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BATTERY ENERGY STORAGE SYSTEM RESPONSE

SCOPE: Western Placer County Fire Chiefs

POLICY CONTACT: Western Placer Regional Operations Group

GUIDELINE:

This guideline shall apply to all incidents involving lithium-ion battery energy storage systems in residential and commercial buildings and as standalone industrial facilities.

RESOURCES:

I. Residential Structure Fire
- 4 Engines
- 2 Trucks
- 1 Medic
- 2 Battalion Chiefs

II. Commercial Structure Fire
- 4 Engines
- 2 Trucks
- 1 Medic
- 2 Battalion Chiefs

III. Industrial Fire (i.e. Power Plant, Solar Farm, Commercial/Industrial BESS)
- 4 Engines
- 2 Trucks
- 1 Medic
- 2 Battalion Chiefs

PROCEDURES:

Never assume that the fire is out based on visual observation alone as re-ignition is common with battery fires. Oftentimes, the best strategy may be to allow the fire to burn itself out while protecting exposures. Use extreme caution, assume the BESS and other electrical equipment is energized.

The primary hazards associated with lithium-ion batteries are toxic inhalation, explosion, electric shock and fire. It should be assumed that the batteries and associated electrical components are energized at all times. All BESS can contain hazardous materials and should be treated as such. Because conditions can change rapidly, hoselines should be pre deployed, charged and ready for operations before ventilation or entry when thermal runaway is suspected.

A thorough risk analysis should be performed prior to engaging in firefighting operations involving lithium-ion batteries. When conditions permit, allowing the battery to consume itself may be the safest

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way to mitigate the incident.

The minimum level of protection is full structural PPE with SCBA for all personnel in close proximity to an incident involving a BESS.

I. RESIDENTIAL BATTERY STORAGE SYSTEM

a. First Engine or Truck Company if involvement of a BESS is known enroute:

- Request a response from the utility company
  - Utilize DOT Emergency Response Guide #138
- Size up the structure for indicators of an installed BESS
  - Indicators include the presence of a photovoltaic system, an additional connection at the electric meter, warning placards affixed to electrical panel or adjacent components, and/or an electric vehicle.
- Avoid positioning apparatus or staging personnel in front of the garage door
  - The greatest risk for explosion hazard is in the driveway and at doors, windows and other vent points
  - Be aware of explosion potential and release of hazardous gases, often indicated by white/gray-colored smoke and/or vapor
- Isolate the area of involvement and evacuate all residents from the structure
- Secure a water supply and prepare for defensive operations
- Identify the type and manufacturer of the BESS and determine the level of involvement, if safe to do so
- If identified, shut off the unit/system, by operating any visible disconnect, Rapid Shut-Down Devices (RSD), or E-stops, if safe to do so
  - Contact manufacturer to determine specific shutdown procedures
  - Shutting off power to the system does not de-energize the battery and an electrocution hazard may still be present
- If actively on fire and system is relatively exposed, water can be directly applied to extinguish and cool the system below 300 F.
  - Personnel are safe to apply water from 20’ using a straight stream and 10’ using a fog stream.
- If actively on fire and unsafe to extinguish without gross exposure, allow the fire to burn itself out while protecting exposures
  - Water may be applied to the exposures from a safe distance using a fog pattern to limit extension
- Once the fire is out, monitor until the unit stabilizes to ambient temperature and there is no fire, smoke, audible popping/hissing, or temperature elevation for at least 45 minutes to 1 hour.
- Develop a hazard mitigation plan in partnership with the utility representative and responsible party/homeowner.

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II. COMMERCIAL / INDUSTRIAL BATTERY STORAGE SYSTEM

a. First Engine or Truck Company

- Size-up the structure or facility for indicators of an installed BESS
  - Confirm the presence with a site representative
  - Commercial installations are often mounted on rooftops or in an adjacent structure(s). Industrial facilities may consist of several structures resembling shipping containers.
- Position apparatus at a safe distance, upwind and uphill
- Isolate the area a minimum distance of 150 feet and assess the site from a safe distance
  - Personnel should not enter a BESS building or compartment unless a thorough risk assessment has been performed and there is a known rescue
  - If there is no rescue, wait for authorized site representative prior to entering the site
- Confirm with site representative that the system has been isolated and/or shut down
  - If no representative is on scene, attempt to contact a site representative through Fire Dispatch, your agency's Fire Prevention, or law enforcement
  - Do not access the site until a site representative arrives
  - Initiate a defensive strategy and be prepared to protect exposures
  - Industrial facilities are configured with enough clearance around each installation so that exposures should not be threatened
  - Allow the affected unit to consume itself and use a wide fog stream to cool neighboring battery enclosures if necessary
- Consider balancing the incident to a High-Level Hazmat and requesting a Hazardous Material Response Team
  - Develop a hazard mitigation plan in partnership with the utility company and/or site representative
  - Allowing a BESS fire to burn itself out may last several hours to days

III. FIRST CHIEF OFFICER

Establish/Assume command if not already established. Use incident management software and/or ICS forms as available.

- Considerations
  - Request additional resources, as needed
  - Request for Hazardous Materials Response Team
  - Establish appropriate command structure
  - Establish personnel accountability
  - The hazard mitigation plan should be developed in partnership with the utility representative, site representative/responsible party, and Hazardous Materials Group Supervisor
  - Request post-incident medical screening for exposure of personnel
- Hazardous Materials Response Team
  - Evaluate the plume and determine needs for protective actions of downwind structures or communities
  - Provide onsite air monitoring and record any findings

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- Conduct defensive operations to contain water runoff as appropriate
- Coordinate with onsite representative and utility company to support onsite systems
  - Some BESS may have automated ventilation systems that can be accessed from a remote location
  - Some BESS have dual agent suppression systems that may need to be supported
- Evaluate the need for formal technical decontamination for crews supporting firefighting operations
- If decontamination is required, support proper decontamination of personnel and equipment
- Coordinate post incident mitigations with Roseville Fire Department CUPA and/or Placer County Environmental Health and other appropriate agencies.

IV. POST INCIDENT DECONTAMINATION

Following extinguishment of the fire, ensure that all hose and equipment is decontaminated with water and mild detergent prior to leaving the scene.

- Structural Firefighting Turnouts
  - If exposed to products of combustion, turnouts should be properly decontaminated per department procedures.
- Procedures For Gross Contamination
  - Gross contamination can be determined by several factors including a fire in an enclosed space, heavy exposure to vapors/gas, or the IC's discretion.
  - Initial decontamination should be performed while the firefighter is still on air to prevent exposure from off-gassing
  - Turnouts should be collected and bagged
  - Bagged turnouts should be labeled for
    - Normal products of combustion
    - Lithium-ion battery byproducts
    - Specialized hazardous materials exposure

V. MEDICAL SCREENING

- Symptomatic Personnel
  - Any member that is experiencing symptoms of chemical exposure should be treated and transported to the appropriate hospital
- Post Incident Medical Screening Recommendations
  - Heavy Metal Screening
  - Antimony, Arsenic, Bismuth, Cadmium, Chromium, Cobalt, Copper Manganese, Lead Mercury, Molybdenum, Nickle, Selenium, Tellurium, Zinc.

DEFINITIONS:

Battery Energy Storage System (BESS): A device or group of devices assembled together capable of storing electricity in order to supply electrical energy at a later time. The primary hazards associated

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with battery energy storage systems are electric shock, fire, and explosion.

Lithium-ion Battery (LiB): Rechargeable batteries consisting of cells containing a lithium salt that produce an electric current by converting chemical energy into electrical energy. They are the preferred energy storage source for rechargeable electronics due to their ability to store large amounts of energy in a small sized vessel and retain and discharge high amounts of power.

Stranded Energy: The energy remaining inside the undamaged modules and cells of a damaged high-voltage battery. This can cause the battery to reignite multiple times after a battery is extinguished. In this case, the best practice may be to let a battery fire burn itself out.

Thermal Runaway: A rapid, uncontrolled release of heat energy from a battery cell that creates more heat than it can effectively dissipate. Thermal runaway in a single cell can result in a chain reaction that heats up adjacent cells and can result in battery fire or explosion. Popping noises or white smoke that is toxic and flammable are common indicators of impending thermal runaway.

Toxic and Flammable Gases: Lithium-ion batteries undergoing thermal runaway or failure can release hazardous gases including Hydrogen (H_2), Carbon Monoxide (CO), Carbon Dioxide (CO_2), Hydrogen Fluoride (HF), Oxygen (O_2), Volatile Organic Compounds (VOCs), and nanoparticles of heavy metals including nickel, cobalt, manganese, lithium, aluminum, and copper. These gases create flammable, explosive, and toxic atmospheres. Personnel must wear full PPE with SCBA and recognize that conventional 4-gas monitors may not detect all of these hazards.

Propagation: The spreading of fire between lithium-ion battery calls initiated by thermal runaway.

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APPENDIX A – RESIDENTIAL BESS









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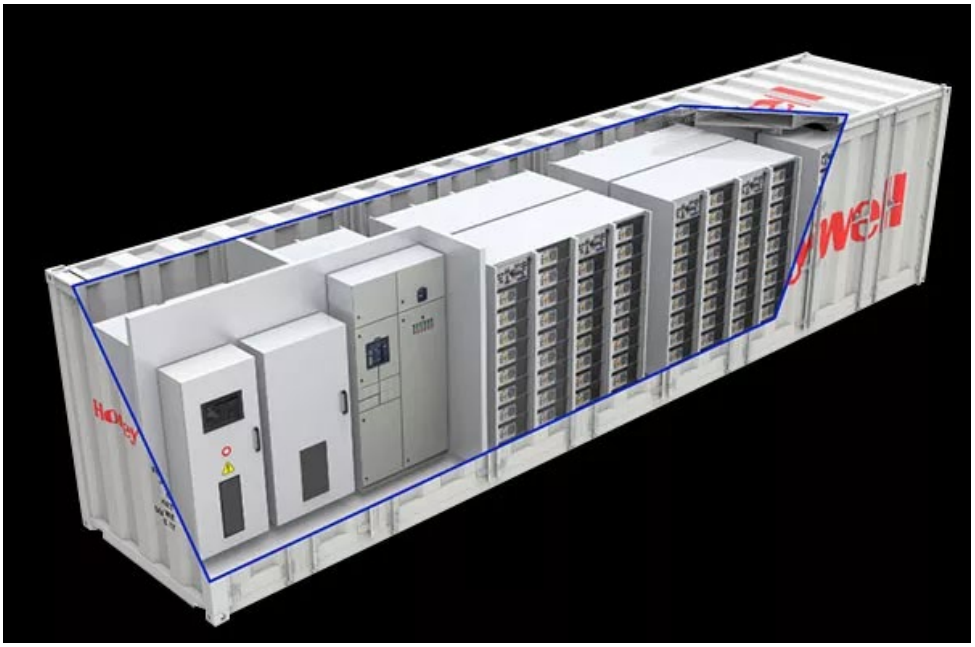
APPENDIX B – COMMERICIAL / INDUSTRIAL BESS





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REFERENCES:

Advanced Extrication: High Voltage Vehicle Firefighting

Department of Energy Alternative Fuels Data Center

IAFC Fire Department Response to Electrical Vehicle Fires

NFPA Electric and Hybrid Vehicle Quick Reference

NFPA Emergency Response to Incidents Involving Electric Vehicle Battery Hazards

NFPA Emergency Response Guides for Alternative Vehicles

FIRESCOPE ICS-1150 Battery Emergencies Operational Guideline (2025)

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The undersigned Fire Chiefs approve the contents of this document.

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