



Siting and Permitting Energy Storage

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2025 OE Energy Storage Program Peer Review



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Agenda

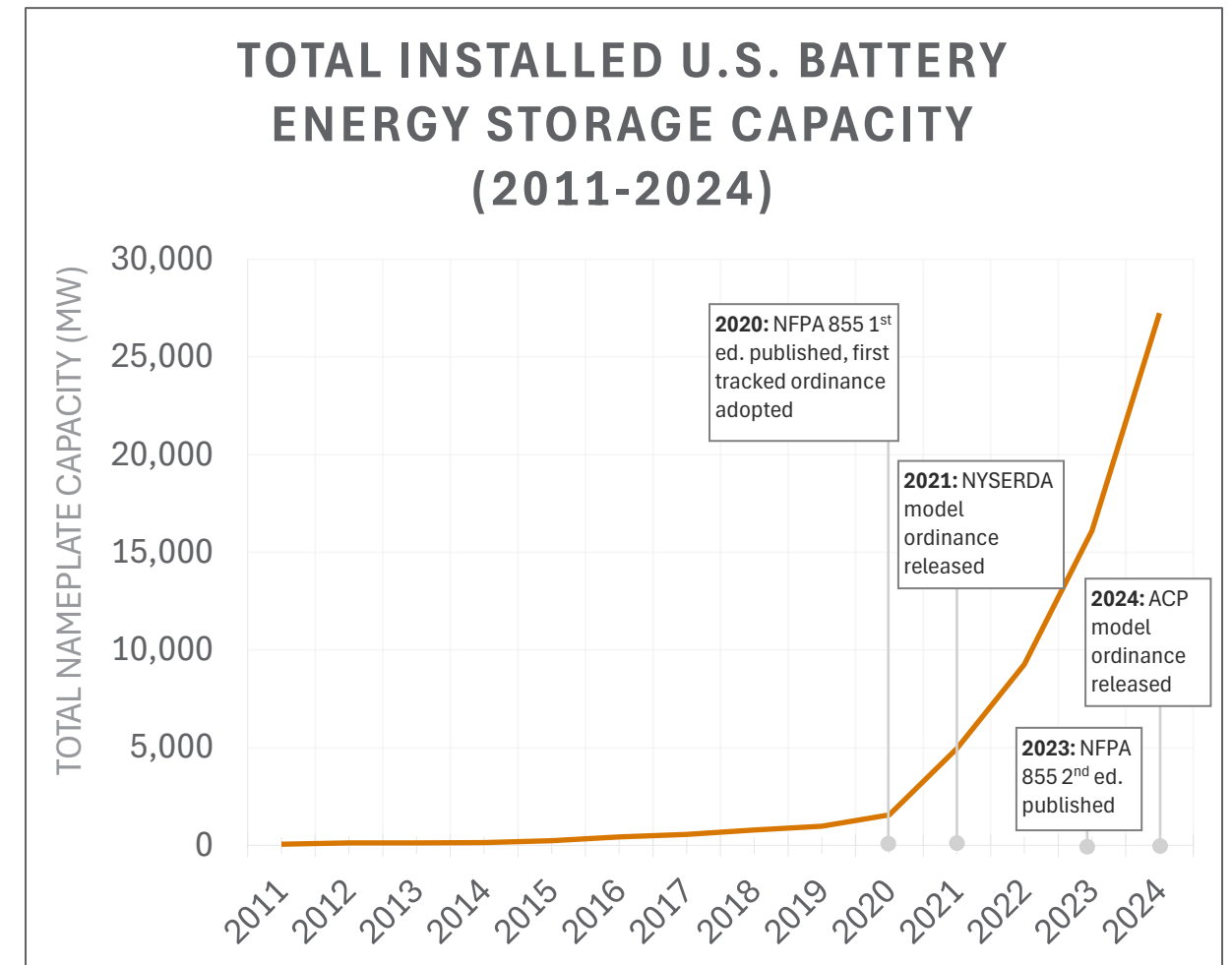
- ▶ **Project Summary**
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Siting and Permitting Energy Storage: Project Summary

- **Project goal:** To provide local jurisdictions with practical and useful information about battery energy storage systems (BESS) to aid them in responding to storage project applications and in developing local ordinances to guide energy storage siting.
- **Current practice:**
 - Explain the benefits, impacts, and risks of energy storage in practical terms
 - Review local proceedings involving energy storage siting to understand the issues and concerns that arise
 - Describe the impacts of energy storage safety standards for local jurisdictions.
- **Role of the lab:** Our team is uniquely suited to bridge between technical information about energy storage and the practical concerns of host jurisdictions. This project was initiated in response to requests from multiple state partners and this work has not been done by anyone else.
- **Project impacts:** Our work has been referenced by local jurisdictions in nine states. It has also been cited by the American Planning Association, American Public Power Association, U.S. Department of Energy, and the University of Michigan, among other organizations.
- **Alignment:** This work supports the Administration's priority for addition of energy resources by contributing to the development of local ordinances that provide clear and fair processes for the siting and permitting of energy storage projects.

Context: Local Zoning Codes and Energy Storage Deployment

- Market incentives, state regulations, and load growth demands are among the factors driving rapid and increasing growth in BESS deployment in the United States.
- The rapid growth in BESS was initially concentrated in only a few states, but energy storage is now seeing wider deployment nationwide, particularly as large loads increase.
- The modular nature of BESS means systems may be built near other existing land uses, unlike other energy infrastructure.
- Planning officials in many cases lack familiarity with BESS technologies and face uncertainty about reasonable zoning decisions that balance safety, local impacts, and other goals.
- Local officials may benefit from seeing how other jurisdictions have addressed the unique question of energy storage siting.

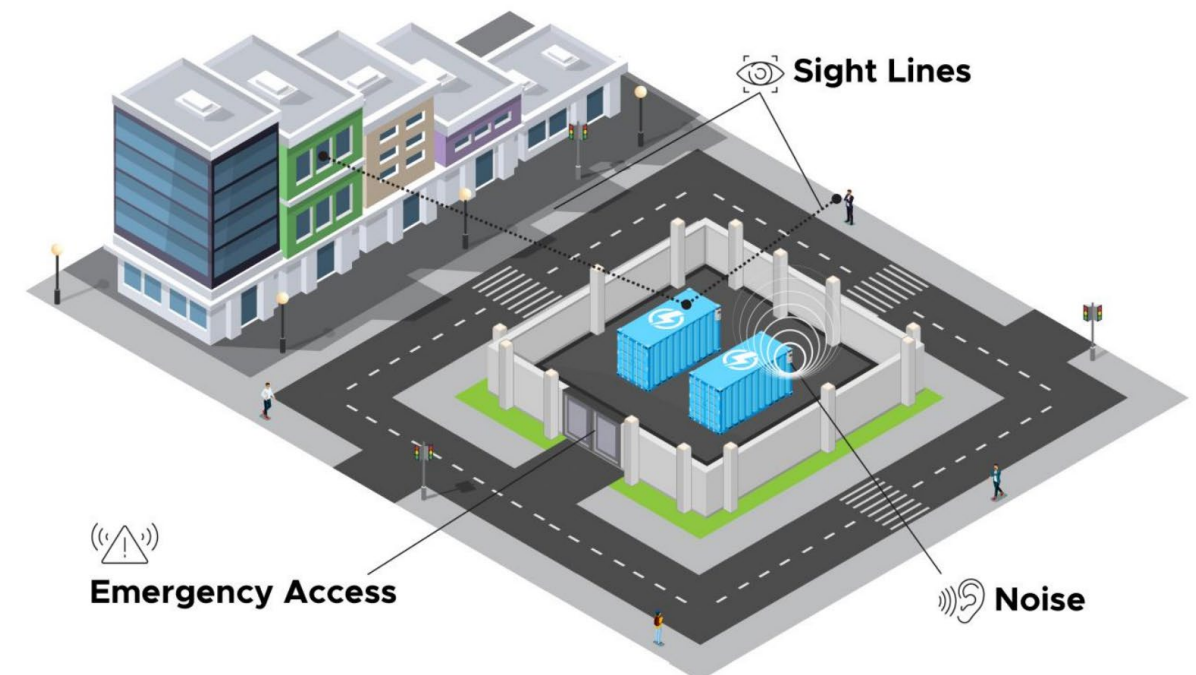


Energy Storage in Local Zoning Ordinances

Local zoning is key to streamlined, balanced deployment of battery energy storage systems:

- Zoning ordinances “automate” land use decisions by enabling efficient, consistent review of proposals, as opposed to requiring an extensive conditional use permit process for each project.
- Ordinances reflect local needs and preferences, helping ensure BESS are deployed in ways that align with an area’s values and maximize benefits.
- Ordinances offer an opportunity to incorporate best practices into local regulations, ensuring that energy storage deployment minimizes any risks to public health and safety.

Related publication: Twitchell, Powell, and Paiss, “Energy Storage in Local Zoning Ordinances,” 2023.



Illustrating potential local energy storage impacts and considerations for siting a utility-scale energy storage system, including visual impacts, noise, and first responder access.

Principles and Options for Designing Battery Energy Storage Zoning Ordinances

- **The authors analyzed local (town, city, and county) codes of ordinances across the United States to identify common elements and frameworks for zoning battery energy storage systems.**
- When initial research on the BESS local zoning landscape began in 2023, very few local governments had language specific to BESS in their codes of ordinances. Ordinance adoption has increased, but uncertainty remains a factor at the local planning level.
- One notable finding: language in local codes of ordinances is frequently adapted from standard NFPA 855, as well as from New York state’s Battery Energy Storage System Model Law, published in 2021. The frequent adaptation of New York’s language in other states emphasizes the value of accessible resources for local planning officials nationwide.

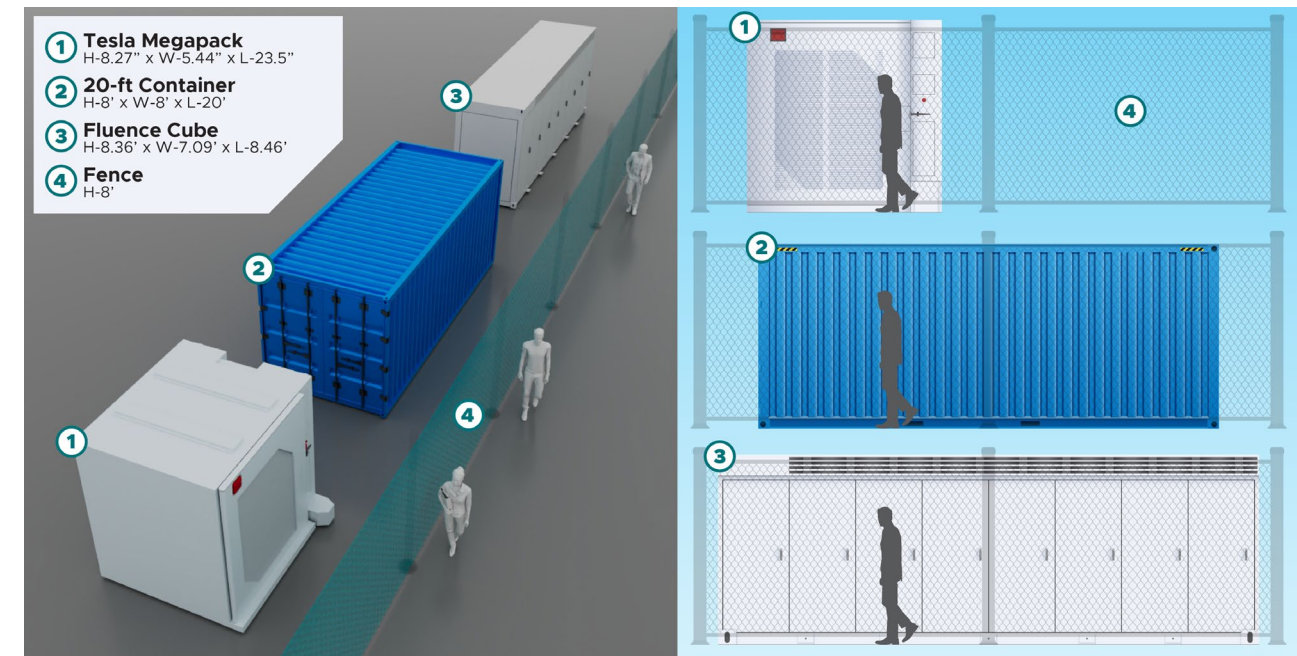
Related publication: Powell and Twitchell, “Principles and Options for Designing Battery Energy Storage Zoning Ordinances,” Forthcoming.

Principles and Options for Designing Battery Energy Storage Zoning Ordinances

Some identified principles and common elements for energy storage zoning ordinances include:

- The definition of size tiers or cutoffs to which all or some requirements apply (e.g. systems with a capacity greater than 600 kWh may only be permitted in certain zones)
- Which zones are permitted by right, and if energy storage may be deployed in other zones with a special use permit (e.g. larger BESS are commonly permitted in industrial or manufacturing zones, and may require permits for approval in residential or some commercial zones)
- Fencing or other visual screening, noise limits, and lighting requirements to ensure that BESS installations are harmonious with other existing land uses and local preferences.

Related publication: Powell and Twitchell, "Principles and Options for Designing Battery Energy Storage Zoning Ordinances," Forthcoming.

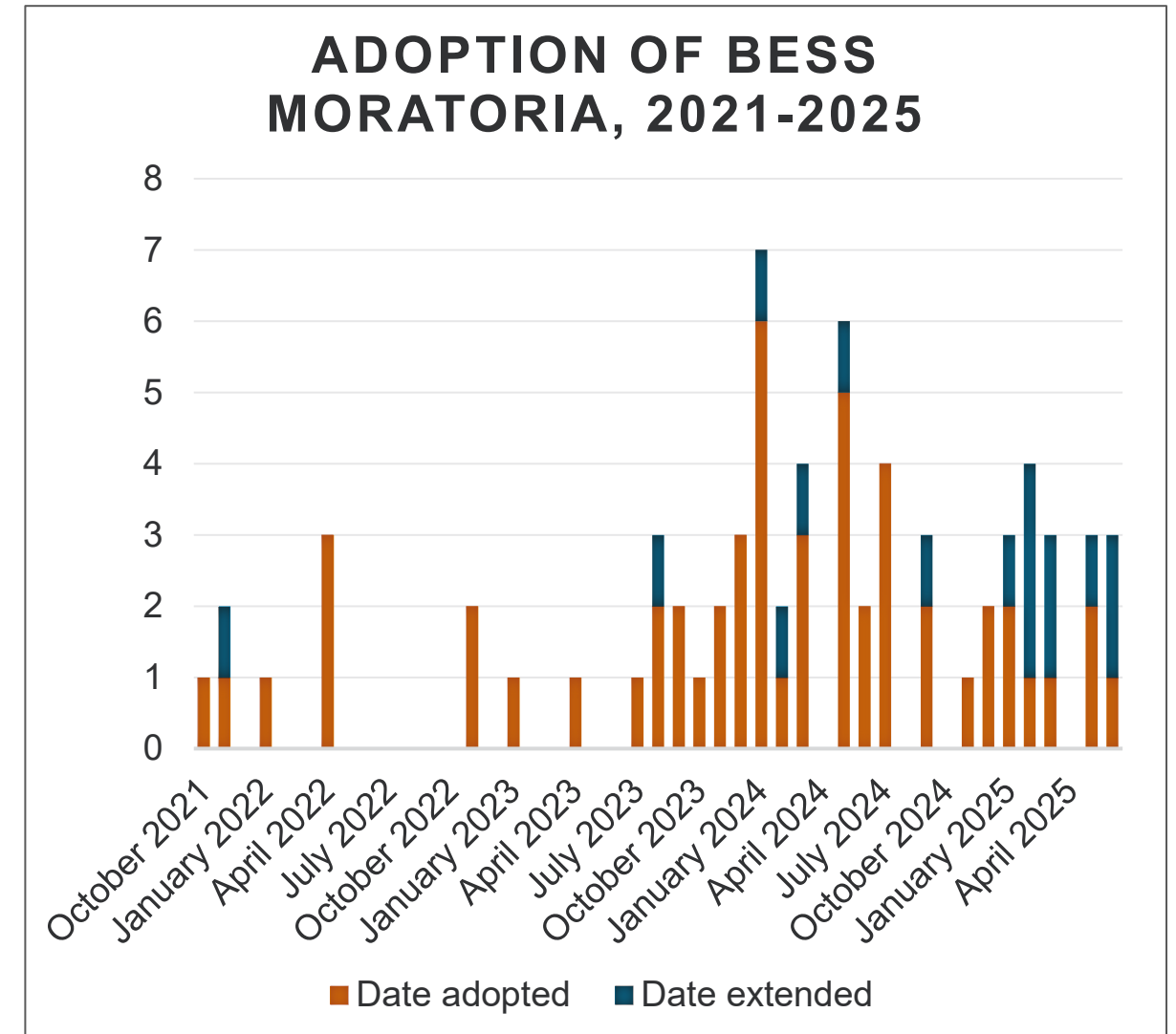


Visual screening requirements are common in local zoning ordinances for BESS systems. Illustrated here is an example of a standard 8-foot screening fence against common commercial BESS installations.

Tracking Energy Storage Moratoria

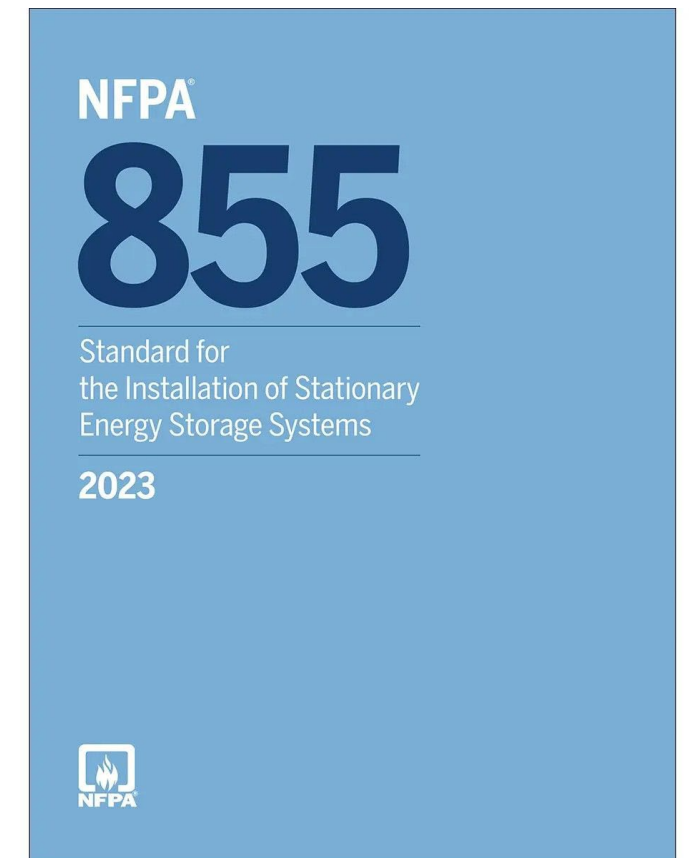
- The authors reviewed moratoria against battery storage at the local level and have identified 56 moratoria in 14 states that have been adopted since 2021.
- The most common drivers behind local moratoria are concerns about safety and general uncertainty with emerging BESS technologies. Other drivers include concerns about land use conflicts and property value impacts.
- Moratoria are commonly adopted to allow local planners the time to develop an informed zoning ordinance for BESS. 13 jurisdictions that initially issued moratoria in this review have since adopted BESS zoning ordinances.

Related publication: Powell, Dave, and Twitchell, “Local Moratoria Against Battery Energy Storage: Key Trends and Drivers” (forthcoming)



Current Work

- **Codes and Standards 101:** Breaking down the numerous energy storage safety codes and standards for non-technical audiences and identifying their relevance to other groups (regulators, local zoning officials, constituents, etc.).
- **Code Update Strategies:** Many states are one or more cycles behind on fire safety code adoption, which means that key updates for energy storage have not been updated. This work will develop resources to support states in their efforts to update energy storage safety codes and standards.
- **Property Values Study:** Quantifying the impact of energy storage projects on neighboring property values.



Takeaways and Conclusions

- Local zoning and siting remains a timely and key topic as BESS installations continue to increase nationwide.
- Incorporating clear zoning regulations informed by current codes and standards is an important piece of ensuring that BESS deployment is harmonious with local preferences and other land uses, maximizes local benefits, and enables efficient use of limited local planning resources.
- PNNL's expertise in this space will continue to provide valuable resources to local and state partners.



Thank you

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