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# Energy Storage System Engineering Design Challenge

SUPDET 2018 Webinar

30 November 2018 | Fire Protection Research Foundation

# Overview

- To meet the “clean energy” strategic plans:
  - Currently seeing a rapid global increase in ESS deployments.
  - Exponential growth expected in the future (Through indoor and outdoor installations as well as containerized solutions)
- Critically important to maintain the safety infrastructure.

Future Projection of Global Li-Ion Battery ESS Installations Over Time





Source: DOE Global Energy Storage Database



# SUPDET ESS Design Challenge Workshop

## Design Challenge Case Study:

- ESS installation inside a high rise building.
  - Purpose: To address and propose innovative solutions to the engineering challenges associated with indoor ESS installations.
- Design concepts will be presented by:
  - Koffel Associates
  - Jensen Hughes/Cal Poly Fire Prot. Eng. Program
  - Fire & Risk Alliance
  - Nexceris



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**SUPDET 2018 ESS Design Challenge Workshop**  
Date Updated: 22 August 2018

When: 12 September 2018, 1:00 – 5:00 pm ET

Where: Embassy Suites Raleigh Durham Research Triangle East, Cary NC during the Foundation's annual SUPDET 20 conference

**Who can attend:** This event is open to all SUPDET registrants. SUPDET annual symposium which brings together leading experts in the field of fire protection engineering for the purpose of sharing recent research and development on techniques used for fire suppression, detection, and signaling. For more information on SUPDET and registration options, please visit [www.nfpa.org/supdet](http://www.nfpa.org/supdet).

**Background:** Energy Storage Systems (ESS) play an integral role for attaining a resilient and efficient electrical grid - providing a means of storing electrical energy generated from other renewable energy sources. However, ESS pose unique challenges with respect to fire safety. Designing engineered fire suppression and detection systems is currently a challenge for fire protection engineers. Since current codes and standards are just beginning to address the applicable requirements for these systems, the design guidance is limited and is significantly reliant upon engineering judgement.

**Objective:** The objective of this workshop is to review preliminary design concepts which illustrate innovative approaches to fire protection of a case study ESS installation within a high-rise building to meet the general design objective of minimizing loss and preventing re-ignition hazards.

**Workshop Discussion:** The workshop will consist of presentations addressing design concepts for ESS in high rise buildings that addresses critical fire scenarios to be protected against, general fire safety design approaches, and any gaps in information and technology. In addition, the facilitated workshop discussion will also include, but not be limited to, the following: handling products of combustion; handling liquid runoff; managing long-duration events, potential overpressure events; use of automatic safety systems; involvement of manual intervention; other concerns and associated challenges.

Time	Agenda Item	Presenter				
1:00 – 1:15 PM	Call to Order, Meeting Preliminaries, Objectives and Deliverables	Casey Grant	15			
1:15 – 1:35 PM	Koffel Associates Design Concepts Presentation	Koffel Assoc.	20			
1:35 – 1:55 PM	Jensen Hughes/Cal Poly Design Concepts Presentation	Jensen Hughes / Cal Poly Fire Protection Engineering Program	20			
1:55 – 2:15 PM	FRA Design Concepts Presentation	FRA	20			
2:15 – 2:35 PM	NEXCERIS Design Concepts	Nexceris	20			
2:35 – 2:55 PM	Applications and Enforcement Issues	Paul Rogers	20			
2:55 – 3:30 PM	Break		35			
3:30 – 4:45 PM	Facilitated discussion on the following topics: <ul style="list-style-type: none"><li>- Handling of products of combustion</li><li>- Handling liquid runoff</li><li>- Managing a long-duration event</li><li>- Potential overpressure events</li><li>- Use of automatic safety systems (e.g. BMS)</li><li>- Involvement of manual intervention</li></ul>	All Attendees	75			
	Other Challenges					
	4:45 – 5:00 PM			Summary and Resp. of Design Concepts and Challenges	Casey Grant	15



# SUPDET ESS Design Challenge Workshop

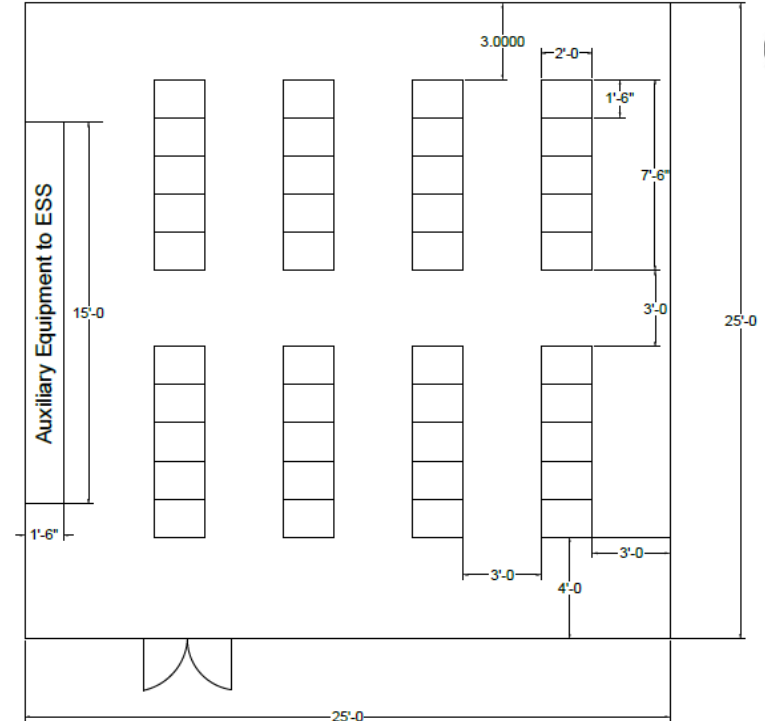
## Objective

- The objective of the following presentations is to review preliminary design concepts which illustrate innovative approaches to fire protection of a case study ESS installation within a high-rise building to meet the general design objective of minimizing loss and preventing re-ignition hazards.



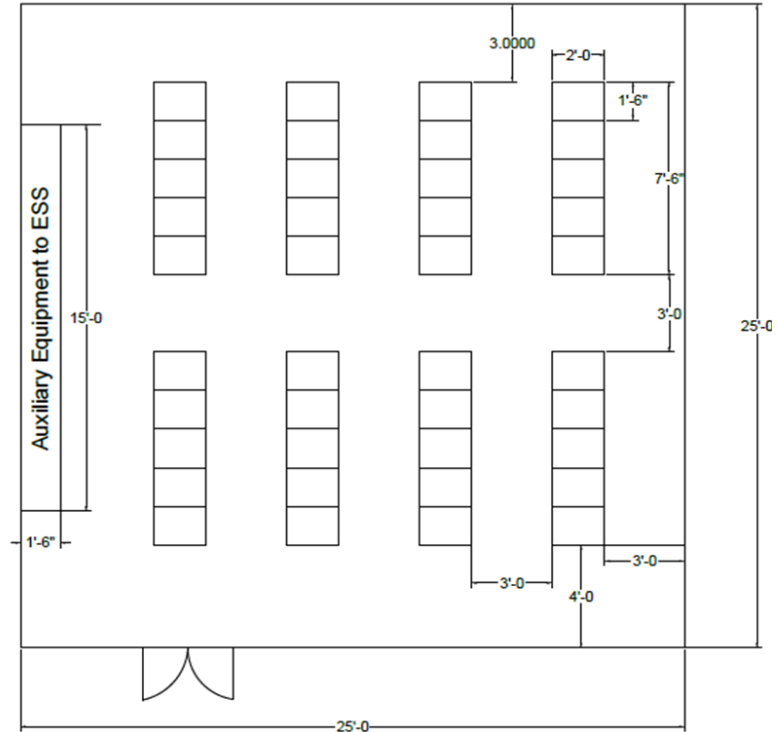
# Case Study Description

- **Location**: In a room on the 5<sup>th</sup> floor of a NEW multi-occupancy high rise building (Retail, Commercial, and Residential).
- **Room Area**: 25 ft x 25 ft x 12 ft (height)
- **Construction Type**: Type 1A – Reinforced Concrete
- **ESS Capacity**: 1.6 MWh (Total) – 40 kWh per rack
- **Battery Chemistry**: Lithium Nickel Manganese Cobalt Oxide (NMC)
- **Fire Department Access**: Exterior FD access restricted



# SUPDET ESS Design Challenge Workshop

- Identify critical fire scenarios
- Present conceptual fire safety design approach
  - System capability
  - Performance expectations
  - Fire safety management issues
- Key concepts to be addressed:
  - Handling products of combustion
  - Handling liquid runoff
  - Long-duration event
  - Potential overpressure
  - Automatic safety systems
  - Post-event hazards
  - Economic feasibility



Case Study Installation: ESS Design Challenge





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## UP NEXT:

### Design Concepts Presented by:

- Koffel Associates
- Jensen Hughes and Cal Poly Fire Protection Engineering Program
- Fire & Risk Alliance
- NEXCERIS