

**STATE OF NEW YORK  
PUBLIC SERVICE COMMISSION**

Proceeding on Motion of the Commission    )       Case 14-M-0101  
In Regard to Reforming the Energy Vision   )

**SMART HOME RATE DEMONSTRATION PROJECT CONCEPT**

Within its *Order Adopting a Ratemaking and Utility Revenue Model Policy Framework* (“Track Two Order”), the New York State Public Service Commission (“Commission”) directed the major New York electric utilities, including Consolidated Edison Corporation of New York, Inc. and Orange and Rockland Utilities, Inc. (together the “Companies”), to propose individual Smart Home Rate (“SHR”) demonstration projects.<sup>1</sup> Following the approach of other Reforming the Energy Vision (“REV”) demonstration projects, the Companies file the attached initial proposal<sup>2</sup> to provide a starting point for discussion as the approach and details are developed into a more specific implementation plan, which the Companies envision filing in the third quarter of 2017. As the process moves forward, the Companies look forward to working with Department of Public Service Staff (“Staff”) and stakeholders, including third parties Distributed Energy Resource (“DER”) providers,<sup>3</sup> customer and community groups, and others, to inform and strengthen the proposal. The Companies submit this proposal jointly in an effort to promote coordination, reduce implementation costs, and expand the applicability of lessons learned.

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<sup>1</sup> Case 14-M-0101, *Proceeding on Motion of the Commission in Regard to Reforming the Energy Vision* (“REV Proceeding”), Order Adopting a Ratemaking and Utility Revenue Model Policy Framework (issued May 19, 2016) (“Track Two Order”), p. 157.

<sup>2</sup> Attached as Exhibit A.

<sup>3</sup> See REV Proceeding, Joint Statement of the Solar Progress Partnership Regarding Smart Home Rate Demonstration Proposals (filed February 1, 2017).

## I. Introduction

In describing an SHR, the Track Two Order recognizes that customer needs and uses for electricity are changing as new DERs become more common.<sup>4</sup> Technically savvy customers, or proactive consumers, known as “prosumers,” are on the cutting edge of technology; they are increasingly adopting new home technologies including solar generation, electric vehicles, battery storage, home automation systems, and other new DER technologies that offer customers the opportunity to reduce their impact on the electricity grid. These customers are becoming more aware of their energy needs and are most likely to engage technology to manage their needs.

The focus of the SHR demonstration project is to combine these customers’ enthusiasm for proactive energy management and technology with rate designs that result in energy management through programmed response, and to test and learn from the resulting actions and reactions of those customers. As background, today’s volumetric rate designs offer little reward for customers to use their technology to change usage patterns, and can result in a missed opportunity to reward the customer and leverage their systems to manage the grid. Moreover, as the Distribution System Platform (“DSP”),<sup>5</sup> utilities are looking for customers with the technology to participate in grid management. The SHR is designed to encourage new actions by providing prosumers information and price signals so that their equipment can be used seamlessly, with little intervention, to respond to prices providing benefits both to the participating customer, and the utility to improve grid management for all customers.

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<sup>4</sup> REV Proceeding, Track 2 Order, pp. 134-137.

<sup>5</sup> Case 16-M-0411, *In the Matter of Distributed System Implementation Plans*, Con Edison Distributed System Implementation Plan (filed June 30, 2016); Orange & Rockland Initial Distributed System Implementation Plan (filed June 30, 2016); Joint Utilities Supplemental Distributed System Implementation Plan (filed November 1, 2016).

Until recently, standard residential meters have been unable to record and transmit the granular usage information needed to establish the pricing signals that form the basis of an SHR. The Companies' Advanced Metering Infrastructure ("AMI")<sup>6</sup> or smart meter rollout will give customers much more information and making new rate options feasible. Indeed, the Companies' SHR proposal relies on new smart meters in order to move forward.

In contrast to these metering developments, home automation systems are still largely in their infancy. Ideally, prosumers participating in an SHR would install sophisticated home energy management systems designed to optimize the use of home appliances like air conditioners, pool pumps, and electric water heaters with solar installations, batteries, and EVs. These systems would enable changing price signals to determine these resources' greatest value, and lessen the home's impact on the system. Customers who program their home appliances to use less energy or export during high-priced periods, and use or store energy during low-priced periods would be rewarded with lower electricity bills. An SHR matched with the right mix of DER and home automation technologies could potentially result in homes that use less energy or perhaps export during times of system peak load and consume during hours when excess capacity is available.

Many questions remain unanswered when considering SHRs, including:

- Will these new technologies integrate and result in seamless benefits as envisioned?
- How will utilities communicate with home automation systems, and what information will be critical for those systems?
- Will customers be interested in participating in an SHR? What will be their primary concerns?

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<sup>6</sup> Cases 15-E-0050 *et al.*, *Proceeding on Motion of the Commission as to the Rates, Charges, Rules and Regulations of Consolidated Edison Company of New York, Inc. for Electric Service*, Con Edison and Orange & Rockland AMI Customer Engagement Plan (filed July 29, 2016).

- How will SHRs interact with other utility rates and programs, such as tariffs developed *In the Matter of the Value of Distributed Energy Resources (“Value of DER Proceeding”)*,<sup>7</sup> existing demand response programs, and Non-Wires Alternative programs?
- How will SHRs affect customer DER investment decisions?
- How can customer education materials and campaigns be best designed to promote a positive customer experience?

The Companies’ SHR demonstration project seeks to provide insights on each of these matters.

## **II. Customer Education and Engagement Is Critical to a Successful SHR**

The SHR is testing a new approach to residential rates that will engage customers with technology systems to work with their utility seamlessly in enhancing system efficiency and reducing the need for infrastructure expansion. To make this possible, the customer engagement is critical. A customer outreach and education campaign must be designed to familiarize customers with the pilot program and its benefits. Equally important is the need to discuss with stakeholders the customer protections that would be available during the pilot program. The Companies recognize the importance of this phase of the demonstration project and will work with communities and third parties regarding customer education and recruitment in the pilot.

The design of the SHR pilot itself will also be a key determinant of the customer experience. Careful thought will need to be given to provisions that allow customers to override technology settings, if needed, according to individual needs.

Considerable attention will also need to be paid to appropriate customer protections, and to providing customers with the opportunity to learn about new technologies before being exposed to new and unexpected price volatility. Questions remain regarding how to construct a

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<sup>7</sup> Case 15-E-0751, *In the Matter of the Value of Distributed Energy Resources*.

demonstration project that at once promotes observable changes in customer behavior, while at the same time reduces the likelihood that customers will have a negative experience.

Coordination will be needed with other customer outreach and education campaigns, particularly the smart meter customer engagement that will be going on at the same time, or in close proximity. Consideration will also be given to interaction with the upcoming Innovative Pricing Pilot (“IPP”),<sup>8</sup> which is intended to test rate designs for mass market customers, not just the technology-savvy prosumers who are the focus of the SHR demonstration project.

### **III. Smart Home Rates Should Align with the Track Two Order’s Rate Design Principles**

At a basic level, SHRs should adhere to the Commission’s rate design principles in the Track Two Order.<sup>9</sup> Beginning with cost causation, these principles reflect the balance that should be achieved by an SHR. These new rate designs should be developed to appropriately recover the costs incurred to serve an SHR customer with a view toward the long-term economic sustainability of the rate structure. Additionally, these rates should encourage policy and market outcomes, provide policy transparency, and promote economically efficient and market-enabled decision making. Pilot programs will provide important insights, and provide for a gradual approach, which is yet another Commission and rate design tenet.

The Companies propose to use the SHR demonstration project not only as an opportunity to learn more about home automation technologies’ ability to manage not only customers’ hourly use, but also their demand on the system. Demand rates are one way of achieving the Commission’s rate design principles, providing transparency, promoting customer choice, and aligning pricing with the costs of infrastructure investment. The SHR pilot program would test the concept in a way that ties with automation, allows learning to occur, and will offer

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<sup>8</sup> See note 6, *supra*.

<sup>9</sup> REV Proceeding, Track Two Order, Appendix A.

protections to pilot participants. The design will be such that the Companies can learn how customers may be able to benefit from such a program, both directly, and indirectly in terms of potential system-wide benefit.

The Companies' proposed concept would combine residential demand rate treatment with aspects of time-of-use rates for energy supply, as well as "events" that would establish capacity values.

#### **IV. Leveraging Smart Homes and Responsive Customer Assets will Become a Central Role of the DSP**

The SHR demonstration project will also provide important insights to the Companies as they continue to develop the functions of the DSP. Lessons learned from the SHR demonstration project will inform efforts to develop rate structures that can work alongside Non-Wires Alternative projects, utility demand response programs, and Value of Distributed Energy Resources tariffs to engage customers in managing their electricity use and generation in ways that support the grid. The Companies see the coordination of these various programs as a central role of the DSP. Over time, the DSP will increasingly leverage these various programs as a core part of system planning and operations – opening up new options for managing the system cost-effectively for all customers.

#### **V. Conclusion**

The Companies look forward to further discussion regarding this proposal.

# Appendix A



**Consolidated Edison Company of New York, Inc.  
Orange and Rockland Utilities, Inc.**

**REV Demonstration Project  
Smart Home Rate Concept**

Date: February 1, 2017



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## 1. Executive Summary

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As technology and customer preferences continue to evolve, electric customers' needs for energy are also changing. Customers of Consolidated Edison Company of New York, Inc., and Orange and Rockland Utilities, Inc. (Companies) are following trends that are developing across the country by purchasing solar systems, electric vehicles, home energy storage devices, and new home energy automation systems. At the same time, many customers' awareness of their energy footprint is expanding, and their expectations of their local utility are growing as well. These technology savvy customers, sometimes referred to as "prosumers," are early movers in a technology adoption curve that is set to transform the electricity industry over the coming years. Customers will need more information, tools, and appropriate pricing mechanisms that will allow them to benefit from managing their usage in ways that align with system needs.

The Companies look forward to developing the new approaches that will meet these changing customer needs as they continue evolving as the Distributed System Platform (DSP). In its May 19, 2016 *Order Adopting Ratemaking and Utility Revenue Model Policy Framework* (REV Track 2 Order), the New York State Public Service Commission (Commission) described its vision of a "retail market and a modernized power system that is increasingly clean, efficient, transactive and adaptable to integrating and optimizing resources in front of and behind the meter."<sup>1</sup> In this future state, investment decisions will be a "direct function of the price signals experienced by customers."<sup>2</sup> Based on this vision, the Commission laid out an agenda for considering alternative ratemaking approaches, and ordered the New York State electric utilities to develop and file a Smart Home Rate and demonstration, aimed at the prosumer by February 1, 2017.<sup>3</sup>

In accordance with the REV Track 2 Order the Companies submit their initial proposal for a Smart Home Rate Demonstration Project (SHR Demonstration Project) that would combine smart home capabilities with the Companies' deployment of Advanced Metering Infrastructure (AMI) to demonstrate a new framework for sophisticated pricing for residential prosumers. The SHR Demonstration Project will provide important insights to the longer-term effort of developing new rate designs that enable efficient customer decision-making and promote system efficiency. The Companies anticipate working with the Department of Public Service Staff ("Staff") and stakeholders, including customers, community groups, third-party providers of distributed energy

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<sup>1</sup> Case 14-M-0101, *Proceeding on Motion of the Commission in Regard to Reforming the Energy Vision* (REV Proceeding), Order Adopting Ratemaking and Utility Revenue Model Policy Framework (issued May 19, 2016)(REV Track 2 Order), p. 2.

<sup>2</sup> *Id.*, p. 9.

<sup>3</sup> The REV Track 2 Order defined the Smart Home Rate as "combin[ing] highly granular time-based rates with location-and-time-based compensation for DER [distributed energy resources], in a manner that is managed automatically to optimize value for the customer and the system." *Id.*, p. 135.

resources (DER), and others in outreach sessions to further refine this SHR Demonstration Project.

Lessons learned from the SHR Demonstration Project will inform future efforts to develop rate structures that can work alongside Non-Wires Alternative projects, utility demand response programs and Value of Distributed Energy Resources tariffs to engage customers in managing their electricity use and generation in ways that support the grid. The Companies see the coordination of these various programs as a central role of the DSP. Over time, the DSP will increasingly leverage these various programs as a core part of system planning and operations – opening up new options for managing the system cost-effectively for all customers.

In the SHR Demonstration Project, the Companies will conduct a research study, testing two different rate designs side-by-side, both enabled by price-responsive automation technology controlled by participants or the participant’s service provider.<sup>4</sup> Both rates will be designed with a common framework which reflects temporal and locational granularity separately for various unbundled cost components, including delineation between energy supply and energy capacity, and between marginal and embedded transmission and distribution (T&D) delivery costs.<sup>5</sup> However, each rate will take a different structural approach to reflect both generation and T&D capacity costs: one rate uses a daily demand charge with peak event demand charges, while the other will use a demand subscription charge with peak event overage penalties. The demonstration will also assess the impacts of battery storage as an enabling technology specifically for customers with existing photovoltaic (PV) systems. The Companies will select and work with partners that will provide various configurations of home automation technologies to participating customers.

With data gathered from the SHR Demonstration Project, the Companies will seek to answer research questions, including:

- What are the coincident electricity usage and bill impacts of each granular, time-varying Smart Home Rate compared to a customer’s previous rate? What are the impacts for the Smart Home Rates compared to each other?
- Does the technology developed in the SHR Demonstration Project reliably enable customers to automate home energy use to their own satisfaction?
- Are customers satisfied with their rate experience and with the enabling technology?
- How do customers perceive the various rate components and accompanying education materials?
- What end uses do customers choose to automate? What other behavior changes or rate related choices are customers receptive to making?

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<sup>4</sup> This is in contrast to traditional demand response programs in which load reductions are called by the utility during events, or periods of constrained capacity.

<sup>5</sup> In the context of the SHR Demonstration Project, marginal costs are considered future, potentially avoidable, or deferrable investments, and embedded costs are considered past investments.

In addition to the SHR Demonstration Project, the Companies' AMI Customer Engagement Plan<sup>6</sup> includes implementation of an Innovative Pricing Pilot (IPP), leveraging the newly-deployed AMI system to test new rate designs for mass market customers and gauge customer acceptance of the pricing alternatives. Unlike the SHR Demonstration Project, which is aimed at residential prosumers and incorporates a substantial technology component, the IPP will test new rates intended for the broader spectrum of mass market customers who do not necessarily rely on technology to the same extent that the SHR Demonstration Project participants will. Together, the SHR Demonstration Project and IPP efforts will provide a multi-dimensional and complimentary set of learnings to inform REV's broader long-term rate reform objectives. The Companies' plan to support co-development of the SHR Demonstration Project and IPP, including careful coordination of SHR Demonstration Project outreach, IPP outreach, and AMI customer education outreach, to prevent customer confusion and fatigue. For the SHR Demonstration Project, the Companies will apply customer-segmentation research so that customers who meet eligibility requirements, and prosumers in particular, are correctly identified for recruitment.

This demonstration project takes these first steps to make the Smart Home Rate a reality: partner with a provider to develop price-responsive home-automation technology; identify the rate designs that more fully reflect system costs; assess customer responsiveness to those rates and corresponding savings opportunities; and collect initial impact and customer perception and behavior information to inform future Smart Home Rate related investments and communications to customers.

This filing lays out the Companies' current thinking regarding the structure of the SHR Demonstration Project. The project has four phases: demonstration project planning and partner selection (at the conclusion of which the SHR Demonstration Project Implementation Plan will be filed), demonstration project development and testing, market launch, and demonstration project evaluation. While the Companies provide some specificity on the current thinking, it is important to note that elements of this approach will evolve and solidify as the process progresses. At the critical juncture during the demonstration project development and testing phase, the Companies will file Smart Home Rate tariffs for Commission approval.

## **2. Business Model(s) Overview**

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### **(a) Problem (the Market Opportunity)**

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Electricity rates enable regulated utilities to collect revenue on investments and costs associated with the provision of power under a universal access model. A significant portion of costs to provide electric service is the result of customer demand, but residential customers are billed for electric service primarily on a volumetric basis with little sensitivity to the time of use. Historically,

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<sup>6</sup> Cases 15-E-0050 *et al.*, *Proceeding on Motion of the commission as to the Rates, Charges, Rules and Regulations of Consolidated Edison Company of New York. for Electric Service, Con Edison and Orange & Rockland AMI Customer Engagement Plan* (filed on July 29, 2016).

volumetric rates became the residential customer standard because they are easy to understand and saved the costs of demand metering.

Today, however, customers have more options (e.g., DER, energy efficiency, smart appliances, and electric vehicles). Volumetric, time-insensitive pricing can have the effect of inefficient customer behavior (e.g., high usage during times of peak demand) and may also lead to inefficient investments in technology (e.g., over-investments in technologies that only lessen overall energy use, when time-sensitive dispatchability could be of equal or greater value). Cost drivers for electricity rates fluctuate on a real-time basis and can be different from location to location. Without economic signals to tell customers to prioritize electricity demand at certain times and locations over others, customers can only consider their own usage preferences, not system costs, in their electricity consumption decisions. The deployment of AMI presents the Companies with the opportunity to develop more cost-reflective rate structures that better optimize value for both individual customers and the system as a whole.

Today's rates are simple in structure and familiar to customers and stakeholders. However, the REV objective of realizing greater economic efficiency and greater system efficiency as a function of "price signals experienced by customers" requires greater alignment of pricing and the cost drivers of the electricity system, which are complex and dynamic in nature.<sup>7</sup> The *Staff White Paper on Ratemaking and Utility Business Models* recognized that "increasing complexity conflicts with the long-standing goal to make mass-market rates simple and understandable."<sup>8</sup>

To implement rates that encourage actions on the customer side of the meter in alignment with both system efficiency and economic efficiency and at the same time to make it practical for customers to manage these actions, it is necessary to leverage automation technology. Rapidly evolving home automation technologies may be an avenue to deliver a seamless experience for residential customers, freeing them from actively monitoring complex price signals, while providing optimized price responsiveness balanced with the customer's usage preferences.<sup>9</sup>

Several market challenges must be addressed in the demonstration project to realize implementation of a Smart Home Rate. These challenges can be grouped into three key areas:

1. **Rate design: A bundled rate, assessed mainly on an undifferentiated, volumetric basis, creates little transparency and limits the potential of market based rates and programs to achieve greater system efficiency.**

The current residential rate structure gives customers limited information or bill savings opportunities beyond reduction in overall energy use. This is because rates structured to mainly reflect a single dimension (energy, kWh) do not enable customers to see the details for other system costs (e.g., generation capacity, T&D capacity) that also vary temporally and by location. Ideally, every cost dimension should provide an opportunity to move customers

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<sup>7</sup> REV Track 2 Order, p. 9.

<sup>8</sup> REV Proceeding, Staff White Paper on Ratemaking and Utility Business Models (issued July 28, 2015), pp. 83-84.

<sup>9</sup> REV Track 2 Order, p.134.

toward economic efficiency by presenting them with more accurate price signals.

2. **Technology: The platform needed for communicating complex, dynamic price signals and enabling seamless price responsiveness does not yet exist.**

Existing technologies and platforms are currently focused on demand response applications that enable utility control. Though there has been some exploration with price-responsive devices and communication of dynamic rates,<sup>10</sup> efforts to date fall short of a granular cost-based rate design that incents customers to make highly efficient choices. Indeed, until such rates exist, there will be little value proposition for development of supporting technologies.

3. **Customer / market: Utilities and technology providers lack the evidence to fully characterize the value proposition of potential solutions.**

A key unknown in an evolving market is assessing how many customers will ultimately be interested in the offered product. Tests to understand customers' perception of the rates, willingness to use technologies, and level of satisfaction with their experience would provide much needed data and information to gauge the market opportunity and inform its future growth and development.

**(b) Solution (REV Demonstration Project)**

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The SHR Demonstration Project will focus on prosumers and prioritize economic efficiency and simplicity separately and by different means:

- Address economic efficiency by structuring SHR Demonstration Project rates to more specifically reflect cost drivers (including delivery and bulk power)
- Address simplicity by developing new program offerings for customers, leveraging technologies that will aid their participation in the new rates.

Table 1 summarizes the SHR Demonstration Project approach to each market challenge area identified in section 2(a).

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<sup>10</sup> SDG&E Dynamic Rate pilot, described in advice letter 2835-E (<http://regarchive.sdge.com/tm2/pdf/2835-E.pdf>); OG&E Smart Hours rate (<https://oge.com/smarthours>); CPS Home Manager (<https://www.sanantonio.gov/Portals/0/Files/Sustainability/STEP/CPS-FY2015.pdf>)

**Table 1: How the SHR Demonstration Project Addresses Market Challenges**

<b>Market Challenge Area</b>	<b>How Smart Home Rate addresses challenge area</b>
<b>Rate design</b>	Enable cost recovery
	Reflect cost causation (unbundling cost components and reflecting temporal and locational granularity)
	Enable efficient customer decision making that promotes electric system efficiency
<b>Technology</b>	Follow a technology-agnostic approach to supporting both active management of end use loads and energy storage as means to achieve peak coincident usage reductions and load shifting
	Leverage home automation and active / algorithm based energy management
	Provide access to granular data through apps / web tools
<b>Customer / market</b>	Provide customers with implementable, understandable choices for home energy management
	Build sustainable partnerships
	Foster customer engagement

The research component of the SHR Demonstration Project will provide information to address market challenges to determine coincident usage impacts and bill impacts of different rate designs and technology packages. These learnings will help inform reasonable, data-driven expectations for the impacts of a complex rate paired with price-responsive technology, and will also inform the Commission’s goal of moving to rates that drive more efficient decision making and enhance system efficiency.

[i. Rate Designs](#)

While the Smart Home Rate must be dynamic to reflect the temporal and locational differences in cost causation, there are multiple rate structures that can be tested. By testing more than one rate structure, it will be possible to determine whether there are significant differences in energy use and customer bill impacts with one structure versus another. As such, the Companies plan to test two different rate design options in the SHR Demonstration Project. Both options are composed of rate components that can be mapped to an underlying set of granular cost components, which are defined in Table 2.

**Table 2: Cost Components and Definitions**

<b>Cost components</b>	<b>Definition</b>
Energy production	Energy supply and transmission costs reflected in LMP prices
Bulk Transmission capacity (zonal congestion portion)	
Bulk ancillary services	Cost to the Companies for procuring ancillary services in wholesale markets
Embedded Transmission costs <sup>11</sup>	Costs for past, and thus unavoidable, infrastructure investments
Embedded Distribution costs	
Generation capacity	Generation capacity costs determined in the NYISO capacity market
Forward Marginal Transmission capacity	Contribution to costs for potentially avoidable future infrastructure investments
Forward Marginal Distribution capacity	
Customer-related cost	Costs per customer including meter, service line, and costs associated with customer accounting (e.g., customer call center, etc.)

Table 3 lays out the two rates—referred to as Rates A and B—that the Companies will test, and shows how each cost component maps to a rate component. Table 3 also highlights the similarities and differences between Rate A and Rate B. Rate components that are structured in the same way for both rates are shown in cells that span both rates (i.e., this includes hourly supply and congestion charges, the flat ancillary service charge, the fixed monthly customer charge, and the system benefit surcharge.)

Table 4 provides a glossary of definitions for the terms used in Table 3.

**Table 3: SHR Demonstration Project Rates**

<b>Cost components</b>	<b>Unit</b>	<b>Rate components</b>	
		<b>Option A</b>	<b>Option B</b>
Energy production (supply)	kWh	Hourly supply charge	
Bulk Transmission capacity (zonal congestion portion)	kWh	Hourly congestion charge	
Bulk ancillary services	kWh	Flat charge for bulk ancillary services	
Embedded Transmission costs	kW	Flat non-coincident daily demand charge (on maximum interval excluding night time hours)	Monthly subscription for preselected kW
Embedded Distribution costs	kW		

<sup>11</sup> Embedded Transmission costs apply to transmission investments by the regulated utility that are part of the utility’s rate base, whereas bulk transmission costs apply to wholesale-level high voltage transmission infrastructure that are within the wholesale price of electricity supply.



Generation capacity <sup>12</sup>	kW	Flat coincident demand event charge (on maximum interval during the event, incremental to flat demand charge), event time windows vary by cost component	Variable coincident demand overage penalty (applied only during event hours to incremental demand above kW preselected by customer), event time windows vary by cost component
Forward Marginal Transmission capacity	kW		
Forward Marginal Distribution capacity	kW		
Customer connection cost	\$/month	Fixed monthly customer charge	

While the supply portions of the two rates are similar, the delivery and generation capacity rate components are structured differently. Rate A is structured as a combination of a daily demand charge and a flat event charge, while Rate B is structured as a subscription for coincident demand coupled with a variable overage penalty.<sup>13</sup> The daily demand charge of Rate A and the demand subscription of Rate B are structured to recover embedded costs for past infrastructure investments. The event charges of Rate A and the overage penalties of Rate B are intended to avoid or attenuate future generation, T&D capacity investments by decreasing coincident customer demand and reducing the peak coincident usage that drives these investments.

In addition to these structural differences, there may be behavioral and financial differences between the rates as well. The daily demand charge structure of Rate A may encourage more active management of demand while the demand subscription of Rate B may foster more bill stability for customers and more revenue stability for the Companies. The purpose of testing both rates is to examine the above hypotheses.

Event days and windows will vary by location to reflect the locational and temporal differences between T&D peaks and between distribution networks or groups of networks.<sup>14</sup> In effect, a distribution peak event may occur only in certain areas and possibly on different days and times than transmission peak events.

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<sup>12</sup> In Rate A and Rate B, capacity costs in the supply will be reflected in event-based demand charges.

<sup>13</sup> The penalty per kW of overage may be lower on days with moderate capacity constraints and higher on days with more severe capacity constraints.

<sup>14</sup> In the case of the variable overage penalty in Rate B, the amount of the penalty per kW will also vary to reflect the relative severity of capacity constraints on one day versus another in a given location.

**Table 4: Glossary of Rate Component Attributes and Terms**

<b>Attribute</b>	<b>Term</b>	<b>Definition</b>
Billing unit	energy	kWh
	demand	kW (averaged over an interval of time)
Timing of demand / usage	coincident	Occurring at the same time as a given resource peak (e.g. in conjunction with a system peak, distribution peak, etc.). In the case of hourly energy usage (kWh), coincidence essentially refers to usage occurring in each hour
	non-coincident	Occurring at any time (though it is still possible to exclude certain hours each day, such as night time hours)
When a charge is assessed	monthly	Assessed on a per month basis (can be prorated for the number of days in each month)
	daily	Assessed on a daily basis (e.g. based on demand each day, may exclude some night time hours)
	hourly	Assessed on an hourly basis (e.g. based on usage in each hour)
	event	Assessed based on demand on a specific event day during designated event hours (both of which may vary to reflect peaking conditions)
Type of charge	fixed	A charge that does not vary by usage (e.g. is the same each month as in \$X/customer/month)
	flat	A charge per billable unit (e.g. per kW) that <i>does not</i> vary from day to day or event to event
	variable	A charge per billable unit (e.g. per kW) that <i>does</i> vary from day to day or event to event (e.g. an event charge could be \$X/kW on moderate peak days and \$Y/kW on extreme peak days)
Demand subscription components	subscription	Fixed monthly charge based on preselected demand level
	overage penalty	Charge assessed on demand above the preselected level; only applied during events

During the implementation phase of the SHR Demonstration Project, the above rate structures may be refined to incorporate adaptations and new information from future analyses of marginal costs and other analyses including, but not limited to bill impacts, and revenue stability.<sup>15</sup> Section 4(b) lays out potential implementation activities in Phase 0 (Demo planning) and Phase 1 (Demo development and testing), detailing that development of the specific tariff sheets that will comprise Rate A and Rate B will occur beginning in the fourth quarter of 2017. Among other things, this will allow the Companies to incorporate information on marginal costs in the SHR rate design—a critical source of data when designing rates to accurately reflect costs.

## ii. Technology

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In addition to the two rate options, the SHR Demonstration Project will test different enabling technologies. As part of the SHR Demonstration Project, the Companies will work with an implementation partner to develop the necessary technology to enable communication of dynamic rates and price responsive operation of end uses.

<sup>15</sup> The Companies plan to perform marginal cost studies, which are slated for completion at the end of 2017.

The SHR Demonstration Project research is organized into two tracks, a rate comparison track, and a storage plus solar track, to test different types of price-responsive automation technology. For participants in the rate comparison track, which will compare the impacts of Rate A and Rate B, the technology will be price-responsive home automation facilitated by a technology such as a smart thermostat or a home energy management system (HEMS), with the former able to automate price response for just central Air Conditioning (AC), and the latter being able to automate price response for both central AC and other end uses.

As described in greater detail in Section 4(c), participants in the rate comparison track will be required to have central AC. There are several reasons for this requirement:

- Technology for controlling central AC is lower cost and more reliable than technology for controlling an equivalent amount of cooling load provided by room air conditioners;
- Studies have shown that central AC is an end use that customers are willing to reduce in response to time-varying price signals; and
- The expected larger coincident usage reductions reduce sample sizes needed to estimate statistically valid coincident usage reductions.

Though central AC will be the only end use eligibility requirement, participants may also decide to automate and/or manually reduce other end uses.

For a smaller group of participants with existing solar PV systems, the automation technology will be based on battery storage systems.<sup>16</sup> Because there is a much smaller pool of potential participants for this element of the program, all of these participants will be put on Rate A, which is likely to have more potential to provide a larger savings opportunity to the customer.<sup>17</sup> The Companies may work with a different technology partner for the storage plus solar track, but both the rate comparison and storage plus solar tracks will be closely coordinated.

The SHR Demonstration Project rate design will incorporate the concept of export credits for distributed generation (DG)—which will be especially important for participants in the storage plus solar track. Export credits as part of a Smart Home Rate design will be credited at the rate levels at the time of export, while preserving the bi-directional nature of the credits.<sup>18</sup> Like the Smart Home

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<sup>16</sup> An initial assumption is that storage would be added to existing PV systems. The Companies plan to refine this assumption with further information from the implementation partner to be selected in an RFI / RFP process.

<sup>17</sup> As a result, the storage plus solar participant will be taken off the otherwise applicable net metering rate (unless the customer decides to remain on the SHR, if offered as an option).

<sup>18</sup> Under the Smart Home Rate, customers will be charged (or credited) based on net energy usage (for energy supply components) and demand. To demonstrate how this bidirectional credit will work for demand-based rate components (credited or charged on a per kW basis), suppose a customer's net demand during an event ranges from -1.5 to -1.0 kW (because gross demand was surpassed by the output of the PV system). The customer will be credited for a 1.0 kW demand reduction. Another customer, whose system does not fully offset gross demand, may have demand between 1.5 kW and 2.0 kW during the event. This customer would be charged for 2.0 kW of demand. Essentially the charge or credit will be based on the maximum net demand, regardless of whether it is positive or negative. This means that the credit works analogously to the charge.

Rate itself, the export credits will be differentiated by rate component, as follows:

- **Energy supply and bulk transmission:** exports will receive energy supply credit at the locational marginal price (LMP) which varies by day and hour;
- **Generation capacity:** exports will receive credit during energy supply capacity events (during zonal peaks);
- **Embedded T&D:** no export credit will be given because this portion of delivery costs serves to recover costs for past, unavoidable infrastructure investments;
- **Forward marginal T&D:** exports will receive credit during T&D capacity events, since these costs may be avoided or attenuated by decreasing coincident customer demand.

The export credits in the SHR will take into account and incorporate the provisions developed in the Value of DER Proceeding,<sup>19</sup> and adopted by the Commission and in effect at the time of the SHR Demonstration Project, regarding the environmental value of the solar production provided by the solar renewable energy credit (REC).

### iii. Customer/Market

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The Companies will conduct an RFP/RFI to assess the full range of technology options commercially available and select an implementation partner (or coordinated team of partners) best positioned to deliver on the objectives of the SHR Demonstration Project. The RFP/RFI process will also inform the ability to leverage third-party capital in the SHR Demonstration Project.

The Companies and the partner will both focus on customer outreach and education to increase participants' understanding of the rate structures and how to utilize the technologies to engage in the Smart Home Rate more effectively. During and after the demonstration, the Companies and the partner will learn from the SHR Demonstration Project about how receptive participants were to the choices offered by the SHR Demonstration Project. The post-demo evaluation will include participant surveys focusing on:

- Participant satisfaction
- Participant understanding of rates and how to respond to rates
- Technology experience
- Helpfulness of education and outreach materials
- Participant demographics and end-uses

Survey data can be linked to coincident usage and bill impact analyses to assess whether certain reported behaviors or levels of understanding are correlated with savings impacts. Such learnings will not only provide valuable insight into SHR benefits, but can also inform future communications to customers and other engagement efforts. In designing and implementing surveys for SHR

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<sup>19</sup> Case 15-E-0751, *In the Matter of the Value of Distributed Energy Resources*.

Demonstration Project participants, the Companies will be mindful of the timing and objectives of concurrent customer research efforts, including but not limited to territory-wide customer satisfaction survey and regional surveys of customers' awareness of AMI technology, features, and benefits.

### (c) Research Questions Addressed by the SHR Demonstration Project

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The market challenges discussed above shape the key research questions that the SHR Demonstration Project will seek to answer both quantitatively and qualitatively. Table 5 summarizes the research questions. The research design includes two different rates and two different technology categories (price responsive end use automation and battery storage). For the rate comparison track, the Companies will seek to understand coincident usage and bill impacts for Rates A and B versus the standard otherwise applicable tariff and versus each other. Because the automation technology and end uses will be chosen by participants, these impacts will represent the composite impacts of rates plus technology. Coincident usage and bill impacts will also be evaluated in the solar plus storage track. However, comparison of the impacts for Rate A between the storage and rate comparison tracks will not be made because the populations will be different given the solar requirements for the battery storage track. The rationale for this experimental design is discussed in greater depth in Section 4(c).

Answers to the rate design research questions in Table 5 should inform how various rate design elements may result in different coincident usage and bill impacts.

Answers to the technology research questions should help provide a range for potential impacts as well as demonstrate how bill impacts may change specifically for customers who switch from net metering with PV only on the standard residential rate to the SHR Demonstration Project rate with price response enabled by battery storage. Technology research questions will also seek to collect information on technology performance and usability.

Finally, customer/market questions focus on customer satisfaction, partner performance, and technology acceptance, given achievable bill impacts. The coincident usage impact and bill impact information collected to answer the rate design questions will also be foundational to understanding customer payback periods for investing in technology. In effect, this will provide input regarding the impact of rates and technology prices on adoption of smart home technologies.

**Table 5: Smart Home Rate Key Research Questions**

<b>Market challenge area</b>	<b>Research questions</b>
<b>Rate design</b>	<ul style="list-style-type: none"> <li>• Do peak reduction, load shifting, and bill impacts vary by location (e.g. will impacts align with local peak windows and will impacts be greater in locations with higher event charges)?</li> <li>• Do peak reduction, load shifting, and bill impacts vary between rate options?</li> <li>• What are customer bill impacts with and without customer price response?</li> <li>• When faced with a demand subscription rate (Rate B), which subscription reservation levels will participants choose?</li> </ul>
<b>Technology</b>	<ul style="list-style-type: none"> <li>• Do price response impacts vary by technology option?</li> <li>• What will be the net bill impact of battery storage + Smart Home Rate for participants who were net metered prior to the research study?</li> <li>• What end uses will HEMS technology participants manage?</li> <li>• Which technologies will be able to respond to granular rate signals? What technical challenges, if any, need to be resolved?</li> <li>• Are customers satisfied with user interface/technology layer meant to simplify their interaction with the complex Smart Home Rate? This includes both rate education interfaces (e.g., for subscription reservation selection) and home automation interfaces.</li> </ul>
<b>Customer/ market</b>	<ul style="list-style-type: none"> <li>• What must technology costs be to achieve defined return on investment (ROI) targets, given what bill impacts imply about savings over the standard rate?</li> <li>• Which customer segments and end-uses will matter most for future market potential estimates?</li> <li>• To what extent will customers be satisfied with the implementation partner?</li> <li>• To what extent will the implementation partner be able to deliver on recruiting targets and technology functionality?</li> <li>• How well do participants understand their rate?</li> <li>• How do participants change their behavior in response to the rate?</li> <li>• To what extent will participants be satisfied with the Smart Home Rate (e.g. with the general experience and with participant chosen elements such as the subscription cap)?</li> <li>• Do participants exhibit differences in satisfaction with the two different rate options? What can be concluded about customer preferences for a daily demand charge versus for a demand subscription?</li> <li>• What are customer perceptions about the amount and type of rate education resources provided for recruitment and throughout the research study?</li> </ul>

#### (d) Addressing Commission's REV Demonstration Principles

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The REV Track 2 Order instructed the Companies to implement the Smart Home Rate as a REV demonstration project. The Commission had earlier issued guiding principles for REV demonstrations intended to be “appropriately flexible,” elicit innovative ideas and partnerships for achieving various REV objectives.<sup>20</sup> The SHR Demonstration Project addressed several of the key REV demonstration principles as summarized below.

***REV demonstrations should include partnerships between utility and third party service providers. These partnerships may be unique to each demonstration depending on the situation. Utilities should endeavor to support demonstrations where third parties use their own capital.***

The Companies will partner with an implementation partner (or coordinated team of partners) capable of providing price-responsive automation technologies, data management, and customer engagement/participant recruiting. Due to the innovative nature of the services needed for the SHR Demonstration Project, this partner will be selected via an RFI/RFP process in which the ability to provide demonstration cost sharing can be used as a selection criteria.

***The utility should identify questions it hopes to answer or problems or situations on the grid and the market should respond with solutions. Hence, third party participation through a traditional RFP/RFI method where the utility has pre-diagnosed the solution(s) does not meet this requirement. Data sharing will be essential to enable market participants to propose solutions.***

The SHR Demonstration Project will address price-responsive home automation technology and alternative rate designs. As such, the Companies will prescribe requirements focused on price signal communications and price-responsiveness attributes rather than specifying efficiency measures or end uses to be automated. Instead, these will be ultimately determined by customers and the implementation partner.

Upon completion of an appropriate cyber security and data protection agreement, the Companies will share customer characteristics data with the partner so that recruitment for the research study is directed at the relevant population. The partner will share and transmit device automation/runtime data with the Companies to support measurement and verification (M&V) activities.

***Demonstrations should inform pricing and rate design modifications. For example, a component of a trial can test demand response, real time, or time of use pricing to better understand how to motivate different consumers. Demonstrations should include opportunities for third parties to demonstrate how various rate designs, information sharing, adjusted standby tariffs, and other technologies can be used to benefit consumers, encourage customer participation, and achieve REV's efficiency***

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<sup>20</sup> REV Proceeding, Memorandum and Resolution on Demonstration Projects (issued December 12, 2014), p.7.

***and bill management objectives.***

The primary focus of the SHR Demonstration Project is to gauge the impacts of rates which transparently communicate cost causation to prosumers, giving them an opportunity to benefit from more cost efficient energy choices.

***Utility and third party service provider(s) should consider deploying in their demonstrations advanced distribution systems, including two way communications, real time operation of dynamic load, and other system technologies that support awareness, flexibility, efficiency and cost-effectiveness.***

The SHR Demonstration Project will include deployment of a price communication platform for sending dynamic rate signals to communicating devices in the home, such as a smart thermostat or Wi-Fi connected appliance. The SHR Demonstration Project is intended to support awareness, flexibility, efficiency, and cost-effectiveness for participants and does so through communication of price signals and provision of a customer-facing price-responsive enabling technology, which by its nature does not necessitate utility control or real time visibility of the devices in the home.

***Utilities should explore opportunities in their demonstrations to work with and include various residential, commercial, institutional and industrial customer participants.***

The SHR Demonstration Project will focus on a small subset of residential customers, prosumers, who have a large potential for engagement with the concept and to realize demand and bill savings.

### **3. Market Attractiveness**

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#### **(a) Unique Value Proposition (from the following perspectives)**

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##### **i. Participating Customer**

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The SHR Demonstration Project will provide a new path for participants to save on energy bills by using energy and the electric grid more efficiently. Today's standard mass market rates largely do not show residential customers when and where energy usage results in incremental costs to operate the grid and supply energy. In contrast, the rate options in the SHR Demonstration Project will incorporate locational and temporal differentiation that will better communicate cost causation in rates, giving participants the opportunity to maximize bill savings by shifting energy demand to lower cost periods. Such rates will be necessarily complex and dynamic. For this approach to be successful in the mass-market segment, the Companies will provide automation technology to help customers effectively respond to prices. This will give customers the necessary tools and information to potentially reduce bills and achieve returns on investments in home automation technologies.



## ii. Partner/Third Party

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To facilitate and enable the SHR Demonstration Project, the Companies will partner with a provider or team of providers that will help develop the communication protocols and technology necessary for sending complex price signals to manage end uses and communicating devices. The provider(s) will also develop a user interface to give customers visibility into the rates and into the automated end uses, and to allow customers to set usage preferences. For the partner, this will provide a unique opportunity to develop and demonstrate a first-of-its-kind application and test its value proposition.

The SHR Demonstration Project will also provide value to future market participants exploring product development in this space. Communication protocols developed in the SHR Demonstration Project could be standardized and leveraged in the future. The estimated bill impacts resulting from the SHR Demonstration Project might also be used to communicate the value proposition to customers as well as to guide cost targets for technology development. For example, if average bill savings are on the order of \$200.00 per year and a vendor wishes to provide a HEM solution with an average ROI of 5 years, the target cost to the customer would have to be less than \$1,000.00. This type of information is of value to develop a market for the technology and associated services.

## iii. Utility

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The SHR Demonstration Project will benefit the Companies in several ways. It will help strengthen customer relationships with a group of engaged residential participants. It will provide empirical data to inform future rate design reforms envisioned as part of REV. Moreover, focusing on the prosumer in this demonstration allows for testing of concepts that are more advanced than typical research studies of tariff-based rates, potentially revealing new and unprecedented findings. Longer term, if the SHR Demonstration Project rate design is shown to be scalable, wider deployment may also help enable the Companies to avoid or defer future T&D investments (as described in the next section).

## iv. System

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The SHR Demonstration Project will provide participants information needed to benefit from a granular rate that reflect cost-causation principles. To the extent that enough participants in certain locations choose to shift energy demand away from these periods, the Companies may be able to defer investments in and improve the overall efficiency of the transmission and distribution system. Also, as the New York State renewable energy supply ramps up in accordance with the Commission's Clean Energy Standard,<sup>21</sup> the combination of a dynamic rate with price-responsive

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<sup>21</sup> Case 15-E-0302, *Proceeding on Motion of the Commission to Implement a Large-Scale Renewable Program and a Clean Energy Standard*, Order Adopting a Clean Energy Standard (issued August 1, 2016).

demand may provide increased demand-side flexibility that would help ease integration of more intermittent supply from wind and solar resources.

From a planning perspective, the information gathered and the process enabled by the price communication and end use automation in the SHR Demonstration Project will allow the Companies to better understand the system-wide potential for demand-side flexibility in the residential segment, including demand reduction potential in distribution load pockets that may benefit from local peak demand reductions. Ultimately, if the SHR Demonstration Project concepts are proven to be scalable, the Companies may be able to integrate dynamic rate impacts into system planning.

### (b) Customer Segmentation and Demographics

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Identifying the optimal customer segment to participate in the SHR Demonstration Project is an important demonstration design element. The primary criteria for determining participant eligibility for the SHR Demonstration Project are (1) availability of smart meters, and (2) the presence of large, discretionary end use loads that may be shifted in response to price. The first criterion narrows prospective participants to three counties that will be among the first in the Companies' AMI deployment plans to receive a significant number of smart meter installations by summer 2018. The interval usage measurements enabled by smart meters are critical for implementation of granular, time-based pricing as well as for evaluation of demand impacts of the rate. The second criterion narrows the focus to single-family homes with central AC, as these are a segment of residential customers with relatively large end use loads during the summer when peak events are likely to occur. Both of these characteristics increase the likelihood that SHR Demonstration Project participation will result in larger coincident usage impacts and that these impacts will be detectable.

The Companies believe that the vast majority of single-family homes with central AC likely have multiple large electric end uses, especially laundry appliances and dishwashers. In addition, a smaller number may also have other large electric end uses such as electric water heating, pool pumps, and electric vehicles. Depending on the capabilities of the technology to be provided, participants may be given the option to connect additional end uses for the research study, but this decision will ultimately be made by each participant based on their openness to allowing these end uses to be connected.

Table 6 provides an estimate in each county of the number of customers that meet the criteria outlined above, assuming 22 percent to 25 percent<sup>22</sup> of single-family residences will have central AC. SHR Demonstration Project recruiting for the rate comparison track with end use automation will be aimed at the estimated participant pool of roughly 34,000 to 38,000 customers.<sup>23</sup> The Companies' estimate that the SHR Demonstration Project will need to recruit a total of 2,250 participants (or

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<sup>22</sup> This assumes moderate growth in central AC saturation over the 22% saturation estimated in 2010.

<sup>23</sup> Additional consideration will be given to the Companies' approach to the customers enrolled in existing Bring Your Own thermostat (BYOT) Programs due to overlap with the estimated population pool for SHR participation. It is anticipated that during the recruitment planning stages, the Companies will determine the extent to which this population will be needed for recruitment into the SHR Demonstration Project.

about 6-7% of the available pool) in order to achieve statistically significant results for the rate comparison track (see Section 4(c)(i) for a more detailed discussion.)

**Table 6: Estimated Participant Pool for Rate Comparison Track**

County	SC-1 Single Family Home accounts <sup>24</sup>	SC-1 Single Family Home accounts with AMI in 2018 <sup>25</sup>	Estimated participant pool	
			Central AC (22%)	Central AC (25%)
Westchester	146,056	17,679	3,889	4,420
Staten Island	46,857	77,630	17,079	19,408
Rockland	92,796	57,357(estimate)	12,619	14,339
Total	285,709	152,666	33,586	38,166

For purposes of estimating the likely participant pool for the storage plus solar track, the Companies reviewed the number of single-family homes which already have installed PV systems in the counties of the research study.<sup>26</sup> Participants would receive the installed battery free of charge in return for going off their current net metered rate for the duration of the SHR Demonstration Project, because the net impact of the SHR Demonstration Project rate on existing net metering participants' bills may be negative. However, a majority of existing residential PV systems are leased and a third-party leasing contract may complicate both the logistics and the economics of the SHR Demonstration Project, as in the case of pay-per-kWh leasing contracts where customers must pay the leasing company a fixed price per kWh produced regardless of how, or at what rate, that production is credited for by the utility. It is expected that the implementation partner should assess the arrangements necessary to implement the storage plus solar track, including the potential need to restrict participation to PV systems that are owned (including those with loan payments) by participants and not leased. The Companies estimate the SHR Demonstration Project will need to recruit approximately 100 participants to the storage plus solar track to achieve statistically significant results, as discussed in Section 4(c)(i).

Table 7 shows the total number of residential solar installations to date in the research study counties.

<sup>24</sup> The Rockland County figure is an estimate based on O&R customer research sample data.

<sup>25</sup> Data reflects the most recent Con Edison smart meter deployment schedule through May 2018 for single-family home accounts, which is still subject to change. The Rockland County figure is estimated by assuming that 94% of the total 61,000 AMI meters to be deployed by 2018 will be in single-family homes (about 94% of the residential accounts in the O&R service territory are single-family homes).

<sup>26</sup> Installation of battery storage within buildings is not currently allowed in New York City without case-by-case approval from the New York City Fire Department. This has the potential to limit the estimated participant pool to Westchester and Rockland Counties.

**Table 7: Estimated Participant Pool for Storage plus Solar Track**

<b>County</b>	<b>Residential PV system installs<sup>27</sup></b>	<b>2018 AMI deployment rate among SFH<sup>28</sup></b>	<b>Estimate of homes with PV and AMI<sup>29</sup></b>
Westchester	3,210	12.1%	389
Staten Island	4,012	94.5%	3,792
Rockland	1,752	61.8%	1,083
Total	8,974	47.6%	5,263

(c) Channels (Communications, Sales, Promotion)

As discussed in Section 3(b), a substantial portion of the eligible population will need to be recruited into the research study for a statistically significant sample. As a result, designing an effective recruitment campaign to be implemented by the selected partner is imperative. The Companies will apply customer segmentation research so that the prosumer segment and customers that meet eligibility requirements are correctly identified.

The recruitment campaign may include multiple channels, including multiple communications using channels such as email to initiate contact, then follow-up contact through phone or in-person. The latter may be necessary in order to explain a new program that will require installation of automation technology, acceptance of a complex rate, and random assignment to one of two rate options (or the control group) following agreement to participate in the SHR Demonstration Project. At this stage, the rules and conditions of program enrollment will be clearly communicated to customers.

In addition to this direct recruiting to eligible customers, it will be necessary to educate participants on the rates and the automation technology, including clear communication that the SHR Demonstration Project rate design is distinguished from demand response programs with utility control. This education is key for customer satisfaction, as well as to help customers implement price-responsive automation, which in theory will result in greater impacts and bill savings.

Recruiting and education materials will be developed in partnership with the implementation partner. Customer research will be conducted so that the materials are understandable and effective for customers. The Companies will also take into account other types of communications distributed

<sup>27</sup> The numbers of residential PV system installations are taken from NYSERDA data, *Statewide 200kW or less residential, non-residential PV installations* (<https://data.ny.gov/Energy-Environment/Statewide-200kW-or-Less-Residential-Non-Residential/3x8r-34rs>), as of November 2016. The totals include leased, power purchase agreement, and owned systems. According to the data, the number of owned PV systems in each county is Westchester: 963, Staten Island: 883, and Rockland: 158.

<sup>28</sup> Percentages are from the AMI deployment schedule as summarized in Table 6.

<sup>29</sup> The estimate assumes the deployment rate is the same among homes with PV systems as it is among all single-family homes in each county.

to customers in the study regions as a result of AMI deployment and the AMI innovative pricing pilots. The Companies will look to leverage new digital platforms (e.g., websites, mobile apps) developed in the Digital Customer Experience (DCX) initiative in the types of communications that customers receive in the SHR Demonstration Project.

#### (d) Ability to Scale

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The SHR Demonstration Project is by design an innovative, forward-looking rate intended to appeal to more technically-savvy customers with larger energy uses. In the short to medium term (3 to 5 years), it is unlikely that the necessary technology will be accessible (in terms of feasibility or ROI) to a substantial portion of residential customers. However, in the medium to long term (5 to 10 years), this may change, especially as the Companies and other utilities offer rates that incorporate economic price signals that raise awareness and foster the development of technology options by creating a value proposition for automation technologies.

If the solutions in the SHR Demonstration Project prove viable, it may be possible to expand the rate and conduct more research on ROI and potential scalability among a wider array of customer segments, including different dwelling types and different electric end uses.

## 4. Demonstration Plan

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### (a) Metrics for Success (now and future)

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As part of the SHR Demonstration Project, the Companies will collect empirical data that provides insight into several over-arching goals. These goals include developing a rate that provides customers with more granular price signals, supports multiple technology approaches, provides customers with choices and information, and builds sustainable partnerships. The SHR Demonstration Project is structured to meet the primary objective of obtaining statistically valid results of the coincident usage impacts and bill impacts of different rate designs and enabling technologies.

Specific tracked impact metrics will include:

- Demand reductions during demand events (quantifying absolute impacts and comparing impacts between the SHR rate options);<sup>30</sup>
- Demand reductions during the summer peak period (quantifying absolute impacts—may or may not be able to detect differences between rates as absolute impacts may be small);<sup>31</sup> and

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<sup>30</sup> Demand events are when event charges (in Rate A) and overage penalties (in Rate B) are applied, that is, during periods where either generation capacity, transmission capacity, or distribution capacity are constrained.

<sup>31</sup> The summer peak period spans the summer months (June-September), when electric demand tends to be highest in the Companies' service territories. It is expected that these full season impacts are likely to be smaller in magnitude but more sustained compared to event impacts.

- Change in bill compared to what it would have been under the participant's original rate.

In addition, data will be collected through participant surveys. As noted above, these surveys will be designed and implemented in close coordination with concurrent customer research efforts.

The objective of data collection will be to understand customer experiences and behavior. Research topics may include customer satisfaction with each rate and the automation technology, bill savings, perceived experience on high demand events, automation choices for end uses (e.g., central AC only or multiple end uses), rationale for these choices, customer understanding of rates, and customer perceptions about the education experience and ongoing customer support.

Specific tracked customer behavior metrics may include:

- The portion of participants who choose to connect multiple end uses (in addition to central AC); and
- The demand subscription level chosen by participants assigned to the demand subscription rate.

Results from the empirical and survey data will inform future rate designs. In addition, data collected from the storage plus solar track should help quantify how bill impacts may change specifically for participants who switch from net metering to a rate with price-response enabled by battery storage.

## (b) Timelines, Milestones, and Data Collection

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### I. Implementation

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SHR Demonstration Project implementation can be organized into five activity areas and four phases.

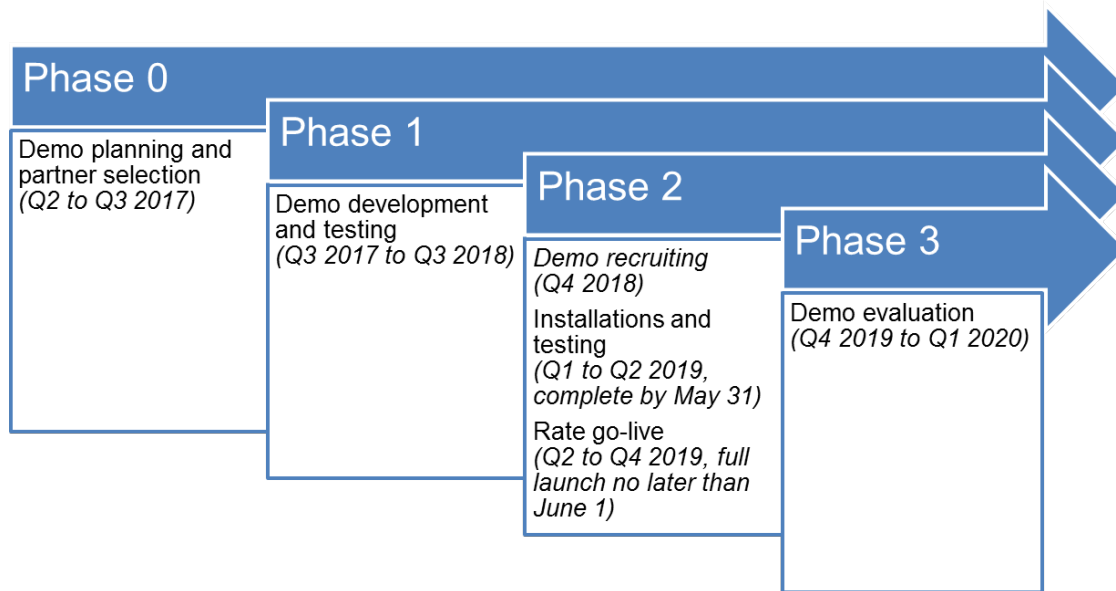
The activity areas are:

- **Technology:** selection of an implementation partner, development and testing of communication protocols and technology, and participant installations.
- **Customer:** preparatory customer research, preparation of education materials, participant marketing analytics, and participant recruiting.
- **Rate:** preparatory analysis, rate development, testing of price communication systems, feasibility evaluation of billing solutions, design and testing of billing solutions.
- **Demo processes:** administration of the demo while it is in the field.
- **Evaluation:** pre-demo analyses so that the participant sample is correctly randomized and designed to be large enough to detect expected impacts and post-demo analyses to measure impacts.

The four implementation phases and timeline are summarized in Figure 1.

In each phase, the Companies and the implementation partner will share implementation responsibilities.

**Figure 1: High level demo implementation timeline**



The following are descriptions of the major implementation phases, which will be further refined upon the selection of an implementation provider. The Companies will file a detailed Implementation Plan at the completion of Phase 0.

**Phase 0 – Demonstration Project Planning**

Phase 0 of the SHR Demonstration Project will focus on selecting the implementation partner and collecting information needed to refine the demo experimental design, as summarized in Table 8. These activities are planned to begin in the second quarter of 2017. Selection of the partner will include an RFI to enable the Companies to research technical and implementation capabilities of potential partners. Partner selection is described further in section 4(c)ii.

**Table 8: Smart Home Rate Demonstration Phase 0 Activities**

<b>Area</b>	<b>Activity</b>
Technology	Research capabilities
Technology	Draft RFI/RFP including detailed requirements
Technology	Select partner(s)
Rate	Develop preliminary rate for analysis
Rate	Perform revenue stability analysis

The demonstration design refinements needed at this early stage include analyses of the proposed rate design, including development of detailed preliminary rates and assessment of revenue stability. This analysis is critical so that this innovative rate design does not result in a problematically large variation in revenue collection.

## Phase 1 – Demonstration Project Development and Testing

Success for the SHR Demonstration Project will require that the price signals and end use automation function as they should, participants are well informed, and the participant sample captures a statistically reliable impact evaluation. Table 9 lays out an illustrative list of activities to be accomplished in Phase 1. Due to the long list of critical activities, this development and testing phase is anticipated to begin in third quarter of 2017 and take approximately one year to complete.

The Companies’ approach to billing the SHR will be evaluated during this phase. As calculation of SHR billing components will be significantly more complex than a typical residential bill, the Companies will assess the feasibility of potential SHR billing solutions based on a number of factors. Such factors include (but are not limited to) the feasibility of accommodating the SHR on existing systems, implementation timeline and costs, and compliance with current New York State rules and regulations for customer protection. Regardless of the billing solution chosen, the Companies’ objective will be to present participants with meaningful information that advances their understanding of the relationship between their usage and the various SHR components.

Other elements that will be developed and tested include the price signal communication platform, a smooth customer interface for end-use automation, the SHR Demonstration Project rates, effective customer recruiting and education materials, and a detailed evaluation plan. The implementation partner will develop the communication platform and customer interface with input from the Companies. The Companies will develop the SHR Demonstration Project rates and will work with the implementation partner to develop many of the processes necessary for carrying out the SHR Demonstration Project. Preparations will also be made during this phase to put in place elements important for program evaluation, including preparatory analyses and a detailed sampling plan.

**Table 9: SHR Demonstration Project Phase 1 Activities**

Area	Activity
Technology	Develop detailed communication protocols
Technology	Build customer interface
Technology	Test technology (platform, interface, and automation devices)
Customer	Develop customer education/outreach: qualitative research
Customer	Develop customer education/outreach: quantitative research
Customer	Design simple customer interface with feedback from qualitative research
Customer	Create recruiting plan and marketing materials
Customer	Marketing analytics
Rate	Design rates
Rate	Develop process and rules for dynamic components ( <i>e.g.</i> , events)
Rate	Develop and test systems for communicating prices
Rate	Evaluate billing solution feasibility
Rate	Develop and test billing solutions for the demo
Process Development	Develop enrollment processes (acceptance, assignment, installation)
Process	Develop content for recurring participant communications (outbound)



Development	
Process Development	Designate processes and ownership for handling customer inquiries
Process Development	Develop processes for managing pricing and event notification
Process Development	Develop processes for calculation and processing of customer bills
Evaluation	Perform pre-demo billing analysis
Evaluation	Update statistical sample power analysis with smart meter data
Evaluation	Develop sampling plan

## Phase 2 – Market Launch

Following the Phase 1 focus on developing and testing supporting technology, Phase 2 will focus on actual recruiting, installation, and field testing. There will be three consecutive activity categories during Phase 2:

- **Recruiting** (Q4 2018): recruiting work to enroll customers into each of the two technology tracks. SHR demo recruitment will occur after the summer 2018 period to collect pretreatment data (from summer 2018) for impact evaluation purposes. If necessary, recruiting may continue into early 2019.
- **Installations and testing** (Q1 to Q2 2019, complete by May 31): installation of end-use automation technology at participant residences and testing of functionality for extracting end use automation data (for evaluation purposes).
- **Rate go-live** (Q2 to Q4 2019): The go-live date is the date by which all new technology and billing processes are installed and functioning for all participants. This is targeted for April 2019, providing 1-2 months for participant to be on board with the new rates and the technologies before the summer 2019 measurement period. After the rate is fully launched in June 2019, the Companies and the implementation partner will administer SHR Demonstration Project processes, including participant communications and billing.

**Table 10: Smart Home Rate Demonstration Phase 2 Activities and Roles**

<b>Area</b>	<b>Activity</b>
Customer	Perform customer outreach and recruit participants
Evaluation	Perform sample randomization and validation
Evaluation	Adjust evaluation design based on real world feedback
Technology	Install customer technology
Technology	Test data extraction functionality
Process Development	Manage participant enrollment (enrollment and de-enrollment)
Process Development	Manage recurring participant communications (outbound)
Process Development	Handle participant inquiries (inbound)
Process Development	Manage pricing and event notification
Process Development	Calculate participant bills
Process Development	Process participant bills

The Companies note that there will be differences between the rate comparison track and the storage plus solar track in specific process details, recruiting approaches, education materials, and costs (especially equipment costs for battery storage).

### **Phase 3 – Evaluation**

The evaluation of the SHR Demonstration Project will include:

- Load impact analysis to estimate coincident usage reductions during peak demand events and coincident usage reductions sustained over the summer peak period.
- Bill impact analysis to determine bill savings.
- Comparisons of impacts relative to the otherwise applicable tariff, and across the two rate options (where possible to detect statistically significant effects).
- Participant surveys to understand demonstration project-specific customer satisfaction, perceptions, and behavior.
- Cross analysis of survey responses and impact analysis to assess whether certain reported behaviors or levels of understanding are correlated with higher or lower savings and to segment impacts by demographics and participation criteria (e.g., number or type of end uses).

The Companies’ evaluation of the qualitative and quantitative results of the SHR Demonstration Project will be used to provide answers to the research questions outlined in section 2(c).

## (c) Participation

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### i. Target Population, Sample Size, Control Group

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As discussed above, the SHR Demonstration Project will have two components. The first will test the impacts of two different Smart Home Rate designs among single family households with AMI and central AC. The second is a design to test the impact of battery storage on homes with existing solar PV systems.

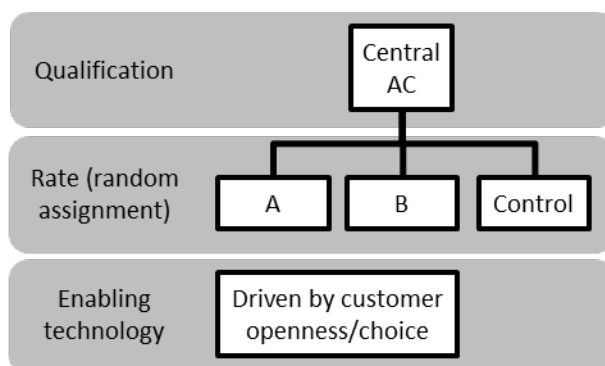
#### **Rate Comparison Track**

The rate comparison track experiment will be conducted using a randomized encouragement design (RED). RED is a variation of a randomized control trial, where customers who volunteer for a treatment (in this case, volunteer to go onto a Smart Home Rate) are randomly assigned to one of the two rate options being investigated or to a control group (which would leave them on the standard otherwise applicable tariff). This type of design eliminates self-selection bias, which can produce biased impact estimates because customers who volunteer for the Smart Home Rate may have different usage patterns compared with those who do not. With a RED, the treatment groups include customers who were offered treatment, but did not take it (such as when a technology installation is not successful).

In the RED, impact analysis will be done by comparing usage profiles for treatment and control participants before and after the treatment (rate) goes into effect (what is called a “difference-in-differences” analysis). In effect, usage profiles for both treatment and control participants will be compared for summer 2018 (pre-treatment) and for summer 2019 (post-treatment). This is why it is important that the design include a control group and that AMI interval data be collected for summer 2018.

Single-family homes with central AC should have large summer peak end use and represent the residential customer segment most likely to demonstrate measurable, significant peak coincident usage impacts. As depicted in Figure 2, recruits among this population with central AC will be randomly assigned to one of three test cells: Rate A, Rate B, or the Control group. As the Companies value customers’ overall satisfaction with the program, regardless of the group they are assigned to, the detailed recruitment approach (e.g., approach such as recruit with delay or denial that have been used in other rate pilots with success) and the messaging to customers will be developed in detail in the implementation phases.

**Figure 2: Rate Comparison Randomized Encouragement Design**



Participants in the two rate test cells will be put on the corresponding rate option and will be required to allow the partner to install enabling technology which allows electrical end uses to automatically respond to the dynamic price signals from the rate. This automation technology may consist of smart thermostat, an HEMS, a cloud application, or other technology format. The technology must, at a minimum, provide price responsive automation to the participant’s central AC. Depending on the capability of the automation platform, the participant may also choose to connect and automate additional large electric end use loads, such as electric water heaters, pool pumps, or dryers. The details of the technology package will be determined after the RFI/RFP process is complete and the Companies have selected a partner.

Initial estimates have been developed for the sample sizes required to reliably detect coincident usage impacts and differences in coincident usage impacts between the two rates.<sup>32</sup> When using a RED, sample sizes must be based on an assumption regarding the percent of customers who stay on the rates despite unsuccessful technology installation. These initial estimates suggest that about 750 participants should be recruited into each of the three test cells, assuming technology is successfully installed for about 80-85% of recruits.<sup>33</sup>

### Solar Plus Storage Track

Due to the small size of the target population, the PV plus storage track will not include a control group or random assignment. Rather, all recruits will be assigned to Rate A and a storage system with price-responsive automation technology will be installed at the home. Note that there will be no

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<sup>32</sup> A sample size statistical power analysis was performed using load research sample data for summer 2013 for single-family homes in O&R territory. Statistical power analysis is used to determine the sample size needed to determine a given effect size (or impact) with a specified level of confidence.

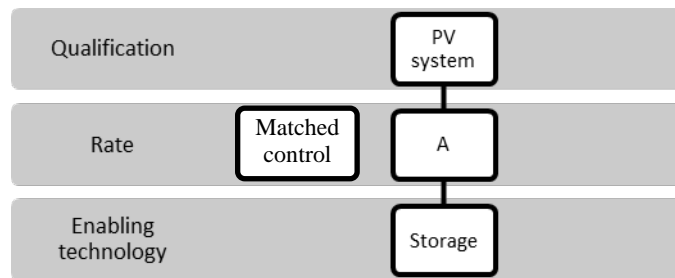
<sup>33</sup> The estimated sample size is sufficient to detect an effect size of 4% with a statistical power of 80%. This assumes that 80-85% of recruits are able to successfully install the technology, which reflects the range of success rates observed in a variety of demand response programs. During the implementation phases, sample size estimates will be refined using AMI data from the summer of 2018.

randomly-assigned control group. Statistical matching will be used to generate a control group post-enrollment from similar types of homes, e.g., single family homes with net metered solar systems.

Figure 3 lays out the quasi-experimental design that will be used for the storage plus solar track. The matched control group will be used to perform a difference-in-differences analysis for this track, similarly to the rate comparison track. Bill impacts will also be estimated by comparing differences in bills before and after the rate treatment for treatment and control customers.

The Companies plan to recruit 100 participants to achieve a sufficient sample size large enough to provide statistically reliable estimates of impacts. It is assumed that impacts of the battery storage technology are likely to be large, and that above a sample size of 100 there are diminishing returns in terms of reducing margin of error.

**Figure 3: Storage plus Solar Quasi-Experimental Design**



## ii. Third-Party Partners and Terms

As described in section 4(b), the Companies will select a turnkey implementation partner capable of developing and supporting price communication and end-use automation technology, managing participant recruitment and installations, and providing ongoing participant support to during the SHR Demonstration Project. The Companies understand that it may be a challenge to find a single vendor capable of providing all of these services. However, given the complexity of the various customer, rate, and technology components of the SHR Demonstration Project, it will be key to the success of the SHR Demonstration Project to have a single party responsible for organizing and managing the various elements. The RFI/RFP for turnkey solution provider will encourage third parties to coordinate to meet the full slate of SHR Demonstration Project requirements.

## iii. Utility Resources and Capabilities

In addition to general project management and shared corporate resources, the Companies will add to and leverage, to the extent possible, existing resources in the form of several internal groups throughout the course of this demonstration, including:

- AMI Deployment
- Corporate Affairs

- Customer Operations
- Digital Customer Experience (DCX)
- Distributed Resource Integration
- Information Resources (IR)
- Rate Engineering

In particular, the Companies will evaluate their approach to billing the SHR during the planning and development phases of the SHR Demonstration Project. As calculation of SHR billing components will be significantly more complex than a typical residential bill, the Companies will assess the feasibility of potential SHR billing solutions. Factors to be considered include, but are not limited to, the feasibility of accommodating the SHR on existing systems, implementation timeline and costs, and compliance with New York State rules and regulations.

#### (d) Customer Outreach/Community Engagement

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The Companies recognize that the core objective of the SHR Demonstration Project is to test a new approach to residential rates and engage customers with sophisticated technology systems that work with the utility in a seamless fashion to improve system efficiency and reduce the need for infrastructure expansion. The Companies also see the SHR Demonstration Project as an avenue to attracting and educating participants about how they can better understand and manage their energy use, in line with similar objectives of the Companies' smart meter Customer Engagement Plan and DCX program.

Successful customer outreach, engagement, and education is particularly important to the success of this effort. Customers must become familiar with the elements of the SHR Demonstration Project and its potential benefits. This means that customer outreach, education, and engagement must address provisions that, for example, permit technology to be overridden to address a particular need, and that also permit sufficient familiarity with new technologies before exposure to price volatility. Inherent in the SHR Demonstration Project is developing a design that promotes changes in customer behavior while at the same time increases the likelihood of a positive experience.

The Companies recognize that identification of customer protections specific to this Demonstration Project is essential and that those protections must be thoughtfully blended with existing regulatory and utility customer protections. The Companies plan to engage in outreach sessions with stakeholders to gather input on project-specific customer protections. The Companies also plan to coordinate the SHR Demonstration Project community engagement, including local and community leadership outreach, with the smart meter community outreach effort. This will raise awareness of the SHR Demonstration Project in step with the awareness campaign for the Innovative Pricing Pilot. Care will also be taken to coordinate SHR outreach with the smart meter Customer Engagement Plan, so that messaging is aligned and customer touch points are coordinated.

The SHR Demonstration Project will, therefore, have a substantial focus on customer outreach and marketing to recruit participants, which will be done in collaboration with a selected implementation partner. The Companies plan to collect information to support development of communications and engagement materials geared towards prosumers that will inform future programs and strategy. SHR Demonstration Project planning materials and approaches for

recruitment into the study will be developed by the Companies and the partner during Phase 1 using a process informed by customer research. The Companies will apply customer segmentation research so that customers that meet eligibility requirements, and prosumers in particular, are correctly identified.

#### (e) Issues to Consider during Implementation Planning and Development

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During the implementation phases of the SHR Demonstration Project, the Companies will gather information to refine aspects important to the administration of the SHR Demonstration Project, identified below. For each issue, the Companies will evaluate options based on its assessment of implementation costs and feasibility, its impact to SHR Demonstration Project objectives and resulting learnings, and the application of rules and regulations.

- Feasibility of different billing solutions;
- Eligibility of retail access customers to participate;
- Rules, conditions, and incentives for participation, including mechanisms to minimize the risks to the participant (e.g., opt-out mechanisms, bill protection mechanisms) and how they will be communicated to participants, including outreach and education materials to provide customers with a comprehensive understanding of program rules and enrollment options;
- Share of costs among the Companies, the implementation customer, and participants;
- Information sharing among the Companies and the implementation partner, including items requiring customer consent.

For the SHR Demonstration Project Implementation Plan to be developed during Phase 0, the Companies will outline each issue in terms of the range of potential options to be considered and provide timelines for evaluation and decision-making.

## **5. Financial Elements**

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### (a) Investments

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#### i. Details and Timing of Spending

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The Companies have conducted a high-level analysis of the SHR Demonstration Project cost and have identified the following potential expense categories:

- **Communication/automation platform:** development and operation of technology required for sending price signals to participant devices and for price-responsive automation of customer end uses;
- **Customer education and outreach:** development of customer education and recruiting materials (separate from other recruitment costs such as incentives, brochures.);
- **Demonstration administration:** labor from the Companies' staff for administering the SHR Demonstration Project;
- **Billing:** development and implementation of a solution capable of producing bills for Smart

Home Rate participants

- **M&V:** includes pre- and post-SHR Demonstration Project evaluation activities (sample development / randomization, participant surveys, coincident usage and bill impact analysis);
- **Recruiting:** all recruitment costs other than development of materials, including incentives, brochures, and outbound calling; and
- **Equipment plus installation:** equipment may include smart thermostats, HEMS, smart devices (capable of automation), battery storage.

However, the bulk of these costs will be part of the contract with the partner and the Companies do not now have a reliable estimate. Once a partner is selected through the competitive RFI/RFP process, costs will be shared via an interim report.

### i. Leveraging Third-Party Capital

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As part of the Companies' RFP/RFI process, the Companies plan to consider a third party's willingness to cost share as one of the selection criteria in choosing a partner.

#### (a) Returns (ROI estimates, when self-sustaining etc.)

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The Companies' SHR Demonstration Project costs will be divided between Con Edison and Orange and Rockland. Costs will be recovered through base rates for Con Edison, and through the Energy Cost Adjustment surcharge for Orange and Rockland until such time as demonstration projects are rolled into base rates in its next electric base rate filing.

## 6. Reporting

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### (a) Information to Be Included in Quarterly Reports to the Commission

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The Companies will report to the Commission every quarter on key SHR Demonstration Project metrics, which will allow the Companies and the Commission to track the progress of this demonstration project. All key metrics will be reported for the quarter, for the calendar year, and from the initiation of the demonstration project. Such data will be reported on an absolute and relative (to plan/budget) basis, and will include:

- Number of customers enrolled and active in the SHR Demonstration Project;
- Number and array of end uses automated using price-responsive technology;
- Capital expenses and operating expenses incurred by the Companies related to the SHR Demonstration Project;
- Tracking of SHR Demonstration Project progress relative to schedule and plans for making up any slippage;
- Problems encountered and solutions implemented;



- Customer complaints;
- Opt-out management (both active drop outs and move outs, separately);
- Technology installation success/failure rates;
- Number of events/peak-price days called; and
- Demand subscription levels signed up for by participants on demand subscription rate.

Once the SHR Demonstration Project is fully enrolled, additional metrics will be reported as they become available, including bill impacts, coincident usage impacts, and survey responses.

## 7. Conclusion

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### (a) Post-demonstration benefits

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#### i. Qualitative

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The SHR Demonstration Project is expected to deliver several benefits that last beyond the term of the demonstration. Information gathered from the SHR Demonstration Project will be used to help inform future rate designs that promote more efficient use of the electric delivery system. Bill impact ranges will also help inform future research around investment in DER that can influence customer investment decisions beyond the horizon of the SHR Demonstration Project. Sufficient DER growth may lead to higher penetrations of automation technology. If the SHR Demonstration Project concepts prove scalable, they may become future tools to help defer grid investments.

#### ii. Quantitative

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At the close of the evaluation phase of the SHR Demonstration Project, the Companies will gain empirical estimates for demand and bill impacts.

### (b) Plans to scale

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If the SHR Demonstration Project shows that substantial demand reductions and bill savings are possible and cost effective among the participants, the Companies may assess the feasibility and value of expanding the rate, possibly leveraging the technology developed for the SHR Demonstration Project. The rates developed as part of the SHR Demonstration Project could be opened to a broader segmentation of customers. As the AMI rollout progresses, the Companies may conduct further research to gauge the impact potential for other segments, including single-family homes and direct-metered customers with room AC or electric space heating. In addition, the Companies may conduct research to understand the receptivity of different customer segments to the Smart Home Rate.

Second, if the research shows reasonable scaling potential, participation could be expanded and opened up to additional technology providers (if viable) from which customers may choose.

Whether or not the SHR Demonstration Project is scaled beyond prosumers in the future, the SHR

Demonstration Project may evolve to a rate that customers can choose along with a variety of enabling technology options. If in the future, the Companies can provide customers with an optional, transparent, cost-reflective rate and a platform for receiving dynamic price signals, progress will be made in evolving utility functions to reflect the DSP role, which includes using transparent rates to more accurately reflect costs.

### (c) Advantage

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The SHR Demonstration Project is to take the first steps necessary to make the Smart Home Rate envisioned in the REV Track 2 Order a reality by developing communication and automation technology, identifying the rate designs that encourage efficient use of the electric system and provide opportunities for bill savings, assessing customer price response to those rates, and collecting initial impact and customer perception and behavior information needed to inform future Smart Home Rate related investments and communications to customers.

If the SHR Demonstration Project is successful, the Smart Home Rate will advance the REV goal of an economically sustainable, open market, technology-agnostic platform in which energy and information flow in both directions.