

Reforming the Energy Vision

Demonstration Project Q4 2017 Report

Flexible Interconnect Capacity Solution



Table of Contents

1.0 Executive Summary 3

2.0 Demonstration Highlights since the Previous Quarter 4

 2.1 Activity Overview 4

 2.1.1 FICS DER #1 4

 2.1.2 FICS DER #2 4

 2.1.3 Screening for Additional Projects 5

 2.1.4 Integrated Solution Proposal 6

 2.1.5 FICS+Energy Storage 6

 2.2 Metrics and Checkpoints 6

 2.3 Issues 9

3.0 Work Plan 10

 3.1 Budget Review 10

 Table 2: Budget Review 10

 3.2 Updated Work Plan 11

 3.3 Next Quarter Planned Activities 11

4.0 Conclusion / Lessons Learned 11

1.0 Executive Summary

New York State Electric & Gas Corporation (“NYSEG” or “the Company”) submits this quarterly report on the progress of the Flexible Interconnect Capacity Solutions (FICS) demonstration project. The FICS demonstration project tests a new model for interconnecting Distributed Energy Resources (DERs) to the distribution grid using Active Network Management (ANM) rather than firm capacity. ANM technology allows the utility to manage DER within grid constraints (e.g., voltage, overloads, etc.) using real-time sensing and controls, avoiding more expensive upgrades. This model provides the potential to save on interconnection costs with minimal curtailment on DER, aiding economic viability. In addition, ANM provides the potential for greater penetration of DER.

Two proposed DERs in the NYSEG service territory have been targeted as the demonstration sites for the initial FICS scope. Using ANM, a portion of the interconnection costs for each DER will be deferred by managing network constraints identified in NYSEG’s interconnection analysis. The DERs include a 2 MW solar photovoltaic (PV) farm and a 450 kW farm waste generator.

During Q4 2017, an analysis of a combined ANM and energy storage FICS solution was completed. In addition, the all the substation equipment work was completed. Also, we continued to work with CYME, Smarter Grid Solutions (SGS), and PowerClerk on the NYSERDA PON 3397 project. Finally, DER

Plans for Q1 2108 include:

- Progress point of interconnection design and installation for DER #1
- Complete substation equipment testing and commissioning
- Progress development on joint SGS-CYME-Clean Power Research NYSERDA PON 3397 project with completion end of Q1 2018-start of Q2 2018
- Complete analysis on additional potential FICS projects

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 and results during Q4 2017 included:

- Conduit installation to LTC complete at the substation for DER #1
- Completion and closure of analysis of a combined solution with ANM and Energy Storage for DER #2
- Execution on NYSERDA PON 3397 project with CYME, Smarter Grid Solutions (SGS), and Clean Power Research

2.1.1 FICS DER #1

On June 28, 2016, this 2 MW PV developer executed a FICS agreement with NYSEG. On July 21, 2016, NYSEG was informed that the 2 MW PV farm project was on hold pending a grasslands bird study. As the agreement has been executed for this project, NYSEG has continued to progress the project factory acceptance test (FAT) and a modified site acceptance test (SAT) in preparation for resumed field activities. The project is scheduled to commence construction between January and April 2018.

Field design is progressing for this interconnection and some of the substation hardware has arrived at the substation. Also, conduit installation at the substation is being prepared. The developer projects an in-service date at the end of Q1 2018. The PV project has been delayed by an environmental assessment and we are currently awaiting notification that the assessment has been completed. NYSEG completed installation of much of the substation equipment for DER #1 in November 2017.

2.1.2 FICS DER #2

On June 29, 2016, NYSEG issued a proposed FICS agreement for a 450 kW farm waste generator. AVANGRID offered three options to interconnect the generator:

1. Do not participate in FICS and upgrade the Aurora substation transformer bank;
2. Participate in FICS, with the generator managed by ANM to address the thermal capacity constraint at the Aurora substation transformer bank. Install new distribution line regulation to prevent high-voltage conditions; or
3. Participate in FICS, with the generator managed by ANM to address the thermal and voltage constraints.

On September 12, 2016, the developer for DER #2 stated that the go-forward decision on this project was on hold pending the interpretation of the \$5k maximum interconnection fee for farm waste generators as described on Page 49 of the New York State Standardized Interconnection Requirements and Application Process For New Distributed Generators 5 MW or Less Connected in Parallel with Utility Distribution Systems. As the customer had not executed the agreement on this project, NYSEG deferred

construction, configuration, and testing the ANM platform for this project pending execution of the FICS agreement.

On January 24, the developer for DER #2 resumed interconnection discussions with NYSEG. On June 2, NYSEG provided an updated analysis and cost estimate to address the changes in the interconnection queue and projects subsequently placed into service. On December 1st, 2017, the developer again resumed interconnection discussions and was informed that the project had been removed from the interconnection queue due to failure to meet PSC mandated time constraints. The developer will have to reapply for interconnection if still interested in moving forward with the project. The developer expressed a desire to reapply, but NYSEG has yet to receive an interconnection request for the project.

2.1.3 Screening for Additional Projects

On October 26, 2015, NYSEG executed a change order with Smarter Grid Solutions (SGS) to provide expertise in screening and planning of DER projects for flexible interconnection. Priorities during this activity include:

- Evaluate and prioritize additional potential FICS DER projects;
- Develop a strategy for a long-term FICS process;
- Create a strategy for long-term FICS process automation;
- Document and disseminate flexible interconnection screening techniques and strategies to help with the DER interconnection demand, including presentations and workshops as necessary; and
- Utilize findings for a possible NYSERDA funding proposal.

In January, 2016, screening and analysis for additional FICS candidate projects was completed from an updated interconnection queue. A number of potential projects were discussed with developers and two projects were identified for further evaluation.

- DER#3: A 1.7 MW PV installation in Peruville was identified and the developer was interested in a flexible interconnection option. The ANM analysis and cost estimate were nearing completion when the developer notified us that the landowner had died without providing land rights. Since the project is deferred indefinitely, development of the FICS project has stopped.
- DER #4: a 2 MW PV installation in Richfield was also identified and the developer showed interest in a flexible interconnection option. As this installation is flicker limited, it is a new use case requiring a faster control response. Further analysis and testing will be required to prove the solution will provide the requisite power quality. Once proved, this solution has the potential to allow even further penetration of DER on the power grid than otherwise.

Subsequently, additional projects have been screened.

- Yawger Substation: Two potential projects driven by a remote voltage issue on Yawger Substation were reviewed between SGS and Avangrid in August 2017. FICS development on

these projects was stopped in December 2017 when it was learned that all the projects on Yawger Substation had progressed with a standard interconnection process.

2.1.4 Integrated Solution Proposal

NYSEG/AVANGRID is participating in a NYSERDA PON3397 proposal to integrate interconnection functionality between Smarter Grid Solutions, Clean Power Research, and CYME. If the proposal is selected we will embark on a proof-of-concept project to integrate SGS (FICS), CYME (Distribution Analysis), and PowerClerk (Interconnection Administration) to facilitate the interconnection process.

At the conclusion of this project, we hope to integrate interconnection planning and analysis with FICS as a business-as-usual process. AVANGRID, CYME, Clean Power Research and SGS held a CYME process meeting on September 25th. The parties held another meeting on Dember 20th to review the changes to the interconnection application process flow in this proof-of-concept.

2.1.5 FICS+Energy Storage

NYSEG/AVANGRID is working with Smarter Grid Solutions to evaluate an Energy Storage System in the NYSEG Aurora Substation that would eliminate the need for voltage regulators for DER #2. The energy storage system would be used to reduce the amount of curtailment of the DERs at this location. SGS presented their analysis on November 13th. NYSEG/AVANGRID decided not to pursue the project due to the costs. The combined project would have required a 350 kW/1 MWh battery with a 1 MVA inverter, but the analysis did show that a battery would have increased the hosting capacity of the circuits involved.

2.2 Metrics and Checkpoints

Table 1: Checkpoints

Check Point	Description
Selection of the FICS Option	<p>Measure: The number and percentage of FICS-qualified projects that elect the FICS option expressed as both the number of projects and MWs.</p> <p>When: Execution of interconnection contracts with participating developers is targeted for Q2 2016, therefore progress updates will be provided in the Q4 2015 and Q1 2016 reports.</p> <p>How: FICS qualification is based on preliminary screening of DER interconnection applications, where ANM can enable incremental DER generation capacity that would otherwise require network reinforcement to accommodate the full proposed capacity.</p> <p>Expected Target: At least two DER developers in the NYSEG and/or RG&E territory will elect the FICS option during the demonstration term.</p> <p>Strategy if Results are Below Expectation: If less than two developers provide a show of interest in the FICS option during initial outreach to be conducted</p>

	<p>in Q4 2015, AVANGRID will review options for next steps in site selection with Staff.</p> <p>Results: FICS DER #1 has elected the FICS option and FICS DER #2 has not proceeded. Additional projects are being screened.</p>
<p>Interconnection Cost</p>	<p>Measure: The total utility infrastructure cost per MW interconnected and the avoided cost of network reinforcement that would otherwise be required. The original project metric proposed included Interconnection Timeframe, but comparing the interconnection period during the demonstration term to that of a firm interconnection may be misleading since the timeline to deliver the ANM system does not accurately represent the timing of deploying ANM at additional DERs following the demonstration term.</p> <p>When: ANM system go live is targeted for Q4 2016, therefore a review of the final interconnection cost for participating sites will be included in the Q4 2016 report.</p> <p>How: The total cost per MW interconnected will be available following completion of the interconnection. The avoided cost of network reinforcement will be determined in the CESIR process based on an estimate developed by AVANGRID.</p> <p>Expected Target: ANM projects in the U.K. have reduced interconnection costs by up to 90 percent. Interconnection costs for current and historical DER projects governed by the New York Standardized Interconnection Requirements vary by location depending on a number of factors, including size of the project, existing network topology, and required network reinforcement. Therefore, it is challenging to project expected cost avoided through FICS at this time. AVANGRID will propose reasonable comparative assumptions for Staff review.</p> <p>Strategy if Results are Below Expectation: Developers will likely not participate in FICS unless there is a cost savings in completing their interconnection. Avangrid will identify scenarios/opportunities where FICS could provide a more economical solution.</p> <p>Results: FICS DER #1 results in an estimated deferral of 57% of the interconnection costs. FICS DER #2 results in an estimated 98% reduction in interconnection costs compared to an interconnection for firm capacity.</p>
<p>Additional MW Exported and Share of Generation Curtailed</p>	<p>Measure: The additional generation exported by participating DER installations (versus projected generation of the baseline firm interconnection capacity offered) and the share of generation curtailed expressed as a comparison between actual curtailment and forecasted curtailment.</p> <p>Timeline: ANM system go live is targeted for Q4 2016, therefore generation and operational curtailment levels will be included in the Q4 2016 report.</p> <p>How: Additional DER generation exported will be measured starting during operations in Q4 2016 and compared to participating developers' generation projections. The share of generation curtailed due to constraint management will be measured during operations in Q4 2016 and compared to Smarter Grid</p>

	<p>Solutions’ forecasted curtailment (as an annualized percentage). Curtailment due to communications failures and network outages will be highlighted and differentiated from curtailment due to constraint management.</p> <p>Expected Target: Additional DER generation exported will vary by project and site. The average DER project curtailment has been approximately five percent annually in the U.K.</p> <p>Strategy if Results are Below Expectation: If actual curtailment in Q4 2016 exceeds the forecasted level on an annualized basis, AVANGRID and Smarter Grid Solutions will reexamine modeling results to refine the curtailment forecast.</p> <p>Results: FICS DER #1 is a 2 MW rated photovoltaic generator. FICS DER #2 is a 450 kW farm waste generator. These sites are not yet operational.</p>
<p>Total FICS Utility Revenue</p>	<p>Measure: Utility revenues from platform-as-a service fees in the aggregate and on a per-MW basis for participating projects.</p> <p>When: Execution of FICS-based interconnection contracts with participating developers is targeted for Q2 2016, therefore progress updates will be provided in the Q4 2015 and Q1 2016 reports.</p> <p>How: Platform-as-a-service fee included in interconnection contracts executed with participating developers, which may be based on a shared risk structure.</p> <p>Expected Target: The area of commercial development for the platform-as-a-service business model is a primary focus for testing. AVANGRID is aiming to obtain robust lessons learned on effective development of revenue opportunities from FICS. In the July 1 FICS proposal filing, AVANGRID examined various fee options that would cover the revenue requirements of adopting FICS capabilities, with analysis indicating that an annual fee charged to each DER would cover the revenue requirements of ANM at scale with DERs contracted.</p> <p>Strategy if Results are Below Expectation: Capture robust lessons learned on developing revenue opportunities from FICS should be the primary indicator of successful testing for the project. Avangrid will identify barriers preventing revenue generation and assess potential alternative revenue models.</p> <p>Results: The FICS DER #1 contract did not include platform service fees, but used a cost deferral calculation instead. The draft FICS DER #2 agreement options include a platform fee of \$23,000 or \$12,000, depending upon the option chosen.</p>
<p>Customer Satisfaction</p>	<p>Measure: Key drivers and obstacles of FICS adoption among targeted DER developers.</p> <p>Timeline: Execution of FICS-based interconnection contracts with participating developers is targeted for Q2 2016, therefore surveying results of targeted developers that decided not to go forward with FICS will be presented in the Q2 2016 report and surveying results of participating projects will be presented in the Q4 2016 report.</p>

	<p>How: Post-interconnection survey of all targeted developers, including those that decided not to go forward.</p> <p>Expected Target: AVANGRID is aiming to obtain robust lessons learned from non-participating developers to inform future FICS site selection and outreach efforts and to gather lessons learned from participating developers to inform how ongoing ANM operations can meet developers’ needs.</p> <p>Strategy if Results are Below Expectation: AVANGRID will evaluate how to improve engagement efforts to increase future participation in FICS and meet participating developers’ needs.</p> <p>Results: Section 4.0 of this report discusses observations from discussions with targeted developers.</p>
External Engagement	<p>Measure: Lessons learned and opportunities for scaling FICS based on feedback from external, non-developer stakeholders with a role in DER development and interconnection in New York.</p> <p>Timeline: AVANGRID will provide updates in each quarterly report on engagement outcomes with the Joint Utilities, NYSERDA, etc.</p> <p>How: Description of stakeholder engagement lessons learned.</p> <p>Expected Target: AVANGRID will engage NYSERDA with the aim to gauge the statewide baseline interconnection record for funded DERs, to effectively develop the platform-as-a-service business model, and identify opportunities for other ANM applications to increase DER interconnections in New York. AVANGRID will engage the Joint Utilities to review current interconnection challenges and alternative interconnection solutions being developed in New York.</p> <p>Strategy if Results are Below Expectation: AVANGRID will utilize NYSEG and RG&E interconnection records as its base data set for reviewing and comparing interconnection outcomes and challenges.</p> <p>Results: We continue to gain insights from the FICS demonstration project and we are investigating tools and options to facilitate FICS as a business-as-usual process. We are evaluating Clean Power Research’s PowerClerk too for interconnection administration and we are a partner to a NYSERDA PON proposal to integrate FICS, PowerClerk, and CYME.</p>

2.3 Issues

Changes in the queue require re-doing the FICS analysis and cost estimates.

Flicker management is a new use case for FICS and requires additional analysis and testing to prove its effectiveness.

3.0 Work Plan

3.1 Budget Review

3.2 Updated Work Plan

Table 3: Work Plan

Activity	Q4 2017	Q1 2018	Q2 2018
Site Acceptance Test (DER #1)			
Construction (DER # 1)			
Operation (DER #1)			
Assessment Completion (FICS + Energy Storage)			
Process Implementation (NYSERDA PON 3397)			

3.3 Next Quarter Planned Activities

In Q4 2017, the project team aims to complete the following tasks:

- Progress point of interconnection design and installation for DER #1
- Complete substation equipment testing and commissioning
- Progress development on joint SGS-CYME-Clean Power Research NYSERDA PON 3397 project with completion end of Q1 2018-start of Q2 2018
- Complete analysis on additional potential FICS projects

4.0 Conclusion / Lessons Learned

Addressing flicker limitations with FICS will require additional analysis and testing, but it has the potential to increase DER capacity even further.

Changes in interconnection queues require revised analyses and cost estimates.

Lessons learned from the NYSERDA PON 3397 proposal have the potential to greatly increase the efficiency of processing and analyzing DER interconnection requests, including ANM analysis.

Combining Energy Storage with ANM technology has the potential to increase the hosting capacity of the circuit and allow for the interconnection of additional DERs, but energy storage is still a very costly solution and how that cost would be allocated to the DER projects is still unclear.