



Recommended Fire Department Response to Energy Storage Systems (ESS) Part 1

Events involving ESS Systems with Lithium-ion batteries can be extremely dangerous. All fire crews must follow department policy, and train all staff on response to incidents involving ESS. Compromised lithium-ion batteries can produce significant amounts of flammable gases with potential risk of deflagration and fire.

1. If a commercial or utility install, follow pre-plan and do not enter structure.
2. Residential setting response, control power to the unit, ventilate the area, and protect exposures.
3. In all cases contact manufacture technical support as soon as possible.

This guide serves as a resource for emergency responders with regards to safety surrounding lithium ion Energy Storage Systems (ESS). Each manufacturer has specific response guidelines that should be made available to first responders prior to activation.

ESS systems come in many shapes and sizes. They may be affiliated with renewable systems (wind, photovoltaic systems, etc) or used as standby power. ESS Systems can be installed in single family homes too large commercial and utility applications.

Pre-Incident

Modify or establish your department policy or standard response guideline to ESS incidents. Include guidelines for mitigation of the event which may include a defensive operations such as non-intervention and manage fire propagation or protect exposures.

Review installation procedures for systems with the various code officials including Building, Fire, and Electrical

ESS systems must be installed per the adopted fire and building codes in the region.

For the 2015 editions of the International Fire Code and NFPA 1 Fire Code and earlier editions the necessary safety requirements are not present (Consider language in 2021 Fire Codes or NFPA 855).

Ensure pre-incident plans are covering location, type, disconnect, and other contact information

Pre-incident plans should provide rapid response resources for company officers specific to your area and region including OEM emergency contact information

Train on department policy and perform practical scenarios which support the response plan

INCIDENT ACTIONS

The fire crew should allow the battery to burn itself out, during which it is recommended to apply water spray to neighboring battery enclosures and exposures to further mitigate the spread of the hazards rather than directly onto the burning unit.

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 shown to only delay the eventual combustion of the entire unit.

- Firefighters must wear full personal protective equipment, including SCBA with face-piece.
- If identified in pre-incident plan, 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). To isolate any PV system and ESS in an emergency, multiple disconnects may need to be shut off. This could include circuit breakers, knife-blade disconnects, or other switches.
- Lithium ion batteries that are in thermal runaway or off gasing will create hazardous atmospheres. Firefighters must stay out of the vapor cloud and not rely on gas monitors (without consideration of cross contamination of the gas sensors)
- Due to construction of the unit, thermal imaging cameras may not give true thermal conditions.

Events can occur from damage, exterior fire, or a malfunction. Smoke or suspicious odor from an ESS system can be an indication of a hazardous condition. When batteries or cells enter thermal runaway, there is typically a period of smoke (may be under pressure). The smoke is most likely flammable and may ignite at any time.

Responding to a venting ESS product

- Evacuate the area. **Never open any doors or remove panels to ESS units.**
- Contact vendor-specific technical support for assistance including BMS data.
- Residential units that are located inside a dwelling unit or garage, the space should be properly ventilated with charged hand-lines in place.
- Maintain a safe distance from the ESS and monitor. A remote FDC may be present on larger commercial or utility ESS to support a sprinkler system inside the enclosure.
- Each manufacturer will have a recommended time for a battery pack to cool down. This can be near a full work cycle of 12 hours or more.
- Defensive Firefighting. Water spray is the preferred agent for response to lithium-ion battery fires (*Lithium-ion is not water reactive*).
 - If a fire has not developed and only smoke is visible, take a defensive stance toward the system and be prepared to apply water spray.
 - If a fire develops, take a defensive stance toward the burning unit and apply water spray to neighboring battery enclosures and exposures.
- Maintaining a safe distance from the unit involved (large commercial systems, at least 300’).
- Response crews should allow the battery to burn out. Water should be applied to adjacent battery enclosures and exposures (building).

