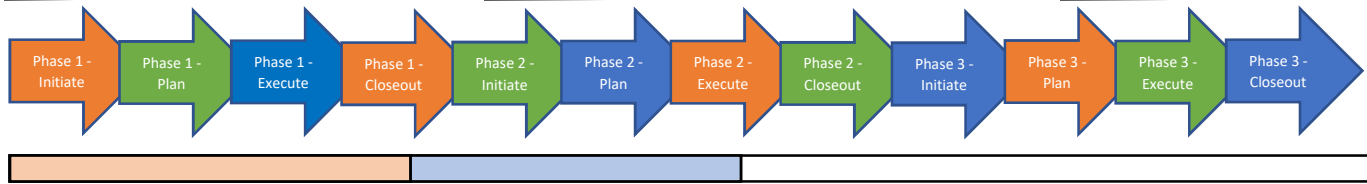


Project Start Date: 06/15/2018

Project End Date: 04/01/2021



Project Summary: The project involves partnering with a third party to install a mixture of small (~53 kW), medium (~159 kW), and large (~265 kW) battery installations for a range of commercial and industrial customers within the footprint of the Energy Smart Community (“ESC”) located in the Ithaca, NY region. NYSEG aims to enroll and aggregate up to eight (8) customers in the battery storage offering, with a total capacity of approximately 1.060 MW and 4.2 MWh. The batteries will be used to address three distinct use cases: customer demand charge management, aggregated market participation, and system efficiency.

Lessons learned:

- **The Customer**
 - Customer interest in behind-the-meter battery storage with a shared-guaranteed savings model remains strong
 - The specific conditions of each customer site can have a large effect on the design and permitting requirements and even the viability of installing a utility or other third-party owned battery behind the customer’s meter.
 - Although customer communications may clearly show anticipated benefits, including financial bill savings, customers may not have the capacity, authority or willingness to move forward with the BTM energy storage program.
 - Customer demand charge management requires the customer’s load to be metered in parallel with their utility meter. This can pose a technical challenge particularly for primary metered customers.
- **Utility Operations**
 - Fire Alarm and Prevention Battery standards are still in development, which leads to design challenges at customer sites.
 - Lack of proper historical data for a site can lead to sub-optimal demand charge savings
 - Consistent data collection can become challenging due to communications equipment failure or lack of signal coverage and results in missing information that can impact performance decisions.

Recent Milestones/Targets Met:

- NYSEG completed construction and substantial completion of its 5th battery storage site in February 2020.

Upcoming Milestones/Targets:

- Phase 2 – Execute
 - Continue construction of remaining customer site.
- Phase 2 – Closeout
 - Closeout the three sites completed December 2019-February 2020
- Phase 3 – Execute
 - Continued development and refining of use case process and procedures
 - Continued data collection on battery performance at the customer sites in that are in service
 - Begin testing of the customer aggregation software and enrollment of customer sites into the SCR and NYSEG DR programs

Reforming the Energy Vision

Demonstration Project Q1 2020 Report

Aggregated Behind the Meter Energy Storage



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1.0 Executive Summary

New York State Gas & Electric Corporation (NYSEG) submits this quarterly report on the progress of the Aggregated Behind the Meter Energy Storage Demonstration Project (Aggregated BTM ES Project).

The project involves partnering with a third party to install a mixture of small (~53 kW), medium (~159 kW), and large (~265 kW) battery installations for a range of commercial and industrial customers within the footprint of the Energy Smart Community (“ESC”) located in the Ithaca, NY region. NYSEG aims to enroll and aggregate of up to eight (8) customers in the battery storage offering, with a total capacity goal of approximately 1.060 MW and 4.2 MWh. NYSEG will also work with the third-party partner to provide the software to aggregate and dispatch the installed batteries. The aggregation software will allow the batteries to participate in the NYISO Special Case Resources demand response (“DR”) program and be dispatched by NYSEG to manage system constraints.

The Aggregated BTM ES Project will demonstrate some of the value streams that can be leveraged in parallel by behind the meter battery storage and attempt to identify new value streams that can be realized. This pilot will also evaluate potential alternative rate designs and their impact on the value proposition of aggregated BTM battery storage.

The Aggregated BTM ES Project execution will be accomplished in three phases: (1) Customer Acquisition, (2) System Installation, and (3) Hypothesis Validation and Reporting. The Project is anticipated to take approximately 43 (forty-three) months from project development to closeout which includes customer acquisition, site selection, construction, and commissioning of the battery systems as well as the validation and testing of the hypothesis, use case functionality and final analysis.

During Q1 2020, the project focus has been on the development and finalizing of use case process and procedures, completion of construction at one additional customer site, and continued data collection on battery performance at the two customer sites that are in service and testing of the data collection capabilities at the three new sites where construction was completed at the time of this report.

Plans for Q2 2020 include:

- Continued development and finalizing of use case process and procedures
- Continued data collection on battery performance at the customer sites that are in service
- Complete construction at the final remaining customer site
- Begin testing of the customer aggregation software and enrollment of customer sites into the SCR and NYSEG DR programs

The following report provides a progress update on the tasks, milestones, checkpoints, and lessons learned to date.

2.0 Demonstration Highlights since the Previous Quarter

2.1 Activity Overview

Activity completed and results up to the end of December or Q1, 2020 included:

- Continued data collection on battery performance at the five customer sites that are in service
- Continued site permitting for one remaining customer site
- Completed construction, testing, and commissioning of one of the remaining two new customer sites

2.1.1 Data collection of the two installed battery systems

The project team has continued data collection and reviewed the two-installed customer battery systems performance since installation of the battery storage systems. With the additional completion of three new battery storage systems the data collection platform has been tested and is ready to begin monitoring and reporting on the additional sites. Significant progress has been made to design and implement a manual billing adjustment for the participating customers to collect the monthly subscription fee and apply any necessary credits to achieve the guaranteed savings. The project team has also begun working with the vendor to set-up a system to allow NYSEG to query the vendor's API to retrieve battery data at will thus simplifying battery performance data and control. The API will also be used to issue commands to the battery aggregation. Implementation of this API has been delayed while NYSEG performs a cybersecurity review of the proposed architecture.

2.1.2 Completion of Construction, Testing, and Commissioning

NYSEG completed construction and substantial completion of its 5th battery storage site in February 2020. Construction on the 6th and final site is expected to start in June of 2020. Some punch list items have been postponed and may be delayed due to COVID-19 restrictions.

2.2 Metrics and Checkpoints

The Aggregated BTM ES Project is completing the Phase II – “System Installation” as defined in the Implementation Plan. The Customer Acquisition metric is the only metric and checkpoint identified to be tracked during Phase 1 and Phase 2 of the demonstration project and is shown below. The remaining Metrics and Checkpoints will be captured as part of the Phase 3 – Hypothesis Validation and Reporting portion of the project.

Phase 1 - Metrics and Checkpoints

Metric	Definition	Target	Final Results
Customer Acquisition	The total number of participating customers in the Project	8	6 ¹

At the end of Q4 2019, NYSEG concluded its customer acquisition efforts with six total customers signed on to participate in the project until May 2021. This falls short of the desired target of eight total customers. Several barriers were encountered during the customer acquisition process and are discussed in-depth in the Issues section.

Phase 2 - Metrics and Checkpoints

Metric	Definition	Target	Current Results
System Installation (2018)	Installing Batteries behind the meter at customer sites, testing, and commissioning in 2018	2	2
System Installation (2019-2020)	Installing Batteries behind the meter at customer sites, testing, and commissioning in 2019	4	3

Phase 3 – Metrics and Checkpoints

Metric	Definition	Target	Current Results
Customer Bill Savings	Average customer monthly bill savings	\$1/kWh	\$0.50/kWh

The chart below shows the total customer bill savings by quarter for each customer in this demonstration project with an installed BTM battery storage system. A positive savings values indicates

¹ NYSEG has received signatures to its preliminary customer agreement for 8 total sites. The first of these 8 sites had to be removed from consideration after preliminary design review due to concerns about the age of the customer’s infrastructure posing an increased risk of failure during construction and interconnection. The second customer site was removed from consideration at the customer’s request due to changes in their operational priorities.

that the BTM battery was able to reduce the customer’s demand charge by reducing the maximum demand seen by the grid. The negative values seen from both customers in Q1 are due to a mistake in meter wiring when the batteries were first installed at each site that caused the batteries to charge in a manner that set a new demand for the month that was greater than what the customer’s demand would have been without the BTM battery. The issue was caught by utility personnel and resolved by the vendor before the end of January 2019.

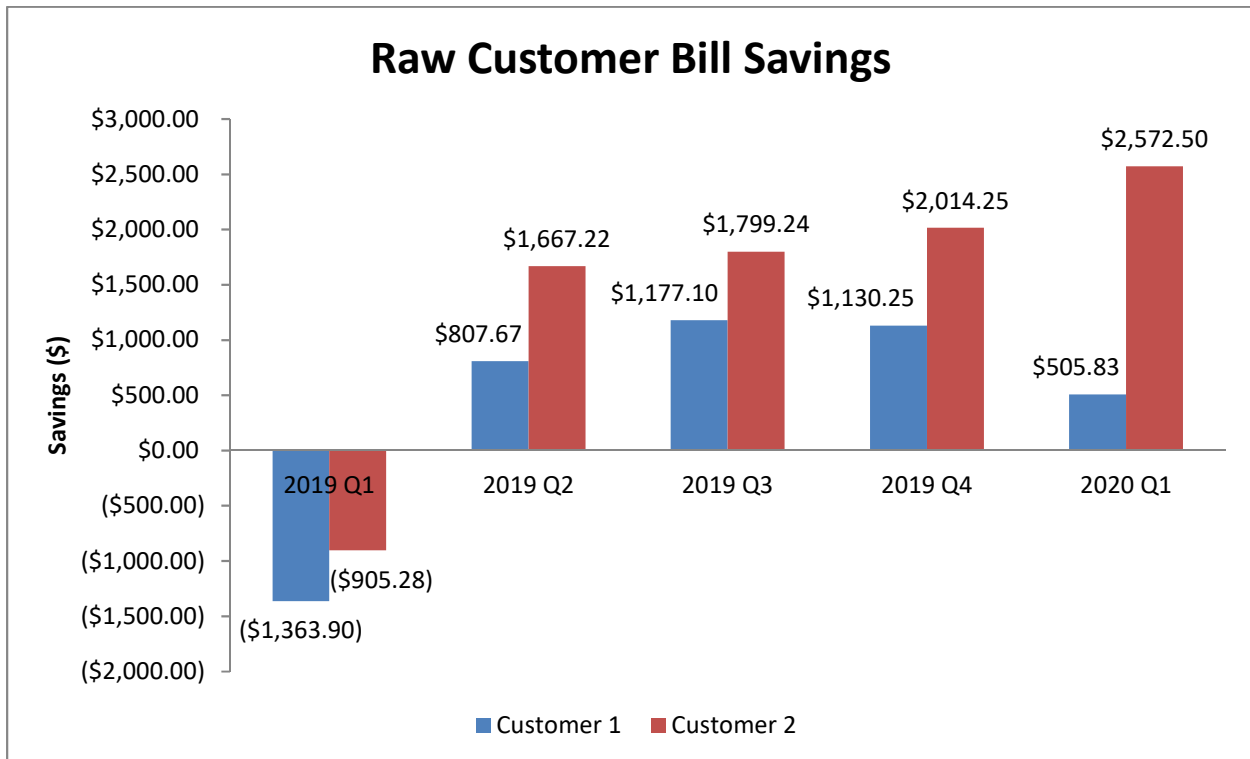


Figure 1 Total Customer Bill Savings by Quarter²

2.3 Issues

2.3.1 Customer Acquisition

The Implementation Plan for this project NYSEG had anticipated a desired target of eight participating Commercial or Industrial customers for a combined capacity of approximately 1.060 MW. This amount of energy storage capacity would give NYSEG the ability to test additional use cases and revenue streams related to NYISO markets that require a minimum of 1 MW. NYSEG has been aggressively pursuing this target since the beginning of this demonstration project but encountered several challenges that led to acquiring only six customers. The first of these challenges was the limited number of eligible commercial or industrial customers in the demonstration target area within the ESC. Due to the size of the battery installations considered in this demonstration project, it was estimated that 125

² Customer demand charge savings compared to predicted bill without battery activity prior to applying subscription fee and any billing adjustment. Savings assigned by the quarter in which the bill period ends.

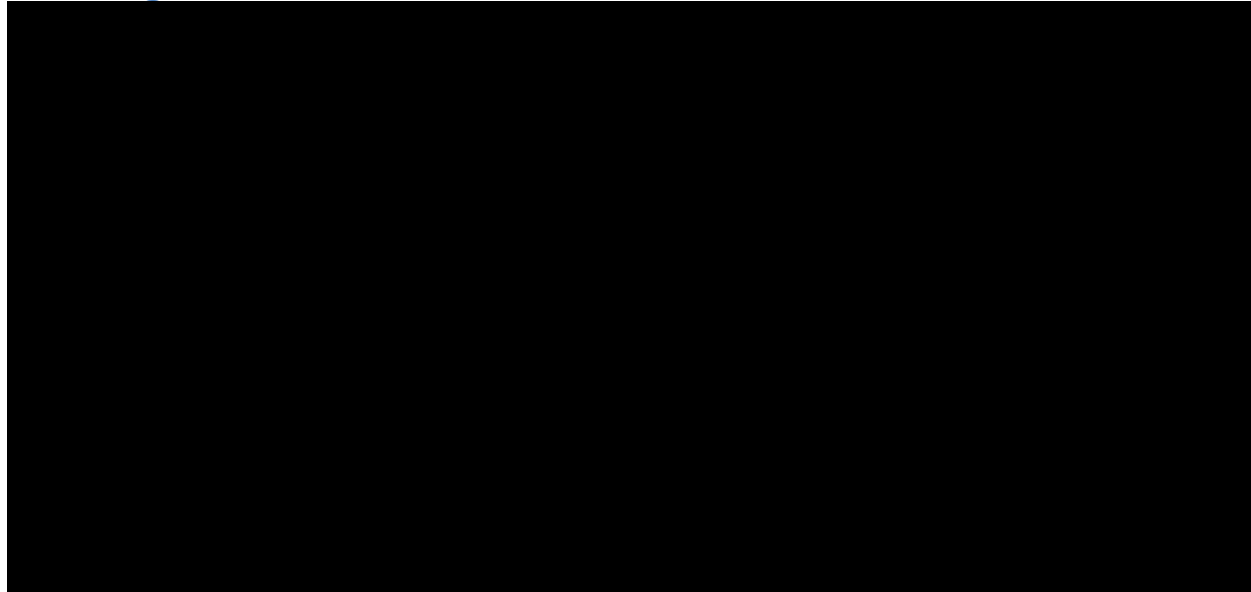
total customer accounts in the ESC would be eligible to install smaller (~53kW) battery size, and even less customers eligible for the medium (~159 kW) and large (~265 kW) batteries. This reduced customer eligibility proved difficult to overcome when offering a product with newer innovative technology.

The second of these challenges is the technical issues inherent to many of the commercial and industrial sites considered for the project. For example, during Q3 2019, upon a more detailed engineering review of one potential customer sites, it was discovered that the age and condition of the customer's electrical infrastructure would require significant upgrades should issues arise during the construction phase of the battery installation. After multiple discussions it was mutually agreed between NYSEG and the customer that the risks outweighed the comparable benefits and the customer decided to drop out of the battery storage demonstration offering. Another issue that hampered NYSEG's customer acquisition efforts included limited physical space at potential customer sites. While the footprint of the battery sites deployed in this demo was modest, no more than a couple parking spaces in size, many customers, especially those located in more urban environments were unable or unwilling to sacrifice this amount of space in exchange for the modest bill savings offered in this pilot.

The third challenge that NYSEG encountered in acquiring additional customers was the relatively modest guaranteed savings offered to them. The guaranteed savings that NYSEG was able to offer its prospective customers for this demonstration project was between 8%-28% of their normal monthly utility bill with the smaller demand customers generally seeing a higher percentage saving guarantee. NYSEG predicted this to be approximately \$100-\$250 in average guaranteed savings per month. While guaranteed demand savings were enticing to many of our potential customers, many of them did not see this savings as significant enough to merit the time or hassle that came with participating in this demo project.

3.0 Work Plan

3.1 Budget Review



3.2 Updated Work Plan

Milestone	Description	Date	Status Update
Phase 1 - Initiate	Develop Business Model for Demonstration	October 2017 – March 2018	Complete
Phase 1 - Plan	Review Customer Load Profile Data, Develop targeted customer list, and Create Demonstration Agreement	December 2017 – April 2018	Complete
Phase 1 - Execute	Meet with Targeted Customers to Determine Interest and Constructability	April 2018 – July 2018	Complete
Phase 1 - Closeout	Sign up Participating Customers	June 2018 – September 2018	Complete
Phase 2 - Initiate	Vendors Selected and Kick Off Meeting	June 2018	Complete
Phase 2 - Plan	Engineering and Procuring Equipment	July 2018 – April 2019	Complete
Phase 2 - Execute	Construction and Testing	October 2018 – May 2019	Completed 5 sites with the final site by June 2020.
Phase 2 - Closeout	Commissioning and Turnover	December 2018 – December 2019	Completed 2 Sites December 2018, 2 Sites completed December 2019, 1 Site February

			2020, and the remaining site by June 2020
Phase 3 - Initiate	Review Metrics and Information Gathering	September 2018	Complete
Phase 3 - Plan	Develop Test Plan and Determine Roles & Responsibility	October - December 2019	Test Plan Completed December 2018 for first two sites. Additional 2 sites Completed December 2019, 1 site in 2020 and Remaining site by June 2020
Phase 3 - Execute	Hypothesis Validation and Data Collection	January 2019 – April 2021	January 2019 – November 2021
Phase 3 - Closeout	Results and Report Creation, Scalability Analysis, Demonstration Project Completion	January 2021 - April 2021	January 2021 - November 2021

3.3 Next Quarter Planned Activities

In Q2 2020, the project team aims to complete the following tasks:

- Phase 2 – Execute
 - Continue construction of remaining customer site.
- Phase 2 – Closeout
 - Closeout the three sites completed December 2019-February 2020
- Phase 3 – Execute
 - Continued development and refining of use case process and procedures
 - Continued data collection on battery performance at the customer sites in that are in service
 - Begin testing of the customer aggregation software and enrollment of customer sites into the SCR and NYSEG DR programs

4.0 Conclusion / Lessons Learned

4.1 Lessons Learned from the First Two Customer Installations

Continual data analysis in the beginning needs to be conducted to ensure the battery, site non-revenue meter, and system is operating correctly. Any failures may result in the customer bill increasing rather than decreasing. Diligence in reviewing performance data is important in ensuring the battery storage system is operating correctly.

With these batteries being “behind the meter”, ownership and maintenance of the batteries does not have a well-defined place within NYSEG’s organization. Currently, Distribution Operations has taken ownership of these systems, but there is still coordination required among the various groups involved in the use case execution and NYISO program participation.

After lessons learned from the first two installations, the scope of work for the additional sites has been more clearly defined. However, this more clearly defined scope of work delayed starting the additional installations. The benefit of the scope of work revision results in a realistic schedule, standard agreement, process, roles, and responsibility moving forward which is critical in ensuring successful installations.

NYSEG has also learned that the particulars of a customer’s site can have a large effect on the design and permitting requirements and even the viability of installing a utility or other third-party owned battery behind the customer’s meter. Each customer site that NYSEG has developed had to be treated individually and while some efficiencies can be found with implementing multiple behind-the-meter sites in the same geographic area, the number of sites required to reach an aggregate of 1 MW has led to a longer project implementation duration.

4.2 Additional Lessons Learned from the 2nd Phase of Customer Installations

The following are lessons learned as part of operating the initial two customer sites and developing the remaining customer locations:

- Informing and educating stakeholders about the battery and projects prior to needing their approval is a good practice.
- Fire Alarm and Prevention Battery standards are still in development, which leads to design challenges at customer sites.
- Communication and regular status meetings between all stakeholders are beneficial for updates and getting quick responses.
- Improper installation of the meter meant to capture site load for the local battery controller can cause the battery to charge in a manner that reduces or eliminates the customer’s demand charge savings
- Lack of proper historical data for a site can lead to sub-optimal demand charge savings

- The age and condition of the customer's infrastructure can be a serious barrier to the adoption of battery storage at a customer site. In these cases, more comprehensive electrical upgrades (such as replacing panels, transformers, and/or cabling) are required to add a behind-the-meter battery.
- Customer demand charge management requires the customer's load to be metered in parallel with their utility meter. This can pose a technical challenge particularly for primary metered customers.
- Although customer communications may clearly show anticipated benefits, including financial bill savings, customers may not have the capacity, authority or willingness to move forward with the BTM energy storage program.
- Communications are a critical factor when collecting battery performance data. Consistent data collection can become challenging due to communications equipment failure or lack of signal coverage and results in missing information that can impact performance decisions.