nationalgrid

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October 31, 2019

VIA ELECTRONIC DELIVERY

Honorable Michelle Phillips
Acting 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)

NIAGARA MOHAWK POWER CORPORATION d/b/a NATIONAL GRID: DISTRIBUTED SYSTEM PLATFORM REV DEMONSTRATION PROJECT – Q3 2019 REPORT

Dear Secretary Phillips:

Niagara Mohawk Power Corporation d/b/a National Grid ("National Grid") hereby submits for filing its quarterly update to the Distributed System Platform REV Demonstration Project Implementation Plan covering the period of July 1, 2019 to September 30, 2019 ("Q3 2019 Report") as required by the REV Demonstration Project Assessment Report filed by the New York State Department of Public Service Staff with the Commission on July 15, 2016 in Case 14-M-0101.

Please direct any questions regarding this filing to:

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Respectfully submitted,

/s/ Karla M. Corpus

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Enc.

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Distributed System Platform
REV Demonstration Project
Buffalo, New York

Q3 2019 Report

October 31, 2019

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1.0 Executive Summary

Under the Commission's Reforming the Energy Vision ("REV") Proceeding, the Distributed System Platform ("DSP") -Demonstration Project (the "Project") aims to develop, deploy, and test a software platform serving as the first of its kind solution addressing the need to create a new distribution-level energy market . The DSP developed under this Project serves as a transactive energy market platform. The Project identifies the locational generation value of customer-owned distributed energy resources ("DER") and provides a platform that allows these assets to provide energy and/or ancillary services to the electric distribution system (*i.e.,* the "grid"). The Project was initially filed with the New York State Public Service Commission ("Commission") by Niagara Mohawk Power Corporation d/b/a National Grid ("National Grid" or the "Company") on July 1, 2015. A revised scope for the Project was filed with the Commission on June 15, 2016. The review of the revised scope for the Project was completed by the New York State Department of Public Service Staff ("DPS Staff") on June 22, 2016. DPS Staff subsequently filed an assessment report with the Commission on July 15, 2016 finding that the Project meets the Commission's REV policy objectives and demonstration project principles and complies with Ordering Clause 4 of the Commission's Track One Order.[1]

The Project was designed to test a simple, small-scale DSP that communicates with network-connected Points of Control ("POCs") associated with the Buffalo Niagara Medical Campus Inc. ("BNMC") DERs and one (1) or two (2) additional participants that may present different distribution-level constraints or DER types. This Project envisioned developing "an intelligent network platform that will provide safe, reliable and efficient electric services by integrating diverse resources to meet customers' and society's evolving needs" where the "DSP fosters broad market activity that monetizes system and social values, by enabling active customer and third-party engagement that is aligned with the wholesale market and bulk power system."[2]

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[1] 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) ("Track One Order"), p. 132.
[2] *Id*., p. 31

Figure 1.1 –Buffalo Niagara Medical Campus Central Area

As healthcare providers, hospitals such as those located at the BNMC are required to have access to back-up or emergency power, which is typically addressed by distributed generation (“DG”). However, these expensive DG assets are seldom used. When not supplying power to their own facility, the DSP provides DG owners the option to extract more value from those DG assets by participating in the DSP energy market.

The original Project team consisted of National Grid, BNMC, and Opus One Solutions (“Opus One”). The Burrstone Energy Center (“Burrstone”) completed the DSP enrollment process in late March 2019 and made its first transaction on the DSP on April 3, 2019, selling power from its cogeneration plant.

Opus One provides contracted software development services to National Grid. Their role in the Project includes software development, as well as thought leadership, planning, and execution.

Burrstone is a combined heat and power (“CHP”) cogeneration plant located near Faxon-St. Luke’s Hospital in Utica, NY. The facility is located in one of the nine (9) high distribution value locations that was identified by National Grid’s Distribution Planning and Asset Management (“DPAM”) group in Q3 2018. The Burrstone plant is operated by Cogen Power Technologies (“CPT”) and is owned jointly by CPT and the three (3) facilities it serves: Faxton-St Luke’s Hospital, Faxton-St Luke’s Nursing Home and Utica College. The four (4) engines that generate 3.7 MW of electricity also generate hot water and steam that Burrstone sells to the nearby hospital facility. The four (4) electric generators (1 per engine) are interconnected to provide behind-the-meter power to the hospital (2200 kW), Utica college (1100 kW), and to an adult living facility (330 kW). The behind-the-meter generators are also able to reverse power through two (2) of the facility meters, exporting a maximum of 1MW to the grid.

Figure 1.2 – Images of Kaleida Health in Buffalo, a BNMC member (left); and the Burrstone Cogen Plant, located in Utica

Under this Project, DER owners were paid for exporting their onsite power to the grid and National Grid was paid a five percent (5%) fee for each energy transactions made on the DSP. This Project also met several New York REV objectives stated in the Track One Order.

The Financial Model for DER Value Streams: LMP+D+E

In the near term, services transacted and purchased through this DSP tested the implementation of a "LMP+D+E" financial model approach for electric services. The value of "LMP+D+E" was used to generate financial incentives to inspire existing DER owners to participate in the DSP market. For LMP, the Project used New York Independent System Operator ("NYISO") locational-based marginal prices ("LBMP") for Day-Ahead ("DA") and hour-ahead (HA) (also sometimes termed same-day (SD) market prices) [3] and any additional capacity constraints and transmission losses that may be priced into the local area through the New York Installed Capacity Market ("ICAP") that can be determined.

"D" refers to distribution delivery value, which is the value that DERs can provide to the electric distribution system, such as load relief to help alleviate substation or feeder constraints. This Project analyzed potential issues with capacity provision by considering average demand, peak demand, forecasts of demand growth, day-ahead load forecast, and historical demand at the feeder and substation levels. After analyzing these issues, values were assigned to each of these items.

"E" refers to external or societal value, such as low carbon, renewable, or domestic fuel source use, that may be provided by DERs. The value of E will be allocated to those renewable generation, or current Net Energy Metered ("NEM") resources, eligible to participate in the Value of DER Phase One NEM or Value Stack compensation as set out in the Commission's Value of

[3] NYISO LBMP and real-time pricing information, *available at*: http://www.nyiso.com/public/markets_operations/market_data/pricing_data/index.jsp.

DER (“VDER”) Order[4], which may include solar PV, biodigester, micro-CHP, fuel cell, and micro-hydro DGs.

[4] Case 15-E-0751 *et al*., *In the Matter of the Value of Distributed Energy Resources* (“VDER Proceeding”) *et al*., *Order on Net Energy Metering Transition, Phase One of Value of Distributed Energy Resources, and Related Matters* (issued March 9, 2017).

2.0 Highlights Since Previous Quarter

During Q3 2019, Opus One Solutions (“Opus One”) completed development of various software features, and National Grid progressed towards ending the Project on schedule. Figure 2.1 lists the major milestones and accomplishments.

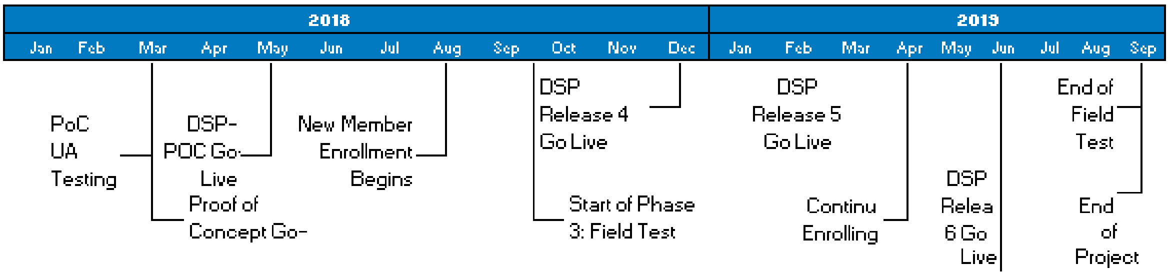


Figure 2.1 – Project Achievements and Milestones Timeline; 2018 – 2019

2.1 Major Task Activities

1. DSP Sprint Releases

National Grid and Opus One maintained focus on the technology development of the DSP software. They completed building software features and provided user acceptance testing (“UAT”) demonstrations. Key DSP software accomplishments completed this quarter include:

- Software Development:
    - *Battery Energy Storage System (“BESS”) control:* The DSP can now collaborate with control hardware to optimally accept events and dispatch BESS to the grid. A BESS will discharge in response to the most lucrative pricing events in a day. Each BESS will dispatch within its physical limits, and recharge when the electric price is at low-cost times of the day.
    - *Improved DSP Key Performance Indicators (“KPI”) Reporting:* The DSP now aggregates and displays market statistics to supplement existing reporting dashboards. These new monthly data aggregations consist of:
        - Customer Performance (MW generation, percent of MW commitment delivered; percent of delivery events completed);
        - Market Summary (reporting energy generated; and Settlement fees paid out); and
        - Top Performing Customers.

- *DSP Alarms*: The DSP now triggers an enhanced alarm and notification system for the DSP operator. The DSP operator can now be informed of event generation failure and market shutoff.

- UAT performed for Service Level Agreement (SLA) 3 scope. Following National Grid's acceptance, the new module was deployed into the DSP software.

- Closing of Project Phase 2: Technology Development; and
- Start of Project Phase 3, Monitoring and Reporting.

Additionally, Opus One hosted a deep-dive demonstration of the software's latest capabilities for National Grid stakeholders

2. Existing DSP Participation

As noted in Project's Q2 2019 report, the Burrstone CHP unit experienced an electromechanical failure in April 2019, ending its DSP participation for that quarter. Although Cogen Power Technologies ("CPT") planned to resume participation in Q3 2019, their equipment supplier did not deliver the required equipment in time to enable the Burrstone plant to resume operation during Q3 2019. In August 2019, CPT reported to National Grid that they pushed back the Burrstone plant's restart date to mid-Q4 2019, which is after the Project has ended.

Kaleida Health did not export power via the DSP during Q3 2019.

3. Enrollment of New DSP Participants

Through its agent, another customer located at the BNMC notified National Grid that it is considering installing a 500kW BESS to meet peak power requirements for new operations planned at the facility. The customer explored both increasing the delivery capacity to their facility as well as installing a BESS. The customer's agent asked National Grid to enroll the proposed BESS in the DSP. National Grid explored this option and learned the customer plans to use the battery only for its own internal peak load shaving; the BESS will not export power to the grid. This Project's fundamental structure centers on exporting power to the grid based on price signals. Furthermore, since the new plant process will occur regardless of the power price, the DER owner's decisions would not be made based on day-ahead or hour-ahead power prices. Therefore, the customer's proposed BESS DER configuration does not match this DSP.

Evaluation of one (1) additional potential participant was completed. A farm customer uses an anaerobic digestor to process animal waste to generate methane which is then used to power the farm's generator. However, this owner will be shutting down his biogas-fueled generator and is thus not a candidate for DSP participation.

National Grid also developed a marketing strategy to identify likely DSP participants based on DER type and location relative to a zone earning the Location System Relief Value (“LSRV”) [5]. Participation is expected to be greater in LSRV zones because DER owners in those zones are expected to qualify to receive a higher payout for exporting power using the DSP price formula than they currently receive selling their power under their respective power purchase agreement (“PPA”).

2.2 Challenges, Changes, and Lessons Learned this Quarter

2019	Issue or Change	Resulting Change to Project Scope/Timeline?	Strategies to Resolve	Lessons Learned
Q3	The Burrstone Energy Plant was not able to return to service during this quarter, and Kaleida Health chose not to participate in the DSP this quarter.	There was no DSP participation this quarter.	DSP participation evaluation will be based on Kaleida Health’s February participation and Burrstone’s April participation.	Plan for a percentage of DER assets to be non-functional for a portion of the year.

[5] Location System Relief Value *(LSRV) is a factor in New York’s Value Stack which addresses the benefit of installing DERs on constrained electric feeders.

3.0 Next Quarter Forecast

Per the Project's schedule, data collection ended in Q3 2019. Opus One will submit their software development report to National Grid and will demonstrate the features of their software developed under this Project. National Grid will also prepare a final Project report.

3.1 Checkpoints/Milestone Progress

As noted in Table 3-1, each of the first three (3) major milestones have been completed per the Project scope. The fourth milestone, 'Enroll new DSP participants', was terminated this quarter, as the Project team determined potential participants were not interested in expending the enrollment effort to subsequently participate in this DSP demo for only a short period.

	Checkpoint/Milestone	**Anticipated Start-End Date**	**Revised Start-End Date**	**Status**
1	DSP Field Demonstration Monitoring and Controlling	10/1/17 – 10/1/18	4/1/18 – 9/30/19	
2	DSP Sprint Development	1/1/19 – 5/31/19	1/1/19 – 9/30/19	
3	User Acceptance Testing and DSP Releases 5&6 Go Live	4/19/19 – 6/28/19	4/19/19 – 9/30/19	
4	Enroll new DSP participants	7/1/18 – 10/25/18	7/1/18 – 7/31/19	

Key

On-Track

Delayed start, at risk of missing on-time completion, or over-budget

Terminated/abandoned checkpoint

Table 3-1 Checkpoints/Milestones Progress

4.0 Work Plan & Budget Review

4.1 Updated Work Plan

There were no changes made to the overall Project work plan or schedule during Q3 2019. The Gantt chart presented in Figure 4-1 remains unchanged from the version presented in the Q2 2019 report.

Task Name	Start	Finish
Phase 0	**Mon 8/15/16**	**Mon 8/29/16**
Project Kickoff	Thu 9/8/16	Thu 9/8/16
Phase 1 - Financial Model	**Thu 9/8/16**	**Wed 3/29/17**
Phase 2 - Technology Development	**Mon 4/17/17**	**Wed 11/28/18**
Phase 2 Kickoff	Mon 4/17/17	Mon 4/17/17
DSP & POC	**Tue 4/18/17**	**Wed 11/28/18**
Requirements definition	**Tue 4/18/17**	**Mon 8/7/17**
Solution Design	**Tue 8/8/17**	**Mon 10/16/17**
Solution Development	**Tue 10/10/17**	**Wed 11/28/18**
Software Development	Tue 10/10/17	Mon 6/4/18
PoC UAT	Wed 3/21/18	Tue 3/27/18
PoC Go Live	Wed 3/28/18	Fri 3/30/18
DSP-POC UAT	Thu 5/17/18	Wed 5/30/18
DSP-POC Go Live	Thu 5/31/18	Fri 6/1/18
Go/No Go Decision	Mon 6/4/18	Tue 6/5/18
Release 3 Go Live	Mon 6/4/18	Wed 11/28/18
Release 4 Go Live	Mon 7/30/18	Wed 11/28/18
Phase 3 - Field demonstration	**Wed 3/21/18**	**Fri 10/25/19**
Phase 3 Kickoff	Fri 3/30/18	Fri 3/30/18
M&V Equipment Installation	Sun 4/1/18	Tue 8/21/18
Evaluate New Customer Enrollment	Wed 3/21/18	Thu 6/28/18
Enroll New Customers	Fri 6/29/18	Mon 4/1/19
DSP, POC and Market Monitoring and Measurement	**Mon 4/2/18**	**Fri 10/25/19**
Evaluate new revenue streams	Mon 4/2/18	Fri 5/24/19
Scenario and Sensitivity Testing and Analysis	Mon 4/2/18	Fri 5/24/19
Continuous Improvement and Updates	Mon 4/2/18	Fri 9/27/19
Project Clousure (Reporting, etc)	Mon 9/30/19	Fri 10/25/19

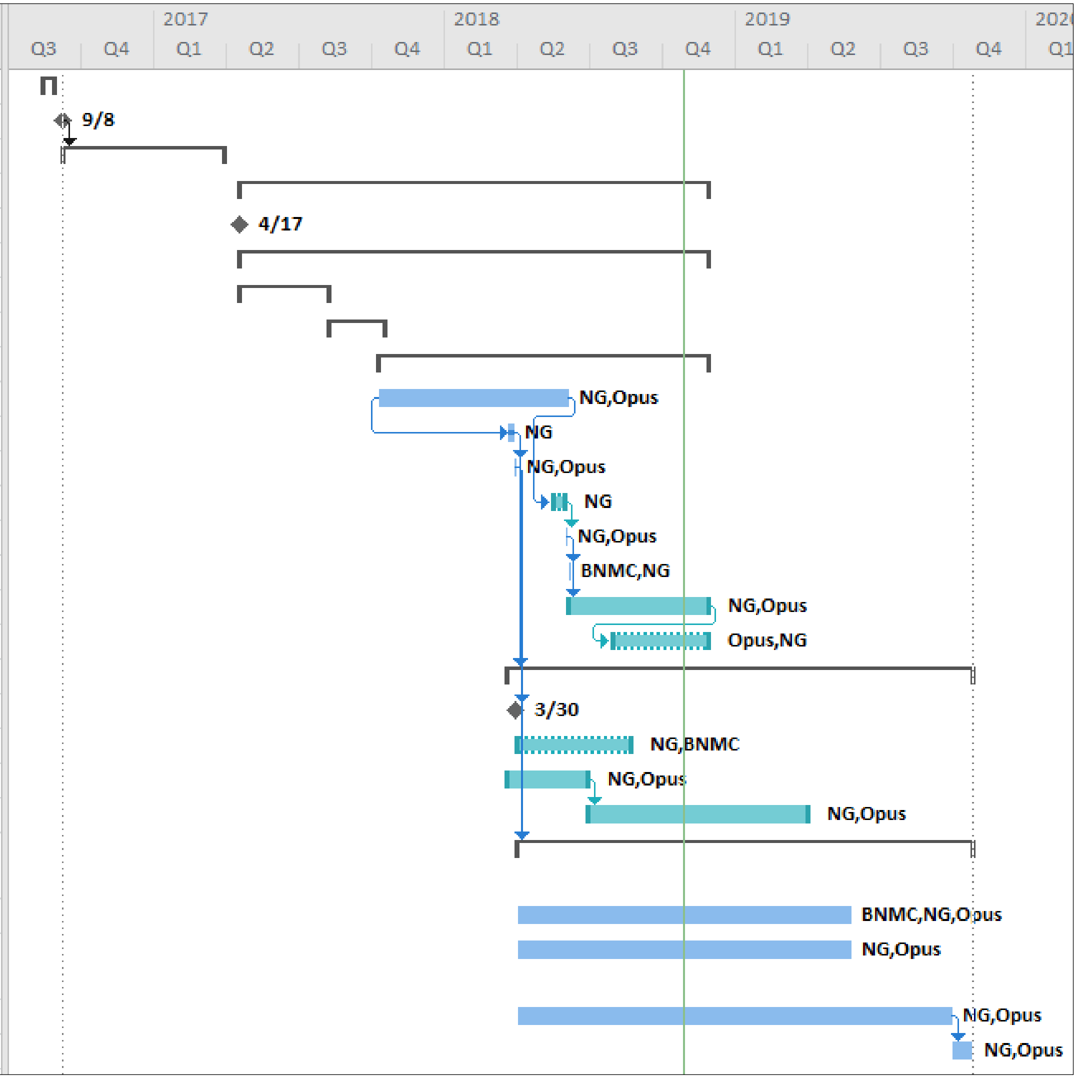


Figure 4.1 – Update of Gantt Chart Presented in the DSP Implementation Plan

4.2 Updated Budget

No changes were made to the Project budget in Q3 2019. The spend-to-date data and the current Project budget are listed in Table 4-1.

Project Task	**3rd Quarter Incremental and Non-Incremental Spend**	**Project Total Incremental and non-Incremental Spend to Date**
NG Resources	$ 4,559	$ 911,572
IT Integration Services	$ -	$ 542,795
Program Management	$ 252,527	$ 2,045,822
Software License	$ -	$ 850,000
Software Development ($2M in kind)	$ -	$ -
DER Payments	$ -	$ -
Annual Software License Maintenance (est.)		
Total	**$ 257,086**	**$ 4,350,189**

-

Table 4.1 – Updated Spend-to-Date and Budget

Project Task	**Incremental Project Budget [6]**
NG Resources	$ 915,000
IT Integration Services	$ 586,000
Program Management	$ 2,000,000
Software License	$ 1,000,000
Software Development ($2M in kind)	$ -
DER Payments	$ 859,000
Annual Software License Maintenance (est.)	$ 150,000
Total	**$ 5,510,000**
Incremental Spend to Date:	**$ 3,296,647**
Remaining Incremental Budget:	**$ 2,213,653**

[6] The Company updated the Project budget to reflect incremental costs, and to account for costs that may have originally been characterized as capital or operating expenses, but now, because of changed circumstances (*e.g.*, licensing instead of owning software), should be categorized differently.

Table 4.2 – Updated Spend-to-Date and Budget

The Project's incremental balance is $2,213,653 (see Table 4-2). Of this balance, approximately $309,000 will be spent on:

- Opus One completing its overall report;
- Annual license maintenance fee balance;
- Preparing the Q3 quarterly report;
- Preparing the Project final report;
- Preparing for and holding a final Project meeting with DPS Staff; and
- Closing out the Project.

The Project's final incremental spend is estimated to be approximately $3.6M.

5.0 Tracking Metrics

The Project team continued to monitor prices at the BNMC location (NYISO Zone A -West) for both day-ahead and same-day (hour ahead) events and monitor any peak events that may have occurred at the bulk or feeder level. Table 5.1 presents the monthly average and maximum DSP prices for DA and SD for Q3 2019 (from July 1, 2019 to September 30, 2019) in $/MWh.

Month	Event Type	Min DSP Price ($/MWh)	Average DSP Price ($/MWh)	Max DSP Price ($/MWh)
July	DA	$12.25	$33.70	$107.11
	SD	-$2.34	$32.07	$128.22
August	DA	$12.15	$26.58	$94.98
	SD	$2.75	$26.94	$142.44
September	DA	$7.99	$23.87	$63.62
	SD	-$6.48	$30.44	$149.10

Table 5.1 – NY ISO Zone E DSP Price Comparison for Q3 2019*

The graphs in Figure 5.1 – 5-3 display the variation trend for DA and SD prices in Q3 2019 in NY ISO Zone A. Note that the price spikes in the DA and SD prices in July, as well as the SD price in August, were excluded from these graphs so as to maintain legibility of the price variation for the other points on the graphs.

DSP price spikes may occur for two main reasons. The first reason is B1 pricing, which is triggered when an hour is deemed by the NYISO to be a potential peak hour. B1 pricing increases the overall price because it values the ICAP savings that would be achieved by reducing peak demand. The second reason is the look-ahead in the Same-Day market. In the Same Day price generation process, the DSP collects and averages NYISO's expected electric prices 85 minutes before the operating hour. However, generation bids for the operating hour are not due to NYISO until 75 minutes before the hour. Consequently, DSP's look-ahead prices do not necessarily reflect accurate price forecasts, and very high price forecasts may subsequently be mitigated by bids submitted for that hour after the DSP has already published its pricing report.

The Project's platform was taken out of service for two (2) short maintenance events during Q3 2019; one on August 13, and one that started on September 16th and extended through September 17th. Thus, no data was collected on the afternoon of August 13th and for all of

September 17th. The September graphs report only on the data collected, therefore they do not show gaps for data that was not collected.

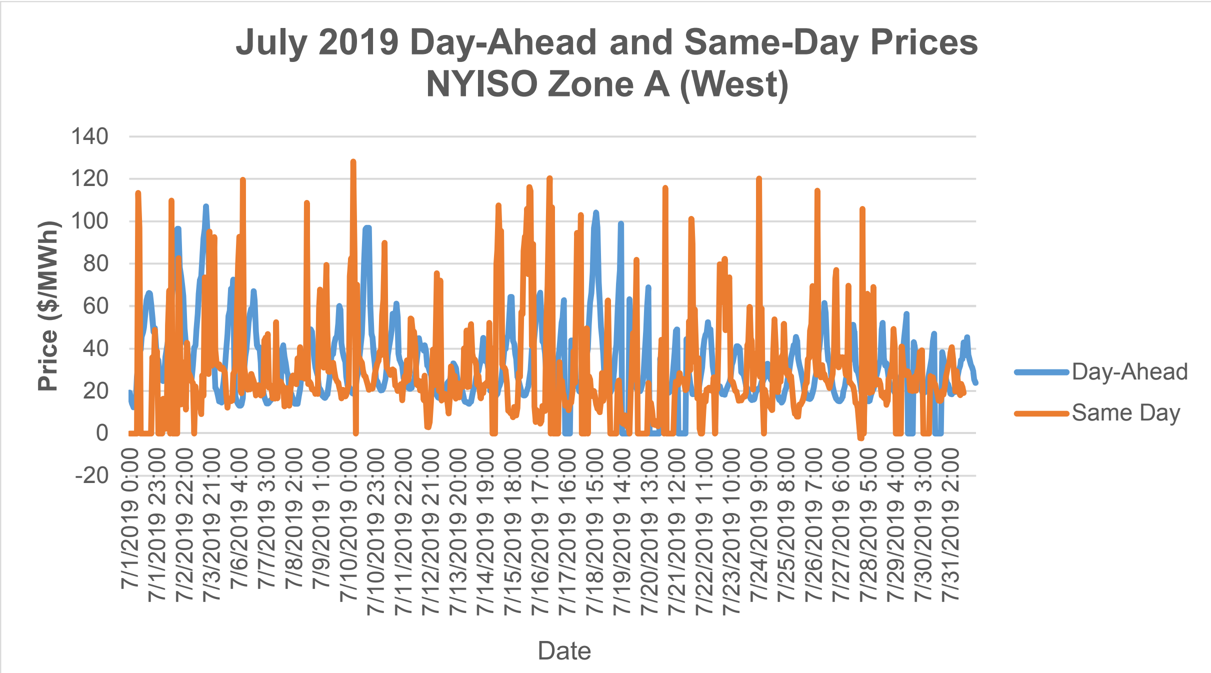


Figure 5.1 – DA vs SD DSP Price trends for July 2019

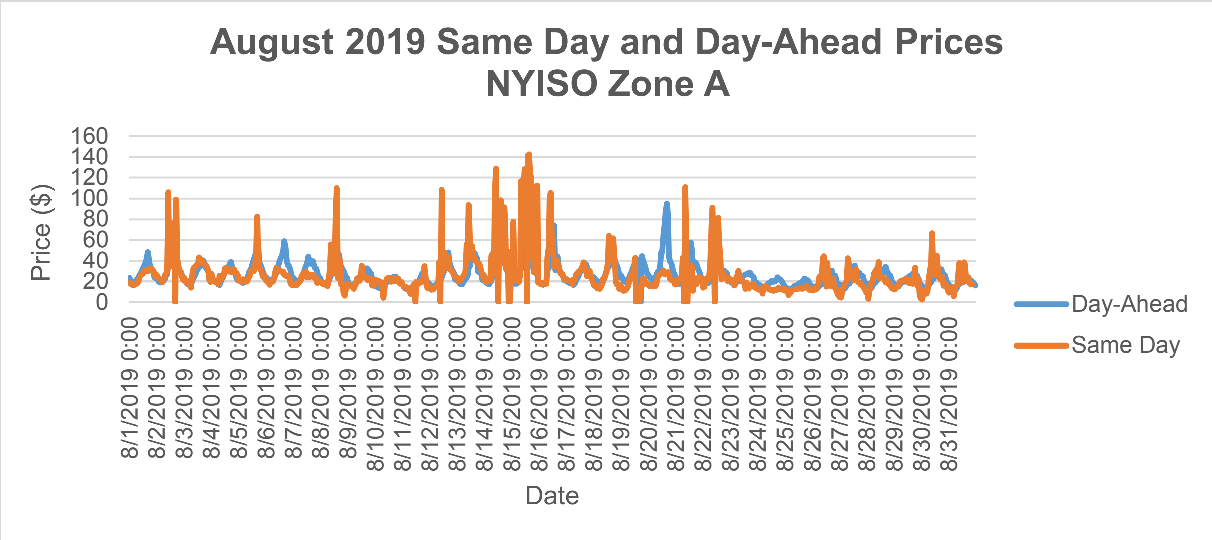


Figure 5.2 DA vs SD DSP Price trends for August 2019

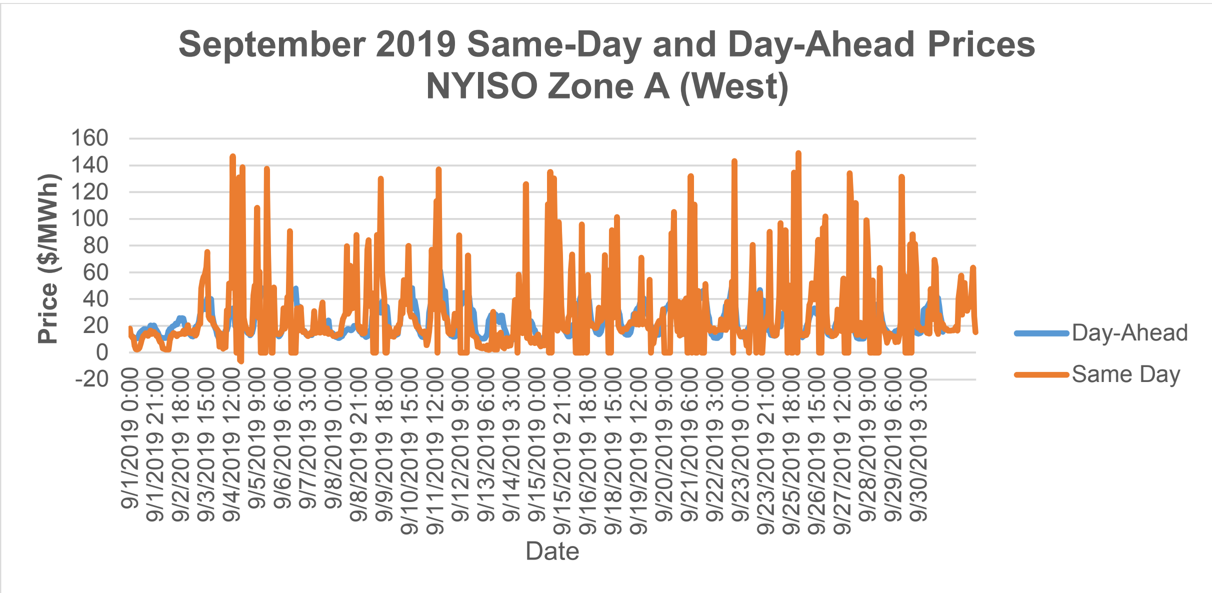


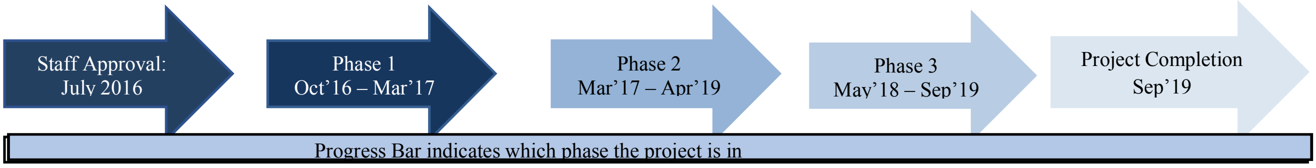
Figure 5.3 – DA vs SD DSP Price trends for September 2019

6.0 Exhibits

A. Exhibit A – One Page Summary

Distributed System Platform REV Demo 9/30/19 (Data as of Q3-19) Status: Completed

Project Start Date: 10/01/2016 **Project End Date:** 09/30/2019
Budget: $5,510,000 **Current Quarter Spend:** $257,086 **Cumulative Spend:** $4,350,189



Project Summary: The DSP Project tested how well a platform can calculate location-specific energy values and open a new marketplace that enables customer-owned DERs to export power to the grid. National Grid Project partners included the Buffalo-Niagara Medical Campus (BNMC), Opus One Solutions, and the Burrstone Energy Center.

Cumulative Lessons Learned		
The Customer	**Market Partner**	**Utility Operations**
• Until VDER is live, NEM-qualifying assets are not likely to join the DSP. • Some DER owners have been interested in exploring participation, but unable to participate in the DSP because of existing PPAs. • There is a high revenue potential for customers with Energy Storage Systems (ESS) paired with renewables, helping NYS to reach its clean energy goals. • There is customer interest to leverage the DSP market when designing the capacity of CHP systems.	• The creation of a new revenue stream for DERs is an opportunity for many DER providers/developers as it can help the business case for new investments and increased DER capacity. • Non-recourse third party financiers require DER partners to demonstrate long term firm revenue streams. • The market adoption of open-source protocols for controlling DERs (*e.g.* VOLTTRON™, OpenADR) is critical for DSP market expansion and should be included as a requisite for all new interconnection requests.	• Using Scrum/Agile for product development has allowed the project to evolve with the pace of technology innovation. • Testing the benefits of informed predictability of DER operation for system operation. • Understanding customer behavior and responsiveness to different types of market events to develop better customer offerings. • By leveraging DER capabilities (and knowing their constraints) NG could improve system operations, power quality, reliability and resiliency. • Using the DSP, NG could guide DER investment in right places with higher location-based pricing.

Application of lessons learned: National Grid continues to use several of the lessons learned to inform the larger Joint Utility work on the DSIP. Concurrently, the company is testing the customer behavior, reliability and responsiveness to market signals to evaluate effectiveness for use in NWA locations and to boost reliability and resilience.

Issues Identified: The only DER located on the BNMC that chose to export power via the DSP reported their air emissions permits limit their DSP participation. The other participant's DER failed in April and did not return to service before the end of this Project.

Solutions Identified: Future DSP participation will require solicitation of DERs not constrained by operating permits or other factors. Rather than enroll diesel generation, enroll owners of DER fueled by biogas, as well as solar and storage facilities because these are better suited for DSP participation, as they are able to dispatch on command and do not emit greenhouse gases.

Recent Milestones/Targets Met: 9/30/19 –DSP field testing completed.

Upcoming Milestones/Targets: This Project's data collection phase has been completed. The close-out process will be completed in Q4 of 2019.

For full details please refer to: Case 14-M-0101 – Proceeding on Motion of the Commission in Regard to Reforming the Energy Vision (REV), NIAGARAMOHAWK POWER CORPORATION d/b/a NATIONAL GRID: DISTRIBUTED SYSTEM PLATFORM REV DEMONSTRATION PROJECT – Q1 2019 REPORT, April 30, 2019