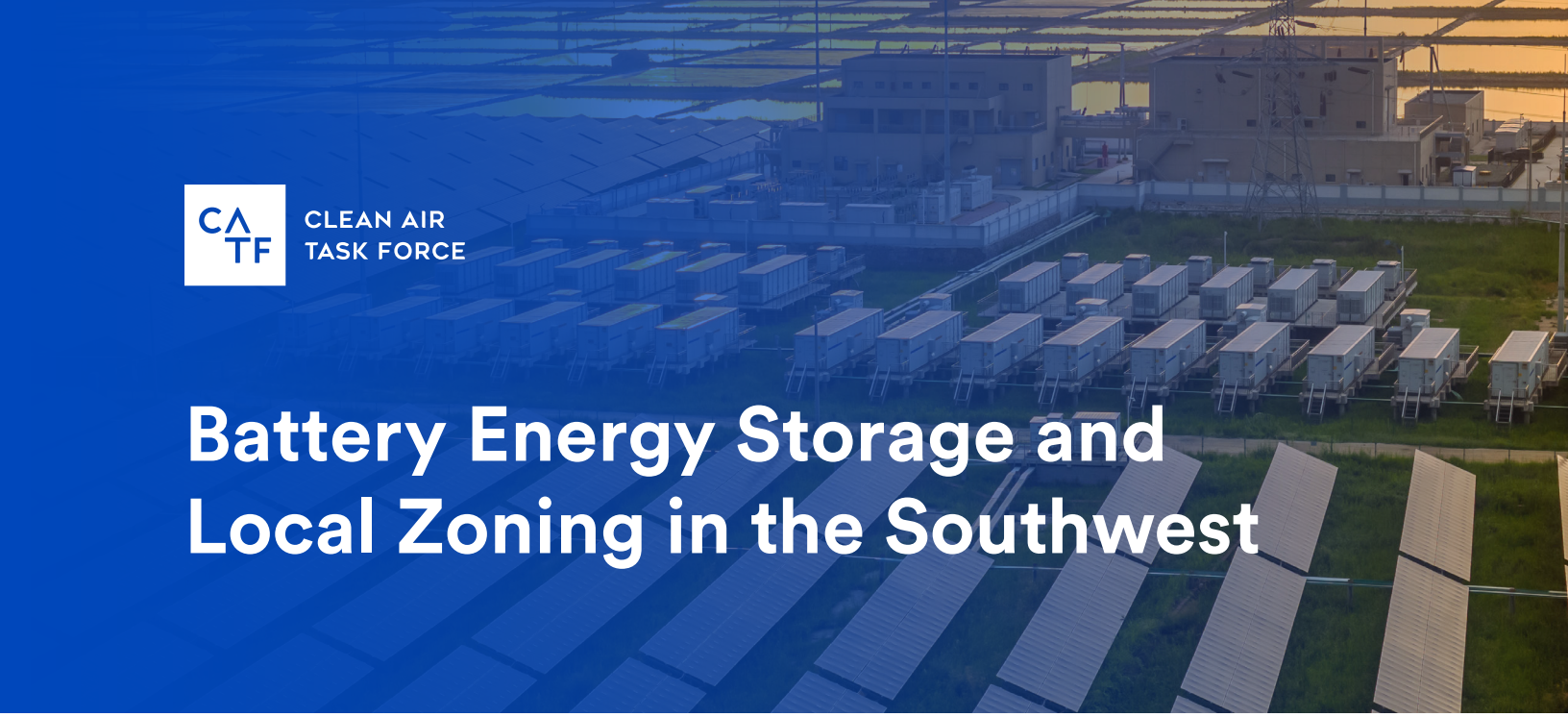


CLEAN AIR TASK FORCE

Battery Energy Storage and Local Zoning in the Southwest

Battery Energy Storage Systems (BESS) are a quickly growing energy resource that enable an affordable, reliable, and clean electric grid. These projects are already being built in communities throughout the Southwest, yet many local zoning codes have not been designed to address this increasingly popular technology.

Clean Air Task Force reviewed existing BESS ordinances in the region and tracked best practices from developers, local governments, and conservation and wildlife advocates to identify points of consensus around BESS development. This resource outlines key considerations and recommends core elements to consider for a BESS-specific zoning ordinance.

Top Five Elements to Consider in a Zoning Ordinance

1. Understand BESS as a Distinct Land Use

Battery energy storage systems are distinct from other kinds of energy infrastructure, like a power plant, solar facility, or a substation, and therefore warrant zoning considerations that differ from those developed for generation or transmission facilities. A BESS does not generate power; instead, it stores electricity produced elsewhere and sends it back to the grid when needed. Because of this direct connection to the grid, BESS facilities are typically best located near substations. The footprint of a BESS is relatively small, with individual units about the size of a shipping container. Recognizing these distinctions helps ensure that zoning ordinances appropriately address site suitability and safety.

2. Create Clear Approval Pathways by Size, Use, and Location

A BESS ordinance should define distinct approval pathways based on project size, whether the system is an accessory to another use, and what zoning district it is in. For example, ordinances should clarify which standards apply to BESS co-located with other infrastructure like a solar facility, and which apply to standalone facilities.

3. Incorporate National Safety Standards by Reference

National standard bodies with deep technical expertise have created and evolved nationally recognized technical safety requirements around BESS. Local ordinances should require compliance with those standards by referencing the latest editions rather than replicating the standard itself. These standards, including National Fire Protection Association's (NFPA) 855, NFPA 70®, and UL Solutions' (UL) 940, set requirements on installation, spacing, fire suppression systems, and equipment certification tailored to each specific battery technology.

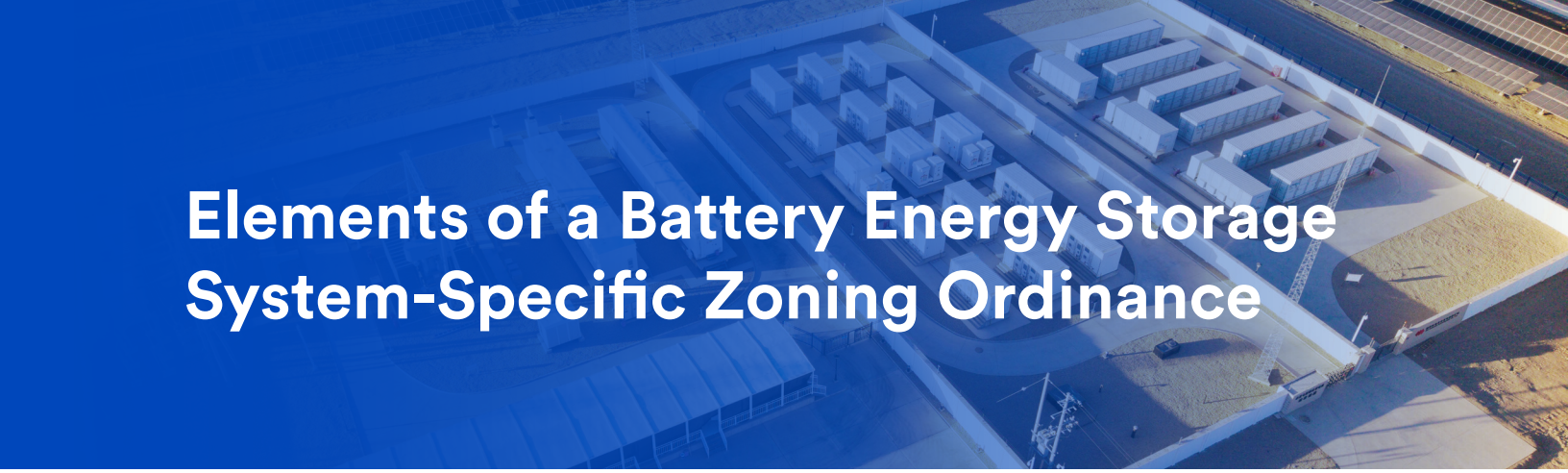
4. Determine Setbacks Based on Safety

Larger setbacks do not guarantee better safety outcomes, even for large facilities. This is because the risk of a thermal runaway event does not increase with the size of the facility.[1] Well-designed BESS facilities are engineered to contain thermal runaway events to a single unit. By referencing national standards like NFPA 855 in a zoning ordinance, projects will already be subject to site-specific fire safety analyses and module configuration.

5. Address Anticipated Changes Throughout the Project Lifecycle

Zoning ordinances should proactively address material changes to a BESS facility over its lifecycle, often referred to as augmentation. Because the capacity of batteries degrades over time, battery modules are typically replaced every seven to ten years over a project's 20-30 year lifespan. Other changes to a project over time, including adding units, using a new battery technology, or other modifications, may alter the facility in ways not addressed by the initial permit. These changes are separate from routine repair and maintenance. Zoning ordinances should clearly identify how planned augmentation can be addressed in the initial application, and what the approval process is for modifications that were not initially pre-approved.

1 Twitchell J.B., D.W. Powell, and M.D. Paiss. (2023). Energy Storage in Local Zoning Ordinances. Pacific Northwest National Laboratory. https://www.pnnl.gov/main/publications/external/technical_reports/PNNL-34462.pdf



Elements of a Battery Energy Storage System-Specific Zoning Ordinance

Definitions and General Provisions

Precise terminology, definitions, and clear language provide clarity on locations that allow Battery Energy Storage Systems (BESS) and applicable permitting requirements.

Create clear pathways for permits and approvals by size, use, and location

- **Size:** Clearly specify the BESS capacity at which requirements apply. Apply the following standards & codes in this document to BESS with a rated nameplate capacity greater than or equal to 1 MWh. Exempt BESS connected to residential structures.
- **Use:** Clearly specify the BESS uses for which these standards apply. Ensure distinction between BESS that are standalone facilities, and those that are a part of solar or other energy generation facilities. Standards should apply to the relevant technology.
- **Location:** Designate BESS as an allowed use in industrial and commercial zones. Designate BESS as a conditional use in other zones. BESS designated as an "allowed use" or "by right" in a zone must be approved if they satisfy all applicable standards. BESS designated as a "conditional use" or "special use" in a zone are not automatically allowed but may be approved with additional conditions.

Reducing Environmental Impacts

Wildlife, habitat, and water impacts of development are highly relevant in the Southwest, and projects should aim to reduce these impacts.

Environmental Compliance: Standards that ensure consultation and compliance with relevant local, state, and federal environmental requirements.

- Project applicants shall comply with, and receive the necessary permits for, relevant local, state, and federal environmental and wildlife laws prior to commencing construction of the BESS facility. Project applicants shall consult with state wildlife agencies, as applicable.

Stormwater: Standards that manage stormwater runoff and water quality on site.

- Require a stormwater assessment and management plan to control runoff, prevent erosion and manage water quality, in line with standard requirements for similar types of development.

Mitigating Visual and Sound Impacts

Mitigation measures for visual and sound impacts can address common points of community concern without overly restricting development.

Setbacks: The minimum distance between the BESS facility and the lot lines.

- Apply the general setback standards in the underlying zoning district. If a specific threshold is set, 50 – 150 ft is a reasonable range.
- Internal spacing between BESS units should comply with the most recent NFPA 855 requirements, it should not be specified in an ordinance.

Fencing: Measures to improve site safety and reduce visual impacts.

- Require a perimeter fence with a height of at least seven feet, in line with installation safety standards established in the most recent NFPA 70®, the National Electrical Code mandatory in all 50 states.
- Allow for use of vegetative screening and landscape buffering to minimize visual and sound impacts, if in accordance with NFPA 855.

Lighting: Measures to limit light pollution, particularly if no lighting standards already exist.

- Apply the general lighting requirements in the underlying zoning district. Require a lighting plan and limit lighting to minimum illumination necessary.

Noise: Measures to limit sound from inverters, transformers, and cooling equipment from the BESS.

- Apply the general noise limits of the underlying zoning district or set a specific decibel limit of 60 dBA time weighted average – about the volume of a dishwasher –measured at the property boundary if abutting property is in a separate zoning district. Align with standard state measurement processes.
- Allow for waiver of noise limits based on informed consent and negotiated agreement with adjacent property owners.

Height: A limit on the allowed height of the BESS facility. The typical height of a BESS unit is eight to twelve feet.

- Apply the general height limits of the underlying zoning district.

Safety Standards and Certifications

Ordinances should aim to mitigate fire risks and consider impacts on and to infrastructure associated with the BESS facility. Require compliance with national safety standards by incorporating the standards by reference, rather than replicating technical requirements into an ordinance.

Safety Standards: Standards to mitigate fire risk and ensure compliance with national standards for BESS installation.

- Incorporate the latest edition of NFPA 855 by reference. Reference 'the latest edition' rather than a specific year to ensure standards remain up to date as new editions are released.
- Require a commissioning plan, an emergency response plan collaboratively prepared with the local fire department, and a hazard mitigation analysis, as required NFPA 855, as a condition of approval.
- Require a plan to provide site-specific training for fire service and emergency personnel prior to commercial operation.

NFPA 855 is the *Standard for the Installation of Stationary Energy Storage Systems* published by the National Fire Protection Association. NFPA 855 is the primary national safety standard for the design, installation, and operation of utility-scale battery energy storage. It outlines criteria based on the technology used, where it is installed, the size and layout of the system, and the fire suppression and control systems in place.

NFPA 855 is not self-enforcing, meaning that local jurisdictions must incorporate the code by reference and enforce it. It is periodically updated, so local jurisdictions should ensure compliance with the latest edition.

NFPA 855 contains criteria on:

- Site and separation distances of units to manage ventilation and reduce fire risk
- Fire detection, suppression systems, and testing under UL 9540
- Battery management and monitoring systems
- Installation requirements for thermal management and electrical safety
- Hazard mitigation and emergency response planning
- Decommissioning and end of life processes

Please note, NFPA is currently developing NFPA 800, a Battery Safety Code that will complement existing standards and codes, with additional provisions that cover the lifecycle of the battery beyond what is covered in NFPA 855. The first edition of NFPA 800, which could be released in Spring of 2026, may also be incorporated by reference.

Equipment Certification: Provisions to ensure compliance with product certification and testing standards.

- Require BESS be listed in accordance with UL 9540, with subcomponents meeting UL 1973.
- Require large-scale fire testing be carried out in accordance with UL 9540A.

UL 9540, UL 1973, and UL 9540A, developed by UL Solutions, are standards that ensure BESS components are properly manufactured and tested.

UL 9540 is the *Standard for Energy Storage Systems and Equipment*, a product certification standard that evaluates whether an individual BESS unit is properly manufactured and safe. It evaluates the product at the system level of the unit and contains criteria around construction and materials, electrical safety, thermal management and more.

UL 1973, the *Standard for Batteries for Use in Stationary, Vehicle Auxiliary Power and Light Electric Rail (LER)*, is one step below UL 9540 and certifies the battery modules or packs that, put together, create a unit in a BESS.

UL 9540A is the *Standard for Test Method for Evaluating Thermal Runaway Fire Propagation in BESS* to assess the fire safety hazard. This test generates data around the fire behavior of the specific product to inform fire prevention strategies, such as through the NFPA 855 Hazard Mitigation Analysis.

Site Maintenance and Modification

BESS sites should be well maintained with clear decommissioning plans.

Vegetation: Standards for vegetation maintenance to reduce fire risk.

- Require a vegetation management plan in compliance with applicable fire code. Ensure vegetation management and weed control during and post-construction, including limiting non-native species, revegetation, and maintenance of ground cover.
- Require all combustible vegetation or other combustible growth within 10 feet of a BESS unit be cleared, in accordance with NFPA 855.

Access and Road Use: Standards for maintaining site access.

- Require access drives be designed in consultation with the local fire department and maintained to enable emergency vehicle access.

Augmentation: Standards that address repairs, modifications, and additions to a BESS facility to remedy capacity degradation over time.

- Allow augmentation of a facility so long as the augmentation is within the project footprint without requiring a new or amended use permit. Require notice of augmentation 90 days before augmentation commences, if augmentation is not already in approved site plan.
- Augmentation outside the project footprint or a change in battery chemistry shall be considered a new application.

Decommissioning: Standards for returning the land to other uses.

- Require decommissioning plan, to be updated every five years, that at a minimum describes the cost of decommissioning, equipment removal and disposal, a site restoration plan, and financial assurance, in accordance with NFPA 855.
- Require decommissioning commence within 12 months of project cessation and complete decommissioning within 12 months.

Capacity degradation is an inherent characteristic of BESS, typically requiring module replacement ever seven to ten years throughout a 20-30 year project lifecycle. As technology evolves, original modules may be replaced with newer chemistries that have improved thermal stability and longer life cycles. However, should new battery chemistries be integrated into a project, all replacements must remain compliant with NFPA 855 standards.

Other Elements

Ordinances can incorporate other helpful elements to incentivize and maximize benefits to communities.

Analysis of local benefits: An application requirement useful for communicating project upside.

- Require local benefit analysis including project cost, estimated tax receipts to locality, percent of construction dollars spent locally, and job creation.

Other Resources

- American Clean Power 2026 Model Ordinance
- Planning & Zoning Guide and Model Ordinance for Battery Energy Storage Systems, Center for EmPowering Communities, University of Michigan
- Zoning Practice: Battery Energy Storage Systems, American Planning Association
- Battery Energy Storage System Guidebook, New York State Energy Research and Development Authority
- Factsheet on NFPA 855, American Clean Power