The Public Health and Environmental Impacts of Lithium-Ion Battery Storage Fires

FREQUENTLY ASKED QUESTIONS

Battery energy storage systems, such as the utility-scale installation pictured here, can be paired with wind and solar.

Photo: iStockphoto/ Mike Mareen

What is battery storage?

A battery energy storage system is a rechargeable battery that stores energy from other sources, such as rooftop solar panels or the electric grid, to be discharged and used at a later time. For homes and businesses, batteries can deliver year-round cost savings, provide valuable grid services, and serve as a clean, reliable and automatic backup power option in the event of a grid outage. For utilities, batteries can be a cost-effective tool to meet peak demand and provide flexibility to the power grid. While battery storage systems can be composed of different materials, lithium-ion batteries are the most common.

What fire safety risks should I be aware of?

In rare cases, lithium-ion batteries can cause fires due to a process called thermal runaway, in which the battery enters an uncontrollable, self-heating state. This can be caused by issues including prolonged exposure to high temperatures, overcharging, an aging battery, system failures, or manufacturer defects. Fires caused by lithium-ion batteries are rare and largely

preventable. Thermal runaway can also be triggered by exposure to high heat, such as from an unrelated fire within the home.

A third-party review of large-scale battery energy storage system fires in the US between 2012–2024 found no contaminant concentrations in water, air, or groundwater that would prompt a public health concern or require further remediation.[1]

Will a lithium-ion battery fire affect air quality?

While lithium-ion batteries do not release emissions during normal operations, in the event of a fire, a lithium-ion battery will primarily emit carbon monoxide (CO), carbon dioxide (CO_2), and other volatile organic compounds (VOCs). Depending on the battery storage system materials, trace amounts of other gases such as hydrogen fluoride (HF) and hydrogen cyanide (HCN) may also be released during a fire. However, air quality data has consistently indicated that toxic gas concentrations outside the immediate fire area do not pose a public health risk. In well-ventilated or outdoor fires, gases tend to disperse quickly and rarely reach flammable concentrations, which minimizes the risk of widespread exposure.

Are there water and soil contamination concerns after battery storage fires?

In some cases, particularly for larger lithium-ion battery systems, first responders may allow a battery fire to burn itself out while using water to cool nearby structures or equipment to prevent the fire from spreading. When water is not applied directly to the battery, this cooling water behaves similarly to rainwater and is unlikely to contain contaminants. Studies indicate that although lithium-ion battery fires produce chemical byproducts, many of these have low water solubility, which reduces the risk of groundwater contamination. However, in certain situations, fire crews may use chemical fire suppressants or large volumes of water to extinguish or control the fire. This can increase the likelihood of soil or water contamination, particularly if runoff is not properly managed. To mitigate this risk, standard stormwater management practices are typically implemented at battery storage sites to contain and prevent contaminated runoff from reaching nearby waterways.

What kind of cleanup and monitoring happens after a battery storage fire?

Remediation following a large-scale battery storage system fire is a complex process that depends on the size of the fire, the type of battery system, and the facility's location. Site operators will coordinate with local environmental agencies to develop a remediation plan tailored to the specific incident. For larger incidents, environmental monitoring will need to

1 This report did not include results from the 2025 Moss Landing battery fire, as the investigation was ongoing when the report was released.

be conducted to assess air, surface water, and groundwater for the presence of toxic gases, heavy metals, and other VOCs. If fire suppression runoff reaches soil or nearby water bodies, targeted testing should be carried out to determine the extent of contamination.

If contamination is found after a battery storage fire, a remediation process should follow. Based on test results, cleanup actions may include soil excavation and disposal, groundwater treatment, or other remediation strategies such as bioremediation. The specific methods used will vary depending on the contaminants detected and the characteristics of the site.

CASE STUDY

Moss Landing Battery Storage Fire

In January 2025, a days-long fire erupted at the Moss Landing Vistra Power Plant located in Monterey County, CA. This was the largest battery storage fire ever recorded; the facility contained roughly 100,000 lithium-ion batteries with a total capacity of 500 megawatts.

An aerial view of the Moss Landing Vistra Power Plant, taken in November 2023.
Photo: iStockphoto/Kara Capaldo

First responders allowed the fire to burn out while managing its containment by using water on surrounding structures. The fire produced large flames and smoke, prompting evacuations of nearby residents and shelter-in-place orders for surrounding areas. Residents were encouraged to close windows and doors as well as turn off ventilation systems due to potential air hazards.

After the fire, the EPA and other local agencies detected no harmful airborne toxins and concluded there was no immediate public health threat. Research scientists detected heavy metal nanoparticles, including nickel, manganese, and cobalt, in soils in the Elkhorn Slough Reserve, an environmentally sensitive area adjacent to Moss Landing. After further soil sampling and testing, Monterey County determined that there was no widespread contamination but observed that localized contamination of cobalt, lead, and/or manganese exceeded screening levels in 8 of 108 samples. Similarly, an analysis published in November 2025 reported evidence of a shallow layer of heavy metals in Elkhorn Slough. Although concentration of metals significantly diminished after rainfall and tide cycles, the findings highlight the need for rigorous environmental monitoring, both immediately following and over the longer term, a large battery storage fire.

The Moss Landing incident underscores the need for clear and comprehensive incident response plans for battery storage sites to ensure first responders, communities, and remediation experts are prepared in the event of a fire. In

the aftermath, the community called for stricter safety regulations around battery storage and local officials proposed revised zoning setbacks for future facilities. Seven months after the fire, the facility owner began working on a formal cleanup process approved and overseen by the EPA. After the incident, EPA developed a Community Involvement Plan to provide transparent information, identify gaps, and engage the community. As of June 2026, most of the burned batteries have been removed and the EPA is moving into Phase 2 of the clean-up, which includes removing the remaining batteries and demolishing the building.

The Moss Landing battery storage system was built prior to the establishment of existing energy storage safety codes and regulations. The Moss Landing Power Plant was a single large battery storage installation housed in one large, repurposed facility. This "warehouse-style" configuration was utilized for a few early, very large projects but is now rare. Once one battery caught fire, it quickly spread, becoming unmanageable almost immediately after igniting. Today, batteries are installed in modular containers, each with its own safety equipment. The delineation between batteries means that fires are less likely to spread, and therefore more easily managed by first responders.

Read other fact sheets in this series:

- *Utility-Scale Lithium-Ion Battery Storage Fire Safety: Frequently Asked Questions* (December 2025)
- *Residential Lithium-Ion Battery Storage Fire Safety: Frequently Asked Questions* (December 2025)

These fact sheets and related resources are available on Clean Energy Group's website at www.cleanegroup.org/battery-energy-storage-fire-safety-toolkit.