



Fire safety considerations for outdoor community batteries, stand-alone power systems, street utilities or fixtures containing lithium-ion batteries

Background and Scope

- Batteries are being used by businesses and distribution network service providers in communities as off-grid or backup supplies, or to reduce grid congestion as households and businesses turn to renewable energy and generate more than they use.
- This document applies to small systems that power street signage and lighting, pillar box-sized pole- and pad-mounted batteries, stand-alone power systems (SAPS) and large kiosk- or container-sized community batteries (also referred to as “community energy storage” or “neighbourhood batteries”) of up to 600 kWh in capacity.
- These systems commonly employ lithium-ion batteries (LiBs) and present several risks and challenges with regards to fire and emergency service intervention in the event of a collision or fire.
- Fire and Rescue NSW (FRNSW) has seen a significant rise in fires related to LiBs in many applications.
- Lithium-ion batteries are highly energy-dense and contain electrolytes that are highly toxic, corrosive, and flammable. Fires can be triggered by overcharging, overheating or exposure to extreme temperatures, physical abuse (e.g., impact, crushing, piercing, etc.), short-circuiting, battery cell defects and ageing.
- When LiBs fail, they can undergo *thermal runaway*. This involves violent bursting of one or multiple battery cells, hissing and release of toxic, corrosive, flammable, and potentially explosive vapours and gases, and an intense, self-sustaining fire that can propagate to surrounding cells and be difficult to extinguish.
- Additional challenges for emergency responders include hazardous voltage and stranded electrical energy risks, protracted extinguishment and cooling, risks of secondary ignitions and related challenges in rendering safe, containment of contaminated firefighting water, and risks in handling, transportation, and disposal/recycling of fire-affected LiBs.

Site and design considerations

The installation of equipment containing LiBs within the urban streetscape should consider the following:

- Surrounding site exposures: LiB systems should be located at least 3 metres away from other buildings, structures, utilities, and occupiable areas. A minimum distance of 0.9 metres is acceptable where a suitable fire-rated barrier (1hr) or enclosure (2hrs) is used in accordance with NFPA 855¹. Consideration should be taken regarding proximity to surrounding vegetation and nearby bushlands. The location should also take into consideration any nearby air intakes for building HVAC systems should an incident occur in which toxic and flammable vapours and gases emanate from the LiB system.
- LiB system exposures: LiB systems are sensitive to extreme temperatures, water ingress, electrical abuse, or impact. Adequate protection by way of site considerations, high ingress protection (IP) of the enclosure and additional impact protection should be considered (e.g., bollards should be provided where LiB systems are installed near roadways).
- Consideration of flammable and explosive vapour/gas build up: LiB system enclosures should include vents to prevent the build-up of explosive vapours and gases should an incident occur involving failure of the LiB cells. Incidents have occurred in which firefighters have been injured and killed when opening LiB enclosures following fires.

- Firefighting water supplies: siting for any LiB system requiring an emergency response strategy that includes the application of water for firefighting and/or extended cooling should be located within 60 metres of an operational street hydrant.
- Contaminated fire water run off: siting for any LiB system should consider the potential for contaminated firefighting water to enter local waterways or groundwater.

Emergency considerations

- Signage for identification, warning, and emergency information: LiB systems must be easily identifiable with appropriate signage displayed in accordance with the relevant requirements of AS/NZS 5139, AS/NZS 3000, and the AS/NZS 4777 series.
- Provision of emergency response information: Emergency contact information, shut down and electrical isolation procedures, safety data sheets (SDS), and emergency response guides should also be made available online, and provided to FRNSW for pre-incident planning.
- Notification: Any LiB system requiring firefighting intervention should include automatic detection and notification to emergency services. In addition, FRNSW should be kept notified of the locations of new installations and provided with up-to-date information on any system or emergency contact changes.

For further information please contact the Fire Safety branch on (02) 9742 7434 or email firesafety@fire.nsw.gov.au.

ⁱ NFPA 855. Standard for the Installation of Stationary Energy Storage Systems. 2023 Edition. Reference: Section 9.5