

# Energy Storage Testing, Codes and Standards



**NEW YORK BATTERY  
AND ENERGY STORAGE**  
TECHNOLOGY CONSORTIUM

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**Central Hudson Solar Summit**  
**Poughkeepsie, NY**  
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# Batteries come in many flavors



## Battery Chemistries

- Lithium Ion
  - NMC
  - NCA
  - LFP
- Lead Acid
- Zinc
- Flow Batteries
- Many others...

## Pack/System Design

- Geometry and spacing
- Cooling and thermal management
- Buffer material
- Sensors and safety systems
- Battery Management Systems
- Fire suppression

# Battery Test and Commercialization Center



# Cell tests

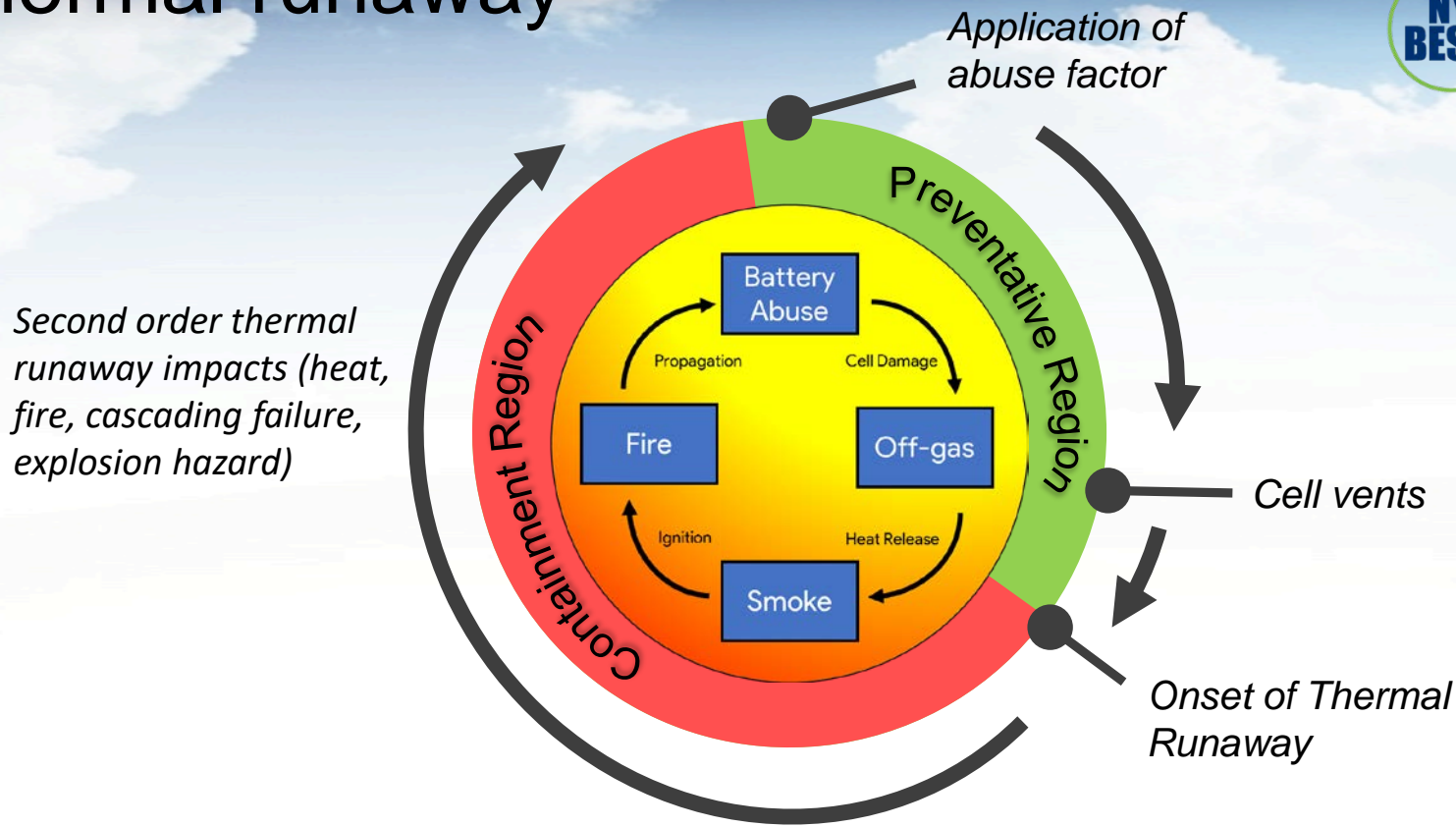
- ❖ Physical damage – puncture, crush, vibration, shock
- ❖ Electrical – over-charge, over-discharge, short circuit
- ❖ Environmental – external fire exposure, salt fog, internal fire
- ❖ Standards – UL 1642, IEC 62133, IEC 62619, UL 2054, UL 1973, UN 38.3

# Module and System Test Standards



Standard	Title	Primary Application(s)	Summary
ANSI/CAN/UL 1973	Batteries for Use in Stationary, Vehicle Auxiliary Power and Light Electric Rail (LER) Applications	Battery cell, module, and packs used for residential, UPS commercial, and utility energy storage	Cell, battery and battery system criteria for LER, VAP, and stationary batteries
IEC 62619 (Insufficient as UL1973 = 62619 + IEC 63056 + IEC 62485-5+ IEC 63057_	Secondary cells and batteries containing alkaline or other non-acid electrolytes – Safety requirements for secondary lithium cells and batteries, for use in industrial applications		
UL 2271	Batteries for Use in Light Electric Vehicle (LEV) Applications	Class III Industrial Trucks, Hoverboards, E-Bikes, UAV's, AGV's	Cell, battery and battery system criteria for light electric vehicles.
UL 2580	Batteries for Use in Electric Vehicles	On-Road Vehicles, E-Bus, Material Handling, GSE, Industrial AGVs	Battery cell, module, and packs used in EV applications such as ride-on and roadworthy vehicles
UL 9540	Standard For Safety For Energy Storage Systems and Equipment	Battery or other storage technology used in conjunction with PCE	U/I, Round Trip Efficiency, Grid Support, Frequency Regulation
IEC 62933-5-2 (Draft Stage)	Electrical energy storage (EES) systems Part 5-2: Safety requirements for grid integrated EES systems - electrochemical based systems		
UL 9540A Source: UL – Class 3 of NY BES+ Testing Codes and standards course October 2019	Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage Systems	Large Scale Fire Test Methodology	Developed to address Installation Codes

# Thermal runaway



# UL 9540A

- ❖ Not pass/fail – need to interpret data
- ❖ Designed to enable determination of:
  - ❖ Separation distances
  - ❖ Ventilation requirement
  - ❖ Fire protection strategies

# Building and Fire Codes

- ❖ NFPA 855 (2020)
- ❖ IFC 2021
- ❖ New York State Uniform Building and Fire Code
- ❖ New York City Codes



# NY State Uniform Building and Fire Code

## Considerations driving treatment

- ❖ Type of Battery
- ❖ Size
- ❖ Location
- ❖ Enclosure

# NY State Uniform Building and Fire Code

## Size

- ❖ Threshold quantity 20kWh for Li Ion and flow batteries, 70 kWh for lead acid
- ❖ 1 kWh for residential

# NY State Uniform Building and Fire Code



Location	Category	Energy limitation
Indoor	Dedicated use building	none
	Non-dedicated use building	600 kWh
Outdoor	Remote outdoor (100 ft clearance)	none
	Installation near exposures	600 kWh
	Parking Garages	600 kWh
	Rooftop (< 75 ft high)	600 kWh

Other enclosure considerations: Walk-In Energy Storage Unit, Energy Storage System Cabinet

# NY State Uniform Building and Fire Code



## Other considerations

Each individual system shall not exceed 50kWh and be separated by 3 ft.

Larger systems or tighter spacing permitted based on large scale fire testing and hazard mitigation analysis (UL9540A and analysis)

## Requirements exist for

Ventilation

Gas Detection

Fire Suppression

Commissioning, decommissioning, and operation and maintenance plans

Equipment listing (UL 9540, UL 1741)

See code for other requirements

# NY State Uniform Building and Fire Code Residential



Allowed Locations	Maximum Energy
Detached garages and detached accessory structures	80 kWh
Attached garages (subject to section R302)	80 kWh
Outdoors on exterior walls located a minimum of 3 feet from doors and windows	80 kWh
Utility closets and storage or utility spaces within dwelling units	40 kWh

Other requirements:

Code applies to all batteries greater than 1kWh

Maximum individual unit energy 20kWh, units must be separated by 3 feet unless justified by fire testing

UL 9540 required

UL 1741 required for any inverters

See code for other requirements, particularly for indoor installation

## NY-BEST Mission

To catalyze and grow the energy storage industry and establish New York State as a global leader.

We do this by:

1. *Communicating information and facilitating connections*
2. *Accelerating commercialization*
3. *Educating policymakers and stakeholders*
4. *Promoting New York's intellectual and manufacturing capabilities and providing access to markets*

# Thank You

Capture the Energy 2020  
Albany, NY  
April 1<sup>st</sup> – 2<sup>nd</sup>



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