

Battery Energy Storage Systems (BESS): Fundamentals of Siting and Safety

**Onondaga County Planning Symposium
Jennifer Manierre, Director, Clean Energy Siting**

NYSERDA

March 19, 2026

Resources for Local Governments

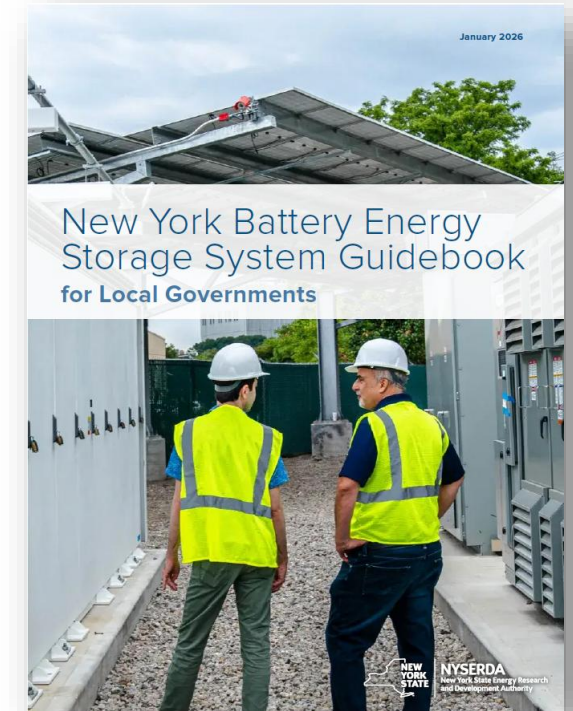
cleanenergyhelp@nyserda.ny.gov

<http://www.nyserda.ny.gov/siting>



NYSEERDA Clean Energy Siting Team:

- Clean Energy Guidebooks for Local Governments, incl. [BESS Guidebook](#)
- Hands-on **education & training opportunities**
- **Technical assistance and local laws review/drafting support**
- **Pre-recorded trainings** (e.g. [‘Deploying Safe Lithium-Ion Energy Storage in Your Community’](#) webinar)
- Support from regional **Clean Energy Advisors** and technical contractor resources



Resources for Local Governments

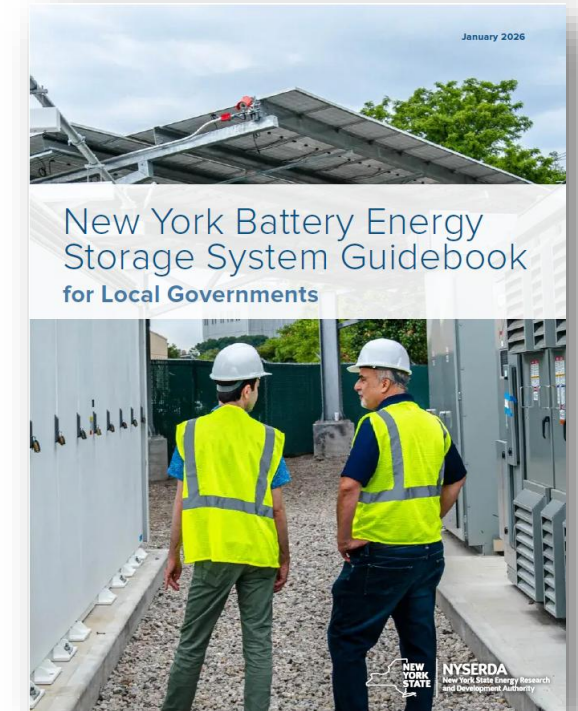
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NYSERDA Clean Energy Siting Team:

Energy Storage Guidebook

- Fact Sheets
- Links to 2025 Fire Code
- FAQ
- Model Law
- Model Permit
- Fire Safety Working Group Deliverables
 - Fire Code Recommendations
 - Press Releases
 - Air, Soil, and Water Report
 - Webinar recording
- Peer Review Resources



Battery Energy Storage Systems (BESS): Fundamentals of Siting and Safety

Agenda

- Introduction to Energy Storage
- Planning & Zoning for Energy Storage
- Fire Safety Considerations
- Resources for Local Governments
- Q&A



Introduction to Energy Storage

Introduction to Energy Storage

Drivers & Technologies

Quick Primer: Watt's in a watt?

Energy technologies are often described in terms of “capacity,” described in terms of how much electricity they generates, store, or consume.

Watt (W): a measurement of **power** (i.e. the rate at which something generates or consumes electricity).

1 Kilowatt (kW) = 1,000 W

1 Megawatt (MW) = 1,000 kW

1 Gigawatt (GW) = 1,000 MW

Watt-hour (Wh): = a measurement of **energy** (i.e. the sum of electricity generated and/or used over a defined timeframe [1-hr]); energy = power x time

1 Kilowatt-hour (kWh) = 1,000 Wh

1 Megawatt-hour (MWh) = 1,000 kWh

1 Gigawatt-hour (GWh) = 1,000 MWh

Example: Consider the tub!



Introduction to Energy Storage

Drivers & Technologies

Why are we talking about energy storage?

Driving electric grid questions/concepts:

- Do we have enough (+ *when we need it*)?
→ **'Resource Adequacy'**
- Can the grid withstand strain / challenges?
→ **'Reliability' / 'Resilience'**
- Can we avoid/minimize/manage costs of grid operations, maintenance?
→ **'Affordability'**

Introduction to Energy Storage

Drivers & Technologies

WHY ARE WE TALKING ABOUT BATTERIES?

Energy storage acts like a giant battery for the electric grid. It can store extra electricity on sunny days when solar panels are producing more power than we need. Then, it releases that stored energy when we need it most, such as during the evening or on hot days when everyone's using air conditioning.

This helps the grid in two significant ways:

Making it more resilient: If something goes wrong, like a storm knocking out power lines, energy storage can step in to supply electricity, keeping the lights on and essential services running until the problem is fixed.

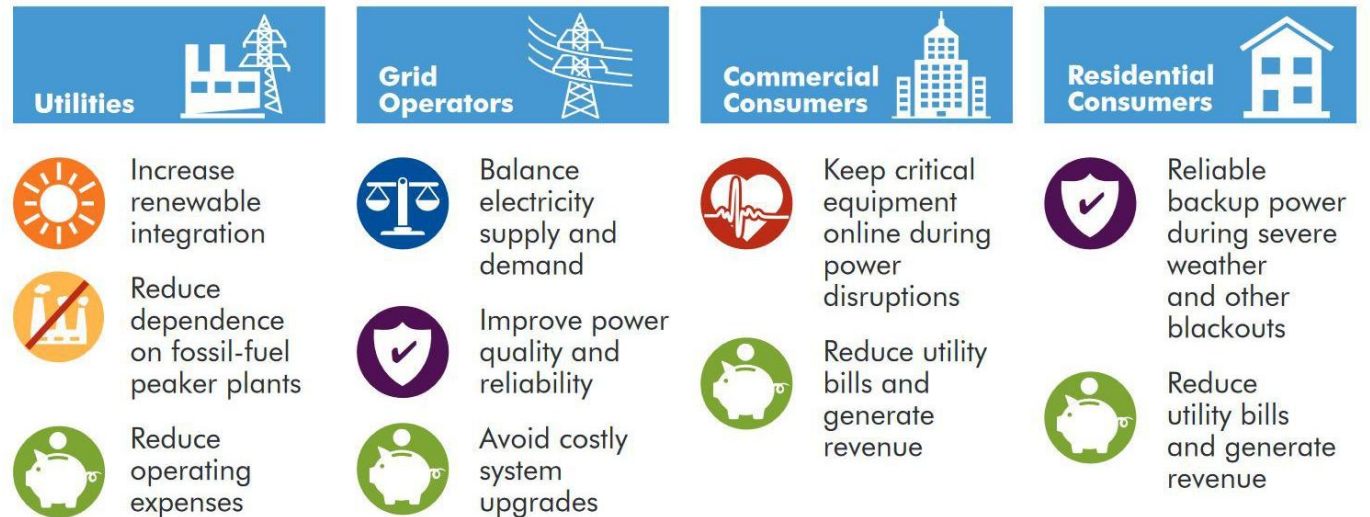
Saving money: Storage helps avoid the need to turn on expensive power plants only used during peak demand times. By smoothing out supply and demand, it reduces costs for everyone.

Introduction to Energy Storage

Drivers & Technologies

Energy storage can help address these questions across 'sectors' of the grid:

- Residential customers
- Businesses/commercial customers
- Electric service utilities (e.g. National Grid)
- Grid operators (NYISO)

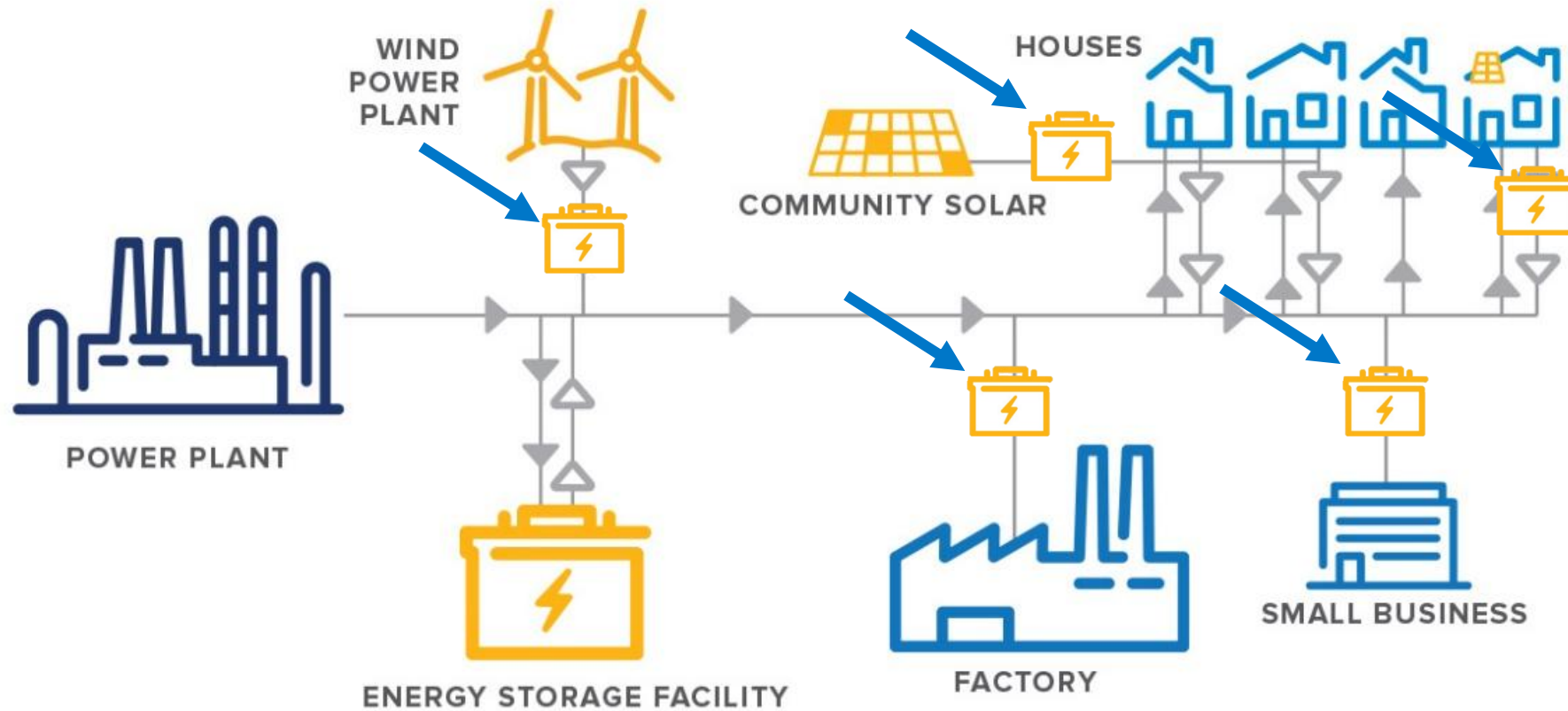


Energy storage technologies have the capacity to benefit each segment of the power system.

© CLEAN ENERGY GROUP

Introduction to Energy Storage

Drivers & Technologies



Introduction to Energy Storage

Drivers & Technologies

Energy storage can help address these questions across ‘sectors’ of the grid:

Residential
“Behind the Meter”
~5-10 kW



On-Site Retail
“Behind the Meter”
~50-750 kW



Off-Site Retail
“Front of the Meter”
~1-5 MW



Bulk
“Front of the Meter”
~20+ MW



Residential & Retail Program

Bulk Program

Introduction to Energy Storage

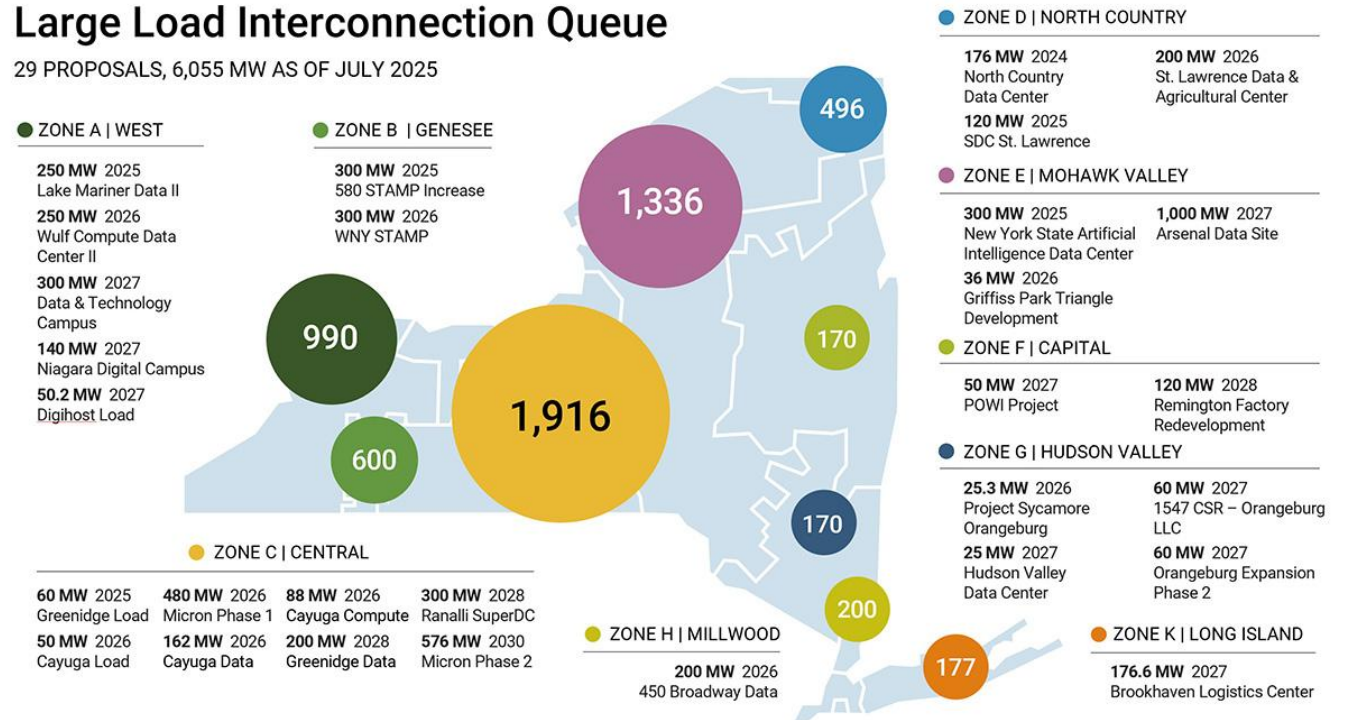
Drivers & Technologies

Why are we talking about energy storage?

- Load growth! (Manufacturing, economic development projects, data centers, electrification, etc.)

Large Load Interconnection Queue

29 PROPOSALS, 6,055 MW AS OF JULY 2025



Introduction to Energy Storage

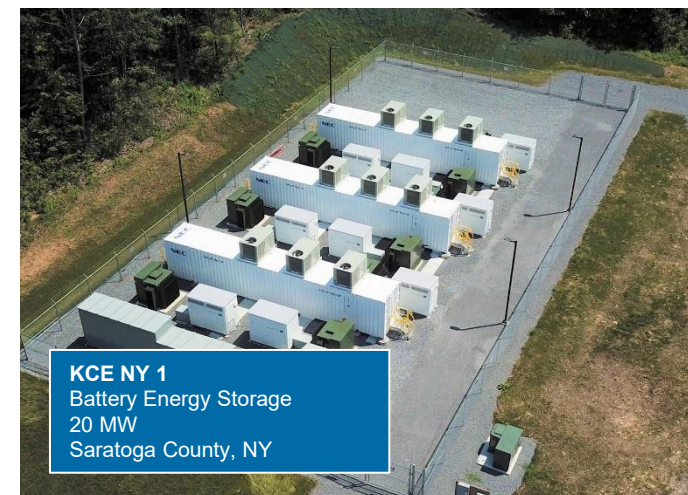
Drivers & Technologies

- We want **electrical energy**
- Energy Storage = Technology which stores and/or converts one form of energy to another usable form (in this case, electrical energy)
- Examples of energy storage technologies:
 - Chemical
 - Mechanical
 - Thermal



Introduction to Energy Storage Drivers & Technologies

NOT Hypothetical - Energy Storage Technologies Exist in NYS:



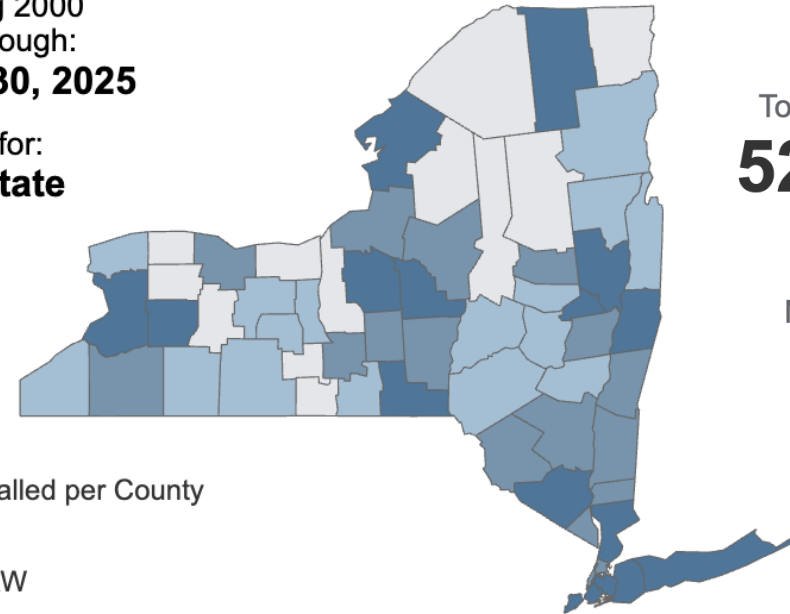
Introduction to Energy Storage

Drivers & Technologies

NOT Hypothetical - Energy Storage Technologies Exist in NYS:

Data beginning 2000 and current through: **November 30, 2025**

Showing Data for: **New York State**



Total Capacity (MW AC)
523.99 MW

Number of Projects
7,311

Megawatts installed per County

- 0 kW
- >0 to 100 kW
- >100 to 1000 kW
- >1 MW to 10 MW
- >10 MW

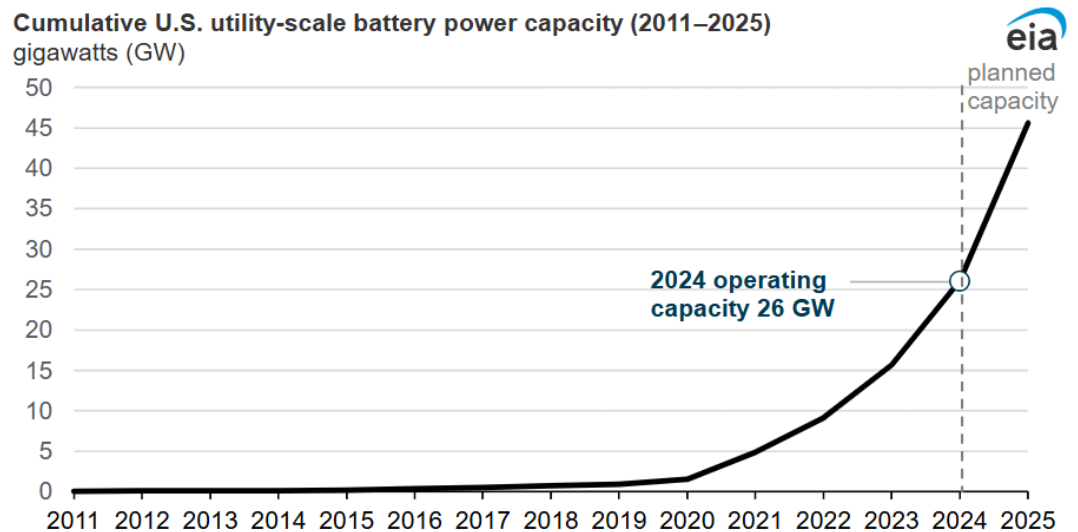
Introduction to Energy Storage Drivers & Technologies

Majority of energy storage being deployed today is battery energy storage, due to:

- Technology maturity
- Falling costs
- Siting considerations
- System efficiency
- Energy density
- Scalability

U.S. battery capacity increased 66% in 2024

Cumulative U.S. utility-scale battery power capacity (2011–2025)
gigawatts (GW)



Data source: U.S. Energy Information Administration, Preliminary Monthly Electric Generator Inventory, January 2025

WHY IS LITHIUM-ION THE PREFERRED CHEMISTRY?

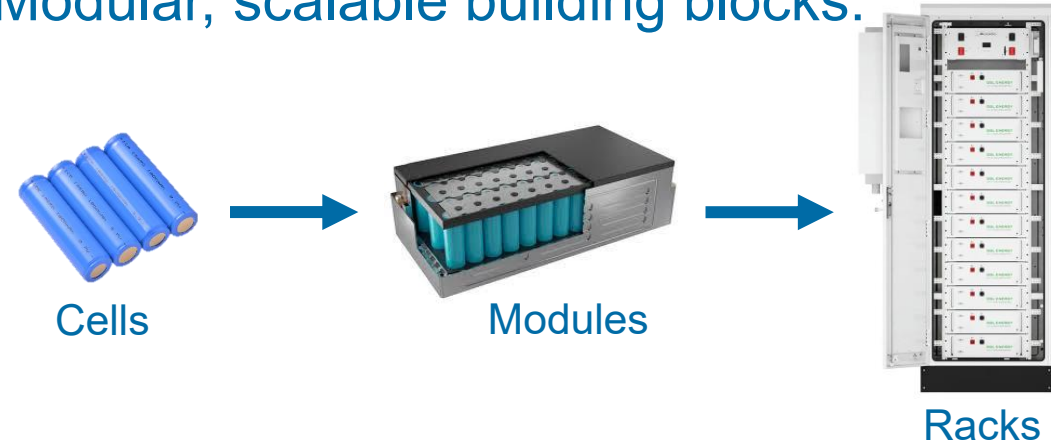
1. **Size**: Can store a large amount of energy in a small, lightweight package
2. **Speed**: Can be charged and discharge quickly
3. **Lifetime**: Last longer with lower long-term costs thus requiring less frequent replacement
4. **Charge Retention**: Loses charge very slowly when not in use
5. **Cost**: Less expensive than alternative forms
6. **Technologically Maturity**: Tremendously high market penetration



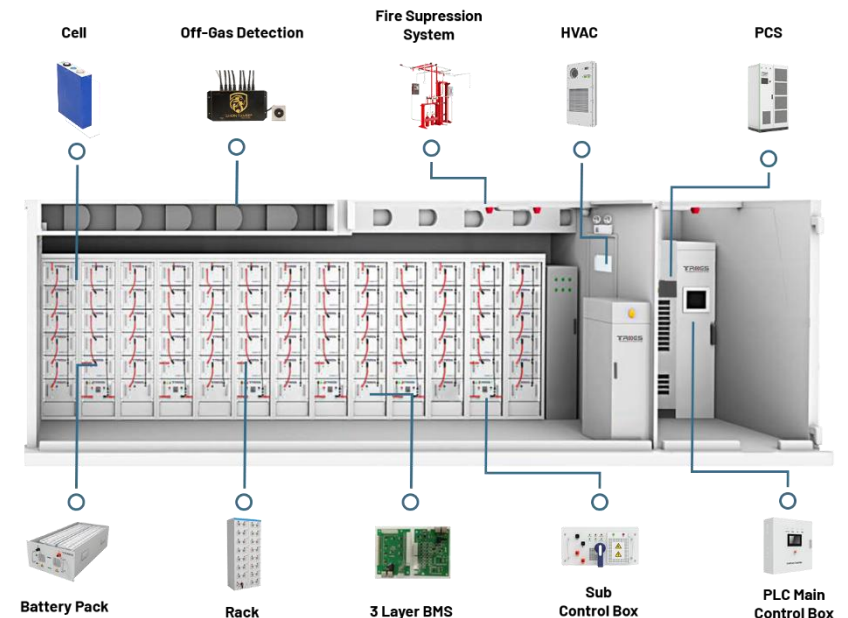
Introduction to Energy Storage Drivers & Technologies

Battery Energy Storage Systems (BESS):

- Modular, scalable building blocks:



- Battery management system (BMS)
- Balance of system (BOS) equipment



Introduction to Energy Storage Drivers & Technologies

Battery Management System (BMS)

- Continuous monitoring down to the cell level
- Will alarm if there are potential issues
- If required, can isolate affected cells or modules from the total system and activate fire protection systems, preventing further failure
- Numerous safety features: cell balancing/monitoring, thermal management, charge/discharge protection, fault diagnosis/reporting



Introduction to Energy Storage Drivers & Technologies

BESS continue to evolve to address numerous variables, including:

- Safety
- Costs
- Energy density
- Duration
- Physical footprint
- Material availability / recoverability

NYS as a leader in battery innovation:

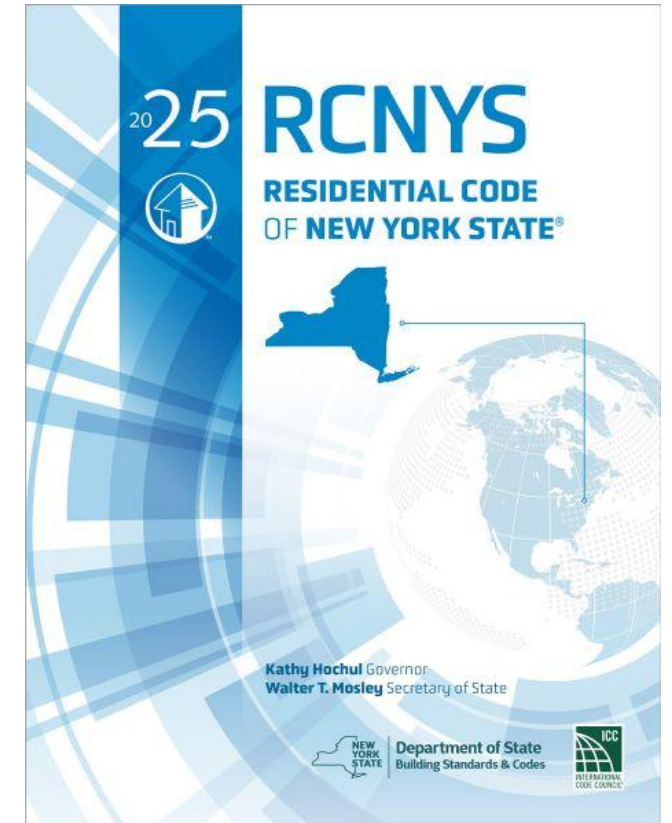
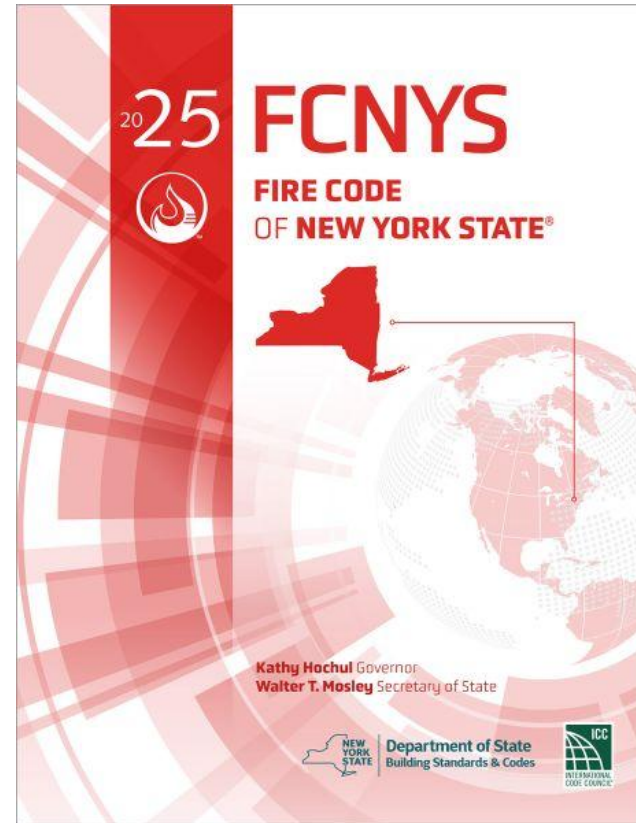
New Energy New York (NENY) Coalition, led by Binghamton University, is one of 10 Regional Innovation Engines funded by the National Science Foundation.



Planning & Zoning for Energy Storage

Planning & Zoning for Energy Storage

Each of your communities already has robust, enforceable regulations in place to ensure safety of BESS installations:



More on that to come!

Planning & Zoning for Energy Storage

Why should local governments proactively consider / plan for energy storage?

- Variety of use cases



20 kWh, residential



White Plains, NY

940 kWh, commercial



Yorktown, NY

1.85 MWh, DER



Blasdell, NY

45.6 MWh, Bulk

Planning & Zoning for Energy Storage

What do each of those use cases / installations have in common?

They are all subject to **local permitting authority**.

Technology Type		State Permitting* (ORES)	Local Permitting (SEQR/local regulations)
Renewable Generator (e.g. solar, wind)		≥ 25 MW*	< 25 MW
Battery Energy Storage System (BESS)	Co-located with Renewable Generator	All sizes if co-located with ≥ 25 MW renewable generator	All sizes if co-located with < 25 MW renewable generator
	Standalone System	N/A	All sizes*

**Under Public Service Law (PSL) §68, electric corporations are required to seek a Certificate of Public Convenience and Necessity (CPCN) for alternate energy production facilities – including renewables and energy storage systems – exceeding 80 MW.*

Planning & Zoning for Energy Storage

Why should local governments proactively consider / plan for energy storage?

- Variety of use cases
- Local permitting authority
- Balancing constituent / shared benefits with impacts
- Moving *beyond* moratoria

Planning & Zoning for Energy Storage

Land Use & Planning Considerations for Clean Energy Technologies:

- Electrical infrastructure (proximity, capacity)
- Appropriate locations (zoning)
- Bulk and area standards
- Environmental impacts
- Visual impacts
- Agricultural impacts
- Decommissioning
- Taxation

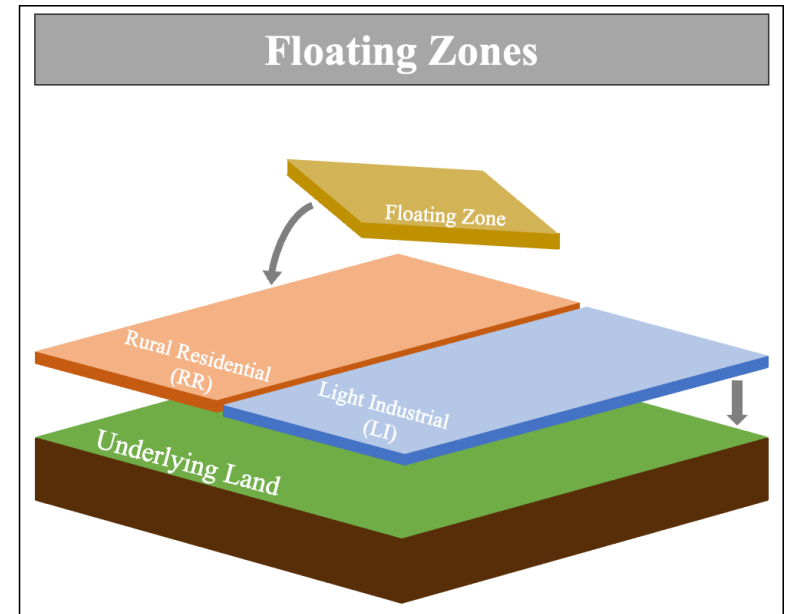
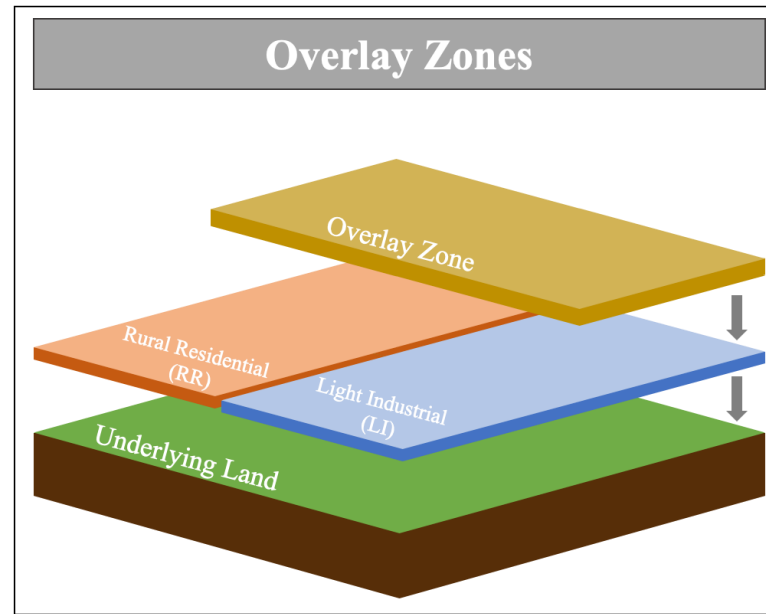
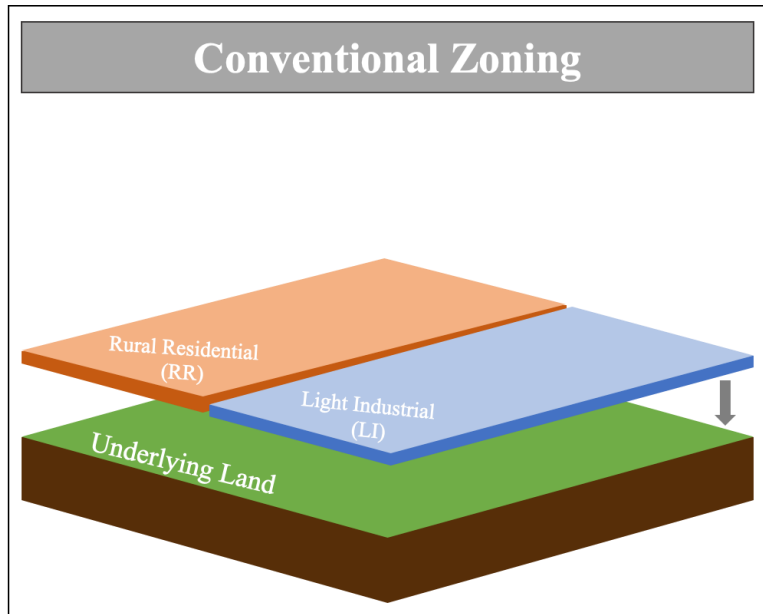
Planning & Zoning for Energy Storage

Land Use & Planning Considerations for Battery Energy Storage Systems:

- Electrical infrastructure (proximity, capacity)
- Appropriate locations (zoning)
- Bulk and area standards
- Environmental impacts
- Visual impacts
- Agricultural impacts
- Decommissioning
- Taxation
- **Fire safety**
- **Incident management training**

Planning & Zoning for Energy Storage

Choosing a regulatory tool for BESS:



Planning & Zoning for Energy Storage

Establish Definitions to Enable Appropriate Zoning:

Tier 1

Tier 1 BESS have an aggregate energy capacity **less than or equal to 600kWh** and, if in a room or enclosed area, consist of only a single energy storage system technology.

Tier 2

Tier 2 BESS have an aggregate energy capacity **greater than 600kWh** or are comprised of more than one storage battery technology in a room or enclosed area.

Tier 1 BESS Examples

Residential BESS:



5 kW / 14 kWh installation: [Tesla Powerwall 2](#)
(5 kW / 14 kWh/unit); installed in utility space



9.8 kW / 20 kWh installation: [SonnenCore+](#)
(4.8 kW / 10 kWh/unit); installed in garage

Tier 1 into Tier 2 BESS Examples

Small to Medium Commercial BESS:



White Plains, NY

50 kW / 250 kWh installation: [Cadenza Innovation system](#), in collaboration with NYPA and NYSERDA; sited at commercial office location in White Plains, NY.



White Plains, NY

375 kW / 940 kWh installation: [Peak Power project](#), part of a virtual power plant arrangement with Con Edison; sited at commercial office location in White Plains, NY.

Tier 2 BESS Examples

Medium to Large Commercial BESS:



Yorktown, NY

490 kW / 1,856 kWh installation: [Tesla Powerpack](#) system, co-located with rooftop community solar; BESS installed in Yorktown, NY parking lot



Brooklyn, NY

750 kW / 2,500 kWh installation: Enel X project, installed at large commercial building (sports arena) in Brooklyn, NY

Tier 2 BESS Examples

Large Commercial to Grid-Scale BESS:



4.8 MW / 16.4 MWh installation: Enel X's [Gateway Center project](#); sited at a commercial shopping center in Brooklyn, NY



20 MW / 45.6 MWh installation: Key Capture Energy's [KCE NY6 project](#); Blasdell, NY, adjacent to self-storage facility, landscaping/topsoil supplier, and plant nursery.

Planning & Zoning for Energy Storage

Establish Definitions to Enable Appropriate Zoning:

RECOMMENDATIONS:

- Learn about the NYS Fire Code requirements, already in place in your community; avoid duplication/conflict.
- If exploring alternate structures/definitions, base them on well-considered, legitimate source(s)
- Consider and account for the reality of system benefits:
 - *On-site* customer-serving?
 - *Remote* customer-serving?
 - Grid-serving?

Planning & Zoning for Energy Storage

Establish Thorough and Reasonable Permitting Requirements:

Section 6: Tier 1 Battery Energy Storage Systems

- Battery Energy Storage System Permit
- Inspection Checklist
- Applicable fire code

Section 7: Tier 2 Battery Energy Storage Systems

- Special Use Permit
- Site Plan Review
- Applicable fire code

Planning & Zoning for Energy Storage

Establish Thorough and Reasonable Permitting Requirements:

For larger systems, this includes:

- Decommissioning planning
(incl. consideration of funds)
- Public hearing process
- Enforcing compliance / avoiding duplication,
conflict with **existing NYS Fire Code
requirements**

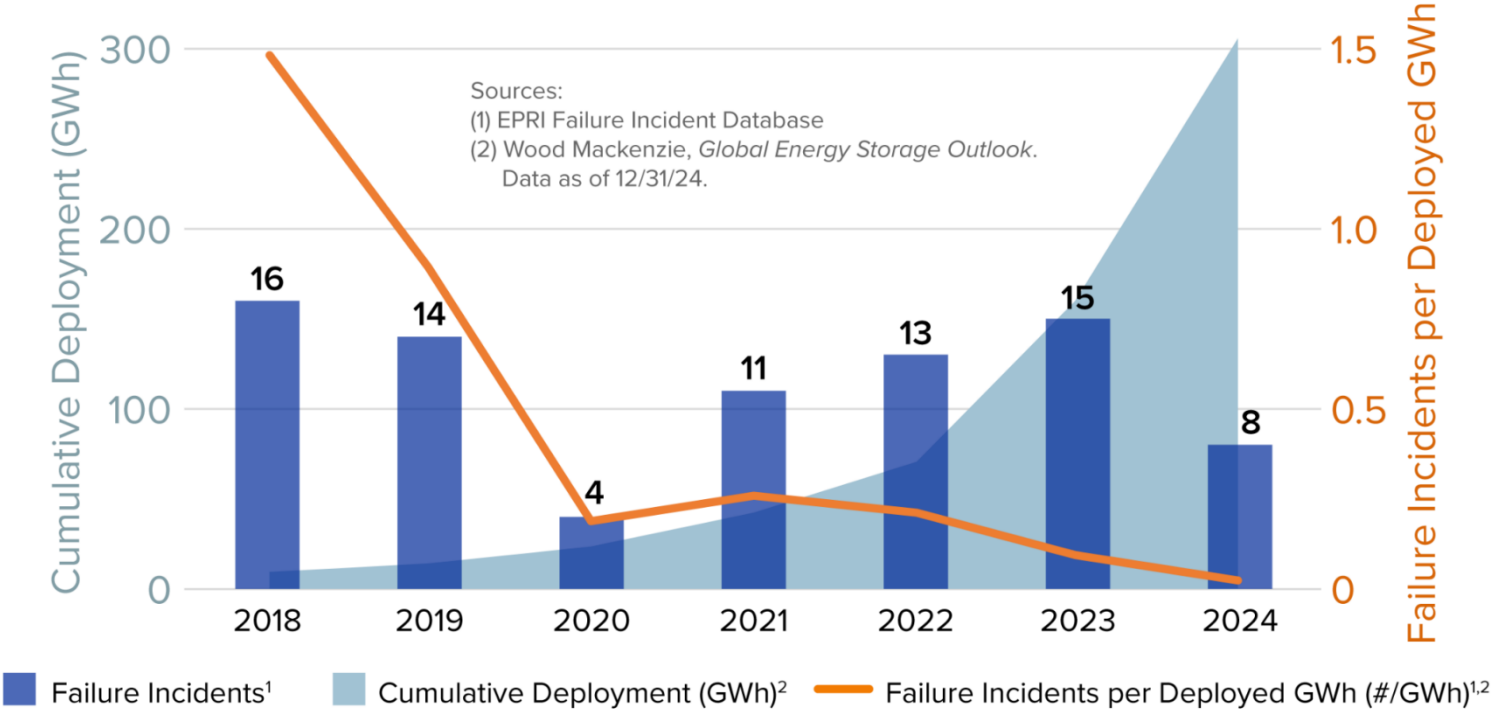


Fire Safety Considerations: Codes, Standards, and Peer Review

Fire Safety & the 2025 NYS Fire Code

BESS failure incident rates continue to decline year-over-year; fire safety and code compliance as well as technology advancements played a role in this trend.

Global Grid-Scale Storage Deployment and Failure Statistics



Fire Safety & the 2025 NYS Fire Code

NYS Inter-Agency Fire Safety Working Group

In July 2023, in response to fires at three BESS sites, Governor Hochul convened an Inter-Agency Fire Safety Working Group (Working Group).

Agency Participants

- Division of Homeland Security Emergency Services (DHSES)
- Office of Fire Prevention and Control (OFPC)
- New York State Energy Research and Development Authority (NYSERDA)
- Department of Environmental Conservation (DEC)
- Department of Public Service (DPS)
- Department of State (DOS)

Working Group Partners

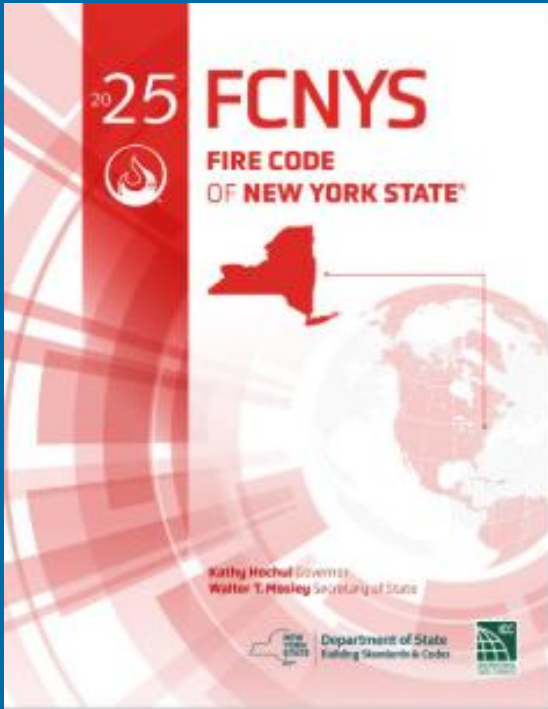
Highly specialized Subject Matter Experts (SME)/fire protection engineering firms, national labs, and New York Power Authority

Fire Safety & the 2025 NYS Fire Code

NYS Inter-Agency Fire Safety Working Group

1. Release **preliminary Air, Soil, and Water Data Findings Report**. No reported injuries, no detected harmful levels of contaminants linked to the fires. *Issued December 2023*
2. Issuance of final **Fire Code Recommendations** for NYS Uniform Code. Resulted in 11 recommendations for large, grid-scale systems. Draft code language to reflect the recommendations now incorporated into the Notice of Proposed Rule Making. *Issued March 2025*
3. **Field Inspections and Quality Assurance** – inspected 57 in-service projects with SME collaboration resulting in an enhanced NYSERDA inspection process. *Completed Dec 2024*
 - *Through lessons learned, incorporated peer review into NYSERDA program*
4. State-wide **Webinar for local communities**. Q2 2025
5. Accessing and examining Root Cause Analysis.

NYS Uniform Code

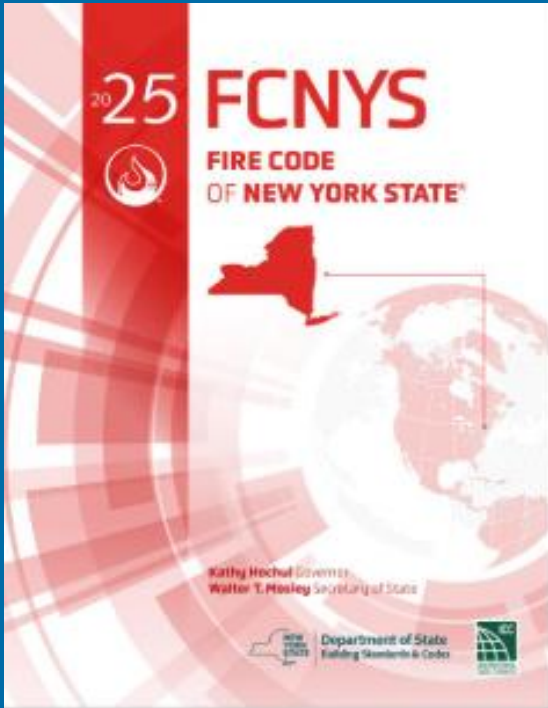


Energy Storage in the NYS Uniform Fire Prevention and Building Code (Uniform Code):

- **May 2020:** 2020 Uniform Code cycle goes into effect; codifies requirements for BESS in multiple codes.
- **July 2025:** NYS Code Council adopts the 2025 Uniform Code, codifying recommendations from the Fire Safety Working Group.

The 2024 IFC is the basis of the 2025 Fire Code of New York State, which is in full effect Jan 1, 2026.

NYS Uniform Code



Energy Storage in the NYS Uniform Fire Prevention and Building Code (Uniform Code):

Key takeaways:

- Numerous key code sections were **previously discretionary; now required!**
- Requires **application peer reviews**, to ensure subject matter experts are involved in all approvals
- Requires project-specific **Pre-Incident Plans** to be developed in consultation with local fire department
- Requires project owners to **provide annual on-site visits, Plan reviews/trainings**
- Requires project owner to furnish **Hazard Support Personnel** to support and collaborate with local first responders

NYSERDA PEER REVIEW LAUNCH

THE PROBLEM WE FACED

Local AHJs need better support to properly review energy storage projects

WHAT WE ARE DOING ABOUT IT

Peer reviews are thorough design reviews to ensure code compliance and they are now a **requirement for all NYSERDA-funded projects**

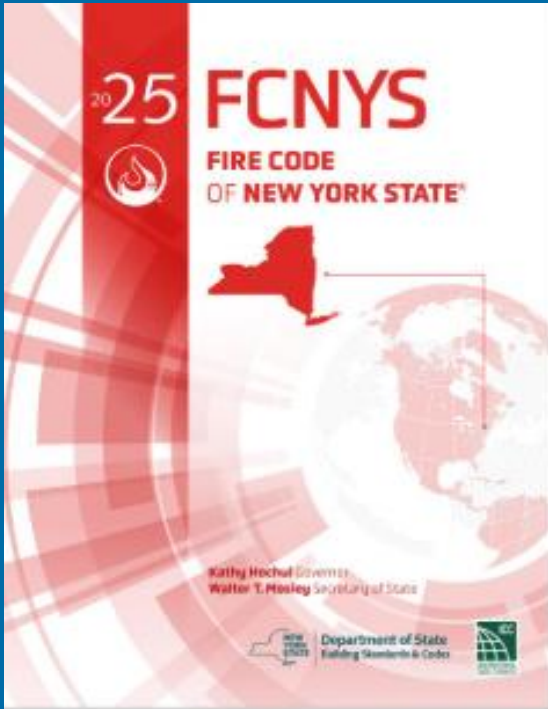
- Three nationally renowned expert firms are contracted to conduct peer reviews on behalf of NYSERDA.
 - **Camelot Energy Group** – Seasoned renewable industry engineering professionals with deep energy storage experience
 - **DNV** – Energy storage fire safety experts who perform peer reviews on behalf of NYC Dept. of Buildings and others
 - **ESRG** – Energy storage fire safety experts consisting of former first responders and engineers

PROCESS AND RESULT

- Peer reviewers looking for compliance with FCNYS, NEC, and other applicable standards.
- Peer reviewers will work on project plans with applicant until approved and then produce a report and approval letter for applicant to pass on to the local government.



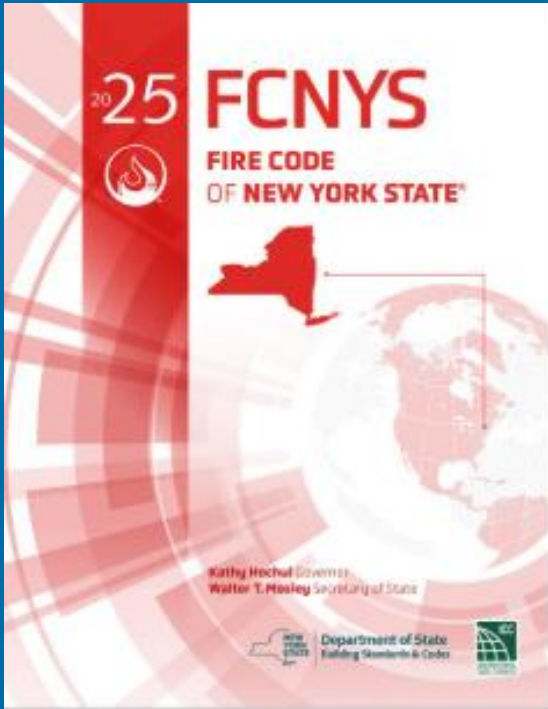
NYS Uniform Code



2025 NYS Fire Code Requirements:

- Building Permits and Operating Permits required
- Permit application requirements to include, among other items:
 - Commissioning Plan
 - Decommissioning Plan
 - Fire Safety & Evacuation Plan
 - Peer Reviewer
- Hazard Mitigation Analysis
- Large-Scale Fire Testing

NYS Uniform Code



2025 NYS Fire Code Requirements:

- Hazard Mitigation Analysis (analyzes failure modes and effects)
- Large-Scale Fire Testing
- Fire Remediation:
 - Hazard support personnel
“...at their own expense...”
- Peer Review
- Annual Site Visit and Trainings
- 3rd Party Safety Inspections

National Standards for BESS

UL 9540



- All systems listed in accordance with **UL 9540** “Standard for Energy Storage Systems and Equipment.”
 - This is an equipment listing, not a field verification/test method
 - Products that received UL 9540 equipment listing in mid-2020 or later have undergone UL 9540A testing
- **UL 9540 Standard certifies that all components of the system work safely in harmony together.**

UL 9540-A



UL 9540A

- **What is UL 9540A?**
 - A performance test method to evaluate fire characteristics of a BESS that undergoes thermal runaway
 - Data can inform product design, installation parameters, code official decisions
 - It is required by the NYS Fire Code (600kWh or greater)
 - May be used for fire code official to approve exceptions to certain requirements

National Standards for BESS

Applicable Codes & Standards:



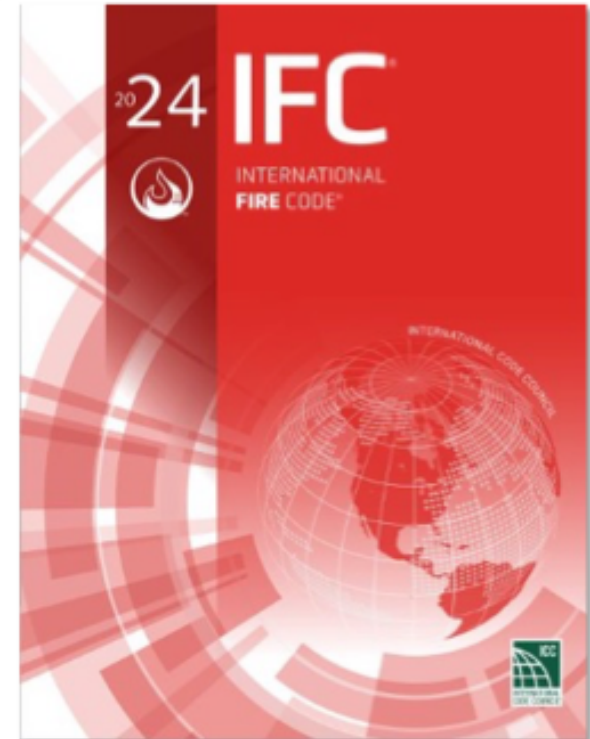
- **UL 9540:** “Standard for Energy Storage Systems and Equipment” certifies that all components of the system work safely in harmony together
- **UL 1741:** Inverters for utility interactive systems listed for use with distributed energy resources
- **UL 9540A:** Test method to evaluate system safety pertaining to thermal runaway



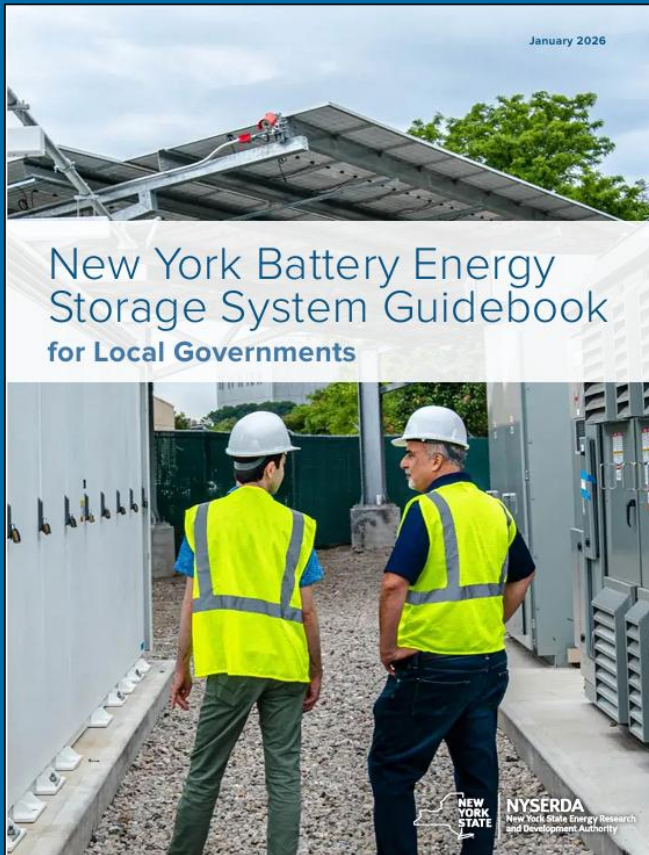
- **International Fire Code (IFC) Chapter 1207, Energy Storage Systems**
 - This is the basis for 2020 FCNYS section 1206 and section 1207 of the 2025 FCNYS



- **NFPA 12** – Standard on CO₂ Extinguishing Systems
- **NFPA 13** – Standard for the Installation of Sprinkler Systems
- **NFPA 15** – Standard for Water Spray Fixed Systems for Fire Protection
- **NFPA 68** – Standard on Explosion Protection by Deflagration Venting
- **NFPA 69** – Standard on Explosion Prevention Systems
- **NFPA 70** – National Electric Code (NEC)
- **NFPA 72** – National Fire Alarm and Signaling Code
- **NFPA 750** – Standard on Water Mist Fire Protection Systems
- **NFPA 855** – Standard for the Installation of Stationary Energy Storage Systems*
- **NFPA 1142** – Standard on Water Supplies for Suburban and Rural Firefighting
- **NFPA 2001** – Standard on Clean Agent Fire Extinguishing Systems
- **NFPA 2010** – Standard for Fixed Aerosol Fire-Extinguishing Systems



Resources for Local Governments

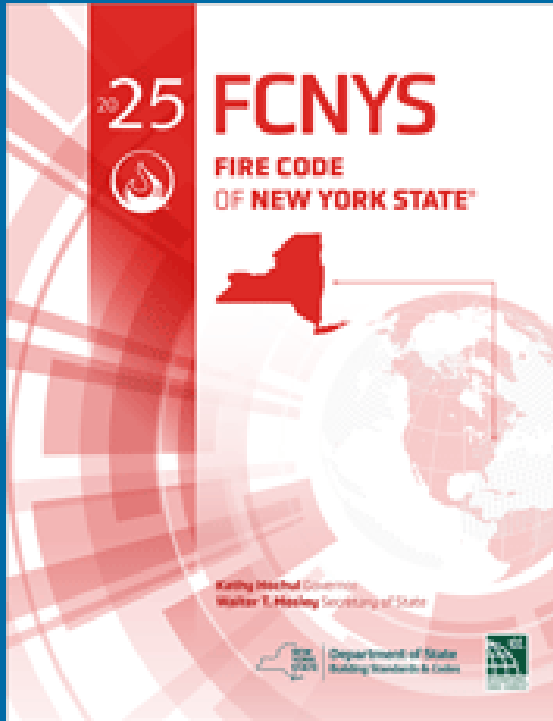


NYSERDA Clean Energy Siting Team:

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- Peer Review Resources

Resources for Local Governments



NYS State Fire Prevention and Building Code Council:

- [New York 2025 Code Books](#)

Office of Fire Prevention & Control (OFPC):

- [BESS Fire Service Response Guide](#)
- [Battery Emergencies Training](#) (DHSES Learning Management)

LAND USE VS FIRE CODE

Land Use

- Regulates the use of land, the density of land use, and the siting of development
- Ensures residential, commercial, and industrial developments coexist in a plan

The Primary Difference

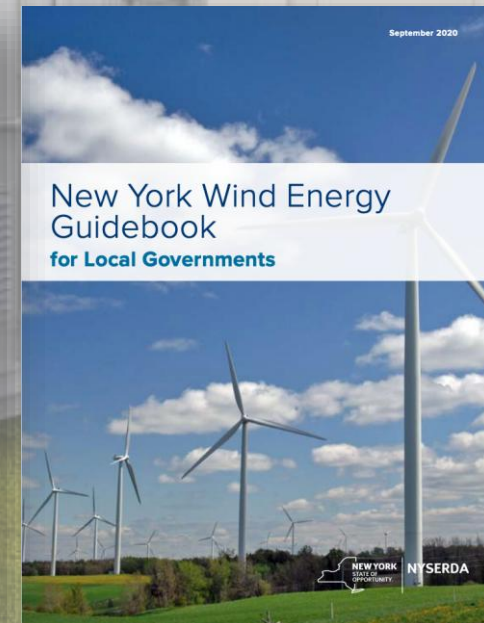
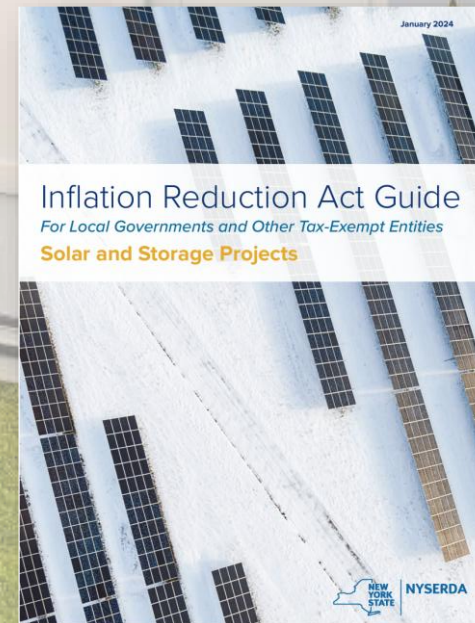
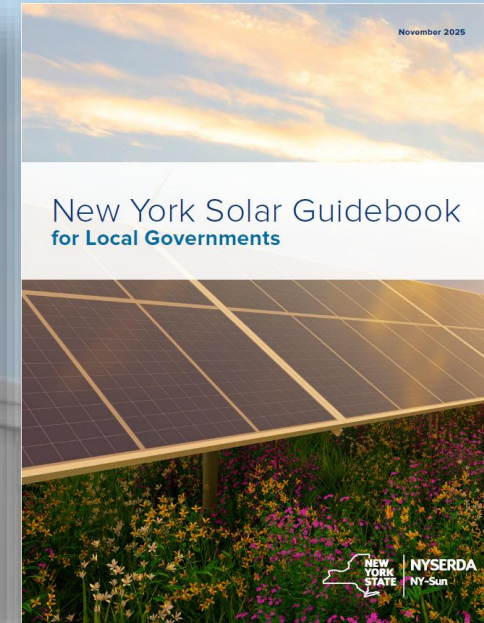
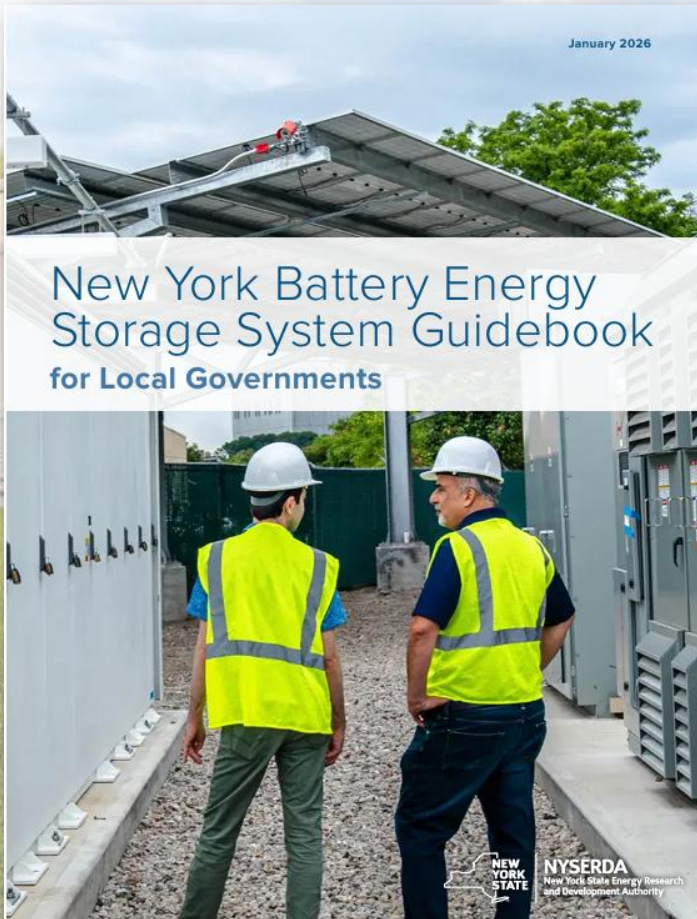
- Encourages **Land use** governs where and what you can build (zoning & redevelopment location), and

Fire Code

- **Fire code** governs how that building/structure is designed, maintained, & operated to prevent fires
- buildings, facilities, and processes across New York State (excluding NYC)
- It regulates fire prevention, hazardous materials, emergency preparedness, and building safety

Clean Energy Siting Team

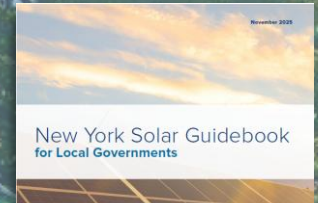
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Q&A

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NineDot installation sited across the street from a school in the Bronx