



U.S. Federal Policy Considerations for the Management of Retired Large-Format Batteries

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Management Options

Reuse

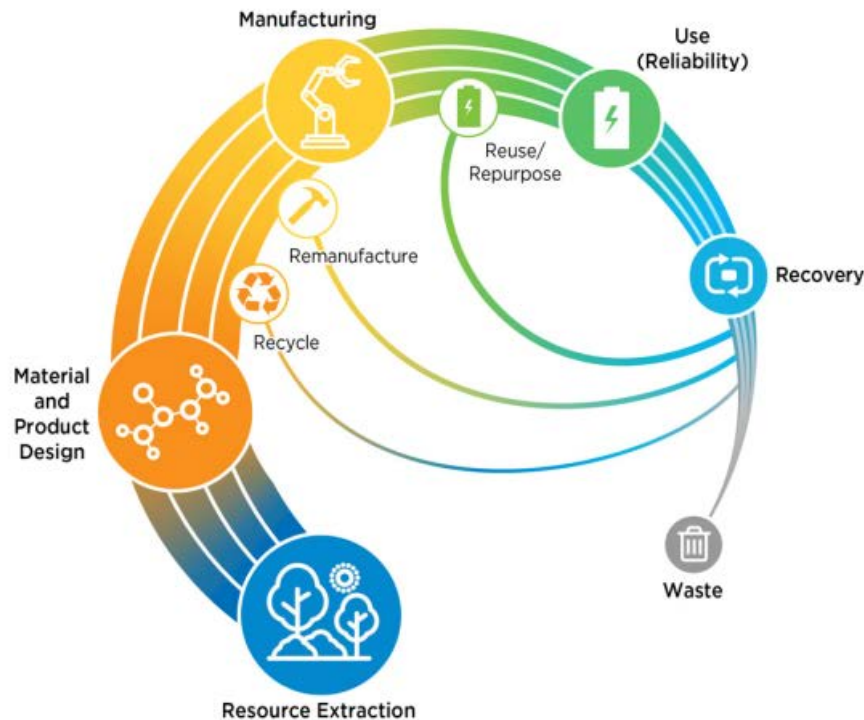
- Retired EV LiB modules and cells may be refurbished/modified for reuse in other mobile BES systems (e.g., forklifts) or for reuse in stationary BES applications

Recycle

- Recovered materials can be used to manufacture new batteries or be sold into commodity markets

Storage

Disposal



Reuse Considerations

Consideration	Description
Interconnection Regulations	State and local regulations that govern how BES systems connect to the electric grid, which may restrict the reuse of large-format batteries in certain grid-tied applications
Fire and Building Regulations	State and local regulations that govern the design, materials, and quality of buildings and structures that connect to stationary BES systems, which may restrict the reuse of large-format batteries in certain grid-tied and off-grid applications
Electrical Regulations	State and local regulations that govern electrical safety, design, installation, and inspection of BES systems and large-format batteries, which may restrict the reuse of large-format batteries in certain grid-tied and off-grid applications

Recycling and Disposal Considerations

Consideration	Description	Application
Solid Waste Laws and Regulations	Mandatory requirements that vary across jurisdictions, which govern the generation, handling, storage, treatment, transport, recycling, and disposal of non-hazardous solid wastes, which may include large-format batteries accumulated or stored before recycling, or disposal and those being recycled or disposed of	Recycle, Disposal
Hazardous Waste Laws and Regulations	Mandatory requirements that vary across jurisdictions, which govern the generation, handling, storage, treatment, transport, recycling, and disposal of hazardous solid wastes, which may include large-format batteries accumulated or stored before recycling, or disposal and those being recycled or disposed of. Hazardous waste requirements are more stringent than non-hazardous waste requirements	Recycle, Disposal
Universal Hazardous Waste Law and Regulations	Optional alternative hazardous waste requirements that vary across jurisdictions, which govern the generation, handling, storage, treatment, transport, recycling and disposal of specified types of wastes, which may include large-format batteries accumulated or stored before recycling, or disposal and those being recycled or disposed of. Universal hazardous waste requirements are a subset of—and are less stringent than—hazardous waste requirements, but more stringent than non-hazardous solid waste requirements	Recycle, Disposal

Reuse, Recycling, and Disposal Considerations

Consideration	Description	Application
Hazardous Materials Transport Regulations	Mandatory federal requirements that govern U.S. interstate commerce shipping and transport of hazardous materials, which may large-format batteries being shipped or transported across state lines for reuse, recycling or disposal	Reuse, Recycle, Disposal
Hazardous Waste Export Regulations	Mandatory requirements that govern the export, shipping, and transport of hazardous materials to other countries, which may include large-format batteries being exported, shipped, or transported for reuse, recycling, or disposal	Reuse, Recycle, Disposal
Penalties for Non-Compliance	Civil and criminal penalties administered for violating a jurisdiction's hazardous waste and/or hazardous materials regulatory requirements	Reuse, Recycle, Disposal

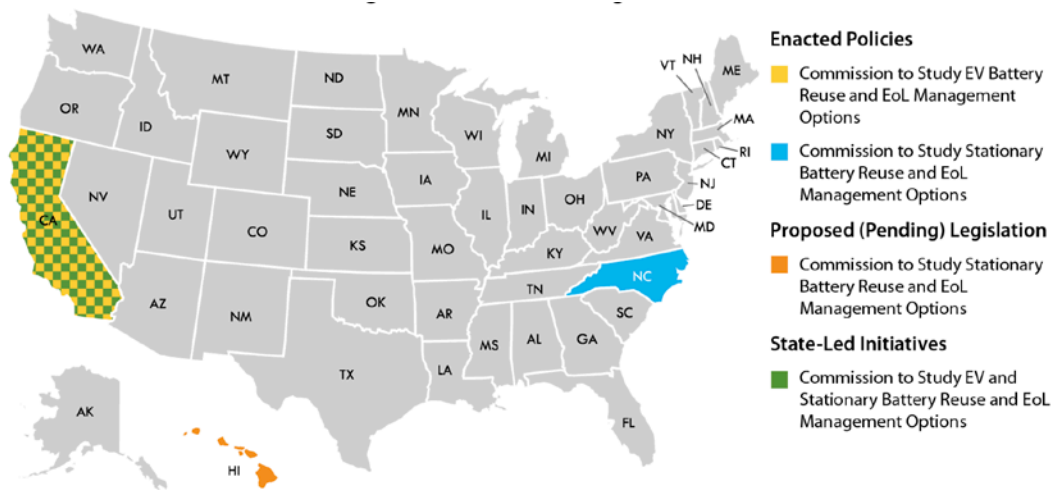


Ex. Noncompliance with any RCRA provision can result criminal penalties up \$50K per violation per day, and up to 2 years in prison or both

Emerging and Future Policy Considerations

Examples:

- Industry - UL's 1974 Standard
- Federal - ReCell, LIBRA, Battery Prize, E.O. 14017, Infrastructure Bill
- State - CA, NC, HI studies
- Other - Lead-acid battery alternative regulation, language



What can we learn from other industries, with more mature reuse and recycling markets?

Resources

Curtis, Taylor L., Ligia Smith, Heather Buchanan, and Garvin Heath. February 2021. *A Circular Economy for Lithium-Ion Batteries Used in Mobile and Stationary Energy Storage: Drivers, Barriers, Enablers, and U.S. Policy Considerations*. Golden, CO: National Renewable Energy Laboratory. NREL/TP-6A20-77035.

<https://www.nrel.gov/docs/fy21osti/77035.pdf>.

Curtis, Taylor L., Garvin, Heath, Heather Buchanan, Ligia Smith, Stephanie Shaw, and Ben Kaldunski. March 2021. *Solar Photovoltaic Module Recycling: A Survey of U.S. State Policies and Initiatives*. Golden, CO: National Renewable Energy Laboratory. NREL/TP-6A20-74124.

<https://www.nrel.gov/docs/fy21osti/74124.pdf>

Curtis, Taylor L., Heather Buchanan, Ligia Smith, and Garvin Heath. March 2021. *A Circular Economy for Solar Photovoltaic System Materials: Drivers, Barriers, Enablers, and U.S. Policy Considerations*. Golden, CO: National Renewable Energy Laboratory. NREL/TP-6A20-77035.

<https://www.nrel.gov/docs/fy21osti/77035.pdf>

Thank you!

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