

New York State Interagency Fire Safety Working Group

Fire Code Recommendations

July 2024



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1 Background and Scope

Following a series of fires at three battery energy storage system (BESS) locations across New York State in 2023, Governor Hochul convened an interagency Fire Safety Working Group (WG) to address safety concerns around lithium-ion BESS.

The WG consists of State agency officials from:

- Division of Homeland Security and Emergency Services (DHSES)
- Office of Fire Prevention and Control (OFPC)
- New York State Energy Research and Development Authority (NYSERDA)
- New York State Department of Environmental Conservation (DEC)
- Department of Public Service (DPS)
- Department of State (DOS)
- Nation-leading BESS safety industry experts, such as national labs and highly specialized professional energy storage consultants.

The WG was formed with the following objectives:

- Investigating the recent fires
- Inspecting current installations
- Identifying gaps in codes and industry best practices
- Developing recommendations for the New York State Fire Prevention and Building Code Council (Code Council) for revisions and enhancements to the Fire Code of New York State (FCNYS or Fire Code).

New York State Fire Prevention and Building Code Council

The Code Council maintains and periodically updates the New York State Uniform Fire Prevention and Building Code (Uniform Code), codified at Title 19 of the New York Codes, Rules, and Regulations (19 NYCRR Parts 1219 through 1229). The Uniform Code incorporates by reference publications including the current 2020 New York State code books, based on the 2018 version of the International Code Council, Inc. (ICC) model code books, published by ICC. The Code Council is comprised of 17 members appointed by the Governor and has members representing architects, engineers, builders, trade unions, persons with disabilities, code enforcement, fire prevention, varying levels of government, the State Fire Administrator, and the Secretary of State.

The Uniform Code prescribes the minimum standards for construction in New York State and includes, among other code books, the 2020 FCNYS. It is applicable in every part of the State except

for New York City, which has its own code.¹ Further, the Uniform Code applies in all jurisdictions without the need for local adoption. The recommendations in this report are intended for the Code Council's consideration as part of the pending Uniform Code update. Interested stakeholders were invited to submit comments on the draft recommendations for incorporation into this document.

New York State BESS Safety Efforts

Only a few years ago, codes and standards governing lithium-ion BESS safety were in their adolescent stage and contained only limited requirements for these systems. In July 2019, following several BESS failures across the globe, New York State was the first state to adopt language from the draft 2021 International Fire Code (IFC) Section 1207 Electrical Energy Storage Systems,² which provided more detailed regulations for lithium-ion batteries than the previous editions of the Fire Code.³ These 2019 amendments were then integrated into the current 2020 FCNYS Section 1206, incorporating changes made to the draft IFC before its official release.

New York State has also actively engaged with local Authorities Having Jurisdiction (AHJ) and fire departments to provide training and education on BESS and recent code updates and plans to continue efforts to support the safe installation of BESS across the State. This will include clarifying requirements through code language and providing avenues for local jurisdictions to seek independent third-party plan reviews by organizations deeply familiar with BESS safety and code compliance.

Scope

This document is intended to provide an overview of potential ways to improve the Fire Code based on WG discussions and Fire Code review, and to provide a list of recommendations for consideration for future code installments and other State requirements to address safety concerns. The draft findings and recommendations released February 6, 2024, were shared with other organizations including, but not limited to the New York City Fire Department (FDNY), National Fire Protection Association (NFPA), International Code Council (ICC), and Underwriters Laboratories (UL), and public comments were received up until March 5, 2024. The recommendations outlined in this memo are intended to apply solely to lithium-ion BESS exceeding the 600 kilowatt-hour (kWh) Maximum Allowable Quantity (MAQ) threshold, as established in 2020 FCNYS Table 1206.12.⁴ Further, the recommendations were developed with a focus on outdoor, dedicated use buildings, and other grid-scale BESS systems. As such, some of these requirements, if adopted, would not apply to other energy storage systems and may be inappropriate or unnecessary for indoor energy other storage systems.

¹ See Executive Law §383, New York State Senate website <https://www.nysenate.gov/legislation/laws/EXC/383>

² Available at <https://codes.iccsafe.org/content/IFC2024P1/chapter-12-energy-systems>

³ See Notice of Emergency Adoption and Proposed Rule Making in the July 17, 2019, State Register, Notice of Emergency Adoption in the October 17, 2019, State Register, and Notice of Adoption in the October 17, 2019, State Register.

⁴ Available at <https://dos.ny.gov/system/files/documents/2020/09/2020-fcnys-november-2019.pdf>

2 Working Group Recommendations

The WG recommendations comprise three categories:

1. **Proposed Recommendations for Fire Code Updates** – These recommendations pertain to existing sections of the FCNYS where potential improvements have been identified in the years since the code went into effect. These recommendations propose updates to bring the regulations in line with recent developments in the BESS industry.
2. **Proposed Recommendations for Fire Code Additions** – These recommendations draw from other standards and regulations that apply to BESS that should be considered for inclusion as new sections in the FCNYS. Additionally, leaders in the BESS fire safety sector in New York State and nationally have leveraged their experience, knowledge, and expertise to recommend new standards for inclusion in the FCNYS that have not yet been officially adopted in any existing BESS codes, standards, and regulations.
3. **Additional Considerations** – Some of the issues identified in the WG did not fall into either of the previous categories. These considerations may not be appropriate for incorporation into the FCNYS, but they could help to address potential issues with BESS fire safety through other regulatory mechanisms.

These proposed recommendations could lead to better coordination with and training for local AHJs and emergency responders in the planning phase of projects, enhanced review of project design and emergency response plans, inclusion of critical safety features in the design and construction of the site, and ongoing emergency preparedness. As the BESS industry evolves, the consideration and potential inclusion of these proposed recommendations into the FCNYS will advance the safe and reliable growth of BESS capacity that is critical to the clean energy transition.

3 Proposed Recommendations for Fire Code Updates

The WG conducted a thorough analysis of the existing fire code in addition to recently updated model codes and standards and prepared recommendations, which are organized by the relevant section of the existing FCNYS, for the next code cycle update of the FCNYS. This section provides a summary of identified potential improvements to the current 2020 FCNYS Section 1206 Electrical Energy Storage Systems. Where available, sections from corresponding sections of 2023 NFPA 855, the proposed 2024 IFC Section 1207, or other codes and standards are provided for reference. Though the 2024 IFC references the 2021 NFPA 855, the WG recommends that the Code Council reference 2023 NFPA 855⁵ in the next edition of FCNYS.

1. FCNYS 1206.8 PEER REVIEW

Require industry-funded independent peer reviews for all projects.

Local AHJs often lack the resources or expertise to understand and interpret critical BESS permitting documents, particularly the Hazard Mitigation Analysis (HMA), the Failure Modes and Effects Analysis (FMEA), and the UL 9540A report, which contain product-level test data on which to base important siting decisions and requirements. This gap in AHJ expertise has led to incomplete or inadequate applications in which the requirements of FCNYS 1206 are not sufficiently met.

“Peer reviews” by experts in the field can assist local AHJs in their review and understanding of BESS permit applications and their compliance with existing Fire Code requirements. Currently, FCNYS 1206.8 Peer Review gives local AHJs the authority to require that BESS developers pay for an independent peer review of the developer’s permit application. However, despite the benefits, peer reviews are rarely utilized.

As such, the WG recommends that peer reviews be mandatory for all BESS installations exceeding energy capacity thresholds established for lithium-ion batteries in FCNYS Table 1206.12 to ensure proper compliance and oversight for upcoming projects.

Once required, NYSERDA or another qualified entity could issue a rolling Request for Qualifications solicitation for firms qualified to conduct BESS peer reviews to establish a list of peer reviewers that BESS project developers can utilize.

The WG notes that a corollary section from Chapter 1 of the 2021 IFC (104.8.2 Technical Assistance) was not adopted into 2020 FCNYS, presumably addressed by the inclusion of 1206.8 Peer Review.

The 2024 IFC does not currently contain language for Peer Review in Chapter 12. The WG strongly recommends that the provision for peer review in Chapter 12 of the Fire Code be updated to require peer reviews for all BESS projects.

⁵ Available at <https://www.nfpa.org/codes-and-standards/nfpa-855-standard-development/855>

Feedback from Public Comments

Commenters were mostly supportive of a peer review requirement but identified peer review costs, scope and deliverables, qualifications of peer reviewers, and peer review process as potential causes for concern. The WG also identified those areas as critical for successful implementation of a peer review requirement. NYSERDA will seek to contract with qualified peer reviewers to provide BESS projects that receive NYSERDA incentives with streamlined, efficient peer reviews at no cost to the project developer as part of the incentive structure of its Energy Storage Program. NYSERDA has also engaged DPS to apply the same peer review process to projects that do not receive NYSERDA incentives. However, to ensure the uniform use of peer reviews across the State, the WG continues to recommend that the Code Council adopt a peer review requirement as described above and in the initial draft recommendations.

2. FCNYS 1206.13.3 EXPLOSION CONTROL

Expand the requirement for explosion control to include BESS cabinets in addition to rooms, areas, and walk-in units. Additionally, provide design requirements or language for what constitutes a passable system.

A primary concern associated with lithium-ion BESS is the potential for explosion or deflagration due to accumulation of flammable off-gases within a confined space, such as a battery enclosure. Currently, FCNYS 1206.13.3 requires that explosion control be provided for lithium-ion BESS in rooms, areas, or walk-in energy storage units, and is therefore not required for non-enterable BESS units, also referred to as “cabinets.” As such, the WG recommends that the requirement for explosion control is expanded to include BESS cabinets in addition to rooms, areas, and walk-in units.

The current code also does not include design requirements for what constitutes a passable explosion control system, which should be established in the next installment of the FCNYS to ensure uniform standards that address a critical safety issue for BESS projects. Currently, NFPA 855, and 3 RCNY section 608-01⁶ require that an explosion control system be provided in accordance with one of the following:

- Explosion prevention in accordance with NFPA 69 Standard on Explosion Prevention Systems.
- Deflagration vent panels in accordance with NFPA 68 Standard on Explosion Protection by Deflagration Venting.

Additionally, alternative explosion control systems currently exist, and language in the next edition of FCNYS should also include flexibility for other potential solutions outside of NFPA 69⁷ and NFPA 68.⁸

Current code also does not require that any substantiating documentation be provided to AHJs to demonstrate the effectiveness of the explosion control system to either mitigate against the impact of an explosion or prevent an explosion from occurring altogether (e.g., Computational Fluid Dynamics [CFD] analysis, sizing calculations, or physical testing of the explosion control system). This gap has been

⁶ Available at <https://www.nyc.gov/assets/fdny/downloads/pdf/codes/3-rcny-608-01.pdf>

⁷ Available at <https://www.nfpa.org/codes-and-standards/nfpa-69-standard-development/69>

⁸ Available at <https://www.nfpa.org/codes-and-standards/nfpa-68-standard-development/68>

addressed in NFPA 855 and Arizona Public Service (APS) Appendix W and similar language is recommended for updates to the FCNYS.

The 2023 NFPA 855 also includes language which requires testing of deflagration mitigation measures when designed into BESS cabinets (9.1.5.1.4),⁹ with validation of the effectiveness of the system demonstrated through fire and explosion testing and engineering evaluation.

Additional language relating to explosion control systems currently provided in 2023 NFPA 855, Arizona Public Service (APS) Appendix W, and 3 RCNY section 608-01(h)(4) should be consulted in developing the explosion requirements in the next edition of FCNYS.

Referenced Codes / Standards:

- 2023 NFPA 855: 9.6.5.6 Explosion Control, 9.1.5 Fire and Explosion Testing, A.9.6.5.6, A.9.6.5.6.3, A.9.6.5.6.4
- APS Appendix W: 2 Applicable Standards and Codes, 4 System Design/Layout, 6 Fire and Explosion Detection, Alarm, Control, and Suppression/Protection, 7 Modeling, 13 Documentation
- 3 RCNY § 608-01: (h)(4) Explosion Mitigation

Feedback from Public Comments

There was strong support among commenters for explicitly including cabinets in explosion control requirements, even though in practice the existing code has largely been interpreted in that way. There was consensus that NFPA 69 and NFPA 68 are currently the primary explosion control standards with prescriptive requirements. However, commenters noted that product manufacturers may design safe and effective explosion control systems addressing unique characteristics of their systems without designing them to NFPA 69 or NFPA 68. To that end, the WG continues to recommend that approved explosion controls systems that incorporate test data, modeling, and other analysis, such as Computational Fluid Dynamics explosion modeling or similar means, to validate the effectiveness of the explosion control system should be required. Though the HMA will be a critical document in validating the efficacy of the explosion control system, WG advisors warn that the HMA alone may not be effective in validating an explosion control system. Validating documentation for explosion control systems must be provided to the peer reviewer and the AHJ in addition to the HMA for approval of systems that are not designed in accordance with NFPA 69 or NFPA 68.

3. FCNYS 1206.7.1 FIRE MITIGATION PERSONNEL

Require that qualified personnel are available for dispatch within 15 minutes and able to arrive on scene within four hours to provide support to local emergency responders.

In the event of a BESS fire, it is critical that qualified personnel or representatives of the site owner/operator with knowledge of the BESS installation can be deployed on-site to support local

⁹ Available at <https://www.nfpa.org/codes-and-standards/nfpa-855-standard-development/855>

emergency responders. Section 1207.1.8.1 of the 2024 IFC¹⁰ requires that these personnel be dispatched within 15 minutes. The WG recommends that this is required for all projects and that these fire mitigation personnel are able to arrive on scene within four hours to provide expert guidance to local first responders. Additionally, the WG recommends that these personnel be familiar (e.g., successfully completed ICS-100,¹¹ ICS-200,¹² and IS-700B¹³ training courses) to effectively coordinate with local public emergency services during an event.

One way to address this recommendation may be to adopt a certification program similar to FDNY’s B28 Certificate of Fitness. Exploring other approaches beyond code changes (e.g., legislation) may also help address these concerns effectively.

The WG also recommends that the Fire Code require a qualified person knowledgeable about the project and associated hazards be immediately available via phone. Additional information on this recommendation is in the “Systems Monitoring” recommendation below.

Referenced Codes / Standards:

- 2023 NFPA 855: 9.6.6 Remediation Measures, C.1.1 Emergency Responder Pre-incident Planning
- 2024 IFC: 1207.1.8.1 Fire Mitigation Personnel
- 3 RCNY § 608-01: (c)(5) Supervision, (i)(4) Technical Assistance, (i)(5) Emergency Management

Feedback from Public Comments

Many industry representatives, local community groups, and other stakeholders stated that this recommendation was impractical. However, it is important to note that this recommendation reflects 2024 IFC and 2023 NFPA 855 standards, strengthened by the WG only by the addition of a clear, easily enforceable, four-hour arrival requirement in the event of a fire. The core problem addressed by this recommendation is that local fire departments are often poorly equipped, in terms of both staffing and expertise, to handle lithium-ion battery fires, particularly those associated with energy storage systems that may burn for several days. The WG also suggests that this code section refer to hazard support personnel, rather than fire mitigation personnel, to better reflect the diverse responsibilities of such personnel, beyond fire mitigation. Local community groups have indicated that their preferred solution is to embed lithium-ion battery experts in county or State emergency response and hazmat infrastructure. The WG suggests that a hazmat cost recovery system could be effective in defraying public costs of integrating battery experts into existing public infrastructure. Further, with increasing proliferation of EVs, residential and small commercial energy storage systems, micro mobility devices, and other lithium-ion battery powered devices, vehicles, and systems, the utility of battery experts integrated into existing emergency response infrastructure could be far more comprehensive than relatively infrequent fires associated with grid-scale energy storage systems. Alternatively, a program

¹⁰ Available at <https://codes.iccsafe.org/content/IFC2024P1/chapter-12-energy-systems>

¹¹ Available at <https://training.fema.gov/is/courseoverview.aspx?code=is-100.c&lang=en>

¹² Available at <https://training.fema.gov/is/courseoverview.aspx?code=IS-200.c&lang=en>

¹³ Available at <https://training.fema.gov/is/courseoverview.aspx?code=is-700.b&lang=en>

like FDNY's Certificate of Fitness program designed for and applied to the entire State may also be an effective way to address this issue.

4. FCNYS 1206.11.8 SIGNAGE

Extend safety signage requirements beyond the BESS unit itself to include perimeter fences or security barriers and include a map of the site, BESS enclosures, and associated equipment.

These signs should clearly display 24-hour emergency contact information and relevant hazard warnings, ensuring improved safety and clear communication for emergency responders and the public, as currently required for entry doors by FCNYS 1206.11.8.¹⁴ All relevant hazard warnings indicated on signage or maps should identify and display isolation distances response personnel should maintain from BESS involved in fire or where there may be a risk of explosion or deflagration. It is critical that this information be accessible outside the project fence line for the health and safety of first responders.

- (a) **The WG recommends the FCNYS directly include signage requirements and/or applicable NEC references for grid-interactive BESS operating in parallel with other power generating sources.** The FCNYS requires compliance with all applicable NEC signage requirements, which can involve multiple different sections depending on the system design. Section 1207.4.8 of the 2024 IFC¹⁵ addresses signage for multiple energy systems.
- (b) **Update the Fire Code to require clear and apparent identification of explosion control panels.** This measure will help ensure that first responders can easily recognize and stay clear of the respective hazard zones, reducing the risk of accidents and facilitating a more efficient and secure emergency response. Section 911.4 of the 2024 IFC¹⁶ requires compliance with NFPA 68, which addresses signage for deflagration venting, though this language may need to be expanded to include other methods of explosion control in addition to deflagration.

Feedback from Public Comments

There was broad support for this recommendation from a variety of stakeholders. Additional suggestions from stakeholders included a requirement that deflagration overpressure panels be directed toward the sky to minimize the chance that they will cause injuries to first responders. Further, commenters suggested that the Code Council should establish a minimum distance from the project fence line or the closest roadway for the signage requirement, in addition to mandating that signage indicate the most recent date that the signage was updated or verified to be accurate.

¹⁴ Available at <https://dos.ny.gov/system/files/documents/2020/09/2020-fcnys-november-2019.pdf>

¹⁵ Available at <https://codes.iccsafe.org/content/IFC2024P1/chapter-12-energy-systems>

¹⁶ Available at <https://codes.iccsafe.org/content/IFC2024P1/chapter-12-energy-systems>

5. FCNYS 1206.9.2.1 SYSTEMS MONITORING

Update the Fire Code to ensure that Battery Management System (BMS) data incorporates high resolution sensor data, including voltage, state of charge, and temperature measurement of each cell or each series-connected cell group, and is monitored by a 24/7 staffed Network Operations Center (NOC). Critical failure notifications should be immediately communicated to the site owner/operator to take corrective actions as necessary.

The WG recommends that the Fire Code require that Battery Management System (BMS) data, including state of charge, voltage and temperature measurements for battery cells or each series of connected cell groups, be monitored 24/7 by a NOC / Remote Operations Center (ROC), staffed by trained personnel with working knowledge of the BESS and sites under their purview. Additionally, the WG recommends that NOC/ROC staff be immediately available to relay relevant data to the local fire department to help guide emergency response if requested.

The NOC could fulfill the recommendation that a qualified person be available for immediate phone consultation found in the last paragraph of the Fire Mitigation Personnel recommendation section.

The NOC providing 24/7 remote monitoring of the BMS or Energy Storage Management System (ESMS) should have the ability to immediately relay alarm notifications indicative of a thermal runaway or other battery failure event to the system owner, O&M company, or other associated parties. Additional information and language for reference is available in 2023 NFPA 855 and 3 RCNY section 608-01.

Referenced Codes / Standards:

- 2023 NFPA 855: A.4.3.2.1.4(3)
- 3 RCNY § 608-01: (g)(2) Remote Monitoring, (i)(1) Remote Monitoring of Battery Management System and Reporting, (i)(3) Remote Monitoring at Constantly Attended On-Site Location

Feedback from Public Comments

There was general support from this recommendation among stakeholders, though some industry stakeholders did point to additional costs associated with the NOC as problematic. Additionally, many stakeholders highlighted the importance of NOC staff having the ability to relay critical information to first responders immediately by phone in the event of a fire. Finally, the NOC was identified by stakeholders as a critical means to identify early warning signs of potential BESS incidents and underscored the importance of continuous monitoring for at least the system characteristics listed in the in-line edits above. While several stakeholders commented that the NOC renders Hazard Support Personnel unnecessary, no comments provided sound rationale for the notion that replacing on-site assistance to first responders during an emergency event with guidance from a remote NOC provided by phone would be appropriate. The WG views the Hazard Support Personnel and Systems Notifications recommendations as complementary, not redundant.

6. FCNYS 1206.11.9 SECURITY OF INSTALLATIONS

Update the Fire Code to incorporate requirements for video surveillance systems, specifying their intended use as both a continuous monitoring tool and a post-event analysis resource.

This update would be specific to New York, as it is not currently incorporated into NFPA 855 or the 2024 IFC. The WG has learned that video surveillance systems can play a critical role in incident analysis, in addition to providing potentially useful real time monitoring capabilities, and therefore the WG recommends including a requirement for video surveillance. Access to video surveillance footage should be available to emergency responders during an incident in addition to being provided to the AHJ to assist with post-incident investigation.

Feedback from Public Comments

Several stakeholders pointed out that closed-circuit television (CCTV) systems refer to a specific technology and one that is not necessarily appropriate to achieve the intent of this recommendation. The recommendation above has been edited accordingly to recommend incorporating requirements for video surveillance systems instead of CCTV systems. Stakeholders representing New York’s utility companies support the recommendation but do not believe it should be applied to BESS located at utility substations for cybersecurity reasons. The WG recommends allowing utilities to monitor utility systems at substations in accordance with other relevant regulations for the utility sector. While the WG maintains its recommendation to have footage available to first responders during a fire and recordings available for post event analysis, it recognizes that cybersecurity and other regulatory issues may inhibit the ability to share video feeds with first responders in real time. The WG recommends including language that requires real-time monitoring of video feeds for first responders “where required by the AHJ.” Further, the WG recommends that the requirement for video storage be capped at 72-168 hours unless a fire occurs in the system, acknowledging the high cost of storing recorded video data. Commenters also suggested that the video surveillance should be monitored by the NOC described in the “Systems Monitoring” recommendation.

7. FCNYS 1206.2 APPLICABILITY

Remove the Fire Code exemption for BESS projects owned or operated by electrical utilities to ensure that all projects comply with the Fire Code.

The removal of this exemption can address concerns relating to access to critical information and jurisdictional authority, promoting safety and accountability. The suggested code revision should be carried out in collaboration with relevant stakeholders to assess the extent of code enforcement authority for public utility projects, maintaining safety standards even in cases involving electric utilities. This recommendation aligns with the proposed language of section 1201.1 in the 2024 IFC¹⁷ and should be considered for inclusion, ensuring a consistent and thorough regulatory framework for all energy systems in the State.

¹⁷ Available at <https://codes.iccsafe.org/content/IFC2024P1/chapter-12-energy-systems>

Feedback from Public Comments

Almost all parties were supportive of this recommendation, with the exception of utility companies, which were concerned about projects co-located with substations with respect to limited access for trained/authorized personnel and potential conflicts with other relevant electrical infrastructure codes. It is important to understand that the 2024 IFC removed this exemption in sections 1207.1.1 and 1207.1.2 and the WG recommendation is that the New York code align with that model code on this issue.

4 Proposed Recommendations for Fire Code Additions

1. EMERGENCY RESPONSE PLANS and REGULAR FIRE DEPARTMENT TRAINING

Include a requirement for an Emergency Response Plan (ERP) and offer annual local first responder training for every BESS installation.

The WG strongly recommends that a site-specific ERP be required in the Fire Code update to ensure that every BESS facility is equipped with a comprehensive strategy for addressing potential emergencies 24 hours a day. While existing standards such as fire safety plans in FCNYS Section 403¹⁸ and 2023 NFPA 855 Section 4.3.2.1¹⁹ address emergency operations for facility personnel, these standards are not specifically written for first responders. As such, there should be a requirement for emergency response protocols specifically addressing the needs of first responders in the event of a fire, like 2023 NFPA 855 Appendix G.11.2. Appendix G.11.2²⁰ is supplemental information rather than a direct part of standard itself. The code should remove any ambiguity around the NFPA requirements and require that system owner/operators provide emergency response plans directed toward first responders and annual site-specific trainings to local fire departments.

This requirement should specify that the ERP must be accessible on-site and shared with the local fire department. Different fire departments may have specific requirements or conditions for presentation of ERPs (e.g., type of lockbox, etc.); therefore, the WG recommends that the FCNYS grant the AHJ the flexibility to determine the most suitable presentation of the ERP based on local fire department needs. Whenever possible, this ERP should be developed in consultation with the local fire department to ensure it is in alignment with their operating procedures, capabilities, resources, etc. In all cases, a copy of the ERP must be maintained on-site outside the fence line of the project.

The WG also recommends requiring site-specific training to be offered for local fire departments to familiarize them with the project, hazards associated with BESS, and procedures outlined in the ERP. The WG recommends that annual trainings be offered to address potential turnover in fire department personnel, and that a log of training records be maintained. The AHJ would play a key role in overseeing and regulating the implementation of this requirement, ensuring that BESS installations are well-prepared for emergencies and that all response team members are adequately trained.

Referenced Codes / Standards:

- 2023 NFPA 855: 4.3.2.1 Emergency Operations Plan, G.11.2 Emergency Responder Pre-incident and Emergency Operation Planning
- 2020 FCNYS: 403 Emergency Preparedness Requirements

¹⁸ Available at <https://dos.ny.gov/system/files/documents/2020/09/2020-fcnys-november-2019.pdf>

¹⁹ Available at <https://www.nfpa.org/codes-and-standards/nfpa-855-standard-development/855>

²⁰ Available at <https://www.nfpa.org/codes-and-standards/nfpa-855-standard-development/855>

Feedback from Public Comments

Stakeholders were almost unanimously supportive of these requirements, albeit with a few caveats. First, local fire departments can be understaffed or otherwise bandwidth constrained making it difficult for them to attend trainings or make meaningful contributions to the development of an emergency response plan. While an ERP will be required regardless, energy storage developers should not be penalized if local emergency services are unable to participate in this process beyond approving the ERP. To that end, the WG is modifying its recommendation to require that BESS project owners or operators must exhaust every possible option to include local emergency services in the development of ERPs but should not be penalized if that is ultimately not an option. Additionally, energy storage developers should consider adding a section to the ERP addressing potential issues during construction, in addition to the bulk of the ERP, addressing first responder needs during a fire throughout the long-term operation of the project.

There are similar bandwidth issues relating to annual trainings. Industry commenters have indicated that local emergency services sometimes do not have the ability or the desire to participate in site-specific trainings. To that end, the WG has modified its recommendation above to stipulate that annual training must be offered, and those offerings should be documented by industry, to local first responders. If local first responders are unable or unwilling to complete the training, developers should similarly not be penalized.

2. CENTRAL STATION MONITORING OF BESS FACILITIES

Include a Fire Code requirement for monitoring of fire detection systems by a central station service alarm system to ensure timely, proper notification to the local fire department in the event of a fire alarm.

The WG recommends that this requirement specify that the central monitoring station must comply with relevant requirements in NFPA 72.²¹ The code should also define criteria for triggering alarms and notifying first responders, ensuring that only critical incidents prompt a response from emergency services. The NOC should be available to assist in determining which incidents are critical enough to warrant a response from emergency services. Clarity in the definition and role of central station monitoring in BESS installations is essential to establish consistent and effective practices across different jurisdictions and facility types. The WG recommends adopting the language in section 1207.5.4 of the 2024 IFC.²²

Referenced Codes / Standards:

- 2024 IFC: 1207.5.4 Fire detection
- 3 RCNY § 608-01: (i)(2) Central Station Monitoring of Fire Protection System
- NFPA 72 Fire Alarm & Signaling Systems

²¹ Available at <https://www.nfpa.org/codes-and-standards/nfpa-72-standard-development/72>

²² Available at <https://codes.iccsafe.org/content/IFC2024P1/chapter-12-energy-systems>

Feedback from Public Comments

Many stakeholders appeared to misunderstand this recommendation, particularly since central station monitoring in accordance with NFPA 72 is already a requirement in FCNYS, barring exemptions granted on a case-by-case basis by the AHJ for certain systems. The core reason for this recommendation is to remove that discretionary element. Central Station Monitoring and Systems Monitoring are different things. Central Station Monitoring relates to the fire alarms transmitted by listed detectors (e.g., listed smoke or heat detectors) and subsequently sent to fire departments. Systems Monitoring refers to a NOC that is monitoring the BMS of the system. These two requirements should be complementary, but they are not redundant. The NOC should help to determine which alarms should trigger response from local fire departments, and which alarms can be handled remotely, by operations and maintenance staff, or other third parties. To clarify, definitions for Central Station Monitoring and Network Operations Center are included below.

- (a) **Central Station (as it refers to NFPA 72 in the context of Battery Energy Storage Systems):** In the context of NFPA 72 applied to Battery Energy Storage Systems (BESS), a central station is a designated facility responsible for monitoring and managing fire alarm and supervisory signals originating from the BESS installation. According to NFPA 855, which provides guidelines for the installation of stationary energy storage systems including BESS, it is required that these systems be equipped with fire detection and suppression mechanisms. The central station, in this case, serves as the hub for receiving these signals, processing them, and initiating appropriate responses in the event of a fire or other emergency situation related to the BESS. NFPA 72 outlines specific requirements for central stations regarding signal reception, processing, documentation, and communication with emergency responders to ensure the safety and protection of personnel and property in facilities housing BESS.
- (b) **Network Operations Center (NOC) or Remote Monitoring Facility in the context of Battery Energy Storage Systems:** For Battery Energy Storage Systems (BESS), a Network Operations Center (NOC) or Remote Monitoring Facility plays a crucial role in ensuring the efficient and safe operation of the energy storage infrastructure. These centers serve as centralized hubs where IT professionals monitor and manage various aspects of the BESS, including battery performance, state of charge, temperature, and other critical parameters. Additionally, NOCs or remote monitoring facilities are responsible for detecting and responding to potential issues or anomalies in the BESS operation in real-time. This proactive monitoring helps prevent safety hazards, optimize performance, and minimize downtime. Furthermore, NOCs may facilitate remote diagnostics and troubleshooting, allowing technicians to address issues promptly and effectively, thereby ensuring the reliability and resilience of battery energy storage systems.

3. PERIODIC SPECIAL INSPECTIONS

Introduce a new provision in the Fire Code mandating industry-funded special inspections for BESS installations to ensure thorough safety and compliance.

The WG recommends requiring special inspections at a regular cadence. The FCNYS should specify a comprehensive scope of inspection criteria, including aspects such as verifying emergency response contacts, system layouts, signage, and other critical components relevant to BESS safety. The frequency of these special inspections should be established to correspond with the specific needs and risks

associated with BESS installations. These inspections should be conducted by specialized, third-party experts who possess the necessary expertise in BESS systems.

Feedback from Public Comments

Stakeholders generally appeared to misunderstand the use of the term Special Inspections. It is a term defined in Chapter 2 of the Building Code with requirements described in Chapter 17. The WG’s recommendation is to apply required inspections for BESS technology analogous to the special inspection requirements in Chapter 17. Industry comments on this recommendation should be addressed by this clarification.

4. CURRENT PERCEIVED EXEMPTIONS FOR BESS CABINETS

Include “cabinets” in all Fire Code requirements that pertain to rooms, areas, or walk-in units, except for fire suppression requirements, as they may be inappropriate for cabinets.

The 2020 FCNYS outlines requirements for outdoor BESS in section 1206.15 and Table 1206.15 (Outdoor ESS Installations) along with the general requirements in section 1206.11²³ (General Installation Requirements). However, the existing language of certain sections initially only appears to be applicable for indoor and outdoor walk-in BESS, as they do not directly address outdoor non-enterable, or cabinet, BESS causing uncertainty for the appropriate application and ensuing enforcement of requirements.

Although the Fire Code does state that “the most restrictive [requirement] shall govern” where there are conflicts between sections, the WG recommends removing any ambiguity regarding the applicability of the following requirements to cabinet ESS:

- §1206.6 Large-Scale Fire Test
- §1206.11.9 Security of Installations
- §1206.12.2 Maximum Allowable Quantities of ESS (MAQ)
- §1206.12.4 Fire Detection

This can be accomplished by including “Energy Storage System Cabinet” directly into the identified sections, [while ensuring language can be carried over / aligns with the model 2024 IFC (during the New York code update process)] as can be seen below with recommended clarifications within the existing 2020 FCNYS language:

The FCNYS defines an energy storage system cabinet as a cabinet containing components of the energy storage system that is included in the UL 9540 listing for the system. Personnel are not able to enter the cabinet, other than reaching inside to access components for maintenance purposes. Historically, cabinets were not directly addressed by several important regulations in the FCNYS. Upon incorporating energy storage system cabinets in existing requirements, it will be important to be clear that requirements apply to rooms, areas, walk-in units, or cabinets, eliminating

²³ Available at <https://dos.ny.gov/system/files/documents/2020/09/2020-fcnys-november-2019.pdf>

misinterpretations that would result in redundant requirements (e.g., fire detection requirement in both the room and energy storage system cabinet).

Feedback from Public Comments

Stakeholders were universally supportive of this recommendation. Most AHJs have been interpreting FCNYS 2020 in a manner consistent with this recommendation for the last few years. The recommendation is simply to remove any ambiguity.

Implementing the recommendations in the previous two sections will help to maintain New York's status as a national and global leader in energy storage fire safety. After months of lengthy discussion and document review among the WG participants, these concrete suggestions are recommended to the Code Council.

5 Additional Considerations

1. ROOT CAUSE ANALYSIS

The WG concluded that the Fire Code may not be the appropriate place to require a Root Cause Analysis (RCA).

The WG identified a need to create a hard requirement for Original Equipment Manufacturers (OEMs) to disclose RCAs to relevant local and State authorities for analysis and evaluation with the intent of promoting continuous improvement of energy storage system fire safety. The WG concluded that the FCNYS may not be the appropriate mechanism to grant government access to RCAs resulting from past or future fires associated with a particular energy storage system product, as OEMs are not directly subject to Fire Code requirements unless they are also acting as project developers. To address potential gaps and establish a clear framework for this requirement, the following suggestions should be considered:

- (a) Define the scope of the requirement to include faults that result in a fire or necessitate a response from first responders, making it clear that not all faults require an RCA.
- (b) Standardize the format of the RCA submission by creating a template that includes specific information, such as manufacturer and model numbers of components, system schematics, maintenance logs, operational data leading up to the incident, battery monitoring system logs, and details about fire suppression systems.
- (c) Set a deadline for providing the RCA information to the relevant authorities, specifying that it should be delivered within a defined number of days after the incident.
- (d) Offer flexibility in the choice of RCA methods and analysis entities but endorse a list of pre-qualified firms or methods to ensure consistency and reliability in the analysis.
- (e) Emphasize transparency in the process to facilitate effective communication between local authorities, operators, and OEMs. Transparency is essential for building trust and ensuring that all parties have access to the same data for a comprehensive understanding of the incident.
- (f) Consider the inclusion of a requirement for peer review of the RCA to ensure the accuracy and credibility of the analysis.

Feedback from Public Comments

Most stakeholders seemed to understand the challenge inherent to the intent of this recommendation. Industry stakeholders urged the WG to further coordinate with industry before creating requirements relating to existing or future RCAs.

2. WATER SUPPLY

The WG recommends enhancing guidance for water supply serving BESS facilities, including whether water is appropriate for different technologies, in an emergency response to a BESS fire and determining if more specific requirements are necessary.

Given the challenges associated with fully extinguishing BESS fires and the variability in system capacity and design, the code should consider the intended purpose of the water supply, whether it is for cooling, smoke control, preventing fire spread, or other scenarios. Referencing Chapter 5 of the code

and standards like NFPA 1142²⁴ may provide a starting point for establishing water supply guidance and requirements. The code should aim to define the specific conditions and scenarios where water supply is necessary and outline the minimum flow rates and water storage requirements, taking into account factors like distance from the water source and the capacity of fire departments for shuttle operations. This information should be detailed and explicit, acknowledging the complexities of BESS facilities and the unique challenges they pose for firefighting. Further discussions should be held by the Code Council, potentially including relevant subject matter experts, to ensure comprehensive guidelines for water supply in BESS facilities, including exceptions for systems to which water should not be applied in the event of fire.

Referenced Codes / Standards:

- 2022 NFPA 1142: Standard on Water Supplies for Suburban and Rural Firefighting
- 2023 NFPA 855: G.11.2 Emergency Responder Pre-incident and Emergency Operation Planning

Feedback from Public Comments

Stakeholders largely reiterated that water is most often not appropriate for extinguishing BESS fire, rather its primary use in a BESS fire is containment. Therefore, a universal requirement for water supply would likely be inappropriate, particularly to the extent that the requirement goes beyond 2022 NFPA 1142. Several commenters suggested tying water requirements to UL 9540A test results. Stakeholders also pointed out that tying water supply requirements to UL 9540A test results and/or Hazard Mitigation Analysis would create inconsistency in requirements and enforcement, therefore causing significant market confusion. As identified in the initial recommendation, water supply needs will vary among systems, so a prescriptive requirement in the Fire Code would most likely not be appropriate or effective.

3. TRANSFORMERS CONTAINING HIGHLY FLAMMABLE MATERIALS

Recommend that the Code Council have further discussions around clearance distances of oil-insulated transformers from BESS.

The WG notes that propagation of fire or heat flux from a BESS fire may pose great risk to non-dry-type (e.g., oil-insulated) transformers, which may exacerbate the impact of a BESS failure incident. FCNYS 1206.15.3²⁵ states that energy storage systems located outdoors shall be separated by a minimum of 10 feet from exposures such as lot lines, public ways, and buildings, as well as “other exposure hazards,” which oil-insulated transformers could fall under. However, it is not clear that this interpretation has been enforced by AHJs. The corresponding section of 2023 NFPA 855 (9.5.2.6.1),²⁶ however, notes that BESS are separated by 10 feet from “other exposures not associated with electrical grid infrastructure,” implying that this does not need to apply for transformers.

²⁴ Available at <https://www.nfpa.org/codes-and-standards/nfpa-1142-standard-development/1142>

²⁵ Available at <https://dos.ny.gov/system/files/documents/2020/09/2020-fcnys-november-2019.pdf>

²⁶ Available at <https://www.nfpa.org/codes-and-standards/nfpa-855-standard-development/855>

The WG recommends that the Code Council hold further discussions around clearance distance requirements to determine if clearance distance requirements should be explicitly enforced for oil-insulated transformers in future code revisions. This discussion should include a review of potential updates to standards and requirements.

Referenced Codes / Standards:

- 2024 IFC: 1207.8.3 Clearance to Exposures
- 2023 NFPA 855: 9.5.2.6.1 Clearance to Exposures
- 3 RCNY § 608-01: (g)(1)(C) Separation Distances
- FM Global Property Loss Prevention Data Sheets: 5-4 Transformers
- 2020 NFPA 850: Table 6.1.4.3

Feedback from Public Comments

Industry stakeholders agreed almost unanimously that subjecting certain transformers to 10 ft. Clearance to Exposures requirements that pertain to BESS in the Fire Code is not appropriate. Many stakeholders identified existing regulations for oil-filled transformers in section 6.1 of 2020 NFPA 850. The WG recommends using existing NFPA, IFC, and other relevant standards to address potential issues with BESS to the extent possible to eliminate market confusion that may stem from a high volume of bespoke, local requirements.

4. FIRE STOPS, BARRIERS, or FIRE BREAKS

Mandate the installation of fire stops for all BESS enclosure penetrations to prevent the propagation of fires from one BESS unit to another through these pathways.

While this specific topic is currently not addressed in the 2024 IFC or NFPA 855, incorporating fire stops or barriers can be effective in limiting fire spread in various facilities. To ensure effectiveness of this requirement, the WG recommends that the code update should include guidance on the installation and performance standards of these fire breaks or barriers to ensure there is no propagation of fire across BESS enclosures.

Feedback from Public Comments

As a result of public comments relating to the Fire Breaks recommendation, the WG deems it appropriate to move this recommendation from the “Proposed Recommendations for Fire Code Additions” section to the “Additional Considerations” section. Many stakeholders identified the

redundancy between this recommendation and UL 9540A testing as creating an onerous burden on industry. Further, industry stakeholders claimed that the recommendation is too vague to predict what costs would be necessitated by implementing it, and they raised concerns about haphazard enforcement as a potential significant source of market confusion. To that end, the WG recommends further deliberation on fire breaks by the Code Council, particularly considering the subject of redundancy between UL 9540A testing and a requirement for fire breaks.

6 Conclusion

After months of careful deliberation and a consensus-based process, the WG submits the recommendations in this document to the Code Council for consideration in the next code installment. While the most critical issues identified by the WG could be addressed by better enforcement and adherence to the existing code, the recommendations in this memo have been identified as ways to further improve the regulatory framework for BESS in New York.

7 Appendix A: FSWG Recommendations That Exceed the 2024 IFC Provisions

1. 2024 IFC 1207.1.8.1 Fire mitigation personnel

- (a) The WG recommends that fire mitigation personnel be mandatory for every project, while the IFC requires fire mitigation personnel “Where, in the opinion of the fire code official, it is essential for public safety that trained personnel be on site to respond to possible ignition or re-ignition of a damaged ESS.”
- (b) The WG recommends that in addition to requiring dispatch of fire mitigation personnel within 15 minutes to respond to a possible incident, fire mitigation personnel should be required to arrive on scene within 4 hours.
- (c) This requirement is estimated to incur an up-front cost of \$19,000 - \$26,900 (<1% of capex) and an annual operating cost of \$22,950 (23% of opex) per BESS project.

2. 2024 IFC 1207.4.8 Signage

- (a) In addition to the signage requirements listed in the 2024 IFC, the WG recommends:
 - 1. Extending signage requirements beyond the BESS unit to include perimeter fences or security barriers.
 - 2. Including information listed in recommendation #4 in the first section of this document, such as 24-hour emergency contact information and relevant hazard warnings, map of the site, BESS enclosures, and associated equipment and isolation distances response personnel should maintain from BESS involved in fire or where there may be a risk of explosion or deflagration.
- (b) This requirement is estimated to incur an up-front cost of \$1,500 - \$3,000 (<1% of capex) per BESS project.

3. 2024 IFC 1207.3.4 Energy storage management system

- (a) In addition to the requirements listed in the 2024 IFC, the WG recommends mandating 24/7 staff network operations centers (NOC) for battery management system data monitoring.
- (b) This is already a requirement in NYC.
- (c) This requirement is estimated to incur an up-front cost of \$5,000 - \$10,000 (<1% of capex) and an ongoing annual cost of \$7,500 (8% of opex) per BESS project.

4. 2024 IFC 1207.4.9 Security of installations

- (a) In addition to the requirements in 2024 IFC, the WG recommends mandating video surveillance systems for both continuous monitoring and post-event analysis resource.
- (b) This requirement is estimated to incur an up-front cost of \$15,000 - \$24,000 (<1% of capex) and an ongoing annual cost of \$900 (1% of opex) per BESS project.

5. 2024 IFC 1207.2.2.1 Ongoing inspection and testing

- (a) In addition to recurring inspections of the Battery Management System, the WG recommends mandating special inspections for BESS installations at a regular cadence for the life of the project.

(b) This requirement is estimated to incur an up-front cost of \$10,000 - \$13,800 (<1% of capex) and an ongoing annual cost of \$11,900 (12% of opex) per BESS project.

6. Mandating emergency response plan and annual local first responder training for every ESS installation is not a requirement in the 2024 IFC, and the WG recommends requiring both a response plan and annual first responder training.

(a) This requirement is estimated to incur an up-front cost of \$12,000 - \$15,500 (<1% of capex) and an ongoing annual cost of \$1,3750 (14% of opex) per BESS project.

7. Peer Review is a requirement that was not addressed in either the 2021 IFC or the 2024 IFC. As such, it was always a requirement that was specific to New York, beginning with the 2020 FCNYS. The WG recommends making Peer Review mandatory for all projects.

(a) This requirement is estimated to incur an up-front cost of \$10,000 - \$18,000 (<1% of capex)) per BESS project.

(b) NYSERDA is seeking to contract with qualified peer reviewers to provide no cost peer review for projects receiving a NYSERDA energy storage program incentive.



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