

April 30, 2018

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)

NIAGARA MOHAWK POWER CORPORATION d/b/a NATIONAL GRID: DISTRIBUTED SYSTEM PLATFORM REV DEMONSTRATION PROJECT – Q1 2018 REPORT

Dear Secretary Burgess:

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 January 1, 2018 to March 31, 2018 (“Q1 2018 Report”) as required by the REV Demonstration Project Assessment Report filed by the New York State Department of Public Service Staff (“Staff”) with the Commission on July 15, 2016 in Case 14-M-0101.

Please direct any questions regarding this filing to:

Arunkumar Vedhathiri
Director, New Energy Solutions
National Grid
1125 Broadway
Albany, NY 12204
Tel.: 518-433-5013
Mobile: 518-423-5738
Email: arunkumar.vedhathiri@nationalgrid.com

Hon. Kathleen H. Burgess, Secretary
National Grid: Distributed System Platform REV Demonstration Project
Q1 2018 Report
April 30, 2018
Page 2

National Grid looks forward to continuing to work collaboratively with Staff as it proceeds with the implementation of the Distributed System Platform REV Demonstration Project.

Respectfully submitted,

/s/ Karla M. Corpus

Karla M. Corpus
Senior Counsel

Enc.

cc: Marco Padula, DPS Staff, w/enclosure (via electronic mail)
Christian Bonvin, DPS Staff, w/enclosure (via electronic mail)
Denise Gerbsch, DPS Staff, w/enclosure (via electronic mail)
Michael Summa, DPS Staff, w/enclosure (via electronic mail)
Melanie Littlejohn, w/enclosure (via electronic mail)
Cathy Hughto-Delzer, w/enclosure (via electronic mail)
Arunkumar Vedhathiri, w/enclosure (via electronic mail)
Carlos Nouel, w/enclosure (via electronic mail)
Ronald Diorio, w/enclosure (via electronic mail)
Daniel Payares Luzio, w/enclosure (via electronic mail)
Pamela I. Echenique, w/enclosure (via electronic mail)
Carol Teixeira, w/enclosure (via electronic mail)
Janet Audunson, w/enclosure (via electronic mail)

nationalgrid

**Distributed System Platform
REV Demonstration Project
Buffalo, New York**

Q1 2018 Report

April 30, 2018

Table of Content

1.0	Executive Summary	1
2.0	Highlights Since Previous Quarter	3
2.1	Major Task Activities	3
2.2	Challenges, Changes, and Lessons Learned this Quarter	6
3.0	Next Quarter Forecast.....	6
3.1	Checkpoints/Milestone Progress	7
4.0	Work Plan & Budget Review	9
4.1	Updated Work Plan.....	9
4.2	Updated Budget	11
5.0	Tracking Metrics.....	11

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 the first of its kind solution with the objective to create a new distribution-level energy market. The Project will identify the locational generation value of customer-owned distributed energy resources ("DER") and provide a platform that will allow these assets to participate and 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 will test services based on a local, small-scale, but centralized DSP that will communicate with network-connected Points of Control ("POCs") associated with the Buffalo Niagara Medical Campus Inc. ("BNMC") DERs. DSP is defined as "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

The Project team consists of National Grid, BNMC, and Opus One Solutions ("Opus One"). Opus One will provide contracted services to National Grid. Opus One is a software engineering company which shares the vision for the Project to develop and deploy one platform that can accommodate a complete range of business models. Their role in the Project will encompass not only software development, but also thought leadership, planning, and execution.



Image 1.1 – Part of the Buffalo Niagara Medical Campus

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

The BNMC (*depicted in Image 1.1*), consisting of thirteen (13) member institutions and close to one hundred (100) public and private companies that are a dynamic mix of health care, life sciences, medical education, and private enterprise, is spurring significant growth in Western New York. As healthcare providers, most BNMC member institutions are required to have access to back-up or emergency power, which typically employ distributed generation (“DG”). However, even in an area that is affected by extreme weather such as Buffalo, these expensive DG assets sit idle most of the time. With the DSP, DER owners would have an option to extract more value from those DG assets by participating in the energy market through the DSP.

If successful, the DSP will create new revenue streams for both the DER owners and National Grid, and meet the other New York REV objectives as stated in the Track One Order. The DSP could then be extended across National Grid’s service territory.



Image 1.2 – Images of Kaleida Health (left) and the Roswell Park Cancer Institute (right), members of the BNMC

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

In the near term, services transacted and purchased through the DSP will test the implementation of a “LMP+D+E” financial model approach for electric services. The value of “LMP+D” will be evaluated in the Project and is expected to generate sufficient financial incentives for existing DERs to participate in the DSP market. For LMP, the Project will consider New York Independent System Operator (“NYISO”) locational-based marginal prices (“LBMP”) Zone-A West for day-ahead and real-time market prices³ and any additional capacity constraints and transmission losses that may be priced into the local area through the New York Installed Capacity Market (“ICAP”), if they 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 evaluation effort will analyze 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 can be assigned to each of these items. Energy supply, volt-ampere reactive (“VAR”) support, voltage

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

management, peak load modifications, and dynamic load management are some of the services that will be evaluated in the Project to test what drives new market opportunities. The value of D will be evaluated in the Project and is expected to generate sufficient financial incentives for DERs to participate in the DSP market.

“E” refers to external or societal value (e.g., low carbon, renewable or domestic fuel source) that may be provided by DERs that are not captured in in LMP or D. The value of E will most likely be attributable 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 DER (“VDER”) Order⁴ (i.e., solar PV, farm waste, micro-CHP, fuel cell, and micro-hydro DG). While this component was initially omitted from the DSP Implementation Plan,⁵ the Project Team has developed a first component in order to incentivize the use of renewable energy.

2.0 Highlights Since Previous Quarter

National Grid and the Project Team had a strong start in 2018, with substantial progress that led to the DSP first release Go Live. At the same time, National Grid worked closely with the BNMC to formalize agreements and plan the installation of the Measurement and Verification (“M&V”) equipment.

For a reference timeline emphasizing the major milestones and accomplishments, see Figure 2.1 below.

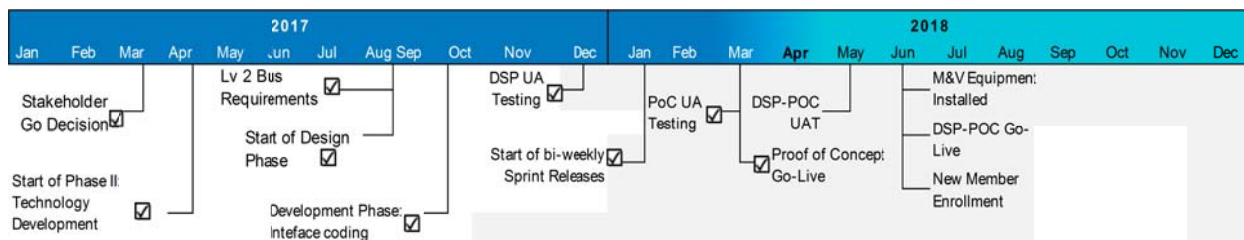


Figure 2.1 – Achievements and Milestones Timeline

2.1 Major Task Activities

1. DSP Sprint Releases

National Grid and Opus One continued to focus on the technology development in this quarter. The team adopted a new method in which each software feature was co-developed and ultimately approved by National Grid before being coded. At the same time, the Project Team performed in depth planning of each sprint and its features.

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).

⁵ REV Proceeding, National Grid: Distributed System Platform REV Demonstration Project-Implementation Plan (filed August 15, 2016) (“DSP Implementation Plan”).

During this quarter the team performed six (6) sprints, each with two (2) week duration. The effort resulted in over twenty (20) product features developed, totaling 147 Story Points⁶. Due to improved efficiency and additional resources committed by Opus One, the Team was able to consistently improve its velocity with each sprint (See Figure 2.2)

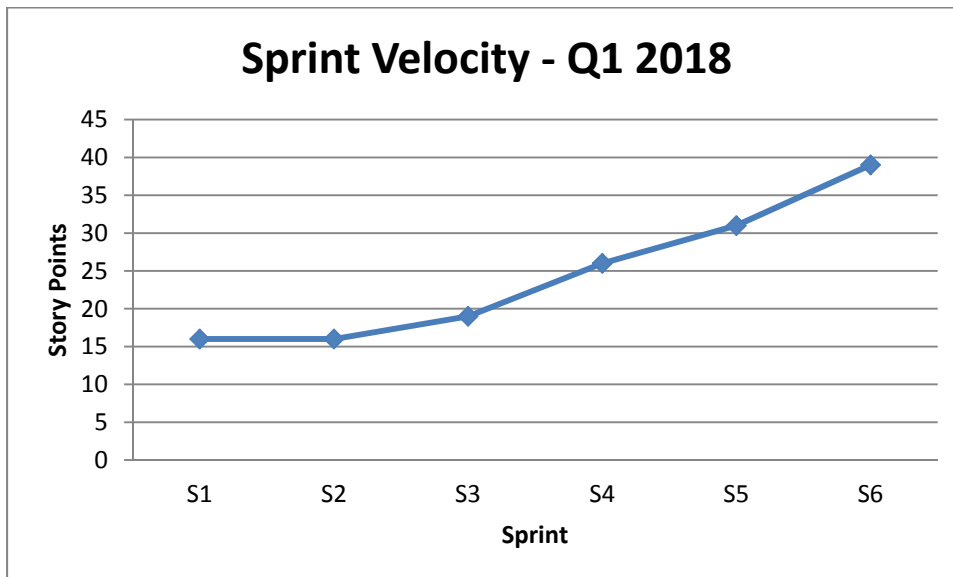


Figure 2.2 – Sprint Velocity Q1 2018

2. DSP End-to-End Testing

The Project Team worked closely with National Grid Information Services (“IS”) and Opus One in the functional and User Acceptance Testing (“UAT”). National Grid IS was able to successfully test all the developed data feeds to the DSP. These feeds include Plant Information (“PI”) system data and meter data.

The Project Team utilized the testing scenarios that were developed for the UAT performed in December 2017. This release of the software met the requirements for a Proof of Concept⁷ (“POC”), and was given the stakeholder approval for Go-Live.

The main features developed in this release were:

- Calculation of Day-Ahead (“DA”) and Same-Day (“SD”) prices;
- Development of DA and SD events, complying with all safety standards and capacity allocation guides;
- Email notification of qualifying events; and
- Several improvements to the User Interface (“UI”).

⁶ A Story Point is a unit adopted by software teams using Scrum.org (a professional organization devoted to improving the profession of software delivery) tools to estimate the level of effort for completing requirements. See <https://www.scrum.org/resources/blog/why-do-we-use-story-points-estimating>.

⁷ A Proof of Concept is a prototype that is designed to determine the feasibility of a product, but does not represent all deliverables or functionality. See <https://www.techopedia.com/definition/4066/proof-of-concept-poc>.

At least two (2) additional releases, each with additional functionality to the software, are planned for Q2 and Q3 2018.

3. DSP Proof of Concept/Go Live

On March 30th the first release of the DSP was successfully migrated to the production environment hosted in Amazon Web Services (“AWS”). The Project Team proceeded to create a workspace for the BNMC, uploading the CYME⁸ feeder models and creating two “Virtual Test DGs” at Kaleida Health’s location until the M&V equipment is installed on the actual assets. For reference, Figure 2.3 displays two (2) screenshots of the current version of the DSP,

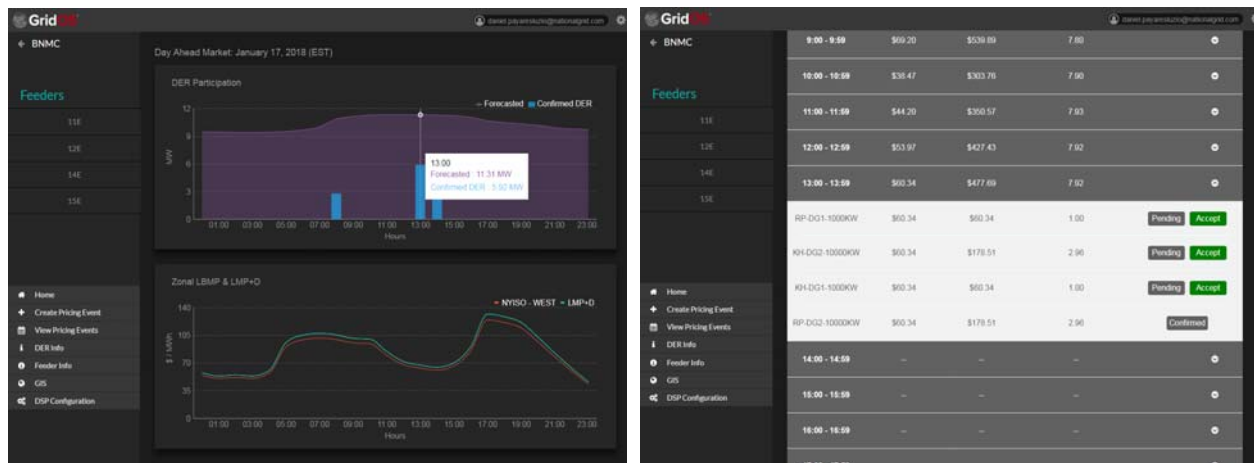


Figure 2.3 – DSP Screenshots – DSP Home Screen (left) and Event Management (right) User Interfaces.

With the addition of these Virtual Assets, the DSP can start creating and storing critical event and pricing information that will be later used to evaluate the marketplace.

⁸ CYME International is a Power Engineering Software company. See <http://www.cyme.com/company/overview/>.

2.2 Challenges, Changes, and Lessons Learned this Quarter

2018	Issue or Change	Resulting Change to Project Scope/Timeline?	Strategies to Resolve	Lessons Learned
Q1	The BMNC's current DERs are limited to only one type of back-up assets, which in turn limits the scope and value of the DSP project. Additional types of DER assets are needed to adequately test the DSP.	DPS Staff has encouraged the Project Team to expand, add participants and asset types to the Project.	Changes in the Project scope, by adding additional customers include: developing new marketing material, identifying potential new Project participants, modeling new feeders, adding new PI/meter feeds. The team is currently assessing the impact on the Project's timeline and budget.	As a recently renovated area, the BNMC has low +D value. Adding areas that present different types of constrains and different types of assets will provide a better basis to evaluate the DSP.
Q1	The Project Sponsor requested DPS Staff for additional time to be able to evaluate the DSP.	The proposed extension is until September 2019.	None.	The extension will provide the DSP with time to add new participants and collect enough data to properly evaluate the marketplace and the seasonality effects on pricing, and on customer behavior.

3.0 Next Quarter Forecast









During the 2nd Quarter of 2018 the Project team will continue to work on the technology development of the DSP software. The majority of the effort will be devoted in coding, releasing, and testing the features of the DSP, and specially the POC.

At the same time, the Project team will continue to work with the BNMC, especially Kaleida Health, which has continued to show strong interest in participating in the final stage of the Project by selecting and installing M&V equipment and setting up the required communications network.

Finally, the Project Team will develop and approach a list of potential new DSP participants, targeting different areas classified as Non-Wires Alternatives ("NWA") opportunities and

different types of DG technology. The Project team will also evaluate the impact of adding new participants on the Project timeline and budget.

3.1 Checkpoints/Milestone Progress

Checkpoint/Milestone	Anticipated Start-End Date	Revised Start-End Date	Status
1 DSP Sprint Releases	10/27/17 – 4/9/18	1/10/18 – 5/16/18	
2 DSP-POC UAT	3/21/18 – 3/27/18	5/16/18 – 5/28/17	
3 DSP-POC Go Live & Phase 3 Go-NoGo	3/28/18 – 4/2/18	5/28/18 – 6/1/18	
4 Customer M&V Equipment Installation	1/5/18 – 2/5/18	1/10/18 – 6/1/18	
5 Evaluate potential enrollment of new DSP participants	3/21/18 – 6/28/18	None	
Key			
 On-Track			
 Delayed start, at risk of missing on-time completion, or over-budget			
 Terminated/abandoned checkpoint			

1. DSP Sprint Releases

Status: 
 Start Date: 1/10/18
 End Date: 6/1/18

National Grid and Opus One will continue with the strategy adopted in the previous quarter, using an agile process for a deeper coordination in software development, which proved successful in improving communications and accelerating the release of features for the DSP.

The Project Team will continue to work directly with Opus One’s development team in multi-week sessions, looking at mockups and using quick prototyping to quickly gather customer and end-user feedback. Opus One will work on, at least four (4), and up to seven (7) sprints during this quarter.

2. DSP-POC User Acceptance Testing

Status: 
 Start Date: 5/16/18
 End Date: 5/28/18

The first four (4) sprints of Q2 2018 will focus on the remaining features of the DSP, and more importantly, the development of the POC. After these features are developed, the Project Team will perform an in depth review of all features and functionalities to ensure accurate and safe DSP operations.

Some of the key features that will be developed and tested are:

- DSP Role Base Access Control (“RBAC”);
- DSP Settlement;
- DSP Reporting; and
- POC UI and integration.

During this process, Opus One’s development team will be on call to promptly address any potential flaws that may be encountered.

3. DSP-POC Go Live & Phase 3 Go/NoGo Checkpoint

Status: [●]

Start Date: 5/28/18

End Date: 6/1/18

After UAT is complete, the main stakeholders will go for a final Go/NoGo checkpoint. If a Go decision is reached, Opus One will have the green light to proceed with the push to the production environment of the DSP-POC software solution.

With the POC operational, the Project Team will provide each market participant with their user log in information, and schedule a series of webinars for training (if needed).

Subsequently, the Project will officially transition to its final Phase. During Phase 3, among other things, the Project Team will test:

- Impact of DSP operations on the network;
- Impact of DSP events on the operations of the market participants;
- Customer behavior, responsiveness and reliability; and
- DSP-POC integration.

4. Customer M&V Equipment Installation

Status: [●]

Start Date: 1/10/18

End Date: 5/31/18

National Grid’s Control and Integration (“C&I”), Meter Data Services and Meter Data Engineering teams will work closely with the BNMC in order to design, procure and install the M&V equipment for the DSP. The initial design requires an advanced revenue grade meter using a Verizon Wireless Network in order to gather data at fifteen (15) minute intervals, which will then be sent daily to the DSP via the Itron cloud. Each participating asset will require a dedicated meter in order to gather the required information for settlement purposes.

The Project Team will work closely with the BNMC to coordinate the required modifications and upgrades for the installation of the equipment.

5. Evaluate Potential Enrollment New DSP Participants

Status: [●]

Start Date: 3/18/18

End Date: 6/28/18

The Project Team will move forward to evaluate the impacts of adding new participants to the DSP. The evaluation process will include the analysis of impacts on the Project timeline and budget.

In order to obtain a diverse portfolio of locations and assets, the team will work closely with National Grid's Distribution Planning and Asset Management ("DPAM") group, which is in charge of leading all of the Company's NWA initiatives.

Preferably, the Project Team will target two (2) to five (5) potential new participants in NWA and non-NWA areas with different types of DER, including dispatchable and non-dispatchable, renewables, Combined Heat and Power ("CHP"), energy storage and/or fuel cells.

The Project Team will also be working with National Grid's Marketing and Communications group to develop the marketing tools and collateral needed for the customer acquisition process. For a complete enrollment into the DSP, for each new participant will require:

- CYME feeder models from National Grid's Advanced Data & Analytics group;
- PI historians tags and feeds for each feeder from National Grid's Energy Management Systems ("EMS") group; and
- Metering from National Grid's Distribution C&I group;

Subsequently, the information will be imported and integrated into the DSP, and each participant will be provided their POC log-in information.

4.0 Work Plan & Budget Review

4.1 Updated Work Plan

An updated version of the Gantt chart found in the DSP Project Implementation Plan is set out below.

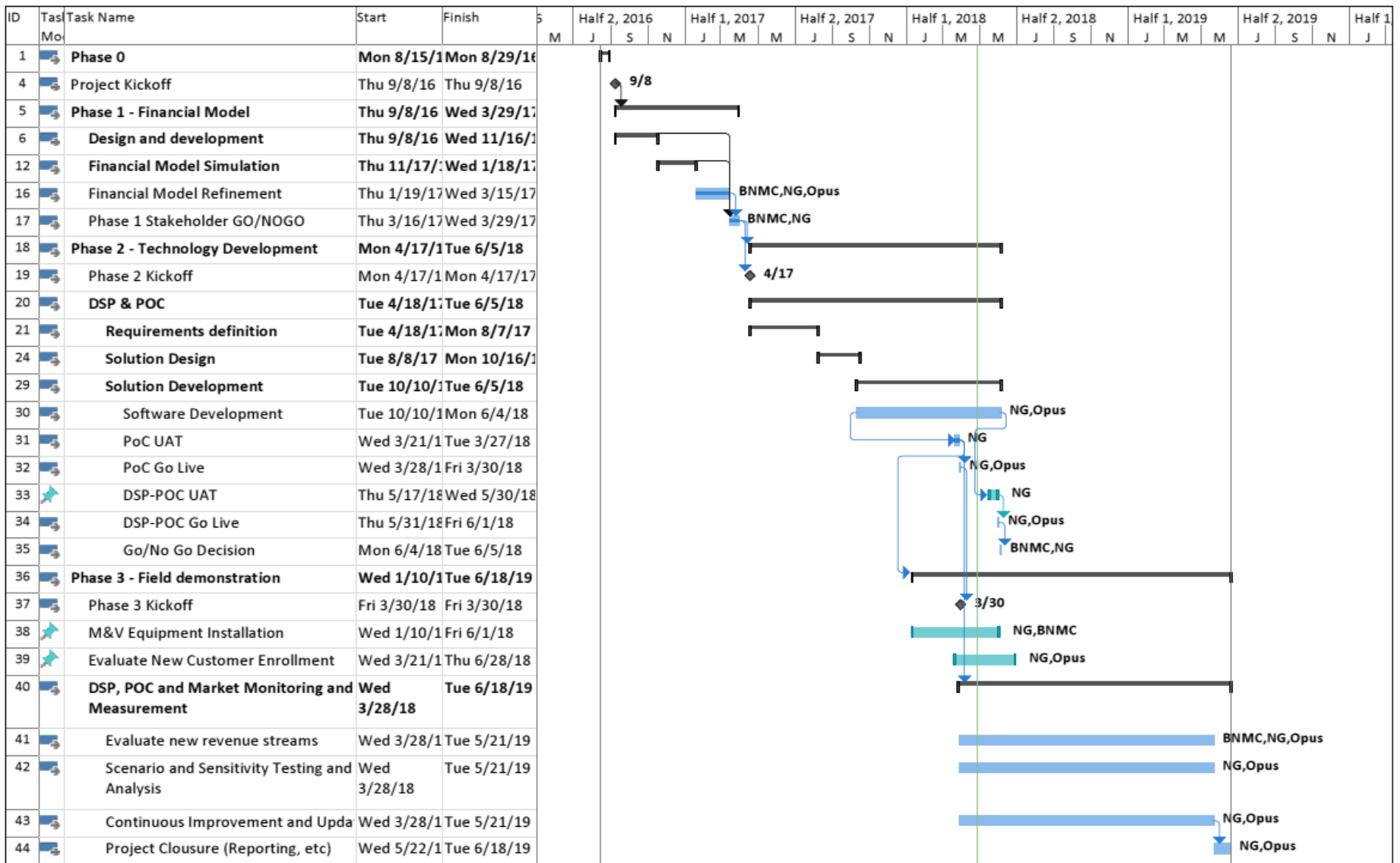


Figure 4.1 – Update of original Gantt Chart found in DSP Implementation Plan

4.2 Updated Budget

There are updates to the estimated budget set forth in the filed DSP Implementation Plan. The updated budget information is displayed in the table below.

Project Task	1 st Quarter Actual Spend	Project Total Spend to Date	Project Budget ⁹	Remaining Balance
CapEx				
	\$ 0	\$ 0	\$ 0	\$ 0
OpEx				
NG Resources	\$ 67,817	\$ 774,623	\$ 1,200,000	\$ 425,377
IT Integration Services	\$ 298,665	\$ 512,461	\$ 890,000	\$ 377,539
Program Management	\$ 212,152	\$ 1,084,515	\$ 2,000,000	\$ 915,485
Software License (est)	\$ -	\$ -	\$ 1,000,000	\$ 1,000,000
Software Development (\$2M in kind)	\$ -	\$ -	\$ -	\$ -
Annual License Maintenance (est)	\$ -	\$ -	\$ 200,000	\$ 200,000
Total	\$ 578,635	\$ 2,371,600	\$ 5,290,000	\$ 2,918,400

Table 4.1 – Updated Budget

The incremental costs associated with the Project as of March 31, 2018 total \$1,263,706. Continued monitoring and reporting of incremental costs will be included in subsequent quarterly reports.

5.0 Tracking Metrics

The Project Team will gather and monitor several data points on the DSP, to measure and evaluate a set Key Performance Indicators (“KPI”) that will serve to inform all stakeholders on the potential and feasibility for Distributed System Platforms.

While the complete set of metrics and KPIs will continue to be developed during Phase 2, the table below displays the initial set developed by the Project Team.

⁹ 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.

Focus Area	Objectives and KPIs
LMP+D Prices	<ul style="list-style-type: none"> • Monitor LMP+D prices (min, avg, max) for both DA and SD markets. • Monitor values for each component of LMP+D price signal (min, avg, max) for both DA and SD markets.
Event Tracking	<ul style="list-style-type: none"> • Track the market participant's responses towards events (number of events generated, accepted, rejected, etc.) for both DA and SD markets.
DER Participation	<ul style="list-style-type: none"> • Total amount of capacity (in MW) enrolled in the DSP. • Number of customers enrolled.
DSP-POC Communication	<ul style="list-style-type: none"> • Measurement of roundtrip communications for price signals and responses. • Average participant's event response time.
DSP Operations	<ul style="list-style-type: none"> • Monitor DSP operations (total hours of DER operation, total MW delivered vs MW committed, Number of peak events generated vs accepted vs delivered).
DER Operations	<ul style="list-style-type: none"> • Monitor and track the participation and effectiveness of different types of DER technology to respond to DSP events.

Table 5.1 – Key Project Metrics