Proactive ESS Safety through Collaboration and Analysis

Utility Engagement

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Agenda

- EPRI ES Safety Work
- ES Fire Prevention and Mitigation Project
- Utility Experiences
- Next Steps
Recent EPRI ESS Safety Efforts

2016
- Energy Storage Safety Guidelines
  (publicly avail.)
  EPRI ESIC w/ Sandia

2018
- Public & Occupational Health Risks
  Associated with the Battery Life Cycle
  EPRI

2019
- Characterization of Grid-Scale Battery Combustion Products
  EPRI
- Energy Storage Fire Incident Reporting Template
  (publicly avail.)
  EPRI ESIC w/ PNNL

2020
- Energy Storage Reference Hazard Analysis Guide
  (publicly avail.)
  EPRI ESIC
- Health and Safety Considerations for Grid Scale BESS
  EPRI
Available Now: Reference Fire Hazard Mitigation Analysis

Mapping Failure Modes to Guide Future Work

www.EPRI.com/ESIC
13 Utility Participants, 15 Industry SMEs
Project Components

Expert Collaboration

Site-Specific Hazard Assessment

Top-Down

Bottoms-Up

Strategic Roadmap

Data Collection
Modeling
Validation

Phase I

Phase II
Convening Industry Experts

- Matching utility in-house knowledge base with industry experts to form multi-disciplinary Advisory Committee
- Bringing wholistic perspectives to the table
- Addressing concerns with recommendations and guidance in real-time
Site-specific Safety Reviews

Inform Failure Modes, Safety Assessments, Response Measures
What are utilities saying?

▪ “Is one Li-battery chemistry "safer" with regards to fire hazard than another?”
▪ Still need “Design requirements of BESS for safety.”
▪ “General recommendations for evacuation zone around a[n] ESS of a given chemistry and size during an event” would be helpful.
▪ “Is the effectiveness of early warning off-gas detection systems verified by independent third parties... are the results consistent at detecting off-gassing and tripping the system in time?”
▪ “How do we quantify the probability of failure and how does that impact the number of layers of protection required to mitigate risk?”
**Have you suspended any energy storage activities in the previous two years to evaluate safety at a site?**

- Yes, at least one operational system was taken offline: 26%
- Yes, at least one design effort was delayed: 19%
- No, we maintained progress as originally planned: 42%
- No, we don't have any sites planned or operating yet: 13%

**Do your energy storage site AHJs recognize NFPA 855?**

- Yes, all: 10%
- Yes, some: 4%
- Not yet: 45%
- We don't deal with permits and AHJs: 21%

**Have you coordinated with your local fire department for energy storage first response activities?**

- Yes, for every site: 44%
- Yes, for some sites: 24%
- No, but we plan to: 29%
- No, we don't have any energy storage: 3%

**Have you received any UL 9540A (or other fire test) data from energy storage integrators/suppliers?**

- Yes: 32%
- No: 68%
- No, but our offtake agreements require it: 0%
- No, we don't have any energy storage: 3%
Business Model Considerations

- Where does responsibility lie for PPA offtakers?
- What role should utilities play for customer-sited ESS?

- Permits and Authorizations
- Community Engagement
- First Responder Coordination
- Inspections and Maintenance
Increasing the Impact of Future Research

- Are standards in design emerging?
  - What are the key trends of product configurations?
  - What denotes a “representative system” for modeling and test?

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<th>Option 1</th>
<th>Option 2</th>
<th>Option 3</th>
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<td>LFP</td>
<td>Vanadium Flow</td>
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<td>Rural (utility)</td>
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Expensive Testing \(\iff\) Limited Data
Standard Configurations May Promote Enhanced Adoption
Together...Shaping the Future of Electricity

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