I. INTRODUCTION

A. Background

In October 2012, the Department of Public Utilities (the "Department") initiated a wide-ranging and comprehensive investigation into the modernization of the Massachusetts electric grid. Modernization of the Electric Grid, D.P.U. 12-76 (2012). NSTAR Electric Company d/b/a Eversource Energy ("Eversource" or the "Company")[1] was an active and engaged partner in the Department's long-running investigation, bringing its expertise and innovation to bear on the effort. Eversource had always been, and continues to be, at the forefront of implementing technologies to further improve service to customers and lessen/mitigate the impact of outages on customers. The Department's Grid Modernization investigation enabled the Company to further expand its efforts on behalf of its customers and in making significant strides to achieve critical Massachusetts energy and environmental policies.

Over the course of several orders incorporating Eversource and other stakeholder input, the Department set out a Grid Modernization framework for Eversource, along with Massachusetts Electric Company and Nantucket Electric Company, each d/b/a National Grid ("National Grid") and Fitchburg Gas and Electric Light Company d/b/a Unitil ("Unitil")(collectively, the "Distribution Companies"), to develop and invest in an innovative and comprehensive Distribution Company-specific Grid Modernization Plans ("GMPs") designed to advance achievement in four grid modernization objectives, specifically to: (1) reduce the effect of outages; (2) optimize demand, including reducing system and customer costs; (3) integrate distributed resources; and (4) improve workforce and asset management.[2]

Consistent with the directives set out in the Department's various D.P.U. 12-76 orders, on August 19, 215, Eversource filed its first GMP. The Department conducted a lengthy and thorough investigation of the Company's GMP. On May 10, 2018, the Department issued an order approving in part and modifying in part the Company's GMP. NSTAR Electric Company d/b/a Eversource Energy d/b/a Eversource Energy, D.P.U. 15-122 (2018) ("D.P.U. 15-122"). In its order, the Department approved the Company's proposed grid-facing grid modernization investments, as well as a three-year (2018-2020) budget of $133 million to undertake the approved investments. D.P.U. 15-122, at 172-173, 186-187. The Department also determined that it was appropriate for Eversource to recover the costs of its energy storage demonstration projects and its

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[1] On December 31, 2017, Western Massachusetts Electric Company ("WMECO") was merged with and into NSTAR Electric Company ("NSTAR Electric"), with NSTAR Electric as the surviving entity pursuant to the Department's approval in D.P.U. 17-05 under G.L. c. 164, § 96. D.P.U. 17-05, at 36-44. Beginning January 1, 2018, the legal name of Eversource Energy's electric distribution company in Massachusetts is NSTAR Electric Company d/b/a Eversource Energy.

[2] The Department refined the grid modernization objectives in its order on the Distribution Companies' 2018-2020 GMPs, with the following established as the final objectives: (1) optimize system performance (by attaining optimal levels of grid visibility, command and control, and self-healing); (2) optimize system demand (by facilitating consumer price-responsiveness); and (3) interconnect and integrate distributed energy resources ("DER"). D.P.U. 15-122, at 106.

electric vehicle ("EV") infrastructure program approved in the Company's 2017 base distribution rate case, D.P.U. 17-05, through its targeted grid modernization cost recovery mechanism ("Grid Modernization Factor" or "GMF").

As part of its ongoing review of Eversource's 2018-2020 and future GMPs, the Department require the Company to file annual GMP progress reports detailing its performance under the GMP during the relevant year ("Grid Modernization Annual Report" or "Report"). D.P.U. 15-122, at 112. The Company is required to report on its performance under the statewide and Eversource-specific infrastructure and performance metrics.[3] Following the completion of its 2018-2020 and future three-year GMPs, the Company will file a performance report covering the term of the GMP in question ("Grid Modernization Term Report"). Id.

After the May 10, 2018 the issuance of the D.P.U. 15-122 order, the Department conducted a sub-proceeding designed to formalize the contents and form of the Grid Modernization Annual Report, including the development of templates to comprehensively and clearly provide data demonstrating the Company's annual progress under its GMP. The Grid Modernization Annual Report Templates have not yet been finalized. Accordingly, the Department directed Eversource and the other Distribution Companies to file, by May 1, 2019, a narrative detailing their performance under their respective 2018 GMPs. D.P.U. 15-122, March 29, 2019 Memorandum, at 2.

Consistent with the Department's directives, Eversource hereby files its 2018 Grid Modernization Annual Report.

B. 2018 Progress Toward Grid Modernization Objectives

1. 2018 Overview

In 2018, the Company made substantial progress towards achievement of its 2018-2020 GMP objectives. Much of the work executed in 2018 was focused on building the organizational capacity to efficiently and cost-effectively scale up the Company's operations to incorporate incremental grid modernization projects. The Company's ability to deliver meaningful progress between May and December of the 2018 GMP investment year was largely attributable to its ability to leverage established, robust and proven processes for executing a multitude of large, complex capital projects. Given the timing of a mid-year start, the Company was challenged to start up the GMP portfolio implementation without impacting existing plans for the 2018 base capital plan, including non-discretionary new customer, emergency response and equipment repair work, as well as the Company's reliability programs. The fact that the Company was able to complete construction and commissioning of multiple GMP devices while successfully executing its 2018 base capital plan reflects the scalability of the Company's processes and the dedication of the organization to expedite delivery of benefits of grid modernization to customers.

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[3] Final performance metrics are currently pending before the Department. Once finalized, the Department will set a deadline for filing the Company's performance under the Grid Modernization performance metrics. D.P.U. 15-122, March 29, 2019 Memorandum.

Efforts to stand up the GMP portfolio implementation capability reinforced the Company's ongoing efforts to build the workforce of the future required to continue to transition the distribution grid into a platform that enables higher penetration of distributed energy resources ("DER"). A grid characterized by widespread sensing, monitoring and control technology requires specialized and highly-trained resources in electrical and telecommunications engineering, field communications, field engineering, system operations, project management and information technology. Approval of the Company's GMP has further emphasized the importance of identifying near and long-term opportunities to build skills, attract talent and grow the execution efficiency of the Company's workforce. Many of the successes and lessons learned described in this Report demonstrate the power of a motivated and well-organized workforce to scale up operations and identify creative solutions to technical challenges as well as the opportunities to augment technical capabilities required to build the grid of the future.

As the Company worked to stand up its grid modernization implementation capability, the distribution system continued to evolve with even higher levels of DER penetration. In 2018, the Company interconnected an additional 4,800 solar generation facilities representing over 106 MW of incremental capacity. Further, the size of the interconnection queue grew from 620 MW to over 1,000 MW. As described in Section V, many of the new solar projects are incorporating energy storage, increasing the complexity of the interconnection study process. High saturation of solar and energy storage in certain areas of the Company's system have resulted in increased need for substation upgrades and Independent System Operator ("ISO") studies. These factors support the fundamental need for grid modernization efforts that support the transparent, cost-effective and efficient planning and deployment of DER on the system.

2. Implementation Strategy

Following the Department's approval of the GMP, the Company initiated a GMP implementation strategy based on the following key principles:

- **Leverage proven, established processes to the extent possible.** As described above, the Company's ability to execute its 2018 GMP work plan was largely attributable to its ability to leverage existing processes and organizational capabilities. Using its existing project approval processes, the Company ensured consistency with its overall policies for capital budget spending authorization. The Company also leveraged its existing work management systems and processes to create dedicated work orders for grid modernization projects; order standardized materials based on the Company's established competitive procurement policies; support planning and scheduling of work and enable robust and accurate tracking of GMP investments. With respect to planning and scheduling, the Company created an integrated schedule for both GMP and base capital projects to ensure maximum execution efficiency and completion of the Company's full scope of work.
- **Dedicate effort to maximize cost-effectiveness of implementation.** Many of the decisions made in the first year of GMP implementation will drive cost-effectiveness in achieving plan objectives. One of the important 2018 activities undertaken by the Company was the prioritization of equipment locations. As described in Section III of this Report regarding Distribution Automation investments, for instance, the Company

established a prioritization methodology ranking potential locations to maximize value of the GMP deployment. Deployment strategies were also established to ensure construction efficiency. With respect to underground work, decisions were made to replace oil switches on a circuit basis to minimize customer impact and operational inefficiencies associated with outage planning and permitting. Efforts relative to labor strategy will also drive cost-effectiveness relative to the use of internal versus outsourced resources for engineering, construction and project management.

- **Establish a dedicated team for portfolio management and financial tracking.** The Company recognizes the critical importance of transparency and visibility in implementing its GMP portfolio. Ensuring accurate, timely tracking and reporting is a principal component required to ensure actions are taken to manage scope, schedule and budget. Focus on tracking and reporting will also support robust performance reporting and active engagement in the measurement and verification ("M&V") process. For the 2018-2020 GMP program, the Company established three positions dedicated solely to GMP program and financial management responsible for developing and executing the integration plan for the GMP portfolio. Specifically, the positions consist of one Financial Analyst, one Program Analyst, and one Program Manager. More details on the Company's GMP portfolio management team and process are provided in Section II of this Report.
- **Engage senior Operations leadership to provide implementation guidance and support.** From approval of the Company's GMP, senior Operations leadership demonstrated a strong commitment to supporting implementation of GMP objectives. Leaders recognize the direct customer benefit and importance in enabling the continued transition to the grid of the future. Periodic meetings to review progress were established, and leadership feedback continues to guide the approach to implementation.

Develop an effective approach to implementation of new grid modernization technologies and capabilities. Many of the programs included in the Company's GMP support deployment of existing monitoring and control, communication and automation technologies. These types of programs are relatively more amenable to leveraging existing processes and capabilities. Investments in Volt VAR optimization ("VVO") and Advanced Distribution Management System ("ADMS") investment categories require more of an innovative approach. In order to implement these new programs, the Company was required to establish organizational structures and assess workforce needs without the same established background of implementation requirements as it had for deployment of existing technologies. Additional work was also required relative to competitive procurement of new technologies. In 2018, extensive competitive procurement processes were established for the advanced load flow and VVO projects.

The process framework described above provided the Company with concrete methods to undertake the necessary preparatory work prior to initiating investments under the 2018 GMP. First, Engineering staff implemented prioritization methodologies to identify investment deployment locations that would maximize the investment's value to customers. For example, a methodology was implemented to analyze all overhead customer isolation zones in order to rank the opportunities to reduce the customer isolation zone size with appropriate consideration for historical reliability performance. This methodology was utilized by Engineering to develop prioritized locations in order to deploy overhead sectionalizing devices in locations that would

provide the most benefit to customers. See Section III for a more detailed description of prioritization methodologies.

In addition, Engineering teams initiated multiple technology selection efforts. For certain technologies, the Company's existing work practices and standards were comprehensive and utilized without the need for modification. For instance, in the case of overhead automation, the Company leveraged its expertise to utilize existing practices and standards in relation to recloser technology for all locations. In other cases, additional work was required to develop and complete technology standards and initiate the procurement process for equipment not previously deployed on the Eversource system. For example, the Company modified its existing voltage regulator standards to account for the incorporation of Supervisory Control and Data Acquisition ("SCADA") capability.

Second, the Engineering teams drafted Project Approval Forms ("PAFs") for each investment category in accordance with the Company's Capital Authorization Policy in order to ensure that all 2018 GMP investments had the requisite spending authorization. The PAFs describe the project need, justification, scope, budget and alternatives considered. The PAFs were approved through the Company's delegation of authority consistent with the process used to authorize all capital expenditures.

Third, the Planning and Scheduling team conducted an analysis to estimate the number of labor hours required to engineer, construct and commission the 2018 GMP work plan. This analysis supported the development of a labor resource strategy designed to maximize the efficiency of GMP execution by leveraging incremental internal resources where possible, particularly for highly technical tasks related to field engineering and communication. This strategy also supported a competitive procurement process to obtain external engineering and construction resources to complete the 2018 GMP work plan. This strategy is consistent with the Company's overall labor resource strategy that allows for hiring external resources to execute work plans such as the GMP portfolio. As noted above, for the 2018-2020 GMP program, the Company established three positions dedicated solely to GMP program and financial management responsible for developing and executing the integration plan for the GMP portfolio.

Fourth, the Eversource Investment Planning team established specific and dedicated cost control processes to isolate and monitor all costs associated with the GMP. The Company established an accounting process to specifically track GMP costs and expenditures, including setting up a work order process to track grid modernization investments separately from other capital projects undertaken by the Company. All grid modernization work orders link to a specific grid modernization project, which in turn links to a specific line of business. The Company will provide

additional information on these efforts in its May 15, 2019 filing regarding recovery of 2018 grid modernization investment costs through the GMF.

These preparatory stages represent critical foundational steps that needed to be developed and deployed in order to ensure that the 2018 GMP investments were undertaken in a deliberate, efficient and cost-effective manner. This framework will be utilized over the remainder of the 2018-2020 GMP, and the Company will continue to monitor the process to identify and implement necessary changes to continue to improve GMP investment deployment. Additionally, these foundational actions have allowed the Company to proactively look forward through the portfolio to understand and plan for areas of opportunity to accelerate the deployment schedule to the maximum extent possible.

C. Summary of 2018 GMP Investment Deployment (Actual vs. Planned)

Drawing upon the implementation strategy described above, the Company initiated execution of its GMP. Planning efforts recognized the importance of achieving the milestone targets established in the Company's August 15, 2018 *Grid Modernization Plan Statewide and Eversource-Specific Infrastructure Metrics Baselines and Targets* filing ("Baseline and Targets Filing")(see Table 2.4.7 at page 15).[4]

The 2018 GMP unit targets from the Baseline and Targets filing is reproduced below *Table 1: 2018 Units Status* in column "Plan Units (2018)." In Table 1, the Company has reflected its progress relative to 2018 targets in the columns "Construction Complete Units (2018)" and "Commissioned Units (2018)". If the unit was not both constructed and commissioned, Table 1 provides the units to be installed in the 2019 GMP year under the column, "2018 Unit Carry Over (2019)".

[4] This filing is still pending before the Department.

Table 1: 2018 Units Status

Investement Categories	Preauthorized Device Types	Plan Units (2018)	Construction Complete Units (2018)	Commissioned Units (2018)	2018 Unit Carry Over (2019)
Monitoring & Control (SCADA)	Microprocessor Relays (SS)	13	10	10	3
	4kV Circuit Breaker SCADA (SS)	0	n/a	n/a	n/a
	Recloser SCADA	18	18	15	3
	Padmount Switch SCADA	21	3	3	18
	Network Protector SCADA	0	n/a	n/a	n/a
Distribution Automation	Overhead DA	29	31	25	4
	Overhead DA w/Ties	0	n/a	n/a	n/a
Distribution Automation	4kV Oil Switch Replacement	10	8	0	10
	4kV VFI Retrofit for DA	0	0	n/a	n/a
Volt-Var Optimization	VVO - Regulators	15	0	0	15
	VVO - Capacitor Banks	0	n/a	n/a	n/a
	VVO - LTC Controls	4	4	4	0
	VVO - Line Sensors	0	n/a	n/a	n/a
	VVO - IT Work	n/a	n/a	n/a	n/a
Advanced Distribution Management System (ADMS)	Advanced Load Flow	n/a	n/a	n/a	n/a
	GIS Verification	n/a	n/a	n/a	n/a
	Distribution Management System	n/a	n/a	n/a	n/a
Communications	Communication - FAN	0	n/a	n/a	n/a
	Communication - Fiber	5	0	0	5

In order to appropriately assess the Company's performance under its 2018 GMP, understanding the manner in which the Company tracks progress under its GMP work orders is important. The Company utilizes two classifications when categorizing the status of an investment:

- **Construction Complete**: the Company classifies a GMP unit as "Construction Complete" when a device is placed in-service, meaning that it is used and useful. Due to the nature of the Company's GMP investment categories, it is often the case, particularly in regards to line-equipment devices, that a piece of equipment is installed and electrically placed into service, but has not yet gone through its commissioning process, which, when complete, places that piece of equipment into the Company's monitoring and control systems (i.e., SCADA).

- **Commissioned**: once a device is commissioned, the piece of equipment is electrically connected to the system, classified as in-service, and has been connected into the Company's monitoring and control systems, typically SCADA, which allows authorized personnel control and/or visibility of that device. The Company refers to the completion of the commissioning step as communicating and functioning consistent with the specifications set out in the GMP.

In terms of reporting its progress on the GMP in the Annual Report, the Company is reporting on both the Construction Complete and Commissioned statuses in order to provide a complete, accurate and transparent view of progress. As shown in *Table 2: 2018 Capital and In-Service Spend Summary*, any grid modernization device or system that has been categorized as

Construction Complete is reflected in the Plant In-Service columns.[5] While a GMP investment is classified as in-service when it falls in the "Construction Complete" category, the Company does not consider it to be operating and providing benefits consistent with the GMP in such a manner that it helps to advance the Department's grid modernization goals, until the investment is "Commissioned". When an investment is "Commissioned", it is complete within the GMP process.

Cost recovery under the GMP is initiated when an investment is "Construction Complete", which is in-service, and used and useful in accordance with standard costs recovery rules. It is at this point that the Company reviews the work orders associated with that investment to ensure the costs charged to-date were appropriately charged to the GMP work order and recoverable through the GMF. Costs will continue to accrue on a work order until the work order is "Commissioned". After the work order is "Commissioned" the Company will undertake the same review of the additional costs incurred to move the investment into the "Commissioned" category.

For the investments that were classified as Construction Complete in 2018, the Company will include the costs associated with the investment in its 2018 cost recovery filing to be submitted on May 15, 2019.

As can be seen in *Table 1: 2018 Unit Status* above, the Company undertook an aggressive approach to implementing the 2018 GMP, due, in part, to the timing of the D.P.U. 15-122 order, which was issued at the mid-point of the Company's fiscal year. The timing of the D.P.U. 15-122 order and the need to undertake the preparatory work described above prior to any actual construction of grid modernization investments did present some challenges in meeting the 2018 grid modernization investments targets. Through significant efforts and due to the comprehensive processes and procedures that were developed as part of the GMP preparatory efforts, Eversource made significant strides in implementing the 2018 GMP. Despite these accomplishments, at the end of 2018, certain 2018 GMP targets were not met and were instead scheduled for implementation in 2019 as carry-over work. Throughout the remainder of the 2018 Grid Modernization Annual Report, the Company has provided a detailed narrative as to its progress under each investment category and device type.

As of April 1, 2019, all carry-over work from the 2018 GMP, with the exception of the Miles of Fiber and VVO-Regulator programs, has been constructed and commissioned. At the end of 2018, the Company established an internal target to complete all 2018 GMP carry-over work in the first quarter of 2019. The Company's progress in achieving this target along with concurrently maintaining focus on 2019 GMP and base capital work is a reflection of the organizational emphasis placed on meeting GMP targets.

The Miles of Fiber program is a component of the Company's communications infrastructure program. The Miles of Fiber program, which is designed to enhance fiber and radio penetration across the service territory and upgrade communications capabilities to support the Company's suite of grid modernization investments, is a very complex program which was challenging to

[5] The Company will also provide a similar summary of grid modernization devices and systems categorization in its May 15, 2019 cost recovery filing.

accelerate given the truncated 2018 GMP investment year. Initially, the Company anticipated undertaking several short, shovel-ready projects under the 2018 GMP. However, after further review, all but one of those projects was more appropriately allocated to other business initiatives and was therefore not appropriate for inclusion in or recovery under the GMP. The Company is re-evaluating appropriate Miles of Fiber projects for construction during the 2019 GMP. Currently, 1.5 miles of fiber optics have been installed but not commissioned.

With respect to the VVO Regulators, given that the VVO program is a new initiative for the Company, the timeframe to engineer, design and plan the unit installations took longer than anticipated. Despite the truncated 2018 GMP investment year, the Company did complete the locational engineering with internal resources and designs were initiated with external resources. However, the timing associated with the shipment of the materials in addition to local the duration of the town planning and zoning petition process, precluded installation in 2018. The team did prepare for the installation of the 15 units in 2019 and, as of April 1, 2019, nine of the 15 units were categorized as "Construction Complete".

In addition to the progress relative to GMP device targets, the Company achieved milestones associated with GMP programs for which unit targets are not appropriate. For instance, the Company initiated extensive competitive procurements for advanced load flow software, advanced load flow engineering support and VVO software. The Company also engaged expert information technology program management support for the advanced load flow and VVO programs to augment the engineering program management capabilities established in the Company's Grid Modernization organization. Additionally, over one-quarter of the eastern MA overhead infrastructure has been surveyed as a part of the GIS verification project.

D. Summary of Spending (Actual v. Planned)

In *"Table 2: 2018 Capital and In-Service Spend Summary"* provided below, the Company has broken out the "Total Capital Spend" and "Plant In-Service" to correspond to the work order progress, as explained in the "*Summary of Grid Modernization Deployment (Actual v. Planned)*" table above. The Company has provided specific, detailed narratives in this Report on the details of each GMP investment category and device type.

Table 1: 2018 Capital and In-Service Spend Summary

Grid Modernization		2018					
		Capital Spend	Budget	Variance	Plant in Service	Budget	Variance
		Actual	Actual	Actual	Actual	Actual	Actual
		12,536,080	62,200,000	(49,663,920)	3,694,645	-	3,694,645
Investment Category	**Preauthorized Device Type**						-
Monitoring & Control (SCADA)	Microprocessor Relay	3,363,115	-	3,363,115	-	-	-
	4kV Circuit Breaker SCADA	83,747	-	83,747	-	-	-
	Recloser SCADA	963,353	-	963,353	700,660	-	700,660
	Padmount Switch SCADA	105,723	-	105,723	-	-	-
	Network Protector SCADA	-	-	-	-	-	-
	OMS/AMI Integration	-	-	-	-	-	-
Distribution Automation	OH DA w/o Ties	2,267,503	-	2,267,503	932,834	-	932,834
	OH DA w/Ties	-	-	-	-	-	-
	4kV Oil Switch Replacement	932,307	-	932,307	764,965	-	764,965
	4kV VFI Retrofit for DA	-	-	-	-	-	-
Volt-Var Optimization	VVO - Regulators	-	-	-	-	-	-
	VVO - Capacitor Banks	-	-	-	-	-	-
	VVO - LTC Controls	377,157	-	377,157	-	-	-
	VVO - Line Sensors		-	-	-	-	-
	VVO - IT Work	-	-	-	-	-	-
Advanced Distribution Management System (ADMS)	Advanced Load Flow	-	-	-	-	-	-
	GIS Survey (Expense)	-	-	-	-	-	-
	Dist. Management System	-	-	-	-	-	-
Communications	Numbers of Nodes	-	-	-	-	-	-
	Miles of Fiber	-	-	-	-	-	-
Workforce Management	Mobile Damage Assessment	-	-	-	-	-	-
Electric Vehicles	Electric Vehicles	2,859,831	-	2,859,831	1,296,186	-	1,296,186
Energy Storage	Martha's Vineyard	958,654	-	958,654	-	-	-
	Provincetown	624,690	-	624,690	-	-	-

Below are several aspects of the 2018 GMP implementation that impact the financial performance under the 2018 GMP:

- The Company budget for the GMP was established in the Fiscal Year 2018 (FY 2018) capital budgeting process conducted at the end of 2017. The $62.2 million capital budget reflected in *Table 2* was based on the Company's original five-year plan as filed in D.P.U. 15-122. Internally, the year-end projection for the total GMP budget was updated throughout 2018 as more information became available. Following approval of the Company's GMP, the Company managed each pre-authorized device type budget based on unit cost targets. Further description of the Company's actual spending relative to unit cost targets for each device type investment is included in Section III.
- Pre-Authorized Device Types with no spending in 2018 reflect the fact that no design or construction work had been completed under Company-authorized GMP projects. For several projects, including advanced load flow and VVO, 2018 engineering labor was charged to non-GMP work orders to enable progress prior to formal internal project authorization.
- In some cases, including microprocessor relays and overhead distribution automation, administrative delays prevented transferring capital spending into the Plant in Service status. In other cases, the difference between Capital Spend and Plant in Service is due to the timing difference associated with the investment being categorized as Construction Complete in 2018 and the investment being moved to Account 101 in 2019 following the completion of the review of the relevant work orders and costs associated with the investment Given the Company's comprehensive review of costs in order to ensure that

they are appropriate for recovery, this timing difference occurs in the normal course of business with all capital investments.

- Table 2 above includes capital spending only. The Company spent an additional $$706,267.56 in expense associated with the GIS verification project.

II. Program Implementation Overview

A. Organizational Changes Designed to Support Program Implementation

In order to ensure successful and efficient implementation of the GMP, the Company layered the GMP into its existing business practices and leveraged the existing capabilities, processes, procedures, departments and personnel within the Eversource system. Administratively, the portfolio of GMP programs is managed by a group of three dedicated employees as shown in red in Figure 1 below. These personnel were charged with developing and constructing the execution platform, and reporting, closing and dispositioning each of the GMP programs. The remaining personnel identified in Figure 1 depict existing employees who are supporting the implementation of the GMP efforts.

Administratively, to support the integration, the team developed a process framework to evaluate, analyze, align and mange cross-functional responsibilities. Under this process framework, the Company has undertaken the following steps in order to successfully implement and manage the GMP.

- **Evaluate/Inventory:** The team studied the strategic and end-state goals of the GMP program, identified the internal and external stakeholders who will/can influence program completion and success, and mapped the data repositories with relevant information, such as STORMs and Passport, the Company's work management systems, PowerPlan, the Company's financial repository system, the Company's Geographical Information System ("GIS"), the Outage Management System and the Primavera P6 scheduling systems. This data was aggregated into a centrally housed database to enable report generation and analysis that will be used over the course of the GMP to track investments and the Company's overall progress under the GMP.

- **Analyze:** The GMP analysts further refined the data into the GMP Portfolio Tracker allows for internal monitoring and reporting for quality assurance/quality control ("QA/QC") checks. This step is critical to successful GMP execution as it allows for visibility into the GMP implementation, which enable the Company to identify potential issues as early as possible during a given investment and develop and apply a resolution before program impact.

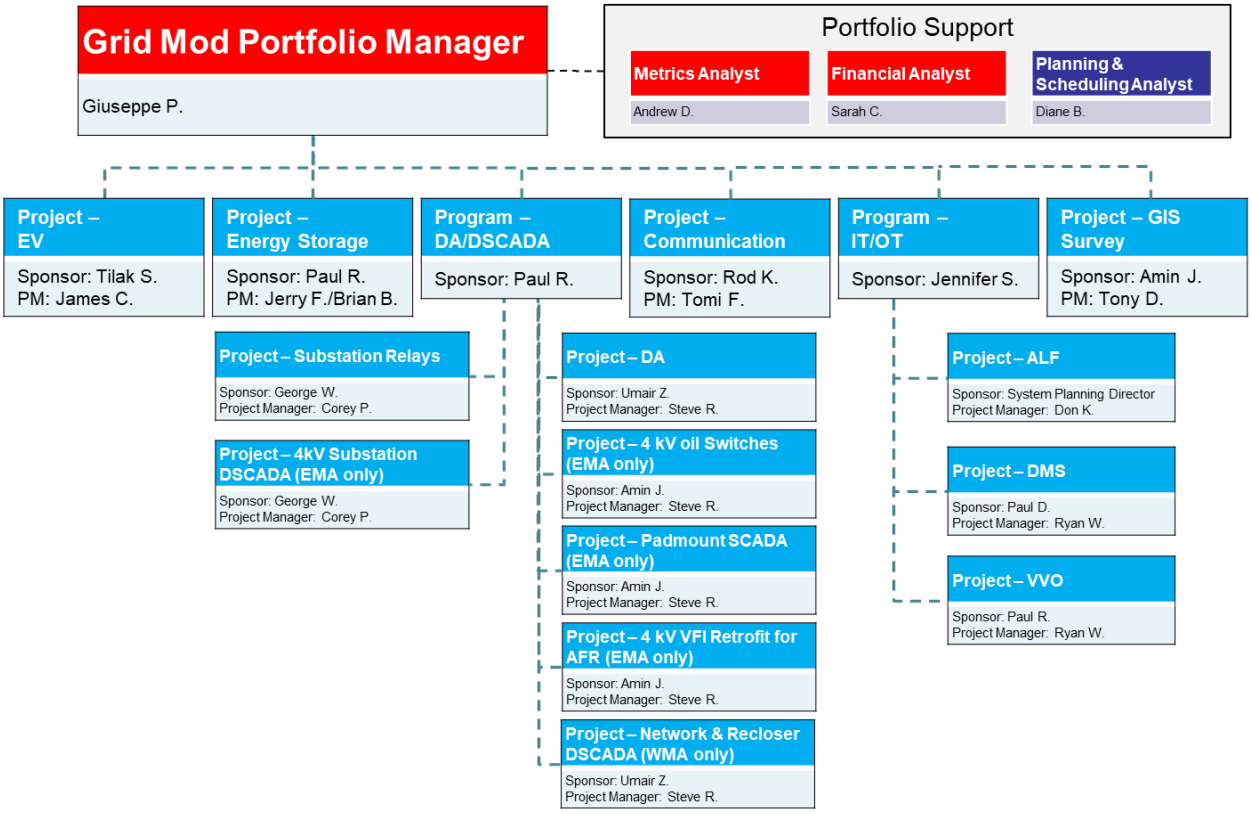
- **Align:** The GMP represents incremental work that was overlaid onto and integrated with Eversource's existing controls and processes. Therefore, the core team coordinated and facilitated a blended oversight and engagement of the various departments responsible for the execution of the GMP, such as Procurement, Planning, Operations, Information Technology, and various administrative functions. This provides inter-departmental visibility into the various GMP program types and enables more effective and efficient planning of work and resources.

Core Grid Mod Team	
Name	**Title**
Jennifer Schilling	Director - Grid Mod
Ryan West	Manager - Grid Mod
Don Kane	Lead Engineer
Akhil Punnoose	Lead Engineer
Emilio Cepeda	Engineer
Giuseppe Perniciaro	Portfolio Manager - MA
Andrew DelGaudio	Program Analyst - MA
Sarah Carey	Financial Analyst - MA

- **Manage:** Through the use of cross-functional GMP project managers, recurring status and coordination meetings, and recurring reporting, the core GMP team developed and utilizes a platform to oversee and guide the implementation of the GMP program to ensure Eversource deploys the GMP investments in an efficient and effective manner designed to advance the achievement of the Department's identified grid modernization objectives.

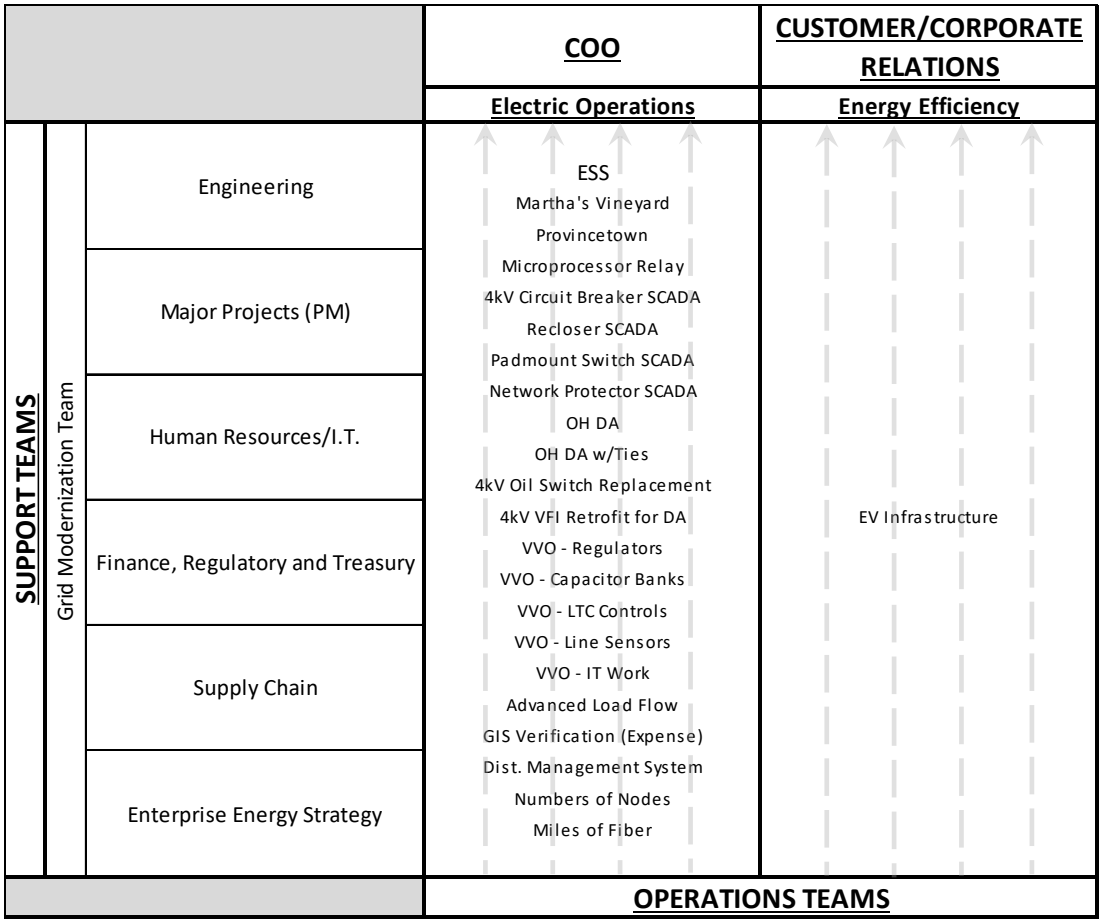
These steps represent critical foundational steps that needed to be developed and deployed in order to ensure that the 2018 GMP investments were undertaken in a deliberate and efficient manner. This framework will be utilized over the remainder of the 2018-2020 GMP.

Figure 3 Grid Modernization Organization



Operationally, the GMP is being implemented by a combination of internal and contracted operational personnel, such as line workers, electricians, technicians, IT developers, and commissioning agents. Eversource uses a matrix organizational structure, as can be seen in Figure 2 below, with many support functions cutting horizontally across the various operational resources. This structure promotes consistency across the enterprise and the ability to scale the organization to incorporate significant initiatives, such as the GMP.

Figure 4 Eversource Organizational Structure



B. Cost and Performance Tracking Measures

GMP Accounting Process

The Company developed a distinct accounting structure to ensure that GMP costs were isolated from all other capital project costs and were incremental to existing or business as usual investments. The GMP accounting structure started with the creation of new cost control centers for both Eastern Massachusetts (E98) and Western Massachusetts (5GW). Although the GMP

was designed and will be implemented across the Company's service territory, the Company is still required, consistent with the Department's directives, to maintain separate financial records for NSTAR Electric and the former WMECO. D.P.U. 17-05, at 44-45. Next, the Company created separate lines of business for each investment type to track GMP projects and work orders separately from any base capital work. The separate lines of business are listed below:

- Electric Vehicle – 12165
- Energy Storage – 12160
- Advanced Sensing Technology – 12190
- Automated Feeder Reconfiguration – 12170
- Urban Underground System Automation – 12175
- Communications – 12180
- Distribution System Network Operator – 12185.

The Company also created a mechanism for properly tracking all GMP Labor charges. A specific work order (GMPLBR21) was created to track all new external hires whose work is dedicated 100 percent to the GMP, i.e., these new hires do not perform any work on other Eversource programs or initiatives. Eversource internal labor direct charges their time to the relevant GMP work orders whenever possible and appropriate. In the event that these individuals cannot direct charge their time, their time is charged to Engineering & Supervision ("E&S") to be spread across all work orders consistent with Eversource accounting practice for all capital work. For existing employees, i.e., those individuals employed prior to March 15, 2018, all of their labor expense productive and non-productive time will remain as an expense in the employee's home cost center and is not recoverable under the current GMF. All outside services procured to design/implement/construct grid modernization capital units of property will charge the GMP capital work orders and be recoverable through the GMF.

GMP Cost Tracking Process

Total O&M and Capital Spend

The Company created a cost tracking process to track total spending for the entire GMP portfolio. The goal was to create a process that was accurate, repeatable, and required minimal manual effort to ensure data consistency and that the spending was incremental. A customized view was created in Eversource's budgeting and financial application, TM1, that contains only GMP projects and lines of business. The view contains monthly Actuals, Budget, Variance, and Projection information that are automatically populated in TM1.

- Actuals – numbers feed into TM1 directly from Eversource's other financial reporting system, PowerPlan.
- Budget – numbers are input into TM1 at the end of each calendar/budgeting year for the following calendar/budgeting year. Budget numbers are then 'locked down' within the first week of the new year so that there cannot be any changes to the budget throughout the year.
- Variance – automatically calculated in TM1 (Actuals-Budget).

- Projection – numbers are input into TM1 monthly, based on historical performance and Actuals from the prior month.

As Actuals accrue for each project, the Projections are manually entered into TM1 by the Budgeting group, who receive updated figures from Project Managers. The Actuals, Budget, Variance, and Projections populate in both a Month to Date and Year to Date view, and the data from the TM1 view is extracted directly into Excel. On or around Business Day 4 of each month's accounting close process, the Grid Modernization Financial Analyst extracts the TM1 data to perform a year-to-date and month-to-date variance analysis of the GMP portfolio and report results to various groups internally. Analysis of TM1 Actuals is also performed to further ensure that the TM1 data is the same as the PowerPlan data.

Total Plant in Service

The Company has created a cost tracking process to track total plant in service dollars for the entire GMP portfolio. Total dollars placed in service cannot be tracked in the same manner as total capital spending because TM1 does not contain the necessary FERC account information used to classify a work order/project as being in service. This information is extracted from PowerPlan, Eversource's Fixed Asset system. To populate this information, the Grid Modernization team established a query in PowerPlan to capture all costs distinctly associated with the GMP. The query contains detailed information needed to accurately and comprehensively track GMP costs, such as FERC Account, Accounting Work Order, Entity, Funding Project, Line of Business, etc. FERC Accounts 106010 and 101010 denote that an Accounting Work Order is Plant in Service. Similar to the total capital spending TM1 process, the PowerPlan extract is performed by the Grid Modernization Financial Analyst on or around Business Day 4 of each month's accounting close process.

Controls and Ensuring Data Accuracy

The Company created various informal and formal tracking mechanisms to report on portfolio performance and ensure the accuracy of the data. In addition to the established accounting process described above, the Company carefully scrutinizes and assesses the reported data. A mechanism was created to track GMP portfolio operational performance and analyze GMP work order activity. The reporting combines both financial and operational metrics of the GMP portfolio. Operational work order details are formally tracked using this reporting. Work order detail, including but not limited to, work order description, service center, costs and work order status are pulled into the reports from various Eversource systems. The Grid Modernization Program Analyst refreshes the data weekly. Eversource's work management systems (Passport and STORMS) are queried weekly to pull GMP work orders that have been created. The population of work orders is cross checked to the Company's financial reporting tool, PowerPlan. Data is organized by project and by the GMP-specific lines of business discussed above in the GMP Accounting Process section. Any identified inconsistencies are addressed and corrected in a timely manner. For example, if it is determined that a work order was inadvertently written to the wrong GMP project and/or line of business, the analyst would work with engineering to cancel and rewrite the work order to the correct GMP project and line of business.

As a further review of the data, weekly meetings are held with diverse group of Eversource personnel. The summarized GMP data, as well as detailed data from the tracking mechanism, is shared and analyzed during this meeting. In addition, the Grid Modernization Portfolio Manager shares additional information related to the program, such as program risks, issues, and progress towards internally established targets. The Grid Modernization Project Managers also report on progress made for their respective areas of responsibility. The weekly meetings provide a recurring opportunity and platform to discuss any issues related to or potentially impacting the GMP.

Informal processes also exist outside of the formal tracking reports and weekly meetings. Integrated Planning & Scheduling, Engineering, Procurement, Corporate Performance Management, and other functional groups across Eversource are in constant communication regarding all aspects of Company business, including the implementation of the GMP. Representatives of these various departments work cross functionally and collaboratively to meet GMP portfolio performance expectations. Stakeholders within these various department also maintain their own tracking mechanisms, which are cross checked periodically to the formal GMP source document maintained by the Grid Modernization Program Analyst.

Grid Modernization Unit Tracking Process

GMP-qualified units are manually tracked by the Grid Modernization Program Analyst in the GMP portfolio tracking reports. As discussed above, all GMP work orders are reviewed and analyzed on a weekly basis, with any inconsistencies or other issues addressed proactively in a timely manner. Based on the attributes assigned to a GMP work order and depending on the outcome of the discussions and collaborations with the GMP Project Manager and/or Engineering, a GMP-qualified unit(s) is assigned to the appropriate GMP work order.

As described above, Eversource has developed a robust and detail set of multi-disciplinary processes and procedures to track the costs associated with GMP projects to ensure that the Department's directives from D.P.U. 15-122 are comprehensively addressed. The Company's procedures allow for detailed analysis to support GMP investments and, eventually, cost recovery. Over the course of the 2018-2020 (and future) GMPs, the Company will continually assess its tracking and reporting processes and, as appropriate, modify those processes and adopt best practices.

C. Project Approval Process

Consistent with the Company's Authorization Policy and procedures, all GMP projects that were placed in service in 2018 have received the requisite spending authorization (adhering to the APS 1 Project Authorization Policy). All GMP projects link to one of the specific GMP lines of business and all GMP work orders link to a specific GMP project, which rolls up to a GMP line of business. For GMP projects where the total costs are below $100,000, the authorization has been granted via the annual program blanket approval that occurs as part of the capital plan book review by the Company's Board of Directors. For GMP projects where the total cost exceeds $100,000, a specific project identification number is assigned and a Project Approval Form ("PAF") is

written and approved through the PowerPlan system following the delegation of authority process set out in the Authorization Policy. If a GMP project is expected to exceed the original authorized dollar amount, then a supplemental project authorization form is required when the direct costs of the project exceed or are expected to exceed the original authorized amount by the following levels:

- $25,000 for projects less than $250,000;
- $50,000 for projects greater than $250,000 and less than $500,000; and
- 10 percent for projects greater than or equal to $500,000.

III. Implementation by Investment Category

III.A.1. Monitoring and Control
(Microprocessor Relays, Recloser SCADA, Padmount SCADA)

A. Description of work completed

MICROPROCESSOR RELAYS: Under the 2018 GMP, the Company replaced the Electromechanical feeder overcurrent, reclosing, and under-frequency relaying schemes with a Primary 351S relay and a Backup 751 relay and associated test devices. The primary relay will include pushbutton controls for the breaker(s), primary overcurrent protection, Hot Line Tag, reclosing, breaker failure, and under-frequency load-shedding schemes. The backup relay will serve as the SCADA interface and will include backup overcurrent protection and breaker timing logic.

RECLOSER SCADA: Under the 2018 GMP, the Company identified existing overhead recloser devices in the field that were both compatible and do not currently have communications capability. Once these devices were identified, the Company added a radio package to the location, so that the device can be centrally monitored and controlled by the Company's System Operations Center ("SOC").

PADMOUNT SWITCH SCADA: Under the 2018 GMP, the Company identified existing motor-operated padmount switch devices in the field that are both compatible and do not currently have communications capability. Once these devices were identified, the Company added a radio package to the location, so that the device can be centrally monitored and controlled by the Company's SOC.

B. Lessons-Learned/Challenges and Successes

MICROPROCESSOR RELAYS:

- Work completed within a substation typical requires a very significant coordination between Company departments. Due to the truncated timeframe for implementation of the 2018 GMP, the speed at which the GMP was scheduled put stain on the ability of the organization to quickly complete this incremental work. Given that the Company will have the benefit of a full investment year in 2019 and 2020, similar scheduling issues are not anticipated to impact the GMP. Obtaining the right mix of internal and external resources was initially a challenge.

- Substation work is often complex and comprehensive. It has been the Company's experience with previous, non-GMP substation projects, that during the execution of the initially scheduled project, it is possible to identify unforeseen conditions and/or additional conditions that are appropriate and prudent to repair/replace in concurrence with the original work scope. This

approach is logical, common in the industry and cost-efficient. The Company is following this same operational approach for any substation work being constructed under the GMP, while ensuring that all costs associated with any work completed that is not due to or related to GMP investments are segregated from the GMP and accounted for separately. The Company has successfully balanced funding and completing all prudent ancillary substation work and maintaining a strict segregation between GMP and non-GMP costs.

- Since all GMP-related substation work is incremental to the Company's base capital business, and because much of the substation work requires the use of highly skilled or niche-skilled resources, securing external labor with the requisite skills and experience to assist with this aggressive program can pose a challenge, particularly given the shortened 2018 GMP investment year and potential competition for these skilled resources. The Company continues to work with the appropriate vendors, utilizing the 2018-2020 GMP to help secure these contracts, when/where needed.

RECLOSER SCADA:

- This program has been instituted in the Company's Western Region where the Company identified significant opportunities, to enhance SCADA sectionalizing capabilities, particularly on long feeders.

- Commissioning resources was identified as an area of opportunity identified by the Company. The Company has placed an emphasis on planning and monitoring for the Commissioning team and is developing a plan to solicit for external resources.

- The Company has exhausted the list of locations on its distribution system that have compatible existing equipment, which can be upgraded by adding radio communications to enable SCADA capability. Based on this, the Company has elected to modify this GMP program into a "replace, in-place" program where locations utilizing older, oil-filled equipment have the entire recloser replaced with new, SCADA-capable equipment.

PADMOUNT SWITCH SCADA:

- During 2018, the Company initially had timing challenges with finding the correct combination of device type locations and sufficient communications methods. This placed the program behind schedule.

- As of the submission of this report, the Company has successfully validated all the previously selected 2018, 2019 and 2020 locations, designed the projects and is ready to construct.

C. Actual vs. Planned Implementation and Spending

Refer to Tables 5 and 6 below for the Company's 2018 implementation unit and spending summaries for the Monitoring and Control GMP Investments. Spending was broken down into "Total Capital Spend" and "Plant In-Service." As indicated in section I. Introduction, Plant In-Service is initiated by a device being "Construction Complete" and therefore cost recoverable.

Table 5: 2018 Implementation Summary

Investement Categories	Preauthorized Device Types	Plan Units (2018)	Construction Complete Units (2018)	Commissioned Units (2018)	2018 Unit Carry Over (2019)
Monitoring & Control (SCADA)	Microprocessor Relays (SS)	13	10	10	3
	Recloser SCADA	18	18	15	3
	Padmount Switch SCADA	21	3	3	18

Table 6: 2018 Implementation Cost Summary

		2018					
		Capital Spend	Budget	Variance	Plant in Service	Budget	Variance
		Actual	Actual	Actual	Actual	Actual	Actual
Investment Category	Preauthorized Device Type						-
Monitoring & Control (SCADA)	Microprocessor Relay	3,363,115	-	3,363,115	-	-	-
	Recloser SCADA	963,353	-	963,353	700,660	-	700,660
	Padmount Switch SCADA	105,723	-	105,723	-	-	-

MICROPROCESSOR RELAYS:

- The Company's implementation of the microprocessor relays was short of its 13-unit target by three units in 2018. Significant effort was taken to build a team, validate locations, execute the 2018 plan to install the microprocessor simultaneously at multiple locations at once and fully commission the devices. This was a major success to the organization.

  Additionally, all equipment/material, planning and resources were in place and ready for the completion of the remaining three relays within 2018. However, the Company, through assemblage of the correct group of personnel, made the decision not to execute on the remaining three devices based on the single-contingency outage condition that would have been created by this project over the long Christmas holiday. Though the project team had a contingency restoration plan, in the event that an outage occurred over the holiday, the team felt that this customer risk was too great and opted to delay the installation of the last three relays until January 2019. As of April 1, 2019, all 2018 carry-over relays have been completed and commissioned.

- For the Total Capital Spend, costs for year one of the three-year GMP averaged higher than budgeted unit costs. Despite this, the Company is still consistent with its three-year GMP budget. As it manages to the three-year GMP budget,

the Company is reviewing the costs in real-time and working to mitigate the cost increases, such as by providing for adequate time to engineer, plan and resource the project, and bring costs back in line with the budget. As of the date of this Annual Report, the Company has not made any changes to this 2018-2020 GMP program. Several factors contributed to this decision, namely the impacts associated with: (1) the truncated 2018 GMP investment year; (2) the need for a significant amount of preparatory work to be undertaken prior to investment, as discussed above; and (3) the limited time available to plan and execute investments in 2018. The Company anticipates that, given the robust organizational and operational processes that have been developed and implemented and that 2019 and 2020 represent full investment years, unit costs will reflect and be consistent with the 2018-2020 GMP budget.

There is no Plant In-Service for 2018 due to the timing difference between when the microprocessor relay investments were categorized as Construction Complete and when the Company completed its review of the relevant work orders and costs and moved the investments into Account 106. The Company is not seeking to recover any of the relay costs through the 2018 GMF, even through 10 were categorized as Construction Complete within the 2018 GMP investment year.

- In analyzing the cost increases from budget to actual, the Company has identified several drivers of the increases, as discussed below.
    a. The microprocessor relay program has relatively significant start-up costs that have a tendency to normalize as the Company streamlines and standardizes its implementation of these devices.
    b. The Department's approval and modifications of the Company's 2018-2020 GMP in May 2018 impacted planning and scheduling of this GMP program. This timing required the Company to rely more heavily on external resources to implement the program. Many of these resources have limited availability, such as Lead Commissioning Engineers ("LCEs") and Substation Test Engineers. Additionally, the resource limitations in the market have led to increased negotiated rates over the last several years.

RECLOSER SCADA:

- The implementation of the recloser SCADA program has been very efficient and cost-effective over the course of 2018. The Eversource GMP team is familiar with completing this type of work and was able to leverage existing processes to implement this incremental investment on the Company's system. However, though all units completed their construction in the field, the Company fell short of the goal by 4 units, which were not commissioned. The "Lessons Learned" placed emphasis on incremental strain that the program has placed on the Commissioning department. As of April 1, 2019, all 2018 carry-over Recloser SCADA devices have been commissioned.

- As discussed in the "Lessons Learned" section above, the Company is shifting this program into a 'replace, in-place' program as an efficient way to continue to deploy SCADA communications to existing field locations.

- The Total Capital Spend for this program is below budgeted unit costs. The Company is modifying the implementation of this GMP program as described above. As demonstrated by the 2018 actual unit costs, this necessary modification will ultimately increase the current unit-cost as the Company will be replacing, as opposed to simply upgrading, the entire recloser. Based on its experience to date with this GMP program, the Company anticipates that it will continue to remain consistent with or slightly under the budgeted costs. Due to the timing difference between when the recloser SCADA investments were categorized as Construction Complete and when the Company completed its review of the relevant work orders and costs, the Company is not seeking to recover costs for three of the units through the 2018 GMF although they were categorized as Construction Complete within the 2018 GMP investment year.

PADMOUNT SWITCH SCADA:

- The implementation of the Padmount switch SCADA proved to be a challenge for the Company to complete in the timeframe remaining in 2018 following the Department approval of the 2018-2020 GMP. Field validating to ensure that both the equipment type and communications infrastructure was adequate took significantly longer to complete than initially estimated. This delay had a cascading effect, particularly on the Company's commissioning teams, on the Company's ability to meet the 2018 targets within the allotted timeframe. As a result, the Company missed the 2018 target by 18 units. As of April 1, 2019, all 2018 carry-over Padmount switch SCADA devices have been completed and commissioned.

- The Total Capital Spend for this program indicates that the unit costs for year one of the three-year GMP averaged higher than budgeted. As it manages to the three-year GMP budget, the Company is reviewing the costs and working to mitigate the cost increases to bring the costs back in line with the three-year budget. Based on the Company's analysis into the cost increases, it determined that the majority of the increase was associated with the time and effort to analyze and validate the chosen locations for these devices, as well as the additional work that was sometimes required to allow the existing device to operate with the communications package that was installed. At this time, without a full year of experience in this GMP program, the Company has determined to maintain the original unit quantities under the 2018-2020 GMP. Based on its efforts in 2018 to identify the appropriate locations for these investments, as well as determining the manner of upgrade, the Company anticipates that, for the remaining years of the GMP, that the unit costs will come back in line with, or under, the three-year GMP budget.

- Due to the timing difference between when the Padmount switch SCADA investments were categorized as Construction Complete and when the Company completed its review of the relevant work orders and costs, there is no Plant In-Service for 2018. The Company will not be seeking to recover any of these unit costs through the 2018 GMF, even though three installations were classified as Construction Complete within the 2018 GMP investment year.

D. Performance on Implementation/Deployment

Performance data cannot yet be ascertained due to the limited installation time in the field. Additionally, the Distribution Companies' proposed GMP performance metrics are still pending before the Department. Following the issuance of the final performance metrics, the Company will report on its performance against the metrics consistent with the Department's directives.

E. Description of Benefits Realized as the Result of Implementation

Although there will be immediate benefits to the Company by having visibility and control of additional devices in the field, such as insight into emergent conditions, remote switching and acquisition of load data, measurable benefits will not be realized until substation and circuit level reporting is completed, in accordance with the proposed performance metrics currently pending before the Department.

F. Description of Capability Improvement by Capability/Status Category

METHODOLOGY

Microprocessor Relays: The specific relays selected for this program were based on a list of feeders and their characteristics. One characteristic was an indication if SCADA was available. Selecting non-SCADA feeders was the first pass analysis. Next, substations for which there was major (non-GMP) work scheduled but not anticipated to be completed prior to year 2020 were eliminated from consideration. Next, all substations that utilized overhead reclosers serving as feeder breakers were removed from consideration. Finally, all substations with scheduled retirements were removed from consideration. What followed from this analysis was the list of substations and feeders that were good candidates for the microprocessor relay upgrades.

SCADA Switches (Recloser, Padmount, Network): Prioritization for reclosers, secondary network[1] protectors and padmount switches was based on the same zone size and reliability ranking methodology as described in the Distribution Automation section of the 2018 Grid Modernization Annual Report (Section III.A.2). These criteria included: number of customers

6 The 2018 GMP investment plan did not include "Network SCADA" switches.

impacted by the device (higher); and the circuit reliability (lower). Padmount switches had an additional criterion: motorized switches were prioritized and were a requirement for investment.

EXPECTED CAPABILITY IMPROVEMENT:

Enabling Monitoring and Control (SCADA) on distribution system equipment provides Eversource with accurate minimum load data for circuit segments. This data is required for Eversource to perform load flow analysis in support of DR integration and automated feeder reconfigurations within a centralized, real-time logic system like a Distribution Management System ("DMS"). Additionally, and even prior to full circuit automation and integration with the GMP-driven IT systems, these new/upgraded devices will provide and enhanced level of visibility and control to the system operators.

Enabling monitoring and control of motor operated padmount switches will have significant reliability benefits by enabling a scheme in which switches will indicate the fault location, enabling dispatch to remotely isolate the faulted cable section and restore power to all customers on the loop.

G. Key Milestones

The Company maintains an execution plan and schedule of all its GMP investment categories. This schedule, which encompasses all three years of the GMP, was developed and is administered with the requisite flexibility that enables the Company to adjust its investment schedule and timing over the course of the GMP in the event that external factors, such as third-party resource availability, material availability, outage authorization, or unforeseen conditions (substations)impact the GMP and the relevant investment schedule. However, a sampling of the key 2018 milestones follows:

- Selection of all device types and locations (COMPLETE)
- Engineering and design for devices installation:
    - Line-devices (Reclosers/Padmounts) (COMPLETE)
    - Substation (Microprocessor Relays) (COMPLETE)
- Commissioning of devices (COMPLETE)

H. Updated Projections for Remainder of the Three-Year Term

On August 15, 2018, the Company submitted its Baseline and Targets Filing, which included the 2018-2020 GMP base line (Baseline and Targets Filing at 15, Table 2.4.7). *Table 7: Three*

Year Term Projections provided below provides the projections for 2019 and 2020 for those investment categories actively worked in the 2018 GMP investment year.

Table 7: Three-Year Term Projections

Investment Category	Preauthorized Device Type	Units			
		Total	2018	2019	2020
			Plan	Plan	Plan
Monitoring & Control (SCADA)	Microprocessor Relay	213	13	100	100
	Recloser SCADA	37	18	11	8
	Padmount Switch SCADA	62	21	24	17

III.A.2 Distribution Automation
(OH DA, 4kV Oil Switch)

A. Description of Work Completed

Overhead Distribution Automation ("OH DA"): Under the 2018 GMP, the Company worked to identify suitable locations for OH DA and installed new OH Reclosers (typically Nova Form 6) with full SCADA capability, to coordinate with the existing devices/equipment in the field and further reduce the number of customers affected during an outage.

4kV Oil Switches: Under the 2018 GMP, the Company worked to identify locations and replace existing oil-filled underground switches with new G&W Vacuum Fault Interrupter ("VFI") switches with full SCADA capability. Under the 2018-2020 GMP, switches are being installed in strategic locations to support the "4kV VFI Retrofit" program when it comes online.

B. Lessons-Learned/Challenges and Successes

OH DA:

- The OH DA program contains typical device installation that is consistent with the Company's experience in installing devices on its system. Given that the Company had processes and procedures in place to address these types of installation, it was efficient in leveraging those processes to set up and undertake these incremental GMP investments.

- Commissioning resources was identified as an area of opportunity identified by the company. The Company has placed an emphasis on planning and monitoring for the Commissioning team and is developing a plan to solicit for external resources.

- This program did somewhat strain the Company's commissioning personnel. The commissioning teams typically cover many aspects of the business and, because the Company's GMP is exclusively focused on ensuring that all equipment has remote visibility and/or control, the commissioning teams were challenged by an increased work load. Regardless of the challenges, the commissioning teams completed the targeted work set out in 2018.

4kV Oil Switches:

- Challenges arise when, given previously scheduled, planned work, the various relevant departments cannot be coordinated to complete the work at the same time, necessitating more than one visit to the site at different times. Multiple site visits increase the duration of the project, as well as costs. Due to the truncated 2018 GMP investment year, the Company was challenged to coordinate the various department schedules to complete the GMP installations,

a factor that prevented the Company from meeting its 2018 GMP planned unit installation. To address this issue, the Company undertook proactive steps early in 2019 and has had identified all of the locations for 2019 installation sufficiently early in order to effectively and efficiently plan for the work and coordinate the various Company department schedules.

- The replacement of the underground oil switches is a complex process. The challenge is due in part to the high customer density and the outage boundaries that need to be established in order to perform the work. The process complexity was further compounded by the truncated 2018 GMP investment schedule for the program. The teams responsible for these replacements need to:
  - closely coordinate, so that the work can be planned and executed as efficiently as possible to limit the extent and duration of the planned outage. The teams accomplish this balance by planning as much maintenance and/or non-GMP work as possible to occur during the outage. The teams ensure that GMP work is maintained separately (administrative/financially) from the other work. The specific GMP work and cost tracking processes developed to implement the GMP consistent with the Department's directives are followed in order to maintain this strict separation.

  - in order to avoid having to schedule a second planned outage, the teams will identify all of the GMP switch locations in advance so that should an emergency outage occur that happens to overlap the GMP location, the installation team would work to install the GMP device at the same time as undertaking the work to address the initial emergency outage. The decision to complete GMP work in this manner will be evaluated on a case-by-case basis to determine the merits of extending the existing outage to install the GMP device versus requiring a second, separate outage to install the device.

C. Actual vs. Planned Implementation and Spending

Tables 8 and 9 below the implementation unit and spending summaries for the Distribution Automation work undertaken in 2018. Spending was broken down into "Total Capital Spend" and "Plant In-Service." As indicated in section I. Introduction, Plant In-Service is triggered by a device being "Construction Complete" and therefore cost recoverable.

Table 8: 2018 Implementation Summary

Investement Categories	Preauthorized Device Types	Plan Units (2018)	Construction Complete Units (2018)	Commissioned Units (2018)	2018 Unit Carry Over (2019)
Distribution Automation	Overhead DA	29	31	25	4
	Overhead DA w/Ties	0	n/a	n/a	n/a
	4kV Oil Switch Replacement	10	8	0	10
	4kV VFI Retrofit for DA	0	0	n/a	n/a

Table 9: 2018 Implementation Cost Summary

		2018					
		Capital Spend	Budget	Variance	Plant in Service	Budget	Variance
		Actual	Actual	Actual	Actual	Actual	Actual
Investment Category	**Preauthorized Device Type**						-
Distribution Automation	OH DA w/o Ties	2,267,503	-	2,267,503	932,834	-	932,834
	4kV Oil Switch Replacement	932,307	-	932,307	764,965	-	764,965

OH DA:

- The Company constructed all of its 2018 OH DA program target and completed an additional two units over and above the target. The additional two units were coordinated for completion very late in 2018. The team wanted to complete as many additional locations as possible to make up for the location shortcomings that occurred within the VVO-Regulator program (see Section III.C Volt-Var Optimization for additional detail). Due to commissioning resources, as previously noted in the "Lessons Learned", six of the units (inclusive of the 2 additional units) were not fully commissioned at the close of 2018. As of April 1, 2019, all 2018 carry-over Overhead Distribution Automation devices have been commissioned.

- The Total Capital Spend for this program is below budgeted unit costs. Plant In-Service for 2018 is significantly less than Total Capital Spend due to two specific reasons:

    - The timing difference between when the OH DA investments were categorized as Construction Complete and when the Company completed its review of the relevant work orders and costs.
    - Through the QA/QC process administered across the portfolio, it was determined that several work orders had been initiated against an incorrect Line of Business. This situation was inadvertent, and the team rectified the mis-match and linked the work orders to the appropriate Lines of Business. The timing of these revisions relative to the year-end close precluded them from the 2018 actuals.

- The Company will not be seeking to recover through the 2018 GMF the costs associated with 18 of the units completed within the 2018 plan year.

4kV Oil Switches:

- The implementation of the 4kV oil switch replacements for 2018 was impacted by the complexity of the installation and the pace of the program, as noted in the "Lessons Learned" section above. Eight units were installed as "Construction Complete" and placed in service in 2018. As of 1 April 2019, all 2018 carry-over Padmount switch SCADA devices have been completed and commissioned.

- The Total Capital Spend for this program is below budgeted unit costs. Plant In-Service for 2018 is less than Total Capital Spend due to installation work not being completed on additional locations, which had not yet reached the in-service status.

D. Performance on Implementation/Deployment

Performance data cannot yet be ascertained due to the limited installation time in the field. Additionally, the Distribution Companies' proposed GMP performance metrics are still pending before the Department. Following the issuance of the final performance metrics, the Company will report on its performance against the metrics consistent with the Department's directives.

E. Description of Benefits Realized as the Result of Implementation

Although there will be immediate benefits to the Company by having visibility and control of additional devices in the field, such as insight into emergent conditions, remote switching and acquisition of load data, as well as safety and environmental benefits, measurable benefits will not be realized until substation and circuit level reporting is completed, in accordance with the proposed performance metrics.

F. Description of Capability Improvement by Capability/Status Category

METHODOLOGY:

To prioritize circuit investment, each circuit was analyzed to identify existing isolation segments or zones. Zone sizes were determined by the number of customers impacted in each zone. Zones with customers greater than the 500 for Eversource West (former WMECO service territory) and 1,000 customers for Eversource East (former NSTAR Electric service territory) were prioritized. Circuit reliability based on historical SAIDI and SAIFI from 2015, 2016 and 2017 was also considered when selecting circuits for investment. The poorer the reliability of the circuit, the higher priority the circuit and its associated zones received. A weight of 60 percent was applied to the zone size and 40 percent for their reliability score and then normalized on a 1 to100 scale, with 100 being the highest priority for investment. Zones were ranked separately between Eversource East and West. For feeders that lack alternate supply sources, infrastructure will be built where cost-effective to tie radial circuits to deliver the benefits of automation. Existing circuit ties will be bolstered to increase their back-up capability where cost-effective.

In siting the investments for automating and upgrading the existing 4kV switching, sectionalization and SCADA infrastructure, the Company focused on the Greater Boston and Cambridge areas. The current, existing 4 kV sectionalization, which is a critical component of the system serving high-density residential and commercial areas, was installed in the period of 1920-1940, making it the least modernized portion of the Company's distribution system.

The investment consists of replacing existing switches with the latest technology and SCADA, so these devices have the same functionality as their overhead counterparts.

2018 GMP investments in 4 kV switches were prioritized using the same zone size and reliability ranking methodology as described above for the overhead circuit.

EXPECTED CAPABILITY IMPROVEMENT:

Distribution automation technology will allow the grid to sense the existence of a fault, automatically isolate it to the smallest possible segment and then restore service to all customers outside the faulted zone with supply from alternate sources. By decreasing the number of customers in each segment between sectionalizing automated devices, the Company can reduce the impact of outages. With this added sectionalization and tie capability, the grid will dramatically increase its ability to reconfigure itself based on systems conditions. In the case of outages during major events (e.g., storms), these distribution automation investments will reduce the duration and extent of the storm events and can result in meaningful benefit to customers.

In addition to these benefits, the automated devices in the field will reduce the amount of day-to-day manual switching operations which occur as a normal part of maintaining the electric system and adding new customers. From a system planning perspective, the enhanced flexibility to shift load based on prevailing conditions has the potential to defer capital upgrades.

Upgrading existing 4kV switches with automation technology will bring the benefits of distribution automation to the Greater Boston and Cambridge areas, as described above. Automated feeder reconfiguration will work by automating the midpoint and tie switches on a circuit such that the midpoint will open for a fault between it and the station breaker allowing the tie to close in and automatically restore the unaffected back half of the circuit. The midpoint switch will operate like a conventional Vacuum Fault Interrupter and open for faults beyond it, so the front half of the circuit is unaffected. The Company anticipates that this added automation will reduce the impact of outages to the customers on circuits where it is deployed.

G. Key Milestones:

The Company maintains an execution plan and schedule of all its GMP investment categories. This schedule, which encompasses all three years of the GMP, was developed and is administered with the requisite flexibility that enables the Company to adjust its investment schedule and timing over the course of the GMP in the event that external factors, such as third-party resource availability, commissioning resources, and material availability. However, a sampling of the key milestones from 2018 follows:

- Selection of all device types and locations:
  - Line-devices (COMPLETE)
  - 4kV Oil Switch Replacement (COMPLETE)
- Engineering and design for devices installation:
  - Line-devices (OH DA) (COMPLETE)

  - 4kV Oil Switch Replacement (COMPLETE)
- Commissioning of devices
  - Line-devices (OH DA) (COMPLETE)
  - 4kV Oil Switch Replacement (COMPLETE – as of April 1, 2019)

H. Updated projections for remainder of the three-year term

On August 15, 2018, the Company submitted its Baseline and Targets Filing, which included the 2018-2020 GMP baseline (Baseline and Targets Filing at 15, Table 2.4.7). *Table 10: Three Year Term Projections* provides the projections for 2019 and 2020 for those investment categories actively worked in the 2018 GMP investment year.

Table 10: Three-Year Term Projections

Investment Category	Preauthorized Device Type	Units			
		Total	2018	2019	2020
			Plan	Plan	Plan
Distribution Automation	OH DA	196	29	100	67
	OH DA w/Ties	38	0	23	15
Distribution Automation	4kV Oil Switch Replacement	105	10	57	38
	4kV VFI Retrofit for DA	78	0	16	62

III.A.3 Volt-Var Optimization
(Regulators, LTC's, I.T.)

A. Description of Work Completed

REGULATORS: Under the 2018 GMP, the Company installed voltage regulators on select feeders from select substations to support the Volt-Var Optimization ("VVO") program. The regulators are generally similar to those the Company typically installs on its system, with the exception being that communications equipment is added to the control in order to enable remote control and monitoring by the central VVO IT system.

LOAD TAP CHANGERS: Under the 2018 GMP, the Company installed new controls on substation transformer load tap changers ("LTCs") at select substations. These devices enable direct communication from the VVO system. The LTCs will automatically adjust feeder voltage based on local measurement and will be optimized by the central VVO IT system located in the SOC.

B. Lessons-Learned/Challenges and Successes

LOAD TAP CHANGERS: The lessons learned with the LTC program were similar to that of the microprocessor relay program.

- Work completed within a substation typically requires a very significant coordination between Company departments. Due to the truncated timeframe for implementation of the 2018 GMP, the speed at which the GMP was/is scheduled put strain on the ability of the organization to quickly complete this incremental work. Given that the Company will have the benefit of a full investment year in 2019 and 2020, similar scheduling issues are not anticipated to impact the GMP. Obtaining the right mix of internal and external resources was initially a challenge.

- Since all GMP-related substation work is incremental to the Company's base capital business, and because much of the substation work requires the use of highly skilled or niche-skilled resources, securing external labor with the requisite skills and experience to assist with this aggressive program can pose a challenge, particularly given the shortened 2018 GMP investment year and potential competition for these skilled resources. The Company continues to work with the appropriate vendors, utilizing the 2018-2020 GMP to help secure these contracts, when/where needed.

REGULATORS:

- Since the VVO program is a new initiative for the Company, it took additional engineering time to locate and design where the specific field components should be installed. This was compounded by the truncated 2018 GMP investment year.

The Company completed the engineering for all regulator locations in late 2018. Due to this delay, the design requirements for the type of equipment selected for installation were delayed, thereby pushing back the procurement schedule. Given these factors, the Company faced challenges in meeting its ambitious targets in 2018.

VVO I.T.

- During the procurement process, the project team found the live demonstrations and reference calls to be quite valuable. The team held detailed reference calls with other utility customers that had procured similar I.T. platforms and implemented VVO pilots and was able to ask questions about their experience and lessons-learned from their respective VVO pilots and deployments. – The Eversource team incorporated that insight into its deployment strategy, both for the field devices and in the contract for the VVO software package. Since the installation and deployment of this software package is still pending, the Company will document any lessons-learned from the Eversource-specific experience in the 2019 Grid Modernization Annual Report.

C. Actual vs. Planned Implementation and Spending

Refer to Tables 11 and 12 below for the Company's 2018 implementation unit and spending summaries for the VVO GMP investments. Spending was broken down into "Total Capital Spend" and "Plant In-Service." As indicated in the Introduction of the Annual Report, Plant In-Service is triggered by a device being "Construction Complete" and therefore cost recoverable.

Table 11:2018 Implementation Summary

Investement Categories	Preauthorized Device Types	Plan Units (2018)	Construction Complete Units (2018)	Commissioned Units (2018)	2018 Unit Carry Over (2019)
Volt-Var Optimization	VVO - Regulators	15	0	0	15
	VVO - LTC Controls	4	4	4	0

Table 12: 2018 Implementation Cost Summary

		2018					
		Capital Spend	Budget	Variance	Plant in Service	Budget	Variance
		Actual	Actual	Actual	Actual	Actual	Actual
Investment Category	Preauthorized Device Type						-
Volt-Var Optimization	VVO - Regulators	-	-	-	-	-	-
	VVO - LTC Controls	377,157	-	377,157	-	-	-
	VVO - IT Work	-	-	-	-	-	-

REGULATORS:

- There were no regulators implemented in 2018. Given that the VVO program is a new initiative for the Company, the timeframe to engineer, design and plan the filed unit installations took longer than anticipated. Despite the truncated 2018 GMP investment year, the Company did complete the necessary engineering, design and planning and was preparing to install the units for the end of 2018. However, the timing associated with the shipment of the materials precluded installation in 2018. The team did prepare for the installation of the 15 units[1] in 2019 and, as of April 1, 2019, nine of the 15 units were categorized as "Construction Complete." The Company does not anticipate 2019 installations having these same issues discussed above since the engineering of the installations is complete. The majority of the designs have been finalized and all necessary material has been ordered.

- The Total Capital Spend for this program is slightly above budgeted unit costs. However, since this conclusion is based on a small sample set of actual costs, the Company anticipates that the actual unit costs will come in line with the budget. There was no work completed in 2018 and, accordingly, there is no cost recovery associated with this program in 2018.

LOAD TAP CHANGERS:

- The Company met its 2018 GMP target for LTCs with all four units commissioned. As was the case with the microprocessor relays, there was a significant effort to build up the team, coordinate with the necessary Company departments and vendors and get the work engineered, designed, installed and commissioned.

- The Total Capital Spend for this program indicates that the unit costs for year one of the three-year GMP averaged higher than budgeted. As it manages to the three-year GMP budget, the Company is reviewing the costs and working to mitigate the cost increases to bring the costs back in line with the three-year budget. As of the date of the Annual Report, the Company has not made any changes to the 2018-2020 GMP given that this program is in its initial stages and the Company does not yet have a full year of data to utilize to determine if changes are warranted. This program is integral component of VVO, and the Company is working within the flexibility of the three-year budget to complete the program.

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[8] As provided in Table 2.4.7 of the Baseline and Targets Filing, any VVO Regulators installed prior to the activation/commissioning of the VVO I.T. software were counted as "complete" when they were installed and electrically in-service but not commissioned. The rationale behind this determination is based on the fact that the VVO I.T. commissioning platform will not be ready until the end of 2019. This method of treating a device as "complete" is atypical of all other GMP devices for which the Company took credit for completed work when the device was commissioned.

- There is no Plant In-Service for 2018 due to the timing difference between when the LTC investments were categorized as Construction Complete and when the Company completed its review of the relevant work orders and costs. The Company will not be seeking to recover any of the LTC costs in the 2018 GMF, even though the installations were classified as Construction Complete within the 2018 GMP investment year.

- In analyzing the cost increases from budget to actual, the Company has identified several drivers of the increases, discussed below:

  a. The LTC program has relatively significant start-up costs that have a tendency to normalize as the Company streamlines and standardizes its implementation of these devices.
  b. The accelerated nature of the program for 2018 required the Company to rely more heavily on external resources to implement the program. Additionally, the Department's approval of and modifications to the 2018-2020 GMP in May 2018 impacted planning and scheduling for this GMP program.

VVO - I.T.

- Consistent with the 2018 GMP developed by the Company, the Company did not undertake any I.T. implementation in 2018. The procurement process described the Lessons Learned section above started in 3Q 2018, with a sizeable portion of the evaluation of bids completed by the end of the year. The Company expects implementation of the VVO I.T. system in late 2019.

  - There were no costs incurred in relation to this program in the 2018 GMP investment year and therefore there will be no costs associated with this program in the Company's May 15, 2019 GMP cost recovery filing.

D. Performance on Implementation/Deployment

The Company's VVO program consists of several interrelated components, all of which must be in place and commissioned before the Company is able to collect and analyze its performance. Performance data cannot yet be ascertained due to the limited installation time in the field. Additionally, the Distribution Companies' proposed GMP performance metrics are still pending before the Department. Following the issuance of the final performance metrics, the Company will report on its performance against the metrics consistent with the Department's directives.

E. Description of Benefits Realized as the Result of Implementation

Although there will be immediate benefits to the Company by having visibility and control of additional devices in the field, such as increased voltage regulation as additional regulators are added to the Company's system, measurable benefits will not be realized until substation and circuit level reporting is completed, in accordance with the proposed performance metrics.

F. Description of Capability Improvement by Capability/Status Category

METHODOLOGY:

Eversource is targeting the deployment of VVO in a limited geographic region (Western MA) that consists of substations and circuits under the jurisdiction of a single control room. The circuits in the target region offer a diverse mix of load and distributed generation ("DG") penetration, which will provide a comprehensive understanding of the impact of VVO across a broad range of circuit types. Within the target region, Eversource picked locations for the pole-top devices based on a combination of load flow analyses, engineering judgment, wireless communication coverage, and any local siting concerns.

The strategy for deployment is focused on maximizing the Company's ability to understand and quantify the benefits from VVO while minimizing the number of and disruption to control room and field personnel impacted by the deployment.

I.T.:

In tandem with the deployment of the VVO field devices described above, Eversource will be deploying a VVO monitoring and control software package in the control room that normally supervises and operates the VVO target region. During a competitive and rigorous procurement process which started with six qualified vendors, a cross-functional project team thoroughly reviewed all submitted proposals and further vetted a shortlist of vendors through live product demonstrations and reference calls. Eversource has selected a software solution from among the proposals that best meets the scope and requirements of this deployment, as well as compliance with Eversource IT/OT standards. Software delivery, installation, and testing is scheduled for 4Q 2019.

EXPECTED CAPABILITY IMPROVEMENT:

VVO is expected to lower peak demand, reduce line losses, lower energy supply costs, and reduced greenhouse gas ("GHG") emissions. The Company also expects that customers in the VVO area potentially could see a reduction in their bill, without any adverse impact to their power quality or change in their normal electric use.

I.T.:

As described in the previous section, the overall VVO deployment is expected to lower peak demand, reduce line losses, and, lower energy supply costs, and reduced GHG emissions. The

Company also expects that customers in the VVO area potentially could see a reduction in their bill, without any adverse impact to their power quality or change in their normal electric use.

Eversource anticipates that the metering capabilities of the field devices at the feeder heads and the end of the line, which will be timestamped and archived by the VVO control software, will deliver a level of visibility and monitoring into the distribution system that was previously unavailable. In addition to understanding and quantifying the benefits of VVO, the Company expects that this data will also provide valuable insight into energy use patterns, DG and weather impacts, undetected power quality issues, etc.

G. Key Milestones

The Company maintains an execution plan and schedule of all its GMP investment categories. However, the VVO program is an entirely new system to the Eversource distribution infrastructure. Significant work has been placed on developing milestones and schedules, but as with any new system, it may be necessary to amend these milestones as the program progresses. A current sampling of the key milestones follows:

VVO – Line Devices:

- Selection of all device types and locations (COMPLETE)
    - Engineering and design for devices installation: (COMPLETE)
- Commissioning of devices (VARIOUS STAGES – IN-PROGRESS to NOT-STARTED)
    - LTC's (COMPELTE)
    - 9 of 15 Regulators (CONSTRUCTION COMPLETE/NOT COMMISSIONED)

VVO – I.T.

- Detailed project plan (Q2-2019)
- Build Complete (Q3-2019)
- Acceptance Testing (Q4-2019)
- Full Commissioning (system operational) (Q1-2020)

H. Updated projections for remainder of the three-year term

On August 15, 2018, the Company submitted its Baseline and Targets Filing, which included the 2018-2020 GMP baseline (Baseline and Targets Filing at 15, Table 2.4.7). *Table 13: Three Year Term Projections* provides the projections for 2019 and 2020 for those investment categories actively worked in the 2018 GMP investment year.

The VVO control software is expected to be installed and commissioned in 4Q 2019, with a phased approach for enabling VVO at the targeted substations and the respective circuits. The

Company projects having VVO enabled on all selected feeders by the 1Q 2020 with the measurement and verification ("M&V") commencing in 1Q 2020.

Table 13:Three-Year Term Projections

Investment Category	Preauthorized Device Type	Units			
		Total	2018	2019	2020
			Plan	Plan	Plan
Volt-Var Optimization	VVO - Regulators	105	15	80	10
	VVO - Capacitor Banks	84	0	76	8
	VVO - LTC Controls	10	4	6	0
	VVO - Line Sensors	140	0	125	15
	VVO - IT Work	100%	0%	66%	34%

III.A.4. Advanced Distribution Management System ("ADMS")
(GIS Verification, Advanced Load Flow)

A. Description of Work Completed

Geographic Information System ("GIS") Verification: The objective of the GIS verification project is to physically visit all overhead facilities in the eastern MA service territory to verify existing data against assets as they currently exist in the field. The final output of the project will provide an accurate GIS database of pole location and attribute information, associated equipment, phasing information and a verification of customer addresses fed by each individual transformer. Improved GIS data accuracy will, among other things, improve the functionality of the Company's advanced load flow ("ALF") tool and increase the accuracy of customer event restoration notifications.

Work progressed as planned during the 2018 GMP investment year, beginning with the solicitation and selection of a vendor to perform the field work. As part of the contract, the Company established a set of protocols and designed a pilot scenario which tested the data acquisition and transfer to the Eversource system. Following successful completion of the pilot, Eversource authorized its vendor to continue field data collection activities for the remainder of the eastern MA overhead system. At the end of 2018, survey work for 24 percent of the eastern MA overhead system had been completed. As the pace of field survey work and the volume of data collected increased, the Company experienced some issues with the process of uploading data into the Company's GIS system. Steps were taken to address the issues with the upload process that have improved throughput significantly.

ALF: This GMP program includes the implementation of ALF software to create detailed computer models of the Company's distribution system. In parallel, the data sources critical to the accuracy of the models will be assessed and enhanced as necessary to leverage the advanced functionality of the software. This enhancement of model data sources will also be critical to the operation of other functions, including VVO and ADMS. During the 2018 GMP investment year, the Company:

- Finalized requirements for ALF software.
- Completed the competitive selection process for the vendor and load flow software tool. The process involved three vendors, all of which provided in-person demonstrations of their tools' capabilities. The tools were evaluated by representatives of the Information Technology and Engineering groups. Engineering disciplines represented included System Planning, DER Engineering, Grid Modernization and Distribution Engineering. The Company ultimately selected the Synergi Electric product offered by DNV GL. Upon selection of the software tool, the Company commenced negotiations regarding the final statement of work.
- Began detailed data assessment of GIS and other supporting data sources to enable the building of accurate, detailed distribution models. Some of the other data sources for which the Company began the assessment process

include: distributed generation facility information; equipment settings; customer load estimates; feeder peak loads as measured by substation meters; and source impedances.

B. Lessons-Learned/Challenges and Successes

GIS VERIFICATION: The Company found that conducting a pilot of the survey and upload process was a useful exercise to ensure the proper data was collected and captured in the Company's systems. Additional work to ensure the scalability of the upload process would have prevented delays in transferring the information to the Company's GIS system.

ALF: Early focus on determining data requirements to support an accurate distribution model provided significant help in establishing a coordinated plan of action for assessing the Company's data sources.

C. Actual vs. Planned Implementation and Spending

Neither the GIS Verification program or the ALF program had any capital spending during the 2018 GMP investment year. Additionally, given the nature of these investments, neither of these programs are being tracked on a unitized basis. The GIS verification is tracked based on percent of survey and data transfer complete. Survey data collected by the vendor is subject to a quality assurance and quality control review by the Company that must be satisfied prior to considering the survey completed. The ALF project is tracked based on milestone completion.

GIS Verification:

- During the 2018 GMP investment year, the Company completed 24 percent of its circuit miles and has a verified and functional process in place to complete the remaining work.
- The Total Capital Spend for this program is zero because this is an expense-only initiative. The Company was schedule to spend 25 percent of the total $6MM budget for 2018. Though 22 percent of the budget was expended, only ~11 percent ($706.267.56) will be sought for recovery in 2018. This is due to the timing and of year-end invoicing of the Company's contracted resource. Though the Company was short of the budgetary target, based on the Company's review of the program's progress, the Company has determined that the program tracking well against estimated milestone.

ALF:

- This program was in its initial planning and engineering stages during 2018, and the work completed utilized internal resources in order to put the detailed program

requirements in place, so that the program could be transitioned into the execution phase of design and implementation.

- The Total Capital Spend for this program is zero with significant work to occur in the remaining GMP years.

		2018					
		Capital Spend	Budget	Variance	Plant in Service	Budget	Variance
		Actual	Actual	Actual	Actual	Actual	Actual
Investment Category	**Preauthorized Device Type**						-
Advanced Distribution Management System (ADMS)	Advanced Load Flow	-	-	-	-	-	-
	GIS Survey (Expense)	-	-	-	-	-	-
	Dist. Management System	-	-	-	-	-	-

D. Performance on Implementation/Deployment

Given the nature of the GIS investment, the relatively short duration of the project and its categorization as a foundational investment necessary to support other GMP investments, the Company has not proposed specific performance metrics for this GMP investment.

E. Description of Benefits Realized as the Result of Implementation

While there will be immediate benefits to the Company via the verification of field conditions, those benefits do not currently have a measurable output. The verification of data will directly contribute to the various existing and new electric distribution system platforms. Some of the benefits of the GIS Verification and ALF are:

- Greater accuracy in customer outage communications.
- Improved ability to optimize capital asset deployment and system reconfiguration.
- Better contingency scenario planning.
- Support increased integration of DER on the distribution system, including the ability to build hosting capacity maps, and ultimately provide the possibility of "value of DER" calculation at any point on the system.

F. Description of Capability Improvement by Capability/Status Category

Given that the Company is still in the design phase of the ALF project the Company has not yet achieved incremental capabilities in the DMS Power Flow and Control capability category.

G. Key Milestones

GIS VERIFICATION:

- Project Kick-off meeting (COMPLETE)
- Requirements Definition Workshop(s) for Pilot & Full Deployment (COMPLETE)
- Pilot (COMPLETE)
- Full Crew Training (COMPLETE)

- Full Deployment (In Progress)
- Data Deliveries [Pilot, 25 percent, 50 percent, 75 percent and 100 percent] – during the 2018 GMP investment year, the Company completed 24 percent of the data deliveries under the GIS Verification.

ALF: The ALF program represents a major improvement from prior load flow capability in Eversource, including new automation of model builds and a new software product for the eastern Massachusetts portion of the 'Company's service territory. Significant work has been undertaken in developing milestones and schedules, but as with any new system, it may be necessary to amend these milestones as the program progresses. A current sampling of the key milestones follows, with note that these milestones indicate future events, whereas other "Key Milestones" sections in this Report reflect the 2018 plan.

- Phase 1:
  - Mobilization and Design Complete (Q3-2019)
  - Build Complete (Q4-2019)
  - Testing Complete (Q4-2019)
  - Phase 1 Commissioning (Q4-2019)
- Phase 2:
  - ALF (Data/Application) Updates Complete (Q2-2020)
  - Testing Complete (Q2-2020)
    Phase 2 Commissioning (Q2-2020)

H. Updated Projections for Remainder of the Three-Year Term

GIS Verification:

- All work for the GIS Verification program is scheduled to be completed in 2019.

ALF:

- 2019: Phase 1 will include implementation of required hardware and base software, including automation of the model build process from GIS. Additional data source enhancement will continue through Phase 1, with limited inclusion in the automated model build process.
- 2020: Phase 2 will include completion of automated model build process, including additional enhanced data sources, and any required software configuration to accommodate those additional sources. The Company expects to enable fully automated load flow capability for all non-mesh circuits by year-end.

III.A.5. Communications (Miles of Fiber)

A. Description of Work Completed

In developing the miles of fiber program for 2018, the Company anticipated utilizing a subset of existing "last mile" installations to deliver fiber optics from street-side infrastructure into several different substations. In operating under this assumption, the Company targeted "last mile" installations that had originally been slated for construction under the Company's OPGW (Optical Ground Wire) program. However, in finalizing its investment plan under the 2018 GMP, the Company determined that the OPWG does not qualify for recovery under the GMP because it's a Transmission Asset. Based on this determination and within the already time-constrained 2018 GMP investment year, the Company shifted its plan and was able to complete 1.5 miles of fiber installation to substation STA 60. "STA 60" is a substation that is planed for 4kV SCADA upgrades under one of the Monitoring and Control preauthorized device type programs. The 1.5 miles of fiber optic cable was installed but not placed in service due to the complexity of the conduit work associated with the installation, permitting delay, and additional work required under the "STA 60" 4kV SCADA upgrade project.

B. Lessons-Learned/Challenges and Successes

There must be Constructing the 1.5 miles of fiber optic cable from the street into the substation was more expensive than originally anticipated.

C. Actual vs. Planned Implementation and Spending

Refer to Tables 14 and 15 below for the Company's 2018 implementation unit and spending summaries for the Communications Investments. Spending was broken down into "Total Capital Spend" and "Plant In-Service." As indicated in Section I. Introduction, Plant In-Service is triggered by a device being "Construction Complete" and therefore cost recoverable.

Table 14: 2018 Implementation Summary

Investement Categories	Preauthorized Device Types	Plan Units (2018)	Construction Complete Units (2018)	Commissioned Units (2018)	2018 Unit Carry Over (2019)
Communications	Communication - FAN	0	n/a	n/a	n/a
	Communication - Fiber	5	0	0	5

Table 15: 2018 Implementation Cost Summary

		2018					
		Capital Spend	Budget	Variance	Plant in Service	Budget	Variance
		Actual	Actual	Actual	Actual	Actual	Actual
Investment Category	Preauthorized Device Type						-
Communications	Numbers of Nodes	-	-	-	-	-	-
	Miles of Fiber	-	-	-	-	-	-

MILES OF FIBER: As discussed in section a. above, the Company determined, prior to implementation of the 2018 GMP, that its initial workplan involving last mile fiber installations to certain designated substations required significant adjustment. Working to support the Monitoring and Control, 4kV SCADA GMP program, the team designed and installed 1.5 miles of fiber to substation, STA 60. The 1.5 miles of fiber optics, though installed, was not placed in service. The timing of the 4kV SCADA GMP program schedule for STA 60 was adjusted to 2019 and the final terminations of the fiber optics will be completed in conjunction with the installation of the Relays.

Through the QA/QC process administered across the portfolio, it was determined that several work orders had been initiated against an incorrect Line of Business. This situation was inadvertent, and the team rectified the mis-match and linked the work orders to the appropriate Lines of Business. The timing of these revisions relative to the year-end close, precluded them from the 2018 actuals. The Company will not be seeking to recover through the 2018 GMF, the costs associated with any of the Communications work completed within the 2018 plan year.

D. Performance on Implementation/Deployment

Performance data cannot yet be ascertained due to the limited installation time in the field. The Distribution Companies' proposed performance metrics are currently pending before the Department. Following the issuance of the final performance metrics, the Company will report on its performance against the metrics consistent with the Department's directives.

E. Description of Benefits Realized as the Result of Implementation

There are no benefits realized from this program in 2018. Once installed and commissioned, the benefits of the GMP fiber optic installations will allow for increased and more robust field communication capabilities and/or will allow the Company to directly own the communications infrastructure, in areas that are currently leased from 3rd party providers.

F. Description of Capability Improvement by Capability/Status Category

The overall increase in both ownership (i.e. control) and coverage and bandwidth, as related to the Communications infrastructure of the Company, has direct bearing on the ability to receive, transmits and process the ever-increasing data streams that are required to operate the grid of

the future. Careful master-planning and deployment of the Communication infrastructure is being administered by the Company so as to provide maximum benefits to the existing and newly installed GMP devices and technologies. There was little physical deployment of communications equipment in 2018, but significant planning and engineering are setting the stage for the remainder of the 2018-2020 GMP.

G. Key Milestones

The Company retains an execution plan and schedule of all its investment categories. This schedule, which encompasses all three years of the GMP, was developed and is administered with the requisite flexibility that enables the Company to adjust its investment schedule and timing over the course of the GMP in the event that external factors, such as third-party resource availability, material availability, etc. However, a sampling of the key 2018 milestones follows:

- Masterplan Engineering and Design (Rolling throughout 2018, based on segmented routes, started Q1-2019)
- Construction (Rolling throughout year, based on segmented routes, start Q2-2019)
- Commissioning Rolling throughout year, based on segmented routes, start Q3-2019)

H. Updated Projections for Remainder of the Three-Year Term

On August 15, 2018, the Company submitted its Baseline and Targets Filing (see page 15, Table 2.4.7). *Table 16: Three Year Term Projections* provided below provides the projections for 2019 and 2020 for those investment categories actively worked in the 2018 GMP investment year.

Table 16: Three-Year Term Projections

Investment Category	Preauthorized Device Type	Units			
		Total	2018	2019	2020
			Plan	Plan	Plan
Communications	Numbers of Nodes	10	0	6	4
Communications	Miles of Fiber	250	5	125	120

III.B. Feeder Level Implementation by Investment Category

A. Monitoring and Control:

1. Highlights of Feeder Level Implementation

The Monitoring and Control program is specifically designed to increase remote visibility and control of existing devices already located on the Company's system. For 2018 the Company installed microprocessor relays and converted, or replaced, existing padmounted and overhead switches to be SCADA-capable. Although already part of the system these devices will now allow for:

- Increased visibility and remote operability by the system operators.
- Provision of valuable data related to load conditions and switch position (open/closed).
- The ability for the system operators to remotely apply protection schemes to the devices, when crews need to work within the device boundaries.
- In terms of the overhead, the reclosers can be built into existing loop schemes, allowing for autonomous system healing.
- In terms of the underground (4kV), the switches will be available for future loop scheme build out.

2. Feeder Level Lessons Learned/Challenges and Successes

As discussed in Section III, in order to undertake the Microprocessor Relay program, the Company undertook significant efforts to develop and implement the project management structure and then design, install and commission the devices. While the GMP team overcame significant challenges, these critical early-stage efforts exerted pressure on the budget, namely due to the need to complete the work within the truncated 2018 GMP investment year. Under the 2019 and 2020 GMP investment years, the Company will manage the Microprocessor Relay program to elicit customer benefits and cost savings.

The Recloser SCADA program was successful in its design and construction, although challenges arose with the commissioning resources. As discussed in Section III, the Company is working to augment the commissioning resources. Additional challenges occurred when the GMP team exhausted the population of locations on the system that could be upgraded with communications devices only. The Company modified the Recloser SCADA program to encompass a 'replace, in-place' alternative that allowed for continued successful implementation of the program.

The Padmount SCADA program presented challenges from the stand point of coordinating the correct type of existing field equipment with a location suitable for communications. A significant amount of time was spent coordinating these requirements and, although the Company did not make its goal for 2018, it did successfully locate suitable locations that will fulfill the entire 2018-2020GMP commitment.

A. Distribution Automation:

1. Highlights of Feeder Level Implementation

Any time a device is placed on the system which will allow for increased fault location precision and the ability to further minimize the effects of that fault, the system's capabilities will inherently improve. The overhead reclosers and 4kV vacuum fault interrupter switches installed in 2018 contribute to both areas of improvement. In addition, these devices allow for:

- Increased visibility and remote operability by the system operators.
- Provision of valuable data, as related to load conditions and switch position (open/closed).
- The ability for the system operators to remotely apply protection schemes to the devices, when crews need to work within the device boundaries.
- In terms of the overhead, the reclosers can be built into existing loop schemes, allowing for autonomous system healing.
- In terms of the underground (4kV), the switches will be available for future loop scheme build out.

2. Feeder Level Lessons Learned/Challenges and Successes

Given that the penetration levels of the current GMP program investments, devices in one program must be closely reviewed and coordinated with the devices of another program. As a result, and particularly for the overhead devices, this made choosing and installing the 2018 reclosers a challenge because of the future work, via other programs, that may affect the current installation. For example, if an overhead recloser is placed on a particular feeder, that recloser would get specific data settings for its controller, to accommodate the circuit as it is configured. However, if through the Recloser SCADA or Overhead DA with Circuit Ties programs, other devices are also to be placed on that circuit, then the controller settings of the first recloser would need to be changed, so that all devices coordinate together. Although this presented a challenge, the Company's management of the current and future system environment and planning efforts will result in an efficient and effective roll-out of these devices.

Implementing GMP programs on the 4kV underground systems, which are often located in densely populated, city environments, is affected by numerous factors, such as the coordination of vehicle removal, police details, city permits and manhole/vault cleaning in order to first inspect the site and equipment to ensure compatibility with the program's intent. The Company is adept at undertaking this level of coordination and these tasks, but the volume of incremental work under the GMP placed a strain on its resources and required a significant amount of time to complete the requisite coordination, which put further pressure on achievement of the 2018 goals.

The lesson learned from the Company's experience with the 2018 GMP implementation is the need for careful and upfront planning to ensure that all the right tasks are done at the right time. This planning will enable the Company to identify situations (emergent or planned) that may exist in areas adjacent to the work area in question, allowing the Company to leverage those ancillary projects and obtain data while other work is progressing. For instance, if there is a

circuit outage evolution for a non-GMP project in the vicinity of a future GMP device installation, the Company may utilize that outage to collect data or perhaps even perform pre-work on the GMP device location. Efforts such as this will require close coordination and separation of GMP and non-GMP project costs.

B. Volt-Var Optimization

1. Highlights of Feeder Level Implementation

The VVO program is completely new to Eversource. In 2018, the team completed the analysis, consistent with the criteria discussed above in Section III.A.3., and selection of substations and circuits, which allowed the Company to commence the engineering and design of the relevant VVO investments. In 2018, the Company identified the specific field device locations and selected the software platform.

In 2018, the Company installed LTC controls on four of ten feeder heads. Given the complexity of this installation, this represented a significant accomplishment given the shortened 2018 GMP investment year.

2. Feeder Level Lessons Learned/Challenges and Successes

As with the implementation of any new program, the Company encountered unanticipated challenges in the roll-out of the 2018 Volt-Var Optimization program, contained within the Distribution System Network Operator investment category. For 2018, specific challenges arose with respect to the location of many of the field devices. Many device locations are located within the Verizon pole-set areas of the Commonwealth. Although the Company and Verizon have a process and procedure in place to request and have pole work completed, the quantity of pole sets for Verizon's team is abnormally high due to the 3rd Party Make-Ready work for the state-sponsored Last-Mile fiber optic installation. Due to this competing call for Verizon's resources, the Company loses some of its flexibility to plan and execute work under the GMP. The Company can and will manage through this challenge, but it does pose an additional, outside constraint on the GMP.

Additionally, the regulator field devices come in three different sizes. The largest of these devices requires a significant amount of pole/platform infrastructure to enable its installation. For new locations, as a preliminary step to their installation, the Company must petition the local municipal siting authority for permission. These petitions can be denied by the siting authority and, given that only certain select feeders have been identified for inclusion in this program, there are limited opportunities for the Company to adjust. The Company is managing this situation by proactively communicating with the towns on the rationale for and timing of the installations. This approach has been successful to date, but still presents a challenge that must be planned for and addressed.

C. Advanced Distribution Management System

1. Highlights of Feeder Level Implementation

The Advance Distribution Management System program was not administered on a feeder basis in the 2018 GMP investment year. As the GMP progresses, feeder level implementation will be incorporated into the Company's Grid Modernization Annual Reports.

2. Feeder Level Lessons Learned/Challenges and Successes

There are no "Feeder Level" lessons learned for the reasons described in 4.a above.

3. Communications

1. Highlights of Feeder Level Implementation

The Communications program will not be implemented on a "Feeder Level". Please see Section III of this Report for a further discussion of the Communications program.

2. Feeder Level Lessons Learned/Challenges and Successes

The Communications program will not be implemented on a "Feeder Level". Discussion about this program can be found in Please see Section III of this Report for a further discussion of the Communications program.

IV. Description and Report on Each Infrastructure Metric

As part of its approval of the Company's GMP, the Department approved the proposed statewide and company-specific infrastructure metrics. Regarding statewide infrastructure metrics, the Department required the Distribution Companies to report on the following: (1) system automation saturation; (2) number/percentage of sensors installed versus planned; (3) percentage of circuits with installed sensors; and (4) total number of grid-connected DG facilities, nameplate capacity and estimate output of each unit and type of customer-owned or operated units. D.P.U. 15-122, at 198-199. As for the Eversource-specific infrastructure metrics, the Company is required to report on the following for each category of preauthorized grid-facing investment: (1) the number of devices or other technologies deployed; (2) the associated cost for deployment; (3) reasons for deviation between actual and planned deployment for the GMP investment year; and (4) projected deployment for the remainder of the GMP term. Id. at 200-201. To assist in the development of these baselines, the Department directed each of the Distribution Companies to develop and maintain information on its system design, operational characteristics (e.g., voltage, loading, line losses), and ratings prior to any deployment of preauthorized grid-facing technologies. Id. at 203. Additionally, the Department directed the Distribution Companies, when developing their proposed baselines to use, to the extent possible, information reported in the annual service quality filings, as well as other publicly available information. Id.

While the purpose of these infrastructure metrics is to determine how performance can be changed because of grid modernization activities, there are outside factors, over which the Company has no control, that can and will impact performance. Weather, customer behavior, economic conditions and other factors will have a significant influence on the parameters being measured under these metrics.

The statewide infrastructure metrics use the following common definitions across the Distribution Companies.

Grid Modernization Device - any device that meets the requirements of either a fully automated or a partially automated device.

Fully Automated Device – a device that meets all of the following requirements:

- reacts to system conditions to isolate or restore portions of the electric system;
- communicates system quantities (e.g., voltage, trip counts) to a central location, such as SCADA; and
- the state of the device can be remotely controlled by dispatch.

Partially Automated Device – a device that meets at least one of following requirements:

- Reacts to system conditions to isolate or restore portions of the electric system;
- Communicates system quantities (e.g., voltage, trip counts) to a central location, such as SCADA;
- The state of the device can be remotely controlled by dispatch; or

• Be capable of upgrade to a fully automated device without full replacement.

Sensor – Equipment that sends or records information of the electric system that can be used to improve the efficiency or effectiveness of workforce or asset management (e.g., Fault locators that would help pinpoint a problem for more efficient crew deployment).

Statewide Infrastructure Metrics

1.1 Grid Connected Distribution Generation Facilities

The data used in the calculation of this metric consider units that have an executed Interconnection Service Agreement ("ISA") and are in service and connected to the distribution system.[1]

The Company has tracked the following data on a substation and circuit basis:

a. Total number by technology or fuel type – count of units by technology or fuel type

b. Nameplate capacity by technology or fuel type – sum total of nameplate capacity

c. Estimated output by technology or fuel type – sum of nameplate capacity * capacity factor * 8760 hours

d. Type of customer-owned or operated units by technology and fuel type – (i.e., count of Photo Voltaic ("PV"), wind, Combined Heat and Power ("CHP"), Fuel Cell, etc.)

e. Nameplate as a Percent of Peak Load – calculated as total nameplate capacity (MW) / peak load (MW)

The baseline for this metric has been quantified and calculated based upon units in service by December 31, 2017. Please refer to the Company's Baselines and Targets Filing for the detailed baseline quantities.

The 2018 results for this metric are summarized in the table below. The 40,374 facilities is an increase of 5,261 facilities over the baseline amount of 35,113. The increase was primarily driven by PV facilities. The supporting details can be found in Attachment SI-1.

[9] It is important to note that DER developers' decisions regarding DER interconnection may be influenced by tax incentives, subsidies, and costs and availability of the technology, which, in turn, will influence these metrics.

SI-1 GRID CONNECTED DISTRIBUTION GENERATION FACILITIES
2018

a. Number of Facilities

Technology Type	Number of Facilities
Fuel Cell	4
Gas Turbine	15
Hydro Electric Turbine	22
Internal Combustion Engine	221
Micro Turbine	5
Other	2
PV	39,984
Steam Turbine	4
Wind Turbine	117
Total	40,374

1.2 System Automation Saturation

This metric measures the automation saturation by customer served by fully automated or partially automated device. The terms "fully automated" and "partially automated" refer to feeders for which Eversource has attained optimal or partial, respectively, levels of visibility, command and control, and self-healing capability through the use of automation.

The baseline saturation rate has been calculated based on what existed on the Eversource system as of the date the baseline was first calculated on August 1, 2018. Customers that can benefit from multiple devices will be counted as one for purposes of calculating the baseline. The installations will not be limited to the main line infrastructure and will include no-load lines and DSS lines.

The following matrix has been provided as guidance to determine which type of equipment would be considered partially automated, fully automated or included as a sensor.

Device Type	Not Included	Partial Automation	Full Automation	Included as a Sensor
Feeder Breakers (No SCADA)		X		
Feeder Breakers (SCADA)			X	X
Reclosers (including sectionalizers, single phase reclosers, intellirupters, ASU) (No SCADA)		X		
Reclosers (including sectionalizers, single phase reclosers, intellirupters, ASU) (SCADA)			X	X
Padmount Switchgear (No SCADA)		X		
Padmount Switchgear (SCADA)			X	X
Network Transformer/Protector with full SCADA			X	X
Network Transformer/Protector with monitoring, no control		X		X
Network Transformer/Protector with no SCADA		X		
Feeder Meter (e.g., ION, with comms)				X
Capacitor and Regulator with SCADA		X		X
Capacitor and Regulator no SCADA	X			
Line Sensor (with comms)				X
Fault Indicator (with comms)				X
Other Fault Indicators (no comms)	X			
Other Voltage Sensing (with comms)			X	X
Sectionalizer (no SCADA)		X		
Sectionalizer (SCADA)			X	
Customer Meter	X			
Distribution / step down Transformer	X			
Other Substation Breakers	X			
Fuse	X			

As more automation is installed on the Company's system, both under the GMP and pursuant to other system investment outside of the GMP, the results of this metric will be reduced.

Metric Calculation:

Customers Served

_____

Fully Automated Device + 0.5*(Partially Automated Device)

The baseline for this metric has been quantified and calculated based upon equipment in service as of August 1, 2018. Eversource's baseline is 247.1. Please see the Company's Baselines and Targets Compliance Filing for circuit level detail.

The calculated score at the end of 2018 was 200.3. This is an improvement of 46.8 over the baseline amount of 247.1. Please see Attachment SI-2 and Attachment SI-3 for circuit level detail.

1.3 Number/Percentage of Circuits with Installed Sensors

This metric measures the total number of electric distribution circuits with installed sensors[2] which will provide information useful for proactive planning and intervention. The installation of sensors provides the means to enable proactive planning and measure several grid modernization initiatives such as VVO and asset management. A sensor analytics development program is an essential part of grid modernization and provides the visibility into network operations needed to move toward an effective grid modernization program.

The baseline for this metric consists of all sensors installations on Eversource's distribution circuits and substations, including existing installations.

The baseline for this metric has been quantified and calculated based upon equipment in service as of August 1, 2018. Eversource's baseline has been calculated as 82.3 percent. Please see the Company's Baselines and Targets Filing for the circuit detail used to develop the baseline.

For 2018, Eversource's number and percentage of circuits with installed sensors has increased to 82.4 percent. Please see the table SI-3 below for further details.

SI-3 NUMBER/ PERCENTAGE OF CIRCUITS WITH INSTALLED SENSORS 2018

Sensor	Number of Feeders	Percent
Y	1,709	82.4%
N	366	17.6%

Eversource-Specific Infrastructure Metrics

2.1 Number of devices or other technologies deployed

Under this metric, Eversource has tracked the following information per GMP investment at the substation and circuit level where appropriate:

a. Number of devices or other technologies deployed

[2] Please see the previous matrix for devices that have been defined as "sensor" for the purpose of determining whether a circuit has a sensor.

b. Total number of devices planned

c. Percent – Number of devices installed / total number of devices planned

This metric is strictly a GMP deployment metric: accordingly, the baseline for this metric necessarily starts at zero to ensure that pre-GMP investments are not captured in the baseline.

Please refer to Table **S2-1** below for the Company's GMP investment deployment for 2018.

Table S2-1

Grid Modernization - 2018 Unit Deployment		2018		
		Commissioned Units	Commissioned Units	Commissioned Units
		Actual	Plan	% Difference
		57	**115**	**50%**
Investment Category	**Preauthorized Device Type**			
Monitoring & Control (SCADA)	Microprocessor Relay	10	13	77%
	4kV Circuit Breaker SCADA	N/A	0	N/A
	Recloser SCADA	15	18	83%
	Padmount Switch SCADA	3	21	14%
	Network Protector SCADA	N/A	0	N/A
	OMS/AMI Integration	N/A	N/A	N/A
Distribution Automation	OH DA w/o Ties	25	29	86%
	OH DA w/Ties	N/A	0	N/A
	4kV Oil Switch Replacement	0	10	0%
	4kV VFI Retrofit for DA	N/A	0	N/A
Volt-Var Optimization	VVO - Regulators	0	15	0%
	VVO - Capacitor Banks	N/A	0	N/A
	VVO - LTC Controls	4	4	100%
	VVO - Line Sensors	N/A	0	N/A
	VVO - IT Work	N/A	N/A	N/A
Advanced Distribution Management System (ADMS)	Advanced Load Flow	N/A	N/A	N/A
	GIS Survey (Expense)	N/A	N/A	N/A
	Dist. Management System	N/A	N/A	N/A
Communications	Numbers of Nodes	N/A	0	N/A
	Miles of Fiber	0	5	0%
Workforce Management	Mobile Damage Assessment	N/A	N/A	N/A
Electric Vehicles	Electric Vehicles	N/A	N/A	N/A
Energy Storage	Martha's Vineyard	N/A	N/A	N/A
	Provincetown	N/A	N/A	N/A

2.2 Associated cost for deployment

Under this metric, the Company has tracked the following information per investment type at the substation and circuit level where appropriate:

a. Cost of devices or other technologies deployed

b. Total cost of devices planned

c. Percent – Cost of devices installed / total cost of devices planned

Please refer to Table **S2-2** below for the Company's associated cost for deployment for 2018.

Table S2-2

Grid Modernization - 2018 Deployment ($)		**2018 Capital Spend**
		Actual
		12,536,080
Investment Category	**Preauthorized Device Type**	
Monitoring & Control (SCADA)	Microprocessor Relay	3,363,115
	4kV Circuit Breaker SCADA	83,747
	Recloser SCADA	963,353
	Padmount Switch SCADA	105,723
	Network Protector SCADA	-
	OMS/AMI Integration	-
Distribution Automation	OH DA w/o Ties	2,267,503
	OH DA w/Ties	-
	4kV Oil Switch Replacement	932,307
	4kV VFI Retrofit for DA	-
Volt-Var Optimization	VVO - Regulators	-
	VVO - Capacitor Banks	-
	VVO - LTC Controls	377,157
	VVO - Line Sensors	-
	VVO - IT Work	-
Advanced Distribution Management System (ADMS)	Advanced Load Flow	-
	GIS Survey (Expense)	-
	Dist. Management System	-
Communications	Numbers of Nodes	-
	Miles of Fiber	-
Workforce Management	Mobile Damage Assessment	-
Electric Vehicles	Electric Vehicles	2,859,831
Energy Storage	Martha's Vineyard	958,654
	Provincetown	624,690

As referenced in section I.2.D, the Company budget for the GMP was established in the Fiscal Year 2018 (FY 2018) capital budgeting process conducted at the end of 2017. The $62.2 million capital budget was based on the Company's original five-year plan as filed in D.P.U. 15-122 and did reflected a full calendar year of GMP investment. This budget was not at the detailed level that is shown in Table S2-2 above. Therefore, the Company was not able to fully address parts b and c in 2018. The Company will present a detailed budget by preauthorized device type in its 2019 Report.

2.3 Reasons for deviation between actual and planned deployment for the plan year

Under this metric, the Company tracked the following information per investment at the substation and circuit level where appropriate:

a. Number of devices or technology installed versus plan for a given year

b. Cost of devices or technologies installed versus plan for a given year

c. Reason for discrepancies

Please refer to Table S2-3 below for the Company's reasons for deviation between actual and planned deployment for the plan year.

Table S2-3

Grid Modernization - 2018 Unit vs. Cost Deployment		2018		
		Commissioned Units	Commissioned Units	Plant in Service
		Actual	Plan	Actual
		57	**115**	**3,694,645**
Investment Category	**Preauthorized Device Type**			
Monitoring & Control (SCADA)	Microprocessor Relay	10	13	-
	4kV Circuit Breaker SCADA	N/A	0	-
	Recloser SCADA	15	18	700,660
	Padmount Switch SCADA	3	21	-
	Network Protector SCADA	N/A	0	-
	OMS/AMI Integration	N/A	N/A	-
Distribution Automation	OH DA w/o Ties	25	29	932,834
	OH DA w/Ties	N/A	0	-
	4kV Oil Switch Replacement	0	10	764,965
	4kV VFI Retrofit for DA	N/A	0	-
Volt-Var Optimization	VVO - Regulators	0	15	-
	VVO - Capacitor Banks	N/A	0	-
	VVO - LTC Controls	4	4	-
	VVO - Line Sensors	N/A	0	-
	VVO - IT Work	N/A	N/A	-
Advanced Distribution Management System (ADMS)	Advanced Load Flow	N/A	N/A	-
	GIS Survey (Expense)	N/A	N/A	-
	Dist. Management System	N/A	N/A	-
Communications	Numbers of Nodes	N/A	0	-
	Miles of Fiber	0	5	-
Workforce Management	Mobile Damage Assessment	N/A	N/A	-
Electric Vehicles	Electric Vehicles	N/A	N/A	1,296,186
Energy Storage	Martha's Vineyard	N/A	N/A	-
	Provincetown	N/A	N/A	-

The Company is interpreting "devices or technologies installed" to mean devices that have been placed in service which has been provided in the table above. Similar to the budget referenced above, a detailed plant in service plan was not developed down to the specific device type for 2018 due to the timing of the planning process. Therefore, the Company will not be able to fully address parts b and c. For the 2019 Report, the Company will have a detailed plant in service plan that will have the ability to fully report on this metric.

As is further discussed in section III.A of this Report, there were a variety of factors that precluded the Company from commissioning all the units planned for calendar year 2018. Most common among this was the accelerated schedule under which the programs needed to be initiated,

engineered, planned, construction and commissioned. This compressed timetable placed significant strain on the Company's commissioning process and resources. With very limit exceptions, all of the work not completed in 2018, was placed in-service and commissioned as of April 1, 2019.

As a final point, through the Company's portfolio-based QA/QC process, inconsistencies in allocation and reporting of information was identified and moved to remediation to ensure complete and accurate data was communicated throughout the organization and externally. This remediation delayed the formal allocation and recording of certain work orders in 2018. As a result, the Company will not be seeking cost recovery through the 2018 GMF for several programs, which explains why some program line items indicate fully commissioned units, but have limited, or no, plant in service costs associated with them. Further information can be found in Section III.A.

2.4 Projected deployment for the remainder of the three-year GMP term

The metric compares the revised projected deployment with the original targeted deployment as the Company implements its GMP. The year-by-year investment plan is subject to change based upon the quantity of work completed, the availability of the technology, material lead times, contractor availability, etc. Each year's revised investment plan will be used as the basis of comparison for the following year's GMP work.

Under this metric, the Company has tracked the following information per investment at the substation and circuit level where appropriate:

a. Number of devices or technology to be installed the following year

b. Cost of devices or technologies installed the following year

The metric will be used as the baseline and target for the following year's work and will be reported on an annual basis. Please refer to Table S2.4 below for the Company's projected GMP investment deployment from 2019 to 2020.

Table S2-4

Grid Modernization - Total Deployment Plan (Cost vs. Units)		2018		2019		2020	
		Commissioned Units	Capital Spend	Commissioned Units	Capital Spend	Commissioned Units	Capital Spend
		Actual	Actual	Plan	Plan	Plan	Plan
		57	**12,536,080**	**822**	**101,593,952**	**518**	**118,869,967**
Investment Category	**Preauthorized Device Type**						
Monitoring & Control (SCADA)	Microprocessor Relay	10	3,363,115	100	20,319,438	100	10,227,731
	4kV Circuit Breaker SCADA	N/A	83,747	21	2,413,892	20	
	Recloser SCADA	15	963,353	11	1,024,000	8	
	Padmount Switch SCADA	3	105,723	24	299,000	17	
	Network Protector SCADA	N/A	-	50	2,200,000	33	
	OMS/AMI Integration	N/A	-	N/A	-	N/A	
Distribution Automation	OH DA w/o Ties	25	2,267,503	100	13,167,000	67	13,608,190
	OH DA w/Ties	N/A	-	23	3,135,000	15	
	4kV Oil Switch Replacement	0	932,307	57	10,010,000	38	
	4kV VFI Retrofit for DA	N/A	-	16	880,000	62	
Volt-Var Optimization	VVO - Regulators	0	-	80	5,223,000	10	1,370,009
	VVO - Capacitor Banks	N/A	-	76	-	8	
	VVO - LTC Controls	4	377,157	6	882,804	0	
	VVO - Line Sensors	N/A		125	-	15	
	VVO - IT Work	N/A	-	66%	5,147,030	34%	
Advanced Distribution Management System (ADMS)	Advanced Load Flow	N/A	-	56%	4,662,150	44%	10,278,059
	GIS Survey (Expense)	N/A	-	75%	-	0%	
	Dist. Management System	N/A	-	44%	2,059,791	56%	
Communications	Numbers of Nodes	N/A	-	6	974,299	4	3,575,379
	Miles of Fiber	0	-	125	13,450,322	120	
Workforce Management	Mobile Damage Assessment	N/A	-	N/A	-	N/A	-
Electric Vehicles	Electric Vehicles	N/A	2,859,831	N/A	6,378,693	N/A	35,761,476
Energy Storage	Martha's Vineyard	N/A	958,654	N/A	3,360,030	N/A	10,681,316
	Provincetown	N/A	624,690	N/A	6,007,503	N/A	33,367,807

The Company submitted its Baseline and Targets Filing in the Compliance Filing on August 15th, 2018, which included the 2018-2020 GMP baseline (Baseline and Targets Filing at 15, Table 2.4.7). As of the conclusion of 2018, the Company is not revising the GMP given that the projects are in their early stages of implementation and the Company does not yet have a full year of experience upon which to make revisions. However, the Company will maintain the flexibility to adjust its GMP budget across various programs or to vary its deployment schedule across remaining GMP years. Additionally, and as discussed in section I.B of this Report, the Company is continuously seeking opportunities to accelerate the preauthorized device type units deployments in an efficient and cost-effective manner. Please also refer to the Company's Attachment ES-1, which provides the Excel versions of the Eversource-specific tables included in Section 2.1, Section 2.2, Section 3.3, and Section 2.4.

V. Distributed Energy Resources ("DER")

Installations of DER are growing at an astonishing rate in many parts of the United States, including Massachusetts. This surge in DER deployment on utility distribution systems has been accelerating over the last decade and is forecast to continue for the foreseeable future

The vast majority of DER installations are solar projects. The projects range from the high-volume residential roof top to large multi-MW stand-alone projects. The success of DER installations in recent years has led to high saturation levels in many areas of the Company's distribution system. The DER activity of large scale solar in areas of relatively low electric load has been high over the last decade and continues to see high application activity.

There are new complicating factors that are now evolving in the market that require more technical review time and integrated system work to ensure the safety and reliability of the system. These factors include the emergence of:

1) Solar plus-storage market.
    a. This market has added complexity to DER studies and screens as well as metering and incentive program applicability.
    b. Applicants are interested in maximizing incentive programs across state and Independent System Operator ("ISO") markets which leads to confusion and application tracks

2) Sub-Station upgrades
    a. Due to high saturation levels in certain areas of the system, studies are determining that sub-station upgrades are required to allow for project interconnection.
        i. This makes studies and construction activities more complicated and time-consuming.
            1. It also requires the Company's planning teams to account for the potential for additional sub-station work or dedicated express feeders due to the expected continuing DER activity. The Company must ensure that resources are utilized and projects are executed in an efficient fashion, which requires careful planning and coordination.

3) More frequent ISO transmission studies
    a. NE-ISO is requiring studies for projects less than 5 MW in areas it deems saturated.
        i. This adds additional time, cost and engineering effort to many projects that historically did not have this extra layer of administrative and engineering complexity.
        ii. There is still ongoing uncertainty with which projects will be required by NE-ISO to undergo a study due to ISO-identified saturation.
        iii. ISO and Eversource work together on the study process to minimize customer impact, but Eversource is aware that these new requirements are confusing to customers.

4) New metering and design configurations
    a. Metering configurations that vary based on system design and/or incentive program (e.g., ISO program participation, SMART program energy storage adder)
    b. Multiple service requests on single parcel and/or building (dedicated service for the DER which is separate from the existing customer)
5) Aggregation of small projects in certain areas
    a. Over time the number of small projects interconnected in an area leads to significant installed capacity.
    b. Simplified applications for multiple small projects in the same area require additional study and administrative and engineering burden to execute outside of the normal simplified process.

Eversource is constantly exploring opportunities to better manage its DER grid interconnection processes in ways that can more fully leverage technology advances (e.g., advanced inverter functionalities), enable procedural transparency, and recognize evolving technical standards.

- Eversource recognizes first and foremost that a core group of technical experts is needed to streamline the application studies and effectively adapt to the changing dynamics. Accordingly, the Company is currently hiring additional engineers, analysts, and program managers into the DER Planning organization with the following objectives:
    - Streamline the interconnection process;
    - Provide additional resources to continue to perform efficient and cost-effective system impact studies;
    - Support faster adaptation of new/updated industry standards and regulatory policies;
    - Further refine and improve the Company's interconnection standards, processes, procedures;
    - Provide developers/customers with additional technical experts to facilitate interconnection options; and
    - Perform rapid DER impact analyses for off-normal system configurations to reduce outages to the interconnected sites.

- Eversource also recognizes that research in these emerging issues is critical in order to continue to support additional integration of DERs, especially with the emergence of a multitude of varying types of technologies. As such, Eversource is funding research organizations such as the Electric Power Research Institute ("EPRI") and local universities performing relevant research to improve the integration and operability of DERs. For example, the Company has provided funding for studies related to enhanced modeling and simulation techniques for DER integration.

Additionally, the Company is exploring initiatives associated with mapping tools, an interactive self-service application portal, and proposing selective locations for storage to meet utility needs. Accurate, up-to-date maps of a utility's distribution system can play a useful role for both the utility and potential DER interconnection applicants. For the utility, having this information can support a more rapid review of an interconnection application on a specific feeder. For applicants,

having access to a more dynamic version of the map, specifically one that indicates remaining hosting capacity for new DER projects, allows them to be more selective in the types of projects and their specifics (e.g., capacity, technology deployed, etc.) to pursue in a formal interconnection application. By increasing visibility into the characteristics and feasibility of individual circuits, these maps can save both customers and utilities time and money.

The Company has published the first version of the hosting capacity maps in its CT service territory. This version, which does not depend on the use of an advanced load flow tool, expeditiously provides key preliminary information to developers.

As demonstrated at the February 13, 2019 technical session, the Company recognizes that hosting capacity maps are of critical importance to developers. As described in Section III, as a part of its GMP, the Company is making progress on its ALF project that will ultimately support the development and deployment of subsequent versions of hosting capacity maps based on more sophisticated logic as calculated by the ALF tool. Given the dynamic nature of DER in Massachusetts, the Company's continued investment in foundational grid modernization investments is crucial to ensuring that the Company is able to aid these developers in siting and interconnecting their projects as part of an expedient and efficient process.

VI. Performance Metrics

In D.P.U. 12-76-B, the Department directed the Distribution Companies to include in their respective GMPs performance metrics that measure progress towards the objectives of grid modernization. D.P.U. 12-76-B, at 30. Eversource filed proposed performance metrics with its GMP in D.P.U. 15-122, as did National Grid and Unitil. The Department determined that additional work was needed to develop performance metrics that appropriately track the quantitative benefits associated with pre-authorized grid-facing investments, and progress toward the Grid Modernization objectives. D.P.U. 15-122, at 95-106. The Department ordered the Distribution Companies to file revised proposed performance metrics designed to address the preauthorized grid-facing investments and noted that it would convene a stakeholder process to facilitate review of the revised performance metrics. Id., at 202.

On August 15, 2018, the Company, along with National Grid and Unitil, filed revised proposed performance metrics. Following that filing, the Department, the Department of Energy Resources ("DOER") and the Cape Light Compact ("Compact") issued information requests to the Distribution Companies regarding the revised proposed performance metrics. On February 13, 2019, the Department held a technical conference to aid its review of the Distribution Companies' revised proposed performance metrics. Following the technical conference, the Department issued a Memorandum on March 19, 2019, ordering the Distribution Companies to file further revised performance metrics consistent with the directives set out in the Memorandum. March 19, 2019 Memorandum at 2-5. The Companies submitted final revised proposed performance metrics on April 9, 2019. The Distribution Companies' April 9, 2019 proposed performance metrics are still pending before the Department.

Given that the performance metrics as well as the Grid Modernization Annual Report templates are not yet finalized, the Department indicated, in its March 29, 2019 Memorandum regarding the content and schedule for filing the 2018 Grid Modernization Annual Report, that the filing date for the remainder of the 2018 Grid Modernization Annual Report, which presumably includes reporting consistent with the to-be-issued final performance metrics, will be established in a subsequent procedural memorandum. March 29, 2019 Memorandum at 2.

The Company, following its review of the final performance metrics and all necessary steps to compile, review and finalize the necessary data, will file its achievements under the 2018 Grid Modernization performance metrics.

VII. Research, Design and Development

In D.P.U. 12-76-B, the Department directed the Distribution Companies, as part of their GMPs, to propose research, design and development ("RD&D") projects that focus on the testing, piloting, and deployment of new and emerging technologies to meet its grid modernization objectives. D.P.U. 12-76-B at 27-30. As part of its GMP, Eversource filed an RD&D proposal to undertake projects in the following areas: (1) sensing and monitoring; (2) advanced analytics; (3) real-time flexible action and dynamic integration of distributed energy resources; (4) impact of grid modernization technologies on low income customers; (5) pricing options; (6) customer engagement and behavioral response; and (7) microgrids. D.P.U. 15-122, at 44.

Ultimately, the Department did not approve the Company's proposed RD&D projects, nor did it approve the proposals filed by National Grid and Unitil. Id. at 185. The Department indicated that any future RD&D proposals incorporated into future GMPs would be reviewed consistent with the standards developed by the Department in light of RD&D proposals made in other contexts. Id. at 185, citing D.P.U. 17-05, at 457-460; NSTAR Electric Company and Western Massachusetts Electric Company, D.P.U. 16-178, at 26, 29-30 (2017); Fitchburg Gas and Electric Light Company, D.P.U. 16-184, at 11 (2017). In reaching its decision, the Department emphasized that any future RD&D proposals contained in future GMPs should be the result of collaboration between the Distribution Companies and other stakeholders. Id.

Consistent with the Department's decision in D.P.U. 15-122, the Company is not undertaking any RD&D efforts as part of its 2018-2020 GMP. The Company will, in developing any future RD&D proposals, collaborate with National Grid and Unitil, as well as relevant stakeholders, prior to filing any proposal with the Department for its review and approval.

VIII. Energy Storage

This Section addresses all activity to date on Eversource's two battery energy storage ("BES") projects following the Department's final order in the Company's last rate case, D.P.U. 17-05.

A. Outer Cape BES

Overview

The Outer Cape BES will be a 25 MW / 38 MWh lithium ion battery, housed in a Cape-style building on approximately 1.4 acres at the Provincetown transfer station on land leased from the Town of Provincetown.

The Outer Cape BES's primary purpose will be to provide back-up power during outages on Line 96, the single, three-phase distribution line that serves as many as 11,000 customers from the Towns of Wellfleet, Truro, and Provincetown.

Line 96 starts at the downstream side of the Wellfleet substation and extends along Route 6 going east to the tip of Provincetown. Due to its proximity to harsh Atlantic winds and weather conditions, Line 96 has poor reliability statistics. In fact, customers in Wellfleet, Truro, and Provincetown have experienced over 50,000 outage hours over the last five years.

One solution to this significant reliability issue for the Company's customers would be to build a 13-mile redundant distribution line. This line, however, would require construction through a significant portion of the Cape Cod National Seashore, which would have potential environmental impacts.

The Eversource engineering team identified this area as a key target for a BES. This recommendation was confirmed by Eversource's expert consultant, Doosan, in its preliminary feasibility analysis. The Department's approved the Company's BES proposal, as well as the $40 million budget, in D.P.U. 17-05.

Design, Site Selection, and Outreach Activity Since the 2017 Rate Case

At the time of the preliminary feasibility analysis, the Eversource team expected that it would construct the battery in Wellfleet, Massachusetts. Following the rate case, however, Eversource and its experts confirmed as part of the final feasibility analysis that siting the BES project as close to the tip of Provincetown as possible would extend the outage back-up duration of the BES.

In fact, Eversource now estimates that during the winter months, late fall, and early spring months, the BES (if sited in Provincetown) will provide approximately 10 hours of back-up power. This is the time period when most outages occur. Eversource further estimates that during the summer, when energy use is at its highest on the Cape, the BES will provide between 1.5 to 3 hours of back-up power depending on where the outage occurs.

For that reason, in January, Eversource approached the Town of Provincetown describing the BES's purpose and inquiring whether there were any Town-owned locations to site the BES. Eversource also examined privately-owned potential sites in Provincetown but found no viable candidates.

The Town of Provincetown was a strong partner from the start and working with the Eversource team, starting in earnest from April 2018 until present, evaluated three potential sites. The sites were evaluated based on the following criteria: (1) minimize the BES Project's visibility; (2) ensure that there will be no sound or other impacts to surrounding properties from the BES; (3) site the BES somewhere where the Town's employees and leadership wanted it; and (4) find a site that has approximately an acre and a half of space and is environmentally clean (i.e., no wetlands, rare species habitat).

One site proved unfeasible due to lack of space and an environmental issue. A second site presented with potential visibility from a bike path. A third, on the Town Transfer Station (aka "the dump") met all the criteria.

Accordingly, with the Town's support, Eversource began a permitting level design of the project with its expert consultant, TRC, in the late summer of 2018. A permitting level design means that the first 30 percent of the project is designed, enabling Eversource to commence permitting and to go out for competitive request for proposals ("RFP") for bids to construct the project (more detail on this process is provided below).

During this time, Eversource continued extensive outreach with the Town of Provincetown leadership and its various departments. This included many face-to-face meetings and two publicly televised presentations to the Provincetown Select Board, who offered feedback and guided Eversource on how to make the BES project the best possible project for their town and its residents. Eversource appreciated the collaboration with the Town of Provincetown.

The Town voted at its October Town Meeting to amend its zoning by-laws to make the project a specially permitted use at the Transfer Station. Then, on April 2, 2018, Eversource went before more than 300 residents at the Town of Provincetown's Annual Meeting to request approval to lease 1.4 acres of Town-owned land at the Transfer Station to construct the BES Project. The warrant was presented by Town leadership and then Eversource was called to the floor to answer multiple questions from town residents about the BES. The evening culminated with the Provincetown residents voting unanimously to authorize the Town to enter into a long-term lease with Eversource to construct the BES at the Transfer Station.

Permitting

The Outer Cape BES will need a Special Permit from the Provincetown Planning Board, review by the Provincetown Conservation Commission, approval from the Cape Cod Commission, a Department of Transportation Highway Permit, minor review under the National Heritage & Endangered Species Program, and a Landfill Post-Closure Minor Modification Permit.

Eversource has done substantial work to develop filings for all these requirements. It is in final stages of advance review with the Provincetown Planning Board to prepare to file for its Special Permit, which will then trigger its Cape Cod Commission filing, with all others to follow. Eversource is targeting to have its Special Permit filing by end of May 2019 and to have all permits in hand by November 15, 2019.

B. Martha's Vineyard BES

Overview

The Martha's Vineyard BES will be a 5 MW / 20 MWh lithium ion battery, housed in a Cape-style building on just over an acre of Eversource-owned land, adjacent to its Area Work Center in Oak Bluffs.

The Martha's Vineyard BES's primary purpose will be enable significantly reduced reliance on two out of five diesel-fired peakers that are used to supply power to the Island during high load conditions.

Martha's Vineyard is served by four undersea cables that connect into the mainland at Falmouth. The year-round population on the Island is around 15,000 but swells to as many as 125,000 in the summer. This causes electricity use on the Island to surge and the undersea cables become strained. When this happens, Eversource calls on five diesel-fired peakers that provide approximately 12.5 MW of back-up power. These peakers date back to the 1950s.

Eversource engineers identified Martha's Vineyard as a potential BES location due to the ability to use a BES to significantly reduce (and ultimately eliminate) reliance on the diesel-fired peakers, as well as to enable the interconnection of additional solar photovoltaics ("PV") on the Island. This recommendation was confirmed by Eversource's expert consultant, Doosan, and its preliminary feasibility analysis. The Department approved the Company's proposed BES, as well as a $15 million budget, in D.P.U. 17-05.

Notably, Eversource contemplates the Martha's Vineyard BES as having two phases: the first will enable significantly reduced reliance on two of the five peakers, and, if the first is successful, a second phase of the BES (constructing additional battery capacity) will enable significantly reduced reliance (and over time elimination) of all five of the peakers.

Design, Site Selection, and Outreach Activity Since the 2017 Rate Case

Following the DPU's November 2017 order pre-authorizing the BES, Eversource and Doosan completed a final feasibility study for the project. This confirmed that the BES would also help address an N-1 contingency condition on the Island and defer construction of an additional undersea cable. The Eversource team also subsequently confirmed that the BES could be used to shave yearly and monthly peaks when not needed to reduce reliance on the peakers, resulting in additional capacity and transmission Regional Network Savings ("RNS") savings.

In January 2018, Eversource commenced outreach to the Town of Oak Bluffs about the project and specific work with the Town began in April 2018. Eversource advised of its intent to construct the BES on Company-owned land behind its Area Work Center in Oak Bluffs. This location met Eversource's criteria of: minimizing the BES Project's visibility; ensuring that there will be no sound or other impacts to surrounding properties from the BES; putting the BES somewhere where the Town's employees and leadership wanted it; and finding a site that has approximately an acre and is environmentally clean (i.e., no wetlands, rare species habitat).

Eversource has appreciated working with the Town of Oak Bluffs, meeting multiple times in person with Town Selectboard members, the Town Manager, the Fire Chief and building inspector, and, most recently, the Planning Board. They provided feedback on height of the BES facility, roof pitch, fire safety, and other design details that Eversource was able to incorporate. Using this feedback, in late summer 2018, Eversource performed a permitting level design for the BES.

Permitting

Eversource and Town of Oak Bluffs leadership spent a significant amount of time working through some issues related to a parcel of land not related to the BES. Eversource's land use attorneys also advised that the Town Bylaws would not permit its planning board to grant Eversource the right to construct the project, and so Eversource filed for a land use permit (zoning relief) with the Department pursuant to G.L. c. 40-A ("Chapter 40-A"). The Oak Bluffs Planning Board has expressed disappointment with this outcome, taking the view that they do have the ability to grant a variance.

Eversource filed a Chapter 40-A land use permit with the Department in late November of 2018. Leading up to the filing, Eversource met multiple times with the Oak Bluffs Fire Chief and Building Inspector and incorporated their input into fire safety and other design aspects. Eversource also conducted abutter outreach and, since filing, held a public hearing in Oak Bluffs.

The Company has remained interested in how it can find ways to present to the Oak Bluffs Planning Board and obtain its substantive feedback, despite the fact that it needed to file for a zoning exemption with the Department. It filed a site plan with the Planning Board and then did a brief presentation in April 2019 and is scheduled to do a full presentation in May 2019, seeking recommendations from the Oak Bluffs Planning Board before it refers the site plan filing on to the Martha's Vineyard Commission, which is the other required permit approval needed to construct the BES.

By November 15, 2019, Eversource hopes to obtain Department approval of its Chapter 40-A petition, Martha's Vineyard Commission approval, and to have incorporated the feedback of the Oak Bluffs Planning Board to its satisfaction.

C. Competitive Procurement

Eversource used a competitive procurement to select a vendor to perform the engineering, procurement, and construction of both BES projects. This disciplined process was conducted by

the same Eversource procurement team that leads negotiation and successful vetting of all of Eversource's contracts.

The process began with a field of over 80 leading BES vendors in the Spring of 2018. By October 2018, six bidders had been short-listed. This selection was based on each vendor's safety record, financial solvency (especially important given that the BES will be relatively new technology but long-lived assets), prior similar BES projects completed on time and on budget, and engineering and project management expertise. Full and formal bids were received from three of these vendors. A cross-functional Eversource team exhaustively reviewed and ranked the bids based on cost, technical design, and project plan strength. One vendor rose to the top and Eversource has completed successful negotiations with that vendor to construct both BES projects on terms that are extremely cost-effective for customers and with strong warranties and other protections.

The successful vendor will now complete in full the design portion of the BES projects. Once the BES projects receive all permits, Eversource will release the vendor to order all equipment and immediately commence construction.

Finally, Eversource was saddened to learn of the BES fire in Arizona. Eversource has requested that its vendor give a full fire safety analysis of the BES design for both projects, incorporate lessons learned from Arizona and best practices more generally, and make any further adjustments needed. Eversource is pleased to give a further report to the Department on the outcome of this request once this important work is completed.

D. Lessons Leaned/Challenges and Successes

Eversource is only just getting started on development of the BES projects. Over the last year the Company has developed a strong cross-functional team that can move swiftly and efficiently on these projects.

Eversource, consistent with other efforts throughout the Commonwealth, recognizes that Town support is a critical, often iterative, aspect of developing BES projects encompassing a variety of stakeholders. The Company works diligently to balance stakeholders' input with its core obligation to provide safe and reliable service.

Consistent with its chief obligation to provide safe and reliable service, the Company recognizes the importance of studying and understanding the impact that the BES projects may have on the distribution system. These lessons learned will be used to inform and influence future BES projects.

The Company has learned that Martha's Vineyard and Cape Cod are some of the more challenging areas to develop clean energy projects from a land availability standpoint.

The Company is also learning a great deal about sound and fire safety issues connected to BES. With respect to sound, the batteries require HVAC systems which do have some sound impact. To attain its goal of ensuring the batteries will not be audible to the human ear from any surrounding residences or businesses, the Company has developed plans to include sound walls,

shrouds, and to house some equipment in free-standing enclosed sheds. Regarding fire safety, Eversource has consulted with industry experts to ensure the BES will immediately disconnect in the event of any trouble warning and will be equipped with the leading BES fire suppression equipment. This is an evolving area and part of the Company's work is to stay up to speed with emerging trends.

Finally, the Company is pleased to see how cost-competitive the vendor bids to Engineer-Procure-Construct ("EPC") the BES projects were. The Company anticipates being able to construct the BES projects under budget as a result of these cost-competitive bids and the Company's disciplined and efficient project management.

E. Actual vs. Planned Implementation and Spending

Spending in 2018 was not material compared to budget, consisting of $958,654 for Martha's Vineyard and $624,690 for the Outer Cape. The Company expects material spend to commence in the November 2019 timeframe when it commences construction and orders equipment.

F. Performance on Implementation/Deployment

Please see above sections (A) and (B).

G. Description of Benefits Realized from Implementation

Please see above sections (A) and (B).

H. Key Milestones

Eversource's goal is to bring in both BES projects on-time and at- or below-budget. Key milestones through commissioning are as follows:

- Obtain all permits for both BES projects by November 15, 2019
- Start construction on both BES projects by December 2019
- Complete construction on both BES projects by November 2020.
- Commence operations on both BES projects by December 2020.

I. Updated Projections for Remainder of 2018-2020 GMP

The Company is targeting to hit the milestones described in Section (G) for both BES projects, barring unforeseen circumstances.

I.X. Electric Vehicles

A. Description of Work Completed

Background

On November 30, 2017, the Department approved the Company's proposal to spend up to $45 million over five years on an electric vehicle ("EV") infrastructure program (the "Make-Ready Program" or "Program"). D.P.U. 17-05, at 475-478, 501.

Consistent with the Department's findings and directives in D.P.U. 15-122 and D.P.U. 17-05, the Company is providing this report on the Make Ready Program's status and achievements, as well as the lessons learned from the Program in 2018. This Program update contains operational information including: the number of EV charging stations and sites deployed; site host enrollment; number of EV supply equipment tools installed; costs, and deployment in or adjacent to disadvantaged communities. The Company's progress report also provides information and idea; gathered from the Company's targeted outreach with various stakeholders and work with environmental justice communities and stakeholders.

As part of its proposal in D.P.U. 17-05, the Company proposed to track and report on six proposed performance metrics to evaluate the implementation and customer benefits of the Make Ready Program. D.P.U. 17-05, at 474. In D.P.U. 15-122, the Department noted that it would develop performance metrics for the Program through a separate EV metrics stakeholder process.[1] D.P.U. 15-122, at 187. In the interest of providing the Department and stakeholders with a robust review of the Company's 2018 progress under the Make Ready Program, the Company is providing its progress under the six proposed performance metrics first introduced in D.P.U. 17-05. The specific performance metrics include:

(1) total number of "make ready" sites developed;

(2) ten percent capital invested in direct charging ("DC") fast charging sites;

(3) ten percent capital invested in Environmental Justice ("EJ") communities;[2]

(4) utilization of EV charging stations separately for Level II chargers and DC fast chargers (measured in annual kWh per port);

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[1] The stakeholder process has not yet been commenced.

[2] Generally, EJ communities are defined in terms of demographic and socioeconomic characteristics, with certain environmental policy implementation practices aimed at these communities because of race/ethnicity/class-based environmental inequities. The Department directed the Company to select EJ communities that meet two of the following three criteria established by the Massachusetts Executive Office of Energy and Environmental Affairs ("EEA") in Eastern Massachusetts and one of the following in Western Massachusetts: (1) 25 percent or more of the population in the communities must earn 65 percent or less than the Massachusetts median household income; (2) 25 percent of more of the population in the communities must identify as a race other than white; and (3) 25 percent of households lack a person over the age of 14 who speaks only English or speaks English very well.

(5) the percentage of Eversource residential customers within the range of an Eversource "make ready" site constructed as part of the EV program (i.e., percentage within 20-mile range and within 40-mile range); and

(6) available data on plug-in EV adoption and CO_2 emissions reductions

Program Overview

In 2018, Eversource the Make-Ready Program with the goals of helping accelerate EV charging infrastructure development within its service territory, encouraging EV purchases, and contributing to greenhouse gas ("GHG") emissions reduction in the Commonwealth. The Program is designed to help meet the Commonwealth's goal contained in the Global Warming Solutions Act ("GWSA") and support the campaign of the EEA to encourage zero emissions vehicles ("ZEVs") via a commitment for 300,000 ZEVs registered in Massachusetts by 2025.

The Make-Ready Program's primary component is increased investment in long dwell-time EV charging make-ready infrastructure in public and workplace settings and at multi-unit dwellings ("MUDs"). Under the Program, Eversource invests in infrastructure beyond the meter up to the charging station, specifically for the service panel and the associated conduit and conductor necessary to connect each piece of equipment.

The Make-Ready Program will be run in two phases: Phase I will extend from January 1, 2018 through December 31, 2019; and Phase II will extend from January 1, 2020 through December 31, 2022. Over the course of five years, Eversource plans to support the deployment of up to 72 DC fast charging ports at 36 charging sites, and up to 3,500 Level II charging ports at 450 charging sites, throughout its service territory in Massachusetts. Based on customer demand for the Program, Eversource anticipates accelerating implementation of the Make-Ready Program.

Eversource will support the deployment of EV charging ports by installing electrical equipment and components necessary to connect EV chargers to its distribution system. Eversource will install the "Eversource-side Infrastructure," and contract with third-party electrical contractors to install behind the meter "Participant-side Infrastructure." Specifically, the EV infrastructure that Eversource is proposing to install and own includes the following: (1) distribution primary lateral service feed; (2) necessary transformer and transformer pad; (3) new service meter; (4) new service panel; and (5) associated conduit and conductor necessary to connect each piece of equipment.

Vendor Prequalification

In the Spring of 2018, Eversource issued a Request for Information / Proposal to begin the process to pre-qualify vendors to participate in the Make-Ready program. This process was undertaken to give electric vehicle charging station manufacturers, network integrators, and installers the opportunity to have their equipment and services pre-authorized for inclusion in the Program. Being selected indicates that Eversource has reviewed and approved the equipment and services and verified that they meet its specifications and standards, and that the vendors have signed Eversource qualification agreement terms and conditions. Site hosts are welcome to use equipment, installers, or network integrators not selected by Eversource

for pre-approval, if those vendors agree to Eversource qualification agreement terms and conditions.

The vendors selected for prequalification in the Spring 2018 procurement round are as follows:

Eversource EV Make Ready Preferred Vendors

Vendor	Type
ChargePoint	Manufacturer & Installer
EVBox	Manufacturer & Installer
AETNA	Installer
EV Launchpad	Installer
Horizon Energy	Installer
Voltrek	Installer
Greenlots	Network Integrator

Recognizing that new technologies and new vendors may emerge over the duration of the program, Eversource intends to issue subsequent rounds of pre-qualification requests, on a schedule to be determined.

Contractor Qualification

Under the program, Eversource uses third-party electrical contractors for the installation of the "behind the meter" infrastructure. This infrastructure primarily includes the new service panel and enclosure and associated conduit and conductor necessary to connect each piece of equipment.

For 2018, Eversource chose to use electrical contractors with proven track records already approved by the Company to work on Eversource Energy Efficiency programs. Those contractors include (but are not necessarily limited to):

- Maverick Construction Corporation (Boston, MA)
- J.&M. Brown Company, Inc. (Jamaica Plain, MA)
- Horizon Energy (Taunton, MA)

Stakeholder Outreach

Throughout 2018 Eversource presented updates and solicited continual program feedback from multiple stakeholders in the Make-Ready Program. Specifically, the Company met with the Massachusetts Department of Energy Resources ("DOER"); EEA; Department of Transportation; Massachusetts Bay Transportation Authority; Massachusetts Department of Environmental Protection; Environmental Business Council of New England; Sierra Club of Massachusetts; Union of Concerned Scientists; Natural Resources Defense Council; Acadia Center; the Zero Emission Vehicle Commission; Georgetown Climate Center, Green Energy Consumers Alliance; National Grid; Electrify America; Plug-In America; Nissan; General Motors; Tesla; multiple charging station vendors; multiple towns and municipalities in Massachusetts.

Site Host Acquisition Strategy

To ensure that Eversource executes on its program commitments, the Company has developed strategies to target potential Level 2 and DC Fast Charging site hosts with a tailored approach. These two distinct segments each have a unique value proposition that must be understood to help determine the ideal type of EV charging infrastructure for different use cases.

Level 2 Sites

Eversource focused its attention in 2018 on Level 2 charging infrastructure as a way of making quick and meaningful progress under the Program. These chargers and the associated electric bills are less expensive than their DC Fast Charging counterpart and therefore create fewer barriers to adoption from the customer's perspective. The initial efforts related to this segment were driven by the Company's Energy Efficiency Account Executives and Community Relations Managers. Large customers were targeted first, including those that had previously expressed interest in deploying EV charging infrastructure onsite. This outreach included education on the Make Ready Program and ensuring a clear communication of responsibilities should the customer choose to become a site host (information available at: https://www.eversource.com/content/ema-c/residential/save-money-energy/explore-alternatives/electric-vehicles/charging-stations).

DC Fast Charger Sites

DC Fast Charging similarly requires the identification of a willing site host, however, the geographical location of this infrastructure is an additional consideration. To advance the electrification of travel corridors throughout the Commonwealth, the Company determined that these chargers should be located within close proximity to major routes and highways. Utilizing an Electric Vehicle Infrastructure Planning Tool developed by MJ Bradley & Associates to support the Transportation and Climate Initiative, and several other external data sources, Eversource identified specific sites that fell within a certain radius of existing exits and that were ideal candidates for Make Ready Program participation. Energy Efficiency Account Executives will use the map created from this exercise to target customers that meet the established criteria. This will be a specific area of focus in 2019.

Pilots/Partnerships

Eversource recognizes the importance of leveraging external partnerships to help deploy the EV charging infrastructure under the Program. As outlined below, the Company is developing relationships with various market players to execute its strategy.

In December 2017, Eversource signed a Memorandum of Understanding with Maven Drive LLC ("Maven"), a subsidiary of General Motors, and EVgo Services LLC ("EVgo") to deploy DC Fast Charging infrastructure throughout the city of Boston. Under the MOU, Eversource will install the enabling Make-Ready infrastructure for these charging stations, EVgo will provide the Electric Vehicle Supply Equipment, and Maven will make these chargers available to the drivers of its vehicles. The ultimate goal is to deploy six of these charging locations throughout the Greater Boston area prior to all program funds being expended.

In September 2018, Eversource entered into an agreement with Envoy Technologies, a community-based shared mobility service provider, to advance the deployment of EV charging infrastructure available to individuals residing in multi-unit dwellings or apartment buildings. Utilities throughout the country have found MUDs to be difficult deployment scenarios for charging equipment since parking is typically limited and tenants may not currently own an electric vehicle. Envoy provides landlords with the ability to offer their tenants an electric vehicle carsharing service as an additional amenity to existing offerings. In this partnership, Eversource is working with Envoy to identify market rate and above apartment complexes that are interested in this business model, and Eversource will provide the Make Ready infrastructure to power the associated charging stations. The Company intends to target a limited number of pilot locations in Boston, and to build on the success of this initial deployment by scaling throughout other areas of the Commonwealth.

Additionally, Eversource has engaged with community development organizations in East Boston (among other communities) and the DOER to begin discussing an EV carsharing service specifically targeted at residents of low-income communities. Eversource understands the importance of providing these disadvantaged neighborhoods with charging infrastructure, as evidenced by the commitment to deploy 10 percent of all program capital to Environmental Justice Communities, however the Company also realizes that individuals living within these areas do not typically have access to EVs. To help overcome this obstacle, Eversource is in the early stages of developing plans to locate 1-2 EVs at community locations accessible to the public via a mobile application.

B. Implementation Metrics

2018 Metrics

The following tables provide information on EV Make-Ready charging station projects as of December 31, 2018:

Program Cycle

	Level 2	DC Fast Charger	Total
Applications	141	9	150
Contracts Signed	55	2	57
Under Construction	37	1	38
Projects Completed	**12**	**0**	**12**

Station Profiles

	Level 2	DC Fast Charger	Total
Charging Ports Installed	62	0	62
Charging ports Enabled	86	1	87
Avg. # Ports Installed Per Site	5	n/a	5
Public Sites	9	0	9
Workplace Sites	3	0	3
Multi-Unit Dwelling Sites	0	0	0
Environmental Justice Sites	1	0	1
Average Station Utilization (kWh/month)*	160.3	0	160.3
Port Utilization (kWh/port)*	209.1	0	209.1

*figures represent small sample size of stations, most of which were electrified late in 2018

Station Locations

	Level 2	DC Fast Charger	Total
Metro Boston	9	0	9
South Coast	1	0	1
Cape & Martha's Vineyard	0	0	0
Western MA	2	0	2
% of residential customers "within range" (40 miles)	100%	n/a	n/a

Environmental

	Total
ZEVs Enabled	372
CO2 Emissions Reductions (annualized MTCO2e)	1302

C. Lessons Learned/Challenges and Successes

Launching the Make-Ready program in 2018 provided several opportunities to learn and adjust Program implementation processes to manage towards optimization. Several of the most significant lessons learned are described below:

Modifying Use Cases based on Costs to Scale

The Make-Ready Program was designed to help customers avoid future costs of expansion while enabling future charging expectations. As originally envisioned, Eversource offered two

primary level 2 charging station deployment use cases: 1) "Up to five ports" – if customers requested two to five ports, the infrastructure would be put in place to support up to five single, or two dual and one single port stations; and 2) "Ten ports" – if customers requested six or more charging ports, the infrastructure would be put in place to support up to ten potential ports.

As Eversource examined the actual implementation costs of both use cases, the Company determined that the cost to deploy the infrastructure to support 10 ports was only marginally more expensive than the cost to support five ports. Going forward, Eversource, where possible, will put in place the infrastructure to support 10 charging ports.

Timelier Legal Agreements

To participate in the program and complete installation of charging station infrastructure, a customer must execute several documents. These include a Site Host Agreement, agreeing to the terms and conditions of participation in the Program, and an Easement granting permission to Eversource for construction and maintenance of the infrastructure that leads to the charging station. These documents can be long lead time items, leading to a delay in infrastructure deployment.

Eversource has taken steps to minimize delays from execution of these legal agreements to help ensure the timely installation of infrastructure. First, the Site Host Agreement is introduced to customers as one of the first steps in the enrollment process. Second, Eversource introduced a Site License Agreement, which grants the Company permission from the Site Host to access the site and perform the work of installing the charging infrastructure until a permanent easement for the facilities at the site is granted. Both steps have helped to reduce the time it takes for legal documents to be executed and facilitated timelier infrastructure deployment.

Customer Owned Distribution Networks

One of the requirements for participation in the Program is that the charging station site must be separately metered, and therefore must be wired directly to Eversource equipment. Several customers who own their own distribution network behind the meter, including universities, airports, and other large campus customers, are not eligible for participation. Many customers who were initially flagged as good targets based on parking characteristics (large, publicly accessible, long dwell-time, highly utilized), were barred from participation.

Multi-Unit Dwellings

Eversource's site host recruitment efforts have confirmed the experience of many other utilities that have implemented EV infrastructure programs – multi-unit dwellings are a challenging use case. Parking spaces in multi-unit dwellings tend to be a scarce resource and often building owners do not yet see EV charging as an amenity by which to increase property value and attract tenants. There are also logistical hurdles, such as payment, scheduling parking, and monitoring use.

Recognizing these challenges, Eversource signed an MOU with Envoy (see additional details in the Pilots/Partnerships section above), a company that specializes in offering EV sharing as

an amenity. Eversource is continuing to refine its strategy towards multi-unit dwellings, including exploring other car-sharing opportunities, and focusing on EJ Communities.

D. Actual v. Planned Implementation and Spending

2018 Milestones Achieved

2018 was an exciting year for EVs across the country generally, and in Massachusetts specifically. The U.S. saw an 80.8 percent year-over-year jump in EV sales to 361,307 in 2018, from 199,826 in 2017,[3] driven largely by California, whose incentive policies and established EV charging programs have led the nation. Massachusetts saw a 93 percent year-over-year jump in EV sales to 9,044 in 2018, from 4,677 in 2017. As charging stations established by the Eversource Make-Ready Program gain in number throughout the Program duration, the Company expects this number to increase.

Eversource made great strides in 2018 to establish the documentation, systems and processes to successfully launch the Make-Ready Program and begin site host recruitment to develop a strong backlog of customers ready to install charging infrastructure.

Eversource EV Make Ready 2018 Key Site Metrics

- 150 applications received
- 57 site host agreements executed
- 12 charging station sites electrified
- 62 charging station ports installed
- 87 charging station ports enabled

E. Performance on Implementation/Deployment

The below table summarizes the investments in the 12 charging station sites placed in service in 2018:

10 https://insideevs.com/monthly-plug-in-sales-scorecard/

Site Address	Town	Environmental Justice Community	Site Type	Charger Type	Ports Installed	Ports Enabled	Capital Deployed
1000 Commonwealth Ave	Newton	No	Public	Level 2	8	10	$ 184,181
208 S Great Road	Lincoln	No	Public	Level 2	6	10	$ 158,053
200 Shire Way	Lexington	No	Workplace	Level 2	10	10	$ 143,085
47 Station Drive	Westwood	No	Workplace	Level 2 / DC Fast	8	11	$ 114,395
1 Laraway Road	Winchester	No	Public	Level 2	2	5	$ 107,613
125 Bedford St	Bedford	No	Workplace	Level 2	6	6	$ 105,238
5 Russell St	Plymouth	No	Public	Level 2	4	5	$ 99,635
525 Canton Avenue	Milton	No	Public	Level 2	2	5	$ 98,129
5 Wahconah Street	Pittsfield	No	Public	Level 2	4	5	$ 80,002
26 High Street	Medway	No	Public	Level 2	2	5	$ 73,582
155 Village Street	Medway	No	Public	Level 2	2	5	$ 68,081
Olive Street	Greenfield	Yes	Public	Level 2	8	10	$ 64,193
Total		1			62	87	$ 1,296,186

Total Capital Deployed: $1,296,186

Total Capital Deployed in EJC: $64,193 (5 percent)

F. Description of Benefits Realized from Implementation

As detailed in Section B (Implementation Metrics), the deployment of the 12 charging station sites with 62 installed ports in 2018 supports 372 incremental EVs on the road, resulting in an annualized CO2e reduction of 1,302 MT.

G. Summary of Interval Charging Data

In 2018, the majority of EV Make-Ready charging stations were electrified in the 4th Quarter, limiting the time in service to collect utilization data. The Company expects that as the program matures the additional data will provide more robust insights. The strong backlog of applications and projects under construction will lead to a significant ramp up in station electrification in 2019.

H. Key Milestones

Eversource EV Make Ready 2018 Key Milestones Timeline

January 2018: Project and Construction leads assigned to Eversource implementation team

March 2018: Presented DC Fast Charger Deployment Plan to EEA/DOER/DOT

April 2018: Request for Information / Proposals issued to qualify EV charging station vendors

April 2018: Site host recruitment efforts initiated

May 2018: Site host agreement / license forms finalized

June 2018: Pre-qualified vendors selected

June 2018: Third-party electrical contractors selected

July 2018: First site host contract executed

October 2018: First charging station site electrified

December 2018: Launched web-site: https://www.eversource.com/content/ema-c/residential/save-money-energy/explore-alternatives/electric-vehicles

I. Updated Projection for Remainder of Three-year Term

As the Make Ready Program enters its second year, Eversource intends to accelerate deployment of EV charging infrastructure by building on successes from 2018. The following key priorities are areas of focus in 2019:

- Electrify 200 additional sites (5 – 10 percent expected to be DC Fast Charger deployments)
- Establish momentum with DC Fast Charger deployments
- Execute on the partnerships currently under development
- Pursue other innovative methods to help the Commonwealth achieve its EV adoption goals

The Company will implement additional lessons learned over the course of 2019 and looks forward to continued collaboration with external stakeholders as the Program progresses.