



REV Demonstration Project:
Clean Virtual Power Plant

2016 3Q Quarterly Progress Report

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1.0 EXECUTIVE SUMMARY

Consolidated Edison Company of New York, Inc. (“Con Edison” or the “Company”) submits this quarterly report on the progress of the Clean Virtual Power Plant REV demonstration project (“Project”) it is implementing as part of the Reforming the Energy Vision (“REV”) proceeding, as required by the *Order Adopting Regulatory Policy Framework and Implementation Plan*, issued by the New York State Public Service Commission (“Commission”) on February 26, 2015.

1.1 PROGRAM ACHIEVEMENTS

On July 1, 2015, Con Edison submitted the Project for approval by Department of Public Service Staff (“DPS Staff”); on November 20, 2015 DPS Staff approved the Project. Con Edison filed an implementation plan for the Project on December 11, 2015. In the first two quarters of 2016, Con Edison and SunPower finalized and signed the Virtual Power Plant Development Agreement for the marketing, installation, and commissioning of the systems, along with the SCADA integration. Concurrently, a 20 year O&M agreement was executed for the ongoing maintenance of all installed systems, and the Project’s marketing plan was finalized.

1.2 CYBERSECURITY AND PERSONALLY-IDENTIFIABLE INFORMATION PROTECTION

Consistent with corporate instructions and Commission policy related to cybersecurity and the protection of personally-identifiable information (“PII”), each partner agreement executed for the implementation of the Project includes specific protections related to cybersecurity and PII. Assurance of this protection is critical in encouraging customers to sign up with new and innovative services offered by utilities. Additionally, because the Project has operational cybersecurity implications, the Project will incorporate industry best practices related to cybersecurity into the Project’s design where appropriate.

1.3 ACCOUNTING PROCEDURE ESTABLISHED

On February 16, 2016, in Case 15-E-0229, Con Edison filed an accounting procedure for the accounting and recovery of all REV demonstration project costs. This accounting procedure establishes a standardized framework that will govern how the Company categorizes and allocates the costs of the REV demonstration projects, and will facilitate analyzing each project to determine the overall financial benefits of the program to customers.

1.4 COSTS, BENEFITS, AND OPERATIONAL SAVINGS

Budget information for all of the Company’s REV demonstration projects is being filed confidentially with the Commission, concurrently with the filing of this document. All costs filed are incremental costs needed to implement the projects. To date, no tax credits or grants have been available to reduce the net costs of the projects, but Con

Edison will take advantage of such offsetting benefits when they are available. Due to the early stage of implementation for the Project, there are no operational savings to report at this time.

1.5 CLEAN VIRTUAL POWER PLANT

The Project is designed to demonstrate how aggregated fleets of solar and energy storage assets in hundreds of residential dwellings can collectively provide network benefits to the grid, resiliency services to customers, monetization value to Con Edison, and results that will help inform future rate design and development of distribution-level markets.

In Q3 2016, the Project: begun marketing and acquired the first customer of the program; obtained a “Letter of No Objection” for one installation in Queens from the New York City Fire Department (“FDNY”), a major milestone as the first such letter for lithium-ion batteries in New York City; continued the design of the Communications Protocol Translator needed for SCADA communications, and installed the servers needed to run the application into Con Edison’s control centers.

2.0 CLEAN VIRTUAL POWER PLANT – QUARTERLY PROGRESS

2.1 DEMONSTRATION HIGHLIGHTS

2.1.1 Since Previous Quarter – Major Tasks Completion

- Program sales and marketing launched with press releases by Con Edison and SunPower, launch of a SunPower webpage dedicated to the program, co-branded marketing flyer and co-branded in-home consultation sales deck deployed in-the-field with SunPower’s dealer salespeople
- First Energy Storage Agreement signed with a customer for resiliency services
- “Letter of No Objection” received from the FDNY for one installation in Queens
- Protocol Translation Client Server for SCADA connection installed in test environment at Con Edison
- Beta DNP Index established for initial communication tests

2.1.2 Activities Overview

Phase 1, Installation of Solar plus Battery Storage, began in Q1 of 2016 with the preliminary marketing materials being produced, and subsequently approved for use in Q2. In this quarter, customer acquisition was initiated with a green light to approved SunPower Dealers to start offering the Sunverge Solar Integration Systems (“SIS”) to qualified customers at the early-bird rate. Sales velocity following launch has been considerably slower than expected, and the team has identified three main reasons:

- 1) SunPower Dealer salespeople need to overcome the learning curve for incorporating an integrated PV + storage utility program into their homeowner consultations – training has taken longer than expected
- 2) Additional time has been needed to devise and implement program adjustments with post-launch dealer feedback
- 3) Dealers have been reluctant to push for SIS sales because of the uncertainty of the program, since the FDNY has not yet approved the technology for all installations in New York City.

As a result, only a handful of customers actually received a formal offer for the program, with the result of only one sale in September. However, this first sale is an important and noteworthy milestone.

The Project Team has been working with the FDNY since the end of 2015 to ensure all of its requirements are met for a timely deployment of the SIS units for this endeavor. The team is pleased that a “Letter of No Objection” was issued in September for one installation in Queens, which is a major milestone for battery projects in New York City as the first such letter for lithium ion batteries. The team will continue to work with the FDNY for a full Technology Approval for all installations.

Due to the concerns of marketing without full FDNY approval, the sales effort will be put on hold until that is obtained. This will result in a delay to the Project.

Con Edison has added a line item to the work plan to help promote the program directly to its customers once FDNY approvals have been obtained. Links to the SunPower project landing pages will be added to Con Edison's website at relevant customer touch points, such as the Energy Future and Solar pages. In addition, the Project will be promoted directly to customers via email. This additional outreach is designed to increase sales velocity, which should help bring the Project back on target after the delay.

Phase 2, SCADA Integration, also began concurrently with Phase 1 in Q1 of 2016. The overall communication design was completed and approved in Q1 and the details of integration, along with an updated schedule were finalized in Q2. In the past quarter, a data index was established for the beta protocol translator, which includes day-ahead dispatch input/outputs and a general map for future expansion of use cases. Server hardware was ordered and installed in Con Edison's test environment used for all SCADA applications prior to being put into production. The first version of the software was delivered by Sunverge in early October for testing and integration.

Phase 3, Market Participation, will begin after the successful commissioning of SIS units.

2.1.3 Key Metrics

During Phase I, the only metric to be reported is the total number of customers signed up for the program during the quarter. As stated above, the total number is one.

After all customer acquisition is complete, the average price of the resiliency service for all customers will be reported. This is a change from the Q2 report, where it was expected that the average price would be reported each quarter. Since various prices are being tested with the use of an early bird special structure, the Company will include all price offerings in the average price metric once sales are completed.

2.1.4 Next Quarter Forecast

In Q4 2016, Con Edison and SunPower will continue to work with the FDNY for a Technology Approval specific to all installations for this Project, which will all use identical lithium ion battery systems, the Sunverge SIS. With this approval, sales from authorized SunPower Dealers will begin again. The need to extend the sales and installation contractual deadlines due to this delay will be evaluated.

The SCADA integration work will continue with the installation and testing of the first version of Sunverge's Protocol Translation Client software. One-way communication will be established first, followed by full two-way communications. Operator screens

and VPP functionality will continue to be designed and built with the goal to bring a beta version of the VPP into the Control Centers in Q1 of 2017.

2.1.5 Checkpoints/Milestone Progress

Checkpoint/Milestone	Timing	Status
Planning and Contract Negotiations	Phase 0 End	Complete
Residential Design and Installation: Resiliency Pricing	Phase 1 Quarterly	
Demonstrate System Control through SCADA Link	Phase 2 Quarterly	
Market Participation	Phase 3 Midpoint / End	

Legend

On Schedule	Delayed w/out Major Impact	Delayed or Stopped – Project Goals Impacted
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2.1.6 Planned Activities for Q4

2.1.6.1 *Customer acquisition will be put on hold until after FDNY approval. Once obtained, various price points will be tested and the average monthly resiliency fee that customers sign up for will be reported after all customers are acquired.*

Status: **YELLOW – Delayed w/out Major Impact**

Expected Target by Phase 1 Midpoint: Approximately 150 customers will have signed up for the program by the end of Q2 2017.

Solutions/strategies in case of results below expectations: A fundamental hypothesis of the Project is that residential customers are willing to pay for resiliency services from a battery coupled with solar, and willing to host the equipment on their property. If enough customers do not sign up for the Project, this hypothesis will be proven incorrect and the Project may be terminated. There are termination clauses in the contract with SunPower that allow for this event. If an insufficient number of customers have signed up for the Project six months after contract execution, the Project can be terminated with minimal penalty. Due to delays, this deadline will be extended.

2.1.6.2 *FDNY and DOB approvals required before installation can proceed.*

Status: YELLO – Delayed w/out Major Impact

Expected target by end of Q4: FDNY to issue a Technology Approval for all SIS installations in New York City.

Solutions/strategies in case of results below expectations: FDNY approvals are required for these systems to be installed at host customers' homes. As such, if the approvals are not acquired there is a provision in the contract language that will cancel the Project at very little cost to Con Edison; all but a program fee will be returned. This limits Con Edison's customers' liability to pay for systems before they have been approved for installation. This deadline is being extended to allow for more time for the FDNY to approve the technology in Q4.

2.1.6.3 Phase II: A Beta, one-way SCADA communication link will be established

Status: Green

Expected target by Phase 2 midpoint: Beta software will be installed in the testing environment of Con Edison's Distribution Control Center SCADA system. After successful testing in Q4, full two-way communication will be implemented and tested.

Solutions/strategies in case of results below expectations: If the beta software requires more time to test and implement than scheduled, less time will be available in 2017 to demonstrate the capabilities of the system to control center operators. However this will have minimal impact to the overall project schedule, as 2017 will have continuous iterative SCADA design throughout the year.

If the software requires a full overhaul and redesign, the Phase II timeline could be significantly impacted.

2.1.7 Changes to Project Design

The Project team will continue to seek FDNY approval in Q4. After such approvals are obtained, Con Edison will work with SunPower on a new digital marketing campaign designed to raise awareness of the Project to drive sales. The original project plan had all marketing activities being performed by SunPower. It is hoped the additional launch time needed for sales in Q3, as well as the delay for FDNY approval will be somewhat offset by the increased customer awareness Con Edison can bring to the marketing effort.

2.2 WORK PLAN & BUDGET REVIEW

2.2.1 Phase Progress

Phase 1 began with the Finalization of the Marketing Plan, a press release issued in Q2, and sales commencing in Q3 with one customer acquired. After FDNY approval, Phase I will continue through 2017 with the acquisition of all customers and the installation of all SIS units.

Phase 2 began in Q1 with the preliminary SCADA architecture design, which was finalized in Q2. In Q3 a more detailed DNP3 Index was developed and the first version of a protocol translator will be delivered in early Q4. Phase 2 will continue through 2017 as an iterative process to improve the VPP control and functionality.

Phase 3 will begin after the first SIS unit is commissioned, expected in Q1 of 2017.

2.2.1.1 Updated Work Plan

Activity No.	Activity Description	Lead	2015		2016			
			Q3	Q4	Q1	Q2	Q3	Q4
1.0	Phase 0 - Demonstration Planning							
1.1	Project Management	Con Edison/Sunpower						
1.1.1	Obtain Commission Approval	Con Edison						
1.1.2	Finalize Contracts	Con Edison						
1.1.2.1	Refine Scope of Work	Sunpower						
1.1.2.2	Draft Partnership Contract	Con Edison						
1.1.2.3	Draft Homeowner Contract	Sunpower						
2.0	Phase1 - Installation of Solar plus Battery Storage							
2.1	Project Management	Con Edison						
2.2	Customer Engagement	Sunpower						
2.2.1	Marketing	SunPower						
2.2.1.1	Con Edison Program Marketing	ConEdison/SunPower						
2.2.3	Customer Acquisition	Sunpower						
2.2	Financing	Sunpower						
2.2.1.1	Supply Chain	Sunpower						
2.2.1.2	Supply chain planning	Sunpower						
2.2.1.3	Design and Installation	Sunpower						
2.2.1.4	Engineering and design, including standard critical load	Sunpower						
2.2.3	Solar PV and storage systems installations and commissioning	Sunpower						
2.3	VPP Capacity Demonstration	Sunpower						
2.4	Solar PV and Storage Operations and Maintenance (O&M)	Sunpower						
3.0	Phase 2 - Demonstrate system control through Con Edison's control center applications							
3.1	Project Management	Con Edison						
3.1.1	Evaluate Project Rollout	Con Edison						
3.2	Design and Install Beta Communication Link	Con Edison/Sunpower						
3.2.1	Upgrade Con Edison's SCADA system	Con Edison						
3.2.2	Set VPP control parameters	Con Edison/Sunpower						
3.2.3	Establish One-Way SCADA Link	Con Edison						
3.2.4	Test Dispatch/System Integration	Con Edison/Sunpower						
3.2.5	Assess Risks	Con Edison						
3.2.6	Establish/Test Two-Way SCADA Link	Con Edison/Sunpower						
3.3	Iterative Design w/Operations to Finalize Functionality	Con Edison						
4.0	Phase 3 - Market Participation and Rate Design							

= Completed
 = In Progress
 = Not Started
 = Delayed
 = New/Modified

2.2.1.2 Updated Budget

Budget information is being filed confidentially with the Commission.

2.3 CONCLUSION

2.3.1 Lessons Learned

Launching a program that includes technology never before offered to Con Edison customers by Dealers that have never sold a similar product takes longer to implement than originally thought. More training for the dealers was needed, and the allocated time to incorporate their feedback into the program was not sufficient. While it is not anticipated that these delays will substantially affect the overall program, this delay of implementation may have been avoided with earlier communications with the dealer network.

It was expected FDNY approvals for new technology would require detailed communications to satisfy their need for product safety and establish first responder procedures. While significant progress has been demonstrated with approval for one site, the process for full technology approval has taken longer than anticipated by the Project team.

Testing the one-way communication first, a change implemented in Q2 of 2016, for the Protocol Translation Client has simplified the testing procedure and will lead to a faster deployment of SCADA integration, with the first version of the software available in early Q4 2016.

2.3.2 Recommendations

The Project team will continue to work with the FDNY on first responder procedures for SIS installations. Due to feedback from SunPower Dealers about the need for certainty of when installations will be permitted, the marketing effort will be postponed until after full technology approval is obtained.

After such approvals, Con Edison and SunPower will continue to implement the project as envisioned in the December 11, 2015 Implementation Plan.

2.4 INCLUDED APPENDICES

Appendix A: Clean Virtual Power Plant Description of Phases

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Phase	0. Demonstration Planning	1. Installation of Residential Systems	2. SCADA Integration	3. Market Participation and Rate Design
Milestone (Stage Gate to Next Phase)	<p><i>Negotiations to be Completed</i></p> <ul style="list-style-type: none"> • Sign Development Agreement • Sign Maintenance Services Agreement • Sign related agreements 	<p><i>Successfully Contract with Host Customers and build a 4.0 MWh Virtual Power Plant</i></p> <ul style="list-style-type: none"> • Gain required market traction before the Guaranteed Marketing Deadline. 	<p><i>Build Control and Monitoring Platform for Regional Control Center Operators.</i></p> <ul style="list-style-type: none"> • Cyber-secure communication architecture. • HMI Functionality • Engineering analysis through PI system • Control Center Customer satisfaction 	<p><i>Shadow a wholesale (NYISO) or distribution (DSP) market to demonstrate monetization of VPP assets</i></p> <ul style="list-style-type: none"> • Calculate % of compliance • Calculate potential penalties during operating time • Determine price that can be offered for battery dispatchability
Key Elements	<ul style="list-style-type: none"> • Vendor Approved • Cybersecurity Plan • 	<ul style="list-style-type: none"> • Learn how much customers are willing to pay on a monthly basis for access to a battery during a grid outage. • Learn the tolerance customers have for hosting battery systems. 	<ul style="list-style-type: none"> • Work with GE to develop initial HMI screens • Iterative Process between SCADA design engineers and Control Center operators • Key takeaways to be learned for expansion for other 3rd party connections. 	<ul style="list-style-type: none"> • Learn how much a distributed system can make in the markets • Learn operating costs of Con Edison • Calculate total risks • Calculate acceptable price to offer 3rd parties for dispatchability
DER Categories	N/A	Solar Plus Storage	<ul style="list-style-type: none"> • Cybersecurity • DSP Functionality • Scalability 	<ul style="list-style-type: none"> • Solar Plus Storage • Market Design • DSP Functionality • Scalability