Mark O. Marini
Director - Regulatory

February 1, 2017

VIA ELECTRONIC MAIL

Honorable Kathleen H. Burgess
Secretary
State of New York Public Service Commission
Three Empire State Plaza
Albany, NY 12223

RE: Case 14-M-0101 - Proceeding on Motion of the Commission in Regard to Reforming the Energy Vision – Smart Home Rate

Dear Secretary Burgess,

In accordance with Ordering Clause No. 7 of the May 19, 2016 *Order Adopting A Ratemaking and Utility Revenue Model Policy Framework* in the above-referenced proceeding, New York State Electric & Gas Corporation and Rochester Gas and Electric Corporation hereby submit their Smart Home Rate demonstration proposal.

Respectfully submitted,

Mark O. Marini

Attachment

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Case 14-M-010 – Proceeding on Motion of the Commission in Regard to Reforming the Energy Vision – Smart Home Rate

NEW YORK STATE ELECTRIC & GAS CORPORATION
ROCHESTER GAS AND ELECTRIC CORPORATION

SMART HOME RATE DEMONSTRATION PROPOSAL

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NEW YORK STATE ELECTRIC & GAS CORPORATION
ROCHESTER GAS AND ELECTRIC CORPORATION
SMART HOME RATE DEMONSTRATION PROPOSAL

In accordance with Ordering Clause 7 of the New York State Public Service Commission's ("Commission") May 19, 2016 Order[1] in this proceeding, New York State Electric & Gas Corporation ("NYSEG") and Rochester Gas and Electric Corporation ("RG&E) (collectively, the "Companies") file this proposal regarding a Smart Home Rate ("SHR") demonstration project.

I. Executive Summary

The Energy Smart Community ("ESC") was approved as part of the recent NYSEG Electric Rate Plan. The ESC is located in Tompkins County in the greater Ithaca region, and will serve as the ecosystem in which the Smart Home Rate ("SHR") demonstration project will be implemented. The ESC is a small-scale deployment of foundational investments necessary to develop a distributed system platform ("DSP"). Through work related to the ESC, the Companies have become partners in Cornell University's National Science Foundation ("NSF") grant 'Energy Smart Community – Leveraging Virtual Storage to Turn Advanced Metering Infrastructure Into a Smart Service System.' Other partners include: Solar City/Tesla, BMW North America, and Distributed Sun. The NSF research will leverage the ESC platform to build a distributed storage simulation platform to test price signals and the associated customer response that results from the smart home system. The NSF research provides a unique and valuable opportunity for the SHR demonstration project to effectively and efficiently test, iterate, learn and provide tangible results to inform future development. The Companies have collaborated with Cornell University and NYSERDA to inform this SHR demonstration project filing.

Consistent with the implementation of the ESC, the Companies propose that the SHR demonstration project apply to both NYSEG and RG&E. As stated by the Commission in the Companies' recently approved Rate Plan, "Through the ESC Project, NYSEG will be able to test DSP functions, new technologies, market concepts and customer engagement models on a controlled scale. RG&E should also benefit from the lessons learned in the ESC Project."[2]

[1] Case 14-M-0101, *Proceeding on Motion of the Commission in Regard to Reforming the Energy Vision*, Order Adopting A Ratemaking and Utility Revenue Model Policy Framework (issued and effective May 19, 2016) ("Track 2 Order").

[2] Cases 15-E-0283 et al. – *Proceeding on Motion of the Commission as to the Rates, Charges, Rules and Regulations of New York State Electric & Gas Corporation for Electric Service*, Order Approving Electric and Gas Rate Plans in Accord With Joint Proposal (issued and effective June 15, 2016), p. 60.

II. Introduction

A. Energy Smart Community

The SHR demonstration project will be developed and implemented in the ESC. The ESC, located in the greater Ithaca region, will be a test-bed for technology investments and identifying methods that successfully engage customers, the community, and the market. The targeted technology deployment is critical to prove the business case of the platform, ensure operational effectiveness, and mitigate risk for full-scale deployment.

The ESC will allow for the testing of a variety of innovative initiatives, including customer and community engagement methodologies and an Advanced Metering Infrastructure ("AMI") pilot project. The primary objectives of the ESC project include the following: (1) test and prove the functionality of foundational platform technologies; (2) develop new capabilities and processes that support the evolution of the DSP; (3) create and test new rate designs that support system efficiency; (4) identify new methods for creating value for customers; (5) identify new methods for engaging with the market; (6) create an environment of collaboration; and (7) support and inform a clean energy policy.

ESC elements focused on Grid Operations include the following projects: implementation of distribution automation, Volt Var Optimization ("VVO"), deployment of AMI and associated telecommunications infrastructure, and implementation of early phases of the Advanced Distribution Management System ("ADMS"). The DSP must evolve its grid operations capabilities to enable it to maintain a secure and flexible distribution network. In addition, Grid Operations must be capable of managing demand-side resources, providing real time network and load monitoring, fault detection and isolation, automated circuit and line switching, and VVO. Each of these functions will be tested on a small scale within the ESC before deployment throughout the system in order to gather experience. There are plans to automate all circuit head breakers, voltage regulation devices, reclosers, tie switches, and sectionalizing switches in the ESC footprint. The ESC will leverage the advanced capabilities of smart meters for near real-time monitoring of DER output and status. In addition, as part of the VVO scheme, smart meters will be used to interface with smart inverters to provide voltage and var set points.

Integrated System Planning ("ISP") components of the ESC include: DER and load forecasting, calculation of Hosting Capacity, DER Performance Analysis and Assessment and a DER Developer Portal. Implementation of ISP within the ESC will provide a range of benefits: online access to necessary information that supports DER developers and local government planners to support the development of community energy plans and processes to enable third-party participation in market solutions including new products and services, energy efficiency and demand response services.

Market enablement features of the ESC will identify new methods of creating value for customers engaging with the market. These features include: customer education programs, the use of innovative time-varying pricing ("TVP") rates and billing practices, customer analysis and segmentation, and the implementation of an online energy platform and marketplace. The ESC will test approaches to helping customers understand the value of available programs and specific means to control their energy costs. The ESC will also develop opportunities for market partners to gain access to new markets, retail customers, and the data needed to effectively engage those that will most benefit from energy services. There will be collaboration with third-party market providers to support participation in the marketplace and to provide access to data that will inform the evolution of a more robust market for energy products and services.

B. Cornell University National Science Foundation Grant

The foundational grid operations, integrated system planning and market enablement investments in the ESC will also serve to support Cornell University's National Science Foundation Grant 'Energy Smart Community – Leveraging Virtual Storage to Turn Advanced Metering Infrastructure Into a Smart Service System.'[3] The research will focus on five tasks:

1. Development of a unique experimental economics platform that is able to guide the design of market mechanisms that focuses on customer-based DER in electricity distribution systems;
2. Design and implement a fully instrumented, control and communication capable, smart service system at the individual residence level;
3. Develop virtual storage and time-varying rate scenarios;
4. Design and implement cross-disciplinary survey effort;
5. Customer choice and consumer incentivization research.

The NSF grant research is led by Cornell University, in partnership with the Companies, Solar City/Tesla, BMW North America, Distributed Sun, and Cornell Cooperative Extension – Tompkins County.

The ESC provides the NSF grant participants with the smart service system test-bed, as the 12,400 electric smart meters will be networked to a central server allowing two-way communication between NYSEG and each smart meter in the ESC. The NSF partners will develop, and implement a virtual storage system[4], explained in more detail below, to rapidly test

[3] https://nsf.gov/awardsearch/showAward?AWD_ID=1632124

[4] Note that herein we define the terms "virtual storage" and "virtual battery" specifically to mean computationally simulated storage, which is different from other definitions of a "virtual battery", which has been defined in some literature as flexible loads that behave like batteries in aggregate.

time-varying pricing models on various simulated storage designs and penetrations while working closely with customers to understand both their concerns, their biases, and how they are motivated.

To fully leverage the power of smart meters, consumers, or smart service systems acting on their behalf, need to make decisions about how to operate their residences on an hourly or faster time scale. The NSF partners will participate in a cross-disciplinary multi-industrial-partner effort to develop this market infrastructure by leveraging the ESC's AMI and other platform infrastructure. The SHR demonstration project will leverage AMI functionality to optimize the use of distributed storage by developing a smart service system that taps into the NYISO day-ahead market that reacts to price signals automatically.

A key aspect of the NSF grant collaboration is the development of virtual storage models to simulate physical storage (that is, simulate electric vehicle ("EV") and stand-alone batteries), minimizing the cost to study the impact of storage and identify potential business opportunities at reduced cost and lower risk. This experiment uses the fundamental concept from experimental economics of testing actual economic incentives in a virtual environment (Smith, 1982), for which Vernon Smith received the Nobel Prize in Economics. Thus, participants in economics experiments are paid based on their decisions as if they were in a real world setting. In the proposed experiments, residential customers, if they choose to purchase virtual storage (*i.e.*, a simulated battery, at any monthly cost or other fee structure the team chooses), can virtually purchase electricity at off-peak, low prices to be used at times of peak electricity prices. This will ensure that consumers see monthly bills that reflect the true costs of storage. Coupled to their smart meter and with time-varying electricity rates, they will realize all net savings that occur. With the smart meter they will be billed as if these were actual transactions.

The NSF research will also include two primary types of physical storage: stand-alone batteries (*e.g.*, new task specific or recycled EV-based batteries) and EVs themselves. The former is the most flexible, as standalone storage can be designed specifically to address business opportunities that emerge. In particular, it acts readily as both a distributed source and a distributed demand for energy. While in theory EVs could be designed with this same flexibility, given their primary role as transportation, there are significant incentives to run EVs in only one direction – charging only, *i.e.*, distributed demand. However, this still remains powerful for three reasons: distributed demand allows variable charging rates that enables load shifting (distributed demand management), it acts as a powerful buffer to the integration of distributed generation and it provides a secondary value to owning an EV, increasing its economic attractiveness as well as providing other societal benefits, and helping to accelerate EV penetration.

III. Track 2 Order

A. Collaboration with Third Parties and NYSERDA

The Track 2 Order requests that each utility collaborate with third-party developers and NYSERDA to develop the design of one or more SHR projects[5].

The Companies are currently collaborating with Cornell University and will leverage their participation in the NSF grant, and will continue to work in partnership with Cornell University to develop the SHR pilot in conjunction with the technology and initiatives developed through the ESC.

Three meetings have been held by the Companies with NYSERDA, one of which included Cornell University. The meetings have reviewed the different areas in which NYSERDA is able to collaborate and provide relevant resources. To date, the parties have not determined the specific area(s) of collaboration, but will continue to meet as specific opportunities are identified and scoped.

B. Smart Home Rate Design

The Track 2 Order specifies that the SHR should include TVP rates with the value of LMP+D, as it relates to Case 15-E-0751[6]. The Track 2 Order also indicates that an "ideal" SHR participant should combine generation, EV charging, storage and load management with a two-way smart inverter. The Order further describes this "ideal" SHR participant as one that can provide 'load shifting, peak reduction, voltage and other ancillary support, and automatic response on a time interval specified by the utility.'[7]

The structure of the Companies' SHR will be developed through collaboration with Cornell during the Planning and Development phases of the SHR demonstration project. The rate will be comprised of both supply and delivery components, with the level of granularity and time variation of the rate to be determined. Distribution system benefits provided by electricity exports from the smart home should be compensated in accordance with the methodology being developed in the Value of DER Proceeding.

The SHR demonstration project will enable the Companies and the Cornell team to better understand the degree to which customers and their device behaviors can be learned and

[5] Track 2 Order, page 137.

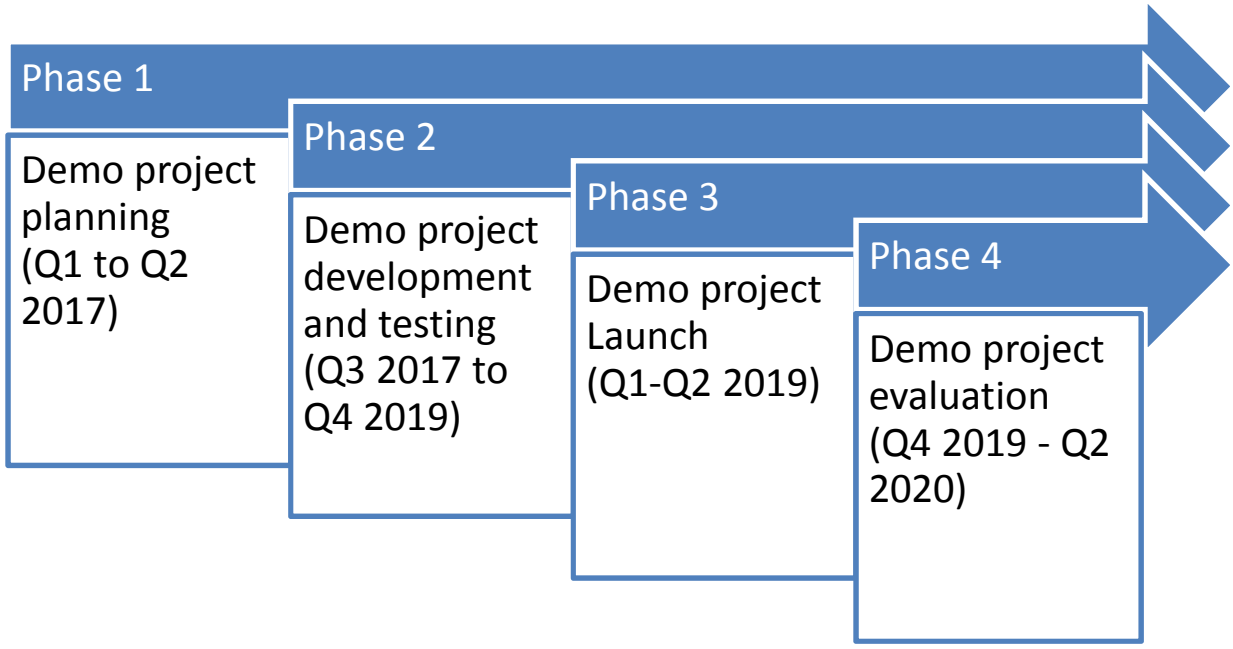
[6] Case 15-E-0751, *In the Matter of the Value of Distributed Energy Resources* ("Value of DER Proceeding").

influenced through indirect (e.g., price) and direct control signals. In order to learn a model of customer behavior, the SHR pricing will be iterative and will require periodic adjustments to the ratio of pricing for consumption. Through this iterative signal adjustment process, the customer's willingness to pay will become more apparent and the associated economic demand curve more clearly defined. Ultimately, the ability to efficiently learn an accurate model of customer response characteristics may substantially enhance the ability of the distribution system platform operator to optimize the mix of resources on the system.

IV. Smart Home Rate Demonstration

A. Timeline

The timeline to plan, develop, test and evaluate the SHR demonstration project is estimated as follows:



SHR demonstration project planning:

- Continued collaboration with Cornell University
- Continued collaboration with NYSERDA
- Finalize project plan

SHR demonstration project development and testing:

- Economic modeling
- Test SHR with virtual storage model and an engineering and experimental economics platform
- Develop customer communications

SHR demonstration project launch:

- Customer education and outreach
- Rate go-live
- Price signal iterations

SHR demonstration project evaluation:

- Evaluate customer impact
- Evaluate economic impact
- Evaluate network impact
- Evaluate for scale

B. Budget

The Companies and Cornell have not yet determined what level of incremental budget is required for the SHR. Both NYSEG and RG&E will commit resources to the project, and will share all incremental costs incurred on a 50/50 basis. Potential areas of incremental costs that may be incurred are for payments to participating customers for any net savings associated with their virtual storage and billings under a SHR, and for any third party consultants whose expertise may be needed to advance the SHR demonstration project. The levels of incremental expenditures will be more definitive once the SHR demonstration project planning phase is complete. The Companies will record the incremental costs as a REV deferral consistent with its 2016 Rate Plan.

V. Conclusion

The Companies appreciate the opportunity to submit this SHR demonstration project proposal for the Commission's consideration.

Respectfully submitted,

Mark O. Marini
Director - Regulatory