BATTERY ENERGY STORAGE SYSTEMS

Battery energy storage systems (BESS) pose unique hazards to firefighters. With recent advances in battery technology and renewable energy, lithium-ion batteries have become one of the leading solutions for large-scale energy storage. Buildings or facilities containing a BESS may not have markings that specifically identify the presence of these systems. Markings may only indicate a general electrical hazard is present. An independent facility containing a BESS may appear to be a steel building resembling a conex box. These facilities may be found anywhere or incorporated in another structure, including residential.

The types of catastrophic failures that can occur in all battery systems are amplified by the size and scale of BESS. The hazards are dependent on the design of the BESS, characteristics of the compartments containing the BESS, and levels of fire protection systems in the structure.

In smaller residential settings, a lithium-ion battery module may undergo thermal runaway as a result of exposure to a heat source unrelated to the battery. For example, a battery module located in or near a garage is exposed to a car fire can liberate toxic and flammable gases and present extinguishment problems.

BESS failures can occur for a variety of reasons including but not limited to:

1. Thermal abuse (external temperatures)
2. Physical/mechanical damage
3. Electrical abuse (over-charging or repeated excessive charging rates)
4. Environmental impacts (electrical surge, lighting, etc.)
5. Internal faults within the battery cell
6. Other electrical faults or system failures

In addition, stranded energy or remaining energy is an important factor regarding a BESS incident. Residual energy within a damaged lithium-ion battery or BESS presents a significant fire, shock, and/or explosion hazard to firefighters.

RESPONSE TO BATTERY ENERGY STORAGE SYSTEMS

- BESS must always be considered energized. Firefighters should exercise extreme caution when dealing with BESS and all energized electrical equipment.
- Request utility company to respond.
- Request a 3&1 or greater hazardous materials response.
- **Do not make entry or approach BESS building or compartment.**
    - The exception to this is a savable life/known rescue.
- Clear the area. Recommended initial evacuation distance is 150 feet.
- **Be aware of explosion potential and off-gassing of hazardous materials. White colored smoke is a good indication of hazardous off-gassing.**
- Place apparatus in a safe location away from BESS and overhead power lines.
- Protect exposures.

- The Incident Commander will make the ultimate determination regarding hazard mitigation. The hazard mitigation plan should be developed in partnership with the utility representative and/or responsible party.
    - Through this careful approach, hazardous materials technicians may take calculated steps to mitigate that hazard.
    - Depending on the BESS type and size, mitigation steps may include identification of the hazard, separating from electrical supply (i.e., electrical grid or photovoltaic system), ventilation, and cooling.

Note: All BESS contain quantities of hazardous materials. In the event of an emergency with a BESS, a toxic environment may be created that is not visible. Metering of the environment by hazardous materials crews is necessary as is the usage of full personal protective equipment. Massive quantities of water over an extended period is the only established means of preventing continuous thermal runaway in a lithium-ion battery. Provisions for controlling hazardous runoff should be implemented.