Baseline Market Evaluation Metrics for Energy Storage

Final Executive Summary

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Executive Summary

The following market characterization report captures a subset of energy storage market activity that occurred in 2016 in New York State. It was collected for NYSERDA to set a baseline on market barriers to energy storage in the State, and NYSERDA-funded efforts have been underway to reduce these barriers. A similar market characterization will take place annually. As explained and defined below, the focus was on distributed energy storage providing load management, and the data from this subset was narrowed down to a smaller subset of valid responses, which were then synthesized. The following data does not reflect current costs, timelines, or technology trends, and does not reflect, for example, what a customer can expect when scoping or installing energy storage today. Interested parties should contact NYSERDA for current information and resources on storage.

Research Into Action completed 26 interviews with vendors between March 3 and April 18, 2017. Of these 26 vendors, 7 provided valid responses about New York State installations. All of the remaining vendors had yet to complete an installation in New York State.

Error! Reference source not found. and ES-2 display the findings from the survey and available secondary data on the relevant performance metrics for the two NYSERDA Clean Energy Fund (CEF) energy storage initiatives:

- Reducing Barriers to Deploying Distributed Energy Storage
- Energy Storage Technology and Product Development

Table ES-1. Evaluation Objectives, Research Questions, and Summary Findings of Survey Data

Objective	Evaluation Question(s)	Data Source(s) & Analytic Method(s)	Findings from Survey of 2016 activity. The data is a high-level summary of the reported responses of 7 valid respondent electrochemical and thermal system vendors. Not all vendors were willing and/or able to provide data for each row.
Clean Energy Fund Investment Plan: Energy Storage Chapter			
Develop a reliable, detailed, NYS based estimate of current soft costs of distributed energy storage systems as a component of the total installed cost	What is the current cycle time for the permitting process?	Telephone-based survey of NYS energy storage vendors	6.5 – 12 months. Lower end for lead acid, and higher end for lithium ion. Permitting cycle time for thermal systems not reported.
	Are there challenges with siting and permitting requirements?		A lack of shared understanding of the battery technology (lithium ion) and codes among the permitting staff.
	How many alternative ownership models are being used?		85% of respondents offer third party ownership, and 70% offer options such as shared savings, performance contracts for site owned projects. No specific details of third party ownership agreements were obtained.
	What is the percent conversion rate of prospective installations from proposal to installed projects?		Electrochemical: Min. 1%; 50% Max; 5% Median. Thermal: 66% based on vendor response.
	What is the cycle time of projects from customer proposal to commissioning?		Electrochemical: 8.75 – 38 months. Median of 19.5 months. Thermal projects cycle time not provided.
	What is the current estimate of soft costs of distributed energy storage systems?		Electrochemical: Min. $50/kWh; Max. $100/kWh (Median of 20% of average soft cost of installed lead acid systems). Thermal system costs not provided (Median of 16% of average soft cost of installed thermal systems).
	What is the average total installed cost per kWh (4-hour duration) for energy storage systems?		$1,000/kWh for lead acid system. Other types of electrochemical systems were not installed by respondent vendors in NYS in 2016 and thermal system total installed cost data was not provided
Develop a reliable, detailed estimate of current hardware and hardware balance of system costs of energy storage systems	What is the current hardware cost for energy storage devices for NYS energy storage system vendors?		Lead acid system: $600-$650/kWh; 40-65% of the total cost. Thermal system 35-42% of the total cost (actual costs not provided).

Note: For detail cost boundaries, see Section 2.1 of the report.

Table ES-2. Evaluation Objectives, Research Questions, and Summary Findings of Secondary Data

Objective	Evaluation Question(s)	Data Source(s)	Cost Boundaries[a]	Findings of Secondary Data
Clean Energy Fund Investment Plan: Energy Storage Chapter				
Develop a reliable, detailed estimate of current hardware and hardware balance of system costs of energy storage systems	What is the current hardware cost for energy storage devices from Secondary Data?	GTM Research, Utility Dive, National Renewable Energy Laboratory (NREL) (National data from 2015-2016)	Supervisory control and data acquisition, (SCADA) controller, containerization, inverter	Lithium ion system[b] Hardware (excluding battery): $369-$380/kW Battery only: $350-$500/kWh
		PacifiCorp/DNV GL (National data from 2016)	SCADA controller, containerization, inverter, power control system, wiring, interconnecting transformer, additional ancillary equipment	Lithium ion system Hardware (excluding battery): $615/kW Battery only: $388-$675/kWh
				Other battery systems Hardware (excluding battery): $635-$858/kW Battery only: $300-$900/kWh
	What is the current hardware balance of system cost for energy storage systems including power electronics and hardware installation cost?	GTM Research, Utility Dive, NREL (National data from 2015-2016)	SCADA controller, containerization, inverter, EPC, soft costs	Lithium ion system $667-$670/kW
		PacifiCorp/DNV GL (National data from 2016)	Wiring, interconnecting transformer, additional ancillary equipment	Lithium ion system $100/kW
				Other battery systems $100-$120/kW
Clean Energy Fund Investment Plan: Renewable Optimization Chapter				
Develop a reliable, detailed estimate of the current performance of energy storage systems	What is the current performance of energy storage systems in terms of efficiency, life, energy/power density, etc.?	2015-2016 data unavailable. Most recent data available is from 2010-2011 and likely does accurately describe current battery performance.		

[a] For detail cost boundaries across data sources, see Table 11, Figure 1, and Figure 2 in Section 4.3.4 of the report.

[b] Secondary data sources report hardware, engineering, procurement and construction (EPC), and soft costs in kW and costs for the battery itself in kWh.

The first finding from this research is that the seven respondents with valid responses reported many more distributed energy storage projects in the pipeline for New York State than have been installed. The cycle time for distributed energy storage approvals reported by these respondents exceeds two years and it is therefore difficult to predict the number of pipeline projects that will be installed. These data support the assumption that there are delays in distributed energy storage installation in New York State.

The first recommendation is that the survey be conducted at intervals to track progress of the initiative in overcoming the barriers to installation of distributed energy storage systems.

The second finding from this research is that respondents were able to provide cost data for hardware costs and engineering, design and construction costs, but could not estimate a reliable cost factor for soft costs, though they could estimate a percent of their total costs. There were costs developing permit documentation but these were part of their design costs, several indicated that the 'cycle time' of the permit process was causing them difficulties and potentially driving them to pursue business outside of New York State. Others noted that the delay did not add costs as they continued to generate projects for their pipeline, in anticipation that the permitting process would improve. Thus, the effect on project costs was low, though the cycle time for the permits was unacceptably high to many of them.

The second recommendation is to use 'cycle time' rather than a dollar value for the effects of permitting on soft costs.