

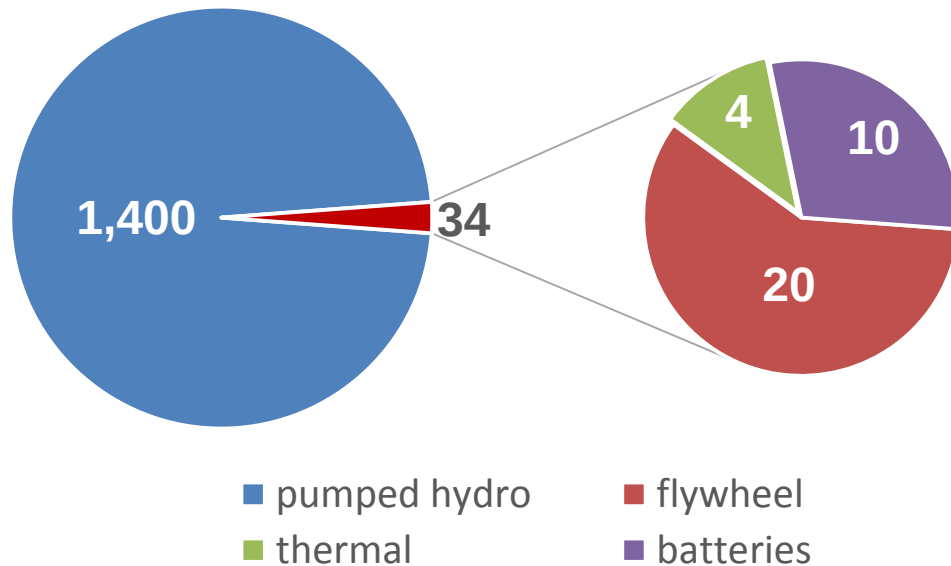


New York Solar (+Storage) Summit

June 21, 2017

Unlocking the Storage Market

Nascent & Emerging Market



Source: adjusted from DOE Global Storage Database – operational systems (in MW) – March 2017

Installed Cost (2-4 hour system)

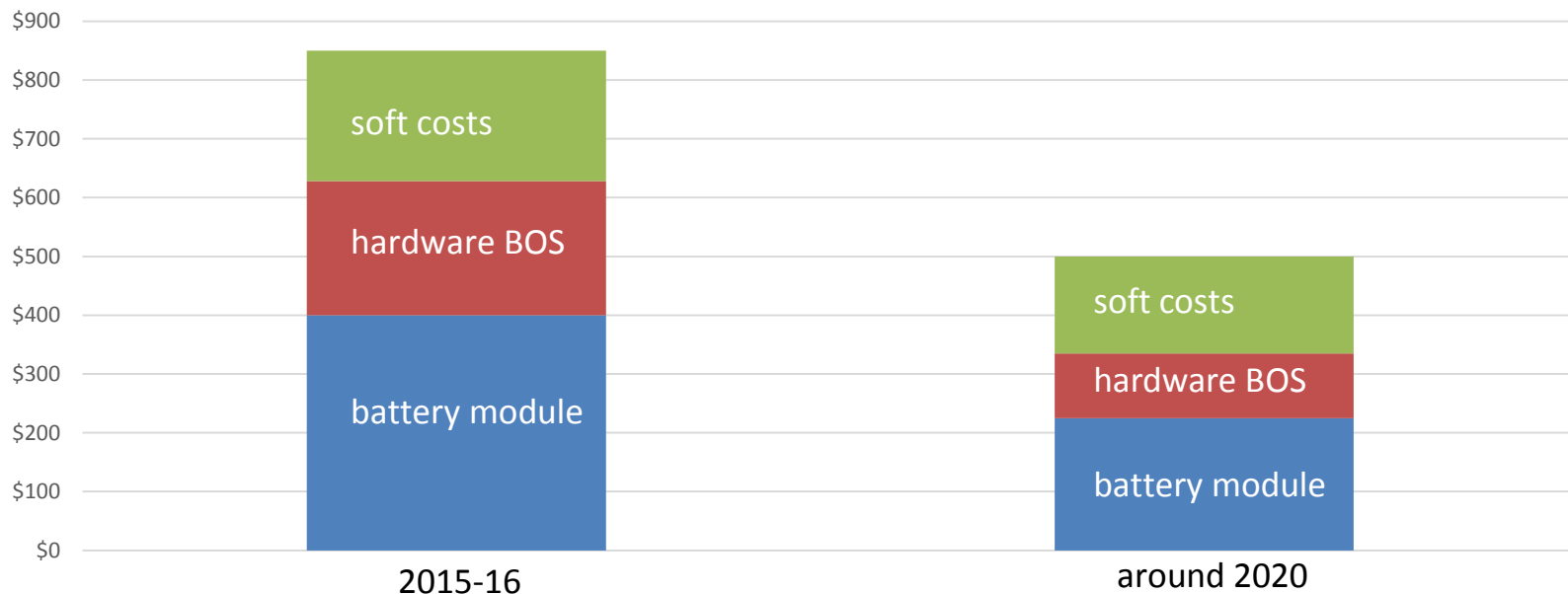
- ❑ Utility scale: ~ \$600-700/kWh (USD, 2016, GTM Research, Navigant)
- ❑ Behind the meter: ~ \$750-\$900/kWh in NYC
(USD, 2016 data adjusted from GTM and scoped project costs)
- ❑ Battery costs are declining by 10%+ per year
- ❑ Installed costs are decreasing 7-10%/year for lithium ion and expected to continue through 2020 (GTM Research, Navigant).

Soft Costs

- ❑ Can comprise 15%-20% of front of meter systems and 25% or more for behind the meter systems
- ❑ Most significant near-term opportunities
 - permitting
 - customer acquisition
 - uncertainty in revenue and performance
- ❑ Our team is committed to reduce soft costs by 25% in 3 years and 33%+ in 5 years

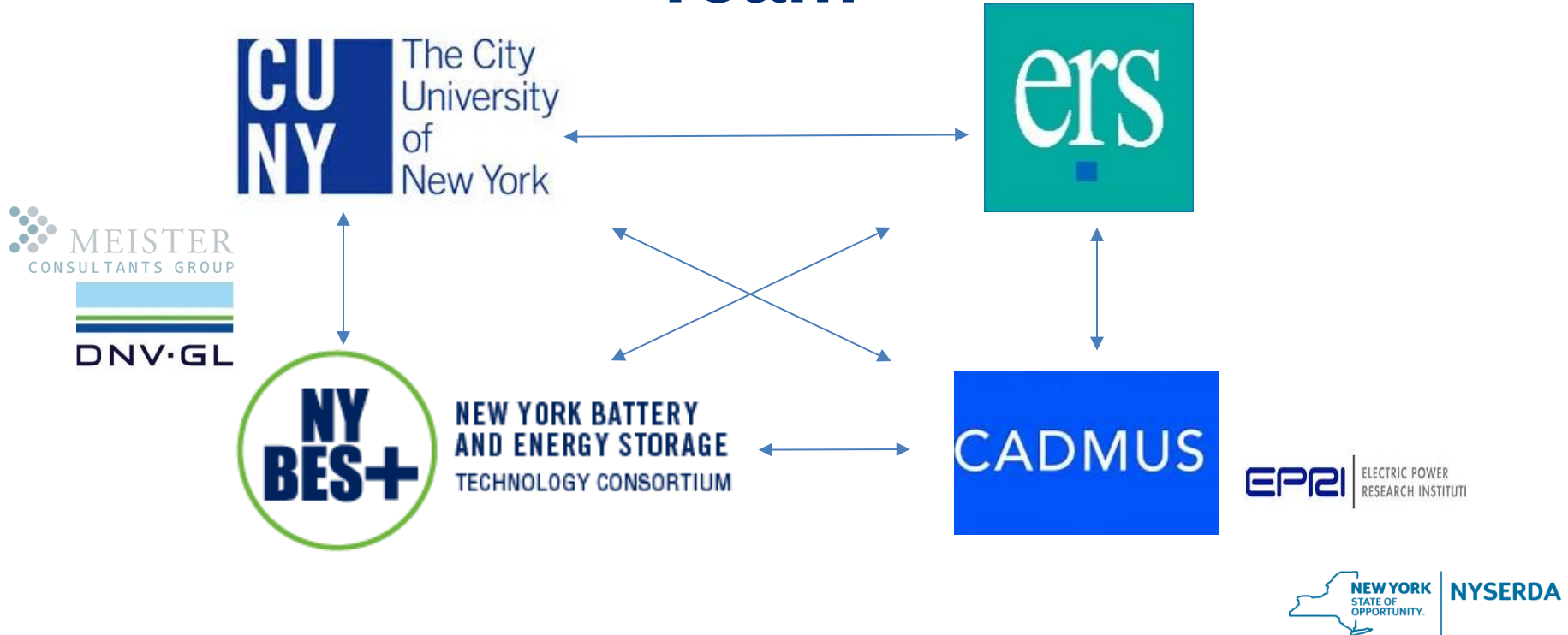
Cost Breakdown – BTM example

Procured Cost for Installed Lithium-Ion System in NYC
per kWh, based on a 4 hour system



Li-ion is used as an example. Sources: Navigant and GTM Research data, Grid Market, DMP, NYSERDA customer engagement. 2015-16 adjusted for experience in DMP and customer conversations, 2020 is Navigant and GTM forecasted cost.

Soft Cost Team



Storage Pilots (PON 3541)

- ❑ Business model pilots compliment the soft cost work: increase certainty and confidence in performance & revenue
- ❑ Supporting commercially available technologies to reduce peak demand, reduce GHG, integrate renewables
- ❑ Seeking projects with high potential for replicability & scalability
- ❑ \$15.5M through 2019-2020; up to 50% cost-share
- ❑ Concept papers can be submitted anytime

Contacts

Join NYSERDA's energy storage [email distribution list](#)

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<https://www.nyserda.ny.gov/All-Programs/Programs/Energy-Storage-Program>



Vendor Outreach



- Storage use cases
- Optimizing tariffs
- Value stream optimization



Emerging New York Markets

Drivers

- Capacity/load reduction
- Renewable integration
- Resilience

Current Opportunities

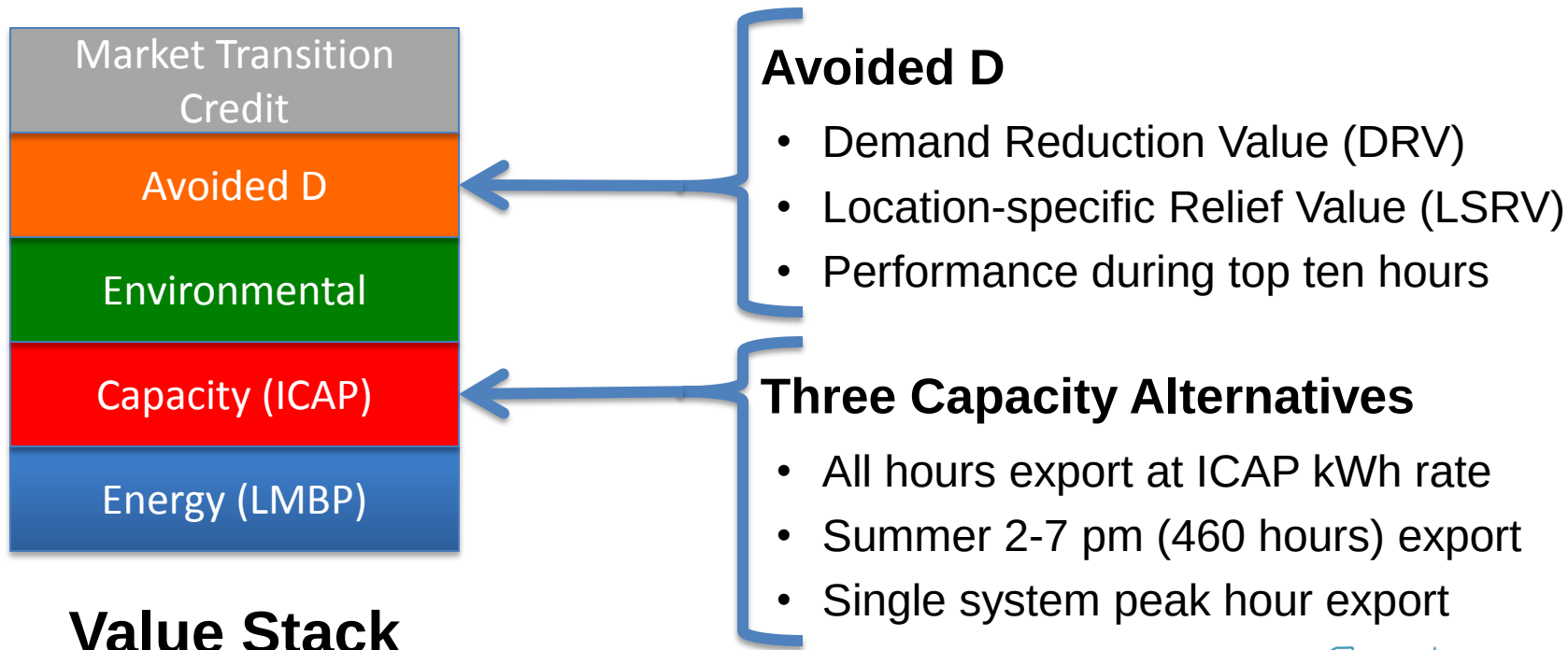
- Demand Charge Reduction + Load relief programs
- Non-Wires Alternatives
- REV Demos
- Value Stack Pilot

Monetizing Value (near-term)

Value of DER phase 1

- Two tariff Categories
 - Phase one NEM
 - Value Stack
- Phase 1 applies to Solar+Storage together
- Phase 2 addresses non-NEM Technologies
- Value Stack approach values capacity and distribution benefit

Value of DER Phase 1



Monetizing Value – Upcoming Opportunities

Utility DSIP

- NWA expansion
 - Probabilistic planning
- DER procurement
- Hosting Capacity

Further Opportunities

- Earning Adjustment Mechanisms
- NYISO Markets
- Energy Storage Roadmap and CES

Engagement

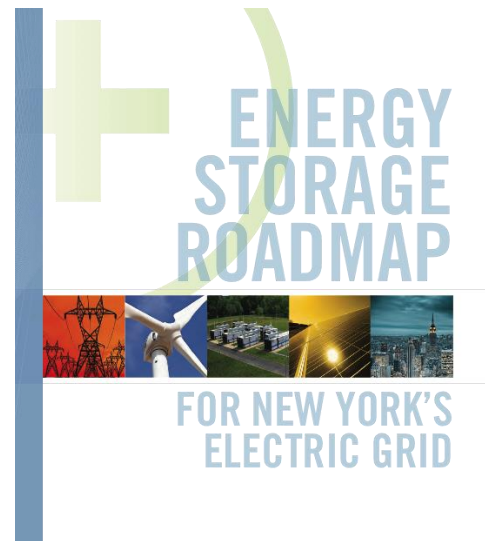
- ☐ Working Groups
- ☐ Individual Discussions
- ☐ Outreach

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CUNY Smart DG Hub

Two focal areas:

A) Develop NYC Storage Permitting Guides & Facilitate For Additional AHJs

B) Best Practices Permitting Guidance For Energy Storage Vendors



A) Permitting Development: Big Picture

Develop Procedural “Best Practices” and Permitting Guides for Siting Energy Storage in NYC

- Initial 90-day project period – incl. weekly facilitated mtgs with FDNY & DOB
- Identify siting/permitting requirements for indoor, outdoor, varied chemistries and project sizes

Use this to facilitate development of AHJ customized permitting and review processes (state-wide)

- Categorical logic model, templates, best practices guidelines
- Live trainings, webinars, podcasts
- Direct technical assistance

Permitting Development – Current Work

7 “Bucket” areas:

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	• To identify the Ventilation & Exhaust req's for ESS Systems • To support FDNY further 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 listed • Safety concerns addressed	• Posting locations • Information requirements • Physical requirements	• To identify siting requirements to minimize risk of and from fire • To allow emergency exit and access as necessary

Permitting Development – Initial Deliverables

90-day project phase – results:

- Recommended rule/code language for FDNY
- Developer Checklist
- Identification of knowledge/data gaps - help inform future large-scale testing

Next Phase: AHJ Guides, Resources & Training

TRAINING PLAN - SUMMARY	Create training tools based on materials created under NYC permitting development process
	Training opportunities to be provided state-wide – in-person trainings, webinars, podcasts.
	Up to 40 training opportunities over 3 years
	Initial ‘energy storage 101’ trainings early in the program to lay groundwork for subsequent deeper dives

Next Phase: Direct Technical Assistance

Assist AHJs to Develop/Build Permitting Guidelines

- Direct technical assistance for AHJ's on evaluating/creating local permitting guides

Assist AHJs with Permit Application Review

- Direct technical assistance to augment AHJ staff in reviewing ESS applications
- Assist AHJs to streamline interagency review and approval processes



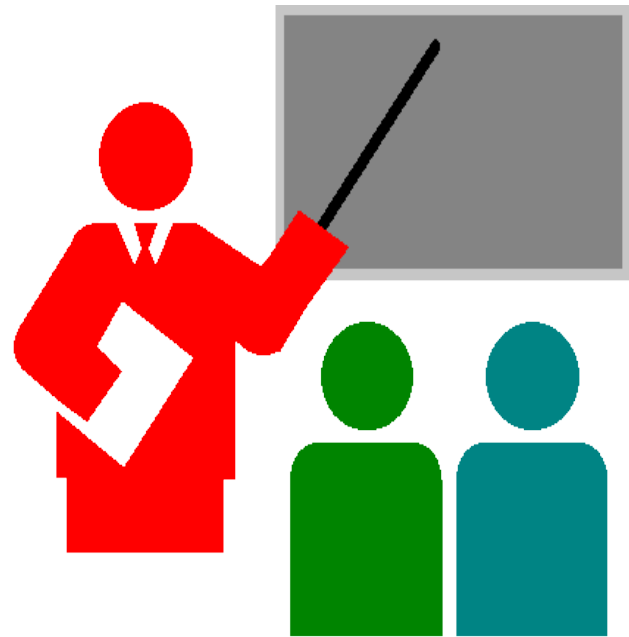
B) Vendor Best Practices

Vendor outreach & education around permitting/siting

- Distribute key energy storage permitting information and best practices as these are developed

Best practices guidance & tools/resources

- Interactive Permitting Vendor Guides for individual AHJs
- Location- and facility-specific best practices & guidance on siting ESS and attaining compliance



Contacts

Contact the Sustainable CUNY Smart DG Hub or visit our resources online:

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Customer best fit profiles

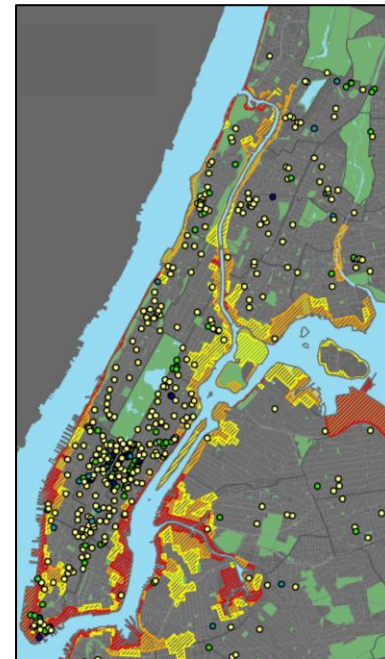
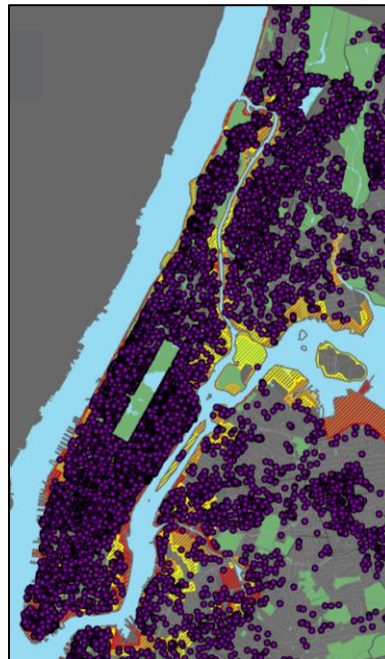
Customer education and outreach



Customer Education and Outreach



- Provide high-level education to end-users on the value proposition of storage
- Identify likely candidates for energy storage projects
- Deploy site-specific screening tools
- Incorporate field lessons into tools





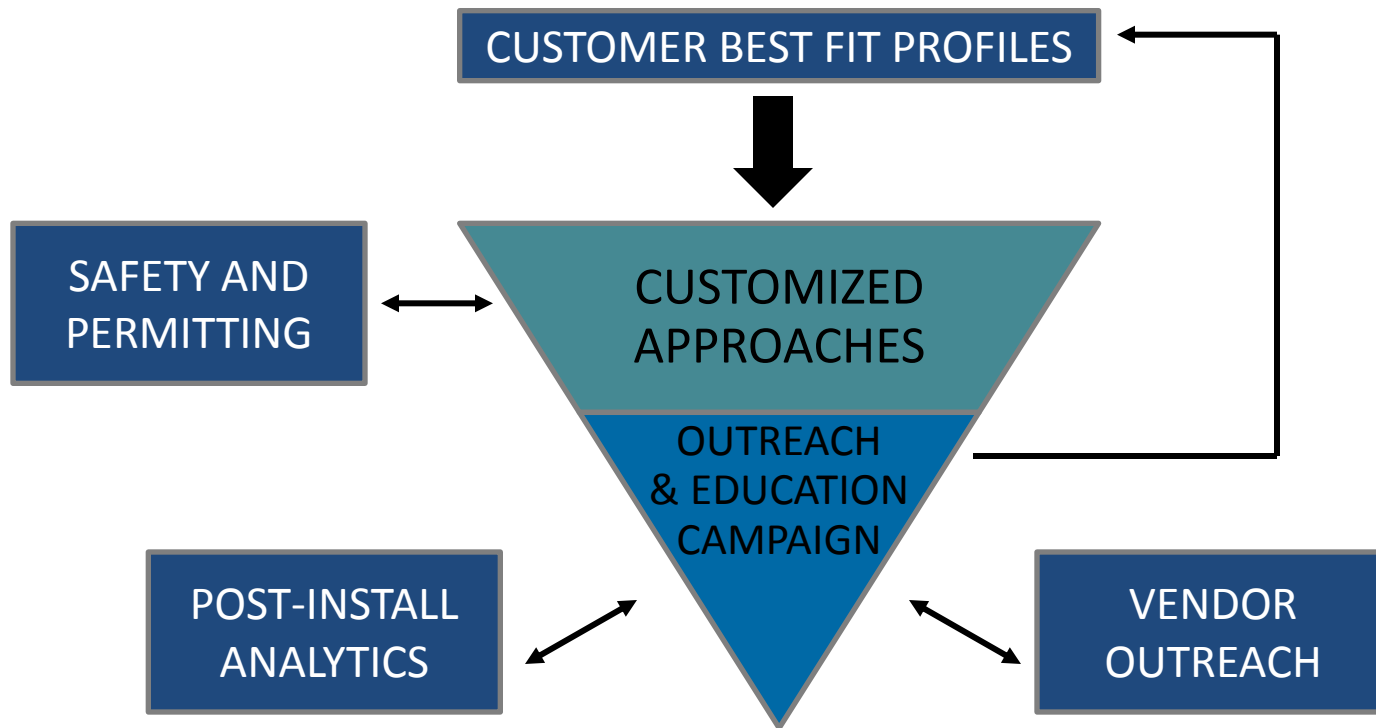
Customer Education and Outreach

- Identify key market segments and associated barriers and value propositions
- Develop sector-specific approaches based on customer characteristics
- Use case studies, collateral materials, and information portals
- Deploy direct outreach campaign and events (webinars, tours, etc.)
- Provide technical assistance for project development





Iterative and Collaborative Process





Begin the Dialogue

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- **Ryan Bossis (Customer Best Fit Profiles):**
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- **Gita Subramony (Customer Education Campaigns):**
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Energy Storage M&V

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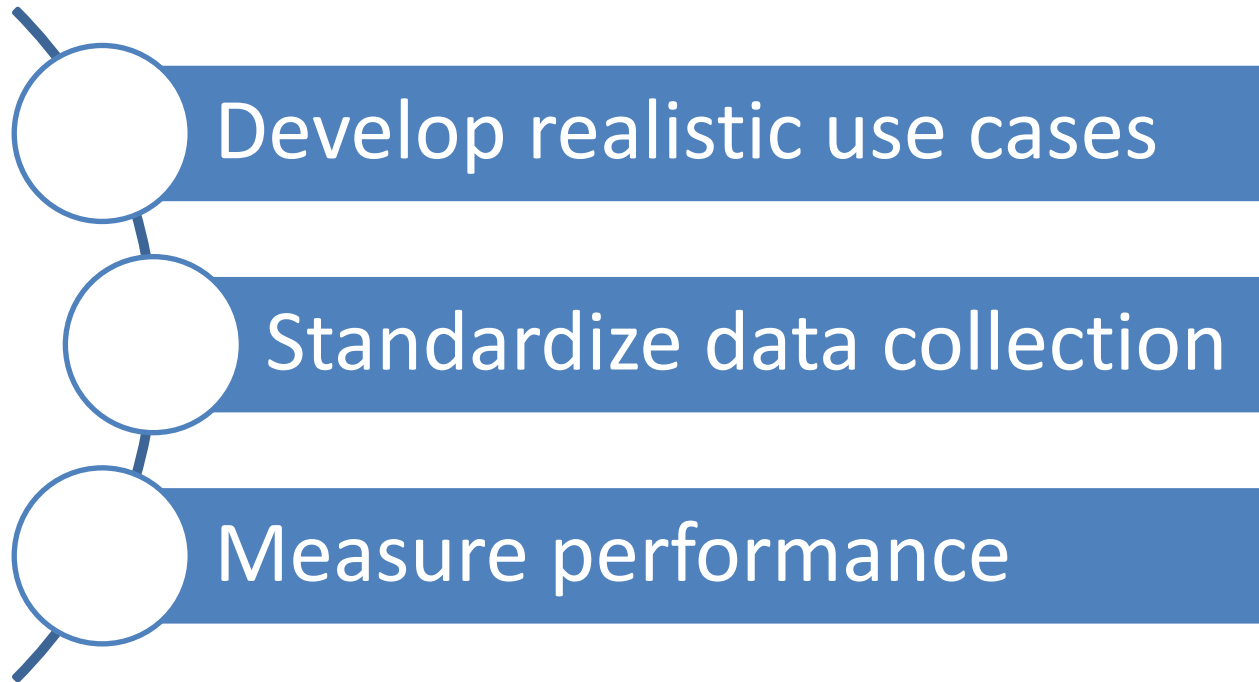
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NYSERDA

How We Will Improve Market Confidence



Step 1: Defining the Question

What will make ESS bankable? Confidence in:

System Reliability & Cash Flow Stability

Controls Functionality & Accessibility

Capacity Delivery & Energy Time-shifting

Longevity & Ease of Maintenance

Step 1 Key Stakeholders: Financiers

Investment Appetite

- Significant project scale/type?
- Reliable revenue streams? (simple vs. complex e.g. Tax Equity)
- Deal structure/parties involved?
- Due diligence?
- Technologies?

Perception of risk:

- Short-term performance shortfall (tax equity investors)?
- System longevity/cycle life?
- Safety/catastrophic failure?
- Developer/vendor reliability?

Step 1 Key Stakeholders: BTM Customers

Willingness to adopt:

- Straight-forward project benefits (Short Simple Payback)?
- Reliable technologies & vendors?
- Desired revenue streams simple vs. complex?

Perception of risk:

- Safety/catastrophic failure?
- Short-term vs. Long-term financial benefits?
- System maintainability/longevity/cycle life?
- Developer/vendor reliability (Available extended warranties)?

Step 1 Key Stakeholders: Utility Programs

Willingness to adopt:

- Grid beneficial project scale/type?
- Reliable Technologies?
- Capacity vs. ancillary services benefit value?

Perception of risk:

- Availability/reliability at scale?
- Control/dispatchability?
- Cost-effectiveness/Cost Recovery?
- Confidence with technology?

Step 1 Key Stakeholders: Vendors

Sales Feedback (why aren't people buying?):

- Revenue streams/incentive availability & longevity?
- Long sales cycles – pipeline for manufacturing?
- Reliable component suppliers/warranty pass-throughs?

Data Availability:

- Component failure history/PCS measurement points?
- Data Confidence / Solid field engineering team?
- Portfolio level vs. project level data?
- Concerns deploying standalone DAS?

Step 1 Key Activities

Collect Feedback from Industry

- Voice of the Customer surveys/interviews
- Develop use cases that reflect industry needs

In close collaboration
with NYSERDA and
Soft Costs Reduction
Team

Step 2: Define Data Collection

Key Data Points

- Energy (kWh) in/out
- System status
- Utility bills and savings
- Market feedback
- Grid interactions

Core Tasks

- Data Standards & Requirements Document
- ESS Planning Guide

Step 3: Prove Performance

- Demand Reduction Projects
 - Deploy DAS and collect data
 - Forensic billing analysis
 - 3rd party verification
- New Applications (resilience, grid support, solar support)
 - Case studies/detailed metering & analysis

What We Bring to the Party

- Improve standardization in data collection
 - Data Standards Requirement Document
 - Non proprietary DAS
- Address gaps in bankability & reliability
 - Industry defined use cases
 - Target perceived risks
- Increase confidence in technology and applications of ESS
 - Case studies
 - Performance data
- **Anything else? Tell us!**

Desired Collaborations

We are here to listen:

- Mark Osborn: Facilitated table discussion on energy storage data
- John Francis: Solar + Storage installation quality & inspections

After the conference:

Shawn Shaw: shawn.shaw@cadmusgroup.com

Mark Osborn: mark.osborn.@cadmusgroup.com

Participation Methods

- VOTC Interviews
- Informal feedback
- New projects
- Experience outside NY



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