Karla M. Corpus Senior Counsel NY Regulatory

January 31, 2017

VIA ELECTRONIC DELIVERY

Honorable Kathleen H. Burgess Secretary New York State Public Service Commission Three Empire State Plaza, 19th Floor Albany, New York 12223-1350

RE: Case 14-M-0101 – Proceeding on Motion of the Commission in Regard to Reforming the Energy Vision (REV)

NIAGARA MOHAWK POWER CORPORATION d/b/a NATIONAL GRID: FRUIT BELT NEIGHBORHOOD SOLAR REV DEMONSTRATION PROJECT – Q4 2016 REPORT

Dear Secretary Burgess:

Niagara Mohawk Power Corporation d/b/a National Grid ("National Grid") hereby submits for filing its quarterly update to the Fruit Belt Neighborhood Solar REV Demonstration Project Implementation Plan covering the period of October 1, 2016 to December 31, 2016 ("Q4 2016 Report") as required by the REV Demonstration Project Assessment Report filed by the New York State Department of Public Service Staff ("Staff") with the Commission on December 2, 2015 in Case 14-M-0101.

Please direct any questions regarding this filing to:

Philip Austen Director, New Energy Solutions Delivery National Grid 175 East Old Country Road Hicksville, New York 11801 Tel.: 516-545-4753 Mobile: 631-599-0285 Email: pausten@nationalgrid.com Hon. Kathleen H. Burgess, Secretary National Grid: Fruit Belt Neighborhood Solar REV Demonstration Project Q4 2016 Report January 31, 2017 Page 2

National Grid looks forward to continuing to work collaboratively with Staff as it proceeds with the implementation of the Fruit Belt Neighborhood Solar REV Demonstration Project.

Respectfully submitted,

/s/ Kara M. Corpus

Karla M. Corpus Senior Counsel

Enc.

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Fruit Belt Neighborhood Solar REV Demonstration Q4 2016 Report

January 31, 2017

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1.0 Executive Summary

The Niagara Mohawk Power Corporation d/b/a National Grid ("National Grid") Fruit Belt Neighborhood Solar REV Demonstration Project ("Demonstration Project" or "Project"), through the partnership with Buffalo Niagara Medical Campus ("BNMC"), Solar Liberty, and the New York State Energy Research and Development Authority ("NYSERDA"), provides solar-generated energy and financial benefits to low-to-moderate income ("LMI") customers while delivering grid efficiencies to the local electric distribution system. The concentration of one hundred (100) rooftop solar systems totaling 0.5 MW of solar photovoltaic ("PV") generation capacity within a specific neighborhood provides the technical conditions necessary for exploring grid efficiency as well as the opportunity to build positive relationships with the local residential community, increasing energy awareness and Project participation. Using utility-owned solar PV equipment mounted on residential roofs, participating residents who are National Grid customers will receive a monthly electric bill credit for the lifespan of the solar PV system.

This Demonstration Project will test the following hypotheses:

- Providing solar bill credits to participants in a LMI neighborhood, as well as partnering with NYSERDA to deliver energy efficiency ("EE") programs to further drive energy bill savings, will have a positive impact on bill payment behavior and enable customers to better manage their arrears.
- Concentrating distributed solar PV resources with reactive power support within a boundary served by a common substation versus scattered deployment of conventional solar PV will deliver measurable grid efficiency benefits.



Figure 1-1: Location of the Fruit Belt Neighborhood (dashed perimeter), located adjacent to the Buffalo Niagara Medical Campus

REV Goal Support

The Demonstration Project supports multiple REV goals using an innovative approach to clean energy collection in a residential area. The electricity generated offsets demand for fossil-fuel generated electricity, thereby meeting the REV goal of reducing greenhouse gas emissions. Local energy production adds resiliency to the local grid, and hiring and training local residents on system sales and installation fulfills yet another REV goal – that of creating new jobs and business opportunities. Collectively, the Demonstration Project's support of multiple REV goals makes it highly valuable in testing the effectiveness of REV objectives as well as modeling how to effectively attain REV goals in a cost-effective, integrated manner.

Progress to Date and Planned 2017 Q1 Goals

Progress continued on this Demonstration Project during Q4 2016 in the areas of customer engagement, marketing material development, and solar PV host selection, culminating with the Project's third and fourth solar PV system installation and interconnection to the grid. A community engagement effort consisting primarily of canvassing was executed and a subsequent work scope for additional in-person engagement was prepared, accepted by the contracting firm (Threshold, Inc.), and executed. Solar PV power generation data reporting was conducted and the customer utility bill credit process was reviewed. General Electric Global Research ("GE"), the consultant contracted to evaluate grid effects resulting from the solar PV installations, commenced the development of a baseline power use model. Lastly, alternative approaches to capturing additional Project participation to help reach the Demonstration Project's stated 500 kW solar PV installation goal were further researched and presented to New York State Department of Public Service ("DPS") Staff for concurrence..

As more fully set forth below, several major efforts are planned for Q1 2017. Additional customer engagement of non-profit owned buildings and schools will be evaluated; and stewardship of existing Project participants will be undertaken to continue the engagement process for potential solar PV host premises, as well as to maintain the interest of those customers whom have already agreed to become hosts, but for which weather conditions have precluded installation until the spring of 2017. Weather permitting, PV system installation will be completed at houses which were scheduled to receive a system in December, but could not due to weather constraints. The grid effects evaluation by GE will continue and bill pool lottery participants will continue to be identified. Q1 2017 efforts will also include workforce development (see Section 3.1).

2.0 Highlights Since Previous Quarter

2.1 Major Tasks Completed

- Regulatory Filings:
 - The Q3 2016 quarterly report was prepared and filed with the New York State Public Service Commission on October 31, 2016.
- Community Engagement:
 - A canvassing effort designed to engage customers who had not yet expressed interest in the Project was executed with a local outreach firm, Threshold, Inc. ("Threshold"). The two-person Threshold team made 1,559 customer calls; in many cases making multiple calls to the same house. Using the canvassing script and wearing Project-specific photo identification cards and Project-branded clothing, the Threshold team secured seventy-nine (79) solar PV Project enrollments.

Threshold first worked from a list of houses that were pre-qualified based on roof size, orientation, and shading data collected from aerial images available through Google. They subsequently targeted houses they identified by walking throughout the Project neighborhood. Additionally, Threshold also canvassed houses belonging to residents who approached them as they conducted their activities in the Project neighborhood.

- Internal Engagement:
 - Site visits were made with a National Grid Distribution Design ("DD") field evaluator to explore what types of electric code compliance issues are being encountered at locations where a second meter will not be needed.
 - In-house meetings were held and site visits conducted by National Grid Retail Connections Engineering representatives to address the appropriate equipment configuration per the Company's Electric System Bulletin No. 750 ("ESB 750") for a house served by an underground feed and to witness a solar PV installation in progress.
 - Established an interconnection method for a solar PV installation at a house served by an underground feed, as well as at a house needing a point-of-attachment relocation.

- National Grid's Specifications for Electrical Installations Committee ("SEIC") continued its review of the proposed meter collar as a way of connecting the solar PV output to the grid.
- In preparation for establishing baseline monitoring and future grid efficiency evaluation, the physical configuration of National Grid's feeders 3463, 3466, and 3467 located within Substation 34 were evaluated. Proposed meter dimensions were then compared to the space available for installation. It was determined that the available meters would not fit due to space limitations and the adverse safety effects on the work environment around these meters. Steps were taken to initiate the purchase of meters that are suitable for the Project and physically capable of fitting into the available space within the substation.
- Data Evaluation, Measurement &Verification ("EM&V"):
 - Teleconferences were held with Enphase, Inc. to determine a method for them to provide the aggregated hourly generation data to National Grid's New York Pricing Group. The data is now being sent automatically twice monthly; each deliverable containing either the first fifteen (15) days or second fifteen/sixteen (15/16) days of the previous month's generation data.
 - The automated bill credit system was finalized, and bill credits are now automatically added to solar host accounts.
- Partner Participation:
 - Weekly and bi-weekly progress calls with each Project partner were conducted to ensure timely information flow.
 - Solar Liberty:
 - Installed the Project's third and fourth solar PV system arrays;
 - Interconnected both the third and fourth PV system installations to the grid;
 - Prepared and submitted four (4) building permit applications;
 - Conducted preliminary on-site reviews of thirteen (13) houses;
 - Completed electrical, roofing, and structural reviews of seventeen (17) houses;
 - Determined twenty-three (23) houses need roof repairs or replacement at a cost exceeding the \$2,000 per house solar readiness funding;
 - Along with National Grid and BNMC, met with six (6) members of the City of Buffalo's Building Department, which is responsible for issuing building permits for solar PV systems; discussed the need for prompt building permit application review for solar PV systems and learned what factors delay a review. The Project team's commitment to providing complete and thorough building permit applications was reiterated.



Figure 2-1: Post cards were sent to homeowners to make them aware of the upcoming canvassing activity

- NYSERDA :
 - Using the form provided by NYSERDA, obtained 199 leads for residential energy efficiency ("EE") program enrollment;
 - Attorneys for National Grid and NYSERDA conferred regarding the need to have Fruit Belt customers additionally provide account information and consumption data regarding their gas utility accounts, as National Grid is only their electric provider. The review and approval process for any incremental expenditure on EE measures that exceed NYSERDA program funding limits, where such incremental costs may be funded by the Project, was also discussed. These discussions are ongoing, with the expectation that these issues will be resolved in the next quarter.
- o GE:
 - Held an in-person GE/National Grid kickoff meeting for grid efficiency analysis in Buffalo;
 - Following the aforementioned meeting, a tour of National Grid's Substation 34 was conducted, followed by a tour of the Project study area;
 - Circuit detail modeling was completed using PSCAD[™].¹ This model includes source-equivalent branch section modeling based on the CYME² network details provided by National Grid, residential and commercial loads and their associated distribution transformers. Nodes were aggregated for circuit reduction based on load locations. The model will be optimized following any new findings during the testing or use phases.
- o BNMC:
 - Evaluated concept of including nonprofit group buildings and schools (as these are also residential SC-1 electric customers) n the Project as a method to achieve Project goals for solar PV installed capacity, and researched contact information for these entities.
- Community Participation:
 - The following are cumulative quantities as of the end of Q4 2016;
 - One hundred forty (140) account holders expressed interest in becoming a solar PV host;
 - Sixty-four (64) houses were deemed unfit to host solar PV due to shading, roof size, pitch, or orientation, or having a location external to the Project area;
 - Of the remaining seventy-four (74) houses:
 - Two (2) solar PV Systems were installed and energized during the Q4 2016 bringing the total number of solar PV systems installed under the Project to four;
 - Eleven (11) houses are now in the process of building permit application preparation;

¹ PSCAD[™] is a simulation tool used to study transient behavior of electrical networks.

² CYME Power Engineering Software is a provider of modeling tools for network grid analysis.

- Two (2) houses were determined to be solar-ready and are now awaiting the customers' signature to proceed;
- Building permits for PV systems at three (3) houses have been issued and will be installed when weather conditions accommodate construction;
- Thirty-one (31) houses are currently under review for solar PV;
- Nineteen (19) houses were reviewed and determined to need roofing repairs that cost more than the \$2,000 allocation provided by the Project;
- Five (5) houses are owned by customers currently evaluating whether or not they want to participate in the Project; and
- One (1) house was deemed solar-ready but the owner withdrew for personal reasons.
- Previous quarterly reports noted the total residential participation may not yield sufficient roof space to achieve the 500 kW Project goal. The canvassing effort conducted this during Q4 2016 encompassed visiting all potentially eligible houses. Analyses of houses identified by those visits shows the total potential viable roof space (provided the roof, structural and electrical analysis prove the house is viable), will yield approximately 275 kW of solar capacity. Inclusion of smaller size roofs that can accommodate only 3.0 to 4.0 kW of generation was incorporated into the Project in Q3 2016. While this increased the projected installed kW potential, additional roof space is still needed. Three (3) alternative actions to help attain the 500 kW goal, noted in the Q3 2016 report, were addressed with DPS Staff in Q4 2016, as follows:
 - Several non-profit owned buildings are located within the Fruit Belt neighborhood, including churches, a community center, and two (2) residential rooming houses; all of which have residential (SC-1) accounts. A teleconference presentation was held with DPS Staff in December 2016, which resulted in approval to include these non-profit buildings in the Project.
 - Similar to the rationale for including non-profit roof space, use of school building roof space was also discussed with DPS Staff during the same December 2016 Project teleconference. There is one (1) school located within the Project area, and one (1) school abutting the Project's northern perimeter. Both of these schools are served by the same electric feeders that serve the residential customers within the Project area. DPS Staff approved the inclusion of school building participation in the Project provided it did not diminish the grid efficiency analysis that is also being conducted for the Project.
 - As noted in previous quarterly reports, several roofs were determined to be in unsatisfactory condition and will require replacement (rather than repair) before a solar PV system could be installed. However, such roof

replacement costs exceed the Project's \$2,000 per house allocation for electrical upgrades, structural support addition, and roof repairs. One option discussed with DPS Staff is to revise the Project scope to permit homeowners to apply any unspent repair funds toward a new roof. This option was first introduced with DPS Staff during the Q3 2016 quarterly report meeting held on November 15, 2016. It was subsequently discussed again with DPS Staff at the December 16, 2016 teleconference, but a final decision was not made. The proposal will be further addressed in a teleconference with DPS Staff scheduled for January 2017.



Figure 2-2: The Fruit Belt Neighborhood Solar Project permits using garage roofs to host PV panels provided the roofs offer the necessary size, pitch, orientation, and shading qualities.

2.2 Key Metrics

Key Project metrics were developed based on the data needs and the proposed work scope. The ability of the selected equipment and systems to provide the key metric data was verified. Attached Appendix B contains the Key Metric Reporting Matrix. Q4 2016 activities consisted primarily of enrollment and determination of "solar readiness" and data collection pertaining to engagement and participation. The third and fourth solar PV systems were installed, and three (3) more systems were permitted and are ready to be installed.

2.3 Challenges, Changes, and Lessons Learned This Quarter											
Challenge or Change	What was the Resulting Change to Scope/Timeline?	Strategies to Resolve	Lessons Learned								
Although interested in participating in the Project, schools and non-profit organization- owned buildings were originally excluded from Project participation on the basis that the Project was to focus exclusively on residential houses.	Schools and non-profit owned buildings are now permitted to have their building(s) enrolled into the Project because they are located on the same feeders, serve the Fruit Belt neighborhood.	Prepared a slide show and held an on-line meeting with DPS Staff to review the slides, answer questions as they arose, and secure approval to expand the Project to include these participants.	For future neighborhood- focused projects, identify any excluded groups and evaluate why they are being excluded. Identify remedies that permit their inclusion.								
Customers commit to in-home visit dates for electrical and structural reviews, but then miss the appointment.	The time frame for completing reviews of numerous houses was delayed, resulting in a corresponding delay of the building permit application submittal date.	Obtain customer cell phone, as well as land line phone numbers, if available. Establish a strong positive rapport during the initial customer visit and make reminder calls two (2) days prior to the scheduled visit date.	Plan for at least 50% more enrollment time due to customer inability to keep scheduled appointments. Conduct reminder calling 2 days in advance of all visits.								
The City of Buffalo is requiring longer than expected to review building permit applications.	The City of Buffalo has required as long as five (5) weeks to review building permit applications, often due to City staff being temporarily unavailable.	Met with City of Buffalo representatives to determine how best to facilitate their review of each solar PV system building permit application.	Build solar PV system project schedules to include six (6) weeks for permitting to accommodate variations in the City of Buffalo building permitting office staffing level.								
Residents do not respond to letters and newspaper advertisements, thereby slowing enrollment in the Project.	The slow enrollment pace has lengthened the Project's installation phase by four (4) months.	A local marketing and communications company was hired to conduct canvassing in the Project neighborhood.	Direct interfacing is the most effective method of securing Project enrollment.								

2.3 Challenges, Changes, and Lessons Learned This Quarter

Homeowners of twenty percent (20%) of the houses in the Project area are willing to become solar PV hosts but their roofs require replacement to do so and the homeowners cannot afford the cost of a new roof.	Additional time must be spent pursuing additional avenues for Project enrollment because houses in need of a roof replacement are unlikely solar PV host candidates.	Propose that for each individual house included in the Project, unused solar readiness funding be re-allocated to offset a portion of the roof replacement cost.	Conduct an aerial survey of roof conditions prior to formally estimating an expected Project participation quantity.
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3.0 Next Quarter Forecast

Annotated below are the status of the open checkpoints and milestones stated in the January 4, 2016 Implementation Plan, with dates stated in the Q4 2016 Report.

As the Customer/Stakeholder Outreach Phase 1 (Awareness) and Phase 2 (Enrollment) efforts were undertaken during Q2 2016 and Q3 2016, it became evident that these phases are actually occurring simultaneously, with enrollment occurring as an output of these efforts. Also note that the Phase 3 (Installation) Outreach efforts commenced upon the customer's initial expression of interest and continue throughout the analysis, permitting, and installation processes. This differs from the Implementation Plan, which indicates all customers would first be identified, with installation to immediately follow thereafter.

	Checkpoint/Milestone	Anticipated Start/End Date Stated in Q3 2016 Report	Revised Start- End Date	Status
1	Finalize contracts with Partners	08/16	Completed	
2	Customer/Stakeholder Outreach: Phase 1: Community Meetings	04/16- 8/16	04/16 – 06/17	
3	Customer/Stakeholder Outreach: Phase 2: Enrollment	04/16-10/17	04/16-08/17	
4	Customer/Stakeholder Outreach Phase 3: Installation	10/16-11/17	Unchanged	
5	Solar PV Assessments	05/16- 06/17	05/16-08/17	
6	Site Selection and Design	01/01/16 – 8/17	Unchanged	
7	Meter Installation	07/16-12/17	07/16-04/17	
8	Permitting	06/16 -07/17	06/16-10/17	
9	Solar PV Installation	06/2016-11/17	Unchanged	
10	Interconnection	07/16-11/17	Unchanged	
11	Bill Credits Administrated	08/16 ongoing	Unchanged	

Table 3.1 Checkpoints/Milestone Progress

12	Solar Workforce Hiring	Q4 2016	03/17-04/17	
13	GE Commissioning and Grid Monitoring	08/16 ongoing	10/16 – Q1 2019	
14	Internal Systems Capability	10/15-04/16	10/15 – 11/17	

Key

- On Track
- Delayed start, at risk of on-time completion; or over-budget
- Terminated/abandoned Checkpoint
 - 1. Partner Contracts Executed.

Status: [Completed]

National Grid's contract with GE was signed in Q3 2016. No further action on this task is required. The Solar Liberty contract was previously executed.

2. Customer/Stakeholder Outreach: Phase 1: Community Meetings

Status: [Ongoing]

Outreach and Education Phase 1 continued in Q4 2016 to drive Project enrollment. Phase 1 efforts included one (1) round of postcard mailing to owners of houses pre-screened to have roofs of sufficient size, orientation, and shading. The screening was conducted by Project partner, Solar Liberty, using Google images. A door-to-door canvassing campaign was then held using a contractor prepared with a script to answer questions and encourage enrollment. In addition, Project representatives continued to provide information to potential and existing participants regarding enrollment, billing credits, educational resources, workforce development, solar PV, and energy efficiency via use of the project-specific call-in telephone number.

All targets for Q4 2016 were met.

Targets/Actuals in Q4 2016:

- Target: Develop and mail a targeted postcard to the homeowners and non-resident landlords of houses meeting screening criteria to announce upcoming canvassing effort;
 - Actual: Developed and mailed one (1) round of postcards to all homeowners and non-resident landlords of houses meeting screening criteria;
- Target: Canvass at least 75% of the owners of houses pre-qualified based on roof size, orientation, and shading;
 - Actual: Canvassed 100% of targeted houses; also visited houses meeting physical criteria which were no on the screening list;
- Target: Respond to 100% of calls received from the Project's toll-free number;

• Actual: 100% of the calls received were responded to within one (1) business day.

Targets in Q1 2017:

- Target: Conduct customer stewardship consisting of re-visiting customers failing to show up to a site visit or structural review appointment;
- Target: Via the customer stewardship effort, obtain host agreement signatures on 90% of the houses declared solar ready during the quarter;
- Conduct outreach to buildings owned by non-profit corporations located within the Project area, present Project participation options, and secure execution of host agreements from 50% of the non-profit owners successfully visited. Conduct further viability assessment of School 37, and provided it is viable, conduct as many as 3 meeting with the school staff to pursue program enrollment.

Solutions/strategies in the event results are below expectations:

National Grid will evaluate the possibility of including residences and non-profits abutting the exterior perimeter of the project area, and which are served by the same three electric feeders serving the Fruit Belt neighborhood.

3. Customer/Stakeholder Outreach: Phase 2: Enrollment.

Status: [Ongoing]

Enrollment began on April 17, 2016 with the first community meeting. The conclusion of enrollment was modified during this quarter due to two factors: inclusion of non-profit owned buildings and enrollment of a greater number of roofs capable of hosting >5 kW, meaning that the 500kW installed goal may be achieved via fewer houses. The enrollment endpoint is now defined as 'a maximum of 500 kW of installed solar on a maximum of 100 "solar-ready" houses and non-profit owned buildings.

Targets/Actuals in Q4 2016:

- Target: Twenty-five (25) owners sign Access Agreements;
 - Actual: A cumulative total of sixty-nine (69) Access Agreements have been signed for this Project;
- Target: Enroll a total of twenty (20) Project participants;
 - Actual: This metric was merged with the 'Signed Access Agreement' metric, as they both result in participants enrolled in Tier 1, above;
- Target: Twenty-five (25) participants sign up for lottery as Tier II;
 - Actual: A cumulative total of sixty-five (65) account holders are eligible to be entered into the bill credit lottery;
- Target: A cumulative total of fifty (50) account holders get referred to NYSERDA as Tier III customers in Q4 2016;
 - Actual: A Memorandum of Understanding ("MOU") between NYSERDA and National Grid was not finalized in Q4 2016. Therefore, referrals were not provided to NYSERDA during this quarter.

Target in Q1 2017:

- Target: Five (5) non-profit organizations sign an Access Agreement and enroll as Tier I;
- Target: Provided the MOU has been signed, fifty (50) participants are referred to NYSERDA's EE residential programs, including the EmPower New York program.

Solutions/strategies in the event results are below expectations:

If the participation level as measured in kW is below the stated target level at the end of Q1 of 2017, National Grid and the Project partners will plan a series of block club meetings, distribute additional collateral materials, and engage existing homeowner participants to spread word-of-mouth information.



Figure 3-1: Existing Feeder 3467 control board where digital metering is planned for installation.

4. Customer/Stakeholder Outreach: Phase 3: Installation.

Status: **[**Ongoing]

Customer engagement activities continue throughout the solar host approval process for each homeowner who signed up to participate in the Project.

Targets/Actuals in Q4 2016:

- Target: Maintain contact with all homeowners enrolled as the houses progress through the review and permitting process;
 - Actual: Maintained contact with all homeowners enrolled as the houses progress through the review and permitting process.

Target in Q1 2017:

- Target: Maintain positive engagement throughout the installation scheduling and implementation process with each homeowner and other types of property owners throughout the review and permitting process.
- Maintain engagement with enrolled and permitted customers who are awaiting installation to occur once the weather permits installation.



Figure 3-2: Installing the second rooftop solar PV system in the Fruit Belt neighborhood

5. Solar Assessments.

Status: **(**Ongoing]

Curbside assessments are conducted on each house for which the owner expresses interest, and for which the Google review shows to be viable. This process will be continued until 500 kW of rooftop solar PV systems are secured via host agreements. Structural assessments, which are conducted following the curbside review and are thus not part of the target/actual evaluation criteria, are conducted by a third-party engineer.

Targets/Actuals in Q4 2016:

- Target: Commence an additional fifteen (15) solar PV site assessments.
 - Actual: Forty (40) initial solar PV assessments were completed, bringing the total quantity of initial assessments completed to seventy-four (74);
 - o Actual: Eleven (11) structural assessments were completed;
 - Actual: The cumulative total of roof assessments conducted since May 2016 is fiftyfour (54).

Target in Q1 2017:

- Complete a Project cumulative total of eighty (80) initial solar PV site assessments;
- Complete a Project cumulative total of sixty (60) structural assessments; and
- Complete a Project cumulative total of sixty (60) roof assessments.

Solutions/strategies in the event results are below expectations:

If the solar PV assessment quantity is low due to the contractor's efforts, National Grid will meet with the contractor and request additional staffing resources be placed on the job and require them to conduct the curbside and roof assessments within ten (10) days of customer enrollment. Structural assessments require coordination with the customer to permit entry into the house, thus the structural assessment step most always requires more than ten (10) business days to complete.

6. Site Selection and Design

Status: **[**Ongoing]

A solar array design (site plan) is prepared for each residence for which a homeowner expressed interest, and deemed eligible following completion of the curbside solar assessment process and the roof assessment.

Targets/Actuals in Q4 2016:

- Target: Continue to design a site plan for each home at which a curbside review shows the house to likely be solar eligible.
 - Actual: A site plan was completed for each home at which a curbside review was completed and which showed the house to likely be solar eligible.

Target in Q1 2017:

Continue to design a site plan for each home or other building at which a curbside review shows the structure to likely be solar eligible.

Solutions/strategies in the event results are below expectations:

• It is expected that a site plan can be prepared within the next quarter for those buildings whose owners express interest, which pass the solar screening assessment, and which pass the roofing assessment, provided there are sufficient remaining business days in the quarter to do so. Buildings that meet the screening criteria, but for which there was insufficient time to prepare a site plan within Q1 2017, will have a site plan created in the following quarter.



Figure 3-3: Four tests conducted using the Enphase meter showed it met the minimum accuracy required by the ANSI C12.20 standard.

7. Meter Installation



Status: [(Revised) 3/31/2017]

The project plan was adjusted in Q4 2016 to install a meter separate from the Enphase electronic meter in five (5) of the proposed one hundred (100) solar PV systems. These will be installed as a check on the Enphase metering system. Building permit applications for three (3) PV systems had already been submitted to the City of Buffalo just prior to the option of installing the single Enphase meter was provided. Due to the lengthy building permit review process, the decision was made not re-draw the electrical one-line diagrams and then re-submit these building permit applications for approval. Rather, there will now be seven (7) houses equipped with a secondary electrical meter in addition to the Enphase electronic meter.

Targets/Actuals in Q4 2016:

- Target: Install a secondary meter at each of the remaining three (3) of the five (5) secondary metered systems will be installed;
 - Actual: Four (4) solar PV systems have been installed to date; two (2) of which were installed in Q4 2016. One (1) secondary meter was installed on each of these four (4) PV systems;
- Target: 100% of solar PV panel arrays are connected and being metered within ten (10) business days of completing solar PV system installation;
 - Actual: 100% of solar PV panel arrays were connected within ten (10) business days of completing solar PV system installation.

Target in Q1 2017:

- Secondary meters will be installed on the fifth, sixth, and seventh of the seven (7) PV systems, weather permitting;
- 100% of solar PV panel arrays are connected and being metered within ten (10) business days of completing solar PV system installation.

Note that the definition of "completing solar installation" shall include securing City of Buffalo inspections. Inspections can require several days following the physical installation of a PV system. Also, electrical inspection is just one of the four steps comprising PV system installation. The other three (3) are panel installation, electrical connection, and system commissioning. Several days may lapse between each these steps during winter months due to weather condition variability. Thus, during Q1 2017 and early Q2 2017, once a PV system's panel installation is started, system commissioning may in fact take place a few weeks later.

Solutions/strategies in the event results are below expectations:

 The Envoy metering is part of the solar PV panel installation. If a solar PV panel system is not active within ten (10) days of installation completion, National Grid will communicate with Solar Liberty and Enphase to determine what is preventing the timely interconnection, and will then address the findings so that all subsequent solar PV systems are active within the ten (10) day timeframe. Delays in installations will be mitigated by implementing lessons learned and anticipating proper lead time for steps, such as obtaining building permits and placing equipment orders



Figure 3-4: Use of safety harnesses by all roof workers is one of several safety protocols followed by the contractor's field installation crews.

8. Permitting

Status: | [Ongoing]

Solar Liberty strives to submit permit applications to the City of Buffalo within three (3) weeks following receipt of a signed host agreement. This time frame was not met during Q4 2016 due to Solar Liberty's contractor's inability to produce the electrical one-line drawings within ten (10) business days of receiving a drawing request.

The City of Buffalo Building Department staff report that permitting typically takes four (4) to six (6) weeks.

Targets/Actuals in Q4 2016:

- Target: Meet with City of Buffalo Building Department to determine what the Project team can do in the permit application process to help facilitate the application review process and enable permit issuance within two (2) weeks of application submittal;
 - Actual: A meeting was held with the City of Buffalo's Building Department staff and fire marshal to discuss methods of facilitating a more rapid building permit application review. While permit applications submitted to date have been acceptable, the fire marshal asked that future applications include additional information on occupant egress locations, surrounding building features such as streets and fences, and a photograph of the front of the house. Solar Liberty agreed to provide these items;
 - Actual: One (1) permit was issued within six 62) weeks and one (1) permit was issued within seven (7) weeks; the latter requiring additional information which caused a 1-week delay in its issuance;
 - Actual: Solar Liberty has required up to six (6) weeks to complete a building permit application. This delay resulted from their electrical design contractor missing their timeframe for preparing the electrical drawing required to be included with each building permit application.

Target in Q1 2017

• Target: Notify the City of Buffalo Building Department approximately one (1) week in advance of each permit submittal; advise them of the quantity of permit applications they should expect, and provide applications in groups, if feasible.

Solutions/strategies in the event results are below expectations:

Hold a third project meeting with the City of Buffalo Building Department regarding the rate of building permit application review. Determine what else can be done by Solar Liberty to facilitate the permit application review process.

9. Solar Installation.

Status: [Ongoing]

As of the end of Q4 2016, four (4) solar PV system installations have been completed.

Targets/Actuals in Q4 2016:

- Target: Install eight (8) rooftop solar PV systems;
 - Actual: Two (2) rooftop solar PV systems were installed this quarter.

Target in Q1 2017:

• Install three (3) rooftop solar PV systems, based on anticipated winter weather conditions and the time frame required for the City of Buffalo to complete its review of building permit applications. Installation is also heavily dependent on weather conditions during the quarter, as noted under Milestone 7, above.

Solutions/strategies in the event results are below expectations:

National Grid will meet with Solar Liberty to identify what issues prevent shorter analysis times and what solutions can be implemented to decrease the turnaround time. If the issue lies with one of their contractors, National Grid will ask Solar Liberty to meet with those contractors to analyze the situation and determine viable solutions to increase the pace of installations.

10. Interconnection

Status: 🛑 [Revised: 07/16 – 11/17]

Interconnection of two (2) installed rooftop systems was completed in Q4 2016. Interconnection within three (3) days of PV solar system inspection by the City of Buffalo is now anticipated.

Targets/Actuals in Q4 2016:

- Target: Complete, or schedule for completion, each solar PV system interconnection within five (5) business days of installation;
 - Actual: Connected two (2) solar PV systems to the grid within two (2) weeks of the City of Buffalo's electrical inspection. This increase in time was due to holidays and a defect discovered in the conduit seal of one of the combiner boxes.

- Connect all systems installed in Q4 2016;
 - o Actual: All systems installed in Q4 2016 were connected.

Target in Q1 2017:

• Complete, or schedule for completion, each solar PV system interconnection within five (5) business days of installation.

Solutions/strategies in the event results are below expectations:

Delays in conducting or scheduling interconnections are not anticipated at this time.

11. Bill Credits Administered.

Status: [(Revised) 08/2016 ongoing] The billing system to calculate and distribute the billing credit was created in Q1 2016.

Targets/Actuals in Q3 2016:

- Target: Distribute all bill credits for the previous month's solar PV credit using the designed bill credit system;
 - Actual: Monthly bill credits are being generated and issued for each of the four (4) solar PV systems installed to date.

Solutions/strategies in the event results are below expectations: Once identified, any issue with the bill credit system will be reviewed and resolved as soon as feasible.



Figure 3-5: The Enphase metering system is capable of concurrently reporting the output of each individual PV panel.

12. Workforce Development (Recruitment of Local Solar PV Employees)

Status: [(Revised) Q4 2016]

Solar Liberty worked with BNMC in Q3 2016 to evaluate options for identifying and hiring local employee candidates. A hiring source for eligible candidates was selected.

Targets/Actuals in Q4 2016:

- Target: Post one (1) job position and identify eligible candidates;
 - Actual: No job postings were prepared during this quarter.

Target in Q1 2017:

• Solar Liberty to procure candidates for at least one (1) job position, identify and interview eligible candidates and select at least one candidate to be hired.

Solutions/strategies in the event results are below expectations:

The workforce development timeline is in flux due to the uncertainty of staffing needs. Solar Liberty will maintain communication with BNMC to explore hiring alternatives, if the proposed hiring processes prove ineffective for identifying viable, qualified candidates.

13. GE Commissioning and Grid Monitoring.

Status: <a>[(Ongoing]

GE grid efficiency analysis consists of feeder modeling and simulation, controls integration, and grid testing.

Targets/Actuals in Q4 2016:

- Target: Hold a contractor contract project kick-off meeting;
 - Actual: Held a contractor project kick-off meeting on October 7, 2016.
- Target: GE to commence baseline development;
 - Actual: GE commenced developing a baseline conditions model; circuit details modeling was completed using PSCAD[™]; circuit model includes source equivalent, branch section modeling based on the CYME network details provided by National Grid, residential and commercial loads, and their associated distribution transformers; nodes have been aggregated for circuit reduction based on loads location, and model can be optimized following new findings.

Target in Q1 2017:

- Complete baseline development process;
- GE to validate the model performance using voltage, power and current measurements at specified nodes along the network.

14. Internal Systems Capability.

Status: **[**Ongoing]

The toll-free number continued to operate in Q4 2016. The Sanction Paper, an internal document used by National Grid for cost authorization, was completed in Q3 2016. The capital cost included in that paper was based on a preliminary budget prior to the Implementation Plan finalization. The Sanction Paper will require updating per the budget values listed in the final Implementation Plan.

Targets/Actuals in Q4 2016:

- Target: Complete the National Grid purchase order for GE's services;
 - Actual: The National Grid purchase order for GE's services was completed.

Target in Q1 2017:

- Maintain internal systems in working condition;
- Update the National Grid Sanction paper using the capital cost listed in the final Implementation Plan budget.



Figure 3-6: The Enphase system provides multiple reporting displays, including a 7day total daily output graph.

4.0 Work Plan & Budget Review

4.1 Updated Work Plan

The overall work scope and work plan has been adjusted per field findings to include non-profit owned buildings and schools located within the Project. Additionally, some alternative equipment for the solar PV system interconnection may change based on pending approvals. The Project timeline has changed due to the delays previously mentioned in this report.



Figure 4.1 – Updated Timeline

4.2 Updated Budget

The following items may impact the budget as they remain unresolved as of the end of Q4 2016.

1. The meter collar proposed for use in this Project is the least costly method of service interconnection and the Project budget was planned based on using the meter collar. As of the end of Q4 2016, its use was still under review by National Grid's Retail Connection Engineering group. The cost increase for using a dedicated service entrance cable instead of the meter collar is \$1,152 per house. If a dedicated service entrance cable is needed in addition to a dedicated meter channel, the cost increase over using just a meter collar is \$1,537 per house. It was previously decided to install the dedicated meter channel on the first five (5) houses while the Envoy meter was under testing. That number increased to seven (7) houses due to the lengthy building permit application process. Installing a dedicated meter channel and not using meter collar results in additional material costs of \$10,759. If the meter collar is not approved, interconnecting approximately ninety-three (93) houses using the dedicated service entrance cable without a dedicated meter channel will cost approximately \$107,136 more than using the meter collar. If the meter collar is not approved, the dedicated service entrance cable will be installed at all participating buildings. Note that the approval of the Enphase meter as the sole meter in the solar PV system decreased the additional cost by \$35,805.

Solutions:

The following solution is proposed:

- Continue to design solar PV systems using a dedicated service entrance cable, and request National Grid's Retail Connection Engineering Group complete its interconnection design review by January 31, 2017.
- 2. The SIM cards used for data communications incur a monthly fee. This fee was not included in the original budget for the Project. The data plan size is being analyzed under the context of the data needs as demonstrated from the first few solar PV system installations. It is too early in the Project to determine if this will require additional funding, as the actual costs are unknown at this time and cannot be compared to the projected budget. Therefore, a budget increase will not be sought at this time.
- 3. The allocated amounts for National Grid's tasks are not well matched to the levels of effort they require. However, it is too early in the Project to identify exact dollar amounts needed to accurately re-allocate the Project funds. This evaluation will take place during Q4 2017, as most all the solar PV systems are expected to be installed at that time, and several of the tasks will have been completed at that time.

Fruit Belt Neighborhood Solar													
Quarterly Budget Status													
Q4 2016													
Operational Expenditures													
Quarterly Spend to Expected													
Task	Budget	Spend	Date	Completion	۱	/ariance							
General Administration and Planning	\$ 30,000	\$ 44,700	\$109,166	\$ 425,000	\$	(395,000)							
Marketing and Community Engagement	\$ 250,000	\$ 29,709	\$ 82,408	\$ 250,000	\$	-							
Incentives	\$-	\$-	\$-	\$-	\$	-							
Implementation	\$1,777,000	\$ (36,383)	\$ 23,995	\$ 1,389,375	\$	387,625							
Evaluation & Analysis	\$ 325,000	\$-	\$-	\$ 300,000	\$	25,000							
Totals:	\$2,382,000	\$ 38,026	\$215,569	\$ 2,364,375	\$	17,625							
Capital Expenditures													
100 Solar PV Systems	\$1,410,000	\$119,230	\$119,230	\$ 1,410,000	\$	-							
Totals:	\$1,410,000	\$119,230	\$119,230	\$ 1,410,000	\$	-							
Project Totals:	\$3,792,000	\$157,256	\$334,799	\$ 3,774,375	\$	17,625							

The updated Project budget is presented below:

Budget figures listed differ from those listed in previous quarterly reports because the above values are from the Implementation Plan. These budget values will be used going forward.³

As noted in previous quarterly reports, the final equipment vendors selected resulted in a lower Project material cost. The additional cost of the solar PV panel removal and re-installation during any future roof repairs/replacements, as well as the cost of removing the solar PV panels after twenty-five (25) years of service, will be derived from re-allocating some funds originally budgeted

³ Prior quarterly report budget figures were inadvertently not reflective of the Implementation Plan.

for those material costs. Therefore, a budget increase for future solar PV panel removal/replacement will not be sought at this time.

The incremental costs associated with the Project as of December 31, 2016 total \$54,647. Continued monitoring and reporting of incremental costs will be included in subsequent quarterly reports.

5.0 Progress Metrics

Appendix B presents key Project metric tracking data available as of the end of Q3 2016. Note that arrears payment data is not available in this quarter because the first solar PV systems were not installed at locations where customers were in arrears. Additional fields have been added to better display the arrears data once arrears data is generated. Also, tier description fields were added to more accurately reflect true Tier enrollment status.

Appendices

Appendix A: Updated Gantt Chart (as of the end of Q4 2016)



Key Previously-Identified Changes: Estimated extensions identified this quarter:



Appendix B: Metric Tracking

															Arearage Participant			
	Outre	ach		Custo	omer Tie	er			Solar Ins	tallation Prog	ress			Gei	neration a	ind Credits		Evaluation
	Expressions of Interest (Calls	Geograph- icall¶	Tier 1		Tier 2	Tier 3	Tier 3	Roof Assess-	Structural Assess-	Electrical Assess-	Rootop	Roortop Systems	kΨ	k¥h	Credits Gener-	Cumula- tive Qty of Bill	Total Quarter	Arrearage
Project	Received.		Enroll-	Tier 1	Enroll	-		ments	ments	ments	Systems	Con-	on-	gener-	ated	Credit	Credit	Particpant
Quarter	· · · · · · · · · · · · ·	ified Calls		Eligibility					Completed		Installed	nected	line	ated	[\$]	Recip-	[\$]	Quantity
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	\$0.00	0	\$0.00	0
2	34	0	1	5	0	14	14	14	10	14	1	0	0	0	\$0.00	0	\$0.00	0
3	28	2	1	10	0	16	16	26	9	5	1	2	12.22	3,166	\$33.96	2	\$16.98	0
4	78	1	2	16	0	34	34	54	21	24	2	2	10.92	12,872	\$116.99	3	\$50.49	0
5																		
6																		
7																		
8																		
Totals:	140	3	4	31	0	64	64	68	40	43	4	4	23.14	16,038	\$150.95			

Table C.1 – Metric Tracking Table