Advanced Energy Conference
2018

Development of NYC Energy Storage Permitting Process
*Sustainable CUNY - Smart DG Hub* and *DNV GL*
Overview - NYSERDA Storage Soft Costs Reduction Initiative

Permitting Development, Training & Assistance

Customer Analysis, Identification & Outreach

Vendor Outreach & Education

M&V and Performance Analysis
NYC Permitting Process

Where we started
- Guide for ESS, relating exclusively to Lead Acid systems
- Moving goal posts

Where we are today
- Considered broad areas of technical concern
- Outdoor and rooftop Lithium ion ESS Permitting Guide to be published imminently

Where we are heading
- Data collection to provide additional certainty and support rule development
- Indoor installations discussions in process
- Expansion of guidelines throughout New York State
Areas of discussion or “buckets”

1. Life cycle management
2. Status communications
3. Cascading protections
4. Ventilation and exhaust
5. Fire protection, suppression, and extinguishing
6. Siting
7. Signage
Basis for guidelines // Industry overview

- *There is no single definitive set of standards currently in force for energy storage*
- 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
# Guidelines – Considerations and iterations

<table>
<thead>
<tr>
<th>Bucket / topic</th>
<th>DNV GL Recommendation</th>
<th>Basis for recommendation</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explosion area</td>
<td>Capacitors: Small = 3 kWh; Med/Large = require testing; Sodium: Remove, as not required for High Speed Ovens. Per IFC, minimal data availability encourages full review with other technologies.</td>
<td>Other: 0 kWh</td>
<td>Other: &gt; 0 kWh</td>
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<tr>
<td>Ventilation requirements</td>
<td>Must comply with zoning regulations per zoning area and equipment category</td>
<td>In place codes and standards</td>
<td></td>
</tr>
</tbody>
</table>
| Sign physical requirements | - Sign will comply with following:  
  - 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 comply with following:  
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Guidelines – Lifecycle Management

• Permits and inspections required:
  • Electrical
  • Construction
  • Operational (annual)
• Developer must supply installation, commissioning, and decommissioning plans
• Maintenance:
  • Must maintain records of maintenance completed
  • Provide O&M manual at request
  • Replacement in kind does not require repermitting – increased capacity or change in battery type will
• Battery disposal
  • End of life
  • Emergency plan – SME available forthwith and within 24 hours
Guidelines – Status communication

• Monitoring of voltage, current, and temperature required 24/7
• Approved controller must balance voltage, current, and temperatures within manufacturer specifications, and be capable of shutting down in case of detected issue
  • Detection thresholds must be identified
  • Alarms and notifications must activate at thresholds / warnings
• System status (off; idle; on; fault and nature of issue) must be displayed on container
• If off-site monitoring identifies issue deemed non-recoverable, SME shall contact local fire department
Guidelines – Cascading protections

- Required tests/certifications:
  - UL 1973
  - UL 1741
  - UL 9540
  - UL 9540a
- Must utilized approved controller which is capable of managing system to prevent thermal runaway
  - System must include auto-stop and emergency stop capabilities
Guidelines – Ventilation and exhaust

• Normal operations
  • Ventilation only required in support of maintaining normal operating temperatures, per manufacturer specifications and environmental conditions
• Abnormal operations
  • Ventilation or exhaust required for medium and large systems to maintain LFL below 25% under abnormal conditions
• Explosion analysis and first responder safety
  • Required for medium and large systems based on UL 9540a test data
  • Engineering judgement shall be utilized based on explosion analysis, designed so that exhaust, flame, or explosion is directed away from first responders
Guidelines – Fire Protection, suppression, extinguishing

- FMEA and hazard analysis required (approved by NYS PE)
- Sprinkler/sprayers required for systems over 250 kWh
  - When UL 9540a test data becomes available, this will be revisited
- Non-water suppression is permitted, but is not primary suppression agent
- Water must be accessible and meet standard pressure requirements
- Cabinet/container requirements
  - Non-combustible and secure
  - Limitations are not placed on arrangement of items within container
  - Size may be restricted on individual containers, per local zoning determinations
- Maximum allowable quantities per container and site
  - Limited by threshold sizes; AHJs must be notified if other systems are already on property
- Compliance with NYC electrical code (NEC 2017 recommended)
Guidelines – Siting (1)

- Compliance with in-place construction codes
  - Including seismic, flood, weather, and vehicle impact protections
- Compliance with separation distances from site features and structures
  - Site specific zoning requirements
  - AND 10’ from lot lines, public ways, buildings, stored combustible material, hazardous material, high piled stock, other exposure hazards, means of egress, and required exits
  - AND separation from other energy storage systems per explosion analysis, OR a minimum of 3 ft between containers over 250 kWh
  - OR can install a line of protection approved by AHJ
  - OR under 20 kWh may install adjacent to building, with additional structure protection requirements
  - OR if testing demonstrates otherwise and is not in conflict with zoning requirements
Guidelines – Siting (2)

- Rooftop installations require compliance with all standards previously noted and...
  - Class A roof assembly (NYC BC 15) OR non-combustible surface underneath, extending 3 ft beyond footprint
  - Dunnage must have 1 – 2 hr fire rating
  - Installations on rooftops below 100 ft must comply with NYC FC 504.4
  - Installations must comply with zoning setbacks and height limits
  - Medium and large systems must provide standpipe connection at ground level for dry sprinkler system
- Electrical disconnects should be accessible, compliant with NEC 706 and ADA
Guidelines – Signage

- Physical requirements
  - 8.5” x 11”, installed at approximately eye level (~5 ft)
  - Durable material with non-glare finish, and contrasting letters of at least 0.5”
  - Must be replaced if fades

- Content requirements
  - Space/container contains energized battery system and electrical circuits
  - Identification of type of system and any chemistry-specific hazards
  - SME contact information

- Location of signage
  - On containers and at entrances to area
  - Identification of location of emergency shut off, if not within sight of battery system
  - Signage by emergency shut off, identifying purpose

- All other labels as required by NYC MC and EC
FDNY ESS Process

Lt Paul Rogers

FDNY - HAZ Mat Operations
FDNY’s Unique Challenge

Challenges

- Power Shortage
- Policy
- Codes / Standards
- Safety
- Unknown risks
OUTDOOR\ROOFTOP

REQUIREMENTS ONLY
INDOOR

WORK IN PROGRESS
Sample Form: FDNY TM1

- This is the initiating form to begin with FDNY’s review process

- Details to include:
  - Project location info, applicant, owner and filing rep info, DOB status and required signatures

- $420 fee required at time of submission
With TM1 Submittal

- Location/Layout ESS (space)
- Hourly resistance rated assemblies
- Quantity & Types of Storage batteries
- Manufacturer Spec of System
- BMS Info
- Signage Info
- UL Listings

- Fire suppression\Detection
- Gas detection
- Ventilation systems
- Emergency Shutdown procedures
- Storage Arrangements of batteries
- Commissioning and Decommissioning Plan
## Thresholds

<table>
<thead>
<tr>
<th>Battery Technology</th>
<th>Aggregate Physical Capacity</th>
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<tbody>
<tr>
<td></td>
<td>Small</td>
</tr>
<tr>
<td>Lead Acid</td>
<td>( \leq 70 \text{ kWh} )</td>
</tr>
<tr>
<td>Nickel Cadmium</td>
<td>( &lt; 70 \text{ kWh} )</td>
</tr>
<tr>
<td>Li-ion</td>
<td>( \leq 20 \text{ kWh} )</td>
</tr>
<tr>
<td>Flow</td>
<td>( \leq 20 \text{ kWh} )</td>
</tr>
<tr>
<td>Other</td>
<td>0 kWh</td>
</tr>
<tr>
<td>COMPLIANCE REQUIRED</td>
<td>SMALL</td>
</tr>
<tr>
<td>------------------------------------------</td>
<td>-------</td>
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<tr>
<td><strong>Permits.</strong></td>
<td>No</td>
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<tr>
<td><strong>Equipment Approvals.</strong></td>
<td>Yes</td>
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<td><strong>Testing Requirements.</strong></td>
<td>Yes</td>
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<tr>
<td><strong>Inspection.</strong></td>
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<tr>
<td><strong>Fire Protection</strong></td>
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</tr>
<tr>
<td><strong>Detection Features</strong></td>
<td>No(^a)</td>
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<tr>
<td><strong>Ventilation system</strong></td>
<td>No</td>
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<tr>
<td><strong>Electrical requirements</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Location and Construction</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Location Specific Requirements</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Signage</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Maintenance and Repair</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Commissioning/Decommissioning</strong></td>
<td>Yes</td>
</tr>
</tbody>
</table>
PRODUCT LISTINGS

UL 1973
UL 1741
UL 9540
UL 9540 A
UL 9540A

Data test

Separation Distances
Suppression Requirements
Ventilation/Exhaust
Re-ignition

STANDARD FOR SAFETY
ESS Grid Support

White Hat program

- Supervisors
- Assets
- Procedures
BMS

RISING TEMPERATURE TRENDS
Permitting in NYC

Commission
- Operational Permit (C of F)
- Inspection

Decommission
- Fire/Emergency
- End Of Life
12 MW of Stored Energy
Thank You !!!!
Sustainable CUNY
DNV-GL
Meister Consultants Group

- AHJ Support
- Development of permit process & guides
- Best Practices Guidance for Energy Storage Vendors
- Technical Assistance with permitting
Outdoor Li-Ion ESS Size Ranges:

- **Small**: \( \leq 20 \text{kWh} \)
- **Medium**: \( >20 \text{kWh} - \leq 250 \text{kWh} \)
- **Large**: \( >250 \text{kWh} \)
Sample from Li Outdoor Permitting Process Guide (ESS >250kWh)

**STEP 1:** These steps initiate the permitting process.

- **OTCR Submission**
- **Site Inspection**
- **OTCR Review**
- **Approval**

DOB and FDNY conduct coordinated site visits. FDNY approval is required for OTCR approval.

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

- **TM Submission**
- **Site Inspection**
- **TM Review**
- **Approval**

DOB and FDNY conduct coordinated site visits. TM review may involve FDNY Operations team, as needed.

- **Interconnection Submission**
- **Plan Review**
- **ESS Review**

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

- **Utility Upgrades**
- **ConEd Inspection**
- **Interconnection**

Multiple inspections may be required. See guide.

- **DOB**
- **Installation Inspection**
- **Construction and Electrical Permit Close-out**
- **Sign-Off**

DOB and FDNY final approvals after installation.

- **FDNY**
- **Interconnection**

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

- **Electrical Submission**
- **Permit**

- **Construction Submission**
- **Plan Review**
- **Permit**

Projects >200kWh require annual inspections from FDNY to ensure the EB’s designated Certificate of Fitness holder is properly trained.

**SMART DG Hub**
Permitting review flow and timeline – Step 1 (ESS ≤20kWh)

- These steps initiate the permitting process
- Submissions may be made in parallel
- ConEd requires submittal on any grid-tied system, but utility upgrades are unlikely for small scale systems
Permitting review flow and timeline – Step 2 (ESS ≤20kWh)

• These steps occur after OTCR approval
• Submissions may be made in parallel
• Electrical permits are applied for online
• Construction permits can be applied for through the HUB or Borough Offices
• Construction may begin after the permits noted here are obtained
Permitting review flow and timeline – Step 3 (ESS $\leq 20\text{kWh}$)

- These steps occur during the installation phase
- System interconnection may occur after successful DOB inspection
- DOB special inspections occur during construction
- After DOB final sign-off, FDNY is notified of project installation
Permitting review flow and timeline – Step 1 (ESS >20kWh)

- These steps initiate the permitting process
- Submissions may be made in parallel
- Joint site visits with DOB and FDNY are scheduled
- FDNY approval is required before OTCR approval
Permitting review flow and timeline – Step 2 (>20kWh)

- These steps occur after OTCR approval
- Submissions may be made in parallel
- Electrical permits are applied for online
- Construction permits can be applied for through the HUB or Borough Offices
- Construction may begin after the permits noted here are obtained
Permitting review flow and timeline – Step 3 (>20kWh)

- These steps occur during the installation phase
- System interconnection occurs after DOB and FDNY final approvals
- DOB special inspections occur during construction
- DOB and FDNY final inspections occur after install to close permits
Permitting review flow and timeline – Step 4 (>20kWh)

- This step begins after project sign-off
- FDNY requires Medium and Large systems to have a Certificate of Fitness holder designated
- The inspection noted here continues annually for the life of the system
Sample Forms: OTCR2

- This is the initiating form to begin the review process with DOB OTCR

- Details to include:
  - applicant, PE, and owner contact info and signatures
  - Brief summary of proposed project and equipment

- $600 fee required at time of submission
Sample Forms:
OTCR Project Checklist

- This checklist must also be filled out and submitted to DOB OTCR

- Primarily a list of where to find supporting documentation like certifications, equipment data sheets, monitoring systems, etc.
Sample Forms: DOB PW1

- This form begins the construction permit application process

- Details to include:
  - Project location info, applicant, owner and filing rep info, DOB status and required signatures

- Fees are dependent on project cost estimates
Information & Contacts

For questions and assistance related to permitting, contact the Sustainable CUNY Smart DG Hub at [DHub@cuny.edu](mailto:DHub@cuny.edu)

<table>
<thead>
<tr>
<th>CUNY</th>
<th>DNV-GL</th>
<th>NYSERDA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daniella Leifer</td>
<td>Victoria Carey</td>
<td>Jason Doling</td>
</tr>
<tr>
<td><a href="mailto:Daniella.Leifer@cuny.edu">Daniella.Leifer@cuny.edu</a></td>
<td><a href="mailto:victoria.carey@dnvgl.com">victoria.carey@dnvgl.com</a></td>
<td><a href="mailto:Jason.doling@nyserda.ny.gov">Jason.doling@nyserda.ny.gov</a></td>
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<tr>
<td>646.664.9459</td>
<td>267.517.2126</td>
<td>212.971.5342 x3558</td>
</tr>
<tr>
<td>Davion Hill</td>
<td></td>
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<tr>
<td><a href="mailto:davion.hill@dnvgl.com">davion.hill@dnvgl.com</a></td>
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<tr>
<td>614.397.5293</td>
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