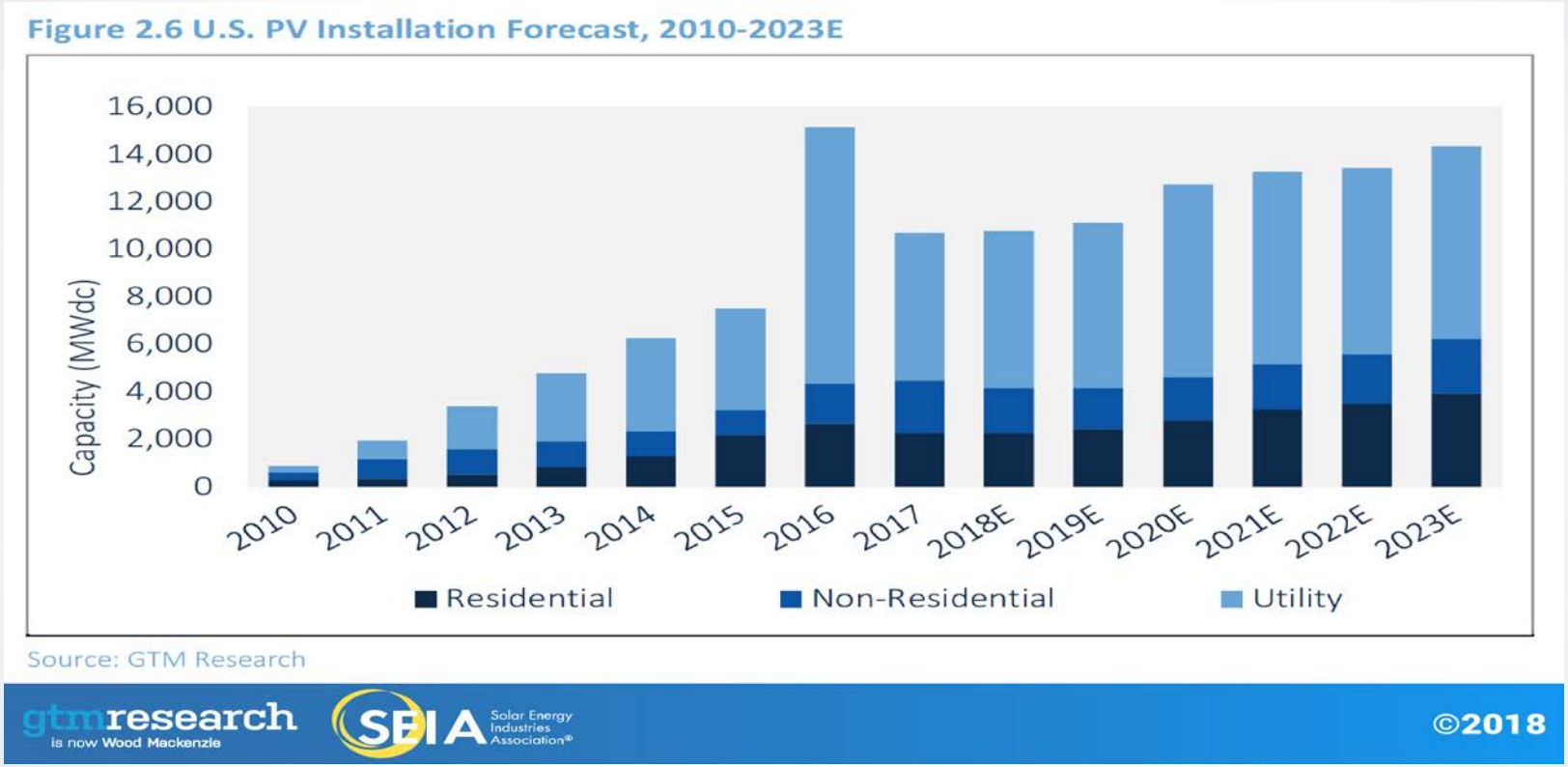
Building a Path to Solar+Storage in NY

Central Hudson Solar Summit
Sustainable CUNY
March 6, 2019

The Path to ESS Permitting?

U.S Solar Growth/Forecast



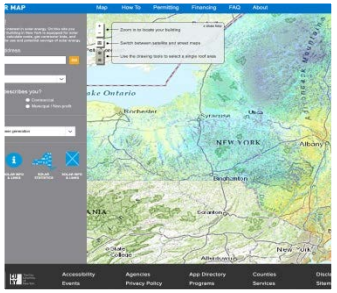
Since 2011 $/W Dropped

New York City	45%
New York State	57%

Sustainable CUNY

Solar Infrastructure

- Permitting
- Zoning
- Grid Analysis
- Policy Support
- Installer Roundtable

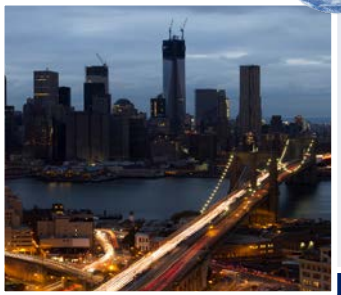


Mapping the Way

- One stop Portal
- Solar Maps
- Data Analytics
- Roadmaps

Accessing Solar

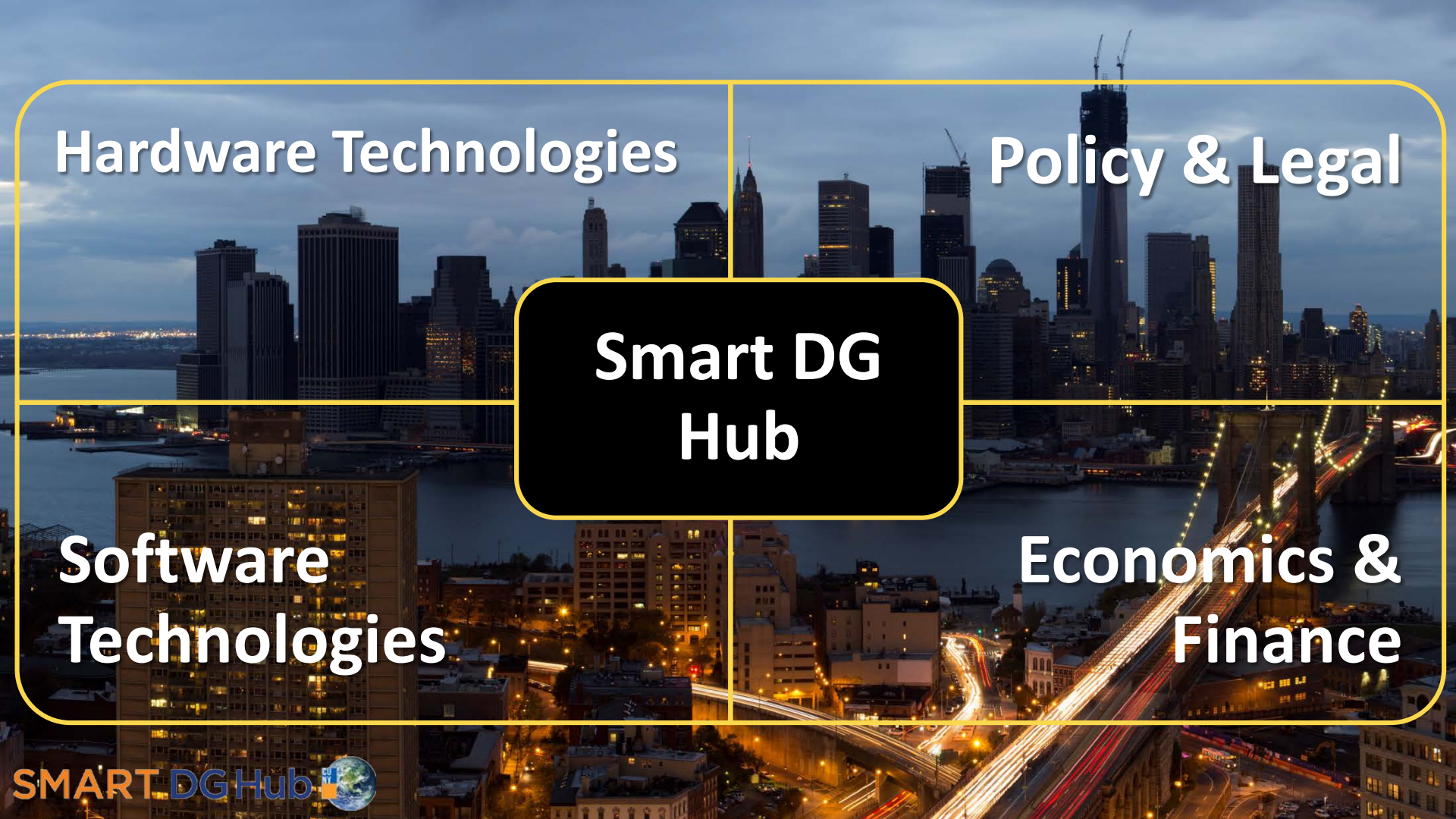
- Group Purchasing
- Community Shared Solar
- Education
- NY Solar Summit



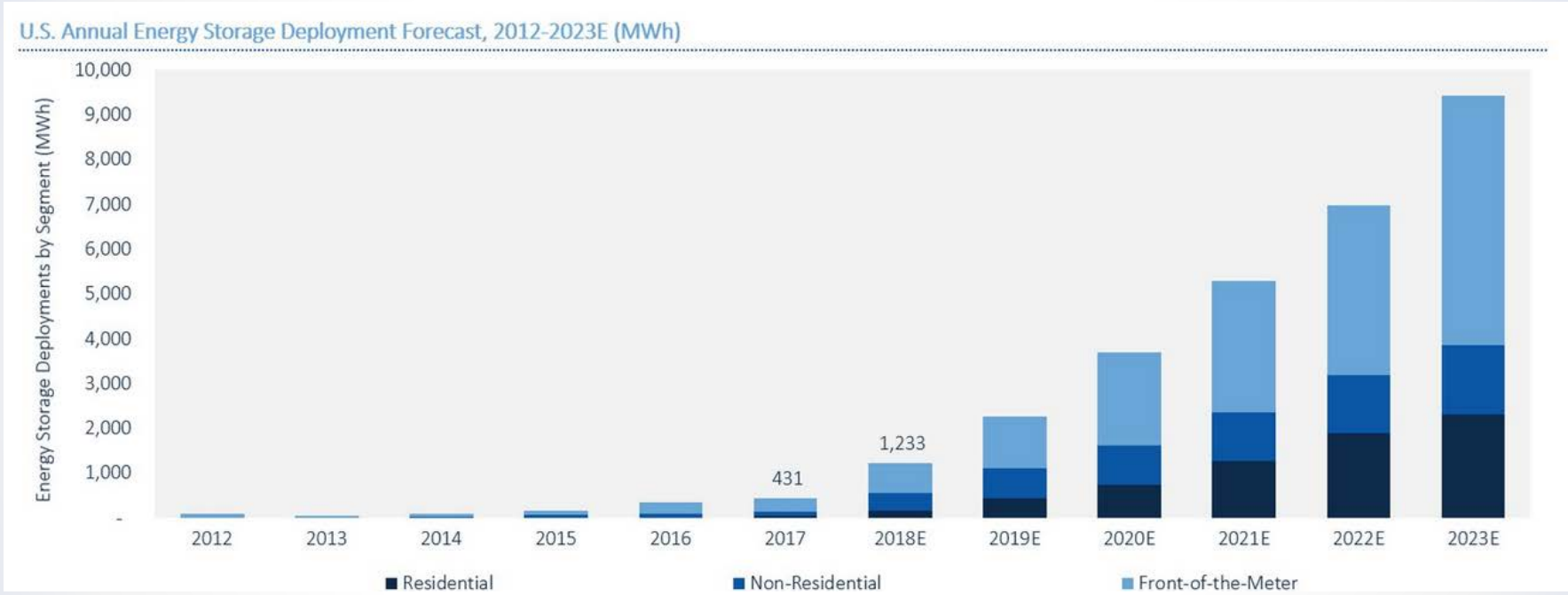
Resiliency

- Smart DG Hub
- Solar-plus-storage
- Critical Facility Support


Smart DG Hub
Trigger
Hurricane Sandy
October 29, 2012
SMART DG Hub


Hardware Technologies
Policy & Legal
Smart DG Hub
Software Technologies
Economics & Finance
SMART DG Hub

U.S. Storage Growth/Forecast



Source: GTM Research / ESA [U.S. Energy Storage Monitor]

NYS Goal

3,000 MW of ESS by 2030

Challenges Include-

- **There is no single definitive set of standards currently in force for energy storage**
- **New York is a home rule state**

The Path

- **Leverage platform that was utilized to create infrastructure for solar, initially in NYC, that was adapted for AHJ diverse needs across the state**
- **Provide guidance and TA to AHJ's across the state**

NYSERDA's Energy Storage Soft Costs Reduction Initiative

Permitting Development, Training & Assistance

DNV·GL

CUNY

ers

Customer Analysis, Identification & Outreach

NEW YORK STATE OF OPPORTUNITY. | NYSERDA

Vendor Outreach & Education

NY BES+ NEW YORK BATTERY AND ENERGY STORAGE TECHNOLOGY CONSORTIUM

CADMUS

EPRI ELECTRIC POWER RESEARCH INSTITUTE

M&V and Performance Analysis

Smart DG Hub- Reducing Soft Costs

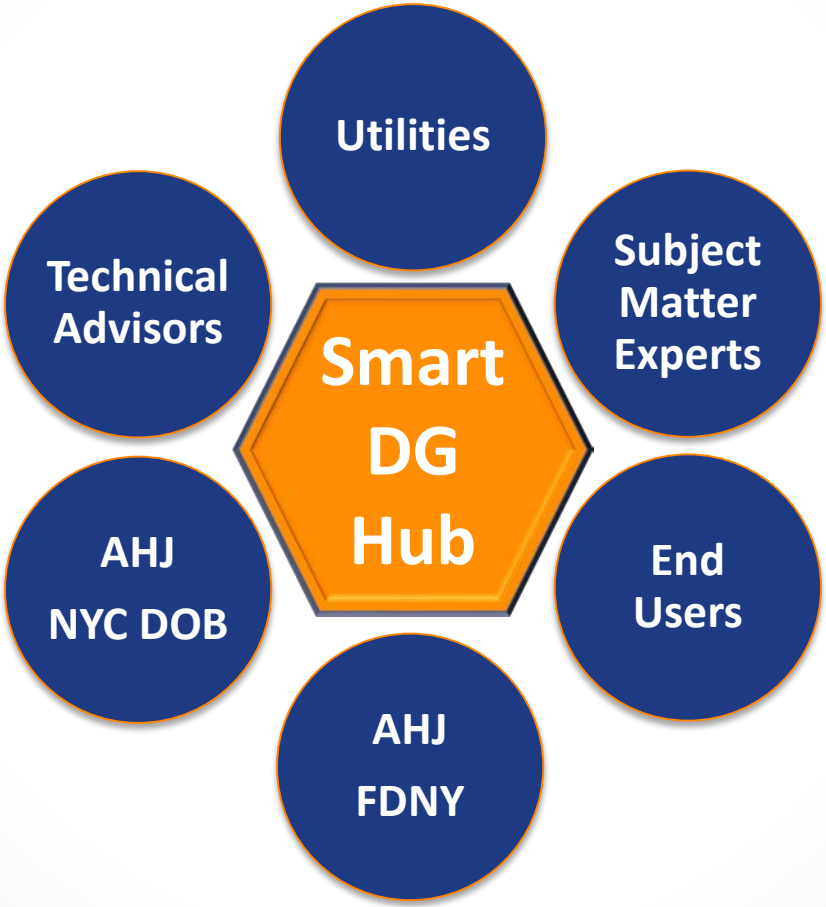
Sustainable CUNY
DNV-GL

Phase 1

- **Develop NYC Storage Permitting Guides**
- **Facilitate Permitting Guidance For NY AHJs**

SMART DG Hub

Smart DG Hub: Engaging the Stakeholders



Industry Expertise

- DNV GL / Con Ed / NYSERDA testing experience
- DNV GL general battery expertise, based on interactions with manufacturers and verification efforts on systems in service
- FDNY field experience
- Current NYC Fire, Building, Mechanical, and Electrical code
- Current and developing standards
  - NFPA 855 (draft), NFPA body of standards as applicable
  - Proposal F95
  - IFC – 2018 and 2021 (draft)
  - IBC – 2018
  - NEC 2017
  - UL body of certification requirements/standards as applicable

Applicable ESS UL Listings

UL 1973

- Batteries for use in Stationary, Vehicle Auxiliary Power and Light Electric Rail (LER) Applications

UL 1741

- Standard for Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources

UL 9540

- Energy Storage System and Equipment

UL 9540 A (testing methodology)

- Thermal Runaway Fire Propagation Within Battery Energy Storage Systems

Outdoor Li-Ion ESS Size Ranges

Small	**≤20kWh**
Medium	**>20kWh – ≤250kWh**
Large	**>250kWh**

ESS Locations/Placement

2 types

Front meter,
“Utility Side”

Behind the meter,
“Customer Side”

Utility

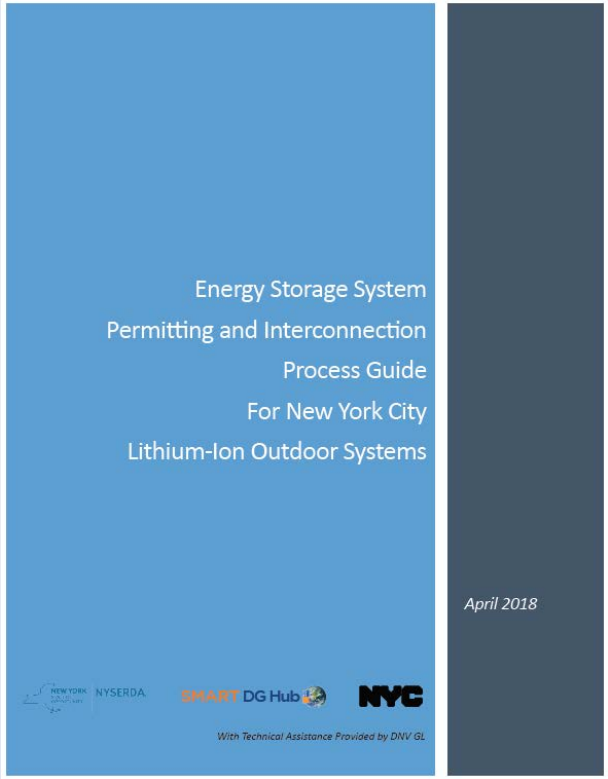
Residential

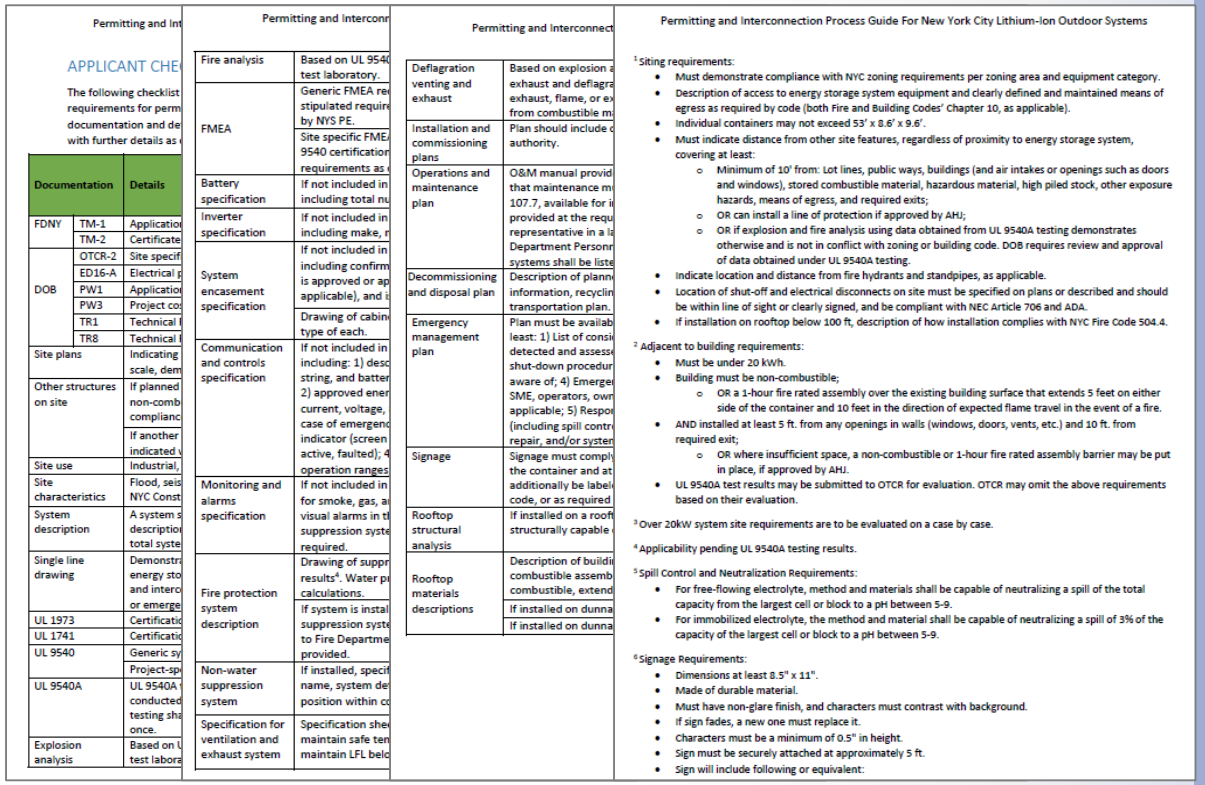
Commercial

Bucket/sub-buckets & main considerations

Fire Protection	Ventilation & Exhaust	Lifecycle Management	Status Communications	Cascading Protection	Signage	Siting
•Define fire protection requirements for mfrs & developers •Define fire suppression & extinguishing techniques to support FDNY SOP development •Support development of threshold quantities and MAQ	•Identify ventilation & exhaust req's (rates, airflow) – normal ops, emergency ops/ fire/explosion •Support development of MAQ and threshold quantities.	•Identify information to be provided by the project developer relating to physical system management •Develop replicable process/template for applicants. •Provide sufficient information to support FDNY SOP development	•On site signaling •Automatic malfunction response •Offsite signaling •Personnel response	•Technology specs •Technology features and functioning •UL listings •Safety concerns addressed	•Posting locations •Information requirements •Physical requirements	•Identify siting requirements to minimize risk of and from fire •Allow emergency exit and access as necessary

Outdoor Li-ion Guide





Permitting and Int

APPLICANT CHE

The following checklist
requirements for perm
documentation and de
with further details as

Documentation		Details
FDNY	TM-1	Applicatio
	TM-2	Certificate
DOB	OTCR-2	Site specif
	ED16-A	Electrical
	PW1	Applicatio
	PW3	Project co
	TR1	Technical
	TR8	Technical
Site plans		Indicating scale, dem
Other structures on site		If planned non-comb compliand
		If another indicated
Site use		Industrial,
Site characteristics		Flood, seis NYC Const
System description		A system s descriptio total syste
Single line drawing		Demonstra energy sto and interc or emerge
UL 1973		Certificatio
UL 1741		Certificatio
UL 9540		Generic sy
		Project-sp
UL 9540A		UL 9540A conducted testing sha once.
Explosion analysis		Based on U test labora

Permitting and Interconn

Fire analysis	Based on UL 954 test laboratory.
FMEA	Generic FMEA re stipulated requir by NYS PE.
	Site specific FME 9540 certificatio requirements as
Battery specification	If not included in including total nu
Inverter specification	If not included in including make,
System encasement specification	If not included in including confirm is approved or ap applicable), and
	Drawing of cabin type of each.
Communication and controls specification	If not included in including: 1) desc string, and batter 2) approved ener current, voltage, case of emergenc indicator (screen active, faulted); 4 operation ranges
Monitoring and alarms specification	If not included in for smoke, gas, a visual alarms in t suppression syste required.
Fire protection system description	Drawing of suppr results[4]. Water p calculations.
	If system is instal suppression syste to Fire Departme provided.
Non-water suppression system	If installed, specif name, system de position within c
Specification for ventilation and exhaust system	Specification she maintain safe ten maintain LFL belo

Permitting and Interconnect

Deflagration venting and exhaust	Based on explosion a exhaust and deflagra exhaust, flame, or ex from combustible m
Installation and commissioning plans	Plan should include authority.
Operations and maintenance plan	O&M manual provid that maintenance m 107.7, available for i provided at the requ representative in a l Department Personn systems shall be liste
Decommissioning and disposal plan	Description of plann information, recyclin transportation plan.
Emergency management plan	Plan must be availab least: 1) List of consi detected and assess shut-down procedur aware of; 4) Emerge SME, operators, own applicable; 5) Respo (including spill contr repair, and/or syste
Signage	Signage must compl the container and at additionally be label code, or as required
Rooftop structural analysis	If installed on a roof structurally capable
Rooftop materials descriptions	Description of build combustible assemb combustible, extend
	If installed on dunna
	If installed on dunna

Permitting and Interconnection Process Guide For New York City Lithium-Ion Outdoor Systems

[1] Siting requirements:
- Must demonstrate compliance with NYC zoning requirements per zoning area and equipment category.
- Description of access to energy storage system equipment and clearly defined and maintained means of egress as required by code (both Fire and Building Codes' Chapter 10, as applicable).
- Individual containers may not exceed 53' x 8.6' x 9.6'.
- Must indicate distance from other site features, regardless of proximity to energy storage system, covering at least:
  - Minimum of 10' from: Lot lines, public ways, buildings (and air intakes or openings such as doors and windows), stored combustible material, hazardous material, high piled stock, other exposure hazards, means of egress, and required exits;
  - OR can install a line of protection if approved by AHJ;
  - OR if explosion and fire analysis using data obtained from UL 9540A testing demonstrates otherwise and is not in conflict with zoning or building code. DOB requires review and approval of data obtained under UL 9540A testing.
- Indicate location and distance from fire hydrants and standpipes, as applicable.
- Location of shut-off and electrical disconnects on site must be specified on plans or described and should be within line of sight or clearly signed, and be compliant with NEC Article 706 and ADA.
- If installation on rooftop below 100 ft, description of how installation complies with NYC Fire Code 504.4.

[2] Adjacent to building requirements:
- Must be under 20 kWh.
- Building must be non-combustible;
  - OR a 1-hour fire rated assembly over the existing building surface that extends 5 feet on either side of the container and 10 feet in the direction of expected flame travel in the event of a fire.
- AND installed at least 5 ft. from any openings in walls (windows, doors, vents, etc.) and 10 ft. from required exit;
  - OR where insufficient space, a non-combustible or 1-hour fire rated assembly barrier may be put in place, if approved by AHJ.
- UL 9540A test results may be submitted to OTCR for evaluation. OTCR may omit the above requirements based on their evaluation.

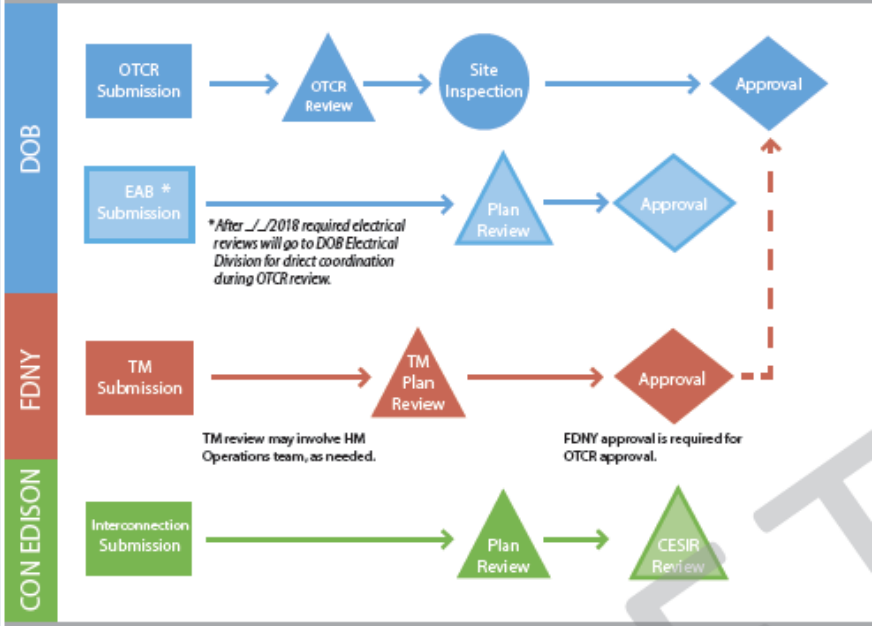
[3] Over 20kW system site requirements are to be evaluated on a case by case.

[4] Applicability pending UL 9540A testing results.

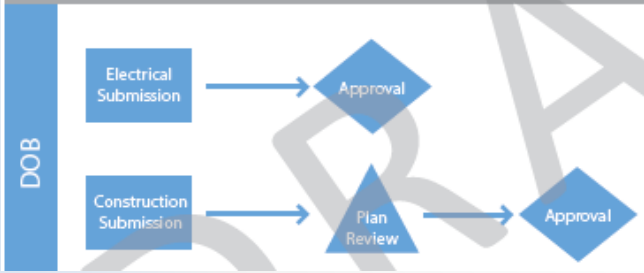
[5] Spill Control and Neutralization Requirements:
- For free-flowing electrolyte, method and materials shall be capable of neutralizing a spill of the total capacity from the largest cell or block to a pH between 5-9.
- For immobilized electrolyte, the method and material shall be capable of neutralizing a spill of 3% of the capacity of the largest cell or block to a pH between 5-9.

[6] Signage Requirements:
- Dimensions at least 8.5" x 11".
- Made of durable material.
- Must have non-glare finish, and characters must contrast with background.
- If sign fades, a new one must replace it.
- Characters must be a minimum of 0.5" in height.
- Sign must be securely attached at approximately 5 ft.
- Sign will include following or equivalent:

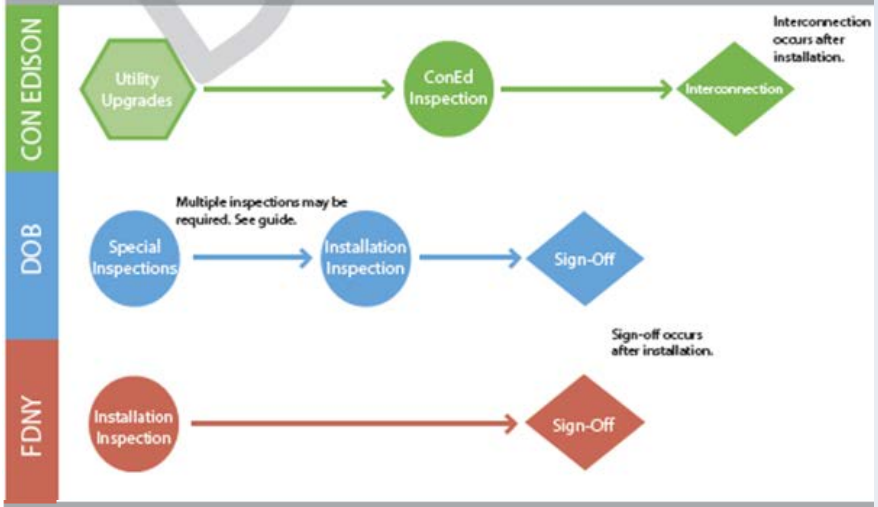
STEP 1: These steps initiate the permitting process.



STEP 2: These steps occur after OTCR approval. Submissions may be made in parallel. Construction may begin after the permits below are obtained.



STEP 3: These steps occur during ESS installation. Inspections may occur in parallel.



STEP 4: These steps begin after project sign-off and continue for the life of the system.

NYC Permitting Process

Where we started

✓ Guide for ESS, relating exclusively to Lead Acid systems

2017 and 2018 Focus

✓ Considered broad areas of technical concern

✓ Published Outdoor and rooftop Lithium ion ESS Permitting Guide for NYC

Current Focus

- Data collection to provide additional certainty and support rule development
- Indoor installations discussions in process, weekly meetings
- Goal: Development of an **“New York City Energy Storage System Permitting Guide: Large Scale Fire Test Data Utilization“** using 9540a criteria

Safety Guidelines/Standards

- UL
- NFPA
- DOE
- Military
- Insurance

Two major industry developments

NFPA 855: Standard for the Installation of Stationary ESS	Establishes criteria for minimizing the hazards associated with energy storage systems. Draft version released for public comment in 2017; final version scheduled for release in 2020.
UL 9540/9540A: Product listing/ certification for ESS	World's first industry safety standard/listing specifically for stationary ESS (9540), and test method for evaluating fire & explosion impacts (9540A). 9540 published in 2014, 9540A released in Nov. 2017.

Hazard topic areas

THERMAL RUNAWAY

- Test methodology
- Initiation method
- Preventative controls

FIRE SPREAD

- Unit spacing
- Fire and smoke detection
- Fire suppression

EXPLOSION

- Deflagration hazards
- Ventilation and exhaust requirements
- Threat to nearby people and buildings

TOXICITY

- IDLH levels
- Ventilation requirements

PERFORMANCE-BASED DESIGN

- Modeling to take into account varying installation environments, system sizes, sprinkler systems, etc.
- Validated models
- Definition of worst case scenario

EPRI SHINES – Queen's College

- Solar + Storage project being developed at CUNY Queen's College with EPRI, NYPA, Solar Liberty, Enel X, NEC
- Solar PV DC System Size: 50 kW
- ESS System Size:
  - Capacity: 200 kWh
  - Power: 100 kW
- Using the 9540A testing data from SHINES as a case study to inform our effort to develop the criteria for **Large Scale Fire Test Data Utilization**

Do you have case study you would like to share? Contact dghub@cuny.edu

SMART DG HUB

The City University of New York formed the Smart Distributed Generation Hub (Smart DG Hub) to develop a strategic pathway to a more resilient distributed energy system, and won Federal and State support for the projects outlined below.

Resources

The Smart DG Hub, working in collaboration with NYS municipalities and partners across the state, has developed an extensive portfolio of educational resources about solar+storage, including guidance for permitting these systems in NYC. SOLAR+STORAGE RESOURCES

CRITICAL FACILITY SOLAR+ EVALUATOR

RESILIENT SOLAR PROJECT

VALUE OF RESILIENCY PROJECT

NY SOLAR MAP | Going Solar | Installing Solar | Financing Solar | Solar+Storage | Resources | NYC Solar | About | Help

STORAGE RESOURCES

STORAGE PERMITTING

ROADMAP | SURVEYS

CASE STUDIES | FACT SHEETS | GUIDANCE

STORAGE MAPPING TOOLS

STORAGE WEBINARS

ADDITIONAL RESOURCES

SMART DG Hub

Technical Assistance

Ask Us

The Smart DG Hub is available to provide TA or point you to the appropriate Subject Matter Expert or agency representative

nysolarmap.com/solarplusstorage/

Dghub@cuny.edu