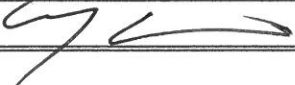


SCOTTS VALLEY FIRE PROTECTION DISTRICT



STANDARD OPERATING PROCEDURES	ARTICLE: II	SOP: 2407
	SECTION: 2400 RESPONSE PROCEDURES	
	SUBJECT: FIRES INVOLVING LITHIUM-ION BATTERIES	
	DATE APPROVED: December 18, 2024	
APPROVED:		

Scope:

Applicable to all SVFPD response personnel managing lithium-ion battery fires in small devices, vehicles, and fixed Energy Storage Systems (ESS).

Purpose:

To provide a structured, safe operating guideline when responding to incidents involving lithium-ion batteries, ensuring hazards such as thermal runaway and toxic gases are properly mitigated. The goal is to protect responders, the public, and property while preventing reignition or thermal events.

Definitions

- Lithium-Ion Energy Storage System (LiESS): A rechargeable energy storage system utilizing lithium-ion technology. Found in portable devices, electric vehicles (EVs), and fixed energy storage systems.
- Thermal Runaway: A failure in the LiESS where cells overheat, leading to a cascade of failures and potential fire/explosion.
- Off-Gassing: Toxic, flammable gases released during a thermal event. Hydrogen fluoride may be present.
- Stranded Energy: Residual energy within a LiESS post-event that poses re-ignition or shock hazards

Procedure

1. General Safety Protocols

- PPE and Scene Safety:
 - Full firefighting PPE, including SCBA, is mandatory when approaching a LiESS scene to protect from inhalation hazards, burns, and off-gassing.
 - Consider positioning uphill, upwind, and away from potential radiant heat or blast zones.
- Incident Command:
 - The Incident Commander (IC) must assess the condition and state of the battery system and notify dispatch to add Hazmat for monitoring and health safety concerns.
 - Use thermal imaging cameras (TICs) and gas meters to assess conditions.
- Thermal Runaway:

SCOTTS VALLEY FIRE PROTECTION DISTRICT



STANDARD OPERATING PROCEDURES	ARTICLE: II	SOP: 2407
	SECTION: 2400 RESPONSE PROCEDURES	
	SUBJECT: FIRES INVOLVING LITHIUM-ION BATTERIES	

- Upon detecting signs of thermal runaway (e.g., swelling, popping sounds, off-gassing), relay the information to command using "Urgent Traffic." Treat any affected area as a high hazard.
- 2. Small Portable Devices (Phones, Laptops, Scooters)
 - Evacuation:
If safe, remove the device from the building to prevent further risk. Do not use elevators.
 - Firefighting Tactics:
 - Use water for suppression. Continue to cool the battery to prevent reignition, as small LiESS can reignite even after initial extinguishment.
 - For small devices, consider submerging in water to limit thermal events.
 - Overhaul:
Conduct a thorough search post-fire and remove all compromised LiESS devices to prevent rekindling.
 - Hazardous Disposal:
 - Isolate and dispose of burned Li-ion batteries using proper hazmat protocols, including using overpack drums and steel containers for transport.
- 3. Vehicle Fires (Electric and Hybrid)
 - Initial Actions:
 - Disable Systems: Disconnect the vehicle's 12V battery and use the 1st Responders Cut Loop to isolate the high-voltage system. Remove key fobs 50 feet away from the vehicle.
 - Vehicle Positioning: Use wheel chocks and place the vehicle in park to immobilize it. Never assume an electric vehicle (EV) won't move due to regenerative braking.
 - Firefighting Tactics:
 - Use water directly on the battery modules (typically located underneath the vehicle). Never pierce or cut into areas near the battery.
 - For vehicles, letting the fire burn defensively while protecting exposures may be the best strategy when thermal runaway is suspected.
 - Towing and Post-Incident Monitoring:
 - Use a flatbed tow truck, ensuring the vehicle is covered with a fire blanket before moving. Monitor the vehicle for at least 72 hours, as reignition risk can persist.
- 4. Energy Storage Systems (ESS)
 - Initial Response:
 - Evacuate and isolate the area. Ensure firefighters maintain a distance of at least 75 feet from the ESS unless directly engaged in extinguishing the fire.

SCOTTS VALLEY FIRE PROTECTION DISTRICT



STANDARD OPERATING PROCEDURES	ARTICLE: II	SOP: 2407
	SECTION: 2400 RESPONSE PROCEDURES	
	SUBJECT: FIRES INVOLVING LITHIUM-ION BATTERIES	

- Request a Hazmat team immediately upon arrival.
- Tactical Assessment:
 - Utilize TICs to assess the thermal condition of the ESS. Be cautious as TICs may not reveal internal heating, leading to incomplete assessments.
- Suppression:
 - Establish a reliable water supply. Use large amounts of water for suppression. Do not use dry chemical or foam extinguishers.
 - If flames are not visible but the battery is off-gassing, consult with Hazmat before opening or ventilating the system.
- Re-Ignition Risks:
 - Re-ignition can occur for hours, days, or even weeks post-event. Monitor damaged ESS units for at least 21 days to prevent rekindling.

5. Post-Fire Procedures

- Long-Term Monitoring:
 - Li-ion batteries remain hazardous after fire events, and continuous monitoring is essential. Hazmat and IC must ensure proper isolation and observation.
- Disposal:
 - Class I Mobility Devices: Once cooled, transfer the batteries to approved containers (e.g., steel drums) for safe disposal.
 - Class II and III Vehicles: Post-fire, tow vehicles with a fire blanket in place, and continue monitoring. Inform the tow company of potential hazards.

Key Considerations

- Runoff Contamination: Lithium-ion battery fires may require thousands of gallons of water. Coordinate with environmental agencies to manage hazardous runoff.
- Electric Shock Hazard: Avoid cutting into vehicle parts or fixed systems that may carry high voltage. Always assume vehicles and ESS are energized.
- Re-Ignition Potential: All LiESS involved in fire incidents pose a significant risk of reignition. Regular thermal monitoring should continue for 72 hours post-fire, with periodic checks for 21 days.