Janet M. Audunson, P.E., Esq.
Senior Counsel II

December 7, 2015

VIA ELECTRONIC DELIVERY

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

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

REV DEMONSTRATION PROJECTS – ADDENDUM FILING

Resiliency Demonstration Project Proposal – Potsdam, New York

Dear Secretary Burgess:

Niagara Mohawk Power Corporation d/b/a National Grid ("National Grid") hereby submits for filing an addendum to its July 1, 2015 proposed REV Demonstration Projects filing in Case 14-M-0101. The purpose of this addendum is to replace that portion of the July 1, 2015 filing with respect to the Resiliency Demonstration Project Proposal for Potsdam, New York in order to capture a number of changes and clarifications to the original proposal.

Please direct any questions regarding this filing to:

Philip Austen
Director, New Energy Solutions Delivery
National Grid
175 East Old Country Road
Hicksville, New York 11801
Tel.: 516-545-4753
Mobile: 631-599-0285
Email: pausten@nationalgrid.com

Hon. Kathleen H. Burgess
REV Demonstration Projects - Addendum Filing
December 7, 2015

National Grid looks forward to continuing to work collaboratively with Department of Public Service Staff to advance the Company's proposed Resiliency Demonstration Project for Potsdam, New York to implementation.

Respectfully submitted,

/s/ Janet M. Audunson

Janet M. Audunson, P.E., Esq.
Senior Counsel II

Enc.

cc: Tammy Mitchell, DPS Staff, w/enclosure (via electronic mail)
Marco Padula, DPS Staff, w/enclosure (via electronic mail)
Denise Gerbsch, DPS Staff, w/enclosure (via electronic mail)
Edward White, w/enclosure (via electronic mail)
Philip Austen, w/enclosure (via electronic mail)
Cathy Hughto-Delzer, w/enclosure (via electronic mail)
John Monaghan, w/enclosure (via electronic mail)

300 Erie Blvd. West, A-4, Syracuse, New York 13202
T: 315/428-3411 ■ M: 315/401-7891 ■ Janet.Audunson@nationalgrid.com ■ www.nationalgrid.com

nationalgrid

Resiliency
Demonstration Project Proposal
Potsdam, New York

Niagara Mohawk Power Corporation d/b/a National Grid

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

December 7, 2015

Table of Contents

Executive Summary

This filing is an addendum to the Niagara Mohawk Power Corporation d/b/a National Grid ("National Grid" or the "Company") July 1, 2015 REV demonstration filing. It replaces the July 1st filing's section on the Resiliency Demonstration Project Proposal, pages 46 through 61. This updated filing reflects a number of changes and clarifications to the original proposal. Changes and clarifications to the proposal include the following:

- Additional detail as to the regulatory and market barriers for community microgrids;
- Additional detail as to the scope and number of services included in the hybrid utility microgrid offering;
- An improved and expanded set of hypotheses to be addressed by the demonstration;
- A detailed explanation of the REV demonstration principles addressed by the project;
- An improved and expanded demonstration plan;
- Staging of the demonstration to include a subsequent stage for evaluation of any hybrid utility microgrid services adopted by customers;
- Improved delineation of milestones and expected deliverables;
- Expansion of project scope and budget to include the direct funding of an audit-grade detailed engineering design of the microgrid;
- And expanded optionality for DER participation in NYISO markets.

This Reforming the Energy Vision ("REV") demonstration project, proposed for the Village of Potsdam, New York, focuses on improving community resiliency during severe weather events. Through this demonstration project, the Company will test customer and community willingness to pay for a premium resiliency service. In so doing, the project aims to prototype a scalable and replicable stakeholder and business model for a hybrid utility microgrid offering using distributed energy resources ("DER"). As described by the New York State Energy Research and Development Authority ("NYSERDA"), the hybrid utility model is a microgrid "where the distribution facilities are owned by the utility but at least some of the microgrid's internal [DER] are owned by a non-utility entity."[1]

The Village of Potsdam (the "Village" or "Potsdam") is located in central St. Lawrence County, in the North Country region of New York. Potsdam includes a population of both permanent residents and university students. Approximately half of the permanent population of 9,428[2] lives in households with incomes below $40,000.[3] Home of the State University of New York at Potsdam ("SUNY Potsdam") and Clarkson University, the Village's population almost doubles with the universities' academic-year population increase of about 8,000 students. In addition to the two universities, commercial customers in Potsdam include multiple municipal buildings, the

[1] *Microgrids for Critical Facility Resiliency in New York State, Final Report*, NYSERDA, Report Number 14-36, December 2014 ("NYSERDA Microgrids Report"), at p. 112.
[2] Based on 2010 Census data from the US Census Bureau for New York.
[3] Internal data.

Canton-Potsdam Hospital, and others. As noted in a Clarkson University application for funding through NYDERDA Program Opportunity Notice ("PON") 2715:

> Catastrophic weather events in the North Country of Upstate New York have caused widespread property and environmental damage. Although these events are infrequent, they seem to be occurring with more regularity. The risk to residents and coordination of emergency services is extremely challenging. Such events include ice storms, major snow events, micro-burst wind events, and flooding due to winter thaw, ice jams, and excessive rain. One of the most devastating events was the ice storm of 1998, which affected most of northern New York, southern Canada, and northern New England, causing outages lasting for weeks. Restoration costs in upstate New York alone exceeded $125M (1998 dollars). Multiple other events of lesser magnitude have followed, including the most recent ice storm in December 2013.
>
> One of the most challenging parts of restoration efforts is mobilization. In the most severe cases, it is difficult to move equipment into the affected area and get a command center set-up due to impassible roads and limited access. In addition, since little or no services are available, possibly with the exception of small back-up generators, all equipment for power (including fuel), communication, material, etc. must be brought in. [4]

The impacts of these severe weather events in the North Country and elsewhere may be mitigated by the creation of community resilience microgrids. Clarkson University and National Grid have embarked on an ambitious project to develop a community resilience microgrid for Potsdam, using the hybrid utility microgrid ownership model and a proposed, new underground network. A number of community stakeholders including the Village government, both universities, the hospital, and a few small businesses providing necessary services (such as banking, gas and groceries) have expressed an interest in a community microgrid[5] to enable them to:

1. Remain energized and provide services during an extended duration outage;
2. Use Potsdam as a staging ground for county-wide emergency services; and
3. Further optimize the "blue-sky" or everyday use of DER to reduce commodity costs.

---

[4] From Clarkson University's NYSERDA PON 2715 application, February 12, 2014.

[5] This is consistent with the Commission's definition of a community microgrid model. *See* Case 14-M-0101 – *Proceeding on Motion of the Commission in Regard to Reforming the Energy Vision* ("REV Proceeding"), Order Adopting Regulatory Policy Framework and Implementation Plan (issued February 26, 2015) where the Commission defines a community microgrid model as one that "involves multiple customers that may range from large institutions to single dwellings, operates in parallel with the grid but is capable of operating as an island during a grid outage and is powered by one or more distributed generation sources supplemented by storage and/or a load management system that provides resilience in case of grid outage and optimal efficiency during normal operations." (footnotes omitted), at p. 110.

The Company proposes this REV demonstration project to develop and test four new hybrid utility microgrid services, in support of the Potsdam community microgrid project, that may be required for the further deployment of hybrid utility microgrids in New York State. The proposal provides required coordination and aggregation, with novel rate recovery, to enable a financially sustainable multi-customer hybrid utility microgrid business model.

The four new hybrid utility microgrid services to be developed and tested in this REV demonstration project are:

1) Tiered recovery for storm-hardened, underground wires;[6]

2) Central procurement for DER;

3) Microgrid control and operations; and

4) Billing and financial transaction services.

Initial conceptual engineering design, equipment specification, and cost analysis for the proposed hybrid utility microgrid in Potsdam are currently underway via NYSERDA PON 2715. The project team consists of representatives from Clarkson University, General Electric, Nova Energy Specialists, and National Grid. In order to advance beyond a conceptual study, the Company seeks funding for an Audit-Grade Detailed Engineering Design[7] through this demonstration project proposal. This Audit-Grade Detailed Engineering Design will serve as the technical basis from which the above services will be developed.

Essential to a REV demonstration project is the ability to test new proposed utility services with customers, stakeholders, and non-utility market participants. With the exception of the construction of the underground wires, National Grid believes the other three services noted above may also be provided by non-utility market participants. For practical reasons, the Company believes it is best positioned to provide these services to facilitate the development of community resilience microgrids through the hybrid utility microgrid business model—partnering with technology companies, where necessary, to leverage their expertise. However, the Company's demonstration project design includes an iterative process for parties to evaluate the Company's proposed contractual and tariff terms as they develop. This will enable the Potsdam stakeholders to compare the Company's proposed services against any that non-utility entities might provide. Included in the Company's pricing will be utility service fee revenues and appropriate return on invested capital.

---

[6] The tiered recovery for storm-hardened, underground wires service proposes a new cost allocation and recovery mechanism for an existing service which is constructing and owning distribution infrastructure.

[7] The Audit-Grade Detailed Engineering Design of the microgrid will be conducted to meet the specifications and requirements of NYSERDA's New York Prize Stage 2 RFP. NYSERDA RFP 3044, NY Prize Stage 2, is anticipated to be publically available by the end of 2015.

The culmination of the first stage of the proposed demonstration project will be final "go/no-go" determinations by the proposed Potsdam microgrid customers and community leaders, to determine which of the four services they wish to accept from National Grid. The Company believes that results will not only inform future decisions internally, but those of peer utilities, policy makers, and regulators. If any or all of the four hybrid utility microgrid services are deemed a "go," they will include binding agreements from each of the affected parties. Furthermore, services deemed a "go" will require a second stage of demonstration. The second stage will consist of evaluation of each of the services to determine the effectiveness of the business model and the services provided. A more formal evaluation plan for the second stage will be proposed in the quarterly report to the Commission following the results of the final "Go/No-Go" meeting. Microgrid services that are a "go" may become commercial offerings available to other communities interested in pursuing a hybrid utility microgrid model, depending on the results of second stage evaluation.

Business Model Overview

The Market Opportunity

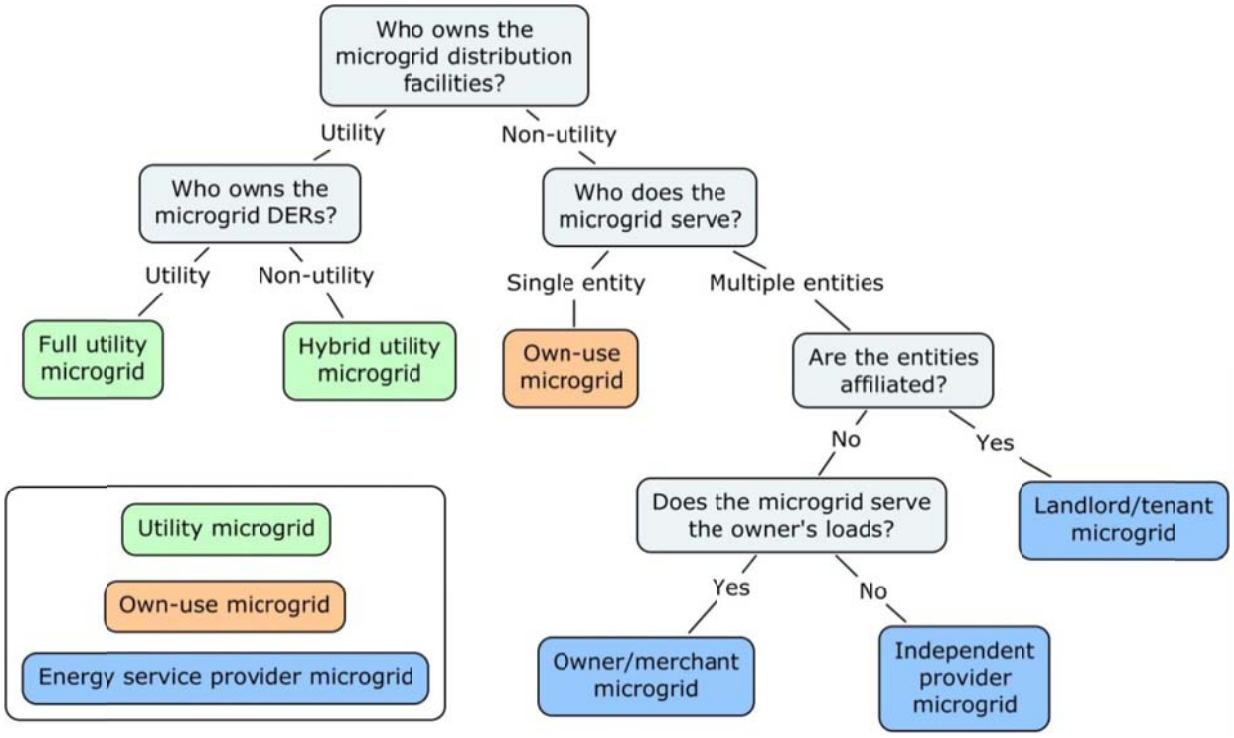
Community resiliency could be improved through the use of hybrid utility microgrids. However, current regulatory and market barriers will need to be addressed.[8] Pertinent regulatory and market barriers are delineated, in part, in the following Proposed Solution section below for each proposed service. Further discussion on such barriers can be found in the Conditions/Barriers sub-section of the Demonstration Plan section of this proposal. The attractiveness of existing net metering and remote net metering statutes and rules, complexity of multi-customer contracting for new agreements/services, existing contractual agreements with DER owners and DER developers, and customer willingness to directly invest capital up-front may all constitute regulatory and/or market barriers.

Proposed Solution

The Company proposes this REV demonstration project to develop and test four new hybrid utility microgrid services, in support of the Potsdam resilient microgrid project, that may also be required elsewhere for the further deployment of community microgrids in New York State.

[8] *See* Case 14-M-0101 – *Proceeding on Motion of the Commission in Regard to Reforming the Energy Vision*, Notice Soliciting Comments on Microgrids (issued March 17, 2015) (the "Notice") where the Commission states that upon a review of parties' comments on possible microgrid configurations that will be presumptively permissible and the specific questions posed by the Commission in the Notice, Staff will issue a detailed proposal on microgrid configurations and oversight.

This hybrid utility microgrid ownership model was chosen for the community resilience microgrid project in Potsdam using the following decision tree:[9]

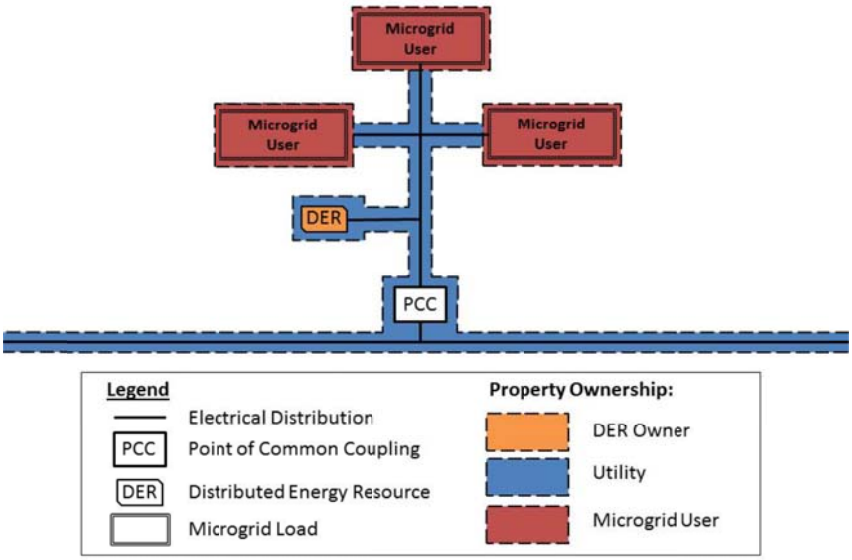


As described by NYSERDA, the hybrid utility model describes a microgrid "where the distribution facilities are owned by the utility but at least some of the microgrid's internal Distributed Energy Resources ("DER") are owned by a non-utility entity."[10]

[9] NYSERDA Microgrids Report, Figure 7-4, at p. 109.

[10] *Supra* note 1.

A simplified version of the hybrid utility microgrid ownership model is depicted in the figure below:[11]



The four new services to be developed and tested in this REV demonstration project are:

1) Tiered recovery for storm hardened, underground wires;

2) Central procurement for DER;

3) Microgrid control and operations; and

4) Billing and financial transaction services.

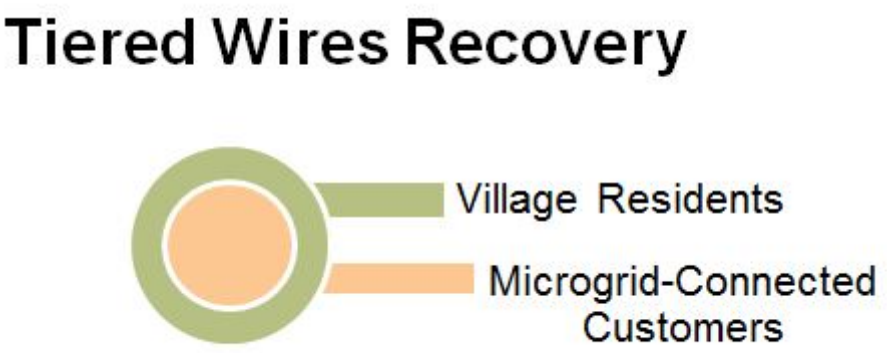
Each of the four services are described in greater detail below

1. Tiered Recovery for Storm-hardened, Underground Wires

The proposed Potsdam hybrid utility microgrid includes new underground distribution infrastructure capable of withstanding the impacts of severe storms in ways that overhead distribution infrastructure cannot. National Grid believes this component distinguishes the proposed Potsdam system from many other microgrid projects in development in New York State. Given existing franchise rights for distribution assets that cross a public right of way, the

[11] *NYSERDA Microgrids Report*, Figure 7-6, at p. 113; note that this diagram has been simplified to only show DER assets sited on the utility side of the customer meter. In actuality all existing DER assets for this proposed demonstration project in Potsdam are sited on the customer side of the meter. The Central Procurement of DER service concerns itself with the siting of new, incremental DER assets on the utility side of the customer's meter. The billing and financial transaction service, however, will address both utility-sited DER, and customer-sited DER.

Company believes it is the preferred entity to construct, own, and operate this proposed underground network.[12] In order to pay for the additional underground wires, the Company proposes a storm-hardening service to be available to potential hybrid utility microgrid customers. Rather than use the traditional rate base approach to pay for this infrastructure investment, the Company proposes a cost allocation model with tiers of cost-sharing based on the customer's level of benefit. The following diagram shows a conceptual model where those customers physically connected to the microgrid pay for the greatest portion of the wires investment costs, while the group of customers who live within the Village of Potsdam (without being connected to the microgrid) benefit from added community resiliency and therefore pay a smaller portion of the wires investment costs.



Much like the process of traditional ratemaking where the utility's capital costs are recovered at varying proportions across different customer classes, the Company proposes that both direct beneficiaries of the microgrid (those physically connected) and indirect beneficiaries (those who benefit from the availability of critical services enabled by the microgrid - the residential community at large) may contribute to the utility's cost recovery for the storm-hardened underground wires. The capital cost of the wires investment would be amortized over the life of the wires. The amortized rate provides an annual revenue requirement for the wires, including the Company's return on equity for the capital investment, which would then be recovered from these microgrid customer classes.

National Grid proposes that microgrid-connected customers will bear the majority of costs for the annual revenue requirement. The remaining minority share of the annual revenue requirement may be socialized to the Village residents. Total cost and the extent of Village government support, on behalf of its constituency, will inform the optimal approach to residential cost-sharing. The Company believes that it is appropriate to consider residential cost-share as it is the residential community at-large which will benefit from the availability of critical services enabled by the microgrid.

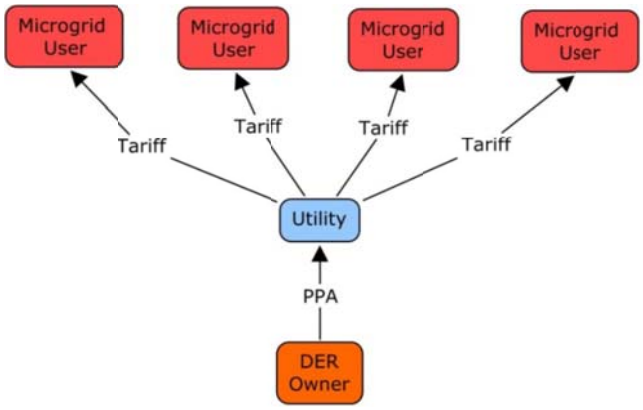
[12]NYSERDA Microgrids Report, at p. 37: "All microgrids that cross a public right of way (e.g. for moving transmission or distribution facilities over public streets) must be granted permission by the presiding municipal authority in the form of a franchise or some lesser consent, depending on the scope of the usage."

The recovery mechanism for this allocation of costs will be further developed through the demonstration project. A distribution surcharge, a revised or new standby rate, or other cost recovery mechanism will be proposed at the Preliminary Service Proposals & Pricing checkpoint and at the final Completion of Financial/Business Plan checkpoint.[13] If the cost recovery mechanism proposal receives the support of the microgrid stakeholders the Company would file a corresponding tariff proposal with the Commission.

2. Central Procurement for DER

National Grid envisions that the DERs required to successfully island the proposed microgrid in Potsdam will include both existing, and potentially new, customer owned DERs--that is, DERs that are sited on the customer's side of the utility meter. Microgrid-connected customers may independently adopt some amount of new DER for which there is a positive return on investment. However, initial indications suggest that an incremental 2-4 MW of synchronous generation may be required to supply the critical loads in the proposed Potsdam hybrid utility microgrid.[14] In order to ensure that the required incremental DERs are developed in Potsdam, National Grid proposes "backstopping" this supplemental DER through central procurement of DER. The Company would serve as the central purchaser of energy output from new DER under a long-term tariff, to ensure that the new DER capacity is developed. In using this model, one may think of the Company as serving as the microgrid DER provider (purchaser) of last resort. Additionally, National Grid does not propose to own the DER asset, but rather proposes buying the energy output from third party owner(s).

The central procurement model is depicted in the following figure:[15]

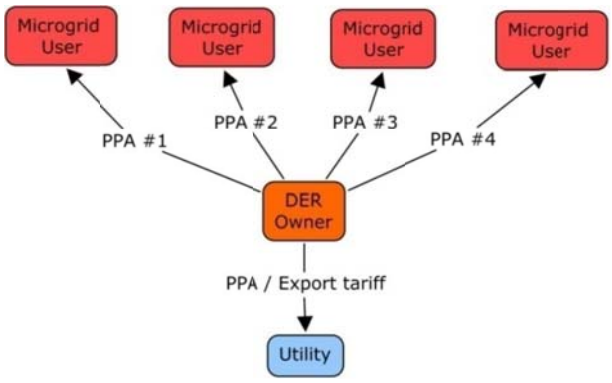


[13] Additional information regarding checkpoints and project milestones can be found in the Timelines, Milestones and Data Collection sub-section of the Demonstration Plan section, of this proposal

[14] Conceptual design study in process, led by Clarkson University under NYSERDA PON 2715.

[15] NYSERDA Microgrids Report, Figure 7-12, at p. 129, National Grid would propose to employ a long-term tariff rather than a power purchase agreement for the DER's output.

The central procurement business model to be tested in this proposed REV demonstration project serves as an alternative to the individual power purchase agreement ("PPA") contracting model as depicted in the following figure:[16]



At present, the individual PPA contracting model would likely be the only viable option for the customers to consider in the absence of this REV demonstration.

The Company believes that the central procurement model, as opposed to other non-utility or market based models such as the individual (bilateral) PPA model, has a number of advantages to bring needed supplemental DERs to the microgrid. These advantages include:

- Increased customer convenience as a result of less time and money spent on bilateral contracting;
- Reduction of customer risk and cost for customers through avoidance of large upfront capital investment as a result of a long term tariff based payment plan;
- Risk reduction for DER developers by ensuring a long-term revenue stream via a creditworthy counterparty; and the
- Ability to leverage the utility's unique ability to propose new tariffs.

Included in the tariff will be a modest upcharge for utility revenue for providing this service.

3. Microgrid Control and Operations

A microgrid, like the bulk power grid, requires some form of centralized control, dispatch and operations. While the New York Independent System Operator ("NYISO") and utility transmission operators have their clear roles within the bulk power system, a similar paradigm does not yet exist for hybrid utility microgrids. The Company proposes creating a microgrid control and operations service to address the control, dispatch and operations requirements for a microgrid. The Company expects to offer these services to microgrid customers with the help of leading-edge technology partners, pairing the utility's broad operational skill sets with the deeper

[16] NYSERDA Microgrids Report, Figure 7-11, at p. 128.

expertise of technology companies specializing in this emerging market. Contracts for microgrid control and operations will include new utility revenue in the form of service fees.

4. Billing and Financial Transaction Services

The compensation for existing customer-sited DER, as well as any new utility-sited DER, requires metering hardware for recording usage, a billing engine to calculate a customer's required payment, and a means to execute a bill and collect payment. While a third party service provider could offer these services to microgrid participants, these services are largely duplicative of the ones the Company provides today for its customers. Through a similar arrangement to the one proposed here, the Company presently offers consolidated utility billing service to energy services companies' ("ESCOs"). The Company proposes offering a similar service for microgrid customers in order to facilitate the required microgrid billing and financial transactions. This service would also include new utility revenue in the form of service fees.

Hypothesis Tested

This REV demonstration project proposal aims to test new utility services to help overcome commercial barriers to the development of community microgirds through use of the hybrid utility microgrid ownership model. The predominant microgrid model today is a single-customer model, serving clusters of buildings on a single campus (corporate, military, or university). Community microgrids require a substantially higher degree of coordination, due to the required aggregation and optimization of customer load and DER, with a financial structure that appropriately shares the burden of incremental cost and benefit. This proposed demonstration project seeks to test utility services that provide the required coordination and aggregation, with novel rate recovery, to enable a financially sustainable community microgrid via the hybrid utility microgrid ownership model. The proposed demonstration project objective can be summarized by the overarching test statement on the following page.

Overarching Test Statement	If…	Then…
The utility can effectively enable a community resilience microgrid through the design of hybrid utility microgrid services that allocate incremental costs primarily to those who benefit from the services.	**Hypothesis 1:** National Grid's proposed microgrid services can enable more convenient, effective backup service for critical facility loads (vs. individual facility backup options), at a modest incremental cost to current service costs	Prospective microgrid-connected customers and other stakeholders will support the continued development of National Grid's proposed microgrid services at specified demonstration checkpoints
	Hypothesis 2: National Grid's proposed utility microgrid services offer higher value than any comparable services available to Potsdam customers from non-utility market participants	Prospective microgrid-connected customers and Village residents (not connected to the microgrid) will agree to service scope and pricing

Prospective microgrid customers and stakeholders will be able to continuously evaluate Hypothesis 1 using the best-available information, including both conceptual design results and the Company's preliminary service proposals and pricing, once available. Parties will evaluate Hypothesis 2 at the end of the demonstration project, with final go/no go determinations for each of the four proposed utility services:

1. Tiered recovery for storm-hardened, underground wires;
2. Central procurement for DER;
3. Microgrid control and operations; and
4. Billing and financial transaction services.

The following supporting test statements allow for a more focused evaluation of the four proposed services in the demonstration project:

Supporting Test Statements	**If…**	**Then…**
Proposed service 1: A tiered cost allocation can recover a majority of incremental distribution infrastructure costs from prospective microgrid customers and beneficiaries	Infrastructure will enable critical load customers to operate for up to two (2) weeks after a prolonged outage event	Those customers will see improved business continuity and ability to provide critical emergency services
	A tiered approach allocates the utility's revenue requirement proportionally to those who receive value of business continuity, emergency services, and restoration benefit	Required stakeholders will agree to tiered recovery tariff terms that correspond to the anticipated value
Proposed service 2: A utility central procurement model for DER can enable the development of incremental, cost-effective capacity needed for a hybrid utility microgrid	National Grid offers a long-term tariff for the purchase of energy from new generation and/or storage capacity, with an associated service fee	This model will overcome the barriers of time/effort and capital/cost encountered in individual PPA/bilateral contracting for the required incremental DER capacity
		Prospective microgrid customers and other beneficiaries will bear any above-market costs associated with the new generation (if required)
Proposed service 3: The utility is well-suited for the control and operations of a hybrid utility microgrid	National Grid offers microgrid control and operations service (maintaining frequency, voltage, and power quality) with an associated service fee.	Prospective microgrid customers and stakeholders will select National Grid as the most qualified and cost-effective company to provide this service
Proposed service 4: Current utility capabilities offer the optimal solution for hybrid utility microgrid billing and financial transaction services	National Grid leverages existing utility services including metering, billing, credit and collections for microgrid customers, with an associated service fee	Prospective microgrid customers and stakeholders will select National Grid as the most qualified and cost-effective company to provide this service

REV Demonstration Principles Addressed

The Company believes that this demonstration project will meet all of the following REV demonstration criteria:

Third Party Participation/Partnerships

There are two services that the Company intends to work with partners to deliver. The first is for central procurement of DER and the second is microgrid control and operations. As stated earlier:

> In order to ensure that the required incremental DERs are developed in Potsdam, National Grid proposes "backstopping" this supplemental DER through central procurement of DER. The Company would serve as the central purchaser of energy output from new DER under a long-term agreement, to ensure that the new DER capacity is developed. In using this model, one may think of the Company as serving as the microgrid DER provider (purchaser) of last resort. Additionally, National Grid does not propose to own the DER asset, but rather proposes buying the energy output from a 3rd party-owned resource.

The Company will seek to entice a DER developer to build the necessary DER assets through use of a long-term tariff or other arrangement. The DER services will be repackaged as a commodity tariff for microgrid connected customers including National Grid's service fee revenues.

For microgrid control and operations, the microgrid controller hardware will need to be provided by a vendor. However, the Company is not aware of microgrid controllers that can dispatch multiple DER assets from multiple unaffiliated customers for both microgrid operations and economic optimization of DER assets. The Company intends to explore how the microgrid controller may be used to optimize the monetization of DER assets. As part of business model development for the control and operations service the Company will explore shared capital investment and revenue generation strategies with microgrid controller companies.

New Utility Business Models

The demonstration project identifies new revenue sources in terms of additional capital investment for the underground wires as well as service fee revenue from the central procurement of DER, microgrid control and operations, and billing and financial transaction services. Additionally, there are new business opportunities for third parties in the microgrid control and operations service and the procurement of DER.

Customer/Community Engagement

Full details can be found in the community outreach/community engagement section of the proposal, but in summation the project has received letters of support under the preceding NYSERDA PON 2715 from the Village of Potsdam, Clarkson University, SUNY Potsdam and the Canton-Potsdam Hospital. The microgrid customers along with others will be continually engaged in the design and pricing of the four utility services. Additionally the customers will

have the opportunity to weigh in more formally at the Preliminary Service Proposals & Pricing checkpoint and again at the final Completion of Financial/Business Plan checkpoint where the "go/no-go" meeting will be held. Lastly, the Company will work with the Village government for any community-based engagement that may be required for the Village to determine if it will support residential cost share for the project.

Identification of Economic Value

Identification of Economic Value is further detailed in the Market Attractiveness, Unique Value Proposition sub-section of this proposal. Customer value for microgrid-connected customers will be nearly continuous supply of power allowing for continued operations during a major outage. Business customers and emergency service providers will be able to continue to operate, providing the availability of services to the residential community at large. The microgrid control and operations service also aims to optimize DER asset utilization during "blue-sky" conditions, improving return on investment for customer-sited and centrally procured DER. The utility receives value in the form of new revenues and third parties receive value in the form of new business opportunities for DER and microgrid controller development.

Pricing and Rate Design

New approaches to rate design and recovery will be taken for the storm hardened, underground wires service and for the central procurement of DER service. Additional details can be found in the Proposed Solution section of this proposal.

Transactive Grid

The microgrid control and operations service will utilize two way communications and real time operation of both DER assets and potentially, dynamic load. Furthermore, the microgrid controller will likely be able to optimize the economic dispatching of the DER assets, not only operational dispatching for islanding purposes. As part of the development of both the microgrid control and operations service and the central procurement of DER the Company will pursue opportunities for NYISO market participation subject to the final approval of the microgrid customers and DER asset owners.

Scalability

The process for scoping and designing these four services is replicable and scalable to other parts of the company's service territory. However the outcome or result of these service such as the amount of DER need to be procured, the cost of storm hardening and/or undergrounding infrastructure, the degree of residential cost share, etc. will vary by project. The approach is loosely analogous to distribution planning. While the process of distribution planning and design is scalable and replicable, the actual design outputs are custom to the needs of the customers being served.

Market Rules and Standards

The microgrid control and operations service will require the utility to assist customers in standardizing operating and dispatch procedures so ensure safe reliable service while the

microgrid is islanded and for the economic dispatch of DER during “blue-sky” conditions. Additionally the Company will pursue opportunities for microgrid-related DER assets to bid into NYISO markets subject to the final approval of the microgrid customers and DER asset owners.

System Benefits

The microgrid may allow for optimization of power quality through the microgrid controller’s optimization of DER assets. The full suite of services proposed here will constitute a complete microgrid and should provide the community with an unparalleled level of resiliency. To be determined through both the central procurement of DER and the billing and financial transaction services will be the method and mechanism of compensation for customer and community DER assets. Part of this may include the monetization of microgrid level ancillary services needed to operate the microgrid including voltage support, frequency regulation and black start capabilities.

Cost Effectiveness

This demonstration project is testing in part, customer’s willingness to pay for a premium resiliency service. While it is anticipated that customers’ total costs will increase to some degree, the demonstration project will test if the incremental benefit of resiliency and DER asset optimization is worth the incremental cost of the services proposed here. Additionally customers will have the opportunity to examine non-utility facilitated solutions as well.

Market Attractiveness

Unique Value Proposition

Participating Customers

The value proposition for direct participants differs depending on whether the participant is a load, a generator, or a combination of the two. The value proposition for this offering is as follows:

The community hybrid utility microgrid resiliency solution for commercial and industrial customers provides:

(1) Load participants with an improved outage experience by enabling them to island via affordable, convenient access to backup generation;
(2) Generator participants with the ability to unlock additional economic value from sharing their distributed energy resources; and
(3) Generator and load participants with the ability to unlock additional economic value from sharing their distributed energy resources and a more robust islanding capability (*e.g.*, redundancy, availability of ancillary services, etc.).

Load-only microgrid participants, which may include Stewart's Shops (a gas and convenience store), KeyBank, Kinney Drugs, The Clarkson Inn, and others, will benefit from the ability to remain energized during an outage. Additionally, these customers will be able to island during an outage without having to directly purchase, maintain or operate DER. For smaller Commercial and Industrial ("C&I") customers this may present an affordable option for backup power with the maximum amount of convenience when compared with purchasing, maintaining and operating DER without facilitation through their utility company.

Generation-only participants are those that will serve primarily as a generator, such as the Village's East and West Dam hydroelectric generating facilities. These participants will be able to secure or continue to secure economic value for their DER regardless of whether the macrogrid is energized and operational. This may strengthen a future generating customer's business case for DER such as combined heat and power ("CHP") or natural gas-fired generation facilities. Additionally, there may be opportunities to monetize other forms of system value at the wholesale, distribution and microgrid level (*e.g.*, peak shaving and ancillary services).

Customers that have DER, but of insufficient capacity to island on their own, could serve both as microgrid generators and loads. These customers could include SUNY Potsdam and Clarkson University. For these customers, the ability to remain energized during an outage is the main value proposition. For example, SUNY Potsdam and Clarkson University can ensure the safety and well-being of their students during a major outage. A secondary benefit could be the monetization of their DER assets regardless of the energized and operational status of the macrogrid. Lastly, for these types of customers, it may prove uneconomical to invest in sufficient backup power to independently island themselves. Consequently, by connecting generation resources and loads via the microgrid, they will likely be able to meet their collective

backup power needs without a major upfront capital investment and the need for a long-term plan for directly addressing DER operations and maintenance.

The value for indirect beneficiaries (the residential community at large) will be the availability of emergency and other services during an extended outage. Residents of the Village of Potsdam will have continued access to police and fire services, healthcare, gas and groceries just to name a few. A full listing of microgrid customers and their associated services is detailed in the participation section of the proposal.

Unique Value Proposition: Third Party

The value to third-party distributed generation developers will be a long-term revenue stream guaranteed by the Company on behalf of the microgrid participants in the form of a tariff. This will remove some of the risk for a generation developer in a region where wholesale generation is plentiful, but too far removed from the microgrid to tap into for islanding purposes. The tariff for third-party distributed generation will include terms for emergency and "blue-sky" operations, which may include commodity service for microgrid participants.

Unique Value Proposition: Utility

The main value to National Grid is the potential for additional revenue from a scalable community microgrid offering. Additional details for a potential revenue model are provided in Section 5(a) New Utility Revenue Streams. Lastly, both National Grid and its customers will benefit from improving critical customer resilience without otherwise hardening or undergrounding the entire local distribution system.

Customer Segmentation and Demographics

This offering is available for direct participation by the C&I customer segment. There are other broader beneficiaries including the residential segment, which will benefit from improved emergency response and access to essential services that will remain energized.

Channels

The channels for marketing and outreach will consist of community meetings, individual customer and stakeholder outreach, and continuing support from National Grid's community and customer management lead in Potsdam.

Scalability

The Company will take into consideration program design and evaluation in order to ensure that lessons learned from this demonstration project could be scalable and standardized to apply to other regions of National Grid's service territory and other utility service territories in New York State. At the conclusion of the demonstration project, National Grid will have the experience needed to create an initial end-to-end process for a hybrid utility microgrid service. Any interested municipality, or group of C&I customers located in close geographical proximity, should be able to use this process.

Demonstration Plan

Metrics for Success

Essential to a REV demonstration project is the ability to test new proposed business arrangements with customers, stakeholders, and non-utility market participants. Other REV demonstration projects seek to prove the value of a new product or service through "market tests" with a sizable number of customers, employing formal experimental design principles such as the use of a control group. The proposed utility demonstration in Potsdam does not lend itself to quite the same approach, since the community in Potsdam is proposing to undertake one microgrid development process (rather than two), and the natural complexity of the undertaking introduces a significant number of variables. However, National Grid believes that a structured project approach can foster concrete learnings from this demonstration project, not only at the end (with final "Go/No Go" determinations by participants), but also at key milestones along the way.

The Company proposes to develop and test four new services in the demonstration:

1) Tiered recovery for storm-hardened, underground wires;

2) Central procurement for DER;

3) Microgrid control and operations; and

4) Billing and financial transaction services.

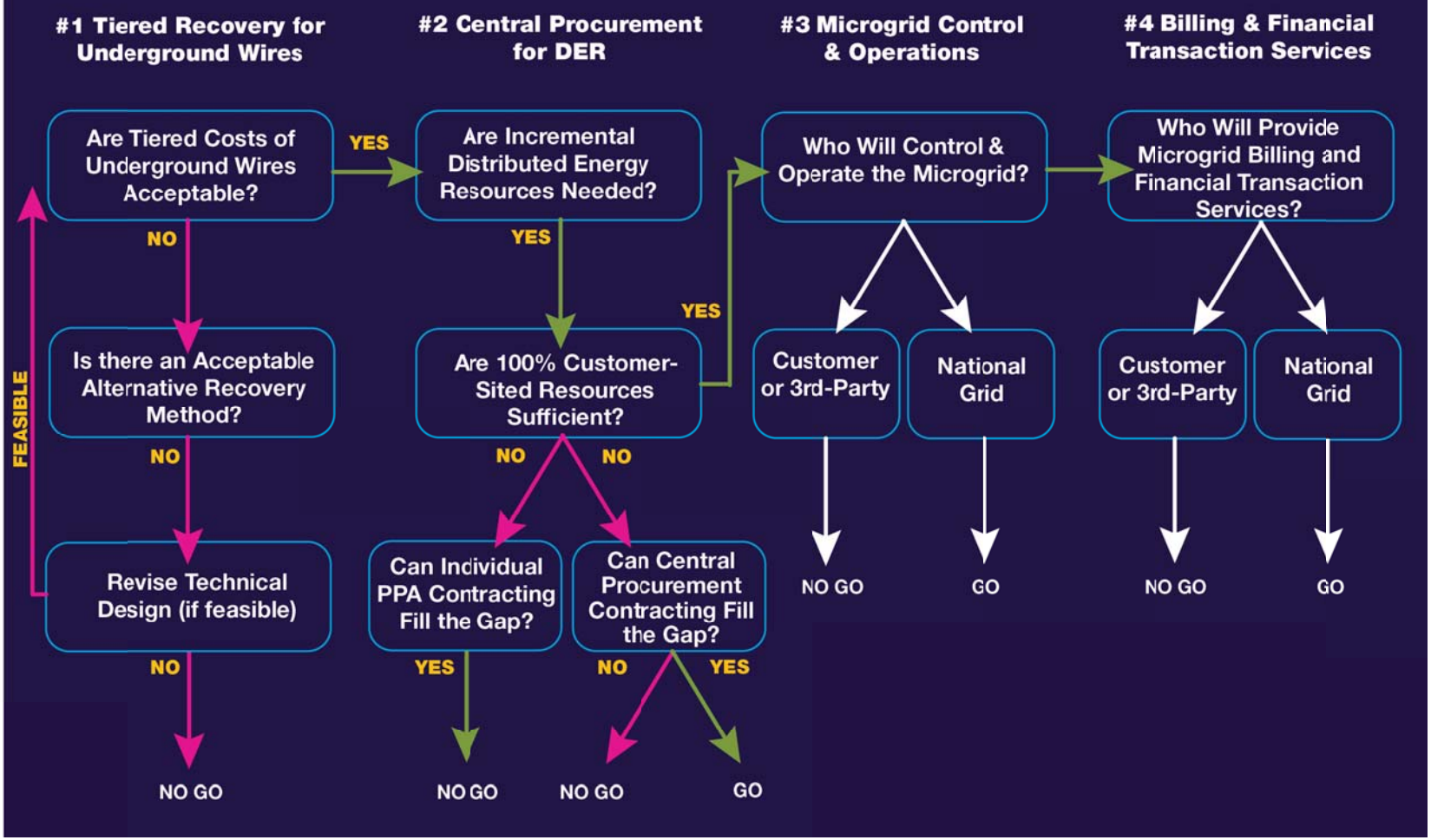
National Grid envisions that its demonstration will enable a "market test" of these services by allowing prospective customers and stakeholders to compare the Company's proposed services against any that non-utility entities might provide. With the exception of item 1) above, National Grid believes the other three services could also be provided by non-utility market participants. For practical reasons described earlier in the Proposed Solution section of the proposal, the Company believes it is best positioned to provide these services in partnership with technology companies, but is committed to enabling prospective customers to evaluate these utility solutions against competing services.

Included in this proposal is funding for a detailed design of the microgrid. National Grid expects this process to enable the Potsdam stakeholders to evaluate non-utility commercial opportunities to develop required incremental DER needed for the microgrid, to secure microgrid control and operations services, and to secure billing and financial transaction services. This REV demonstration project would allow customers to assess National Grid's proposed microgrid service against non-utility provided microgrid services.

The decision-tree diagram on the following page illustrates the high-level process by which prospective microgrid customers and required stakeholders may reach the final "Go/No-Go" determination for each of the 4 component services

Resiliency REV Demonstration
Go/No-Go Decision Tree

nationalgrid
HERE WITH YOU. HERE FOR YOU.



Timelines, Milestones, and Data Collection

There are several points in the proposed REV demonstration project at which prospective microgrid customers and other stakeholders should be able to evaluate National Grid's proposed services against other entities' capabilities, and REV demonstration evaluators should be able to review REV demonstration project results, including:

- **Completion of Conceptual Design** - *Expected June 2016*
    - This will be the point when initial design and cost ranges for new underground wires, controller, existing generation, and new incremental DER (capacity and type), are available to the REV demonstration team.
    - This will be an opportunity for the REV demonstration team to identify any significant modifications to the technical design that would affect the scope of services envisioned in this demonstration proposal.
    - This will also be the point at which microgrid stakeholders in Potsdam may provide the results of the conceptual design to any other potential partners they wish to compare against National Grid.
- **Preliminary Service Proposals & Pricing** - *Expected December 2016*
    - This will be the point at which National Grid presents its preliminary service proposals and indicative pricing to Potsdam microgrid customers, including proposed cost allocation from prospective connected customers and beneficiaries in the village and surrounding areas.
    - Microgrid stakeholders in Potsdam would then be able to compare these proposals with any available from non-utility entities.
- **Completion of Financial/Business Plan** - *Expected July 2017*
    - This will be the point at which affected parties in Potsdam would conclude their evaluation of National Grid's final proposed service agreements and determine whether to execute definitive agreements with National Grid or a non-utility entity (or none at all).[17] This is envisioned to be the final "Go/No Go" determination for each of the proposed services.

National Grid notes that the timing of these checkpoints will depend, in part, upon the outcomes of efforts by outside parties, including the conceptual design study led by Clarkson.

[17] Such agreements may still be contingent on additional conditions, such as the PSC's approval of a proposed National Grid tariff, or financial closing by new DER developers.

Participation

Target Population, Sample Size, Control Group

The Company has identified interested participants in the roles of microgrid-connected critical load customers and participating generators. With resiliency and availability of emergency services to the residential community at large enabled by a microgrid, a group of indirect beneficiaries have been identified as well.

Prospective Microgrid-Connected Customers

Prospective microgrid-connected customers include the following "critical load" customers:

- Universities
    - SUNY Potsdam
    - Clarkson University
- Village of Potsdam Municipal Buildings
    - Police Department (co-located at the Civic Center)
    - Fire Department and Civic Center
    - Wastewater Treatment Plant
    - Water Treatment Plant
- Potsdam High School
- The Clarkson Inn
- Canton-Potsdam Hospital
- Stewart's Shops (convenience store and gasoline)
- Key Bank
- National Grid Service Center

These critical load customers would see improved business continuity and ability to provide critical emergency services during an extreme weather event that causes anelectric system outage. In light of these benefits, National Grid expects customers physically connected to the microgrid to pay for the greatest portion of the required underground wires investment.

Microgrid Generation Sources

Microgrid generation will come from both existing and new generating sources.

Existing generation sources may include:

- Village of Potsdam
    - East Dam Hydro
    - West Dam Hydro
- SUNY Potsdam
    - Combined Heat and Power
- Clarkson University
    - Combined Heat and Power
    - Solar Photovoltaic

New generation sources are also expected to be required for the microgrid. Critical load customers will evaluate the business case for independently adding new generation. If this does not yield the required generation to successfully island the microgrid, National Grid will offer to centrally procure the incremental DER to ensure the incremental required capacity.

Village of Potsdam Residents

With the envisioned microgrid in place, the Village and surrounding areas will see more certain availability of community services, during an electric system outage, enabled by the microgrid including banking, grocery, gas, water treatment, waste water treatment, medical services, and police and fire services, among others. Potsdam will also become a regional staging ground for emergency responders and electric restoration crews.

The participants will be connected to the microgrid as shown in the following conceptual diagram:[18]

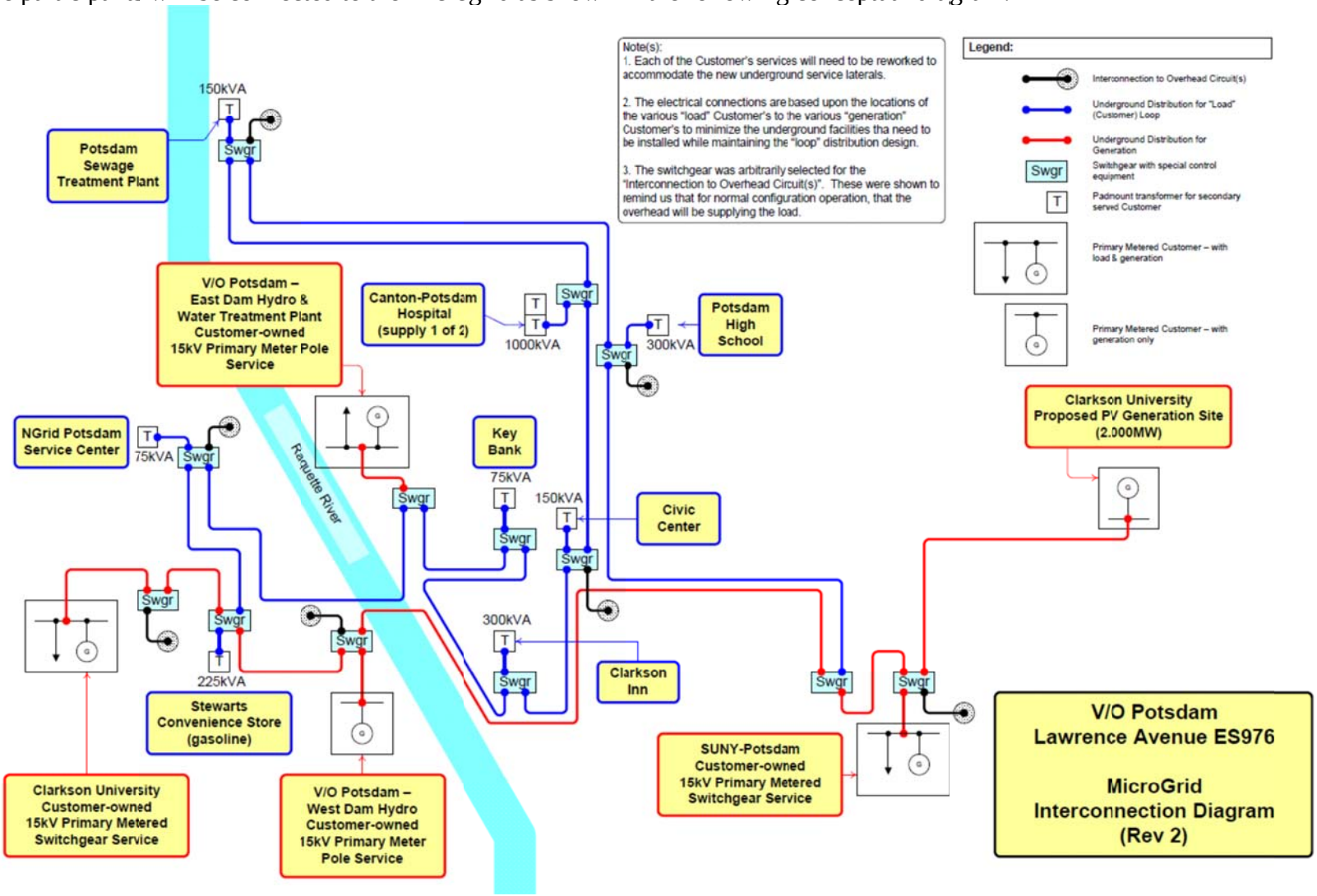


Figure 1: Resiliency Feasibility and Conceptual Design Study

[18] From Clarkson University's NYSERDA Program Opportunity Notice ("PON") 2715 application, February 12, 2014.

Third-Party Partners

The Company anticipates that some amount of additional generation in the range of 2 to 4 MW of capacity may be needed for the microgrid to island (assuming the full inclusion of existing run-of-river hydro generation, CHP generation and solar farm). If customers within the microgrid determine that their business case is adequate to build all of the additional generation needed on the customer side of the meter, then no additional generation would need to be facilitated by National Grid. However, the Company believes that some amount of community distributed generation may be needed, likely in the form of natural gas-fired generation. There may also be a need for a grid-scale energy storage unit to provide ancillary services needed by the microgrid such as voltage and frequency support. In both cases, the Company anticipates issuing a request for proposals ("RFP") once the scope of the services needed are better understood through the completion of the on-going microgrid feasibility[19] study and stakeholder work. Any additional generation, storage or demand response may be secured by the Company from DER developers through a new long-term tariff and repackaged as a commodity and service tariff for customers to utilize the centrally procured DER during both everyday/"blue-sky" scenarios and during an outage when the microgrid is islanded. The Company will also work with microgrid participants, DER asset owners, and the NYISO to identify potential wholesale market monetization opportunities, including capacity, energy and ancillary services markets.

Utility Resources and Capabilities

A utility company is uniquely positioned to facilitate community microgrid development via the hybrid utility microgrid ownership model. Given the Company's core competency in the design, construction and operation of the macro electric grid, the Company can bring those skills to the design, construction and operation of a limited underground network to support a community resilience microgrid. Additionally, given the Company's existing billing relationship with all customers in its service territory, it has the capability to craft new tariffs, subject to Commission approval, and bill accordingly to ensure that all microgrid participants pay for the services they receive, and are paid for the services they provide. Lastly, National Grid has existing relationships with major Commercial and Industrial ("C&I") customers, critical customers, and the local governments in the communities we serve. With coordination of multiple non-affiliated customer entities being one barrier to microgrid adoption, the Company is in the prime position to be the "glue" that can bring these customers together and creatively serve their resiliency needs through this REV demonstration project.

Community Outreach / Community Engagement

Outreach to Affected Communities

As stated earlier in this proposal, stakeholder outreach and engagement has already begun as part of the NYSERDA-funded feasibility study. Formal letters of support were included in Clarkson University's NYSERDA PON 2715 application from the Village of Potsdam, Clarkson

[19] As detailed in PON 2715 application.

University, SUNY Potsdam and the Canton-Potsdam Hospital. In addition, the Company has recently participated in several meetings with the full stakeholder, study and design teams, the Village Administrator, Clarkson University, and SUNY Potsdam regarding this REV demonstration project proposal.

Motivating Customers / Communities

Customers in this community are already fairly motivated to advance a community microgrid. As stated in Clarkson University's NYSERDA PON 2715 Application:

> Catastrophic weather events in the North Country of Upstate New York have caused widespread property and environmental damage. Although these events are infrequent, they seem to be occurring with more regularity. The risk to residents and coordination of emergency services is extremely challenging. Such events include ice storms, major snow events, micro-burst wind events, and flooding due to winter thaw, ice jams, and excessive rain. One of the most devastating events was the ice storm of 1998, which affected most of northern New York, southern Canada, and northern New England, causing outages lasting for weeks. Restoration costs in upstate New York alone exceeded $125M (1998 dollars). Multiple other events of lesser magnitude have followed, including the most recent ice storm in December 2013.[20]

As an example of the level of motivation from customers in building a community microgrid, Clarkson University has been contemplating using a microgrid to support the resilience of its campus since at least 2003 when it partnered with the Electric Power Research Institute ("EPRI") to design a multi-energy park (*i.e.*, a microgrid) at Clarkson University.[21] Given the longstanding weather-related challenges as well as past and current customer interest in leveraging community microgrids to improve resilience, the Company remains optimistic in the level of motivation of these customers and their community.

Conditions / Barriers

Market rules and standards

A barrier to deployment of the microgrid may be the restructuring of existing net metering and remote net metering arrangements and PPAs. For example, the existing run-of-river hydroelectric generating facility, the West Dam Hydro, is owned by the Village, but operates through a remote net metering arrangement where Clarkson University serves as the co-operator of the facility and receives the benefits of net metering credits. Another example would be Clarkson University's existing 2 MW solar PV farm, which is under a long-term PPA with the

[20] From Clarkson University's NYSERDA Program Opportunity Notice ("PON") 2715 application, February 12, 2014, at p. 7.

[21] *Partial Design of a Multi-Energy Park at Clarkson University*, EPRI, report number 1002286, December 2003.

solar developer. As part of the stakeholder and business model work, new or modified contracts may need to be put in place for existing generation to be used for the hybrid utility microgrid.

An additional barrier in the hybrid utility microgrid market is liability agreements. When the microgrid is operating in islanded mode there is a risk of damage to customer equipment due to problems with voltage and frequency regulation or to customer generation equipment due to controller failure or error. Lastly, there will likely be additional complexities in entering into agreements involving public entities such as the Village government and the SUNY system.

Consumer Protections

The Company will adhere to any existing and applicable consumer protection and privacy laws. Additionally, no capital will be invested in the microgrid until after there is a "go" decision with binding agreements for the microgrid costs, payment plans, compensation for customer provided DER and Commission approval where required.

Channel or Market Challenges

The Company does not know of any community resilience microgrids that have been built and have achieved commercial viability without substantial grant, subsidy, rate base or other support. This demonstration project is believed to be the first of its kind in that, if successful, it would be the first community resilience microgrid substantially funded by its participants and broader beneficiaries. Furthermore, the Company believes that learning from this stakeholder and business model work may yield a replicable process for other utility offerings for community resilience microgrids. That said, some degree of customization is needed both on the technical and business model side. As a result, there is some risk of over-customization. The Company will strive to help stakeholders reach a "go" decision while continuously identifying the aspects that could be scaled and standardized while accommodating sufficient customer/community diversity and customization.

Financial Elements / Revenue Model

The culmination of this demonstration project will be a financial or business model complete with revenue opportunities for the utility and customers with DER assets. While a complete revenue model will not be arrived at until the completion of the demonstration project, the Company anticipates that the revenue model will be structured as follows:

New Utility Revenue Streams

New utility revenue may come from the two sources described below; however the stakeholder and business model work might yield a better alternative.

The first will be a premium charged to direct participants for the capital investment needed to build out the underground network as part of the storm hardened, underground wires services. There exists the possibility to recover some portion of these costs from the broader beneficiaries in the area. This targeted and potentially multi-tiered approach differs from typical utility recovery via rate base. The full details of this business model including utility returns will be determined by the final "Go/No-Go" meeting. At present, the Company's initial hypothesis is that the service will be indexed to the rate of return for National Grid as determined by the Company's rate plan in effect at that time.

The second revenue stream will likely come in the form of service fees charged to the microgrid participants to cover ongoing O&M costs and a modest margin for services such as central procurement of DER, microgrid control and operations, and billing and financial transactions. The full details of these business models including utility returns will be determined by the final "Go/No-Go" meeting. At present, the Company's initial hypothesis is that the services will have a single digit percentage upcharge to the total cost of the service. Services which present potentially greater financial risk to the Company such as the central procurement of DER will likely have a higher upcharge than services with less financial risk such as billing services.

Investments

There are two main categories of capital investments that need to be included in the business model development. The first is the capital investment for the underground wires. The second is for supplemental DER.

Returns & Cost Effectiveness

The return on investment for all parties (utility, partners, and customers with DER assets) will be calculated as part of the stakeholder and business model work. The returns will vary depending on the final underground system design, the amount of DER assets provided by customers, and the amount of supplemental DER needed.

The cost effectiveness of the community resilience microgrid will be determined through the stakeholder and business model work. While the demonstration project is needed to arrive at final cost, repayment, and benefit calculations; the Company hypothesizes that it will be more

economical for customers to pool DER, control systems, and operations and maintenance through a hybrid utility microgrid than to have each customer finance, install and maintain 100% of their own back-up power. For the customers who currently have back-up power, the hybrid utility microgrid may provide additional value through ancillary services such as voltage support and frequency regulation and potential revenue streams from compensation for use of their DER assets. Additionally, the Company will strive for majority funding of the microgrid through participants and broader beneficiaries, limiting the burden on all utility customers while creating an overall more resilient system. Ultimately, the cost effectiveness of the construction and operation of the microgrid will be a major input into the stakeholder and utility decision making process that will culminate in the "Go/No-Go" decision.

Budget

The Company estimates that the demonstration project will cost a total of $1.606 million in incremental operating expense, over the two-year duration of the proposed demonstration. These costs include incremental labor, project management support, marketing and communications, and stakeholder and community engagement expenses. The Audit-Grade Detailed Engineering Design of the microgrid will be conducted to meet the specifications and requirements of NYSERDA's New York Prize Stage 2 RFP.[22]

Operating Expenses	**Year 1**	**Year 2**	**Total**
Project Administration and Planning (PMO)	$104,000	$27,000	$131,000
Stakeholder and Community Engagement, Marketing and Communications	$100,000	$100,000	$200,000
Implementation (Including Legal and Economic Modeling Support)	$150,000	$125,000	$275,000
Audit-Grade Detailed Engineering Design of Microgrid	$1,000,000	$0	$1,000,000
Total Incremental Operating Expenses	$1,354,000	$252,000	$1,606,000

[22] NYSERDA RFP 3044, NY Prize Stage 2, is anticipated to be publically available by the end of 2015.

Reporting

Information to be Included in Quarterly Reports to the Commission

Quarterly progress reports on the stakeholder and business model work will be provided to the Department of Public Service ("DPS") Staff. These reports will include, at a minimum, an overview of project progress against timeline/plan and results as they become available. Additionally, in order to maintain flexibility and maximize the potential for innovation and learning the reports may contain other updates or deviations from the initial details provided in this filing. To further ensure alignment, the Company would propose to meet with DPS Staff to discuss the quarterly progress reports. Furthermore, as highlighted in the DPS letter dated June 24, 2015,[23] should a situation or activity arise that is not authorized by the Commission the Company would include a description in the quarterly report and request such authorization through a petition to the Commission. Lastly, the Company looks forward to continued collaboration with DPS Staff beyond the formal quarterly reports.

[23] Tammy Mitchell and Marco Padula, "Letter to Utility REV Demonstration Project Representatives," Department of Public Service, via email, June 24, 2015.

Conclusion

Post-Demonstration Qualitative and Quantitative Benefits; Plans to Scale

The culmination of the first stage of the proposed demonstration project will be final "go/no-go" determinations by the proposed Potsdam microgrid customers and community leaders, to determine which of the four services they wish to receive from National Grid. The Company believes that results will not only inform future decisions internally, but those of peer utilities, policy makers, and regulators. If any or all of the four utility services are deemed a "go," they will include binding agreements from each of the affected parties. Furthermore, services deemed a "go" will require a second stage of demonstration. The second stage will consist of evaluation of each of the services to determine the effectiveness of the business model and the services provided. A more formal evaluation plan for the second stage will be proposed in the quarterly report to the Commission pending the results of the final "go/no-go" meeting. Microgrid services that are a "go" may become commercial offerings available to other communities interested in pursuing a community microgrid, depending on the results of second stage evaluation.

Post-demonstration, the Company will determine if a utility offering hybrid utility microgrids is feasible and scalable at that point in time. By conducting this demonstration, the Company will have a prototype of the stakeholder, business model, and technical study processes needed to offer, finance and build hybrid utility microgrids.

Advantage

With over *100 NY Prize* applications, this demonstration project can provide lessons learned useful not only to National Grid, but to other electric utilities, policy makers and regulators as they determine how to best fund and advance community resilience microgrids throughout New York State. While there is a great deal of technical promise in community microgrids, there are still many barriers to overcome in terms of hybrid utility microgrid business models. The Company believes that it can make meaningful progress in helping New York solve this challenge through this REV demonstration project.