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Major concerns - hazard consequence analysis

Additional submitted attachment is included below.

June 30, 2025

Commissioners and Staff
California Energy Commission
715 P Street Sacramento, CA 95814

INADEQUATE HAZARDOUS CONSEQUENCE ANALYSIS – COMPASS PROJECT

Commissioners and Staff:

The CEQA purpose for a Battery Energy Storage System Hazard Consequence Analysis report is to assess the potential environmental impacts related to hazards and hazardous materials associated with the project. The analysis helps identify potential safety risks, determine impacts on surrounding receptors (e.g., nearby residences, schools, businesses), and identifies potential hazards associated with the BESS, such as **fire**, explosions, thermal runaway, and the release of hazardous materials (e.g., toxic gases).

Dudek's Hazardous Consequence Analysis, dated May 23, 2025, evaluated the potential to cause adverse health effects on nearby receptors in the scenario of only a runaway thermal event, and not a **fire**.

This analysis provides a list of the chemical constituents that could be emitted from lithium-iron phosphate batteries during a thermal runaway event, based only on the UL 9540A testing, which did not show a significant combustion event, so there was only an extrapolation of data to apply to a full battery unit failure for comparison. The data would be much different if it were based on a large-scale fire test, which many fire authorities are now requiring.

The UL 9540a test and large-scale fire test difference lies in what each test is designed to reveal—and how far they push the system.

UL 9540A is a thermal runaway characterization test. It's a stepwise method (cell → module → unit → installation) that evaluates whether a lithium battery system, when forced into thermal runaway, will propagate fire or release flammable gases. But here's the catch: UL 9540A doesn't require ignition. It's more about understanding the conditions under which fire might occur, not proving that it will.

In contrast, large-scale fire testing—like the CSA TS-800:24 protocol—intentionally ignites a fully charged energy storage system to simulate a worst-case fire scenario. The goal is to observe whether flames, heat, or explosions spread to adjacent units. This test is far more aggressive and realistic, especially for utility-scale deployments where multiple containers are packed closely together. To put it simply:

> UL 9540A = "What happens if thermal runaway starts?"

Large-scale fire test = “What happens when it’s already on fire?”

This distinction is why many authorities having jurisdiction (AHJs) now require both tests. UL 9540A helps with design and risk modeling, while large-scale fire testing validates real-world containment and fire spread prevention. When evaluating systems for wildfire-prone areas or tight installations, large-scale fire test data is vital and fire code compliant.

There’s a meaningful difference in toxic smoke emissions between UL 9540A testing and large-scale fire tests—primarily due to how each test is conducted and what it’s designed to measure. UL 9540A tests—especially at the cell and module levels—are performed under controlled lab conditions. These tests often use gas chromatography and calorimetry to quantify emissions precisely. Because ignition is not always involved, the smoke profile may reflect pre-combustion venting more than full combustion.

In contrast, large-scale fire tests (like CSA TS-800 or full-scale container burns) intentionally ignite the system and allow it to burn under realistic conditions. This results in:

- Higher total smoke output
- More complete combustion, producing different toxicants (e.g., dioxins, PAHs)
- Greater release of hydrogen fluoride (HF) and metallic particulates from battery electrolytes and casings

These tests better simulate what first responders or nearby populations might face in an actual fire, including acute inhalation hazards.

Also, the thermal runaway phase and the large-scale fire phase in grid-scale energy storage systems are related but distinct stages of a failure event.

Thermal Runaway Phase

- Self-sustaining chemical reaction within a battery cell leads to rapid temperature rise, gas release, and potential ignition.
- Triggered by overcharging, physical damage, manufacturing defects, or external heat sources.
- One cell overheats and fails, releasing heat and gases that cause neighboring cells to fail in a domino effect.
- Temperatures can exceed 1,000°C (1,800°F) inside the cell.
- Releases toxic and flammable gases like hydrogen fluoride (HF), carbon monoxide (CO), and volatile organic compounds (VOCs).
- May occur without visible fire; white or gray vapor clouds may be the only sign.
- Gases can accumulate and ignite explosively if not properly vented.

Large-Scale Fire Phase

- Escalation of a thermal runaway event into a full-blown fire that spreads across multiple battery modules or containers.
- Flames spread from one module or container to others, especially if fire barriers or suppression systems fail.
- May involve enclosures, adjacent infrastructure, or even buildings.
- Accumulated gases from thermal runaway can ignite violently.
- Releases large volumes of toxic smoke and heat, posing risks to first responders and nearby communities.
- Fires can burn for hours or even days, especially in high-capacity systems.

If the CEC is genuinely concerned about safety, please seriously consider requiring a large-scale fire test, to acquire more complete data for a better understanding of the fire and toxic smoke threats to public health and safety.

Sincerely,

Ronald J Cabrera
Battalion Chief (Retired)
Operations – Investigation – Prevention
Los Angeles County Fire Department