

## **Falmouth Fire-EMS Operating Guideline**

### **Response to Lithium Battery / Energy Storage System Fires**

#### **Objective:**

To provide guidelines for responding to reported Lithium Ion Battery or Energy Storage System (ESS) fires.

#### General Information:

Events can occur from damage to a battery, exterior fire, or malfunction. Smoke or suspicious odor from an ESS can be an indication of a hazardous condition. When batteries or cells enter thermal runaway, there is typically a period of smoke (maybe under pressure). The smoke is most likely flammable and may ignite at any time. Gases released depend on the battery chemistry involved but typically include gases such as: carbon monoxide, carbon dioxide, hydrogen, methane, ethane, and other hydrocarbons. After being extinguished, re-ignition can occur minutes, hours, or even days after the initial event.

#### **Guidelines:**

##### **A. Response:**

1. Response to any reported or confirmed damaged lithium-ion battery is a hazardous materials incident.
2. Response is 2 Engines, 1 Aerial, 1 Ambulance. Chief Officer if available.
3. Initial apparatus placement is the same as for a fire alarm.
4. If there is smoke or fire in a building the incident will be upgraded to a Desk Box assignment.
5. Further upgrades will be at the discretion of the incident commander (Working Fire, 2<sup>nd</sup> Alarm, etc.).

##### **B. Size-up:**

6. Initial Size-up should follow the CAN (Conditions, Action, Need). Under conditions, include any information known about the battery involved.
7. Lithium-ion batteries that are in thermal runaway or off-gassing will create hazardous atmospheres (IDLH). Crews must stay out of the vapor cloud and not rely solely on multi-gas meters (due to cross-contamination of the gas sensors).
8. For response to possible or confirmed incidents with damaged Lithium-Ion batteries or ESS fires, full personal protective equipment, including SCBA with face-piece, must be worn.
9. Due to the construction of the unit, thermal imaging cameras may not give true thermal conditions.
10. The following are signs of battery failure: Swelling of battery pack, Smoke emitting from battery, Hissing or popping noise.

11. Refer to Emergency Response Guidebook Guide 147.

**B. Fire has not developed but smoke is visible:**

1. The space should be properly ventilated with charged hand lines in place.
2. Maintain a safe distance from the battery.

**C. If fire develops**

1. Evacuate the area.
2. Defensive Firefighting, Water spray is the preferred agent for response to lithium-ion battery fires (Lithium-ion is not water reactive).
3. For ESS Isolate the area. Recommended initial evacuation distance is 150 feet. Do not enter the isolated area other than to perform a rescue.
4. Maintain a safe distance from the unit involved, fires can burn up to 3,000 degrees F.
5. If possible, crews should allow the battery to burn itself out.
6. Water should be sprayed on neighboring battery enclosures and exposures to further mitigate the spread of the hazards rather than directly onto the burning unit.
7. Applying water directly to the affected enclosure will not stop the thermal runaway event, as the fire will be located behind several layers of steel material, and direct application of water has been shown to only delay the eventual combustion of the entire unit.
8. Prior to overhaul, check to see if the battery pack is accounted for and to see if any cells may have been expelled during the fire.
9. Overpack into a vented metal container rated for the watts of the battery and cover with a thermal regulating material.
  - i. Falmouth Fire-EMS carries 8-liter containers on each Engine and a larger 5-gallon container on Engine 2.
10. For batteries larger than overpack carried by Falmouth Fire-EMS contact Portland Fire Department and request their Haz-Mat team respond to the scene.
11. Be prepared for possible re-ignition.

**D. Energy Storage System**

1. Shut off the unit/system by operating any visible disconnects or E-stops (shutting off the disconnect does not remove the energy from the battery). This could include circuit breakers, knife-blade disconnects, or other switches.
2. Maintain a safe distance from the ESS.
3. **If fire develops**
  - i. Evacuate the area. Never open any doors or remove panels to ESS units.
  - ii. Protection of exposures should be the primary firefighting objective.
  - iii. Defensive cooling/vapor suppression may be attempted after the establishment of a continuous water supply.

**E. Transportation and storage**

1. Any battery placed in department overpack container should be brought back to Central Station, preferably using Utility 4 or 6.
2. The battery and used thermal regulating material should be transferred to the 5-gallon container in the enclosure adjacent to hydrant at Central Station. This allows the remainder of the 8-liter container to be placed back in service.
3. The Incident Commander shall notify DEP and the Weekly Duty Chief.

These guidelines may be changed or altered by the Fire Chief at any time.