

# Lithium Battery Vessel Fire Workshop and Exercise

## Training and Exercise Goals:

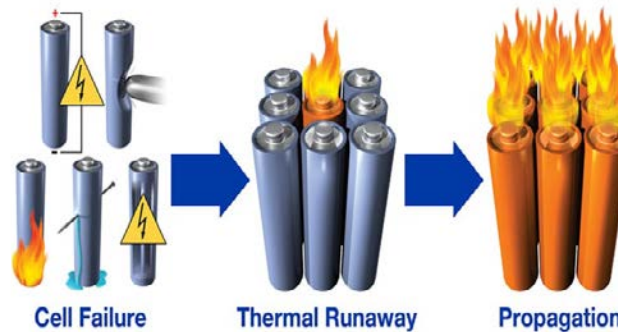
- Familiarize stakeholders with the hazards of Lithium Battery (LIB) Fires aboard vessels.
- Familiarize stakeholders with Fire Control of LIB's aboard vessels.
- Identify and validate emergency response plans for LIB Fires aboard Vessels.
- Familiarize stakeholders with LIB Salvage and Recovery Operations.
- Pilot a Mobile Workshop and Exercise that can be scaled to meet different Port requirements.



***Felicity Ace 2022***

# Prevalence and Problem

- LI Car Ferry: The ferry is equipped with 10 tons of batteries with capacity of two times 500 kWh
- LI long-duration Storage: 69 megawatts/552 megawatt-hours of storage
- LI Material Handling Equipment: 350-volt lithium-ion solutions to deliver the big power, performance



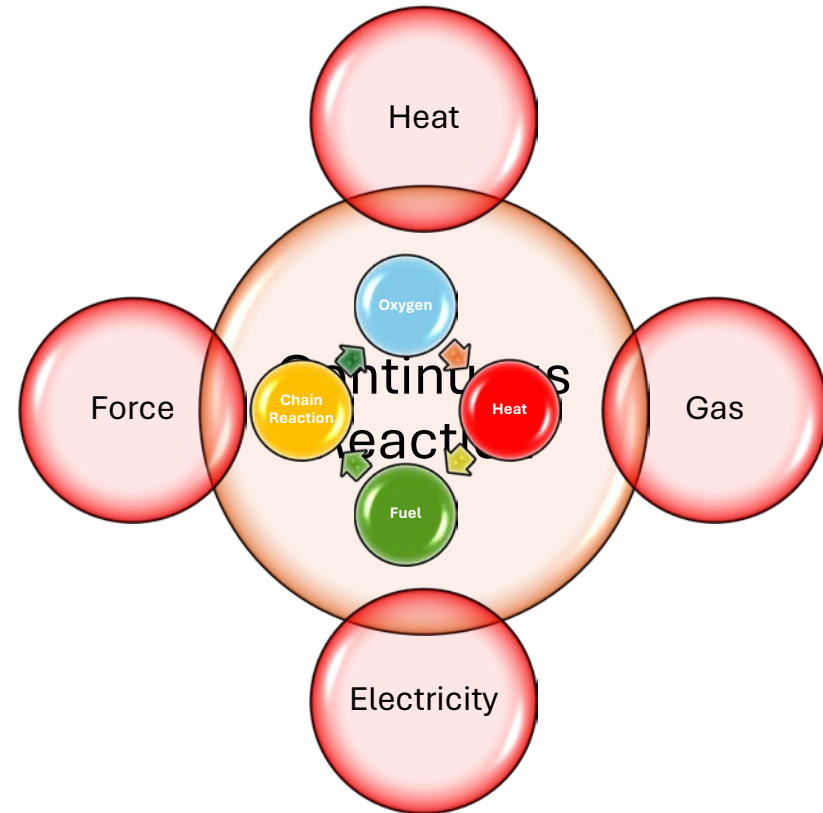
*Problem: Failure of one cell can lead to Thermal Runaway propagated to multiple cells*

# LIB Fire Problem: Runaway Thermal Reaction

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The problem exists at three levels of complexity:

- reaction between individual anode or cathode particles and electrolytes
- thermal runaway of a single, for example, cylindrical cell including venting and spray flames and
- thermal runaway of an array of cells in a battery pack







# Planning Timeline



*Genius Star XI 2023*

# Lithium Battery Planning Scenarios

<b>Concept and Objectives (C&amp;O) Meeting Outcomes:</b>		
<b>National Preparedness Mission Area:</b>		Response
<b>National Preparedness Capability Target</b>	<b>4 Preparedness Core Capabilities</b>	
	<b>Planning</b>	Conduct a systematic process in the development of executable strategic, operational, and/or tactical-level approaches to meet defined objectives.
	<b>Operational Coordination</b>	Establish and maintain a unified and coordinated operational structure and process that appropriately integrates all critical stakeholders.
	<b>Fire Management</b>	Provide structural, and specialized firefighting capabilities to manage and suppress fires of all types, kinds, and complexities.
	<b>Environmental Response</b>	Conduct appropriate measures to ensure the protection of the health and safety of the public and workers, as well as the environment, from all hazards.

<b>Planned agenda for the drill and Tabletop exercise.</b>	
<b>DRILL: Time TBD; Morning Session</b>	
An operations-based exercise to validate a single fire control and recovery operation	
<b>Module</b>	<b>Scenario</b>
LIB Personal Mobility Devices	<ul style="list-style-type: none"> <li>• Fire Control on Ferries</li> <li>• Fire Control on Passenger Cruise Ships</li> </ul>
LIB on the Bridge of a Vessel	<ul style="list-style-type: none"> <li>• Fire Control Navigation System Reserve Power</li> <li>• Reserve Power for vessel systems</li> </ul>
LIB shipped in Bulk	<ul style="list-style-type: none"> <li>• Fire Control Container transport</li> <li>• Fire Control Bulk Shipments</li> </ul>
LIB in Electric Vehicles	<ul style="list-style-type: none"> <li>• Fire Control ROLL-ON-ROLL-OFF</li> <li>• Fire Control ROLL-ON-ROLL-OFF/Combination Container</li> </ul>
LIB Fire Salvage Operations	<ul style="list-style-type: none"> <li>• Environmental Remediation</li> </ul>

TASKS COVERED		CAPABILITY
1.	AORs and AHJs	Plans Procedures and Agreements
2.	Regulatory bodies AOR, capabilities and limitations, malicious compliance, trending issue, lack of respect for material and hazards	
3.	Designated waterfront facility NFPA 307 USCG requirements to operate. Water supplies, access, etc.	
4.	SOLAS requirements and Class Approvals, existing systems and equipment.	
5.	Identification of deep-water salvage locations, consideration of a vessel sinking or blocking port commerce.	
6.	Mutual Aid versus MOU, MOAs, contracts. What commitments are in place or need to be developed. Adequate resources.	
7.	Crew training adequacy vessel	
8.	Crew capabilities at sea and in port	
9.	Security and port and vessel	
10.	Early detection early decision	Training
11.	Material/Chemistry Characterization and behavior from stable, to run-away with SOC, to damaged or post destruction	
12.	Secondary hazards thermal insult and hydrogen deflag/det transition	
13.	Acceptance, segregation and stowage considerations risk to vessel, crews, first responders. Commercial interests and pressures.	
14.	Exposure critical system and infrastructure protection, dead in the water or still under its own power. Vessel stability at sea.	
15.	Fire suppression equipment shoreside, vessel, location, adequacy, compatibility (thread type), delivery of water.	Fire Management
16.	Confined space: CO2 and other gas buildup in spaces.	
17.	Correct Instrumentation Detection Equipment	
18.	Fire management methods sea	
19.	Fire management methods port	
20.	Confinement hazards in RoRo	
21.	Hazardous materials discharge liquid, solid, gas vessel, port, environment	
22.	Salvage considerations fire management	
23.	Dewatering and vessel stability, international shore connection and pumps	