BEFORE THE BOARD OF COUNTY COMMISSIONERS
OF SANTA FE COUNTY

CASE NO. 24-5200
RANCHO VIEJO SOLAR, LLC CONDITIONAL USE PERMIT (CUP)
RANCHO VIEJO LIMITED PARTNERSHIP, RANCHO VIEJO SOLAR, LLC,
AES CLEAN ENERGY DEVELOPMENT, LLC, APPLICANTS

EXHIBITS SUBMITTED ON DECEMBER 6, 2024

Ashley C. Schannauer
12 Mariano Road
Santa Fe, NM 87508
Schannauer21@outlook.com
(505) 920-0326

EXHIBIT LIST

Schannauer letters to County officials:

1 November 1, 2023 letter – Schannauer to Commissioners, County Manager Shaffer, County Attorney Jeffrey Young, Fire Chief Jacob Black, Fire Marshal Jaome Blay and Growth Management Director Penny Ellis-Green "Re: The County's adoption of the International Fire Code and National Fire Protection Association Standard 855"

2 November 20, 2023 letter – Schannauer to Penny Ellis-Green and Case Manager Jose Larranaga "Re: NFPA 855, Hazard Mitigation Analysis, Trade Secrets and the Rancho Viejo Solar Project"

3 January 21, 2024 letter – Schannauer to Penny Ellis-Green, Jaome Blay and Assistant County Attorney Roger Prucino "Re: Follow-Up Questions from the January 17 Meeting on the Conditional Use Permitting Process for Commercial Renewable Energy Projects"

4 February 12, 2024 letter – Schannauer to County Commissioners with copies to Shaffer, Young, Black, Blay and Ellis-Green "Re: National Fire Protection Association Standard 855"

5 February 18, 2024 letter – Schannauer to County Commissioners with copies to Shaffer, Young, Black, Blay, Assistant Fire Chief, Emergency Management and LEPC Coordinator Martin Vigil and Ellis-Green

6 February 27, 2024 letter – Schannauer letter to County Commissioners with copies to Shaffer, Young, Black, Blay and Ellis-Green "Re: Annex G of the 2023 edition of National Fire Protection Association Standard 855"

7 April 28, 2024 letter -- Schannauer to Blay and Ellis-Green with copies to County Commissioners, Shaffer, Young, Black, Case Manager Dominic Sisneros, and Building and Development Manager Jordan Yutzy "Re: Ordinance 2023-09 and Annex G of NFPA 855"

8 June 2, 2024 letter – Schannauer to Blay, Ellis-Green, AES Senior Manager Joshua Mayer, and Nick Bartlett, Atar Fire "Re: Request to identify 'stakeholders' to participate in Hazard Mitigation Analysis under NFPA 855 for the Rancho Viejo Solar Project"

9 July 5, 2024 letter – Schannauer to Blay, Interim Growth Management Director Leandro Cordova, Deputy Growth Management Director Lisaida Archuleta, Mayer and Bartlett with copies to Shaffer, Young, Black, Sisneros, Yutzy, Brian Egolf and Matt Gordon "Re: Request to start the stakeholder process for the Hazard Mitigation Analysis under NFPA 855 for the Rancho Viejo Solar Project"

10 July 31, 2024 letter – Schannauer to Shaffer with copies to Young, Black, Blay, Cordova, Archuleta, Growth Management Director Alexandra Ladd, Yutzy, Sisneros and Commissioner Hank Hughes "Re: Request for virtual public meeting on the Rancho Viejo Solar Project application"

11 August 25, 2024 letter – Schannauer to Ladd and Blay with copies to Shaffer, Young, Cordova, Archuleta, Yutzy and Sisneros “Re: Public input for the Conditional Use Permit process for the Rancho Viejo Solar Project”

Letters from County Staff and AES responding to the above letters:

12 April 29, 2024 letter – Blay to Schannauer “Re: Ordinance 2023-09 and Annex G of NFPA 855”

13 June 7, 2024 letter – AES Permitting Project Manager Matt Gordon to Schannauer with copies to Shaffer, Young, Black, Sisneros and Yutzy responding to Schannauer letter of June 2, 2024 letter regarding stakeholder input under Annex G of NFPA 855

Other relevant items:

14 Ordinance 2023-09

15 Annex G to NFPA 855

16 February 29, 2024 letter -- Larranaga letter to Matt Gordon, AES Clean Energy/The AES Corporation “Re: Case #23-5010 AES-Rancho Viejo Solar Conditional Use Permit (CUP) 4152 NM 14 Santa Fe, NM 87508”

Exhibit 1

November 1, 2023 letter

Schannauer to Commissioners, County Manager Shaffer, County Attorney Jeffrey Young, Fire Chief Jacob Black, Fire Marshal Jaome Blay and Growth Management Director Penny Ellis-Green "Re: The County's adoption of the International Fire Code and National Fire Protection Association Standard 855"

Service by Email:

November 1, 2023

Chairperson Anna C. Hansen
ahansen@santafecountynm.gov

Commissioner Justin S. Greene
jsgreene@santafecountynm.gov

Commissioner Camilla Bustamante
cbustamante@santafecountynm.gov

Commissioner Anna T. Hamilton
athamilton@santafecountynm.gov

Commissioner Hank Hughes
hhughes@santafecountynm.gov

Gregory S. Shaffer, Santa Fe County Manager
gshaffer@santafecountynm.gov

Jeffrey S. Young, Santa Fe County Attorney
jyoung@santafecountynm.gov

Jacob Black, Fire Chief
jblack@santafecountynm.gov

Jaome Blay, Assistant Chief, Fire Marshal
jblay@santafecountynm.gov

Penny Ellis-Green, Growth Management Director
pengreen@santafecountynm.gov

102 Grant Avenue
Santa Fe, NM 87501

Re: The County's adoption of the International Fire Code and National Fire Protection Association Standard 855

Dear County Commissioners, County Manager Shaffer, County Attorney Young, Fire Chief Black, Fire Marshal Blay and Director Ellis-Green:

I'm writing to express my concern about the County's adoption of an obsolete fire safety standard when it adopted the 2021 edition of the International Fire Code (IFC) on August 29, 2023 as the Santa Fe County Fire Code. County Ordinance 2023-06 adopted the 2021 IFC (which is the

most current edition) except for modifications specifically identified in the ordinance. As one of the modifications, Section 7.DD of the adopting ordinance amended Chapter 80 of the IFC, titled "Referenced Standards," to add National Fire Protection Association (NFPA) Standard 855-20, regarding the Installation of Stationary Energy Storage Systems.

But the County's ordinance adopted the 2020 edition of NFPA 855 ("NFPA 855-20: Standard for the Installation of Stationary Energy Storage Systems") instead of the 2023 edition. And the differences between the two editions are significant.

The NFPA began its initial work on the subject in 2016 and issued the first edition of the standard on August 5, 2019. This became known as the 2020 edition of NFPA 855.

The introduction to the current 2023 standard states that the 2023 edition was developed expressly to address the fire and other risks of battery energy storage systems that have become known since the 2020 standard was issued:

> In response to international incidents of ESS fires, requirements for fire detection and suppression, explosion control, exhaust ventilation, gas detection and thermal runaway have been added or revised. The requirements for fire and explosion testing (formally large-scale fire testing) have been clarified.
>
> Requirements from Chapters 4 and 10 specific to electrochemical ESS have been consolidated and reorganized in Chapter 9. Chapter 13 has been added to address flywheel ESS.
>
> Information has been added in Annex B to provide guidance on the hazards associated with different battery types. Annex G has been added as a guide for suppression and safety of lithium-ion battery ESS.[1]

Among the various differences between the 2020 and 2023 standards, the 2023 standard, in particular, provides greater elaboration on the requirements for Hazard Mitigation Analyses. Section G.3.5 of the 2023 standard establishes site-specific Hazard Mitigation Analyses as a key focus of permitting. This section includes provisions for early input from stakeholders to develop the fire and explosion criteria that the stakeholders agree is appropriate for the level of risk they are willing to accept at a particular site:

> G.3.5 Fire Protection HMA or FRA (Deliverables)
> G.3.5.1 The scope of the HMA should be to establish the fire and explosion protection design criteria for the facility. The development of the HMA should be an iterative process. The HMA should be revised as the design progresses and technical design aspects are selected and finalized, based on dialogue among the stakeholders. The HMA should outline the protection/prevention design basis for

[1] NFPA 855, Standard for the Installation of Stationary Energy Storage Systems, 2023 Edition, National Fire Protection Association, at 855-1.

achieving the fire hazard control objectives agreed upon by the stakeholders, including the following:
(1) Identify assumptions and threats (including Section 3.3.2).
(2) Identify source documents.
(3) Identify each hazard and consequence, identify which prevention/protection features are to be provided or omitted, and summarize the decision-making process.
(4) Identify where operational and administrative controls are assumed to be in place to mitigate the need for fire protection features.[2]

The 2023 edition also highlights the importance of considering in the Hazard Mitigation Analysis the input of stakeholders with an interest in the fire risks of the project:

G.3.2 Stakeholders
G.3.2.1 Stakeholders with an interest in the scope and applicability of the fire protection design should be identified early in the process.
G.3.2.2 Stakeholders should establish goals and objectives and evaluate whether the requirements of NFPA 855 are adequate to meet these goals and objectives. The criteria for acceptability of the level of fire and explosion protection should consider the perspective of the various stakeholders.[3]

Clearly, the County's review of the Conditional Use Permit application and any permit applications under the Santa Fe County Fire Code for the Rancho Viejo Solar Energy Project should be evaluated under the most current safety standards that apply to lithium-ion battery energy storage systems.

Indeed, one of the County's primary standards for the issuance of a Conditional Use Permit is whether the project will "create a potential hazard for fire, panic, or other danger" for adjacent lands.[4] It also appears that Construction and Operational permits are required for the project under the County Fire Code, and a Hazard Mitigation Analysis is required for the issuance of those permits.[5] The Rancho Viejo applications should be evaluated under the 2023 standards for Hazard Mitigation Analyses, not the obsolete 2020 standard.

[2] NFPA 855-23, Annex G, G.3.5. Section G.1.2.1 states the purpose of Annex G "is to help stakeholders, designers, and authorities having jurisdiction (AHJs) understand and implement minimum safety requirements through a permitting and inspection process to ensure efficiency, transparency, and safety in their local communities."

[3] NFPA 855-23, Annex G, G.3.2 (Emphasis added).

[4] Sustainable Land Development Code, Section 4.9.6.5.

[5] International Fire Code, Sections 1207.1.2; 1207.1.4.

Please explain why the County did not include the 2023 edition of NFPA 855 in its August 2023 adoption of the IFC. Ordinance 2023-06 should be amended to include NFPA 855-23, and the County should apply it to the applications for the Rancho Viejo Solar Energy Project under the Sustainable Land Development Code, the Fire Code and any other requirements that may pertain to the project.

Respectfully,
Ashley C. Schannauer
12 Mariano Road
Santa Fe, NM 87508

cc: joselarra@santafecountynm.gov

Exhibit 2

November 20, 2023 letter

Schannauer to Penny Ellis-Green and Case Manager Jose Larranaga "Re: NFPA 855, Hazard Mitigation Analysis, Trade Secrets and the Rancho Viejo Solar Project"

Service by Email:

November 20, 2023

Penny Ellis-Green, SLDC Administrator, Growth Management Director
pengreen@santafecountynm.gov

Jose Larranaga, Case Manager, Growth Management Department
joselarra@santafecountynm.gov

102 Grant Avenue
Santa Fe, NM 87501

Re: NFPA 855, Hazard Mitigation Analysis, Trade Secrets and the Rancho Viejo Solar Project

Dear Ms. Ellis-Green and Mr. Larranaga:

I'm writing to stress the importance of nine issues in the County's review of the battery storage portion of the Conditional Use Permit application for the Rancho Viejo Solar Project. **The issues all relate to the fact that, in order to obtain a Conditional Use Permit for this project, AES must prove that the Rancho Viejo Solar Project will not be "detrimental to the health, safety and general welfare of the area" or "create a potential hazard for fire, panic, or other danger."[1]**

First, the County must promptly amend the Santa Fe County Fire Code to incorporate the 2023 edition of National Fire Protection Association Standard 855 (NFPA 855) instead of the 2020 edition that the County included in Ordinance No. 2023-06 last August.

Second, the County must require AES Corporation to conduct and submit a Hazard Mitigation Analysis in accordance with the 2023 edition of NFPA 855.

Third, the County must apply the updated edition of NFPA 855, including the requirement for a Hazard Mitigation Analysis, in its decision on the merits of AES's Conditional Use Permit application. The Hazard Mitigation Analysis should not be deferred to a later date, at the time of construction after the Conditional Use Permit has been granted, as AES proposes. Establishing the 2023 edition of NFPA 855 only as a permit condition to be satisfied after the Conditional Use Permit has been issued would violate Section 6.3.10.2 of the SLDC.

Fourth, the County must require that the information already submitted in AES's January 2023 Application be revised to address the 2023 edition of NFPA 855.

Fifth, the County must ensure that the public has a meaningful role as a stakeholder as required under NFPA 855 in the development of the Hazard Mitigation Analysis for the project.

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[1] Sustainable Land Development Code, Section 4.9.6.5.

Sixth, the County must require AES to submit a new Environmental Impact Report that addresses the issues identified in Terracon's July 10, 2023 report to the County. These include AES's duty to evaluate alternatives such as a no-battery alternative and an alternative that evaluates the feasibility of safer, sustainable, longer-duration batteries.

Seventh, the County should require AES to submit the reports prepared by AES after fires and explosions at AES-affiliated facilities, including the April 2019 fire and explosion at AES's McMicken battery storage facility in Surprise, Arizona and the April 2022 fire at AES's Dorman battery storage facility in Chandler, Arizona on the causes, consequences and lessons learned from the accidents. These can help the County avoid the hazards experienced in prior AES projects.

Eighth, the County must use its authority set out in the Sustainable Land Development Code to ensure that the public has meaningful access to information in the permit application and Hazard Mitigation Analysis about the project's risks -- even if the information qualifies as a trade secret.

Ninth, the County should take further measures in Santa Fe District Court to ensure that further information about the project's risks is made available to the public.

1. Adopt the 2023 edition of NFPA 855.

My November 1, 2023 letter to you and other County officials informed you that the 2020 edition of NFPA 855 that the Commissioners approved in Ordinance No. 2023-06 is obsolete and has been superseded by a revised edition (the 2023 edition) that was issued by the NFPA on August 12, 2022 (with an effective date of September 1, 2022.) The 2023 edition was issued for the specific purpose of addressing the number of fires related to battery energy storage systems that have occurred since the issuance of the 2020 edition. The differences between the two editions are significant.

The introduction to the current 2023 standard states that the 2023 edition was developed expressly to address the fire and other risks of battery energy storage systems that have become known since the 2020 standard was issued:

> In response to international incidents of ESS fires, requirements for fire detection and suppression, explosion control, exhaust ventilation, gas detection and thermal runaway have been added or revised. The requirements for fire and explosion testing (formally large-scale fire testing) have been clarified.
>
> Requirements from Chapters 4 and 10 specific to electrochemical ESS have been consolidated and reorganized in Chapter 9. Chapter 13 has been added to address flywheel ESS.

> Information has been added in Annex B to provide guidance on the hazards associated with different battery types. Annex G has been added as a guide for suppression and safety of lithium-ion battery ESS.[2]

Both the 2020 and 2023 editions establish site-specific Hazard Mitigation Analyses as a key focus of permitting. However, among the differences between the 2020 and 2023 standards, the 2023 edition adds a new "Annex G" as an appendix titled "Guide for Suppression and Safety of Lithium-Ion Battery (LIB) Energy Storage Systems (ESS)." Annex G supplements the mandatory requirements of NFPA 855 with 41 pages of "information for designers, users, and enforcers planning, approving, or encountering installations of LIB-based ESS."[3]

> This annex focuses on hazard identification and assessment, firefighting, fire protection, and fire and gas detection. It represents information on LIB properties and characteristics, guidance on implementing minimum safety requirements, maintenance and operation of fire protection systems, and other information that can be used to promote safety of LIB installations.[4]

It is encouraging that in the November 17 BCC meeting, an ordinance was proposed to adopt the 2023 edition of NFPA 855. This ordinance should be adopted as soon as possible. The adoption should be made, at minimum, before the County proceeds further with its review on the request for a Conditional Use Permit for the Rancho Viejo Solar Project.

2. Require AES to conduct and submit a Hazard Mitigation Analysis in accordance with the 2023 edition of NFPA 855 as part of AES's application for the Conditional Use Permit.

The County's Sustainable Land Development Code (SLDC) requires that Environmental Impact Reports prepared for Conditional Use Permits identify mitigation measures for significant environmental effects of a project.[5] To satisfy this requirement, the County must require AES to submit a Hazard Mitigation Analysis.

The SLDC also requires that development comply with the Santa Fe County Fire Code.[6] Since Santa Fe County Ordinance 2023-06 revised the Santa Fe County Fire Code to include the 2020 edition of NFPA 855, AES's Hazard Mitigation Analysis must at least comply with the standards

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[2] NFPA 855, Standard for the Installation of Stationary Energy Storage Systems, 2023 Edition, National Fire Protection Association, at 855-1.

[3] Id., Annex G, Section G.1.1.

[4] Id.

[5] SLDC, at Section 6.3.10.1. The County "may, in the course of processing an application, request the owner/applicant to clarify, amplify, correct, or otherwise supplement the information required for the application, if [the information] is required to render a final development order on the merits." Id., at Section 4.4.6.6.

[6] Section 7.1 of the SLDC states that development approvals "shall not occur unless the applicant demonstrates compliance with all applicable standards" of Chapter 7-Sustainable Design Standards and Chapter 4-Procedures and Permits. Section 7.2 states that all development shall comply with the most current applicable codes adopted by the State of New Mexico, Santa Fe County, and other entities, including but not limited to the Santa Fe County Fire Code. *See,* SLDC, Sections 7.1, 7.2, 7.16.

in the 2020 edition. If Santa Fe County adopts the 2023 edition of NFPA 855, the Hazard Mitigation Analysis will have to comply with the 2023 edition.

Both the 2020 and 2023 editions of NFPA 855 require the preparation of Hazard Mitigation Analyses for proposed battery energy storage systems. The 2023 edition includes a new Annex G that elaborates on issues specific to lithium-ion systems.

Section G.1.2.1 of the 2023 edition of NFPA 855 states that the purpose of Annex G "is to help stakeholders, designers, and authorities having jurisdiction (AHJs) understand and implement minimum safety requirements through a permitting and inspection process to ensure efficiency, transparency, and safety in their local communities."

Section G.3.5 of the 2023 standard (not addressed in the 2020 edition) establishes site-specific Hazard Mitigation Analyses as a key focus of permitting. Section G.3.5 states that Hazard Mitigation Analyses should document the level of risk that stakeholders are willing to accept and the resulting "fire and explosion protection design criteria" for the facility.

Levels of acceptable risk are important because different levels of risk might be acceptable for different sites, and different levels of risk translate into lesser or greater expense to the developer. Less risk can mean more expensive design criteria. Conversely, the acceptance of greater risk can mean less expensive design criteria. Examples could potentially include measures such as redundant fire protection systems, permanent water supplies for fire protection, and manned versus remotely controlled battery sites. The Fire Risk Assessment prepared by an AES consultant, for example, recommended that "additional mitigation measures (evaporative cooling) be considered within the required Hazard Mitigation Analysis to control adjacent BESS surface temperatures to lessen the probability of cascading container fire propagation."[7]

In addition, Section G.3.5 of the 2023 edition also states that the Hazard Mitigation Analysis should "[i]dentify each hazard and consequence, identify which prevention/protection features are to be provided or omitted, and summarize the decision-making process:"

> G.3.5 Fire Protection HMA or FRA (Deliverables)
> G.3.5.1 The scope of the HMA should be to establish the fire and explosion protection design criteria for the facility. The development of the HMA should be an iterative process. The HMA should be revised as the design progresses and technical design aspects are selected and finalized, based on dialogue among the stakeholders. The HMA should outline the protection/prevention design basis for achieving the fire hazard control objectives agreed upon by the stakeholders, including the following:
> (1) Identify assumptions and threats (including Section 3.3.2).
> (2) Identify source documents.
> (3) Identify each hazard and consequence, identify which prevention/protection features are to be provided or omitted, and summarize the decision-making process.

[7] *Hiller FRA*, at 5.

(4) Identify where operational and administrative controls are assumed to be in place to mitigate the need for fire protection features.[8]

The information contained in a Hazard Mitigation Analysis is directly relevant to the issues of risk that are central to the issuance of a Conditional Use Permit for the proposed Rancho Viejo battery storage system. The County should, therefore, insist that AES prepare the Hazard Mitigation Analysis as an element of AES's permit application and EIR and that the documents be reviewed by the County (and the public) before the County makes a decision on the Conditional Use Permit request.

3. The Hazard Mitigation Analysis must be completed, considered and approved during the Conditional Use Permit process, not after the Permit is issued.

The SLDC requires that "[f]ormulation of mitigation measures shall be identified at the first discretionary approval and under no circumstances deferred until the ministerial development process."[9]

This means that the Hazard Mitigation Analysis should be conducted and submitted for review as part of the Conditional Use Permit process (i.e., the first discretionary approval for the project). It should not be deferred until after the County has granted the Conditional Use Permit.

The risks to "the health, safety and general welfare of the area" and the "potential hazard for fire, panic, or other danger" are central issues in the County's review of the Conditional Use Permit that AES requests. But AES's application and the Environmental Impact Report AES submitted for the Conditional Use Permit state only that a Hazard Mitigation Analysis "will be performed as part of the detailed engineering process." AES's Application and EIR state that "[t]his HMA will include site and product specific fire risk assessment and a first responder plan."

Further, it has been suggested that the County might not immediately apply the standards in the 2023 edition of NFPA 855 to AES's Application. The County might instead include compliance with the 2023 edition as a permit condition when the County issues the Conditional Use Permit. This approach would align with AES Corporation's Application, in which AES states that it will prepare a Hazard Mitigation Analysis for the project after the Conditional Use Permit has been issued.

However, delaying the application of NFPA 855 (2023) until after a permit decision has been reached would be a big mistake and a violation of the SLDC. The core issues in this case for issuing a Conditional Use Permit are whether the proposed project will be "detrimental to the health, safety and general welfare of the area" or "create a potential hazard for fire, panic, or other danger."[10] NFPA 855 (2023) needs to be applied in the course of the Conditional Use Permit review to determine whether the proposed project will satisfy those conditions. If the risks of fire, explosions and toxic gases are too great for the location proposed, the permit should not be issued -- period. Issuing the permit with a requirement that NFPA 855 be complied with

[8] NFPA 855 (2023), Annex G, G.3.5.1. (Emphasis added).

[9] SLDC, at Section 6.3.10.2. (Emphasis added.)

[10] SLDC, Section 4.9.6.5.

after a decision on the permit has been made for that location would violate the Conditional Use Permit application process as set out in the County's SLDC.

4. Require that the information already submitted in AES's January 2023 Application be revised to address the 2023 edition of NFPA 855.

Although the new edition of NFPA 855 is titled as the 2023 edition, it was acted on by NFPA membership during the 2022 NFPA Technical Meeting held on June 8-9, 2022 and issued by the NFPA Standards Council on August 12, 2022, to become effective on September 1, 2022.[11] But the information already submitted in AES's application, submitted in January 2023, appears to have addressed the superseded 2020 edition.

As an example of the problem, AES submitted to the County a *Fire Risk Assessment* (first issued on November 26, 2019 and last revised on April 14, 2022) that asserts that the batteries proposed by AES satisfy the Hazard Mitigation Analysis requirements in NFPA 855. Given the April 2022 revision date of the *Assessment*, the document addresses the edition of NFPA 855 in effect at that time, i.e., the *2020 edition of NFPA 855.* It does not address the *2023 edition*.[12]

There may also be additional examples of other application materials that address the superseded 2020 edition of NFPA 855.

The County should require AES to revise its application to eliminate information that addresses the *2020 edition of NFPA 855* and replace it with information that satisfies the requirements of the current *2023 edition* of NFPA 855.

5. Provide for stakeholder input in the Hazard Mitigation Analysis.

The 2023 edition of NFPA 855 provides for the early input of stakeholders in the preparation of the Hazard Mitigation Analysis. The 2023 edition highlights the importance of considering in the Hazard Mitigation Analysis the input of stakeholders on the level of risk that is acceptable to parties with an interest in the fire and explosion risks of the project:

> G.3.2 Stakeholders
> G.3.2.1 Stakeholders with an interest in the scope and applicability of the fire protection design should be identified early in the process.
> G.3.2.2 Stakeholders should establish goals and objectives and evaluate whether the requirements of NFPA 855 are adequate to meet these goals and objectives. The criteria for acceptability of the level of fire and explosion protection should consider the perspective of the various stakeholders.[13]

The County should be a stakeholder in its role of evaluating the level of risk to be assumed by the public. And the public should also be a stakeholder as they will be asked to assume the level of risk.

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[11] NFPA 855 (2023), at 855-1.

[12] *Fire Risk Assessment for Outdoor, Remote, Non-Walk-in BESS Enclosures*, AES Corporation, Rev 3. Updated for SDI E4L batteries, April 14, 2022, at 11-15 of 19.

[13] NFPA 855 (2023), Annex G, G.3.2. (Emphasis added).

6. Require AES to submit a new Environmental Impact Report

Terracon, the consultant the County hired to review the Environmental Impact Report (EIR) that AES submitted with its Conditional Use application, issued a report on July 10, 2023. The Terracon Report consisted of 18 pages of comments and criticisms. The County must require AES to submit a new Environmental Impact Report that addresses the issues identified by Terracon.

Among the most important of the issues, Section 6.3.11 of the SLDC requires EIRs to describe a range of reasonable alternatives to the project, which would feasibly attain some of the basic objectives of the project but would avoid or substantially lessen the significant and adverse impacts or effects of the project. Section 6.3.11 requires EIRs to evaluate the comparative merits of the alternatives, even if those alternatives would impede the attainment of the project objectives or would be more costly.[14]

Section 6.3.11 requires EIRs to include sufficient information about each alternative to allow meaningful evaluation, analysis, and comparison with the proposed project. And it requires the EIR to describe the rationale for selecting the alternatives to be discussed. Further, the EIR must identify any alternatives that were considered but were rejected as infeasible during the scoping process and briefly explain the reasons underlying the determination.[15]

AES's analysis of alternatives was woefully inadequate, consisting of three whole sentences on alternative locations for the proposed solar array:

> Alternative locations for the solar array were explored within the larger parcel. Specifically, partially siting the Project in Sections 5 and 6 was examined but dismissed due to natural resource constraints along the southern branch of Bonanza Creek and the north-facing slopes. Locating the Project closer to State Road 14 was also considered but discouraged because it is part of the Turquoise Trail National Scenic Byway.[16]

Terracon's Report stated that alternative locations should also have been considered for the project's tie-line to PNM's transmission line, the access roads, battery facilities and substation:

> It does not appear that alternatives to the gen-tie route, access roads, BESS, or substation location were considered in the EIR. No screening analysis was presented in the EIR for the identification of feasible alternatives (gen-tie routes for example) that would allow for identification and selection of the least level of impact to be carried forward and evaluated in detail.[17]

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[14] SLDC, Section 6.3.11.1.

[15] SLDC, Sections 6.3.11.2 - .3.

[16] AES EIR, at p. 2-6.

[17] Terracon Report, at p. 10.

Location of facilities, however, should not be the only issue for which alternatives are identified and evaluated.

The most obvious alternative would be a solar facility as proposed by AES but without battery storage facilities. AES should prepare an analysis of the technical and financial feasibility of such a project. This more limited project would mitigate the risks of fires, explosions and toxic gases that are central to the issues to be decided by the County for AES's requested Conditional Use Permit.

A second alternative should substitute safer, longer-duration and more sustainable battery storage facilities for the lithium-ion battery facilities proposed by AES. Fire, explosion and toxic gas releases are documented risks of lithium-ion battery facilities. Much has also been reported about the environmental impacts (including impacts on workers' health) of the mining practices associated with the lithium, cobalt and other minerals used for lithium-ion batteries. Lithium-ion batteries also generally have four-hour durations, which are shorter than needed to replace the nighttime capacity that will be lost with the replacement of coal and natural gas generation.

Public Service Company of New Mexico (PNM) and other public utilities are seeking battery storage systems with longer durations than the four-hour durations of lithium-ion batteries. As examples, earlier this year, Xcel Energy (the parent company of Southwestern Public Service Company, which serves eastern and southeastern New Mexico) entered into agreements for the deployment of 10 MW (1000 MWh) iron-air batteries in Minnesota and Colorado. Georgia Power Company also entered into an agreement for a 15 MW (1500 MWh) iron-air battery. Great River Energy, a wholesale generation and transmission cooperative in Minnesota serving 27 member distribution cooperatives in Minnesota and Wisconsin, is installing a 1.5 MW iron-air battery in central Minnesota.

Iron-air batteries have long duration times (up to 100 hours) and, unlike lithium-ion batteries, are not subject to thermal runaway. They use iron and other sustainable materials. Santa Fe County could be a leader in the deployment of these innovative battery storage technologies if AES were to pursue them.[18]

7. Require AES to submit accident reports for fires and explosion at AES-affiliated battery storage facilities.

The County should require AES to submit the reports prepared by AES on the causes, damages and lessons learned after fires and explosions at AES-affiliated battery storage facilities. The

[18] Further information about iron-air batteries and their deployments can be found at the following websites:

https://formenergy.com/technology/battery-technology/

https://www.pbs.org/wgbh/nova/article/iron-air-battery-renewable-grid/

https://www.utilitydive.com/news/minnesota-puc-xcel-form-energy-battery-sherco-solar/685460/

https://www.cbsnews.com/colorado/news/xcel-colorado-pueblo-power-plant-renewable-energy-storage-ldes/

https://www.mprnews.org/story/2023/02/10/rusty-batteries-could-hold-key-to-carbonfree-power-future

https://formenergy.com/wp-content/uploads/2023/04/24-7-Carbon-Free-Resource-Portfolio-4.24.23.pdf

accidents include the April 2019 fire and explosion at AES's McMicken battery storage facility in Surprise, Arizona and the April 2022 fire at AES's Dorman battery storage facility in Chandler, Arizona. The reports should also include any other less publicly reported accidents at AES facilities plus any accidents at facilities involving Fluence, the joint venture designer and facility integrator of AES and Siemens. The reports should be reviewed by the County's experts and be made available to the public. The information in the reports can help the County avoid the hazards experienced in prior AES projects.

8. Insist that fire, explosion and toxic gas risks be made available to the public -- even if the information qualifies as a trade secret.

The development and content of the Hazard Mitigation Analysis must be transparent. This is especially important, given the potential impacts of the project on the adjacent residential communities.

AES has submitted to the County two Fire Risk Assessments in support of the Rancho Viejo project -- one prepared by an AES consultant and the other by AES. The assessments were prepared under NFPA 551 as generic analyses (not site-specific Hazard Mitigation Analyses under NFPA 855) for the types of batteries proposed by AES, and, in both assessments, AES redacted large amounts of information about the project's risks of fires, explosions and releases of toxic gases that are central to the Conditional Use review here and of critical interest to the public.[19] The assessments redact, for example, information about the chance of accidents and their consequences, including fires, explosions and the composition of toxic gases expected to be released.

In addition, in a recent District Court hearing on September 28, 2023 involving only AES and the County, AES obtained orders from the First Judicial District Court in Santa Fe declaring the redacted information to be trade secrets and prohibiting the County from disclosing the information to the public.[20] The County took a neutral position at the hearing, declaring that it lacked sufficient personnel to challenge AES's claims -- this despite the Board of County Commissioners' adoption of Resolution 2023-093 which authorized County staff to hire expert consultants in connection with the County's review of permit applications for commercial renewable energy projects.

For example, AES redacted Hiller's estimate of the likelihood of a thermal runaway occurring:

> Based on our continued research, and the completed numerical analysis, there remains approximately less than a **_[redacted]_** likelihood across the global battery energy storage system market sector that an event resulting in an exothermic reaction and thermal runaway could occur.[21]

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[19] *AES Clean Energy 40' CEN Battery Energy Storage System Project Battery Energy Storage System (BESS) Level Fire Risk Assessment*, Hiller Companies, January 5, 2023 ("Hiller FRA"); see also AES FRA.

[20] See, Order Granting Preliminary Injunction, *AES Clean Energy Development, LLC v. The Board of Commissioners of Santa Fe County*, No. D-101-CV-2023-02249, October 26, 2023.

[21] *Hiller FRA*, at 4.

AES redacted Hiller's identification of the gases that would be released during a thermal runaway:

> The gases vented during a thermal runaway reaction include:
> **__[redacted]__**
> **__[redacted]__**
> **__[redacted]__**
> **__[redacted]__**
> **__[redacted]__**
> **__[redacted]__**[22]

AES also heavily redacted a section describing how battery cells break down and their components erupt from their enclosures during a thermal runaway:

> It is well documented that cell component breakdown due to thermal runaway results in the production of hot flammable gases due to the chemical reactions mentioned above [15, 18, 19, 35-40]. The flammable gas generation occurs during cell decomposition resulting in increased internal pressure, leading to cell expansion, including the application of compressive force to adjacent parts in the system. Depending on the magnitude of the expansive forces the cells have been known to rupture encapsulation.
>
> Upon rupture, the cell begins to vent and together with the produced gas and a chaotic mixture of hot and glowing particles are ejected from the cell. Expelled particles typically contain pieces of active material from the cell's anode and cathode. Temperature measurement of released gases for the Samsung SDI E4L NMC cells averages **--[Redacted]--**. Analysis of the ejected gas showed high proportions of **--[Redacted]-- [Redacted]--[Redacted]--[Redacted]_-**. Therefore, flammability and the risk of deflagration or explosion, based upon industry performance is given at a fuel concentration of approximately **--[Redacted]--** at ambient temperatures [2-5].
>
> The mentioned effects usually have their impact on the battery and its environment as a function of time. The Samsung SDI E4L cells time to thermal runaway ranges from **--[Redacted]--[Redacted]--[Redacted]--** [4]. **--[Redacted]--[Redacted]--[Redacted]--[Redacted]--[Redacted]--[Redacted]--[Redacted]--[Redacted]--[Redacted]--[Redacted] --[Redacted]--[Redacted]--[Redacted]--[Redacted]--[Redacted]--[Redacted]--[Redacted]--[Redacted]--[Redacted]--[Redacted]--[Redacted]--**[3]. **--[Redacted]--[Redacted]--[Redacted]--[Redacted]--[Redacted]--[Redacted]--[Redacted]--[Redacted]--[Redacted]--[Redacted]--[Redacted]--[Redacted]--[Redacted]--[Redacted].** To be compliant with UL 1642, all lithium-ion cells include safety vents that are designed to release the internal pressure of the cell when a specified pressure is reached [41]. Upon cell rupture, the gas accumulating inside the cell will be

[22] *Hiller FRA*, at 20.

released and will react with atmospheric air (with fresh oxygen and moisture). **--[Redacted]--[Redacted]--[Redacted]--[Redacted]--[Redacted]--[Redacted]--[Redacted]--[Redacted]--.**[23]

AES made similar redactions in the Fire Risk Assessment it prepared and submitted to the County.

Nevertheless, regardless of any information found to constitute a trade secret, the County has the authority to require the disclosure of the information under Section 6.3.1 of the SLDC. Section 6.3.1 of the SLDC states that "[n]o EIR or SRA prepared pursuant to this Chapter that is available for public examination shall require the disclosure of a trade secret, except where the preservation of any trade secret involves a significant threat to health and safety."[24] The redacted information relates to the risks (i.e., fire, explosion, toxic gas) to which the public would be exposed if the Conditional Use Permit is granted. The County therefore has the authority to insist that the redacted information be disclosed to the public.

9. The County should take actions to ensure that information about the project's risks is made available to the public.

Information about the project's risks must be made available to the public in the permit review process before the County takes action on AES's permit request.

The preliminary injunction issued by the District Court is, in fact, a *preliminary* order. Further, because it is a *preliminary* injunction, the issues in the case have not been determined with finality. Parties, such as Santa Fe County or an intervenor, still have the option to request a further hearing in the matter.

The County's Resolution 2023-093 authorized County staff to hire expert consultants in connection with the County's review of permit applications for commercial renewable energy projects. With an expert witness, the County could present evidence challenging AES's trade secret claims.

Further, as noted above, the County has the authority under Section 6.3.1 of the SLDC to require the disclosure of the information. The Order issuing the preliminary injunction has two parts. First, it finds, based upon the evidence presented at the September hearing, that the redacted information in the two reports constitutes privileged trade secrets. Second, because the information is protected, the Order prohibits the County from publicly disclosing the information.

The current language of the preliminary injunction issued on October 26, 2023, however, contains a flat prohibition against the County disclosing the information. It does not recognize the County's authority under Section 6.3.1 of the SLDC.

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[23] *Hiller FRA*, at 13.

[24] SLDC, Section 6.3.1. (Emphasis added).

The County, therefore, should seek a further hearing before the District Court to either challenge the trade secret status of the documents at issue in that case. Alternatively, the County should ask the Court to modify its preliminary injunction to recognize the County's authority to disclose the information at issue there under its authority in the SLDC.

Finally, it is also important to recognize that the preliminary injunction issued in October applies only to the redacted information in the two documents that were reviewed in that case. It is likely that AES will submit additional information in support of its Conditional Use Application for which it will seek trade secret protection. The County should exercise its authority to disclose trade secret information to the public under the conditions established in Section 6.3.1 of the SLDC.

Please enter this letter as a comment in the administrative record for the Conditional Use Permit request for the Rancho Viejo Solar Project.

Respectfully submitted,

Ashley C. Schannauer

cc: Gregory S. Shaffer, County Manager
Jeffrey S. Young, County Attorney
Jacob Black, Fire Chief
Jaome Blay, Fire Marshal

Exhibit 3

January 21, 2024 letter

Schannauer to Penny Ellis-Green, Jaome Blay and Assistant County Attorney Roger Prucino "Re: Follow-Up Questions from the January 17 Meeting on the Conditional Use Permitting Process for Commercial Renewable Energy Projects"

Service by Email: January 21, 2024

Penny Ellis-Green, SLDC Administrator, Growth Management Director
pengreen@santafecountynm.gov

Jaome Blay, Assistant Chief, Fire Marshal
jblay@santafecountynm.gov

Roger Prucino, Assistant County Attorney
rprucino@santafecountynm.gov

102 Grant Avenue
Santa Fe, NM 87501

Re: Follow-Up Questions from the January 17 Meeting on the Conditional Use Permitting Process for Commercial Renewable Energy Projects

Dear Ms. Ellis-Green, Fire Marshal Blay and Mr. Prucino:

Thank you and all the other County representatives who participated in the January 17 meeting to inform and discuss with the public the permitting process for AES Corporation's Rancho Viejo solar project. I am sure you are aware, as public representatives, how important it is that the public is willing to accept and respect your decisions. To achieve that goal, the permitting process must be open and transparent. So, I appreciate the dialogue.

However, due to the shortness of time that was available for each participant to ask questions, I am writing to request that you answer several follow-up questions, and I would appreciate your responses.

1. The public's participation rights in a Conditional Use Permit hearing
At the January 17 meeting, in discussing the Conditional Use Permit hearing for the Rancho Viejo solar project, Ms. Ellis-Green described only the participation rights of the general public (whose participation the County limits to two minutes each), not the rights of people entitled to participate as formal parties.

Section V.B of the Rules of Order for the Board of County Commissioners (attached), which you identified as applying to the eventual hearing on AES's Application, establishes the order of proceeding in an administrative adjudicatory hearing. Section B provides for presentations by four classes of participants: Staff, Applicant, *Other Parties* and Public Input:

-- Staff Presentation (Section B.2)
-- Applicant's Presentation (Section B.4)
-- Presentation of Other Parties (Section B.6)
-- Public Input (Section B.8)

Section V.B distinguishes between (1) presentations of parties claiming an interest in the outcome of the administrative hearing and (2) public input, which appears to include any

“members of the public.” According to the Rules, "other parties" must "identify themselves" as a party to the proceedings and must state with specificity their interest in the outcome. These "other parties" are entitled to make a presentation during the hearing in support of or in opposition to the outcome and to call witnesses in support of the party's position. They have the right to cross examine the witnesses presented by Staff and the Applicant. Parties also have the right to appeal the decision of the Planning Commission to the Board of County Commissioners under the Sustainable Land Development Code (SLDC).[1]

The rights of the public generally under Public Input are more limited. Members of the public have only the right to make their own statements, and the two-minute time and other limits described by Ms. Ellis-Green can be placed upon their participation (Section B.8).

The procedural rules for a Conditional Use hearing set forth in Section 4.7.2.1 of the SLDC are similar.

Follow-up questions:
a. Does the County dispute that certain members of the public will have the right to participate in any upcoming hearings as "Other Parties" under Section B.6? The exclusion of people's rights to participate as parties (and the limitation of those rights to public commenters) would violate the County's rules. It would also produce a fundamentally unfair hearing process -- one in which only the Applicant and the County's Staff have the right to present evidence.

b. Does the Growth Management Department have the authority to interpret and implement the Rules of Order in such hearings – or does that authority belong to the Hearing Officer?

c. Do parties in the proceedings have the right to conduct discovery?

d. Who has the authority (i.e., the Growth Management Department or the Hearing Officer) to schedule the dates for any prehearing conferences and hearings?

e. Does the County Staff (i.e., the Growth Management Department, the Fire Department and the County Attorney's Office) have any role in the deliberations of the Hearing Officer, the Planning Commission or in the appeals hearing conducted by the Board of Commissioners? If so, how will the County avoid the issues addressed in the Court of Appeals decision in *Kerr-McGee Nuclear Corp. v. New Mexico Envtl. Imp. Bd.*?[2] This case held that a hearing on proposed regulations was not fair or impartial because the same staff who presented testimony proposing regulations then provided staff support for the agency's deliberations on the regulations that staff proposed.

2. Additional public meeting hosted by AES
At the January 17 meeting, I and at least one other member of the public requested that the County require AES to hold an additional public meeting to explain and answer the public's questions about AES's further filings with the County, regardless of whether those filings are

[1] SLDC Section 4.5.4.
[2] 1981-NMCA-044, paras. 46-53, 97 N.M. 88, 637 P.2d 38.

characterized as a new application, a resubmitted application or a supplement to AES's original application.

AES's original application was filed on January 23, 2023, almost exactly one year ago. Since then, AES has indicated to the County and the public that it plans to make changes to the proposal it submitted in its January 2023 application. The consultant hired by the County to review the Environmental Impact Report in AES's Application issued a report with 14 pages of comments, criticisms and requests for further information to which AES needs to respond. The County Fire Department has identified additional information that should be included in further submittals. The County also intends to hire an additional consultant who is expected to require further information about the battery storage portion of AES's proposal. Responding to all of these requests will entail substantial changes and additions to the application, effectively making it a new application.

Follow-up questions:
a. Under these circumstances, does the County intend to treat AES's anticipated resubmittal as a new application? If not, why not?

b. Does the County believe that AES should be required to conduct an informational meeting with the public pursuant to Section 4.4 of the SLDC and, as discussed below, conduct an additional set of Studies, Reports and Assessments under Chapter 6 of the SLDC? If not, why not?

3. "Neutrality" versus Due Diligence
The County indicated that it intends to stay "neutral" in the pending District Court proceedings on whether information such as the percentage chance of a thermal runaway event, the likely gases generated during such an event and the explosive impacts of such an event qualify as "trade secrets" that should not be disclosed to the public. The County said at the initial September 2023 hearing on the issue that it lacked the expertise to evaluate AES's claims. In accordance with the County's September 26, 2023 adoption of a Resolution (Resolution 2023-093) which authorized the County to hire experts to assist the County with its review of permit applications for commercial renewable energy projects, the County could presumably hire an expert to evaluate and present evidence challenging or at least testing AES's trade secret claims. But County staff stated at the January 17 meeting that it will not do so; it will not take a position and will stay "neutral."

At a minimum, the County could ask the District Court to recognize the County's authority (under SLDC 6.3.1) to disclose trade secret information "where the preservation of any trade secret involves a significant threat to health and safety." The County could then further ask the District Court to recognize the County's authority and modify its injunctive relief to state that the District Court's orders do not limit the County's authority under the SLDC.

The County also stated at the Jan 17 meeting that it would not request any investigative reports or other information related to the second of the AES battery facility fires in Arizona -- the April 2022 fire in Chandler, Arizona. The fire hazard of the project proposed here is a key issue in the Conditional Use proceeding, but Fire Department officials have stated that the Department needs

to maintain a "neutral" position on AES's Application. At the January 17 meeting, Fire Marshal Blay also stated that the Fire Department is focused on the safety of AES's current technology, not the technologies in AES's Arizona facilities.

The issues that the County, including the Fire Department, should diligently research in its Conditional Use review include (1) the damages (i.e., personal injury and property damage) that were caused by the Arizona explosion and fires, (2) the extent to which the technologies used by AES in Arizona are similar to the technologies proposed here, (3) the extent to which any AES management practices may have contributed to the Arizona incidents, and (4) lessons AES may have learned from its investigations of the Arizona incidents and the extent to which those lessons have been incorporated into the technologies and management practices that AES proposes to avoid similar incidents here.

Follow-up Questions:

a. The County's duty is to protect the health and safety of the residents of the County, not to remain "neutral" or to protect AES's trade secrets. The "trade secret" issues are of serious public concern. What is the County's reason for refusing to take a position on these issues? Does the County not want the public to be aware of information that is central to the County's determination of whether the proposed project will be "detrimental to the health, safety and general welfare of the area" or "create a potential hazard for fire, panic, or other danger?"[3] If not, why not?

b. Does the County agree that it has the authority under Section 6.3.1 of the SLDC to disclose trade secret information "where the preservation of any trade secret involves a significant threat to health and safety"? If the County agrees that it has that authority, should it not at least ask the District Court to recognize the County's authority and modify its injunctive relief to state that the District Court's orders do not limit the County's authority under the SLDC? If not, why not?

c. In the County's determination about whether AES's proposed project will be "detrimental to the health, safety and general welfare of the area" or "create a potential hazard for fire, panic, or other danger," does the County believe that AES's role in the Arizona explosion and fires is relevant and that due diligence requires the County's investigation of those incidents? If not, why not?

d. Does the County believe it should require AES to provide an account of the injuries and property damages that resulted from AES's explosion and fires in Arizona and the amounts of the damage claims received by AES and its insurer? If not, why not? This information should provide concrete examples of the fire risks and other risks associated with the proposed project.

e. If the County insists on maintaining absolute "neutrality" on these issues, does the County agree that this is a compelling reason that parties should have a right to intervene in the Conditional Use proceeding and have the right to conduct discovery to ensure that these central issues are addressed?

[3] SLDC, Section 4.9.6.5.

4. The County Fire Department's September 26, 2023 "Approval with Conditions"
The same resolution (Resolution 2023-093) that authorized the County Staff to hire experts to review applications for commercial renewable energy projects also directed County Staff to create a website to provide information to the public about such projects. The current website recently added an item titled "Compliance with the Santa Fe County Fire Code." The link for the item pulls up a September 26, 2023 document titled:

Santa Fe County
Fire Department Fire Prevention Division
Development Plan Review

The document contains four optional boxes for the reviewer to check: "Approved," "Approved with Conditions," "Denied," and "Incomplete." The Fire Department reviewer checked "Approved with Conditions." The document states that the "Development plan review documents are approved" and then includes seven pages of references to portions of the International Fire Code, the International Wildland Urban-Interface Code and National Fire Protection Association Standard 855. Significantly, two of the conditions require that AES provide further information about the details of the project:

1. Location and layout diagram of the room or area in which the ESS is to be installed.
2. Details on the hourly fire-resistance ratings of assemblies enclosing the ESS.
3. The quantities and types of ESS to be installed.
4. Manufacturer's specifications, ratings and listings of each ESS.
5. Description of energy (battery) management systems and their operation.
6. Location and content of required signage.
7. Details on fire suppression, smoke or fire detection, thermal management, ventilation, exhaust and deflagration venting systems, if provided.
8. Support arrangement associated with the installation, including any required seismic restraint.
9. A commissioning plan complying with Section 1207.2.1.
10. A decommissioning plan complying with Section 1207.2.3.

A further condition is that AES provide a "failure modes and effects analysis (FMEA) or other approved hazard mitigation analysis."

At the January 17 meeting, I asked what specifically was approved and how this approval relates to the Conditional Use Permit application. Ms. Ellis-Green stated that there has not been an approval, but she did not address the fact that the County Fire Department's Development Plan review shows a checked box labeled "Approved with Conditions." Fire Marshal Blay also did not describe the effect of the "approval," but he indicated that the additional information the Fire Department requested would not be required for submission until AES applies to the Fire Department for a Construction Permit AFTER the Conditional Use Permit has been approved.

Furthermore, the conditions referencing NFPA 855 in the Fire Department's Development Plan Review relate to the 2020 edition of NFPA 855, which is the obsolete standard the County adopted on August 29, 2023. After the County was alerted to its adoption of the obsolete standard in November 2023, the County Commission corrected its mistake, but the Fire

Department has not changed the conditions in its September 26 approval. In the January 17 meeting, the Fire Marshal downplayed the significance of this issue, but the outdated 2020 edition of NFPA 855 (and the references to it adopted by the Fire Department) does not include the entirely new section (Annex G) that the NFPA added in 2023 "in response to international incidents of ESS fires."[4]

Annex G is an appendix titled "Guide for Suppression and Safety of Lithium-Ion Battery (LIB) Energy Storage Systems (ESS)." Annex G supplements the mandatory requirements of NFPA 855 with 41 pages of "information for designers, users, and enforcers planning, approving, or encountering installations of LIB-based ESS."[5]

> This annex focuses on hazard identification and assessment, firefighting, fire protection, and fire and gas detection. It represents information on LIB properties and characteristics, guidance on implementing minimum safety requirements, maintenance and operation of fire protection systems, and other information that can be used to promote safety of LIB installations.[6]

Follow-up questions:
a. What is the "Approved with Conditions" determination under the SLDC or the County Fire Code that the Fire Department is making and how does it relate to the Conditional Use Permit process?

b. Why does the County not require the submission and evaluation of information (i.e., fire hazards and public safety) central to the Conditional Use Permit process BEFORE the County makes a decision on those issues? The SLDC requires that AES's Environmental Impact Report identify and mitigate the project's hazards[7] and that **"[f]ormulation of mitigation measures shall be identified at the first discretionary approval [i.e., the Conditional Use Permit process] and under no circumstances deferred until the ministerial development process."**[8] Does the County agree that any delay in requiring and evaluating AES's Hazard Mitigation Analysis would violate these SLDC requirements? If not, why not?

c. Does the County Fire Department plan to update its Development Plan Review document to address the updated 2023 version of the fire safety standards? If not, why not?

5. AES reimbursement of County costs
At the January 17 meeting, a member of the public asked whether the County could recover the costs it incurs in responding to fires or other emergencies created by incidents at the proposed project, and the County's attorney answered that he doubts that the County could penalize AES for such costs.

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[4] NFPA 855, Standard for the Installation of Stationary Energy Storage Systems, 2023 Edition, National Fire Protection Association, at 855-1.
[5] Id., Annex G, Section G.1.1.
[6] Id.
[7] SLDC Sections 6.3.6, 6.3.10.
[8] SLDC Section 6.3.10.2.

The SLDC provides for conditions the County can impose and mechanisms by which the County and the company can agree in advance that the County will be able to recover certain costs incurred by the County. These would not be a "penalty" paid by the company, but rather conditions of approval imposed on AES by the County, and/or arrangements entered into voluntarily by AES and the County.

AES's proposed emergency plan appears to consist simply of AES's provision of training for County Fire Department personnel on how the County should respond to incidents at AES's site. The SLDC authorizes the County to require AES to conduct studies (e.g., an Adequate Public Facilities and Services Assessment[9] and a Fiscal Impact Assessment[10]) to quantify the costs the County is anticipated to incur for AES's project. The SLDC authorizes the County to establish conditions providing for recovery of the County's costs for facilities and services"[11] and for a related payment and performance guaranty.[12] The SLDC also authorizes a voluntary development agreement between a developer and the County to carry out all requirements, conditions and mitigation measures.[13]

Follow-up questions:
a. Does the County intend to exercise its authority to pursue AES's funding of the additional personnel, equipment and facility costs the County will incur to prepare its emergency response to any incidents at the proposed site? If not, why not?

b. Does the County intend to implement any of the above authorities to be able to recover the substantial costs it will likely incur in responding to minor and major incidents at the proposed site? If not, why not?

c. Has the County investigated AES's emergency response and cost recovery arrangements with other municipalities in which AES operates generation resources? If not, why not?

I look forward to your responses.

Respectfully,
/s/ Ashley C. Schannauer
Santa Fe, NM 87508

cc: Jose Larranaga, Case Manager, Growth Management Department
joselarra@santafecountynm.gov

[9] SLDC Section 6.1.2.2.
[10] SLDC Section 6.1.2.5.
[11] SLDC Section 4.9.6.6.1a.
[12] SLDC Section 4.9.6.6.2.
[13] SLDC Section 4.9.6.6.3.

Exhibit 4

February 12, 2024 letter

Schannauer to County Commissioners with copies to Shaffer, Young, Black, Blay and Ellis-Green “Re: National Fire Protection Association Standard 855”

Service by Email: February 12, 2024

Chairperson Hank Hughes
hhughes@santafecountynm.gov

Commissioner Camilla Bustamante
cbustamante@santafecountynm.gov

Commissioner Justin S. Greene
jsgreene@santafecountynm.gov

Commissioner Anna T. Hamilton
athamilton@santafecountynm.gov

Commissioner Anna C. Hansen
ahansen@santafecountynm.gov

Re: National Fire Protection Association Standard 855

Dear Commissioners,

I'm writing to request that the Board of County Commissioners expressly adopt Annex G of the 2023 edition of National Fire Protection Association Standard 855 (NFPA 855) as a mandatory requirement for Santa Fe County. This appendix, titled "Annex G - Guide for Suppression and Safety of Lithium-Ion Battery (LIB) Energy Storage Systems (ESS)," was the major change in the 2023 update to the 2020 edition of NFPA 855. The NFPA developed the 2023 edition to address the fire and other risks of battery energy storage systems that have become known since the 2020 edition of NFPA 855.

The reason for my request is that the County Fire Department appears to have interpreted the Board's December 2023 adoption of the 2023 edition as not including Annex G, since the Department is not requiring the Rancho Viejo Solar Project to comply with it.

The Board, on December 5, 2023, appeared to intend to require the most up-to-date safety protections adopted by the NFPA in 2023. But, perhaps because the NFPA denoted the protections in Annex G as informational guidance, it appears that the Fire Department is not requiring Commercial Renewable Energy Projects to comply with them. **The Fire Department's interpretation defeats the purpose of the Board's December action.** The Board should expressly adopt the NFPA's 2023 Annex G as mandatory to ensure that the NFPA's 2023 protections are applied for the benefit of the County's residents.

The Board has attempted to adopt the most up-to-date safety requirements of NFPA 855.
On August 29, 2023, the Board enacted Ordinance No. 2023-06, which adopted as the Santa Fe Fire Code portions of the 2021 edition of the International Fire Code and the outdated 2020 edition of NFPA 855 ("NFPA 855-20: Standard for the Installation of Stationary Energy Storage

Systems"). On November 1, 2023, I wrote to you requesting that you adopt the current 2023 edition of NFPA 855, and, on December 13, 2023, you adopted Ordinance No. 2023-09, which appeared on its face to do so.

Annex G - Guide for Suppression and Safety of Lithium-Ion Battery (LIB) Energy Storage Systems (ESS).

In my November 1, 2023 letter, I wrote that the 2023 edition of NFPA 855 was important. I said the County's review of the Conditional Use Permit application and any permit applications under the Santa Fe County Fire Code for the Rancho Viejo Solar Energy Project should be evaluated under the most current safety standards that apply to lithium-ion battery energy storage systems.

The introduction to the current 2023 standard states that the 2023 edition, including the 41-page Annex G, was developed expressly to address the fire and other risks of battery energy storage systems that have become known since the 2020 standard was issued:

> In response to international incidents of ESS fires, requirements for fire detection and suppression, explosion control, exhaust ventilation, gas detection and thermal runaway have been added or revised. The requirements for fire and explosion testing (formally large-scale fire testing) have been clarified.
>
> Requirements from Chapters 4 and 10 specific to electrochemical ESS have been consolidated and reorganized in Chapter 9. Chapter 13 has been added to address flywheel ESS.
>
> Information has been added in Annex B to provide guidance on the hazards associated with different battery types. Annex G has been added as a guide for suppression and safety of lithium-ion battery ESS.[1]

Annex G is titled "Guide for Suppression and Safety of Lithium-Ion Battery (LIB) Energy Storage Systems (ESS)." The NFPA states that Annex G is especially important for permitting authorities' implementation of minimum safety requirements:

> G.1.1 Scope. This annex presents information for designers, users, and enforcers planning, approving or encountering installations of LIB-based ESS. This annex focuses on hazard identification and assessment, firefighting, fire protection, and fire and gas detection. It represents information on LIB properties and characteristics, guidance on implementing minimum safety requirements, maintenance and operation of fire protection systems, and other information that can be used to promote safety of LIB installations.[2]

Annex G's purpose "is to help stakeholders, designers, and authorities having jurisdiction (AHJs) understand and implement minimum safety requirements through a permitting and inspection

[1] NFPA 855, Standard for the Installation of Stationary Energy Storage Systems, 2023 Edition, National Fire Protection Association, at 855-1 (emphasis added).
[2] NFPA 855-23, Annex G, G.1.1.

process to ensure efficiency, transparency, and safety in their local communities."[3] Annex G "describes the use and application of minimum safety requirements in NFPA 855."[4]

Annex G, in particular, elaborates on the requirements for Hazard Mitigation Analyses (HMA). Section G.3.5 establishes site-specific Hazard Mitigation Analyses as a key focus of permitting. It provides for early input from stakeholders to develop the fire and explosion criteria that the stakeholders agree is appropriate for the level of risk they are willing to accept at a particular site:

> G.3.5 Fire Protection HMA or FRA (Deliverables)
> G.3.5.1 The scope of the HMA should be to establish the fire and explosion protection design criteria for the facility. The development of the HMA should be an iterative process. The HMA should be revised as the design progresses and technical design aspects are selected and finalized, based on dialogue among the stakeholders. The HMA should outline the protection/prevention design basis for achieving the fire hazard control objectives agreed upon by the stakeholders, including the following:
> (1) Identify assumptions and threats (including Section 3.3.2).
> (2) Identify source documents.
> (3) Identify each hazard and consequence, identify which prevention/protection features are to be provided or omitted, and summarize the decision-making process.
> (4) Identify where operational and administrative controls are assumed to be in place to mitigate the need for fire protection features.[5]

The 2023 edition also highlights the importance of considering in the Hazard Mitigation Analysis the input of stakeholders with an interest in the fire risks of the project:

> G.3.2 Stakeholders
> G.3.2.1 Stakeholders with an interest in the scope and applicability of the fire protection design should be identified early in the process.
> G.3.2.2 Stakeholders should establish goals and objectives and evaluate whether the requirements of NFPA 855 are adequate to meet these goals and objectives. The criteria for acceptability of the level of fire and explosion protection should consider the perspective of the various stakeholders.[6]

The Fire Department's interpretation and implementation of the Board's December 5 action defeat the Board's intentions

On September 26, 2023 (after the August adoption of the 2020 edition of NFPA 855 but before the Board's December update), the Fire Department issued an "Approval with Conditions" of the

[3] NFPA 855-23, Annex G, Section G.1.2.1.
[4] NFPA 855-23, Annex G, Section G.1.1.2.
[5] NFPA 855-23, Annex G, G.3.5. Section G.1.2.1 states the purpose of Annex G "is to help stakeholders, designers, and authorities having jurisdiction (AHJs) understand and implement minimum safety requirements through a permitting and inspection process to ensure efficiency, transparency, and safety in their local communities."
[6] NFPA 855-23, Annex G, G.3.2 (emphasis added).

application filed by AES Corporation for the Rancho Viejo Solar Project. The Approval cited the standards in the 2020 edition of NFPA 855 as conditions.

At a public meeting with County Staff on January 17, 2024, I asked whether the Fire Department intended to update its September Approval to refer to the 2023 edition of NFPA 855 and did not receive a direct answer. On January 21, 2024, I wrote to the County Staff requesting that the Fire Department update its reference.

On January 26, 2024, the Fire Department issued a further "Approval with Conditions," which referred specifically to the 2023 edition of NFPA 855. But, significantly, the January 26 Approval specifically incorporated only Chapters 1 through 9 of NFPA 855. It did not incorporate and require compliance with the most significant of the changes that the NFPA made in the 2023 edition. In particular, the Fire Department's January 26 Approval omitted reference to Annex G. NFPA 855 describes the Annexes as informational guidance, but they do reflect the NFPA's recommendations on regulatory measures that are needed to address the fire and other risks of battery energy storage systems that have become known since 2020.

Request to adopt the guidelines in Annex G of NFPA 855

By far the most substantial difference between the 2020 and 2023 versions of NFPA 855 is the inclusion of Annex G, a Guide for Suppression and Safety of Lithium-Ion Battery (LIB) Storage Systems. Therefore, if the County Fire Department is excluding the guidance in Annex G from its compliance requirements in the AES project, then the Department is not really abiding by the Board's intent when it adopted the 2023 standard.

If the Board intends that the County Staff apply the most current standards to ensure the health and safety of the people that reside near Commercial Renewable Energy Projects, the Board should insist explicitly that the guidelines in Annex G of NFPA 855 be applied to such facilities. The County has the authority to adopt the guidance in NFPA 855 as part of the Santa Fe County Fire Code as it has to adopt the other requirements. I respectfully request that you amend the Fire Code to explicitly adopt Annex G.

Thank you,

Ashley C. Schannauer

Santa Fe, NM 87508

cc: Gregory S. Shaffer, Santa Fe County Manager, gshaffer@santafecountynm.gov
Jeffrey S. Young, Santa Fe County Attorney, jyoung@santafecountynm.gov
Jacob Black, Fire Chief, jblack@santafecountynm.gov
Jaome Blay, Assistant Chief, Fire Marshal, jblay@santafecountynm.gov
Penny Ellis-Green, Growth Management Director, pengreen@santafecountynm.gov

Exhibit 5

February 18, 2024 letter

Schannauer to County Commissioners with copies to Shaffer, Young, Black, Blay, Assistant Fire Chief, Emergency Management and LEPC Coordinator Martin Vigil and Ellis-Green

Service by Email: February 18, 2024

Chairperson Hank Hughes
hhughes@santafecountynm.gov

Commissioner Camilla Bustamante
cbustamante@santafecountynm.gov

Commissioner Justin S. Greene
jsgreene@santafecountynm.gov

Commissioner Anna T. Hamilton
athamilton@santafecountynm.gov

Commissioner Anna C. Hansen
ahansen@santafecountynm.gov

102 Grant Avenue
Santa Fe, NM 87501

Re: Santa Fe County's lack of emergency planning required under state and federal law and Santa Fe County's Sustainable Growth Management Plan

Dear Commissioners:

I'm writing to express my concerns about the County's lack of emergency planning. This letter describes some of the state, federal and county requirements for emergency planning and asks why the County is not complying. These include the New Mexico All Hazard Emergency Act, the New Mexico Hazardous Chemicals Information Act, the federal Emergency Planning and Community Right-to-Know Act, and Santa Fe County's own Sustainable Growth Management Plan. Satisfying these requirements is important and should be accomplished before approving the introduction of new hazards adjacent to residential communities.

Emergency planning is especially important for the residential neighborhood of Eldorado, where I live. Eldorado sits in a dry, windy location just east of grasslands where the County is considering a Conditional Use Permit application to build an 800-acre solar project with 48 MW of lithium-ion battery storage facilities that pose a risk of explosion, fire and release of toxic gases.

Eldorado has over 6,600 residents,[1] and it includes the Eldorado Community School with approximately 400 students in grades K-8 serving Eldorado, Lamy, Galisteo and beyond.[2] There

[1] https://eldoradosf.org/wp-content/uploads/2024/02/2.6.24-ECIA-Welcome-Packet.pdf
[2] https://eldorado.sfps.info/o/edc/page/about-edcs
https://webnew.ped.state.nm.us/bureaus/safe-healthy-schools/attendance-for-success/annual-state-districts-and-schools-attendance-report/

are only three roads to evacuate Eldorado: Avenida Amistad, Avenida Vista Grande and Avenida Eldorado. They are all two-lane roads, and they exit onto Route 285 at locations all within a mile of each other. Any attempt to evacuate would quickly result in a gridlock.

Why has the County not developed the required emergency plans? When will it take steps to do so?

1. The County's responsibility for an emergency operations plan under the New Mexico All Hazard Emergency Management Act

a. The County's failure to adopt and maintain an all-hazard emergency operations plan

The October 24, 2023 report of the Santa Fe County Office of Emergency Management Task Force stated that Section 5 of the New Mexico All Hazard Emergency Management Act assigns responsibility to the County for maintaining an up-to-date emergency operations plan,[3] and it found that the County has lacked such a plan since 2008. In 2008, the City of Santa Fe withdrew from the joint emergency management plan that it developed with the County in 2007.[4]

The Task Force Report, which was adopted by the Board of County Commissioners on November 14, 2023, lists 45 recommendations, including ten that require "immediate attention."[5] One of the recommendations for immediate attention is the development of an emergency operations plan, and, significantly, it recommends that the plan be developed with input from the public:

> It is critical for the County and OEM to engage in a thorough planning process to create an updated EOP that follows federal planning doctrine. This will enable the County to better manage large-scale and complicated incidents. Forming a collaborative planning team is essential to achieving this. This team should include representatives from Couty [sic] departments, partnering government entities, community groups, private sector, faith-based organizations, as well as Access and Functional Needs (AFN) organizations. Inclusion of these stakeholders will ensure their buy-in and participation in the process.[6]

The Task Force Report describes the importance of emergency plans both to address "complex and large-scale emergencies" and "to socialize emergency functions throughout the entire County:"

> **3.6 Emergency Planning – Best Practice**
> Having up-to-date and comprehensive emergency plans is crucial for effectively handling complex and large-scale emergencies. These plans serve as the

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[3] Section 12-10-5 of the All Hazard Emergency Management Act provides that "the governing bodies of the political subdivisions of the state are responsible for the all hazard emergency management of their respective jurisdictions." NMSA 1978, 12-10-5. Santa Fe County, New Mexico Office of Emergency Management *Assessment and Recommendations Report*, October 24, 2003 ("Task Force Report") citing NMSA 12-10-5, at 14.
[4] Task Force Report, at 21.
[5] Id., at 6, 56.
[6] Id., at 51 (emphasis in original).

> foundation for the emergency management program and should be continuously maintained and updated through a thorough planning process. This process should consider various factors such as potential threats, community input, stakeholder engagement, resilience, and organizational capabilities. By focusing on these factors, Santa Fe County can better prepare and develop effective strategies to manage disasters.
>
> Having emergency plans in place is critical. They offer clear strategies and courses of action for managing complex and large-scale emergencies. Furthermore, the planning process itself is essential for gaining a comprehensive understanding of participant roles, capabilities, limitations, and resources. When executed effectively, these plans can serve as the foundation for the emergency organization and help to socialize emergency functions throughout the entire County.[7]

The Task Force's consultant, Michael Dube, elaborated further on his findings in his presentation to the Task Force on October 24, 2023:

> Another significant issue that requires immediate attention is a thorough planning process to create an updated EOP. So that while that may have happened or started to happen, it was clear during [in] particular the current conditions that the emergency operations plan that was of reference was from 2007. It included the City of Santa Fe and had no functional annexes.
>
> So all those items were a shortcoming. It was a good start, but it certainly had been superseded, and in the 16 years since … no emergency operations plan had been updated and/or approved. So it was substantively flawed in that respect. So that needs to be addressed fairly quickly.[8]

Mr. Dube said the "annexes" are the "meat" of an emergency operations plan:

> And then to support that EOP, to make sure that it's just not an emergency operations plan that is updated, … also all the functional annexes [are needed]. Those are as critical because while the EOP has set guidance and structure and kind of specifies the 'what needs to be done' or 'what will be done,' the functional annexes really is the 'how' and the 'who.' So it's important for those items to be developed and exercised as much as the emergency operations plan itself because that's really where the meat is in many cases… -- in the functional annexes.[9]

The consultant's report and presentation makes it clear that the County's emergency operations planning is "substantively flawed" and needs "immediate attention."

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[7] Id, at 21.
[8] Task Force recording of October 24, 2023 meeting.
[9] Id.

b. The County's Sustainable Growth Management Plan

The lack of an all-hazards emergency management plan is not news to the County. Since at least 2010, Chapter 9 of the County's Sustainable Growth Management Plan (SGMP) has identified as a "Key Issue" that "[t]he current emergency response system is not sufficient to service our population today. In the case of a large-scale emergency, where large numbers of County residents would have to be evacuated or hospitalized, the County and provider infrastructure and resources would be insufficient."[10] The SGMP also describes the involvement of the community in public safety planning is one of the "Keys to Sustainability."[11]

The County often cites Chapter 7 of the SGMP, "Renewable Energy and Energy Efficiency," in support of its efforts to promote the development of renewable energy projects. But Chapter 9, "Public Safety," is equally important. Chapter 9 presents goals, policies and strategies for addressing public safety issues. The primary goal is to establish and maintain an all-hazard emergency response plan:

> 9.6 GOALS, POLICIES AND STRATEGIES
> Goal 28: Establish and maintain an all-hazard emergency response plan for Santa Fe County.
> Policy 28.1: Develop emergency response plans with a particular emphasis on a coordinated response to large scale epidemics and natural disasters.
> Strategy 28.1.1: Work with local, state and federal agencies and other organizations to develop emergency plans.
> Policy 28.2: Ensure adequate resources exist for implementation of emergency management services.

c. The 2007 Santa Fe City/County Emergency Management Basic Plan

In response to public records requests, the County provided a copy of the 2007 Santa Fe City/County Emergency Management Basic Plan. It was signed by the Chair of the Board of County Commissioners, the Santa Fe Mayor and the Santa Fe City/County Emergency Management Director in April 2007 ("2007 Basic Plan") minus all 26 of its "annexes."

As noted above, the Task Force's consultant described the annexes as the "meat" of an emergency operations plan. Section XI.B.2 assigned responsibilities to various City and County departments and outside entities for the "who" and "how" of the plan, but the consultant said the annexes were never developed.[12]

Section X.A Plan Development stated that the City Manager and County Commission Chair were responsible for approving and promulgating the plan. Section X.C stated that local officials shall review the Basic Plan and the "annexes" annually. It stated that the Emergency Management Coordinator would establish a schedule for annual review of planning documents "by those tasked them." Finally, Section X.D provided for updates to the plan each year and a formal change at least every five years:

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[10] Santa Fe County Sustainable Growth Management Plan (2020), Section 9.1.1.4 (p. 138); 2015 Santa Fe County Sustainable Growth Management Plan, Section 9.1.1.4 (p. 146).
[11] Id., at Section 9.1.2.7.
[12] The Annex Assignments are outlined in Attachment 4 to the Basic Plan. Attachment 4 is enclosed with this letter.

D. Updates

1. This plan will be updated based upon deficiencies identified during actual emergency situations and exercises and when changes in threat hazards, resources and capabilities, or government structure occur.

2. The Basic Plan and its annexes must be revised or updated by a formal change at least **every five years**. Responsibility for revising or updating the Basic Plan is assigned to Emergency Management Director. Responsibility for revising or updating the annexes will be consistent with Annex Assignments Attachment 4.

The emphasized phrase "every five years" is bolded in the Basic Plan.

Based upon the OEM Task Force Report and the lack of responsive documents to my public record requests, it appears that no annual reviews or updates were ever done, and the emergency plan lapsed in 2008 shortly after it was developed and was never implemented.

d. The Santa Fe County Office of Emergency Management Task Force

The Board of County Commissioners adopted Resolution 2023-017 last February establishing an Office of Emergency Management Task Force. Section 2 of the Resolution directs the Task Force to "analyze and make non-binding recommendations to the Board concerning the structure, staffing, and responsibilities of the SFC OEM [Santa Fe County Office of Emergency Management], including, but not limited to, where it should be housed and to whom it should report." The Resolution directed the Task Force to submit its recommendations to the Board by the end of May 2023. That deadline was later extended indefinitely in Resolution 2023-029.

Despite the Task Force's recommendation that the County's emergency planning requires "immediate attention," the County Commissioners' discussion of the Task Force Report on November 14, 2023 addressed only the potential restructuring of the OEM. The Commissioners did not mention the need for an emergency management plan. The discussion also did not address the serious turmoil within County government on these issues that is evident from the Emergency Management Director's November 7, 2023 memo on the Task Force report (presented at the November 14 meeting) and the discussion among the Task Force members at the October 24, 2023 Task Force meeting.

2. The County's responsibility for an emergency response plan under the federal Emergency Planning and Community Right-to-Know Act (EPCRA) and the New Mexico Hazardous Chemicals Information Act

a. EPCRA's requirement that a Santa Fe County Local Emergency Planning Committee develop an Emergency Response Plan for hazardous chemicals

Congress enacted the federal Emergency Planning and Community Right-to-Know Act (EPCRA) in 1986. EPCRA requires local emergency response plans to address the risks of hazardous chemical releases, public input to the response plans, and public access to information about hazardous chemicals present and released in their communities.

In terms of emergency planning, EPCRA requires states to establish emergency response commissions, requires each state to establish local emergency planning commissions (LEPCs), and requires the LEPCs to develop emergency response plans.[13] To implement the EPCRA, the New Mexico legislature in 1989 enacted the Hazardous Chemicals Information Act, which established the State Emergency Response Commission (SERC) for New Mexico.[14] The SERC subsequently established Santa Fe County as a local emergency planning district with its own LEPC. The SERC website names Assistant Fire Chief Martin A. Vigil as the Coordinator for the County's LEPC.[15]

EPCRA requires the appointment of LEPC members from a wide variety of backgrounds, including community groups and the media. It requires public meetings to discuss the emergency plan, the opportunity for public comments on the plan, and public access to information about the plan:

> **(c) Establishment of local emergency planning committees**
> Not later than 30 days after designation of emergency planning districts or 10 months after October 17, 1986, whichever is earlier, the State emergency response commission shall appoint members of a local emergency planning committee for each emergency planning district. Each committee shall include, at a minimum, representatives from each of the following groups or organizations: elected State and local officials; law enforcement, civil defense, firefighting, first aid, health, local environmental, hospital, and transportation personnel; broadcast and print media; community groups; and owners and operators of facilities subject to the requirements of this subchapter. Such committee shall appoint a chairperson and shall establish rules by which the committee shall function. Such rules shall include provisions for public notification of committee activities, public meetings to discuss the emergency plan, public comments, response to such comments by the committee, and distribution of the emergency plan. The local emergency planning committee shall establish procedures for receiving and processing requests from the public for information under section 11044 of this title, including tier II information under section 11022 of this title. Such procedures shall include the designation of an official to serve as coordinator for information.[16]

Section 11003(a) of EPCRA requires each LEPC to complete preparation of an emergency plan in accordance with the requirements of EPCRA not later than two years after October 17, 1986. Thereafter, it requires the LEPC to review the plan once a year, or more frequently as changed circumstances in the community or at any facility may require.[17]

Section 11003(c) lists the required elements of each plan:

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[13] 42 USC Section 11001.
[14] NMSA 1978, Section 74-4E-4.
[15] https://www.nmdhsem.org/lepcs/
[16] 42 USC 11001(c) (emphasis added).
[17] 42 USC 11003(a).

Each emergency plan shall include (but is not limited to) each of the following:

(1) Identification of facilities subject to the requirements of this subchapter that are within the emergency planning district, identification of routes likely to be used for the transportation of substances on the list of extremely hazardous substances referred to in section 11002(a) of this title, and identification of additional facilities contributing or subjected to additional risk due to their proximity to facilities subject to the requirements of this subchapter, such as hospitals or natural gas facilities.

(2) Methods and procedures to be followed by facility owners and operators and local emergency and medical personnel to respond to any release of such substances.

(3) Designation of a community emergency coordinator and facility emergency coordinators, who shall make determinations necessary to implement the plan.

(4) Procedures providing reliable, effective, and timely notification by the facility emergency coordinators and the community emergency coordinator to persons designated in the emergency plan, and to the public, that a release has occurred (consistent with the emergency notification requirements of section 11004 of this title).

(5) Methods for determining the occurrence of a release, and the area or population likely to be affected by such release.

(6) A description of emergency equipment and facilities in the community and at each facility in the community subject to the requirements of this subchapter, and an identification of the persons responsible for such equipment and facilities.

(7) Evacuation plans, including provisions for a precautionary evacuation and alternative traffic routes.

(8) Training programs, including schedules for training of local emergency response and medical personnel.

(9) Methods and schedules for exercising the emergency plan.[18]

Section 11003(e) requires the LEPC to submit a copy of the plan to the SERC, which is then required to review the plan and make recommendations to the LEPC on revisions of the plan that may be necessary to ensure coordination of such plan with emergency response plans of other emergency planning districts.[19]

[18] 42 USC 11003(e).
[19] 42 USC 11003(e).

b. Public records requests and the SERC indicate that a County LEPC never functioned and never developed an EPCRA emergency response plan

I've filed public records requests with the SERC and County to understand whether, when and how the LEPC for Santa Fe County has developed the required emergency response plan for EPCRA. I've also spoken to agency staff for the SERC at the New Mexico Department of Homeland Security and Emergency Management. The County's Emergency Management Coordinator did not respond to my request for information.

The SERC provided the EPA's National LEPC-TEPC Handbook under EPCRA for "Emergency Planning for Releases of Hazardous Chemicals." The Handbook spells out in 244 pages of detail the responsibilities of LEPCs for the planning discussed above and the notifications that are required to be provided to LEPCs about the storing and releases of hazardous chemicals in their jurisdictions.

But neither the SERC nor the County produced any records that would indicate that a County LEPC was ever actually formed, that it ever functioned, or that it developed the emergency response plan required by EPCRA. The County supplied the 2007 emergency plan discussed above, but SERC said the plan was never submitted to them for its review.

3. Questions

1. Has the County begun the process of developing emergency management plans under the New Mexico All Hazard Management Act, the County's SGMP and EPCRA?
2. Does the County have an estimate of when it might complete the emergency management plans?
3. Does the County intend to establish an active, functioning LEPC to develop and annually update the emergency response plan required by EPCRA?
4. Does the County intend to ensure that the Local Emergency Planning staff have adequate resources to accomplish the required emergency planning?
5. Apart from the interests of the County residents, has the County considered that it may be exposed to legal liability for the harm that may be caused by the County's failure to perform these legally required emergency plans?

4. The County's emergency-planning responsibilities with respect to the Conditional Use Permit application filed by AES Corp. for the Rancho Viejo solar project

The emergency planning required by federal and state law and by the County's SGMP are particularly relevant to the AES Corporation's application to the County for a Conditional Use Permit to operate a utility-scale solar facility with 48 MW of battery storage in a dry, windy area adjacent to thousands of residences. The County's Sustainable Land Development Code requires that AES's request for a Conditional Use Permit be consistent with the County's SGMP.[20] The public safety elements of the SGMP in Chapter 9 have, since 2010, noted the inadequacy of the County's emergency response system and have cited the need for the County to develop an all-hazard emergency response plan for Santa Fe County. These portions of the SGMP are just as important as the renewable energy elements in Chapter 7. In addition, the EPCRA requirements related to local emergency planning and hazardous substances are particularly relevant to the AES Corporation's application. The County should develop the emergency plans required by

[20] Sustainable Land Development Code, Section 4.9.6.5.

state and federal law and by the SGMP before the County continues its review of AES's permit request.

Respectfully submitted,

/s/ Ashley C. Schannauer
Ashley C. Schannauer
12 Mariano Road
Santa Fe, NM 87508

cc: Gregory S. Shaffer, Santa Fe County Manager, gshaffer@santafecountynm.gov
Jeffrey S. Young, Santa Fe County Attorney, jyoung@santafecountynm.gov
Jacob Black, Fire Chief, jblack@santafecountynm.gov
Jaome Blay, Assistant Chief, Fire Marshal, jblay@santafecountynm.gov
Martin A. Vigil, Assistant Fire Chief, Emergency Management, and LEPC Coordinator, mavigil@santafecountynm.gov
Penny Ellis-Green, Growth Management Director, pengreen@santafecountynm.gov

Exhibit 6

February 27, 2024 letter

Schannauer letter to County Commissioners with copies to Shaffer, Young, Black, Blay and Ellis-Green "Re: Annex G of the 2023 edition of National Fire Protection Association Standard 855"

Service by Email: February 27, 2024

Chairperson Hank Hughes
hhughes@santafecountynm.gov

Commissioner Camilla Bustamante
cbustamante@santafecountynm.gov

Commissioner Justin S. Greene
jsgreene@santafecountynm.gov

Commissioner Anna T. Hamilton
athamilton@santafecountynm.gov

Commissioner Anna C. Hansen
ahansen@santafecountynm.gov

Re: Annex G of the 2023 edition of National Fire Protection Association Standard 855

Dear Commissioners,

On February 12, 2024, I wrote to you to request that the County Commissioners expressly adopt Annex G of the 2023 edition of National Fire Protection Association Standard 855 (NFPA 855) as a mandatory requirement in the Santa Fe County Fire Code. Annex G is the "Guide for Suppression and Safety of Lithium-Ion Battery (LIB) Energy Storage Systems (ESS)."

Annex G was the major change in the 2023 update to the 2020 edition of NFPA 855. It addresses the fire and other risks of battery energy storage systems that have become known since the 2020 edition of NFPA 855.

To incorporate the 2023 edition of NFPA 855 into the Santa Fe County Fire Code, the Commissioners enacted Ordinance 2023-09 in December, updating the 2020 edition of NFPA 855 that the Commissioners had enacted a few months earlier in August 2023. In Ordinance 2023-09, the Board stated in December 2023 that it "incorporates by reference as though fully set out in this Ordinance and adopts as part of the Fire Code the following standard as promulgated by the National Fire Protection Association (NFPA) . . . : NFPA 855-2023: Standard for the Installation of Stationary Storage Systems." NFPA 855-2023 (the 2023 edition of NFPA 855) contains nine chapters relating to lithium-ion storage systems and eight annexes, including Annex G, Guide for Suppression and Safety of Lithium-Ion Battery (LIB) Energy Storage Systems (ESS).

Annex G is part of the 2023 edition of NFPA 855 adopted by the Commission, yet the Fire Marshal omitted Annex G from the requirements he established in the Development Plan Review he issued on January 26, 2024 for the Rancho Viejo Solar Project.[1]

In response to that omission, I wrote to you on February 12 asking that you clarify the issue. You could either (1) amend the Fire Code to make it explicit that the County incorporates Annex G into the Fire Code or (2) issue a clarification directly to the Fire Marshal to that effect.

In response to my February 12 letter, Chairperson Hughes forwarded my letter to Fire Marshal Blay by email on that same day. Chairperson Hughes referenced my letter and asked Fire Marshal Blay to "let me know if we do need further board action to fully adopt the 2023 standards for battery storage."

Fire Marshal Blay responded by email the next day on February 13. He said, first, that "Annex G is not a part of the requirements of NFPA 855 document but is included for informational purposes only." Nevertheless, Fire Marshal Blay goes on to suggest that the Fire Department's January 26 Review implicitly includes Annex G. He says the January 26 Review "specifically states: [AES] shall comply with NFPA 855-23 including, **but not limited** to Chapters 1 through 9."[2] He further states that the "last two pages of the fire department CUP review letter incorporates language from NFPA 855 Annex G to address transparency, efficiency, and safety to the local community." The "last two pages" establish the language of Sections G.1.3.1 and G.1.3.2 of Annex G as requirements -- but only those sections.

Fire Marshal Blay ended his explanation with his request that Chairperson Hughes provide him with direction on how to proceed: "Please let us know what is the pleasure of the Board."

On February 19, Chairperson Hughes forwarded the Fire Marshal's February 13 explanation to me and another resident. He said he was attaching "the Fire Department response to concerns about the fire code and safety of battery electric energy storage systems" and said, "If you have any questions, I suggest you email Assistant Chief Blay directly."

Chairperson Hughes did not describe or include the response he or other County officials may have provided to Fire Marshal Blay's request for further instructions on how to proceed.

This letter responds to the February 19 email (attached) from Chairperson Hughes and asks the Board to either **(1) amend the Fire Code to make it explicit that the County incorporates Annex G into the Fire Code or (2) issue a clarification directly to the Fire Marshal to that effect.**

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[1] The January 26, 2024 Development Plan Review (attached) modified a similar Review that had been issued the day before on January 25. The January 25 Review listed the "Project Status" for "AES-Rancho Viejo Solar" as "Approved with Conditions." The January 26 document amended the January 25 Review to include a new additional check box that listed the project as "Accepted." But the January 26 document otherwise left the January 25 Review unchanged, continuing to describe the Review as an “approval” with enumerated conditions. There was no explanation for the change in "Project Status" or what the new "Project Status" means.

[2] Emphasis in original.

First, in Fire Marshal Blay's February 13 email, it's unclear whether the Fire Department believes that Annex G has been adopted by the County in Ordinance 2023-09 as a mandatory requirement that a developer of a battery energy storage system must comply with. Fire Marshal Blay states in his email that Annex G is informational only, but he then suggests that the language in the January 26 Review includes Annex G as mandatory. He states further that portions of Annex G have been expressly included in the Review document.

Second, it appears clear from the sequence of the Commissioners' actions (i.e., the August 2023 of the 2020 edition of NFPA 855 and the December update with the 2023 edition) that the Commissioners intended to incorporate the significant changes that were included in the 2023 edition -- and Annex G was the most significant of those changes. This apparent intention is reinforced by Commissioner Hughes' February 12 e-mail to Mr. Blay, when he said, "let me know if we do need further board action to fully adopt the 2023 standards for battery storage" (emphasis added).

Third, assuming the Commissioners intended to incorporate the most up-to-date and most protective of the NFPA's standards, the Commissioners had the authority to adopt all of the provisions of NFPA 855 -- even any provisions that NFPA included as "informational." Indeed, the same January 26 Review expressly incorporated as a mandatory requirement the non-mandatory guidance in Appendix D of the 2021 International Fire Code on Fire Apparatus Access Roads.[3]

Fourth, the provisions of Annex G are important in implementing the mandatory requirements of NFPA 855. "The purpose of this annex is to help stakeholders, designers, and authorities having jurisdiction (AHJs) understand and implement minimum safety requirements through a permitting and inspection process to ensure efficiency, transparency, and safety in their local communities." Annex G, Section G.1.2.1 (emphasis added).

Perhaps most significant, the Fire Department's January 26 Review incorporates the mandatory portions of both the International Fire Code and Chapters 1-9 of the NFPA 855 that require AES to conduct a Hazard Mitigation Analysis (HMA). But the details describing *how* the HMA should be conducted are found *only* in Section G.3.5 of Annex G, "Fire Protection HMA or FRA

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[3] Appendix D Fire Apparatus Access Roads in the International Fire Code reads as follows:

> Appendix D Fire Apparatus Access Roads.
> The provisions contained in this Appendix are not mandatory unless specifically referenced in the adopting ordinance or legislation of the jurisdiction.
>
> User Note:
> About this appendix: Appendix D contains more detailed elements for use with the basic access requirements found in Section 503, which gives some minimum criteria, such as a maximum length of 150 feet and a minimum width of 20 feet, but in many cases does not state specific criteria. This appendix, like Appendices B and C, is a tool for jurisdictions looking for guidance in establishing access requirements and includes criteria for multiple-family residential developments, large one- and two-family subdivisions, specific examples for various types of turnabouts for fire department apparatus and parking regulatory signage.

Appendix D, International Fire Code (2021).

Deliverables." Section G.3.5 states that the HMA is the process in which the design criteria for fire and explosion protection for the facility are established; i.e., it addresses how much risk the facility should be designed to prevent.

Other notable sections that also could and should be applied to AES's application in Mr. Blay's Review are Section G.6 Fire Protection Systems, Section G.7 Fire and Flammable Gas Detection, Section G.11 Inspection and Maintenance for Installed LIB Fire Protection Systems, and Section G.12 emergency planning.

As noted earlier, the January 26 Review established as mandatory requirements the language of two provisions of Annex G (i.e., Sections G.1.3.1 and G.1.3.2) but none of Annex G's other provisions. If Ordinance 2023-09 requires compliance with the entirety of NFPA 855, including Annex G, **the Fire Marshal should not have the authority to pick and choose which portions of the ordinance require compliance**.

My questions for the Commission are as follows:

1) What instructions, if any, did Chairperson Hughes or other County officials provide in response to Fire Marshal Blay's February 13 email?

2) The ultimate question for the Commissioners (not the Fire Marshal) is what does Ordinance 2023-09 require? Was it intended to require adherence to all of the 2023 edition of NFPA 855, including Section G.3.5 and the rest of Annex G? If the Board intends that the County Staff apply the most current standards to ensure the health and safety of the people that reside near Commercial Renewable Energy Projects, why would the Commissioners intend that *less* than the entire Annex be enforced?

Finally, there is no indication in the Ordinance that the Commissioners intended that the Fire Department should have the authority to pick and choose among the protections established in Ordinance 2023-09. **The Fire Marshal's interpretation of the Board's Ordinance 2023-09 defeats the purpose of the Board's December action.** The Board should either (1) amend the Fire Code to make it explicit that the County incorporates Annex G into the Fire Code or (2) issue a clarification directly to the Fire Marshal to that effect.

Thank you,

Ashley C. Schannauer

Santa Fe, NM 87508

cc: Gregory S. Shaffer, Santa Fe County Manager, gshaffer@santafecountynm.gov
Jeffrey S. Young, Santa Fe County Attorney, jyoung@santafecountynm.gov
Jacob Black, Fire Chief, jblack@santafecountynm.gov
Jaome Blay, Assistant Chief, Fire Marshal, jblay@santafecountynm.gov
Penny Ellis-Green, Growth Management Director, pengreen@santafecountynm.gov

Exhibit 7

April 28, 2024 letter

Schannauer to Blay and Ellis-Green with copies to County Commissioners, Shaffer, Young, Black, Case Manager Dominic Sisneros, and Building and Development Manager Jordan Yutzy "Re: Ordinance 2023-09 and Annex G of NFPA 855"

By Email: April 28, 2024

Jaome Blay, Assistant Chief, Fire Marshal
jblay@santafecountynm.gov

Penny Ellis-Green, SLDC Administrator, Growth Management Director
pengreen@santafecountynm.gov

102 Grant Avenue
Santa Fe, NM 87501

Re: Ordinance 2023-09 and Annex G of NFPA 855

Dear Fire Marshal Blay and Director Ellis-Green:

This is a follow-up to my letter of February 27, 2024 in which I asked the County Commissioners to expressly adopt Annex G of the 2023 edition of National Fire Protection Association Standard 855 (NFPA 855) into the Santa Fe County Fire Code. I am writing this letter to review the importance of Annex G and to request that the County Fire Department and other County decision-makers include Annex G in their consideration of Conditional Use Permits for Commercial Solar Production Facilities.

On December 13, 2023, the County Commissioners adopted the 2023 edition of NFPA 855 in whole in Ordinance 2023-09, such that all of its provisions, including Annex G, apply to applications by developers of Commercial Solar Energy Production Facilities for Conditional Use Permits. The most significant of the 2023 changes to the 2020 edition of NFPA 855 was the addition of Annex G, which, in light of the accidents involving lithium-ion battery energy storage systems since 2020, contains the most current information on the hazards of such systems. Annex G also includes recommended safety requirements for lithium-ion battery systems to address those hazards. In addition, the most significant part of Annex G is an extensive step-by-step process for conducting a Hazard Mitigation Analysis to evaluate the hazards for each proposed lithium-ion battery system. The 2020 edition of NFPA 855 required the performance of the Analysis but did not prescribe a process for conducting it.

Although the County Commission had adopted the 2023 edition of NFPA 855 in December 2023, the Fire Department chose not to apply Annex G of NFPA 855 in the January 26, 2024 Development Plan Review (attached) that it submitted to the Growth Management Department on the Rancho Viejo application for a Conditional Use Permit. In addition, the Fire Department cites the requirement in NFPA 855 for the performance of a Hazard Mitigation Analysis, but it requires its submission for the County's review only after the Conditional Use Permit for the project has been issued.

The primary issue in Conditional Use proceedings for Commercial Solar Energy Production Facilities concerns the hazards they pose to neighboring property owners. The issue under Section 4.9.6.5 of the Sustainable Land Development Code is whether the facility will be

"detrimental to the health, safety and general welfare" of the area or create a "potential hazard for fire, panic, or other danger."

Since Annex G of NFPA 855 contains the most current information on the hazards of lithium-ion battery energy storage systems and on recommended safety requirements for such systems, the information and recommended safety requirements in Annex G should be considered and applied by the County's decision-makers on Conditional Use Permits for Commercial Solar Energy Production Facilities. For the same reason, Annex G's procedure for conducting a Hazard Mitigation Analysis is of crucial importance to the County's Conditional Use review for such facilities.

Section 1 of this letter describes the "discretionary" review process that applies to requests for Conditional Use Permits and the particular relevance and importance of Annex G's information and recommended safety requirements to that process.

Section 2 provides a summary of the information and recommended safety requirements in Annex G, including when and how to conduct the Hazard Mitigation Analysis. Section 3 describes in greater depth the steps and process recommended by the NFPA for that Analysis. It includes the recommendation that the Hazard Mitigation Analysis be conducted as early as possible in the design of the facility.

Section 4 discusses the limited input that the Fire Department provided to the Growth Management Department and its dismissal of Annex G's importance as "informational only." Section 4 also discusses Annex G's recommendation that the Hazard Mitigation Analysis be performed early in the design process for the facility and the Fire Department's requirement that the Analysis only be submitted after the Conditional Use Permit has been issued.

Section 5 includes this letter's final request that the Fire and Growth Management Departments fully incorporate NFPA 855 and Annex G into their reviews and recommendations.

1. The relevance and importance of NFPA 855 and its Annex G to the Discretionary Review Process for Conditional Use Permits

A developer does not have a legal right to build a Commercial Solar Energy Production Facility in most zoning districts in Santa Fe County, because the facilities are not permitted uses in most zoning districts. A developer must generally obtain a Conditional Use Permit (CUP) for such a facility. The County's Sustainable Land Development Code (SLDC) requires that a developer requesting a CUP prove that the use for which the permit is requested will not "be detrimental to the health, safety and general welfare of the area" or "create a potential hazard for fire, panic, or other danger."[1]

Correspondingly, the issue for the County to consider is whether a proposed facility will, in fact, be detrimental to the health, safety and general welfare of the area or will create a potential hazard for fire, panic, or other danger. The County's determinations must be made on the basis of evidence (i.e., facts and analysis) presented at a hearing initially before the County's SLDC

[1] SLDC Section 4.9.6.5.

hearing officer, later by the Planning Commission, and by the County Commissioners if the Planning Commission's decision is appealed. **The SLDC calls the process to obtain a CUP a "discretionary" proceeding.**[2]

The SLDC distinguishes "discretionary" proceedings from "ministerial" proceedings. **"Discretionary" proceedings involve evidentiary hearings and the County's exercise of judgment on whether an applicant has proven that the standards for a permit are satisfied and whether the requested permit should be granted.** A "ministerial" proceeding involves proposed uses of land to which an applicant has an established right that is subject to previously established conditions. **In "ministerial" proceedings, the County does not hold a hearing to determine whether the requested permit should be granted.** The permit is granted subject to the previously established permit conditions. Unlike a "discretionary" proceeding, the "ministerial" process is sometimes referred to as a "check-the-box" review.[3]

The entirety of NFPA 855, including the NFPA's recent adoption of Annex G, is important for its relevance to the "discretionary" review required to issue a CUP for a Commercial Solar Energy Production Facility. Annex G, in particular, provides the most current information on the hazards of lithium-ion battery systems, and that information is relevant and should be considered by the County in determining whether the proposed facility will, in fact, be detrimental to the health, safety and general welfare of the area or will create a potential hazard for fire, panic, or other danger. The minimum safety requirements represent the product of the NFPA's consideration of the hazards of battery energy storage systems that became evident since the NFPA issued the 2020 edition of NFPA 855. The minimum safety requirements in Annex G are characterized in NFPA 855 as recommendations (not mandatory requirements), but the County Commission, in adopting Ordinance 2023-09, has required the County to adopt and comply with them.

Sections 2 and 3 below provide a summary of the main parts of Annex G and of specific reasons why each part should be implemented by the County and the Fire Department in their review of Conditional Use Permit applications for Commercial Solar Energy Production Facilities.

2. Annex G -- Chapter by Chapter

Introduction -- Annex G includes the most current information on the hazards of lithium-ion battery energy storage systems

Annex G is titled "Guide for Suppression and Safety of Lithium-Ion Battery (LIB) Energy Storage Systems (ESS)." The introduction states that the 2023 edition, including the 41-page Annex G, was developed expressly to address the fire and other risks of battery energy storage systems that have become known since the 2020 edition of NFPA 855 was issued:

> In response to international incidents of ESS fires, requirements for fire detection and suppression, explosion control, exhaust ventilation, gas detection and thermal runaway have been added or revised. The requirements for fire and explosion testing (formally large-scale fire testing) have been clarified.

[2] SLDC Section 4.9.6.3.
[3] SDC Section 4.3.

. . .

Information has been added in Annex B to provide guidance on the hazards associated with different battery types. Annex G has been added as a guide for suppression and safety of lithium-ion battery ESS.[4]

Chapter G.1 -- Annex G as an information source and guide for permitting decisions

Chapter G.1 states that Annex G is important for permitting authorities' consideration of lithium-ion battery (LIB) permits and the authorities' implementation of minimum safety requirements. Annex G's purpose "is to help stakeholders, designers, and authorities having jurisdiction (AHJs) understand and implement minimum safety requirements through a permitting and inspection process to ensure efficiency, transparency, and safety in their local communities."[5]

> G.1.1 Scope. This annex presents information for designers, users, and enforcers planning, approving or encountering installations of LIB-based ESS. This annex focuses on hazard identification and assessment, firefighting, fire protection, and fire and gas detection. It represents information on LIB properties and characteristics, guidance on implementing minimum safety requirements, maintenance and operation of fire protection systems, and other information that can be used to promote safety of LIB installations.[6]

Both the "information" and minimum safety recommendations in Annex G should be considered and evaluated by the County in its consideration of whether a particular Commercial Solar Energy Production Facility proposed for a CUP will be detrimental to the health, safety and general welfare of the area or create a potential hazard for fire, panic, or other danger.

Chapter G.2 -- "Fundamentals of Hazards Associated with LIB-Based ESS"

Chapter G.2 identifies and describes the array of hazards that need to be addressed in the permitting of lithium-ion battery facilities during both normal and abnormal operating conditions:

-- Fire and explosion hazards
-- Chemical hazards, including toxic gas exposure, toxic liquid exposure, corrosive spills, and water-reactive material exposure
-- Electrical hazards
-- Stranded or stored energy hazards
-- Physical hazards

All of these potential hazards should be considered and evaluated by the County in its consideration of whether a particular Commercial Solar Energy Production Facility proposed for a CUP will be detrimental to the health, safety and general welfare of the area or create a potential hazard for fire, panic, or other danger.

Annex G describes fire and explosion and chemical hazards as follows:

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[4] NFPA 855-23, Standard for the Installation of Stationary Energy Storage Systems, 2023 Edition, National Fire Protection Association, at 855-1 (emphasis added).
[5] NFPA 855-23, Annex G, Section G.1.2.1.
[6] NFPA 855-23, Annex G, G.1.1. (Emphasis added.)

G.2.2 Fire and Explosion Hazards.

. . .

G.2.2.2 Under normal operating conditions, fire and explosion hazards can be due to heat sources such as live parts that can be in contact with combustible materials during service or maintenance, or to ignition of combustible concentrations or ignitable fluids and solids that can occur as part of the normal operation of ESS, such as hydrogen off-gassing from batteries with aqueous electrolytes that are open to the atmosphere.

G.2.2.3 Under abnormal operating conditions, fires can be the direct result of the following:

(1) Flammable concentrations can develop due to overheating and venting of flammable gases. A fire or explosion will occur if concentrations of vented gases such as hydrogen and hydrocarbons are sufficient to create combustible/flammable concentrations in the presence of hot surfaces, live electrical equipment, or other sources of ignition. All batteries, with the exception of hermetically sealed types such as sodium beta, have means to relieve internal pressure when overheated to prevent explosions of the battery cell from overpressurization.

(2) Short circuits and thermal runaway can cause overheating of electrical parts or ignitable plastic casings. In the case of thermal runaway, this can lead to a cascade failure of several modules or racks, and extensive fire damage.

(3) An oxidizer in an ESS will increase the intensity of a fire of other materials.

G.2.3 Chemical Hazards.

. . .

G.2.3.2 Under normal operating conditions, workers can be exposed to hazardous materials during maintenance, repair, and replacement of batteries, racks, or entire systems. OSHA and NIOSH have guidelines on exposures to hazardous materials, including limits for workers that have the potential for exposure during normal operation and maintenance.

G.2.3.3 The following similar hazards are present during abnormal operation, but should be considered more likely as a result of upset or damage:

(1) *Corrosive spills*: A liquid with a pH ≤ 2 or ≥ 11.5 is considered corrosive and hazard level 3 and can cause serious or permanent eye injury for someone who comes in direct contact with it per Table B.1 in NFPA 704. With some systems that contain corrosive liquids, there can be the possibility of leaks or spills from the system under emergency/abnormal conditions.

(2) *Toxic liquid exposure*: There are different levels of toxicity from vapors generated under emergency conditions such as fires and hazardous

toxic liquid leaks and spills. NFPA and OSHA provide extensive guidance on classifying the hazards associated with toxic liquids and vapors.
(3) *Water-reactive material exposure*: Water-reactive materials in ESS could be exposed under abnormal conditions, resulting in a violent reaction with the moisture in the air.
(4) *Toxic gas exposure*: Toxic gases can be released during abnormal operation or following damage to an ESS. OSHA and NFPA 704 contain guidelines for classification of these hazards.

Chapters G.3 and G.4 -- Hazard Mitigation Analysis
Chapter 4 of the mandatory sections of NFPA 855 (part of the mandatory provisions of NFPA 855 that the Fire Department explicitly incorporated into its January 26 Plan Review) requires the performance of a Hazard Mitigation Analysis, but it does not prescribe how and when it should be performed.[7] Chapters G.3 and G.4 in Annex G provide that detail.

Annex G recognizes that there is not a single uniform set of standards that is sufficient to address the risks of lithium-ion batteries regardless of the type of system, its location and a community's willingness to accept the risks. The Annex requires a review that is conducted on a project-specific basis, with input from stakeholders to determine an acceptable level of risk and safety requirements to address that level of risk.

Annex G includes the recommendation that a Hazard Mitigation Analysis be conducted as early as possible in a facility's design process. Annex G's recommendations for the Hazard Mitigation Analysis are discussed in more detail in Section 3 of this letter, following this summary.

Chapters G.5 and G.8 -- Reserved for future development
Chapter G.5 "Application of LIB-Based ESS and How Location Within a Building Impacts the Hazard Analysis" and Chapter G.8 "Flammable Gas, Deflagration Hazard Studies, and Use of NFPA 68 and NFPA 69 for Lithium-Ion Batteries" are "reserved" as placeholders. These chapters are still works in progress.

Chapter G.6 -- Fire protection systems and explosion risks
Chapter G.6 describes the complexity of the fire and explosion risks addressed with fire protection systems and the explosion risks they generate if the systems succeed in suppressing flames. As one example, the use of "clean agent systems" by AES Corporation and others needs to manage the trade-offs between extinguishing flames that burn the gases released during a thermal runaway and allowing the gases to accumulate and form an explosive situation. Section G.6.1.4 states that "clean-agent suppression systems" can extinguish a fire but will not stop thermal runaway or off-gassing if the cells are damaged, creating a potential explosive environment. Similar to a natural gas fire, if gas is allowed to accumulate, a more hazardous condition can develop. There might be times when venting is more critical than suppression. Section G.6.1.4 recommends the installation of a device that vents the suppressant and potentially restarts the flames to avoid the greater harm of an explosion.

[7] NFPA 855-23, Section 4.4.

Chapter G.7 -- Fire and flammable gas detection measures
Chapter G.7 stresses the importance of Fire and Flammable Gas Detection measures. Section G.7.3.6 notes that thermal runaway generally begins with the off-gassing of flammable gases and recommends the installation of off-gas monitors and detectors to detect and respond to thermal runaway. Section G.7.3.6 states that off-gas monitoring or off-gas particle detection provide the most amount of time to react to the condition.

Chapters G.9-G.11 -- Construction and Installation, Inspection and Maintenance, and First Responder Plans
Chapters G.9-G.11 provide recommendations on Construction and Installation plans, Inspection and Maintenance plans for installed systems, and First Responder plans. The Chapters also include sample formats for each type of plan.

The risks and recommended safety requirements described in Chapters G.6, G.7 and G.9-11 should be considered and evaluated by the County in its consideration of whether a particular Commercial Solar Energy Production Facility proposed for a CUP will be detrimental to the health, safety and general welfare of the area or create a potential hazard for fire, panic, or other danger. The County should require any application for a Commercial Solar Energy Production Facility to include these types of safety requirements as early in the project design process as possible, before a CUP application can be approved. More details on this are included in the section below.

3. Hazard Mitigation Analysis as a key component of the permitting process
Chapter 4 of NFPA 855 (part of the mandatory provisions of NFPA 855 which the Fire Department explicitly incorporated into its January 26 Plan Review) requires that a developer perform a Hazard Mitigation Analysis, but it doesn't say how and what hazards should be addressed. Annex G provides those details.

a. The Hazard Mitigation Analysis should be started early in the design process -- not after the CUP decision
Section G.3.1.2 of Annex G states that the creation of the Hazard Mitigation Analysis **should be initiated as early in the design process as practical** to ensure that the fire prevention, fire protection, and explosion prevention recommendations described in the Annex have been evaluated in view of the project-specific consideration of the design, layout, and anticipated operating requirements. The Hazard Mitigation Analysis should also be a living document that continues to evolve, as the plant design is refined, and it should be maintained and revised for the life of the plant.[8]

b. Stakeholder input
Annex G provides for early input into the Hazard Mitigation Analysis from stakeholders with an interest in the fire risks of the project to develop the fire and explosion design and protections that the stakeholders agree are appropriate for the level of risk they are willing to accept at a particular site.

[8] See also NFPA 855-23, Annex G, Section G.3.4.5.

Annex G states that the Hazard Mitigation Analysis should involve the perspectives of stakeholders: (i) to determine plant-specific safety goals for each project and (ii) to evaluate whether the mandatory standards in NFPA 855 standards are sufficient. Section G.3.2.2 states that stakeholders should establish goals for safety on a project-specific basis and evaluate whether the requirements of NFPA 855 are adequate to meet the goals. The actual design criteria for the level of fire and explosion protection should consider the perspective of these stakeholders.[9]

c. Project-specific reviews of risks

Annex G recognizes that there is no one-size-fits-all level of risk that is acceptable for every project and that there is also no one-size-fits-all set of standards that will provide adequate protection to the public for the risks. Section G.3.3.2 Project-Specific Inputs states that each facility has its own special conditions that impact the nature of the installation. The Hazard Mitigation Analysis should, accordingly, address each of the following project-specific factors:

(1) Energy capacity and power
(2) Personnel/life presence levels as follows:
    (a) Unattended/remote
    (b) Manned but unoccupied
    (c) Unoccupied but in populated area
    (d) Occupied space
    (e) Ambulatory space
(3) Energy types and volatility
(4) Plant layout and geographic (i.e., remote) location
(5) Equipment availability/redundancy
(6) Availability of water supply
(7) Capability of emergency responders
(8) Storage configuration (e.g., short term and long term)
(9) Historical loss information/lessons learned/fire reports
(10) Additional environmental considerations

This section of the Annex does not provide details on each of the Project-Specific Inputs. The items listed suggest, however, that, at a minimum, any Hazard Mitigation Analysis should address the following issues:

Energy capacity and power. The Analysis should consider the relative size of each project, for example, the MW of power it is designed to generate and deliver.

Personnel. The Hazard Mitigation Analysis should consider the number, functions and qualifications of the personnel that will be present at the facility to operate and monitor its performance and respond to accidents. This includes whether the facility will be manned or monitored remotely. An unattended facility presents a higher risk of accidents and a potentially greater elapse of time before an accident is detected and an emergency response can be initiated. If the facility is manned, the Analysis should consider whether the in-person staff will be skilled or unskilled, what their job functions will be, and whether the staff will include personnel skilled in responding to battery-related accidents.

[9] NFPA 855-23, Annex G, Section G.3.2.

Energy types and volatility. The Hazard Mitigation Analysis should consider the types of battery storage proposed, including their history of fires, accidents and explosions.

Plant layout and geographic (i.e., remote) location. Also important is the geographic location of the facility and its proximity to residential neighborhoods and schools. The impact of an accident near a residential area and school is greater than the impact if the facility is located in a more remote area. The Analysis should also consider the potentially greater severity of any hazards that result from normally windy weather conditions and the flammability of the adjacent vegetation (i.e., dry grassland).

Availability of water supply. The availability of water supply is also an important factor, especially as it relates to the emergency response to any fires and explosions. The availability of water as a means of fire suppression is, at a minimum, considered to be an important backup for "clean agent" fire suppression systems.

Capability of emergency responders. Similarly, the capability of the emergency responders who would be called on to address any fires and explosions is important. Will the responders be in close enough proximity, in large enough numbers, and with sufficient firefighting equipment and protections to address an emergency?

Storage configuration (e.g., short term and long term). The length of time in which the facility is planned to operate is also important. The greater the time period for the facility's operation, the greater the risk of accident will be.

Historical loss information/lessons learned/fire reports. The historical record of the applicant is also an important factor, i.e., the number and severity of accidents the applicant may have experienced at other projects. In the case of the Rancho Viejo Solar Project, this would include a review of the causes and consequences of the 2019 explosion and 2022 fire at AES Corporation's facilities in Arizona. It should also include consideration of the nature and dollar amount of the financial and other damages that resulted from the incidents and for which AES was liable.

d. Levels of acceptable risk

Annex G requires that the Hazard Mitigation Analysis evaluate whether the requirements of NFPA 855 are sufficient for a particular project. Section G.3.4.1 states that the stakeholders should establish goals and objectives and evaluate whether the requirements of NFPA 855 are adequate to meet those goals and objectives.

e. Identify each hazard and each prevention measure

Section G.3.5 states that the Hazard Mitigation Analysis should identify each hazard and consequence, identify which prevention/protection features are to be provided or omitted, and summarize the decision-making process.[10] Section G.3.6 also provides examples of threats, hazards, and consequences posed by energy storage systems and how they might fit into a hazard mitigation assessment:

[10] NFPA 855-23, Annex G, Section G.3.5.

(1) Thermal failures (HVAC or noncell related)
(2) Controls failures
(3) Cell internal failures
(4) External/environmental risks
(5) Electrical risks

In this regard, Annex G warns of the limitations of industry tests, including UL 9540, that are used to evaluate the effectiveness of specific components of the project, such as specific types of fire suppression systems and their configurations within the battery installations. Section G.3.6 states that the Hazard Mitigation Analysis should include a broader "more holistic" review of the risks that preventive measures may fail, including the possibility/likelihood that more than one failure could occur at the same time:

> Within these hazard categories [identified above], multiple threats exist, which would result in cells catching fire and, ultimately, that fire propagating, or posing the risk of propagating, throughout the whole system. Between these threats and such hazard events occurring, barriers exist that can stop the failure from occurring, minimize its severity, or contain its outcome such that it is unable to propagate. Should these barriers fail to do so, the event would then result in a propagating failure, leading to some consequence that could range from a fire involving some number of cells to a container or system wide, catastrophic conflagration. <u>While the failure mode and effects analysis (FMEA) called for in UL 1973 and UL 9540 look at the barriers in place to prevent these types of events within the ESS itself, an HMA or FRA looks holistically at the system and includes environmental and as-built components and considerations not included at the product level</u>.[11]

4. The Fire Department's incomplete and ministerial review, and its requirement that the Hazard Mitigation Analysis be submitted <u>after</u> the issuance of a Conditional Use Permit for the Rancho Viejo Solar Project

On January 26, 2024, the Fire Department issued the most recent update of its Development Plan Review for the Rancho Viejo Solar Project.[12] The document itself does not describe its purpose or significance, but it appears to have been issued in response to a request of the Growth Management Department for input, pursuant to Section 4.4.7 of the SLDC. Section 4.4.7 authorizes the Growth Management Department to refer CUP applications to federal, State or County agencies for **completeness review, substantive review and opinion**.[13] (Emphasis added).

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[11] NFPA 855-23, Annex G, Section G.3.5. (Emphasis added.)

[12] The Fire Department issued previous Development Plan Reviews on February 23, 2023, September 26, 2023 and January 25, 2024.

[13] Section 4.4.7 of the SLDC authorizes the Growth Management Department to refer CUP applications to federal, State or County agencies for completeness review, substantive review and opinions:

> 4.4.7 Agency Review and Opinions. Except as otherwise provided in Section 5.7.5 (agency review of major subdivisions), the Administrator shall refer applications, as appropriate, to the following federal, State or County agencies for completeness review, substantive review and opinions:
> 4.4.7.1 the Office of the New Mexico State Engineer (OSE);

The Fire Department's Review, however, does not provide a review of whether the Rancho Viejo Solar Project application is complete, a substantive review of the application, or opinions regarding the application. It appears to be the result of a standard "check-the-box" ministerial review that assumes that the proposed use is a permitted use and the only issue left for the County is to identify the already established requirements of the fire and other safety codes that apply.

The Fire Department checks a box on the Review form indicating "Accepted." The rest of the document's first page includes citations to the Santa Fe Fire Code that the Fire Department identifies as applicable to the proposed use:

> Development plan review documents are approved with the intent that such documents shall comply with:
> 1.Santa Fe County Ordinance 2023-06 as adopted by the Board of County Commissioners.
> 2.Santa Fe County Ordinance 2023-09 as adopted by the Board of County Commissioners.
> 3.2021 International Fire Code (IFC) and 2021 International Wildland Urban-Interface Code (IWUIC) as amended by Santa Fe County Ordinance 2023-06.

After listing citations to the various codes that apply to the project, the document concludes on page 7 with the requirement that the applicant "shall comply with Santa Fe County Fire Department (SFCFD) application checklist on hazard identification and assessment, fire protection, and fire and gas detection on Lithium-Ion Battery (LIB) Energy Storage System (ESS) Installations."

The Fire Department's review is not project-specific, contrary to NFPA 855. It also leapfrogs the question of whether the proposed project will be detrimental to the health, safety and general welfare of the area or create a potential hazard for fire, panic, or other danger. It is therefore not the discretionary review that is required in the SLDC for a CUP.

Moreover, the Fire Marshal has indicated that the applicant will only be required to comply with one of the most important provisions of NFPA 855 -- the performance of a Hazard Mitigation Analysis -- **after** the CUP has been issued. The Review states that the applicant must comply with NFPA 855, including but not limited to Chapters 1 through 9. But, when questioned at a

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> 4.4.7.2 the New Mexico Environment Department (NMED);
> 4.4.7.3 the New Mexico Department of Transportation (NMDOT);
> 4.4.7.4 the applicable Soil and Water Conservation District;
> 4.4.7.5 the State Historic Preservation Office (SHPO);
> 4.4.7.6 a Tribal Government within Santa Fe County;
> 4.4.7.7 Any County Departments and other public agencies that the Administrator deems necessary to assist the Administrator and staff to determine compliance with this and other relevant Ordinances; (Emphasis added).

Instead of providing an opinion on the fire and explosion risks of the project to assist the Growth Management Department in its review, the Fire Department appears to have assumed that the CUP would be issued as of right through a ministerial review process, and it provided a list of regulatory requirements to be included in the permit.

public information meeting on January 17, 2024, the Fire Marshal stated that the Hazard Mitigation Analysis required by NFPA 855 should be submitted in connection with the applicant's request for an installation permit under the Santa Fe County Fire Code, not with the applicant's request for the CUP. The Hazard Mitigation Analysis would therefore be submitted **after** the CUP is issued.[14]

The Fire Department's Review fundamentally conflicts with common sense, with the SLDC's standard for considering CUP applications, and with County Ordinance 2023-09, including Annex G. Given that the SLDC requires proof that a proposed use will not be detrimental to the health, safety and general welfare of the area or create a potential hazard for fire, panic, or other danger,[15] a project's potential hazards should be evaluated during the CUP review process, not **after** the CUP has been issued. In addition, the SLDC requires that "[f]ormulation of mitigation measures shall be identified at the first discretionary approval and under no circumstances deferred until the ministerial development process."[16] And, as noted earlier, Annex G states that the Hazard Mitigation Analysis should be performed in the early stage of the design process, and County Ordinance 2023-09 adopts NFPA 855 (of which Annex G is a part).

The Fire Marshal largely dismisses the relevance of Annex G as being "informational only." Instead, the Fire Marshal parses NFPA 855 to select various sections that can be applied as regulatory requirements. But the Fire Marshal's comments miss the essential point of a CUP review. The "information" provided in Annex G represents the most current information regarding the hazards of lithium-ion battery storage systems. And it is those hazards that are the focus and primary issue in the discretionary review for a CUP. That information should be available and be considered by the County's decision-makers in CUP proceedings.

5. Annex G provides the most current information on lithium-ion battery storage system hazards and safety requirements that should be considered during the County's CUP review process

The purpose of the Conditional Use Permit review is to determine whether a CUP should be granted and, if so, to establish any necessary permit conditions to protect the public's interests. The CUP review should consider the best and most current information regarding the central issues of whether the proposed land use will be detrimental to the health, safety and general welfare of the area or create a potential hazard for fire, panic, or other danger.

The entirety of Annex G is, therefore, relevant to the County's CUP review. Annex G includes the best and most current information regarding the hazards of lithium-ion batteries and Annex G's recommended safety requirements. It is part of NFPA 855, which was adopted in County Ordinance 2023-09. It should be considered by the Fire and Growth Management Departments and all other County decision-makers in CUP reviews for Commercial Solar Energy Production Facilities.

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[14] The Santa Fe County Fire Code incorporates most of the International Fire Code, including Section 1207.1.2, which requires a Construction Permit before installing an Electrical Energy Storage System. 2021 International Fire Code, Section 1207.1.2.

[15] SLDC Section 4.9.6.5.

[16] SLDC Section 6.3.10.2. (Emphasis added.)

The Fire Department's January 26 Development Plan Review ignores the relevance of the information in Annex G to the CUP decision-makers. This is an especially crucial mistake given the centrality of a Hazard Mitigation Analysis in a CUP review. A site-specific Hazard Mitigation Analysis performed in the manner prescribed in Annex G should be required of every CUP applicant before a CUP is issued for a Commercial Solar Energy Production Facility that includes a Battery Energy Storage System.

Respectfully,
Ashley C. Schannauer
Santa Fe, NM 87508

cc: County Commissioners
Gregory S. Shaffer, County Manager gshaffer@santafecountynm.gov
Jeffrey S. Young, County Attorney jyoung@santafecountynm.gov
Jacob Black, Fire Chief jblack@santafecountynm.gov
Dominic Sisneros, Case Manger djsisneros@santafecountynm.gov
Jordan Yutzy, Building and Development Manager jyutzy@santafecountynm.gov

Exhibit 8

June 2, 2024 letter

Schannauer to Blay, Ellis-Green, AES Senior Manager Joshua Mayer, and Nick Bartlett, Atar Fire "Re: Request to identify 'stakeholders' to participate in Hazard Mitigation Analysis under NFPA 855 for the Rancho Viejo Solar Project"

By Email: June 2, 2024

Jaome Blay, Assistant Chief, Fire Marshal
jblay@santafecountynm.gov

Penny Ellis-Green, SLDC Administrator, Growth Management Director
pengreen@santafecountynm.gov

Joshua Mayer, Senior Manager, Project Development
Joshua.Mayer@aes.com

Nick Bartlett, Atar Fire
nick@atarfire.com

Re: Request to identify "stakeholders" to participate in Hazard Mitigation Analysis under NFPA 855 for the Rancho Viejo Solar Project

Dear Mr. Blay, Ms. Ellis-Green, Mr. Mayer and Mr. Bartlett:

I am writing to follow up on two letters: (1) the letter I sent to Fire Marshal Blay and Director Ellis-Green on April 28, 2024 regarding County Ordinance 2023-09 and NFPA 855 and its requirements for Hazard Mitigation Analysis (HMA); and (2) Fire Marshal Blay's April 29, 2024 response to my letter (copies attached). Referring to NFPA 855, Fire Marshal Blay wrote that "Annex G shall be considered in its entirety for all BESS installations within Santa Fe County," and that "the HMA shall be reviewed **prior** to the granting of a Conditional Use Permit" (emphasis in original).

In a May 14 meeting with County staff member Dominic Sisneros, County residents learned that AES Corp. intends to file a new application for its proposed Rancho Viejo solar and BESS project in July 2024. I'm writing now to request that you initiate the process, required by NFPA 855, to identify members of the public to serve as "stakeholders" for the development of the Hazard Mitigation Analysis. I'm also requesting the opportunity to participate as a stakeholder.

As you know, Chapter 4 of NFPA 855 requires developers of battery storage projects to prepare Hazard Mitigation Analyses to obtain necessary permits.[1] Hazard Mitigation Analyses are conducted on a project-specific basis. They identify the hazards posed by each project and the availability of regulatory standards and measures to mitigate the hazards. They then evaluate whether the regulatory standards and measures are sufficient to address the level of risk that "stakeholders" determine is acceptable for the unique conditions of the affected area and its residents.

[1] NFPA 855-2023, Section 4.4.

Annex G of NFPA 855 requires the early input of stakeholders in the preparation of a Hazard Mitigation Analysis. Section G.3.2 highlights the importance of considering their input on the level of the fire and explosion risks that should be acceptable for each project:

> G.3.2 Stakeholders
> G.3.2.1 Stakeholders with an interest in the scope and applicability of the fire protection design should be identified early in the process.
> G.3.2.2 Stakeholders should establish goals and objectives and evaluate whether the requirements of NFPA 855 are adequate to meet these goals and objectives. The criteria for acceptability of the level of fire and explosion protection should consider the perspective of the various stakeholders.[2]

Annex G recognizes that there is no one-size-fits-all level of risk that is acceptable for every project and that there is also no one-size-fits-all set of standards that will provide adequate protection to the public for the risks. Section G.3.3.2 Project-Specific Inputs states that each facility has its own special conditions that impact the risks associated with the installation. It states that the Analysis should address each of the following project-specific factors:

(1) Energy capacity and power
(2) Personnel/life presence levels as follows:
    (a) Unattended/remote
    (b) Manned but unoccupied
    (c) Unoccupied but in populated area
    (d) Occupied space
    (e) Ambulatory space
(3) Energy types and volatility
(4) Plant layout and geographic (i.e., remote) location
(5) Equipment availability/redundancy
(6) Availability of water supply
(7) Capability of emergency responders
(8) Storage configuration (e.g., short term and long term)
(9) Historical loss information/lessons learned/fire reports
(10) Additional environmental considerations[3]

A Hazard Mitigation Analysis is critical to the central issues in Santa Fe County's standards for the issuance of a Conditional Use Permit. The primary issues under Section 4.9.6.5 of the Sustainable Land Development Code are whether the facility will be "detrimental to the health, safety and general welfare" of the area or create a "potential hazard for fire, panic, or other danger."[4]

AES is currently or will likely soon be preparing a Hazard Mitigation Analysis for the new Conditional Use Permit Application it plans to file. And both AES and the County have roles to ensure that the Analysis is done in accordance with NFPA 855. Preparation of the Hazard Mitigation Analysis is AES's responsibility, but the County also has a role. The County will

[2] NFPA 855-2023, Annex G, G.3.2. (Emphasis added).
[3] NFPA 855-2023, Annex G, Section G.3.3.2.
[4] SLDC, Section 4.9.6.5.

ultimately have to evaluate AES's compliance with NFPA 855, including the appropriate selection of stakeholders, and the County has hired a consultant to assist the County in that evaluation.

Annex G does not contain a definition *per se* of the term "stakeholder," but Section G.3.2.1 refers to "stakeholders" as persons or entities "with an interest in the scope and applicability of the fire protection design."[5] Members of the public residing in both the Rancho San Marcos and Eldorado subdivisions should be able to participate as stakeholders in the Hazard Mitigation Analysis. They have a special "interest in the scope and applicability of the fire protection design" of the proposed project. They have interests in the potential hazards posed by the project, the effectiveness of potential mitigation measures and the remaining level of risk they may be asked to bear.

In that regard, I am requesting the opportunity to participate as a stakeholder. I currently live in Eldorado and have done so for the last 20 years. I am familiar with the vulnerability of the dry and windy Eldorado area to the risk of fires and its limited and likely-to-be-congested evacuation routes. I am familiar with the applicable provisions of NFPA 855 and the International Fire Code. I have corresponded with Santa Fe County officials on the application of NFPA 855 and other issues related to Commercial Solar Energy Production Facilities since August 2023. As a former administrative law judge (now retired) at the NM Public Regulation Commission, I am also familiar with siting issues for utility resources and the types and risks of battery energy storage systems.

Please let me know how and when AES intends to proceed with its selection of stakeholder participants for the Hazard Mitigation Analysis. AES should ensure (and the County needs to require) that Eldorado and San Marcos residents are included as stakeholders. Their inclusion is necessary to ensure that the hazards posed by the proposed project are identified and thoroughly evaluated and that residents' concerns about the identified hazards are incorporated into the analysis.

Thank you,

Ashley C. Schannauer
Ashley C. Schannauer
Santa Fe, 87508
Schannauer21@outlook.com

cc: Gregory S. Shaffer, County Manager, gshaffer@santafecountynm.gov
Jeffrey S. Young, County Attorney, jyoung@santafecountynm.gov
Jacob Black, Fire Chief, jblack@santafecountynm.gov
Dominic Sisneros, Case Manager, djsisneros@santafecountynm.gov
Jordan Yutzy, Building and Development Manager, jyutzy@santafecountynm.gov
Brian Egolf, Brian@EgolfLaw.com
Matt Gordon, Matt.Gordon@aes.com

[5] NFPA 855-2023, Annex G, Section G.3.2.1.

Exhibit 9

July 5, 2024 letter

Schannauer to Blay, Interim Growth Management Director Leandro Cordova, Deputy Growth Management Director Lisaida Archuleta, Mayer and Bartlett with copies to Shaffer, Young, Black, Sisneros, Yutzy, Brian Egolf and Matt Gordon "Re: Request to start the stakeholder process for the Hazard Mitigation Analysis under NFPA 855 for the Rancho Viejo Solar Project"

By Email: July 5, 2024

Jaome Blay, Assistant Chief, Fire Marshal
jblay@santafecountynm.gov

Leandro Cordova, Interim Growth Management Director
lcordova@santafecountynm.gov

Lisaida Archuleta, Deputy Growth Management Director
lmarchuleta@santafecountynm.gov

Joshua Mayer, Senior Manager, Project Development
Joshua.Mayer@aes.com

Nick Bartlett, Atar Fire
nick@atarfire.com

Re: Request to start the stakeholder process for the Hazard Mitigation Analysis under NFPA 855 for the Rancho Viejo Solar Project

Dear Mr. Blay, Mr. Cordova, Ms. Archuleta, Mr. Mayer and Mr. Bartlett:

I'm writing to request that the County and AES Corporation move forward with the stakeholder process prescribed in Annex G of NFPA 855 for the Rancho Viejo Solar Project.

In response to my request of April 28, 2024 to Fire Marshal Blay and then-Director Penny Ellis-Green, Fire Marshal Blay wrote on April 29, 2024 that "Annex G shall be considered in its entirety for all BESS installations within Santa Fe County." Section G.1.2.1 of Annex G states that the purpose of the annex is "to help stakeholders, designers, and authorities having jurisdiction (AHJs) understand and implement minimum safety requirements through a permitting and inspection process to ensure efficiency, transparency, and safety in their local communities."[1] Section G.3.2 of Annex G provides for the early input of stakeholders in the preparation of a Hazard Mitigation Analysis for each project, including the level of the fire and explosion risks that should be considered acceptable for the project.[2]

Subsequently, in response to my request of June 2, 2024 that the County and AES start the process of identifying stakeholders, Matt Gordon of AES Clean Energy stated in a June 7, 2024 letter that AES recognizes the authority of the Fire Marshal to incorporate Annex G's stakeholder process in the Conditional Use Permit process for the Rancho Viejo Solar Project and stated that AES Clean Energy will gladly cooperate if the Fire Marshal elects to proceed with the process. Mr. Gordon stated that AES Clean Energy has no objection to me serving as a stakeholder and said that AES Clean Energy would recommend additional persons with local and subject matter knowledge to serve as additional stakeholders in the process. Mr. Gordon stated that AES Clean Energy anticipates that the development of the Hazard Mitigation Analysis will be an iterative

[1] NFPA 855, Annex G, Section G.1.2.1.
[2] NFPA 855, Annex G, Section G.3.2.

process based on feedback from the County's third-party reviewer, the Fire Marshal and County staff. He stated that AES Clean Energy would like to incorporate the stakeholders' input as early in that iterative process as possible.

Despite AES's willingness to incorporate the stakeholder process into the preparation of its Hazard Mitigation Analysis for the Rancho Viejo Solar Project, I have not seen a response from the County to AES's June 7 letter, and I have received no further word from the County or AES about the initiation of the process, including the identification as stakeholders of additional residents impacted by the project.

As noted above, Annex G includes recommendations "to help stakeholders, designers, and authorities having jurisdiction (AHJs) understand and implement minimum safety requirements through a permitting and inspection process to ensure efficiency, transparency, and safety in their local communities."[3] I ask the County and AES to move forward with the stakeholder process prescribed in NFPA 855, Annex G to ensure efficiency, transparency and safety in the communities impacted by the Rancho Viejo Solar Project.

The County should (1) notify AES that it should incorporate Annex G's stakeholder process into the preparation of the Hazard Mitigation Analysis for the Rancho Viejo Solar Project, (2) grant residents impacted by the project (and the residents' experts) the right to participate as stakeholders, and (3) establish an organizational meeting to discuss and agree on a schedule and other details for the stakeholders' work.

Thank you,

Ashley C. Schannauer
Santa Fe, 87508
Schannauer21@outlook.com

Attachments:
-- April 28, 2024 letter Schannauer to Fire Marshal Blay and Director Ellis-Green
-- April 29, 2024 letter Fire Marshal Blay to Schannauer
-- June 2, 2024 letter Schannauer to Fire Marshal Blay, Director Ellis-Green, Joshua Mayer (AES) and Nick Bartlett (Atar Fire)
-- June 7, 2024 letter Matt Gordon (AES) to Fire Marshal Blay, Schannauer, Director Ellis-Green and Nick Bartlett (Atar Fire)

cc: Gregory S. Shaffer, County Manager, gshaffer@santafecountynm.gov
Jeffrey S. Young, County Attorney, jyoung@santafecountynm.gov
Jacob Black, Fire Chief, jblack@santafecountynm.gov
Dominic Sisneros, Case Manager, djsisneros@santafecountynm.gov
Jordan Yutzy, Building and Development Manager, jyutzy@santafecountynm.gov
Brian Egolf, Brian@EgolfLaw.com
Matt Gordon, Matt.Gordon@aes.com

[3] NFPA 855, Annex G, Section G.1.2.1.

Exhibit 10

July 31, 2024 letter

Schannauer to Shaffer with copies to Young, Black, Blay, Cordova, Archuleta, Growth Management Director Alexandra Ladd, Yutzy, Sisneros and Commissioner Hank Hughes "Re: Request for virtual public meeting on the Rancho Viejo Solar Project application"

By Email: July 31, 2024

Gregory S. Shaffer, County Manager
gshaffer@santafecountynm.gov

Re: Request for virtual public meeting on the Rancho Viejo Solar Project application

Dear County Manager Shaffer:

I'm writing to respectfully ask that you grant the requests made by Commissioner Hughes and District 5 residents for the Growth Management and Fire Departments to hold a public meeting to discuss the status of the Rancho Viejo Solar Project application and the County staff's plans for reviewing it.

In recent monthly virtual meetings between Commissioner Hughes and his District 5 constituents, residents asked Commissioner Hughes to arrange a virtual public meeting to be held by County staff (similar to the previous meeting on January 17, 2024) to discuss the status of the project. Commissioner Hughes followed up on the residents' request, but County staff refused his request. In a communication to a resident, Commissioner Hughes wrote:

> I feel that openness provided by a meeting is useful. I requested the meeting with staff about AES, however they feel that it would not be useful until they have had a chance to review the application. They have not received the application and they would need 30 days to review to have a useful meeting.[1]

A public meeting with County staff should not wait until after AES files its resubmittal. The public has many questions that County staff can answer prior to AES's resubmittal. The questions do not relate to the content of the resubmitted application.

Responses to IPRA requests indicate that AES has been regularly discussing its plans to resubmit its conditional use application with County staff since January, and the discussions appear to have accelerated in May. The County's AES Project Applications webpage is out of date, forcing the public to resort to Inspection of Public Records Act (IPRA) requests to try to discover what is going on with the application.

Therefore, perhaps the most important question to be addressed in a public meeting with County staff is: what has AES been discussing with the County staff since May of this year? Those conversations should not be considered confidential.

Other questions to be addressed in a meeting between residents and County staff include a list of follow-up questions I sent to Growth Management and Fire Department staff after the January 17 meeting, to which I never received a response. One of the questions in particular that has been asked by many residents is whether residents potentially affected by the project will be allowed to participate in the conditional use hearing as parties with the rights to present witnesses and conduct cross-examination (in accordance with Section 4.7.2.1 of the Sustainable Land

[1] See attached email.

Development Code (SLDC) and the County's Rules of Order) or whether their participation will be limited to public comments. Who (i.e., County staff or Hearing Officer) will make those decisions and when? To whom should residents make their requests for participation?

Another question relates to the stakeholder process provided in NFPA 855 during the preparation of the Hazard Mitigation Analysis required for AES's conditional use application. In my letter of June 2, I asked to participate as such a stakeholder, and on June 7, AES replied that it did not oppose my request, leaving the issue to the County staff. I never received a response from the County on the issue either in June or in response to my further letter of July 5 requesting a response and the start of the stakeholder process. The three letters are attached.

Additional questions include the following:

-- Will the County's recently hired battery expert be asked to review AES's January 2023 application to identify issues for AES's resubmittal?

-- Will the County's recently hired battery expert also be asked to review the company's 2024 resubmittal?

-- Will Terracon be hired to review the 2024 resubmittal to determine whether AES has addressed the issues that Terracon identified in July 2023? If the company revises and resubmits its 2024 application based on Terracon's July 2023 review, will Terracon then be re-hired to review the resubmitted application?

-- Will the County hire a consultant to perform an independent noise study with the cost charged to AES pursuant to County Resolution 2023-093?

-- Are the costs of the County's consultants being recovered from AES pursuant to Resolution 2023-093 adopted by the Commissioners in October?

These are only some of the questions that residents would like to discuss in a public virtual meeting with County staff.

As you know, it has now been 18 months since AES application filed its application for the conditional use permit. County staff has been meeting regularly with AES since then, but staff has met with the public exactly once. The County needs to provide more transparency to the process to convince the public that the review process is at least as fair to the public as it has been to AES.

Thank you,
Ashley C. Schannauer
Santa Fe, NM 87508

Attachments:
-- July 23, 2024 email Commissioner Hughes to Camilla Brom
-- June 2, 2024 letter Schannauer to Blay, Ellis-Green, AES and Atar Fire
-- June 7, letter Gordon (AES) to Blay, Schannauer, Ellis-Green and Atar Fire
-- July 5, 2024 letter Schannauer to Blay, Cordova, Archuleta, Mayer (AES) and Atar Fire

cc: Jeffrey S. Young, County Attorney, jyoung@santafecountynm.gov
Jacob Black, Fire Chief, jblack@santafecountynm.gov
Jaome Blay, Assistant Chief, Fire Marshal, jblay@santafecountynm.gov
Leandro Cordova, Interim Growth Management Director, lcordova@santafecountynm.gov
Lisaida Archuleta, Deputy Growth Management Director, lmarchuleta@santafecountynm.gov
Alexandra Ladd, Growth Management Director, aladd@santafecountynm.gov
Jordan Yutzy, Building and Development Manager, jyutzy@santafecountynm.gov
Dominic Sisneros, Case Manager, djsisneros@santafecountynm.gov
Commissioner Hank Hughes, hhughes@santafecountynm.gov

Ashley Schannauer <schannauer@comcast.net> 7/31/2024 11:24 AM

Follow up Regarding Virtual Meeting Request

To ASHLEY SCHANNAUER <schannauer@comcast.net>

On Tuesday, July 23, 2024 at 02:13:41 PM MDT, Hank Hughes <hhughes@santafecountynm.gov> wrote:

I feel that openness provided by a meeting is useful. I requested the meeting with staff about AES, however they feel that it would not be useful until they have had a chance to review the application. They have not received the application and they would need 30 days to review to have a useful meeting.

Hank Hughes

Santa Fe County Commissioner, District 5

SANTA FE COUNTY

From: Camilla Brom [br.camilla@yahoo.com]
Sent: Monday, July 22, 2024 11:14 AM
To: Hank Hughes <hhughes@santafecountynm.gov>
Cc: Gabriel C. Bustos <gcbustos@santafecountynm.gov>
Subject: Follow up Regarding Virtual Meeting Request

Warning:

EXTERNAL EMAIL: Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Dear Commissioner Hughes,

I am reaching out to ask if you had requested a Virtual Public meeting for Santa Fe County residents regarding AES updates with questions from SF Co. Residents.

I would sincerely appreciate if you would have Jaome Blay, Jordan Yutzy and Dominic Sisneros host it, as most of the questions would be directly for them.

I also know at your Hour with Hank you said AES had planned to resubmit their 2nd application this month, so I (along with many other SF Co. residents) would like a meeting as soon as possible.

Thanks so much,

Camilla Brom

181 San Marcos Loop

Santa Fe NM 87508

- image001.png (18 KB)

By Email: June 2, 2024

Jaome Blay, Assistant Chief, Fire Marshal
jblay@santafecountynm.gov

Penny Ellis-Green, SLDC Administrator, Growth Management Director
pengreen@santafecountynm.gov

Joshua Mayer, Senior Manager, Project Development
Joshua.Mayer@aes.com

Nick Bartlett, Atar Fire
nick@atarfire.com

Re: Request to identify "stakeholders" to participate in Hazard Mitigation Analysis under NFPA 855 for the Rancho Viejo Solar Project

Dear Mr. Blay, Ms. Ellis-Green, Mr. Mayer and Mr. Bartlett:

I am writing to follow up on two letters: (1) the letter I sent to Fire Marshal Blay and Director Ellis-Green on April 28, 2024 regarding County Ordinance 2023-09 and NFPA 855 and its requirements for Hazard Mitigation Analysis (HMA); and (2) Fire Marshal Blay's April 29, 2024 response to my letter (copies attached). Referring to NFPA 855, Fire Marshal Blay wrote that "Annex G shall be considered in its entirety for all BESS installations within Santa Fe County," and that "the HMA shall be reviewed **prior** to the granting of a Conditional Use Permit" (emphasis in original).

In a May 14 meeting with County staff member Dominic Sisneros, County residents learned that AES Corp. intends to file a new application for its proposed Rancho Viejo solar and BESS project in July 2024. I'm writing now to request that you initiate the process, required by NFPA 855, to identify members of the public to serve as "stakeholders" for the development of the Hazard Mitigation Analysis. I'm also requesting the opportunity to participate as a stakeholder.

As you know, Chapter 4 of NFPA 855 requires developers of battery storage projects to prepare Hazard Mitigation Analyses to obtain necessary permits.[1] Hazard Mitigation Analyses are conducted on a project-specific basis. They identify the hazards posed by each project and the availability of regulatory standards and measures to mitigate the hazards. They then evaluate whether the regulatory standards and measures are sufficient to address the level of risk that "stakeholders" determine is acceptable for the unique conditions of the affected area and its residents.

[1] NFPA 855-2023, Section 4.4.

Annex G of NFPA 855 requires the early input of stakeholders in the preparation of a Hazard Mitigation Analysis. Section G.3.2 highlights the importance of considering their input on the level of the fire and explosion risks that should be acceptable for each project:

> G.3.2 Stakeholders
> G.3.2.1 Stakeholders with an interest in the scope and applicability of the fire protection design should be identified early in the process.
> G.3.2.2 Stakeholders should establish goals and objectives and evaluate whether the requirements of NFPA 855 are adequate to meet these goals and objectives. The criteria for acceptability of the level of fire and explosion protection should consider the perspective of the various stakeholders.[2]

Annex G recognizes that there is no one-size-fits-all level of risk that is acceptable for every project and that there is also no one-size-fits-all set of standards that will provide adequate protection to the public for the risks. Section G.3.3.2 Project-Specific Inputs states that each facility has its own special conditions that impact the risks associated with the installation. It states that the Analysis should address each of the following project-specific factors:

(1) Energy capacity and power
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    (c) Unoccupied but in populated area
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(3) Energy types and volatility
(4) Plant layout and geographic (i.e., remote) location
(5) Equipment availability/redundancy
(6) Availability of water supply
(7) Capability of emergency responders
(8) Storage configuration (e.g., short term and long term)
(9) Historical loss information/lessons learned/fire reports
(10) Additional environmental considerations[3]

A Hazard Mitigation Analysis is critical to the central issues in Santa Fe County's standards for the issuance of a Conditional Use Permit. The primary issues under Section 4.9.6.5 of the Sustainable Land Development Code are whether the facility will be "detrimental to the health, safety and general welfare" of the area or create a "potential hazard for fire, panic, or other danger."[4]

AES is currently or will likely soon be preparing a Hazard Mitigation Analysis for the new Conditional Use Permit Application it plans to file. And both AES and the County have roles to ensure that the Analysis is done in accordance with NFPA 855. Preparation of the Hazard Mitigation Analysis is AES's responsibility, but the County also has a role. The County will

[2] NFPA 855-2023, Annex G, G.3.2. (Emphasis added).
[3] NFPA 855-2023, Annex G, Section G.3.3.2.
[4] SLDC, Section 4.9.6.5.

ultimately have to evaluate AES's compliance with NFPA 855, including the appropriate selection of stakeholders, and the County has hired a consultant to assist the County in that evaluation.

Annex G does not contain a definition *per se* of the term "stakeholder," but Section G.3.2.1 refers to "stakeholders" as persons or entities "with an interest in the scope and applicability of the fire protection design."[5] Members of the public residing in both the Rancho San Marcos and Eldorado subdivisions should be able to participate as stakeholders in the Hazard Mitigation Analysis. They have a special "interest in the scope and applicability of the fire protection design" of the proposed project. They have interests in the potential hazards posed by the project, the effectiveness of potential mitigation measures and the remaining level of risk they may be asked to bear.

In that regard, I am requesting the opportunity to participate as a stakeholder. I currently live in Eldorado and have done so for the last 20 years. I am familiar with the vulnerability of the dry and windy Eldorado area to the risk of fires and its limited and likely-to-be-congested evacuation routes. I am familiar with the applicable provisions of NFPA 855 and the International Fire Code. I have corresponded with Santa Fe County officials on the application of NFPA 855 and other issues related to Commercial Solar Energy Production Facilities since August 2023. As a former administrative law judge (now retired) at the NM Public Regulation Commission, I am also familiar with siting issues for utility resources and the types and risks of battery energy storage systems.

Please let me know how and when AES intends to proceed with its selection of stakeholder participants for the Hazard Mitigation Analysis. AES should ensure (and the County needs to require) that Eldorado and San Marcos residents are included as stakeholders. Their inclusion is necessary to ensure that the hazards posed by the proposed project are identified and thoroughly evaluated and that residents' concerns about the identified hazards are incorporated into the analysis.

Thank you,

Ashley C. Schannauer
Ashley C. Schannauer
Santa Fe, 87508
Schannauer21@outlook.com

cc: Gregory S. Shaffer, County Manager, gshaffer@santafecountynm.gov
Jeffrey S. Young, County Attorney, jyoung@santafecountynm.gov
Jacob Black, Fire Chief, jblack@santafecountynm.gov
Dominic Sisneros, Case Manager, djsisneros@santafecountynm.gov
Jordan Yutzy, Building and Development Manager, jyutzy@santafecountynm.gov
Brian Egolf, Brian@EgolfLaw.com
Matt Gordon, Matt.Gordon@aes.com

[5] NFPA 855-2023, Annex G, Section G.3.2.1.

June 7, 2024

Dear Fire Marshal Blay, Mr. Schannauer, Ms. Ellis-Green, and Mr. Bartlett:

This letter is in response to Mr. Schannauer's letter dated June 2, 2024, requesting appointment as a stakeholder as referenced in Annex G of NFPA 855 for the Rancho Viejo Solar Project. Annex G, by its own terms is "not a part of the requirements of this NFPA document but is included for informational purposes only." Annex G is a "comprehensive set of guidelines for reviewing and evaluating LIB ESS facilities." As such the Fire Marshal, as the Authority Having Jurisdiction (AHJ) who is responsible for the review of the Rancho Viejo Solar Project's compliance with NFPA 855 has discretion to incorporate this stakeholder process. To the extent that the Fire Marshal intends to incorporate the stakeholder process described in Annex G, AES Clean Energy has no objection to Mr. Schannauer serving as a stakeholder. However, the qualifications and role of the stakeholders must be clearly defined and consistent with what is set forth in Annex G.

"Stakeholders" and their qualifications are not defined under Annex G beyond what is set out in Section G.3.2.1 which provides that "stakeholders with an interest in the scope and applicability of the fire protection design should be identified early in the process." As described in this section, stakeholders should be limited to those persons who are interested in, and presumably competent to opine on, the scope and applicability of the fire protection design as well as the unique hazard profile of the technology and the specific project. As such AES Clean Energy strongly encourages that any stakeholders have the necessary expertise to evaluate the fire protection design and the adequacy of NFPA 855 to address the fire protection requirements for the project. This expertise is necessary to effectively accomplish the role of stakeholders under Annex G.

The role of stakeholders under Annex G Section G.3.2.2 is to establish goals and objectives for fire hazard control and evaluate whether the requirements of NFPA 855 are adequate to meet those goals and objectives. This evaluation requires familiarity both with fire control systems and the requirements of NFPA 855. Once the stakeholders have established these goals and objectives, and made the evaluation related to the adequacy of NFPA 855, it appears that the stakeholder role under Annex G is complete. These "stakeholder inputs" then become one of the elements that the AHJ should consider in determining the criteria for the acceptable level of fire and explosion protection against which the Hazard Mitigation Analysis is evaluated. Annex G.3.4.1. Notably, the stakeholders do not have a role in reviewing the Hazard Mitigation Analysis, nor in evaluating the adequacy of the fire protection design against NFPA 855.

Finally, AES Clean Energy has commissioned a Hazard Mitigation Analysis that will be submitted to Santa Fe County's third-party reviewer for review and inclusion with its complete Conditional Use Permit application. AES Clean Energy is committed to complying with all applicable requirements of NFPA 855 in the battery storage component of the Rancho Viejo Solar Project. If the Fire Marshal does elect to proceed with the stakeholder process set forth in Annex G, AES Clean Energy will gladly cooperate and recommend additional persons with local and subject matter knowledge to serve as additional stakeholders in the process. In addition, we would request that the process be assigned a firm

timeline that is commensurate with the scope of the stakeholder's role so that AES Clean Energy can receive and consider the stakeholders' goals and objectives in the development of the Hazard Mitigation Analysis. AES Clean Energy anticipates that the development of the Hazard Mitigation Analysis will be an iterative process based on feedback from the County's third-party reviewer, the Fire Marshal, and County staff, and would like to incorporate the stakeholders' input as early in that iterative process as possible.

Best Regards,

Matt Gordon
Permitting Project Manager
AES Clean Energy

Cc: Gregory S. Shaffer, County Manager, gshaffer@santafecountynm.gov
Jeffrey S. Young, County Attorney, jyoung@santafecountynm.gov
Jacob Black, Fire Chief, jblack@santafecountynm.gov
Dominic Sisneros, Case Manager, djsisneros@santafecountynm.gov
Jordan Yutzy, Building and Development Manager, jyutzy@santafecountynm.gov

By Email: July 5, 2024

Jaome Blay, Assistant Chief, Fire Marshal
jblay@santafecountynm.gov

Leandro Cordova, Interim Growth Management Director
lcordova@santafecountynm.gov

Lisaida Archuleta, Deputy Growth Management Director
lmarchuleta@santafecountynm.gov

Joshua Mayer, Senior Manager, Project Development
Joshua.Mayer@aes.com

Nick Bartlett, Atar Fire
nick@atarfire.com

Re: Request to start the stakeholder process for the Hazard Mitigation Analysis under NFPA 855 for the Rancho Viejo Solar Project

Dear Mr. Blay, Mr. Cordova, Ms. Archuleta, Mr. Mayer and Mr. Bartlett:

I'm writing to request that the County and AES Corporation move forward with the stakeholder process prescribed in Annex G of NFPA 855 for the Rancho Viejo Solar Project.

In response to my request of April 28, 2024 to Fire Marshal Blay and then-Director Penny Ellis-Green, Fire Marshal Blay wrote on April 29, 2024 that "Annex G shall be considered in its entirety for all BESS installations within Santa Fe County." Section G.1.2.1 of Annex G states that the purpose of the annex is "to help stakeholders, designers, and authorities having jurisdiction (AHJs) understand and implement minimum safety requirements through a permitting and inspection process to ensure efficiency, transparency, and safety in their local communities."[1] Section G.3.2 of Annex G provides for the early input of stakeholders in the preparation of a Hazard Mitigation Analysis for each project, including the level of the fire and explosion risks that should be considered acceptable for the project.[2]

Subsequently, in response to my request of June 2, 2024 that the County and AES start the process of identifying stakeholders, Matt Gordon of AES Clean Energy stated in a June 7, 2024 letter that AES recognizes the authority of the Fire Marshal to incorporate Annex G's stakeholder process in the Conditional Use Permit process for the Rancho Viejo Solar Project and stated that AES Clean Energy will gladly cooperate if the Fire Marshal elects to proceed with the process. Mr. Gordon stated that AES Clean Energy has no objection to me serving as a stakeholder and said that AES Clean Energy would recommend additional persons with local and subject matter knowledge to serve as additional stakeholders in the process. Mr. Gordon stated that AES Clean Energy anticipates that the development of the Hazard Mitigation Analysis will be an iterative

[1] NFPA 855, Annex G, Section G.1.2.1.
[2] NFPA 855, Annex G, Section G.3.2.

process based on feedback from the County's third-party reviewer, the Fire Marshal and County staff. He stated that AES Clean Energy would like to incorporate the stakeholders' input as early in that iterative process as possible.

Despite AES's willingness to incorporate the stakeholder process into the preparation of its Hazard Mitigation Analysis for the Rancho Viejo Solar Project, I have not seen a response from the County to AES's June 7 letter, and I have received no further word from the County or AES about the initiation of the process, including the identification as stakeholders of additional residents impacted by the project.

As noted above, Annex G includes recommendations "to help stakeholders, designers, and authorities having jurisdiction (AHJs) understand and implement minimum safety requirements through a permitting and inspection process to ensure efficiency, transparency, and safety in their local communities."[3] I ask the County and AES to move forward with the stakeholder process prescribed in NFPA 855, Annex G to ensure efficiency, transparency and safety in the communities impacted by the Rancho Viejo Solar Project.

The County should (1) notify AES that it should incorporate Annex G's stakeholder process into the preparation of the Hazard Mitigation Analysis for the Rancho Viejo Solar Project, (2) grant residents impacted by the project (and the residents' experts) the right to participate as stakeholders, and (3) establish an organizational meeting to discuss and agree on a schedule and other details for the stakeholders' work.

Thank you,

Ashley C. Schannauer
Santa Fe, 87508
Schannauer21@outlook.com

Attachments:
-- April 28, 2024 letter Schannauer to Fire Marshal Blay and Director Ellis-Green
-- April 29, 2024 letter Fire Marshal Blay to Schannauer
-- June 2, 2024 letter Schannauer to Fire Marshal Blay, Director Ellis-Green, Joshua Mayer (AES) and Nick Bartlett (Atar Fire)
-- June 7, 2024 letter Matt Gordon (AES) to Fire Marshal Blay, Schannauer, Director Ellis-Green and Nick Bartlett (Atar Fire)

cc: Gregory S. Shaffer, County Manager, gshaffer@santafecountynm.gov
Jeffrey S. Young, County Attorney, jyoung@santafecountynm.gov
Jacob Black, Fire Chief, jblack@santafecountynm.gov
Dominic Sisneros, Case Manager, djsisneros@santafecountynm.gov
Jordan Yutzy, Building and Development Manager, jyutzy@santafecountynm.gov
Brian Egolf, Brian@EgolfLaw.com
Matt Gordon, Matt.Gordon@aes.com

[3] NFPA 855, Annex G, Section G.1.2.1.

Exhibit 11

August 25, 2024 letter

Schannauer to Ladd and Blay with copies to Shaffer, Young, Cordova, Archuleta, Yutzy and Sisneros “Re: Public input for the Conditional Use Permit process for the Rancho Viejo Solar Project”

By Email: August 25, 2024

Alexandra Ladd, Growth Management Director
aladd@santafecountynm.gov

Jaome Blay, Assistant Chief, Fire Marshal
jblay@santafecountynm.gov

Re: Public input for the Conditional Use Permit process for the Rancho Viejo Solar Project

Dear Director Ladd and Fire Marshal Blay:
I'm writing to ask you to establish a process to provide public information and the opportunity for citizen input into the Conditional Use Permit process for the Rancho Viejo solar project. I copied you both on a July 31 letter (attached) that I sent to the County Manager on these issues, but I received no response from the County Manager or from you to that letter.

More recently, I received responses to an IPRA request indicating that the County has been planning to establish a process to incorporate public input into the permitting process (see attached emails), but the process appears to have been abandoned -- for no stated reason. The emails followed my June 2 request to the County that the County establish the public stakeholder process set forth in NFPA 855 to review AES's Hazard Mitigation Analysis for the Rancho Viejo Solar Project and AES's June 7 acceptance of that request, subject to the County's concurrence.

At the end of several email exchanges, Fire Marshal Blay and Jordan Yutzy prepared a press release on June 11 (attached) seeking "community stakeholders" to form a temporary working group "to provide public input on the applicability of Hazardous Mitigation Analysis (HMA) for battery energy storage systems as required by the 2023 NFPA 855." The press release sought volunteers from each of the 5 council districts plus two at-large members. And once the recommendations of the temporary working group were finalized, one working group member would be appointed to a "technical stakeholder group tasked with establishing goals and objectives to evaluate whether the requirements of NFPA 855 are adequate to meet the criteria for acceptability of the level of fire and explosion protection."

The June 11 press release was never issued. Instead, on July 16, Fire Marshal Blay sent an email (attached) to Mr. Yutzy and Deputy County Manager Cordova, in which he indicated his interest in moving forward to request "input and perspective from various stakeholders during the creation of a hazardous mitigation analysis (HMA)." But he said he did not intend to do so until the Growth Management Department finalized an apparently separate public input process. "Per our conversation earlier, the fire department would like to know the status of the community stakeholder group selection process for CUP applications relative to large scale solar installations."

In another message received in response to my IPRA request, Fire Marshal Blay wrote to San Marcos resident Camilla Brom on August 5. He said "the Growth Management, County Manager's Office, and the Fire Department are working diligently to set up a process in which interested stakeholders will have an opportunity to participate and provide input. The details of

this process are currently being reviewed by the legal department with the intention of presenting it to the BCC, and if approved, make the process permanent for all applications relative to large-scale BESS installations. Also, please note that interested stakeholders will be selected and appointed by Growth Management, County Manager's Office, and Fire Department personnel. Please refer to the Growth Management Department for more details and status of this process." (See attached email.)

The responses to my IPRA request included no replies to Fire Marshal Blay's emails from the Growth Management Department or the County Manager's Office.

At the August 22 pre-application meeting held by AES Corporation, neither of you spoke about the public input processes described in Fire Marshal Blay's emails. Instead, you described a process going forward in which County staff would simply hold a public meeting 30 days before the date scheduled for the hearing on the Conditional Use Permit request to answer the public's questions.

As my July 31 letter to the County Manager stated, the County has been meeting regularly with AES representatives to discuss AES's application and the process the County will use to review it. By contrast, the County Staff has met with the public on this issue exactly once. No one at the County has responded to my July 31 letter or had the courtesy to acknowledge its receipt. And no explanation has been given for the County's apparent abandonment of the public input processes discussed by County staff.

County residents deserve as much respect and input into County decisions that affect their lives as the respect and input that the County provides to corporations pursuing developments that will affect residents' lives. I know from conversations with other residents that they share the same interests in providing input into the County's decision-making process. And they share the same confusion and disappointment that the County Staff is not taking their concerns seriously.

Please explain what happened to the ideas proposed by Fire Marshal Blay and initially by Mr. Yutzy. Why have they been abandoned?

Please establish a public input process for the Rancho Viejo Solar Conditional Use Permit process that, at a minimum, promptly answers the questions in my July 31 letter to the County Manager. Please also establish public input processes similar to those described in Fire Marshal Blay's emails, or a meaningful alternative. As you know, stakeholder input into the Hazard Mitigation Analysis is a minimum requirement of NFPA 855, Annex G.

Informed public input will improve the quality of your decision-making, and, if meaningful input is allowed, it will enhance the credibility and acceptance the public will afford to your decision. This is especially important for a project as controversial as the Rancho Viejo Solar Project. Keeping the public in the dark will only breed distrust.

Thank you,
Ashley C. Schannauer
Santa Fe, NM 87508

Attachments:
-- July 31, 2024 letter Schannauer to Shaffer
-- IPRA responses:
  -- June 11, 2024 email Blay to Romo and Cordova with proposed press release
  -- July 16, 2024 email Blay to Yutzy and Cordova
  -- August 5, 2024 email Blay to Brom

cc: Gregory S. Shaffer, County Manager, gshaffer@santafecountynm.gov
Jeffrey S. Young, County Attorney, jyoung@santafecountynm.gov
Leandro Cordova, Deputy County Manager, lcordova@santafecountynm.gov
Lisaida Archuleta, Deputy Growth Management Director, lmarchuleta@santafecountynm.gov
Jordan Yutzy, Building and Development Manager, jyutzy@santafecountynm.gov
Dominic Sisneros, Case Manager, djsisneros@santafecountynm.gov

By Email: July 31, 2024

Gregory S. Shaffer, County Manager
gshaffer@santafecountynm.gov

Re: Request for virtual public meeting on the Rancho Viejo Solar Project application

Dear County Manager Shaffer:

I'm writing to respectfully ask that you grant the requests made by Commissioner Hughes and District 5 residents for the Growth Management and Fire Departments to hold a public meeting to discuss the status of the Rancho Viejo Solar Project application and the County staff's plans for reviewing it.

In recent monthly virtual meetings between Commissioner Hughes and his District 5 constituents, residents asked Commissioner Hughes to arrange a virtual public meeting to be held by County staff (similar to the previous meeting on January 17, 2024) to discuss the status of the project. Commissioner Hughes followed up on the residents' request, but County staff refused his request. In a communication to a resident, Commissioner Hughes wrote:

> I feel that openness provided by a meeting is useful. I requested the meeting with staff about AES, however they feel that it would not be useful until they have had a chance to review the application. They have not received the application and they would need 30 days to review to have a useful meeting.[1]

A public meeting with County staff should not wait until after AES files its resubmittal. The public has many questions that County staff can answer prior to AES's resubmittal. The questions do not relate to the content of the resubmitted application.

Responses to IPRA requests indicate that AES has been regularly discussing its plans to resubmit its conditional use application with County staff since January, and the discussions appear to have accelerated in May. The County's AES Project Applications webpage is out of date, forcing the public to resort to Inspection of Public Records Act (IPRA) requests to try to discover what is going on with the application.

Therefore, perhaps the most important question to be addressed in a public meeting with County staff is: what has AES been discussing with the County staff since May of this year? Those conversations should not be considered confidential.

Other questions to be addressed in a meeting between residents and County staff include a list of follow-up questions I sent to Growth Management and Fire Department staff after the January 17 meeting, to which I never received a response. One of the questions in particular that has been asked by many residents is whether residents potentially affected by the project will be allowed to participate in the conditional use hearing as parties with the rights to present witnesses and conduct cross-examination (in accordance with Section 4.7.2.1 of the Sustainable Land

[1] See attached email.

Development Code (SLDC) and the County's Rules of Order) or whether their participation will be limited to public comments. Who (i.e., County staff or Hearing Officer) will make those decisions and when? To whom should residents make their requests for participation?

Another question relates to the stakeholder process provided in NFPA 855 during the preparation of the Hazard Mitigation Analysis required for AES's conditional use application. In my letter of June 2, I asked to participate as such a stakeholder, and on June 7, AES replied that it did not oppose my request, leaving the issue to the County staff. I never received a response from the County on the issue either in June or in response to my further letter of July 5 requesting a response and the start of the stakeholder process. The three letters are attached.

Additional questions include the following:

-- Will the County's recently hired battery expert be asked to review AES's January 2023 application to identify issues for AES's resubmittal?

-- Will the County's recently hired battery expert also be asked to review the company's 2024 resubmittal?

-- Will Terracon be hired to review the 2024 resubmittal to determine whether AES has addressed the issues that Terracon identified in July 2023? If the company revises and resubmits its 2024 application based on Terracon's July 2023 review, will Terracon then be re-hired to review the resubmitted application?

-- Will the County hire a consultant to perform an independent noise study with the cost charged to AES pursuant to County Resolution 2023-093?

-- Are the costs of the County's consultants being recovered from AES pursuant to Resolution 2023-093 adopted by the Commissioners in October?

These are only some of the questions that residents would like to discuss in a public virtual meeting with County staff.

As you know, it has now been 18 months since AES application filed its application for the conditional use permit. County staff has been meeting regularly with AES since then, but staff has met with the public exactly once. The County needs to provide more transparency to the process to convince the public that the review process is at least as fair to the public as it has been to AES.

Thank you,
Ashley C. Schannauer
Santa Fe, NM 87508

Attachments:
-- July 23, 2024 email Commissioner Hughes to Camilla Brom
-- June 2, 2024 letter Schannauer to Blay, Ellis-Green, AES and Atar Fire
-- June 7, letter Gordon (AES) to Blay, Schannauer, Ellis-Green and Atar Fire
-- July 5, 2024 letter Schannauer to Blay, Cordova, Archuleta, Mayer (AES) and Atar Fire

cc: Jeffrey S. Young, County Attorney, jyoung@santafecountynm.gov
Jacob Black, Fire Chief, jblack@santafecountynm.gov
Jaome Blay, Assistant Chief, Fire Marshal, jblay@santafecountynm.gov
Leandro Cordova, Interim Growth Management Director, lcordova@santafecountynm.gov
Lisaida Archuleta, Deputy Growth Management Director, lmarchuleta@santafecountynm.gov
Alexandra Ladd, Growth Management Director, aladd@santafecountynm.gov
Jordan Yutzy, Building and Development Manager, jyutzy@santafecountynm.gov
Dominic Sisneros, Case Manager, djsisneros@santafecountynm.gov
Commissioner Hank Hughes, hhughes@santafecountynm.gov

From: Jaome R. Blay
Sent: Tuesday, June 11, 2024 3:57 PM
To: Olivia R. Romo; Leandro R. Cordova
Cc: Jordan A. Yutzy; Jacob Black; Jeffrey Carroll; Greg Shaffer
Subject: Press Release Annex G Advisory Committee 6.11.24
Attachments: Press Release Annex G Advisory Committee 6.11.24.docx

Good afternoon Olivia and Leandro,

Please see revised document attached. Let me know if I can assist further.

Respectfully,

Jaome R. Blay
Santa Fe County Fire Department
Assistant Chief/Fire Marshal
(505)995-6526
jblay@santafecountynm.gov

From: Jaome R. Blay
Sent: Tuesday, July 16, 2024 3:19 PM
To: Jordan A. Yutzy; Leandro R. Cordova
Cc: Jacob Black; Jeffrey Carroll
Subject: Community stakeholder working group

Good afternoon Jordan,

As you know, NFPA 855 Annex G allows the fire code official to request input and perspective from various stakeholders during the creation of a hazardous mitigation analysis (HMA), but will not move forward until the County-wide community stakeholder group selection process for CUP is finalized. Per our conversation earlier, the fire department would like to know the status of the community stakeholder group selection process for CUP applications relative to large scale solar installations.

Thank you for your attention to this matter.

Jaome R Blay
Santa Fe County Fire Department
Assistant Chief of Support/Fire Marshal
(505) 995-6526
jblay@santafecountynm.gov

From: Ashley Schannauer <schannauer@comcast.net>
Sent: Monday, August 12, 2024 7:24 PM
To: ASHLEY SCHANNAUER
Subject: Request for Stakeholder Status Participation

From: Jaome R. Blay <jblay@santafecountynm.gov>
To: Camilla Brom <br.camilla@yahoo.com>; Hank Hughes <hhughes@santafecountynm.gov>
Cc: Greg Shaffer <gshaffer@santafecountynm.gov>; Jeff S. Young <jyoung@santafecountynm.gov>; Jacob Black <jblack@santafecountynm.gov>; Jordan A. Yutzy <jyutzy@santafecountynm.gov>; Leandro R. Cordova <lcordova@santafecountynm.gov>; Jeffrey Carroll <jcarroll@santafecountynm.gov>; Nicholas Bartlett <nick@atarfire.com>; Matt Gordon <matt.gordon@aes.com>; Michael A. Nunez <mnunez@santafecountynm.gov>; Roger L. Prucino <rlprucino@santafecountynm.gov>; Wallace S. Starks <wstarks@santafecountynm.gov>
Sent: Monday, August 5, 2024 at 11:08:28 AM MDT
Subject: RE: Request for Stakeholder Status Participation

Ms. Brom,

Thank you for reaching out to the fire department with your concern. As the fire code official of Santa Fe County, the safety of this community is of outmost importance to my position. Also, be aware this is the first application of its kind, and all SFC staff involved in this process are working exhaustively to learn how to navigate through such controversial process while ensuring both the public and the applicant are treated fairly and equally.

As you point out, Annex G is vague relative to the definition of *interested stakeholder* vs. *risk assessment stakeholder*. Firstly, the Growth Management, County Manager's Office, and the Fire Department are working diligently to set up a process in which *interested stakeholders* will have an opportunity to participate and provide input. The details of this process are currently being reviewed by the legal department with the intention of presenting it to the BCC, and if approved, make the process permanent for all applications relative to large-scale BESS installations. Also, please note that *interested stakeholders* will be selected and appointed by Growth Management, County Manager's Office, and Fire Department personnel. Please refer to the Growth Management Department for more details and status of this process.

Secondly, risk assessment design process should be directed by *risk assessment stakeholders* experienced in the fire protection engineering and in energy storage risk assessment and plant operation of the type of, or similar to the plant under construction to ensure that the fire prevention, fire protection and explosion prevention recommendations have been evaluated in view of the project specific consideration regarding design, layout and anticipated operating requirements. These *risk assessment stakeholders* will be selected and appointed by the fire department, which include county staff, subject matter expert, fire department plan reviewer, applicant/s, and potentially a representative (with technical knowledge and background in BESS) from the *interested stakeholder* group. As you can see, there are various moving parts and processes we are currently working on.

I do apologize for not communicating periodically, as some of these processes are being assessed and scrutinized by various departments at different times.

Sincerely,

Jaome R Blay

Santa Fe County Fire Department

Assistant Chief of Support/Fire Marshal

(505) 995-6526

jblay@santafecountynm.gov

From: Camilla Brom <br.camilla@yahoo.com>
Sent: Monday, August 5, 2024 9:17 AM
To: Jaome R. Blay <jblay@santafecountynm.gov>
Cc: Greg Shaffer <gshaffer@santafecountynm.gov>; Jeff S. Young <jyoung@santafecountynm.gov>; Jacob Black <jblack@santafecountynm.gov>; Jordan A. Yutzy <jyutzy@santafecountynm.gov>; Leandro R. Cordova <lcordova@santafecountynm.gov>; Jeffrey Carroll <jcarroll@santafecountynm.gov>; Nicholas Bartlett <nick@atarfire.com>; Matt Gordon <matt.gordon@aes.com>; Michael A. Nunez <mnunez@santafecountynm.gov>
Subject: Re: Request for Stakeholder Status Participation

Warning:

Dear Mr. Blay,

I appreciate your response. I do have a couple of follow up questions. You pointed out that according to Annex G, the risk assessment design process should be directed by parties (stakeholders) experienced in the fire protection engineering and in energy storage risk assessment and plant operation of the type of, or similar to the plant under construction to ensure that the fire prevention, fire protection and explosion prevention recommendations have been evaluated in view of the project specific consideration regarding design, layout and anticipated operating requirements. I am familiar with that section of Annex G, which is section G.3.1.1 (regarding the risk assessment process being done by people with technical experience).

However, in Section G.3.2, it refers to “Stakeholders with an interest in the scope and applicability of the fire protection design.” This would pertain to people such as myself, and so that is why I requested to have Stakeholder status. Annex G does not include a definition which groups a “Stakeholder” into a specific definition, but rather includes different types of Stakeholders. The “Risk Assessment Stakeholder” falls under one type, and the “Interested Stakeholders” (who will be directly affected) falls under another.

I would like to point out that AES held several pre-application neighborhood meetings, in which one of the requirements was to send first class letters to all property owners who bordered Mr. Thompsons parcel. That requirement “indicated” to me, that those of us who border his property, in which AES was required to send notification via USPS (vs a postcard) have more of a vested interest “Stake” in this proposed facility (vested interest meaning financial loss and greatest safety risk).

As I understand this, you are the person who would decide who to include as “Stakeholders” in this process. It would seem that it would be better to be open to those people with a vested interest in this, to be a part of the review process, rather than limiting it to only Atar Fire and County Staff. As you know, many of us are deeply concerned about this project, and I believe including those of us who fall under the section G.3.2 Stakeholder description, would be the best approach.

Sincerely,

Camilla Brom

181 San Marcos Loop

Santa Fe NM 87508

On Thursday, July 18, 2024 at 02:36:18 PM MDT, Jaome R. Blay <jblay@santafecountynm.gov> wrote:

Ms. Camilla Brom,

Thank you for reaching to our office.

Currently, the Growth Management (Land Use) Department is working on developing a County-wide system to evaluate and manage the community stakeholder working group process relative to CUP applications for large scale BESS installations. Please refer to Land Use personnel with questions or concerns relative to that process.

The fire department, in collaboration with a subject matter expert, will evaluate and manage the technical stakeholder process described in the 2023 NFPA 855 Annex G once the community stakeholder working group mentioned above has provided their input and perspective. Per the 2023 NFPA 855 Annex G, the risk assessment design process should be directed by parties (stakeholders) experienced in fire protection engineering and in energy storage risk assessment and plant operation of the type of, or similar to the, plant under consideration to ensure that the fire prevention, fire protection, and explosion prevention recommendations have been evaluated in view of the project specific consideration regarding design, layout, and anticipated operating requirements.

Sincerely,

Jaome R Blay

Santa Fe County Fire Department

Assistant Chief of Support/Fire Marshal

(505) 995-6526

jblay@santafecountynm.gov

From: Camilla Brom <br.camilla@yahoo.com>
Sent: Thursday, July 18, 2024 12:49 PM
To: Jaome R. Blay <jblay@santafecountynm.gov>
Cc: Greg Shaffer <gshaffer@santafecountynm.gov>; Jeff S. Young <jyoung@santafecountynm.gov>; Jacob Black <jblack@santafecountynm.gov>; Jordan A. Yutzy <jyutzy@santafecountynm.gov>; Leandro R. Cordova <lcordova@santafecountynm.gov>
Subject: Re: Request for Stakeholder Status Participation

Warning:

Dear Mr. Blay,

I sent an email to you (and several other people listed below) on June 12, 2024, requesting to be a Stakeholder in the review process of the AES Hazard Mitigation Analysis pertaining to the Lithium-ion Battery Energy Storage System.

After no response from you or the others, I sent a 2nd email on July 1, 2024, once again pertaining to the same request.

After my second email, the ***only*** response I received (on July 5, 2024) was from AES Senior Permitting Project Manager Matt Gordon who said this.

"*Dear Ms. Brom,*

Please find attached letter provided in response to prior stakeholder request. As noted in the letter, the Fire Marshal, as the Authority Having Jurisdiction (AHJ) who is responsible for the review of the Rancho Viejo Solar Project's compliance with NFPA 855 has discretion to incorporate this stakeholder process. In this regard, AES Clean Energy will support the Fire Marshal's efforts to evaluate and manage the stakeholder process described in Annex G.

Thank you,

Matt"

The attached letter, which Mr. Gordon cc'd you and others on, is attached to this email today. Key information in the first paragraph of the letter states...

"This letter is in response to Mr. Schannauer's letter dated June 2, 2024, requesting appointment as a stakeholder as referenced in Annex G of NFPA 855 for the Rancho Viejo Solar Project. Annex G, by its own terms is "not a part of the requirements of this NFPA document but is included for informational purposes only." Annex G is a "comprehensive set of guidelines for reviewing and evaluating LIB ESS facilities." As such the Fire Marshal, as the Authority Having Jurisdiction (AHJ) who is responsible for the review of the Rancho Viejo Solar Project's compliance with NFPA 855 has discretion to incorporate this stakeholder process. To the extent that the Fire Marshal intends to incorporate the stakeholder process described in Annex G, AES Clean Energy has no objection to Mr. Schannauer serving as a stakeholder. However, the qualifications and role of the stakeholders must be clearly defined and consistent with what is set forth in Annex G."

Mr. Gordon cc'd you, along with a number of other county staff people.

I am once again emailing you, to find out why you have not responded to this request, given you are specifically the "Authority Having Jurisdiction" for Santa Fe County. I would like to know why you have not provided any type of response to me or county residents regarding our participation to be involved in the process of the AES HMA as Stakeholders?

Sincerely,

Camilla Brom

181 San Marcos Loop

Santa Fe NM 87508

Additional people my emails were sent to:

Leandro Cordorva (Interim Growth Management Director)

Joshua Mayer (AES Senior Manager Project Development)

Nick Bartlett (ATAR Fire)

Other people cc'd in both of my emails included:

Greg Shaffer (Santa Fe County Manager)

Jeff Young (Santa Fe County Attorney)

Jacob Black (Santa Fe County Fire Chief)

Dominic Sisneros (Santa Fe County AES Case Manager)

Jordan Yutzy (Santa Fe County Bldg. and Development Director)

Matt Gordon (AES Senior Permitting Project Manager)

On Monday, July 1, 2024 at 10:17:41 PM MDT, Camilla Brom <br.camilla@yahoo.com> wrote:

Dear All,

I am following up on the below email that I sent to all of you on June 12, 2024. I have not heard a response from anyone at all. I would like to know who I would need to reach out to, if I don't hear back from any of you.

I do believe, based on my below email, that I have justified reasoning as to why I have the right to be an involved Stakeholder in the development and review process of the AES Hazard Mitigation Analysis (HMA) pertaining to the Lithium-ion Battery Energy Storage System (BESS) for the proposed AES Rancho Viejo Solar project.

I would sincerely appreciate a response within the week.

Thank you,

Camilla Brom

181 San Marcos Loop

Santa Fe NM 87508

On Wednesday, June 12, 2024 at 03:54:31 PM MDT, Camilla Brom <br.camilla@yahoo.com> wrote:

June 12, 2024

Jaome Blay, Assistant Fire Chief, Fire Marshal

Leandro Cordova, Deputy County Manager, and Interim Santa Fe County Land Use Administrator/Growth Management Director

Joshua Mayer, Senior Manager, Project Development AES

Nick Bartlett, Atar Fire

Dear Mr. Blay, Mr. Cordova, Mr. Mayer and Mr. Bartlett,

I am writing to request appointment as a Stakeholder, to provide early input in the development and review process of the AES Hazard Mitigation Analysis (HMA) pertaining to the Lithium-ion Battery Energy Storage System (BESS) for the proposed AES Rancho Viejo Solar project.

As part of Annex G, in the 2023 NFPA 855 Standards which Santa Fe County has stated will be applied to the AES Rancho Viejo HMA, it states Stakeholders should have early input during the preparation of an HMA. Based on recent emails between certain county staff and AES, communication suggests that the preparation of an HMA has either already begun or will very soon.

My property is adjacent to the Rancho Viejo property, in which the AES Rancho Viejo Solar Facility is being proposed. I have been involved in following this proposed facility since early Summer of 2022, and throughout this time, have done extensive research regarding Lithium-ion Battery Energy Storage Systems and the dangers they pose. I developed a website to share information with Santa Fe County residents (and the public) about proposed facilities such as the AES Rancho Viejo facility and issues such facilities may present. I've also given presentations to community groups and have been interviewed by newspapers and radio. I have corresponded and/or had meetings with various county staff, and also have had direct communication with representatives of AES, pertaining to concerns over the location and safety of this facility (including the lithium-ion BESS).

Lastly, I'm a healthcare professional (Hospitalist Physician Assistant) employed by Presbyterian. Thus, in the event of a fire, explosion or toxic chemical release from this facility, it is possible that I may become involved in the care of patients requiring hospitalization from sustained injuries or complications from sustained injuries.

In considering the close proximity of this facility (including the lithium-ion BESS) to my own property/home, the knowledge I've acquired and shared over the past 2 years, and my professional background as a Hospitalist Physician Assistant, I hold a significant interest in the scope and applicability of the fire protection design pertaining to the AES BESS. Therefore, I respectfully request to be a Stakeholder, in order to provide input on the AES Hazard Mitigation Analysis, given my background and the risks this proposed facility presents to me.

Sincerely,

Camilla Brom

181 San Marcos Loop

Santa Fe NM 87508

Exhibit 12

April 29, 2024 letter

Blay to Schannauer “Re: Ordinance 2023-09 and Annex G of NFPA 855”

By Email: April 29, 2024

Mr. Ashley C. Schannauer
schannauer21@outlook.com

Re: Ordinance 2023-09 and Annex G of NFPA 855

Dear Mr. Ashley C. Schannauer:

This is a response to your letter of April 28, 2024. For ease of reference, I am breaking down my responses to your letter by the page in which they are contained.

Page 1

The fire department shall enforce, amongst other enforceable codes and standards, the 2023 edition of NFPA 855, and shall, in collaboration with a BESS expert consultant, review and reference Annex G in its totality to ensure the CUP application meets the minimum requirements for mitigating the hazards associated with ESS and the storage of lithium metal or lithium-ion batteries.

The fire department looks forward to collaborating with a BESS expert consultant, once hired by Santa Fe County, to review Annex G's Hazard Mitigation Analysis (HMA).

The fire department is awaiting the hiring of a BESS expert consultant to review the HMA that will be submitted by the applicant **before** a CUP is granted.

Page 2

The information and recommended safety requirements detailed in Annex G shall be considered and applied per the review of the expert consultant.

As soon as an expert consultant is hired and updated CUP application submittal documents are received, the fire department shall contact the expert consultant to review the submittal documents for compliance with the 2023 edition of NFPA 855, including Annex G. Again, the HMA shall be reviewed **prior** to granting a CUP.

Page 3

NFPA's inclusion of a new annex G (not mandatory requirements) with current and pertinent information on the hazards of lithium-ion battery systems shall be reviewed and implemented per the recommendation of the expert consultant.

Page 4 and 5

The information, including the fundamentals of hazards associated with LIB-Based ESS, and minimum safety recommendations in Annex G should be considered and evaluated by the fire department in consultation with the expert consultant.

Page 6

A HMA shall be prepared and submitted as part of a BESS CUP application. The expert consultant shall review as well as evaluate the HMA and provide the fire and growth management departments a report to determine its compliance with the 2023 edition of NFPA 855, including Annex G.

The expert consultant shall review, evaluate, and determine the risks of explosion and safest fire protection system/s required for this particular CUP application.

Page 7

Fire and flammable gas detection measures, Construction and Installation, Inspection and Maintenance, and First Responder Plans shall be reviewed and evaluated by the expert consultant as part of the CUP application submittal process.

The HMA shall be submitted as part of the CUP application.

Stakeholder input process shall be evaluated by the County.

Page 8

Project-specific reviews of risks shall be evaluated by the expert consultant to provide adequate protection to the public.

The HMA shall address the energy capacity and power as well as personnel issues.

Page 9

Energy types and volatility, plant layout and geographic (i.e., remote) location, storage configuration (e.g., short term and long term), and availability of water supply shall be evaluated by the expert consultant to provide adequate protection to the public.

Capability of emergency responders, historical loss information/lessons learned/fire reports, levels of acceptable risk, and identify each hazard and each prevention measure shall be reviewed, evaluated, and a report created by the expert consultant to address the needs.

Page 10

The fire department shall require the expert consultant to review the HMA for the CUP application to include a broader "more holistic" review of the risks that preventive measures may fail to address, including the possibility/likelihood that more than one failure could occur at the same time.

The fire department review of the CUP application shall be in coordination with the expert consultant and **prior** to the granting of a CUP.

Page 11 and 12

The fire department shall require the expert consultant to review and evaluate the CUP application for accuracy, code compliance, and overall safety as it pertains to lithium-ion and lithium metal batteries, **prior** to the granting of a conditional use permit.

Annex G shall be considered in its entirety for all BESS installations within Santa Fe County.

Respectfully,

Jaome R. Blay

Santa Fe County Fire Marshal

Exhibit 13

June 7, 2024 letter

AES Permitting Project Manager Matt Gordon to Schannauer with copies to Shaffer, Young, Black, Sisneros and Yutzy responding to Schannauer letter of June 2, 2024 letter regarding stakeholder input under Annex G of NFPA 855

June 7, 2024

Dear Fire Marshal Blay, Mr. Schannauer, Ms. Ellis-Green, and Mr. Bartlett:

This letter is in response to Mr. Schannauer's letter dated June 2, 2024, requesting appointment as a stakeholder as referenced in Annex G of NFPA 855 for the Rancho Viejo Solar Project. Annex G, by its own terms is "not a part of the requirements of this NFPA document but is included for informational purposes only." Annex G is a "comprehensive set of guidelines for reviewing and evaluating LIB ESS facilities." As such the Fire Marshal, as the Authority Having Jurisdiction (AHJ) who is responsible for the review of the Rancho Viejo Solar Project's compliance with NFPA 855 has discretion to incorporate this stakeholder process. To the extent that the Fire Marshal intends to incorporate the stakeholder process described in Annex G, AES Clean Energy has no objection to Mr. Schannauer serving as a stakeholder. However, the qualifications and role of the stakeholders must be clearly defined and consistent with what is set forth in Annex G.

"Stakeholders" and their qualifications are not defined under Annex G beyond what is set out in Section G.3.2.1 which provides that "stakeholders with an interest in the scope and applicability of the fire protection design should be identified early in the process." As described in this section, stakeholders should be limited to those persons who are interested in, and presumably competent to opine on, the scope and applicability of the fire protection design as well as the unique hazard profile of the technology and the specific project. As such AES Clean Energy strongly encourages that any stakeholders have the necessary expertise to evaluate the fire protection design and the adequacy of NFPA 855 to address the fire protection requirements for the project. This expertise is necessary to effectively accomplish the role of stakeholders under Annex G.

The role of stakeholders under Annex G Section G.3.2.2 is to establish goals and objectives for fire hazard control and evaluate whether the requirements of NFPA 855 are adequate to meet those goals and objectives. This evaluation requires familiarity both with fire control systems and the requirements of NFPA 855. Once the stakeholders have established these goals and objectives, and made the evaluation related to the adequacy of NFPA 855, it appears that the stakeholder role under Annex G is complete. These "stakeholder inputs" then become one of the elements that the AHJ should consider in determining the criteria for the acceptable level of fire and explosion protection against which the Hazard Mitigation Analysis is evaluated. Annex G.3.4.1. Notably, the stakeholders do not have a role in reviewing the Hazard Mitigation Analysis, nor in evaluating the adequacy of the fire protection design against NFPA 855.

Finally, AES Clean Energy has commissioned a Hazard Mitigation Analysis that will be submitted to Santa Fe County's third-party reviewer for review and inclusion with its complete Conditional Use Permit application. AES Clean Energy is committed to complying with all applicable requirements of NFPA 855 in the battery storage component of the Rancho Viejo Solar Project. If the Fire Marshal does elect to proceed with the stakeholder process set forth in Annex G, AES Clean Energy will gladly cooperate and recommend additional persons with local and subject matter knowledge to serve as additional stakeholders in the process. In addition, we would request that the process be assigned a firm

timeline that is commensurate with the scope of the stakeholder's role so that AES Clean Energy can receive and consider the stakeholders' goals and objectives in the development of the Hazard Mitigation Analysis. AES Clean Energy anticipates that the development of the Hazard Mitigation Analysis will be an iterative process based on feedback from the County's third-party reviewer, the Fire Marshal, and County staff, and would like to incorporate the stakeholders' input as early in that iterative process as possible.

Best Regards,

Matt Gordon
Permitting Project Manager
AES Clean Energy

Cc: Gregory S. Shaffer, County Manager, gshaffer@santafecountynm.gov
Jeffrey S. Young, County Attorney, jyoung@santafecountynm.gov
Jacob Black, Fire Chief, jblack@santafecountynm.gov
Dominic Sisneros, Case Manager, djsisneros@santafecountynm.gov
Jordan Yutzy, Building and Development Manager, jyutzy@santafecountynm.gov

Exhibit 14

Ordinance 2023-09

THE BOARD OF COUNTY COMMISSIONERS
OF SANTA FE COUNTY

ORDINANCE NO. 2023-09

AN ORDINANCE
AMENDING ORDINANCE NO. 2023-06,
THE SANTA FE COUNTY FIRE CODE, TO ADOPT CURRENT NFPA 855
STATIONARY ENERGY STORAGE SYSTEMS STANDARDS

BE IT ORDAINED BY THE BOARD OF COUNTY COMMISSIONERS OF SANTA FE COUNTY:

Section 1. Section 7(DD) of Ordinance No. 2023-06 is deleted in its entirety.

Section 2. A new section of Ordinance No. 2023-06 is added as follows:

"**Section 22.** The County hereby incorporates by reference as though fully set out in this Ordinance and adopts as part of the Fire Code the following standard as promulgated by the National Fire Protection Association (NFPA), 1 Batterymarch Park, Quincy, MA 02269:

A. NFPA 855-2023: Standard for the Installation of Stationary Energy Storage Systems. In the event NFPA amends NFPA 855-2023 or adopts a new edition of NFPA 855, the Fire Marshal shall, within three months of the Fire Marshal becoming aware of NFPA's adoption of the amendment or new edition, inform the Board of County Commissioners and make a recommendation concerning whether it should adopt the amended or new edition of NFPA 855."

PASSED, ADOPTED AND APPROVED this 13th day of December 2023 by the Board of County Commissioners of Santa Fe County.

THE BOARD OF COUNTY COMMISSIONERS
OF SANTA FE COUNTY

By: _____
Anna C. Hansen, Chair

ATTEST:

_____
Katharine Clark
Santa Fe County Clerk

Date: 12/14/2023

Approved as to form:

Jeff Young
Santa Fe County Attorney

COUNTY OF SANTA FE)
STATE OF NEW MEXICO) ss

BCC RESOLUTIONS
PAGES: 3

I Hereby Certify That This Instrument Was Filed for Record On The 19TH Day Of December, 2023 at 04:40:50 PM And Was Duly Recorded as Instrument # 2025358 Of The Records Of Santa Fe County

Witness My Hand And Seal Of Office
Katharine E. Clar
Deputy _____ County Clerk, Santa Fe, NM

SFC CLERK RECORDED 12/19/2023

AFFIDAVIT OF PUBLICATION

STATE OF NEW MEXICO

County of Bernalillo SS

Wayne Barnard, the undersigned, authorized Representative of the Albuquerque Journal, on oath states that this newspaper is duly qualified to publish legal notices or advertisements within the meaning of Section 3, Chapter 167, Session Laws of 1937, that payment therefore has been made of assessed as court cost; and that the notice, copy of which is hereto attached, was published in said paper in the regular daily edition, for 1 time(s) on the following date(s):

11/22/2023

AUDREY RAYLEENE CRESPIN
Notary Public - State of New Mexico
Commission # 1140072
My Comm. Expires Apr 6, 2027

Audrey Rayleene Crespin

Sworn and subscribed before me, a Notary Public, in and for the County of Bernalillo and State of New Mexico this 22 day of November of 2023

PRICE $161.78

Statement to come at the end of month.

ACCOUNT NUMBER 1009632

SANTA FE

NOTICE OF PUBLIC HEARING ON AND GENERAL SUMMARY OF SANTA FE COUNTY ORDINANCE NO. 2023-, ENTITLED "An Ordinance Amending Ordinance No. 2023-06, the Santa Fe County Fire Code, to Adopt Current NFPA 855 Stationary Energy Storage Systems Standards."

Notice is hereby given that the Board of County Commissioners (BCC) of Santa Fe County (County) will hold a public hearing on the above-titled ordinance (Proposed Ordinance) in the BCC's Chambers located at 102 Grant Avenue Santa Fe, NM 87501, at or after 5:00 p.m. on December 12, 2023. Individuals who would like to request auxiliary aids or services should contact the County Manager's Office at (505) 986-6200 in advance to discuss specific needs.

If you choose not to attend in person, members of the public can listen and participate in the virtual public hearing via Webex, using meeting number (access code) 2486 022 3588 and password P5JbEVTgQU9. To participate by phone, call 1-408-418-9388. To participate via the internet, go to https://sfco.webex.com/sfco/. For instructions on participating via Webex, visit www.santafecountynm.gov/pinmeeting.

General Summary of Proposed Ordinance. The Proposed Ordinance would amend County Ordinance 2023-06, the Santa Fe County Fire Code, to adopt current NFPA 855 Stationary Energy Storage Standards. In addition, in the event NFPA amends NFPA 855-2023 or adopts a new edition of NFPA 855, the Fire Marshal shall, within three months of the Fire Marshal becoming aware of NFPA's adoption of the amendment or new edition, inform the Board of County Commissioners and make a recommendation concerning whether it should adopt the amended or new edition of NFPA 855. This is only a general summary of the Proposed Ordinance. Interested persons must consult the Proposed Ordinance itself to understand all of its provisions.

Public Hearing and Submission of Written Comments. All interested parties will be heard at the public hearing. Written comments, questions, and objections regarding the Proposed Ordinance may also be submitted to the County Manager's Office in writing to P.O. Box 276, Santa Fe, New Mexico 87504-0276, via email at asmith@santafecountynm.gov, or presented in person at the public hearing. Comments, questions, and objections submitted in advance of the public hearing must be received by 1:00 p.m. on December 11, 2023, to ensure that they are provided to the BCC before the public hearing.

Following BCC Action on December 12, 2023, After the public hearing on December 12, 2023, the BCC may adopt the Proposed Ordinance, with or without changes, vote not to adopt the Proposed Ordinance, recess the public hearing in accordance with the Open Meetings Act, or postpone the public hearing or delay action on the Proposed Ordinance until a future meeting of the BCC. Further postponement or publication of a rescheduled meeting or postponed hearing or action is not legally required. Interested parties not in attendance at or watching the December 12, 2023, public hearing where recesses or postponement might be announced should thus inquire of the County as to whether the BCC took action to recess or postpone.

Copies of Proposed Ordinance. Copies of the proposed ordinance are available for inspection and copying in the Santa Fe County Clerk's Office, located at 100 Catron St. Santa Fe NM 87501. The proposed ordinance is also available at the County's website, www.santafecountynm.gov.

Journal: November 22, 2023

SFC CLERK RECORDED 12/19/2023

Exhibit 15

Annex G to NFPA 855

G Guide for Suppression and Safety of Lithium-Ion Battery (LIB) Energy Storage Systems (ESS)

This annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

G.1 General.

G.1.1 Scope.

This annex presents information for designers, users, and enforcers planning, approving, or encountering installations of LIB-based ESS. This annex focuses on hazard identification and assessment, firefighting, fire protection, and fire and gas detection. It represents information on LIB properties and characteristics, guidance on implementing minimum safety requirements, maintenance and operation of fire protection systems, and other information that can be used to promote safety of LIB installations.

G.1.1.1

ESS information could be classified as critical electric infrastructure information (CEII) as defined by the Federal Energy Regulatory Commission (FERC). The sharing of CEII documents might be limited by utilities to prevent their access through the Freedom of Information Act or by persons seeking to disrupt the US bulk electric. Utilities might require non-disclosure agreements and background checks of individuals with an AHJ that will have access to CEII.

G.1.1.2

This annex describes the use and application of minimum safety requirements in NFPA 855.

G.1.1.3

This annex does not apply to installations of any non-LIB-based ESS.

G.1.1.4

Section G.2 addresses fundamentals of hazards associated with LIB-based ESS.

G.1.1.5

Section G.3 addresses the hazards and risks posed by ESS with hazard mitigation analysis (HMA) and fire risk assessment (FRA).

G.1.1.6

Section G.4 addresses known failure modes and their associated consequences and mitigation approaches (i.e., bowtie analysis).

G.1.1.7

Section G.5 addresses application of LIB-based ESS and how location within a building impacts the hazard analysis.

G.1.1.8

Section G.6 addresses fire protections systems, including system goal, water duration, and water application strategies.

G.1.1.9

Section G.7 addresses fire and flammable gas detection, including the location, type, and purpose for available technologies.

G.1.1.10

Section G.9 addresses LIB construction and installation guidance.

G.1.1.11

Section G.10 addresses guidance on inspection and maintenance for installed LIB fire protection systems.

G.1.1.12

Section G.11 address guidance on developing a first responder plan for LIB-based ESS installations.

G.1.2 Purpose.

G.1.2.1

The purpose of this annex is to help stakeholders, designers, and authorities having jurisdiction (AHJs) understand and implement minimum safety requirements through a permitting and inspection process to ensure efficiency, transparency, and safety in their local communities.

All battery ESS, all ESS dedicated-use buildings, and all other buildings or structures that contain or are otherwise associated with an LIB ESS and that are subject to NFPA 855, should be designed, erected, and installed in accordance with all applicable requirements of NFPA 855, all applicable provisions of the Energy Code, and all applicable provisions of the codes, regulations, and industry standards as referenced in the *Uniform Fire Code,* the Energy Code, and local and state requirements.

G.1.2.2

As an important first step in protecting public and first responder safety while promoting safe energy storage, the technical committee has developed this annex as a comprehensive set of guidelines for reviewing and evaluating LIB ESS facilities. The annex helps owners, designers, installers, stakeholders, local government officials, AHJs, and developers understand and develop an LIB ESS permitting and development process to ensure efficiency, transparency, and safety in their local communities. This annex provides details about the design, hazard evaluation, installation, operations, appropriate technology application, inspection, and first responder safety processes of LIB-based ESS.

This annex is intended to help owners, designers, installers, stakeholders, local government officials, and AHJs understand the requirements of NFPA 855 to responsibly accommodate battery ESS in their application. This annex lays recommended frameworks, substantive requirements, and examples for residential, commercial, and utility-scale LIB-based ESS.

In some cases, there might be multiple approaches to regulate a certain aspect of battery ESS. Municipalities should choose the option that works best for their application or requirements. Depending on local circumstances or project-specific requirements, the appropriate party might want to include this content or choose to adopt a different approach.

G.1.3 Minimum Installation Information.

G.1.3.1

The plans and specifications associated with the ESS and its intended installation, replacement or renewal, commissioning, and use could be required by the AHJ for permitting purposes, but should at least be available to the facility owner/operator by hard or electronic copy that can be shared with first responders. The following documentation should be documented and available where an LIB-based ESS is or will be installed:

(1) Location and layout diagram of the room or area in which the ESS is to be installed
(2) Details on fire-resistant-rated assemblies provided or relied upon in relation to the ESS
(3) Quantities and types of ESS units
(4) Manufacturer's specifications, ratings, and listings of ESS
(5) Description of energy storage management systems and their operation
(6) Location and content of required signage
(7) Details on fire suppression/protection, smoke or fire detection, gas detection, thermal management, ventilation, exhaust, and deflagration venting systems, if provided
(8) Support arrangement associated with the installation, including any required seismic support

G.1.3.2

The following test data, evaluation information, and calculations, as applicable, should be provided in addition to the plans and specifications in accordance with the minimum safety requirements of NFPA 855:

(1) Fire and explosion test data
(2) Hazard mitigation analysis
(3) Calculations or modeling data to determine compliance with NFPA 68 and NFPA 69 as required
(4) Other test data, evaluation information, or calculations if needed to support deviations from minimum safety requirements

G.1.3.3

Additional information could be required by AHJs for permitting and prior to commissioning, including, but not limited to, the following:

(1) Analysis of live loads associated with the ESS installation to ensure building structural integrity
(2) Shop drawings of fire protection systems
(3) Electrical one- or three-line diagrams demonstrating method of interconnection, overcurrent protection, and all disconnect locations
(4) Flood protection or mitigation for installations in flood zones

G.1.4 Hazard Communication.

G.1.4.1 General.

Most manufacturers provide safety data sheets (SDS) in accordance with the Globally Harmonized Standard (GHS) or equivalent published information outlining the hazards associated with the specific LIBs and associated products of thermal runaway. These publications contain important information for installers, end-users, and first responders. These publications should be used to develop hazard communication tools for personnel and first responders as part of an effective emergency response plan.

G.1.4.2 Signs and Placards.

G.1.4.2.1

Hazard communication signs and placards should be located on the exterior of the building or enclosure housing LIB-based ESS. Where multiple enclosures are installed, it isn't necessary to place a sign on every enclosure, but signs should be located at reasonable intervals (see G.1.4.2.1.2).

G.1.4.2.1.1

Signs on the exterior of a building or enclosure should be sized such that at least one sign is legible at night at a distance of 100 ft (30.5 m) or from the property line, whichever is closer.

G.1.4.2.1.2

Signs on the exterior of a building or enclosure should be placed at intervals so that at least one sign is visible in every direction that can be reasonably used to approach the installation, enclosure, or building.

G.1.4.2.2

Signs and placards should be placed at the entrance to a room or designated ESS area inside a building housing other occupancies.

G.1.4.2.2.1

Signs inside buildings should be sized to be legible at the furthest straight-line distance on approach to the room or area. Where the ESS is located in a long hallway, installers should consider installing at least one side perpendicular to the room entrance.

G.1.4.3 Electrical Hazards.

G.1.4.3.1

Electrical warning signage should be provided in accordance with *NFPA 70*.

G.1.4.3.2

Signs should be provided on the building or in the installation area indicating the location of main disconnects from the electrical supply or grid. In the event of a fire, personnel or first responders might need to access the main electrical disconnect.

G.1.4.3.3

Where emergency ventilation is used to mitigate an explosion hazard, the disconnect for the ventilation system should be clearly marked to notify personnel or first responders to not disconnect the power supply to the ventilation system during an evolving incident.

G.1.4.4 Thermal Runaway Hazards.

G.1.4.4.1

There are hazards associated with the gaseous products of thermal runaway, including the potential for fire, explosion, and inhalation or dermal toxicity (see G.2). The manufacturers' SDS should be used to develop signs and placards to inform personnel and first responders as part of an effective emergency response plan.

G.1.4.4.2

Many manufacturers have developed hazard communication materials using the GHS, including pictograms that are generally accepted international warning signs. Installers and operators should consider using the manufacturers' pictograms to develop warning signs or placards.

G.2 Fundamentals of Hazards Associated with LIB-Based ESS.

Battery energy storage systems (ESS) that are designed with sufficient safety protections and are installed, operated, and maintained in a manner that maintains the system safety can be operated without incident as evidenced by the systems currently operating safely in the field. The safety controls and hazard mitigation approach need to consider the inherent hazards associated with these systems, which can vary depending on the battery technology.

G.2.1 Hazards General.

The hazards that need to be addressed for ESS are fire and explosion hazards, chemical hazards, electrical hazards, stranded or stored energy hazards, and physical hazards. These hazards can vary by technology but can also vary under normal operating conditions compared with emergency and abnormal conditions.

G.2.2 Fire and Explosion Hazards.

G.2.2.1

The potential for fire hazards can be evaluated through control of the elements of the fire triangle. These elements are the fuel for the fire, the oxidant, and the ignition source heat. There is no potential for fire unless there is an appropriate concentration of fuel, oxidant, and a heat source sufficient to ignite the concentration.

G.2.2.2

Under normal operating conditions, fire and explosion hazards can be due to heat sources such as live parts that can be in contact with combustible materials during service or maintenance, or to ignition of combustible concentrations or ignitable fluids and solids that can occur as part of the normal operation of ESS, such as hydrogen off-gassing from batteries with aqueous electrolytes that are open to the atmosphere.

G.2.2.3

Under abnormal operating conditions, fires can be the direct result of the following:

(1) Flammable concentrations can develop due to overheating and venting of flammable gases. A fire or explosion will occur if concentrations of vented gases such as hydrogen and hydrocarbons are sufficient to create combustible/flammable concentrations in the presence of hot surfaces, live electrical equipment, or other sources of ignition. All batteries, with the exception of hermetically sealed types such as sodium beta, have means to relieve internal pressure when overheated to prevent explosions of the battery cell from overpressurization
(2) Short circuits and thermal runaway can cause overheating of electrical parts or ignitable plastic casings. In the case of thermal runaway, this can lead to a cascade failure of several modules or racks, and extensive fire damage.
(3) An oxidizer in an ESS will increase the intensity of a fire of other materials.

G.2.3 Chemical Hazards.

G.2.3.1

Chemical hazards are categorized in accordance with OSHA/NIOSH hazardous materials limits for normal operation of the ESS and NFPA 704 for acute exposure, such as during a fire or other emergency incident.

G.2.3.2

Under normal operating conditions, workers can be exposed to hazardous materials during maintenance, repair, and replacement of batteries, racks, or entire systems. OSHA and NIOSH have guidelines on exposures to hazardous materials, including limits for workers that have the potential for exposure during normal operation and maintenance.

G.2.3.3

The following similar hazards are present during abnormal operation, but should be considered more likely as a result of upset or damage:

(1) *Corrosive spills*: A liquid with a pH ≤2 or ≥11.5 is considered corrosive and hazard level 3 and can cause serious or permanent eye injury for someone who comes in direct contact with it per Table B.1 in NFPA 704. With some systems that contain corrosive liquids, there can be the possibility of leaks or spills from the system under emergency/abnormal conditions.
(2) *Toxic liquid exposure*: There are different levels of toxicity from vapors generated under emergency conditions such as fires and hazardous toxic liquid leaks and spills. NFPA and OSHA provide extensive guidance on classifying the hazards associated with toxic liquids and vapors.
(3) *Water-reactive material exposure*: Water-reactive materials in ESS could be exposed under abnormal conditions, resulting in a violent reaction with the moisture in the air.
(4) *Toxic gas exposure*: Toxic gases can be released during abnormal operation or following damage to an ESS. OSHA and NFPA 704 contain guidelines for classification of these hazards.

G.2.4 Electrical Hazards.

G.2.4.1

Electrical hazards for persons working with ESS where they might come in contact with energized parts greater than 50 V and exposed to arcing of electric energy with an incident energy level of 1.2 cal/cm^2 (5 J/cm^2) (i.e., potential to cause second-degree burns on skin) are electrical shock and arc flash as identified in NFPA 70E.

G.2.4.2

The term *stranded* or *stored energy* refers to unquantified hazardous levels of electrical energy that can be contained in all or part of an ESS, including one that has been damaged or thought to be discharged and that represents a hazard to persons in contact with the system who are unaware of the hazardous energy. Since this hazard represents a potential unquantified electrical hazard, the allowed levels will be different depending on whether it pertains to normal conditions for repair and replacement by trained workers or for emergency responders dealing with damaged ESS that can still contain hazardous energy.

G.2.4.3

The following electrical hazards can occur during normal operating conditions:

(1) *Electrical shock*: ESS with voltages above 50 V (per NFPA *70E* limits for electrical shock) can pose hazards if personnel come in contact with live parts during operation and servicing of the systems. It is necessary that appropriate labeling, safe work procedures, and personal protective equipment (PPE) are utilized by workers when servicing these systems.
(2) *Arc flash*: ESS that have an incident energy level greater than 1.2 cal/cm^2 (5 J/cm^2) should have the arc flash boundaries calculated and identified through markings. Safe work procedures and PPE should be utilized to prevent worker injury from arc flash during normal operation and servicing.
(3) *Stranded (stored) energy hazards*: An example of a stranded energy hazard is worker exposure to ESS that are not discharged sufficiently or ESS that are damaged, resulting in the potential for electric shock and arc flash hazards. For normal operating conditions, sites housing commercial and industrial-battery ESS should maintain onsite instructions for isolation of hazardous voltage and energy for maintenance and for discharging batteries for safe replacement and disposal. Residential and smaller commercial systems should have information provided and access to trained technicians to perform these duties to ensure that stranded energy do not represent a hazard under normal operating conditions.

G.2.4.4

The following electrical hazards under abnormal operating conditions are similar, but could be particularly challenging for first responders:

(1) *Electrical shock*: First responders might not have the training and protective equipment that trained electrical workers have and are therefore at greater risk of electrical shock under emergency conditions. In such emergencies, emergency responders could be exposed to live parts that have been exposed as a result of abnormal conditions, and these live parts could be in contact with conductive fluids such as water. Facility operators should work with local first responders to familiarize them with the layout, define standoff distance, and identify type and angle of water spray. The emergency operations plan required by Chapter 4 includes a section on safe shutdown, de-energization, and isolation of equipment or systems during emergency conditions.
(2) *Shock, arc flash, and arc blast hazards*: First responders are generally not provided with training and PPE appropriate for arc flash, and arc blast hazards. The emergency operations plan should address these hazards and provide first responders with exclusion zones or similar guidance to eliminate exposure to areas where arcing might occur.

G.2.5 Physical Hazards.

G.2.5.1

Physical hazards are hazards to persons that can occur from contact with parts having sufficient kinetic energy, parts that have hazardous thermal characteristics that can cause burns, or parts that contain fluids at hazardous pressure levels with either insufficient structural integrity to safely contain the fluids or the ability to safely relieve the pressure.

G.2.5.2

Physical hazards under normal operation can include the following:

(1) *Burn hazards*: For electrochemical ESS, the potential exists for burn hazards to workers in contact with some technologies during normal operation and repair if workers are not properly thermally insulated by PPE.
(2) *Pressurized hazards*: Parts containing pressurized fluids, including compressed gasses.
(3) *Parts with kinetic energy*: Moving parts of ESS, such as flywheels or integral fans, should be properly guarded to prevent personnel injury.

G.2.5.3

Some examples of physical hazards under abnormal operating conditions include the following:

(1) Overpressurization due to overheating of contents, which can result in a physical hazard. This could present a hazard to first responders dealing with damaged ESS. This can occur due to overheating of equipment and devices that do not have pressure relief devices, or where flammable gases generated during thermal runaway experience delayed ignition.
(2) Potential hot parts

(3) Exposed parts with hazardous kinetic energy sufficient to cause bodily harm for persons coming in contact with them, such as exposed fan blades or flywheels

G.2.6 Lithium-Ion Battery Hazards.

The term *lithium-ion battery* refers to a battery where the negative electrode (i.e., anode) and positive electrode (i.e., cathode) materials serve as a host for the lithium ion (Li+). Lithium ions move from the anode to the cathode during discharge and are intercalated into (i.e., inserted into voids in the crystallographic structure of) the cathode. The ions reverse direction during charging. Since lithium ions are intercalated into host materials during charge or discharge, there is no free lithium metal within a lithium-ion cell and thus, even if a cell does ignite due to external flame impingement or an internal fault, metal fire suppression techniques are not appropriate for controlling lithium-ion fire.

G.2.6.1

Hazard considerations for Li-ion batteries under normal operating conditions are as follows:

(1) *Fire hazards*: There can be the potential for fire hazards if there are latent defects within the cells or design issues with the controls that prevent thermal runaway of the cells. Systems need to be evaluated for their ability to prevent propagation due to these defects.
(2) *Chemical hazards*: Not applicable.
(3) *Electrical hazards*: There are electrical hazards associated with routine maintenance of these batteries if they are at hazardous voltage and energy levels.
(4) *Stranded or stored energy hazards*: There can be the potential for stranded or stored energy hazards during maintenance if the batteries cannot be isolated for maintenance or replacement.
(5) *Physical hazards*: Not applicable.

G.2.6.2

Hazard considerations for Li-ion batteries under emergency/abnormal conditions are as follows:

(1) *Fire hazards*: There can be the potential for thermal runaway if the batteries are not maintained at appropriate operating parameters as a result of abnormal conditions. Also, there might be fire hazards due to short-circuiting abnormal conditions.
(2) *Chemical hazards*: There can be the potential for off-gassing of hazardous vapors under abnormal conditions depending on the size of the cells and the level of failure.
(3) *Electrical hazards*: Electrical hazards might be present under abnormal conditions if the system is at hazardous voltage and energy levels.
(4) *Stranded or stored energy hazards*: There can be the potential for stranded energy hazards if the batteries are exposed to abnormal conditions. Damaged batteries might contain stored energy that can be a hazard during disposal if care is not taken.
(5) *Physical hazards*: Depending on the design of the system, the potential exists for physical hazards under abnormal conditions if accessible parts are overheating or if there is exposure to moving hazardous parts such as fans where guards might be missing.

G.2.7 Other (Reserved).

G.3 Hazards and Risks Posed by ESS with Hazard Mitigation Analysis (HMA) and Fire Risk Assessment (FRA).

G.3.1 General.

G.3.1.1

The risk assessment design process should be directed by parties experienced in fire protection engineering and in energy storage risk assessment and plant operation of the type of, or similar to the, plant under consideration.

G.3.1.2

The creation of the assessment should be initiated as early in the design process as practical to ensure that the fire prevention, fire protection, and explosion prevention recommendations as described in this document have been evaluated in view of the project-specific consideration regarding design, layout, and anticipated operating requirements.

G.3.1.3

Applicable process safety management (PSM) techniques should be considered.

G.3.1.4

The purpose of the HMA is to provide a record of the decision-making process in determining the fire prevention, fire protection, and explosion prevention for appropriate hazards.

G.3.1.5

The HMA should be a living document that continues to evolve, as the plant design is refined, and it should be maintained and revised for the life of the plant. The HMA is key to the management of change process.

G.3.2 Stakeholders.

G.3.2.1

Stakeholders with an interest in the scope and applicability of the fire protection design should be identified early in the process.

G.3.2.2

Stakeholders should establish goals and objectives and evaluate whether the requirements of NFPA 855 are adequate to meet those goals and objectives. The criteria for acceptability of the level of fire and explosion protection should consider the perspective of the various stakeholders.

G.3.3 Inputs to the HMA Process.

G.3.3.1 General Inputs.

In addition to the guidelines in this annex, the following should be reviewed for applicability:

(1) Codes, including the following:
    (a) State and local building codes
    (b) State and local fire codes
(2) Standards, including the following:
    (a) Industry standards
    (b) Utility company standards
    (c) Insurance requirements
    (d) Applicable NFPA documents (see Chapter 2)
(3) Regulations, including the following:
    (a) Environmental
    (b) OSHA
(4) Other references, including the following:
    (a) *SFPE Handbook of Fire Protection Engineering* and journals
    (b) *SFPE Engineering Guide to Fire Risk Assessment* (Chapters 14 and 15)
    (c) Best practices: EEI, EPRI, IEEE
    (d) NFPA *Fire Protection Handbook*
    (e) NFPA 805 (performance-based criteria in Chapter 4)
    (f) NFPA 550
    (g) NFPA 551
(5) Design documents
(6) Stakeholder inputs

G.3.3.2 Project-Specific Inputs.

Each facility has its own special conditions that impact the nature of the installation. Many of the specific criteria herein might need modification, due to the consideration of all project-specific factors involved. The project-specific inputs utilized in the HMA process include, but are not limited to, the following:

(1) Energy capacity and power
(2) Personnel/life presence levels as follows:
    (a) Unattended/remote
    (b) Manned but unoccupied
    (c) Unoccupied but in populated area
    (d) Occupied space
    (e) Ambulatory space
(3) Energy types and volatility
(4) Plant layout and geographic (i.e., remote) location
(5) Equipment availability/redundancy
(6) Availability of water supply
(7) Capability of emergency responders

(8) Storage configuration (e.g., short term and long term)
(9) Historical loss information/lessons learned/fire reports
(10) Additional environmental considerations

G.3.4 Fire and Explosion Protection Design Basis Process.

G.3.4.1

Stakeholders should establish goals and objectives and evaluate whether the requirements of NFPA 855 are adequate to meet those goals and objectives. The criteria for acceptability of the level of fire and explosion protection should consider the perspective of the various stakeholders.

G.3.4.2

The general arrangement and plant layout should be provided to clearly reflect the separation of hazards. If the layout is not acceptable, an additional fire and explosion risk evaluation should be developed to ensure objectives are met, and then return to the review process.

G.3.4.3

Each hazard/area should be reviewed against the goals and objectives and NFPA 855. If the hazards control is not acceptable, then a fire risk evaluation should be developed to ensure objectives are met, and then return to the review process. NFPA 550 and NFPA 551 should be utilized for evaluation techniques. EPRI provides a good safety analysis base on bowtie review of failure analysis.

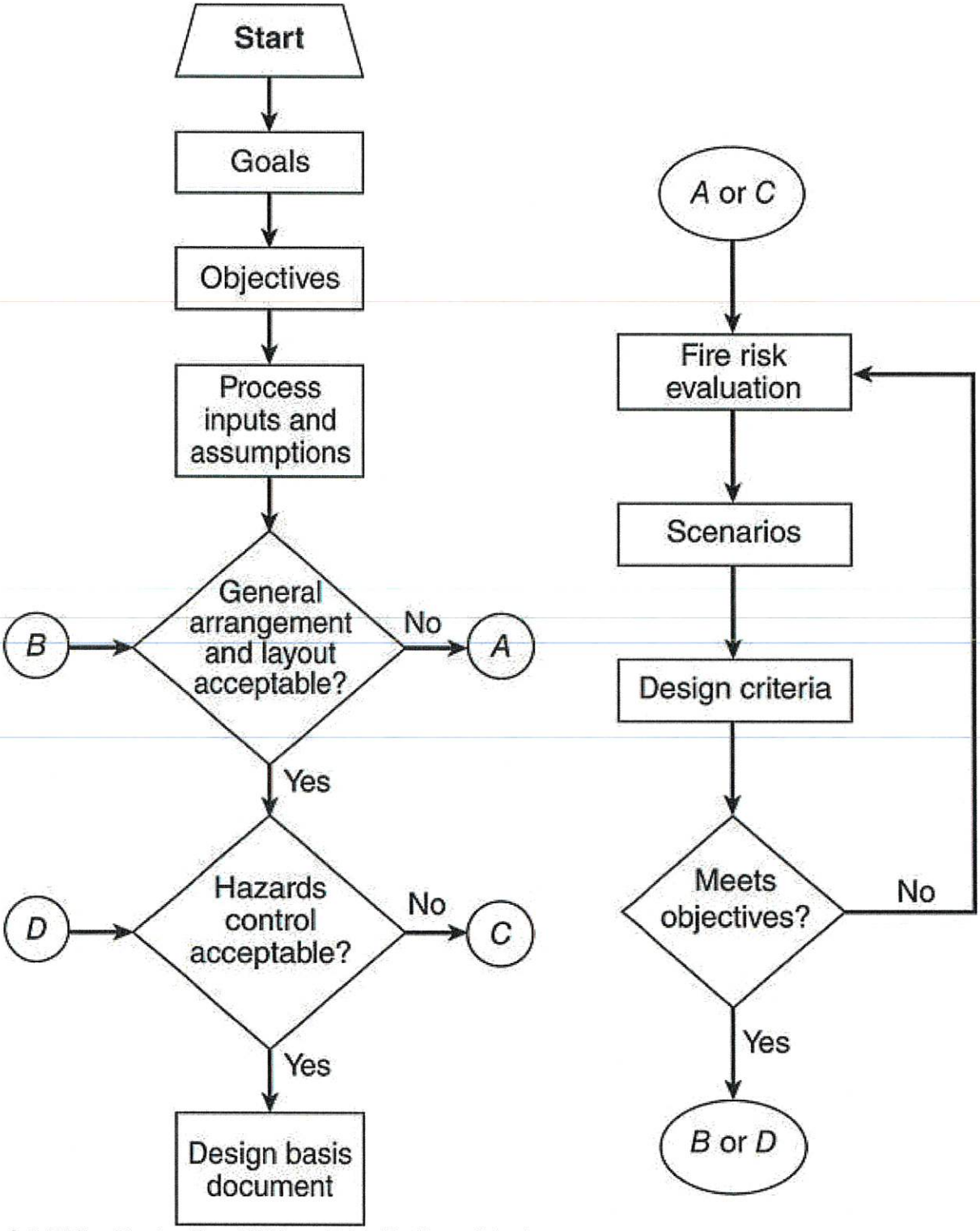
G.3.4.4

An HMA should be developed.

G.3.4.5

As the project evolves, the HMA should be reviewed and updated as necessary to incorporate changes and revisions (see Figure G.3.4.5).

Figure G.3.4.5 Fire Protection Design Basis Process Flow Chart.



G.3.5 Fire Protection HMA or FRA (Deliverables).

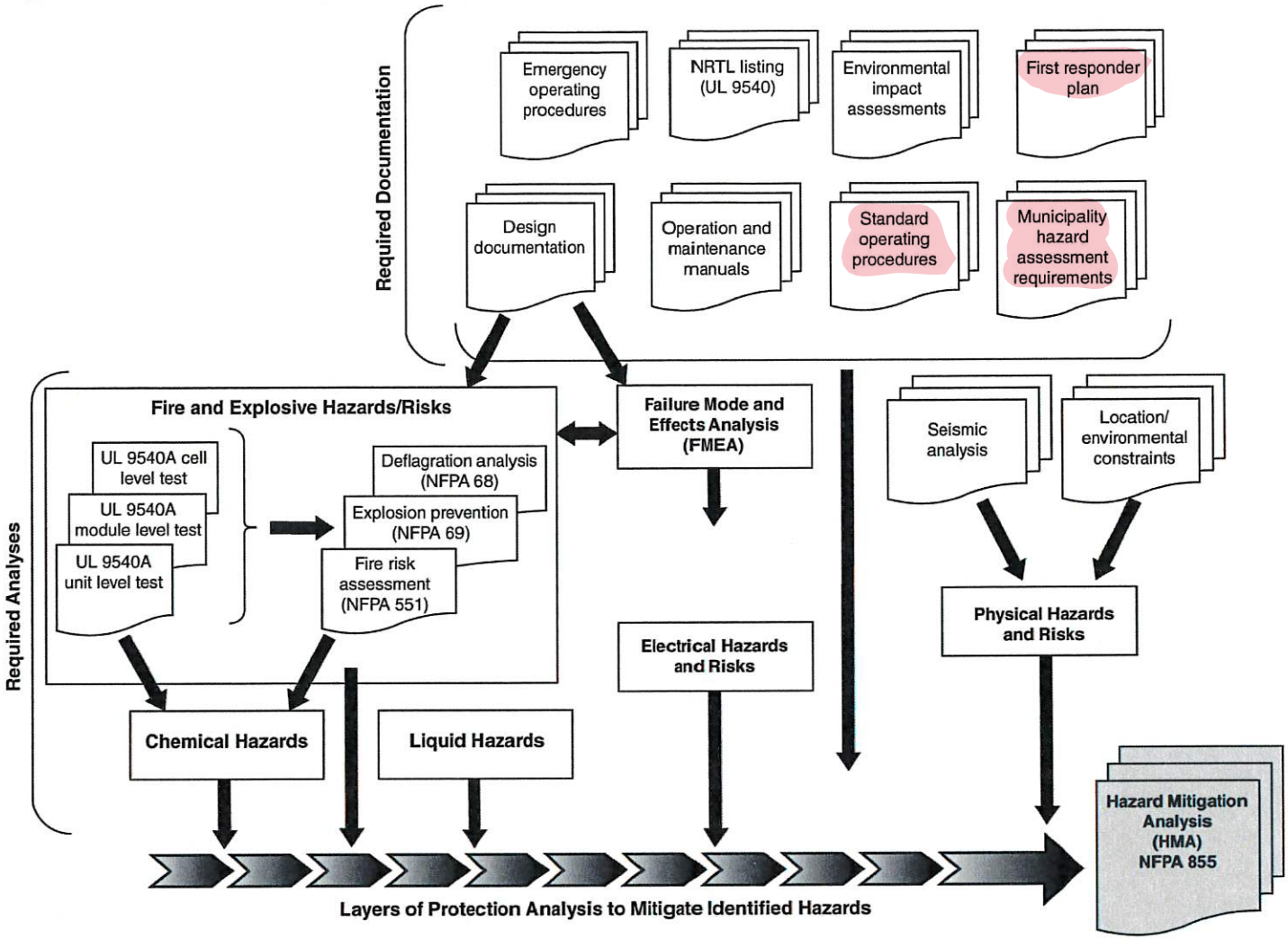
G.3.5.1

The scope of the HMA should be to establish the fire and explosion protection design criteria for the facility. The development of the HMA should be an iterative process. The HMA should be revised as the design progresses and technical design aspects are selected and finalized, and based on dialogue among the stakeholders. The HMA should outline the protection/prevention design basis for achieving the fire hazard control objectives agreed upon by the stakeholders, including the following:

(1) Identify assumptions and threats (including G.3.3.2)
(2) Identify source documents
(3) Identify each hazard and consequence, identify which prevention/protection features are to be provided or omitted, and summarize the decision-making process
(4) Identify where operational and administrative controls are assumed to be in place to mitigate the need for fire protection features

See Figure G.3.5.1 for an HMA process flow diagram.

Figure G.3.5.1 Hazard Mitigation Analysis (HMA) Process Flow Diagram.



G.3.5.2

During the various stages of the design development and the development of the HMA/FRA, assumptions should be made when inadequate or insufficient information is available. These assumptions should be clearly identified and documented in accordance with Section G.3.5. As additional information becomes available, the assumptions should be updated or replaced with actual design information and the HMA should be amended as necessary to reflect the more definitive information.

G.3.5.3

The process identified in G.3.5.1 and G.3.5.2 should be documented. The format of the document is a statement on general fire and explosion protection philosophy for the facility and a comparison of the facility fire protection features to the guidelines in the design chapters; for example, protection of thermal runaway addressing suppression and mitigation measures.

G.3.6 Common HMA and FRA Concepts Related to ESS.

To ease the process of developing and reviewing HMAs or FRAs as they relate to energy storage, this section provides examples of threats, hazards, and consequences posed by energy storage systems; how they might fit into a hazard mitigation assessment; and then parallels between the hazard mitigation assessment and fire risk assessment. As a reference, NFPA 550 was used to provide clear comparisons between certain types of hazard mitigation assessments, namely the bowtie model and fire safety/risk concepts. While some bowtie models cover dozens of threats across multiple models, these threats can be broken down into a smaller number of general hazard categories. For energy storage, one proposed set of hazard categories includes the following:

(1) Thermal failures (HVAC or noncell related)
(2) Controls failures
(3) Cell internal failures
(4) External/environmental risks
(5) Electrical risks

Within these hazard categories, multiple threats exist, which would result in cells catching fire and, ultimately, that fire propagating, or posing the risk of propagating, throughout the whole system. Between these threats and such hazard events occurring, barriers exist that can stop the failure from occurring, minimize its severity, or contain its outcome such that it is unable to propagate. Should these barriers fail to do so, the event would then result in a propagating failure, leading to some consequence that could range from a fire involving some number of cells to a container or system wide, catastrophic conflagration. While the failure mode and effects analysis (FMEA) called for in UL 1973 and UL 9540 look at the barriers in place to prevent these types of events within the ESS itself, an HMA or FRA looks holistically at the system and includes environmental and as-built components and considerations not included at the product level.

Alternatively, the Fire Safety Concept Tree, which lays out fire safety objectives, is broken into two categories, Prevent Fire Ignition and Manage Fire Impact; which are nearly direct parallels to mitigating threats and managing consequences in the bowtie model.

Each of the subconcepts beneath Prevent Fire Ignition and Manage Fire Impact themselves have further subcategories, and it is at this level and lower where direct parallels to hazard mitigation assessments, and ultimately the physical hardware of a battery system, can be explained to the lay stakeholder. Figure G.3.6(a),Figure G.3.6(b), and Figure G.3.6(c), are examples of flowcharts for fire safety from objectives though ignition and propagation.

As an example, Prevent Fire Ignition is broken into three subcategories: Control heat-energy sources, Control source-fuel interactions, and Control fuel. These categories themselves are broken into their own subcategories. It is these subcategories that begin to align with aspects of the HMA as well as with physical components of the system.

To conclude the example, control heat-energy source(s), as shown in Figure G.3.6(b), can be thought of as preventing thermal runaway or failure. To do this, one can control the rate of heat-energy release or eliminate the heat-energy source. As the flammability of lithium-ion cells is a function of their hydrocarbon electrolyte and the ability of the cells, either electrically or electrochemically to ignite that fuel, it is not possible to make the battery completely nonflammable, therefore, one must either use controls to prevent the battery from reaching a state of failure and must build the battery such that it is not inherently unstable and prone to this condition on its own.

Figure G.3.6(a) Example Fire Safety Objectives Flow Chart.

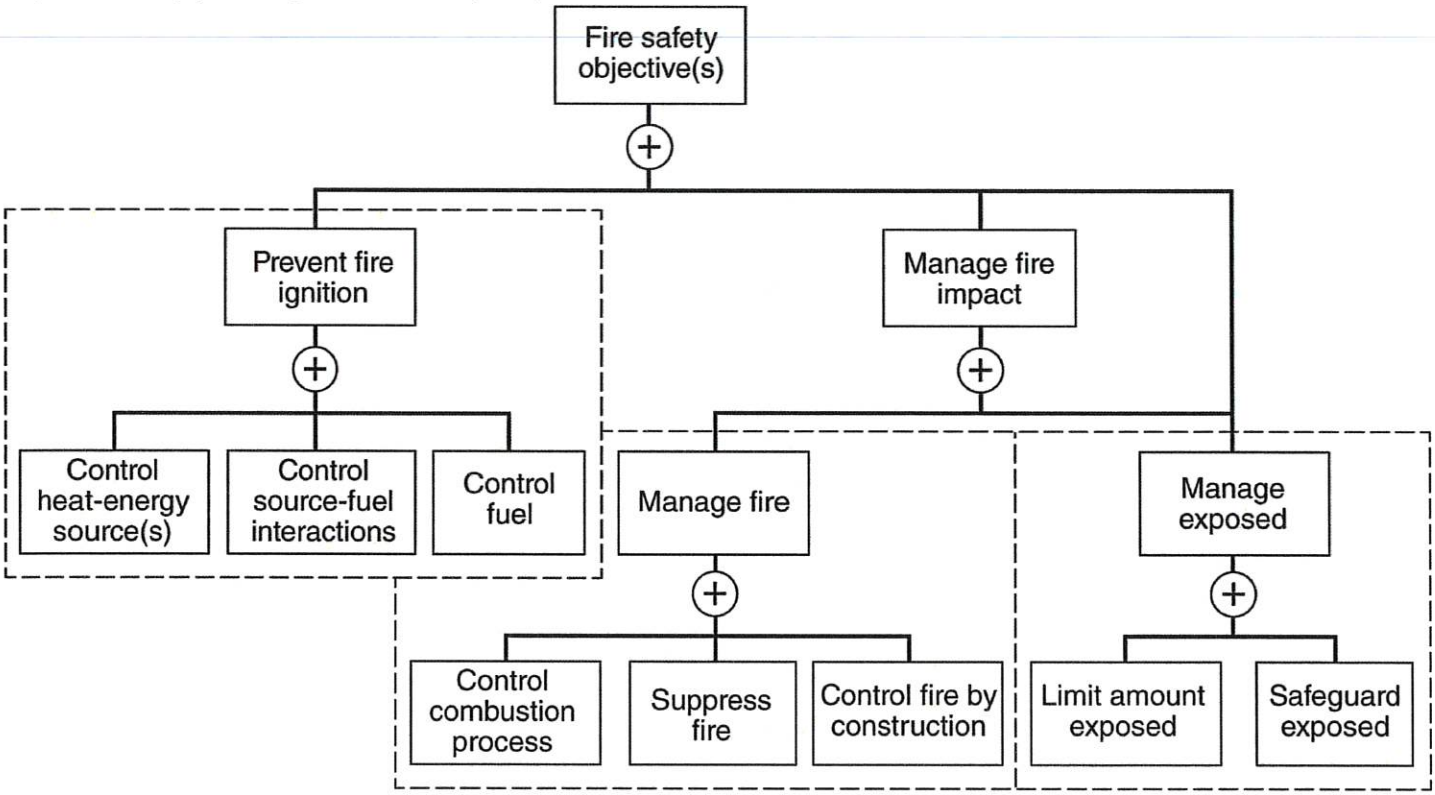


Figure G.3.6(b) Example Prevention of Fire Ignition Flow Chart.

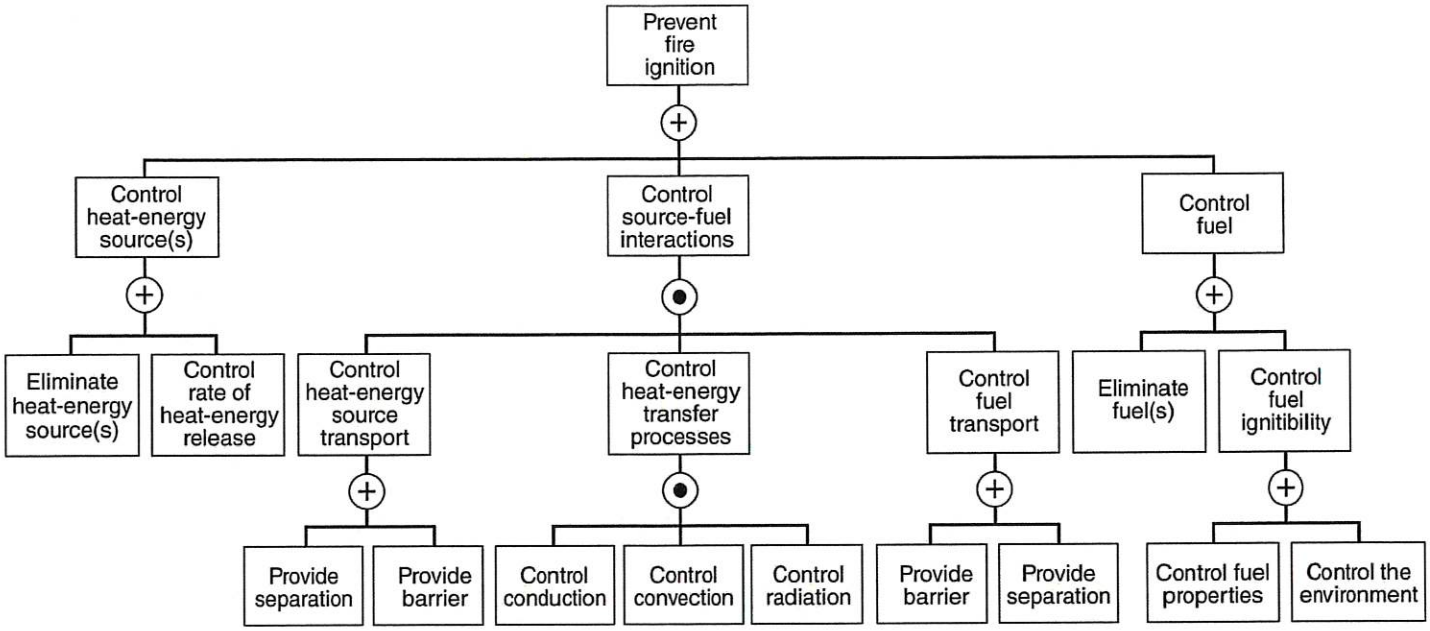
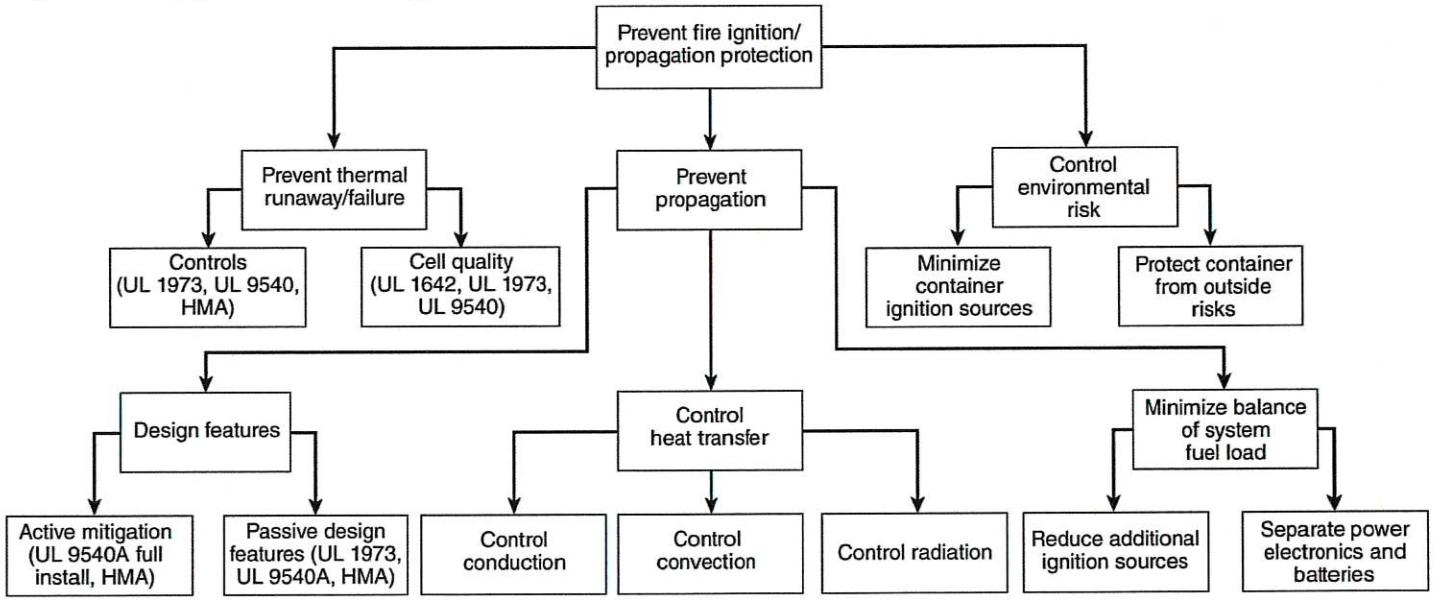
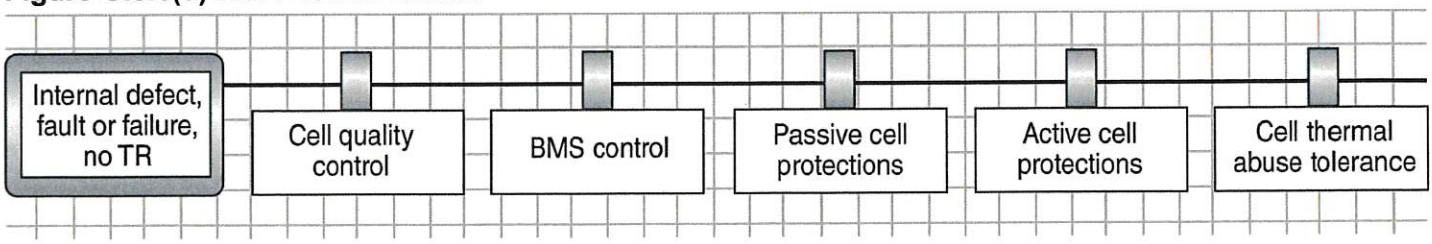


Figure G.3.6(c) Example Fire Ignition and Propagation Protection Flow Chart.



As a result, preventing thermal runaway at the cell level can be split between controls [i.e., eliminate heat-energy source(s)] and cell quality (i.e., control rate of heat-energy release). While these categories themselves can be evaluated by qualified experts, insight into their risk and effectiveness can be evaluated initially by a number of product standards. For controls, UL 1973 and UL 9540 evaluate the effectiveness of many of the controls designed to prevent thermal runaway, while an in-depth HMA can also evaluate the effectiveness of those barriers. An example of these barriers in a hazard mitigation model is shown in Figure G.3.6(d).

Figure G.3.6(d) HMA Bowtie Model.

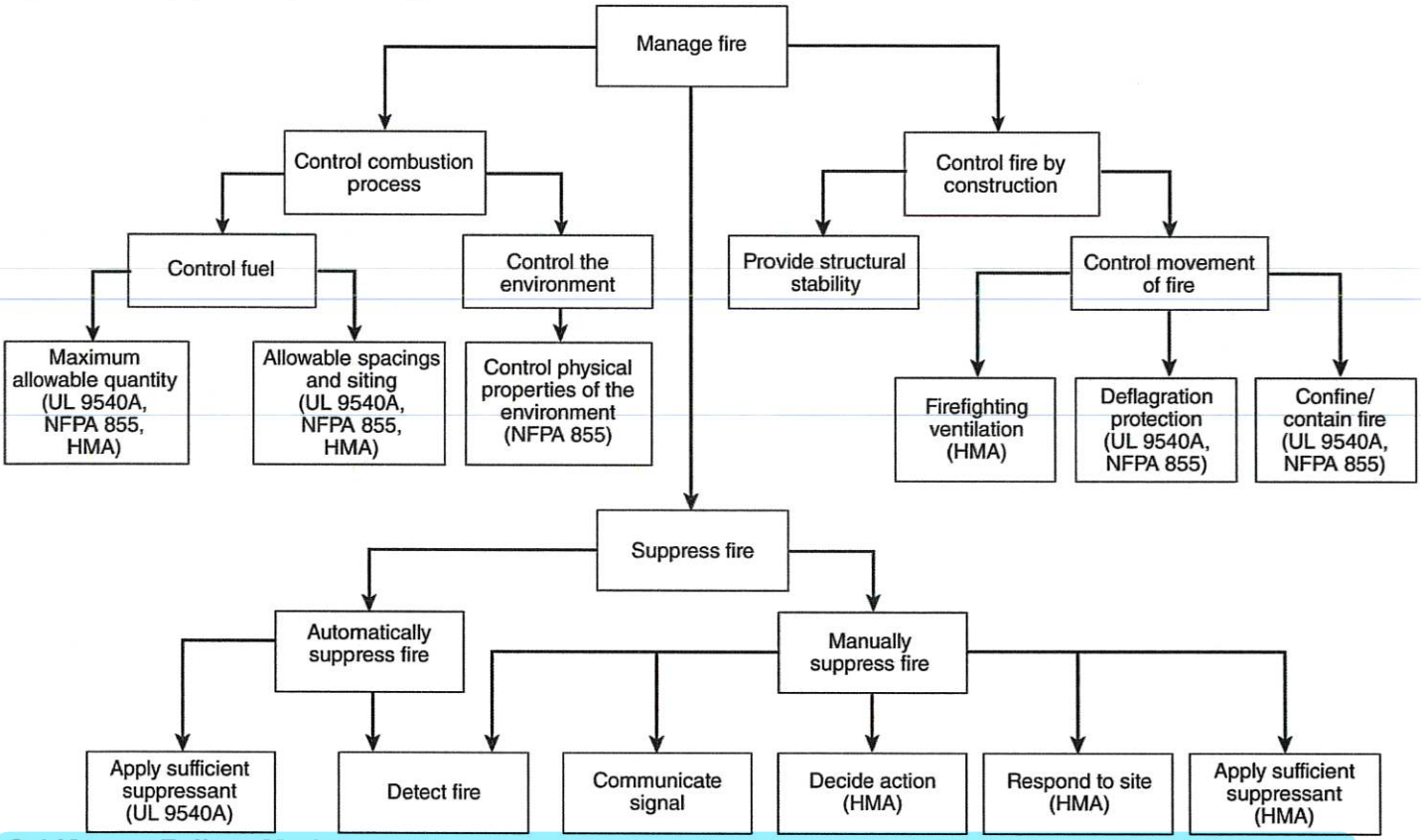


In Figure G.3.6(d), cell quality control and BMS control, along with three other barriers, stand between an internal cell fault and a propagating fire through the system. These other barriers, passive cell protections, active cell protections, and cell thermal abuse tolerance, might also tie back to other aspects of the fire safety concepts tree. In this case, active mitigation, equivalent to active cell protections in the bowtie HMA, can be found under design features, itself a subcategory of prevent propagation in the model. These barriers are thus related, with some liberties, to provide separation and provide barrier in control heat-energy source transport under the concept tree. As these categories are rather broad, and themselves not necessarily relevant to energy storage, one must look at

their role and their parent category, control heat-energy source transport. In considering a failing cell, and its tremendous heat output, once should consider design aspects, both active or passive, which will divert this heat away, preventing further spread to adjacent cells and modules. In a more traditional fire assessment, minimizing this heat transfer is easily accomplished by creating spacing or placing a physical barrier to minimize heat transfer, but the complex nature of ESS makes this more difficult, and while placing literal fire walls (a passive approach), can help slow convective heat transfer (or even conductive), it could also allow for the buildup of explosive gases or direct the heat to other, unanticipated locations within the system. As a result, fire management designs in ESS might be more complex, involving active and passive ventilation systems, passive safety materials such as phase change or intumescent materials, or other design features not yet envisioned.

Controlling heat transfer is self-explanatory, and while the nature of lithium-ion battery fires is unique, made up of a combination of behaviors not typically observed by the fire service, each of these risks or behaviors is itself not unique. As such, UL 9540A should lend the data necessary for identifying other conduction, convection, and radiation risks and mitigating these risks. These categories, themselves while not directly addressed in the bowtie HMA, could easily be included in passive cell protections, as well as module and system passive protections used for dealing with other risks. [See Figure G.3.6(e).]

Figure G.3.6(e) Example Manage Fire Flow Chart.



G.4 Known Failure Modes and Their Associated Consequences and Mitigation Approaches (Bowtie Analysis).

G.4.1 Bowtie and Hazard Mitigation Analysis Overview.

Bowtie modeling is a common, industry-accepted risk and hazard mitigation analysis tool used in the maritime, oil and gas, and utility industries because it provides a clear graphical representation of the risks and protections of large, purpose-built ESS structures in traditionally difficult markets.

The strength of the bowtie approach comes from its visual nature, which forgoes complex, numerical tables for threat pathways in favor of illustrating a single hazard event or consequence and all the barriers in place to stop it. On the left side are the threats, which are failures, events, or other actions, which all result in a single, common hazard event in the center. For an ESS system, many of these threats parallel the hazards addressed by the fire code, such as unexpected thermal runaway.

The goal is to capture an entire analysis in a single model; therefore, some of the risks requiring assessment are actually consequences of the failures. For the model to be complete, the central hazard event is defined as a single-cell failure that begins to propagate through the system, rather than simply the failure of a single cell. As a result, the threats on the left are events, actions, or modes that could result in a single cell not just failing, but failing and beginning to propagate through the system in a manner which can cause more severe consequences.

As all threats and consequences tie into a single hazard event, the shape of the model resembles a bow tie. The length of the pathway on either side is dependent on the number of barriers that exist to prevent that threat from reaching the hazard event or the hazard event from devolving into the full consequence.

G.4.2 Threats.

Threats identified in a bowtie analysis are not generally catastrophic failures, but rather the smaller, precursor events that can lead to catastrophic consequences. As most catastrophic failures are not the result of everything going as expected, the threat pathway of the model allows plausible and probable events to be assessed by evaluating the strength and category of the barriers designed to prevent those events from resulting in failure. In the case of energy storage systems, many of these barriers include active electrical monitoring and controls, passive electrical safeties, and redundant failure detection. Should these systems fail to detect the failure, shutdown the system, or otherwise prevent thermal runaway from occurring, there are physical design elements that can prevent that fire from spreading. Should those elements fail as well, the threat pathway arrives at the central hazard event: a propagating fire that will escalate unless mitigated by barriers on the consequence side. Without mitigation, the central hazard event will almost assuredly result in property damage and long-term system shutdown. As such, it is critical the consequence barriers be evaluated in an intellectually honest manner such that the true strengths and weaknesses of the system are understood. This provides operators with the opportunity to identify and correct weaknesses before becoming problematic during a failure.

G.4.2.1 Individual Pathways.

G.4.2.1.1 Single-Cell Thermal Runaway.

One of the more straightforward threats, this pathway details what barriers exist to keep a single-cell thermal runaway from occurring —if electrically initiated—and if it occurs, what barriers can prevent it from propagating to neighboring cells.

G.4.2.1.2 Multicell Thermal Runaway Causes.

Causes of multicell thermal runaway include the following:

(1) Internal defect or failure that doesn't result in thermal runaway
(2) BMS failure, ESMS failure, inverter failure, sensor failure
(3) Site control, balance of plant, balance of system, programmable logic controller (PLC) failure
(4) Ground fault, short-circuit hazardous voltage condition

G.4.2.2 Individual Barriers.

G.4.2.2.1 Cell-Level Failures and Protections.

G.4.2.2.1.1 Passive Cell Protections.

System design, passive materials, or other design elements incorporated to passively protect neighboring cells from localized cell failure. This also includes the likelihood of cell-to-cell propagation based on system design.

G.4.2.2.1.2 Active Cell Protection.

Active cell protections that can mitigate thermal runaway such as module fans, liquid cooling systems, module scale suppression systems, or other mitigation measures.

G.4.2.2.1.3 Cell Thermal Abuse Tolerance.

Ability of the cells to withstand thermal abuse without going into failure themselves.

G.4.2.2.1.4 Cell Quality Control.

Overall quality of the cell such that internal defects are minimized and cells maintain rigidity and shape during operations. Also includes tight tolerances with respect to degradation and new capacity.

G.4.2.2.1.5 Cell Electrical Abuse Tolerance.

Ability of the cell to withstand electrical abuse such as overcharge, overdischarge, high currents, or other adverse electrical abuse.

G.4.2.3 Passive Physical and Electrical Protections.

G.4.2.3.1 Passive Circuit Protection and Design.

Current interrupt devices, breakers, fuses, or other passive elements that can open the circuit in the case of failure and general resilience of design to withstand adverse electrical conditions.

G.4.2.3.2 System Shutdown/Disconnect.

Ability of system to actively shut itself down or disconnect itself. This is the aggregate of the battery management system (BMS) or inverter's shutdown ability, as well as physical disconnects and the BMS controller's ability to shut down.

G.4.2.4 Active Monitoring, Controls and Electrical Protections.

G.4.2.4.1 System Shutdown/Disconnect.

Ability of the system to actively shut itself down or disconnect itself. This is the aggregate of the BMS or inverter's shutdown ability, as well as physical disconnects and the BMS controller's ability to shut down.

G.4.2.4.2 Redundant Failure Detection/System Intelligence.

Ability of system to determine a sensor has failed, to shut down safely without that sensor, or operate safely indefinitely without that sensor. This can include check sums, additional sensors, or the ability to pull data from other sensors.

G.4.2.4.3 BMS Control.

Includes monitoring and shutdown/isolation capabilities of the affected BMS/module.

G.4.2.4.4 Voltage Monitoring.

The overall effectiveness of the voltage monitoring scheme of the system.

G.4.2.4.5 Inverter/PCS Controls.

Includes monitoring and shutdown/isolation capabilities.

G.4.2.4.6 System Electrical Abuse Tolerance.

The ability of the overall system collectively to withstand adverse electrical abuse, such as overcharge or dead shorts, without failure.

G.4.3 Consequences.

G.4.3.1 Individual Pathways.

G.4.3.1.1 Individual Barriers.

G.4.3.1.1.1 Fire, Smoke, Heat, and Failure Detection.

The system used in this example will include early warning smoke detection and early intervention off-gas sensors in the ESS envelope. This category can also include gas detection technologies to identify battery off-gas in the environment outside of the ESS.

G.4.3.1.1.2 Situational Awareness.

Knowledge of failure condition for active mitigation and response management.

G.4.3.1.1.3 Gas Phase Suppression System.

A gaseous special protection system, such as inert gas or aerosolized gas-based agent designed for fire suppression is included in the sample analysis.

G.4.3.1.1.4 Exhaust Ventilation.

Effectiveness of exhaust ventilation to remove battery off-gas, heat, and smoke, which can result in adverse atmospheric conditions.

G.4.3.1.1.5 Water-Based Suppression System.

Water-based suppression systems include sprinklers, sprayers, deluge systems, or water mist systems designed to suppress fire.

G.4.3.1.1.6 Emergency Action Plan/First Responders.

The system operator's plan to handle any and all emergency events—separate from local/public fire service response.

G.4.3.1.1.7 Fire Service Response.

Fire department response, including active firefighting.

G.4.3.1.1.8 Thermal Isolation/Cascading Protection.

Thermal protections inside the battery compartment to limit module fire/thermal exposure.

G.4.3.1.1.9 Facility Design and Siting.

Placement of the facility such that adverse environmental effects such as flooding, vehicle impact, and fire impingement are mitigated or avoided. Likewise, placement such that adverse effects from the system to exposures are limited.

G.4.3.2 Other Pathways. (Reserved)

G.5 Application of LIB-Based ESS and How Location Within a Building Impacts the Hazard Analysis. (Reserved)

G.6 Fire Protections Systems and Mitigation Strategies, Including System Goal, Water Duration, and Water Application Strategies.

G.6.1 Suppression Technologies.

Suppression systems can extinguish a fire but will not stop thermal runaway once initiated in a cell or off-gassing of damaged cells, which creates a potentially explosive environment. If gas is allowed to accumulate, a more hazardous condition can develop. There might be times that venting is more critical than suppression. Challenges in gas detection might lead to increasing levels of combustible gas or toxic gases during suppression. Venting might be required through either a direct tie to the fire detection system or operator action. While non-water-based fire suppression has been shown to be effective at suppressing Class A, Class B, and Class C fires in ESS enclosures, both water-based and non-water-based current suppression agents might not provide the cooling needed to stop thermal runaway once begun in a cell or to prevent propagation. While water is effective at long-term cooling if directed at the affected cell(s), additional damage from water exposure might lead to extended thermal events in other cells or modules.

The current protection concepts in this standard, including size and separation, maximum rated energy, and elevation, are designed to keep a thermal runaway event from propagating from one ESS unit to another, contain a fire within a room or outdoor walk-in unit, and prevent it from compromising exposures. Even if the fire has been extinguished, the fire detection system should still be monitored in case of any subsequent reignitions. The technologies detailed in G.6.1.1 through G.6.1.6 represent those commonly used at the time of publication. It does not preclude the design or implementation of engineered or pre-engineered systems that comply with the fire and explosion test criteria provided in 9.1.5.

G.6.1.1 Sprinklers.

There are two known publicly available fire and explosion tests, equivalent to UL 9540A, supporting the use of ceiling-level sprinkler systems for the protection of LIB ESS. One test evaluated a 83 kWh system made up of lithium-iron-phosphate batteries and another evaluated a 125 kWh system made up of nickel-manganese-cobalt-oxide batteries. In both tests, protection was provided by ceiling sprinklers having a K-factor of 5.6 gpm/psi$^{1/2}$ operating at a discharge pressure of 2 bar (29 psi) to provide a nominal discharge density of 0.3 gpm/ft^2. The results show that fire and explosion testing is needed to determine the following:

(1) Ceiling sprinkler protection can prevent or delay a fire from spreading beyond the ESS rack of origin, but obstructions caused by the design of ESS system (e.g., solid-metal cabinet encompassing tightly packed battery modules) limit the ability to suppress or extinguish fire within the rack of origin.
(2) Minimum space separation has been provided from the ESS to surrounding combustibles to limit the potential for additional fire spread, including nearby ESS racks
(3) Minimum space separation has been provided from the ESS to surrounding noncombustible objects to limit the potential for damage
(4) If fire does spread to an adjacent ESS rack (i.e., installed side-by-side), it does not impact the design and electrical capacity of battery components as well as the design of the ESS cabinet that houses the battery components (e.g., battery modules)
(5) Adequate cooling of the batteries is provided to prevent reignition, which can occur after a fire appears to be extinguished. A fire watch should be present until all potentially damaged ESS equipment containing Li-ion batteries is removed from the area following a fire event.
(6) Adequate building component rating is provided to withstand the expected intensity and duration of an ESS fire event.

The wide range of results highlight the need for fire and explosion testing to evaluate sprinkler protection for each unique ESS to ensure the expected level of protection is provided. Protection system considerations that would require a fire and explosion test include a reduction in the specified sprinkler system design density, a reduction in the minimum separation distance from nearby combustible and noncombustibles, changes in ESS cabinet, or increasing ESS electrical capacity.

G.6.1.2 Spray Systems. (Reserved)

G.6.1.3 Water Mist Systems.

Water mist is a water spray for which the 99 percent of the total volume of liquid (Dv0.99) is distributed in droplets with a diameter smaller than 1000 microns at the minimum design operating pressure of the water mist nozzle.

G.6.1.3.1 Different Types of Water Mist Systems.

The types of water mist systems are as follows:

(1) *High Pressure*: Water mist system where the distribution system piping is exposed to pressures of 34.5 bar (500 psi) or greater.
(2) *Medium Pressure*: Water mist system where the distribution system piping is exposed to pressures greater than 12.1 bar (175 psi) but less than 34.5 bar (500 psi).
(3) *Low Pressure*: Water mist system where the distribution piping is exposed to pressures of 12.1 bar (175 psi) or less.

G.6.1.3.2 Standards.

For more information on water mist systems, see NFPA 750.

G.6.1.3.3 Fire and Explosion Test Report References for Li-Ion Battery Fire Suppression with Water Mist.

For more information on fire and explosion testing for Li-ion battery fire suppression with water mist, see the following:

(1) DNVGL Battery Safety Joint Development Project Report, "Technical Reference for Li-ion Battery Explosion Risk and Fire Suppression."
(2) Marioff Corporation – Fire Test Summary #57/BR/AUG15, "HI-FOG® Systems for Protection of Li-ion Rooms."

G.6.1.3.3.1 Testing.

Water mist fire protection systems are performance-based systems and must be tested by means of fire and explosion testing to verify performance to achieve predefined testing objectives of fire extinguishment, fire suppression, fire control, temperature control, or exposure protection per NFPA 750.

Testing performed as part of the DNVGL Battery Safety Joint Development Project and published in the report dated January 7, 2020, included a specific water mist manufacturer's high-pressure water mist product, and gave promising insight to the effectiveness of a high-pressure water mist system on Li-ion battery fires. The data collected yielded the following results for the high-pressure water mist system tested:

(1) Could not stop thermal runaway process in the damaged battery module
(2) Extinguished the flames in both the front and back of the burning module
(3) Provided long-term heat absorption
(4) Absorbed and cooled flammable gases reducing LEL percent
(5) Cooled down the space as a whole
(6) Scrubbed toxic gases
(7) System was effective with the enclosure vented or sealed
(8) Reduced and minimized propagation to neighboring module

Currently there are no specific fire-testing protocols or guidance documents developed for water mist systems by any listing agency for the protection of battery storage systems incorporating Li-ion batteries that would result in a listed water mist system for this specific hazard. Additionally, there are no publicly available test data using water mist systems that was completed as part of the UL 9540A propagation evaluation.

Currently, FM Approvals does not have a specific fire testing protocol or guidance document developed for water mist systems for the protection of battery storage systems incorporating Li-ion batteries that would result in an FM approval for the water mist system for this specific hazard type for the water mist system's manufacturer.

G.6.1.3.4 Design and Installation.

Design and installation should be based on NFPA 750 and manufacturer-specific requirements as it pertains to LIB ESS (e.g., nozzles spacings, maximum ceiling heights, nozzle mounting orientation, min and max distance from front of Li-ion rack front face, and so on). Manufacturer requirements should be derived from a fire and explosion test of the proposed ESS arrangement and manufacturer-specific design, installation, operations, and maintenance manuals.

G.6.1.3.5 Inspection, Testing, and Maintenance.

Inspection, testing, and maintenance should be done in accordance with the requirements of the water mist system manufacturer's design, installation, and maintenance manuals; NFPA 750; or NFPA 25 with regard to the relevant servicing intervals and other servicing requirements to properly maintain the system.

G.6.1.4 Clean Agents.

Clean-agent suppression systems can extinguish a fire but will not stop thermal runaway or off-gassing if the cells are damaged, creating a potential explosive environment. Similar to a natural gas fire, if gas is allowed to accumulate, a more hazardous condition can develop. There might be times that venting is more critical than suppression. If the gas detection system continues to see increasing levels of combustible gas or toxic gases during suppression, venting might be required through either a direct tie to the gas detection system or a manual operation to begin venting. The suppression systems might not have reached their hold times yet and

agent might be vented. Even if the fire has been extinguished and hold times have been met, the gas detection system should still be monitored in case of any subsequent events, including reflash due to stranded energy. Venting might be required at a later point as well.

If clean agent suppression is used as the primary fire suppression method and is not backed up by a water-based sprinkler system designed per NFPA 855 or with a fire and explosion test meeting the specifications of the sprinkler section in this annex, a fire and explosion test should be conducted using the proposed ESS arrangement with the clean-agent protection criteria proposed. Such a test should meet predefined approval criteria and also dictate the necessary hold time for the anticipated thermal runaway event.

G.6.1.4.1 Design and Installation.

Total flooding and local application gaseous agent systems should be designed based on factors including, but not limited to, the following:

(1) Agent concentrations required for the specific combustible materials involved, including building systems and battery electrolytes, whichever are higher
(2) Specific configuration of the equipment and enclosure
(3) Maintaining the design concentration within the enclosure for a time to ensure that the fire is extinguished and that the enclosure temperatures of the ESS have cooled to below the autoignition temperature of combustible material present and below the enclosure temperature that can cause thermal runaway as defined in the emergency operations plan
(4) Suppression systems' inability to cool the internal battery temperature once thermal runaway has started

Fire suppression system discharge durations should be held as long as the hazards of temperatures above the autoignition temperature and the temperature at which thermal runaway can occur. The manufacturer should be consulted for applicable ESS cooldown times. Information on fire tests that demonstrate the extinguishment time for an ESS should also be considered in determining the minimum discharge time. An extended discharge time is necessary to prevent potential fire reignition due to smoldering and heat soak. Where design concentrations cannot be maintained effectively, an alternative system should be provided.

If gas levels should continue to increase during a fire event, an operating device should be available in an approved location such that fire services can begin exhaust prior to hold time expiration if deemed necessary.

G.6.1.5 Inerting. (Reserved)

G.6.1.6 Aerosols.

Aerosol suppression systems can extinguish a fire but will not stop thermal runaway or off-gassing if the cells are damaged, which creates a potentially explosive environment. If gas is allowed to accumulate, a more hazardous condition can develop. There might be times that venting is more critical than suppression. If the gas detection system continues to see increasing levels of combustible gas or toxic gases during suppression, venting might be required through either a direct tie to the gas detection system or a manual operation to begin venting. The suppression systems might not have reached their hold times yet and agent might be vented. Even if the fire has been extinguished and hold times have been met, the gas detection system should still be monitored in case of any subsequent events, including reflash due to stranded energy. Venting might be required at a later point as well.

EN 15276-1 and EN 15276-2 state that condensed aerosols are not to be used on fires involving the following:

(1) Chemicals containing their own supply of oxygen (e.g., cellulose nitrate)
(2) Mixtures containing oxidizing materials (e.g., sodium chlorate, sodium nitrate)
(3) Chemicals capable of undergoing autothermal decomposition (e.g., some organic peroxides)
(4) Reactive metals (e.g., sodium, potassium, magnesium, titanium, zirconium), reactive hydrides, or metal amides, some of which can react violently with the extinguishants
(5) Oxidizing agents (e.g., nitric oxides and fluorine)
(6) Pyrophoric materials (e.g., white phosphorous, metallo-organic compounds)

The above list is not exhaustive. Items (3) and (5) are applicable to lithium-ion batteries.

G.6.1.6.1 Standards.

For more information on aerosol systems, see the following:

(1) NFPA 2010
(2) *NFPA 70*
(3) *NFPA 72*
(4) ANSI/UL 2775, *Standard for Fixed Condensed Aerosol Extinguishing System Units*
(5) International Code Council IFC and IBC standards

G.6.1.6.2 Listing.

G.6.1.6.2.1

The fire extinguishing agents addressed in this standard should be listed in the US EPA SNAP list for use as a total-flooding fire-extinguishing agent in occupied and unoccupied spaces.

G.6.1.6.2.2

Aerosol systems and automatic aerosol units should be listed for service at ambient operating temperatures of the LIB ESS facility where they are installed.

G.6.1.6.2.3

All aerosol systems and automatic extinguishing units should comply with ANSI/UL 2775.

G.6.1.6.3 Design and Installation.

Aerosol systems for ESS applications can be electrically operated or manually released with a fire alarm control system meeting *NFPA 72* and *NFPA 70* requirements. Multiple electric operated aerosol extinguishing units can be wired in series or in parallel to the fire alarm control panel and in accordance with NFPA 2010. System design should meet listing requirements, NFPA 2010, and ICC IFC/IBC standards.

G.6.1.6.3.1

Aerosol quantities for the protection of ESS applications should be based on the calculation methods described in NFPA 2010.

G.6.1.6.3.2

ESS enclosure integrity and uncloseable opening aerosol leakage impact on aerosol density should be compensated in accordance with the methods and design factor calculations described in NFPA 2010.

G.6.1.6.3.3

ESS open loop ventilation systems should be shut down or ventilation dampers closed prior to activation of the aerosol units.

G.6.1.6.3.4

All aerosol systems and automatic extinguishing units should be installed and used to protect ESS hazards within the limitations of and in accordance with their listing or as designated by a fire and explosion fire test.

G.6.1.6.3.5

Electrically operated aerosol systems installed for the protection of ESS systems during transit can be fitted with a battery-operated detection and aerosol control system. ESS systems in remote locations with no primary source of AC power can be fitted with a battery-operated detection and aerosol control system.

G.6.1.6.3.6

Automatic aerosol units for ESS applications can be stand-alone extinguishing units provided the units have sufficient capacity to flood the ESS enclosure to the minimum design density for extinguishing Class A (surface), Class B, or Class C fires in accordance with the listing.

G.6.1.6.4 Testing.

If aerosol suppression is used as the primary fire suppression method and is not backed up by a water-based sprinkler system designed per the requirements of NFPA 855 or with a fire and explosion test meeting the specifications of the sprinkler section in this annex, a fire and explosion test should be conducted using the proposed ESS arrangement with the aerosol protection criteria proposed. Such a test should meet the same criteria as the sprinkler testing criteria listed and also dictate the required hold time for the anticipated thermal runaway event.

G.6.1.6.5 Inspection, Testing, and Maintenance.

Aerosol system and automatic aerosol unit inspection, testing, and maintenance requirements should comply with listing and manufacturer guidance described in the product design, installation, operation, and maintenance manual.

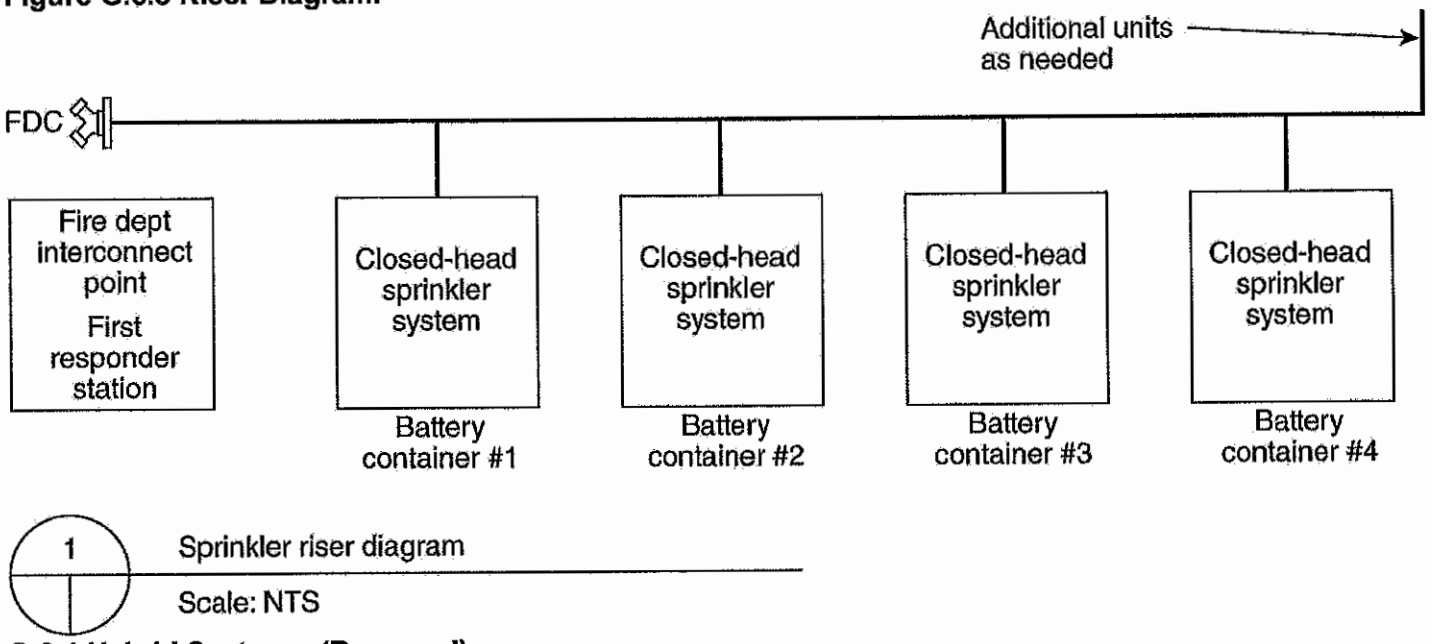
G.6.2 CO_2. (Reserved)

G.6.3 Standpipes.

Current applications for water on LIB ESS are not meeting the true definition of NFPA 13, NFPA 14, or NFPA 15. These are traditionally applied on containers, enclosures, or cabinets. They are installed as a hybrid application. The intent is to provide as much water as possible as quickly as possible. A dry stand-pipe can be added with either a connected water supply, if available, or a dry fire

department connection. It can be provided at an access point or first responder's station located at the entrance to the site and away from the ESS. This application is usually applied as a last resort when all other mitigation measures have failed. It can be applied as a deluge type system or a closed-head system. While deluge systems will provide a quicker application of water, a closed-head system only applies the water at the point of heat or fire. High flow ESFR heads are recommended. The closed-head system allows for a simpler piping system to connect multiple containers or enclosures on one piping network, and possible connection to the wrong fire area. This can be applied in remote areas with a lack of water supply or urban environments where water demand might be limited. See Figure G.6.3.

Figure G.6.3 Riser Diagram.



G.6.4 Hybrid Systems. (Reserved)

G.6.5 Encapsulation. (Reserved)

G.6.6 Pre-Engineered Systems. (Reserved)

G.6.7 Active Technologies. (Reserved)

G.6.8 Passive Technologies. (Reserved)

G.6.9 Physical Barriers. (Reserved)

G.7 Fire and Flammable Gas Detection, Including the Location, Type, and Purpose for Available Technologies.

G.7.1 General.

All fire system components, devices, equipment, and system materials that are provided or required as part of a battery rack fire suppression system should be approved by the local statutory authorities and listed or approved for their intended use.

G.7.2 Design and Installation.

All battery rack assemblies should be designed and installed in accordance with the applicable codes and standards; their tested certified configuration; and within the limitations of their certifications, listing, and approvals. Arranging and installing a battery rack assembly in configurations other than its tested and certified configuration (for example, stacking of racks, back-to-back racks, and so on) should be prohibited.

G.7.3 Detection Systems.

G.7.3.1 BMS.

While not technically a detection system, a BMS can provide input into the fire system as a first-stage warning. A BMS can monitor fault conditions, abnormal voltages, and increase in heat—all potential precursors to LIB failure. The BMS, in conjunction with other detection technologies, can provide a better indication of the type of fire condition—either internal or external to the batteries.

G.7.3.2 Smoke Detection.

Standard spot-type smoke detection is applicable to nonbattery fires and can detect conditions that can lead to a battery failure or thermal runaway. In a battery failure, smoke is detected after thermal runaway and is not applicable to early detection of LIB failures. Smoke detection can be applied at a cabinet level for a quicker response to an LIB failure. Spot-type smoke detection can be used as an interlock for fire suppression system release.

G.7.3.3 Flame Detection.

Flames do not present until after an LIB has gone into thermal runaway. Flame detection can be applied internal or external to an installation. Internal application would be to the container, enclosure, or building. It would not traditionally be applied inside a cabinet. For example, it can be used to monitor a hot isle. External application would be to ESS facilities with multiple containers. It would provide a detection if internal measures failed. It can also be tied to video cameras to provide situation information to first responders of an incident.

G.7.3.4 Heat Detection.

Spot-type heat detection is applicable to nonbattery fires and can detect conditions that can lead to a battery failure or thermal runaway. In a battery failure, heat is detected after thermal runaway and is not applicable to early detection. Heat detection can be used as an interlock for fire suppression system release. The best use of heat detection is as a high-flow ESFR head attached to a dry stand-pipe or fire department connection to apply water to the building, area, container, or cabinet in LIB failure. Heat detection or temperature monitoring integral to the BMS can provide early indication of a battery failure prior to thermal runaway.

G.7.3.5 Thermal Imaging—Temperature Monitoring and Early Warning Fire Detection.

Thermal imaging might be applicable to early detection of LIB failure. With proper placement, detectors are capable of detecting small changes in temperature associated with battery failure and early detection. It requires a line of site and might not function in a small container or cabinet. It can provide the added benefit of visual images. It can be used internal or external to the BESS. First responders can use the images to access the internal condition of the ESS.

Thermal radiation is invisible electromagnetic radiation emitted by a body or object based on its surface temperature. Thermal imaging technology (i.e., thermal radiometry) makes it possible to view, record, and alarm on the slightest temperature anomalies, making it an effective solution in monitoring batteries during normal load or test.

Fixed-mounted thermal cameras provide a predetermined field of view and continuous temperature monitoring as opposed to hand-held units requiring personnel time and potential for variation of readings and views. As a fixed unit, the camera tracks temperature and can provide graphical data over time that can be utilized in a preventative maintenance program and post-event evaluation of battery failures. Alarm relay outputs are available for monitoring by a PLC for equipment shutdown and annunciation.

Thermal radiometry hand-held cameras are commonly carried by first responders into smoke-filled buildings, as the technology can see hot spots through the smoke. Along these lines, fixed thermal radiometry cameras in an ESS building with many racks will simplify first responders' evaluation of the fire size and location, providing situational awareness and lead them directly to the fire and away from potential danger, which minimizes their time in the hazard.

Thermal radiometry cameras are available in wide to narrow field of view, various resolutions of image sensor pixel count, and software platforms. Care should be taken to ensure that the correct product is selected allowing the resolution required to accurately measure the required temperature variations at the specified distance.

Camera software can provide live or recorded video, floating-crosshair indicating pixel(s) with highest or lowest temperature, various color schemes representing temperatures, email notification of alarm, as well as configuration of multiple areas of interest with unique temperature monitoring, alarm, and graphical information within a single camera image.

G.7.3.6 Gas Detection.

G.7.3.6.1 Cell-Level Event.

Carbon monoxide (CO) is one of the main components present for the longest period of time and is considered especially important for early stage detection.

Off-gas in the early stages of thermal runaway events will be colder than off-gas in the later stages. The early off-gas can therefore become heavier than the air, collecting at floor level. It should therefore be considered if gas detection related to room explosion risks should be applied at both levels, close to the floor and close to the ceiling. Both sensor and ASD detection technologies can provide off-gas detection in the early stages of lithium-ion battery thermal runaway events. In addition to off-gas detection, ASD detection can provide very early smoke detection.

Tests conducted in this project indicate that solely relying on lower explosion limit (LEL) sensors and cell voltage levels to detect early stages of a thermal runway event is insufficient.

Cell-level detection, close to or inside the affected module, has proven the most reliable means of pre-thermal-runaway warning. The early detection of thermal runaway has also proven that a cell can be disconnected, effectively stopping the overheating process.

One important aspect of the protection of LIB systems in ESS is the prevention of thermal runaway and propagation of cell failures. While there are many ways to detect and prevent thermal runaway, off-gas monitoring or off-gas particle detection is, perhaps, the most effective because it provides the most amount of time to react to the condition. Off-gas monitors or detectors are installed at the battery rack level and capable of sensing the off-gas byproducts from a single cell. In this way, they can provide up to 30 minutes of time for investigation and intervention by automatic deactivation of charging before thermal runaway.

Off-gas sensors or detectors must be designed to detect the variety of different gases from the many types of LIB chemistries. The gases emitted during the early stages of battery failure are a precursor to the much larger and more dangerous issue of thermal runaway and potential propagation of fire from cell to cell and module to module. This is why, for thermal runaway prevention, LEL gas detectors are not adequate because the concentrations of flammable gases are not high enough. Flammable gas detection has a role to play in other aspects of the protection of the ESS *(see 9.6.5.6)*.

Off-gas sensors or detectors are typically mounted in each battery rack or module, with the exact location of the sensors or detectors being dictated by the actual rack design. But, in general, the sensors must be mounted in the path of airflow. This could mean that, depending upon rack design, the sensor or detector could be either at the top or bottom of the rack. For specific detection design requirements, refer to the manufacturer's published installation and operation manuals and any relevant regulatory approvals/listings for the intended purpose of "off-gas detection" from the incipient stages of a lithium-ion battery thermal runaway.

To be most effective, the network of sensors or detectors throughout the many battery racks in the ESS must be connected with a central controller that allows for the supervision for failures of the individual sensors and a coordinated response when one or more sensors or detectors detect an off-gas event. The responses can be either automated or human generated.

G.7.3.6.2 Installation Level Event.

Once cells have gone into thermal runaway, the release of gas from a single cell can be 10s of gal (100s of L) of gas with concentration from 20 to 50 percent hydrogen, with other components such as CO, CO_2, and flammable hydrocarbons (HCs) also released. A gas detection system should be installed at the installation level. That would include the ceiling for buildings and in the appropriate air flow streams for containers, enclosures, or cabinets. This detection can be configured to provide early notification at 10 percent lower flammable limit (LFL) and alarm condition at 25 percent LFL. If any of these gas components are detected at rising levels, the implication is a nonburning battery failure. If the batteries have ignited, then these gases will be burned off. As explosion is greater risk than fire, monitoring for installation level gases will take priority over a potential fire condition. The gas detection can be tied to the exhaust system to exhaust gases prior to reaching an explosive level. Evaluation and mitigation measure should be evaluated by a deflagration study and hazard mitigation analysis to determine appropriate response to an installation-level gas event.

G.7.3.6.3 Effects on H_2 Gas Detection After Suppression Discharge.

Hydrogen is a significate percentage of the gases released during thermal runaway of an LIB. Traditional gas detection technology for detection of H_2 is a catalytic bead. A catalytic bead burns the gases across the sensor to determine concentration level or LFL. LIBs also release other HCs during failure. These other HCs will be burned on the sensor and recognized as H_2.

A catalytic sensor will not perform well in a low-oxygen or suppression environment as the sensor's ability to burn the gases will be limited. The sensors might fail or underreport the percentage of LFL. Other technology exists for detection of H_2 but can be overwhelmed and fail in a high H_2 release. In conjunction with a suppression system, a secondary sensor monitoring CO or CO_2 might be necessary to monitor as a reference gas. It is seen that for overheating and overcharging, CO is the most continuously present gas and thus provides a good indication of the full spectrum of gas profiles that can be expected. A similar profile can be found by monitoring CO_2. Rising levels of CO or CO_2 indicate a battery failure or cascading event.

Gas release data should be utilized from the fire and explosion testing at a cell, module, and installation level for evaluation of appropriate gas detection. Cell to module to installation is not always a linear progression; meaning scaling up the test results might not give you an actual gas release. These conditions can change due to additional construction material and incorporated barriers. Installation testing can show more or less propagation than cell- or module-level tests.

G.7.3.7 Aspirating Smoke Detection (ASD).

Fire events in LIB ESS must be detected as early as possible to ensure personnel safety, asset protection, and uninterrupted business operation. Aspirated smoke detection mitigates the risk of fire and the consequences of downtime in an ESS in the following ways:

(1) Aspirated smoke detectors detect fires at their incipient stage, allowing early intervention for investigation and action before smoke and corrosive gases affect equipment and personnel. Early detection can prevent the spread of fire from one rack to another.
(2) Early intervention reduces the reliance on active fire suppression or fire department intervention.
(3) Aspirated smoke detectors monitor all fire stages from incipient to fully developed, providing multiple alarms for staged response. Later stages assure prompt evacuation for life safety of building occupants.
(4) An aspirated smoke detection system can be designed to reliably detect diluted smoke due to its very sensitive sensing chamber and cumulative sampling (e.g., smoke drawn through multiple sampling holes).
(5) The system can be designed to accommodate temperature and humidity extremes.

(6) The aspirated smoke detection system can monitor HVAC outside air intakes and adjust smoke readings to avoid nuisance alarms from outside sources. This feature is particularly important for high sensitivity levels.
(7) Where a gaseous or sprinkler fire suppression system forms part of the overall fire protection solution, the system can be designed to actuate the release mechanisms flexibly with various systems, from noninterlocked to double-interlocked systems, by different detection schemes, including coincidence detection.
(8) Aspirated smoke detectors can be mounted in easily accessible areas. This allows for easy and safe system maintenance when sampling in awkward locations such as inside cabinets, above cable trays, under raised floors, in ceiling voids, and in underground cable tunnels/vaults; and will not disrupt operations or cause a security breach of secure areas.

G.7.3.7.1 Localized Protection (Cabinets).

Partially enclosed cabinets containing electrical equipment or batteries are usually ventilated vertically (i.e., bottom to top) or horizontally (i.e., front to back) or could be fully enclosed with active internal cooling. The following are two methods for protecting cabinets with aspirated smoke detectors:

(1) *Microbore system*: This type of detector is ideally suited for localized cabinet detection where a fire event can be readily identified and traced to an individual cabinet. Sampling locations should be directly in the airflow distribution path where the air exhausts for passively cooled or low-speed active bottom-to-top cooling cabinet configurations, or at a point where air recirculates within fully sealed cabinets with internal cooling. Where a single aspirating unit is used to provide detection across multiple rooms or enclosures, the pressure differential should be within the limits of the system being designed to avoid faults.
(2) *Large bore (traditional) systems*: For ventilated or fully sealed cabinets with internal cooling, a large bore detector can be dedicated to an individual cabinet or row or bank of cabinets. For ventilated cabinets, sampling locations should be directly within the airflow distribution path at a point where the airflow exhausts. For fully enclosed cabinets, sampling locations should be at the top of the cabinet, or at a point where air recirculates for sealed cabinets with internal cooling.

A capillary tube or down pipe with vented end cap is inserted in the top of the cabinet. A detector can be used to protect a single row of cabinets or multiple rows or banks of cabinets. This arrangement is suitable only for sealed cabinets or cabinets with minimal ventilation.

For vertically ventilated cabinets (i.e., bottom to top) the sampling pipe is placed close to the exhaust vent(s) of the cabinets with sampling holes directly in the path of the main airflow to optimize the detection. This arrangement allows a fire event to be traced to a particular row or bank of cabinets.

For horizontally ventilated cabinets (i.e., front to back) the sampling pipe is placed close to the exhaust side of the cabinets with sampling holes directly in the path of the exhaust air to optimize the detection. This arrangement allows a fire event to be traced to a particular row or bank of cabinets. For this configuration, the sampling holes coverage area should not exceed 2 ft^2 (0.2 m^2).

G.7.3.7.2 High-Risk Equipment Protection.

Certain equipment in ESS facilities are designated high-risk. The consequences of a fire event within such equipment could create or exacerbate other hazards. Examples of these types of equipment include the following:

(1) Those that are likely to promote a fast developing fire.
(2) Those that will generate corrosive and toxic gas species.
(3) Those whose unnecessary shutdown would result in substantial network service losses.
(4) System losses that could create conditions for battery failure such as HVAC or BMS system loss.

Sampling location considerations are often similar to those for cabinet protection and include the following:

(1) Sampling should be conducted within or around high-risk equipment for the earliest possible detection of smoke.
(2) Where appropriate and within the system design capacity, capillary tubes branched from the main sampling pipe can be used to penetrate equipment or equipment cabinets. Normally, dedicated systems should be used unless in small rooms.
(3) All sampling pipes should be airtight, firmly secured, and held clear of equipment, especially moving parts, to avoid physical damage to the pipe network or the equipment.

G.7.3.8 Video Detection.

Video detection imaging can be applicable to detection of LIB failure. With proper placement of the detectors, it is possible to detect flame or smoke that is associated with battery failure. It requires a line of sight and might not function in a small container or cabinet.

Video detection can provide the added benefit of visual images. Images can be captured internally or externally to the BESS. First responders can use the images to assess the internal condition of the ESS. Video imaging requires visual light and will not function in a dark container or at nighttime.

The principle of using automatic analysis of real-time video images is for very early smoke or visible gas detection.

G.7.3.8.1 Video Image Smoke Detection (VISD).

G.7.3.8.1.1

VISD is a software-based method of smoke detection that has become practical use with the advancement of digital video cameras and increasingly powerful computer processors. VISD systems use sophisticated algorithms, developed through artificial intelligence, to analyze images for smoke through changes in features such as brightness, contrast, edge content, loss of detail, and motion.

The detection equipment can consist of cameras producing video signals and a processing unit(s) that maintain the software—either embedded on the camera or separate computer—and interface with the fire alarm control unit through relay dry contacts.

VISD can be useful for detecting smoke and/or flame. VISD can monitor, in most cases, floor to ceiling so it is effective in high-ceiling applications.

G.7.3.8.1.2

Installation cameras are typically mounted with a view above racks, and as much of the sides and top of the battery as possible, so that the smoke or products of off-gassing can be seen and tracked from their lowest point, or inception. Some VISD systems use alarm zones, or virtual areas within the camera field of view, targeting specific areas for alarm while avoiding false alarms from movement in the space.

VISD is used solely for indoor applications as natural lighting changes and darkness can prohibit effective detection.

VISD measures light movement across pixels to detect and track smoke or visible gasses. Care should be given to comply with the manufacturer's recommendations for minimum light levels.

Care should be given when applying the technology in rooms with high airflow or air changes that would break up or remove the smoke before it can be detected.

Where applying VISD in test cells, a means to disable alarm outputs (such as a maintenance lock-out) during work by personnel in the cell is recommended to avoid false alarms so that highest sensitivity settings can be used.

Where listed/approved VISD systems are required, they should be designed, installed, and maintained in accordance with the requirements of *NFPA 72*.

G.7.4 Battery Management System Safety Functions.

The battery management system should be equipped with the following safety functions at a minimum:

(1) *High cell temperature trip (cell level)*: This function isolates the module or battery rack when detecting cell temperatures that exceed limits. A common design is to have modules hard-wired in series within a rack. Therefore, the smallest unit that can be isolated is generally the rack. Where a design accommodates it, isolating a module is acceptable.

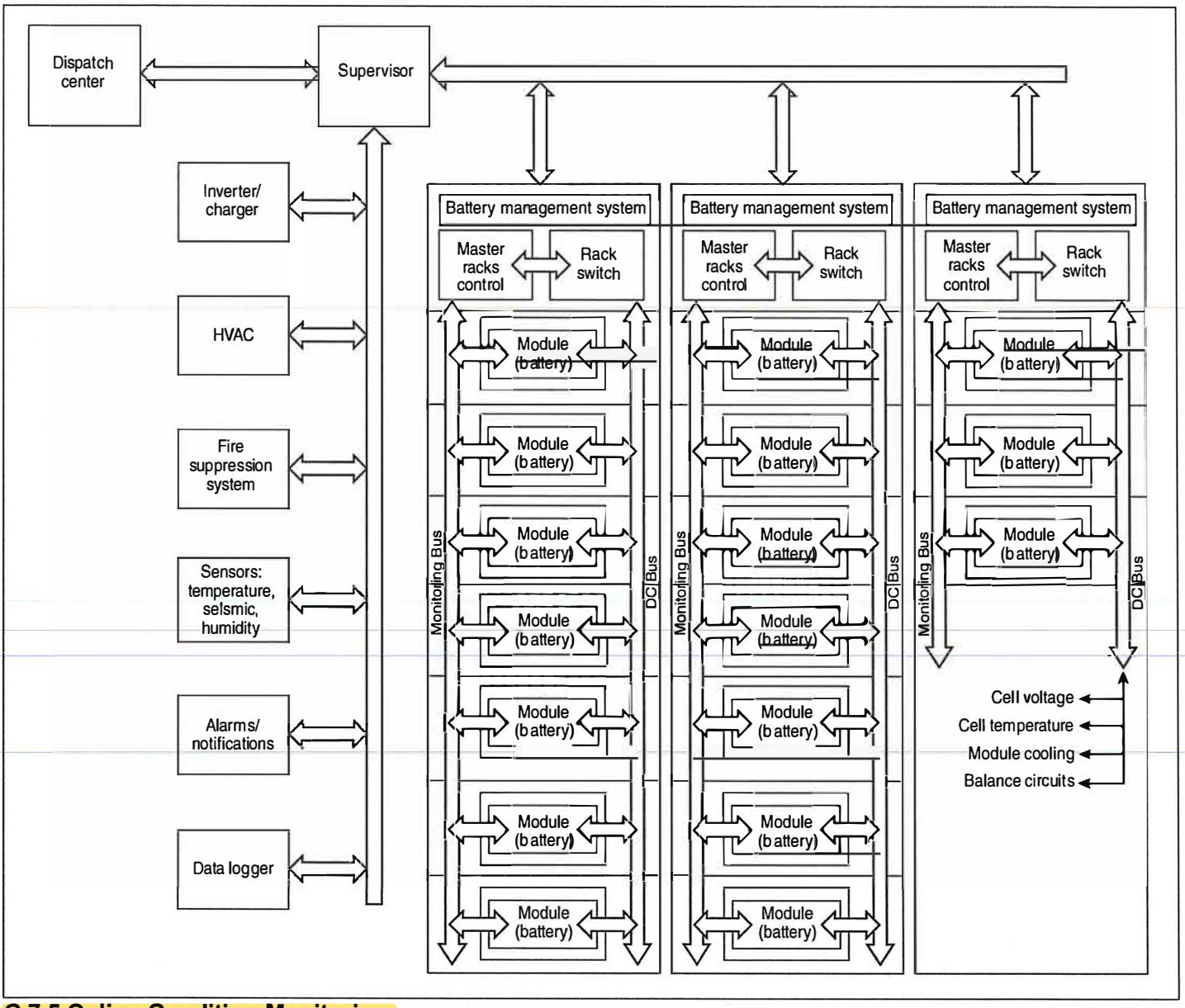
(2) *Thermal runaway trip (cell level)*: This function trips the entire system when a cell is detected to have entered a thermal runaway condition. In scenarios involving a thermal runaway, this function is the first to activate when thermal runaway conditions are detected.

(3) *Rack switch fail-to-trip (rack level)*: This function identifies any failure from the pack switch to trip once a trip command is initiated. The rack switch is also known as the "pack switch." It is a switch that disconnects a single rack in response to an abnormal condition. The rack switch is shown separately from the "master" level in Figure G.7.4 for clarity. It is generally incorporated into the BMS.

(4) *Inverter/charger fail-to-trip (supervisor level)*: This function initiates a trip command to an upstream breaker to isolate the ESS if the inverter/charger fails to respond to a trip command. The "supervisor" control system controls the entire system, including the combination of racks, the environmental support systems, and the charging/discharging status. The supervisor level should isolate the ESS if the inverter/charger fails to trip on an appropriate signal, or if communication is disrupted between the inverter/charger and the supervisor control.

See Figure G.7.4 for an explanation of management levels.

Figure G.7.4 Management Levels.



G.7.5 Online Condition Monitoring.

G.7.5.1

An online condition monitoring system should be provided that will monitor battery room temperature and the following parameters, at a minimum, at the battery module or cell level:

(1) Charging and discharging voltage and current
(2) Temperature
(3) Internal ohmic (resistance)
(4) Capacity
(5) State of charge (SOC)
(6) State of health (SOH)
(7) Alarm or fault log

G.7.5.2

The online condition monitoring system should include the following features:

(1) The ability to transmit data to a constantly attended location or specific operations personnel
(2) The ability to generate alarms when unusual conditions are detected
(3) The ability to analyze monitored parameters and generate a summary of the condition of the battery
(4) Security to prevent unauthorized changes of critical parameter limits, such as voltage, temperature, and current, which are essential to maintain reliable LIB operation

(5) Self-diagnostic capability

G.7.6 Electrical Disconnects.

G.7.6.1

A disconnect device for maintenance needs or abnormal events should be provided for each rack.

G.7.6.2

A method of manual, remote, and local disconnect for the ESS should be provided. A remote disconnect should be in an accessible area that is monitored 24/7. A local disconnect should be provided adjacent to the ESS space.

G.7.6.3

Temperature monitoring with high alarm for ESS room, building, or enclosure should be provided. Alarms should be routed to a continuously attended location or specific operations personnel.

G.7.7 ESS Rack.

G.7.7.1 Ground-Fault Protection.

Dc ground-fault protection for grounded battery systems should be provided. For ungrounded battery systems, dc ground-fault monitoring with an alarming function should be provided. The alarm should be routed to a constantly attended location or specific operations personnel.

G.7.7.2 Overcurrent Protection.

Overcurrent protection against overload and short-circuit faults should be provided.

G.7.7.3 Voltage Protection.

Over- and undervoltage protection against overcharging and over-discharging should be provided.

G.8 Flammable Gas, Deflagration Hazard Studies, and Use of NFPA 68 and NFPA 69 for Lithium-Ion Batteries. (Reserved)

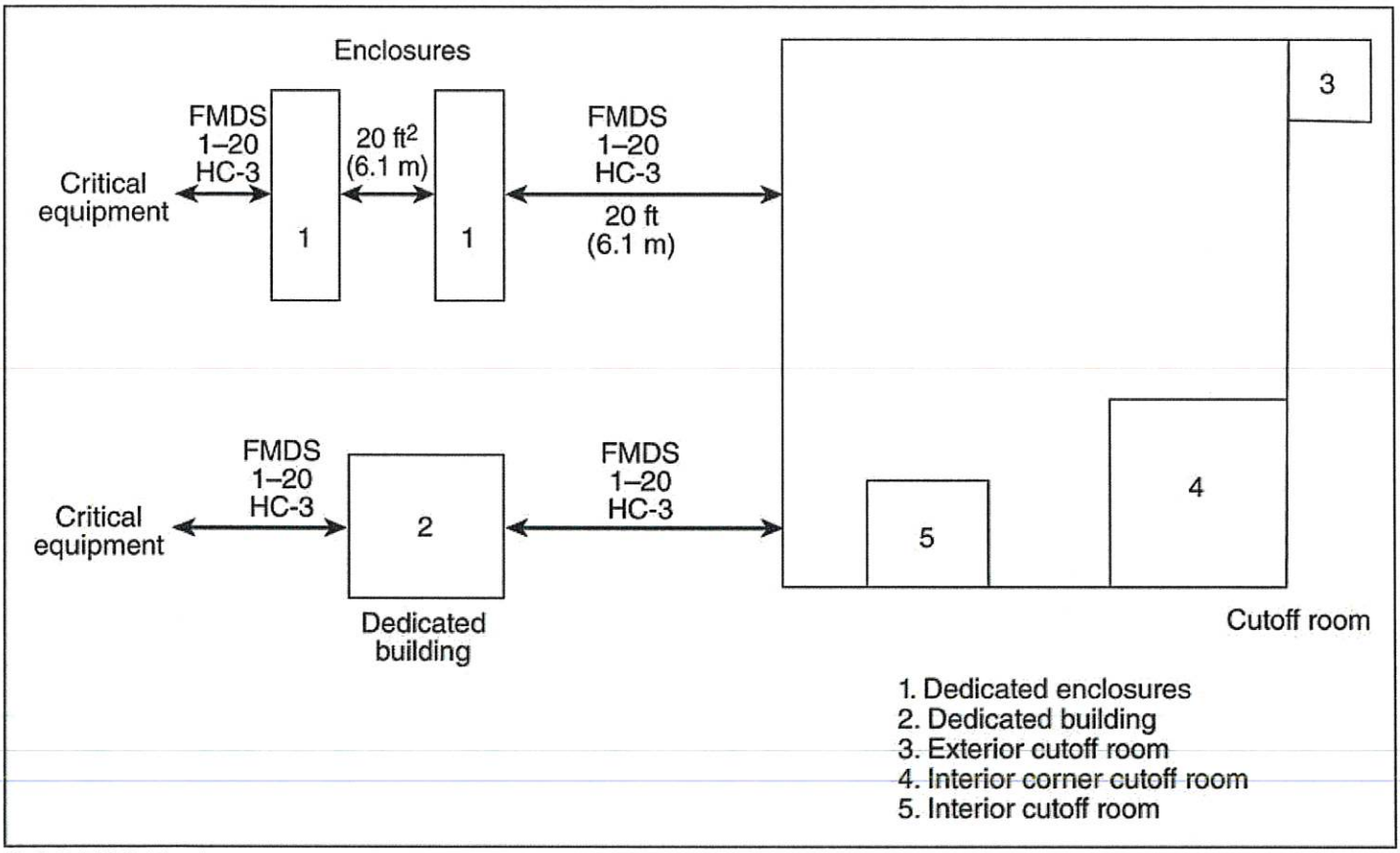
G.9 LIB Construction and Installation Guidance.

G.9.1 General Location and Construction.

The ESS room, building, walk-in unit, enclosure, container or cabinet, or otherwise nonoccupiable enclosure should be located as following, listed in order of preference:

(1) In an enclosure outside and away from critical buildings or equipment in accordance with Section G.9.2 (see Figure G.9.1, location 1)
(2) In a dedicated building containing only ESS and associated support equipment in accordance with Section G.9.3 (see Figure G.9.1, location 2)
(3) In a dedicated exterior cutoff room that is accessible for manual firefighting operations and is constructed in accordance with Section G.9.4 (see Figure G.9.1, location 3)
(4) In a dedicated interior corner cutoff room that is accessible for manual firefighting and is constructed in accordance with Section G.9.4 (see Figure G.9.1, location 4)
(5) In a dedicated interior cutoff room that is accessible for manual firefighting and is constructed in accordance with Section G.9.4 (see Figure G.9.1, location 5)

Figure G.9.1 ESS Location by Preference



G.9.2 ESS Enclosures.

G.9.2.1

Minimum space separation should be provided between ESS enclosures and adjacent buildings or critical site utilities or equipment at a distance that minimizes the exposure to the building from fire or explosion hazards.

G.9.2.2

Minimum space separation of 20 ft (6 m) should be provided between adjacent ESS enclosures with noncombustible walls.

G.9.2.2.1

If the walls are combustible, separation distance should be extended to minimize exposure from one enclosure to another.

G.9.2.2.2

If the space separation between ESS enclosures is less than 20 ft (6 m), a thermal barrier, rated at a minimum of 1 hour, should be provided on the inside or outside of the enclosure.

G.9.2.3

Where enclosure vents or other penetrations are provided, they should be directed away from surrounding equipment and buildings. In a fire, these enclosures might have vents or penetrations that could allow hot gas and products of combustion to escape the enclosure, causing an exposure to adjacent equipment or buildings. Penetrations could include electrical cabling, doors, HVAC units, and so on.

G.9.3 Dedicated ESS Building or Enclosure Larger Than 500 ft^2 (46.5 m^2).

A prefabricated container or enclosure that is larger than 500 ft^2 (46.5 m^2) should be treated as a building.

G.9.3.1

A dedicated ESS building should be constructed of noncombustible materials.

G.9.3.2

A minimum space separation between dedicated ESS buildings and other facility buildings or critical site utilities or equipment should be provided to minimize the potential for fire spread to an adjacent building or piece of equipment.

G.9.3.3 Damage-Limiting Construction (DLC).

G.9.3.3.1
DLC should be provided to prevent building collapse in the event of an explosion involving the off-gas products from ESS failure.

G.9.3.3.2
DLC should be provided to prevent collapse of any shared walls with the main building.

G.9.3.4 Mechanical Ventilation.

G.9.3.4.1
The ventilation system should be designed to take suction at or near the ceiling because most constituent gases released as a result of thermal runaway are lighter than air. Therefore, upward flow of ventilation air provides the best opportunity for timely detection of flammable gases.

G.9.3.4.2
A combustible gas detector that will alarm at the presence of flammable gas, shut down the ESS, and cause the switchover to full exhaust of the ventilation system should be installed in the suction duct or at the ceiling. Since the only reason for the presence of flammable gas is thermal runaway, a simple yes/no detector is sufficient.

G.9.3.4.3
Combustible gas detection in the ventilation system is not needed where combustible gas detection arranged for rack shutdown is provided in each ESS rack as part of the battery management system.

G.9.3.4.4
Exhaust air should be removed through a system of blowers, fans, and ductwork terminating outdoors away from air inlets, doorways, and other openings.

G.9.3.4.5
Ductwork should be constructed of noncombustible materials.

G.9.3.4.6
Make-up air inlets should be provided in exterior walls, in a remote location from exhaust outlets to prevent entrainment of exhaust gases.

G.9.3.4.7
Ventilation systems should be arranged to recirculate air into the room with an approved or listed combustible gas detector arranged to stop recirculation and return to full exhaust when flammable gas is detected in the ductwork.

G.9.3.4.8
The ventilation system controls should be arranged to alarm to a constantly attended location or specific operations personnel.. Modern communications technology allows for specific personnel to be notified via text message or other automated messaging. Where such a system is used, it should be tested monthly to ensure communication is available. Users should also consider alerting multiple personnel to account for vacations, out-of-range travels, and so on.

G.9.3.4.9
HVAC systems should be designed to maintain temperatures within operating limits in the event of a single component failure.

G.9.3.4.10
The HVAC system should be arranged to alarm to a constantly attended location or specific operations personnel if any part of the system fails.

G.9.4 ESS Cutoff Rooms.
A minimum 2-hour fire-rated room, floors, walls, and ceiling should be provided in accordance with 4.3.6 of NFPA 855. The following should also be provided:

(1) Listed or approved fire doors with the same room rating
(2) Listed or approved fire barriers for all floor, ceiling, and wall penetrations

G.10 Guidance on Inspection and Maintenance for Installed LIB Fire Protection Systems.

G.10.1 General.

G.10.1.1

This section covers the inspection and maintenance procedures necessary for proper function and operation of fire safety and suppression systems for lithium-ion BESS facilities.

G.10.1.2

Upon installation, all fire protection systems should be inspected before operation and tested in accordance with applicable NFPA standards. Where appropriate standards do not exist, inspection and test procedures outlined in the purchase and design specifications should be followed.

G.10.1.3

Plant lockout/tagout procedures should be strictly followed.

G.10.1.4

Regular inspection and maintenance of systems should be maintained to ensure proper functioning of the system. The suitable time intervals depend mainly on the consistency of the systems in the facility.

G.10.1.5

Inspections should be conducted prior to facility energization and time intervals for all inspection and maintenance should be determined in that process. Future maintenance intervals, which are necessary to provide safe operation, should be determined and documented accordingly within facility/process operating instructions. Inspection and maintenance procedures should include a list of required personal protective equipment (PPE).

G.10.1.6

All personnel conducting inspections, maintenance, and testing should be trained on the specific hazards and equipment of the facility.

G.10.2 Testing, Inspection, and Maintenance.

G.10.2.1

All fire protection systems and equipment should be periodically inspected, tested, and maintained in accordance with applicable national fire codes. (See Table G.10.2.1 for guidance.)

Table G.10.2.1 Reference Guide for Fire Equipment Inspection, Testing, and Maintenance

Item	NFPA Document No.
Supervisory and fire alarm circuits	72
Fire detectors	72
Manual fire alarms	72
Sprinkler water flow alarms	25/72
Sprinkler and water spray systems	25/72
Halogenated agent, chemical, and CO_2 systems	12/12A/17/2001
Fire pumps and booster pumps	25/72
Water tanks and alarms	25/72
PIV.s and OS&Y valves	25/72
Fire hydrants and associated valves	13/24
Fire hose and standpipes and hose nozzles	1962/25
Portable fire extinguishers	10
Fire doors and dampers	80/90A
Smoke vents	204
Emergency lighting	110
Radio communication equipment	1221

Item	NFPA Document No.
Audible and visual signals	72
Water mist fire protection systems	750

G.10.2.2

Testing, inspection, and maintenance should be documented with written procedures, results, and follow-up corrective actions recorded and tracked for closure.

G.10.2.3

A reduction of the state of charge (SOC) to 30 percent should be confirmed prior to performing testing or maintenance procedures.

G.10.2.4

If maintenance is performed on a damaged battery, the damaged battery should be closely monitored until personnel can remove the battery or confirm that no stranded energy remains.

G.10.3 Lockout/Tagout.

G.10.3.1

Lockout/tagout (LOTO) procedures in 29 CFR 1910.147 and 29 CFR 1910.269(d), or the local country equivalents, should be followed prior to entering or performing maintenance on BESS and associated protection systems.

G.10.3.2

Review the facility LOTO plan and ensure that all employees are trained to the degree necessary to execute their responsibilities as related to the procedure.

G.10.3.3

Prior to beginning any LOTO procedures, personnel should be made aware that equipment lockout/tagout is going to be taking place. Affected employees should be informed that power will be turned off, the reason it will be off, and not to operate equipment. Responsible or qualified employees should be informed of all energy sources and locations, including stored energy.

G.10.3.4

Following the application of the lockout or tagout devices to the energy isolating devices, qualified personnel should verify that stored or stranded energy in the equipment is safely disconnected and managed (see NFPA *70E*).

G.10.3.5

Verification that equipment is isolated from the energy source can be achieved by means of attempting to operate or testing for the absence of voltage.

G.10.3.6

Facility procedures for grounding should be followed as applicable to the work being performed. Any conductive battery racks, cases, or trays must be connected to an equipment grounding conductor.

G.10.3.7

LOTO procedures should remain in place until work is complete. If the work requires more than one work period, energy source, location, or involves another individual crew, then a complex LOTO procedure should be followed.

G.10.4 Impairments.

A written procedure should be established to address impairments to fire protection systems and other plant systems that impact the level of fire hazard (e.g., gas detection systems, HVAC systems, BMS systems). As a minimum, this procedure should address the following:

(1) Identify equipment not available for service
(2) Identify personnel to be notified (e.g., public fire department, facility fire protection coordinator, control room operator)
(3) Increase fire surveillance as needed
(4) Provide additional protected measures as necessary (e.g., temporary water supplies, additional hose)

G.10.5 Decommissioning.

G.10.5.1

For new projects, prior to facility startup a battery decommissioning plan should be developed. Projects that are already commissioned should develop this plan as soon as possible. The decommissioning plan should be developed with battery manufacturer guidance and should be approved by the authority having jurisdiction (AHJ). The decommissioning plan should include, but not be limited to, the following:

(1) Process and procedure of battery removal
(2) Reporting procedures
(3) Disposal plan
(4) Local and federal environmental regulations for battery disposal
(5) Safety data sheets
(6) Contact list of responsible parties involved in the execution of the plan

G.10.5.2

The decommissioning plan should include the following:

(1) Anticipated life of the BESS
(2) Estimated decommissioning costs
(3) How said estimate was determined
(4) Method of ensuring funds for decommissioning and restoration
(5) Method by which the decommissioning cost will be kept current
(6) Manner in which the BESS will be decommissioned and the site restored

G.10.6 Record Keeping.

G.10.6.1

A record should be maintained that indicates the date and the results of each inspection and the date and description of each maintenance activity.

G.10.6.2

System inspection reports should be retained on site for at least 3 years. The report should include test and calibration data on all system components.

G.10.6.3

The records of inspections should be retained by the owner/operator for the life of the protected process.

G.10.7 Safety Training.

G.10.7.1

Operating and maintenance procedures and emergency plans should be developed. The plans and procedures should be revalidated regularly and as required by management of change procedures.

G.10.7.2

Initial and refresher training should be provided to personnel who operate, maintain, supervise, or are exposed to equipment and processes protected by explosion protection systems. Training should include the following:

(1) Hazards of their respective workplaces
(2) General orientation, including plant safety rules
(3) Process description
(4) Equipment operation, safe startup, shutdown, and response to upset conditions
(5) The necessity for proper functioning of related fire and explosion protection systems
(6) Maintenance requirements and practices
(7) Explosion protection system procedures
(8) Process lockout/tagout procedures
(9) Housekeeping requirements
(10) Emergency response and egress plans
(11) Management of change procedures
(12) System impairment reporting procedures

G.10.7.3 Inspection/Audit Checklists.

Figure G.10.7.3 shows an example of an inspection/audit checklist.

Figure G.10.7.3 Inspection/Audit Checklist.

SAMPLE INSPECTION/AUDIT CHECKLIST

GENERAL

	Exact match of component product number and rating with plan.
	All equipment bears the appropriate listing mark or identifying mark of an organization that is acceptable to the authority having jurisdiction where such marking is required as part of the listing.
	BESS includes a manual containing system description, operating and safety instructions, maintenance requirements, and safe battery-handling requirements/recommendations.
	The personnel door(s) for entrance to and egress from rooms designed as BESS rooms open in the direction of egress and are equipped with listed panic hardware, [See 480.10(E) of *NFPA 70*]
	Sufficient clearances for batteries and working spaces have been provided and measured from the edge of the battery cabinet, racks, or trays. (NEC 480.10(C), 110.26)
	Spaces about the ESS comply with 110.26 of *NFPA 70*. Working space is measured from the edge of the ESS modules, battery cabinets, racks, or trays. (NEC 706.10(C)) • For battery racks, there shall be a minimum clearance of 1 in. between a cell container and any wall or structure on the side not requiring access for maintenance. • ESS modules, battery cabinets, racks, or trays shall be permitted to contact adjacent walls or structures, provided that the battery shelf has a free air space for not less than 90% of its length. • Pre-engineered and self-contained ESSs shall be permitted to have working space between components within the system in accordance with the manufacturer's recommendations and listing of the system.
	Flexible battery dc conductors are listed as hard service use or moisture resistant, or both. (NEC, 480.12)
	Fine stranded flexible cables (if used) terminate in accordance with 110.14 of *NFPA 70*. (NEC 110.14, 480.12)
	Ungrounded conductors are not marked using white, gray, or white-striped conductors to avoid confusion with grounded conductor markings. (NEC 200.7)
	Battery dc conductors are properly guarded from accidental contact. (NEC 503.155(B))
	Electrochemically dissimilar metals are not in direct physical contact. (NEC 110.14)
	The temperature, humidity, and other environmental conditions where the ESS is located allow for maintenance of the ESS in accordance with the listing and the manufacturer's specifications. (IFC 2018 1206.2.10.3)
	All connections are secure. (NEC 110.14, 480.4)
	All metallic raceways and equipment are bonded and electrically continuous. (NEC 110.3(B), 250.8)
	Unused opening are closed with protection equivalent to the wall of enclosure. (NEC 110.3(B), 408.7)
	The selected wiring methods are appropriate for the location and installed in accordance with their intended use. (NEC 310, 706)
	All live parts of batteries are guarded regardless of voltage or battery type. (NEC 110.27(B))
	Batteries' live parts are guarded in accordance with 110.27 and 480.10(B) of *NFPA 70(NEC)*
	Verify that the attachment of the battery storage unit to the wall or floor is per the approved plans. If the wall or floor construction differs from the approved plans, a revision to the approved plan is required prior to inspection.

EQUIPMENT

Grounding

	All conductive battery racks, cases, or trays are connected to an equipment grounding conductor. (NEC 250.110)
	Equipment grounding conductors are properly identified as either bare, green, or green with continuous yellow stripe(s). (NEC 250.119)
	If there is no existing ac grounding electrode, there are two ground rods installed 6 ft (1.8 m) apart at the main electrical service. If there is only one ground rod, a second one must be installed. (NEC 250, 706)

Main Electric Service

	Circuit breakers are of the same manufacturer as the main service panel. (NEC 110.3)

Ventilation

	There is adequate ventilation for batteries. (NEC 480.10, 706.20(A))
	Batteries/enclosures contain ventilation equipment to prevent excessive accumulation of gas pressure or gas ignition. (NEC 706.20, 480.10)
	Rooms or spaces containing ESS are separated from other areas of the building by fire barriers with a minimum fire resistance rating of two hours and horizontal assemblies with a minimum fire resistance rating of two hours constructed in accordance with the *NYS Uniform Building Code*, and local laws and ordinances. (IFC 2018 1206.2.8.2) (NFPA 855 Section 4.3.6)

Connections and Terminations

	Measures have been taken to prevent corrosion of cell terminations.
	Electrical connections do not put mechanical strain on battery terminals. (NEC 480.4, 110.14(A))
	Overcurrent protection of ungrounded conductors have overcurrent protection device(s) located as close as practicable to the battery terminals in an unclassified location. (NEC 480.5, 706.15)
	Battery circuit and equipment are protected by overcurrent protective devices as close as practicable to the storage battery terminals in accordance with Article 240 of *NFPA 70*. (NEC 240.21(H), 705.30, 706.65(A))
	Unless the short-circuit currents from all sources do not exceed the ampacity of the conductors, storage battery inverters are protected by overcurrent protective devices from all other sources. (NEC 705.30)
	A listed current-limiting overcurrent protective device is installed adjacent to the ESS for each dc output circuit. (NEC 706.31(C))
	In an ac-coupled system, the plug-in-type circuit breaker connected to the output of the storage battery or multimode inverter is secured in accordance with 408.36(D) of *NFPA 70*. (NEC 408.36(D), 710.15(E))
	Storage battery, multimode, and utility-interactive inverter output circuit breakers that are marked "Line" and "Load" are not back-fed. (NEC 408.36(D), 110.3(B), 705.30(D))
	Single 120-volt inverter in ac-coupled systems do not supply back-up loads containing multiwire branch circuit or any 240-volt outlets. Such action can overload the common neutral in such a wiring method (NEC 710.15(C))

Monitoring and Charge Control

	Charge controllers are compatible with the battery or ESS manufacturer's electrical ratings and charging specifications. (IFC 2018, 1206.2.10.3)
	Charge controller is properly installed to prevent overcharging or damaging batteries. (NEC 690.72, 706.33)
	PV systems with diversion charge controllers used for regulating the charging of a battery have a second independent means to prevent battery overcharge. (NEC 690.72(B)(1))
	For systems with charge controllers that are not inverter-integrated, indicate if the charge controllers with direct photovoltaic source or output circuit inputs from the grounded photovoltaic array or arrays are provided with dc ground-fault protection. (NEC 690.41)
	Indicate if the charge controller ground-fault detection is capable of detecting a ground fault, provides an indication of the fault, interrupts the flow of fault current, and either isolates the faulted array section or disables the charge controller to cease the export of power. (NEC 690.41(B))
	Diversionary charge controllers with utility-interactive and multimode inverters have a second independent controller to prevent battery overcharge in the event the diversion loads are unavailable or the diversion charge controller fails. (NEC 706.33(B)(3)(b))

Disconnecting Means

	A dc disconnect is installed on the dc battery system. (NEC 480.7, 706.7)
	A dc disconnecting means is provided for all ungrounded conductors derived from a dc stationary battery system with a voltage over 60 volts dc. (NEC 706.15)
	A disconnecting means is provided for all ungrounded conductors derived from an ESS and is readily accessible and located within sight of the ESS. (NEC 706.30(C))
	Battery circuits subject to field servicing where currents can exceed 240 volts nominal between conductors or to ground have provisions to disconnect the series-connected strings into segments not exceeding 240 volts nominal for maintenance by qualified persons. Non-load-break bolted or plug-in disconnects are permitted. (NEC 706.15(E)(1))
	ESS exceeding 100 volts between conductors or to ground have a disconnecting means, accessible only to qualified persons, that disconnects ungrounded and grounded circuit conductor(s) in the electrical storage system for maintenance. This disconnecting means does not disconnect the grounded circuit conductor(s) for the remainder of any other electrical system. Anon-load-break-rated switch is permitted to be used as a disconnecting means. (NEC 706.30(C))
	Where battery energy storage system input and output terminals are more than 5 ft (1.5 m) from the connected equipment or where these terminals pass through a wall or partition comply with all of 706.7(E) of *NFPA 70*. (NEC 706.7(E))
	If the disconnecting means required by 706.7(E)(1) of *NFPA 70* is not in line of sight of the connected equipment, a second disconnecting means at the connected equipment has been provided. (NEC 706.7(E)(2))
	Where a disconnecting means located in accordance with 480.7(A) of NFPA 70 is provided with remote controls to activate the disconnecting means and the controls for the disconnecting means are not located within sight of the stationary battery system, the disconnecting means is lockable in the open position. (NEC 480.7(D))
	Verify that the utility ac disconnect is located within sight of and within 10 ft (3 m) of the main electrical service.
	The equipment grounding lug is as specified by the manufacturer. Verify that the lug matches the part number as specified on the inside of the door. Verify that the grounding lugs are located where specified by the manufacturer. (NEC 110.3(B))
	Remove any insulating finish, such as paint, under the equipment grounding lug prior to installation. (NEC 250.8, 250.12)
	Integrated disconnects follow the maximum height requirements for disconnects.

Interconnection

	The interconnection methods comply with 705.11, 705.12 of *NFPA 70* if connected to other energy sources.

Signage

	Signage complies with ANSI Z535 and includes the following information: (1) Labeled "Energy Storage Systems" with symbol of lightning bolt in a triangle (2) Type of technology associated with the ESS (3) Special hazards associated with the ESS (4) Type of suppression system installed near the ESS (5) Emergency contact information
	A permanent plaque or directory complying with 110.21B of *NFPA 70* that denotes the location of all electric power source disconnecting means on or in the premises is installed at each service equipment location and at the locations(s) of the system disconnect(s) for all electric power production sources capable of being interconnected. (NEC 706.11)
	Equipment containing overcurrent devices in circuits supplying power to a busbar or conductors supplied from multiple sources is marked to indicate the presence of all sources. (NEC 705.12(B)(3))
	PV system output circuit conductors are marked to indicate the polarity where connected to battery energy storage systems. (NEC 690.31)

Signage (continued)

	Dc system conductors of 6 AWG or smaller are identified for negative or positive polarity per 210.5(C)(2)(a) of *NFPA 70*.
	Where controls to activate the disconnecting means of a battery are not located within sight of a stationary battery system the location of the controls is field marked on the disconnecting means. (NEC 480.7(D))
	Where the battery energy storage device disconnecting means is not within sight of the PV system ac and dc disconnecting means, placards or directories are installed at the locations of all disconnecting means indicating the location of all disconnecting means. (NEC 705.10, 706.7(E)(5))
	Where the sum of inverter overcurrent device rating(s) and the rating of the overcurrent device protecting the busbar exceeds the ampacity of the busbar, and the sum of ratings for all overcurrent device ratings in the panelboard (both load and supply, but excluding the device protecting the busbar) does not exceed the busbar ampacity, the following label is applied to the distribution equipment (NEC 705.12(B)(2)(c)): **WARNING:** **THIS EQUIPMENT FED BY MULTIPLE SOURCES TOTAL RATING OF ALL OVERCURRENT DEVICES, EXCLUDING MAIN SUPPLY**
	Where a busbar is the point of connection for the inverter(s) and is rated to 120 percent in accordance with 705.12(2)(3)((b) of *NFPA 70*, a warning label with the following language is applied to the distribution equipment adjacent to the back-fed breaker from the inverter (NEC 705.12(B)(2)(b)): **WARNING:** **INVERTER OUTPUT CONNECTION: DO NOT RELOCATE THIS OVERCURRENT DEVICE**
	All battery and battery management equipment and associated switchgear are marked and labeled according to all applicable codes, including arc flash incident calculations for the safety of operation and maintenance personnel required by *NFPA 70* and OSHA.
	If a battery dc disconnecting means is not provided at the batteries, the disconnecting means are legibly marked in the field. The marking are of sufficient durability to withstand the environment involved and include the following (NEC 480.7(F)): (1) Nominal battery voltage (2) Maximum available short-circuit current derived from the stationary battery system (3) Date the calculation was performed for the value of list item (2)

G.11 Guidance on Developing a First Responder Plan for LIB-Based ESS Installations.

G.11.1 Overview.

This section contains information that firefighters and emergency responders should know to allow them to effectively respond to events involving lithium-ion energy storage systems (ESS).

G.11.2 Emergency Responder Pre-incident and Emergency Operation Planning.

G.11.2.1

Emergency planning and training for facility staff and emergency responders is covered in 4.3.1. To comply with the requirement, the owner should work with their local fire department to develop a pre-incident plan for responding to fires, explosions, and other emergency conditions associated with the lithium-ion ESS installation. The training required by 4.3.1 should ensure that the local fire department understands the procedures included in the facility emergency operations plan described in 4.3.2.1.1.

The pre-incident plan should address the following elements:

(1) Purpose with any limitation, the facility description, and all plan reviews and revisions
(2) Emergency management
(3) Fire suppression systems, including location and size of water supply
(4) Emergency manual shut down/electrical isolation switchgear locations
(5) Fire department access location
(6) Alarm panels
(7) Signage
(8) Chain of command and emergency phone numbers
(9) Ventilation, including discharge location
(10) Deflagration panel location, where provided
(11) Evacuation routes
(12) Fire incidents
(13) Medical emergency procedures
(14) Other incidents
(15) Other procedures as determined necessary by the local AHJ to provide for the safety of occupants and emergency responders

G.11.2.2

The following minimum LIB ESS system information should be included:

(1) Identification of technologies present, the potential hazards associated with the systems, and methods for responding to fires and incidents associated with the ESS.
(2) Procedures for safe shutdown, de-energizing, or isolation of equipment and systems under emergency conditions to reduce the risk of fire, electric shock, and personal injuries, and for safe start-up following cessation of emergency conditions. The location of all electrical disconnects in the building and understanding that electrical energy stored in ESS equipment cannot always be removed or isolated. Procedures for shutting down and de-energizing or isolating equipment to reduce the risk of fire, electric shock, and personal injury hazards.
(3) Maintenance records and system manual information
(4) Procedures for inspection and testing of associated alarms, interlocks, and controls.
(5) Procedures to be followed in response to notifications from the battery energy storage management system, where provided, that could signify potentially dangerous conditions, including shutting down equipment, summoning service and repair personnel, and providing agreed-upon notification to fire department personnel for potentially hazardous conditions in the event of a system failure.
(6) Emergency procedures to be followed in case of fire, explosion, release of liquids or vapors, damage to critical moving parts, or other potentially dangerous conditions. Procedures can include sounding the alarm, notifying the fire department, evacuating personnel, de-energizing equipment, and controlling and extinguishing the fire. Recognition that stranded electrical energy in fire-damaged storage batteries and other ESS has the potential for reignition after initial extinguishment.
(7) Response considerations similar to a safety data sheet (SDS) that address response safety concerns and extinguishment where an SDS is not required.
(8) Procedures for dealing with battery energy storage system equipment damaged in a fire or other emergency event, including maintaining contact information for personnel qualified to safely remove damaged battery energy storage system equipment from the facility.
(9) Procedures and schedules for conducting drills of these procedures.

G.11.3 Guidelines.

Battery ESS based on electrochemical technologies represent the majority of ESS being designed and installed. The safe operation of electrochemical ESS is critical—especially when installed inside occupied structures. The primary concerns of the fire service with this type of installation would include the implications of overheating via internal or external heat source, thermal runaway, potential deflagration event in enclosed spaces, and the effective operation of fire detection, suppression, and smoke exhaust systems. There are additional concerns to be considered where assessing firefighter responses to electrochemical ESS.

Handover procedures for potentially damaged systems should be developed for fire departments to ensure the timely response of qualified technical representatives to manage safety issues. These procedures would also cover issues such as the removal or recycling of damaged equipment. Another procedural component is the realization that damaged ESS system components could include significant stored or stranded energy with no known method for safe dissipation. Stored or stranded energy could be defined as energy that remains in a battery after the system has been shut down.

G.11.4 Suppression Systems.

Some ESS design validations have included pre-engineered inert or clean-agent fire suppression systems for fire protection. These system installations were often approved without validation based on fire and explosion testing in accordance with 9.1.5 by nationally recognized testing laboratories. Evidence-based data is needed to ensure ESS designers specify appropriate fire protection systems based on the material involved and physical design characteristics. Several early research papers from multiple organizations, including NFPA's Fire Protection Research Foundation, and third-party engineering groups have shown that fires involving lithium-ion cells must be cooled to terminate the thermal runaway process. Water is the agent of choice, yet system cabinet design could pose a significant barrier to the efficient application of water while simultaneously allowing the free movement of fire and combustion gases.

One of the more challenging types of incidents will be one where no signs of overheating are visible, and no information is available via integral displays. This places the responding firefighter in the challenging position of determining what is safe or not with very little information. Integrated energy management systems (EMS) are designed to monitor and manage critical safety parameters of the battery such as cell temperature, voltage, and available current. While this data might prove valuable to responders to best understand the current state of the battery, there is no standard for manufacturers to provide a user interface to access the state of these parameters or a method to interface with to monitored alarm systems within the building. Responders should attempt to gather any visible information prior to shutting down the system unless there is clear evidence of imminent danger. Additionally, the response of a qualified and trained individual in ESS should be made available to assist the firefighters in the event of damage to an installed system.

G.11.5 Overheated Batteries.

The process of charging/discharging results in heat dissipation from cells. An optimum overall system design should include cascading layers of hardware and software protection, including at the battery cell, module or pod, and rack levels. Should a fault occur and over-heating of a cell continues, damage could occur resulting in swelling, off-gassing, fire, or explosion. Proper response to an overheated battery is needed.

Fires in electrochemical ESS are often a result of a failure mode called *thermal runaway.* Thermal runaway can simply be defined as the process in which a battery creates heat within an individual cell but cannot dissipate that heat, resulting in dynamic temperature increase. Initial signs of thermal runaway might include pressure increase at the cell level, temperature increase, and off-gassing. As the process continues, additional signs might include vent gas ignition, exploding cells, projectile release, heat propagation, and flame propagation.

As the failure cascades, responders should also be prepared for toxic and potentially explosive gas release. Though fire and explosion testing in accordance with 9.5.3.2 to determine battery burn outcomes remains incomplete, including toxic gas release calculations, responders should treat them as highly dangerous ECE hazardous materials and use their full suite of PPE and breathing apparatus when responding.

Proper response to electrochemical ESS fires should include the following procedures and steps:

(1) System isolation and shutdown
(2) Hazard confinement and exposure protection
(3) Fire suppression
(4) Controlled ventilation

G.11.6 Suppressing Agent Choice Considerations.

Water is considered the preferred agent for suppressing lithium-ion battery fires. Water has superior cooling capacity, is plentiful (in many areas), and is easy to transport to the seat of the fire. While water might be the agent of choice, the module/cabinet configuration could make penetration of water difficult for cooling the area of origin but might still be effective for containment. Water spray has been deemed safe as an agent for use on high-voltage systems. The possibility of current leakage back to the nozzle, and ultimately the firefighter, is insignificant based on testing data published in the Fire Protection Research Foundation report: *Best Practices for Emergency Response to Incidents Involving Electric Vehicles Battery Hazards: A Report on Full-Scale Testing Results.* Firefighting foams are not considered effective for these chemistries because they lack the ability to cool sufficiently and can conduct electricity. There is also some evidence that foams might actually encourage thermal runaway progression by insulating the burning materials and exacerbating heat rise.

Firefighting dry-chemical powders can eliminate visible flame. However, they lack the ability to cool burning battery components. Quite often, even if visible flame is removed, the thermal runaway inside the battery will continue resulting in reignition. Carbon dioxide and inert gas suppressing agents will also eliminate visible flame but will likely not provide sufficient cooling to interrupt the thermal runaway process. ESS with clean-agent suppression systems installed have ventilation systems that are tied in with the fire detection

and control panel so that the HVAC shuts down and dampers close to ensure the agents have sufficient hold times at the proper concentration levels to be effective suppressants. In some fire suppression systems, the HVAC recirculates and does not shut down, which provides a means of dispersing the clean agents. Responders must ensure adequate hold time has occurred prior to accessing battery room/container. Manufacturer-recommended times should be made clear. These agents might also reduce flammability by suppressing oxygen levels, but data has identified that flammable gases will continue to be produced due to the continued heating and could create an environment ripe for flashover or backdraft when oxygen is reintroduced into the system.

However, there is anecdotal evidence that many suppressants could work to suppress burning batteries. Battery chemistry plays a significant role in suppressant choice, as some suppressants will perform well on a single chemistry while others might work well on a suite of battery chemistries. Additionally, some suppressants might be inappropriate for certain battery chemistries, and their release could create a more dangerous situation.

In addition, most suppressants only provide a limited application time/number of uses. The practicality of a single-use suppressant should be discouraged for installations where a cascade event involving time-delayed subsequent ignition could occur.

When choosing a suppression system, the following should be considered:

(1) Cooling effect
(2) Availability
(3) Portability
(4) Conductivity
(5) Available testing data
(6) Cascading protections

G.11.7 Fire Detection and Suppression.

G.11.7.1 Fire Detection.

Battery management systems are primarily designed to monitor temperatures and voltages of cells and modules. They can be designed to shut down the affected charging/discharging circuits in the event of out-of-parameter conditions but might not be able to determine whether a fire is actually occurring. Fire detection should be designed into the ESS installation.

G.11.7.2 Passive Fire Control.

Passive fire control features should be designed to meet the unique challenges of managing electrochemical ESS fires. Passive fire control features should be designed to limit the cascading effects of fire spread. This might include cell to cell (built into the module), module to module (built into the rack/or pack), rack to rack (built into the ESS room or container), or even protection from system-to-system propagation.

G.11.7.3 Suppression Tactics.

As previously mentioned, battery components are often housed in cabinets or other configurations that can serve to protect the components and thus limit the ability of fire stream penetration. Firefighters should never use piercing nozzles and long penetrating irons. It is recommended that firefighters use the reach of the water stream instead but should never be up close to these installations. Mechanically damaged cells or puncturing unburned or undamaged cells can result in the immediate ignition of those cells. In addition, internal shorting within the cabinets could create an electrocution risk. The use of salt water on a damaged system will cause more electrical leakage back to the water appliance. Only unadulterated fresh water should be used on ECE hazardous materials.

Movement of damaged cells might result in arcing or reignition if active material or cells remain in the modules. Modules should not be moved without consultation from qualified personnel. Firefighter should never attempt to "overhaul" a damaged ECE hazardous material.

Ventilation during suppression is critical. Research has shown that Li-ion batteries might continue to generate flammable gases during and after extinguishing. In addition, testing has shown that during sprinkler suppression, removal of combustion and flammable gases emitted from the battery significantly improves the effectiveness of the suppression. Ventilation of an enclosure does not remove the potential of explosion. Ventilation manual activation devices that can be used in enclosure to exhaust flammable and toxic gases from within the enclosure must be remote from the installation and marked for fire department use. This option of ventilation of an enclosure should be in consultation with the system SME. No ventilation should be attempted by the fire service until more information is gathered and the area around the installation is secured.

Testing has shown that electrical current leakage back through hose streams using unadulterated fresh water will not be a shock hazard when appropriate streams are used and distances maintained. Firefighters that use tower ladders (i.e., buckets) should be aware of explosion hazards and should not be in the explosion area when operating a water source from these types of apparatus. In cases where systems are destroyed and electric potential is shown to be minimal, close-range engagement with hoses for drowning modules can be performed to provide more direct cooling. During postfire operations, SCBA should continue to be worn by all persons near the damaged ESS, especially where systems are in confined or poorly ventilated spaces or have not been sufficiently cooled yet. There is a concern that the buildup of these gases can cause an explosion even after the fire has been put under control. Gases, and

CO in particular, should be monitored during this period, as dangerous buildups have been observed during postfire testing. If possible, batteries should be monitored for residual heat and temperature, as reignition is a possibility in cells that are not sufficiently cooled.

Care should be taken to secure the area where the batteries are located and ensure that the heat has been removed and that the batteries are not at risk of being electrically shorted or mechanically damaged. This should be done at the guidance of a qualified technician. At this point, the fire scene should be handed over to the owner, operator, or responsible party appointed by the site owner. Though trace amounts of heavy metals such as nickel and cobalt can be deposited from combustion of the batteries, these elements are not expected to be present in large quantities or in quantities larger than any other similar fire. In most instances, water exposed to the batteries shows very mild acidity, with an approximate pH of 6. Runoff-water pH can be monitored during firefighting operations but should not pose a greater risk than normal firefighting runoff. In unique cases where a system on fire poses little or no risk to the surrounding uninvolved equipment or the environment, it is reasonable to assume a defensive posture and allow the system to burn itself out. Some typical steps for this approach include local municipal firefighters responding to the scene to make sure that the flames do not spread beyond the property perimeter, having ESS operations personnel arriving at the scene to review the situation and conditions, and then allowing the fire to burn out. This option should only be considered when no risks are posed to the environment and the risk to firefighting operations is great or unknown. It is up to the site owner/operator to communicate with fire services in the event of an emergency to relay vital system information to fire services.

G.11.7.4 Flooding and Seismic Influences.

Flooding can induce electrical damage to ESS that should be taken into consideration after water has receded. Battery systems in earthquake- prone zones should be seismically tested and certified for such abuse. Systems damaged in earthquakes might be prone to fire if cells have been mechanically damaged or power electronics are damaged and operating improperly, leading to electrical overcharge or other abuse conditions that can cause fire. In addition, if there is an extended power outage for several days, balance of system power might be out, and ventilation fans or automatic suppression systems might be inoperable, leading to more hazardous fire conditions.

G.11.7.5 Emergency Response to ESS Incidents.

Responses to ESS incidents should take into consideration the range of possible conditions and associated hazards as specified in Annex B. The response should include commonly accepted practices with any hazmat response, including isolating the area to all personnel, confirming location and type of alarm, performing air monitoring, managing ventilation/exhaust, and suppressing fires. Since this type of ECE hazardous material is in a category by itself, firefighters need to employ protective measure that are specific to the chemistry that they are responding to.

G.11.8 Site Access and Conditions First Responder Hazards.

G.11.8.1 Upon Arrival.

The following actions should be taken by first responders upon arrival at an ESS incident:

(1) Stage fire trucks upwind.
(2) Use binoculars to determine scene size-up.
(3) Attempt to isolate the enclosure that is damaged/on fire by confirming that the enclosure is no longer charging or discharging electrical energy.
(4) Work with the SME representative to determine when it is safe to enter the area. Do not enter the area until authorized to do so by the SME. Never assume that the fire is out based on a visual observation. The batteries themselves are the largest risk within the facilities. While firs can start in the inverters as well, the greatest risk for the site would be a battery fire that could lead to thermal runaway.
(5) Contact person or company responsible for operation and maintenance of the system.
(6) Continue temperature monitoring to ensure mitigation of overheating condition; never enter a facility until the SME representative is on-site.
(7) Isolate area of all nonessential personnel and keep the public away.
(8) Review status of both building and ESS alarm system with available data.
(9) Review status of any fire protection system activation.
(10) Perform air monitoring of all connected spaces.
(11) Never assume a fire is out—reignition is common.
(12) Use respiratory protection due to chemicals being produced during the fire—SCBA should be used at all times while in and around the hazard during firefighting efforts as well as during any overhaul and recovery required by fire department personnel.
(13) Determine if tankers or drop tanks are needed to supply enough water to fight the fire.
(14) Protect other buildings, if possible—water curtains can be set up to help protect surrounding exposures but could place personnel within the blast radius of the hazard.

G.11.8.2 Unique Challenges.

Energy storage systems present a unique challenge for firefighters. Unlike a typical electrical or gas utility, an ESS does not have a single point of disconnect. There are disconnects that will deenergize select parts of the system, but batteries will remain energized.

The following hazards might be encountered when fighting fires in ESSs:

(1) Shock or arcing hazard due to the presence of water during suppression activities
(2) Related electrical enclosures might not resist water intrusion from the high-pressure stream of a fire hose
(3) Batteries damaged in the fire might not resist water intrusion
(4) Damaged conductors might not resist water intrusion
(5) Shock hazard due to direct contact with energized components
(6) No means of complete electrical disconnect due to stranded energy

Due to these hazards, care and consideration should be applied when considering fire suppression by means of water inundation within ESSs. But because water as an extinguisher is commonplace, the appropriate use of water as an extinguishing medium should be assessed (i.e., whether water reacts with the chemistries present or whether it is an appropriate extinguisher class).

G.11.8.3 Potential Impact Radius.

Explosion modeling has shown that the minimum distance should be 75 ft (23 m). It is recommended increasing that to a minimum clearance of 100 ft (30.5 m).

G.11.8.4 Evacuate Area.

Recommend evacuating buildings within a 200 ft (61 m) diameter of the battery energy storage system (BESS).

There is potential for damage to glass in windows and structure depending on distance from the site. Each hazard will be different based on the state of charge at the time of the event.

G.11.8.5 Types of Hazards Once a Fire has Started.

Fire, explosions, toxic gases, chemical hazards, CO, CO_2, hydrocarbons (i.e., typically propane and methane, but this depends on the chemistry of the specific battery), and H_2.

G.11.8.6 Lithium-ion Battery Can Burn for Hours and Possible Days.

The burn time for Li-ion batteries depends on battery chemistry, size, and state of charge.

Cells that remain hot pose a risk of gas generation leading to explosion, as well as a delayed ignition risk, whereby heat in the cell can transfer to undamaged adjacent cells or remaining active material and reignite the fire.

G.11.8.7 Electrical Hazards.

G.11.8.7.1 Stored Energy.

Stored energy within the batteries can be an electrical hazard. When any battery fire is extinguished, there is still stranded energy within the unaffected cells that will need to be properly handled to reduce the risk of an additional fire hazard or electrical shock.

Some of the equipment (i.e., batteries) will remain energized no matter what actions are taken, and the recommended option is containment. Batteries remain energized even if all the contactors, breakers, and switches have been opened.

G.11.8.7.2 Ignition—Stranded Energy.

If the battery has reached the point of thermal runaway, suppression systems will only reduce the flammable risk. Once the suppression systems have released, if O_2 is introduced through remote venting or opening of access doors there is a risk of additional fire or explosion.

G.11.9 Example Format for an Emergency Response Plan.

Figure G.11.9 shows an example layout for formatting an emergency response plan.

Figure G.11.9 Example Format for an Emergency Response Plan.

EXAMPLE FORMAT FOR AN EMERGENCY RESPONSE PLAN

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1 INTRODUCTION.

1.1 Purpose.

The following emergency response procedures are provided so that all [SITE NAME] personnel understand the practices that are to be followed to be prepared for and to provide quick and effective response to emergencies that might arise at the facility. Because the safety of employees is of primary concern, the [SITE NAME] O&M manager and each member of the [SITE NAME] staff are committed to providing a safe, healthy work environment and are responsible for ensuring implementation of these procedures.

1.2 Limitations.

This plan does not imply, nor should it infer or guarantee a perfect response will be practical or possible. No plan can shield individuals from all events.

Responders will attempt to coordinate the plan and response according to standards.

Every reasonable effort will be made to respond to emergencies, events, or disasters; however, personnel and resources could be overwhelmed.

There might be little to no warning during specific events to implement operational procedures.

The success or failure of all emergency plans depends upon effective tactical execution. Successful implementation of this plan depends on timely identification of capabilities, available resources at the time of the incident, and a thorough information exchange between responding organizations and the facility or transporter.

Each agency, facility, and jurisdiction will respond within the limits of their training, capabilities, and qualifications.

1.3 Facility Description.

[SITE NAME] is located in [CITY/COUNTY] at [ADDRESS].
The site is composed of [very brief description of equipment].

Appendix 1 provides a map of the facility. Notification information for plant and external support organizations (e.g., police, fire department, medical facilities, and so on) that can be called to respond to emergency situations at [SITE NAME] is included in Tables 1 and 2. Support personnel are available on the plant site from [TIMES].
The site manager is available via cellular phone in case of an emergency.

1.4 Plan Review and Revision.

A review of this emergency response plan (ERP) shall be conducted and documented at minimum on an annual basis. The plan will also be reviewed and amended whenever there is a change in facility design, construction, operation, or maintenance that affects emergency response planning.

2 EMERGENCY RESPONSE MANAGEMENT.

2.1 Overall Organization.

Overall responsibility for the ERP lies with the [SITE NAME] O&M manager. The O&M manager or lead technician is responsible for program implementation, including designating evacuation routes and employee assembly points, coordinating severe weather activities, communicating emergency response procedures to site personnel, contracting with emergency response organizations, and contractor coordination.

2.2 Roles and Responsibilities.

Specific management personnel will assume leadership roles for emergency responses. The site manager or lead technician will assist in the implementation of this plan by knowing and communicating evacuation routes to workers during emergency evacuation and reporting the status of the evacuation to the fire department. The O&M manager is responsible for seeing that this plan is implemented and will appoint an adequate number of personnel to enforce the plan, assure everyone is familiar with this plan, and act as a liaison with the local fire department(s).

All facility personnel have a responsibility to immediately report emergency situations to the lead technician on duty, who then notifies the O&M manager and other key personnel of the situation using the [SITE NAME] emergency contacts list (see Appendix 3). Where a lead technician is not assigned, facility personnel will refer to the emergency contact list to inform key personnel.
Titles and roles are summarized in Appendix 2.

2.3 Preparation and Planning for Emergencies.

2.3.1 Preplanning.

Preplanning for emergencies is a crucial element of this plan. The following steps have been taken in planning for emergency situations at the site:

(1) All road exits have been established and posted in the [SITE NAME] O&M building.
(2) Evacuation route diagrams have been documented and posted in the [O&M Building].
(3) All buildings and property surrounded by fencing have been marked by signage that identifies specific hazards (e.g., the NFPA diamond, and all applicable danger, caution, warning signal words).

(4) Site personnel have received instruction to keep exits from the site or O&M building clear and to maintain ready access to fire extinguishers by not blocking them with furniture, or any other means.
(5) The site O&M manager and lead technicians have been trained in their specific duties. All building occupants have been instructed in actions to take in case of an emergency through their copies of procedures and training, as needed.
(6) A variety of emergency response drills (such as fire, tornado, bomb threat, and so on) have been held, at a minimum, on a quarterly basis, and have been documented. At least on an annual basis, the [locality] fire department and other emergency response personnel will be requested to participate and assist with critique of evacuation drills.

2.3.2 Emergency Routes.

A [SITE NAME] evacuation sheet must be posted and orally communicated to site personnel. These procedures shall be discussed at periodic safety meetings in addition to being covered during new employee orientation. Personnel are to know at least two exits whenever possible and be familiar with the evacuation routes posted in the O&M building.

Depending upon the degree of emergency, weather, or site conditions, roadways as designated on the site drawings (see Appendix 1) will be used for routes of evacuation. In the event of an evacuation, all personnel will meet at the designated muster point for further information. If personnel are unable to make it to the designated muster point, they should seek shelter wherever possible and contact their supervisor for further instructions.

2.3.3 Safety Data Sheets.

It is recommended to provide safety data sheets (SDS) to local first responders and stakeholders. In some cases, suppliers will provide material safety data sheets (MSDS) instead of SDS. They might be relevant, but it should be taken into account that MSDS sheets are meant for chemicals that the environment can be exposed to, which is not the case in most energy storage systems since they contain sealed components. Ventilation should not contaminate fresh air supplies to occupied spaces. Spill management should not contaminate freshwater drain pathways. Disposal of hazardous materials should comply with local and national rules and regulations. SDS and MSDS are generally available online.

2.4 Communications.

Timely and efficient communications are essential to deal with an emergency response situation. For that reason, the following requirements have been established at [SITE NAME].

Employees using radios/phones shall yield to individuals who are the most directly involved in an emergency response activity, (i.e., emergency response takes priority over all other communication on company network).

If radio/phone communications are interrupted or unclear, employees should proceed to the O&M building.

All hand-held radio/phones should be recharged daily with backup batteries ready for use.

Provisions shall be made for non-English-speaking workers on-site.

2.5 Operator Safety and Equipment.

2.5.1 General Recommendations for Operator Safety.

(1) Inspect equipment daily for unsafe conditions
(2) Keep hands away from exposed electrical connections
(3) Keep hands away from hot surfaces
(4) Observe all high-voltage warnings

2.5.2 Personal Protective Equipment.

The operation or maintenance of specific equipment can have different safety requirements. Always be aware of individual equipment operational requirements and hazards.
For example:
(1) Safety glasses with side shields (no dark glasses are permitted except those approved for welding or cutting)
(2) Face shields for cutting and grinding
(3) Approved safety toe shoes
(4) Approved hearing protection
(5) Hardhat
(6) Gloves
(7) Long-sleeve shirts
(8) Long pants

2.6 Safety Training.

Operator personnel should receive supplier- or manufacturer-approved training on the specific characteristics of the energy storage system. Applicable common standards (e.g., on electrical safety) should be taken into account.

A service manual that contains comprehensive information for carrying out maintenance activities should be provided for maintenance personnel. The service manual should provide energy-storage-specific safety instructions.

A local subject matter expert should be available in cases where substantial numbers of energy storage systems exist. This person should be readily available to first responders in the case of emergency situations. If this is not practical, a toll-free phone number should be available such that first responders can call at any time, and give operational data on the system, including its current state, and advise on how to proceed with the event.

All hazardous materials incident emergency responders and workers at hazardous materials facilities, transport companies, waste treatment facilities, storage facilities, and disposal facilities will be provided training that meets federal and state standards. Such training will be commensurate with their employer's or organization's plan and policies.

Initial and refresher training of the ERP to site personnel shall be conducted at least annually. Documentation of ERP training is to be maintained in site files.

3 EMERGENCY RESPONSE.

The phases of emergency response can be categorized as follows:

(1) Discovery
(2) Initial response/notification
(3) Sustained actions
(4) Termination and follow-up actions

3.1 Discovery.

Without entering an immediate hazard area, the employee who first discovers an emergency should identify the following:

(1) Is there a fire, spill, or explosion?
(2) Does medical assistance appear to be needed?
(3) Who/what is at risk: people, property, or the environment?
(4) Where does the released chemical appear to be migrating?
(5) What are the weather and terrain conditions?

The employee will also isolate the area to keep people away from the scene until trained responders arrive, as long as it is safe to do so. An employee who has not received training in emergency response should take no actions beyond notification, isolation of the area, and personal safety precautions. Any efforts made to rescue persons, protect property, or protect the environment must be weighed against the possibility of becoming part of the problem. Persons at the scene must not walk or touch spilled material or inhale fumes, smoke, and vapors.

3.2 Initial Response/Notification Procedures.

The initial response phase starts with notification, which activates the emergency response system. Anyone who observes or receives information regarding an emergency at [SITE NAME] should immediately notify available personnel using the [SITE NAME] radio network or their issued cell phones. The O&M manager or lead technician will then ensure 911 is notified. At [SITE NAME], employees are notified of emergencies by cell phone/radio and word of mouth from the O&M manager or lead technician. Appendix 2 provides a list of emergency contact information for [SITE NAME] personnel.

If an event has the potential to impact the local community, [SITE NAME] will contact local fire/police to make community notifications. The contact list in Appendix 2 also provides notification information for the company public affairs team who will provide guidance for instances involving media. The O&M manager or lead technician will coordinate any media efforts through the [SITE NAME] asset manager and company legal department. Trained responders are called to the scene by the O&M manager or lead technician to begin the process of hazard assessment, establish objectives and priorities, implement a tactical plan, and mobilize resources.

Trained responders can enter the area only when wearing appropriate protective gear. Only trained responders are authorized to risk exposure to chemicals for containing or stopping the material release

The O&M manager is the designated emergency coordinator at [SITE NAME]; he or she or a designee will be responsible for notifying the appropriate regulatory agencies and, if necessary, the emergency response contractor or mutual aid groups. Appendix 2 includes a list of offsite emergency contacts and agencies that can be notified in the event of an emergency. The incident will be documented and kept on file.

3.3 Sustained Actions.

3.3.1

In the absence of the O&M manager acting as emergency coordinator, the lead technician assumes the lead as the emergency coordinator. In the event both the O&M manager and lead technician are absent, their designee will assume the role of emergency coordinator. The emergency coordinator takes control of the emergency and any resources necessary until the emergency has been eliminated and the necessary cleanup or restoration are complete.

The emergency coordinator will direct the following activities during the evaluation process:

(1) Evaluate if operations in the affected area should be shut down
(2) Take precautions to prevent or limit the spread of fire or explosions
(3) Isolate affected area and provide direction for radio announcements
(4) Determine the source/cause of the emergency and evaluate the primary and secondary hazards to allow a full-scale, safe response

(5) Ensure that appropriate internal and external notifications are made
(6) Coordinate outside assistance from public or private organizations
(7) Implement other appropriate response provisions as necessary

Only employees that are properly trained in accordance with 29 CFR 1910.120(q)(6) can respond to chemical releases. No employee is required or permitted to place themselves in harm's way to facilitate extinguishment, evacuation, or rescue.

All rescue operations will be performed by trained professionals upon their arrival.

3.3.2 Evacuation Procedures.

When notified to evacuate, site personnel shall do so in a calm and orderly fashion, keeping the following instructions in mind:

(1) Walk, don't run—help others who need assistance
(2) Drive safely through smoke, if you must
(3) Watch for other traffic and farm equipment on access roads and roadways
(4) Be aware of ice/snow and loose gravel conditions, drive safely

Site personnel shall go to the primary designated assembly area which is the O&M building. If employees are unable to make it to the assembly area, they should contact their supervisor for further instructions.

During evacuation, the O&M manager or lead technician should ensure that every person on his/her crew has been notified and that evacuation routes are clear. Any person with a disability (e.g., mobility, hearing, sight, and so on) who requires assistance to evacuate is responsible for prearranging with someone in their immediate work area to assist them in the event of an emergency. Anyone knowing of a person with a disability or injury who was not able to evacuate will report this fact immediately to their supervisor.

Once an evacuation is complete, the O&M manager or lead technician should account for all personnel.

3.4 Post-Emergency Reporting Procedures.

Following any emergency described in this plan, and in compliance with facility permits and other county or state requirements, an incident report will be prepared by the O&M manager and transmitted to the appropriate individuals and agencies after review by the company regional manager.

The O&M manager shall compile all documentation and perform a post-accident investigation. Immediate performance of this activity will aid in determining the exact circumstances and cause of the incident.

Issues to be determined include the following:

(1) Causes of the incident
(2) Effectiveness of the ERP
(3) Need for amendments to the response plan
(4) Need for additional training programs

4 FIRE INCIDENTS.

All staff working at [Site Name] are to be trained and should know how to prevent and respond to a fire emergency. All on-site staff shall:

(1) Complete an on-site training program identifying the fire risks at [Site Name]
(2) Understand the protocol and follow emergency procedures should an event occur
(3) Review and report potential fire hazards to the O&M managers

No employee is required or permitted to place themselves in harm's way to facilitate extinguishment, evacuation, or rescue. All rescue operations will be performed by trained professionals upon their arrival.

4.1 Conditions Associated with Energy Storage Systems.

4.1.1 Unique Challenges.

Energy storage systems present a unique challenge for firefighters. Unlike a typical electrical or gas utility, an energy storage system does not have a single point of disconnect. Whereas there are disconnects that will deenergize select parts of the system, batteries will remain energized.

The following hazards might be encountered when fighting fires in energy storage systems:

(1) Shock or arcing hazard due to the presence of water during suppression activities
(2) Related electrical enclosures might not resist water intrusion from the high-pressure stream of a fire hose
(3) Batteries damaged in the fire might not resist water intrusion
(4) Damaged conductors might not resist water intrusion
(5) Shock hazard due to direct contact with energized components
(6) No means of complete electrical disconnect

4.1.2 Fire and Water.

Due to the hazards described in 4.1.1, care and consideration should be applied when considering fire suppression by means of water inundation within energy storage systems. But because water as an extinguisher is commonplace, the appropriate use of water as an extinguishing medium should be assessed (i.e., whether water reacts with the chemistries present or whether it is not an appropriate extinguisher class).

If unconventional fire extinguishers are required, local first responders should be alerted and trained on their use. The appropriate and most suitable extinguisher should be recommended based on the specific needs of the site. This might include water in some cases, and in all scenarios its use should not be discouraged.

If an energy storage system is enclosed, a means to connect water extinguishers to the exterior to activate interior sprinkler heads might be a requirement. First responders should be trained on this procedure.
This is only applicable if water is deemed as an appropriate extinguisher.

4.2 Response to a Fire Incident.

Each storage unit/container is equipped with fire detection and suppression systems. They are continuously monitored for smoke detection and are set up for alarm system notifications.

In the event of an incipient stage (i.e., beginning, small) fire, employees should notify adjacent individuals of this situation and exit the area. Only employees trained in the use of fire extinguishers should attempt to use an extinguisher. Employees are not expected or authorized to respond to fires beyond the incipient stage (i.e., fires that are beyond the beginning stage and which cannot be extinguished using a hand-held, portable fire extinguisher). If necessary, the fire department should be immediately notified by dialing 911.
Site management shall also be immediately notified of any emergency.

4.2.1 Fire External to Battery Container.

For fires external to the battery container:

(1) Make sure the immediate area of the fire is clear of personnel.
(2) Account for all employees, contractors, and visitors who were working in the area of the fire.
(3) Contact the O&M manager (if present) and emergency response coordinator (if not the O&M manager) immediately.
(4) Call 911 and report the following:
    a. Site name: [Site Name]
    b. The address of the main entrance: [ADDRESS] or nearest site access point
    c. Injuries, if any, and need for ambulance
(5) Remove any obstructions (e.g., vehicles, materials) that might impede response to the scene.
(6) Station available personnel at road intersections to stop traffic flow into the fire scene.
(7) Evacuate the energy storage system area immediately if the fire-warning alarm sounds or fire-warning lights illuminate.
(8) Proceed to the designated muster point for head count.
    (a) If onsite, the designated emergency response coordinator will do a head count and relay any information/instructions.
(9) If you encounter heavy smoke, stay low and breath through a handkerchief or other fabric; move away from the area.
(10) Assist anyone having trouble leaving the area.
(11) Attempt to extinguish the fire only if you have had the appropriate training and proper firefighting agent for the type of fire. Refer to the specific safety data sheet.
(12) Do not leave the designated muster point until advised to do so.
(13) The O&M manager will issue an 'all clear' only when the fire department informs them that it is safe to do so.
(14) The energy storage system is not to be accessed until the O&M manager or designated emergency response coordinator gives authorization.

4.2.2 Fire Internal to Battery Container.

For fires internal to the battery container:

(1) Make sure the immediate area of the fire is clear of personnel.
(2) Account for all employees, contractors, and visitors who were working in the area of the fire.
(3) Contact the O&M manager (if present) and emergency response coordinator (if not the O&M manager) immediately.
(4) Contact the operations center and manager (if present).
(5) Evacuate the area immediately if the fire-warning alarm sounds or fire-warning lights illuminate.
(6) Account for all employees, contractors, and visitors who were working in the area of the fire.
(7) Call 911 and report the following:
    a. Site name: [Site Name]
    b. The address of the main entrance: [ADDRESS] or nearest site access point
    c. Injuries, if any, and need for ambulance
(8) Remove any obstructions (e.g., vehicles, materials) that might impede response to the scene.
(9) Proceed to the designated muster point for head count.
    (a) If onsite, the designated emergency response coordinator will do a head count and relay any information/instructions.
(10) If you encounter heavy smoke, stay low and breath through a handkerchief or other fabric.
(11) Assist anyone having trouble leaving the area.

(12) The fire suppression system is designed to work in a contained environment. Do not open the doors until it has been determined that the agent has been fully released and a predetermined amount of time has passed to ensure no hazards are present.
(13) *Do not* put anyone in harm's way to save the battery equipment in the container.
(14) Once the fire department arrives, provide them with the following:
  (a) All applicable SDS documents
  (b) Assistance isolating equipment electrically
(15) Do not leave the designated muster point until advised to do so.
(16) The O&M manager will issue an 'all clear' only when the fire department informs them that it is safe to do so.
(17) The energy storage system is not to be accessed until the O&M manager or designated emergency response coordinator gives authorization.

In the event of a fire incident, the designated operations personnel responsible for the safe shutdown of the plant will open switchgear to ensure the grid side of the plant is deenergized and isolate the batteries as best able to (i.e., verify the AC and DC breakers are open in the inverter). The fire department needs to understand that some of the equipment (e.g., batteries) will remain energized no matter what actions are taken, and the recommended option is containment. Batteries remain energized even if all the contactors, breakers, and switches have been opened.

4.2.3 After a Fire.

Hazards after a fire should be identified at the time of installation such that recommendations for personal protective equipment (PPE) are available for clean-up crews and hazardous materials (HAZMAT) teams. This can include respirators to protect personnel from toxic gas that continues to be generated from hot cells. Firewater retention and cleanup measures might be required by local regulations.

In addition to the gas generation risk, cells that remain hot also pose a delayed ignition risk, whereby heat in the cell might transfer to undamaged adjacent cells or remaining active material and reignite the fire.

4.2.4 Inverter Fires.

In the event of an inverter fire at [SITE NAME]:

(1) Make sure the immediate area of the fire is clear of personnel.
(2) Account for all employees, contractors, and visitors who were working in the area of the fire.
(3) Remove any obstructions (e.g., vehicles, materials) that might impede response to the scene.
(4) Station available personnel at road intersections to stop traffic flow into the fire scene.
(5) Contact the operations center and site manager (if present) immediately.
(6) *Do not* attempt to extinguish fire near electrical equipment with water or other chemicals as an electric shock or arc could occur.
(7) Call 911 and report the following:
  (a) Site Name: [SITE NAME]
  (b) The address of the main entrance: [ADDRESS] or nearest site access point
  (c) Injuries if any, and need for ambulance
(8) A designated O&M employee shall meet firefighters at the project site entrance and direct them to the location of the fire.
(9) If possible, O&M staff shall safely attempt to shut down power at the inverter using the DC disconnect.
(10) O&M staff protect surrounding areas from flying embers with fire extinguishers.
(11) Provide safety data sheets (SDS) for the skid if needed.
(12) The O&M manager will issue an 'all clear' only when the fire department informs them that it is safe to do so.

4.3 Employee Training and Education.

Fire procedures are to be posted at the project site on a bulletin board along with the OSHA compliance postings, first aid, and site-specific project information. The bulletin board is to be located at the O&M building located on-site.

O&M staff shall be trained in the practices of fire prevention relevant to their duties. O&M staff shall be trained and equipped to extinguish small fires to prevent them from growing into more serious threats. Staff must understand the function and elements of potential emergencies, reporting procedures, evacuation plans, and shutdown procedures. Review any special hazards that might occur at [SITE NAME], such as flammable materials, fuel storage, toxic chemicals, and water reactive substances.

Fire safety training will occur during the site safety training. O&M staff are required to undergo training prior to starting work.

Training shall include the following:

(1) Employee roles and responsibilities
(2) Recognition of potential fire hazards
(3) Alarm system and evacuation routes
(4) Location and operation of manually operated equipment (e.g., fire extinguishers)
(5) Emergency response procedures
(6) Emergency shutdown procedures
(7) Information regarding specific materials to which employees might be exposed
(8) Review OSHA requirements contained in 29 CFR 1910.38

(9) Review OSHA requirements contained in 29 CFR 1910.39
(10) The location of the company fire protection plan and how it can be accessed
(11) Good fire-prevention housekeeping practices and equipment maintenance

The O&M managers are responsible for fire safety training. Written documentation of the training received by each employee must be maintained.

4.4 Site Maintenance and Housekeeping.

Maintenance and housekeeping should include the following:

(1) Fire extinguishers shall be inspected monthly.
(2) Fire extinguishers shall not be obstructed and should be in conspicuous locations.
(3) Combustible material shall not be stored in mechanical rooms, electrical equipment rooms, or the SCADA buildings.
(4) Outside dumpsters shall be kept at least five (5) feet away from combustible materials and the lid should be kept closed.
(5) Storage is not allowed in electrical equipment rooms, or near electrical panels.
(6) Electrical panel openings must be covered.
(7) Power strips must be plugged directly into an outlet and not daisy-chained and should be for temporary use only.
(8) Extension cords and flexible cords should not be substituted for permanent.

5 MEDICAL EMERGENCY.

5.1 Medical Emergency Response Procedures.

If an employee is injured, or an accident has occurred on-site and first aid is not enough treatment for the emergency, 911 must be called. The call to 911 can be made by phone by any available site personnel. The caller must state to the dispatch that they are at the "[Company [SITE NAME]]." A second notification will be made to the O&M building, to inform others of the situation.

All [SITE NAME] employees are to be certified in first aid/cardiopulmonary resuscitation (CPR) and can administer aid if they have completed training. An automated external defibrillator (AED) is stored at the O&M building and each service truck which should be utilized as necessary.

5.1.1 Serious Injury.

The following procedures apply for serious medical injuries such as loss of consciousness, heart attack, bone fractures, neck trauma, or severe burns:

(1) Notify operations or safety managers.
(2) If life threatening, call 911.
(3) Provide name, exact location, number of injured persons, and brief description of incident.
(4) On-site personnel shall meet EMS responders at site entrance and direct them to location of incident.
(5) Do not leave or move the injured unless directed to by safety managers or EMS responders.
(6) Administer first aid if necessary.
(7) Document incident and keep on file.

5.1.2 Attending an Incident.

When attending an incident, the following procedures apply:

(1) Clear a path to the injured person for operations or safety managers and assign personnel to assist with signaling EMS responders to the location of the incident.
(2) Identify location of project site entrance nearest to the incident and notify EMS responders.
(3) Operations or safety managers shall meet EMS responders at site entrance.
(4) Direct and accompany EMS responders to location of incident.
(5) Follow all directions of EMS responders.
(6) Contact management staff or subcontractors.
(7) Document incident and keep on file.

5.1.3 Medical Facilities.

The nearest medical facility to the project site is: [HOSPITAL ADDRESS]

Directions from site entrance: [Turn-by-turn directions, and link to online map directions]

5.2 Nonemergency Safety Incident.

5.2.1 Notification of Minor Incidents.

In the event a safety incident occurs where emergency response is not required (e.g., first aid treatment, near miss, and so on) work is to be stopped immediately and reported to the O&M manager or lead technician. Risk will be reassessed, adequate controls implemented, and the situation made safe before resuming the task. The event will be documented and kept on file.

5.2.2 Heat Illness.

When the temperature exceeds 95°F (35°C), or is expected to be so during the course of a shift or work project, the O&M manger will hold short staff meetings to review the weather report; reinforce heat illness prevention with all workers; and provide reminders to drink water frequently, to be on the lookout for signs and symptoms of heat illness, and inform them that shade can be made available upon request.

Employees shall have free access to potable drinking water provided and located as close as practicable to the areas where employees are working. Where drinking water is not plumbed or otherwise continuously supplied, it shall be provided in sufficient quantity at the beginning of the work shift to provide one quart per employee per hour for drinking for the entire shift. Employers can begin the shift with smaller quantities of water if they have effective procedures for replenishment during the shift as needed to allow employees to drink one quart or more per hour.
The frequent drinking of water shall be encouraged.

6 SECURITY INCIDENTS. (Not included, add as appropriate.)

6.1 Bomb Threat.

6.2 Chemical/Biological Agent Threat.

6.3 Sabotage or Vandalism.

6.4 Active Shooter.

7 SEVERE WEATHER. (Not included, add as appropriate.)

7.1 Flooding and Flash Floods.

7.2 Tornado.

7.3 Lighting Storm.

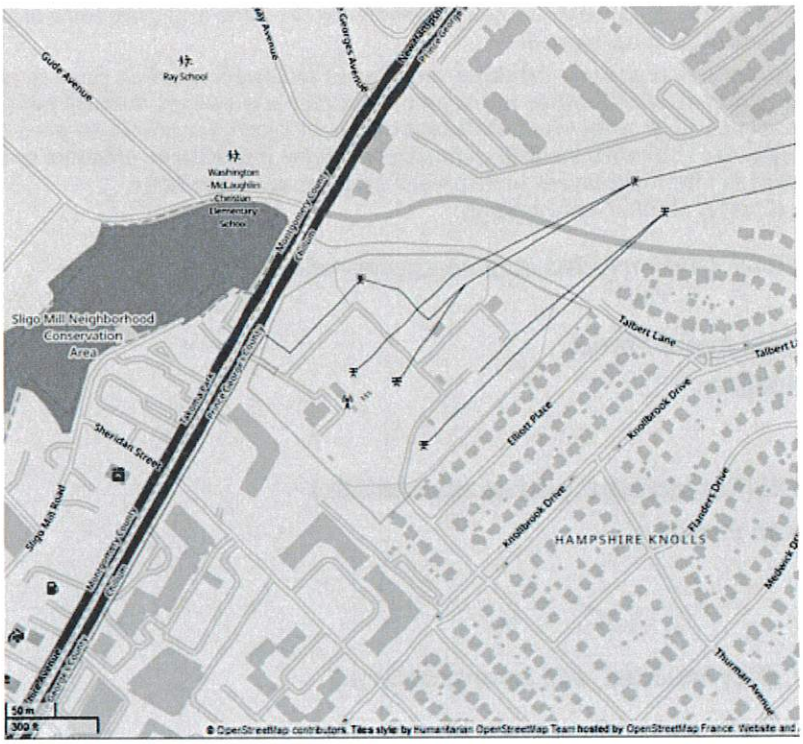
8 CYBERSECURITY. (Not included, add as appropriate.)

Acronyms

AED	automated external defibrillator
CHEMTREC	chemical shipping regulation and incident support
CPR	cardiopulmonary resuscitation
DHS	Department of Homeland Security
EMS	emergency medical services
ERP	emergency response plan
HAZMAT	hazardous materials
ICS	incident command system
MSDS	material safety data sheets
NFPA	National Fire Protection Association
NRC	National Response Center (U.S. EPA)
OSHA	Occupational Safety and Health Administration
O&M	operations and maintenance
PPE	personal protective equipment
SCADA	supervisory control and data acquisition
SDS	safety data sheets

APPENDICES

Appendix 1: Map of Site.



(To include site boundaries, primary and secondary entrances, O&M building.)

Appendix 2: Referenced Titles and Roles.

Company regional manager: [role]
Emergency response contractor: [role]
Emergency response coordinator: [role]
O&M manager: [role]
Lead technician: [role]
Site manager: [role]

Appendix 3: Emergency Contacts.

Title	Individual	Telephone number
O&M manager / Emergency coordinator	Name	Office: (999) 999-9999 Cell: (999) 999-9994
Site safety representative	Name	Cell: (999) 999-3411
Lead technician	Name	Cell: (999) 999-7624
Alternate emergency contact	Name	Cell: (999) 999-9699
Company regional manager	Name	Office: (999) 999-9999 Cell: (999) 991-9999
Company asset manager	Name	Office: (999) 999-9999
Company control center	Operator on duty	Cell: (999) 992-1999

Organization	Telephone Number
Offsite Emergency Assistance Fire/Police/Ambulance State Police Hospital Memorial Health Center, 1000 Road Crossing, Townsville, JK 99999	 911 911 999-999-9999
Emergency Spill Response Contractor Construction and Response Co. Townsville, JK	999-888-3999
Agency Notifications NRC (24-hour) (report oil spills) State Department of Public Health and Environment	 800-999-9999 877-999-9999
Additional Assistance Sheriff's Department State Poison and Drug Center	 911 800-999-9999

Appendix 4: Incident Report Form.

HAZARDOUS MATERIALS INCIDENT REPORT

INITIAL CONTACT INFORMATION

(Check one): Reported/actual incident _____ Drill/exercise _____

1. Date/time of notification: _____ Report received by: _____
2. Reported by (name and phone number or radio call signs): _____

_____

3. Company/agency and position (if applicable): _____

_____

4. Incident address/descriptive location: _____

_____

5. Agencies at the scene: _____
6. Known damage/casualties (do not provide names over unsecured communications): _____

_____

_____

CHEMICAL INFORMATION

7. Nature of emergency (check all that apply): ❑ Leak ❑ Explosion ❑ Spill ❑ Fire ❑ Derailment ❑ Other
Description: _____

_____

_____

8. Name of material(s) released/placard number(s): _____
9. Release of materials:

_____ Has ended _____ Is continuing. Estimated release rate and duration: _____

10. Estimated amount of material which *has been* released: _____

11. Estimated amount of material which *could be* released: _____

12. Media into which the release occurred: ❑ Air ❑ Ground ❑ Water

13. Plume characteristics:

a. Direction (compass direction of plume): _____ c. Color: _____

b. Height of plume: _____ d. Odor: _____

14. Characteristics of material (e.g., color, smell, liquid, gaseous, solid) _____

15. Present status of material (i.e., solid, liquid, or gas): _____

16. Apparently responsible party or parties: _____

ENVIRONMENTAL CONDITIONS

17. Current weather conditions at incident site:

Wind from: _____ Wind speed (mph): _____ Temperature (F): _____

Humidity (%): _____ Precipitation: _____ Visibility: _____

18. Forecast: _____

19. Terrain conditions: _____

HAZARD INFORMATION — (from ERG, MSDS, CHEMTREC, or facility)

20. Potential hazards: _____

21. Potential health effects: _____

22. Safety recommendations: _____

23. Recommended evacuation distance: _____

IMPACT DATA

24. Estimated areas/populations at risk: _____

25. Special facilities at risk: _____

26. Other facilities with HAZMAT in area of incident: _____

PROTECTIVE ACTION DECISIONS

27. Tools used for formulating protective actions

_____ a. Recommendations by facility operator/responsible party

_____ b. *Emergency Response Guidebook*

_____ c. Material safety data sheet

_____ d. Recommendations by CHEMTREC

_____ e. Results of incident modeling (CAMEO or similar software)

_____ f. Other: _____

28. Protective action recommendations:

_____ Evacuation _____ Shelter-in-place _____ Combination _____ No action

_____ Other _____

Time Actions Implemented

_____

_____

_____

29. Evacuation routes recommended: _____

_____

EXTERNAL NOTIFICATIONS

30. Notification made to:

_____ National Response Center (federal spill reporting) 1-800-999-9999

_____ CHEMTREC (hazardous materials information) 1-800-999-9999

_____ RRC (Oil/gas spills—production facilities, intrastate pipelines) _____

_____ State emergency response commission _____

31. Other Information: _____

_____

_____

Exhibit 16

February 29, 2024 letter

Larranaga letter to Matt Gordon, AES Clean Energy/The AES Corporation "Re: Case #23-5010 AES-Rancho Viejo Solar Conditional Use Permit (CUP) 4152 NM 14 Santa Fe, NM 87508"

February 29, 2024

BY ELECTRONIC MAIL

Matt Gordon of AES Clean Energy | The AES Corporation
C/O Rancho Viejo LP
P.O. Box 236
Santa Fe, NM 87504

RE: Case #23-5010 AES-Rancho Viejo Solar Conditional Use Permit (CUP) **4152 NM 14 Santa Fe, NM 87508**

Staff has reviewed the CUP application submittal and has deemed the submittal **INCOMPLETE** due to the following reasons:

1. Approved plat:
    - The plat has not yet gone through recordation. Plat submittal for lot line adjustment in progress.
2. EIR:
    - Terracon's third party review comments have not yet been addressed.
    - Santa Fe County Staff's comments have not yet been addressed.
3. Battery Storage:
    - Staff requested more detailed information on the battery storage. AES is waiting to amending submittal pending Battery Storage 3rd party review comments.

(See Next Page)

4. Santa Fe County Fire Prevention:

    - Plans reflecting review comments. AES is waiting to amend submittal pending Battery Storage 3rd party review comments.

5. 3rd Party Review for Battery Storage:

    - Awaiting selection of 3rd party reviewer and review. AES is waiting to amend submittal pending Battery Storage 3rd party review comments.

Staff has deemed your submittal INCOMPLETE. Please contact Staff regarding the deficiencies of your CUP submittal or if you have any additional questions. **Other comments on the submittal application may be forthcoming.**

Sincerely,

Jose E. Larrañaga

Jose E. Larrañaga
Building and Development Supervisor