued

[Commodities are listed alphabetically. Supply chain considerations were utilized in the selection process, meaning a commodity is included if any step in its supply chain is deemed problematic. Information in this table is from U.S. Geological Survey (2017, 2018, variously dated)]

Mineral commodity	Summary
Lithium	Lithium can be recovered from hard-rock deposits and brines. Lithium demand is expected to grow substantially because of its use in rechargeable batteries, particularly for electric vehicles. Lithium hydroxide also is used for cooling water chemistry control in pressurized water reactors and may be required in some advanced concept nuclear reactors (molten salt). The U.S. import reliance is moderate, but increasing foreign consumption in addition to U.S. demand growth has driven a substantial exploration boom.

THE 35 MINERALS CRITICAL TO U.S. NATIONAL SECURITY

This draft list of minerals deemed essential to the economic and national security was released Feb 16, 2018



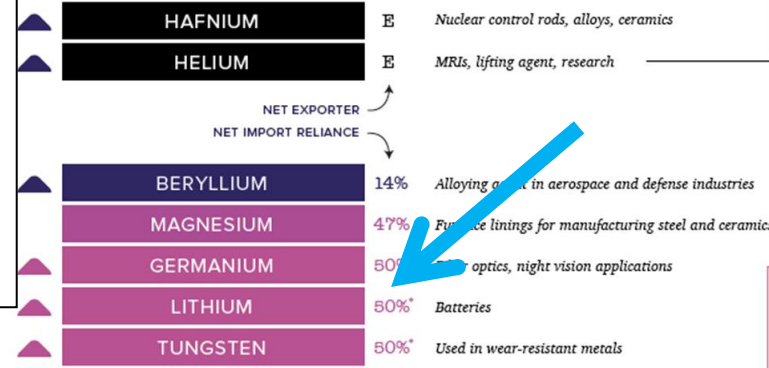
“...our nation’s mission [is] to reduce our vulnerability to disruptions in the supply of critical minerals. Any shortage of these resources constitutes a strategic vulnerability for the security and prosperity of the United States.”

—Dr. Tim Petty, Assistant Secretary of the Interior for Water and Science

How to read this



Critical Minerals List



HELIUM
The Federal Helium Reserve is the world’s only sizable long-term storage facility for crude helium. In recent years, the U.S. has become the world’s major source of helium as global demand has risen sharply. In the summer of 2017, an embargo of products from Qatar caused a temporary shortage of Helium.

ALUMINUM
U.S. production of primary aluminum decreased for the fifth consecutive year and is now at its lowest level since 1951.

“The U.S. import reliance [on lithium] is moderate, but increasing foreign consumption in addition to U.S. demand growth has driven a substantial exploration boom”.

AUSTRALIA AND CHILE IN THE FRONT ROW

Countries with major Lithium production and reserves



<https://www.volkswagenag.com/en/news/stories/2020/03/lithium-mining-what-you-should-know-about-the-contentious-issue.html>



source: USGS 2019

production (in 1,000t) ●

● reserves (in 1,000t)

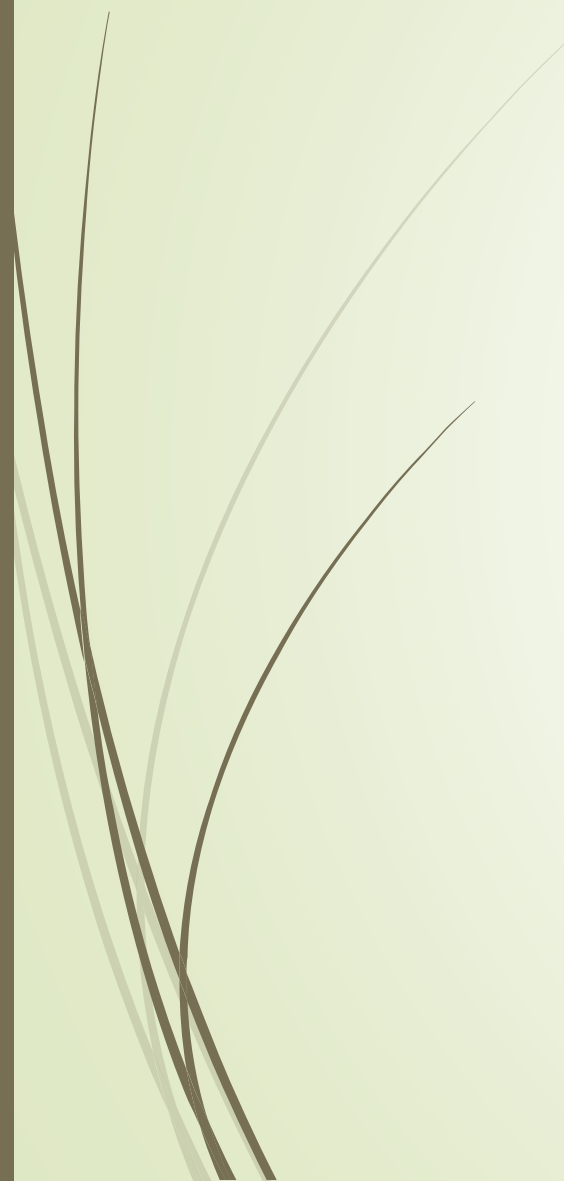


What will be in significant demand tomorrow, is the very thing we are throwing away today...

...the mineral resources found in lithium batteries and battery containing devices.



Regulatory Compliance





Batteries Can Be Managed as a Universal Waste

Universal Wastes DO NOT originate from the recycling world

But Rather

The hazardous waste world.

Why is this important?

If batteries are viewed no different than curbside recycling by collection programs, then:

1. There is a risk the public will also view recycling batteries no different than recycling at the curbside.
2. Likely to be unaware of Universal Waste regulations and more importantly unaware of the changing DOT/PHMSA regulation that apply when offering batteries to a transporter destined for a battery recycler or consolidator.

Universal Waste Rules - Batteries



- Universal Waste Batteries: CFR 273 (NR673 for WI)
 - NOTE: Not all batteries fall under Universal Waste Rules (i.e., Alkaline)
 - However, all batteries fall under DOT rules!
 - Containers compatible with waste
 - Rigid Container
 - Labeled as “Universal Waste - Batteries”, “Used Batteries”, or “Waste Batteries”
 - Accumulation Start Date
 - Removed from site within 1 year AND able to be demonstrated
 - Employee Training Requirements



Wisconsin



Federal

DOT Hazardous Material Regulations (HMR)

- ▶ 49 CFR 173.21 – Forbidden materials and packages
 - ▶ “Unless otherwise provided in this subchapter, the offering for transportation or transportation of the following is forbidden:”
 - ▶ **49 CFR 173.21(c)**
 - ▶ Electrical devices, such as batteries and battery-powered devices which are likely to create sparks or generate a dangerous evolution of heat, unless...
 - ▶ ...packaged in a manner which precludes such an occurrence.



Lithium Ion Batteries

(Preparing Lithium Ion Packaging)

- 1 **'Universal Waste - Used Batteries' Label**
Regulatory Citing: NR 673
Must Include:
-the words 'Universal Waste: Used Batteries'
-an Accumulation Start Date
- 2 **Non-Hazardous Waste Label**
Regulatory Citing: 49 cfr 172.2
Must Include:
-Shipper Name
-Shipper Address
-Contents: Use the following shipping name:
UN3480 Waste Lithium Ion Batteries, 9, II
- 4 **Lithium Battery & Cell Marking**
Regulatory Citing: 49 cfr 173.185(c)(3)
Must Include:
-Appropriate UN number (UN3480)
-Telephone number for additional information
- 5 **Air/Vessel Forbidden**
Regulatory Citing: 49 cfr 173.185(c)(1)(iv)
Must Include:
-Required Verbiage: "LITHIUM BATTERIES - FORBIDDEN FOR TRANSPORT ABOARD AIRCRAFT AND VESSEL"
- 6 **HMR Internal Drum Number**
Regulatory Citing: NA
Must Include:
-drum number

UN/DOT Approved
DF 12 Gallon Pail



BATTERIES INDIVIDUALLY BAGGED OR TERMINALS TAPED; NO DAMAGED BATTERIES

Lithium Metal Batteries

(Preparing Lithium Metal Packaging)

- 1 **'Universal Waste - Used Batteries' Label**
Regulatory Citing: NR 673
Must Include:
-the words 'Universal Waste: Used Batteries'
-an Accumulation Start Date
- 2 **Non-Hazardous Waste Label**
Regulatory Citing: 49 cfr 172.2
Must Include:
-Shipper Name
-Shipper Address
-Contents: Use the following shipping name:
UN3090 Waste Lithium Metal Batteries, 9, II
- 4 **Lithium Battery & Cell Marking**
Regulatory Citing: 49 cfr 173.185(c)(3)
Must Include:
-Appropriate UN number (UN3090)
-Telephone number for additional information
- 5 **Air/Vessel Forbidden**
Regulatory Citing: 49 cfr 173.185(c)(1)(iv)
Must Include:
-Required Verbiage: "LITHIUM BATTERIES - FORBIDDEN FOR TRANSPORT ABOARD AIRCRAFT AND VESSEL"
- 6 **HMR Internal Drum Number**
Regulatory Citing: NA
Must Include:
-drum number

UN/DOT Approved
DF 5 Gallon Pail



BATTERIES INDIVIDUALLY BAGGED OR TERMINALS TAPED; NO DAMAGED BATTERIES

Nickel Metal Hydride & Nickel Cadmium Batteries

(Preparing NiMH & NiCd Battery Packaging)

- 1 **'Universal Waste - Used Batteries' Label**
Regulatory Citing: NR 673
Must Include:
-the words 'Universal Waste: Used Batteries'
-an Accumulation Start Date
- 2 **Non-Hazardous Waste Label**
Regulatory Citing: 49 cfr 172.2
Must Include:
-Shipper Name
-Shipper Address
-Contents: Use the following shipping name:
Waste Batteries, dry, sealed, n.o.s (used NiCd & NiMH)
- 3 **HMR Internal Drum Number**
Regulatory Citing: NA
Must Include:
-drum number



BATTERIES INDIVIDUALLY BAGGED OR TERMINALS TAPED; NO DAMAGED BATTERIES

Battery Containing Devices (BCD)

**LITHIUM ION BATTERIES -
FORBIDDEN FOR TRANSPORT
ABOARD PASSENGER
AIRCRAFT**



UNIVERSAL WASTE

Accumulation Start Date:

Generator:

Brown County HMR
2561 S. Broadway
Green Bay, WI 54304

Contents:

Battery Containing
Devices

USED BATTERIES



173.185(c)(iv): The 66 lb. gross weight for packaging does not apply to BCD

Bulk Packaging Placarding Requirements



Should a waste that is considered a DOT hazardous material be allowed in refuse and recycling systems?





Summary of Battery Issues

- * Battery Fires are happening more often than what we think.**
- * No one wants to talk about it for fear of negative perception.**
- * We are throwing away resources we'll eventually wish we hadn't**
- * Most of the waste industry is not aware of current DOT hazardous material transport rules; therefore, breaking those rules.**



Thank You!

**Chris Blan, CHMM
Resource Recovery Technician
Brown County Resource Recovery
Chris.Blan@browncountywi.gov
920-492-4954**





Solutions to the Problem

- ▶ **Provide and promote an anonymous reporting platform to accurately demonstrate the scope of the problem**
 - ▶ Protection against insurance rate increase because of battery fires
- ▶ **Create a more expansive battery collection infrastructure**
 - ▶ Or are our current limited private sector options, HHW programs, and MRFs enough?
- ▶ **Educate, educate, educate**
 - ▶ Problem: The message given is best received at the time the message is needed.
 - ▶ Or create a platform to launch an educational campaign like...
- ▶ **Landfill Ban** or
- ▶ **An Extended Producer Responsibility (EPR) Law**



Government and DOT HMR Exemptions

Isn't Government Exempt From DOT HMR?

(d) *Functions not subject to the requirements of the HMR.* The following are examples of activities to which the HMR do not apply: (49 CFR 171.1(d))

(5) 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.

(49 CFR 171.1(d)(5))



DOT Interpretation letters involving 49 CFR 171.1(d)(5):

Interpretation Letter Reference No. 18-0071:

“...if a government entity (e.g., APHIS) contracts a third party to transport a hazardous material on their behalf, the government exception would no longer apply and government operations would be categorized as transportation for commercial purposes and subject to the HMR.”

Interpretation Letter Reference No. 14-0101:

“...a state agency, such as a state university, that transports hazardous materials for its own use, using its own personnel and vehicles, and is not engaged in transportation in commerce is not subject to the HMR. **However, if the university transports hazardous materials using a commercial carrier, such as a contractor or a contract or common carrier, it is subject to the requirements of the HMR”.**



Vaping Device Issues

- ▶ Multiple components: battery, electronic, hazardous waste (P075 nicotine)
- ▶ Issues will vary from state to state
 - ▶ Some states residential and VSQG (CESQG) are exempted from cradle to grave, following federal rules
 - ▶ Some states are stricter, i.e.. Wisconsin
 - ▶ (2) Solid wastes that are not hazardous wastes. All of the following solid wastes are not hazardous wastes:
 - ▶ (a) Household waste, including household waste that has been collected, transported, stored, treated, disposed, recovered, such as refuse-derived fuel, or reused, except if the hazardous waste in this waste stream is separated for management at a collection facility regulated under subch. [HH of ch. NR 666](#). [All HHW programs]
 - ▶ A Waste Determination Conclusion?
- ▶ DEA Takeback Program: Let each state advertise events
 - ▶ Vaping device confusion



Required Pre-Transportation Functions

DOT Pre-Transportation Functions Required by Offeror of Hazardous Materials

- Determining Hazard Class
- Selecting Packaging
- Labeling a Package
- Marking a Package
- Filling Packaging
- Securing Closures
- Preparing shipping paper
- Emergency Response
- Reviewing Shipping Papers
- Proper Condition for Transport
- Loading, Blocking, Bracing...
- Segregating in Freight Container
- Providing Placards
- Selecting & Affixing Placards

Our Responsibility

Shared Responsibility

Primarily Contractor



Universal Waste Rules - Batteries



- ▶ Universal Waste Batteries: CFR 273 (NR673 for WI)
 - ▶ Allowable activities:
 - ▶ **(i) Sorting batteries by type;**
 - ▶ **(ii) Mixing battery types in one container;**
 - ▶ (iii) Discharging batteries so as to remove the electric charge;
 - ▶ (iv) Regenerating used batteries;
 - ▶ (v) Disassembling batteries or battery packs into individual batteries or cells;
 - ▶ **→ (vi) Removing batteries from consumer products; or**
 - ▶ (vii) Removing electrolyte from batteries.

Wisconsin



Federal



49 CFR 172.101 Table of Hazardous Materials and Special Provisions

Symbols	Hazardous Material Descriptions and	Hazard Class	Identification	Packing Group	Label	Special Provisions	Packaging (173.***)		
	Proper Shipping Names						or Division	Number	PG
Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7	Column 8		
	Batteries, dry, sealed, n.o.s.					130			
	Lithium ion batteries	9	UN3480		9	388, 422, A54, A100	185	185	185
	Lithium ion batteries contained in equipment	9	UN3481		9	181, 388, 422, A54	185	185	185
	Lithium metal batteries	9	UN3090		9	388, 422, A54	185	185	185
	Lithium metal batteries contained in equipment	9	UN3091		9	181, 388, 422, A54, A101	185	185	185

➤ **Alkaline, NiMH, & NiCd: “Dry, sealed batteries”**

➤ Special Provision: 130

➤ Terminals of rechargeable batteries and alkaline batteries greater than 9 volts need to be covered (to prevent 1 - dangerous evolution of heat; 2 - short circuits; and 3 - damage to terminals) – **172.102(c)(1)(130)(b)**



§ 172.101 Purpose and use of hazardous materials table.

Symbols	Hazardous Material Descriptions and	Hazard Class	Identification	Packing Group	Label	Special Provisions	Packaging (173.***)		
	Proper Shipping Names	or Division	Number	PG	Codes	(172.102)	Exceptions	Non-Bulk	Bulk
Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7	Column 8		
	Batteries, dry, sealed, n.o.s.					130			
	Lithium ion batteries	9	UN3480		9	388, 422, A54, A100	185	185	185
	Lithium ion batteries contained in equipment	9	UN3481		9	181, 388, 422, A54	185	185	185
	Lithium metal batteries	9	UN3090		9	388, 422, A54	185	185	185
	Lithium metal batteries contained in equipment	9	UN3091		9	181, 388, 422, A54, A101	185	185	185

▶ Lithium Cells & Batteries

- ▶ Relaxed requirements for primary and rechargeable lithium batteries shipped for disposal or recycling - **173.185(d)**
- ▶ If a lithium cell or battery meets the 1) **size**, 2) **packaging**, and 3) **hazard communication** conditions listed in **173.185(c)(1-3)** then the batteries are exempted from:
 - ▶ DOT Labeling & Markings
 - ▶ DOT Placarding
 - ▶ Some shipping paper aspects
 - ▶ Full DOT training requirements
 - ▶ Emergency Response aspects



Criteria Listed in 173.185(c)(1-3)...

▶ 1) Size Limits:

▶ Maximum size for road transport:

- ▶ Lithium Metal: 5 g per cell or 25 g per battery
- ▶ Lithium Ion: 60 Wh rating per cell or 300 Wh rating per battery (Wh = Ah*V)

▶ 2) Packaging:

▶ Cells/Batteries

- ▶ Cells/Batteries placed in inner packaging fully enclosed then placed in strong rigid outer packaging
- ▶ Gross weight of package not to exceed 66 lbs.
- ▶ Each package must withstand a 1.2 meter drop test

▶ BCDs

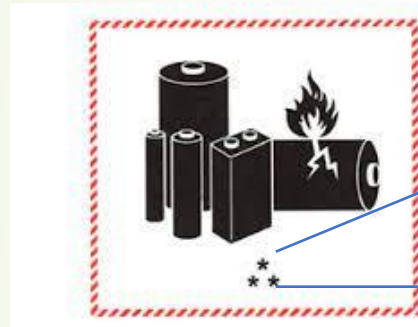
- ▶ If in a device, the device provides the protection.
- ▶ Device can not turn on during transport
- ▶ Gross weight limit does not apply to BCDs



Criteria Listed in 173.185(c)(1-3)...

▶ 3) Hazard Communication

- ▶ Lithium battery packages with marking - **“Lithium Batteries – Forbidden For Transport Aboard Aircraft and Vessel”**
- ▶ The lithium battery mark must be displayed



*Indicates UN number
Ex. UN3480, UN3481, UN3090, UN3091

** Telephone number for additional information
(Potential Change: HM-215Q: Jan 1, 2023)

- ▶ HM-215P rules effective August 10, 2022
 - ▶ Creates minimum marking size (100 mm x 100 mm down to 100 mm x 70 mm)
 - ▶ Shipping Papers: notation batteries are to be ‘recycled’ or are ‘damaged’



