NC CLEAN ENERGY TECHNOLOGY CENTER

Carolinas Development Assistance and Siting Hub

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# NORTH CAROLINA UTILITY-SCALE SOLAR AND STORAGE MODEL ORDINANCE

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# NC Utility-Scale Solar and Storage Model Ordinance

## Introduction

Currently ranking 5th in installed solar capacity, and ranking 2nd within the last decade, North Carolina has a legacy of being a national leader in solar deployment.[1] Rapid solar development in the early 2000s - 2010s led to the first iteration of the NC Clean Energy Technology Center's Solar Model Ordinance in 2013, with minor revisions up to 2016. Today, North Carolina continues to see deployment of solar energy on different scales. The State is experiencing unprecedented energy demand, growing community concerns over large-scale renewables, and a changing energy policy landscape since 2016. With this context in mind, the Carolinas Development Assistance and Siting Hub (DASH), a program led by the NC Clean Energy Technology Center, organized a second collaborative effort to construct a template ordinance.[2] This template provides policy-based best practices for regulation and, unlike the previous version, includes provisions addressing both utility-scale solar systems (SES) and utility-scale battery energy storage systems (BESS).

This template ordinance is especially relevant given the urgent need to expand grid capacity. Duke Energy, North Carolina's utility provider, forecasts in its 2025 Carolinas Resource Plan that total net energy demand across its two North Carolina systems is projected to increase between 16% and 60% over the next 15 years, compared to a 7% increase across the state over the last two decades. To meet this demand, Duke Energy plans to procure 4,000 MW of solar through competitive processes between 2025 and 2028, with projects expected to come online between 2030 and 2034. The company has also targeted battery energy storage, aiming for 5,600 MW by 2034 in its plan.[3] To meet these targets, these renewable projects will be going up in communities across North Carolina, and local governments need to be equipped to regulate these land uses with clear and common-sense guidelines.

This material was prepared as part of the Carolinas DASH, which provides education and technical assistance on reliable energy siting and permitting issues for local governments and communities in North and South Carolina. This model ordinance was developed to help local governments navigate the permitting of large-scale solar and

[1] https://seia.org/state-solar-policy/north-carolina-solar/
[2] https://carolinas-dash.org/
[3] https://www.duke-energy.com/our-company/about-us/irp-carolinas

battery energy storage projects. The Carolinas DASH also houses the North and South Carolina county ordinance database covering regulations for utility-scale solar, wind, and energy storage. As of the most recent update to the Carolinas DASH ordinance database in early March 2026, 69% of counties in North Carolina have specific regulations pertaining to solar permitting, and 5% explicitly reference energy storage permitting. This variation illustrates how inconsistent approaches to regulating solar and energy storage development have created a patchwork of disparate and often undefined local standards, potentially creating unnecessary barriers to investment and project development.

Since the drafting of the previous model ordinance, there have been substantial policy changes at both the state and federal levels, altering the economics that drive projects and the considerations reflected in the model itself. The North Carolina legislature passed H.B. 589 (2017), "Competitive Energy Solutions for NC," which reduced the maximum size for standard contract power purchase agreements (PPAs) from 5 MW to 1 MW, incentivizing developers to pursue larger-scale projects. At the federal level, the Inflation Reduction Act (IRA) of 2022 introduced, expanded, or extended investment and production tax credits for energy technologies of all kinds, including solar and energy storage, and fueling a nationwide push to procure and build more renewable energy. However, many of the incentives created or extended by the IRA were repealed or are slated for accelerated phase-out due to the passage of the One Big Beautiful Bill (OBBB) Act in July 2025. In 2023, North Carolina established solar decommissioning requirements for projects larger than 2 MW. In 2024, a similar bill was introduced to establish decommissioning requirements for BESS of 1 MW and above, but it ultimately died in committee. Meanwhile, since the mid-2010s, battery energy storage has proliferated nationwide due to declining costs and improvements in grid reliability.

The drafting process included five months of stakeholder engagement sessions and several rounds of revisions based on stakeholders' written feedback. The stakeholders included representatives from government and planning, the agricultural and environmental sectors, and the utility and solar industries.[4] Balancing stakeholder interests on each aspect of this template ordinance was the goal throughout the drafting process with the understanding that the NC Clean Energy Technology Center was the sole decision maker on what was included in the template. The template ordinance set forth in this document aims to organize and harmonize language for regulating solar and energy storage at the county and municipal levels while incorporating best practices. The ordinance proposes development regulations based

[4] See Appendix A: List of Stakeholders

on trends in North Carolina and across the nation to maximize the requirements' legitimacy and relevance.

## Recommended Ordinance Adoption Protocol

This template is not law, rather carefully crafted guidance for municipalities and counties to consider when adopting ordinances specific to solar and energy storage development in their jurisdiction. The authors of this template emphasize that the standards must be tailored to local land development ordinances and suggest that ordinances treat solar similarly to other uses with similar attributes and land/community impacts. Sections within the template that include ***ranges of values in brackets*** are intended to present a minimum and maximum possible value. The suggested ranges allow authority having jurisdictions (AHJs) to select a single value within the range that best aligns with their priorities and local context. The zoning districts included in this template ordinance are generic and ***must be replaced with the jurisdiction's existing zoning districts***. The template ordinance may also be applied in non-zoned jurisdictions upon the modification and approval of the authorizing agency. Furthermore, the adoption of an ordinance will not supersede any existing federal, state, or local rules pertaining to the development of the project.

Solar and storage technologies are fundamentally different in their features and risk profiles. Accordingly, the technologies have different appropriate standards to manage their unique impacts. It is ***highly recommended*** that jurisdictions consider ***adopting and applying distinct standards for each solar and storage technology***. As written, the utility-scale solar and battery energy storage ordinances are intended to be considered for adoption together. The ordinances reference one another for appropriate technology standards in the case of a potential co-located solar and storage facility.

This document also includes appendices that address additional topics and resources relevant to communities and other solar and storage facility stakeholders, but which were not deemed appropriate for inclusion in the body of the template ordinance. These topics include, for example, local benefit mechanisms and a glossary of land use terms referenced throughout the document.

## Stakeholders Available for Contact*

*List indicates stakeholders available for contact surrounding the model ordinance and solar and storage development. A stakeholder organization's inclusion in the list does not necessarily indicate endorsement of the ordinance or its provisions.

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## Living Document

As with previous model ordinance iterations, this model ordinance, as a living document, will continue to evolve with the state policy landscape and new information. The document is no longer in the working document stage; however, readers may contact the Center by emailing both ccflanag@ncsu.edu and dsire-admin@ncsu.edu with feedback for potential consideration and incorporation.

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# Utility-Scale Solar Energy System Zoning Ordinance

## 1. Purpose

The purpose of this ordinance is to facilitate the construction, installation, and operation of utility-scale solar energy systems (SES) in the authority having jurisdictions (AHJ) of _____ in a manner that promotes economic development and ensures the protection of public health, safety, and general welfare while also preserving the character of the community. It is the intent of this ordinance to encourage the development of utility-scale SES that bolster local economic development and job creation, support the diversification of the state's energy portfolio, strengthen energy and grid security, reduce greenhouse gas emissions, reduce local air and water pollution, reduce reliance on foreign and out-of-state energy resources, and aid in North Carolina's target of electric public utilities achieving carbon neutrality by 2050.
Utility-scale SES may be co-located with battery energy storage systems (BESS); in such cases the relevant standards from the utility-scale SES and BESS ordinance provisions will be applied to the corresponding technology. In the case of conflicting provisions, the more stringent applicable provisions shall govern. This ordinance is not intended to abridge safety, health or environmental requirements contained in other applicable codes, standards, or ordinances. The provisions of this ordinance shall not be deemed to nullify any provisions of local, state or federal law.

## 2. Definitions

**Decommissioning**: The removal and proper disposal of solar energy equipment, facilities, or devices located on real property utilized by or in a solar energy system. This includes the reasonable restoration of the property as nearly as practicable to its condition before the
utility-scale SES was sited or to an alternative condition agreed upon in a written contract or lease agreement between the landowner and the project owner. Restoration activities include but are not limited to: soil stabilization and revegetation of the ground cover of the real property disturbed by the installation of such equipment, facilities, or devices.

a. "Solar energy equipment" means electrical material, hardware, inverters, conduit, storage devices, footings, braces, stands, or any other equipment to any electric grid equipment associated with the operation of a solar energy system.

**Dual-use**: Pairing of solar with other land uses, which include but are not limited to active
agricultural production, pollinator habitats, aquaculture, or other compatible land uses.

**Energy Storage**: A device or group of devices assembled together, capable of storing energy in order to supply electrical energy at a later time.[5]

**Nameplate capacity**: The maximum rated output of a generator, prime mover, or other electric power production equipment under specific conditions designated by the manufacturer. Installed generator nameplate capacity is commonly expressed in megawatts ($MW_{AC}$) and is usually indicated on a nameplate physically attached to the generator.[6]

**National Electrical Code (NEC)**: Also known as NFPA 70, is a set of standards for the safe electrical design, installation, and inspection to protect people and property from electrical hazards.

**Nonparticipating property:** Property that is not subject to any agreement (e.g., lease, easement, or any other agreement) with the utility-scale SES and BESS.

**Pollinator Habitat**: The establishment of conservation efforts to provide native and/or naturalized perennial vegetation and foraging habitats to gamebirds, songbirds, and pollinators; and reduce stormwater runoff and erosion at solar generation sites.[7]

**Utility-scale battery energy storage system (BESS)**: An electrochemical energy storage system with a rated discharge capacity that is equal to or greater than 4 megawatt-hours and is interconnected to an electric utility's transmission or distribution system pursuant to an interconnection agreement, intended to supply electric power to the electric grid or one large end-use customer, rather than to offset on-site consumption of a small or medium residential or commercial customer. It may be a primary use or accessory use to an SES, power generating facility, or substation.[8]

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[5] https://www.nfpa.org/codes-and-standards/nfpa-855-standard-development/855
[6] https://www.eia.gov/tools/glossary/index.php?id=G#gen_nameplate
[7] https://www.scstatehouse.gov/code/t50c004.php
[8] Co-location is addressed in this ordinance, but specific accessory use definitions between utility-scale SES and utility-scale BESS have not been outlined in this ordinance due to a range of methodologies and feedback on defining BESS as an accessory use. Some real-world and model ordinances define accessory use based on whether the BESS has greater capacity than the SES, whether it fits within the existing SES footprint, if the BESS serves the SES or the greater grid, or simply make BESS an accessory use within an SES primary use. Commenters also raised the possibility of BESS using surplus interconnection service with an SES as an accessory use. AHJs may reference accessory use determinations from APA Zoning

**Utility-scale solar energy system (SES)**: An assembly of photovoltaic devices used to generate electricity from solar energy and interconnected to an electric utility's transmission or distribution system pursuant to an interconnection agreement, intended to supply electric power to the electric grid or one large end-use customer, rather than to offset on-site consumption of a small or medium residential or commercial customer.

## 3. Applicability

a. This ordinance applies to the construction of any new utility-scale Solar Energy Systems (SES) with a nameplate capacity equal to or greater than 2 megawatts ($MW_{AC}$) within the jurisdiction of the AHJ.
b. Utility-scale SES for which a building or electrical permit has been issued prior to the effective date of this ordinance shall remain exempt:
    i. Exception: Modifications to an existing SES that increase the SES area by more than 5% of the original footprint shall be subjected to this ordinance.
c. Energy Storage
    i. Co-located energy facilities: If a BESS is to be co-located with another energy facility, such as a wind or solar energy facility, both land uses may be included in one application and each component shall be reviewed for compliance with the appropriate standards.
    ii. Standalone utility-scale BESS facilities will be regulated as a primary use.

## 4. Design

a. Setbacks
    i. Setbacks will be consistent with [AHJ's] setback ordinance or standards typically applied in the relevant zoning district. When current zoning setback standards are determined to be inadequate based on a legitimate community purpose consistent with local government planning documents, the [Zoning Administrator/Planning Director] may require the following setback requirements:

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Practice: Battery Energy Storage Systems and draft model bylaw from the Massachusetts Department of Energy Resources. Additionally, subsequent BESS additions as they relate to minor/major permit modifications and additions within existing project footprints have not been outlined in this ordinance based on stakeholder feedback that adding utility-scale BESS within the footprint of an existing utility-scale SES may not be feasible and potential compatibility concerns between existing SES and new BESS equipment. AHJs may reference Appendix H to see preliminary language for review and modification.

1. A utility-scale SES, measured from the nearest edge of the perimeter fencing of the SES facility, shall be located at least 50 feet from a nonparticipating property parcel line and at least 50 feet from the nearest edge of any road right-of-way.
2. A utility-scale SES, measured from the nearest edge of the perimeter fencing of the SES facility, shall be located at least [100-200] feet from the outside wall of any sensitive receptor on a property other than that on which the utility-scale SES facility is to be installed.[9]

ii. These setback provisions above can be altered by the [Board of Adjustments] through the applicable variance process.[10]

iii. Necessary ingress and egress for vehicles and utility and transmission lines may be located within the perimeter setback.

b. Buffer and Screening[11]

i. Intent: The intent of the following buffer and screening provisions is to mitigate the visual impacts of utility-scale SES facilities on neighboring sensitive receptors and public rights of way. Buffer requirements apply on each side of the facility based on the adjacent land use or receptor specified below. Different requirements may apply to different segments of the same perimeter dependent on the adjacent features.

ii. A landscaping plan that identifies the type and extent of the proposed buffer and screening and that demonstrates that any buffer and screening complies with the requirements as outlined in the ordinance will be submitted.

[9] The setback is presented as a range of values in brackets to indicate minimum and maximum possible standards. This range allows the authority having jurisdiction (AHJ) to select a single value that best aligns with local priorities and context. Values toward the higher end of the range may disincentivize development by increasing the amount of required non-buildable area, thereby reducing the total developable land available. Because project feasibility is tied to the amount of usable land, a reduction in buildable area can weaken project economics and make it more difficult for development to pencil out.

[10] If AHJs wish to allow for administrative approval of alternative compliance by planning staff, alternative requirements should be tied to objective, measurable standards. For example, some North Carolina jurisdictions allow reduced setbacks when applicants enhance visual buffers, such as increasing buffer opacity, width, or vegetative density, provided those improvements meet clearly defined ordinance criteria to allow for administrative determinations by planning staff. For example [xyz specific enhancement] may result in an [xyz % or foot setback reduction].

[11] Due to its relatively low height and visual impacts, existing screening and buffering provisions can often be utilized for solar. However, if a jurisdiction determines that there is a legitimate community concern requiring separate screening requirements to maintain character in an area with sensitive receptors, the additive buffer provisions may be appropriate.

iii. Screening and buffering will be consistent with [AHJ's] screening ordinance or standards typically applied for land uses requiring screening. In districts that call for screening or landscaping along rear or side property lines, these shall only be required where an adjoining non-participating property has an existing sensitive receptor.

iv. When current zoning district screening and buffering standards are determined to be inadequate based on a legitimate community purpose consistent with local government planning documents, the [Zoning Administrator/Planning Director] may require the following buffer requirements based on the adjacent land use or features.

1. An opaque buffer requirement will apply if the adjacent land use or features are a sensitive receptor or residential district.[12]
2. A sensitive receptor is any of the following located on non-participating parcel(s):
    a. An occupied dwelling unit (structure used and intended for human habitation)
    b. School or educational facility or licensed childcare facility
    c. A place of worship (facility used primarily for religious assembly)
    d. A community building
3. Buffer and screening type definitions
4. Opaque buffer: A buffer that functions as a continuous visual screen and contains little to no gaps at maturity. [AHJ should insert its buffer requirements consistent with the intent of an opaque buffer. AHJ may refer to its own screening and landscape requirements, consistent with the intent of an opaque buffer. Please refer to Appendix E for examples of buffer types in North Carolina.]

v. Additional plant and site preparation requirements

1. The vegetative buffer and screening shall utilize a variety of species to avoid the creation of a monoculture vegetative buffer.

[12] Best practice from SolSmart materials recommend that screening should not be required along roadways or highways unless there is a clear community interest in maintaining the viewshed. https://solsmart.org/wp-content/uploads/2024/05/Solar-PV-Best-Pracitices-in-Planning-and-Zoning-for-Colorado-Communities.pdf

2. Existing trees, shrubs, and vegetation shall be preserved to the maximum extent practicable, unless preservation impedes safety, access, or promoting healthy growth. Existing vegetation that is deemed to meet the applicable screening and buffering type requirement for the adjacent use may be credited towards compliance with said requirement.
3. Developers should avoid clear-cutting or adding impervious surface to the area of a required buffer whenever possible.
4. To the maximum extent practicable, the vegetative buffer should be planted in accordance with the North Carolina Technical Guidance for Native Plantings on Solar Sites.[13]
5. Buffer and site preparation should minimize grading where possible.

vi. Alternative Compliance

1. The [Zoning Administrator/Planning Director] may determine that an existing natural or constructed feature [under the same ownership or control as that of the SES parcel] the intent of the above buffer and screening requirements without requiring new plantings, upon written finding that the existing feature meets the following requirements:
    a. Existing vegetation will be credited as complying with the applicable buffer and screening requirements if:
        i. The vegetation is located along the applicable perimeter between the facility and the adjacent use or feature
        ii. The vegetation provides screening that is at least equivalent to the applicable buffer and screening requirements in terms of height, opacity, and character
        iii. The applicant submits documentation that the existing vegetation meets requirements (i) and (ii) above and agrees to maintain the existing vegetation in accordance with otherwise applicable buffer and screening maintenance requirements.

[13]https://web.archive.org/web/20250206175215/http://ncpollinatoralliance.org/wp-content/uploads/2018/10/NC-Solar-Technical-Guidance-Oct-2018.pdf

b. Existing constructed barriers or topographic features (i.e. a highway sound barrier, noise wall, embankment, berm, or other constructed or natural physical feature) will be credited as complying with the applicable buffer and screening requirements if
    i. The feature is located along the applicable perimeter between the facility and the adjacent use or feature
    ii. The feature provides screening that is at least equivalent to the applicable buffer and screening requirements in terms of height, opacity, and character as viewed from the adjacent use or feature at ground level
    iii. The applicant submits documentation that the existing feature meets requirements (i) and (ii) above
c. Where an existing feature or existing vegetation satisfies the screening requirements for only part of the perimeter of the facility, new plantings (or other screening and buffer compliance actions) will only be necessary for the parts of the perimeter where the existing feature does not satisfy the above credit criteria.

vii. Transmission and utility lines extending outside of the facility's perimeter fence will not be subject to the buffering and screening provisions. To the extent possible, such lines will be located underground.

c. Fencing
    i. Fencing 7 feet in height with a self-locking gate shall be installed for security and to prevent unauthorized access.
        1. Use the wildlife-permeable fencing design standards approved by the N.C. Chapter of the Nature Conservancy when possible.[14]
        2. Alternative fencing can be used if the site incorporates dual-use systems.
d. Height Restrictions

[14] https://www.nature.org/content/dam/tnc/nature/en/documents/2023SolarGuidanceTNCNC.pdf

i. Except for poles, lines, and other equipment necessary to connect the facility to the electrical utility grid, including communications and data collection equipment, no structure shall achieve a height of greater than [20-25] feet.
    1. Dual-use solar systems – such as installations combined with active agricultural production, pollinator habitats, aquaculture, or other compatible land uses – may receive an exemption from the height limitation. Approval of such exemptions shall be subject to review by the [Building / Planning] Department or their designee, and may include conditions to ensure continued land use compatibility, safety, and site aesthetics.

e. Noise[15]
    i. OPTION 1: Noise requirements will be consistent with [AHJ's] noise ordinance provisions established for each land use zone. When current noise standards are determined to be inadequate based on a legitimate community purpose consistent with local government planning documents, the [Zoning Administrator/Planning Director] may require the following noise requirements based on the adjacent land use or features:
        1. Noise levels will be modeled at the nearest outer wall of the nearest sensitive receptor located on a non-participating property. The sound pressure level shall not exceed a noise level of (i) [55-65] dBA (Leq, 1-hour) when the relevant sensitive receptor is located on a residential neighboring parcel or [65-75] dBA (Leq, 1-hour) for a relevant sensitive receptor located on a non-residential neighboring parcel or (ii) the existing ambient noise level, whichever is greater.

[15] The noise section is based on the understanding that utility-scale SES facilities are not inherently noisy; rather, specific components, most notably inverters, can generate a low-level humming sound. To address this, the template provides two regulatory options for local governments. Option 1 establishes ranges of hourly equivalent sound levels according to neighboring parcel type if the underlying noise ordinance is deemed inadequate. This range allows the AHJ to select a single value that best aligns with local priorities and context. However, this approach has received feedback noting that inconsistent methodologies for measuring sound proves difficult for demonstrating compliance across jurisdictions. Under this option, sound levels should be measured at the exterior wall of the nearest sensitive receptor. Option 2 responds to these concerns by avoiding sound measurement requirements altogether. Instead, it requires a fixed setback distance between stationary noise sources, such as inverters from sensitive receptors based on modeling conducted for the State of Washington. Both options include an exemption for temporary increases in noise associated with maintenance and repair activities.

Decibel modeling shall use the A-weighted scale as designed by the American National Standards Institute.

2. Any maintenance activities will be exempt from this requirement.

ii. OPTION 2: Noise requirements will be consistent with [AHJ's] noise ordinance provisions established for each land use zone. When current noise standards are determined to be inadequate based on a legitimate community purpose consistent with local government planning documents, the [Zoning Administrator/Planning Director] may require the following noise requirements based on the adjacent land use or features:

1. Stationary noise sources (i.e. inverters and transformers) will be set back at least 350 feet from sensitive receptors at time of permit application.

f. Lighting
   i. Lighting shall be the minimum necessary for safety and/or security purposes and shall be shielded and downward facing to minimize off-site glare.[16]

g. Glare
   i. Solar collectors in the utility-scale SES must be designed to have an anti-glare coating to minimize glare. Mirrors shall not be allowed.

h. Federal Aviation Administration (FAA) Notification
   i. In the case that a project is located within a federally obligated airport or within 2 miles of the approach zone, permit applicants for utility-scale SESs shall utilize the FAA Notice Criteria Tool to determine whether Form 7460-1 needs to be filed in order to be studied by the FAA.

i. Signage
   i. A warning sign concerning voltage must be placed at the main gate to include the address and name of the solar energy system operator and a local, 24-hour phone number for the solar farm operator in case of an emergency. The sign should meet all Occupational Safety and Health Administration (OSHA) and National Electrical Code (NEC) requirements.
   ii. The utility-scale SES will comply with the requirements of the applicable zoning district for displaying any advertisement and may have signs that

[16] https://www.fws.gov/project/dark-skies-initiative

iii. Contain educational information about the utility-scale SES.

## 5. Permit

| Zoning District | Agricultural/ Residential | Office/ Institutional | Commercial/ Business | Industrial |
|---|---|---|---|---|
| Utility-scale SES | P | SUP | SUP | P |
| The use table is intended to illustrate where utility-scale SES may be permitted by right (P) or allowed as a special use (SUP), subject to review and approval by the appropriate body.<br><br>***Agricultural/Residential***: Represents rural areas characterized by low-density residential development and agricultural uses.<br>***Office/Institutional***: Represents areas intended for office uses, public institutions, and other civic-oriented development, often with a mix of complementary uses.<br>***Commercial/Business***: Represents areas to accommodate a range of retail, service, and commercial uses, and may also include mixed-use or residential development.<br>***Industrial***: District that includes both high- and low-impact industrial uses. | | | | |

## 6. Application

a. Any application for a utility-scale SES will contain the following information. Where a utility-scale SES requires a Special Use Permit, the general requirements for such a permit set forth in [AHJ] zoning code will also apply:
   i. Basic Information
      1. A summary description of the project, including its general location.
      2. The address of the property on which the utility-scale SES will be located.
      3. A description of the applicant, project owner, and operator, including their respective business structures; including the names, addresses, e-mail addresses, and phone numbers of the applicants, owners and operators, and all property owners.
      4. If known, the installation company's name, address, telephone number, email address, and license number.
      5. Evidence of a legally binding agreement that exemplifies site control, such as an option agreement.

6. Total nameplate capacity AC of the utility-scale SES facility.
7. A preliminary equipment specification sheet that documents the proposed utility-scale SES components, inverters, and associated electrical equipment that are to be installed.
    a. A final specification sheet will be required prior to commencing construction.
8. A site plan of the property, including:
    a. Existing property lines, structures, physical features, rights of way, roads, vegetative cover, watersheds, or wetlands on the property.
    b. Proposed changes to the landscape, including, vegetation change, screening, fencing, and exterior lighting.
        i. Planned location of structures (including solar arrays, inverters, transformers, electrical substations, and buildings), property lines, setback lines, public access roads, substations, electric cabling, transmission.

ii. A decommissioning plan shall be submitted at the time of application, as outlined below and in compliance with North Carolina General Statutes.

iii. When applicable, zoning district designation of the project.

iv. Certifications and further Compliance

1. The applicant shall submit an affidavit that provides, to the best of the applicant's knowledge:
    a. Construction and operation of the utility-scale SES will comply with all applicable federal and state laws;
    b. Construction and operation of the utility-scale SES will comply with all local laws, including the requirements of the [AHJ] zoning code, unless waived by the [AHJ].
2. Prior to site plan approval, the applicant will provide a timeline for all relevant permits required by federal, state, and local law and commit to providing the [AHJ] notification of permit applications and their progress. All relevant permits must be granted before commencing construction.

## 7. Decommissioning

a. A Decommissioning Plan shall be submitted at the time of permit application. The Decommissioning Plan shall comply with the requirements set forth in North Carolina Session Law 2019-132. All decommissioning procedures and financial assurance provisions shall follow the applicable state statute.[17]

[17] In addition to complying with the requirements in State regulations, the utility-scale solar project must comply with any applicable landowner and local government requirements that are more stringent than State law/rules. G.S. 130A-309.240(g) does not preempt the authority of the landowner/local authority.

# Utility-Scale Battery Energy Storage System Zoning Ordinance

## 1. Purpose

The purpose of this ordinance is to facilitate the construction, installation, and operation of utility-scale battery energy storage systems (BESS) in the authority having jurisdiction (AHJ) of _____ in a manner that promotes economic development and ensures the protection of health, safety, and welfare while also preserving the character of the community. It is the intent of this ordinance to encourage the development of utility-scale BESS that bolster local economic development, support diversification of the state's energy portfolio, strengthen energy reliability and grid security, increase solar dispatchability when paired with solar facilities, reduce reliance on foreign and out-of-state energy resources, and aid in North Carolina's target of electric public utilities achieving carbon neutrality by 2050. Utility-scale BESS may be co-located with solar energy systems (SES); in such cases the relevant standards from the utility-scale BESS and SES ordinance provisions will be applied to the corresponding technology. In the case of conflicting provisions, the more stringent applicable provisions shall govern. This ordinance is not intended to abridge safety, health, or environmental requirements contained in other applicable codes, standards, or ordinances. The provisions of this ordinance shall not be deemed to nullify any provisions of local, state or federal law.

## 2. Definitions

**Decommissioning**: The removal of all components of a battery storage system development. This includes but is not limited to BESS modules and associated anchoring systems and foundations and other structures, buildings, roads, fences, cables, electrical components or associated facilities and foundations to the extent the components of the development are not otherwise used in or proposed to be placed in productive use or otherwise authorized to remain in place by the AHJ.

**Energy Storage**: A device or group of devices assembled together, capable of storing energy in order to supply electrical energy at a later time.[18]

**Nameplate capacity**: The maximum rated output of a generator, prime mover, or other electric power production equipment under specific conditions designated by the

[18] https://www.nfpa.org/codes-and-standards/nfpa-855-standard-development/855

manufacturer. Installed generator nameplate capacity is commonly expressed in megawatts ($MW_{AC}$) and is usually indicated on a nameplate physically attached to the generator.[19]

**National Fire Protection Association (NFPA)**: An independent, non-profit entity that develops fire safety codes and standards

**National Electrical Code (NEC)**: Also known as NFPA 70, is a set of standards for the safe electrical design, installation, and inspection to protect people and property from electrical hazards.

**NFPA 855**: The Standard for the Installation of Stationary Energy Storage Systems, which governs how an energy storage project interacts with the built environment. Requires fire protection and explosion prevention, and also requires project developers to provide local first responders with detailed information about the project, an emergency response plan, and training. This code is an industry standard that is in part incorporated into forthcoming versions of the NC Fire Code.

**Underwriters Laboratories (UL)**: A private company that provides independent product testing and certification services

**UL9540**: Standard for Energy Storage Systems (ESS) and Equipment, a standard that governs the design and construction of battery systems, ensuring that components are of good material, properly connected, and functional.

**UL9540A**: A testing procedure that induces thermal runaway in a system, measures its severity, and then imposes spacing requirements to limit a thermal runaway event from spreading

**Utility-scale battery energy storage system (BESS)**: An electrochemical energy storage system with a rated discharge capacity that is equal to or greater than 4 megawatt-hours and is interconnected to an electric utility's transmission or distribution system pursuant to an interconnection agreement, intended to supply electric power to the electric grid or one large end-use customer, rather than to offset on-site consumption of a small or medium residential or commercial customer. It may be a primary use or accessory use to an SES, power generating facility, or substation.[20]

[19] https://www.eia.gov/tools/glossary/index.php?id=G#gen_nameplate

[20] Co-location is addressed in this ordinance, but specific accessory use definitions between utility-scale SES and utility-scale BESS have not been outlined in this ordinance due to a range of methodologies and

**Utility-scale solar energy system (SES)**: An assembly of photovoltaic devices used to generate electricity from solar energy and interconnected to an electric utility's transmission or distribution system pursuant to an interconnection agreement, intended to supply electric power to the electric grid or one large end-use customer, rather than to offset on-site consumption of a small or medium residential or commercial customer.

## 3. Applicability

a. This ordinance applies to the construction of any new utility-scale BESS, as defined, within the jurisdiction of [AHJ]. This ordinance also applies to physical modifications that materially alter the type, configuration, or size of existing utility-scale BESS. The following requirements apply to all applications. [except in the case of differentiated requirements specified below for Special Use Permits.][21]

b. Utility-scale BESS applicants may include a plan for periodic augmentation (i.e. installation of additional enclosures) to maintain the system's capacity or nominally increase the system's capacity for approval as part of the site plan application. If the facility requires a permit, the owner of an operating utility-scale BESS shall provide notice to the [AHJ] at least [90 days] prior to the commencement of augmentation activities.

c. Augmentation that requires the issuance of a building permit may be administratively approved if the augmentation is substantially compliant with the augmentation plan approved with the relevant permit, does not involve a change in battery chemistry, and remains within the approved security perimeter.

d. If augmentation was not considered in the approved relevant permit and the augmentations would result in an increase in site footprint or a change

feedback on defining BESS as an accessory use. Some real-world and model ordinances define accessory use based on whether the BESS has greater capacity than the SES, whether it fits within the existing SES footprint, if the BESS serves the SES or the greater grid, or simply make BESS an accessory use within an SES primary use. Commenters also raised the possibility of BESS using surplus interconnection service with an SES as an accessory use. AHJs may reference accessory use determinations from APA Zoning Practice: Battery Energy Storage Systems and draft model bylaw from Massachusetts Department of Energy Resources. Additionally, subsequent BESS additions as they relate to minor/major permit modifications and additions within existing project footprints have not been outlined in this ordinance based on stakeholder feedback that adding utility-scale BESS within the footprint of an existing utility-scale SES may not be feasible and potential compatibility concerns between existing SES and new BESS equipment. AHJs may reference Appendix H to see preliminary language for review and modification.

[21] This text or similar text should be included should the AHJ adopt the differentiated NFPA 855 provisions for discretionary use permits.

in battery chemistry, such augmentation shall be considered under the relevant permit application process.

e. Co-located energy facilities: If a BESS is to be co-located with another energy generating facility, such as a wind or solar energy facility, both land uses may be included in one application and each component shall be reviewed for compliance with the appropriate standards.
f. Standalone utility-scale BESS facilities will be regulated as a primary use.

## 4. Design

a. Setbacks
    i. Setbacks will be consistent with [AHJ's] setback ordinance or standards typically applied in the relevant zoning district. When current zoning setback standards are determined to be inadequate based on a legitimate community purpose consistent with local government planning documents, the [Zoning Administrator/Planning Director] may require the following setback requirements:
        1. Utility-scale BESS facility, measured from the nearest edge of the perimeter fencing of the facility, shall be located at least [50-100] feet from a nonparticipating property parcel line and at least [50-100][22] feet from the nearest edge of any road right-of-way.
        2. A utility-scale BESS facility, measured from the nearest edge of the perimeter fencing of the facility, shall be located at least [100-200] feet from the outside wall of any sensitive receptor.
    ii. Necessary ingress and egress for vehicles and utility and transmission lines may be located within the perimeter setback
b. Buffer and screening[23]
    i. Intent: The intent of the following buffer and screening provisions is to mitigate the visual impacts of utility-scale SES facilities on neighboring sensitive receptors and public rights of way. Buffer requirements apply on each side of the facility based on the

[22] This range allows the AHJ to select a single value that best aligns with local priorities and context. Note that the industry standard code NFPA 855 (though not North Carolina currently adopted fire code at time of writing) recommends a clearance of 100 feet between BESS and non-associated structures for remote installations.
[23] Existing screening and buffering provisions can often be utilized. However, if a jurisdiction determines that there is a legitimate community concern requiring separate screening requirements to maintain character in an area with sensitive receptors, the additive buffer provisions may be appropriate.

adjacent land use or receptor specified below. Different requirements may apply to different segments of the same perimeter dependent on the adjacent features.

ii. A landscaping plan that identifies the type and extent of the proposed buffer and screening and that demonstrates that any visual buffer complies with the requirements as outlined in the ordinance will be submitted.

iii. Screening will be consistent with [AHJ's] screening ordinance or standards typically applied for land uses requiring screening. Any screening and landscaping shall be placed outside of the perimeter fencing. Screening is not subject to setbacks. In districts that call for screening or landscaping along rear or side property lines, these shall only be required where an adjoining non-participating property has an existing sensitive receptor.

iv. When current zoning district screening and buffering standards are determined to be inadequate based on a legitimate community purpose consistent with local government planning documents, the [Zoning Administrator/Planning Director] may require the following buffer requirements based on the adjacent land use or features.

1. An opaque buffer requirement will apply if the adjacent land use or features are a sensitive receptor or residential district. The requirements will still apply if such land uses or features are across a roadway or highway from the project.

v. Buffer and screening type definitions:

1. Opaque buffer: [AHJ may refer to its own screening and landscape requirements, consistent with the intent of a full opaque buffer. Please refer to Appendix E for illustrative examples of buffer types in North Carolina.]

vi. A sensitive receptor is any of the following located on non-participating parcel(s):

1. An occupied dwelling unit (structure used and intended for human habitation)
2. School or educational facility or licensed childcare facility
3. A place of worship (facility used primarily for religious assembly)
4. A community building

vii. Breaks in the buffer may be permitted to allow access to the property and for required gaps for utility easements and/or other critical services.

viii. The utility-scale BESS facility will have at least one entrance of sufficient design to allow for the provision of emergency services, as approved by [AHJ fire district].

ix. Areas within 10 feet of BESS containers and related equipment must be cleared of combustible vegetation.

x. Additional plant and site preparation requirements
    1. The vegetative buffer and screening shall utilize a variety of species to avoid the creation of a monoculture vegetative buffer.
    2. Existing trees, shrubs, and vegetation shall be preserved to the maximum extent practicable, unless preservation impedes safety, access, or promoting healthy growth. Existing vegetation that is deemed to meet the applicable screening and buffering type requirement for the adjacent use may be credited towards compliance with said requirement.

xi. Alternative Compliance
    1. The [Zoning Administrator/Planning Director] may determine that an existing natural or constructed feature [under the same ownership or control as that of the BESS parcel] satisfies the intent of the above buffer and screening requirements without requiring new plantings, upon written finding that the existing feature meets the following requirements:
        a. Existing vegetation will be credited as complying with the applicable buffer and screening requirements if:
            i. The vegetation is located along the applicable perimeter between the facility and the adjacent use or feature
            ii. The vegetation provides screening that is at least equivalent to the applicable buffer and screening requirements in terms of height, opacity, and character
            iii. The applicant submits documentation that the existing vegetation meets requirements (i) and (ii) above and agrees to maintain the existing vegetation in accordance with otherwise applicable buffer and screening maintenance requirements.

b. Existing constructed barriers or topographic features (i.e. a highway sound barrier, noise wall, embankment, berm, or other constructed or natural physical feature) will be credited as complying with the applicable buffer and screening requirements if
    i. The feature is located along the applicable perimeter between the facility and the adjacent use or feature
    ii. The feature provides screening that is at least equivalent to the applicable buffer and screening requirements in terms of height, opacity, and character as viewed from the adjacent use or feature at ground level
    iii. The applicant submits documentation that the existing feature meets requirements (i) and (ii) above

2. Where an existing feature or existing vegetation satisfies the screening requirements for only part of the perimeter of the facility, new plantings (or other screening and buffer compliance actions) will only be necessary for the parts of the perimeter where the existing feature does not satisfy the above credit criteria.

xii. Transmission and utility lines extending outside of the facility's perimeter fence will not be subject to the buffering and screening provisions. To the extent possible, such lines will be located underground.

xiii. Variances may be made for screening along properties adjacent to non-residential uses or along roadways with written authorization from the [Board of Adjustments].

c. Fencing
    i. Utility-scale BESS will be enclosed by a fence at least 7 feet high, in compliance with the latest code cycle of NFPA 70.

d. Height Restrictions
    i. Except for poles, lines, and other equipment necessary to connect the facility to the electrical utility grid, including communications and data collection equipment, no structure shall achieve a height exceeding the greater of 29 feet or the height limit of the underlying zoning district.

e. Noise

i. Noise requirements will be consistent with [AHJ's] noise ordinance provisions established for each land use zone. When current noise standards are determined to be inadequate based on a legitimate community purpose consistent with local government planning documents, the [Zoning Administrator/Planning Director] may require the following noise requirements based on the adjacent land use or features:

1. Noise levels will be modeled at the nearest outer wall of the nearest sensitive receptor located on a non-participating property. The sound pressure level shall not exceed a noise level of (i) [55-65] dBA (Leq, 1-hour) when the relevant sensitive receptor is located on a residential neighboring parcel or [65-75] dBA (Leq, 1-hour) for a relevant sensitive receptor located on a non-residential neighboring parcel or (ii) the existing ambient noise level, whichever is greater. Decibel modeling shall use the A-weighted scale as designed by the American National Standards Institute.

f. Lighting
   i. Lighting shall be the minimum necessary for safety and/or security purposes and shall be shielded and downward facing to minimize off-site glare.

g. Signage
   i. In compliance with NFPA 855 requirements in Chapter 9, signage will be posted on a utility-scale BESS facility. The signage shall comply with ANSI Z535 and shall include the type of technology associated with the utility-scale BESS, any special hazards associated with it, the type of protection system installed in the area of the utility-scale BESS and 24-hour emergency contact information.

## 5. Permit

| Zoning District | Agricultural/ Residential | Office/ Institutional | Commercial/ Business | Industrial |
|---|---|---|---|---|
| Utility-scale BESS | P | SUP | P | P |

The use table is intended to illustrate where utility-scale Battery Energy Storage Systems (BESS) may be permitted by right (P) or allowed as a special use (SUP), subject to review and approval by the appropriate body.

***Agricultural/Residential***: Represents rural areas characterized by low-density residential development and agricultural uses.
***Office/Institutional***: Represents areas intended for office uses, public institutions, and other civic-oriented development, often with a mix of complementary uses.
***Commercial/Business***: Represents areas to accommodate a range of retail, service, and commercial uses, and may also include mixed-use or residential development.
***Industrial***: District that includes both high- and low-impact industrial uses.

## 6. Application

a. The following shall be contained in any application for a utility-scale BESS:
    i. A site plan of the property, including:
        1. Existing property lines, structures, physical features, rights of way, roads, vegetative cover, watersheds, or wetlands on the property.
        2. Proposed changes to the landscape, including, vegetation change, screening, fencing, and exterior lighting
        3. Planned location of structures (including inverters, transformers, electrical substations, and buildings), property lines, setback lines, public access roads, substations, electric cabling, and transmission.
    ii. Certifications and further compliance:
        1. The applicant shall submit an affidavit that provides, to the best of the applicant's knowledge:
            a. Construction and operation of the utility-scale BESS will comply with all applicable federal and state laws;
            b. Construction and operation of the utility-scale BESS will comply with all local laws, including the requirements of the [AHJ] zoning code, unless waived by the [AHJ].
        2. Prior to site plan approval, the applicant will provide a timeline for all relevant permits required by federal, state, and local [AHJ] law and commit to providing the [AHJ] notification of permit applications and their progress. All relevant permits must be granted before commencing construction.
    iii. Where applicable, zoning district designation

## 7. Commissioning and Safety Standards

a. Commissioning Plan: Prior to commencing construction, a utility-scale BESS project applicant will submit a commissioning plan including the following:
   i. A summary description of the project, including its general location.
   ii. The address of the property on which the BESS will be located.
   iii. Name, address, phone number, and digital or physical signature of the project applicant, as well as all the property owners, demonstrating their consent to the application and the use of the property for the utility-scale BESS.
   iv. Name, address, and contact information of the proposed or potential system installer and the owner and/or operator of the utility-scale BESS. Such information of the final system installer shall be submitted prior to the issuance of the permit.
   v. An electrical diagram detailing the utility-scale BESS layout and electrical interconnection methods, compliant with applicable state or local electrical codes, including NEC and NESC.
   vi. A preliminary equipment specification sheet that documents the proposed utility-scale BESS components, inverters, and associated electrical equipment that are to be installed.
      1. A final specification sheet will be required prior to commencing construction.
   vii. Statement(s) from the local fire district responsible for fire protection at the site confirming that the applicant met with and conferred with the district prior to submission, discussed the energy storage system design, and sought input on mitigating potential fire and life safety concerns.

b. Safety Standards
   i. In the case of a permit application prior to the effective date of the 2024 North Carolina Fire Code, as that date may be established by the State Fire Marshal:
      1. Project applicants are strongly encouraged to request that the 2024 Code be accepted by the Code Enforcement Official as an alternate method of construction and applied to the project.
      2. Project applicants are strongly encouraged to voluntarily comply with and demonstrate compliance to the [AHJ] with NFPA 855, as amended.

ii. In the case of a permit application after the effective date of the 2024 North Carolina Fire Code, as that date may be established by the State Fire Marshal, project applicants shall, at minimum, comply with the applicable BESS standards of the most recent iteration of the North Carolina Fire Code.

Drafting note: Industry standard for BESS fire code inspection and adherence is compliance with NFPA 855, as amended. North Carolina is still operating under the 2018 North Carolina State Building Code, since the effective date of the 2024 North Carolina State Building Code has not yet been determined. The 2024 North Carolina State Building Code is an amended version of the 2021 International Fire Code (IFC), which incorporates BESS provisions from NFPA 855, though NFPA 855 has been amended with relevant provisions since the 2021 IFC. North Carolina code officials generally may not inspect to a standard that has not been adopted in North Carolina, i.e. more stringent than the currently effective North Carolina State Building Code, per General Statute 160D. There is an exception in the case of the state Building Code Council being able to approve provisions for local jurisdictions that are more stringent than the currently adopted standards; however, Council members have yet to be determined as of May 2026. Should the Building Code Council membership be determined, AHJs may consider submitting more stringent provisions to the Council for approval. At this time, in the case of by-right permits, AHJs are recommended to include a provision strongly encouraging that applicants request that Code Enforcement Officials apply the 2024 code to their project per North Carolina Administrative Code 102.5 Interim Use of Approved Rules in order to incorporate NFPA 855 in an enforceable way. Additionally, they are recommended to include a provision encouraging voluntary compliance with NFPA 855.[24] Please refer to 2018 North Carolina Fire Code Chapter 6 Section 608 and 2024 North Carolina Fire Code Chapter 12 Section 1207 for applicable North Carolina codes at time of Model Ordinance Version 1 publication.

## 8. Decommissioning

a. Decommissioning:[25] The owner of a utility-scale BESS shall be responsible for proper decommissioning of the system upon cessation of operations and restoration of the property in compliance with subdivision (c) of this subsection, including all costs associated therewith, no later than one year following cessation of operations. Prior to decommissioning, the owner of a utility-scale BESS or their designated agent(s) shall prepare a written decommissioning plan that provides the steps to be taken to decommission the system and restore the site. At a minimum, an owner shall take all of the following steps in decommissioning a system:

[24] https://www.ncosfm.gov/letter-re-2024-state-building-code-effective-date/open

[25] North Carolina does not currently have storage decommissioning laws commensurate with its solar decommissioning laws. BESS decommissioning provisions are based on an introduced battery decommissioning bill that draws on the state's solar decommissioning law. https://www.ncleg.gov/Sessions/2025/Bills/Senate/PDF/S728v1.pdf

i. Disconnect the utility scale BESS from the power grid.
ii. Remove all equipment from the utility-scale BESS, and collect and ship equipment for reuse, or recycle all of the components thereof practicably capable of being recycled, including energy storage system batteries; aboveground electrical interconnection and distribution cables that are no longer deemed necessary; subsurface cable no longer deemed necessary; any metal fencing; and electrical and electronic devices, including transformers and inverters. Components that will not be shipped for reuse, are incapable of being recycled, and do not meet the definition of hazardous waste shall be properly disposed of in (i) an industrial landfill or (ii) a municipal solid waste landfill. Energy storage system batteries that meet the definition of a hazardous waste shall comply with hazardous waste requirements for recycling and disposal as applicable.
iii. Restore the property (i) as nearly as practicable to its condition before the utility-scale BESS was sited or (ii) to an alternative condition agreed upon in a written contract or lease agreement between the landowner and the system owner. The condition of the property shall otherwise comply with any applicable statutory requirements, rules adopted thereunder, and requirements in local ordinance. Land that was cleared of trees for the utility-scale BESS may be revegetated or reforested with seedlings.

b. The owner of a utility-scale BESS shall submit a decommissioning plan, which shall be prepared, signed, and sealed by a professional engineer licensed in the State and shall contain all of the following information:
i. The name, address, and contact information for the owner of the system, and name, address, and contact information for the landowner of the property on which the system is to be sited, if different than the owner.
ii. A narrative description of how the decommissioning will be conducted, including the decommissioning sequencing; the disposition of materials to be used upon decommissioning, such as landfilling, reuse, or recycling of system equipment, which shall specifically delineate methods to be used for solid and hazardous waste; and a schedule for completion of the decommissioning activities.

iii. Information on equipment proposed to be salvaged, including estimated salvage value of the equipment for the purpose of determining financial assurance.
iv. Information on steps to be taken to restore the property in compliance with subdivision (a) of this subsection.
v. A cost estimate for decommissioning the system and restoration of the property in compliance with subdivision (a) of this subsection.
vi. The proposed mechanism to satisfy the financial assurance requirements established under subdivision (c) of this subsection.

c. The decommissioning plan shall include financial assurance:
   i. The applicant shall provide the county with one or more of the following financial assurance mechanisms: cash, insurance, trust funds, surety bonds, letters of credit, certificates of deposit, and financial tests in the amount of [100]% of the estimated decommission cost minus the salvageable value, or $[50,000], whichever is greater. Estimates shall be determined by a North Carolina-licensed professional engineer.
   ii. All performance bonds shall renew automatically; provide a minimum [90]-day notice to the county prior to cancellation; be approved by the Planning Director or their designee; and be provided by a company on the U.S. Department of Treasury's Listing of Certified Companies.
   iii. Every five years from the initial submission of the decommissioning plan and within one month from a change in ownership of a utility-scale BESS, a new estimate of the probable cost of decommissioning, prepared by a North Carolina-licensed professional engineer, shall be provided to the Building Department. Based on this updated estimate, the required bond, letter of credit, or other approved financial security shall be adjusted accordingly, either upward or downward, to accurately reflect the current potential cost of decommissioning.
d. The [AHJ] shall be notified prior to decommissioning an utility-scale BESS. The utility-scale BESS shall be decommissioned by the owner of the utility-scale BESS or their designated agent(s) in accordance with the decommissioning plan.
e. Abandonment:
   i. Should a utility-scale BESS cease operation or energy dispatch on a continuous basis for twelve (12) consecutive months, it shall be considered abandoned unless the current responsible party (or

parties) with ownership interest in the system provides substantial evidence to the [Building / Planning] Department or their designee of the intent to maintain and reinstate operation of the facility, with such evidence updated every three (3) months following the initial twelve (12) months of non-operation. Temporary cessation of operations due to routine maintenance, equipment replacement, system upgrades, repowering, battery module swaps, or construction activities associated with the continued operation or improvement of the facility shall not constitute abandonment or trigger decommissioning requirements. Planned idle periods for operational, regulatory, or testing purposes shall also not trigger decommissioning.

ii. Upon determination of abandonment, the [Building / Planning] Department or their designee shall notify the party (or parties) responsible that they shall remove the system and properly restore or stabilize the property for future use, per the decommissioning plan.

iii. If the responsible party (or parties) fails to comply after [six (6)] months from the date of notice has passed, the county may pursue all actions available at law or in equity, including, but not limited to; breach of contract, specific performance, mandatory injunctions, fines, abatement, nuisance, liens, assessments and judicial sale of the property.

## 9. Additional Use Standards for Special Use Permits for Utility-Scale BESS

a. For all facilities requiring a Special Use Permit, the [Board of Adjustment] shall approve a Special Use Permit upon finding that evidence establishes that the proposed facility:
b. Does not materially endanger public health or safety;
c. Meets all applicable conditions and specifications of the above articles and the following condition:
    i. All BESS components and facilities comply with the standards in NFPA 855, as amended;
d. Would not substantially injure the value of adjoining property or be a public necessity; and
e. Will be in harmony with the area in which it is located and be in general conformity with the comprehensive plan.

Drafting note: In the case of a by-right permit, the above drafting note about inspecting to the current NC Code per 160D or adhering to North Carolina Administrative Code 102.5 Interim Use of Approved Rules prevails. In the case of a discretionary permit (i.e. a special use permit or conditional rezoning), AHJs may be able to request compliance with NFPA 855 as amended as a condition of approval. However, to the authors' knowledge, such a provision has only been proposed and has not yet been adopted anywhere in North Carolina. Please consult with your AHJ's relevant legal counsel before proposing adoption of this condition.

# Appendices

## Appendix A: Stakeholder Organization List*

* List represents organizations contacted for feedback and/or invited to stakeholder feedback sessions.

- American Clean Power Association
- Cape Fear Council of Governments
- Carolina Solar Energy
- Carolinas Clean Energy Buyers Association
- Center for Energy Education
- Clean Energy Conservatives
- Clearway Energy
- Clemson University
- Cypress Creek Renewables
- Duke Energy
- Eastpoint Energy
- EDF Renewables
- Edgecombe County Planning and Inspections Department
- EIP Storage
- ElectriCities
- EnergyRe
- Environmental Justice Community Action Network
- FlexGen
- Fox Rothschild
- Granville County Cooperative Extension
- Granville County Planning Department
- Greenlight America
- Hanwha Renewables
- HDR
- Hexagon Energy
- Holocene Energy
- Jones Consulting
- Kilpatrick Townsend
- NC Battery Industry Partnership at Appalachian State University
- NC Cooperative Extension
- NC Department of Environmental Quality
- North Carolina Environmental Justice Network
- NC Farm Bureau
- North Carolina Fire Marshal's Association
- NC Grange
- NC State University
- NC Sustainable Energy Association
- Nelson Mullins
- NextEra Energy
- Parker Poe
- Person County Planning Department
- Recurrent Energy
- RWE
- Smarttrak AI
- Solar Energy Industries Association (SEIA)
- Sonder Energy
- South Carolina Association of Counties
- Southern Alliance for Clean Energy
- Stewart
- Sun Energy1
- TED Renewables
- TerraForm Power
- Tesla
- Total Energies
- UNC School of Government

## Appendix B: Local Benefit Mechanisms (LBMs)

LBMs help communities attain specific funding or services. LBMs may provide a wide range of local benefits, including tax revenue and economic growth, education and workforce, community investment, environmental stewardship efforts, and job creation. They also involve a wide variety of defining characteristics and structures. To ensure that LBMs accurately reflect community interests and provide meaningful benefits, strong, early, ongoing communication between local government and developers and involve representatives who are directly connected to the community and understand its interests and needs. Developers, local government, and community members are encouraged to review the Carolinas DASH LBM resource: https://cms.carolinas-dash.org/wp-content/uploads/2026/02/Local-Benefits-Mechanisms-Guide-Carolinas-DASH.pdf

## Appendix C: Enforcement

This template has been curated with the purpose of outlining best practices when regulating utility-scale SES and BESS. However, there are no guidelines in the template on how to enforce the requirements the Center deems best practices. The Carolinas DASH team has conducted technical assistance throughout the Carolinas and, through this engagement, the team has heard a myriad of community concerns regarding projects staying in compliance with development regulations after they are built. More specifically these concerns relate to the upkeep of vegetative buffers. This is a valid concern as not all jurisdictions have an enforcement section that applies directly to their utility-scale SES and BESS. Even when jurisdictions do have an enforcement section some communities have trouble enforcing the section due to capacity constraints in staffing.

Enforcement is an important topic that applies to both pre-construction and post-construction compliance. For pre-construction and during construction, enforcement tools exist within NC General Statute Chapter 160D-404[26], including Notices of Violation and Stop Work Orders, which can be used if work or activity has been undertaken in violation of a development regulation. Post-construction, however, the statute offers less clear guidance on the tools available to local governments for enforcing requirements on projects that have already been developed. As a result, if a local government were to adopt this ordinance without an existing enforcement section covering these provisions, those requirements would be effectively unenforceable.

Here are examples of enforcement sections from jurisdictions across North Carolina that you can refer to:

1. Wake County, N.C., Unified Development Ordinance art. 20 (amended Mar. 20, 2023)[27]
2. Brunswick County, N.C., Unified Development Ordinance § 9.11 (Jan. 28, 2025)[28]
3. Rockingham County, N.C., Unified Development Ordinance div. 7, § 37.01 (amended Nov. 15, 2021)[29]

[26] https://www.ncleg.gov/EnactedLegislation/Statutes/PDF/BySection/Chapter_160D/GS_160D-404.pdf

[27] https://library.municode.com/nc/wake_county/codes/unified_development_ordinance?nodeId=UNDEOR_ART20ENPE

[28] https://www.brunswickcountync.gov/DocumentCenter/View/5460/UDO-Revised-and-Readopted---March-2015-Revision--19Aug24?bidId=

[29] https://files.municipalone.com/rockinghamcounty-nc/UDOAmended562024140210024909 2024AM.pdf

## Appendix D: Permit Type

| Zoning District | Agricultural/ Residential | Office/ Institutional | Commercial/Business | Industrial |
|---|---|---|---|---|
| Utility-scale SES | P | SUP | SUP | P |
| Utility-scale BESS | P | SUP | P | P |

The use table is intended to illustrate where utility-scale SES and utility-scale BESS may be permitted by right (P) or allowed as a special use (SUP), subject to review and approval by the appropriate body.

***Agricultural/Residential***: Represents rural areas characterized by low-density residential development and agricultural uses.
***Office/Institutional***: Represents areas intended for office uses, public institutions, and other civic-oriented development, often with a mix of complementary uses.
***Commercial/Business***: Represents areas to accommodate a range of retail, service, and commercial uses, and may also include mixed-use or residential development.
***Industrial***: District that includes both high- and low-impact industrial uses.

Each template ordinance includes a permitted use table that outlines generic zoning districts alongside each land use type and its corresponding permitting designation within those districts. These generic zoning districts are intended to represent areas within a jurisdiction where utility-scale SES and BESS are most appropriate. Specifically, they reflect locations with land uses that are compatible with solar development and battery storage facilities.

Utility-scale SES and utility-scale BESS are permitted by right in agricultural/residential and industrial zoning districts, while utility-scale SBESS is also permitted by right in commercial and business districts. By-right permitting is a process that allows a land use within a zoning district as long as the proposed development complies with applicable regulations outlined in the template ordinance. This approach ensures consistency in how similar land uses are treated within the same areas, reflecting their comparable impacts on the surrounding community.

These permit types are allowed in these districts due to the compatibility of the underlying land uses. Agricultural and residential areas are typically characterized by rural landscapes, low-density development, and land characteristics well-suited for utility-scale solar siting. Projects in these areas must comply with the applicable

standards of the template ordinance, which ensure that development aligns with the character and expectations of the designated areas. In addition, required decommissioning procedures ensure that, at the end of a project's life, the land is restored to its prior condition and can be redeveloped in accordance with zoning district standards. Utility-scale BESS is also permitted in commercial and business districts because its unique capabilities can enhance grid reliability in economically important areas without compromising safety or disrupting the character of the surrounding community.

Utility-scale SES and utility-scale BESS require a special use permit in office/institutional zoning districts, and utility-scale SES also require a special use permit in commercial/business districts. Office and institutional districts are often characterized by mixed-use development, and these projects may be considered appropriate when evaluated under discretionary standards through the special use permitting process. Special use permits require approval by a decision-making board through a quasi-judicial hearing. In this process, the applicant and any opponents must present evidence, including sworn expert testimony, to support their cases. The board then makes findings of fact to determine whether the proposed project meets the applicable standards.

Throughout the stakeholder engagement and drafting process, there was significant discussion regarding the appropriate permitting approach, with most stakeholders recommending a special use permit, while local government and agricultural representatives advocated for conditional zoning as an alternative approach to solar development. This sentiment from local governments was echoed across North Carolina, where many jurisdictions are increasingly moving toward conditional zoning frameworks.

Conditional zoning is a legislative rezoning process in which land is rezoned to a new district with site-specific conditions attached to the approval. The process requires at least one community meeting prior to a legislative hearing, and unlike quasi-judicial proceedings, it does not require formal evidence or expert testimony. Instead, conditions are typically negotiated and must be mutually agreed upon as part of the rezoning approval.

Local government and agricultural stakeholders noted that the special use permit process, which relies on the presentation of evidence and expert testimony, can be a barrier to participation for community members and farmers. In contrast, conditional zoning allows for more direct community participation in the public hearing process and enables decision-makers to respond more directly to community input. Additionally, this

approach provides local governments more stringent development standards through negotiated conditions.

While recognizing these important points raised during stakeholder engagement, this template recommends the special use permit process, while also acknowledging that it is intended to be adapted and adopted based on local context. The Center finds that the quasi-judicial nature of the special use permit can balance competing interests and is a viable approach for siting decisions of this nature. The Carolinas DASH program was created to provide expert-crafted technical assistance and model documents, and therefore emphasizes that expert testimony is an essential component of the process to ensure all perspectives are fully understood and decision-makers can reach the most informed determination possible.

While conditional zoning offers meaningful opportunities for negotiation and community input, it also requires a distinct legislative process for each individual project. Given that one of the purposes of the applicability section of the ordinance is to aid North Carolina in achieving its target of electric public utilities reaching carbon neutrality by 2050, introducing a new rezoning process for each project can add uncertainty and delay. These additional procedural steps may deter development in certain jurisdictions due to extended timelines and variability in process. In contrast, a more standardized special use permitting framework provides greater predictability while still allowing for robust public participation, which is critical given the urgency of bringing new generation resources online to support grid reliability and meet growing demand.

## Appendix E: Vegetative Buffer Examples

This section provides examples from across North Carolina with different designs and best practices for buffers. The objective is to offer options while simultaneously allowing AHJs to select and/or modify one that aligns with their area's topography and conditions for vegetation growth.

1. Guilford County, NC:
    a. Opaque Buffer:

| TABLE 6-2-1: PLANTING AREA DESCRIPTIONS | | | | | |
|---|---|---|---|---|---|
| **Planting Yard Type** | **Description** | **Min. Width** | **Min. Average Width** | **Max. Width** | **Planting Requirement Rate** |
| **TYPE A PLANTING YARD** | | | | | |
|  | A high density screen intended to block substantially visual contact between adjacent uses and create spatial separation. A Type A Planting Yard reduces lighting and noise which would otherwise intrude upon adjacent uses. | 40' | 50' | 75' | Canopy: 4 per 100 lf.<br><br>Understory: 10 per 100 lf.<br><br>Shrubs: 33 per 100 lf. |

    b. Semi-opaque buffer

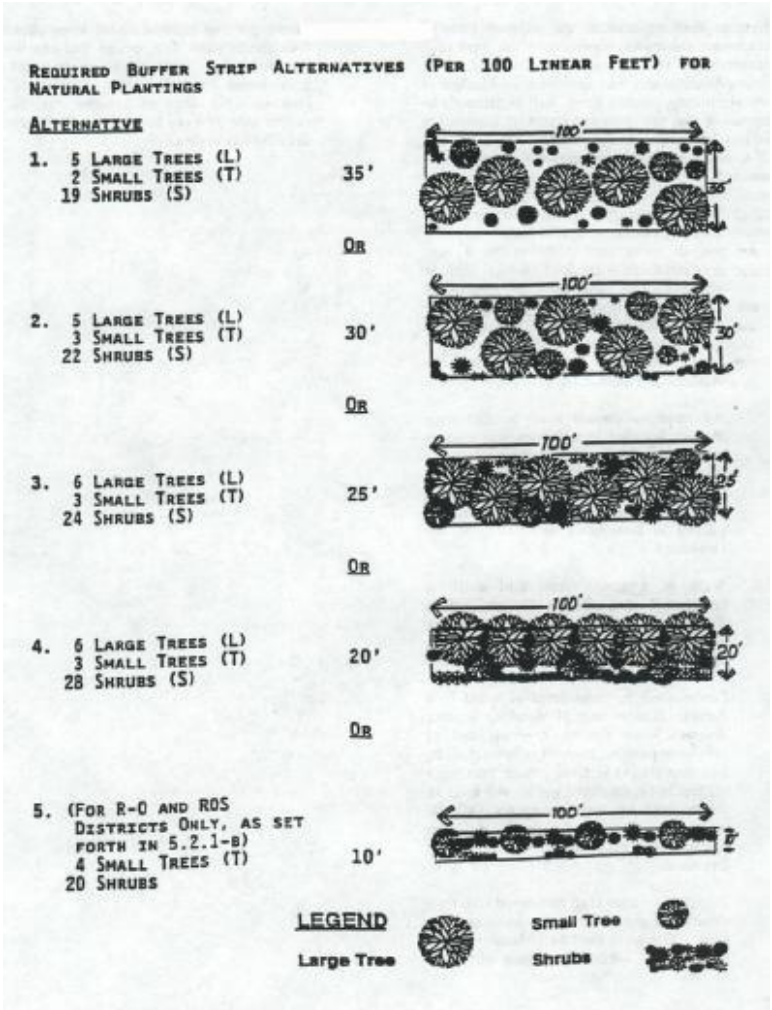
| TABLE 6-2-1: PLANTING AREA DESCRIPTIONS | | | | | |
|---|---|---|---|---|---|
| **Planting Yard Type** | **Description** | **Min. Width** | **Min. Average Width** | **Max. Width** | **Planting Requirement Rate** |
| **TYPE B PLANTING YARD** | | | | | |
|  | A medium density screen intended to partially block visual contact between uses and create spatial separation. | 25' | 30' | 50' | Canopy: 3 per 100 lf.<br><br>Understory: 5 per 100 lf.<br><br>Shrubs: 25 per 100 lf. |

2. Henderson County, NC:
    a. B1 - Opaque Buffer
    b. B2 - Semi-opaque Buffer

**Table 5.2 Buffer Width And Plant Material Requirements**

| Buffer Type | Width (FT) | Plant Material Required Per 100 Linear Feet | | | |
|---|---|---|---|---|---|
| | | Deciduous Trees | | Evergreen Trees | |
| | | Large | Small | Large | Small |
| B1 | 20 | 1 | 2 | 2 | 6 |
| B2 | 30 | 2 | 3 | 5 | 12 |

3. Lincolnton, NC:
    a. 1 & 2 - Semi-Opaque Buffer
    b. 3 & 4 - Opaque Buffer



## Appendix G: Community Engagement

A guide for developers on best practices for community engagement beyond required community meetings or project notification, pulled from the Utility-Scale Solar and Storage Model Ordinance for South Carolina – an effort that the NC Clean Energy Technology Center participated in, in addition to a number of other conservation and agricultural organizations, developers, utilities, among others.

**Engage Early**

1. Begin outreach before permit applications or final route/site selections
2. Explain the purpose and need for the project in plain language to the community
3. Be transparent with the timeline, including decision points and public input opportunities

**Prioritize Transparency & Two-Way Communication**

1. Give clear, consistent updates (i.e., websites, local media, etc.)
2. Be honest about trade-offs, and be clear about what is and isn't open for negotiation

**Respect Local Knowledge & Lived Experience**

1. Involve landowners, community leaders, and local organizations from the star
2. Incorporate feedback into design decisions
3. Host listening session to understand concerns around land use, health, and equity
4. Consider local benefits mechanisms to support community development

**Make Engagement Inclusive & Accessible**

1. Schedule events at convenient times and locations
2. Offer language interpretation and ADA accommodations
3. Provide printed materials and virtual participation options for rural or under-connected Communities

**Stay Engaged After Groundbreaking**

1. Designate a community liaison for ongoing communication through construction and operations
2. Provide regular updates on progress and mitigation
3. Establish a system for feedback, complaints, or questions to be heard and addressed promptly

**Examples of Successful Engagement Tools**

1. Community Advisory Committees
2. Interactive Project Maps & Dashboards
3. Pop-up Info Booths at Local Events
4. Landowner Working Groups
5. Co-hosted Town Halls with Local Leaders Developers, in partnership with counties, are encouraged to consult with local soil and water conservation districts and farmland protection boards/advisory committees when reviewing proposed projects to ensure siting decisions align with long-term working lands conservation goals.

Based on best practices from: U.S. Department of Energy, National Laboratory of the Rockies (NLR), Lawrence Berkeley National Laboratory, & SEIA and National Association of Regulatory Utility Commissioners (NARUC)

## Appendix H: Battery Storage Accessory Use

Co-location is addressed in this ordinance and allowance of BESS as an accessory use to a generating facility or substation is included in the BESS definition. However, specific accessory use definitions between utility-scale SES and utility-scale BESS have not been outlined due to a range of methodologies and feedback on defining BESS as an accessory use. Some real-world and model ordinances define accessory use based on whether the BESS has greater capacity than the SES, whether it fits within the existing SES footprint, if the BESS serves the SES or the greater grid, or simply make BESS an accessory use within an SES primary use. Commenters also raised the possibility of BESS using surplus interconnection service with an SES as an accessory use. AHJs may reference accessory use determinations from APA Zoning Practice: Battery Energy Storage Systems and draft model bylaw from the Massachusetts Department of Energy Resources.

Additionally, subsequent BESS additions as they relate to minor/major permit modifications and additions within existing project footprints have not been outlined in this ordinance based on stakeholder feedback that adding utility-scale BESS within the footprint of an existing utility-scale SES may not be feasible and potential compatibility concerns between existing SES and new BESS equipment. Preliminary language for consideration and modification by AHJs is included in this appendix.

1. Qualification for Accessory Use Classification
    a. A utility-scale BESS will qualify as an accessory use to an SES, power generating facility, or substation primary use if the BESS [expands the originally approved project footprint by no more than 10%]
    b. Sequential addition of an accessory use
        i. If an applicant proposes to add a co-located BESS as a qualifying accessory use to an existing solar facility, power generating facility, or substation that was permitted by right, the utility-scale accessory BESS may be permitted by-right in accordance with the application requirements and standards in [Utility-Scale BESS ordinance as adopted by the AHJ].
        ii. The designation of utility-scale accessory battery energy storage systems as a permitted use by right under this ordinance in accordance with the application requirements and standards in [Utility-Scale BESS ordinance as adopted by the AHJ] shall apply to parcels subject to existing special use permit approvals for utility-scale solar energy facilities, utility-scale wind energy facilities, and electric utility substations, subject to the following:
            1. Administrative approval for utility-scale accessory BESS on a parcel subject to an existing special use permit shall not be

issued where the proposed BESS conflicts with a condition of such existing approval that expressly and specifically prohibits energy storage;

2. Where an existing approval condition requires compliance with an approved site plan, administrative approval of an amended application with an amended site plan incorporating the proposed utility-scale accessory BESS shall constitute compliance with such condition, provided the amended site plan demonstrates that all other conditions of the existing approval remain satisfied;
3. Where the applicant cannot represent that no conflict exists between the proposed utility-scale accessory BESS and an existing approval condition, the applicant shall seek modification of the existing approval before or concurrently with submission of an utility-scale accessory BESS site plan application; and
4. If an existing approval or its conditions do not address battery energy storage, this shall not constitute a conflict for purposes of this Section.

iii. Minor Modification — Administrative Review: A modification to a special use permit solely to accommodate the addition of a utility-scale accessory BESS [that does not expand the originally approved project footprint by more than 10%] shall be a minor modification and processed administratively by the [Zoning Administrator / Planning Director] where all of the following criteria are satisfied:

1. The modification does not change the use permitted under the special use permit; and
2. The modification does not increase the overall density of development in a manner that would require reconsideration of the site-specific findings made in the original special use permit proceeding.

iv. The proposed utility-scale accessory BESS complies with all applicable development standards of [Utility-Scale BESS Ordinance as adopted by AHJ]; and

v. All conditions of the special use permit not specifically modified remain in full force and effect.

c. Major Modification Required: A modification to a special use permit shall be classified as a major modification and processed in the same manner

as an original special use permit application in the case that the modification does not satisfy the criteria for a minor modification. The proposed utility-scale accessory BESS shall be reviewed for compliance with all applicable development standards of [Utility-Scale BESS Ordinance as adopted by AHJ].

## Appendix I: Glossary

**Buffer**: A strip of land with natural or planted vegetation located between a structure and a side or rear property line intended to slow water runoff and sedimentation from a particular land use.

**Code**: A document that guides installation requirements.[30]

**Conditional zoning**: A legislative zoning map amendment with site-specific conditions incorporated into the zoning map amendment.[31]

**Quasi-judicial decision**: A decision involving the finding of facts regarding a specific application of a development regulation and that requires the exercise of discretion when applying the standards of the regulation. The term includes, but is not limited to, decisions involving variances, special use permits, certificates of appropriateness, and appeals of administrative determinations. Decisions on the approval of subdivision plats and site plans are quasi-judicial in nature if the regulation authorizes a decision-making board to approve or deny the application based not only upon whether the application complies with the specific requirements set forth in the regulation, but also on whether the application complies with one or more generally stated standards requiring a discretionary decision on the findings to be made by the decision-making board.

**Screening:** Method of visually shielding or obscuring an abutting or nearby use or structure, often a row of vegetation sufficient to visually obscure a certain facility or land use

**Setbacks**: Minimum lateral distance by which any structure must be separated from a certain point, often a parcel boundary or another structure or facility

**Site Plan**: A scaled drawing and supporting text showing the relationship between lot lines and the existing or proposed uses, buildings, or structures on the lot. The site plan may include site-specific details such as building areas, building height and floor area, setbacks from lot lines and street rights-of-way, intensities, densities, utility lines and locations, parking, access points, roads, and stormwater control facilities that are depicted to show compliance with all legally required development regulations that are applicable to the project and the site plan review. A site plan approval based solely upon

[30] https://www.pnnl.gov/main/publications/external/technical_reports/PNNL-34462.pdf
[31] https://www.ncleg.gov/EnactedLegislation/Statutes/HTML/bychapter/Chapter_160d.html

application of objective standards is an administrative decision, and a site plan approval based in whole or in part upon the application of standards involving judgment and discretion is a quasi-judicial decision. A site plan may also be approved as part of a conditional zoning decision.

**Special use permits**: A permit issued to authorize development or land uses in a particular zoning district upon presentation of competent, material, and substantial evidence establishing compliance with one or more general standards requiring that judgment and discretion be exercised, as well as compliance with specific standards. The term includes permits previously referred to as conditional use permits or special exceptions.

**Standard**: A standard is a document that describes the safety requirements of a product and how to perform certification testing

**Authority-Having Jurisdiction (AHJ)**: an organization, office, or individual responsible for enforcing the requirements of a code or standard, or for approving equipment, materials, an installation, or a procedure.

## Appendix J: Resources

Along with stakeholder input, authors made use of several helpful model ordinance resources, noting North Carolina statutory differences:

A Local Government Guidebook for Improving Large-Scale Solar Development Outcomes, Solar@Scale

Battery Energy Storage and Local Zoning in the Southwest, Clean Air Task Force

DRAFT BESS Model Ordinance and Guide, GO Biz California

DRAFT Model Zoning Bylaw: Allowing Use of Battery Energy Storage Systems, Massachusetts Department of Energy Resources

DRAFT Model Zoning Bylaw: Allowing Use of Solar Photovoltaic Installations, Massachusetts Department of Energy Resources

Large-Scale Solar and Battery Storage Toolkit, IREC

New York State Battery Energy Storage System Guidebook, NYSERDA

Planning for Utility-Scale Solar Energy Facilities, APA

Planning and Zoning Best Practices for Solar Energy, Colorado SolSmart Program

Planning & Zoning for Battery Energy Storage Systems, Center for EmPowering Communities at the University of Michigan's Graham Sustainability Institute

Principles and Options for Designing Battery Energy Storage Zoning Ordinances, Pacific Northwest National Laboratory

Siting and Safety Best Practices for Battery Energy Storage Systems, Maryland Department of Natural Resources

Template Solar Energy Development Ordinance for North Carolina, NC Clean Energy Technology Center and NC Sustainable Energy Association

Utility-Scale Battery Energy Storage Systems Model Ordinance, American Clean Power

Utility-Scale Solar Energy Systems Model Ordinance, American Clean Power

Zoning Practice: Battery Energy Storage Systems, APA