nationalgrid

Community Resilience

REV Demonstration Project

Potsdam, New York

Q1 2016 Report

May 2, 2016

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1.0 Executive Summary

Under the Commission's Reforming the Energy Vision ("REV") proceeding, this Community Resilience Demonstration Project (the "Project") focuses on improving the local resiliency during severe weather events in the Village of Potsdam ("Potsdam"), located in the northern foothills of the Adirondacks in Upstate New York (the "North Country"), with the creation of a community microgrid. Potsdam and surrounding St. Lawrence County have experienced a number of multi-day power outages as a result of microbursts and winter ice storms; Most notably the "Ice Storm of 1998" which left over 100,000 customers without power for up to 3 weeks in the North Country and recently, in December of 2013, another ice storm isolated over 80,000 customers for days.

Image 1.2 – Photo of Upstate New York during the 1998 Ice Storm

Niagara Mohawk Power Corporation d/b/a National Grid ("National Grid or the "Company") has partnered with Clarkson University in order to develop a community resilience microgrid for Potsdam with an underground distribution network and coordination of new and existing Distributed Energy Resources ("DER"). Concurrently, the Company will develop and test new utility services that may be required for further microgrid deployment in New York State.

The four services to be developed and tested 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.

While National Grid is leading the Project, this demonstration is actually a close-knit partnership effort between Clarkson University and National Grid. Moreover, it will require significant input

from other major Potsdam stakeholders, such as the Village of Potsdam government, the Canton-Potsdam Hospital, and SUNY Potsdam.

Image 1.1 – The major stakeholder partners of the Community Resilience Demonstration (clockwise, from top left: Clarkson University, SUNY Potsdam, The Village of Potsdam, Canton-Potsdam (Hospital)

The project accomplished significant milestones in Q1 of 2016. The Company received approval by the Department of Public Service Staff ("Staff") in the Assessment Report (February 10, 2016). Meanwhile, National Grid developed and submitted a detailed Implementation Plan (March 11, 2016) while working alongside Clarkson University and General Electric ("GE") on the NYSERDA PON Study led by Clarkson University, which has 3 out of the 4 major tasks completed and is on track to be finished in schedule.

2.0 Highlights Since Previous Quarter

National Grid and the key partners have made critical progress in Q1 2016, with all parties on track to deliver the expected outcomes laid out in the Implementation Plan. Currently, most of the efforts relate to initial engineering design and feasibility studies plus community outreach and engagement. For a reference timeline highlighting the major milestones and accomplishments, please see Figure 2.1 below.

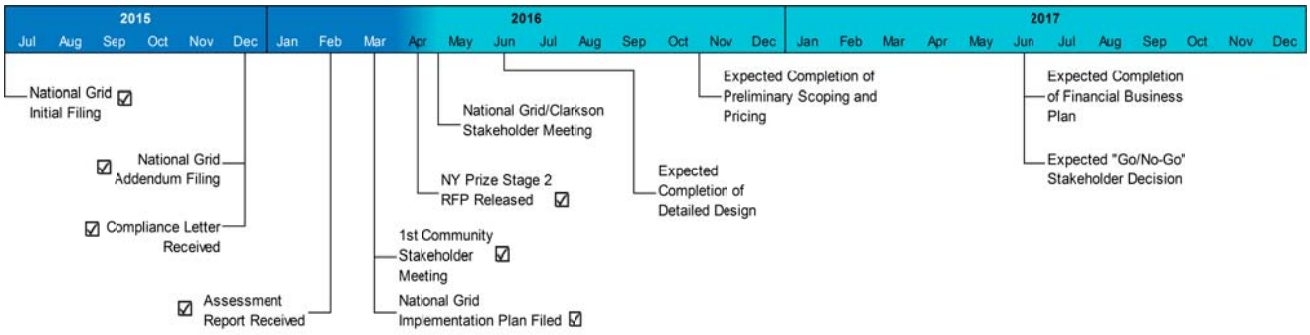

Figure 2.1 – Achievements and Milestones Timeline

2.1 Major Task Completion

1. Reforming the Energy Vision Demonstration Project Assessment Report; National Grid: Resiliency Demonstration Project Report received (February 10, 2016).
    - The report shows strong support and interest from Staff as they find it represents a "*relevant and innovative REV project*". Main quotes from the report:
        - *"The Potsdam Resiliency Project is the only demonstration project, to date, that explores the development of utility services and tariffs for the facilitation of community microgrids"*
        - *"The Potsdam Resiliency Project provides the opportunity to develop and test rules that may lead to standards and market rules for microgrids."*

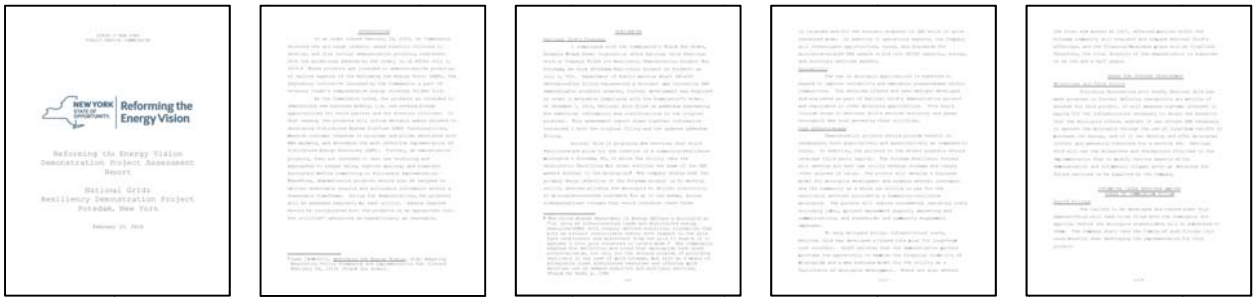

Figure 2.2 - Excerpts from the Assessment Report

2. Community Resilience Implementation Plan filed (March 11, 2016).
    - This document highlights a detailed structure for the successful implementation of this REV demo project.
3. Community Stakeholder Outreach Meeting at Clarkson University (March 14, 2016).
    - Participants:

- National Grid.
- Clarkson University.
- SUNY – Potsdam.
- Village of Potsdam.
- Canton - Potsdam Hospital.

- Utilized to update key stakeholders and solicit their continued input to the process. Items reviewed included:
  - Project scope and cost ranges, depending on size and number of participants of the microgrid.
  - The tiered-cost recovery (preferred financial recovery method)
  - Upcoming challenges and tasks for project demonstration.
- Meeting was well received by all participants. Possible microgrid participants were interested in learning more about the project's costs. Questions centered around:
  - Project finances.
  - Potential funding sources.
  - Regulatory questions regarding utility control and operation of the microgrid.
- National Grid Community Resiliency REV Demonstration Briefing Book created and distributed, which detailed project progress to date, including:
  - Study progress done to date and the funding sources from NYSERDA, GE, U.S. Department of Energy, and the National Science Foundation.
  - REV Demonstration Schedule and Estimated Microgrid Costs and financial barriers.
  - Stakeholder and Participant Overviews.
  - Recent Press Clippings.

Figure 1.3 - Excerpts from the Potsdam Community Resiliency REV Demonstration Briefing Book from March 14th

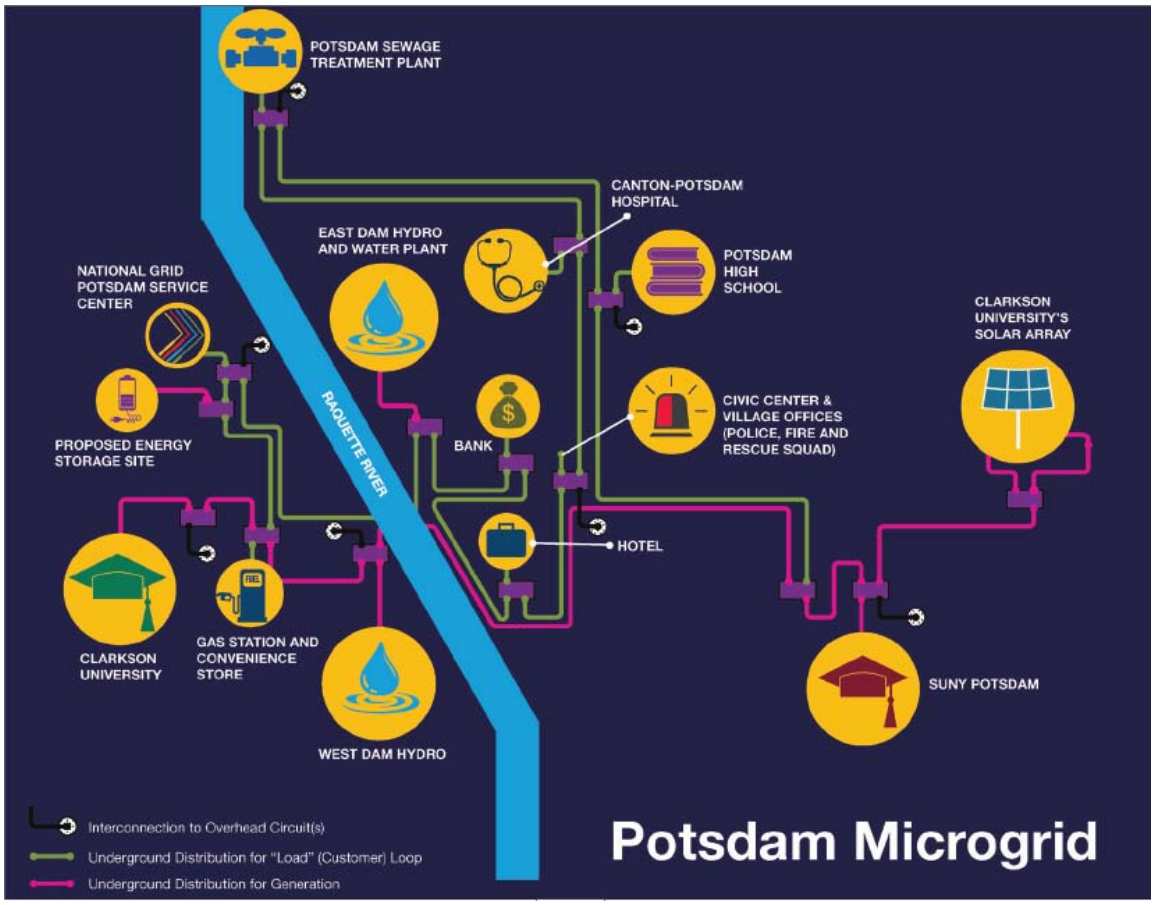

Figure 2.4 - Potsdam Microgrid Schematic prepared on the Briefing Book

4. Clarkson University NYSERDA PON 3 out of 4 Tasks Completion.
    - The NYSERDA/National Grid-funded project “Design of a Resilient Underground Microgrid in Potsdam, NY” has completed Technical Tasks 2 and 3, which are focused in analyzing the preliminary scoping of the microgrid in the Potsdam community.
    - This study has found that the existing generation will provide a significant benefit to the microgrid construction and islanding operations, however, additional DER are needed.
    - The underground primary distribution network will need to be reinforced with capacitors for voltage support (See Appendix B for initial design blueprints), which will be a major cost factor for construction. To limit overvoltage and provide appropriate ground fault current, two grounding transformers will need to be constructed.
    - The quantitative findings of Tasks 2 and 3 can be found in the table below.

Peak Microgrid Load	9 MW
Necessary peak-shed (Demand Response) during isolated operation	2 MW
New generation required for microgrid construction	4 MW

2.2 Challenges, Changes, and Lessons Learned

Issue or Change	What was the resulting change to Demo scope/timeline?	Strategies to resolve	Lessons Learned
Change in Project Management.	Christopher Yee (Project Manager, Solutions Delivery Team of New Energy Solutions, Christopher.yee@nationalgrid.com) and Daniel Payares (Project Manager, Solutions Delivery Team of New Energy Solutions, Daniel.PayaresLuzio@nationalgrid.com) replace John Monaghan as the Project Managers of the Community Resilience REV Demonstration.	Detailed transition task list developed by the former Project Manager to facilitate the transition.	Strong communication between all stakeholders is needed in order to maintain direction.
National Grid designated Executive Sponsor.	Phil Austen (Director, Solution Delivery Team of New Energy Solutions, PAusten@nationalgrid.com) designated as the Executive Sponsor for the Community Resilience REV Demonstration.	N/A	Corporate project sponsors can often facilitate resources and provide solutions for the development of the project.
Delayed release for NY Prize Stage 2 RFP.	Project timeline may be modified due to the delayed release of the NY Prize Stage 2 RFP. The RFP was originally scheduled to be released in the Fall of 2015, but was actually released on April 20, 2016.	Analyze which project tasks are and are not dependent on the NY Prize Stage 2 RFP release. To ensure minimal delays, National Gird has progressed on independent tasks and will reassess timeline changes for tasks that are dependent.	Delays and changes to the project timeline are still being analyzed due to the delay of the Stage 2 RFP release. Some delays may be unavoidable but with good planning and communication, they may be controlled and minimized. Project delays, if any, will be specified in a subsequent quarterly report.
Financial and technical issues for the Village of Potsdam: 1. Village under documented financial constraints 2. East Dam hydro plant is currently in disrepair.	The teams from Clarkson University and National Grid have been working together to develop alternative solutions that can be financially viable for the Village.	Looking for strategic partnerships or funding options to repair the East Dam hydro plant without posing a burden for the Village of Potsdam.	It's important to work alongside the different stakeholders, keeping communication channels open and honest.

3.0 Next Quarter Forecast

Q2 2016 will be focused on the NY Prize Stage 2 RFP (released on April 20, 2016) and community outreach efforts for microgrid generation stakeholders and microgrid participant stakeholders. NYSERDA Stage 2 RFP submissions will be due on October 12, 2016, and while National Grid will not have a submittal for this RFP, National Grid and Clarkson University will be coordinating roles and responsibilities, scoping, and pricing with our project partners to meet the RFP's detailed design requirements. However, due to the recent release of the Stage 2 RFP, it is unclear to what extent, if at all, the delay will affect the project timeline. Any need for a revised Project timeline will be reflected in a subsequent Quarterly Report.

From an engagement standpoint, National Grid will focus its efforts on calculating the participation benefits for commercial and residential customers for use in participant recruitment.

3.1 Checkpoints/Milestone Progress

	Checkpoint/Milestone	Anticipated Start-End Date	Revised Start-End Date	Status
1	Stakeholder Outreach	12/16/15 – 4/5/16	12/16/15 - Ongoing	●
2	Detailed Scoping Design (NY Prize Stage 2 RFP)	3/16/16 – 12/1/17	4/21/16 – 10/21/16	●
3	Clarkson University NYSERDA PON Study	10/2015 – Fall 2016	Un-changed	●

1. Stakeholder Outreach Roles and Responsibilities Meeting (May 2, 2016).

Stakeholder Outreach
Status: [●]
Start date: 12/16/15
End date: Ongoing

Clarkson University and National Grid will delineate roles and responsibilities for future stakeholder outreach for microgrid generation stakeholders, microgrid participants, and community residents to be conducted through a series of meetings. To reflect the continuous nature of the stakeholder outreach that is required for this Project, the end date has been changed from April 5^{t}, 2016 to 'Ongoing.' There are little to no associated impacts on the budget for this change. This includes delineating technical and management assignments for each type of customer who is affected or impacted by the microgrid. For example, the roles and responsibilities task list would look like:

- Microgrid Generation Stakeholders:

    - SUNY Potsdam.
        - National Grid Representative:
            - Technical.
            - Management.
        - Clarkson University:
            - Technical.
            - Management.
    - Canton-Potsdam Hospital:
        - National Grid Representative:
            - Technical.
            - Management.
        - Clarkson University:
            - Technical.
            - Management.
    - Village of Potsdam:
        - National Grid Representative:
            - Technical.
            - Management.
        - Clarkson University:
            - Technical.
            - Management.
- Microgrid Participants:
    - Grocery Store:
        - National Grid Representative:
            - Technical.
            - Management.
        - Clarkson University:
            - Technical.
            - Management.
    - Gas Station:
        - National Grid Representative:
            - Technical.
            - Management.
        - Clarkson University:
            - Technical.
            - Management.
    - Waste Water Treatment Plant.

In April, the National Grid and Clarkson University teams will begin to communicate about those in the community to engage in microgrid participation discussions, the best approach strategy (including the direct benefits to participants), and any marketing materials that can be created. In May, these teams will meet in-person in Syracuse to discuss their roles and responsibilities in depth.

2. NY Prize Stage 2 RFP.

Detailed Scoping Design
Status: [🟡]
Start Date: 4/212016
End Date: 10/21/2016

The delay in the NY Prize Stage 2 RFP from December 2015 to April 2016 may have an effect on the Project timeline. The RFP was released on April 20, 2016, and the National Grid team is actively reviewing its requirements. The National Grid team will reassess the responsibilities and requirements and how they may impact the Project timeline as it is currently proposed.

To begin work on the NY Prize Stage 2 RFP, the National Grid team has scheduled a meeting in May to discuss project roles and responsibilities between possible engineering consultants, National Grid, and other Project partners. In this meeting, partner scoping, pricing, and responsibilities will be tentatively established and assigned. Additionally, potential impacts associated with the NY Prize Stage 2 RFP release will be discussed and presented in a future Quarterly Report.

3. Clarkson University NYSERDA PON Study – Task 4 (Final).

Status: [🟢]
Start Date: Oct 2015
End Date: Fall 2016

Task 4, the final technical task of the Project, is underway. Task 4 aims to accomplish the following items:

- Cost/benefit analysis for the microgrid
- Further refinement of microgrid performance

4.0 Work Plan & Budget Review

4.1 Updated Work Plan

Due to the recent release of the NY Prize Stage 2 RFP, it is unclear how or to what extent the work plan will be affected. An updated work plan and timeline will be incorporated in the next Quarterly Report (Q2 2016).

The Gantt chart from the Project Implementation Plan (filed in March 2016) is below:

	Task Name	Duration	Start	Finish	Pre	Resource Names	Cost	Cost Notes	Funding Source
10	**REV Demonstration**	**394 days?**	**Tue 12/15/15**	**Fri 6/16/17**			**$606,000.00**		
11	Demonstration Approval	1 day	Tue 12/15/15	Tue 12/15/15		Department of Public Service	$0.00		
12	Set up project PMO	4 mons	Wed 12/16/15	Tue 4/5/16	11	John Monaghan	$104,000.00	This includes travel costs for Ngrid Employees for whole project and incremental labor for the PM	REV Demo
13	Initial stakeholder engagement and community outreach	4 mons?	Wed 12/16/15	Tue 4/5/16	3,11	Rich Burns,Virginia Limmiatis,Al Bianchetti,Dennis Elsenbeck	$50,000.00	This includes incremental labor as well as marketing materials, meeting costs, and local outreach to	REV Demo
14	Conceptual Design Complete Milestone	0 days	Fri 6/17/16	Fri 6/17/16	6		$0.00		
15	Initial Engineering Design Recovery Plan (Capital Costs)	4 mons	Wed 4/6/16	Tue 7/26/16	13,4	Carol Teixeira	$75,000.00	Incremental labor and/or external consulting	REV Demo
16	Initial Tariff Design (Commodity Costs)	5 mons	Mon 4/25/16	Fri 9/9/16	5,13	Carol Teixeira	$75,000.00	Incremental labor and/or external consulting	REV Demo
17	Stakeholder feedback on initial cost estimates and recovery/payment plan & additional community outreach	2 mons	Mon 9/12/16	Fri 11/4/16	15,16	Rich Burns,Virginia Limmiatis,Al Bianchetti,Dennis Elsenbeck	$50,000.00	Incremental labor and any community based marketing, outreach and education that is needed	REV Demo
18	Preliminary Service Proposals & Pricing	0 days	Fri 11/4/16	Fri 11/4/16	17		$0.00		
19	Coordinate and incorporate stakeholder feedback with Detailed Design Study team	2 mons?	Mon 11/7/16	Fri 12/30/16	17,8	John Monaghan,Rich Burns,Clay Burns	$27,000.00	Costs reflect PMO expenses in year 2	
20	Revise tariffs based on possible changes to NY Prize technical study	3 mons?	Mon 1/2/17	Fri 3/24/17	19	Carol Teixeria	$50,000.00	If changes to the tariff design are needed then the funds for initial tariff design will also be used here.	REV Demo
21	Draft contracts for Go/No-Go meeting with refined tariffs and business cases	3 mons	Mon 3/27/17	Fri 6/16/17	20	Janet Audunson	$75,000.00	Incremental labor and/or external legal counsel	REV Demo
22	Financial/Business Plan & Contracting ("Go/No-Go")	0 days	Fri 6/16/17	Fri 6/16/17	21	John Monaghan	$100,000.00	Costs include all stakeholder and community engagement as well as marketing and communications	

Figure 4.1 – Filed Gantt Chart from Project Implementation Plan

4.2 Updated Budget

The updated budget through February 2016 is:

Operational Expenditures					
Task	Budget	Quarterly Spend	Spend to Date	Expected Completion	Variance
Project Administration and Planning	$ 131,000	$ 19,323	$ 64,199	$ 131,000	$ -
Marketing and Community Engagement	$ 200,000	$ -	$ 869	$ 200,000	$ -
Implementation	$ 275,000	$ 861	$ 2,166	$ 275,000	$ -
Audit Grade Detailed Engineering Design	$ 1,000,000	$ 1,473	$ 3,516	$ 1,000,000	$ -
Totals:	**$ 1,606,000**	**$ 21,657**	**$ 70,750**	**$ 1,606,000**	**$ -**

Table 4.1 – Updated Budget

In the event of an overrun in the Project Administration and Planning task of the budget, a portion of the budgets from Marketing and Implementation will be reallocated to Project Administration. Due to the delay of the NY Prize Stage 2 RFP, it is unclear if and to what extent the associated delays will be to the Project, and the impact those delays will have on the budgets of this project. This will be updated in a subsequent quarterly report.

5.0 Progress Metrics

The size and number of participants in the microgrid will dramatically change the projected cost of the microgrid construction. This section will track the current projected cost range of the microgrid depending on the most recent engineering estimates as well as the projected resiliency duration of the detailed design.

Metric	As of Q1 2016
Projected Cost Range of Microgrid Construction	$5M - $12M
Projected Resiliency Duration	14 Days

Other metrics may be added to subsequent quarterly reports as they become more relevant as the Project progresses.

6.0 Appendices

Appendix A: Detailed Microgrid Info Graphic

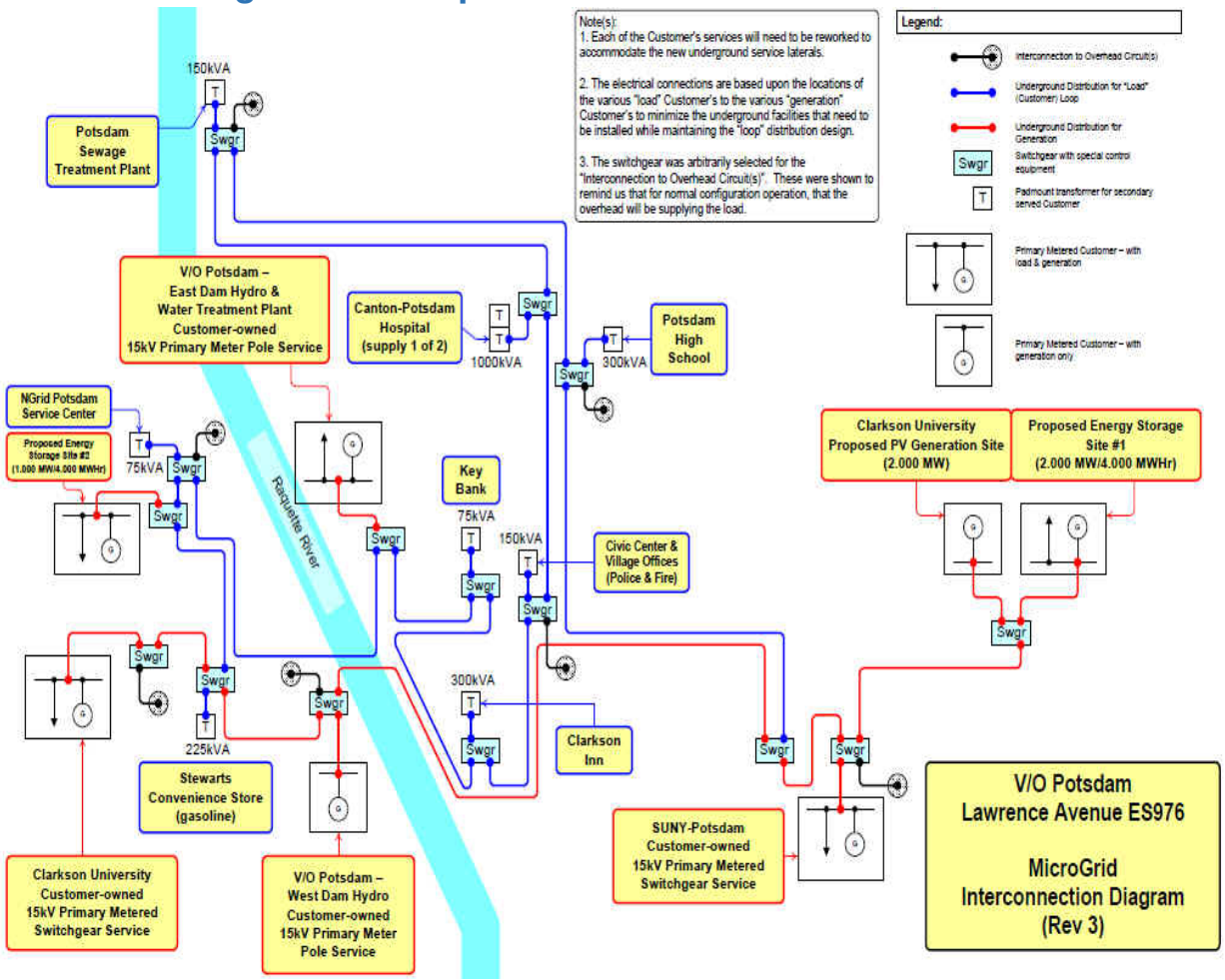

Figure A.1 – Detailed Microgrid Info graphic.

Appendix B: Initial Microgrid Underground Duct-Line Design

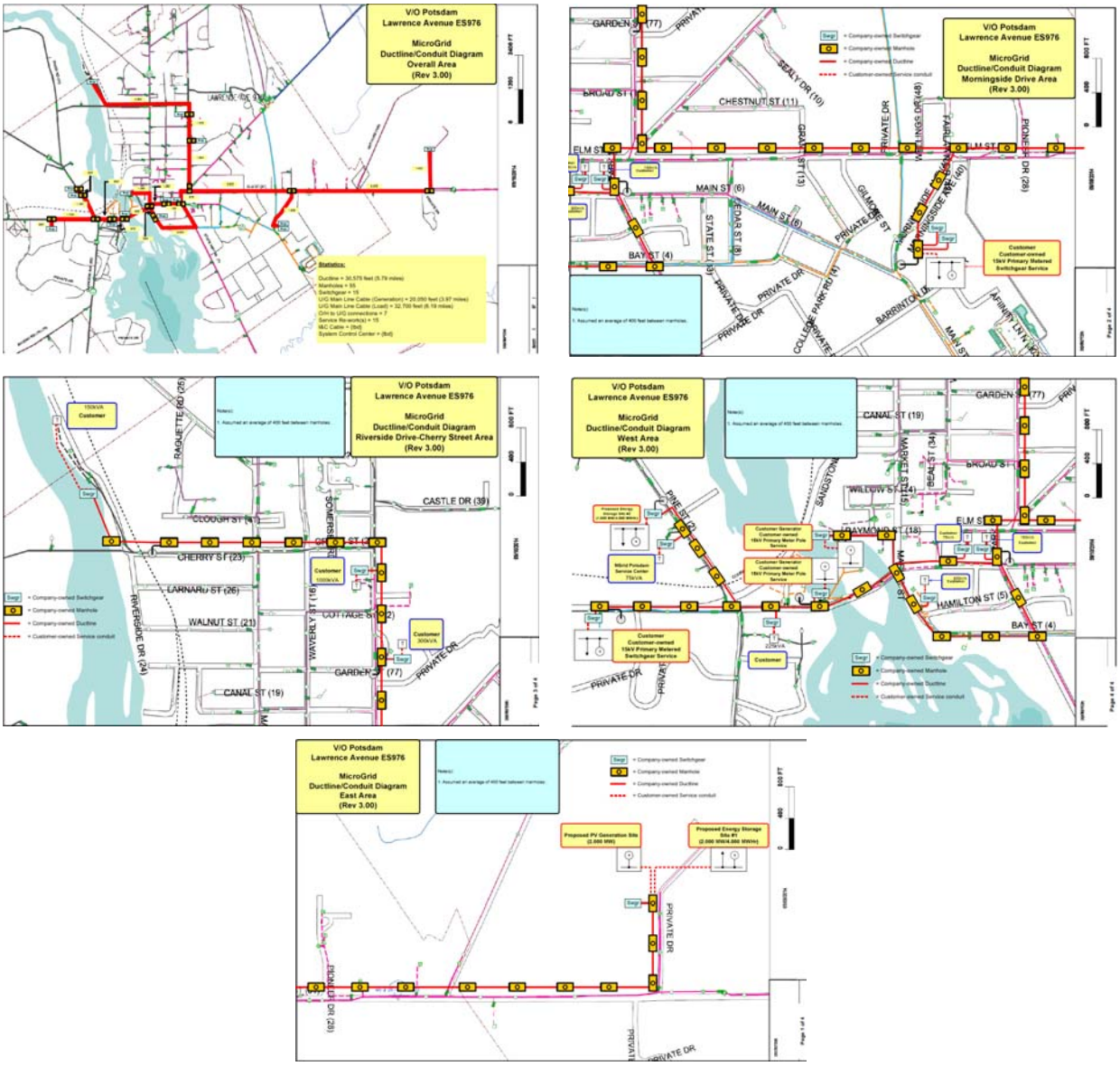

Figure B.1 – Images from Initial Microgrid Underground Duct-Line Design