

## Hybrid and Electric Vehicle Batteries

### What types of batteries are found in electric vehicles and hybrid vehicles and why are they of concern?

Lithium-ion and nickel metal hydride rechargeable batteries are currently used in both hybrid and electric vehicles and have high-voltage electrical systems that typically range from 100 to 600 volts. Nickel metal hydride battery packs can contain up to approximately 250 individual battery cells and lithium-ion battery packs can contain up to approximately 95 individual battery cells.

Lithium-ion batteries may present a fire and explosion hazard when damaged and can also be reactive if not fully discharged. Lithium-ion batteries are increasing in use and can also be found in motorcycles, scooters, RV equipment and many other products.

Nickel Metal Hydride batteries are not reactive but contain valuable metals that can be recycled.

### How are Lithium-ion and nickel metal hydride batteries from businesses regulated?

#### Lithium-ion Battery Management

Spent lithium-ion batteries that are generated by businesses can be managed by either of the following standards:

- 1) As **Universal Waste** by following the standards outlined in [Subchapter 9](#) of the [Vermont Hazardous Waste Management Regulations \(VHWMR\)](#) and Part 273 of the Code of Federal Regulations Title 40 (refer to the ["Universal Waste" fact sheet](#) for more information about this option).

Or

- 2) As **Hazardous Waste** (due in part to the ignitability and reactivity characteristics), following the management standards provided in [Subchapter 3](#) of the VHWMR.

#### Nickel Metal Hydride Battery Management

Spent nickel metal hydride batteries that are generated by businesses are not regulated as hazardous waste, but most businesses in VT choose to recycle nickel metal hydride batteries.

### Best Management Practices

- ✓ Provide safety training for all employees removing, disassembling, or handling the batteries;
- ✓ Isolate the terminals of the batteries with non-conductive tape, plastic bags, or other separation techniques, keeping the label legible;
- ✓ Prevent damage to batteries;
- ✓ Store batteries in climate-controlled spaces with good ventilation;
- ✓ Store batteries in a separate building away from other flammable materials and occupied spaces when possible;
- ✓ Store batteries that have been identified as damaged, defective, or recalled (DDR) separately from non-DDR batteries in appropriate containers;

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- ✓ Install advanced fire detection and suppression equipment;
- ✓ Conduct frequent visual and thermal inspections of batteries;
- ✓ Have ongoing communications with local fire marshals and first responders about materials and processes happening on site; and
- ✓ Maintain a plan for how to respond and evacuate in case of an emergency.
- ✓ Avoid stockpiling spent batteries.
- ✓ Contact the automotive manufacturer/retailer for the type of vehicle the battery has been removed from to see if they will accept for recycling.
- ✓ If an automotive manufacturer/retailer will not accept the battery for recycling, Schedule pickups with a recycling contractor at least once a year or more if needed.
- ✓ Check batteries for swelling and damage prior to storing.
- ✓ Place swollen or damaged batteries in a closed, watertight, storage container such as a five-gallon plastic (polyethylene) pail or bin. Add Sand, kitty litter, vermiculite or another fire containment material such as CellBlockEx to aid in safe storage.
- ✓ Store batteries upright on an impervious surface and separate by battery type.
- ✓ When handling batteries, always wear safety equipment (e.g., gloves, apron, and eye protection).
- ✓ Keep an ABC Fire Extinguisher next to battery storage area. Class D is also recommended for extra safety with lithium-ion or any lithium-based batteries.
- ✓ For shipping purposes, remember that any damaged lithium-ion battery or a lithium-ion battery that is over 300 watt hours is a hazardous material per Department of Transportation Code and considered highly dangerous.

### How are Lithium-Ion and Nickel Metal Hydride batteries from households regulated?

Although household wastes are exempt from the VT Hazardous Waste Management Regulations, all spent nickel metal hydride and lithium-ion batteries, including those generated by households, should be recycled through one of the following: an automotive manufacturer/retailer, battery recycling contractor, or solid waste management entity. Contact information for [solid waste management entities](#) in VT.

For information on the recycling of other small consumer batteries such as those used in laptops, phones, tools, toys, flashlights, etc., please see [Call2RecycleVT](#).

### Resources:

#### Battery Recycling Contractors

[Battery Recyclers of America](#)  
[Battery Solutions](#)  
[Complete Recycling Solutions](#)  
[Clean Harbors](#)  
[Call2Recycle](#)  
[ENPRO](#)  
[Interstate](#)  
[Veolia](#)

**Solid Waste Management Entities-** <https://dec.vermont.gov/waste-management/solid/local-districts>

#### Maintenance and Safety of Hybrid and Plug-In Electric Vehicles-Battery Maintenance

[https://afdc.energy.gov/vehicles/electric\\_maintenance.html](https://afdc.energy.gov/vehicles/electric_maintenance.html)

## **Environmental Fact Sheet: Hybrid and Electric Vehicle Batteries**

### **Alternative Fuel Vehicles Safety Training**

Training, tools, and information for emergency responders to safely handle emergencies involving alternative fuel vehicles: <https://www.nfpa.org/Training-and-Events/By-topic/Alternative-Fuel-Vehicle-Safety-Training>

**Hybrid Cars.Com-** <https://www.hybridcars.com/hybrid-car-battery/>

### **Rechargeable Battery Association**

<https://www.prba.org/wp-content/uploads/Overview-of-Battery-Transport-Regulations.pdf>

### **Fact Sheet for Businesses Managing Spent Batteries:**

<https://dec.vermont.gov/sites/dec/files/wmp/HazWaste/Documents/FactSheets/Batteries%20Fact%20Sheet%202023.pdf>

**EPA memo from May 24, 2023:** [“Lithium Battery Recycling Regulatory Status and FAQs”](#)