Natural Hazards Research Australia

Safety of Alternative and Renewable Energy Technologies (SARET)

Collaborative Research Program

Jamie Vistnes
Manager Fire Safety Policy
Fire and Rescue NSW

As one of the world's largest urban fire services, FRNSW has a duty to minimise the risk and impact of fire on the public and our firefighters.

FRNSW intends to deliver impactful research that:

- supports evidence-based policy and decision making;
- informs our fire prevention activities in the community and in the built environment; and
- enhances our response capabilities.

LITHIUM-ION BATTERIES (LiBs)

APPLICATIONS

What are the hazards?

- THERMAL RUNAWAY
- VAPOUR CLOUD EXPLOSION
- TOXIC EMISSIONS & EFFLUENTS
- STRANDED ELECTRICAL ENERGY
- PROTRACTED EXTINGUISHMENT
- RECYCLING AND DISPOSAL

Natural Hazards Research Australia

FIRE + RESCUE

LITHIUM-ION BATTERY INCIDENTS

2022 - 2023

Version 1.4 – 21 March 2024

Prepared by the SARET Research Team

research@fire.nsw.gov.au

Summary of Main Findings

- FRNSW attended 171 incidents in 2022, and 285 in 2023 where lithium-ion batteries (LiBs) or LiB devices were involved in ignition or failure
- This represents a 66% increase in incidents year-on-year
- Incidents involving LiBs were 4 times more likely to result in injury than all fire and explosion incidents attended
- The duration of incidents involving LiBs increased by 67% from an average of 73 minutes in 2022 to 122 minutes in 2023

Summary of Main Findings

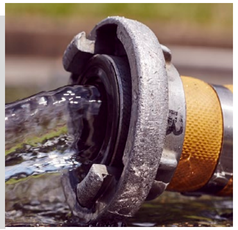
- FRNSW attended 177 fire incidents in 2023 involving waste trucks, waste collection and waste management, representing an increase of 43% from 2022
- Due to mixed loads, compaction and fire damage, it is often difficult to determine the exact cause of fires in waste receptacles and sites
- Of the 301 waste management related fires in the period, 31 (10%) were reported to have been caused or likely to have been caused by incorrect disposal of LiBs or LiB devices

LiB Incident Risk

SARET COLLABORATIVE RESEARCH PROGRAM

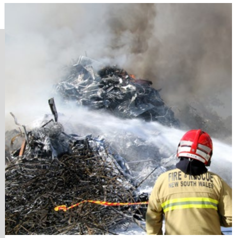
P1 - FIRE SERVICE RESPONSE TO LIB FIRES

Efficacy of various extinguishing agents and methods, specialty tools and equipment, and first responder personal protective clothing and equipment in LiB-related incidents.



P2 - END-OF-LIFE LIB HAZARD MANAGEMENT

Lithium-ion battery-related fire and explosion risk in battery recycling collection programs, and the safe handling, storage and transportation of damaged LiBs and battery systems.



P3 - ELECTRIC VEHICLE FIRES IN STRUCTURES

Electric vehicle fire behaviour and fire brigade response in parking garages.

P4 - FIRE PROPAGATION IN ENERGY STORAGE SYSTEMS

Fire propagation within and between stationary battery energy storage systems and fire safety requirements.

https://www.fire.nsw.gov.au/saret

Project 4 - Fire Propagation In Battery Energy Storage Systems

→ Project 4 of the SARET Collaborative Research Program aligns with both NHRA's focus on research that will promote natural hazard resilience and reduce disaster risk, and a number of FRNSW's research priority areas, including:

- safety of our built environment;
- the production, storage, use and transport of new and emerging fuels;
- operational decision-making and safety during an incident; and,
- reducing the economic impact of emergencies.

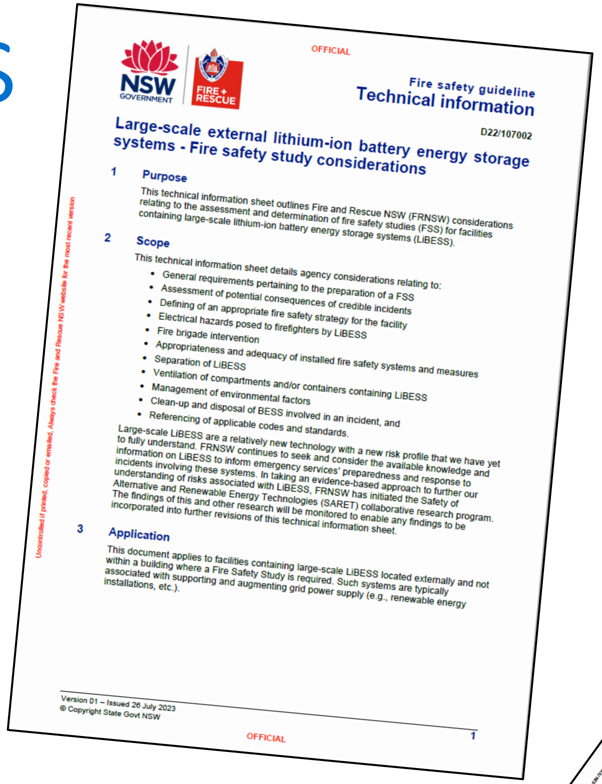
Project 4 - Fire Propagation In Battery Energy Storage Systems

- The project aims to investigate the risks related to fire propagation within and between stationary energy storage systems due to external factors (such as fire impingement, temperature extremes, impact/shock and vibrations, and water ingress/flooding) not considered in current standards.
- This will be achieved by conducting a series of comprehensive real fire tests at Fire and Rescue NSW's Fire Research and Testing Facility in Londonderry, NSW.

Intended Project Outcomes

→ A better evidence base for fire safety recommendations regarding battery energy storage system installations, including residential, commercial and grid-scale installations that will inform:

- Standard operating procedures and guidelines for emergency responders on energy storage system fires
- Improved training materials for emergency responders on best practice BESS fire response and management
- Revision of building regulations, codes and standards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NSW GOVERNMENT | FIRE + RESCUE

Fire safety guideline

Technical information

D22/107002

Large-scale external lithium-ion battery energy storage systems - Fire safety study considerations

1 Purpose

This technical information sheet outlines Fire and Rescue NSW (FRNSW) considerations relating to the assessment and determination of fire safety studies (FSS) for facilities containing large-scale lithium-ion battery energy storage systems (LiBESS).

2 Scope

This technical information sheet details agency considerations relating to:

- General requirements pertaining to the preparation of a FSS
- Assessment of potential consequences of credible incidents
- Defining of an appropriate fire safety strategy for the facility
- Electrical hazards posed to firefighters by LiBESS
- Fire brigade intervention
- Appropriateness and adequacy of installed fire safety systems and measures
- Separation of LiBESS
- Ventilation of compartments and/or containers containing LiBESS
- Management of environmental factors
- Clean-up and disposal of BESS involved in an incident, and
- Referencing of applicable codes and standards.

Large-scale LiBESS are a relatively new technology with a new risk profile that we have yet to fully understand. FRNSW continues to seek and consider the available knowledge and information on LiBESS to inform emergency services' preparedness and response to incidents involving these systems. In taking an evidence-based approach to further our understanding of risks associated with LiBESS, FRNSW has initiated the Safety of Alternative and Renewable Energy Technologies (SARET) collaborative research program. The findings of this and other research will be monitored to enable any findings to be incorporated into further revisions of this technical information sheet.

3 Application

This document applies to facilities containing large-scale LiBESS located externally and not within a building where a Fire Safety Study is required. Such systems are typically associated with supporting and augmenting grid power supply (e.g., renewable energy installations, etc.).

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Thank You

Jamie Vistnes
Manager Fire Safety Policy
Community Safety Directorate
Fire and Rescue NSW
Email: jamie.vistnes@fire.nsw.gov.au