



Vape Device and Battery Management

Picture credit: Vapor4Life



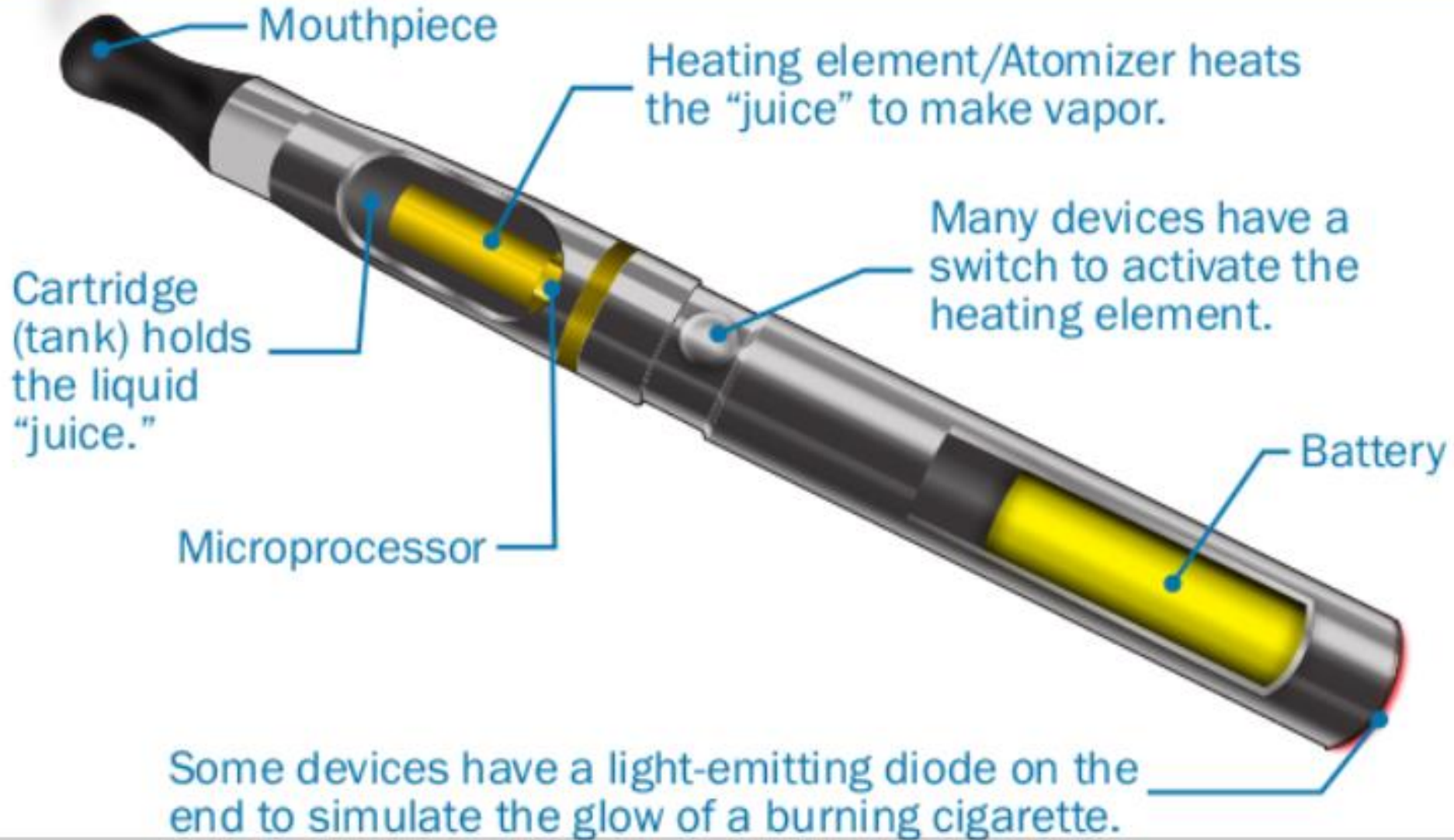
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HHW Program Administrator
February 28, 2020

E-cigs, Vape Devices, and Squonks, Oh My!

Unlimited configuration of devices, all of which have:

- **Battery:** (lithium primary or rechargeable)
that powers a
- **Heating element** (carbomizer, clearomizer or atomizer)
that vaporizes
- **e-liquids, e-juice or vape juice** containing nicotine or other substances so that it can be inhaled.

Parts of an Electronic Cigarette



4 Generations of Vape Devices



All “generations” are still marketed



- One piece
- Primary lithium battery
- Not readily distinguishable from similar shapes of rechargeable vapes



- Use refillable or pre-filled pods, cartridges or tanks
- Rechargeable lithium batteries

Because we needed more nicotine per hit:



- Huge and powerful rechargeable lithium batteries
- Refillable tanks



- Pod Mods typically use nicotine salts rather than “freebase” nicotine from former generations
- Nicotine salts allow many times the level of nicotine to be inhaled more easily and with less irritation to the throat

The Squonk Mod (Gen 5)



Magnetic cover: easy to take apart

Triple battery squonks are common

Sound like a coffee maker

Vape devices + tanks, pods or cartridges



- ◀ Myriad compatible
- ◀ Rechargeable
- ◀ Over-discharge protection
- ◀ Battery capacity display
- ◀ Long live energy
- ◀ ON/OFF
- ◀ 10 seconds cutoff

- ◀ Short circuit / Atomizer protection
- ◀ Passthrough
- ◀ Puff counter
- ◀ Recommended operating volt range
- ◀ Operating volt adjustable

← Devices, cartridges and tanks have three standard thread sizes

Some devices and pods are not interchangeable



E-Juice



Nicotine content compared--confusing

- The nicotine content of cigarettes ranges from 4mg-14mg per cigarette
- Heavy smoker would use 12mg/mL or 18mg/mL vape juice for a rough equivalent
- Vape Juice is available at up to 42 mg/ml; some websites don't sell concentrations of more than 36 mg/ml

Make your own!

Also referred to as 0%, 0.8%,
1.6%, 2.4%, 3.6%, 5.4% and 6%

1.6-2.4 is a rough equivalent to a
cigarette



The FDA “Flavor Ban” Loopholes

- The FDA banned flavors ~January 31, 2020
- *Ban only applies to pre-filled cartridges*
- Ban does not apply to bulk juice or disposables
- Kids are switching to disposables or tank systems
- Watch MN legislation for flavor bans



Vape Pens are (almost) unique in their ability to start fires

- The push button igniter is unique to vape pens and freckle removers (sad)
- Vape pens heat to 420°F – 600°F in seconds (Fahrenheit 451)



Some have built in protections; some don't



8-10 Second
Cutoff



Short Circuit
Protection
(overheat)



Low Voltage
Protection

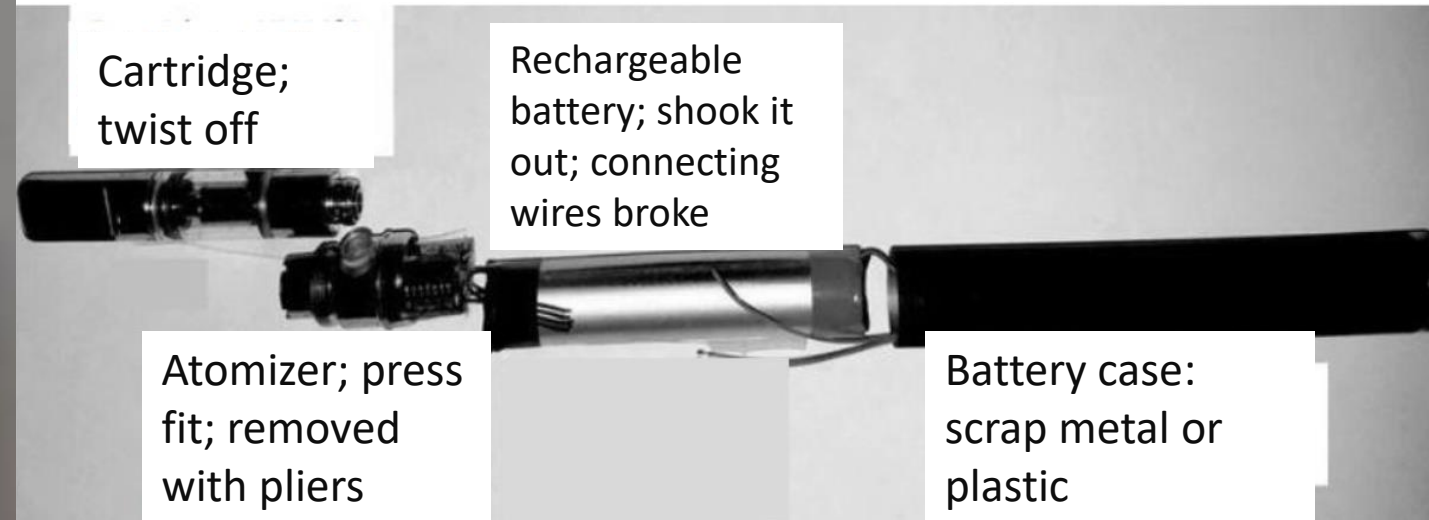
Innards of a JUUL Vape



More Vape Device Innards



Historically the most common rechargeable



Lithium Ion vs. Lithium

- Both are fire starters
- Lithium primary batteries contain a considerable amount of lithium and require a Class D extinguisher
- Lithium Ion can be extinguished with a standard ABC extinguisher, the metal content is low
- Recommend HHW have a Class D extinguisher on site

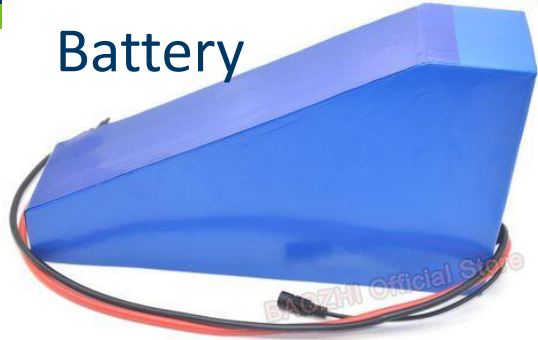
What Could Go Wrong?



- Unmanned battery box fire at Hennepin Library
- Note how it almost burned through a power tool battery!
- All 76 Unsupervised battery boxes removed from public buildings
- Minneapolis shuts down curbside battery collection

Lithium fire at HHW Facility

New
Battery



Extinguished Battery



Facility floor in
Storage area

New Storage area



CellBlockEx™ (Example Suppression Product)

- Made from recycled glass
- Designed to melt around battery or device to smother fire and absorb fumes
- Packing material, blankets, packaging, gloves, DDR kits



55L: \$85 Full Pallet: \$2,260

Check internet for other similar solutions

Vape Pen Management at HHW Facilities

4 Sort categories for Vape Devices:

- **Disposable e-cigs and vape pens:** lithium primary batteries
- **Rechargeable** devices: rechargeable lithium-ion batteries
- Vape juice, pods, cartridges—lab pack as P075
- Empty pods/tanks/cartridges: garbage, possibly some scrap metal

Storage and Disposal of Vape Devices

- Tape or bag all batteries or devices
- Sort between lithium and lithium ion to the best of your abilities
- Pack in 5 gal bucket with vermiculite or CellBlock type fire suppression material
- Ship for disposal via Veolia: \$125/5 gal bucket
- Ship for recycling via Clean Harbors \$5.63/lb



Vape Devices are E-waste, not Batteries



Photo credit 123rf.com

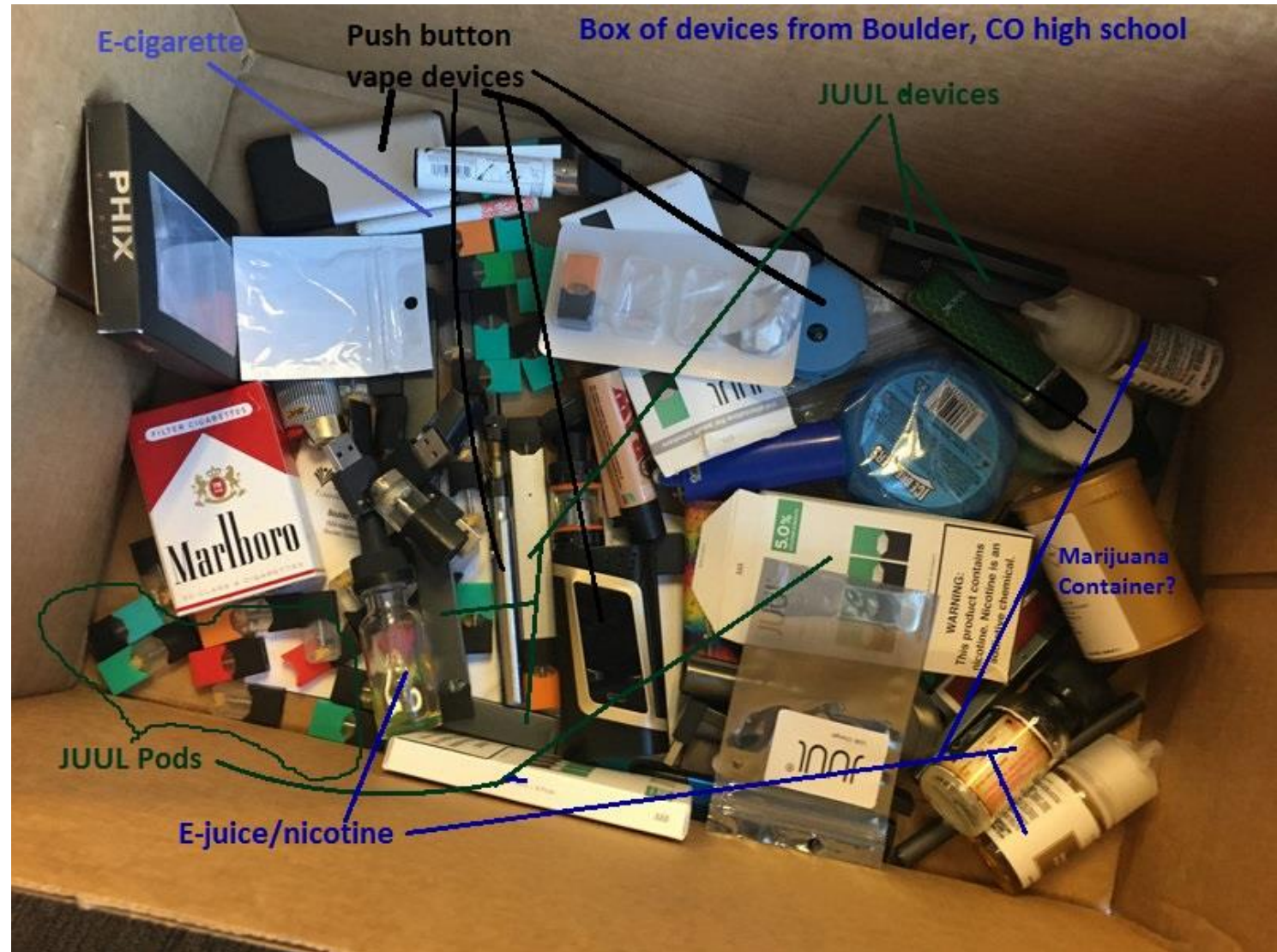
- Vape devices and e-cigs with embedded batteries cannot be shipped in C2R boxes
- Batteries removed from vape devices may be placed in C2R boxes (covered by PS law)
- HHW Programs don't want to remove batteries from vapes or the myriad other embedded battery devices due to safety concerns and staffing constraints.
- All non-vape embedded battery devices may be shipped with the E-Waste State contractor for \$1; Vape devices are not CEDs

To remove or not remove batteries from Vape Devices

- Some programs have decided they absolutely will not remove batteries
- Some devices have relatively easily removable batteries; some are seemingly impossible, requiring a vice and vice grips—dicey!
- JV's experience:
 - Sparking is common
 - 2 of 11 devices had swollen batteries
 - 1 battery was damaged upon removal (plastic cover torn)
- Should a SOP for HHW cover battery removal?

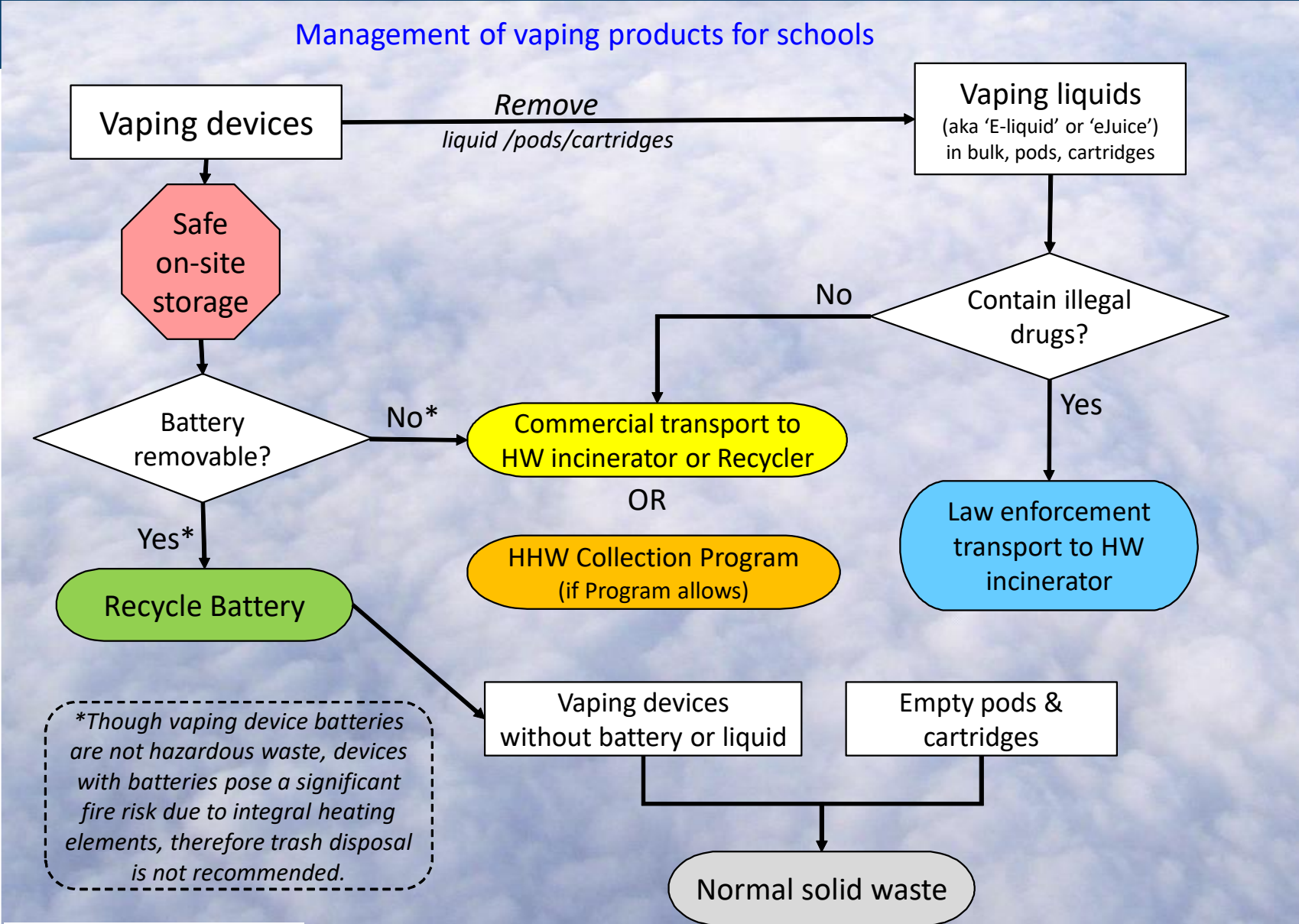
Schools and Vape Devices

- Typical box of confiscated devices from a school



Vape Products Management for Schools

DRAFT flow chart for schools:



HHW and VSQG Programs MAY help schools

- HHW can give guidance to local schools or refer them to a HW contractor or the MPCA regional offices HW staff
- Schools commonly do cleanouts once per year and can safely separate and store devices for annual disposal (MDE recommends the use of CellBlockEx or similar)
- If devices or cartridges contain THC, only law enforcement can help them manage the cartridges and devices
- Law enforcement can manage devices at the 3M incinerator along with other confiscated materials

Lithium Fire and Some Fire Stats

- Battery fire demonstration:

<https://www.youtube.com/watch?v=oieH2wwDGzo>

- Fire Rover report on LinkedIn:

https://www.linkedin.com/pulse/2019-report-annual-reported-waste-recycling-facility-fires-fogelman/?utm_source=newsletter&utm_medium=email&utm_content=Read%20The%20Report&utm_campaign=Peace%20of%20Mind%20

- [Veolia UK](#) recently issued a press release that stated that [fires in waste vehicles have increased](#) by 37.5 percent since 2017

Fire Stats



REPORTED WASTE & RECYCLING FACILITY FIRES INJURIES & DEATHS IN US/CAN

	2018	2019	Yr./Yr. Increase (Decrease)
Injuries Reported	19	49	158%
Deaths Reported	2	2	0%
# Of Incidents Where Injuries Were Reported	12	25	108%
# Of Fire Total Reported Fire Incidents	365	343	-6%
% Of Fire Incidents w/Injuries or Death Reported	4%	8%	100%

Source: Ryan Fogelman, rfogelman@firerover.com

Author believes the number of waste and recycling facility fires that occurred in 2019 in the US/Canada is more than 1,800.

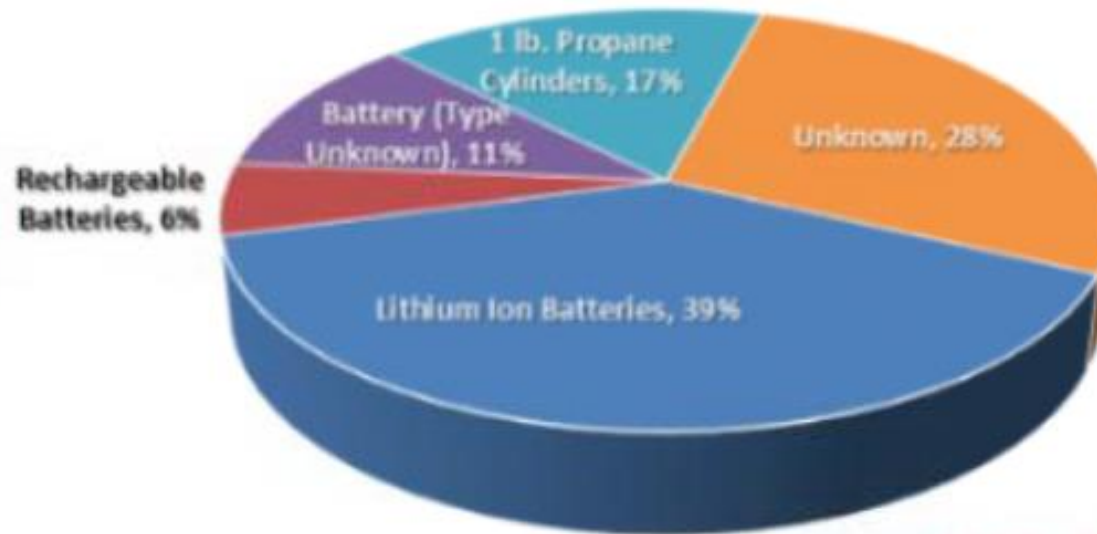
Injuries were mainly to fire fighters

According to the California Product Stewardship Council (CPSC) in a survey released March 9 of 2018, 26 respondents from 22 waste facilities operators across California, including northern and southern counties, as well as rural and urban:

56% of the reported fires were due to batteries.

44% of reported Fires were made up traditional hazards of combustibles (aerosols, butane cans, chemicals, hot ashes, and talking greetings cards).

Sources of Fires at Waste Management Facilities

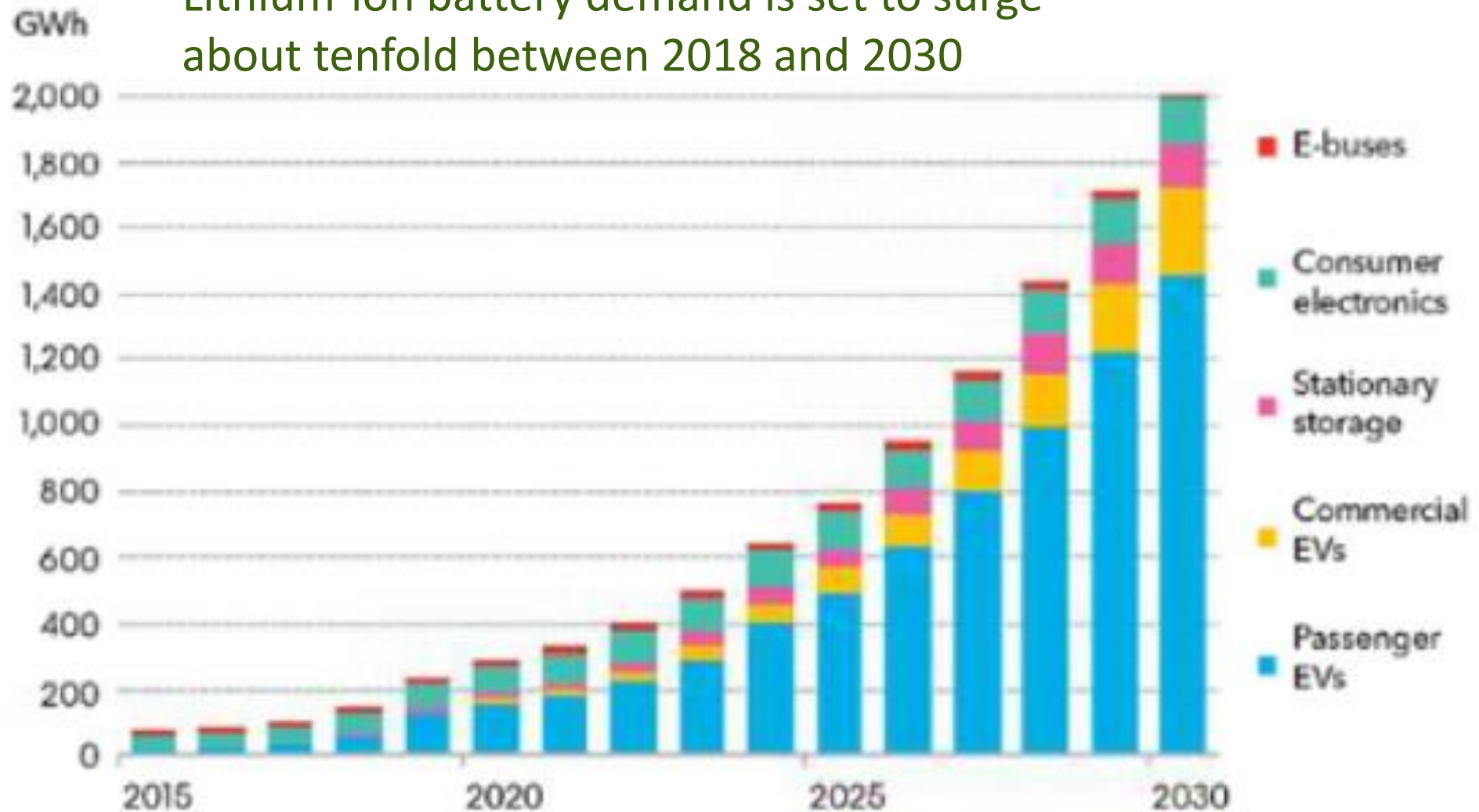


REPORTED WASTE & RECYCLING FACILITY FIRES IN US/CAN JAN 2019 – DEC 2019 (MONTH)



Annual Lithium Battery Demand

Lithium-ion battery demand is set to surge about tenfold between 2018 and 2030



KEEP BATTERIES OUT OF RECYCLING AND WASTE CARTS

757943



Here's why.

Batteries pose a safety hazard for our workers as they can cause fires in our trucks and recycling facilities. Never dispose of batteries in your waste or recycling carts.

Instead, safely recycle batteries in the following ways.

- Check State, City or County websites, or local retailers for battery recycling drop off locations.

Thank you.

Waste Management

RecycleOftenRecycleRight.com



Outreach

- Mailer to WM customers
- Does not distinguish between battery types
- Public can't distinguish types either
- MPCA has guidance for vape pens and batteries on our website:

<https://www.pca.state.mn.us/living-green/reducing-toxicity-home>

All battery collection seems to be the only way to address the lithium issue?

Current MN battery laws

- Developed in early 1990's primarily to address:
 - nickel-cadmium and lead in rechargeables,
 - new rechargeable chemistries that may be toxic, and
 - silver and mercury in single use batteries
- Include an outdated embedded rechargeable battery prohibition that does not define or address e-waste containing embedded batteries
- Do not specifically reference lithium or NiMh chemistries, which are not RCRA hazardous and did not exist when laws were enacted
- Do not specifically ban these newer chemistries from the SW stream

Is there interest in updating the existing battery law?

- To provide additional coverage of battery chemistries
- To prohibit lithium chemistries from the SW stream
- To improve outreach to the public
- To help with issues of non-participation by manufacturers
- To encourage more retail participation in collection

“People will accept your idea more readily if you tell them Benjamin Franklin said it first.”

– David H. Comins, quoted in *The Washingtonian*

Thank you!

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**MINNESOTA POLLUTION
CONTROL AGENCY**