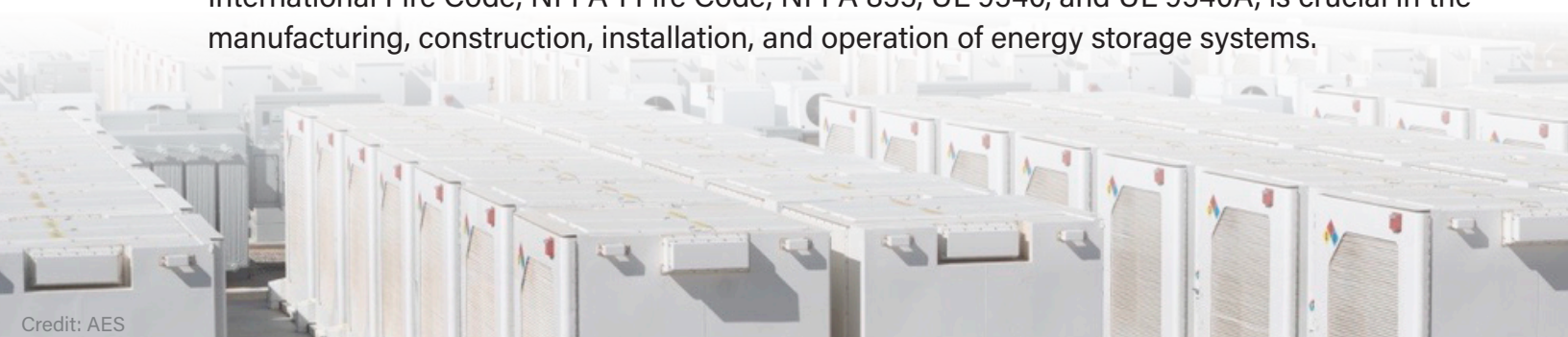


# Considerations for Government Partners on Energy Storage Siting & Permitting

Collaborative efforts between industry and government partners are essential for creating effective rules and ordinances for siting and permitting battery energy storage systems as energy storage continues to grow rapidly and is a critical component for a resilient, efficient, and clean electric grid.

## Key Takeaways

- 1 Importance of energy storage systems:** Energy storage technologies, particularly battery energy storage systems, are growing rapidly (by more than 1,200% between 2016 and 2021) and already play a crucial role in enhancing the electrical grid by supporting the deployment and integration of renewable energy sources — increasing reliability, controlling costs, and building a more resilient grid.
- 2 Siting and permitting considerations:** It is essential for government partners and policymakers to create specific definitions, standards, and regulations for energy storage facilities, considering their unique attributes and distinct functions compared to traditional electrical generation facilities. Flexibility in zoning, environmental review, and sound level considerations are necessary for the effective integration of energy storage systems in various locations and applications.
- 3 Collaboration and safety:** The energy storage industry seeks to collaborate with government partners and first responders to develop effective rules, ordinances, and emergency response plans. Ensuring safety and compliance with relevant codes and standards, such as the International Fire Code, NFPA 1 Fire Code, NFPA 855, UL 9540, and UL 9540A, is crucial in the manufacturing, construction, installation, and operation of energy storage systems.



Credit: AES

## Background

Energy storage refers to a variety of technologies that can store energy for later use when it is most valuable. This includes technologies like batteries, pumped hydropower, and flywheels, among many others in development or initial deployment. Energy storage is critical to an efficient, clean electric grid. In addition to supporting the deployment and grid integration of additional renewable energy sources, energy storage systems provide a variety of valuable services. By storing energy during times of excess and dispatching during times of need, energy storage increases reliability, controls costs for consumers, and ultimately helps build a more resilient grid.

Energy storage is a critical hub for the entire electric grid, enhancing the grid to accommodate all forms of electrical generation—such as wind, solar, hydro, nuclear, and fossil fuel-based generation. While there are many types of energy storage technologies, the majority of new projects utilize batteries. Energy storage technologies have experienced rapid growth over the past few years, with battery energy storage deployments growing by more than 1,200% between 2016 and 2021. This growth is expected to continue over the next decade.

Battery energy storage systems begin with relatively small, individual battery cells. Battery cells are electrically connected and are then packaged in a battery module. These battery modules are aggregated and stored within battery racks. One or more battery racks (depending on available space) are then stored in specially engineered shipping containers, outdoor-rated cabinets, or purpose-built buildings designed to safely house and maintain these batteries. One or more of these enclosures or buildings, along with necessary electrical equipment, comprise the battery energy storage facility which will export electricity to and import electricity from the electrical grid.

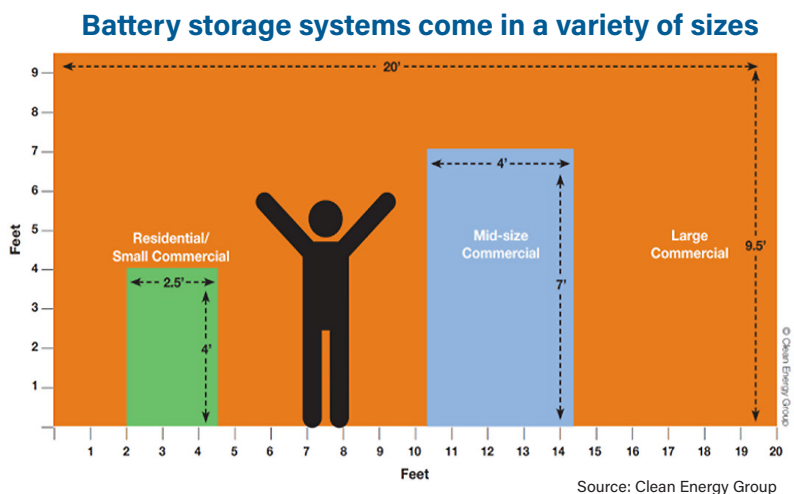
## Siting & Permitting Considerations For Government Partners & Policymakers

### ENERGY STORAGE VS. OTHER ELECTRICAL ASSETS

Energy storage technologies provide unique services to the electrical grid and are fundamentally different assets and resources from traditional electrical generation facilities. Energy storage systems can act as both generation and load and can switch rapidly from one to the other, providing important benefits for grid stability. As such, certain standards and regulations applied to other types of electricity generation are not applicable to energy storage facilities, and energy storage facilities should not be classified under existing regulations for solar or wind. It is important that state and local permitting authorities for energy storage facilities utilize definitions and standards that are applicable to the distinct functions of battery energy storage projects.

### SITING & LAND USE ZONING

Energy storage systems are as likely to be sited in urban and suburban areas as they are in rural areas. Energy storage systems are often housed in pre-assembled modular enclosures or containers, which creates flexibility that allows developers to efficiently utilize sites that pose development challenges for other types of facilities, whether due to limited size or shape. As a result, energy storage systems can be seamlessly integrated into the existing fabric of a municipality in residential, commercial, industrial, or agricultural areas.



Energy storage systems can also be housed in buildings or within existing infrastructure. This option can allow for the integration of energy storage into existing sites, including urban spaces or previously operating fossil fuel generation facilities, where there may be increased demand for immediately dispatchable energy.

**Zoning Districts:** Because of the flexibility and variety of beneficial applications of stand-alone energy storage systems, policymakers should not limit energy storage projects to a specific set of zoning districts. When careful and conscientious development practices are employed, energy storage systems can appropriately integrate within any type of zoning district. For this reason, concerns about locational suitability, should be considered on a case-by-case basis.

**Setbacks:** Energy density is a unique advantage to energy storage siting that allows it to be deployed in a wide variety of locations and applications, and provide meaningful benefits to the communities it serves. Furthermore, given the fundamental differences between battery storage and other facilities categorized as power generation, battery storage project setbacks should be standardized independently of other types of electricity infrastructure.

**Screening & Security Barriers:** In many instances, walls, fences, building façade design, and other features can be utilized to screen an energy storage project or blend it in with its surroundings. Design constraints such as siding requirements for buildings may not be appropriate for 'off-the-shelf,' pre-manufactured, containerized systems purchased and deployed by energy storage developers. Such requirements may impose safety risks by voiding warranties or reducing effectiveness of HVAC & thermal management systems critical to the operation of battery storage systems. Energy storage projects proposed in industrial areas do not require blending with adjacent uses.

## ENVIRONMENTAL REVIEW & COMPLIANCE

Energy storage facilities have minimal environmental impact. They do not produce any emissions or discharge waste under normal operations, and often require a much smaller footprint than other utility-scale electrical infrastructure or generation facilities.

**Water Quality:** Energy storage facilities do not discharge wastewater into bodies of water; therefore, they fall within the general requirements of the National Pollutant Discharge Elimination System (NPDES).

**Air Quality:** Because operating energy storage facilities do not produce any emissions or air-pollutants project operations are exempt from providing information or demonstrating compliance with state and federal air pollution regulations.

**Expedited Permitting for Energy Storage Co-Located with Renewable Generation:** At sites where renewable energy generation facilities like solar or wind already operate or are proposed, environmental review and permitting can be streamlined. Considering these sites have already conducted site assessments and obtained the necessary permitting to operate, duplicative and redundant environmental assessments and permitting processes can be eliminated by tiering off prior environmental reviews. Streamlining permitting processes at existing renewable generation sites increase the cost-effectiveness of projects without sacrificing environmental standards.

## SOUND LEVELS

Sound levels amongst battery energy storage systems vary based on the facility size, type of enclosure, and the unique technology utilized in each individual system. Projects are thoughtfully designed to minimize noise impacts and use a variety of strategies to integrate facilities into a variety of environments. The sound sources associated with battery storage are not unique, rather they are associated with familiar equipment, such as heating ventilation air conditioning (HVAC) systems, inverters and transformers employed by other types of grid infrastructure. Sounds may also be produced by fans, coolant pumps, or power-switching equipment, which are common in industrial settings. These sources of sound are likely already addressed by the permitting authorities and acoustical analysis may be conducted to confirm the anticipated project will comply, consistent with how other developments are permitted. Generally, when permitting energy storage systems, the expected sound levels fall within the accepted limits integrated into land use zoning ordinances.

## PROJECT CONSTRUCTION & OPERATION

Like other construction projects, battery energy storage developers work with local and state governments to develop and share site plans. Generally, typical construction equipment is utilized and projects can be constructed in accordance with the applicable criteria used for other developments, such as limiting heavy equipment operations to daytime hours. Project construction and operational planning also includes the development of emergency service plans and ongoing maintenance plans, similar to other utility infrastructure projects. This work also includes a delineation of a project's footprint within the proposed project site and the type of enclosure utilized to house the battery systems, among other engineering and construction specifications. Other relevant matters include planning related to exterior landscaping and physical facility security. While traffic volumes and sound levels may increase during periods of construction, consistent with other private construction or public works projects, traffic should not be expected to substantially increase once a facility is complete and operating.

## INTERCONNECTION

The operator of an energy storage system will seek to execute an interconnection service agreement with the relevant electric utility or cooperative. Typically, this application and execution of an interconnection service agreement begins with an interconnection study process which will be completed later in the permitting process of an energy storage project. Technical requirements for interconnection and interoperability are detailed in the IEEE 1547 series of standards for distributed energy resources and the IEEE 2800 series for transmission-connected systems.

## SAFETY CODES & STANDARDS RELEVANT TO ENERGY STORAGE SYSTEMS

Numerous nationally and internationally recognized standards and codes have been developed to inform safe manufacturing, construction, installation, and operation of energy storage systems. Laboratories certified by the Department of Labor Occupational Safety and Health Administration's (OSHA) Nationally Recognized Testing Laboratories (NRTL) Program have spent years developing industry best practices and procedures that are used to mitigate risks and promote safe operation of energy storage facilities. These codes and standards include, but are not limited to, the following:

- **2021 International Fire Code:** contains regulations to safeguard against fires and other hazards and addresses general precautions, emergency planning and preparedness, fire department access and water supplies, automatic sprinkler systems, fire alarm systems, special hazards, and other matters.
- **2021 NFPA 1 Fire Code:** advances fire and life safety for the public and first responders as well as property protection by providing a comprehensive, integrated approach to fire code regulation and hazard management.
- **NFPA 855 Standard for the Installation of Stationary Energy Storage Systems:** provides the minimum requirements for mitigating the hazards associated with energy storage systems.
- **UL 9540 Energy Storage Systems and Equipment:** presents a safety standard for energy storage systems and equipment intended for connection to a local utility grid or standalone application.
- **UL 9540A Test Method:** delineates procedures for testing the fire safety hazards associated with propagating thermal runaway within battery systems.

## PARTNERSHIPS WITH FIRST RESPONDERS

Energy storage system operators develop robust emergency response plans relevant and applicable to each individual energy storage facility. These plans are developed based on a standard template of national best practices that are customized for each facility. These best practices include extensive collaboration with first responders. These plans address emergency situations that might be encountered at an energy storage site, including extreme weather, fires, security incidents and more. These plans also address emergency response roles and highlight the importance of coordinating with first responders—particularly during planning—to ensure a complete, detailed understanding of potential emergencies and the proper safety responses.

Discussions with first responders involves the sharing of important information and consultation on project design, including appropriate placement of roads, entry points, and staging locations, as well as the dissemination of site maps, appropriate signage, emergency contacts, and other safety-relevant items. Partnerships between developers, operators, and first responders may include initial trainings, as well as ongoing follow-up activities and trainings. Energy storage developers and operators are eager to work with local officials to develop a strong partnership and an appropriate plan for their project.

## Effective Permitting Through Industry Collaboration

### The Energy Storage Industry is Prepared to Work Together to Develop Effective Rules and Ordinances

The U.S. energy storage industry welcomes collaborating with government partners, sharing information and best practices, and proactively discussing potential state and local government permitting rules. Collaboration between government partners and industry members can ensure that permitting rules and ordinances can serve as effective guidelines that appropriately account for all relevant considerations, while also ensuring that these valuable technologies can be deployed to enhance a community's electrical grid.

**If you are interested in working with energy storage companies or experts, we welcome you to contact the American Clean Power Association at [membership@cleanpower.org](mailto:membership@cleanpower.org) .**

## Additional Resources

**Energy Storage Systems:** What You Need to Know about UL 9540 and 9540A (on-demand webinar): <https://www.ul.com/resources/energy-storage-systems-what-you-need-know-about-ul-9540-and-9540a>

**UL 9540A 4th Edition Unit Level AHJ Checklist:** [https://code-authorities.ul.com/wp-content/uploads/sites/46/2020/09/UL-9540A-AHJ-Checklist\\_Rev-2.pdf](https://code-authorities.ul.com/wp-content/uploads/sites/46/2020/09/UL-9540A-AHJ-Checklist_Rev-2.pdf)

**Lawrence Berkely National Laboratory's Best Practices and Considerations for Siting Battery Energy Storage Systems:** [https://eta-publications.lbl.gov/sites/default/files/battery\\_siting-sein-factsheet\\_052522.pdf](https://eta-publications.lbl.gov/sites/default/files/battery_siting-sein-factsheet_052522.pdf)



Credit: AES