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Deficiencies on Frequency Analysis

Additional submitted attachment is included below.



CORBY BATTERY ENERGY STORAGE SYSTEM PROJECT

Docket No. 24-OPT-05

Subject: Regarding BESS Failure Frequency Calculations in Appendix D (Section 5.0) and Recommended EIR Re-analysis for the Corby Battery Energy Storage System Project

Dear Members of the Commission and CEC Staff:

Thank you for the opportunity to review the Staff Assessment and associated Appendix D hazard evaluations for the proposed Corby Battery Energy Storage System (BESS) Project. While we appreciate the structured approach taken in Section 5.0 (Frequency Analysis) to evaluate thermal off-gassing and fire risks, we write to highlight critical omissions in the historical incident dataset and to suggest standard risk assessment methodologies that provide a more accurate evaluation of project safety.

1. OMISSION OF VERIFIED LFP FACILITY INCIDENTS (3-YEAR & 5-YEAR DATASETS)

Section 5.2 and Table 16 base their optimistic 3-year failure frequency on the assumption that only a single LFP incident occurred nationwide among systems installed in the last three years (referencing the Melba, ID event on October 2, 2023).

Public records verify that at least four additional verified fire/thermal incidents occurred at facilities installed within the relevant operational windows:

- Warwick, NY (School Site / Converter Station Road): June 26, 2023
- Warwick, NY (Church Street): June 27, 2023
- Warwick, NY (Church Street / Substation Site - 2nd Fire at Facility): December 19, 2025
- Douglas, MA (Solar Energy Storage Facility): August 4, 2026

While the Staff Assessment recognized the Warwick, NY facilities within its 5-year evaluation, it incorrectly categorized their commercial operation dates, inappropriately excluding them from the 3-year operational cohort. Furthermore, the report needs to

include the August 4, 2026 fire at the Douglas, MA solar energy storage facility (commercial operation c. late 2023 / 2024).

A. Corrected 3-Year Historical Baseline (5 Incidents): Re-categorizing the Warwick, NY events into the 3-year window and adding Douglas, MA increases the 3-year incident tally from 1 to 5 incidents across 80,640 MWh-years of operating history:

Updated 3-Year Failure Rate (λ) = 5 incidents / 80,640 MWh-years = 0.0000620 incidents / MWh-year

When scaled to the proposed 1,200 MWh Corby facility ($0.0000620 \times 1,200$), the expected annual incident frequency increases from 1.49% to 7.44% per year. This reduces the calculated average timeframe between incidents from **67.2 years down to 13.4 years.**

B. Corrected 5-Year Historical Baseline (9 Incidents): While the CEC cited 8 fires in its 5-year dataset, incorporating the omitted Douglas, MA incident brings the total to 9 fires across 106,190 MWh-years of operating history:

Updated 5-Year Failure Rate (λ) = 9 incidents / 106,190 MWh-years = 0.0000848 incidents / MWh-year

When scaled to the proposed 1,200 MWh Corby facility ($0.0000848 \times 1,200$), the expected annual incident frequency increases from 9.04% to 10.17% per year,. This reduces the expected average return period once every **11.1 years to once every 9.8 years.**

2. APPLICATION OF STANDARD QUANTITATIVE RISK ASSESSMENT (QRA) METHODOLOGIES

Beyond updating the incident count, relying solely on a simple point estimate (dividing incidents by total operating years) presents two significant methodological limitations: Why a 95% Upper Confidence Bound (UCL) is Statistically Mandatory: Relying on a simple point estimate introduces severe statistical bias into public safety planning. Because utility BESS deployment expanded rapidly between 2023 and 2026, millions of newly installed MWh artificially inflate the denominator before those systems have accumulated long-term operational wear or cell degradation.

Furthermore, when dealing with very small historical sample sizes (1 to 9 incidents), standard regulatory risk guidelines (including EPA and OSHA Quantitative Risk Assessments) prohibit simple point estimates. Applying a 95% UCL accounts for sample size uncertainty and prevents over-optimistic risk projections, establishing the true "worst-credible case" required for public health and emergency preparedness.

To ensure public safety and emergency planning are evaluated against realistic conditions, we respectfully request that the lead agency incorporate the following

standard risk-assessment adjustments into the final analysis: **Apply a 95% Upper Confidence Bound (UCL): Standard regulatory protocol applies a Chi-Square distribution to account for uncertainty in small sample sizes.**

Applied to Corrected 3-Year Data (5 incidents / 80,640 MWh-years): Applying the Chi-Square 95% UCL yields an effective failure rate of approximately 0.0001272 per MWh-year. For a 1,200 MWh facility, this translates to an annual incident probability of 15.26%, or an expected event frequency of once every **6.5 years** (compared to the point estimate of 13.4 years).

Applied to Corrected 5-Year Data (9 incidents / 106,190 MWh-years): Applying the Chi-Square 95% UCL yields an effective failure rate of approximately 0.0001479 per MWh-year. For a 1,200 MWh facility, this translates to an annual incident probability of 17.75%, or an expected event frequency of once every **5.6 years** (compared to the CEC baseline point estimate of 11.1 years).

Filter for Utility-Scale Architectures and Global Data: Restricting the operational baseline to domestic EIA records aggregates small, highly compartmentalized commercial units with massive centralized utility blocks. Filtering for utility-scale architectures or incorporating global utility BESS operational datasets provides a more representative baseline, yielding realistic incident frequencies on the order of **every 4 to 6 years for a 1,200 MWh footprint.**

SUMMARY OF FAILURE FREQUENCY ADJUSTMENTS:

Metric / Scenario	Incidents	Failure Rate	Annual Prob	Expected Interval
3 year frequency				
CEC Baseline Draft EIR (3-Yr Point)	1 / 80,640	0.0000124	1.49%	Once per 67.2 yrs
Corrected 3-Yr Point Estimate	5 / 80,640	0.0000620	7.44%	Once per 13.4 yrs
Corrected 3-Yr 95% UCL (Stat. Max)	5 / 80,640	0.0001272	15.26%	Once per 6.5 yrs
5 year frequency				
CEC Baseline Draft EIR (5-Yr Point)	8 / 106,190	0.0000753	9.04%	Once per 11.1 yrs
Corrected 5-Yr Point Estimate	9 / 106,190	0.0000848	10.17%	Once per 9.8 yrs
Corrected 5-Yr 95% UCL (Stat. Max)	9 / 106,190	0.0001479	17.75%	Once per 5.6 yrs

3. IMPERATIVE FOR RE-ANALYSIS ACROSS EIR SECTIONS AND PROJECT ALTERNATIVES

The proposed Corby Project has an anticipated operational lifespan of 30 years. Under the original analysis (67.2 years between events based on 3-year data), a thermal off-gassing or fire incident was framed as a low-probability, remote occurrence during the project's operational life.

However, under the corrected 3-year point estimate (once every 13.4 years) and corrected 5-year point estimate (once every 9.8 years) and particularly under standard 95% statistical confidence modeling (once every 5.6 to 6.5 years) **a thermal off-gassing or fire event is statistically probable to occur 3 to 5 times during the 30-year life of the facility.**

Because an off-gassing or fire incident must be evaluated as a foreseeable operational occurrence rather than a remote anomaly, this corrected data must be re-analyzed across all corresponding sections of the Environmental Impact Report (EIR):

Project Alternatives Analysis: State environmental guidelines require an EIR to evaluate a reasonable range of alternatives that can feasibly attain most project objectives while avoiding or substantially lessening significant environmental and public safety impacts. When off-gassing or fire is correctly identified as a high-probability event over 30 years, alternative locations carry far greater weight.

The EIR must re-evaluate alternative site locations specifically viable industrial or remote sites that lack nearby sensitive receptors, schools, or residential communities to substantially reduce risk to public health during a thermal event.

- Hazards and Hazardous Materials / Public Health: Threshold exceedance and toxic plume dispersion models (e.g., AEGL-1 threshold exceedances) must be re-evaluated to account for the heightened probability of off-gassing events over 30 years, assessing cumulative exposure risks to nearby sensitive receptors and surrounding properties.
- Fire Protection and Emergency Response: First responder capabilities, specialized hazmat training, localized water supply requirements, and site access strategies must be re-analyzed under the assumption that local fire departments will need to manage multiple major thermal events or multi-day burns during the project period.
- Air Quality and Environmental Impacts: Plume dispersion and atmospheric release scenarios must reflect the increased frequency of off-gassing and combustion products released during potential thermal events.

4. MULTI-FAILURE INCIDENT PRECEDENTS AND REASONABLE FORESEEABILITY OVER A 30–35 YEAR OPERATIONAL LIFESPAN

In addition to calculating facility-wide failure frequencies, the EIR must account for the demonstrated historical reality that **utility-scale BESS sites frequently experience repeat failure events**. Treating a thermal runaway, fire, or explosion as a "once-in-a-lifetime" event for a single facility ignores documented industry trends cataloged in the Electric Power Research Institute (EPRI) BESS Failure Event Database and public emergency response records.

Because the proposed Corby BESS project is projected to operate for **30 to 35 years**, statistical modeling and real-world failure history demonstrate that **multiple fires or major thermal incidents at this exact facility are reasonably foreseeable occurrences**, rather than isolated anomalies.

EPRI and Industry Precedents of Repeat Facility Failures

Multiple energy storage installations across North America and internationally have suffered second or even third major catastrophic failures or re-ignition events at the same site, often years apart or during post-incident operations:

Valley Center Energy Storage Facility / Terra-Gen (San Diego County, CA):

Initial Incident (April 5, 2022): A failure inside the 139 MW / 560 MWh facility triggered an electrical fault and thermal runaway event, causing localized module and rack damage.

Second Incident (September 18, 2023): Just 17 months later, a second major thermal runaway fire broke out in a separate container enclosure at the same facility. The incident triggered emergency wireless broadcasts, forced Sheriff's deputies to order **mandatory evacuations** for nearby residents within a quarter-mile, and placed residents within a half-mile under **shelter-in-place orders** due to toxic off-gassing fears.

Moss Landing Energy Storage Facility (Monterey County, CA):

Phase I Incident (September 2021): An overheating event triggered localized fire suppression and damaged hundreds of battery modules.

Phase II Incident (February 2022): Just five months later, a second separate thermal event occurred in a different block of the same facility, releasing toxic smoke and requiring surrounding community shelter-in-place orders.

September 2022 Event: A third separate thermal runaway incident occurred at the adjacent Megapack installation on the same Moss Landing footprint, causing a major 12-hour closure of Highway 1 and broad toxic plume concerns.

Warwick, New York (Church Street / Substation Site):

Initial Incident (June 27, 2023): A major fire destroyed an LFP containerized system, burning for multi-day periods near local structures.

Second Incident (December 19, 2025): A second major thermal failure/fire occurred at the same Church Street facility location, proving that initial mitigation protocols did not eliminate repeat risks across the site's operational footprint.

2. Statistical Certainty Over a 30- to 35-Year Lifespan

When the corrected 3-year and 5-year failure frequencies are applied to Corby's 1,200 MWh capacity over a **30- to 35-year operational lifecycle**, the probability of experiencing **at least one fire** incident approaches **100%**, and the probability of experiencing **multiple independent fires** becomes a statistical certainty:

Under the Corrected 3-Year Baseline ($\lambda = 0.0000620$ / MWh-yr):

Expected Return Period: 13.4 years.

30-Year Lifecycle: Expected average of **2.24 fire events**.

35-Year Lifecycle: Expected average of **2.61 fire events**.

Under the 95% Upper Confidence Limit ($\lambda = 0.0001272$ to 0.0001479 / MWh-yr):

Expected Return Period: 5.6 to 6.5 years.

30-Year Lifecycle: Expected average of **4.6 to 5.3 fire events**.

35-Year Lifecycle: Expected average of **5.4 to 6.2 fire events**.

3. Legal and Regulatory Implications for the EIR

Under CEQA guidelines, an EIR must analyze environmental impacts that are "reasonably foreseeable." The empirical data showing repeat facility fires at Valley Center, Moss Landing, and Warwick establishes that:

Multiple fires over the 30–35 year lifespan are not remote contingencies; they are the baseline expectation.

Cumulative Toxic Burden & Sensitive Receptors: The Health Risk Assessment (HRA) and Air Quality models must account for the cumulative physiological and toxicological impacts of multiple multi-day toxic plume releases over decades. Nearby sensitive receptors in Vacaville, including local school children, elderly populations, and agricultural workers, will face repeated, multi-year exposure cycles, compounding acute respiratory stressors and recurring community shelter-in-place or evacuation disruptions.

Emergency Response Strain: While responding to lithium-ion BESS fires typically take a defensive strategy, it requires continuous perimeter management, traffic control, air monitoring, and mutual aid staffing over 24 to 120+ continuous hours. The Fire Protection Plan must demonstrate how local fire departments and emergency services will handle recurring hazmat emergencies, evacuation alerts, multi-day monitoring, and site de-activation/re-commissioning cycles repeatedly across the facility's life.

Prioritizing Remote Industrial Sites: When thermal off-gassing, multi-day burns, and regional evacuations are correctly recognized as recurring events over 30 to 35 years, site selection becomes the primary mitigation tool. The Commission must require a re-analysis of **Alternative Site Locations**, specifically identifying heavy industrial or remote parcels positioned away from residential neighborhoods, schools, and sensitive community receptors, to eliminate the recurring toxic exposure risk to Vacaville residents.

CONCLUSION & REQUESTED ACTION

Correcting the 3-year historical incident baseline to include the Warwick, NY and Douglas, MA events increases the verified failure rate for a 1,200 MWh facility from once every 67.2 years down to once every 13.4 years. Updating the 5-year baseline to incorporate omitted events yields 9 verified fires, reducing the expected return period to under 10 years (9.8 years). Furthermore, applying standard regulatory 95% Upper Confidence Bounds (UCL) mandated by EPA and OSHA guidelines to adjust for sample size uncertainty and operational denominator dilution demonstrates that the failure rate converges on an expected return period of **once every 5.6 to 6.5 years**.

Over the proposed **30 to 35-year operational lifespan** of the Corby BESS Project, a major thermal runaway, toxic off-gassing, or fire event is not a remote, once-in-a-lifetime anomaly it is statistically calculated to occur **between 2 and 6 times**. Real-world empirical data from the EPRI Failure Event Database highlighted by repeat multi-fire incidents at facilities such as Valley Center (San Diego County, CA), Moss Landing (Monterey County, CA), and Warwick (New York) confirm that recurring failures at the exact same utility-scale footprint are **reasonably foreseeable operational occurrences** under CEQA.

Because multi-event thermal incidents represent the baseline operational reality over 30 to 35 years, we respectfully request that the Commission revise the point estimates in Appendix. To ensure legal sufficiency under CEQA, these updated frequencies must be fully integrated across the following Environmental Impact Report (EIR) sections:

1. **Mandatory Re-Evaluation of Off-Site Project Alternatives:** Under CEQA Guidelines, site selection is the primary mitigation tool when operational hazards cannot be suppressed to non-significant levels. Because recurring multi-day burns, toxic plumes, and community evacuations are reasonably foreseeable over 30 to 35 years, the EIR must re-evaluate **Alternative Site Locations** specifically heavy industrial or remote parcels located away from residential neighborhoods, schools, and sensitive community receptors in Vacaville.

2. **Cumulative Health Risk Assessment (CEQA Guidelines § 15130):** Public health and air quality models cannot evaluate toxic emissions (including Hydrogen Fluoride, Phosphoryl Fluoride, and Hydrogen Cyanide) as isolated, non-recurring events. The Health Risk Assessment (HRA) must analyze the **cumulative physiological and toxicological impacts** of repeated multi-day plume releases and evacuation/shelter-in-place disruptions on nearby Vacaville residents and vulnerable populations over decades.
3. **Emergency Response Strain & Mutual Aid Depletion:** The Fire Protection Plan must move beyond reliance on basic developer fee agreements or code compliance (NFPA 855). The EIR must evaluate the unmitigated operational strain placed on local first responders when forced to execute hazmat response lasting multiple hours, or days, repeatedly compromising emergency and medical coverage from the rest of Vacaville and Solano County, when the Corby BESS catches fire.

We ask that the Lead Agency issue a Revised Staff Assessment / Environmental Impact Report reflecting these empirical and statistical corrections prior to taking any formal certification action on Docket No. 24-OPT-05.

Sincerely,

Keep Vacaville Safe