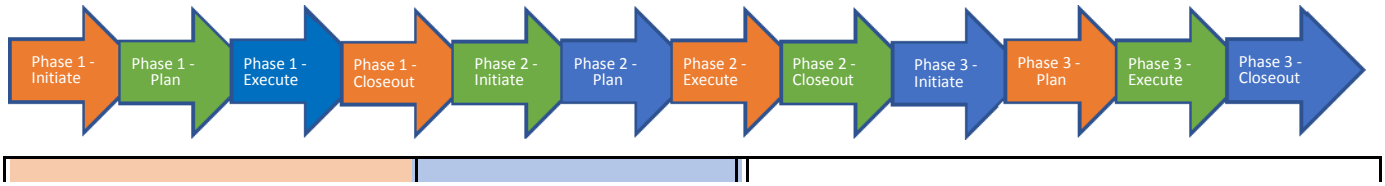
Project Start Date: 06*/15/2018* **Project End Date:** 04/01/2021
Budget: *$8,059,000* **Current Quarter Spend:** *$872,086* **Cumulative Spend:** *$2,448,151*



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 with in 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
  - Customer space restrictions continue to be the most common challenge during customer acquisition
  - Continual data analysis in the beginning needs to be conducted in order to ensure the battery, site non-revenue meter, and system is operating correctly.
  - 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.
  - The age and condition of the customer's infrastructure can be a serious barrier to the adoption of battery storage at a customer site.
- **The Market**
  - N/A
- **Utility Operations**
  - 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.

Application of lessons learned: NYSEG will continue to assess the observed customer adoption rates for the project along with the value derived from the project to determine future plans for behind-the-meter battery storage. The Companies will work to include batteries in their standards such as existing operations manual, communications document, and design specifications.

Explanation for over budget: *N/A*

Issues Identified: During Q3 2019, upon a more detailed engineering review of one of the eight 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 versus the rewards the battery would offer was too great and the customer decided to drop out of the battery storage offering.

Solutions Identified: NYSEG has found some additional candidates for the energy storage offering in the Ithaca area and has been aggressively pursuing these customers with an expectation that they will be able to sign a contract by the end of the 4th quarter.

Recent Milestones/Targets Met:

- Phase 2 – Closeout (2 Initial Customer Sites)
- Phase 2 – Initiate (5 Additional Customer Sites)

Upcoming Milestones/Targets:

- Phase 1 – Closeout: Sign remaining one customer to behind-the-meter demo project
- Phase 2 – Plan:
    - Continued engineering for one customer site.
    - Continued surveying, geotechnical and the required permitting process for five customer sites.
- Phase 2 – Execute: Begin construction for four customer sites.
- Phase 3 – Execute:
    - Continued development and refining of use case process and procedures
    - Continued data collection on battery performance at the two customer sites in service – ongoing

Reforming the Energy Vision

Demonstration Project Q3 2019 Report

Aggregated Behind the Meter Energy Storage

NYSEG

Table of Contents

1.0 Executive Summary

New York State Gas & Electric Corporation (NYSEG or the Company) 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 up to eight (8) customers in the battery storage offering, with a total capacity 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 added. 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 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 Q3 2019, the project focus has been on the development and finalizing of use case process and procedures, continued data collection on battery performance at the two customer sites that are in service, final customer agreements, engineering and permitting at the four additional customer sites, and finalization of a vendor EPC contract for one new additional customer site.

Plans for Q4 2019 include:

- Continued development and finalizing of use case process and procedures
- Continued data collection on battery performance at the two customer sites that are in service
- Signing of four final customer contracts for additional customer sites
- Begin construction at the four additional customer sites
- Finalization of customer agreements
- Site engineering for the newly signed customer location
- Identification of the final customer location

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 September or Q3, 2019 included:

- Continued development and finalizing of use case process and procedures
- Continued data collection on battery performance at the two customer sites that are in service
- Finalization of vendor EPC contracts for one additional customer site and continued focus on customer final agreements for four new customer sites
- Continued site engineering and permitting for four new customer sites

2.1.1 Development of use case process and procedures

The project team has been improving the procedures for the collection of use case data and performance review. Activity in the third quarter included refinement of the use case metrics and data retrieval.

2.1.2 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 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.

2.1.3 Additional vendor EPC contracts and continued customer contract focus

NYSEG has finalized preliminary contracts with five additional customers to participate in this demonstration project. NYSEG has also finalized contracts with the vendor for battery storage systems for all 5 of these sites. The project team is continuing to work with the vendor to execute engineering, permitting, and construction for these sites so that they will be installed by 12/31/2019. However, four of the sites may not be completed until 2020. Two of the sites have had significant delays with getting customer signatures on the interconnection application as there are customer insurance requirements, which conflict with preliminary agreements made between NYSEG and the customers. Another site has been determined to require an unscheduled CESIR study due to the amount of pre-existing generation on site. The team is working with the customers and the applicable state groups to determine the impacts to the schedule. One additional customer site is needed to replace one that was previously identified, but had to be removed. This site is still in the process of being identified.

2.1.5 Preliminary engineering for new customer locations

Engineering has been completed for four sites. NYSEG plans to receive permits from the AHJs for these 4 sites in Q4 2019. NYSEG anticipates receiving CD30s from the vendor for the 5th site within the next few weeks after this filing.

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	Current Results
Customer Acquisition	The total number of participating customers in the Project	8	7[1]

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)	Installing Batteries behind the meter at customer sites, testing, and commissioning in 2019	6	0

Phase 3 – Metrics and Checkpoints

Metric	Definition	Target	Current Results
Customer Bill Savings	Average customer monthly bill savings	$1/kWh	$0.28/kWh

The chart below shows the total customer bill savings by quarter for each customer in this demo project with an installed BTM battery. A positive savings values indicates that the BTM battery was able to reduce the customer's demand charge by reducing the max 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

[1] To date, NYSEG has received signatures to its preliminary customer agreement for 8 total sites. One 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 search for a replacement for this site is still on-going but as of this update a few promising leads have are being developed.

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.

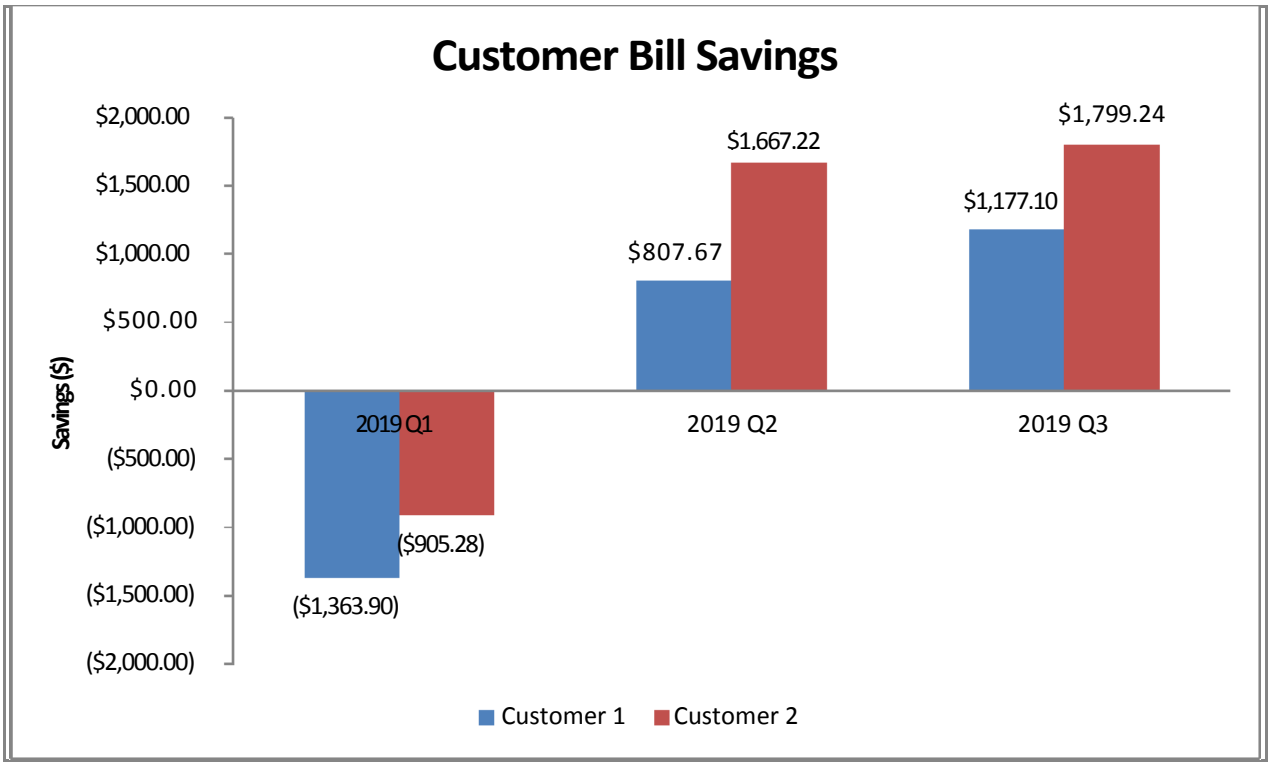


Figure 1 Total Customer Bill Savings by Quarter[2]

2.3 Issues

NYSEG has been aggressively targeting the installation of battery storage systems at eight customer sites to deliver 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. Recently, upon a more detailed engineering review of one of the eight 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 versus the rewards the battery would offer was too great and the customer decided to drop out of the battery storage offering. NYSEG has found some additional candidates for the energy storage offering in the Ithaca area and has been aggressively pursuing these customers with an expectation that they will be able to sign a contract by the end of the 4th quarter.

In the event that NYSEG cannot secure the remaining customer agreements, including final contracts for an eighth customer and 1 MW of energy storage capacity by the end of the 4th quarter, NYSEG proposes

2 Savings assigned by the quarter in which the bill period ends.

to stop its customer acquisition activities and focus solely on finalizing the signed customer locations. With these final BTM customer locations and an energy storage capacity of less than 1 MW NYSEG can still execute on the original use cases as outlined in the implementation plan but will not be able to pursue additional use cases and NYISO revenue streams that are available to a 1MW or greater capacity.

3.0 Work Plan

3.1 Budget Review

The project budget and actual spend through the end of Q3 2019 is outlined in Table 1.

Table 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 - July 2018	Complete
Phase 1 - Closeout	Sign up Participating Customers	June - 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	Completed 2 Sites 2018, January 2019 – October 2019
Phase 2 - Execute	Construction and Testing	October 2018 - May 2019	Completed 2 Sites 2018), September-November 2019
Phase 2 - Closeout	Commissioning and Turnover	December 2018 - December 2019	Commissioning Completed December 2018

			and Closeout on-going, Additional 4 sites December 2019 and remaining 2 sites early 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 4 sites December 2019 and remaining 2 sites early 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 Q4 2019, the project team aims to complete the following tasks:

- Phase 1 – Closeout
  - Sign remaining one customer to behind-the-meter demo project
- Phase 2 - Plan
  - Continued engineering for one customer site.
  - Continued surveying, geotechnical and the required permitting process for five customer sites.
- Phase 2 – Execute
  - Begin construction for four customer sites.

- Phase 2 – Closeout
  - No closeout activity during this update period.

- Phase 3 – Execute
  - Continued development and refining of use case process and procedures
  - Continued data collection on battery performance at the two customer sites in service – ongoing

4.0 Conclusion / Lessons Learned

4.1 Lessons Learned from the First Two Customer Installations

We have learned continual data analysis in the beginning needs to be conducted in order 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 with final signed agreements.
- 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.