NFPA Energy Storage Safety Training

February 22, 2017
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Incidents

Kahuku, Hawaii: August 2011

• 12,000 lead acid batteries
• Fire burned for several days
• Initial extinguishment was attempted with dry chemical with limited success
• Building not designed for hazard level
Incidents

Franklin, Wisconsin: August, 2016

• Fire in a battery energy storage system under construction in shipping container

• Facility staff advised against using water due to Lithium

• 20+ departments responded, fire confined to container
NFPA Energy Storage Systems Research

2014 - DOE Published a Strategic Plan for Energy Storage Safety.

- Identified gaps in CSR and first responder training.


Battery ESS Safety Focus: Li-ion Chemistries

Li-ion Projects (2015): 115,  Lead Acid: 37,  Sodium based: 20  Nickel based: 4

Li-ion ESS concerns for fire service:
- Corrosive to Eye Tissue
- Can cause Skin Burns
- May be Carcinogenic (if Cobalt compounds present)
- Can cause Tissue Damage

Thermal Runaway Issues:
- Venting of Toxic and Flammable Gases (CO2, CO, H2, CH4)
- Difficult to Extinguish Fire
- Projection of Battery Materials
Fire Service Safety Training

- Instructor-led Classroom Course
- Online Training
- Interactive 3D Models
- Educational Videos
- Quick Reference Materials
Topics Covered

• ESS applications, types, and terminology
• Basic electrical theory
• Introduction to battery energy storage systems Failure modes and hazards
• Pre-incident planning
• Emergency response procedures
• Chapter 52, Stationary Storage Battery Systems

- Venting
- Thermal Runaway
- Location & Separation
- Spill Control

- Neutralization
- Signs
- Seismic Protection
- Smoke Detection
• Article 706, Energy Storage Systems
  – Classifies ESS into 3 Categories
    • ESS, self-contained
    • ESS, pre-engineered of matched components
    • ESS, other
  – Circuit Requirements
  – Electrochemical Energy Storage Systems
  – Flow Battery Energy Storage Systems
NFPA 855 – Standard on the Installation of Stationary Energy Storage Systems

Standard will address
• Design
• Construction
• Installation
• Fire Protection
• Fire Prevention
• Commissioning
• Operation
• Maintenance
• Decommissioning

1.1 Scope.
This standard establishes criteria for minimizing the hazards associated with Energy Storage Systems.
**Energy Storage System** - A device or more than one device, assembled together capable of storing energy for use as electrical energy at a future time.

- **Chemical**
  - Hydrogen
- **Electro-chemical**
  - Batteries
  - Flow Batteries
- **Electrical**
  - Capacitors
- **Mechanical**
  - Flywheel
  - Pumped Hydro
  - Compressed Air
- **Thermal**
  - Thermal Energy Storage
**Activities to Date**

- **Project Proposal:** Early 2016
- **Project Approved:** April 2016
- **Roster Approved:** August 2016
- **Introductory Meeting:** December, 2016
- **Drafting Meeting:** January, 2017
NFPA 855 – Standard on the Installation of Stationary Energy Storage Systems

Timeline
Drafting Meeting: April 2017
Standards Council Approves Draft: August 2017
Open for Public Input: 2017
First Draft Meeting: 2017
Open for Public Comment: 2018
Second Draft Meeting: 2018
Thank You