



Pipeline and Hazardous Materials Safety Administration
Office of Hazardous Materials Safety

Research, Development and Technology
Battery Safety Research

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OHMS Background

3.3 Billion Tons of Hazardous Materials Shipped Annually

1.2 Million Hazardous Materials Shipments per Day

Intermodal Partners with FAA, FRA, FMCSA, and USCG

International Role in the UN, IMO, and ICAO



Our Mission

To improve hazardous materials safety and transportation through a proactive and holistic approach that enables...



Innovative research



Extensive collaboration



Data-driven decision making



Types of Battery Research



Emerging Technology for Safety



End-of-life Battery Handling



Safety of new Battery Chemistries

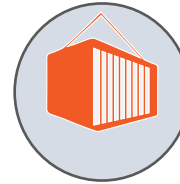


Conditions of Transport and Storage

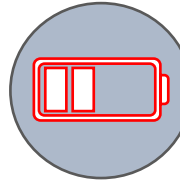


Project Spotlight: Battery Logistics Integrated Safety System (BLISS)

Battery Logistics Integrated Safety System (BLISS)



Mitigation/Containment



Monitoring/Detection



Fire/Toxic Gas Control



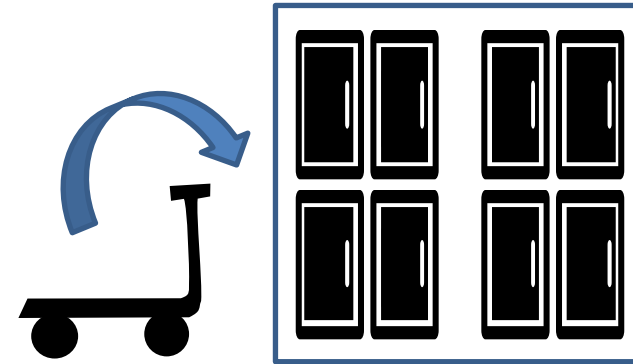
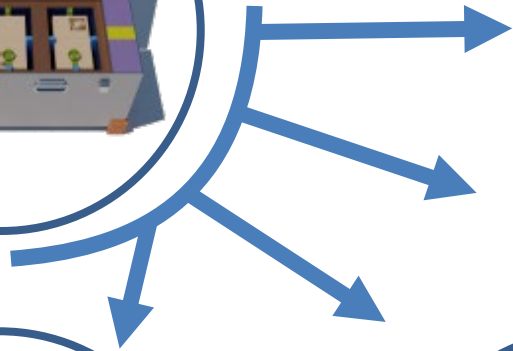
Notification



Communications



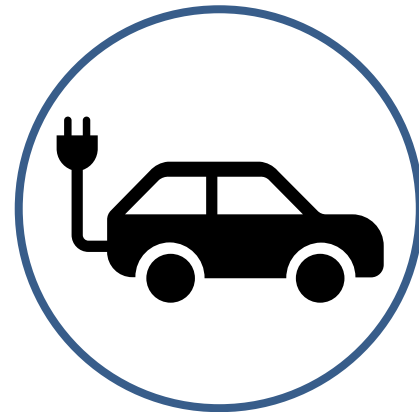
Battery Logistics Integrated Safety System (BLISS) form-factors



Transport, Storage, Charging Stations



"Smart" Drum Cap



Smart Safety Blanket



Battery Logistics Trailer



BLISS – The Solutions – “Smart Drum”



- Prevention of incidents with DDR batteries
- Specialized CAP and lid unit
- Full Detect, Notify, Communicate (DNOC)



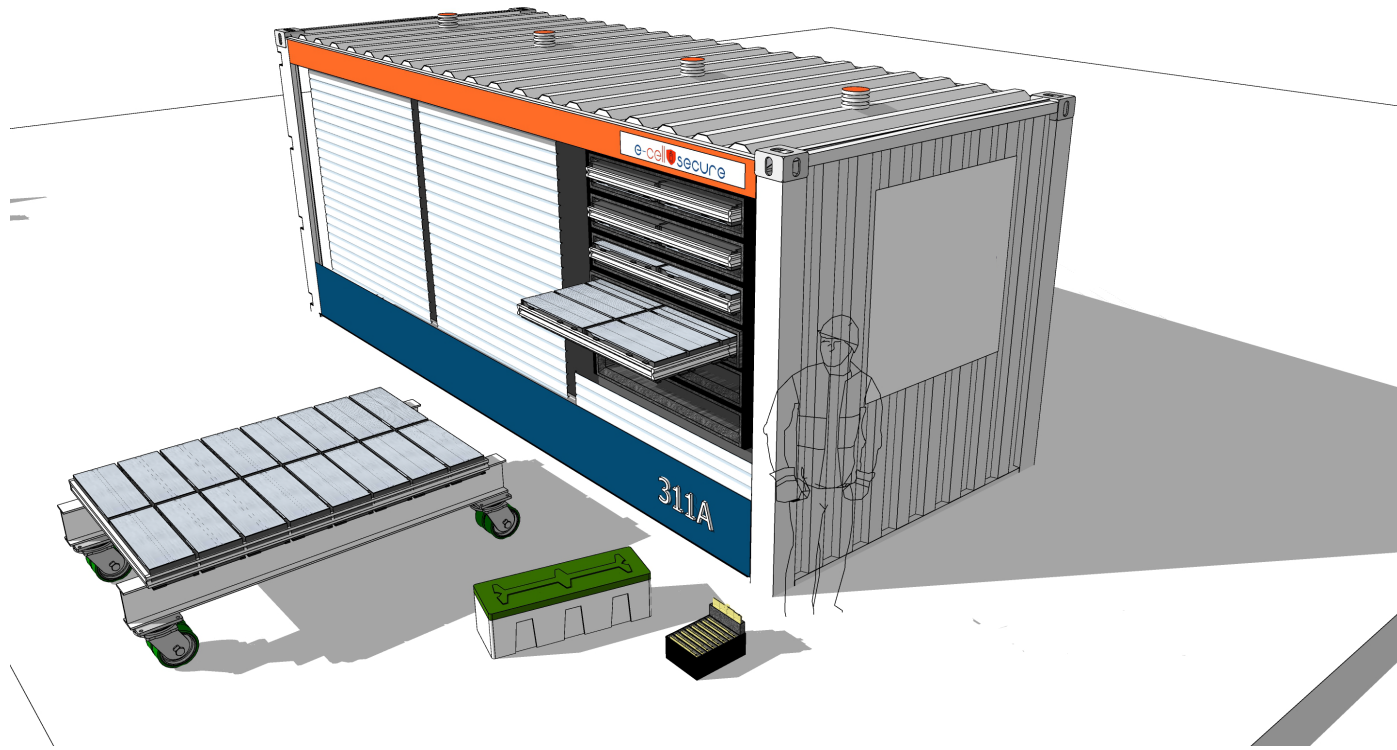
BLISS – The Solutions – Rack Battery Storage and Charging



- Deployable in buildings
- Fire-resistant material to prevent exposure to toxic gases
- Full DNOC



BLISS – The Solutions –ISO/Conex



- EV battery pack, module and cell transport and storage
- Closed-loop system can be used for transport and permanent/semi-permanent storage
- Plug-in fire suppression and ventilation capability
- TRL 4



BLISS – The Solutions – Smart Fire Blanket



- Blanket controls fire and off-gassing
- Specialized fire-resistant material
- Full DNOC
- Potential uses:
 - RORO vessels that are shipping EVs
 - Adapted to manufacturing assembly



BLISS – The Solutions - Charging Kiosk



- Designed based on work with NYC and FDNY
- Full DNOC system
- Provides solution for indoor/outdoor SAFE charging



BLISS – The Solutions – Logistics Trailer



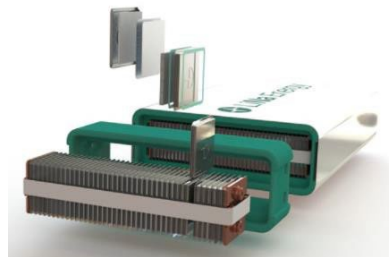
- Full DNOC system for a logistics trailer
- Includes active fire suppression, pressure and toxic gas control, and ventilation (EVACS)
- Ready for extended design and development
- Appropriate for post failure event cleanup



Naval Research Laboratory Battery Projects

Sodium-ion Battery Testing Phase II

Preliminary safety and performance testing of Na-ion batteries



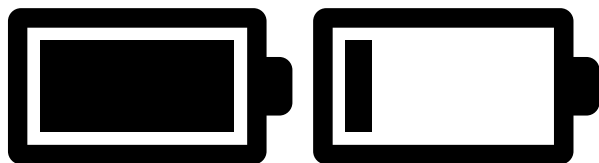
Strategy to De-Energize Damaged/ Defective Lithium-ion Batteries

Develop simple, cost effective, broadly applicable method to de-energize Li-ion batteries



The Problem

**HM-224I rule requiring
Lithium-Ion batteries to be at
a 30% state of charge (SOC)**



Current Methods

Voltage reading

- Unreliable
- Requires contact with Battery

Coulomb counting

- Very accurate
- Requires contact with Battery
- Very time intensive

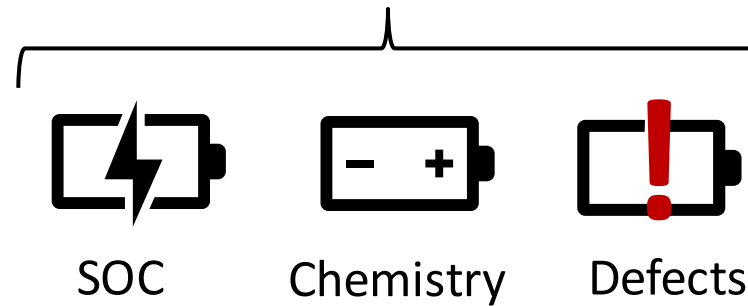


The Solution: State-of-Charge Detection

 How do we ensure safe states of charge in shipped batteries?



Magnetic Flux



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