STATE OF NEW JERSEY
BOARD OF PUBLIC UTILITIES

In the Matter of the Petition of Public Service Electric and Gas Company for Approval of an Increase in Electric and Gas Rates and for Changes in the Tariffs for Electric and Gas Service, B.P.U.N.J. No. 16 Electric and B.P.U.N.J. No. 16 Gas, and for Changes in Depreciation Rates, Pursuant to N.J.S.A. 48:2-18, N.J.S.A. 48:2-21 and N.J.S.A. 48:2-21.1, and for Other Appropriate Relief

BPU Docket Nos. ER18010029 & GR18010030

SUPPLEMENTAL DIRECT TESTIMONY OF JORGE CARDENAS 12+0 UPDATE

VICE PRESIDENT – ASSET MANAGEMENT AND CENTRALIZED SERVICES

August 8, 2018
P-3 R-2

Table of Contents

PUBLIC SERVICE ELECTRIC AND GAS COMPANY
DIRECT TESTIMONY
OF
JORGE CARDENAS
VICE PRESIDENT – ASSET MANAGEMENT
AND CENTRALIZED SERVICES

I. INTRODUCTION

Q. Please state your name, position and business address.

A. My name is Jorge Cardenas. My business address is 80 Park Plaza, Newark, New Jersey 07102. I am Vice President – Asset Management and Centralized Services of Public Service Electric and Gas Company ("PSE&G" or the "Company").

Q. Are you the same Jorge L. Cardenas who previously submitted direct testimony in this proceeding?

A. Yes. I am.

Q. What is the purpose of your supplemental direct testimony?

A. The purpose of my supplemental direct testimony is to provide an update to the Company's electric and gas distribution-related capital expenditures for the test year -- the twelve month period July 1, 2017 through June 30, 2018 -- and post-test year -- the six month period July 1, 2018 through December 31, 2018 -- periods. This update includes actual information for electric and gas capital expenditures for the twelve months ended June 30, 2018 and forecast capital expenditures for the six months ending December 31, 2018. I also update the electric and gas distribution-related expense component of PSE&G's total operations and maintenance ("O&M") expense for actual test year results for twelve months. As was the case for my direct testimony, my supplemental direct testimony does not propose any post-test year adjustments for electric or gas distribution operating costs.

I am submitting revised schedules as identified below in support of these updates. Unless otherwise indicated, other than the supplements addressed herein, my direct testimony as filed in this proceeding remains unchanged and is incorporated by reference.

Q. Do you sponsor any schedules as part of your testimony?

A. Yes. I am sponsoring the following revised schedules that were prepared under my direction and supervision:

- Schedule JLC-2(a) R-2 sets forth 12+0 electric capital expenditure levels by major category during the test year and post-test year;
- Schedule JLC-2(b) R-2 sets forth 12+0 gas capital expenditure levels by major category during the test year and post-test year;
- Schedule JLC-3(a) R-2 contains additional Pegasus Reports that have been issued since the initial filing and supplements the reports provided in Schedule JLC-3(a) provided with the initial filing.
- Schedule JLC-3(b) R-2 contains a copy of the most recent Energy Strong Program Electric and Gas Quarterly Report; this report updates the information provided in Schedule JLC-3(b) included with the initial filing;
- Schedule JLC-3 (c) R-2 contains a copy of the most recent Gas System Modernization Program Monthly Report; this report updates the information provided in Schedule JLC-3(c) included with the initial filing;
- Schedule JLC-4(a) R-2 sets forth 12+0 total test year electric distribution-related O&M expense by major cost category; and
- Schedule JLC-4(b) R-2 sets forth 12+0 total test year gas distribution-related O&M expense by major cost category.

These schedules update the corresponding schedules sponsored in my direct testimony.

II. CAPITAL EXPENDITURES UPDATE

A. Electric Capital Expenditures

Q. Please summarize the results of the 12+0 electric capital expenditure update.

A. The results of the 12+0 electric capital expenditure update, as compared to the Company's initial filing and 9+3 update, are summarized in the table below:

Electric Capital Expenditures (in $000)			
	Initial Filing	**9+3 Update**	**12+0 Update**
Test Year Total	$793,969	$910,428	$860,521
Post Test Year Forecast	$216,778	$215,790	$242,031
Total	$1,010,747	$1,126,218	$1,102,552

The results of the 12+0 update for electric capital expenditures are reflected in detail on Schedule JLC-2(a) R-2.

Q. Please explain how the 12+0 test-year and post-test year electric capital expenditures compare to those included in the Company's 9+3 update and initial filing.

A. The increase in the electric capital expenditures from the initial filing to the 12+0 update is largely due to the Company completing more facilities replacement, facilities support and new business work by June 30, 2018 relative to the original forecast. Having completed more work in the test year than initially forecast, the Company is now positioned to complete additional work in the post-test year, resulting in an increase in the post-test year capital expenditures in the 12+0 update relative to the 9+3 update and the initial filing. I note that while capital expenditures

have increased in total compared to the initial filing, in total through the end of the post-test-year, they are lower than presented in the 9+3 update.

Q. Can you discuss some of the major electric capital projects that the Company expects to complete during the post-test year period?

A. A major project expected to be completed during the post-test year is the American Dream project at a total cost of approximately $12.5 million. This project will provide system reinforcement to support the American Dream project and meet the forecasted demand in the Bergen / East Rutherford area. The project involves the installation at the Carlstadt Substation of a new 26kV ten (10) breaker Sheltered Aisle Switchgear Ring Bus and one (1) 26kV Neutral Grounding Resistor. Contractors are fully engaged and work on this project continues at a steady pace. The Company expects this project to be fully in service by November 30, 2018 at a projected cost of approximately $12.2 million, excluding the cost of removal.

B. Gas Capital Expenditures

Q. Please summarize the results of the 12+0 gas capital expenditure update.

A. The results of the 12+0 gas capital expenditure update, as compared to the Company's initial filing and 9+3 update, are summarized in the table below:

Gas Capital Expenditures (in $000)			
	Initial Filing	**9+3 Update**	**12+0 Update**
Test Year Total	$833,242	$898,068	$962,354
Post Test Year Forecast	$341,015	$353,700	$380,746
Total	$1,174,257	$1,251,768	$1,343,100

The results of the 12+0 update for gas capital expenditures are reflected in detail on Schedule JLC-2(b) R-2.

Q. Please explain how the 12+0 test-year and post-test year gas capital expenditures compare to those included in the Company's 9+3 update and initial filing.

A. The increase in the gas capital expenditures from the initial filing to the 12+0 update is primarily attributable to a greater number of main and service replacements by June 30, 2018 than was first forecast. The 12+0 main and service replacements, as compared to the Company's initial filing and 9+3 update, are summarized in the table below:

Main and Service Replacements			
	Initial Filing	**9+3 Update**	**12+0 Update**
Main Miles (including GSMP)	198	223	236
Service Replacements (including GSMP)	21,318	23,745	26,607

The Company's ability to increase the number of main and service replacements has enhanced the safety and reliability of the Company distribution system. In comparison, the historic average actual run rates are 175 miles per year for mains and 19,405 per year for services, for 2014 through 2017. In addition, because the Company was able to complete these main and service replacements by June 30, 2018, it is now in position where it can complete additional work in the post-test year, which is the reason for the increase in the post-test year capital expenditures in the 12+0 update relative to the 9+3 update and the initial filing.

Q. In addition to the facilities replacement work, is there any other work that has resulted in the increase in gas capital expenditures?

A. Also contributing to the increase is a greater amount of system reinforcements and facilities support projects that were completed sooner than expected, specifically by June 30, 2018. These projects included work to increase system capacity, reliability enhancements and building improvements.

Q. Can you discuss some of the major gas projects that the Company expects to complete during the post-test year period?

A. The Company expects to complete two major gas projects during the post-test year -- the Crown Central Transmission Main Replacement and the Transmission Pipeline Integrity Management project. In addition, the Company projects that it will complete various projects associated with the Company's Gas System Modernization Programs ("GSMP") "Stipulated Base" requirements.

Q. Please explain the Crown Central Transmission Main Replacement.

A. This project involves the elimination of an area of significant corrosion on the pipeline that was found by an in-line inspection conducted as part of the Company's Integrity Management Plan for gas transmission pipelines. The Project includes the replacement of approximately 4,200 feet of the 30" steel 600 psi Crown Central Pipeline located in the Phillips 66 Bayway Refinery in Linden, with 4,200 feet of 30" steel utilizing the horizontal directional drill (HDD) method. The HDD method was chosen to avoid conflicts with existing pipelines, alleviate the replacement of existing aerial crossings in wetlands, avoid the management of a high water table during open cut trenching, and minimize wetland disturbance. Contractor crews are fully mobilized and performing the work at a steady pace. The HDD is currently in progress; the new transmission pipe is on the jobsite and is being welded in preparation for an initial pressure test. Piping is planned to be installed and pressure tested by early October with final connection of the new pipe and abandonment of the old pipe immediately thereafter. The Company anticipates a total investment of approximately $20.0 million for the Crown Central Transmission Main Replacement and completion by December 31, 2018.

Q. Please describe the Transmission Pipeline Integrity Management Project.

A. This project involves the installation of pipeline modifications on existing gas transmission pipelines to allow the use of robotic internal line inspections ("ILI") to meet the requirements of federal regulations for gas transmission integrity assessment. Six segments of transmission pipeline will be modified to accommodate the robotic ILI: the 12" Bayonne Lateral in Bayonne; the 16" Hyatt Line in Harrison; the 12" Harrison Rail Crossing in Harrison; the 20" Bergen Gen Line in Ridgefield; the 12" Essex Gen Line in Newark; and the 12" Sayreville line in Sayreville. Work also includes the coordination with the ILI inspection service company to perform the robotic ILI on the designated gas transmission pipelines.

The pipeline modifications and ILI have been completed on the Hyatt Line and Essex Gen line. Pipeline modifications are in progress on the Bayonne Line, Bergen Gen Line, and Sayreville line. The Harrison Rail Crossing modifications and ILI are scheduled for August. There are no major issues at this time and none are foreseeable. The Company reasonably expects to complete this work associated with this project by December 31, 2018 at a total investment of $3.9 million.

Q. Please discuss the expenditures associated with the GSMP Stipulated Base.

A. By the terms of the GSMP stipulation in BPU Docket No. GR15030272, the Company is required to maintain a base level of capital spending of $85 million per calendar year that is not recoverable through the GSMP Alternative Rate Mechanism. The GSMP Stipulated Base investments are for (i) the replacement of cast iron and unprotected steel mains and associated services, as well as the costs required to uprate the Utilization Pressure Cast Iron (UPCI) systems if applicable (including the uprating of associated protected steel and plastic mains and services) to higher

pressures, (ii) the elimination, where applicable, of district regulators, (iii) the installation of excess flow valves associated with the Stipulated Base, and (iv) the additional costs associated with the relocation of inside meter sets that are associated with the Stipulated Base as well as the program main replacements. Contractor and Company crews are fully mobilized and performing the work. As stated in paragraph 20 of the GSMP stipulation, "The Parties further agree that the required annual Stipulated Base spending for 2016 through 6 months after the end of the Test Year used in the Next Base Case is subject to prudence review and, unless disallowed as unreasonable or imprudent, shall be included in rate base and rates as a result of the Next Base Case." Six months beyond the test year would be through December 31, 2018. The Company has invested $21.5 million to date and thus will invest $63.5 million through December 31, 2018 to comply with the GSMP Stipulation and that investment is included in the post test year additions consistent with the GSMP Order.

III. OPERATION AND MAINTENANCE EXPENSES

Q. Please summarize the results of the 12+0 electric and gas O&M expenditures update.

A. The results of the 12+0 electric and gas O&M expenditure update as compared to the Company's initial filing and 9+3 update, are summarized in the table below:

Total O&M Expenditures (in $000)			
	Initial Filing	**9+3 Update**	**12+0 Update**
Total – Electric	$180,888	$181,962	$173,762
Total – Gas	$106,811	$108,616	$112,452
Total O&M	$287,699	$290,578	$286,214

The 12+0 update results are set out in detail on Schedule JLC-4(a) R-2 for electric and JLC-4(b) R-2 for gas.

Q. Has PSE&G continued efforts to control costs?

A. Yes, we continue the efforts described in my initial direct testimony to help manage electric and gas distribution operating costs. While many of these costs relate to essential functions that are required to operate and maintain our electric and gas distribution systems, we continue to look for ways to control these unavoidable operating costs.

Q. Does this conclude your 12+0 supplemental direct testimony?

A. Yes, it does.

EXHIBIT P-3 R-2
Schedule - JLC-2 (a) R-2

Test Year / Post Test Year Electric Capital Expenditures

in $000

	Test Year Total July 2017 - June 2018	Post Test Year Forecast July 2018 - Dec 2018
Facilities Replacements	$ 290,038	$ 90,987
System Reinforcements	$ 229,738	$ 61,890
New Business	$ 134,723	$ 64,528
Environmental/Regulatory	$ 5,347	$ 3,543
Facilities Support	$ 147,736	$ 13,951
Energy Strong	$ 52,938	$ 7,131
Total	$ 860,521	$ 242,031

EXHIBIT P-3 R-2
Schedule - JLC-2 (b) R-2

Test Year / Post Test Year Gas Capital Expenditures

in $000

	Test Year Total July 2017 - June 2018	Post Test Year Forecast July 2018 - Dec 2018
Facilities Replacements	$ 357,364	$ 81,151
System Reinforcements	$ 84,679	$ 25,054
New Business	$ 81,760	$ 39,905
Environmental/Regulatory	$ 32,343	$ 19,130
Facilities Support	$ 136,628	$ 15,558
Energy Strong	$ 861	$ 464
GSMP	$ 215,378	$ 136,028
GSMP Stipulated Base	$ 53,342	$ 63,455
Total	$ 962,354	$ 380,746

ENERGY STRONG PROGRAM

INDEPENDENT MONITOR

2017 ANNUAL REPORT

PREPARED AND SUBMITTED BY

PEGASUS GLOBAL HOLDINGS, INC. ®

11 APRIL 2018

PUBLIC VERSION – INFORMATION DEEMED CONFIDENTIAL BY PSE&G REDACTED

Table of Contents

Appendices

List of Acronyms/Abbreviations

AACE International, Inc. ..... AACE

Allowance for Funds Used During Construction ..... AFUDC

Board of Public Utilities ..... BPU

Capital Review Committee ..... CRC

Construction Work-in-Progress ..... CWIP

Costs of Removal ..... COR

Delivery Projects & Construction ..... DP&C

Distribution Supervisory Control and Data Acquisition ..... D-SCADA

Excess Flow Valve ..... EFV

Federal Emergency Management Agency ..... FEMA

Florida Power & Light ..... FPL

Gas Construction Field Quality Assessment Form ..... FQA Form

Gas System Operation Center ..... GSOC

Generally Accepted Government Auditing Standards ..... GAGAS

Independent Monitor ..... IM

International Brotherhood of Electrical Workers ..... IBEW

Liquefied Natural Gas ..... LNG

Liquefied Propane ..... LP

Metering and Regulating ..... M&R

Neutral Ground Resistor ..... NGR

New Jersey Department of Environmental Protection ..... NJDEP

Office of Emergency Management ..... OEM

Operator Qualified ..... OQ

Pegasus Global Holdings, Inc. ..... Pegasus-Global

Port Authority of New York and New Jersey ..... Port Authority

Pounds per Square Inch ..... psi

Program Management Office ..... PMO

Project Execution Plan ..... PEP

PSEG Internal Audit Department ..... PSEGIA

Public Service Electric and Gas Company ..... PSE&G

Public Service Enterprise Group..... PSEG

Quality Assurance..... QA

Quality Control .....QC

Record of Decision .....ROD

Remote Terminal Unit ..... RTU

Risk & Contingency.....R&C

Stantec Consulting Services..... Stantec

Supervisory Control and Data Acquisition.....SCADA

Transmission Hardening Project.....THP

Utility Review Board.....URB

Utilization Pressure Cast Iron ..... UPCI

Work Breakdown Structure ..... WBS

Executive Summary

I. Introduction

Pegasus Global Holdings, Inc. (Pegasus-Global) was engaged by Public Service Electric and Gas Company (PSE&G) to provide independent monitoring services for PSE&G's Energy Strong Program. Under the Stipulation approved by the May 21, 2014 Order, PSE&G was required to hire a monitor to:

> *"[R]eview and report to Board Staff and Rate Counsel on the impact of the Energy Strong program on overall system performance during severe weather events; cost effectiveness and efficiency; appropriate cost assignment; and other information deemed appropriate by the Company, Board Staff and Rate Counsel."*

The independent monitor (IM) scope of work revolves around three primary tasks:

1) Review and report on the impact of the Energy Strong Program on overall system performance during severe weather events;
2) Review and report on cost effectiveness and efficiency; and,
3) Review and report on appropriate cost assignment.

This IM 2017 Annual Report is intended to convey the independent monitoring activities of Pegasus-Global that have taken place during 2017, with extra focus for the fourth quarter period of October 1, 2017 through December 31, 2017, and on a general review of the now completed subprograms. To the extent information is available after December 31, 2017 through the date of this IM 2017 Annual Report that will assist PSE&G, Board of Public Utilities (BPU) Staff, and Rate Counsel, it has been included herein.

As with its previous annual reports, the IM has conducted its assessment in accordance with Generally Accepted Government Auditing Standards (GAGAS, or more commonly referred to as the "Yellow Book" standards). Those standards require that the IM plan and perform the assessment to obtain sufficient, appropriate evidence to provide a reasonable basis for the IM's findings and observations based on the IM's objectives. To date, the IM has been provided full and free access to personnel and document records by PSE&G during the execution of the independent monitoring. The personnel interviewed responded fully to every issue raised and questions asked by the IM. The findings contained within this initial report are based upon the oral discussions and documents provided by PSE&G. The IM finds that the information obtained provides a reasonable basis for the IM's findings and observations.

The Yellow Book provides a framework for conducting performance management reviews/audit engagements with competence, integrity, objectivity, and independence that result in information used for oversight, accountability, transparency, and improvements of the audited programs and operations. On March 20, 2018, a draft report was presented and submitted to PSE&G, BPU Staff, and Rate Counsel. Per the Yellow Book, this was to allow for review and comment by the audited entity and others to develop a fair, complete, and objective report. A summary of the comments on the draft report and the IM's response is provided in **Appendix A – Draft Report Comments and Responses**. This **Appendix A** also identifies specific sections within this IM 2017 Annual Report that have been edited, supplemented with additional information, or otherwise revised in response to the comments received.

II. Highlights

A. Energy Strong Costs and Schedule to Date

As of the date of this IM 2017 Annual Report, four of the five subprograms within the Energy Strong Program have been completed, with the overall Energy Strong Program remaining on schedule and on budget for the total program completion at or before May 23, 2019. For the purposes of project and subprogram completion, the Stipulation provided the period in which investments were to be made, but did not explicitly define "completion," but continuously refers to "in-service." Using the Stipulation references to "in-service," during the IM's initial review, it was identified that there was some potential ambiguity as to when a project (and subprogram) were considered "complete." The time interval between the project being placed in-service and the completion of its project closeout report is assigned by the PSE&G project manager and is variable, depending upon the estimate of the volume of documentation and closeout tasks associated with a specific project, a function of the complexity of the project. While that time interval provides some variation in identifying when a project is complete, the IM did not consider this a consistent completion date definition and raised this concern with PSE&G. The IM recommended that PSE&G consider a completion date definition of when the project is placed in-service in accordance with the completion date required by the Stipulation, providing value to PSE&G customers. PSE&G accepted the IM's recommendations clarifying the definition of completion date to the date when the last component of a project is placed in-service. An in-service documentation process for projects in all Energy Strong subprograms was memorialized in PSE&G's record of decision (ROD) FM-61.

During execution of the Energy Strong Program, PSE&G consistently used the in-service date to indicate project completion, with the in-service date for the final project designating subprogram completion,[1] which represents the investments being used and useful to the customers of PSE&G. Closeout work may continue beyond the completion date as final restoration activities are completed, trailing costs recorded, and internal closeout procedures at PSE&G are performed; however, any costs associated with this closeout effort are expected to be de minimis. The Stipulation also provided the general requirements and scope for each subprogram. Based on its review of the Energy Strong Program, the IM continues to find that PSE&G has progressed the work within the general requirements of the Stipulation. A summary of those requirements and the current status of each subprogram is described below, with a more robust review of the individual subprograms later in the report.

Electric Station Flood Mitigation

In the Stipulation, 29 switching/substations were identified that were to receive flood mitigation work as part of the Energy Strong Program. These stations included:

- Bayonne 26/13kV
- Bayway 26kV substation
- Bayway 4kV substation
- Belmont Unit substation
- Cranford substation
- Essex switching station
- Ewing substation
- Garfield Place substation
- Hackensack substation
- Hillsdale substation
- Hoboken 13kV substation
- Howell Street substation
- Jackson Road substation
- Jersey City 13kV substation

[1] *See* Direct Testimony of Jorge L. Cardenas, page 3, September 2017 ES Electric Rates Filing, September 29, 2017

- Linden switching station
- Little Ferry Unit substation
- Madison substation
- Marion switching station 26kV
- Marshall substation
- New Milford 26/13kV
- Newark Airport Breaker station
- Port Street substation
- Rahway substation
- River Edge
- Sewaren switching station
- Somerville substation
- South Waterfront 26kV
- St. Pauls Unit substation
- Third Street substation

This subprogram was estimated at $620 million, $400 million of which to be recoverable through the electric Energy Strong Adjustment Mechanism, and up to an additional $220 million in PSE&G's next base rate case. The work in this subprogram was to be performed within five years of the Stipulation date, or by May 23, 2019.

Through the end of 2017, PSE&G has spent approximately $406.8 million on this subprogram and currently is forecasted to be completed under the $620 million initial subprogram estimate. PSE&G has placed 22 stations fully in-service, cancelled one station (Newark Airport), reached an agreement to mitigate two stations outside of the Energy Strong Program (Madison and Marshall), and has three other substations partially in-service. The remaining stations are currently forecasted to be placed in-service by the end of the second quarter of 2018, which will complete the subprogram ahead of the Stipulation date.

To date, there have been no flood intrusion events at any completed station.

Gas M&R Flood Mitigation

In the Stipulation, eight stations were identified for work in this subprogram. Seven of the stations were to be raised and hardened, the eighth station (Burlington Liquefied Natural Gas (LNG) Plant station) was to receive an auxiliary generator. The stations included in this subprogram include:

- Burlington LNG station
- Crown Central Liquefied Propane (LP) station
- Crown Central M&R station
- Harrison LP station
- Harrison M&R station
- Newark Airport M&R station
- Piles Creek M&R station
- West End M&R station

The total investment in this subprogram was to be $50 million, and the work was to be completed within five years of the Stipulation date, or by May 23, 2019. In December 2015, and again in July 2016, PSE&G announced that it was transferring funds ($13.5 million and $6.5 million, respectively) out of the Gas M&R subprogram and into the Utilization Pressure Cast Iron (UPCI) Replacement subprogram. PSE&G completed the Gas M&R subprogram at a cost less than identified in the Stipulation in large part due to identifying scope changes that provide the stations with the intended mitigation benefits at a reduced cost.

In the second quarter of 2017, the final two stations (Newark Airport M&R and Harrison M&R) were placed in-service, approximately two years ahead of the Stipulation date. Demolition work continued at Newark Airport M&R station, which was completed as of October 6, 2017, leaving closeout work as the only remaining activity on the Gas M&R subprogram. As of December 31, 2017, $25.3 million has been expended in the Gas M&R subprogram, leaving the subprogram $4.7 million under its revised budget of $30.0 million.

To date, there have been no flood intrusion events at any completed station.

UPCI Replacement

The Stipulation contemplated that PSE&G would invest up to $350 million over a three-year period (that may be accelerated to two years) to replace an estimated of 250 miles of UPCI main and associated services with a higher operating pressure system utilizing plastic or cathodically protected steel mains and services in areas that were previously flooded or are in FEMA flood zones or proximity thereto.

PSE&G's original plan proposed replacement of 750 miles of UPCI main and associated services. The initial PSE&G petition proposed replacement of the first 600 miles in a five-year period, which was broken into Priorities A, B, and C.[2] Priority A included areas that had experienced street-level flooding in prior storm events, which totaled 118 miles of UPCI mains in PSE&G flood zones (previously flooded streets), 24 miles of UPCI mains in FEMA flood zones adjoining PSE&G flood zones, and 245 miles of required UPCI proximity mains, for a total of 387 miles of main. To identify 250 miles of main for replacement in the UPCI Replacement subprogram, PSE&G used the Priority A main and selected projects based on a series of criteria that emphasized previously flooded areas and adjoining FEMA flood zones with the lowest ratio of proximity mains as well as mains in areas with a history of leaks.

As mentioned above in the Gas M&R overview, a total of $20 million was transferred from the Gas M&R subprogram to the UPCI Replacement subprogram. While executing the UPCI Replacement subprogram, PSE&G identified it was experiencing higher than forecasted costs resulting from:

- Increased quantity of replacement services, transfers, uprate footage, uprate services;
- Payment and performance bonds;
- Soil management costs;
- Final restoration (increased stakeholder expectations); and,
- Additional costs for resources (replacement services, transfer and uprate services).

The transfer of funds, allowed by a reduced cost in certain Gas M&R projects, allowed PSE&G to maximize the customer benefit under the UPCI Replacement subprogram by increasing the flood zone main installed, main uprated, and the number of customers on elevated pressure.

Construction and restoration activities in the UPCI Replacement subprogram were completed as of July 22, 2016, or approximately ten months ahead of the Stipulation date.[3] The total amount of UPCI main installed was 1,265,105 feet (approximately 240 miles), and the total number of UPCI services replaced was 21,053. The final cost of the UPCI Replacement subprogram was approximately $370 million, matching the revised budget following the transfer of funds from the Gas M&R subprogram.

Advanced Technologies

Per the Stipulation, PSE&G was to invest up to $100 million over a three-year period to equip certain stations with microprocessor relays and expanded Supervisory Control and Data Acquisition (SCADA), which is intended to shorten storm restoration processes for PSE&G and mutual aid crews. After the Stipulation was approved, PSE&G prioritized the work to be performed under this subprogram, with the preliminary scope of the subprogram consisting of upgrades at 81 stations consisting of 13kV Class H stations (out of a total population of 81) and 28 4kV Class A/B stations (out of a total population of 48),

[2] *See* PSE&G letter to Rate Counsel, December 13, 2013
[3] The Stipulation provided that UPCI investments were to be made over a three-year period, but the subprogram "may be accelerated and completed in two years if possible"; UPCI subprogram references to the Stipulation date refer to the three-year period.

as well implementation of Distribution Supervisory Control and Data Acquisition (D-SCADA) and Pi Historian systems.[4] The level of inclusion of Class C substations was dependent on the availability of funds once the scopes and estimate were developed for the initial Class H and Class A/B stations, and was further prioritized for inclusion in the subprogram based on number of customers benefited. Ultimately, 29 Class C substations were included in the Energy Strong Program.

As of the end of 2017, and with the subprogram complete, a total of $106.2 million has been spent on the Advanced Technologies subprogram, under the adjusted subprogram budget of $107 million, after the transfer of $7 million from the Contingency Reconfiguration subprogram. The subprogram was completed approximately one month ahead of the Stipulation completion date and included a total 111 stations, encompassing 1,176 relays and 51 RTUs. A total of 1,453,984 customers are served by the upgraded substations and benefit from the investments made.[5]

Contingency Reconfiguration

The Stipulation allowed for PSE&G to invest up to $100 million in the Contingency Reconfiguration subprogram over a three-year period in its loop scheme by creating multiple sections, utilizing smart switches, smart fuses, and adding redundancy. These investments, by allowing more sections in loop schemes and/or more circuit ties, should allow fewer customers to be affected by service interruptions when damage occurs in a specific section of the loop.

In executing the Contingency Reconfiguration subprogram, PSE&G identified certain customers/facilities that need to recover quickly from damage on circuits in major storm events or experience reduced outage durations and determined those design changes that are required to provide that higher level of assurance. Those customers/facilities may include water treatment plants, hospitals and other less obvious facilities like FBI communication towers. Originally, the prioritization of projects selected for the Contingency Reconfiguration subprogram was essentially the same prioritization that PSE&G had used in restoring power to those same critical facilities after it experienced a power interruption. Later, PSE&G developed a linear equation for prioritization based upon facility type, historical CAIDI and SAIFI, and circuit outages.

As of the end of 2017, and with the subprogram complete, a total of $83.6 million has been spent on the Contingency Reconfiguration subprogram, under the adjusted subprogram budget of $93 million, after $7 million was transferred to the Advanced Technologies subprogram. The subprogram was completed ahead of the Stipulation completion date and included a total of 465 reclosers placed in-service, with portions of 223 circuits improved.

Overall Energy Strong Program Status

A summary of the overall subprogram cost and schedule status as of December 31, 2017, is provided in **Table II-1 – Energy Strong Program Summary Cost and Schedule as of December 31, 2017**.

[4] The D-SCADA scope provides a system to visualize, control, collect, and analyze all monitored points from each Distribution station. Pi Historian serves as a data warehouse to store historical information obtained from relays and RTUs.
[5] Customer count as of December 2017.

Table II-1 – Energy Strong Program Summary Cost and Schedule as of December 31, 2017

Subprogram	Status Point	2014				2015				2016				2017				2018				2019		Total $
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	(in thousands)
Electric Station Flood Mitigation	Dec. 2014 Plan/Estimate																						Stipulation End Date	$620,000*
	Dec. 2015 Plan/Estimate																							$620,000*
	Dec. 2016 Plan/Estimate																							$620,000*
	Dec. 2017 Plan/Estimate																							$620,000*
	Actual	66% spent																						$406,820
Gas M&R Flood Mitigation	Dec. 2014 Plan/Estimate																						Stipulation End Date	$50,000
	Dec. 2015 Plan/Estimate^																							$36,500
	Dec. 2016 Plan/Estimate**																							$30,000
	Dec. 2017 Plan/Estimate	*Final project in-service as of May 12, 2017 (closeout remains)*																						$30,000
	Actual	84% spent													X									$25,252
UPCI Replacement	Dec. 2014 Plan/Estimate													Stipulation End Date										$350,000
	Dec. 2015 Plan/Estimate^																							$363,500
	Dec. 2016 Plan/Estimate**	*Final construction/restoration complete as of July 22, 2016*																						$370,000
	Actual	100% spent											X											$370,015
Advanced Technologies	Dec. 2014 Plan/Estimate													Stipulation End Date										$100,000
	Dec. 2015 Plan/Estimate																							$100,000
	Dec. 2016 Plan/Estimate***																							$105,000
	Dec. 2017 Plan/Estimate	*Final project in-service as of April 21, 2017 (closeout remains)*																						$107,000
	Actual^^	99% spent													X									$106,218
Contingency Reconfiguration	Dec. 2014 Plan/Estimate													Stipulation End Date										$100,000
	Dec. 2015 Plan/Estimate																							$100,000
	Dec. 2016 Plan/Estimate***																							$95,000
	Dec. 2017 Plan/Estimate	*Final project in-service as of May 21, 2017 (closeout remains)*																						$93,000
	Actual^^	90% spent													X									$83,614

**-The Stipulation allows PSE&G to invest $620 million in the Electric Station Flood Mitigation subprogram; however, the Stipulation provides that the amounts beyond the first $400 million shall be recovered through a traditional rate recovery mechanism rather than through the electric Energy Strong Adjustment Mechanism.*
***-In May 2016, $6.5 million was transferred from the Gas M&R subprogram to the UPCI subprogram. This is reflected in the Dec. 2016 Plan/Estimate figure.*
****-In June 2016, $5 million was transferred from the Contingency Reconfiguration subprogram to the Advanced Technologies subprogram. This is reflected in the Dec. 2016 Plan/Estimate figure.*
^-The Dec. 2015 estimates for the Gas M&R and UPCI subprograms in previous IM reports reflected the preliminary amount of the transfer identified as $13.4 million in Record of Decision #9 (from Gas M&R to UPCI); the formal transfer, as memorialized in a notice provided to the BPU on December 21, 2015 provided the actual transfer amount was $13.5 million (rounded) and was reflected in a revision to Record of Decision #9. This table shows the actual resulting subprogram estimates following the formal transfer of funds.
^^-In March 2017, an additional $2 million was transferred from the Contingency Reconfiguration subprogram to the Advanced Technologies subprogram. The actual percent spent for these subprograms is reflective of the post-transfer balances (i.e. $93 million for Contingency Reconfiguration, $107 million for Advanced Technologies).
X-Indicates quarter in which the final investment/project within a subprogram was placed in-service.

Additional detailed information as to the cost and schedule status of each subprogram is contained within the respective section of this IM 2017 Annual Report.

Given the prominence of the Electric Station Flood Mitigation subprogram, **Table II-2 – Electric Station Flood Mitigation Summary Cost and Schedule as of December 31, 2017** depicts the status of the 26 substations that comprise this subprogram (after the removal of Madison and Marshall from Energy Strong, and the cancellation of Newark Airport). **Table II-2** highlights the scheduled (or actual) kickoff date, start of construction, in-service date, and closeout date, comparing the status as of December 2014 to the status as of December 2015, December 2016, and December 2017 (unless a project had no activity in 2017). In addition, the current status for each substation is identified along with the actual spend to date through December 31, 2017.

Table II-2 – Electric Station Flood Mitigation Summary Cost and Schedule as of December 31, 2017

Project	Status Point	2014				2015				2016				2017				2018				2019		Total $
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	(in thousands)
Bayonne	Dec. 2014 Plan/Estimate						KO					C		CO									Program End Date Per Stipulation - May 23, 2019	$42,300
	Dec. 2015 Plan/Estimate					KO					C			IS	CO									$37,600
	Dec. 2016 Plan/Estimate					KO					C				IS	CO								$34,000
	Dec. 2017 Plan/Estimate					KO					C					IS	CO							$34,000
	Actual					KO					C					IS	CO							$30,318
Bayway 26kV	Dec. 2014 Plan/Estimate						KO		C					CO										$26,600
	Dec. 2015 Plan/Estimate				KO				C		IS	CO												$22,000
	Dec. 2016 Plan/Estimate				KO				C		IS		CO											$23,700
	Actual				KO				C		IS		CO											$23,140
Bayway 4kV	Dec. 2014 Plan/Estimate						KO								C				CO					$11,100
	Dec. 2015 Plan/Estimate						KO					C			IS/OS			CO						$8,800
	Dec. 2016 Plan/Estimate						KO				C				IS	OS		CO						$8,800
	Dec. 2017 Plan/Estimate						KO				C				IS	OS		CO						$8,800
	Actual						KO				C				IS	OS								$8,246
Belmont	Dec. 2014 Plan/Estimate				KO		C			IS		CO												$2,700
	Dec. 2015 Plan/Estimate				KO			C		IS		CO												$6,200
	Dec. 2016 Plan/Estimate				KO			C			IS/CO													$5,300
	Actual				KO			C			IS/CO													$4,912
Cranford	Dec. 2014 Plan/Estimate			KO								C				IS	CO							$23,100
	Dec. 2015 Plan/Estimate			KO								C			IS		CO							$27,000
	Dec. 2016 Plan/Estimate			KO									C					IS			CO			$37,400
	Dec. 2017 Plan/Estimate			KO									C					IS					CO	$35,400
	Actual			KO									C											$25,540
Essex	Dec. 2014 Plan/Estimate			KO				C								IS			CO					$76,700
	Dec. 2015 Plan/Estimate				KO	C									IS		CO							$69,900
	Dec. 2016 Plan/Estimate				KO	C									IS					CO				$42,300
	Dec. 2017 Plan/Estimate				KO	C												IS			CO			$42,300
	Actual				KO	C																		$30,927
Ewing	Dec. 2014 Plan/Estimate						KO				C				CO									$10,500
	Dec. 2015 Plan/Estimate						KO							C	IS				CO					$10,500
	Dec. 2016 Plan/Estimate						KO						C		IS		CO							$8,700
	Dec. 2017 Plan/Estimate						KO						C			IS							CO	$8,700
	Actual						KO						C			IS								$7,578
Garfield Place	Dec. 2014 Plan/Estimate							KO/C					CO											$13,100
	Dec. 2015 Plan/Estimate							KO		C							IS	OS		CO				$14,900
	Dec. 2016 Plan/Estimate							KO			C				IS		OS		CO					$14,900
	Dec. 2017 Plan/Estimate							KO		^	C				IS		OS/CO							$14,900
	Actual							KO		^	C				IS		OS/CO							$11,857
Hackensack	Dec. 2014 Plan/Estimate				KO					C						IS		CO						$34,500
	Dec. 2015 Plan/Estimate				KO					C					IS		CO							$50,000
	Dec. 2016 Plan/Estimate				KO					C					IS				CO					$34,000
	Dec. 2017 Plan/Estimate				KO					C					IS		CO							$34,000
	Actual				KO					C					IS		CO							$32,415
Hillsdale	Dec. 2014 Plan/Estimate			KO					C						IS		CO							$25,900
	Dec. 2015 Plan/Estimate			KO						C					IS		CO							$25,900
	Dec. 2016 Plan/Estimate			KO						C							IS	CO						$30,700
	Dec. 2017 Plan/Estimate			KO						C							IS		CO					$28,800
	Actual			KO						C							IS							$24,977
Hoboken	Dec. 2014 Plan/Estimate			KO				C					IS		CO									$28,800
	Dec. 2015 Plan/Estimate				KO				C				IS		CO									$35,000
	Dec. 2016 Plan/Estimate				KO				C						IS		CO							$29,600
	Dec. 2017 Plan/Estimate				KO				C						IS				CO					$29,600
	Actual				KO				C						IS									$24,546
Howell Street	Dec. 2014 Plan/Estimate						KO		C					CO										$26,000
	Dec. 2015 Plan/Estimate						KO					C			IS	CO								$19,500
	Dec. 2016 Plan/Estimate						KO						C		IS	CO								$16,700
	Dec. 2017 Plan/Estimate						KO						C		IS				CO					$16,700
	Actual						KO						C		IS									$8,767
Jackson Road	Dec. 2014 Plan/Estimate				KO		C			IS		CO												$16,600
	Dec. 2015 Plan/Estimate				KO						C						IS		CO					$20,200
	Dec. 2016 Plan/Estimate				KO										C		IS		CO					$16,700
	Dec. 2017 Plan/Estimate				KO									C					IS				CO	$14,100
	Actual				KO									C										$8,171

Project	Status Point	2014				2015				2016				2017				2018				2019		Total $
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	(in thousands)
Jersey City	Dec. 2014 Plan/Estimate						KO		C					CO										$27,800
	Dec. 2015 Plan/Estimate						KO						C		IS	CO								$21,000
	Dec. 2016 Plan/Estimate						KO					C			IS		CO							$14,900
	Dec. 2017 Plan/Estimate						KO					C					IS		CO					$14,900
	Actual						KO					C					IS							$7,313
Linden	Dec. 2014 Plan/Estimate						KO		C					CO										$18,000
	Dec. 2015 Plan/Estimate				KO			C			IS	CO												$15,400
	Dec. 2016 Plan/Estimate				KO			C		IS			CO											$15,400
	Actual				KO			C		IS			CO											$15,819
Little Ferry	Dec. 2014 Plan/Estimate			KO	C						IS		CO											$2,800
	Dec. 2015 Plan/Estimate			KO		C						IS/OS		CO										$6,500
	Dec. 2016 Plan/Estimate			KO		C					IS	OS	CO											$6,500
	Actual			KO		C					IS	OS	CO											$5,012
Marion	Dec. 2014 Plan/Estimate		KO			C					IS			CO										$19,200
	Dec. 2015 Plan/Estimate					KO		C					IS		CO									$13,800
	Dec. 2016 Plan/Estimate					KO		C						IS		CO								$13,800
	Dec. 2017 Plan/Estimate					KO		C							IS			CO						$13,800
	Actual					KO		C							IS									$14,718
New Milford	Dec. 2014 Plan/Estimate			KO							C			IS		CO								$21,200
	Dec. 2015 Plan/Estimate			KO								C				IS			CO					$21,200
	Dec. 2016 Plan/Estimate			KO								C					IS			CO				$22,600
	Dec. 2017 Plan/Estimate			KO								C					IS		CO					$18,600
	Actual			KO								C					IS							$13,369
Port Street	Dec. 2014 Plan/Estimate											KO				C			CO					$25,000
	Dec. 2015 Plan/Estimate										KO					C	IS			CO				$25,000
	Dec. 2016 Plan/Estimate										KO			C	IS		CO							$19,600
	Dec. 2017 Plan/Estimate										KO				C				IS		CO			$15,100
	Actual										KO				C									$7,451
Rahway	Dec. 2014 Plan/Estimate				KO	C					IS	CO												$5,900
	Dec. 2015 Plan/Estimate			KO				C					IS		CO									$4,800
	Dec. 2016 Plan/Estimate			KO				C		OS			IS			CO								$5,900
	Actual			KO				C		OS			IS			CO								$5,858
River Edge	Dec. 2014 Plan/Estimate			KO/C	IS		OS		CO															$7,500
	Dec. 2015 Plan/Estimate			KO/C	IS			OS	CO															$6,700
	Dec. 2016 Plan/Estimate			KO/C	IS			OS	CO															$6,700
	Actual			KO/C	IS			OS	CO															$6,405
Sewaren	Dec. 2014 Plan/Estimate			KO		C					IS		CO											$22,400
	Dec. 2015 Plan/Estimate			KO		C				IS		CO												$30,900
	Dec. 2016 Plan/Estimate			KO		C				IS	CO													$24,300
	Actual			KO		C				IS	CO													$24,962
Somerville	Dec. 2014 Plan/Estimate			KO		C					IS		CO											$10,900
	Dec. 2015 Plan/Estimate			KO			C		IS			CO												$8,400
	Dec. 2016 Plan/Estimate			KO			C		IS		CO													$5,800
	Actual			KO			C		IS		CO													$6,041
So. Waterfront	Dec. 2014 Plan/Estimate			KO	C						IS		CO											$55,800
	Dec. 2015 Plan/Estimate			KO	C						IS			CO										$61,300
	Dec. 2016 Plan/Estimate			KO	C							IS				CO								$51,000
	Actual			KO	C							IS	CO											$50,934
St Paul's	Dec. 2014 Plan/Estimate						KO							C		CO								$2,800
	Dec. 2015 Plan/Estimate						KO							C/IS/OS			CO							$1,400
	Dec. 2016 Plan/Estimate						KO							C/IS/OS										$1,400
	Dec. 2017 Plan/Estimate						KO								C	IS	OS		CO					$1,400
	Actual						KO								C	IS	OS							$481
Third Street	Dec. 2014 Plan/Estimate							KO/C						CO										$16,200
	Dec. 2015 Plan/Estimate						KO	C					IS			CO								$12,400
	Dec. 2016 Plan/Estimate						KO	C									IS		OS		CO			$12,404
	Dec. 2017 Plan/Estimate						KO	C									IS		OS		CO			$12,054
	Actual						KO	C									IS							$7,094

Program End Date Per Stipulation - May 23, 2019

Legend: KO = Kickoff; C = Construction; IS = Fully In-Service; OS = Out-of-Service (if eliminated); CO = Closeout

Note: due to the early status of the subprogram as of December 2014, some stations did not have a defined in-service date at the time, thus there may be no 'IS' designation for the Dec. 2014 plan in some cases. Additionally, the Kickoff milestone was not included in the schedule at this time, so the 'KO' for the Dec. 2014 plan is the quarter following the procurement of consultants or the quarter for which the consultant contract was issued (if data is available) to allow for a rough comparison.

Rate Counsel, BPU Staff, and PSE&G reached a settlement on November 30, 2016 that noted an agreement that PSE&G may proceed with the Madison and Marshall projects outside the Energy Strong Program, raising and rebuilding both the Madison and Marshall electric substations at the Madison Substation site, subject to certain terms and conditions. Thus, Madison and Marshall have been removed from this table and are now discussed independently of the Energy Strong Program.

^-Garfield Place outside plant construction began in Q1 2016, with inside plant construction starting in Q2 2016.

1. Costs to Date

A summary of the Energy Strong Program costs is presented in **Table II-3 – Q4 2017 Energy Strong Program Cost Summary**.[6] Detailed discussions of each subprogram's costs are discussed in the respective section of this IM 2017 Annual Report.

Table II-3 – Q4 2017 Energy Strong Program Cost Summary

Subprogram	2017 Q4 Spend	2017 Actuals	Subprogram to Date	Stipulation Amount	% of Subprogram Spent to Date
	(in thousands)				
Electric Station Flood Mitigation	$19,123	$96,307	$406,820	$620,000*	66%
Gas M&R Flood Mitigation	$41	$4,625	$25,252	$30,000**	84%
UPCI Replacement	-	-	$370,015	$370,000**	100%
Advanced Technologies	$4	$7,637	$106,218	$107,000***	99%
Contingency Reconfiguration	-	$4,964	$83,614	$93,000***	90%
Total Energy Strong	**$19,168**	**$113,533**	**$991,918**	**$1,220,000***	**81%**

**-The Stipulation allows PSE&G to invest $620 million in the Electric Station Flood Mitigation subprogram; however, the Stipulation provides that the amounts beyond the first $400 million shall be recovered through a traditional rate recovery mechanism rather than through the electric Energy Strong Adjustment Mechanism.*
***-In December 2015, $13.5 million was transferred from the Gas M&R subprogram to the UPCI Replacement subprogram; and in May 2016, an additional $6.5 million was transferred from the Gas M&R subprogram to the UPCI Replacement subprogram; these figures reflect this reallocation of the respective budgets.*
****-In June 2016, $5 million was transferred from the Contingency Reconfiguration subprogram to the Advanced Technologies subprogram and in March 2017, an additional $2 million was transferred; these figures reflect this reallocation of the respective budgets.*

Essentially the full amount of Energy Strong spend in the fourth quarter of 2017 continued to be within the Electric Station Flood Mitigation subprogram, which comprises approximately half of the overall amount of the Energy Strong Program (including the additional $220 million to be recovered through a traditional rate recovery mechanism), and is the only active subprogram that remains following completion of the other four subprograms.

2. Forecast vs. Actual

Table-II-4 – Energy Strong Q4 2017 Forecast vs. Actual Spend examines the PSE&G forecasted costs versus actual costs spent during the fourth quarter of 2017. Variances in these amounts can often result from the timing of payments (i.e. costs being realized in late December instead of early January as forecasted would potentially indicate higher spend in the fourth quarter than forecasted, which would typically be offset in the following quarter).

[6] Note: for consistency and readability, the numbers presented in this IM 2017 Annual Report are rounded to the nearest thousand when shown in a table. In some cases, this may cause a minor discrepancy in total/sum amounts due to the rounding of numbers.

Table II-4 – Energy Strong Q4 2017 Forecast vs. Actual Spend

Subprogram	Q4 2017 Forecasted Spend	Q4 2017 Actual Spend	Variance*	% of Variance*
	(in thousands)			
Electric Station Flood Mitigation	$19,030	$19,123	$93	0%
Gas M&R Flood Mitigation	$127	$41	($86)	-67%
UPCI Replacement	$0	$0	-	-
Advanced Technologies	$0	$4	$4	N/A
Contingency Reconfiguration	$0	$0	-	-
Total Energy Strong	**$19,157**	**$19,168**	**$11**	**0%**

**-Negative values indicate less spent than forecasted, positive values indicate more spent than forecasted for Q4.*

The Electric Station Flood Mitigation had the bulk of the forecasted and actual spend during the fourth quarter of 2017 (approximately 99% of the total Energy Strong Program), but had only a minor variance, with actual spend approximately $93,000 above forecast. Only two other subprogram had any spend during the fourth quarter of 2017, Advanced Technologies saw approximately $4,000 in costs related to final closeout of the subprogram, and Gas M&R saw approximately $41,000 in costs related to the completion of demolition work at Newark Airport M&R station and closeout at the final three stations in the subprogram (Newark Airport M&R, Harrison M&R, and West End M&R). The variance in the Gas M&R subprogram of approximately $86,000 less spent than forecasted is primarily related to the actual demolition costs at Newark Airport M&R being less than estimated.

A summary of the notable overall variances in the forecasted versus actual spend for the fourth quarter are summarized in each subprogram's respective section of this IM 2017 Annual Report as appropriate.

Table II-5 – Energy Strong 2017 Forecast vs. Actual Spend summarizes the PSE&G forecasted costs compared to the actual costs incurred in each subprogram over the entire 2017 year.

Table II-5 – Energy Strong 2017 Forecast vs. Actual Spend

Subprogram	2017 Forecasted Spend^	2017 Actual Spend	Variance*	% of Variance*
	(in thousands)			
Electric Station Flood Mitigation	$93,940	$96,307	$2,367	3%
Gas M&R Flood Mitigation	$4,437	$4,625	$187	4%
UPCI Replacement	$0	$0	-	-
Advanced Technologies	$7,472	$7,637	$165	2%
Contingency Reconfiguration	$4,452	$4,964	$512	12%
Total Energy Strong	**$110,300**	**$113,533**	**$3,233**	**3%**

^-Due to PSE&G not using a forecast for the month of January, actual January numbers were used in the forecast column to demonstrate as complete a picture as possible for the year as a whole.
**-Negative values indicate less spent than forecasted, positive values indicate more spent than forecasted for 2017.*

Only the Contingency Reconfiguration subprogram, with actual 2017 spend 12% above forecast, experienced a 2017 variance of at least 10%. This was largely attributable to first quarter of 2017 spend exceeding the forecast as PSE&G advanced work earlier than anticipated and had additional manpower on select projects.

3. Allowance for Funds Used During Construction (AFUDC)

The amount of AFUDC recorded by the Company for each Energy Strong subprogram during each quarter of 2017, the full years 2014-2017, and total Energy Strong AFUDC accrued to date, is shown below in **Table II-6 – Recorded AFUDC by Energy Strong Subprogram as of December 31, 2017**.

Table II-6 – Recorded AFUDC by Energy Strong Subprogram as of December 31, 2017

Subprogram	Q4 2017	Q3 2017	Q2 2017	Q1 2017	2017 Total	2016 Total	2015 Total	2014 Total	Total to Date
	(in thousands)								
Electric Station Flood Mitigation	$344	$829	$1,276	$1,667	$4,116	$5,284	$2,963	$125	$12,488
Gas M&R Flood Mitigation	$0	$0	$58	$178	$236	$361	$161	$3	$761
UPCI Replacement	$0	$0	$0	$0	$0	$0	$0	$0	$0
Advanced Technologies	$0	$0	$5	$47	$52	$649	$713	$80	$1,494
Contingency Reconfiguration	$0	($5)	($23)	$24	($4)	$152	$778	$228	$1,154
Total Energy Strong	**$344**	**$824**	**$1,316**	**$1,916**	**$4,400**	**$6,446**	**$4,615**	**$436**	**$15,897**

During the first quarter of each year, the AFUDC rate is reviewed for possible reset as it applies the current year based on updated capital structure and component cost data. If reset, the new rate is applied retroactively to January 1 of the current year. For the year 2017, a reset AFUDC rate was calculated to be 6.96%, using the capital structure and component costs as of January 31, 2017. In calculating the 2017 reset AFUDC rate, the Company used (i) a 4.09% embedded cost of long term debt, (ii) a short term debt rate of 0.98%, and (iii) a cost of equity of 9.75%.

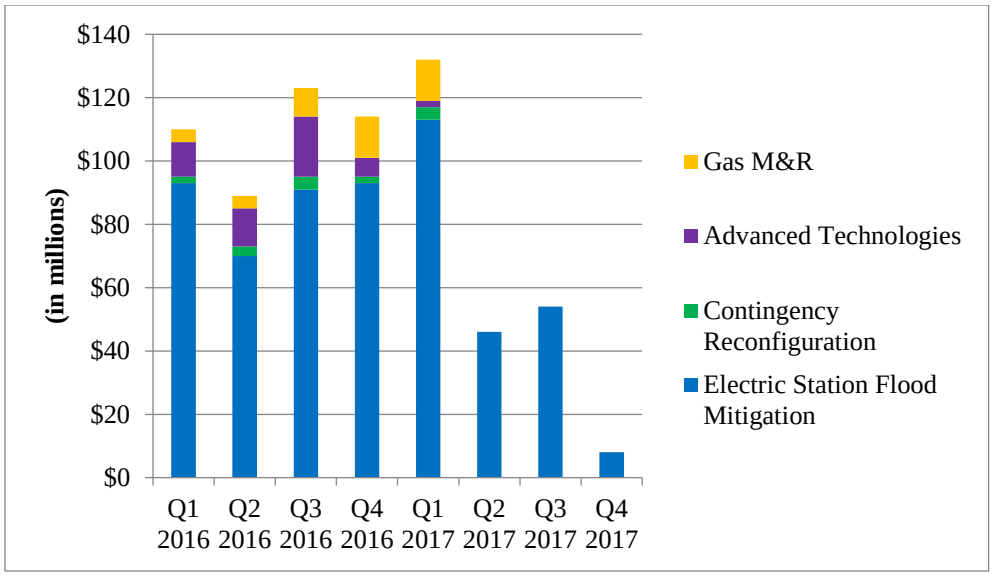
Subsequent to the annual reset calculation referred to above, and during the course of each year, the AFUDC rate is also recalculated as it applies to each fiscal quarter. If the recalculated rate changes by 25 basis points from the rate then in effect, the rate is reset and retroactively applied to January 1 of that year. For the fourth quarter of 2017, the recalculated weighted average AFUDC accrual rate was 7.07%, which did not meet the criterion to warrant changing from the annual rate of 6.96% then in effect. Therefore, AFUDC was accrued during the fourth quarter of 2017 at the calculated rate of 6.96%. The 11 basis point increase in the fourth quarter recalculated rate over the rate in effect is due to a much lower average balance of short-term debt outstanding, along with its lower associated cost relative to the embedded costs of long-term debt and equity capital. This resulted in component capital with higher relative costs being a larger proportion of the capital structure in the fourth quarter of 2017. The ratio of short-term debt to total construction work in progress (a component of the AFUDC calculation) was 1.8% in the currently implemented AFUDC rate calculation, compared to 0.03% in the recalculated rate.

AFUDC accrued for Energy Strong projects during the fourth quarter of 2017 was incurred entirely by projects in the Electric Station Flood Mitigation subprogram. For the fourth quarter of 2017, AFUDC decreased by 59% from the third quarter. This is the result of a 75% (unadjusted – see below) decrease in the average month-end balances of construction work in progress (CWIP) during the fourth quarter of 2017 from the third quarter. The reduction in average CWIP is attributed to transfers from CWIP to installed plant that occurred later in the third quarter and early in the fourth quarter. Major transfers from CWIP to plant-in-service included Cranford ($22 million), New Milford ($12 million), Jackson Road ($7 million), and Hillsdale ($6 million). It should also be noted that CWIP, and therefore AFUDC, would have been affected by an error in the recordation in the fourth quarter of 2017 of certain environmental costs as costs of removal (COR) rather than correctly recorded as CWIP (see **Section II.A.4.** below). The effect on AFUDC will be a relatively minor amount.

End-of-quarter CWIP – Virtually the entirety of total end-of-quarter CWIP was associated with the Electric Flood Mitigation subprogram. At the end of the fourth quarter 2017, the Energy Strong CWIP balance was $7.6 million (unadjusted), compared to $54 million at the end of the third quarter, reflecting the plant transfers noted above. At the end of the fourth quarter 2017, only one Energy Strong Flood Mitigation project, Port Street, had a material CWIP balance.

As previously mentioned, and as depicted below, as of December 31, 2017, virtually the entirety of Energy Strong CWIP was comprised of project costs residing in the Electric Flood Mitigation subprogram. ***Figure II-1 – Quarterly CWIP Balances by Subprogram as of December 31, 2017*** shows the composition of end-of-period CWIP balances by subprogram for each quarter of 2016 and 2017.

Figure II-1 – Quarterly CWIP Balances by Subprogram as of December 31, 2017



The IM observes that the Company's calculation of the AFUDC rate and its application is in accordance with both PSE&G's accounting policy and Plant Instruction 3(17) of the Federal Energy Regulatory Commission's Uniform Systems of Accounts prescribed for public utilities.

The IM also notes that the relevant AFUDC information as it relates to fourth quarter 2017 Energy Strong project costs is consistent, where appropriate, with information filed in PSE&G's Energy Strong current electric roll-in filing, and specifically the use of a 9.75% cost of equity, which was the subject of the settlement agreement reached in August 2015 and the subsequent BPU Order. The IM will continue to review future Energy Strong AFUDC accruals for consistency with relevant provisions of roll-in filings, the Stipulation, the settlement agreement and BPU Order for accounting and reporting purposes only, and not as a party to, or in expressing an opinion concerning, any rate proceedings.

4. Costs of Removal (COR)

Under the May 2014 Stipulation, PSE&G may seek to recover an investment in Energy Strong projects of up to $1 billion through the stipulated cost recovery mechanism. The $1 billion of investment is to include actual costs of removal (COR) expenditures, thereby providing a return on this investment; however, revenue requirements will not include an expense for recovery of COR, unless embedded in depreciation rates. COR generally includes costs for such removal activities as environmental (soil and water) removal, inside station equipment, structures, foundations, towers and fixtures, conductors and

other electrical devices, poles and fixtures, transformers, plant demolition, foundations, and removal of underground conduit and other wiring that is being retired or replaced.[7]

Table II-6 – Energy Strong Costs of Removal as of December 31, 2017 below itemizes the charges to COR for each quarter of 2017, annual amounts of COR for the years 2014-2017, and total Energy Strong COR to date. These amounts do not reflect any salvage value reductions, which generally have been de minimis amounts for the Energy Strong program.

Table II-6 – Energy Strong Costs of Removal as of December 31, 2017

Subprogram	Q4 2017	Q3 2017	Q2 2017	Q1 2017	2017 Total	2016 Total	2015 Total	2014 Total	Total to Date
	(in thousands)								
Electric Station Flood Mitigation	$2,620	$1,365	($188)	$3,120	$6,917	$21,539	$4,984	$672	$34,112
Gas M&R Flood Mitigation	$5	$536	($116)	($293)	$132	$273	$172	$0	$577
UPCI Replacement	$0	$0	$0	$0	$0	$5,560	$7,956	$1,451	$14,967
Advanced Technologies	$4	$9	$83	$700	$796	$3,281	$3,319	$575	$7,971
Contingency Reconfiguration	$0	$1	$178	$563	$742	$2,070	$3,502	$3,192	$9,506
Total	**$2,629**	**$1,911**	**($43)**	**$4,090**	**$8,587**	**$32,723**	**$19,933**	**$5,890**	**$67,133**

COR charges for the fourth quarter of 2017, virtually all of which were incurred in the Electric Station Flood Mitigation subprogram, appeared to have increased substantially from the third quarter; however, fourth quarter COR reflects about $1.2 million of costs charged to COR on the Port Street and Essex projects that should have been charged to CWIP. For Port Street, [REDACTED] million related to soil removal was charged to COR, and for Essex [REDACTED] million primarily related to dewatering was charged to COR. Since this work is ultimately related to installation of new equipment, it should have been charged to CWIP. It is anticipated that PSE&G will make the correcting journal entries to the affected accounts the first quarter of 2018.

After giving effect to this correction, total Energy Strong COR for the fourth quarter of 2017 would have been about $1.4 million. Based on this adjusted figure, total fourth quarter 2017 COR decreased by about 26% from third quarter COR, reflecting the continuing progress and completion of Energy Strong projects. Only three projects, which were Electric Station Flood Mitigation projects, incurred any significant COR during the 2017 fourth quarter.

The IM notes that the relevant information as it relates to fourth quarter 2017 Energy Strong COR is consistent with COR information filed in PSE&G's current Energy Strong electric roll-in filing. The IM assumes that the incorrect COR figures noted above, a portion of which also appear to have been included in the current rate roll-in filing for the months of October and November 2017, will be corrected by PSEG. The IM will continue to review future Energy Strong COR for consistency with relevant provisions of roll-in filings, the Stipulation, the settlement agreement and BPU Order for accounting and reporting purposes only, and not as a party to, or in expressing an opinion concerning, any rate proceedings.

[7] *See* PSE&G's letter to the BPU, "Material Requested during the Meeting with the Energy Strong Monitor on September 16, 2015 (supplement to material provided December 6, 2016)", February 3, 2017

B. Recommendation Update

1. Recommendations Raised During Energy Strong Status Meetings

All prior recommendations made by the IM at the Energy Strong Status Meetings have been satisfactorily addressed by PSE&G and have been closed. During the fourth quarter of 2017, there were no new recommendations made at the meetings. A list of all recommendations made to date is provided in **Appendix B**.[8]

C. Reporting

As noted in the Stipulation, PSE&G is to provide the BPU Staff and Rate counsel a quarterly report that demonstrates the following:

- *The estimated quantity of work and the quantity completed to date or, if the project cannot be quantified with numbers, the major tasks completed, e.g., design phase, material procurement, permit gathering, phases of construction, etc.;*
- *The forecasted and actual Energy Strong costs to date for the quarterly reporting period and for the program-to-date;*
- *The estimated Energy Strong project completion date.*

The IM observes that the PSE&G quarterly reports, up through the most recent report provided for the fourth quarter of 2017, contain accurate information based on the data available to and reviewed by the IM.

III. Major Decisions

A. Records of Decisions

To capture formalized decisions regarding the Energy Strong Program, PSE&G completes a "Record of Decision" (ROD) that includes a description of the decision; alternatives considered; the decision made; and, rationale for the decision. In accordance with the IM's contractual scope of work, Task 2.2.1, the RODs are reviewed for reasonableness and prudency by the IM as they are completed. In addition, the IM may request PSE&G to complete a ROD to formalize a decision if such a decision has not yet been formalized.

The approved RODs as of the date of this IM 2017 Annual Report are presented below in **Table III-1 – Energy Strong Record of Decisions**. This includes information on the content of the ROD, the date of the ROD, and in which IM report it has been discussed.

Table III-1 – Energy Strong Record of Decisions

ROD #	Title	Date ROD Approved	IM Comments*
1	Relay/ SCADA Upgrade (Construction)	3/11/2015 (Rev. 1)	Reasonable and Prudent *(See 2014 IM Annual Report, Section 4.4)*

[8] In the IM's reports, only those outstanding recommendations and recommendations made during the reporting period will be shown. An appendix of all IM recommendations will be attached to all IM Annual Reports.

ROD #	Title	Date ROD Approved	IM Comments*
2	UP Cast Iron Replacement	1/14/2015	Reasonable and Prudent *(See 2014 IM Annual Report, Section 7.9)*
3	M&R Station Selection and Mitigation Method	1/15/2015	Reasonable and Prudent *(See 2014 IM Annual Report, Section 4.6)*[9]
4	Energy Strong PMO [Program Management Office] – Scheduling Methodology	2/4/2015	Reasonable and Prudent *(See 2014 IM Annual Report, Section 5.4.1)*
5	Energy Strong Contingency Reconfiguration Project Selection	4/17/2015 (Rev. 1) 2/10/2016 (Rev. 2)	Reasonable and Prudent *(See 2014 IM Annual Report, Section 7.8; 2015 First Quarter Report Section X.C; and the 2016 First Quarter Report, Section III. D.)*
6	Utility Review Board (URB) Notification for Projects >$1.0M	3/11/2015	Reasonable and Prudent *(See 2015 First Quarter Report Section X.C)*
FM-61	Documentation of the In-Service Process for Assets Associated with the 29 Energy Strong Electric Station Flood Mitigation Projects[10]	6/26/2015	Reasonable and Prudent *(See 2015 Second Quarter Report Section III. D.)*
FM-216	Newark Airport Scope Change	6/26/2015	Reasonable and Prudent *(See 2015 Second Quarter Report Section III. B.)*
7	Energy Strong – Program Management Office (PMO) – Quality Assurance/Quality Control (QA/QC) Plan	10/21/2015	Reasonable and Prudent *(See Section II. B. in the IM 2015 Third Quarter Report, and in the IM 2015 Second Quarter Report Section II. B.)*
8	ES – Harrison (Propane) Project Scope Change	7/23/2015	Reasonable and Prudent *(See 2015 Second Quarter Report Section III. C.)*
9	UPCI – Increase in Investment Funding	10/7/2015 Rev. 10/25/2016	Reasonable and Prudent *(See Section III. C. in the IM 2015 Third Quarter Report, and Section III. C. in the IM 2015 Annual Report)*
FM-269	Rahway Electric Substation Change in Mitigation Method	4/20/2015	Reasonable and Prudent *(See 2015 Second Quarter Report Section III. B.)*
FM-314	Bayway Electric Substation Change in Mitigation Method	4/20/2015	Reasonable and Prudent *(See 2015 Second Quarter Report Section III. B.)*
FM-322	Third St. Electric Substation Change in Mitigation Method	4/20/2015	Reasonable and Prudent *(See 2015 Second Quarter Report Section III. B.)*
FM-401	Garfield Place Electric Substation Change in Mitigation Method	11/17/2015	Reasonable and Prudent *(See 2015 Third Quarter Report Section III. B., and Section III. B in the IM 2015 Annual Report)*
FM-411	Little Ferry Electric Substation Change in Mitigation Method	10/6/2015	Reasonable and Prudent *(See 2015 Third Quarter Report Section III. B.)*

[9] The M&R station selection and mitigation method was formalized through inclusion in the Stipulation.
[10] This ROD includes the in-service notification process used all projects within the Energy Strong Program, not just the Electric Station Flood Mitigation subprogram.

ROD #	Title	Date ROD Approved	IM Comments*
FM-414	South Waterfront Electric Substation Additional Scope	12/18/2015	Reasonable and Prudent *(See Section III. D. in the IM 2015 Annual Report)*
FM-415	Sewaren Electric Substation Additional Scope	5/21/2015**	Reasonable and Prudent *(See Section III. D. in the IM 2015 Annual Report)*
FM-419	South Waterfront Helical Piles	5/4/2016	Reasonable and Prudent *(See Section III. C. in the IM 2016 First Quarter Report)*
FM-420	St. Paul's Unit Substation Change in Mitigation Method	11/19/2015**	Reasonable and Prudent *(See Section III.B. in the IM 2015 Second Quarter Report)*
11	Newark Airport Gas M&R Station Scope Change	5/3/2016	Reasonable and Prudent *(See Section III. E. in the IM 2016 First Quarter Report)*
FM-421	Port Street Electric Substation Scope Change	5/11/2016	Reasonable and Prudent *(See Section III. D. in the IM 2016 Second Quarter Report)*
FM-422	Belmont Electric Substation Additional Scope	1/26/2016	Reasonable and Prudent *(See Section III. E. in the IM 2016 Second Quarter Report)*
10	Advanced Technologies Subprogram – Increase in Investment Funding	6/3/2016	Reasonable and Prudent *(See Section III. G. in the IM 2016 Second Quarter Report)*
12	West End Gas M&R Project Scope Change	6/13/2016	Reasonable and Prudent *(See Section III. H. in the IM 2016 Second Quarter Report)*
13	UPCI Subprogram – Additional Increase in Investment Funding	5/26/2016	Reasonable and Prudent *(See Section III. J. in the IM 2016 Second Quarter Report)*
FM-423	Bayway 26kV Additional Scope	7/8/2016	Reasonable and Prudent *(See Section III. F. in the IM 2016 Second Quarter Report)*
14	Harrison Gas M&R Project Scope Change	7/26/2016	Reasonable and Prudent *(See Section III. I. in the IM 2016 Second Quarter Report)*
FM-425	Newark Airport Breaker Station Cancellation	8/10/2016	Reasonable and Prudent *(See Section III. B. in the IM 2016 Second Quarter Report)*
FM-426	Madison & Marshall Substations	1/25/2017	N/A *(See Section III. C. in the IM 2016 Annual Report)*
FM-429	Jackson Road Substation Scope Deletion	3/9/2017	Reasonable and Prudent *(See Section III. C. in the IM 2017 First Quarter Report)*
15	Advanced Technologies Subprogram – Additional Increase in Investment Funding	3/15/2017	Reasonable and Prudent *(See Section III. D. in the IM 2017 First Quarter Report)*

**-Note: Use of the term "Reasonable and Prudent" is not a legal interpretation, nor does it supplant the BPU's determination of what is "reasonable and prudent" in the context of future rate cases. It is used here strictly as an interpretation of the IM's review and observation of these key decisions.*

B. Change in Electric Station Flood Mitigation Methodology

With the majority of the Electric Stations Flood Mitigation projects now complete, and with the remaining projects well-advanced, there continues to be no change in the flood mitigation methodology since the last methodology change made in the second quarter of 2016. A summary of the current flood mitigation methodology, as of December 31, 2017, is as follows:

- Changed from raise/rebuild to eliminate:[11]
  - Bayway 4kV
  - Rahway partial eliminate (4012 circuit)
  - St. Paul's Unit (13kV)
  - Third Street
  - Garfield Place
  - Little Ferry – Of the three transformers, only eliminate transformer T3
- Removed from Energy Strong and put in "base":[12]
  - Madison
  - Marshall Street
- Replaced by a non-Energy Strong Project:[13]
  - Newark Airport Breaker Station – The Port Authority of New York and New Jersey (Port Authority) requested that the current 27kV Newark Airport Station site (the land) be returned to the Port Authority since a new 345kV switching station, which is not part of the Energy Strong Program, will serve the airport. This results in the current 27kV Newark Airport station no longer being in the Energy Strong Program.

IV. Major Events[14]

A. Major Events during Fourth Quarter Reporting Period

During the fourth quarter of 2017, PSE&G reported one Major Event for Mutual Aid that was provided to PSEG-LI during a nor'easter event that occurred from October 30-November 1, 2017. PSE&G's resources deployed to Mutual Aid assignment to PSEG-LI included 119 line FTEs, 20 support personnel, 39 contractor line FTEs, and 173 contractor tree trimming FTEs. Although the brunt of the storm affected Long Island, PSE&G's service territory did experience rain and wind impacts from the storm that led to 10,130 PSE&G customers experiencing service interruptions of under three hours.

[11] *See* IM 2014 Annual Report, pages 87-91; IM 2015 First Quarter Report, pages 6-7; IM 2015 Second Quarter Report, pages 14-15; IM 2015 Third Quarter Report, pages 10-11
[12] *See* IM 2015 Second Quarter Report, page 14; IM 2015 Third Quarter Report, page 10; IM 2015 Annual Report, pages 13-14; IM 2016 First Quarter Report, pages 40-44; IM 2016 Second Quarter Report, pages 45-48
[13] *See* IM 2016 Second Quarter Report, pages 15-16; Rate Counsel, BPU Staff, and PSE&G reached a settlement on November 30, 2016, that noted an agreement that PSE&G may proceed with the Madison and Marshall projects outside the Energy Strong Program, raising and rebuilding both the Madison and Marshall electric substations at the Madison Substation site, subject to certain terms and conditions.
[14] Generally defined by the BPU as a sustained interruption of electric service resulting from conditions beyond the control of the Utility (e.g. thunderstorms, hurricanes, snow/ice storms) which affect at least 10 percent of the customers in the operating area. (N.J.A.C. 14:5-1.2)

B. Performance of Energy Strong Investments in Severe Weather Events

Prior IM quarterly reports have discussed the Major Events that have occurred in the Energy Strong Program to date. In early 2018, PSE&G issued its Performance of Energy Strong Investments in Major Event report for the two Major Events that occurred during the third quarter of 2017, both of which related to Mutual Aid PSE&G provided to other utilities. A summary of these two Major Events and the performance of PSE&G's Energy Strong investments in during the Major Events is provided as follows:

September 10-24, 2017 – Mutual Aid to Florida Power & Light (FPL)

- Summary: Hurricane Irma had significant impacts to FPL's service territory, with wide-spread outages as a result of the hurricane. As a result, Mutual Aid was requested by FPL, which led to PSE&G supplying resources from September 10 through September 24, 2017 to assist FPL in its recovery efforts.
- Impact to PSE&G Electric Customers: During the period in which Mutual Aid was provided, PSE&G's service territory encountered outages due to excessive heat in the region and switching performed at a substation in response to an unscheduled transformer outage that were unrelated to Hurricane Irma
- Energy Strong Performance:
    - Electric Station Flood Mitigation – 17 stations were completed at the time of the event (four eliminated, 13 raise and rebuild), no station was impacted by this Major Event.
    - Gas M&R – eight stations completed at the time of the event, no station was impacted by this Major Event.
    - Advanced Technologies – 111 substations were completed at the time of this Major Event, the CAIDI of completed circuits impacted by this event was as follows:

Status	Major Event CAIDI	5-Year Average Major Event CAIDI
Complete	78.30	1,161.28

    - Contingency Reconfiguration – 223 circuits were improved at the time of this Major Event, 27 of which experienced an outage due to this Major Event. The performance of the improved circuits was as follows:

Circuit Improved	Major Event CAIDI	5-Year Average Major Event CAIDI
BEN 8021	204.50	267.00
MIN 8014	42.00	22.31
POH 8013*	95.45	-
SOS 8015	54.00	4,460.42
CED 8011	145.22	15,715.00
CLF 8022	86.00	12,504.61
LAU 8014	82.00	5,496.60
MAI 8011	161.00	9,292.84
MAI 8012	114.00	12,598.77
WEW 8021	20.00	4,740.12
BEA 8006	37.00	242.23
CIN 8042	63.00	53.09
CRX 8004	188.78	618.32

Circuit Improved	Major Event CAIDI	5-Year Average Major Event CAIDI
CUT 8003	78.00	2,649.57
CUT 8004	101.00	452.57
DFD 8031	69.49	1,010.19
KUS 8002	142.00	101.00
KUS 8033	28.44	1,903.23
KUS 8041	294.17	1,011.04
LEV 8008	53.73	1,643.18
LUM 8011	109.23	2,301.54
MAD 8022	94.74	1,156.30
MAD 8038	165.17	29.71
MAR 8007	90.00	1,048.05
MAR 8019	78.88	1,294.46
MAR 8020	120.00	98.00
MTL 8023	170.00	2,529.64
**-Circuit did not experience an outage during Major Event in previous five years.*		

September 19-20, 2017 – Mutual Aid to PSEG-LI

- Summary: PSE&G provided Mutual Assistance to PSEG-LI in support of efforts to return service to PSEG-LI's service territory affected by Hurricane Jose.
- Impact to PSE&G Electric Customers: Although the brunt of the hurricane was off the eastern end of Long Island, PSE&G's service territory did experience rain and wind impacts from the storm that led to 7,407 PSE&G customers experiencing service interruptions of under three hours.
- Energy Strong Performance:
    - Electric Station Flood Mitigation – 17 stations were completed at the time of the event (four eliminated, 13 raise and rebuild), no station was impacted by this Major Event.
    - Gas M&R – eight stations completed at the time of the event, no station was impacted by this Major Event.
    - Advanced Technologies – 111 substations were completed at the time of this Major Event, the CAIDI of completed circuits impacted by this event was as follows:

Status	Major Event CAIDI	5-Year Average Major Event CAIDI
Complete	41.95	1,634.09

    - Contingency Reconfiguration – 223 circuits were improved at the time of this Major Event, four of which experienced an outage due to this Major Event. The improved circuit performance was as follows:

Circuit Improved	Major Event CAIDI	5-Year Average Major Event CAIDI
CED 8011	145.22	15,715.00
BUS 8014	51.00	54.66
LUM 8011	109.23	2,301.54
MAD 8038	165.17	29.71

Because of the overlapping time of these two Major Events, circuits CED 8011, LUM 8011, and MAD 8038 appear in both Major Events, but experienced only a single outage, and thus the Major Event CAIDI figures are the same for both Major Events.

C. Summary of 2017 Major Events

During 2017, PSE&G experienced the following Major Events:

- March 10-13, 2017 – Mutual Aid to Rochester Gas and Electric
- March 13-16, 2017 – State of Emergency / Nor'easter
- September 10-24, 2017 – Mutual Aid to FPL / Hurricane Irma
- September 19-20, 2017 – Mutual Aid to PSEG-LI / Hurricane Jose
- October 30-November 1, 2017 – Mutual Aid to PSEG-LI / Nor'easter

Four of the five Major Events during 2017 were related to Mutual Aid that PSE&G provided to other utilities, and while PSE&G's service territory experienced minor outages during each of the Mutual Aid periods, they were of a much smaller significance than a storm that directly affects PSE&G's service territory. Performance of Energy Strong investments during the March 13-16, 2017 Major Event was initially discussed in the IM 2017 Second Quarter Report;[15] however, additional information presented below demonstrates the Energy Strong investment performance compared to a five-year average without Hurricanes Sandy and Irene.

March 13-16, 2017 Major Event

- Advanced Technologies – 102 substations were completed at the time of this Major Event, the CAIDI of completed and non-invested circuits was as follows:

Status	Major Event CAIDI	5-Year Avg. Major Event CAIDI	5-Year Avg. Major Event CAIDI w/o Sandy/Irene
Complete	225.25	1,193.20	297.81
Non-Invested	179.83	1,202.00	117.50

- Contingency Reconfiguration – 203 circuits were improved at the time of this Major Event, 25 of which experienced outages due to this Major Event. The improved circuit performance was as follows:

Circuit Improved	Major Event CAIDI	5-Year Avg. Major Event CAIDI	5-Year Avg. Major Event CAIDI w/o Sandy/Irene
DOR 8044	211.00	4,832.68	*
MEA 8021	242.41	5,245.92	65.00
CED 8022	312.00	4,447.19	8.44
LAU 8046	326.00	4,628.11	122.00
MAI 8021	402.00	7,285.25	171.41
MAI 8024	303.00	3,249.59	198.93
BEA 8005	1,553.00	397.33	397.33
BEA 8006	408.00	135.34	135.34
BEA 8008	425.00	336.22	336.22
CIN 8001	236.56	515.55	198.74
CUT 8003	254.00	2,689.02	412.44
CUT 8004	996.51	431.93	349.26

[15] *See* IM 2017 Second Quarter Report, pages 16-17

Circuit Improved	Major Event CAIDI	5-Year Avg. Major Event CAIDI	5-Year Avg. Major Event CAIDI w/o Sandy/Irene
CUT 8035	650.50	83.68	83.68
DFD 8008	3,271.00	81.02	116.76
DFD 8031	572.13	1,180.55	1,180.55
LAW 8031	522.10	*	*
LAW 8033	80.11	603.05	603.05
LEV 8004	155.00	1,986.87	320.57
LEV 8009	457.00	1,113.41	322.04
MAD 8022	858.91	1,364.00	1,364.00
MAD 8038	632.00	8.42	8.42
MAR 8003	319.90	1,353.18	1,353.18
MAR 8019	645.00	1,378.05	867.92
MTL 8014	825.00	*	*
MTL 8025	180.82	203.07	203.07
**-No outage data to report.*			

D. Examination of Selected Circuit Performance during Major Events

To provide a more robust view of the performance of Energy Strong investments during Major Events, improved circuits in which the Major Event CAIDI was greater than the 5-year Major Event CAIDI average were identified and information gathered to explain the divergence in CAIDI performance. This information is presented in **Table IV-1 – Selected Major Event Performance**. Selected circuit performance for the September 2017 Major Events will be provided in the IM 2018 First Quarter Report.

Table IV-1 – Selected Major Event Performance

Circuit	Major Event CAIDI	5-year Average Major Event CAIDI	Additional Information
6/23-6/27/2015 – Severe Thunderstorms			
CUT 8041	3,596.00	1,067.00	Circuit was out during this Major Event due to a down pole during the severe weather/lightning. 33 customers experienced a loss of service for 3,596 minutes.
LUM 8013	1,296.00	505.00	Circuit was out during this Major Event due to down trees resulting in all three phase of primary down. 946 customers experienced a loss of service for 1,296 minutes.
THO 8022	1,046.50*	50.00	Circuit experienced two outages during this Major Event; the first was due to severe winds and down trees resulting in 15 customers losing service for 708 minutes, the second outage was due to down trees on the primary resulting in 15 customers experiencing a loss of service for 1,385 minutes. This circuit did not experience an outage during Superstorm Sandy.
2/24-2/27/2016 – Severe Wind/Rain & Mutual Aid			
CUT 8004	609.00	431.37	Circuit was out during the severe winds due to downed wires and a blown transformer. 24 customers experienced a loss of service for 609 minutes.
MAD 8021	1,420.00	837.61	Circuit was out during the severe winds due to down wires. 25 customers experienced a loss of service for 1,420 minutes.

Circuit	Major Event CAIDI	5-year Average Major Event CAIDI	Additional Information
3/13-3/16/2017 – Nor'easter			
BEA 8005	1,553.00	397.33	Circuit was out due to downed tree limbs. 27 customers experienced a loss of service for 1,553 minutes. This circuit did not experience an outage during Superstorm Sandy.
BEA 8006	408.00	135.34	Circuit was out due to a downed tree that cased a fuse to blow. 72 customers experienced a loss of service for 408 minutes. This circuit did not experience an outage during Superstorm Sandy.
CUT 8004	996.51*	431.93	Circuit had five outages during this Major Event, four as a result of down trees, and one as a result of a broken pole from ice and wind. The outages varied in number of customers impacted (14 to 73) and in duration (279 to 1,398).
CUT 8035	650.50*	83.68	Circuit was out due to a down tree. 83 customers experienced a loss of service for 289 minutes, and 34 customers experienced a loss of service for 1,533 minutes. This circuit only experienced a momentary outage during Superstorm Sandy.
DFD 8008	3,271.00	81.02	Circuit was out due to a single phase down. One customer (a vacant building) experienced a loss of service for 3,271 minutes.
MAD 8038	632.00	8.42	Circuit was out due to a down tree. 21 customers experienced a loss of service for 632 minutes. This circuit did not experience an outage during Superstorm Sandy.
**-Circuit had more than one outage during the Major Event period, thus the Major Event CAIDI is an average of the total outages on the circuit during the Major Event period. For example, on CUT 8035, during the Major Event period, 83 customers had an outage of 289 minutes in one outage, and 34 customers had an outage of 1,533 minutes in another outage. The Major Event CAIDI is calculated as [(83 customers x 289 minutes) + (34 customers x 1,533 minutes)] divided by (83 customers + 34 customers) = 650.50.*			

E. Findings & Observations

The IM observes that during the Energy Strong Program, there has been a total of 18 Major Events. Of these, five related to load shedding or emergency switching events and had no outages on circuits receiving Energy Strong investments. An additional six Major Events related to Mutual Aid provided to other utilities, which while there may have been outages in PSE&G's service territory during the same time period, the event might not be considered a "traditional" storm-related event in PSE&G's services territory (e.g. Mutual Aid provided to FPL from September 10-24, 2017 was in response to Hurricane Irma, while the outages PSE&G experienced at this time were related to excessively hot weather; similarly the Mutual Aid provided to PSEG-LI from August 4-7, 2015 was in response to severe thunderstorms, while the outages PSE&G experienced at this time were normal operating condition outages). Thus, there is limited information from which to gauge the performance of Energy Strong investments at this time. However, the IM found that the average of the Major Event CAIDI of Energy Strong investments against the five-year Major Event CAIDI average suggests that PSE&G and its customers have already realized benefits from the investments. This overall Major Event CAIDI comparison is provided in **Table IV-2 – Overall Major Event CAIDI Performance**.

Table IV-2 – Overall Major Event CAIDI Performance

Subprogram	Major Event CAIDI Average	Major Event 5-Year CAIDI Average
Advanced Technologies*	142.09	1,497.73
Contingency Reconfiguration**	358.25	2,590.22
-Includes completed circuits (as of the Major Event) only.* *-Does not include circuits that had not experienced a Major Event outage in previous five years.*		

Status of the Energy Strong Program

V. Electric Station Flood Mitigation

A. Current Status

During the fourth quarter of 2017, four additional stations were placed fully in-service: Third Street, Hillsdale, Jersey City, and New Milford. Thus, as of December 31, 2017, only four of the 26 electric substations remain in construction, with three of those four having achieved partial in-service. The four substations remaining for completion are Cranford, Essex, Jackson Road and Port Street. The Essex substation achieved partial in-service in May 2017, while Cranford and Jackson Road achieved partial in-service during the fourth quarter of 2017. The Port Street substation is scheduled to achieve partial in-service during the second quarter of 2018. Each of these four remaining substations is scheduled to be placed completely in-service during the first half of 2018, with Cranford reaching full in-service status on January 18, 2018, Essex scheduled for the end of March 2018, and Port Street and Jackson Road scheduled for May 31, 2018.

As noted in the IM 2017 Third Quarter Report, **Table V-1 – Status of Electric Station Flood Mitigation Projects**, which had been included in prior IM reports reflecting the phase of each substation has been revised starting with the IM 2017 Third Quarter Report to specifically provide the status of the construction and in-service activities for the remaining active electric substations as shown in **Table V-1 – Status of the Electric Station Flood Mitigation Projects as of December 31, 2017**.

Table V-1 – Status of Electric Station Flood Mitigation Projects as of December 31, 2017

Project	Construction		Partial In-Service		Full In-Service	
	Q3 2017	Q4 2017	Q3 2017	Q4 2017	Q3 2017	Q4 2017
Cranford	✓	✓		✓+		
Essex Switching	✓	✓	✓	✓		
Hillsdale	✓	X	✓	X		✓+
Jackson Road	✓	✓		✓+		
Jersey City	✓	X	✓	X		✓+
New Milford	✓	X	✓	X		✓+
Port Street	✓	✓				
Third Street*	✓	X				✓+
Total	**8**	**4**	**4**	**3**	**-**	**4**
✓ = ongoing status as previously reported ✓+ = new since prior quarter X = removed since prior quarter (e.g. project transitioned out of construction)						

Project	Construction		Partial In-Service		Full In-Service	
	Q3 2017	Q4 2017	Q3 2017	Q4 2017	Q3 2017	Q4 2017
**-Third Street was eliminated, and thus out-of-service, not fully in-service.*						

Additional information as to the status and accomplishments of the active projects in the Electric Station Flood Mitigation subprogram during the fourth quarter of 2017 and upcoming activities is provided below.

Cranford Substation

- 4kV circuit cutovers.
- 26kV circuit cutovers.
- Connect transformer #1 between 26kV and 4kV bus.
- Dismantle old station yard.
- Placed fully in-service on January 18, 2018.

Essex Switching Station

- Rebuild manholes.
- Pull and terminate cables into the switchgear.
- 26kV circuit cutovers.

Hillsdale Substation

- Testing and commissioning the 26kV switchgear.
- Pulling and terminating cables from the control house.
- Placed fully in-service on November 29, 2017.

Jackson Road Substation

- Relay testing switchgear #1 and #2.
- 13kV aluminum bus support installation.
- 13kV circuit relocation.
- Pull and prepare 13kV cables prior to cutovers.
- 13kV circuit cutovers.
- Placed partially in-service on November 28, 2017.

Jersey City Substation

- Placed fully in-service on October 6, 2017.

New Milford Substation 16/13kV

- Building platform assembly for switchgear #2.
- Pulling and terminating cable in the control room.
- 13kV circuit cutovers.
- Pulling and terminating underground cable for switchgear #2.
- Placed fully in-service on December 29, 2017.

Port Street Substation

- Relocate Port Street 8003 13kV circuit from overhead to underground.
- Energize contingency unit sub.

- Relocated the Y-77 26kV circuit from overhead to underground.
- Pile driving for switchgear and transformer platforms.
- Pre-excavating for sheeting piles for manholes.
- Duct bank work between manholes #2 and #3.

Third Street Substation

- Outside plant conversion from 4kV to 13kV.
- Placed fully in-service on November 21, 2017.

In prior IM quarterly reports, Table V-2 – Electric Station Flood Mitigation Estimating & Mitigation Status as of [the End of the Quarter for that Report] provided the status of the cost estimating level and the corresponding flood mitigation method for each of the 26 electric substations in the Electric Station Flood Mitigation subprogram. As noted in the IM 2017 Third Quarter Report, only the Jackson Road substation had not achieved the 90% Definitive level of cost estimate, PSE&G has since updated its cost estimate and submitted it to the URB as the 90% Definitive Cost Estimate which the URB approved on November 17, 2017.

The schedule data for the electric substations in the ESFM subprogram was reviewed by the IM to determine if there were any large changes in the current in-service dates as compared to in-service dates as of the end of the third quarter of 2017. The criterion used to identify a large change is that the in-service dates would change by 60 days (two months) or more. That change may be an extension or an advancement of the current in-service date. The Port Street substation was the only substation that fell into that category as its in-service date was changed by 66 days from March 24, 2018 to May 29, 2018. This date change was caused to accommodate some civil scope changes to facilitate the construction of another project that impacts the Port Street substation project of the ESFM subprogram.

Based on the information known to PSE&G as of the end of the fourth quarter of 2017 and reviewed by the IM, the IM does not have any reason to believe that the remaining substations cannot be completed by the Stipulation mandated completion date for this subprogram of May 23, 2019. As noted above, 22 of the 26 electric substations in this subprogram have achieved full in-service as of the end of the fourth quarter of 2017, with the remaining four anticipated to be placed fully in-service by the end of the second quarter of 2018.

B. Cost Overview

Table V-2 – Electric Station Flood Mitigation Cost Status as of December 31, 2017 provides the breakdown of the cost estimates for each electric substation into their respective base cost, and risk and contingency (R&C) cost. The first set of columns after the station name provides the initial estimate for each electric substation. This is the same initial estimate information that was provided in previous IM reports and serves as the initial estimate that is compared to the current estimate to calculate the variance for each substation. The second set of columns provides the information for the current estimate, as of December 31, 2017. The Stipulation amount for the Electric Station Flood Mitigation subprogram of the Energy Strong Program is $620 million. The initial estimate of $619.8 million when rounded represents the $620 million number.

As discussed in prior IM reports, when cost estimates are changed, they must go before PSE&G's URB with sufficient justification for the URB to approve those new cost estimates.[16] Considering the advanced state of this subprogram, there have been no cost estimate changes from those provided in the IM 2017

[16] *See*, IM 2014 Annual Report, pages 35-36, 43, 46

Second Quarter Report. While there was a URB meeting in November 2017, in which the URB approved the Jackson Road substation 90% Definitive cost estimate level, the total cost estimate for this project remained unchanged.

As of December 31, 2017, the current PSE&G cost estimate for the entire Electric Station Flood Mitigation subprogram was $486.2 million, remaining unchanged since the second quarter of 2017. From a cost perspective, as with the other completed subprograms, PSE&G is managing the Electric Station Flood Mitigation subprogram as essentially one program, rather than 26 individual projects. That is, PSE&G is managing this subprogram to the Stipulation amount of $620 million. **Table V-2** shows that, as of December 31, 2017, the variance of the current PSE&G project estimates compared to the initial estimates is now negative $133.6 million compared to the initial estimates ($619.8 million total initial estimates compared to $486.2 million total current estimates), which has not changed since the second quarter of 2017 and is still tracking under budget.

Table V-2 – Electric Station Flood Mitigation Cost Status as of December 31, 2017[17]

Station Name	Initial Estimate*			Current Estimate			Current Estimate Variance to Initial Estimate	Actuals to Date	% of Actuals to Estimate
	Base	R&C	Total	Base	R&C	Total			
	(in thousands)								
Bayonne	$25,700	$16,600	$42,300	$29,500	$4,500	$34,000	($8,300)	$30,318	89%
Bayway 26kV	$16,200	$10,400	$26,600	$23,200	$0	$23,200	($3,400)	$23,140	100%
Bayway 4kV	$6,700	$4,400	$11,100	$8,500	$300	$8,800	($2,300)	$8,246	94%
Belmont	$1,600	$1,100	$2,700	$4,900	$0	$4,900	$2,200	$4,912	100%
Cranford	$13,800	$9,300	$23,100	$32,200	$3,200	$35,400	$12,300	$25,540	72%
Essex	$46,600	$30,000	$76,600	$37,500	$4,800	$42,300	($34,300)	$30,926	73%
Ewing	$6,400	$4,100	$10,500	$8,600	$100	$8,700	($1,800)	$7,578	87%
Garfield Place	$8,000	$5,100	$13,100	$13,400	$1,500	$14,900	$1,800	$11,857	80%
Hackensack	$20,800	$13,700	$34,500	$31,200	$2,800	$34,000	($500)	$32,415	95%
Hillsdale	$15,700	$10,200	$25,900	$26,200	$2,600	$28,800	$2,900	$24,977	87%
Hoboken	$17,500	$11,300	$28,800	$27,100	$2,500	$29,600	$800	$24,546	83%
Howell Street	$15,800	$10,200	$26,000	$14,500	$2,200	$16,700	($9,300)	$8,767	53%
Jackson Road	$10,100	$6,500	$16,600	$10,900	$3,200	$14,100	($2,500)	$8,171	58%
Jersey City	$16,900	$10,900	$27,800	$12,900	$2,000	$14,900	($12,900)	$7,313	49%
Linden	$10,900	$7,100	$18,000	$15,500	$0	$15,500	($2,500)	$15,819	103%
Little Ferry	$1,700	$1,100	$2,800	$5,100	$0	$5,100	$2,300	$5,012	98%
Madison	$12,600	$8,100	$20,700	***Removed from Energy Strong***			($20,700)		
Marion	$11,700	$7,500	$19,200	$13,800	$0	$13,800	($5,400)	$14,718	107%
Marshall	$10,400	$6,700	$17,100	***Removed from Energy Strong***			($17,100)		
New Milford	$12,900	$8,300	$21,200	$16,900	$1,700	$18,600	($2,600)	$13,369	72%
Newark Airport	$5,300	$3,400	$8,700	***Cancelled***			($8,700)		
Port Street	$15,200	$9,800	$25,000	$13,700	$1,400	$15,100	($9,900)	$7,451	49%
Rahway	$3,900	$2,000	$5,900	$5,900	$0	$5,900	$0	$5,858	99%
River Edge	$4,600	$2,900	$7,500	$6,700	$0	$6,700	($800)	$6,405	96%

[17] **Table V-2** provides a comparison between the original Office-level, the current budget as of the end of the fourth quarter of 2017, and the actual spend; whereas **Table II-2** provides a comparison of annual estimates of the projects as of the end of the year, for each year, to the actual spend.

Station Name	Initial Estimate*			Current Estimate			Current Estimate Variance to Initial Estimate	Actuals to Date	% of Actuals to Estimate
	Base	R&C	Total	Base	R&C	Total			
	(in thousands)								
Sewaren	$13,600	$8,800	$22,400	$25,000	$0	$25,000	$2,600	$24,962	100%
Somerville	$6,600	$4,300	$10,900	$5,800	$0	$5,800	($5,100)	$6,041	104%
South Waterfront	$33,900	$21,900	$55,800	$50,900	$0	$50,900	($4,900)	$50,934	100%
St. Paul's	$1,700	$1,100	$2,800	$1,400	$0	$1,400	($1,400)	$481	34%
Third Street	$9,800	$6,400	$16,200	$9,100	$3,000	$12,100	($4,100)	$7,094	59%
Subtotal	**$376,600**	**$243,200**	**$619,800**	**$450,400**	**$35,800**	**$486,200**	**($133,600)**	**$406,820**	**84%**

As shown in **Table V-2**, overall 84% of the $486.2 million current estimate for the ESFM subprogram has been spent as of December 31, 2017. This compares to 80% of the current estimate spent at the end of the third quarter of 2017. When compared to the $620 million Stipulation amount, the $406.8 million spent represents approximately 66% of the total amount.

Comparing the current R&C amounts shown in **Table V-2** to the initial estimates of R&C shows that the R&C amount has decreased for all of the substations in the current budget. This would be expected since as the engineering design is further developed, the R&C component of the total project cost would decrease since there is more certainty in the design. **Table V-2** shows that the current R&C amount, not including the R&C from Madison, Marshall and the cancelled Newark Airport projects, decreased by $207.4 million from the initial estimate (current R&C is at $35.8 million; initially it was at $243.2 million). This remains unchanged from the third quarter of 2017 because, as noted above, there were no estimate changes during the fourth quarter of 2017.

In prior reports, the IM provided an analysis of those substations whose base estimate, excluding R&C, increased or decreased by more than 5% during the quarter being reported on and provided the reasons for those changes. As noted earlier, there were no cost changes in estimate for any of the Electric Station Flood Mitigation projects during the fourth quarter of 2017. As such, the current December 31, 2017 current cost estimate is the same as the cost estimate as of September 30, 2017 resulting in no cost increases or decreases and therefore there are no new estimate changes to discuss.

The quarterly cost variance is the difference between the amount forecast and the amount that was spent in the fourth quarter of 2017. **Table V-3 – Electric Station Flood Mitigation 2017 Q4 Cost Variance** provides the fourth quarter cost variance for each of the substation projects in the ESFM subprogram and then totals the variance from each of the substation projects to provide a quarterly variance.

Table V-3 – Electric Station Flood Mitigation 2017 Q4 Cost Variance

Electric Station Flood Mitigation 2017 Q4 Cost Variance* *(in thousands)*									
Project	**Forecast**				**Actual**				**Variance**
	Oct-17	***Nov-17***	***Dec-17***	***Q4 Total***	***Oct-17***	***Nov-17***	***Dec-17***	***Q4 Total***	
Bayonne	$515	$253	$780	$1,548	$383	$220	$990	$1,593	$45
Bayway 26kV	$8	$0	($51)	($43)	$18	$3	($85)	($64)	($21)
Bayway 4kV	$1	$3	$12	$16	($7)	($30)	$0	($37)	($53)
Belmont	$0	$0	$0	$0	$0	$0	$0	$0	-
Cranford	$572	$518	$647	$1,736	$434	$318	$613	$1,365	($372)
Essex	$2,067	$1,172	$1,345	$4,585	$1,554	$566	$1,098	$3,218	($1,367)
Ewing	$96	$10	$17	$124	$106	$10	$60	$176	$52
Garfield	$320	$225	$31	$577	$327	$164	$54	$545	($31)
Hackensack	$390	$159	$5	$554	$267	$317	$167	$751	$197
Hillsdale	$1,184	$1,552	$4	$2,740	$2,562	$1,624	$7	$4,192	$1,452
Hoboken	$149	$89	$228	$465	$37	$38	$84	$159	($306)
Howell St	$30	$336	($504)	($139)	$171	($31)	($350)	($210)	($71)
Jackson Rd	($905)	$557	$447	$98	($738)	$828	$583	$673	$575
Jersey City	$101	$140	($169)	$72	$156	$66	($295)	($73)	($145)
Linden	$25	$3	$26	$55	$14	($2)	$30	$42	($13)
Little Ferry	$0	$0	$0	$0	$1	$0	$0	$1	$1

Electric Station Flood Mitigation 2017 Q4 Cost Variance* *(in thousands)*									
Project	**Forecast**				**Actual**				**Variance**
	Oct-17	***Nov-17***	***Dec-17***	***Q4 Total***	***Oct-17***	***Nov-17***	***Dec-17***	***Q4 Total***	
Madison	$0	$0	$0	$0	$0	$0	$0	$0	-
Marion	$6	($78)	$37	($34)	$11	($82)	$12	($59)	($25)
Marshall	$0	$0	$0	$0	$0	$1	$0	$1	$1
New Milford	$264	$440	$863	$1,567	$21	$228	$831	$1,080	($486)
Newark Airport	$0	$0	$0	$0	$0	$0	$0	$0	-
Port Street	$381	$886	$1,628	$2,895	$462	$599	$2,001	$3,063	$168
Rahway	$0	$0	$0	$0	$2	($36)	$1	($33)	($33)
River Edge	$0	$0	$0	$0	$0	$0	$0	$0	-
Sewaren	$0	$0	$0	$0	$0	$0	$0	$0	-
Somerville	$0	$0	$0	$0	$0	$0	$4	$4	$4
So. Waterfront	$0	$10	$7	$17	$20	$28	$28	$76	$59
St Paul's	$19	$47	$18	$83	$9	$11	$12	$32	($52)
Third Street	$1,053	$819	$241	$2,114	$1,270	$890	$468	$2,627	$513
Subtotal	**$6,277**	**$7,143**	**$5,610**	**$19,030**	**$7,078**	**$5,732**	**$6,314**	**$19,123**	**$93**
**-Negative variance values indicate less spent than forecasted, positive values indicate more spent than forecasted for Q4.*									

Summing the 29 individual variances as shown in **Table V-3** indicates the total variance for the fourth quarter of 2017 resulted in an actual amount spend that was approximately $93,000 more than the forecasted amount. The majority of the variance is due to higher actual spending at the Hillsdale, Jackson Road and Third Street electric substations and to a lesser degree higher spending at the Hackensack and Port Street electric substations. An explanation of the reasons for the higher individual month variances for all substations in the fourth quarter of 2017 is provided in **Table V-4 – Cost Variance Explanation for the Fourth Quarter of 2017**. As more electric substations are completed and construction starts to wind down, the quarterly variances are expected to continue to remain fairly insignificant.

The IM reviewed and analyzed the cost information for the fourth quarter of 2017 to determine if any significant variances (greater than 10%) occurred from the forecast to the actual amounts spent during the quarter. For each month in the fourth quarter, **Table V-4** provides the explanation for the cost variance between the forecast and actual amount spent on a substation project basis, for those substations in construction, where that variance is significant. Those substations not listed in **Table V-4**, or have a "dash" in the box, indicate that they are no longer in construction during Q4 of 2017 or their cost variance was not significant.

Table V-4 – Cost Variance Explanation for the Fourth Quarter of 2017

Project	October 2017	November 2017	December 2017
Bayonne	Division completed less work than forecast. Testing and commissioning work completed below forecast.	-	More work completed by electrical contractor than forecasted.
Bayway 26kV	-	-	-
Bayway 4kV	-	-	-
Belmont	-	-	-

Cranford	Division completed less work than forecast.	Less commissioning and relay work accomplished than forecast.	-
Essex	Material deliveries shifted a month out. Delays in Division starting manhole related work.	Decrease due to Division completing only one week of work due to waiting for manhole to be turned over from contractor.	-
Ewing	-	-	-
Garfield Place	-	Division resources completed work for less than originally forecast. All station work is now complete.	-
Hackensack	Grating work surrounding switchgear not fully completed as scheduled.	Increase is due to additional work for the switchgear grating.	Installation of 4kV regulator doors for switchgear 1 &2.
Hillsdale	Station decorative wall installation costs not forecast. Division completed more work than forecast.	-	-
Hoboken	Division work and inside plant Relay Tech was forecasted higher than actuals.	Division completed less work than forecast. Inside plant relay work shifted out.	Site restoration work.
Howell St	Division completed more work than forecast.	Less civil and electrical work completed than forecast. Demolition scope shifted to Q2 2018.	Correction of over accrual.
Jackson Rd	-	Higher charges from Metro Division and relay techs than forecast.	Division relay techs did more work than forecasted.
Jersey City	More civil work was completed than forecasted.	Less civil and electrical work completed than forecast. Demolition scope shifted to Q2 2018.	Correction of over accrual.
Linden	-	-	-
Little Ferry	-	-	-
Madison	-	-	-
Marion	-	-	-
Marshall Street	-	-	-
New Milford	Division needed less cable than forecasted.	Division resources completed less work than forecast.	-
Newark Airport	-	-	-
Port Street	Pad Mount Transformer delivered ahead of schedule.	Only a portion of forecast materials delivered by A/E. Less work by environmental contractor than forecast.	Resource recovery costs for soil and dewatering - a portion was incorrectly allocated and will be journaled off in January 2018.
Rahway	-	-	-
River Edge	-	-	-
Sewaren	-	-	-
Somerville	-	-	-

South Waterfront	-	-	-
St Paul's	-	-	-
Third Street	Expedited delivery of conduit material.	-	Traffic control costs higher than expected.

C. Findings & Observations

- As of the end of the fourth quarter of 2017, significant progress has been made on the Electric Station Flood Mitigation subprogram, with a total of 22 out of 26 projects placed fully in-service, and three of the remaining four being partially in-service. This compares to 19 projects placed fully in-service and four partially in-service as of the end of the third quarter of 2017. Based on the IM's review of PSE&G's planning and progress to date, the IM finds that PSE&G should complete this subprogram ahead of the stipulated completion date of May 23, 2019.
- The current cost estimate, as of December 31, 2017, to complete the entire Electric Station Flood Mitigation subprogram is $486.2 million compared to $620 million in the Stipulation. The $486.2 million does not include the original cost estimates for the Madison and Marshall substations, which were removed from the Energy Strong Program, nor the Newark Airport substation, which was cancelled.
- The total amount spent, as of December 31, 2017 on the entire Electric Station Flood Mitigation subprogram is $406.8 million, which is approximately 84% of the current cost estimate of $486.2 million, compared to 80% spent as of September 30, 2017. As noted in the IM 2017 Second Quarter Report, PSE&G had calculated a new forecast cost estimate as of August 1, 2017, of $431.7 million, $54.4 million less than the current URB approved cost estimate of $486.2 million.
- Considering the progress made to date, the amount actually spent and the advanced level of the engineering design, and that all substation projects are at the 90% Definitive Cost Estimate level, and the level of construction completion, the IM finds that the Electric Station Flood Mitigation subprogram should be completed well within the Stipulation amount of $620 million, even with adjusting for the removal of the Madison/Marshall and Newark Airport projects from the Energy Strong Program.

VI. Gas M&R Flood Mitigation

A. Current Status

As reported in the IM 2017 Second Quarter Report, the final two stations, Newark Airport M&R and Harrison M&R were placed in-service in April and May 2017, respectively, which completed the Gas M&R subprogram. As reported in the IM 2017 Third Quarter Report, demolition work at the Newark Airport M&R station was completed as of October 6, 2017, leaving closeout related activities as the only remaining activity, which is currently forecasted to be completed during the second quarter of 2018.

A summary of the key milestones for each project (kickoff, construction, in-service, and closeout) is presented in **Table VI-1 – Gas M&R Subprogram Project Schedule as of December 31, 2017**.

Table VI-1 – Gas M&R Subprogram Project Schedule as of December 31, 2017

Project	Status Point	2014				2015				2016				2017				2018				2019		Total $
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	(in thousands)
Crown Central M&R	Dec. 2014 Plan/Estimate			KO			C		*															$3,829
	Dec. 2015 Plan/Estimate			KO		C	IS		CO															$2,850
	Actual			KO		C	IS		CO															$2,406
Piles Creek M&R	Dec. 2014 Plan/Estimate			KO			C/IS		*															$2,155
	Dec. 2015 Plan/Estimate			KO			C/IS		CO															$1,850
	Actual			KO			C/IS		CO															$1,435
Newark Airport M&R	Dec. 2014 Plan/Estimate			KO						C	IS		*											$8,363
	Dec. 2015 Plan/Estimate			KO							C				IS			CO						$8,400
	Dec. 2016 Plan/Estimate			KO							C				IS			CO						$8,400
	Actual			KO							C				IS									$8,393
Crown Central LP	Dec. 2014 Plan/Estimate			KO						C	IS		CO											$3,119
	Dec. 2015 Plan/Estimate			KO				C			IS		CO											$2,860
	Dec. 2016 Plan/Estimate			KO				C			IS		CO											$2,860
	Actual			KO				C		IS			CO											$2,444
Burlington LNG	Dec. 2014 Plan/Estimate			KO						C	IS		CO											$2,732
	Dec. 2015 Plan/Estimate			KO			C				IS		CO											$1,980
	Dec. 2016 Plan/Estimate			KO			C				IS		CO											$1,980
	Actual			KO			C				IS		CO											$1,747
West End M&R	Dec. 2014 Plan/Estimate			KO										C	IS		*							$9,108
	Dec. 2015 Plan/Estimate			KO				C							IS		CO							$9,100
	Dec. 2016 Plan/Estimate			KO				C							IS		CO							$3,500
	Actual			KO				C						IS		CO								$2,476
Harrison M&R	Dec. 2014 Plan/Estimate			KO										C	IS		*							$8,512
	Dec. 2015 Plan/Estimate			KO				C							IS		CO							$8,500
	Dec. 2016 Plan/Estimate			KO				C							IS		CO							$6,100
	Actual			KO				C							IS		CO							$5,425
Harrison LP	Dec. 2014 Plan/Estimate			KO		C	IS		CO															$12,182
	Dec. 2015 Plan/Estimate			KO			C/IS		CO															$928
	Actual			KO			C/IS		CO															$926

Program End Date Per Stipulation - May 21, 2019

Legend: KO = Kickoff; C = Construction; IS = In-Service; CO = Closeout
**-No Closeout date identified in schedule.*

B. Cost Overview

The Gas M&R subprogram was approved per the Stipulation in the total amount of $50 million. Subsequently, PSE&G approved two transfers of funds from the Gas M&R subprogram to the UPCI subprogram that have reduced the Gas M&R budget to $30.0 million. The first transfer, in the fourth quarter of 2015, transferred $13.5 million, and the second transfer, in the second quarter of 2016, transferred $6.5 million. With all projects now in-service, a total of approximately $25.2 million has been spent in the Gas M&R subprogram to date.

Table VI-2 – Gas M&R Project Estimates & Costs as of December 31, 2017 shows that after all projects in the subprogram have been placed in-service, the subprogram has now spent 92% of the sum of the individual project estimates.

Table VI-2 – Gas M&R Project Estimates & Costs as of December 31, 2017

Project	Estimate*	Project Actuals to Date**	% Spend of Estimate
	(in thousands)		
Crown Central M&R	$2,400	$2,406	100%
Piles Creek M&R	$1,400	$1,435	103%
Newark Airport M&R	$8,400	$8,393	100%
Crown Central LP	$2,860	$2,444	85%
Burlington LNG	$1,980	$1,747	88%

Project	Estimate*	Project Actuals to Date**	% Spend of Estimate
	(in thousands)		
West End M&R	$3,500	$2,476	71%
Harrison M&R	$6,100	$5,425	89%
Harrison LP	$928	$926	100%
Total	**$27,568**	**$25,252**	**92%**

**-Two transfers of funds have taken place from the Gas M&R subprogram to the UPCI subprogram; in the fourth quarter of 2015, $13.5 million was transferred, and in the second quarter of 2016, $6.5 million was transferred. The current balance of funds for the Gas M&R subprogram is $30.0 million.*

***-Although all projects are now in-service, project actuals may continue to show minor adjustments as final invoices are recorded and closeout costs are incurred.*

As shown in **Table VI-2**, the proportion of estimate spent on the subprogram is currently 92%, or roughly $25.2 million (or 84% of the full $30 million currently allocated to the subprogram). With all projects in the subprogram in-service, remaining work consists of closeout work. Only one project, Newark Airport M&R, has yet to be closed out; Newark Airport M&R had demolition work that was completed in October 2017, and project closeout is forecasted to be complete in April 2018.

The details of the individual Gas M&R project costs for the fourth quarter of 2017 are provided in **Table VI-3 – Q4 2017 Gas M&R Subprogram Project Costs**.

Table VI-3 – Q4 2017 Gas M&R Subprogram Project Costs

Project	Q4 2017 Forecast	Q4 2017 Actuals	Q4 2017 Variance*
	(in thousands)		
Crown Central M&R	$0	$0	-
Piles Creek M&R	$0	$0	-
Newark Airport M&R	$87	($1)	($88)
Crown Central LP	$0	$0	-
Burlington LNG	$0	$0	-
West End M&R	$0	$1	$1
Harrison M&R	$40	$42	$2
Harrison LP	$0	$0	-
Total	**$127**	**$41**	**($86)**

**-Negative values indicate less spent than forecasted, positive values indicate more spent than forecasted for Q4.*

During the fourth quarter of 2017, the overall subprogram spending was approximately 33% less than forecasted for the quarter. This fourth quarter Gas M&R subprogram variance of approximately $86,000 less spent than forecasted is primarily related to the actual demolition costs at Newark Airport M&R being less than estimated.

C. Findings & Observations

- Aside from associated closeout work at Newark Airport M&R station, the Gas M&R subprogram has essentially concluded, well in advance of the Stipulation mandated completion date of May 2019.
- Cost performance in the subprogram continues to be a positive, with most projects completed under their individual project estimates. Pending close out costs associated with Newark Airport

M&R station, the overall subprogram was completed well under budget (84% of the subprogram budget spent as of the end of the fourth quarter of 2017, or 92% of the current subprogram estimate spent).

- As of the date of this IM 2017 Annual Report, there have been no water intrusion events at any of the completed Gas M&R Flood Mitigation projects.

VII. UPCI Replacement

As reported in the IM 2016 Third Quarter Report, construction and restoration activities were completed as of July 22, 2016.

In terms of the total subprogram, 100% of the sub-program forecast of $370 million (which reflects the transfer in investment funding of $20 million from the Gas M&R subprogram) has been spent – *i.e.* $370 million.

VIII. Advanced Technologies

As reported in the IM 2017 Second Quarter Report, the Advanced Technologies subprogram put its remaining projects in-service during the second quarter of 2017, which completed the subprogram ahead of the May 2017 planned completion date identified in the Stipulation. The remaining activities within the Advanced Technologies subprogram are related to closeout of the overall subprogram. Closeout is ongoing and expected to be completed on or ahead of the PSE&G's scheduled April 21, 2018 closeout completion date.

The Advanced Technologies subprogram was approved per the Stipulation in the total amount of $100 million, and in the second quarter of 2016 an additional $5 million in investment funds was transferred from the Contingency Reconfiguration subprogram to Advanced Technologies.[18] During the first quarter of 2017, an additional $2 million in investment funds was transferred between these two subprograms, raising the Advanced Technologies subprogram budget to $107 million. Through the end of the fourth quarter of 2017, a total of $106.2 million was expended on this subprogram, or approximately 99% of the total subprogram budget. The summary of the subprogram costs is provided in **Table VIII-1 – Advanced Technologies Subprogram Costs as of December 31, 2017**.

Table VIII-1 – Advanced Technologies Subprogram Costs as of December 31, 2017

Q4 2017 Actuals	2017 Actuals	Subprogram to Date	Subprogram Budget[19]	% of Stipulation
(in thousands)				
$4	**$7,637**	**$106,218**	**$107,000**	**99%**

Actual spend in the fourth quarter 2017 was approximately $4,000 as closeout of the subprogram continued.

[18] *See* IM 2016 Second Quarter Report, pages 20-21

[19] As discussed in the IM 2016 Second Quarter Report, $5 million was transferred from the Contingency Reconfiguration Stipulation amount of $100 million to the Advanced Technologies subprogram; and, as discussed in the IM 2017 First Quarter Report, an additional $2 million was transferred from the Contingency Reconfiguration subprogram, resulting in a revised investment amount of $107 for the Advanced Technologies subprogram.

IX. Contingency Reconfiguration

As reported in the IM 2017 Second Quarter Report, the Contingency Reconfiguration subprogram put its remaining projects in-service during the second quarter of 2017, which completed the subprogram and met the May 2017 planned completion date identified in the Stipulation. The remaining work within the Contingency Reconfiguration subprogram is related to closeout work associated with recently completed projects and for the overall subprogram. Closeout is ongoing and expected to be completed on or ahead of the scheduled May 22, 2018 closeout completion date.

There was no additional spend in the Contingency Reconfiguration subprogram during the fourth quarter of 2017, and the total spend for the subprogram remains at $83.6 million. **Table IX-1 – Contingency Reconfiguration Costs as of December 31, 2017** depicts the overall status of costs on this subprogram through the end of 2017 in terms of the adjusted amount of the subprogram budget. Minimal changes are expected to these costs as closeout continues.

Table IX-1 – Contingency Reconfiguration Costs as of December 31, 2017

Q4 2017 Actuals	2017 Actuals	Subprogram to Date	Subprogram Budget[20]	% of Stipulation
(in thousands)				
-	**$4,964**	**$83,614**	**$93,000**	**90%**

[20] As discussed in the IM 2016 Second Quarter Report, $5 million was transferred from the Contingency Reconfiguration Stipulation amount of $100 million to the Advanced Technologies subprogram, resulting in a revised investment amount of $95 million for the Contingency Reconfiguration subprogram. In addition, as discussed in the IM 2017 First Quarter Report, during the first quarter of 2017 an additional $2 million was transferred from the Contingency Reconfiguration Stipulation amount to the Advanced Technologies subprogram, resulting in a revised investment amount of $93 million for the Contingency Reconfiguration subprogram.

X. Comprehensive Review of the Energy Strong Program

With four of the five Energy Strong subprograms complete as of the end of 2017, and with the remaining subprogram (Electric Station Flood Mitigation) significantly complete, the IM has conducted a comprehensive review of the Energy Strong Program to assess the intended objectives and benefits defined through the Stipulation and PSE&G's execution of the Program in fulfilling these objectives and benefits. While each of the subprograms will be discussed in detail in the following subsections, this comprehensive review begins with an assessment of the overall Energy Strong Program.

A. Background

During the period from August 2011 to November 2012, New Jersey experienced a series of four significant weather events that resulted in substantial damage to the electric and gas utility infrastructure in the State causing wide areas of power outages for extended periods of time. The principal weather events were Hurricanes Irene and Superstorm Sandy. The BPU commissioned several studies and held hearings to develop an Order requiring the electric utilities in New Jersey to prepare an implementation plan that would result in being better prepared for and responding to future major weather events. PSE&G responded to that January 23, 2013 BPU Order on February 20, 2013, proposing a $3.9 billion program to be implemented over a 10-year period.

There were multiple parties that negotiated the PSE&G proposal that included multiple hearing dates. Ultimately, the parties including the BPU agreed by Stipulation dated May 1, 2014 and approved by Order of the BPU with an effective date of May 23, 2014, to establish PSE&G's Energy Strong Program. The Energy Strong Program, memorialized in the Stipulation, authorized PSE&G to implement certain work, defined in five separate subprograms. The Stipulation defines, among other things, the scope of the PSE&G Energy Strong Program, its maximum recoverable investment for ratemaking purposes, the time to complete that defined scope, a contemporaneous and reviewable rate recovery mechanism, and the role of the Independent Monitor.

Under the Stipulation, it was agreed that PSE&G would make an investment of up to $1 billion (with up to an additional $220 million recoverable through the Company's next base rate case) to harden its electric and gas infrastructure and increase the resiliency of its electric delivery system. The Energy Strong Program was defined to included five subprograms, a summary of the investment levels and duration of each is provided in **Table X-1 – Energy Strong Program Investments**

Table X-1 – Energy Strong Program Investments

Subprogram	Initial Investment Level	Duration[21]
Electric Station Flood Mitigation	$400 million (plus additional $220 million)	5 years
Gas M&R	$50 million	5 years
UPCI	$350 million	3 years (may be accelerated to 2 years)
Advanced Technologies	$100 million	3 years
Contingency Reconfiguration	$100 million	3 years

[21] As mentioned in **Section II.A** above, the duration is based on the period in which the investments are made and is considered complete when the final project is placed in-service.

B. Overview

PSE&G established an organizational structure for execution of the Energy Strong Program. The Energy Strong Program's overall direction and oversight was managed by several key personnel, including:

- John A. Bridges – Division Manager Electric Operations (currently Vice President of Electric Operations);
- Michael Gaffney – Director Gas Distribution Field Construction (currently Senior Director – Gas System Modernization);
- Robert J. Felton Jr. – Director Program Areas (currently Senior Director – Program Areas);
- Ananda Kanapathy – Director Electric & Gas Asset Strategy (currently Senior Director – Gas Field Operaitons);
- Ed Gray – Director Transmission & Distribution Engineering; and,
- Wade Miller – Director Gas Transmission and Distribution Engineering.

Each of the five subprograms under Energy Strong was assigned one or more personnel or, "Leads", who are the technical leads for that subprogram and responsible for all aspects of their assigned subprogram. The initial Leads for the Energy Strong subprograms were as follows:

- Electric Substation Flood Mitigation – Lauren Thomas;
- Contingency Reconfiguration – Namita Bhagavathula and Jim Duswalt;
- Advanced Technologies – Paul Toscarelli and Damon LoBoi;
- UPCI Replacement – Bill Elmer; and,
- Gas M&R Station Flood Mitigation – Kevin Powers.

Included in those responsibilities was staffing for their subprogram, project management control which includes cost and schedule, permitting, outreach and other areas required for the successful execution of their subprogram. The subprograms also received functional support from within the entire PSE&G organization and a Program Management Office (PMO), led by AJ D'Alessandro, was established to support the Program. AJ D'Alessandro has also served as the primary interface for the IM, always professional, providing responses and other support (arranging for field tours of the Energy Strong facilities) promptly and effectively.

John Latka, the Senior Vice President – Electric & Gas Operations, serves as the program sponsor for all Energy Strong Program work.

The IM found that the Energy Strong Program organizational structure was reasonable and typical for a program with multiple subprograms. The IM also found the individuals with responsibility for the implementation of the Energy Strong Program to be highly qualified to fulfill their responsibilities.

At the Program's onset, weekly Energy Strong Program meetings were held with all of the Leads, support personnel and others. The frequency of these meetings was adjusted to be reflective of the level of activity within the Program (i.e. as more aspects of the Program were completed, the frequency of the meetings decreased). To facilitate the exchange of information at these meetings, the PMO prepares a "dashboard" document that summarized the Energy Strong Program status by each of the subprograms as well as a financial update for the entire Program.

The Energy Strong PMO also established a process for sharing lessons learned amongst the entire Energy Strong team. In general, the PMO was notified of any potential lessons learned in order to log such an

event and then notified the Energy Strong subprogram leads, who in turn notified those directly overseeing and managing the Energy Strong work. Other manners in which lessons learned were shared included monthly meetings, weekly safety messages, and monthly newsletters.

Execution of the Energy Strong Program was performed under guidance from the Delivery Projects & Construction (DP&C) group for the Electric Station Flood Mitigation and Gas M&R subprograms, by the Gas Distribution Divisions and Districts for the UPCI, and Electric Operations Divisions for the Advanced Technologies and Contingency Reconfiguration subprograms. General PSE&G procedures relied on for the Energy Strong Program included:

Corporate Oversight *Financial Risk Management Practice (Practice 940-1)*

Cost Control *PSEG Practice for Transaction Review (Practice 930-1)*
Enterprise Practice 242-1-1 Procurement Procedures

Cost Reporting *Cost Accounting Manual (Practice 660-1)*
Preparation and Content of the Financial Analytics Process (Accounting Services Practice 6401-1)

Accounting *Accounting Services Practice 630-4*
Accounting Practice 650-16, Practice for Use of Account E183
Accounting Practice 650-3, Capitalization Practice
Accounting Practice 650-10, In-Service Transfers
Property Record Unit Manual Practice GI-6, GI-7 and GI-8
Sarbanes-Oxley Control FA005
Cost Accounting Manual
Accounting Practice 650-11, Retirements and Associated Transfers
Accounting Practice 650-9, Allowance for Funds Used during Construction and Rate Calculations

Procurement *PSEG Enterprise Practice 242-1*

Risk Management *PSEG Enterprise Policy 4 – Risk Management*

As discussed in the IM 2014 Annual Report, the IM found the PSE&G enterprise procedures provided the functional guidance that supported the successful implementation of the subprograms.

Specific DP&C procedures used for execution of the Electric Station Flood Mitigation and Gas M&R subprograms included the following:

Project Management Procedures
PMP-01 – Project Execution Plan
PMP-02 – Project Scope Management
PMP-03 – Project Estimating
PMP-04 – Project Scheduling
PMP-05 – Project Authorization
PMP-06 – Invoice Management
PMP-07 – Quality Assurance and Control
PMP-08 – Project and Contractor Safety
PMP-09 – Contract Administration Procedures
PMP-10 – Project Construction Oversight
PMP-11 – Project Risk Procedure
PMP-12 – Materials Management
PMP-13 – Procurement

PMP-14 – Status Reporting
PMP-15 – Inside Plant Commissioning
PMP-16 – Land Use and Environmental Management Plan

Reference Manuals
RM-01 – Project Controls Engineering
RM-02 – Project Controls Scheduling
RM-03 – Portfolio Management
RM-04 – Project Management Information System
RM-05 – Project Support Specialist
RM-06 – Project Engineering Inside Plant

The IM found that all projects performed under DP&C were highly structured and followed the defined set of procedures listed above. These DP&C procedures have been used by PSE&G in projects prior to the formation of the Energy Strong Program. As a result, all DP&C personnel are familiar with those procedures and are experienced using them.

In addition to the enterprise and DP&C procedures, a specific QA/QC procedure was developed to support the Energy Strong subprograms that were executed outside the DP&C group (UPCI, Advanced Technologies, and Contingency Reconfiguration), *Energy Strong Quality Assurance & Quality Control Plan*. This QA/QC procedure ensured the products and services used in the Energy Strong Program complied with the quality requirements, codes, and specifications applicable to the equipment and projects.

As recommended by the IM, and as previously discussed in the IM's quarterly reports for the third and fourth quarters of 2015, PSEG's Internal Audit Department (PSEGIA) conducted an audit of the Energy Strong program that primarily covered various aspects of the Advanced Technologies, Contingency Reconfiguration and UPCI subprograms (the 2015 Audit). This section of the IM's Annual Report summarizes the audit steps and findings for that audit, all of which were previously reported by the IM in 2015.[22] As discussed in prior IM reports, a second audit was conducted during 2016 covering the Electric Station Flood Mitigation subprogram, and a summarization of that audit will be rendered at the conclusion of that subprogram and the IM's final reporting thereon.[23]

For the 2015 Audit, PSEGIA developed a statement of audit objectives and methods, on which the IM commented and suggested certain additions. This revised statement formed the blueprint for the 2015 audit. The audit covered about 50 activities to be reviewed, verified or examined, which reflected areas requested by the IM and areas selected by PSEGIA. The activities included issues specific to the Stipulation, as well as other financial areas which would be examined in the normal course of a typical financial audit.

Audit workpapers are generally confidential and, therefore, the IM was not given copies of this material by PSEGIA. However, at audit completion, the IM was given the report written by PSEGIA covering its audit objectives, scope, methods, and conclusions, which also addressed issues that the IM requested be examined. The IM reviewed the report and requested further information and clarifications, which were subsequently addressed by PSEGIA. Below is a summary of the relevant elements of the 2015 Audit.

[22] *See* IM 2015 Second Quarter Report, page 20; IM 2015 Third Quarter Report, pages 16-18; IM 2015 Annual Report, pages 22-23
[23] *See* IM 2016 Revised Second Quarter Report, pages 9-10; IM 2016 Third Quarter Report, pages 11-12; IM 2016 Annual Report, pages 15-18; IM 2017 First Quarter Report, 13-16

1. Objectives of the Audit
    a. Determine that PSE&G is complying with the terms of the Energy Strong BPU Stipulation. In addition and in accordance with the Stipulation, ensure "appropriate cost assignment" with respect to Energy Strong projects, and specifically that:
        i. monies expended are for Energy Strong projects;
        ii. costs are legitimately capitalized rather than expensed;
        iii. expenditures are for Energy Strong distribution projects;
        iv. proper overheads are applied; and
        v. AFUDC and costs of removal are properly recorded.
    b. Ensure Energy Strong project management includes appropriate planning, cost estimating and approval processes, and that such procedures are followed.
2. Audit Steps and Methods
    a. Invoice Sampling – 50 invoices from all five subprograms were selected, examined and traced from invoice to recordation of costs to specific projects. Verifications were made that invoice costs were tagged properly as Energy Strong related gas/electric utility costs in the SAP system, that appropriate purchase order line item dollars were directed at capital accounts, and that costs appearing in the SAP system were ultimately directed to distribution projects.
    b. Accounting Cost Tracking – Amounts for AFUDC and costs of removal were tracked from the fixed asset system to SAP. Amounts were also tracked to verify that AFUDC is excluded and costs of removal are included in investment levels, in accordance with the Stipulation.
    c. Application of Overheads – Walkthroughs were conducted of the Company's application process with respect to direct charges and overhead allocations. A sample of 14 overhead charges were selected and manually recalculated to ensure mathematical accuracy, reasonableness and consistency in application in accordance with historical PSE&G methodologies.
    d. Interviews and Discussions – Interviews were conducted with appropriate Company personnel considered knowledgeable and active within the areas under review. These discussions not only gain a greater understanding of the particular task, but assure that personnel have the requisite experience, tools and abilities to perform the tasks completely and accurately. Personnel were interviewed from the following areas:
        i. Investment Planning and Resource Development;
        ii. SAP Strategy and Planning;
        iii. Property Accounting;
        iv. Program Management in Advanced Technologies, Contingency Reconfiguration and UPCI;
        v. New Business and Work Management; and
        vi. Utility Business Analytics.
    e. Documentary Reviews – Project management documents were reviewed to assess compliance with company policies and procedures, including project execution plans (PEPs). Project scope and materials management documents were reviewed to ensure project work requirements were identified. Project controls and cost management documents were reviewed to evaluate the existence of cost estimating, contingency reserves, reporting, budgeting, variance analysis and risk management reporting.
    f. Site Visits – Visits to various job sites for the subprograms in scope were done to verify that work was in fact being conducted, and that the sites were for distribution circuits, pipelines and substations. The various project managers escorted audit personnel to explain the specifics of each project, review the schedule and answer questions.

Based on data accumulated and calculations derived from using the steps and methods outlined above, PSEGIA was satisfied that:

1. Costs are being properly charged to Energy Strong projects;
2. Costs charged are being capitalized and not expensed;
3. Costs are being accumulated in gas and electric distribution projects;
4. Overhead costs being applied to Energy Strong projects are reasonable and consistent with Company policies and methodologies;
5. AFUDC and costs of removal are being properly recorded in accordance with Company policy and the Stipulation; and,
6. Generally, project controls are adequate, appropriate and effective to provide reasonable assurance that risks are being managed and objectives met.

The audit did identify areas where moderate risk exposure was observed, but with no major impact on internal controls. The audit report specifically recommended for both the UPCI and Contingency Reconfiguration subprograms that (i) more formal PEPs be developed, (ii) project risk analyses be more fully documented, and (iii) more detailed project schedule variances be explained in regular periodic reporting.

The audit recommendations noted above were addressed by PSE&G during the fourth quarter of 2015. Specifically, (i) formal execution plans were developed for the UPCI and Contingency Reconfiguration subprograms covering, among other things, project scope, schedule, construction, and management of costs and risks, (ii) project risk analyses were documented in the PEPs, and (iii) in addition to disclosing any project schedule variances in its weekly meetings and reporting in its Energy Strong Dashboards, PSE&G's Energy Strong PMO compiles and maintains a master schedule for the entire Energy Strong Program, which requires subprogram leads to disclose and explain material project schedule variances.

As a result of the subsequent actions taken, PSEGIA considered the action plan recommendations made by it in the audit report to have been met. The IM obtained and reviewed the above documentation and agreed that they address the risk observations noted in the audit report. As previously noted in the IM 2015 Fourth Quarter Report, the IM reviewed the audit steps taken and certain other work performed by PSEGIA in connection with its 2015 Audit of the Energy Strong Program. The audit was conducted with the purpose of ensuring that PSE&G was conforming to the Stipulation and its own internal procedures with respect to accounting, costing, documenting and approving the Energy Strong projects in scope. The IM found that PSEGIA collected and examined an appropriate amount of accounting evidence, performed adequate tests, conducted adequate interviews with similar PSE&G personnel interviewed by the IM that are involved in the Energy Strong execution, and obtained and reviewed proper documentation to base its findings as disclosed above. The IM was of the opinion that such findings were reasonable, and it was in agreement therewith. In addition, the IM concurred that the actions taken by PSE&G subsequent to the dissemination of the audit report adequately addressed the areas of risk observed in that audit report.

C. Major Decisions

Two major decisions were implemented by PSE&G at the program-level during execution of the Energy Strong Program, one pertained to scheduling practices and one to implementation of the QA/QC plan described above.

1. Scheduling Methodology

An Energy Strong Program master schedule was developed and finalized as of December 31, 2014. It includes a Level 1 and Level 2 schedule for the entire Program developed using Microsoft Project scheduling software.

Each subprogram also developed its own schedule reflective of the needs and complexity of the projects contained within each subprogram. For the non-DP&C subprograms (UPCI, Advanced Technologies, and Contingency Reconfiguration), schedules were created through Microsoft Project, which is the scheduling software successfully used by PSE&G on large programs in the past. The DP&C subprograms (Electric Station Flood Mitigation and Gas M&R) involved more complex and non-routine work compared to the other subprograms, and reflective of this aspect, Primavera P6, a more robust schedule software used for more complex projects, is used for scheduling these projects.

The IM found that PSE&G's use of both Microsoft Project and Primavera P6 met the schedule control objectives of the Energy Strong Program and facilitated PSE&G to track and monitor the progress of each of the subprograms and the overall Program.

2. Implementation of a QA/QC Plan

In the IM's 2014 Annual Report, the IM made the following recommendation with respect to quality assurance and quality control:

> *PSE&G should consider assigning a QA/QC individual to monitor the implementation of the Energy Strong Program. Specifically, this role would audit practices in engineering and in the field against PSE&G policies and procedures and ensure work is performed in accordance with these policies and procedures.*

In response to the IM's recommendation, PSE&G addressed this recommendation and provided the IM with the following response regarding the status of implementation:

> *Since the Independent Monitor's recommendation was made in their first annual report, PSE&G began developing and formalizing a QA/QC procedure for the Energy Strong program. The procedure is in the final stages of development with a planned completion timeframe of Q2 2015. Once the plan has been reviewed and approved internally, it will be shared with the IM to obtain comments and any additional recommendations before implementation. The intent is to have the QA/QC plan finalized and the hiring process for the additional QA employee started in Q2 2015.*

PSE&G issued the Energy Strong Quality Assurance & Quality Control Plan, Version 1, in June 2015. The implementation of PSE&G's response to this IM recommendation is appropriate and PSE&G is fulfilling the commitment it made with regard to the IM's recommendation involving the Energy Strong QA/QC program, including the hiring of a QA/QC person in early September 2015, dedicated to overviewing the non-DP&C Energy Strong subprograms.

D. Comprehensive Findings & Observations

The IM has consolidated its previous findings, observations, and any recommendations that relate to the overall Energy Strong Program as shown in **Table X-2 – Energy Strong Program Comprehensive Findings & Observations** adding a comment as to the action, benefit, or result of the finding, observation, or recommendation.

Table X-2 – Energy Strong Program Comprehensive Findings & Observations

Report	Finding/Observation/Recommendation	Action/Benefit/Result
2014 Annual	The Energy Strong Program's organizational structure is reasonable and typical for a program with multiple subprograms. By the IM taking part in the regular project	The Energy Strong Program utilized highly qualified individuals to lead each of the subprograms and

Report	Finding/Observation/Recommendation	Action/Benefit/Result
	meetings and by conducting interviews with essentially everyone having substantive responsibilities for the Energy Strong Program, the IM has had the opportunity to evaluate the technical and management skills of these individuals. While there is an expected range of such skills, the individuals having responsibility for the implementation of the Energy Strong Program are highly qualified to fulfill their responsibilities.	established regular program-level meetings to ensure proper oversight of the subprograms.
2014 Annual	The Company has in place sufficient procedures which provide for adequate analytics, exposure, visibility, approval, and on-going monitoring for its major capital investment projects. The requirements for project approval and on-going monitoring and funding are as comprehensive as any seen in the utility industry. Financial analyses encompass the involvement of several areas, require sensitivities, and approvals are to be rigorously documented. The use of a three-tiered (major) approval approach (URB, Capital Review Committee (CRC), and the Board of Directors) is relatively unique and appears at this stage of the Energy Strong Program to be effective.	The capital spend in the Energy Strong Program was supported by several corporate procedures and oversight groups that provided assurance of cost efficiency during the Program's execution.
2014 Annual	PSE&G uses both Microsoft Project and Primavera P6, which are standard scheduling software systems used within the construction and utility industries. While each has their own benefits and drawbacks, both are capable of meeting the needs of PSE&G based on the current usage.	The Energy Strong Program master schedule provided a useful tracking and status tool for program management to monitor the progress of the Program.
2014 Annual	Environmental specialists are involved throughout the planning and construction stages for all subprograms involving permitting and environmental issues.	PSE&G ensured the subprograms had the necessary environmental support to facilitate successful execution.
2014 Annual	The PSE&G procedures and reference manuals that are used in the performance of the engineering and design work have been used by PSE&G to perform other similar work and conform to utility industry best practices.	Following the policies and procedures supported successful execution of the subprogram.
2014 Annual	The IM observes that PSE&G has multiple lessons learned processes in place to facilitate identification and sharing of relevant information related to lessons learned on reliability and safety events, including measures specific to the Energy Strong Program.	By having established means by which to exchange lessons learned, PSE&G was able to identify and gain efficiencies through the execution of the Program.
2014 Annual	Existing QA/QC procedures constituted an acceptable approach for this subprogram. However, the IM did recommend that PSE&G did consider assigning a QA/QC individual to monitor the implementation of the Energy Strong Program.	Having appropriate QA/QC procedures reduces the risk of rework and the attendant additional cost and delay. PSE&G did follow the IM's recommendation to assign a QA/QC individual for the Energy Strong Program, and this helped to ensure that practices in the field complied with Company procedures, further reducing the risk of rework.

XI. Electric Station Flood Mitigation Review

A. Background

The Stipulation identified that PSE&G could invest $400 million for the Electric Station Flood Mitigation subprogram, and provided that an additional $220 million could be invested in the subprogram beyond the $400 million in the Energy Strong rate adjustments mechanism. That additional investment of up to $220 million was to be recovered in the next PSE&G base rate case, rather than through the Energy Strong rate adjustment mechanism. On January 12, 2018, PSE&G filed its rate case, which included Energy Strong Electric Station Flood Mitigation subprogram expenditures of $451 million (based on actual data plus projections through the end of 2018). Thus, the PSE&G rate case filing anticipates that the $400 million will be recovered through the Energy Strong rate adjustment mechanism and an additional $51 million (as part of the up to additional $220 million available) to be recovered through the Company's base rate case.

The original PSE&G response to the BPU Order identified 29 electric substations that were impacted either by Hurricanes Irene or Superstorm Sandy, or other water intrusion events, and an additional 61 other electric substations that were sited lower than the FEMA base flood elevations. Of that total of 90 electric stations, the Stipulation identified 29 electric stations that would make up the Electric Station Flood Mitigation subprogram within the Energy Strong Program.

The Stipulation stated that it was expected that the flood mitigation work on these 29 substations would be completed within five years by May 23, 2019. The base Energy Strong Program schedule, dated December 31, 2014, provided that the Electric Station Flood Mitigation subprogram was scheduled to be completed by May 31, 2018, representing a conservative target to achieve the May 23, 2019 date.

B. Overview

The Electric Station Flood Mitigation subprogram is the only Energy Strong subprogram not yet completed but has advanced significantly with only four remaining electric substations yet to be placed fully in-service as of the end of 2017. Those four substations remaining are Cranford, Essex, Jackson Road and Port Street. Cranford and Jackson Road achieved partial in-service during the fourth quarter of 2017 (with Cranford placed fully in-service on January 18, 2018), and the Essex substation achieved partial in-service during the second quarter of 2017. The Port Street substation is scheduled to achieve partial in-service during the first quarter of 2018. These remaining substations are scheduled to be placed fully in-service by the end of the second quarter of 2018.

As noted above, the Stipulation originally identified 29 electric stations for inclusion in the Electric Station Flood Mitigation subprogram. As discussed in prior IM quarterly reports, by agreement dated November 30, 2016, the Madison and Marshall substations were taken out of the Energy Strong Program and the cost to implement the flood mitigation methodology at those two substations will be recovered as part of a base PSE&G rate case. Pursuant to a request by the Port Authority of New York and New Jersey (Port Authority), PSE&G cancelled the Newark Airport Breaker Station since a new 345kV switching station, which is not part of the Energy Strong Program, will serve the airport. This resulted in the current 27kV Newark Airport station no longer being in the Energy Strong Program.

As discussed in the earlier IM reports, each of the remaining 26 stations within the Electric Station Flood Mitigation subprogram has its own specific and separate project schedule, which details the scheduled start and finish dates for every specific activity in each project's schedule. There are no ties or

dependencies, such as predecessor or successor activities, connecting one Electric Station Flood Mitigation project schedule to another project schedule within this subprogram since each of the substation project schedules is separate from and independent of any of the other substation projects schedules. However, the specific timing of the start and finish of these substation projects is coordinated by PSE&G with other outage activities at PSE&G substations as well as interdependencies with other projects, including other Energy Strong subprograms.

Considering the cumulative complexities of scheduling all the 26 substations in this subprogram, the IM found the scheduling process to be reasonable. The process provides PSE&G the flexibility to start these projects early, or delay completion of them, considering the overall constraints created by other PSE&G activities outside of the Energy Strong Program.

When the IM first became involved with the Energy Strong Program, the substation project start date definition was not specifically defined but was implicitly understood to mean the date when activities started on the specific substation. Referring to the substation specific schedules, those activities could have been early engineering, development of engineering documents, drafting of purchase orders, or other activities that are typical early project activities. Soon after the issuance of the IM 2015 First Quarter Report, the IM realized that there could be some degree of variability in the specific activity that was selected to determine the project start date. The IM recommended to PSE&G that a common activity should be identified that would define the start date for all the Electric Station Flood Mitigation projects.

Discussions with PSE&G resulted in identifying the "Kick-Off Meeting" for each of the substation projects as its respective start date. The PSE&G procedures require that a kick-off meeting be held for each electric substation project. As such, PSE&G agreed to include the kick-off date as an activity in each of the electric substation project schedules in this subprogram. Typically, the kick-off meeting is held shortly before the more traditional early project activities. Defining the start date of a project as the kick-off meeting date for that project allowed a consistent date for each substation start date. This further allowed project durations to be agreed upon and better control over the scheduling of these substation projects.

There was a similar issue regarding the definition of a substation finish date. The PSE&G operative definition of when a specific substation was completed was when the project was closed-out. Close-out means that all construction work has been completed, that the substation has been cutover so that it is servicing all the customers it was designed to serve, any remaining site demolition work (not impacting the completion of construction) has been completed, any required site restoration work has been completed and the substation's document package (including as-built drawings) has been completed.

The time interval between the project being placed in-service and the completion of its project closeout report is assigned by the PSE&G project manager and is variable, depending upon the estimate of the volume of documentation and closeout tasks associated with a specific project, a function of the complexity of the project. While that time interval provides some variation in defining when a project is complete, the IM did not consider this a consistent completion date definition and raised this concern with PSE&G. The IM recommended that PSE&G consider a completion date definition of when the substation is placed in-service in accordance with the completion date required by the Stipulation, providing power to PSE&G customers. PSE&G accepted the IM's recommendations redefining the definition of completion date to the date when the last component in an electric substation is placed in-service, and similarly this definition was applied to the other subprograms with the Energy Strong Program.

PSE&G and the IM discussed the situation when a substation has multiple pieces of equipment, such as transformers or switchgear, and the in-service dates for the equipment would be different. The IM

suggested that in those situations there be two definitions of in-service. The first would be "partial in-service" which is when the first piece of equipment, such as a transformer or switchgear, in a substation would be cutover and providing power to PSE&G customers. The second would be "full in-service" which would be when all the equipment in that substation were cutover and the PSE&G customers were being fed by all the equipment in that substation. PSE&G also accepted this IM recommendation.

Once a substation project achieves full in-service, certain activities remain such as additional demolition and site restoration that require additional time and adds to the cost of that substation. The Stipulation does not provide a definition of "complete," thus the IM and PSE&G agreed that a project (and subprogram) is considered complete when it is placed in-service. The Stipulation does state that it is expected that the flood mitigation work on the 29 substations will be completed within five years by May 23, 2019. Considering that the four remaining substations are forecasted to be placed fully in-service by the end of the second quarter of 2018, the IM's opinion based on what is known as of the date of this report is that those closeout activities remaining after a substation is declared full in-service will likely be completed by the May 23, 2019 Stipulation date.

As the Electric Station Flood Mitigation subprogram is nearing completion, based on what is known as of the date of this IM 2017 Annual Report, the IM provides the following summary conclusions respect to the performance of the subprogram:

- It was reasonable for PSE&G to schedule each project independently of the other projects in this subprogram, allowing PSE&G the flexibility to start these projects, or delay completion of them, considering the overall constraints created by other PSE&G activities.

- The individual leads for the subprogram have the knowledge, experience and overall expertise to successfully manage the subprogram. They were selected with the concurrence of PSE&G senior management. They have the combination of home office and field experience providing them with a realistic knowledge base to successfully understand and resolve the issues they faced.

- PSE&G's use of its DP&C group to implement the subprogram was reasonable, considering DP&C has an existing and time-tested set of policies and procedures that guide their work and that have been used on prior DP&C projects. As a result, DP&C personnel are familiar with those procedures and have had experience using them. Collectively, those policies and procedures have provided the basis for efficient and effective implementation of the work under the subprogram.

- In the course of design development, PSE&G changed the initially identified flood mitigation methodology from raise/rebuild to elimination for certain situations that resulted in cost savings while not decreasing the flood mitigation protection.

- In making decisions based on an evaluation of the preferred flood mitigation methodology for a particular substation, PSE&G used a disciplined approach to perform that evaluation, consulted with the IM in that process, and documented those substations whose original flood mitigation methodology was changed. The disciplined evaluation undertaken resulted in decreasing the cost of the entire Electric Station Flood Mitigation subprogram.

- PSE&G made a decision to use a single source selection process for outside engineering firms to perform the detailed engineering and design work, and a similar approach was also used for the procurement of switchgear. The IM found that PSE&G's single source approach for both the detailed design work and switchgear was justified, appropriately supported, and resulted in efficiencies without compromising costs.

Initially, the organizational lead for the Electric Station Flood Mitigation subprogram was Lauren Thomas, a Senior Project Manager for Transmission Projects in PSE&G's DP&C group. DP&C managed projects starting from their inception to design, procurement, construction, and commissioning. The Electric Station Flood Mitigation subprogram had a dedicated project team in DP&C that included Project Controls, Procurement, Design, Engineering, Construction, Startup and Commissioning. The majority of inside plant work as performed by contractors managed by the project team. A portion of the inside plant work as well as a majority of the outside plant work (primarily on the station elimination projects) was performed by the PSE&G Electric Divisions responsible for that territory.

Approximately two years into the Energy Strong Program, Lauren Thomas was promoted to Director of Projects and was replaced by Andres Gomez, a Senior Project Manager in DP&C, and who remains the current lead on the Electric Station Flood Mitigation subprogram. The IM finds that both individuals have the knowledge, combination of home office and field experience and overall expertise providing them with a realistic knowledge base to successfully understand and resolve the issues they face in managing the subprogram.

For all DP&C projects, a PEP is written and approved before any detailed engineering and design work and fieldwork starts. The PEP identifies the processes that will be used to manage the all functional areas of the project from its start to its turnover to operations and includes such information as: the project's organizational chart; scope definition; cost estimate; schedule; work breakdown structure; quality plan; health and safety plan; risk management; licensing and permitting; and, environmental management. While the PEP is required on all DP&C projects its content is commensurate with the complexity of the specific project.

C. Major Decisions

Under the Electric Station Flood Mitigation subprogram, the major decisions made by PSE&G included six pertaining to scope changes, two pertaining to change in mitigation methods at six projects (five changed to eliminate, one to raise and rebuilt before later being cancelled), two pertaining to canceling/removing projects from the Energy Strong Program, and one general subprogram decision. Prior to any major decision, PSE&G reviewed its decision-making process, the potential options, and the evaluation for each option with the IM. PSE&G made presentations to the IM regarding its decisions and, as appropriate, requested and received feedback and comments on those major decisions before implementation.

1. Documentation of the In-Service Progress

PSE&G submitted ROD FM-61 on June 26, 2015, which specifically addressed the in-service process for assets associated with the 29 Energy Strong Electric Station Flood Mitigation projects.[24] Per this process, once a project (or segment) is energized and carrying load it is considered used and useful and must be designated in-service, which aside from minor closeout work completes the project.

To document a project going in-service, the work planner or project manager will send an email to the Energy Strong Team Leader, Program Lead, and Division Manager. A standard template is used to convey this information, which includes:

[24] Note: the ROD is specific to the Electric Station Flood Mitigation subprogram; however, the ROD notes the same process applies to all Energy Strong electric projects.

- Tagged Work Breakdown Structure (WBS) (high level inside plant/outside plant point, by Roll in Period for a given segment).
- Actuals to be placed in-service (costs expended to date at tagged WBS level).
- Estimate at completion (costs to date, plus trailing costs).
- In-service scope (brief description of work done for a given segment/project).
- Circuits improved by Energy Strong.

The IM found that the in-service notification process used by PSE&G was reasonable and appropriate for documenting the segments/projects put in-service as part of the Energy Strong Program.

2. Newark Airport Breaker Station Change in Mitigation Method and Elimination[25]

The Stipulation identified that the Newark Airport breaker station was to be mitigated by means of a floodwall around the station. After further design analysis and the geotechnical study performed at the Newark Airport breaker station, PSE&G had determined that the proposed floodwall mitigation would not be suitable, as the test soil borings were found to not be suitable to support the proposed flood wall, particularly as it would require deep foundation systems that would interfere with the underground conduits running into the station.

As a result of the constructability issues, the PSE&G team evaluated an alternative mitigation methodology of a partial raise/rebuild. The "partial" refers to not having to raise the breakers, which also meant that new breakers would not have to be purchased. The partial raise and rebuild was selected by PSE&G as the preferred mitigation method for the Newark Airport breaker station as it eliminated some of the construction risks posed by the flood wall and was estimated to be a lower cost option.

Later, on May 17, 2016, the Port Authority formally advised PSE&G that once a new 345kV switching station at Newark Airport is complete and operational, it will request PSE&G remove the existing 27kV Newark Airport station. The Port Authority requested that PSE&G return the current 27kV Newark Airport Station site property to the Port Authority as soon as it is vacated. As a result, that funding will not be used for the new 345kV switching station. This decision eliminated the current 27kV Newark Airport Station from the Energy Strong Program.

3. Elimination of Substations

The original scope for the Third Street, Bayway 4kV, St. Paul's Unit, Rahway, and Garfield Place stations included a full raise and rebuild of the stations' critical infrastructure. After PSE&G performed further evaluation on the proposed mitigation method, it determined that it could replace the 4kV service provided by these stations by transferring the load to 13kV stations, which are supplied at transmission voltages of 138kV or 230kV, delivered either via clear cut right-of-way or via underground cable. During Superstorm Sandy and Hurricane Irene, there were no service issues with these transmission facilities. Additionally, elimination of these 4kV stations further benefits customers by eliminating the life-cycle maintenance and replacement costs with the older equipment at these stations and provides additional resiliency benefits by upgrading to the 13kV system that includes automatic reclosing systems and advanced loop schemes. This change in flood mitigation methodology was formally announced to BPU, BPU Staff, and Rate Counsel in a PSE&G letter dated December 9, 2014.

The change from raise and rebuilt to eliminate of these six substations was collectively estimated to cost less than the original mitigation methods, with only the Garfield Place initially estimated to have a higher

[25] *See*, IM 2015 Second Quarter Report, pages 13-15; IM 2016 Revised Second Quarter Report, page 16

cost as a result of the change in mitigation method. The original estimate, proposed estimate based on change to eliminate, and the actual costs as of December 2017 for these stations is provided in **Table XI-1 – Substation Change in Mitigation Estimates to Actuals**.

Table XI-1 – Substation Change in Mitigation Estimates to Actuals

Station	Original Estimate	Revised Mitigation Estimate	Actuals (as of Dec. 2017)	Variance to Original Estimate	Variance to Revised Mitigation Estimate
	(in thousands)				
Bayway 4kV	$11,100	$8,800	$8,246	($2,854)	($554)
Garfield Place	$13,100	$14,900	$11,857	($1,243)	($3,043)
Rahway	$5,900	$4,800	$5,858	($42)	$1,058
St. Paul's	$2,800	$1,400	$481	($2,319)	($919)
Third Street	$16,200	$12,600	$7,094	($9,106)	($5,506)
Total	***$49,100***	***$42,500***	***$33,536***	***($15,564)***	***($8,964)***

As shown in **Table XI-1**, the change from raise and rebuilt to eliminate of these five stations was initially estimated to reduce the cost of completing the stations by approximately $6.6 million. With each of these five stations now complete (i.e. out of service), the actual cost was approximately $9 million less than estimated at the time of the change in mitigation, or approximately $15.6 million less than the original estimates for implementing flood mitigation measures at these stations. Only Rahway experienced higher costs than the revised mitigation estimate, which was attributed to higher than forecasted construction costs and encountering unforeseen underground obstructions during civil construction. Despite the cost pressures faced at Rahway, the station was still completed with final costs in line with the original estimate.

As the Energy Strong Program continued to develop, PSE&G similarly reviewed additional substations in the Electric Station Flood Mitigation subprogram to determine if the originally proposed mitigation method was still the preferred solution based on additional information gathered since the Stipulation date. As part of this effort, PSE&G determined that one of the transformers at the Little Ferry substation (T3) was in such poor condition that it was unlikely it would be able to be raised and rebuilt without substantial additional refurbishment work. PSE&G considered alternatives for the T3 transformer that included: relocate a 26/4kV unit sub from another location (no unit subs were found to be available for release); perform repairs to T3 while it is removed from service (higher cost, extended duration); procure and install new 26/4kV unit sub to replace T3 (lead time estimated at 52 weeks, putting the in-service date at risk); or, convert the 4kV circuit to 13kV to eliminate T3 (lowest cost option). The conversion of the 4kV circuit to 13kV, eliminating T3, was selected by PSE&G as the most cost effective method of providing flood mitigation at Little Ferry. This change in flood mitigation methodology was formally announced to BPU, BPU Staff, and Rate Counsel in a PSE&G letter dated August 6, 2015.

4. South Waterfront Scope Change[26]

PSE&G's review of the current underground infrastructure and underground design standards for the final project design led to the determination that four additional manholes and an additional 1,645 feet of duct

[26] *See* IM 2015 Annual Report, page 15; IM 2016 First Quarter Report, pages 15-16

bank installations were required to service the new switchgear locations at the South Waterfront substation.

The original conceptual design was inadequate to service the number of underground conduit runs needed to tie into the switchgear and additional duct bank runs were required to eliminate the circuit ampacity de-rating in order to meet planning criteria. The revised design with new manholes and additional duct banks enabled supporting of the cut over sequence while maintaining reliability and adhering to the design standards. The costs associated with this additional scope resulted in an increase of [REDACTED] million to the South Waterfront estimate. This was composed of [REDACTED] million for engineering, [REDACTED] million for construction, and [REDACTED] million for materials.

A second scope change was implemented at South Waterfront at an estimated cost of [REDACTED] million, which involved the design and installation of helical piles, a temporary mobile transformer, additional concrete pads for stairs/platforms for unit subs and switchgears, and demolition of existing duct banks and removal and restoration of fence to install new bus supports in the switchgear area. The reasons for each was identified as follows:

- Helical piles: The initial scope called for pipe piles at all locations, helical piles were proposed in general as a result of site restrictions (limited staging area, clearance outages, etc.). In addition, pipe pile driving would require excessive vibration in proximity of the underground circuit, which would pose a safety hazard.
- Temporary transformer: The existing structure for the unit subs will be removed to construct new raised foundations. A temporary mobile transformer will allow for uninterrupted service during the construction sequence.
- Additional concrete pads for stairs/platforms for unit subs and switchgears: Platform modifications for unit substations were needed to facilitate removal of breakers for maintenance by the Division. Platform additions required concrete pads for footings and additional steel.
- Demolition of existing duct banks and removal and restoration of fencing to install new bus supports in the switchgear area: The new I/M Bus support foundations were located on the property line and needed to be moved further from the fence, requiring demolition of the existing duct bank after I/M was energized.

The actual costs at South Waterfront were $50.9 million, with the project placed fully in-service as of September 21, 2016. The IM found this scope change to be appropriate to improve the constructability of the project, including maintain service during construction, and alleviated de-rating and operations and maintenance concerns.

5. Sewaren Scope Change[27]

PSE&G's review of the current underground infrastructure and underground design standards for the final project design led to the determination that five manhole button modifications, one manhole expansion, and an additional 1,325 feet of duct bank installations were required to service the new switchgear. Additionally, PSE&G's review of the detail of the installation of the 26kV raised shelter isle switchgear noted that the final design required two below grade vaults to support the feeder cable installation and maintainability of the equipment.

[27] *See* IM 2015 Annual Report, page 16

The manhole modifications, additional cable bank installations, and cable vault installations resulted in a total increase of [REDACTED] million to the Sewaren estimate. The costs associated with the manhole modifications and additional duct bank installations included [REDACTED] for engineering, [REDACTED] million for construction, and [REDACTED] million for materials. The costs associated with the cable vault installations included [REDACTED] for engineering, [REDACTED] million for construction, and [REDACTED] million for materials. In addition, there was a construction surcharge of approximately [REDACTED] million relating to costs allocated to Divisions for work performed by the Division. Actual costs at Sewaren were $25.0 million, with the project going fully in-service as of March 9, 2016.

The IM found this scope change to be appropriate in order to improve the constructability, particularly as the existing conduit and manhole system lacked adequate capacity to service the new switchgear and the use of a vault system allowed the cable to be pulled into the vault directly under the switchgear.

6. Port Street Scope Change[28]

In the second quarter of 2016, PSE&G initiated a scope change for the Port Street project in the Electric Station Flood Mitigation subprogram. The initial scope, based on the engineering study, was to raise and rebuild the 4kV switchgear with sheltered aisle switchgear, which included raising the 13kV unit sub, the 26kV GCB tie breakers, and control cabinets. With the revised scope, PSE&G would replace the 4kV switchgear with 13kV shelter aisle gear, which eliminated the need for the 13kV unit sub. It was also determined from PSE&G's investigation that the 26kV GCB tie breakers were above the observed flood elevation +1 foot, and did not need to be raised.

PSE&G's rationale for replacing the 4kV switchgear with 13kV switchgear was that the Port Street substation currently supplies customers on radial 4kV circuits, which historically experience higher restoration durations than 13kV networks. Supplying customers at 13kV allows the critical facilities (petroleum terminals) that are fed from this station to be provided with an alternate feed as a result of interstation ties with other surrounding stations and create self-healing loops to improve reliability.

As a result of this scope change, the base estimate for Port Street was reduced [REDACTED] million to a total of [REDACTED] million. Actual costs at Port Street, as of December 2017, were [REDACTED] million, with the project currently forecasted to be placed in-service by May 31, 2018.

In summary, the IM found that PSE&G identified these changes as an opportunity to improve reliability to its customers, including the critical facilities fed from the Port Street station, while reducing the cost of the raise and rebuild flood mitigation work for this station.

7. Belmont Scope Change[29]

PSE&G identified additional scope at the Belmont substation during the detailed engineering and design process, through constructability reviews, and a result of township requirements. The aspects of this additional scope include:

- Engineering and Design:
  - Firewall
  - Lightning protection – masts (2)
  - Station lighting

[28] *See* IM 2016 Revised Second Quarter Report, page 19
[29] *See* IM 2016 Revised Second Quarter Report, pages 19-20

  - Grounding protection upgrade

- Constructability:
  - Contingency/mobile
  - Leased property for contractor parking/laydown area
  - Transportation and rigging of unit subs
  - Unit subs oil processing

- Township (Garfield, Bergen County):
  - Landscaping plan
  - Fence upgrade
  - Street curbing
  - Paved driveway

In summary, PSE&G identified these changes as necessary primarily for reasons related to mitigating safety concerns during construction, maintaining uninterrupted service to the station, site constraints (small footprint), and township requirements to secure a waiver from site plan requirements to avoid a county site plan. If these changes were not implemented, PSE&G would have faced additional risks to customers and/or system reliability with potential extended outages and delays (and additional costs) of going through the county site plan.

These changes accounted for an increase in the base cost estimate for Belmont of $1.2 million. As discussed in the IM 2016 First Quarter Report,[30] these scope changes along with other increases, primarily in construction costs, increased the Belmont base cost estimate to $5.6 million (with $0.6 million in risk & contingency, or R&C), for a total project estimate of $6.2 million. The Belmont substation went full in-service on August 9, 2016, at a final cost of $4.9 million.

The IM found this scope change to be appropriate in order to improve the constructability, particularly as they allowed PSE&G to avoid additional risks and delay while maintaining uninterrupted service to the customers.

8. Bayway 26kV Scope Change[31]

In the second quarter of 2016, PSE&G identified the need to adjust the scope for the Bayway 26kV switching station project in the Electric Station Flood Mitigation subprogram. The modified scope involves:

- Added scope: Procurement and installation of one replacement reactor, 12 disconnect switches, one neutral ground resistor (NGR), and one fast acting ground switch.

- Removed scope: Relocation of two capacitor banks and three reactors.

The original scope for the 26kV bus connection was to connect 132-1 and 132-2 transformers directly to the new shelter aisle switchgear, with the scope and arrangement mimicking the current outdoor 26kV switchyard arrangement. This original scope did not include a reactor between the "U" bus and "M" bus and the requisite disconnect switches. The replacement reactor supported the continuity of service, allowing PSE&G to install the new reactor before taking the existing reactor out of service (additionally, there is no way to reuse the existing reactor). Also, in the original scope, there was no provision for raising the NGR, as per flood mitigation guidelines. A drawing review identified that the existing NGR

[30] *See* IM 2016 First Quarter Report, pages 34-35
[31] *See* IM 2016 Revised Second Quarter Report, pages 20-21

and associated terminal blocks would be below the observed flood elevation plus one-foot level, which made it necessary to raise the NRG arrangement. It became apparent that procuring and installing an entirely new NGR was the most effective solution. The original scope included relocation of two capacitor banks. The revised plan did not require that these capacitor banks be relocated and that three existing reactors on the 26kV feeders were now unnecessary and were be removed.

The changes to the scope were identified through constructability reviews and were necessary to successfully implement the flood mitigation design. This scope change was part of the base cost estimate increase of $5.8 million at the Bayway 26kV substation discussed in the IM 2016 First Quarter Report.[32] The added and removed scope addressed at the Bayway 26kV substation accounted for approximately [REDACTED] million of the $5.8 million base cost estimate increase. The actual costs at the Bayway 26kV substation were $23.1 million, and the project went fully in-service as of April 11, 2016.

Based on the need these changes brought in meeting the flood mitigation objectives, the IM found that this scope change to the Bayway 26kV switching station was reasonable.

9. Jackson Road Scope Change[33]

The original Jackson Road substation layout was impacted by the purchase of additional property adjacent to the original substation property as part of the concurrent Jackson Road transmission hardening project (THP). That THP required the relocation of the 230kV yard and the Energy Strong sheltered aisle switchgear to the new property. As a result of moving the location of this equipment, it required new manholes and duct banks, which were charged to the THP. This resulted in a net reduction in the scope of the Jackson Road Energy Strong project due to the elimination of the manhole and duct bank that was part of the original Energy Strong Jackson Road design. As a result of this scope removal, the budget for the Jackson Road project within Energy Strong was reduced approximately $1.5 million, with no impact to the project's in-service date of May 31, 2018. The current costs at Jackson Road, as of December 2017, are $8.2 million.

The IM found that the Jackson Road substation scope change was reasonable based on it maintaining the flood mitigation objectives of the Energy Strong work, while reducing the cost impact to the Energy Strong Program.

10. Madison and Marshall Substations

PSE&G developed its initial estimate for the Electric Station Flood Mitigation subprogram based on preliminary engineering studies prepared by several outside A/E firms. PSE&G retained three outside engineering firms, URS, Sargent & Lundy, and Burns & McDonnell to draft the individual engineering reports for each substation and develop the preliminary cost estimates for each of the 29 substations in the subprogram. URS delivered its engineering reports to PSE&G for both the Madison and Marshall substations in November 2013. The URS cost estimate to raise and rebuild the Madison and Marshall substations was $20.7 million and $17.1 million respectively, or a total of $37.8 million.

During design development, PSE&G concluded that there were inadequacies in the URS engineering reports for both the Madison and Marshall substations that were carried forward into URS's respective cost estimates of these stations. Those inadequacies involved URS not including certain portions of the original scope defining URS's work, which resulted in a flawed, lower cost estimate, providing a design

[32] *See* IM 2016 First Quarter Report, page 34
[33] *See* IM 2017 Revised First Quarter Report, page 20

that was not constructible, and not fulfilling the PSE&G requirement that customers' service shall not be interrupted, or minimally interrupted.

PSE&G concluded that the site footprints for both the Madison and Marshall substations, especially the Marshall substation, were too small to implement the raise and rebuild designs contained in the URS engineering reports and they would cost far more than indicated by the cost estimates in the URS reports. A key factor in implementing the selected flood mitigation method for any substation is to assure that customer service is not interrupted. To implement a raise/rebuild, the "new" raised/rebuilt substation, or those parts of it that are called to be raised, are typically first constructed at the raised elevation within the existing footprint of the substation. The new substation is essentially completed and then the load is switched from the old substation to the new substation in such a way that customers do not lose power. To accomplish this within a reasonable cost, the substation footprint must be large enough to accompany both the new and the old substations at the same time.

The more constrained the substation footprint is, the more challenging and costly it is to assure no service interruptions. Temporary transformers may be needed, adjacent perimeter roads may have to be closed for extended periods to expand a substation's footprint, and the staging and location of equipment becomes more difficult, and temporary facilities may have to be built. All of this increases the cost to raise/rebuild a substation that does not have an adequate amount of land area.

Faced with these concerns involving the Madison and Marshall substations, PSE&G contracted with Stantec Consulting Services (Stantec) in July 2015 to perform several analyses to assist PSE&G in determining what options were available to address the inadequacies in the URS estimates. Prior to evaluating different options to be considered by PSE&G, PSE&G requested Stantec to develop a cost estimate for the Madison and Marshall substations based upon the original criteria of raising and rebuilding each substation on its current site, taking into account and correcting for the inadequacies identified with the original URS engineering report cost estimates. Stantec's cost estimates to raise/rebuild the Madison and Marshall substations on their original sites was $64.0 million for Madison and $68.7 million for Marshall for a total of $132.7 million, compared to a total of $37.8 million calculated by URS.

Given the significant cost to raise and rebuild the Madison and Marshall substations on their own sites, PSE&G evaluated alternative options. An additional factor in this evaluation of options was a vacant piece of property adjacent to the Madison site that was then owned by the City of Hoboken. If PSE&G were to acquire that vacant property, the combined contiguous property at Madison would be sufficient to raise and rebuild both substations on the "expanded" Madison site. An advantage to this option was it would allow PSE&G to benefit from the 69kV transmission project at Madison and that the new Madison and Marshall substations would have a feed of 69kV and a 4kV service. The new 69/4kV transformers, the new control house, and the costs of acquiring the vacant property would be covered under the Madison 69kV transmission project and not under the Energy Strong Program.

The cost estimate for this alternative Madison/Marshall option totaled $68.8 million. Not only was this option the lowest cost option for mitigating these substations, it also provided other advantages, including minimizing the constructability risks and assuring the continuity of service to PSE&G customers.

Given the basis of the Madison and Marshall cost increases being the result of estimate inadequacies by URS, the IM suggested that PSE&G conduct a root cause analysis of the incident to determine whether this was an isolated incident and to ensure that similar inadequacies did not exist with other substation estimates. PSE&G conducted a root cause analysis and found that while there were some similar inadequacies, none of the cost estimates for the other substations were out of range from the original cost

estimates developed by the engineering firms and, in particular, URS. PSE&G determined that the URS estimate for Madison/Marshall contained inadequacies that were found to be an isolated incident and did not impact any other subprogram estimates. The IM found the actions taken by PSE&G to be reasonable and prudent and with corrective actions put in place to prevent similar incidents on future Energy Strong projects. More details of this Madison/Marshall incident can be found in prior IM reports.[34]

On December 14, 2015, PSE&G provided notice that it anticipated raising and rebuilding both the Madison and Marshall electric substations at the Madison Substation site, rather than raising and rebuilding both stations at their original sites as provided in their respective Engineering Reports. On December 22, 2015, the Division of Rate Counsel filed an objection to this change and requested a meeting and opportunities to receive additional information. On November 30, 2016, BPU Staff, Rate Counsel, and PSE&G reached an agreement that PSE&G may proceed with the project of raising and rebuilding both the Madison and Marshall electric substations at the Madison Substation site, but that the Madison/Marshall projects be undertaken outside the Energy Strong Program with the costs to be included in the filing of PSE&G's next base case.

D. Comprehensive Findings & Observations

Over the course of the Electric Station Flood Mitigation subprogram, the IM made several observations, findings, and recommendations regarding the subprogram, which have been summarized in **Table XI-2 – Comprehensive Findings & Observations**.

Table XI-2 – Comprehensive Findings & Observations

Report	Finding/Observation/Recommendation	Action/Benefit/Result
2014 Annual	The DP&C justification to award the engineering/design on the Electric Station Flood Mitigation subprogram on a single source basis is reasonable and prudent. In addition, requesting vendors to provide a not-to-exceed price and having an independent third party A/E firm perform an estimate of the cost of the engineering scope of work for each of the substations is a reasonable and prudent approach to award the engineering work for the Electric Station Flood Mitigation subprogram.	PSE&G utilized its procurement process to ensure that the subprogram would utilize qualified vendors while protecting the overall costs to the subprogram.

[34] *See* IM 2015 Annual Report, pages 44-48; IM 2016 First Quarter Report, pages 40-43; IM 2016 Revised Second Quarter Report, pages 45-47; IM 2016 Revised Third Quarter Report, pages 38-39; IM 2017 Revised First Quarter Report, pages 40-42; and ongoing and current information provided in the IM Madison 4kV Substation Reports.

2015 Q1; 2015 Q2	PSE&G should expand its Risk Register to provide additional risk mitigation strategies specifically to address the risk that delays in electric substation work may result in compressing the work to be performed at different substations such that there could be a challenge to have available, properly trained and qualified resources to perform that work.	Contractors perform the majority of the work and to a lesser degree the PSE&G Division personnel also support that work at those substations within the respective Divisions. PSE&G can assign personnel from other Divisions to assist as needed. This will help to assure that substation work will not be delayed due to insufficient resources and that the subprogram will be completed by the May 23, 2019 Stipulation date, and that PSE&G's customers will be protected against severe weather events. In addition, PSE&G deliberately starts the Electric Station Flood Mitigation projects earlier than usual practice to gain some float, resulting in a schedule that may otherwise have been too demanding.
2015 Q1	Each of the 29 [now 26, after cancellation of Newark Airport and removal of Madison/Marshall from Energy Strong] substations has its own specific and separate project schedule, which details the scheduled start and finish dates for every specific activity in each project's schedule. There are no ties or dependencies, such as predecessor or successor activities, connecting one project schedule to another project schedule within this subprogram since each of the substation project schedules is separate from and independent of any of the other substation projects schedules. However, the specific timing of the start and finish of these substation projects has to be coordinated with other outage activities at PSE&G substations as well as interdependencies with other projects, including other Energy Strong subprograms.	Considering the cumulative complexities of scheduling the substations in this subprogram, it is reasonable that each project be scheduled independent of the other projects in this subprogram. This gives PSE&G the flexibility to start these projects, or delay completion of them, considering the overall constraints created by other PSE&G activities. This approach advances the goals of all the stations in the Electric Station Flood Mitigation subprogram being completed by the Stipulation requirement and that PSE&G customers will be protected against future severe weather events.
2015 Q1	PSE&G has developed monthly budget forecasts for each of the substations, which are rolled up to a total budget forecast on a monthly basis. PSE&G has implemented a process that tracks and controls costs by capturing and analyzing sufficient cost and schedule data to identify negative trends early in order to take corrective action. The cost estimates, schedules, and budget forecasts appear reasonable based on PSE&G's use of its processes for those respective purposes.	While each substation in the Electric Station Flood Mitigation subprogram has its own unique cost estimate, which allows PSE&G to manage the costs for each individual substation, PSE&G is managing this subprogram to not exceed the Stipulation cost of $620 million using the policies and procedures of DP&C. This enables the goal of completion of this subprogram within the Stipulation amount without overruns.

2015 Q2	A critical and long lead-time activity that impacts each of the electric substation flood mitigation projects is the on-time delivery of the required switchgear for each specific substation. The IM recognized this and requested that PSE&G provide enhanced monitoring and reporting of the status of the switchgear delivery, as applicable (some substations are planned to be eliminated so would not require new switchgear), so that both PSE&G management and the IM can evaluate any issue involving the delivery of switchgear.	PSE&G expanded the information it provides in the Dashboard that is prepared every week, to include a new table that provides information on switchgear delivery for those stations under construction or close to starting construction. The Dashboard document provides important Energy Strong Program information to the members of the senior PSE&G management team responsible for its implementation, as well as to the IM. In addition, PSE&G deliberately schedules those activities leading up to and including the delivery of the switchgear, sufficiently in advance such that should there be any delay in any of those activities, including the design, procurement, inspection and delivery of the switchgear, there would be sufficient float in the schedule to absorb that delay without impacting the overall electric substation schedule. As a result of these changes, switchgear delivery has not impacted any electric substation completion date. This action helps enable the goal of the timely completion of the Electric Station Flood Mitigation subprogram.
2015 Q2	The substation project start date definition was not specifically defined but was implicitly understood to mean the date when activities started on the specific substation. Referring to the substation specific schedules, those activities could have been early engineering, development of engineering documents, drafting of purchase orders, or other activities that are typical early project activities. Soon after the issuance of the IM 2015 First Quarter Report, the IM realized that there could be some degree of variability in the specific activity that was selected to determine the project start date. The IM recommended to PSE&G that a common activity should be identified that would define the start date for all of the Electric Station Flood Mitigation projects.	Discussions with PSE&G resulted in identifying the “Kick-Off Meeting” for each of the substation projects as its respective start date. The PSE&G procedures require that a kick-off meeting be held for each electric substation project. As such, PSE&G agreed to include the kick-off meeting date as an activity in each of the electric substation project schedules in this subprogram. Typically, the kick-off meeting is held shortly before the more traditional early project activities. This allows project durations to be agreed upon and better control over the scheduling of these substation projects.
2015 Q2	The time interval between the project being placed in-service and the completion of its project closeout report is assigned by PSE&G and is variable, depending upon the estimate of the volume of documentation associated with a specific project, which is a function of the complexity of the project. That time interval is subjective to the manager of the project and could be variable. Indeed, that time interval provides PSE&G with some degree of cushion in defining when a project is complete. The IM did not consider this a realistic definition of	PSE&G agreed to refer to the date when the last component in an electric substation is placed in-service as the completion date. While the completion of the substation’s close out report and its associated documentation is certainly critical and important, the operative finish date is when the PSE&G customers start to benefit from the raising or elimination of the electric substation, which is when it would be placed in-service. Since several substations have multiple pieces of major equipment, such as transformers or switchgear, the in-service dates for those

	finish date and raised this concern with PSE&G. A more meaningful date to declare a project finished is when it is placed in-service, providing power to PSE&G customers.	transformers will be different. That led the IM to suggest that there be two definitions of in-service. The first would be "partial in-service" which is when the first piece of equipment such as a transformer or switchgear in a substation would be cutover and providing power to PSE&G customers. The second would be "full in-service" which would be when all of the equipment in that substation were cutover and the PSE&G customers were receiving power from all of the transformers in that substation. PSE&G agreed to these changes. Using the project start as the kick-off meeting date and the project finish as the final in-service date for each respective project provides a more realistic and meaningful measure of those two critical dates as well as a project's duration.
2015 Q3	The IM identified a discrepancy in how PSE&G calculates the percent complete in the Dashboard page entitled, "Flood Mitigation Status Matrix Data." This was identified by reviewing the percent complete for the Ewing substation, where those numbers were unexpectedly decreasing in subsequent Dashboards. PSE&G said it was due to the algorithm, which adds time to an activity that is delayed, and incorrectly divides the amount of work completed by a larger time number, resulting in decreasing the percent complete.	PSE&G investigated this anomaly in the algorithm and decided to eliminate this page from the Dashboard since the numbers populating this table are recalculated at the end of each month and the collection of that data takes place well after the end of a month. PSE&G agreed to provide this data in the Electric Station Flood Mitigation monthly progress reports. The suggested PSE&G resolution to this recommendation was accepted by the IM.
2015 Q4	PSE&G made a presentation to the IM providing information on the Madison and Marshall electric substations concerning certain errors and oversights contained in the respective engineering reports that were prepared by URS. The IM requested that a root cause analysis be performed by PSE&G that identifies the "root cause" reason why this occurred, takes action to cure the immediate problem, identify if this is a systemic problem in the engineering reports for the substations, and take action to assure that there will not be a recurrence of this in the future.	PSE&G was receptive to the IM requests and noted it would prepare a root cause analysis. PSE&G reviewed its findings from its root cause analysis on January 29, 2016. The IM asked additional questions and made several observations regarding its discussion with PSE&G during that review. PSE&G reviewed those comments and incorporated them into its root cause analysis as it determined appropriate. A root cause analysis is a traditional engineering method to assure that a significant problem has been appropriately addressed and there is a high degree of confidence that it will not be repeated. This enabled the goal that this particular incident would not have an impact on the Electric Station Flood Mitigation subprogram. PSE&G issued its Final Root Cause Analysis Report on this issue on April 6, 2016. The IM found that Report to be acceptable.

2015 Q4	On the Dashboard page entitled "Flood Mitigation Switchgear Delivery Status," PSE&G reported that several sets of switchgear have been delayed but that the corresponding substation in-service date had not been compromised. The IM recommended that PSE&G add a column to this page that identifies the date when late switchgear delivery would impact or delay the project.	PSE&G agreed to add a column that identified this "drop dead" switchgear delivery date for each substation. Considering the importance of receiving the switchgear when required by the project schedule, adding this information provided greater assurance that switchgear delivery would not delay a substation project and that the entire subprogram would be completed by the Stipulation date.
2017 Q1	Since switchgear delivery is a critical milestone, the weekly Dashboard contained a page that provided the status of the electric substation switchgear delivery. With only two substations still to receive their switchgear, the IM recommended that once those remaining switchgear deliveries have been completed, that dashboard page be replaced with one showing the status of the remaining projects to be completed.	This recommendation was made at a time in which there were 13 projects in the subprogram that remained to be completed. The recommendation was accepted by PSE&G and they assembled the data to show the completion status of the 13 remaining substations. That information has been contained in subsequent dashboards allowing a more accurate picture of the actual substation completion progress, leading to better schedule control.
2017 Q1	In the agreement concerning the Madison and Marshall electric substations between Rate Counsel, the BPU Staff, and PSE&G, it was agreed that: *"PSE&G shall cooperate with the Energy Strong Monitor in its review of this project in the same manner as if it was part of the Energy Strong program, as long as the Monitor is available under identical or similar terms as in the Energy Strong program."* The IM and PSE&G had several discussions starting on February 16, 2017, concerning the data that would be provided to the IM to fulfill this obligation. The IM made several recommendations concerning the format and content of the Madison information that PSE&G was to provide.	The PSE&G dashboard that contains information on the Madison Project was reviewed at the March 23, 2017 Energy Strong Project Meeting. The IM provided comments and PSE&G revised the Madison dashboard and provided it to the IM at the April 20, 2017 Energy Strong meeting, which the IM found acceptable. This allowed the IM to better monitor the progress and issues concerning the Madison 4kV Substation Project enabling the goal that PSE&G is following its procedures to achieve positive schedule and cost results.

XII. Gas M&R Review

A. Background

The Stipulation set the parameters for PSE&G's investments in the Gas M&R subprogram, specifically providing that,

> *"The Company will invest up to $50 million for the raising and hardening of stations listed below that were flooded during Superstorm Sandy as well as for an auxiliary generator at the*

Burlington Liquefied Natural Gas (LNG) Plant station. The previously flooded stations that will be addressed are:

Crown Central M&R Station and LPG Storage in Linden

Piles Creek M&R Station in Linden

Newark Airport M&R Station in Newark

West End M&R Station in Jersey City

Harrison M&R Stations (2) in Harrison

Harrison LPG peak shaving plant in Harrison"

The intent of the subprogram was to significantly limit the damage to the station infrastructure during storms and severe weather events. Protecting the station and controls from direct physical damage minimizes the possibility of loss of supply, over-pressurization, or catastrophic failure. As these stations were inaccessible in the aftermath of Superstorm Sandy, protecting station controls and equipment from damage enables continuous safe gas delivery operations, including maintaining the capability of the Gas Systems Operations Center (GSOC) to monitor and control station operations during periods of inaccessibility.

With the final selection of projects as identified in the Stipulation, PSE&G had topographic surveys performed at each of the M&R and gas plant locations. A preliminary assessment of the projects was also conducted that provided Office Level estimates for the projects (less than 50% confidence level), as well as the preferred flood mitigation solution to best accomplish the station hardening objective of Energy Strong. Following the field surveys and preliminary assessment, PSE&G's DP&C group performed preliminary engineering for the projects, which facilitated the development of the Study Level estimates (50% confidence level) that PSE&G requires to obtain initial internal capital funding approval. These Study Level estimates were approved by the URB in December 2014, providing each of the projects within the Gas M&R subprogram with full project funding. As the projects advanced, the DP&C group followed its estimating procedure in developing Conceptual and Definitive Level estimates.

B. Overview

PSE&G's DP&C group oversaw the execution of the Gas M&R subprogram. As noted in **Section X.B.**, the DP&C group relies on its established policies and procedures for execution of projects, including those that comprised the Gas M&R subprogram. During the execution of the subprogram, the IM continued to review the processes followed by PSE&G and found that PSE&G executed the subprogram in accordance with its established DP&C policies and procedures.

The Gas M&R subprogram was managed by Kevin Powers, Senior Project Manager DP&C, with support provided by the Energy Strong PMO and the following key personnel:

- Mark Sellin – Project Control Engineer;
- Richard Terjesen – Project Control Engineer;
- Yogeshwar Ramkirath – Project Engineer; and,
- Shirley Blankson – Project Control Scheduler.

The projects within the Gas M&R subprogram also received functional support from PSE&G and DP&C in areas such as permitting, procurement, environmental, etc.

The IM finds that the Gas M&R subprogram organization was effective in managing and overseeing the subprogram and demonstrated a consistent understanding by those responsible of the policies and procedures used for management and monitoring of the subprogram and allowed for a consistent process that facilitated the Gas M&R subprogram being completed both below the Stipulation budget and ahead of the Stipulation completion date.

The original estimate for the Gas M&R subprogram was the sum of the individual project estimates, which were developed in accordance with the DP&C Procedure PMP-03 Project Estimating at an original sum of $50 million. The actual final cost (less minor close out costs) of the Gas M&R subprogram is $25.3 million, or approximately half of the initial subprogram estimate. After scope changes were implemented that substantially reduced the estimates of the Harrison LP, Harrison M&R, and West End M&R projects, $20 million of the original Gas M&R subprogram budget was transferred to the UPCI subprogram. During the execution of the subprogram, the IM found that PSE&G continued to monitor the cost of each of the Gas M&R projects in accordance with its DP&C Procedure PMP-14 Status Reporting, which included monthly cost reports and monthly variance explanations as appropriate, which contributed to PSE&G being able to successfully complete the Gas M&R subprogram significantly below the initial estimate.

The original planned schedule for the M&R program was developed in accordance with DP&C Procedure PMP-04 Project Scheduling. Per the Energy Strong Program master schedule dated December 31, 2014, the Gas M&R subprogram was to have all projects in-service by May 31, 2017. The IM found that PSE&G continuously monitored the Gas M&R subprogram schedule, including monthly updates and variance reports, in accordance with the DP&C scheduling procedure. The IM finds that PSE&G's diligence in closely monitoring the schedule contributed to the overall Gas M&R subprogram being completed ahead of the planned final in-service date.

The IM finds that PSE&G's successful completion of the Gas M&R subprogram was possible through effective planning and use of the DP&C policies and procedures, including effective and consistent implementation of those policies and procedures by the key personnel that led the subprogram. Completion of the Gas M&R subprogram has prepared the invested stations to be less susceptible to storm damage from storm surges, flooding, and floating debris, which in future flood events will allow continued operations of these facilities.

Some of the initial decisions, as noted in the IM 2014 Annual Report, assisted in the successful outcome of the subprogram. For example, unlike the electric substations, the M&R station design work does not have a design drawing control issue (design configuration) as little design work had been performed on these stations over the past several years. Thus, the drawings PSE&G has are current since they were not revised as often as design drawings for the electric substations. All design work for the M&R stations was competitively bid and awarded in accordance with PSE&G's procurement policies and procedures and was based upon a technical evaluation of the vendors and their respective bid price for the design work (50/50 weighting). Similarly, competitive bid packages were prepared for the construction scope of work and equipment. This process further assisted PSE&G in its ability to control costs while still utilizing experienced vendors and contractors per the procurement process outlined in DP&C procedure PMP-13 Procurement.

C. Major Decisions

During the execution of the Gas M&R subprogram, PSE&G implemented five major decisions that affected the subprogram. The first major decision documented the rationale and process used in selection

of the stations to be included in the Gas M&R subprogram and the mitigated method to be employed.[35] The next three major decisions were specific to individual projects (West End M&R,[36] Harrison M&R,[37] and Harrison LP[38]), relating to scope changes that altered the remediation approach to the project and resulted in cost savings to each of the projects. The last major decision pertained to transferring funds from the Gas M&R subprogram to the UPCI subprogram,[39] which was in effect made possible by the cost savings realized from the other major decisions.

1. Gas M&R Station Selection and Mitigation Method

To define the basis of the station and mitigation method selection for the Gas M&R subprogram, PSE&G documented its decision process in a formal record of decision. In preparing for the Energy Strong filing, PSE&G gathered information from the Operations group and the GSOC related to impacts Superstorm Sandy and identified which locations are located in flood hazard zones. This information served as the basis for determining which stations would be included in the subprogram. Following the station identification, preliminary scope documents were prepared identifying the hardening and storm mitigation measures for the selected locations. The selected stations were also formally recognized through the Stipulation.

2. Harrison LP Scope Change

The original scope for the Harrison LP project contemplated raising all critical process equipment and station structures above the FEMA flood elevation. PSE&G determined that construction of an earthen berm, while still raising some critical equipment, would provide adequate protection for the critical process equipment and stations structures. As such, PSE&G filed a permit to construct an earthen berm in January 2015; this allowed PSE&G to determine if a revised approach was feasible without affecting the original in-service date scheduled for May 2017. In March 2015, the permit was approved for construction of the earthen berm and PSE&G proceeded with construction in April 2015.

By implementing this scope change, PSE&G was able to place the project in-service on May 30, 2015, providing immediate benefit to customers in the event of major storm events. In addition, there is a significant cost benefit to the rate payers through the implementation of this scope change. The original scope was estimated at $12.2 million ($8.7 million base estimate, $3.5 million risk and contingency); this was reduced to $1.0 million for the revised scope ($0.9 million base estimate, $0.1 million risk and contingency) for a total reduction of $11.2 million.

3. Harrison M&R Scope Change

The original scope for the Harrison M&R station included a provision to elevate three existing water bath heaters or to modify the heater flame arrestor burner system. PSE&G worked with the vendor to modify the heater flame arrestor burner system. Thus, the raising of the three water bath heaters was removed from the scope. The new gas supply system, burner management systems, and associated piping, valves, and fittings would be installed at a point above the flood line of the station, achieving the objective of the flood mitigation work.

[35] *See* IM 2014 Annual Report, page 43
[36] *See* IM Revised 2016 Second Quarter Report, pages 21-22
[37] *See* IM Revised 2016 Second Quarter Report, pages 22
[38] *See* IM 2015 Second Quarter Report, pages 17-18
[39] *See* IM 2015 Third Quarter Report, pages 11-12; IM 2015 Annual Report, pages 15-16; IM Revised 2016 Second Quarter Report, pages 22-23

PSE&G, by avoiding the need to raise the three water bath heaters, avoided taking the heaters out of service, reconstructing and mounting the heaters on a new foundation, and constructing a working platform around the heaters to facilitate operating and maintenance requirements.

As a result of this scope change, the Harrison M&R project reduced its estimate from $8.5 million ($5.7 million base, $2.8 million risk and contingency) to $7.0 million ($4.7 million base, $2.3 million risk and contingency), an overall reduction of $1.5 million.

4. West End M&R Scope Change

The original scope for the West End M&R station included a provision to elevate six existing water bath heaters or to modify the heater flame arrestor burner system. PSE&G worked with the vendor to modify the heater flame arrestor burner system. Thus, the raising of the six water bath heaters was removed from the scope. The new gas supply system, burner management systems, and associated piping, valves, and fittings would be installed at a point above the flood line of the station, achieving the objective of the flood mitigation work.

PSE&G, by avoiding the need to raise the six water bath heaters, avoided taking the heaters out of service, reconstructing and mounting the heaters on a new foundation, and constructing a working platform around the heaters to facilitate operating and maintenance requirements.

As a result of this scope change, the West End Gas M&R project reduced its estimate from $9.1 million ($6.1 million base, $3.0 million risk and contingency) to $3.7 million ($2.5 million base, $1.2 million risk and contingency), an overall reduction of $5.4 million.

5. Newark Airport M&R Scope Change

PSE&G identified a conflict with existing, but previously unidentified, waterlines at the Newark Airport M&R station. The location of the two waterlines posed major concerns for construction of the Newark Airport M&R project due to the waterlines currently located under the proposed foundations and below the proposed high-pressure gas transmission and distribution facilities. PSE&G identified that relocating the waterlines from the project area into the street along Distribution Way would avoid any short or long term potential conflicts, including protection of the waterlines during construction on this project.

PSE&G estimated this scope change cost approximately [REDACTED] million. Funds to cover this increase were allocated from the currently approved risk and contingency for the project, which preserved the overall project estimate. As a result of this issue, PSE&G first had to identify its potential options and evaluate which solution was most appropriate. The fact that the waterlines serve the Port Authority and are operated by the City of Newark required PSE&G to have several meetings with both parties in order to reach agreement and obtain approval for the relocation of the waterlines. This unanticipated scope caused work on the Newark Airport M&R station to be delayed, resulting in a revision of the in-service date from the planned date of May 31, 2016 to an actual date of April 27, 2017.

6. Transfer of Funds from Gas M&R to UPCI

PSE&G evaluated the status and forecast of the UPCI subprogram following the end of the second quarter of 2017 and identified several variances from the original forecasting assumptions that resulted in increased costs to the UPCI subprogram (as discussed in detail in **Section XIV.B.**). As a result of the revised forecast assumptions, the result would have been a reduction in the quantity of work PSE&G was able to perform, should the original budget have been maintained. However, as the Stipulation provides a

mechanism that allows PSE&G to transfer funds between subprograms, PSE&G was able to take advantage of the cost savings realized through scope changes in the Gas M&R subprogram (specifically on the Harrison LP, Harrison M&R, and West M&R projects) by first transferring $13.5 million from Gas M&R to UPCI in the fourth quarter of 2015, and later by transferring an additional $6.5 million in the second quarter of 2016.

As a result of the two funds transfers between Gas M&R and UPCI, UPCI was able to maximize the customer benefit resulting from increased investments in flood zone main installed, main uprated, and the number of customers on elevated pressure. Because of the scope changes implemented to the Gas M&R projects listed above, these transfers of funds had no impact on PSE&G's ability to obtain the objective for the Gas M&R subprogram.

D. Gas M&R Project Detail

As initially discussed in the IM 2014 Annual Report, the Gas M&R subprogram, as a DP&C implemented program, followed the DP&C policies and procedures for implementing a PEP for each of the projects within the subprogram. The PEP serves as the document that identifies the processes that will be used to manage the project from engineering and design through construction and to turnover to operations. A PEP contains the project's organizational chart, defines the scope of the project, and contains the project cost estimate, schedule, work breakdown structure, the project's quality plan, its health and safety plan, its risk management plan, its licensing and permitting outreach plan, and a plan to manage any environmental issues. For projects whose estimated cost is greater than $5 million a full PEP is required. For those projects under $5 million, a "light" PEP is allowed, which provides a project execution strategy summary that addresses scope, schedule, cost estimate, and other items as identified by the Director. At the onset of the Gas M&R subprogram, the following projects were estimated at over $5 million, constituting a full PEP: Newark Airport M&R, West End M&R, Harrison M&R, and Harrison LP (although the West End M&R and Harrison LP projects finished below $5 million due to scope changes); with the remaining projects receiving a "light" PEP.

During execution of the subprogram, cost and schedule information was updated and reported on a monthly basis, as per the DP&C policies and procedures. Specific instances of cost and/or schedule variances during a given month were recognized with an explanation provided and any impacts identified. At the conclusion of a project, a project closeout report was prepared that summarized the project scope, cost, benefits, comments on the execution, and any lessons learned.

The scope, execution, and resulting performance of each project is discussed in detail in the following subsections.

1. Crown Central M&R

i. Background

The Crown Central M&R station is located in Linden, New Jersey, and the station serves as a major supplier to PSE&G's gas transmission system, serving power generation stations at Linden, Essex, and Hudson, cogeneration plants in Linden, Newark, and Bayonne, and Harrison, Newark Airport, and West End M&R stations. During Super Storm Sandy, the Crown Central M&R station and surrounding area experienced a storm surge of approximately four feet of standing water, rendering the site inaccessible. Additionally, the Spectra Energy owned gas regulating equipment at the site failed to correctly respond to changing conditions, which resulted in a loss of pressure from 490 psi to 300 psi.

ii. Scope

To minimize future disruptions and damage to the Crown Central M&R station, PSE&G invested in the elevation of facilities and equipment at the station and installed new equipment, which increases the integrity and reliability of the station during future severe weather events. Specific investments made at the Crown Central M&R station included:

- Installation of a two-room pre-cast concrete building with associated foundation, staircase/railing, etc.;
- Installation and connection of a new outdoor main power supply;
- Installation and connection of a 20" valve at the station outlet to the RTU;
- Elevation of the natural gas emergency generator;
- Elevation and reconnection of all communications and electrical junction boxes to the RTU; and,
- Elevation and reconnection of all vents for regulators, pilots, relief valves, and similar devices.

iii. Execution

Execution of the Crown Central M&R project began in August 2014, with the development of the project scope. In September 2014, a project kickoff meeting was held, followed in October 2014 with the start of engineering. Engineering drawings were prepared through the winter of 2014, with designs issued for construction in January 2015. Construction began on March 23, 2015 and was completed on May 29, 2015, with the Crown Central M&R project being placed in-service on May 28, 2015.

A comparison of the initial estimate and schedule to the actual costs and schedule is provided in **Table XIII-1 – Crown Central M&R**.

Table XIII-1 – Crown Central M&R

Schedule Performance			
Planned Start	Planned In-Service	Planned Duration	
8/1/2014	5/31/2015	303 days	
Actual Start	Actual In-Service	Actual Duration	
8/1/2014	5/28/2015	300 days	
Variance in Duration		**-3 days**	
Cost Performance			
Initial Estimate	Actual Cost	**Cost Variance ($)**	**Cost Variance (%)**
$3,828,679	$2,405,592	**($1,423,087)**	**-37%**

As shown in **Table XIII-1**, the Crown Central M&R project was completed three days ahead of the planned completion date at a cost approximately $1.4 million below the initial estimate due to lower than estimated permitting and material costs and unused risk and contingency.

2. Piles Creek M&R

i. Background

The Piles Creek M&R station is located in Linden, New Jersey, and like the Crown Central M&R station, serves as a major supplier to PSE&G's gas transmission system, serving power generating stations at Linden, Essex, and Hudson, cogeneration plants in Linden, Newark, and Bayonne, and Harrison, Newark Airport, and West End M&R stations. During Super Storm Sandy, the Piles Creek M&R station and

surrounding area experienced a storm surge of approximately four feet of standing water, rendering the site inaccessible.

ii. Scope

To minimize future disruptions and damage to the Piles Creek M&R station, PSE&G invested in the elevation of facilities and equipment at the station and installed new equipment, which increases the integrity and reliability of the station during future severe weather events. Specific investments made at the Piles Creek M&R station included:

- Installation of one pre-cast concrete building with associated foundation, staircase/railings, etc.;
- Installation and connection of a new outdoor main power supply;
- Elevation and reconnection of the regulator control system instrument column, catalytic heater and gas dryer;
- Elevation and reconnection to the RTU of the control system for the 24" monitor regulator;
- Elevation and reconnection of all communications and electric junction boxes;
- Elevation and reconnection of all vents for regulators, pilots, relief valves, and similar devices;
- Installation and connection of a new Shafer rotary vane operator to station outlet valves #5000 and #5009;
- Installation and connection of new outlet pressure transmitters to the RTU (for outlet valves #5000 and #5009); and,
- Installation of platforms/railings and staircases to elevated equipment.

iii. Execution

Execution of the Piles Creek M&R project began in August 2014, with the development of the project scope. In September 2014, a project kickoff meeting was held as well as the start of engineering. Engineering drawings were prepared through the winter of 2014, with designs issued for construction in January 2015. Construction began on April 13, 2015 and was completed on May 31, 2015, with the Piles Creek M&R station raised equipment being placed in-service on May 31, 2015, and the station's actuator completed on June 2, 2015.

A comparison of the initial estimate and schedule to the actual costs and schedule is provided in **Table XIII-2 – Piles Creek M&R**.

Table XIII-2 – Piles Creek M&R

Schedule Performance			
Planned Start	Planned In-Service	Planned Duration	
8/1/2014	5/31/2015	303 days	
Actual Start	Actual In-Service	Actual Duration	
8/1/2014	6/2/2015	305 days	
Variance in Duration		**+2 days**	
Cost Performance			
Initial Estimate	Actual Cost	**Cost Variance ($)**	**Cost Variance (%)**
$2,155,729	$1,435,459	**($720,270)**	**-33%**

As shown in **Table XIII-2**, the Piles Creek M&R project was completed two days after the planned completion date (although the majority of the project was completed on the planned date) at a cost approximately $0.7 million below the initial estimate due to unused risk and contingency.

3. Newark Airport M&R

i. Background

The Newark Airport M&R station is located in Newark, New Jersey, and serves as a major gas supplier to Newark Liberty Airport, Port Newark, and the industrial areas of Newark and Kearny. During Super Storm Sandy, the Newark Airport M&R station and surrounding area experienced approximately four feet of standing water, rendering the site inaccessible, flooding the site building, and submerging piping and equipment.

ii. Scope

To minimize future disruptions and damage to the Newark Airport M&R station, PSE&G invested in the elevation of facilities and equipment at the station and installed new equipment, which increases the integrity and reliability of the station during future severe weather events. Specific investments made at the Newark Airport M&R station included:

- Elevation and installation of a new two-room, pre-cast concrete building to house the RTU and gas analyzer, including associated foundation, staircase/railing/platform, electrical outfitting, interior and exterior lighting;
- Elevation and installation of a new single room, pre-cast concrete building to house monitors, regulators, and associated controls, including associated foundation, staircase/railing/platform, electrical outfitting, interior and exterior lighting;
- Installation of AC power to new devices;
- Installation and connection of equipment in the RTU, analyzer, and regulator rooms;
- Elevation and reconnection of new outdoor main power supply;
- Elevation and installation of housing and connection to the new natural gas driven electric generator;
- Elevation and reconnection to RTU of all electronic transmitters;
- Modification of the heater flamer arrestor burner systems;
- Elevation and reconnection of two 8-inch relief valves and associated equipment;
- Elevation and reconnection of all vents for regulators, pilots, relief valves, and similar devices;
- Installation of platforms/railings and staircases to elevated equipment;
- Installation of 8-foot high chain link perimeter fence;
- Installation of concrete barriers along roadside fence; and,
- Post-construction ground restoration.

As discussed above, the discovery of unidentified Port Authority waterlines at the facility led to the decision to add to the scope relocation of these waterlines to protect the facility from future issues that may arise with having the waterlines below the station equipment.

iii. Execution

Execution of the Newark Airport M&R project began in August 2014, with the development of the project scope. In September 2014, a project kickoff meeting was held, followed in October 2014 with the start of engineering. Engineering drawings were prepared through the winter of 2014 into early 2015, with designs issued for construction in May 2015. Construction began on June 17, 2016 and was completed on April 27, 2017, with the Crown Central M&R project being placed in-service on April 27, 2017.

During the construction permit review process with the Port Authority, the Port Authority presented PSE&G with information regarding two water lines than run directly through the Newark Airport M&R station site. PSE&G determined, and the IM agreed, it would be prudent to relocate the water lines away from the site to avoid potential conflicts that may be posed from the water lines running below the equipment foundations and high pressure gas lines. As a result of this unforeseen development, the forecasted in-service date for the project was changed from May 31, 2016 to April 30, 2017. The cost impact of relocating the water lines was approximately $1.7 million, however, this was covered by risk and contingency and did not require an increase to the project funding.

A comparison of the initial estimate and schedule to the actual costs and schedule is provided in **Table XIII-3 – Newark Airport M&R**.

Table XIII-3 – Newark Airport M&R

Schedule Performance			
Planned Start	Planned In-Service	Planned Duration	
8/1/2014	5/31/2016	669 days	
Actual Start	Actual In-Service	Actual Duration	
8/1/2014	4/27/2017	1,000 days	
Variance in Duration		**+331 days**	
Cost Performance			
Initial Estimate	Actual Cost	**Cost Variance ($)**	**Cost Variance (%)**
$8,362,560	$8,392,524	**$29,964**	**0%**

As shown in **Table XIII-3**, the Newark Airport M&R project was completed approximately eleven months behind the planned completion date due to the added scope of relocating the Port Authority's water lines, but was still well within the overall Gas M&R subprogram completion date as defined by the Stipulation completion date by approximately two years. The actual cost was nearly identical to the initial estimate, aided by risk and contingency funds covering the water line relocation.

4. Crown Central LP

i. Background

The Crown Central LP station is located in Linden, New Jersey. During Super Storm Sandy, the Crown Central LP station and surrounding area experienced a storm surge of approximately four feet of standing water, rendering the site inaccessible.

ii. Scope

To minimize future disruptions and damage to the Crown Central LP station, PSE&G invested in the elevation of facilities and equipment at the station and installed new equipment, which increases the integrity and reliability of the station during future severe weather events. Specific investments made at the Crown Central LP station included:

- Raising the propane pump above the FEMA +1' flood elevation;
- Raising electrical equipment above the FEMA +1' flood elevation; and,
- Raising compressors above the FEMA +1' flood elevation.

Additionally, PSE&G conducted a buoyancy study to evaluate potential risks that may be posed by the eleven large propane tanks at the station not being above the FEMA +1' elevation. The study determined that no risks were posed.

iii. Execution

Execution of the Crown Central LP project began in August 2014, with the development of the project scope. In September 2014, a project kickoff meeting was held and in February 2015, engineering commenced. Engineering designs were issued for construction in March 2015. Construction began on September 14, 2015 and was completed on December 28, 2015, with the Burlington LNG project being placed in-service on March 23, 2016.

A comparison of the initial estimate and schedule to the actual costs and schedule is provided in **Table XIII-4 – Crown Central LP**.

Table XIII-4 – Crown Central LP

Schedule Performance			
Planned Start	Planned In-Service	Planned Duration	
8/1/2014	5/31/2016	669 days	
Actual Start	Actual In-Service	Actual Duration	
8/1/2014	3/23/2016	600 days	
Variance in Duration		**-69 days**	
Cost Performance			
Initial Estimate	Actual Cost	**Cost Variance ($)**	**Cost Variance (%)**
$3,118,556	$2,444,107	**($674,449)**	**-22%**

As shown in **Table XIII-4**, the Crown Central LP project was completed sixty-nine days ahead of the planned completion date at a cost approximately $0.7 million below the initial estimate due to unused risk and contingency.

5. Burlington LNG

i. Background

The Burlington LNG plant is located in Burlington Township, New Jersey, and is entirely owned and operated by PSE&G, providing peak day gas supply into the distribution system. During Super Storm Sandy, the Burlington LNG plant lost the off-site secondary power supply, leaving the plant operating on a single power supply.

ii. Scope

To harden the system to protect the Burlington LNG plan infrastructure from damage due to loss of site electric power, PSE&G installed an onsite gas-fired generator to provide redundancy of electrical power supply, thereby ensuring safe operation of the facility during severe storm conditions.

iii. Execution

Execution of the Burlington LNG project began in August 2014, with the development of the project scope. In September 2014, a project kickoff meeting was held and engineering commenced. Engineering drawings were prepared through the winter of 2014 and early 2015, with designs issued for construction

in April 2015. Construction began on September 14, 2015 and was completed on March 25, 2016, with the Burlington LNG project being placed in-service on May 18, 2016.

A comparison of the initial estimate and schedule to the actual costs and schedule is provided in **Table XIII-5 – Burlington LNG**

Table XIII-5 – Burlington LNG

Schedule Performance			
Planned Start	Planned In-Service	Planned Duration	
8/1/2014	5/31/2016	669 days	
Actual Start	Actual In-Service	Actual Duration	
8/1/2014	5/18/2016	656 days	
Variance in Duration		**-13 days**	
Cost Performance			
Initial Estimate	Actual Cost	**Cost Variance ($)**	**Cost Variance (%)**
$2,732,310	$1,747,130	**($985,180)**	**-36%**

As shown in **Table XIII-5**, the Burlington LNG project was completed thirteen days ahead of the planned completion date at a cost approximately $1 million below the initial estimate due to lower than anticipated COR costs and unused risk and contingency.

6. West End M&R

i. Background

The West End M&R station is located in Jersey City, New Jersey, and supplies gas to all of Hudson County, southeast Bergen County, and the PSEG Hudson Generating Station. During Super Storm Sandy, the West End M&R station and surrounding areas experienced approximately three feet of standing water, rending the station inaccessible.

ii. Scope

To increase the integrity and reliability of the West End M&R station, flood susceptible facilities and equipment was elevated. Such equipment included: valve actuators, instruments and transducers, modems, RTUs, controllers, security cabinets, standby generators, and MEG foggers.

The original scope also contemplated elevating six water bath heaters. After evaluating the feasibility of modifying the heater flame arrestors, PSE&G concluded that such modifications would realize the benefits of elevating the water bath heaters, without the additional time and cost that would be required for doing so. As a result of this change to modifying the heater flame arrestors, the project budget was reduced by [REDACTED] million.

iii. Execution

Execution of the West End M&R project began in August 2014, with the development of the project scope. In September 2014, a project kickoff meeting was held and engineering commenced. Engineering drawings were prepared through the winter of 2014 and early 2015, with designs issued for construction in March 2015. Construction began on July 13, 2016 and was completed on February 28, 2017, with the West End M&R project being placed in-service on February 24, 2017.

A comparison of the initial estimate and schedule to the actual costs and schedule is provided in **Table XIII-6 – West End M&R**

Table XIII-6 – West End M&R

Schedule Performance			
Planned Start	Planned In-Service	Planned Duration	
8/1/2014	5/31/2017	1,034 days	
Actual Start	Actual In-Service	Actual Duration	
8/1/2014	2/24/2017	938 days	
Variance in Duration		**-96 days**	
Cost Performance			
Initial Estimate	Actual Cost	**Cost Variance ($)**	**Cost Variance (%)**
$9,108,321	$2,476,086	**($6,632,235)**	**-73%**

As shown in **Table XIII-6**, the West End M&R project was completed ninety-six days ahead of the planned completion date as a result of prioritizing the use of shared resources and starting construction earlier than planned in order to complete the majority of the operational sensitive work outside of the prime operating season. The actual cost was approximately $6.6 million below the initial estimate, largely due to the scope change discussed above, along with unused risk and contingency.

7. Harrison M&R

i. Background

The Harrison M&R station is located in Harrison, New Jersey, and is one of the largest facilities maintaining supply into the PSE&G gas distribution system, supplying gas to Essex, Morris, Passaic, and Bergen Counties. During Super Storm Sandy, the Harrison M&R station experienced a storm surge of approximately four feet of standing water.

ii. Scope

To minimize future disruptions and damage to the Harrison M&R station, PSE&G invested in the elevation of facilities and equipment at the station and installed new equipment, which increases the integrity and reliability of the station during future severe weather events. Specific investments made at the Harrison M&R station included:

- Installation of raised precast structure for new control and analyzer room to house critical equipment above flood elevation;
- Installation of new flame arrestors with raised ventilation to allow for water bath heater operation during flooding events;
- Installation and raised new MEG foggers to increase reliability of gas conditioning system; and,
- Installation of fencing to protect station inlet valves from debris during flooding events.

Similar to the West End M&R station, the original scope of the Harrison M&R project contemplated elevating three water bath heaters. After evaluating the feasibility of modifying the heater flame arrestors, PSE&G concluded that such modifications would realize the benefits of elevating the water bath heaters, without the additional time and cost that would be required for doing so. As a result of this change to modifying the heater flame arrestors, the project budget was reduced by $1.5 million.

iii. Execution

Execution of the Harrison M&R project began in August 2014, with the development of the project scope. In September 2014, a project kickoff meeting was held and engineering commenced. Engineering drawings were prepared through the winter of 2014 and early 2015, with designs issued for construction in March 2015. Construction began on July 5, 2016 and was completed on May 12, 2017, with the Harrison M&R project being placed in-service on May 12, 2017.

A comparison of the initial estimate and schedule to the actual costs and schedule is provided in **Table XIII-7 – Harrison M&R**

Table XIII-7 – Harrison M&R

Schedule Performance			
Planned Start	Planned In-Service	Planned Duration	
8/1/2014	5/31/2017	1,034 days	
Actual Start	Actual In-Service	Actual Duration	
8/1/2014	5/12/2017	1,015 days	
Variance in Duration		**-19 days**	
Cost Performance			
Initial Estimate	Actual Cost	**Cost Variance ($)**	**Cost Variance (%)**
$8,511,501	$5,424,557	**($3,086,944)**	**-36%**

As shown in **Table XIII-7**, the Harrison M&R project was completed nineteen days ahead of the planned completion date at a cost approximately $3 million below the initial estimate, largely due to the scope change discussed above.

8. Harrison LP

i. Background

The Harrison LP station is located in Harrison, New Jersey, and serves as a supplemental peaking supply to the distribution system. During Super Storm Sandy, the Harrison LP station experienced a storm surge ranging from approximately zero to three feet of standing water.[40]

ii. Scope

To protect the Harrison LP station from future storm impacts, flood-sensitive equipment was raised above the flood level, and facility integrity and reliability was increased as a result of the following investments:

- Elevation and reconnection of electric junction boxes and associated conduit/wires for the electric motors of the liquid propane pumps;
- Elevation and reconnection of the three 50 HP electric motors and associated conduit/wires for the liquid propane pumps;
- Elevation and reconnection of the four hydraulic actuators;
- Elevation and reconnection of the spillback control devices for the liquid propane pumps;
- Construction of a one-foot berm along the propane vaporizers;

[40] The Harrison M&R station and Harrison LP station are located at the same site, however the individual facilities are spread out over a large area, which resulted in different levels of storm surge impacting the facilities during Superstorm Sandy.

- Elevation and reconnection of the security camera pole-mounted control cabinets; and,
- Extension and connection of the instrument air header to the propane pump spillback controls.

The original scope also contemplated raising all critical process equipment and station structures at the site. After evaluating the feasibility of utilizing an earthen berm to provide adequate protection to the station equipment, PSE&G concluded that such a berm would realize the intended benefits of elevating the equipment, without the additional time and cost that would be required for doing so. As a result of this scope change to an earthen berm remediation, the project budget was reduced by $11.2 million.

iii. Execution

Execution of the Harrison LP project began in August 2014, with the development of the project scope. In September 2014, a project kickoff meeting was held and engineering commenced. Engineering drawings were prepared through the winter of 2014, with designs issued for construction in January 2015. Construction began on April 6, 2015 and was completed on May 30, 2015, with the Harrison LP project being placed in-service on May 12, 2017.

A comparison of the initial estimate and schedule to the actual costs and schedule is provided in **Table XIII-8 – Harrison LP**

Table XIII-8 – Harrison LP

Schedule Performance			
Planned Start	Planned In-Service	Planned Duration	
8/1/2014	5/31/2015	303 days	
Actual Start	Actual In-Service	Actual Duration	
8/1/2014	5/30/2015	302 days	
Variance in Duration		**-1 days**	
Cost Performance			
Initial Estimate	Actual Cost	**Cost Variance ($)**	**Cost Variance (%)**
$12,182,345	$926,265	**($11,256,080)**	**-92%**

As shown in **Table XIII-8**, the Burlington LNG project was completed one day ahead of the planned completion date at a cost approximately $11.3 million below the initial estimate, largely due to the scope change discussed above, along with unused risk and contingency.

E. Comprehensive Findings & Observations

As noted in the IM 2017 Second Quarter Report, PSE&G placed the final projects within the Gas M&R subprogram in-service during the second quarter of 2017, ahead of the Stipulation mandated completion date of May 2019, and below the overall subprogram budget. With the Gas M&R subprogram previously reported as effectively complete (pending closeout of the Newark Airport M&R project) and with no water intrusion events at any of the stations, the IM has no new findings; however, the IM has consolidated its previous findings, observations, and any recommendations that relate to the subprogram as shown in **Table XIII-9 – Gas M&R Comprehensive Findings & Observations** adding a comment as to the action, benefit, or result of the finding, observation, or recommendation.

Table XIII-9 – Gas M&R Comprehensive Findings & Observations

Report	Finding/Observation/Recommendation	Action/Benefit/Result
2014 Annual	DP&C's *PMP-03 Project Estimating* procedure provides detailed processes for producing each level of estimate specifically for electrical projects inside-plant and outside-plant as well as for gas projects for all DP&C projects. It also includes detailed flowcharts illustrating the estimate completion process. The level of combined risk and contingency associated with each level is appropriate given the status of the project at the various estimate phases. Although the terminology is somewhat different, these different levels of estimate are reflective of what is prescribed by AACE in its cost estimate classification system which defines five estimate classes, each reflective of a various stage of project maturity.	Utilizing an estimating procedure that aligned with industry standards supported the creation of realistic estimates and ensures adequate levels of contingency are included in each project estimate.
2014 Annual	The policies and procedures that PSE&G has in place to assist in cost control efforts for projects under the auspices of the DP&C area are extensive and should afford the Company every opportunity to discern and mitigate potential project cost overruns. The procedures are highly interdisciplinary covering the entire range of a potential project from initiation, estimating, funding, execution, procurement, risk management, and status reports, and clearly delineate the responsibilities and expectations of functional area experts. In addition, several enterprise-wide practices exist covering project review and procurement.	PSE&G used its robust set of policies and procedures to facilitate successful execution of the subprogram.
2014 Annual	A schedule for the M&R subprogram has been completed which shows activities such as design and engineering, licensing and permitting, procurement, construction, and in-service dates for each of the projects within this subprogram.	PSE&G followed its schedule procedure and utilized industry standard practices in developing and monitoring its schedules. All projects placed in-service by May 2017, ahead of the initial schedule.
2014 Annual	DP&C's *PMP-11 Project Risk Management* procedure provides detailed processes for the specific defined stages of risk management through the execution of a project. It also includes sample risk registries and risk score sheets with corresponding instructions for qualitative and quantitative analysis. This procedure provides direction to implement standard industry practices and particularly aligns with the PMBOK as so noted within the procedure.	PSE&G's risk management procedure was aligned with industry standards and in execution demonstrated reasonable and appropriate risk management practices.
2014 Annual	Awarding the engineering work for the M&R Gas Station Flood Mitigation subprogram by competitive bid and the methodology for evaluating those bids is reasonable and prudent. This is the standard approach for DP&C awarding this type of work and it is applicable to the M&R Gas Station Flood Mitigation subprogram scope of work.	PSE&G used its procurement process and policies to evaluate the bids received on the subprogram and to support the recommendation to award, which demonstrated cost efficiency on the Energy Strong Program.
2015 Q1	During the first quarter 2015, PEPs were created for each of the Gas M&R projects. For this effort, PSE&G has followed the DP&C project management procedures examined by the IM in	PSE&G followed its DP&C procedures in establishing light or full PEPs (depending on project size)

Report	Finding/Observation/Recommendation	Action/Benefit/Result
	the 2014 Annual Report. As indicated in the DP&C procedures, projects under $5,000,000 in total cost have a light-version PEP, reflective of their size and scope. The full PEPs contain detailed information such as project charter; project scope document; project cost; project schedule; invoice management; quality assurance & quality control; safety; environmental; risk management; status reporting; procurement; and construction.	for each Gas M&R project. This provided the governing document for the projects that established the means to execute, control, and monitor the projects.
2015 Q1	Procurement of material is being tracked through a "Material Management Plan" which consolidates the material needs of each project in this subprogram into one document. Information contained on this document includes: vendor, material name & description; quantity ordered; date of purchase order; required delivery date; estimated delivery date; lead time; and other comments as appropriate.	Use of procurement processes such as the "Material Management Plan" facilitated successful execution of the subprogram by ensuring the required material was identified and available when needed to support project execution.
2015 Q1	The emergency generator needed for the Burlington LNG project was identified as a long-lead time item (approximately four to five months lead-time required). The bidding for this item closed on February 27, 2015 and included responses from each of the four vendors invited to bid. The recommended bid was awarded to Cummins Power Systems, as they met the requirements of the specifications and were identified as the lowest bidder by a significant margin (approximately 26% lower than the next lowest bid).	PSE&G used its procurement process and policies to identify long-lead time items for the Gas M&R subprogram and support the recommendation to award that demonstrated cost efficiency on the Energy Strong Program.
2015 Q2	The IM finds that the PSE&G decision to change the scope at the Harrison LP project allowed for adequate protection to be implemented at the station at a fraction of the cost of the initial scope. Such cost savings that can be realized while maintaining the protections intended to be implemented by the Energy Strong Program are of maximum benefit to the ratepayers.	Decision benefited the overall subprogram by maintaining the intended benefits/objectives at a reduced cost.
2015 Q3	The cost of the three completed 2015 Gas M&R subprogram projects has come in under the estimate (substantially under in the case of the Harrison LP project). The IM notes that $13.5 million in funds are in process of being transferred from the Gas M&R subprogram to the UPCI subprogram.	Cost savings on completed projects supported the decision to transfer funds from Gas M&R to UPCI.
2015 Annual	PSE&G appropriately identified means by which it could increase the benefit to its customers by providing additional funds to the UPCI subprogram from amounts saved in the Gas M&R subprogram. It is the opinion of the IM that both subprograms have adequate funding available to complete the current scopes defined for the respective subprograms.	Decision benefited the Energy Strong program by benefiting more customers (UPCI) through the savings realized in the Gas M&R subprogram.
2015 Annual	The unanticipated water lines at the Newark Airport M&R station, led to delaying the construction on the project until later in 2016. However, PSE&G has responded to this issue appropriately by developing a plan to address the water lines by moving the water lines outside the station. In addition, PSE&G has met multiple times with the key stakeholders to this project (City of Newark and Port Authority) to reach consensus on the revised plan.	PSE&G's response to unidentified water lines at Newark Airport M&R station mitigates risk of future concerns with the water lines at the station. The risk and contingency in the project estimate was sufficient to cover these unexpected costs, however there was a slight delay to the in-service date (still completed well ahead of the Stipulation date).

Report	Finding/Observation/Recommendation	Action/Benefit/Result
2016 Q2	The IM finds that the West End Gas M&R Station scope change is reasonable based on it maintaining the flood mitigation objectives of the Energy Strong work, while reducing the cost impact of the project.	Decision benefited the overall subprogram by maintaining the intended benefits/objectives at a reduced cost.
2016 Q2	The IM finds that the Harrison Gas M&R Station scope change is reasonable based on it maintaining the flood mitigation objectives of the Energy Strong work, while reducing the cost impact of the project.	Decision benefited the overall subprogram by maintaining the intended benefits/objectives at a reduced cost.
2016 Q2	The IM finds that based on the current status of the Gas M&R subprogram, the availability of excess funds identified for transfer to the UPCI subprogram will result in added benefits to PSE&G's gas customers, while having no adverse impact to the Gas M&R subprogram or the Energy Strong Program based on the projects already completed to date and revised scope of remaining projects (and decreased cost) in that subprogram.	Decision benefited the Energy Strong program by benefiting more customers (UPCI) through the savings realized in the Gas M&R subprogram.
2016 Q2	The revised scope for the West End M&R and Harrison M&R projects, maintains the objectives of the flood mitigation work, while reducing the overall cost of the projects.	Decision benefited the overall subprogram by maintaining the intended benefits/objectives at a reduced cost.

XIV. UPCI Review

A. Background

PSE&G had proposed two subprograms for the Gas Delivery-Hardening, of which the UPCI subprogram was one. The Stipulation set the parameters for PSE&G's investments in the UPCI subprogram, specifically providing that,

> *"Public Service will invest up to $350 million in the UPCI subprogram to replace an estimated 250 miles of utilization pressure cast iron main and associated services over a three year period with a higher operating pressure system utilizing plastic or cathodically protected steel mains and services in areas that were previously flooded or are in Federal Emergency Management Agency ('FEMA') flood zones or proximity thereto. Replacement priority will reflect the Signatories' agreement that previously flooded areas and adjoining FEMA flood zones with the lowest ratio of proximity mains will be addressed first. The Company further agrees to prioritize to the greatest extent possible mains in those areas that have a history of leaks. The Gas UPCI subprogram may be accelerated and completed in two years if possible."*[41]

The intent of the subprogram was to "eliminate water infiltration and thereby reduce associated outages."[42] The gas pressure in the new lines was to be upgraded from 0.25 pounds per square inch (psi) to 15 or 60 psi to eliminate water intrusion in the system.

[41] *See* Stipulation in BPU Docket Nos. EO13020155 & GO13020156 dated 5/1/14, Para. 26.
[42] *Id.* at Para. 29.

In terms of performance metrics, the Stipulation noted that the Company's active leak inventory as of December 31, 2013 was 1,937 leaks.[43]

> *"The Signatory Parties stipulate and agree that the Company will use best efforts to annually reduce the inventory of open leaks by 10 percent. The Company represents and warrants that it will use best efforts to reduce that active leak inventory by 582 leaks (194 per year) or approximately 30 percent within the first three years of the Energy Strong Program. . . . The Company represents that in those areas where UPCI mains are replaced and system pressures are increased as part of the Energy Strong Program, the Company shall not have customer outages due to water infiltration during the ten years following such replacement and pressure increase."*[44]

At the same time PSE&G was replacing the UPCI, it also would install excess flow valves (EFVs) for most residential customers. These are safety devices that detect excess flow and automatically shut off the flow of gas when excess flow occurs. In addition to replacing 250 miles of old UPCI, this subprogram originally anticipated replacing approximately 16,000 services (lines feeding customers) and abandoning 84 district regulators.

B. Overview

The work done as part of the UPCI subprogram reflected work that had been done routinely by PSE&G in the past. As such, it relied on existing cost information for purposes of cost estimating, and on existing practices in the areas of engineering and design, project execution, and risk management.

The IM has continued to review the process followed by PSE&G in its execution of the UPCI subprogram and finds that PSE&G executed the subprogram in accordance with the general policies and procedures and practices as listed in **Section X.B.**[45]

The UPCI subprogram was managed by Bill Elmer, Project Manager Elec. & Appl. Service Measurement, with the assistance provided by the District Manager for each of PSE&G's gas districts and PSE&G's internal functional groups (e.g. Environmental, Licensing and Permitting, etc.).

The IM finds that the UPCI subprogram was implemented and executed by the initial UPCI organization. The continuity of the organizational structure allowed for a consistent understanding by those responsible of the policies and procedures to be used for management and monitoring of the subprogram and allowed for a consistent process for ensuring the UPCI subprogram was executed in a manner consistent with the goals of the Stipulation and ahead of the Stipulation Schedule.

The Stipulation provided that PSE&G would invest up to $350 million in the UPCI subprogram during a three-year period with a target of replacing an estimated 250 miles of main and associated services. Using existing cost information for cost estimating and following the prioritization process described below, complete projects were chosen for replacement and included in the subprogram until 250 miles of main replacement was reached. The actual final cost of the subprogram was $370 million, or $20 above the initial estimate. The additional $20 million in investment funding was transferred to the subprogram from the Gas M&R subprogram. As described below, although $20 million more was spent than originally anticipated, and although 240 miles of main were installed instead of 250 miles, numerous other customer

[43] *Id.* at Para.32.
[44] *Id*. at para. 33, 35.
[45] An enterprise-wide assessment of PSE&G's cost control, cost reporting and accounting practices as applicable to the Energy Strong Program will be included in the IM's Final Report on the Energy Strong Program.

benefits in excess of the Initial Plan were realized as the plan was modified during its execution. Thus, the IM finds that PSE&G continued to monitor the cost of each of the projects and of the subprogram as a whole in accordance with the cost control policies set forth above and with continued diligence was able to meet the goals of the UPCI subprogram within the available funding. For example, in the first three years of the subprogram, the active leaks inventory was reduced by 1,792, 1,210 more than specified in the Stipulation, and there have been no customer outages due to water infiltration.

The original planned schedule for the UCPI subprogram was created using Microsoft Project, which is the scheduling software successfully used by PSE&G on large programs in the past. It is standard scheduling software used within the construction and utility industries and was capable of meeting PSE&G's needs for the program. Per the Energy Strong Program master schedule dated December 31, 2014, the UPCI subprogram was to be completed by September 2017. The subprogram level schedule was maintained by the subprogram Project Control Engineer with input from the Districts and contractors as needed. Schedule updates were published and distributed to the appropriate stakeholders twice monthly. The subprogram schedule was incorporated into the Energy Strong Program schedule which was published monthly. The IM finds that PSE&G continuously used and updated the UPCI schedule in accordance with its work tracking and scheduling control practices. The IM finds that PSE&G's diligence in closely monitoring the schedule resulted in the overall UPCI subprogram being able to be completed on July 22, 2016, or more than a year ahead of the planned completion of September 2017.

The engineering and design work involved in the UPCI Replacement subprogram of the Energy Strong Program was typical work that had been going on for years at PSE&G. The Gas Asset Strategy Group under the direction of the Director Gas Transmission and Distribution Engineering performed the design work for the UPCI Replacement subprogram. That engineering work was performed at PSE&G in Newark. As discussed in more detail above, PSE&G gas engineers performed the process for prioritizing the 250 miles to be replaced as part of the Energy Strong Program. With the projects defined, Engineering then determined the actual routing of the replacement main and the required proximity footage, together with the abandonment of regulators and the design of the new customer services. Energy Strong Sequence Maps were created by the GIS Group per the Energy Strong Sequence Map Creation Procedure. The work was designed and engineered in accordance with the PSE&G Gas Design Manual. The IM found this approach to engineering and design for the UPCI subprogram to be reasonable.

Construction was managed out of Gas Delivery and the projects were managed by the district where the work was being performed. Approximately 10 percent of the main installation work was performed by PSE&G Gas Distribution crews under PSE&G supervision. Approximately 90 percent of the main installation work was contracted to outside parties based on the availability of division resources. Contracted crews installed equipment under PSE&G oversight.

The subprogram was estimated at a high level in the Asset Management group based on historical unit costs, projected units, and calculated variations from normal replacement work. The development of the detailed work plan, and the execution of that plan, was managed by Gas Construction under the Senior Director of Gas Distribution Field Construction. The UPCI subprogram Lead was responsible for managing the work plan in accordance with the Stipulation. The District Managers-Gas Construction were accountable for constructing the targeted projects and managing the resources for all Energy Strong projects within their districts.

The UPCI subprogram had several important procedures that served to assure the quality of this subprogram. *Gas Distribution Standards* contains sections that address pipe layout, construction and maintenance, construction inspections, operations, regulators, and operator qualifications. The *Gas*

Design Manual addresses all aspects of gas system design. Craft labor doing field gas work must be Operator Qualified (OQ) by the state of New Jersey. To achieve this unique requirement the craft labor must be trained and then tested to receive that OQ qualification.

Every site where gas work is being performed in the field has multiple PSE&G inspectors who, among other responsibilities, witness and review the final pressure test. This pressure test is essentially the final QA check that the fieldwork has been performed to the applicable requirements. In addition, PSE&G has two Supervisors per District (there are 12 Districts within the PSE&G system) that go out to inspect the gas fieldwork periodically. These Supervisors fill out the "Gas Construction Field Quality Assessment Form" (FQA Form) each time they visit a worksite. The FQA Form covers all aspects of the fieldwork for this subprogram. Further, there is a "Bid & Daily Work Record for Contractors" form that includes a "Contractor Daily Record." The PSE&G inspector evaluating the Contractor for such items as main installation procedures, shoring, welder/fuser qualification, pipe cleaning, material/pipe storage and handling, and backfill material fills out this form.

The IM finds that the successful completion of the UPCI subprogram was possible thru the effective use of the planned project control policies and procedures and through the effective and consistent implementation of those policies and procedures by continuity of key personnel possessing the appropriate skills, experience and expertise. Completion of the UPCI subprogram has enabled the following benefits, among others: 1) minimizing infrastructure damage during storms or other emergency situations; 2) upgrading to higher pressure has allowed installation of excess flow valves, which automatically shut off gas flow should a break occur downstream of the valve, an obvious safety improvement; 3) minimizing and/or expediting restoration time; 4) improving overall reliability by reducing leaks, and 5) allowing the use of high efficiency appliances and generators.

C. Major Decisions

1. Selection of the 250 Miles of the UPCI Replacement

The original PSE&G Petition proposed replacing 750 miles of UPCI pipe at an estimated cost of $1,040 million over a ten-year period. The Petition stated that:

- The UPCI mains to be replaced are those that are within or in proximity of a defined flood hazard zone;
- The UPCI pipe to be replaced is in municipalities that previously experienced flooding or storm surge from prior storms including Hurricanes Irene and Superstorm Sandy, and that UPCI pipe in those areas within or in proximity of a defined FEMA flood zone will be replaced next;
- UPCI in previously flooded areas and areas adjoining FEMA flood zones with the lowest ratio of proximity mains will be replaced first; and
- Those areas that have had a history of leaks will be prioritized to the greatest extent possible.

On December 13, 2013, PSE&G provided Rate Counsel and other parties involved in the Stipulation with the criteria used to determine UPCI replacement prioritization. This document distinguished the first five years of the UPCI replacement to include 600 miles at an approximate cost of $830 million and identified three categories associated with the UPCI replacement as follows:

- Category A – 387 miles, $537 million: *"Category A provides water infiltration protection to all areas that have experienced street-level flooding in a prior storm event. The UPCI Mains in the FEMA flood zones that adjoin the PSE&G Flood Zones are included in this category since the areas are not geographically distinct but are contiguous areas and can be planned, designed and constructed in a cost effective manner."*
- Category B – 55 miles, $76 million: *"Category B provides water infiltration protection to the highest number of customers per mile of main in the isolated FEMA zones that have not experienced flooding to date."*
- Category C – 158 miles, $217 million: *"Category C provides water infiltration protection to progressively fewer customers per mile of main in the isolated FEMA zones that have not experienced flooding to date."*

The Stipulation distinguished that PSE&G will invest up to $350 million in the UPCI subprogram over a three-year period with a target of replacing an estimated 250 miles. The projects for replacement were identified from within the Category A group using PSE&G's *Process for Identifying UPCI Projects in Flood Areas*, which establishes several considerations for identifying UPCI replacements. As projects were identified, they were prioritized by the amount of proximity footage associated with a project (with the lowest ratio of proximity mains addressed first) and the number of leak repairs within a project.

Complete projects were chosen for replacement and included in the subprogram until 250 miles of replacement were reached. PSE&G reserved lowest priority projects beyond the 250 miles allocated by the Stipulation to be on hold, remaining ready for layout if higher ranked projects become infeasible (issues obtaining permits, etc.). Weekly updates were provided to the PSE&G team to monitor construction progress and reconcile any footage discrepancies. Field changes from Gas Construction were reviewed by Planning & Design Engineers and either approved or rejected. If changes were approved and implemented, the project map and spreadsheet were updated accordingly to ensure consistency between all information sources, and updates were communicated to all key players.

PSE&G informed the IM on October 1, 2014 that the 250 miles of UPCI pipe to be replaced was in areas flooded by Hurricanes Irene and Superstorm Sandy and other severe weather events, and pipe that was in the new FEMA flood zones. This definition of the 250 miles of UPCI pipe to be replaced was consistent with the Stipulation. PSE&G noted proximity piping is included in its calculation – *i.e.* among other piping, those runs of pipe that are needed to deliver the higher-pressure gas that the new plastic pipe will carry. The IM found that PSE&G had a documented process by which it determined the prioritization of UPCI replacement, which allowed PSE&G to identify the work to be performed under the Energy Strong Program consistent with the Stipulation. The IM found that process to be reasonable and prudent.

2. Increase in Investment Funding

Stemming from the change in scope to the Harrison LP project (see **Section XI.C.2.**), PSE&G had additional funds available to its gas portion of the Energy Strong Program. As was discussed in the IM 2015 Second Quarter Report, PSE&G assumed an average of 1.25 service replacements per 100 feet of main in its UPCI subprogram but observed closer to 1.61 service replacements per 100 feet of main. This resulted in an increase in the cost per mile, but also added the benefit of serving more customers than originally anticipated. Thus, PSE&G effectively had two choices: 1) maintain the original estimated UPCI investment of $350 million, adjusting the forecasted quantity of work to be performed to reflect this

investment amount; or, 2) increase the investment amount by transferring funds originally allocated to the Gas M&R subprogram to the UPCI subprogram.

PSE&G's decision was memorialized in Record of Decision 09 dated October 7, 2015. In its rationale, the Company noted that several variances from the original forecasting assumptions had become apparent, and that the current forecast accounted for cost increases associated with several factors including:

- Increased quantity of replacement services, transfers, uprate footage, uprate services
- Payment and performance bonds
- Soil management costs
- Final restoration (increased expectations)
- Traffic control costs
- Additional costs for resources – replacement services, transfer and uprate services

The transfer of funds allowed the UPCI subprogram to maintain 95 percent of the originally forecasted work and resulted in an increased benefit to customers based on several factors. The forecast for PSE&G and the adjoining FEMA flood zone main installed increased by 13 miles from the original plan. This was attributed to a better than expected ratio of proximity main to flood zone main achieved during the job identification and prioritization process. The original assumption was a ratio of proximity main to flood zone main equal to 1.72:1, but the revised forecast assumed a revised ratio of 1.24:1. It also forecasted that approximately 17 more miles of existing main would be uprated than originally planned because of the Energy Strong Program work. It was originally planned that 10 percent of the main would be uprated, whereas the revised forecast assumed that 18 percent of the main would be uprated.

In addition, the forecasted number of services to be replaced increased by 21 percent because the areas prioritized by Energy Strong were, on average, more densely populated than originally planned. Overall, the estimated increase in the number of customers on elevated pressure was more than 13,000 customers, or almost a 60 percent increase when compared to the original plan.

Based on these factors, PSE&G concluded that the increase in funding investment level would positively contribute to the UPCI subprogram by allowing for a maximized customer benefit resulting from increases in flood zone main installed, main uprated, and number of customers on elevated pressure. The Company also concluded that the changes to the investment and forecasted quantities would not impact the ability to meet the leak reduction metric required by the Stipulation. The planned and revised quantities are provided in **Table XIV-1 – UPCI Subprogram Quantity Revisions**.

Table XIV-1 – UPCI Subprogram Quantity Revisions

Unit	Plan	Then-current Forecast	Net Change (Qty.)	Net Change (%)
Main Installed (miles)	250	236	-14	-6%
PSE&G & Adjoining FEMA Flood Zone Main (miles)	92	105	13	14%
Uprate Main (miles)	25	42	17	68%
Replacement Services (each)	16,650	20,111	3,461	21%
Service Transfers (each)	4,160	10,200	6,040	145%
Uprate Transfers (each)	1,322	5,100	3,778	286%

Given the ability to provide benefit to the maximum number of customers, PSE&G elected to increase the investment to the UPCI subprogram by $13.5 million through the transfer of funds from the Gas M&R subprogram. This is in compliance with the Stipulation, which provided:

> *"…funds may be moved within the ES-Gas subprograms and the ES-Electric subprograms. The Signatories recognize that the infrastructure initiatives covered under the ES-Electric and the ES-Gas Programs will be of such substantial scale and scope that it will be difficult to precisely budget each sub-program project initiative within each ES Program. Accordingly, the Signatories agree that a process enabling the Company to make adjustments to sub-program budgets in response to real market and service conditions experienced is justified."*

The process is then defined in the Stipulation that cumulative amounts of 5% or less of the overall Energy Strong Program investment may be adjusted by PSE&G on an immediate basis. PSE&G is then required to notify BPU Staff and Rate Counsel of the change within 30 days of its implementation. Amounts over 5% require prior notification to BPU Staff and Rate Counsel before implementation. The $13.5 million transferred amounted to 3.4% of the $400M investment under the Energy Strong Program gas subprograms, and thus required no prior notification to the BPU Staff and Rate Counsel.

On December 21, 2015, PSE&G provided Notice to the BPU Staff and to Rate Counsel that it was moving funds between the Energy Strong Gas subprograms in compliance with the Stipulation.

The IM found that PSE&G appropriately identified means by which it could increase the benefit to its customers by providing additional funds to the UPCI subprogram from amounts saved in the Gas M&R subprogram.

3. Additional Increase in Investment Funding

As discussed above and in the IM 2015 Third Quarter Report, PSE&G identified that the reduction in the cost of the Harrison LP project in the Gas M&R subprogram, coupled with higher than anticipated service replacements in the UPCI subprogram, presented a solution through transferring of $13.5 million in funds from the Gas M&R subprogram to the UPCI subprogram.[46] Based on the reduction in cost for the West End Gas M&R station,[47] PSE&G identified that $6.5 million of additional funding could be made available to the UPCI subprogram to allow the UPCI subprogram to complete the existing identified jobs and associated restoration and service work.

The $6.5 million in additional funding resulted in a modified forecast for the UPCI work as shown in **Table XIV-2 – UPCI Revised Forecast**.

Table XIV-2 – UPCI Revised Forecast

Scope	Forecast at ROD 9 ($13.4 million transfer)	Forecast at ROD 13 ($6.5 million transfer)	Net Change
Main Installed (miles)	236	240	+4
Replacement Services (each)	20,111	21,607	1,496

By transferring $6.5 million in additional funds, PSE&G maximized customer benefit through increases in flood zone main installed, main uprated, and the number of customers on elevated pressure.

The IM found that based on the then-current status of the Gas M&R subprogram, the availability of excess funds identified for transfer to the UPCI subprogram would result in added benefits to PSE&G's

[46] *See*, IM 2015 Third Quarter Report, pages 11-12, December 17, 2015
[47] *See*, IM Revised 2016 Second Quarter Report, page 22, December 2, 2016 and **Section XII.C.6.**

gas customers, while having no adverse impact to the Gas M&R subprogram or the Energy Strong Program based on the projects already completed to date and revised scope of remaining projects (and decreased cost) in that subprogram.

D. Comprehensive Findings & Observations

The final spend and key metrics are shown in **Table XIV-3 – UPCI Final.**

Table XIV-3 – UPCI Final

Scope	Forecast at ROD 13 ($6.5 million transfer)	Final
Main Installed (miles)	240	240
Replacement Services (each)	21,607	21,092
Financials (,000)	$370,000	$370,007

The estimated replacement services at the time of the $6.5 million transfer were based on an estimate relating to the remaining miles of replacement main. The actual replacement services ended up approximately 500 less than this forecast, however, the final number of services installed remained significantly higher than originally anticipated (21,092 installed vs. 16,650 initially estimated).

As noted, PSE&G completed the UPCI during the third quarter of 2016, ahead of the planned completion date of September 2017. Although, an additional $20 million was transferred to the subprogram budget, and 10 fewer miles of main was replaced than originally planned, additional unanticipated benefits as described above were achieved. In addition to the findings and observations set forth above, the IM has consolidated its previous findings, observations, and any recommendations that relate to the subprogram as shown in **Table XIV-4 – UPCI Comprehensive Findings & Observations** adding a comment as to the action, benefit, or result of the finding, observation, or recommendation.

Table XIV-4 – UPCI Comprehensive Findings & Observations

Report	Finding/Observation/Recommendation	Action/Benefit/Result
2014 Annual	PSE&G had a documented process by which it determined the prioritization or UPCI replacement, which allowed PSE&G to identify the work to be performed under the subprogram consistent with the Stipulation.	Having a prioritization process that aligned with the Stipulation supported achieving the objectives of the subprogram.
2014 Annual	The level of combined risk and contingency associated with each level was appropriate given the status of the project at the various estimate phases. Although the terminology was somewhat different, these different levels of estimate were reflective of what is prescribed by AACE International, Inc. (AACE) in its cost estimate classification system which defines five estimate classes, each reflective of a various stage of project maturity. UPCI work relied largely on a combination of cost information on past projects and the oversight and approval of the Asset Management Group. As this reflected work that is routinely done by PSE&G, the IM found this approach acceptable.	Having an appropriate cost estimating process improved the quality of project estimates and assisted in the allocation of funds between projects.
2014 Annual	Existing policies and procedures that PSE&G has in place to assist in risk management efforts for projects under the auspices of the UPCI subprogram reasonably identify risks and response	Having appropriate risk management policies and procedures reduced the

Report	Finding/Observation/Recommendation	Action/Benefit/Result
	strategies. As the UPCI subprogram consists of work that is done routinely by PSE&G, the IM found this approach acceptable.	risk of cost overruns and schedule delays.
2014 Annual	From the dashboards presented at the Weekly Energy Strong Project meetings, the reporting of the amount of UPCI pipe replaced did not provide a rate of completion that would indicate when the program would be completed. For example, the dashboard indicated that the plan was to complete 98 miles by the end of 2014. However, no metric was provided that indicated whether the Company was on schedule to meet that goal. The IM raised this issue with Company personnel.	The dashboard was modified to reflect the rate of progress, which enhanced schedule control on the projects.
2014 Annual	PSE&G had well established procurement policies and procedures in place that aligned with common industry practices. The teams responsible for the primary projects associated with the Energy Strong Program were shown to have regular and open communications with the PSE&G Procurement Group which facilitated timely submittal and review of bids as well as identification of long-lead items. Both the processes and personnel in place have the capabilities to successfully execute the procurement needs of the Energy Strong Program.	Having appropriate procurement policies and procedures reduced the risk of excessive costs and schedule delays.
2015 Q1	The new Dashboard format did not include start and end dates for UPCI jobs, only start and end months. The IM suggested revising this to provide more project status information.	The Dashboard format for UPCI was revised to include start and end dates. This enhanced schedule control on the projects.
2015 Q3	PSE&G appropriately identified means by which it could increase the benefit to its customers by providing additional funds to the UPCI subprogram from the amounts saved in the Gas M&R subprogram.	As described above, permitted additional customer benefits to be realized in several areas.
2016 Q2	Based on the reduction in cost for the West End Gas M&R station, PSE&G identified that $6.5 million of additional funding could be made available to the UPCI subprogram to allow the UPCI subprogram to complete the existing identified jobs and associated restoration and service work.	Based on the the-current status of the Gas M&R subprogram, the availability of excess funds identified for transfer to the UPCI subprogram would result in added benefits to PSE&G's customers, while having no adverse impact to the Gas M&R subprogram or the Energy Strong Program based on the projects already completed and revised scope of remaining subprojects in that subprogram.

XV. Advanced Technologies Review

A. Background

The Stipulation set the parameters for PSE&G's investments in the Advanced Technologies subprogram, specifically providing that,

> *"The Company will invest up to $100 million for the Advanced Technologies subprogram in order to install and implement Microprocessor Relays and expanded Supervisory Control and Data Acquisition ('SCADA')…"*

The intended benefits of the investment in Advanced Technologies were also identified within the Stipulation,

> *"The Advanced Technologies subprogram will equip certain stations with Microprocessor Relays and expanded SCADA and is intended to shorten storm restoration processes with respect to damage assessment and efficiency of storm restoration work preparation for PSE&G and mutual aid crews. Installation of Microprocessor Relays and expanded SCADA is also intended to enhance available information with respect to the operation of the electric distribution system."*

Prior to the Energy Strong Program, PSE&G had some level of SCADA at the majority of its stations, however the partial SCADA typically provided only general station alarms without the control function enabled by a full SCADA implementation.[48] In larger storms and Major Events, the control function is an important tool that allows dispatchers to remotely operate devices to restore customers or create safe work environments, rather than having to physically visit each station and field location, thus providing faster system restoration. Other benefits of implementing microprocessor relays and expanded SCADA to the targeted substations is the upgraded relays that provide more information such as high-speed fault clearing, distance to fault, loading information, and circuit breaker position in a digital format, which allows integration with the SCADA systems. This integration supports the non-construction pieces of the Advanced Technologies subprogram, installation of D-SCADA and Pi Historian systems that enable PSE&G to centrally collect the data for more effective decision-making in response to outages, particularly those stemming from large storms where real-time data can be provided to line personnel.[49]

B. Overview

As noted above, the Advanced Technologies subprogram was comprised of two general components, the software side of D-SCADA and Pi Historian, led by Damon Lo Boi, Director Strategic Utility Technologies, and the relay and RTU installations at the physical stations, led by Paul Toscarelli, Distribution Manager Electric Maintenance. The Advanced Technologies team was supported by internal PSE&G groups such as Division Substation Maintenance, Division Operations, DP&C Outage Coordination, IT Engineering, and Licensing & Permitting.

The Advanced Technologies management team was actively engaged with the work with regular meetings to ensure adherence to the project schedules, forecasts, and regulatory requirements, and identifying efficiencies to address additional stations beyond what was originally planned. This oversight included by-monthly work plan meetings, weekly tactical meetings, and daily conference calls with field resources to ensure the project team remained in alignment throughout the duration of the subprogram. The IM finds that the Advanced Technologies subprogram was effective in managing and overseeing the subprogram, including monitoring of the subprogram to ensure efficient execution.

[48] Full SCADA implementation is the installation of microprocessor relays on every feeder communicating with a remote terminal unit (RTU) within the station that in turn communicates to the master SCADA system.
[49] The D-SCADA scope provides a system to visualize, control, collect, and analyze all monitored points from each Distribution station. Pi Historian serves as a data warehouse to store historical information obtained from relays and RTUs.

Under PSE&G's execution plan for the subprogram, the stations identified for upgrades were placed into groups of approximately 5-10 stations, where the collection of substations within a group afforded PSE&G the ability to execute the work independently of other groups. By using this grouped approach, PSE&G reduced the risk to the overall subprogram schedule, as each group's deployment and installation schedule was independent of any other group's critical path and each group included a geographically diverse spread of substations to minimize impact to overall customer service. Substations that required feeder upgrades (requiring an outage) were scheduled to minimize work during the summer timeframe, which is historically a peak load time for the system; however, substation preparation (requiring no outage) was scheduled during this period, allowing PSE&G to level the work load and increase schedule flexibility. The original planned schedule for the Advanced Technologies subprogram was created using Microsoft Project, which is the scheduling software successfully used by PSE&G on large programs in the past. It is standard scheduling software used within the construction and utility industries and was capable of meeting PSE&G's needs for the subprogram. Per the Energy Strong Program master schedule dated December 31, 2014, the Advanced Technologies subprogram was to be completed by May 2017. The IM finds that PSE&G continuously used and updated the Advanced Technologies schedule in accordance with its work tracking and scheduling control practices.

As the projects within the Advanced Technologies subprogram are smaller in scale and duration than the DP&C-led projects of the Electric Station Flood Mitigation and Gas M&R subprograms, estimates were created and updated by the Advanced Technologies team. PSE&G had not executed projects that installed relays and expanded SCADA in at least the past five years, thus pre-program estimates were developed by subject matter experts. As work advanced, estimates were updated based on the observed cost per unit of the first group of stations completed, with more detailed estimates generated following completion of engineering and based on the planned labor, material, and outside services required for each project. Forecasts were updated monthly by the Advanced Technologies team based on the best information available, with any variances identified.

PSE&G's original plan was to perform relay and SCADA upgrades for all distribution feeders, however the agreed upon Stipulation provides for less funding than PSE&G's initial proposal for this scope of work (PSE&G's initially filed for $250 million in funding for the Advanced Technologies subprogram, the Stipulation approved amount was $100 million). The Stipulation did not explicitly provide which stations would receive the Advanced Technologies investment of Energy Strong, thus PSE&G implemented a formal decision it made in outlining the station selection and deployment strategy of the subprogram. The basis of PSE&G's station selection for the Advanced Technologies investments was selecting stations that fed the most customers, thus providing the greatest customer reliability benefit for the investments. With this basis of prioritization, PSE&G identified the following work sequence for the subprogram:

1. 13kV "Class H" substations – these stations provide service to approximately 65% of PSE&G's customers.
2. 4kV "Class A & B" substations – these stations provide service to approximately 20% of PSE&G's customers, some of which had already received microprocessor upgrades. The stations with existing relay upgrades were targeted first to enable such upgrades to be fully utilized for improved customer reliability, followed by Class A and B stations with no upgrades previously performed.
3. 4kV "Class C" substations – these stations provide service to approximately 15% of PSE&G's customers, and were selected for inclusion in Energy Strong following the advancement of the higher prioritized work.

In the original plan, a total of 81 stations were identified for inclusion in the subprogram; 53 Class H stations (out of a total population of 81), and 28 Class A/B stations (out of a total population of 48). As work advanced, additional stations were identified and added to the subprogram, which was further supported by the two transfer of funds from the Contingency Reconfiguration subprogram to the Advanced Technologies subprogram. Ultimately, a total of 111 stations received investments in the Advanced Technologies subprogram; **Table XV-1 – Advanced Technologies Station Summary** depicts the final count of stations and summary of upgrades made in the subprogram by class.

Table XV-1 – Advanced Technologies Station Summary

Station Class	Number of Stations in Subprogram	Relays Installed	RTUs Installed	Customers Served*	Cost (in thousands)
Class H	54	624	9	880,410	$56,381
Class A/B	30	262	28	298,020	$16,509
Class C	27	262	14	275,554	$16,057
Total	***111***	***1,176***	***51***	***1,453,984***	***$88,948***

The Advanced Technologies subprogram put its final projects in-service in April 2017, ahead of the May 2017 planned completion date. A summary of the actual subprogram schedule for the Advanced Technologies work is provided in **Table XV-2 – Advanced Technologies Subprogram Actual Summary Schedule**.

Table XV-2 – Advanced Technologies Subprogram Actual Summary Schedule

Task	Start Date	Finish Date
13kV Substations	8/4/2014	3/28/2017
Group 0	8/21/2014	3/31/2015
Group 1	1/23/2015	6/17/2015
Group 2	8/29/2015	1/31/2016
Group 3	1/4/2016	4/22/2016
Group 4	9/1/2016	11/23/2016
Group 5	8/26/2016	3/28/2017
4kV Substations	10/3/2014	4/20/2017
Group 1	10/3/2014	10/27/2015
Group 2.1	5/28/2015	12/7/2015
Group 2.2	6/29/2015	11/24/2015
Group 2.3	6/1/2016	9/2/2016
Group 2.4	7/20/2016	11/30/2016
Group 3.1	5/27/2016	11/30/2016
Group 3.2	6/6/2016	12/1/2016
Group 3.3	9/23/2016	3/24/2017
Group 3.4	1/21/2017	4/20/2017
Pi Historian	6/11/2014	2/22/2016
D-SCADA	8/4/2014	3/24/2017

Following completion of the components of the Advanced Technologies subprogram, the work has received accolades from the utility industry. PSE&G was awarded the 2018 POWERGRID International and DistribuTECH Grid Optimization Project of the Year for the Advanced Technologies subprogram, which noted that following the Advanced Technologies investment, 91% of PSE&G's customers are now served by an advanced technology system and receive benefits from a reduction in the number and

duration of electric outages. The PI Historian work was also the recipient of a CS Week Expanding Excellence award in "Best Devices, Data & Analytics." CS Week is an annual educational and customer service conference serving the utility industry's customer service efforts. The Best Devices, Data & Analytics award is based on an evaluation of the project in areas of complexity, innovation, improved operations, and improvement to customer service. CS Week's chief executive officer, Rod Litke, remarked that, *"On behalf of the judges, I can say they were very impressed with PSE&G's actions to ensure the entire environment is highly available with both primary and secondary servers by function, plus a disaster recovery environment for fail over in case of catastrophic loss."*

C. Major Decisions

During the execution of the Advanced Technologies subprogram, PSE&G implemented three major decisions that affected the subprogram. The first major decision documented the rationale and process used in selection of the stations to be included in the Advanced Technologies subprogram.[50] The next two major decisions pertained to two transfers of funds from the Contingency Reconfiguration subprogram to the Advanced Technologies subprogram.[51]

1. Selection Criteria for the Advanced Technologies Subprogram

As discussed above, PSE&G's criteria for station selection in the Advanced Technologies subprogram was predominantly based on providing the benefits of the subprogram to the largest number of customers possible. Consideration was also given to the likelihood of other future investments being performed at a substation, for instance if the switchgear at a station was scheduled to be replaced in the coming years or if a station was slated to be eliminated, it would not be included in the Energy Strong Program. The first group of stations were the 13kV Class H substations that serve approximately 65% of PSE&G's customers. This was followed by the 4kV Class A/B substations that serve approximately 20% of PSE&G's customers and were further prioritized based by stations that had already received relay upgrades but lacked SCADA communication. The next group were the 4kV Class A/B substations with no relay or SCADA communication upgrades yet performed. The final group were the Class C substations.

2. Transfer of Funds from Contingency Reconfiguration to Advanced Technologies

PSE&G evaluated the status and forecast of the Contingency Reconfiguration subprogram following the end of the first quarter of 2016 and identified that at that point work had been completed on 158 of the 262 critical facilities to be addressed by the subprogram. Based on the progress of completed facilities and the then current estimate of remaining facilities, PSE&G estimated the Contingency Reconfiguration subprogram would complete its scope for approximately $85 million. Based on this evaluation, PSE&G determined that it had the opportunity to transfer funds from the Contingency Reconfiguration subprogram to the Advanced Technologies subprogram to allow for additional Class C substations to receive the Advanced Technologies investments.

The second transfer between these subprograms took place during the first quarter of 2017, and was driven by the Advanced Technologies subprogram forecasting higher costs to implement the D-SCADA portion of that subprogram than originally anticipated, which required an increase in its funding. This

[50] *See* IM 2014 Annual Report, pages 99-100
[51] *See* IM Revised 2016 Second Quarter Report, page 21; IM Revised 2017 First Quarter Report, page 21

transfer of funds was for $2 million, and was made possible by the Contingency Reconfiguration subprogram continuing to be forecasted to complete under its budget.

With both of these transfers, the funding for the Advanced Technologies subprogram was set to $107 million. The transfer of these funds was conducted in accordance with Paragraph 28 of the Stipulation. The IM finds that the transfer of a total of $7 million in additional funds from Contingency Reconfiguration to Advanced Technologies was appropriate as it maintains the scope of both the Contingency Reconfiguration and Advanced Technologies subprograms, while allowing PSE&G to maximize the customers benefited through projects implemented in the Advanced Technologies subprogram.

D. Comprehensive Findings & Observations

As noted in the IM 2017 Second Quarter Report, PSE&G placed the final projects within the Advanced Technologies subprogram in-service during the second quarter of 2017, ahead of the Stipulation mandated completion date of May 2017, and below the adjusted overall subprogram budget. With the Advanced Technologies subprogram previously reported as effectively complete (less minor closeout related work), the IM has no new findings; however, the IM has consolidated its previous findings, observations, and any recommendations that relate to the subprogram as shown in **Table XV-3 – Advanced Technologies Comprehensive Findings & Observations** adding a comment as to the action, benefit, or result of the finding, observation, or recommendation.

Table XV-3 – Advanced Technologies Comprehensive Findings & Observations

Report	Finding/Observation/Recommendation	Action/Benefit/Result
2014 Annual	PSE&G is implementing the Advanced Technologies subprogram of the Energy Strong Program by prioritizing the work on the electric substations that provide restoration after a power interruption to the greatest number of PSE&G customers.	Having a prioritization process that aligned with the Stipulation and supported achieving the objectives of the subprogram.
2014 Annual	An Advanced Technology subprogram master schedule has been completed which provides detail to the scope of this effort by substation type (13kV or 4kV) and subgroups for each substation type, further detailed to the work being performed at each substation.	Using industry standard scheduling practices provided PSE&G with an effective oversight tool to plan and monitor progress on the subprogram.
2014 Annual	The first five 13kV stations were single sourced to SEL [Schweitzer Engineering Laboratories, Inc.], with the remaining stations engineering and design work was competitively bid and also awarded to SEL. SEL has the technical knowledge and experience to perform the scope of work.	PSE&G followed its procurement practices to award the relay/SCADA upgrade work to a qualified vendor that supported successful execution of the subprogram.
2014 Annual	Advanced Technologies uses cost estimating based on past experience and utilizes baseline cost estimates to compare against actual costs. The project manager hired for the Advanced Technologies program has experience under prior similar scopes of work.	Having an appropriate cost estimating process improved the quality of project estimates and assisted in the forecasting of work in the subprogram.
2014 Annual	A few basic risks have been identified, such as outages and labor resources. The work being performed as part of the Advanced Technologies subprogram is done routinely – the Energy Strong Program has simply increased the volume of the work.	PSE&G identified the risks associated with the subprogram, the likelihood of occurrence, impact or outcome, and risk management strategy.
2015 Q1	The Project Closeout/Reporting Checklist is a useful summary document providing relevant information on the closeout of	PSE&G indicated to the IM that this information was already captured by

Report	Finding/Observation/Recommendation	Action/Benefit/Result
	individual projects in the Advanced Technologies subprogram. The IM recommends adding summary cost information to these reports, particularly initial estimate, final cost, and summary of any variances.	PSE&G in separate reports, thus no further action was necessary.
2015 Q1	The conventional relay technician-training program is a two-year apprentice-training program, covering all aspects of the relay technician job activities. As many of the typical training modules are not relevant to the installation and SCADA commissioning of relays that comprise part of the Advanced Technologies subprogram, PSE&G developed a modified training program to deliver the necessary training modules in a condensed timeframe to support the Energy Strong activities. This modified training program is condensed to 20 weeks and covers the specific training aspects associated with the Advanced Technologies subprogram.	PSE&G entered into an agreement with the International Brotherhood of Electrical Workers (IBEW) Local 94 union to implement this modified training program. The IM observed that the modified training program meets the needs of the Energy Strong program and had been implemented in a deliberate and well-planned manner.
2015 Q2	PSE&G is developing a migration plan to shift Advanced Technology work from Division Relay Techs to the Energy Strong Relay Techs. The IM will monitor the status and success of this migration as it is rolled out.	The transition to Energy Strong Relay Techs was successful and allowed the PSE&G team to fulfill the subprogram deliverables safely, on time, within budget, and to the desired scope and quality. It also allowed PSE&G to fulfill other planned work commitments outside of Energy Strong with the pre-existing workforce.
2015 Q3	To assure timely delivery of the panels needed for Advanced Technology, the vendor, SEL, moved some of the panel assembly work from a plant in the U.S. to one in Mexico. The IM raised the issue of whether the QA/QC on those panels would be equivalent to the QA/QC in the U.S. plant.	By SEL allocating some of the production to a different facility, it was able to reduce the projected shortage of relay panels. PSE&G had the vendor provide assurance that was the quality of the relay panels would remain at the same level. PSE&G also upon receipt of those panels, performed additional checks to assure no quality defects in the panels.
2016 Q1	The Dashboard page entitled Advanced Technologies Relay/SCADA Construction, started to list those stations that were in-service. The IM recommended that for each group/class of stations, the Dashboard contain a summary statement that provides the number of stations in-service compared to the total number of stations involved with that category defined by the group/class.	PSE&G implemented this suggestion on future Dashboards, providing additional visibility to the subprogram's status.
2016 Q1	PSE&G has prioritized its Class C substations for inclusion in the Advanced Technologies subprogram based on the customers benefited from each station. Projects are being added from this group as funds allow.	PSE&G continued utilizing the prioritization process that aligned with the Stipulation and supported achieving the objectives of the subprogram.

Report	Finding/Observation/Recommendation	Action/Benefit/Result
2016 Q2	PSE&G appropriately identified means by which it could increase the benefit to its customers by providing additional funds to the Advanced Technologies subprogram from the amounts saved in the Contingency Reconfiguration subprogram.	As described above, this permitted additional customers to benefit from investments in the subprogram.

XVI. Contingency Reconfiguration Review

A. Background

The Stipulation specified that PSE&G would invest up to $100 million for the Contingency Reconfiguration subprogram over the next three years following issuance of a Board Order approving the Stipulation.[52] It further described the parameters for PSE&G's investments in the Contingency Reconfiguration subprogram, specifically providing that:

> *"PSE&G will increase the sections in its present loop designs, creating multiple sections, utilizing smart switches, smart fuses, and adding redundancy within its loop schemes. By having more sections in loop schemes and/or more circuit ties, fewer customers should be interrupted when damage occurs in a specific section of the loop. The work will include deployment of additional feeder reclosers to traditional 13-kV loops."*[53]

In terms of performance metrics, the Stipulation stated the following:

> *"Storm Circuit CAIDI will be measured against a baseline that reflects performance under Major Event conditions for the 5 years prior to the reporting date for the applicable group of impacted circuits associated with the Contingency Reconfiguration investments. PSE&G will compare aggregated Storm Circuit CAIDI performance of circuits where Contingency Reconfiguration investments are completed to those without such investments under Major Event conditions."*[54]

As indicated above, the work performed as a part of this subprogram was intended to increase the resiliency of the system, or the ability to restore power more quickly once a power interruption has occurred. This is especially important for customers such as defense/security, hospitals, police and fire stations, water treatment facilities, oil/petroleum facilities, and prisons.

B. Overview

The work done as part of the Contingency Reconfiguration subprogram reflected work that had been done routinely by PSE&G in the past. As such, it relied on existing cost information for purposes of cost estimating, on the oversight and approval of the Asset Management Group, and on existing practices in the areas of engineering and design, project execution, and risk management.

[52] *See* Stipulation in BPU Docket Nos. EO13020155 & GO13020156 dated 5/1/14, Para. 24.
[53] *Id*. at Para. 29.
[54] *Id*. at Para. 37.

The IM has continued to review the process followed by PSE&G in its execution of the Contingency Reconfiguration subprogram and finds that PSE&G executed the subprogram in accordance with these policies and procedures and practices.[55]

The Contingency Reconfiguration subprogram was also executed in accordance with a PEP developed for the subprogram. The PEP contained the following components:

- Identification of responsible persons
- Charter (including statement of work; program description, scope, and budget summary)
- Cost Management
- Scheduling and Milestones
- Cost Estimating
- Staffing Plan
- License and Permitting
- QA/QC
- Risk Management (including program risk and project risk)
- Construction (including construction work management, commissioning plan, construction project management, and environmental compliance/remediation)
- Communication Management (including communication protocol and communication protocol with public relations/community outreach)
- Program Closeout Plan (including financial closeout and closeout reporting)
- Lessons Learned Analysis

Appendices to the PEP included:

- The subprogram's investment request
- The critical customer identification process
- ROD 5 and ROD 6
- Investment Planning and Resource Development Capital Investment Reporting Procedures
- A sample Contingency Reconfiguration monthly schedule from Microsoft Project
- A description of estimating phases and confidence levels
- A sample 18-month resource forecasting plan
- A sample Contingency Reconfiguration weekly dashboard
- A risk identification and management plan specifically tailored for the Contingency Reconfiguration subprogram
- A complexity factor matrix

The IM finds that the PEP was comprehensive and was a critical component in the subprogram meeting its goals while being completed on schedule and below budget, as was PSE&G's continual monitoring of contractor performance and resource availability.

The Contingency Reconfiguration subprogram initially was managed by Jim Duswalt, Manager New Business & Work Management, and Namita Bhagavathula, Principal Staff Engineer - Technical. During the execution of the subprogram, Patrick McLaughlin, Asset Management Engineer, replaced Ms. Bhagavathula. Support for the subprogram was provided by the Divisions, with each having a lead to

[55] An enterprise-wide assessment of PSE&G's cost control, cost reporting and accounting practices as applicable to the Energy Strong Program will be included in the IM's Final Report on the Energy Strong Program.

ensure effective project execution. Bi-weekly calls were held between the subprogram and Division teams along with centralized monthly meetings to discuss and share status and resolve any issues.

The IM finds that the Contingency Reconfiguration subprogram was implemented and executed with continuity in the organizational structure that allowed for a consistent understanding by those responsible of the policies and procedures to be used for management and monitoring of the subprogram and allowed for a consistent process for ensuring the Contingency Reconfiguration subprogram was executed in a manner consistent with the goals of the Stipulation, below budget and on schedule. As required by the Stipulation, PSE&G has been reporting on the performance of Energy Strong investments in Major Events. Most of circuits improved as a part of the subprogram that have been impacted by a Major Event have experienced a CAIDI that was improved from the five-year reporting average. The overall performance of the subprogram will be difficult to appreciate, however, until the next hurricane-level event affects the region.

The original planned schedule for the Contingency Reconfiguration subprogram was created using Microsoft Project, which is the scheduling software successfully used by PSE&G on large programs in the past. It is standard scheduling software used within the construction and utility industries and was capable of meeting PSE&G's needs for the program. Per the Energy Strong Program Master Schedule dated December 31, 2014, the Contingency Reconfiguration subprogram was to be completed by May 2017. The IM finds that PSE&G continuously used and updated the Contingency Reconfiguration schedule in accordance with its work tracking and scheduling control practices. The IM finds that PSE&G's diligence in closely monitoring the schedule resulted in the Contingency Reconfiguration subprogram being able to be completed on May 21, 2017, on-target with the planned completion of May 2017.

In the second quarter of 2015, PSE&G completed a study of engineering resources and determined that they were sufficient to complete the subprogram on schedule and budget. The study noted that many of the engineering hours included in the study were from preliminary estimates and subject to change. It also provided ways to mitigate potential resource shortages that had been successfully implemented in past programs, such as; increase overtime, outsource focused engineering efforts, hiring contract geographic information system technicians for short engagements, and cross division lines with engineering support.[56]

The Contingency Reconfiguration subprogram was controlled and implemented by the management team, while the work was executed out of the four PSE&G Divisions where the specific projects were located. Once the priority was established for a project in Contingency Reconfiguration it was sent to the Division where the project was to be in addition to receiving input from external stakeholders. The Division performed the necessary engineering to implement the project. That included going to the specific distribution line location where that project would be installed to identify any local conditions that might impact the project, including the need to reroute the associated distribution lines or construct new ones. Those conditions might also involve the setting of additional poles, stringing additional distribution lines, installing recloser switches or other equipment, and addressing the general topography of the area where this work was to take place.

Per PSE&G's regular processes, the technical staffs within the Divisions performed the necessary engineering work required to implement the Contingency Reconfiguration projects. The manual that provided guidance for performing this engineering work was the *Operation Outside Plant Manual*. This is

[56] See IM 2015 Second Quarter Report, page 43

an extensive document that addresses such engineering areas as poles, cross arms, guys and anchors, wire data, sags, clearances, circuit layout and design, transformers, capacitors, conduits, manholes, etc. The work involved in the Contingency Reconfiguration subprogram that had been previously performed by PSE&G on a regular basis which provided an understanding of the engineering requirements necessary to successfully complete that work. The only difference was the quantity of work performed under this subprogram. The conduct of the management and performance of the engineering work for this subprogram was appropriate, known and had been successfully implemented in the past.

Before payment was released to contractors doing the fieldwork, a PSE&G supervisor inspected the work and, if it met the requirements, signed off to release payment. This verified that the project was completed as per its specific requirements and that it was functional.

As stated earlier, the Contingency Reconfiguration subprogram was completed on May 21, 2017. As described in the IM 2015 First Quarter Report, PSE&G initially identified and prioritized 262 facilities. At the completion of the subprogram, 219 projects were completed for 260 of those facilities. As set forth in detail in the IM 2017 Second Quarter Report, one facility was removed from the Energy Strong Program and one facility was moved to the category of No Action Required.[57] An additional 37 end-user facilities were assessed, but no action was required under the Contingency Reconfiguration subprogram for various reasons, such as the facility is supplied by underground circuits, has been or will be improved by another program, costs of improvement outweigh the benefits, or no feasible engineering solution.

While each Contingency Reconfiguration project had one or possibly more primary customers, such as a hospital, once improvements are made, all customers on the same improved portion of the circuit benefit. PSE&G refers to those additional customers receiving the benefit of the improvements as ancillary customers. A total of 260 critical facilities were addressed, and the Company estimates that 412,516 ancillary customers benefitted from 219 projects.

The IM finds that the successful completion of the Contingency Reconfiguration subprogram was possible thru the effective use of the planned project control policies and procedures and through the effective and consistent implementation of those policies and procedures by continuity of key personnel possessing the appropriate skills, experience, and expertise.

C. Major Decisions

During the course of the Contingency Reconfiguration subprogram execution, four major decisions were made. One established the process by which PSE&G identified and prioritized customers and facilities for inclusion in the subprogram, one pertained to URB approval for projects within the subprogram, and two involved transfers of funds from Contingency Reconfiguration to Advanced Technologies.

1. Identification and Prioritization of Customers and Facilities

PSE&G initially used two approaches to identify customers/facilities requiring a higher level of assurance that they would not lose power during a storm and the design changes required to provide that higher level of assurance. The first was to contact the New Jersey Department of Environmental Protection (NJDEP) and the Office of Emergency Management (OEM) requesting they identify specific facilities falling into that category. PSE&G also developed its own list of facilities requiring a higher level of assurance. Those lists then were provided to PSE&G's four Divisions who recommended which facilities in their respective areas to include in the Contingency Reconfiguration subprogram. PSE&G Asset Strategy then decided which of those projects would be approved and included in the subprogram. A

[57] See IM 2917 Second Quarter Report, pages 42-43

ranking and weighting system gave priority to hospitals, water facilities, senior care, airports, refineries, etc.

These approaches generated several questions by the IM. PSE&G Asset Strategy used qualitative judgment in making those decisions, and there was no formal quantitative analysis used in that process. Metrics such as CAIDI and SAIFI, or reviewing historical records to determine which hospitals actually lost power, apparently were not considered in deciding which hospitals would be included in the subprogram. The IM recommended prioritization based on an appropriate linear equation that relied more on quantitative factors than qualitative factors. PSE&G developed and implemented such a linear equation for prioritization based on facility type, historical CAIDI and SAIFI, and circuit outages. This selection and prioritization procedure was documented in ROD 5.[58]

Many projects had been approved based on the previous selection criteria, raising the question of whether those projects would still score high enough to be approved under the new selection criteria. The IM requested that the Company re-evaluate those projects to determine where they would be ranked pursuant to the new criteria. The Company did so, and the re-evaluation indicated that all the projects would have been approved using the new selection criteria.[59]

In the first quarter of 2015, PSE&G fully defined the scope of the subprogram by identifying all the facilities/projects to be completed.[60]

ROD 5 was revised in the first quarter of 2016. The revision noted that PSE&G targeted customers that were given the highest restoration priority by the OEM, and that OEM provided a list of facilities for consideration in the prioritization process. However, as facilities were evaluated for improvement, it was found that some facilities were duplicated under different names, had been closed, were determined to be non-critical, or could not be reasonably improved. Those facilities were removed from the list of facilities to be improved. The subprogram maintained a list of 262 critical facilities to continue the intended budgetary scope and selected additional facilities as others were removed. Facilities continued to be evaluated in accordance with the selection criteria contained in ROD 5. Facilities that could not reasonably be improved remained on the list with no action taken. Facilities considered to be "No Action" fell into the falling categories:

- Facility is supplied by underground circuits;
- Facility has been or will be improved by another program;
- Facility is too costly for the benefit received; or
- No feasible engineering solution.

PSE&G considers these facilities to be addressed by this subprogram because they were evaluated, although no actual improvements were made.[61]

ROD 5 was supplemented a second time in the third quarter of 2016. The supplement noted that facilities "that cannot reasonably be improved" will remain on the Prioritized Customer List with "No Action" to be taken per the previous revision. It goes on to state:

> *"For each facility deemed 'No Action', the next highest scored unaddressed facility per the ESCR Prioritized Customer List will be added to the program scope. The same criteria for 'No Action' will apply to any added facility. Facilities will continue to be evaluated in accordance with ROD*

[58] *See* IM 2014 Annual Report, pages 92-96; IM 2015 First Quarter Report, pages 28-29
[59] *See* IM 2015 First Quarter Report, page 27
[60] *See* IM 2015 First Quarter Report, pages, 4, 28, Appendix A
[61] *See* IM 2016 First Quarter Report, page 17

5 until 262 critical facilities have been improved. The number of facilities addressed by the program will exceed 262."

Meaning that PSE&G addressed, or evaluated, more than 262 facilities in the process of determining the 262 facilities improved by the Contingency Reconfiguration subprogram.[62]

2. Utility Review Board Notification for Projects >$1.0M

The Contingency Reconfiguration subprogram was originally approved by PSE&G's URB for $100 million in total investments. URB procedures identify "specific" and "blanket" projects, but as the Contingency Reconfiguration subprogram was approved as a "program," it was unclear if it should follow procedures for a "specific" project or "blanket" authorization. PSE&G decided to take a conservative approach and requested URB notification for any project in the subprogram over $1.0 million.

The IM found this to be a prudent decision that allowed for the continued URB oversight as intended by the URB's charter.

3. Transfer of Investment Funding

In the second quarter of 2016, PSE&G implemented the decision to transfer $5 million from the Contingency Reconfiguration subprogram to the Advanced Technologies subprogram. The resulting funding levels for these subprograms was Contingency Reconfiguration at $95 million and Advanced Technologies at $105 million. The rationale for the transfer was described as follows.

As previously indicated, the scope of the Contingency Reconfiguration subprogram identified 262 critical facilities to be addressed by the subprogram. At the end of the first quarter of 2016, work was completed on 158 critical facilities and based on the then current estimates of the remaining facilities, PSE&G determined the work could be completed for less than the Stipulation amount of $100 million. PSE&G's original scope for the Advanced Technologies subprogram contemplated work at an estimated 82 Class H, and A & B substations. During the execution of the Advanced Technologies subprogram, PSE&G benefitted from gained efficiencies, which contributed to lower than planned unit costs for relays and RTUs. ROD 1 identified the possibility of expanding the Advanced Technologies work to include Class C substations, and this was later refined to 19 identified Class C substations to be included in the subprogram. By transferring $5 million to Advanced Technologies, PSE&G was able to address additional Class C substations to the benefit of additional customers while maintaining the scope of the Contingency Reconfiguration subprogram. The rationale for this transfer was documented in ROD 10.[63]

4. Additional Transfer in Investment Funding

A second transfer of funds of $2 million from the Contingency Reconfiguration subprogram to the Advanced Technologies subprogram occurred in the first quarter of 2017 as the Advanced Technologies subprogram was forecasting higher costs to implement the D-SCADA portion of that subprogram while the Contingency Reconfiguration subprogram was still forecasting the completion of its subprogram under budget. With this second transfer of funds, the budget of the Contingency Reconfiguration subprogram stood at $93 million and that of the Advanced Technologies subprogram at $107 million. The transfer of these funds maintained the scope of both subprograms while allowing PSE&G to maximize the customers benefitted through projects implemented in the Advanced Technologies subprogram. The rationale for the transfer of these funds was documented in ROD 15.[64]

[62] *See* IM 2016 Second Quarter Report, page 19
[63] *See* IM 2016 Second Quarter Report, pages 21, 59 and **Section XV.C.2**
[64] *See* IM 2017 First Quarter Report, pages 21, 47 and **Section XV.C.2**

D. Comprehensive Findings & Observations

Final quantities installed in the Contingency Reconfiguration subprogram are depicted in **Table XVI-1 – Contingency Reconfiguration Subprogram – Final Status**

Table XVI-1 – Contingency Reconfiguration Subprogram Final Status

Type	Program (Final)
Poles (each)	1795
Primary Wire (miles)	63.27
Equipment – Other (each)	1759
Equipment – Reclosers (each)	465

As noted, PSE&G completed the Contingency Reconfiguration subprogram on May 21, 2017, on schedule and at a cost of approximately $83.6 million, below the Stipulation-authorized amount of $93 million (after adjusting for transfers to Advanced Technologies). In addition to the findings and observations set forth above, the IM has consolidated its previous findings, observations, and any recommendations that relate to the subprogram as shown in **Table XVI-2 – Contingency Reconfiguration Comprehensive Findings & Observations** adding a comment as to the action, benefit, or result of the finding, observation, or recommendation.

Table XVI-2 – Contingency Reconfiguration Comprehensive Findings & Observations

Report	Finding/Observation/Recommendation	Action/Benefit/Result
2014 Annual	The method of reporting did not provide sufficient information to allow an understanding of the overall progress of Contingency Reconfiguration within the Energy Strong Program – i.e. when will Contingency Reconfiguration be completed and how progress can be monitored toward that completion date?	In response to the IM's recommendation, PSE&G refined the weekly dashboard to reflect the anticipated replacement of poles, primary wire, other equipment and reclosers and the amount (and percentage) replaced to date.
2014 Annual	Existing policies and procedures that PSE&G has in place to assist in risk management efforts for projects under the auspices of the Contingency Reconfiguration subprogram reasonably identify risks and response strategies. As the Contingency Reconfiguration subprogram consists of work that is done routinely by PSE&G, the IM found this approach acceptable.	Having appropriate risk management policies and procedures reduced the risk of cost overruns and schedule delays.
2014 Annual	PSE&G had well established procurement policies and procedures in place that aligned with common industry practices. The teams responsible for the primary projects associated with the Energy Strong Program were shown to have regular and open communications with the PSE&G Procurement Group which facilitated timely submittal and review of bids as well as identification of long-lead items. Both the processes and personnel in place have the capabilities to successfully execute the procurement needs of the Energy Strong Program.	Having appropriate procurement policies and procedures reduced the risk of excessive costs and schedule delays.
2015 Q 1	PSE&G previously had been ordering reclosers as it needed them. Eventually, this issue had the potential to impact schedule.	The IM found that that PSE&G successfully addressed this issue by issuing an open order for reclosers, which resulted in them being delivered to the sites more quickly.

Report	Finding/Observation/Recommendation	Action/Benefit/Result
2015 Q1	The subprogram previously had been approved by the URB for $100 million. The subprogram was comprised of multiple individual projects anticipated to be less than $1 million each. In February 2015, PSE&G Utility Finance clarified existing procedures and determined that URB notification was required for any individual Contingency Reconfiguration project exceeding $1 million.	The IM found this to be a prudent decision that allowed for continued URB oversight as intended by the URB's charter.
2015 Q1	The IM recommended that the process used by PSE&G to select and prioritize those critical facilities selected for the subprogram be better defined and documented in a guideline or procedure.	The Company did so in ROD 5 and its revisions. The IM found the ROD and the revisions were reasonable and prudent and supported the goals of the Contingency Reconfiguration subprogram.

ENERGY STRONG PROGRAM

INDEPENDENT MONITOR

2017 ANNUAL REPORT

APPENDIX A – DRAFT REPORT COMMENTS AND RESPONSES

11 APRIL 2018

PEGASUS GLOBAL HOLDINGS, INC. ®

Note: The IM captured verbal questions and comments during the presentation of its 2017 Annual Report (Draft) on March 20, 2018. A collection of the verbal comments to the draft report were recorded and distributed to each of the parties, no further comments were received.

Verbal Questions & Comments to the IM 2017 Annual Report From the March 20, 2018 Meeting

Question / Comment #	Question / Comment	IM Response	Report Changes (indicates Section #)
1	Summary of performance metrics related to Energy Strong reaction to storms to date. Particularly interested in comparison metrics before Hurricane Sandy and after; have the measures been implemented and have they been effective.	The IM has discussed this request with PSE&G, PSE&G indicated the information will be gathered and provided to the IM. The IM will review this information once available and include a discussion in the IM 2018 First Quarter Report.	No change
2	Request for PSE&G to provide info on which facilities were impacted by recent events that benefited from Contingency Reconfiguration investments. To the extent practicable, compare facilities that have not yet had contingency reconfiguration investments with those facilities benefit from Energy Strong contingency reconfigurations.	The IM has discussed this request with PSE&G, PSE&G indicated the information will be gathered and provided to the IM. The IM will review this information once available and include a discussion in the IM 2018 First Quarter Report.	No change
3	Reason for lengthy duration between in-service and closeout at Ewing and Cranford?	On Cranford: removal of old equipment, landscaping plan (part of condition of approval). On Ewing: still have the demo phase of the old switchgear, tied with a different project on the site.	No change
4	On Table IV-1, THO 8022, CUT 8004, CUT 8035, request to add footnote explaining CAIDI figures reflective of the average of the duration of the two outages that occurred during the Major Event.	Footnote added to Table IV-1 to explain the calculation.	Table IV-1 (page 21)
5	As part of the analysis on the Contingency Reconfiguration circuit performance, data compiled by the critical facilities (even anecdotally) would be useful.	See Comment #3 above.	No change
6	Additional info on the [REDACTED] COR adjustment in the Electric Station Flood Mitigation subprogram made during the first quarter of 2018.	Port Street and Essex had [REDACTED] charged as COR that should have been charged as CWIP during the Q4 2017, will be/has been adjusted as CWIP. Port Street-dewatering can be applied as a new project (CWIP) or something that is being removed (COR).	Section II.A.4. (page 12)

Question / Comment #	Question / Comment	IM Response	Report Changes (indicates Section #)
7	Energy Strong Program organization lists John Latka as sponsor, what does that mean?	John Latka oversees the Program to make sure it runs smoothly.	No change
8	What information was given to the IM from the PSEG auditors covering the internal audit?	A report addressed to the IM covering the audit's objectives, scope, methods, and conclusions. The IM suggested certain additions to the initial draft of the report, which was subsequently incorporated into a revised report by the internal auditors.	Section X.B. (page 39)
9	With regard to the interviews conducted by the PSEG auditors, why does the IM believe the interviews were adequate?	The people that the auditors interviewed in the course of the audit are virtually the same as the IM has interviewed as subject matter experts in the course of its work.	Section X.B. (page 41)
10	What was the engineering selection process for the initial work?	This selection occurred prior to the Stipulation, thus not an area reviewed by the IM.	No change
11	Why was the Newark Airport project cancelled?	Port Authority would not extend lease for 27kV project as it felt the 345kV switching station project was sufficient, and PSE&G agreed. When the 345kV switching station is complete, the existing 27kV station will be eliminated, the property returned to the greenfield state and the land returned to the Port Authority.	No change
12	Regarding Table XI-1, is COR included in the actual costs?	As of December 2017, yes. Clarified this detail in the table header.	Table XI-1 (page 49)

ENERGY STRONG PROGRAM
INDEPENDENT MONITOR
2017 ANNUAL REPORT

APPENDIX B – IM RECOMMENDATIONS

11 APRIL 2018

PEGASUS GLOBAL HOLDINGS, INC. ®

Energy Strong Program Meetings Recommendations

Rec. #	Meeting Date	Recommendation/Suggestions	Status
1	16 Oct 2014	PSE&G prepared a spreadsheet showing the cost estimates for approximately 4 -5 substations that were originally planned to be raise/rebuilt and PSE&G is now considering the eliminate option. Several issues were raised to clarify the data and to rearrange the data to make it easier to understand and to add a level of consistency between the data presented for individual substations allowing the reader to better compare the information.	PSE&G made changes to its spreadsheet that addresses these concerns. CLOSED
2	23 Oct 2014	Requested to receive a Dashboard update document for each meeting prior to the meeting and on dates when there are no meetings.	The IM receives the dashboard weekly, and prior to each bi-weekly meeting. CLOSED
3	26 Nov 2014	Asked if each Energy Strong Subprogram will have its own project controls engineer. This raises the question of integrating the individual subprogram schedule and cost data into an overall Energy Strong schedule and cost control process.	Each ES subprogram has an individual for the project controls activities. There has not been a problem in integrating these into an overall ES schedule. CLOSED
4	22 Jan 2015	Contingency Reconfiguration – Discussion of high cost projects not being given high priority due to cost, where 5 smaller projects could be completed. Questioned this since PSE&G have a methodology to prioritize these projects but it appears that cost can “trump” that priority methodology.	Cost does not trump facility purpose (hospital, waste water treatment plant, etc.). CLOSED
5	19 Feb 2015	Suggested PSE&G create a “break-even” analysis to back out the probability of damage such that when the repair cost is multiplied by that probability you get the “break-even” $600,000, relating to the raise/rebuild vs elimination of Little Ferry.	The Little Ferry decision to eliminate is being determined on a different basis that is acceptable to the IM. CLOSED
6	19 Mar 2015	Asked if the T1 and T4 transformers at Little Ferry were as old as the T3 being considered for elimination. It is 66 years old and in poor condition compared to T1 and T4.	The age of T1 and T4 is not relevant in deciding what to do with T3. CLOSED
7	14 May 2015	Inquired if there was a ROD for the raise/rebuild of T4 at Little Ferry. No ROD exists since PSE&G used a “Change in Scope” (CIS) document to record and justify the decision. Over 200 CIS documents exist and reluctant to duplicate that into RODs. Agreed to write a ROD that will just reference the CIS.	There are hundreds of Changes in Scope maintained on a running list but far fewer Change in Scope that are individually documented, which require multiple approvals. All critical CIS documents will have a cover sheet that conveys the decision-making process and thus constitutes them as an ROD. CLOSED
8	28 May 2015	Financial Update: Last page of Dashboard presenting ES Program data, contains column “May Est MTD”, and does not appear useful.	PSE&G has eliminated that column. CLOSED

Rec. #	Meeting Date	Recommendation/Suggestions	Status
9	11 Jun 2015	The new Dashboard format does not include start and end days for UPCI Jobs, only start and end months. Bill Elmer will consider these two points.	The Dashboard for UPCI was revised to include these dates. CLOSED
10	11 Jun 2015	As a result of switchgear delivery delays that have occurred, requests PSE&G focus on switchgear delivery for each substation and provide a comment such as on target, delayed, delivered, etc.	PSE&G has developed a table that is now included in the Dashboard to track any switchgear delays for each electric substation. CLOSED
11	11 Jun 2015	Request more specific cost and schedule information to be included in IM reports. The IM will be discussing what specific data will be needed and presentation format.	The IM has discussed the additional cost information needed with PSE&G, and PSE&G is providing that data on a recurring basis. CLOSED
12	25 Jun 2015	Add a note to the Electric Substation Dashboard Table that Switchgear delivery schedule had several months of float built in due to potential delay in deliveries. This is why some items show a delay in delivery but no change in completion date.	PSE&G has added an appropriate note. CLOSED
13	25 Jun 2015	The IM indicated it would submit a formal data request inquiring if the work already performed under the Energy Strong Program resulted in PSE&G being able to restore power to customers after the major events in late June faster than before without Energy Strong Improvements.	The IM will continue to evaluate the performance of Energy Strong investments as more Major Events occur to provide a better representation of such performance. CLOSED
14	23 July 2015	For Contingency Reconfiguration, the Dashboard page had a column that included quantities (poles, wire and equipment) for only those facilities that had been approved and estimated. As more Contingency Reconfiguration facilities are approved and estimated, those numbers would change and that column of data would also change, such that it was not a good indication of progress. The IM suggested that column of data be eliminated since it was not useful and could be misleading.	The Contingency Reconfiguration Dashboard was revised to eliminate that data. CLOSED
15	6 Aug 2015	For Contingency Reconfiguration, PSE&G was asked to provide a breakdown of the 262 facilities in CR by 1) number completed, 2) number in construction, 3) number approved but not yet in construction, 4) number pending to be submitted for approval, 5) and the remaining number where no action has been taken other than to identify them based upon the CR selection criteria. These five categories should be presented by facility and by project.	The Dashboard for Contingency Reconfiguration has been modified to include the information requested by the categories identified. CLOSED
16	20 Aug 2015	In order to assure timely delivery of the panels needed for Advanced Technology, the vendor, SEL, has moved some of the panel assembly	PSE&G said they are equivalent, but would ask the vendor to assure in writing that was the case. PSE&G

Rec. #	Meeting Date	Recommendation/Suggestions	Status
		work from a plant in the U.S. to one in Mexico. The IM raised the issue of whether the QA/QC on those panels would be equivalent to the QA/QC in the U.S. plant.	also said that upon receipt of those panels, they would perform additional checks to assure that is the case. CLOSED
17	15 Oct 2015	The IM identified a discrepancy in how PSE&G calculates the percent complete in the Dashboard page entitled, "Flood Mitigation Status Matrix Data". This was identified by reviewing the percent complete for the Ewing substation, where those numbers were unexpectedly decreasing in subsequent Dashboards. PSE&G said it was due to the algorithm, which adds time to an activity that is delayed, and incorrectly divides the amount of work completed by a larger time number, resulting in decreasing the percent complete.	PSE&G has investigated this anomaly in the algorithm and has changed the calculation. It has decided to eliminate this page from the Dashboard since the numbers populating this table are recalculated at the end of each month and the collection of that data takes place well after the end of a month. PSE&G will provide this data in the Energy Strong Flood Mitigation Monthly Progress Reports. CLOSED
18	15 Oct 2015	On the Dashboard page entitled, "Flood Mitigation Switchgear Delivery Status," PSE&G was carrying switchgear that was delivered in 2014, which added unnecessary clutter to the information on that page. The IM suggested switchgear delivered in 2014 be removed from that status page.	PSE&G has implemented this suggestion. CLOSED
19	29 Oct 2015	Under the Advance Technologies relay Dashboard page the IM suggested that when end dates for scheduled activities are revised out in time rather than entering "On Target" under the status column (since the date was revised) the status should say "Revised Date – No Impact on In-Service Date" or if there is an impact, to explain it. This would make monitoring schedule changes in AT consistent with the other ES Subprograms.	PSE&G agreed to implement this suggestion. CLOSED
20	29 Oct 2015	After the conclusion of the ES Bi-Weekly Project Meeting, PSE&G made a presentation to the IM providing information on the Madison and Marshall electric substations concerning certain errors and oversights contained in its respective engineering reports that were prepared by URS. The IM requested that a root cause analysis be performed by PSE&G that identifies the "root cause" reason why this occurred, takes action to cure the immediate problem, identify if this is a systemic problem in the engineering reports for the substations, and take action to assure that there will not be a recurrence of this in Energy Strong projects.	With regard to the PSE&G Incident Analysis Team Report on Madison and Marshall (the root cause analysis report), the IM considers the corrective actions that PSE&G has and will implement within the Energy Strong Program appropriate. The IM has concluded that the issues with Madison and Marshall are limited to those two substations and that the other 27 electric substations, including the others where URS provided the engineering reports, in the Energy Strong Flood Mitigation subprogram have been minimally, if at all, impacted by the factors that caused the issues at Madison and Marshall. The IM also concludes that the corrective actions developed by PSE&G are reasonable and should prevent recurrence of this

Rec. #	Meeting Date	Recommendation/Suggestions	Status
			issue at other substations in the Energy Strong Flood Mitigation subprogram. CLOSED
21	10 Dec 2015	On the Dashboard page entitled "Flood Mitigation Switchgear Delivery Status," PSE&G has reported that several sets of switchgear have been delayed but that their respective in-service date has not been compromised. The IM recommended that PSE&G add a column to this page that identifies the date when late switchgear delivery would impact or delay the substation project.	PSE&G agreed to add a column that identifies this "drop dead" switchgear delivery date for each substation. CLOSED
22	21 Jan 2016	The IM suggested that on the Dashboard page entitled "Flood Mitigation Switchgear Delivery Status" when PSE&G reports a switchgear delivery delay, that it identify both the old date and the revised date in the status column in order to preserve some history of the delay.	PSE&G has agreed to do this on future Dashboards. CLOSED
23	21 Jan 2016	On the Dashboard page entitled "Flood Mitigation Switchgear Delivery Status" there are several sets of switchgear that have yet to be ordered and those sets did not have a drop-dead delivery date. The IM noted that even though some switchgear has not been ordered, schedules exist for those substations that identify when the switchgear has to be delivered in order to avoid any delay. That drop-dead delivery date should be included in this Dashboard page since it will provide info on the timeliness needed in the ordering of the switchgear.	PSE&G has agreed to do this on future Dashboards. CLOSED
24	17 Mar 2016	On the Dashboard page entitled "Flood Mitigation Switchgear Delivery Status" when PSE&G changes the drop-dead delivery date, it does not continue to record the previous drop-dead date. The IM noted that the movement of the drop-dead delivery date is an indication of where the substation completion date is going. The IM recommended that there is a need to know what the "old" drop-dead date was and what the changed drop-dead date is, for the above stated reason.	PSE&G understood the concern expressed and will propose a suggested resolution of this issue to the IM. A follow up conference call was held on this topic and PSE&G agreed to keep the old drop-dead dates on the Dashboard. CLOSED
25	28 April 2016	The Dashboard page entitled "Flood Mitigation" lists those electric substations that are in-service. Since there are two levels of in-service, the IM recommended that PSE&G indicate which substations are "partial in-service" and those that are "total in-service".	PSE&G agreed to do that on future Dashboards. CLOSED
26	28 April 2016	The Dashboard page entitled Advanced Technologies Relay/SCADA Construction (the first page with that title), is starting to list those stations that are in-service. AT does not have a partial in-service category. The IM	PSE&G agreed to do that on future Dashboards. CLOSED

Rec. #	Meeting Date	Recommendation/Suggestions	Status
		recommended that for each group/class of stations, the Dashboard contain a summary statement that provides the number of stations in-service compared to the total number of stations involved with that category defined by the group/class.	

Overall Energy Strong Program Recommendations

Rec. #	IM Report Reference	Recommendation/Suggestions	Status
1	IM 2014 Annual Report	Recommended that PSE&G identify all projects that are/will be in the Contingency Reconfiguration subprogram.	PSE&G implemented the recommendation. CLOSED
2	IM 2014 Annual Report	Recommended that the process used to prioritize facilities in the Contingency Reconfiguration subprogram be better defined.	PSE&G implemented the recommendation. CLOSED
3	IM 2014 Annual Report	PSE&G should consider assigning a QA/QC individual to monitor implementation of the Energy Strong Program.	PSE&G implemented the recommendation. CLOSED
4	IM 2014 Annual Report	PSE&G should consider undertaking non-financial audits of the Energy Strong Program (e.g. project controls).	PSE&G implemented the recommendation. CLOSED
5	IM 2014 Annual Report	Recommended that the Investment Planning and Resource Development (IPRD) Group establish its reporting responsibilities in a written procedure document.	PSE&G implemented the recommendation. CLOSED
6	IM 2015 First Quarter Report	PSE&G should provide additional risk mitigation strategies specifically to address the risk that delays in electric substation work may result in compressing the work to be performed, leading to potential resource availability concerns.	PSE&G actively monitors the resource availability for the Energy Strong Program and has built in float in the individual project schedules to allow for appropriate shifting of resources. CLOSED
7	IM 2015 First Quarter Report	Recommended that the Project Closeout/Reporting Checklist used on the Advanced Technologies subprogram contain additional cost information.	PSE&G is capturing the appropriate cost information. CLOSED
8	IM 2015 Second Quarter Report	Recommended that PSEGIA evaluate the Electric Station Flood Mitigation subprogram, as it represents the largest component of capital spending in Energy Strong.	PSE&G has incorporated the Electric Station Flood Mitigation subprogram for its 2016 audit plan. CLOSED

MADISON 4KV SUBSTATION PROJECT

INDEPENDENT MONITOR

2017 FOURTH QUARTER REPORT

PREPARED AND SUBMITTED BY

PEGASUS GLOBAL HOLDINGS, INC. ®

11 APRIL 2018

PUBLIC VERSION

Table of Contents

Appendices

List of Acronyms/Abbreviations

Board of Public Utilities	BPU
City of Hoboken	City
Delivery Projects & Construction	DP&C
Independent Monitor	IM
Issued for Construction	IFC
Issued for Review	IFR
Madison 4kV Substation Project	Madison Project
Pegasus-Global Holdings, Inc.	Pegasus-Global
Public Service Electric and Gas Company	PSE&G
Purchase Order	PO
Utility Review Board	URB

I. Introduction

Pegasus-Global Holdings, Inc. (Pegasus-Global) was engaged by Public Service Electric and Gas Company (PSE&G) to provide independent monitoring services for PSE&G's Energy Strong Program. Under the Stipulation approved by the May 21, 2014 Order, PSE&G was required to hire a monitor to:

> *"[R]eview and report to Board Staff and Rate Counsel on the impact of the Energy Strong Program on overall system performance during severe weather events; cost effectiveness and efficiency; appropriate cost assignment; and other information deemed appropriate by the Company, Board Staff and Rate Counsel."*

The independent monitor (IM) scope of work revolves around three primary tasks:

1) Review and report on the impact of the Energy Strong Program on overall system performance during severe weather events;
2) Review and report on cost effectiveness and efficiency; and,
3) Review and report on appropriate cost assignment.

In a November 30, 2016 agreement, Rate Counsel, the Board of Public Utilities (BPU) Staff, and PSE&G reached an agreement that allows PSE&G to proceed with the project of raising and rebuilding both the Madison and Marshall electric substations at the Madison Substation site outside of the Energy Strong Program. As such, going forward this project will be formally referred to as the Madison 4kV Substation Project (Madison Project[1]). Among other things, the agreement contains several terms and conditions, including:

- PSE&G shall not undertake flood mitigation of the Madison and Marshall substations through the Energy Strong Program but may include the costs associated with the raise and rebuild of the Madison and Marshall substations in the filing of its next base case.
- PSE&G shall cooperate with the Energy Strong Monitor, the IM, in its review of this project in the same manner as if it was part of the Energy Strong Program, as long as the Monitor is available under identical or similar terms as in the Energy Strong Program.

This IM Madison 4kV Substation Project Q4 2017 Report is intended to convey the independent monitoring activities of Pegasus-Global that have taken place during the fourth quarter of 2017 on the Madison Project. To the extent information is available after December 31, 2017 through the date of this report that will assist PSE&G, Board of Public Utilities (BPU), Staff, and Rate Counsel it has been included herein.

[1] For the purposes of this report, the project is generally referred to as the Madison Project, which is meant explicitly as the Madison 4kV Substation Project and does not make reference to the Madison 69kV Project that PSE&G is also executing.

II. Background[2]

A history of the Madison and Marshall substations can be found in prior IM reports on the Energy Strong Program.[3]

As of the end of the fourth quarter of 2017, there has been no change in the anticipated scope of work for the Madison Project. As previously described in the IM 2017 Second Quarter Madison Project Report,[4] this project will result in the installation of a new 4kV sheltered aisle switchgear at the Madison 4kV Substation that conforms to the FEMA flood zone advisory base flood elevation plus two feet flood mitigation as required by the City of Hoboken (City). Outside plant underground and overhead infrastructure will be constructed to transfer the Marshall Street substation load to the new Madison Street 4kV substation. The completion of this project will allow for the transfer of the load from the Marshall Street substation to the Madison Street 4kV substation while increasing the overall resiliency and reliability of the new Madison Street 4kV substation infrastructure.

The Madison Project, as with other similar substation projects within the Energy Strong Program, will be performed by the Delivery Projects & Construction (DP&C) group within PSE&G and will be subject to the same processes and procedures DP&C uses for those types of projects, including defining the scope of the project, preparing purchase orders, developing the project's key plan and its project execution plan, issuing drawings, obtaining all required permits, starting and managing construction, and commissioning and startup.

III. Property Transfer Status

A history of the Madison Project property evaluation, remediation, and transfer status leading up to this fourth quarter 2017 report can be found in prior IM reports on the Madison Project.[5]

PSE&G and the City entered into negotiations to address the additional remediation efforts that would be required considering the results of the recent soil sampling tests. The applicable requirements allow for remediation down to a level of 25 ppm PCBs, rather than the 1 ppm level, under certain restrictions including minimal occupancy of the property. As an electric substation, the Madison Project would qualify for this, reducing the estimated cost of the remediation to $2.1 million. Having determined the magnitude of the additional remediation cost, PSE&G and the City continued their negotiations.

Tentative agreement was reach with the City agreeing to split the estimated additional remediation cost of not to exceed $2.1 million, or $1.05 million each. In addition, the City agreed to allow PSE&G to file a lawsuit, at its own expense, against the prior owner of the property, should PSE&G decide to do so. With those parameters agreed between PSE&G and the City, the appropriate documents were prepared for

[2] Rate Counsel, BPU Staff, and PSE&G reached a settlement on November 30, 2016, that noted an agreement that PSE&G may proceed with the Madison Project outside the Energy Strong Program, raising and rebuilding both the Madison and Marshall electric substations at the Madison substation site, subject to certain terms and conditions.
[3] IM 2015 Annual Report, pages 44-48; IM 2016 First Quarter Report, pages 40-43; IM 2016 Revised Second Quarter Report, pages 45-47; IM 2016 Third Quarter Report, pages 37-38; IM 2016 Annual Report, page 46
[4] IM 2017 Second Quarter Madison Project Report, page 2
[5] *See* IM 2017 Second Quarter Madison Project Report, pages 2-3; IM 2017 Third Quarter Madison Project Report, pages 2-3

presentation to the Hoboken City Council for its required approval, presented, and they were all approved on January 3, 2018.

Before any remediation work can start the parties must close on the property, which PSE&G informed the IM occurred on February 15, 2018. PSE&G will now apply for a permit from the Federal EPA to perform the necessary remediation work. PSE&G anticipates the EPA permitting review process to take 30 days. Once the EPA permit is issued, PSE&G will provide a notice to proceed to its remediation contractor. After the property is remediated, the more traditional construction work will start on the raise/rebuild flood mitigation, including relocating the Marshall substation to the expanded Madison site.

The IM continues to be actively engaged in the process including receiving weekly updates from the PSE&G Madison Project team. As the remediation activities must be competed before any construction work can begin, the remediation work is part of the critical path of the Madison Project.

IV. Current Status

Given the criticality of the remediation work, many of the Madison Project schedule milestones dates are at risk including the partial and full in-service dates; as such, the IM cannot provide an assessment regarding the planned milestone completion dates.

Table 1 – Madison Project Milestone Dates and Financial Summary as of December 31, 2017 presents the milestone schedule dates and financial status of the Madison Project based on what is contained on the December 31, 2017 monthly report as well as the Dashboard for the Madison Project dated January 25, 2018.

Table 1 – Madison Project Milestone Dates and Financial Summary as of December 31, 2017

Madison Project Milestone Dates			
Milestone	**Original Date**	**Current Date**	**Status**
Scope Locked	11/23/2016	11/23/2016	Complete
Kick-Off	3/2/2017	3/2/2017	Complete
Utility Review Board (URB) Approval for 2017	3/21/2017	3/21/2017	Complete
Issue Switchgear Purchase Order (PO)	6/1/2017	5/8/2017	Complete
Issue Capacitor Bank PO	6/1/2017	5/8/2017	Complete
Issue Remaining Major Equipment POs	6/1/2017	5/8/2017	Complete
Issue Purchase Order for Structural Steel	12/1/2017	2/23/2018	Revised
Civil Construction Start for Activities Not Requiring Permits	12/8/2017	4/16/2018	At Risk
Complete 70% Cost Estimate	12/29/2017	2/12/2018	Revised
Construction Start for Activities Requiring Permits - Hoboken Site Plan Application	1/2/2018	4/16/2018	PCB Impact
Major Equipment Delivery - Switchgear	2/28/2018	6/30/2018	PCB Impact
Major Equipment Delivery – Capacitor Banks	2/28/2018	7/31/2018	PCB Impact
Drawings – Final Issue for Review (IFR)	3/1/2018	4/10/2018	Revised
Drawings – Final Issue for Construction (IFC)	6/30/2018	6/30/2018	On Target
Partial In-Service	12/31/2018	5/31/2019	PCB Impact
Full In-Service*	12/31/2018	3/31/2020	At Risk
Madison Project Financial Summary			
Item	**Amount in Thousands**		
Project Spend to Date	$19,922		
2017 URB Approval	$7,338		

2017 Year End Forecast	$19,921
Q4 2017 Actuals	$11,246
Q4 2017 Forecast	$12,725
Project Cost Estimate (Study Level Estimate)	$68,800
**The new Madison 4kV Substation will be considered in service by PSE&G's definition when it is energized and carrying load, scheduled for December 2018. Additional load will be added through May 2019. At that point, the additional capacity created by the completion of the Madison 69kV Project, scheduled in December 2019, will be required to transfer any further load onto the new Madison 4kV switchgear in the new Madison 4kV Substation. The final cutover from Marshall, or the Energy Strong definition of "Full In-Service", is therefore March 2020. At that point, all current loads from both the Marshall Street and Madison Street substations will be carried by the new switchgear.*	

As identified in **Table 1**, the fourth quarter of 2017 shows the actual spend on the Madison Project of approximately $11.2 million, approximately $1.5 million below the forecast, for a total project spend as of December 31, 2017 of approximately $19.9 million. The fourth quarter variance was due in part to outside plant dewatering efforts coming in less than forecasted, outside plant civil progress delayed due to underground interferences and city traffic constraints, delayed shipment of piles from September to January 2018 due to the site acquisition delay, and timing of civil vendor invoices (received in October rather than September as forecasted).

The IM will continue to monitor the schedule progress, cost estimates, and the actual spend on the Madison Project. The IM anticipates that as the Madison Project further develops there will be additional milestones, financial, and other information upon which the IM will discuss and report in future quarterly reports.

V. Findings and Observations

- PSE&G and the City have concluded their negotiations and the Hoboken City Council has given its approval for the property transfer. PSE&G closed on the property on February 15, 2018. PSE&G will now apply to the Federal EPA for the required permit to start the remediation work. Once the permit has been granted, the actual remediation work will start. Following completion of the remediation work, the more traditional raise/rebuild construction activities will start on the expanded Madison substation site.
- Based on what is known to PSE&G as of the date of this fourth quarter IM report, the vacant property adjacent to the current Madison Substation site, transferred from the City, has been adequately characterized and will be properly and sufficiently remediated. However, until excavation has commenced, it is unknown at this time whether differing site conditions exist that may require additional remediation. The IM requested, and PSE&G has agreed, that the IM be notified should any unanticipated events occur and to discuss potential plans of action prior to PSE&G executing those plans.
- Considering that the PCB remediation work has yet to be completed, the entire Madison schedule is uncertain and at risk. While PSE&G has developed a schedule and a corresponding cost estimate, the IM considers that schedule and cost estimate as the best available based on the information currently available. As the situation on the site may change, it is likely that the Madison schedule and cost estimate may also change, though the magnitude of such changes remains unknown based on the information available as of December 31, 2017.

- Since the Madison Project is not under the Energy Strong Program it does not have the Stipulation constraints with regard to cost and schedule. However, PSE&G has developed a cost estimate and a schedule that is being monitored by the IM as if they were Stipulation requirements.

MADISON 4kV SUBSTATION PROJECT

INDEPENDENT MONITOR

2017 FOURTH QUARTER REPORT

APPENDIX A – DRAFT REPORT COMMENTS AND RESPONSES

11 APRIL 2018

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Note: The IM captured verbal questions and comments during the presentation of its 2017 Fourth Quarter Report on March 20, 2018. A collection of the verbal comments to the draft report were recorded and distributed to each of the parties, no further comments were received.

Verbal Questions & Comments to the IM 2017 Fourth Quarter Report From the March 20, 2018 Meeting

Question / Comment #	Question / Comment	IM Response	Report Changes (indicates Section #)
1	Current status of EPA approval?	Permit received on April 9, 2018.	No change
2	Is the intent to clear to 1ppm in site remediation?	Targeting a low residency permit, which is to 25 ppm. Have an onsite Licensed Site Remediation Professional (LSRP) handling all aspects of remediation (including signage at the site).	No change
3	Any update on the rebuild by design undertaken by the City of Hoboken?	Going from conceptual to final design, a lengthy process; construction anticipated to start in 2019.	No change
4	Who covers additional remediation costs?	PSE&G has agreement with the City of Hoboken to split remediation costs, and has also agreed to pursue litigation with prior owner (who had responsibility to remediate before transferring land to Hoboken). $2.3 million estimate for remediation is based on LSRP input (previously was estimated at $2.1 million). Anticipating a 4-6 week schedule for remediation.	No change

ENERGY STRONG PROGRAM

INDEPENDENT MONITOR

REVISED 2018 FIRST QUARTER REPORT

PREPARED AND SUBMITTED BY

PEGASUS GLOBAL HOLDINGS, INC. ®

21 JUNE 2018

PUBLIC VERSION

Table of Contents

List of Acronyms/Abbreviations

Allowance for Funds Used During Construction	AFUDC
Atlantic City Electric Company	ACE
Board of Public Utilities	BPU
Construction Work-in-Progress	CWIP
Costs of Removal	COR
Fulltime Equivalents	FTEs
Independent Monitor	IM
Jersey City Power & Light	JCP&L
Metering and Regulating	M&R
Pegasus-Global Holdings, Inc.	Pegasus-Global
Port Authority of New York and New Jersey	Port Authority
Program Management Office	PMO
PSEG Long Island	PSEG-LI
Public Service Electric and Gas Company	PSE&G
Public Service Enterprise Group	PSEG
Quality Assurance	QA
Quality Control	QC
Record of Decision	ROD
Risk & Contingency	R&C
Supervisory Control and Data Acquisition	SCADA
Utility Review Board	URB
Utilization Pressure Cast Iron	UPCI

Executive Summary

I. Introduction

Pegasus-Global Holdings, Inc. (Pegasus-Global) was engaged by Public Service Electric and Gas Company (PSE&G) to provide independent monitoring services for PSE&G's Energy Strong Program. Under the Stipulation approved by the May 21, 2014 Order, PSE&G was required to hire a monitor to:

> *"[R]eview and report to Board Staff and Rate Counsel on the impact of the Energy Strong program on overall system performance during severe weather events; cost effectiveness and efficiency; appropriate cost assignment; and other information deemed appropriate by the Company, Board Staff and Rate Counsel."*

The independent monitor (IM) scope of work revolves around three primary tasks:

1) Review and report on the impact of the Energy Strong Program on overall system performance during severe weather events;
2) Review and report on cost effectiveness and efficiency; and,
3) Review and report on appropriate cost assignment.

This IM 2018 First Quarter Report is intended to convey the independent monitoring activities of Pegasus-Global that have taken place during the first quarter of 2018. To the extent information is available after March 31, 2018 through the date of this IM 2018 First Quarter Report that will assist PSE&G, Board of Public Utilities (BPU) Staff, and Rate Counsel, it has been included herein.

II. Highlights

A. Energy Strong Costs and Schedule to Date

The Stipulation provided the general requirements and scope for each subprogram. Based on its review of the Energy Strong Program, the IM continues to find that PSE&G is progressing the work within the general requirements of the Stipulation. As of the date of this IM 2018 First Quarter Report, four of the five Energy Strong subprograms have been completed (meaning all projects placed in-service), and the remaining subprogram, Electric Station Flood Mitigation, remains on schedule and on budget for the total program completion at or before May 23, 2019.

A summary of the overall subprogram cost and schedule status as of March 31, 2018, is provided in **Table II-1 – Energy Strong Program Summary Cost and Schedule as of March 31, 2018**. As this table provides a high-level summary of the subprograms, it is the intent of the IM to update the plan/estimate status on an annual basis, while providing quarterly updates to the actual amounts.

As can be seen from **Table II-1**, four of the five subprograms were successfully placed in-service prior to the Stipulation mandated date, each of which was completed at or within budget. The first subprogram completed, the UPCI subprogram, was completed on July 22, 2016 at approximately 100% of its budgeted cost; the Advanced Technologies subprogram was completed on April 20, 2017 at approximately 99% of its budgeted cost; the Gas M&R subprogram was completed on May 12, 2017 at

approximately 84% of its budgeted cost; and, the Contingency Reconfiguration subprogram was completed on May 21, 2017 at approximately 90% of its budgeted cost. Closeout of the UPCI, Contingency Reconfiguration, and Advanced Technologies subprogram has been completed while the Gas M&R subprogram continues to go through subprogram closeout, meaning final costs are still be reconciled as the final invoices are processed.

Table II-1 – Energy Strong Program Summary Cost and Schedule as of March 31, 2018

Subprogram	Status Point	2014				2015				2016				2017				2018				2019		Total $
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	(in thousands)
Electric Station Flood Mitigation	Dec. 2014 Plan/Estimate																						Stipulation End Date	$620,000*
	Dec. 2015 Plan/Estimate																							$620,000*
	Dec. 2016 Plan/Estimate																							$620,000*
	Dec. 2017 Plan/Estimate																							$620,000*
	Actual	67% spent																						$417,418
Gas M&R Flood Mitigation	Dec. 2014 Plan/Estimate																						Stipulation End Date	$50,000
	Dec. 2015 Plan/Estimate^																							$36,500
	Dec. 2016 Plan/Estimate**																							$30,000
	Dec. 2017 Plan/Estimate	*Final project in-service as of May 12, 2017 (closeout remains)*																						$30,000
	Actual	84% spent													X									$25,284
UPCI Replacement	Dec. 2014 Plan/Estimate																							$350,000
	Dec. 2015 Plan/Estimate^																							$363,500
	Dec. 2016 Plan/Estimate**	*Final construction/restoration complete as of July 22, 2016*																						$370,000
	Actual	100% spent											X											$370,015
Advanced Technologies	Dec. 2014 Plan/Estimate																							$100,000
	Dec. 2015 Plan/Estimate																							$100,000
	Dec. 2016 Plan/Estimate***																							$105,000
	Dec. 2017 Plan/Estimate	*Final project in-service as of April 20, 2017*																						$107,000
	Actual^^	99% spent													X									$106,218
Contingency Reconfiguration	Dec. 2014 Plan/Estimate																							$100,000
	Dec. 2015 Plan/Estimate																							$100,000
	Dec. 2016 Plan/Estimate***																							$95,000
	Dec. 2017 Plan/Estimate	*Final project in-service as of May 21, 2017*																						$93,000
	Actual^^	90% spent													X									$83,614

**-The Stipulation allows PSE&G to invest $620 million in the Electric Station Flood Mitigation subprogram; however, the Stipulation provides that the amounts beyond the first $400 million shall be recovered through a traditional rate recovery mechanism rather than through the electric Energy Strong Adjustment Mechanism.*
***-In May 2016, $6.5 million was transferred from the Gas M&R subprogram to the UPCI subprogram. This is reflected in the Dec. 2016 Plan/Estimate figure.*
****-In June 2016, $5 million was transferred from the Contingency Reconfiguration subprogram to the Advanced Technologies subprogram. This is reflected in the Dec. 2016 Plan/Estimate figure.*
^-The Dec. 2015 estimates for the Gas M&R and UPCI subprograms in previous IM reports reflected the preliminary amount of the transfer identified as $13.4 million in Record of Decision #9 (from Gas M&R to UPCI); the formal transfer, as memorialized in a notice provided to the BPU on December 21, 2015 provided the actual transfer amount was $13.5 million (rounded) and was reflected in a revision to Record of Decision #9. This table shows the actual resulting subprogram estimates following the formal transfer of funds.
^^-In March 2017, an additional $2 million was transferred from the Contingency Reconfiguration subprogram to the Advanced Technologies subprogram. The actual percent spent for these subprograms is reflective of the post-transfer balances (i.e. $93 million for Contingency Reconfiguration, $107 million for Advanced Technologies).
X-*Indicates quarter in which the final investment/project within a subprogram was placed in-service.*

Additional detailed information as to the cost and schedule status of each subprogram is contained within the respective sections of this IM 2018 First Quarter Report.

Given the prominence of the Electric Station Flood Mitigation subprogram, **Table II-2 – Electric Station Flood Mitigation Summary Cost and Schedule as of March 31, 2018** depicts the status of the 26 substations that comprise this subprogram. **Table II-2** highlights the scheduled (or actual) kickoff date, start of construction, in-service date, and closeout date, comparing the status as of December 2014 to the status as of December 2015, December 2016, and December 2017. In addition, the current status for each substation is identified along with the actual spend to date through March 31, 2018.

Table II-2 – Electric Station Flood Mitigation Summary Cost and Schedule as of March 31, 2018

Project	Status Point	2014				2015				2016				2017				2018				2019		Total $
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	(in thousands)
Bayonne	Dec. 2014 Plan/Estimate						KO					C		CO									Program End Date Per Stipulation - May 23, 2019	$42,300
	Dec. 2015 Plan/Estimate					KO					C			IS	CO									$37,600
	Dec. 2016 Plan/Estimate					KO					C				IS	CO								$34,000
	Dec. 2017 Plan/Estimate					KO					C					IS	CO							$34,000
	Actual					KO					C					IS	CO							$31,252
Bayway 26kV	Dec. 2014 Plan/Estimate						KO		C					CO										$26,600
	Dec. 2015 Plan/Estimate				KO				C		IS	CO												$22,000
	Dec. 2016 Plan/Estimate				KO				C		IS		CO											$23,700
	Actual				KO				C		IS		CO											$23,152
Bayway 4kV	Dec. 2014 Plan/Estimate						KO								C				CO					$11,100
	Dec. 2015 Plan/Estimate						KO					C			IS/OS			CO						$8,800
	Dec. 2016 Plan/Estimate						KO				C				IS	OS		CO						$8,800
	Dec. 2017 Plan/Estimate						KO				C				IS	OS		CO						$8,800
	Actual						KO				C				IS	OS								$8,247
Belmont	Dec. 2014 Plan/Estimate				KO		C			IS		CO												$2,700
	Dec. 2015 Plan/Estimate				KO			C		IS		CO												$6,200
	Dec. 2016 Plan/Estimate				KO			C			IS/CO													$5,300
	Actual				KO			C			IS/CO													$4,912
Cranford	Dec. 2014 Plan/Estimate			KO								C				IS	CO							$23,100
	Dec. 2015 Plan/Estimate			KO								C			IS		CO							$27,000
	Dec. 2016 Plan/Estimate			KO									C					IS			CO			$37,400
	Dec. 2017 Plan/Estimate			KO									C					IS					CO	$35,400
	Actual			KO									C					IS						$26,732
Essex	Dec. 2014 Plan/Estimate			KO				C								IS			CO					$76,700
	Dec. 2015 Plan/Estimate				KO	C									IS		CO							$69,900
	Dec. 2016 Plan/Estimate				KO	C									IS					CO				$42,300
	Dec. 2017 Plan/Estimate				KO	C												IS			CO			$42,300
	Actual				KO	C																		$32,527
Ewing	Dec. 2014 Plan/Estimate						KO				C				CO									$10,500
	Dec. 2015 Plan/Estimate						KO							C	IS				CO					$10,500
	Dec. 2016 Plan/Estimate						KO						C		IS		CO							$8,700
	Dec. 2017 Plan/Estimate						KO						C			IS							CO	$8,700
	Actual						KO						C			IS								$7,671
Garfield Place	Dec. 2014 Plan/Estimate							KO/C					CO											$13,100
	Dec. 2015 Plan/Estimate							KO		C							IS	OS		CO				$14,900
	Dec. 2016 Plan/Estimate							KO			C				IS		OS		CO					$14,900
	Dec. 2017 Plan/Estimate							KO		^	C				IS		OS/CO							$14,900
	Actual							KO		^	C				IS		OS/CO							$11,834
Hackensack	Dec. 2014 Plan/Estimate				KO					C						IS		CO						$34,500
	Dec. 2015 Plan/Estimate				KO					C					IS		CO							$50,000
	Dec. 2016 Plan/Estimate				KO					C					IS				CO					$34,000
	Dec. 2017 Plan/Estimate				KO					C					IS		CO							$34,000
	Actual				KO					C					IS		CO							$32,527
Hillsdale	Dec. 2014 Plan/Estimate			KO					C						IS		CO							$25,900
	Dec. 2015 Plan/Estimate			KO						C					IS		CO							$25,900
	Dec. 2016 Plan/Estimate			KO						C							IS	CO						$30,700
	Dec. 2017 Plan/Estimate			KO						C							IS		CO					$28,800
	Actual			KO						C							IS							$25,714
Hoboken	Dec. 2014 Plan/Estimate			KO				C					IS		CO									$28,800
	Dec. 2015 Plan/Estimate				KO				C				IS		CO									$35,000
	Dec. 2016 Plan/Estimate				KO				C						IS		CO							$29,600
	Dec. 2017 Plan/Estimate				KO				C						IS				CO					$29,600
	Actual				KO				C						IS									$24,920
Howell Street	Dec. 2014 Plan/Estimate						KO		C					CO										$26,000
	Dec. 2015 Plan/Estimate						KO					C			IS	CO								$19,500
	Dec. 2016 Plan/Estimate						KO						C		IS	CO								$16,700
	Dec. 2017 Plan/Estimate						KO						C		IS				CO					$16,700
	Actual						KO						C		IS									$9,031
Jackson Road	Dec. 2014 Plan/Estimate				KO		C			IS		CO												$16,600
	Dec. 2015 Plan/Estimate				KO						C						IS		CO					$20,200
	Dec. 2016 Plan/Estimate				KO										C		IS		CO					$16,700
	Dec. 2017 Plan/Estimate				KO									C					IS				CO	$14,100
	Actual				KO									C				IS						$9,133

Project	Status Point	2014				2015				2016				2017				2018				2019		Total $
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	(in thousands)
Jersey City	Dec. 2014 Plan/Estimate						KO		C					CO										$27,800
	Dec. 2015 Plan/Estimate						KO						C		IS	CO								$21,000
	Dec. 2016 Plan/Estimate						KO					C			IS		CO							$14,900
	Dec. 2017 Plan/Estimate						KO					C					IS		CO					$14,900
	Actual						KO					C					IS							$7,355
Linden	Dec. 2014 Plan/Estimate						KO		C					CO										$18,000
	Dec. 2015 Plan/Estimate				KO			C			IS	CO												$15,400
	Dec. 2016 Plan/Estimate				KO			C		IS			CO											$15,400
	Actual				KO			C		IS			CO											$15,783
Little Ferry	Dec. 2014 Plan/Estimate			KO	C						IS		CO											$2,800
	Dec. 2015 Plan/Estimate			KO		C						IS/OS		CO										$6,500
	Dec. 2016 Plan/Estimate			KO		C					IS	OS	CO											$6,500
	Actual			KO		C					IS	OS	CO											$5,022
Marion	Dec. 2014 Plan/Estimate		KO			C					IS			CO										$19,200
	Dec. 2015 Plan/Estimate					KO		C					IS		CO									$13,800
	Dec. 2016 Plan/Estimate					KO		C						IS		CO								$13,800
	Dec. 2017 Plan/Estimate					KO		C							IS			CO						$13,800
	Actual					KO		C							IS									$14,751
New Milford	Dec. 2014 Plan/Estimate			KO							C			IS		CO								$21,200
	Dec. 2015 Plan/Estimate			KO								C				IS			CO					$21,200
	Dec. 2016 Plan/Estimate			KO								C					IS			CO				$22,600
	Dec. 2017 Plan/Estimate			KO								C					IS		CO					$18,600
	Actual			KO								C					IS							$13,652
Port Street	Dec. 2014 Plan/Estimate											KO				C			CO					$25,000
	Dec. 2015 Plan/Estimate										KO					C	IS			CO				$25,000
	Dec. 2016 Plan/Estimate										KO			C	IS		CO							$19,600
	Dec. 2017 Plan/Estimate										KO				C				IS		CO			$15,100
	Actual										KO				C									$10,719
Rahway	Dec. 2014 Plan/Estimate				KO	C					IS	CO												$5,900
	Dec. 2015 Plan/Estimate			KO				C					IS		CO									$4,800
	Dec. 2016 Plan/Estimate			KO				C		OS			IS			CO								$5,900
	Actual			KO				C		OS			IS			CO								$5,860
River Edge	Dec. 2014 Plan/Estimate			KO/C	IS		OS		CO															$7,500
	Dec. 2015 Plan/Estimate			KO/C	IS			OS	CO															$6,700
	Dec. 2016 Plan/Estimate			KO/C	IS			OS	CO															$6,700
	Actual			KO/C	IS			OS	CO															$6,405
Sewaren	Dec. 2014 Plan/Estimate			KO		C					IS		CO											$22,400
	Dec. 2015 Plan/Estimate			KO		C				IS		CO												$30,900
	Dec. 2016 Plan/Estimate			KO		C				IS	CO													$24,300
	Actual			KO		C				IS	CO													$24,962
Somerville	Dec. 2014 Plan/Estimate			KO		C					IS		CO											$10,900
	Dec. 2015 Plan/Estimate			KO			C		IS			CO												$8,400
	Dec. 2016 Plan/Estimate			KO			C		IS		CO													$5,800
	Actual			KO			C		IS		CO													$6,041
So. Waterfront	Dec. 2014 Plan/Estimate			KO	C						IS		CO											$55,800
	Dec. 2015 Plan/Estimate			KO	C						IS			CO										$61,300
	Dec. 2016 Plan/Estimate			KO	C							IS				CO								$51,000
	Actual			KO	C							IS	CO											$50,956
St Paul's	Dec. 2014 Plan/Estimate						KO							C		CO								$2,800
	Dec. 2015 Plan/Estimate						KO							C/IS/OS			CO							$1,400
	Dec. 2016 Plan/Estimate						KO							C/IS/OS										$1,400
	Dec. 2017 Plan/Estimate						KO								C	IS	OS		CO					$1,400
	Actual						KO								C	IS	OS							$493
Third Street	Dec. 2014 Plan/Estimate							KO/C						CO										$16,200
	Dec. 2015 Plan/Estimate						KO	C					IS			CO								$12,400
	Dec. 2016 Plan/Estimate						KO	C									IS		OS		CO			$12,404
	Dec. 2017 Plan/Estimate						KO	C									IS		OS		CO			$12,054
	Actual						KO	C									IS							$7,799

Program End Date Per Stipulation - May 23, 2019

Legend: KO = Kickoff; C = Construction; IS = Fully In-Service; OS = Out-of-Service (if eliminated); CO = Closeout

Note: due to the early status of the subprogram as of December 2014, some stations did not have a defined in-service date at the time, thus there may be no 'IS' designation for the Dec. 2014 plan in some cases. Additionally, the Kickoff milestone was not included in the schedule at this time, so the 'KO' for the Dec. 2014 plan is the quarter following the procurement of consultants or the quarter for which the consultant contract was issued (if data is available) to allow for a rough comparison.

Rate Counsel, BPU Staff, and PSE&G reached a settlement on November 30, 2016 that noted an agreement that PSE&G may proceed with the Madison and Marshall projects outside the Energy Strong Program, raising and rebuilding both the Madison and Marshall electric substations at the Madison Substation site, subject to certain terms and conditions. Thus, Madison and Marshall have been removed from this table and are now discussed independently of the Energy Strong Program.

^-Garfield Place outside plant construction began in Q1 2016, with inside plant construction starting in Q2 2016.

1. Costs to Date[1]

A summary of the Energy Strong Program costs is presented in **Table II-3 – Q1 2018 Energy Strong Program Cost Summary**.[2] Detailed discussions of each subprogram's costs are discussed in the respective section of this IM 2018 First Quarter Report.

Table II-3 – Q1 2018 Energy Strong Program Cost Summary

Subprogram	2018 Q1 Spend	2018 Year-to-Date Subprogram to Date	Stipulation Amount	% of Subprogram Spent to Date
	(in thousands)			
Electric Station Flood Mitigation	$10,599	$417,418	$620,000*	67%
Gas M&R Flood Mitigation	$33	$25,284	$30,000**	84%
UPCI Replacement	$0	$370,015	$370,000**	100%
Advanced Technologies	$0	$106,218	$107,000***	99%
Contingency Reconfiguration	$0	$83,614	$93,000***	90%
Total Energy Strong	**$10,631**	**$1,002,549**	**$1,220,000***	**82%**

**-The Stipulation allows PSE&G to invest $620 million in the Electric Station Flood Mitigation subprogram; however, the Stipulation provides that the amounts beyond the first $400 million shall be recovered through a traditional rate recovery mechanism rather than through the electric Energy Strong Adjustment Mechanism.*
***-In December 2015, $13.5 million was transferred from the Gas M&R subprogram to the UPCI Replacement subprogram; and in May 2016, an additional $6.5 million was transferred from the Gas M&R subprogram to the UPCI Replacement subprogram; these figures reflect this reallocation of the respective budgets.*
****-In June 2016, $5 million was transferred from the Contingency Reconfiguration subprogram to the Advanced Technologies subprogram, and in March 2017, an additional $2 million was transferred; these figures reflect this reallocation of the respective budgets.*

Essentially all of the Energy Strong spend in the first quarter of 2018 continued to be within the Electric Station Flood Mitigation subprogram with some additional spend in the Gas M&R subprogram predominantly related to closeout/trailing costs. Of the four completed subprograms, each was completed under the Stipulation amount as revised by the selected inter-subprogram transfers that took place during execution of the subprograms. The Electric Station Flood Mitigation subprogram comprises approximately half of the overall amount of the Energy Strong Program (including the additional $220 million to be recovered through a traditional rate recovery mechanism), and is the only active subprogram following the completion of the Gas M&R, Advanced Technologies, and Contingency Reconfiguration subprograms during the second quarter of 2017. As of the end of the end of the first quarter of 2018, the Electric Station Flood Mitigation subprogram is also tracking under budget, resulting in the actual costs of the overall Energy Strong Subprogram remaining below the Stipulation amount.

2. Forecast vs. Actual

Table-II-4 – Energy Strong Q1 2018 Forecast vs. Actual Spend examines the PSE&G forecasted costs versus actual costs spent during the first quarter of 2018. Variances in these amounts can often result from

[1] Per the November 30, 2016 Agreement between PSE&G, Rate Counsel, and BPU Staff, the Madison and Marshall substation projects are no longer a part of the Energy Strong Program, as such, the prior actual costs of those projects have been removed from the Electric Station Flood Mitigation subprogram figures.
[2] Note: for consistency and readability, the numbers presented in this IM 2018 First Quarter Report are rounded to the nearest thousand when shown in a table. In some cases, this may cause a minor discrepancy in total/sum amounts due to the rounding of numbers.

the timing of payments (i.e. costs being realized in late March instead of early April as forecasted would potentially indicate higher spend in the first quarter than forecasted, which would typically be offset in the following quarter).

Table II-4 – Energy Strong Q1 2018 Forecast vs. Actual Spend

Subprogram	Q1 2018 Forecasted Spend^	Q1 2018 Actual Spend	Variance*	% of Variance*
	(in thousands)			
Electric Station Flood Mitigation	$10,005	$10,599	$594	6%
Gas M&R Flood Mitigation	$41	$33	($8)	(20%)
UPCI Replacement	$0	$0	$0	0%
Advanced Technologies	$0	$0	$0	0%
Contingency Reconfiguration	$0	$0	$0	0%
Total Energy Strong	**$10,046**	**$10,631**	**$585**	**6%**

^-Due to PSE&G not using a forecast for the month of January, actual January numbers were used in the forecast column in order to demonstrate as complete a picture as possible for the first quarter as a whole.
**-Negative values indicate less spent than forecasted, positive values indicate more spent than forecasted for Q1.*

Total Energy Strong Program spend during the first quarter of 2018 was within 6% of the forecasted spend. The notable variance during the first quarter of 2018 from a dollar standpoint came within the Electric Station Flood Mitigation subprogram, which experienced actual spend 6% above the forecast for the first quarter. This variance was largely the result of an invoice paid to the underground contractor for the Third Street substation in February that was not forecasted in that quarter and the cost of crews at the Essex Switching Station that were able to perform cutover work earlier than anticipated.

A summary of the notable overall variances in the forecasted versus actual spend for the first quarter of 2018 is presented in each subprogram's respective section of this IM 2018 First Quarter Report as appropriate.

3. Allowance for Funds Used During Construction (AFUDC)

The amount of AFUDC recorded by the Company for each Energy Strong subprogram during each of the first quarter of 2018 (and for comparative purposes only, the fourth quarter of 2017), the full years 2014-2017, and total Energy Strong AFUDC accrued to date, is shown below in **Table II-5 – Recorded AFUDC by Energy Strong Subprogram as of March 31, 2018**.

Table II-5 – Recorded AFUDC by Energy Strong Subprogram as of March 31, 2018

Subprogram	Q1 2018	Q4 2017	2017 YTD	2016 Total	2015 Total	2014 Total	Total to Date
	(in thousands)						
Electric Station Flood Mitigation	$135	$344	$4,116	$5,284	$2,963	$125	$12,623
Gas M&R Flood Mitigation	$0	$0	$236	$361	$161	$3	$761
UPCI Replacement	$0	$0	$0	$0	$0	$0	$0
Advanced Technologies	$0	$0	$52	$649	$713	$80	$1,494
Contingency Reconfiguration	$0	$0	($4)	$152	$778	$228	$1,154
Total Energy Strong	**$135**	**$344**	**$4,400**	**$6,446**	**$4,615**	**$436**	**$16,032**

During the first quarter of each year, the AFUDC rate is reviewed for possible reset as it applies the current year based on updated capital structure and component cost data. If reset, the new rate is applied retroactively to January 1 of the current year. For the year 2018, a reset AFUDC rate was calculated to be 7.01% (vs. 6.96 in 2017), using the capital structure and component costs as of January 31, 2018. In calculating the 2018 reset AFUDC rate, the Company used (i) a 4.03% embedded cost of long term debt (vs. 4.09 % in 2017), (ii) a short term debt rate of 1.77% (vs. 0.98% in 2017), (iii) a cost of equity of 9.75% (no change from 2017), and (iv) an average short term debt to average construction work in progress (CWIP) ratio of 1.50% (vs. 1.80% in 2017).

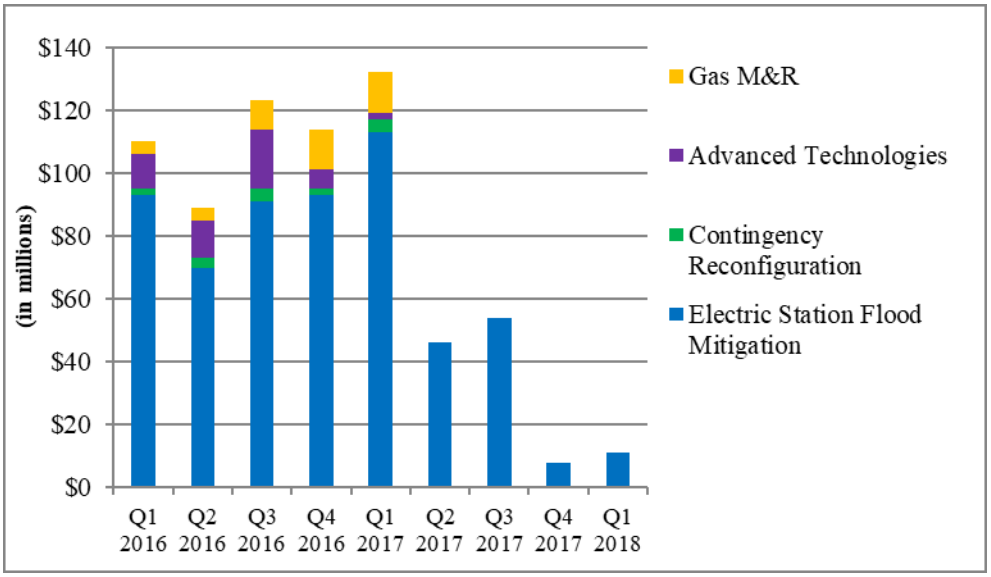
Subsequent to the annual reset calculation referred to above, and during the course of each year, the AFUDC rate is also recalculated as it applies to each fiscal quarter. If the recalculated rate changes by 25 basis points from the rate then in effect, the rate is reset and retroactively applied to January 1 of that year. For the first quarter of 2018, the recalculated weighted average AFUDC accrual rate was 7.00%, which did not meet the criterion to warrant changing from the annual rate of 7.01% then in effect. Therefore, AFUDC was accrued during the first quarter of 2018 at the calculated rate of 7.01%. The ratio of average short-term debt to average total CWIP (a component of the AFUDC calculation) was 1.50% in the currently implemented AFUDC rate calculation, compared to 1.64% in the recalculated rate.

AFUDC accrued for Energy Strong projects during the first quarter of 2018 was incurred entirely by projects in the Electric Station Flood Mitigation subprogram. For the first quarter of 2018, AFUDC decreased by 61% from the fourth quarter of 2017. This is the result of a 26% decrease in the average month-end balances of CWIP during the first quarter of 2018 from the fourth quarter of 2017. The reduction in average CWIP reflects several project transfers from CWIP to installed plant that occurred in the fourth quarter of 2017, as noted in the IM's 2017 Annual Report.

End-of-quarter CWIP – Virtually the entirety of total end-of-quarter CWIP was associated with the Electric Station Flood Mitigation subprogram. At the end of the first quarter 2018, the Energy Strong CWIP balance was $11.2 million, compared to $7.6 million at the end of the fourth quarter of 2017, which is attributable to the increase in Port Street CWIP, the only Energy Strong project that has a material CWIP balance ($11.0 million) at the end of the first quarter. These figures do not reflect certain accounting adjustments affecting both quarters arising from a reclassification of costs of removal recorded in the fourth quarter of 2017 that should have been charged to CWIP (see "Costs of Removal" below). The adjustments would have had minimal impact on the amount of AFUDC accrued.

Depicted below in **Figure II-1 – Quarterly CWIP Balances by Subprogram as of March 31, 2018** is the composition of the end-of-quarter balances of CWIP by subprogram for each quarter of 2016 and 2017, and for the first quarter of 2018. The balances for the end of the fourth quarter of 2017 and the first quarter of 2018 do not reflect the accounting adjustments referred to above and in "Costs of Removal" below.

Figure II-1 – Quarterly CWIP Balances by Subprogram as of March 31, 2018



The IM observes that the Company's calculation of the AFUDC rate and its application is in accordance with both PSE&G's accounting policy and Plant Instruction 3(17) of the Federal Regulatory Commission's Uniform Systems of Accounts prescribed for public utilities.

The IM also notes that the relevant AFUDC information as it relates to first quarter of 2018 Energy Strong projects is consistent, where appropriate, with information filed in PSE&G's Energy Strong current electric and gas roll-in filings, and specifically historical AFUDC rates, embedded cost of long term debt, and the use of a 9.75% cost of equity, which was the subject of the settlement agreement reached in August 2015 and the subsequent BPU Order. The IM will continue to review future Energy Strong AFUDC accruals for consistency with relevant provisions of roll-in filings, the Stipulation, the settlement agreement and BPU Order for accounting and reporting purposes only, and not as a party to, or in expressing an opinion concerning, any rate proceedings.

4. Costs of Removal (COR)

Under the May 2014 Stipulation, PSE&G may seek to recover an investment in Energy Strong projects of up to $1 billion through the stipulated cost recovery mechanism. The $1 billion of investment is to include actual costs of removal (COR) expenditures, thereby providing a return on this investment; however, revenue requirements will not include an expense for recovery of COR, unless embedded in depreciation rates. COR generally includes costs for such removal activities as environmental (soil and water) removal, inside station equipment, structures, foundations, towers and fixtures, conductors and other electrical devices, poles and fixtures, transformers, plant demolition, foundations, and removal of underground conduit and other wiring.[3]

Table II-6 – Energy Strong Costs of Removal as of March 31, 2018 below itemizes the charges to COR for the first quarter of 2018, annual amounts of COR for the years 2014-2017, and total Energy Strong COR to date. These amounts do not reflect any salvage value reductions, which generally have been *de minimis* amounts for the Energy Strong Program.

[3] See also, PSE&G's letter to the BPU, "Material Requested during the Meeting with the Energy Strong Monitor on September 16, 2015 (supplement to material provided December 6, 2016)", February 3, 2017

Table II-6 – Energy Strong Costs of Removal as of March 31, 2018

Subprogram	2018 Q1	2017 Total	2016 Total	2015 Total	2014 Total	Total to Date
Electric Station Flood Mitigation	($837)	$6,917	$21,539	$4,984	$672	$33,275
Gas M&R Flood Mitigation	$1	$132	$273	$172	$0	$578
UPCI Replacement	$0	$0	$5,560	$7,956	$1,451	$14,967
Advanced Technologies	$0	$796	$3,281	$3,319	$575	$7,971
Contingency Reconfiguration	$0	$742	$2,070	$3,502	$3,192	$9,506
Total	**($836)**	**$8,587**	**$32,723**	**$19,933**	**$5,890**	**$66,297**

Although recorded COR charges for the first quarter of 2018, essentially all of which were incurred in the Electric Station Flood Mitigation subprogram, were negative $0.8 million, this reflects certain accounting adjustments made during the quarter to reverse COR costs recorded in the fourth quarter of 2017 that should have been charged to CWIP. The adjustment included $0.8 million of dewatering costs at Essex and $0.5 million of soil removal costs at Port Street.

After giving effect to these corrections, total Energy Strong COR for the first quarter of 2018 would have been approximately $0.5 million. COR for the first quarter reflected continued equipment removal and foundation demolition work primarily at the Cranford, Hillsdale, and Bayonne projects.

The IM notes that the relevant information as it relates to first quarter 2018 Energy Strong COR is generally consistent with COR information filed in PSE&G's current Energy Strong electric and gas roll-in filings, including recognition of accounting adjustments referred to above. The IM will continue to review future Energy Strong COR for consistency with relevant provisions of roll-in filings, the Stipulation, the settlement agreement and BPU Order for accounting and reporting purposes only, and not as a party to, or in expressing an opinion concerning, any rate proceedings.

B. Recommendation Update

1. Recommendations Raised During Energy Strong Status Meetings

All prior recommendations made by the IM at the Energy Strong Status Meetings have been satisfactorily addressed by PSE&G and have been closed. During the first quarter of 2018, there were no new recommendations made at the meetings.[4]

C. Reporting

As noted in the Stipulation, PSE&G is to provide the BPU Staff and Rate counsel a quarterly report that demonstrates the following:

- *The estimated quantity of work and the quantity completed to date or, if the project cannot be quantified with numbers, the major tasks completed, e.g., design phase, material procurement, permit gathering, phases of construction, etc.;*

[4] In the IM's reports, only those outstanding recommendations and recommendations made during the reporting period will be shown. An appendix of all IM recommendations will be attached to all IM Annual Reports.

- *The forecasted and actual Energy Strong costs to date for the quarterly reporting period and for the program-to-date;*
- *The estimated Energy Strong project completion date.*

The IM observes that the PSE&G quarterly reports, up through the most recent report provided for the first quarter of 2018, contain accurate information based on the data available to and reviewed by the IM. Based on the IM's review of the PSE&G reports and the IM's continued monitoring of the Energy Strong Program, the IM continues to find that the overall estimated Energy Strong Program completion date remains ahead of the Stipulation completion date.

III. Major Decisions

A. Records of Decisions

To capture formalized decisions regarding the Energy Strong Program, PSE&G completes a "Record of Decision" (ROD) that includes a description of the decision; alternatives considered; the decision made; and, rationale for the decision. In accordance with the IM's contractual scope of work, Task 2.2.1, the RODs are reviewed for reasonableness and prudency by the IM as they are completed. In addition, the IM may request PSE&G to complete a ROD to formalize a decision if such a decision has not yet been formalized.

As of March 31, 2018, there were no new or pending RODs. The approved RODs are presented below in **Table III-1 – Energy Strong Record of Decisions**. This includes information on the content of the ROD, the date of the ROD, and in which IM report it was discussed.

Table III-1 – Energy Strong Record of Decisions

ROD #	Title	Date ROD Approved	IM Comments*
1	Relay/ SCADA [Supervisory Control and Data Acquisition] Upgrade (Construction)	3/11/2015 (Rev. 1)	Reasonable and Prudent *(See 2014 IM Annual Report, Section 4.4)*
2	UP Cast Iron Replacement	1/14/2015	Reasonable and Prudent *(See 2014 IM Annual Report, Section 7.9)*
3	M&R Station Selection and Mitigation Method	1/15/2015	Reasonable and Prudent *(See 2014 IM Annual Report, Section 4.6)*[5]
4	Energy Strong PMO [Program Management Office] – Scheduling Methodology	2/4/2015	Reasonable and Prudent *(See 2014 IM Annual Report, Section 5.4.1)*
5	Energy Strong Contingency Reconfiguration Project Selection	4/17/2015 (Rev. 1) 2/10/2016 (Rev. 2)	Reasonable and Prudent *(See 2014 IM Annual Report, Section 7.8; 2015 First Quarter Report Section X.C; and the 2016 First Quarter Report, Section III. D.)*
6	Utility Review Board (URB) Notification for Projects >$1.0M	3/11/2015	Reasonable and Prudent *(See 2015 First Quarter Report Section X.C)*

[5] The M&R station selection and mitigation method was formalized through inclusion in the Stipulation.

ROD #	Title	Date ROD Approved	IM Comments*
FM-61	Documentation of the In-Service Process for Assets Associated with the 29 Energy Strong Electric Station Flood Mitigation Projects	6/26/2015	Reasonable and Prudent *(See 2015 Second Quarter Report Section III. D.)*
FM-216	Newark Airport Scope Change	6/26/2015	Reasonable and Prudent *(See 2015 Second Quarter Report Section III. B.)*
7	Energy Strong – Program Management Office (PMO) – Quality Assurance/Quality Control (QA/QC) Plan	10/21/2015	Reasonable and Prudent *(See Section II. B. in the IM 2015 Third Quarter Report, and in the IM 2015 Second Quarter Report Section II. B.)*
8	ES – Harrison (Propane) Project Scope Change	7/23/2015	Reasonable and Prudent *(See 2015 Second Quarter Report Section III. C.)*
9	UPCI – Increase in Investment Funding	10/7/2015 Rev. 10/25/2016	Reasonable and Prudent *(See Section III. C. in the IM 2015 Third Quarter Report, and Section III. C. in the IM 2015 Annual Report)*
FM-269	Rahway Electric Substation Change in Mitigation Method	4/20/2015	Reasonable and Prudent *(See 2015 Second Quarter Report Section III. B.)*
FM-314	Bayway Electric Substation Change in Mitigation Method	4/20/2015	Reasonable and Prudent *(See 2015 Second Quarter Report Section III. B.)*
FM-322	Third St. Electric Substation Change in Mitigation Method	4/20/2015	Reasonable and Prudent *(See 2015 Second Quarter Report Section III. B.)*
FM-401	Garfield Place Electric Substation Change in Mitigation Method	11/17/2015	Reasonable and Prudent *(See 2015 Third Quarter Report Section III. B., and Section III. B in the IM 2015 Annual Report)*
FM-411	Little Ferry Electric Substation Change in Mitigation Method	10/6/2015	Reasonable and Prudent *(See 2015 Third Quarter Report Section III. B.)*
FM-414	South Waterfront Electric Substation Additional Scope	12/18/2015	Reasonable and Prudent *(See Section III. D. in the IM 2015 Annual Report)*
FM-415	Sewaren Electric Substation Additional Scope	5/21/2015**	Reasonable and Prudent *(See Section III. D. in the IM 2015 Annual Report)*
FM-419	South Waterfront Helical Piles	5/4/2016	Reasonable and Prudent *(See Section III. C. in the IM 2016 First Quarter Report)*
FM-420	St. Paul's Unit Substation Change in Mitigation Method	11/19/2015**	Reasonable and Prudent *(See Section III.B. in the IM 2015 Second Quarter Report)*
11	Newark Airport Gas M&R Station Scope Change	5/3/2016	Reasonable and Prudent *(See Section III. E. in the IM 2016 First Quarter Report)*
FM-421	Port Street Electric Substation Scope Change	5/11/2016	Reasonable and Prudent *(See Section III. D. in the IM 2016 Second Quarter Report)*
FM-422	Belmont Electric Substation Additional Scope	1/26/2016**	Reasonable and Prudent *(See Section III. E. in the IM 2016 Second Quarter Report)*
10	Advanced Technologies Subprogram – Increase in Investment Funding	6/3/2016	Reasonable and Prudent *(See Section III. G. in the IM 2016 Second Quarter Report)*
12	West End Gas M&R Project Scope Change	6/13/2016	Reasonable and Prudent *(See Section III. H. in the IM 2016 Second Quarter Report)*

ROD #	Title	Date ROD Approved	IM Comments*
13	UPCI Subprogram – Additional Increase in Investment Funding	5/26/2016	Reasonable and Prudent *(See Section III. J. in the IM 2016 Second Quarter Report)*
FM-423	Bayway 26kV Additional Scope	7/8/2016	Reasonable and Prudent *(See Section III. F. in the IM 2016 Second Quarter Report)*
14	Harrison Gas M&R Project Scope Change	7/26/2016	Reasonable and Prudent *(See Section III. I. in the IM 2016 Second Quarter Report)*
FM-425	Newark Airport Breaker Station Cancellation	8/10/2016	Reasonable and Prudent *(See Section III. B. in the IM 2016 Second Quarter Report)*
FM-426	Madison & Marshall Substations	1/25/2017	N/A *(See Section III. C. in the IM 2016 Annual Report)*
FM-429	Jackson Road Substation Scope Deletion	3/9/2017	Reasonable and Prudent *(See Section III. C. in the IM 2017 First Quarter Report)*
15	Advanced Technologies Subprogram – Additional Increase in Investment Funding	3/15/2017	Reasonable and Prudent *(See Section III. D. in the IM 2017 First Quarter Report)*

**-Note: Use of the term "Reasonable and Prudent" is not a legal interpretation, nor does it supplant the BPU's determination of what is "reasonable and prudent" in the context of future rate cases. It is used here strictly as an interpretation of the IM's review and observation of these key decisions.*
***-Note: The final ROD paperwork was made available to the IM later than the ROD approval date, which is why these RODs did not appear in this table in an earlier IM Report.*

B. Change in Electric Station Flood Mitigation Methodology

There continues to be no change in the flood mitigation methodology since the second quarter of 2016. A summary of the current flood mitigation methodology, as of March 31, 2018, is provided below:

- Changed from raise/rebuild to eliminate:[6]
  - Bayway 4kV
  - Rahway partial eliminate (4012 circuit)
  - St. Paul's Unit (13kV)
  - Third Street
  - Garfield Place
  - Little Ferry – Of the three transformers, only eliminate transformer T3
- Removed from Energy Strong and put in "base":[7]
  - Madison
  - Marshall Street
- Replaced by a non-Energy Strong Project:[8]

[6] See IM 2014 Annual Report, pages 87-91; IM 2015 First Quarter Report, pages 6-7; IM 2015 Second Quarter Report, pages 14-15; IM 2015 Third Quarter Report, pages 10-11
[7] See IM 2015 Second Quarter Report, page 14; IM 2015 Third Quarter Report, page 10; IM 2015 Annual Report, pages 13-14; IM 2016 First Quarter Report, pages 40-44; IM 2016 Second Quarter Report, pages 45-48
[8] See IM 2016 Second Quarter Report, pages 15-16; Rate Counsel, BPU Staff, and PSE&G reached a settlement on November 30, 2016, that noted an agreement that PSE&G may proceed with the Madison and Marshall projects

- Newark Airport Breaker Station – The Port Authority of New York and New Jersey (Port Authority) requested that the current 27kV Newark Airport Station site (the land) be returned to the Port Authority since a new 345kV switching station, which is not part of the Energy Strong Program, will serve the airport. This results in the current 27kV Newark Airport station no longer being in the Energy Strong Program.

IV. Major Events[9]

A. Major Events during First Quarter Reporting Period

During the first quarter of 2018, PSE&G reported three Major Events, each stemming from a Nor'easter/State of Emergency.

January 4-5, 2018 – State of Emergency/Nor'easter

On January 4, 2018, Governor Christie declared a State of Emergency in response to a Nor'easter that was impacting the region. 11,708 of PSE&G's customers experienced service interruptions as a result of this storm, with all customers being restored within eight hours or less of the outage. PSE&G also released 50 contractor tree trimming fulltime equivalents (FTEs) to PSEG Long Island (PSEG-LI) on January 4, which were released by PSEG-LI the following day.

March 2-13, 2018 – Nor'easters, State of Emergency, and Mutual Aid to Jersey City Power & Light (JCP&L)

During this March 2-13, 2018 period, a series of three events occurred that included two Nor'easters in between which PSE&G provided Mutual Aid to JCP&L. From March 2-5, 2018, the first Nor'easter affected PSE&G, causing 129,349 PSE&G customers to experience service interruptions. Following this first storm, from March 5-8, 2018, PSE&G provided Mutual Aid to JCP&L, supplying 120 PSE&G and 132 contractor line FTEs to assist with restoration efforts. During the Mutual Aid period, 7,364 PSE&G customers experienced service interruptions. Another Nor'easter affected the region beginning on March 6, 2018, leading to Governor Murphy declaring a State of Emergency that was in effect from March 6 through March 13, 2018. In this second Nor'easter, 339,203 PSE&G customers experienced service interruptions. Recovery efforts by PSE&G were aided by Mutual Aid and contractor assistance that included 613 line FTEs and 357 tree trimming FTEs.

In total, this combination of events resulted in 475,916 PSE&G customers experiencing service interruptions.

March 20-26, 2018 – State of Emergency/Mutual Aid to Atlantic City Electric Company (ACE)

In response to a Nor'easter event that impacted the region, Governor Murphy declared a State of Emergency that was in effect from March 20-26, 2018. In preparation for the storm, PSE&G secured 195 contractor and Mutual Aid line FTEs and 402 tree trimming FTEs. As the storm crossed the region, PSE&G's service territory was spared the full impact of the storm, with service interruptions limited to

outside the Energy Strong Program, raising and rebuilding both the Madison and Marshall electric substations at the Madison Substation site, subject to certain terms and conditions.

[9] Generally defined by the BPU as a sustained interruption of electric service resulting from conditions beyond the control of the Utility (e.g. thunderstorms, hurricanes, snow/ice storms) which affect at least 10 percent of the customers in the operating area. (N.J.A.C. 14:5-1.2)

18,784 PSE&G's customers, all of which were returned to service within a few hours. On March 22, 2018, PSE&G released the contractor and Mutual Aid FTEs that it had secured, with ACE requesting and receiving Mutual Aid from PSE&G that same day, which included 69 line FTEs and additional support personnel.

B. Performance of Energy Strong Investments in Severe Weather Events

The Major Event performance discussed below identifies a number of circuits in which CAIDI performance during the Major Event exceeded that of the 5-year Major Event Average. As with prior Major Events, the IM has requested additional information on these 2018 first quarter Major Events and additional insight into the circuits that experienced a higher outage than the 5-year average. This information is still being prepared by PSE&G and was not available for inclusion in this IM 2018 First Quarter Report, but will be provided in the 2018 second quarter report.

October 30-November 1, 2017 – Mutual Aid to PSEG-LI/Nor'easter

- Summary: PSE&G provided Mutual Assistance to PSEG-LI in support of efforts to return service to PSEG-LI's service territory affected by a Nor'easter that also had lesser impacts to PSE&G's service territory.
- Impact to PSE&G Electric Customers: Although the brunt of the storm affected Long Island, PSE&G's service territory did experience rain and wind impacts from the storm that led to 10,130 PSE&G customers experiencing service interruptions.
- Energy Strong Performance:
    - Electric Station Flood Mitigation – 19 stations were completed at the time of the event (four eliminated, 15 raise and rebuild), no station was impacted by this Major Event.
    - Gas M&R – eight stations completed at the time of the event, no station was impacted by this Major Event.
    - Advanced Technologies – 111 substations were completed at the time of this Major Event, the CAIDI of completed circuits impacted by this event was as follows:

Status	Major Event CAIDI	5-Year Average Major Event CAIDI
Complete	93.00	1,100.93

    - Contingency Reconfiguration – 223 circuits were improved at the time of this Major Event, four of which experienced an outage due to this Major Event. The improved circuit performance was as follows:

Circuit Improved	Major Event CAIDI	5-Year Average Major Event CAIDI
MEA 8014	23.00	3,194.37
NED 8014	210.00	140.36
CED 8011	68.00	15,394.05
LAU 8015	290.00	3,692.12
WEW 8021	88.00	3,475.62
NRB 8021	28.00	1,692.00
CRX 8002	106.00	862.61
KUS 8007	13.00	1,714.60

LEV 8009	174.00	1,461.94
MAD 8022	45.00	844.49

January 4-5, 2018 – State of Emergency/Nor'easter

- Summary: A Nor'easter affected the region leading to a State of Emergency being declared. During this Major Event, PSE&G had minor impacts to its service territory and also provided Mutual Assistance to PSEG-LI in support of its efforts to regain service.
- Impact to PSE&G Electric Customers: PSE&G's service territory experienced rain and wind impacts from the storm that led to 11,708 PSE&G customers experiencing service interruptions.
- Energy Strong Performance:
    - Electric Station Flood Mitigation – 22 stations were completed at the time of the event (five eliminated, 17 raise and rebuild), no station was impacted by this Major Event.
    - Gas M&R – eight stations completed at the time of the event, no station was impacted by this Major Event.
    - Advanced Technologies – 111 substations were completed at the time of this Major Event, the CAIDI of completed circuits impacted by this event was as follows:

Status	Major Event CAIDI	5-Year Average Major Event CAIDI
Complete	263.94	270.97

    - Contingency Reconfiguration – 223 circuits were improved at the time of this Major Event, four of which experienced an outage due to this Major Event. The improved circuit performance was as follows:

Circuit Improved	Major Event CAIDI	5-Year Average Major Event CAIDI
MIN 8012	9.14	61.00
FOU 8014	182.88	690.00
WEW 8022	2,016.93	90.00
LCE 8042	38.19	245.76

March 2-13, 2018 – Nor'easters, State of Emergency, and Mutual Aid to JCP&L

- Summary: During this March 2-13, 2018 period, a series of three events occurred that included two Nor'easters in between which PSE&G provided Mutual Aid to JCP&L, the second Nor'easter also resulted in a State of Emergency being declared from March 6-13, 2018.
- Impact to PSE&G Electric Customers: From March 2-5, 2018, the first Nor'easter affected PSE&G, causing 129,349 PSE&G customers to experience service interruptions. During the Mutual Aid to JCP&L, 7,364 customers experienced service interruptions. And, in this second Nor'easter, 339,203 PSE&G customers experienced service interruptions.
- Energy Strong Performance:
    - Electric Station Flood Mitigation – 22 stations were completed at the time of the event (five eliminated, 17 raise and rebuild), no station was impacted by this Major Event.

- Gas M&R – eight stations completed at the time of the event, no station was impacted by this Major Event.
- Advanced Technologies – 111 substations were completed at the time of this Major Event, the CAIDI of completed circuits impacted by this event was as follows:

Status	Major Event CAIDI	5-Year Average Major Event CAIDI
Complete	501.74	308.55

- Contingency Reconfiguration – 223 circuits were improved at the time of this Major Event, 88 of which experienced an outage due to this Major Event. The improved circuit performance was as follows:

Circuit Improved	Major Event CAIDI	5-Year Average Major Event CAIDI
ALD 8013*	283.39	-
BEN 8013*	2,957.00	-
BRU 8013*	151.00	-
DOR 8023	74.00	39.24
DOR 8044	114.00	211.00
FAW 8021*	424.40	-
FAW 8025	1,424.53	161.93
FRA 8022*	155.00	-
LAF 8024	75.29	339.00
MEA 8014	523.00	242.41
NED 8012*	1,424.55	-
NED 8014	1,470.84	140.83
SOS 8015	787.53	503.25
SOS 8026	759.08	264.00
SPF 8026*	1,125.50	-
CED 8011	1,269.61	139.95
CED 8022	138.00	22.79
CLF 8022	2,052.29	157.66
HNC 8014	507.00	51.27
JAC 8012*	883.42	-
KUL 8012	1,648.56	33.00
LAU 8011	922.92	164.00
LAU 8014	941.77	256.22
LAU 8015	351.00	60.31
LAU 8035	982.98	8.00
LAU 8044*	810.70	-
LAU 8046	2,117.87	272.72
MAI 8011	3,018.89	161.71
MAI 8012	234.24	246.16
MAI 8021	513.75	171.89
MAI 8024	739.00	199.13
ORA 4007*	1,216.81	-
WEW 8012	2,783.67	275.00
WEW 8013*	2,076.00	-
WEW 8021	1,157.79	77.14

WEW 8022	2,016.93	90.00
WEW 8025	13.00	56.00
WEW 8042	562.76	789.00
WEW 8043*	553.07	-
WOA 4010	580.00	764.00
HID 8031	1,145.00	129.00
HID 8032	678.50	441.00
HOM 8001	143.74	70.00
NEW 8011*	2,357.41	-
WAD 8012	398.52	120.00
WAD 8013	124.82	63.00
BEA 8007*	75.00	-
BEA 8008	1,279.25	336.56
BUS 8014	352.16	52.80
BUS 8022	1,132.32	930.98
BUS 8024*	652.17	-
CIN 8001	1,850.00	212.99
CIN 8011	405.82	1,259.20
CIN 8012	4,793.00	1,271.79
CUT 8004	1,072.00	386.26
CUT 8005	266.50	157.70
CUT 8009	75.00	1,903.33
CUT 8041	397.42	3,596.00
DFD 8031	1,205.07	929.59
FEN 8051	319.80	345.83
LAW 8023	92.52	2,204.00
LAW 8033	1,057.41	114.18
LCE 8005	1,147.39	439.29
LCE 8006	1,046.00	804.44
LCE 8042	38.19	245.76
LEV 8004	188.93	310.46
LEV 8007	1,582.00	1,141.59
LEV 8008	1,928.42	1,089.06
LEV 8018*	122.73	-
LUM 8011	106.00	238.20
LUM 8012	589.78	482.00
LUM 8013	2,487.92	1,277.29
LUM 8015*	2,615.48	-
MAD 8018	1,461.91	269.63
MAD 8022	1,546.00	788.08
MAD 8038	263.00	40.65
MAR 8019	376.00	821.03
MAR 8020	200.67	120.00
MDF 8014	126.09	460.87
MTL 8023	260.00	312.42
MTL 8025	839.78	197.90
PEK 8013	1,465.00	199.29
PEK 8018*	1,346.00	-
PLI 8009	1,538.05	46.00
RUN 8004	324.68	1,511.00

SOH 8022	221.96	158.53
YRD 8013	154.00	407.48
YRD 8022	179.50	628.10
**-Circuit did not experience an outage during Major Event in previous five years.*		

March 20-26, 2018 – State of Emergency/Mutual Aid to ACE

- Summary: In response to a Nor'easter event that impacted the region, Governor Murphy declared a State of Emergency that was in effect from March 20-26, 2018.
- Impact to PSE&G Electric Customers: PSE&G's service territory was spared the full impact of the storm, with service interruptions limited to 18,784 PSE&G's customers, all of which were returned to service within a few hours.
- Energy Strong Performance:
  - Electric Station Flood Mitigation – 23 stations were completed at the time of the event (five eliminated, 18 raise and rebuild), no station was impacted by this Major Event.
  - Gas M&R – eight stations completed at the time of the event, no station was impacted by this Major Event.
  - Advanced Technologies – 111 substations were completed at the time of this Major Event, the CAIDI of completed circuits impacted by this event was as follows:

Status	Major Event CAIDI	5-Year Average Major Event CAIDI
Complete	379.42	402.50

  - Contingency Reconfiguration – 223 circuits were improved at the time of this Major Event, 15 of which experienced an outage due to this Major Event. The improved circuit performance was as follows:

Circuit Improved	Major Event CAIDI	5-Year Average Major Event CAIDI
LAF 8011	194.00	149.64
FOU 8014	182.88	690.00
LAU 8035	982.98	8.00
HOM 8021*	104.00	-
BUS 8022	1,132.32	930.98
CRX 8002	78.00	121.02
LEV 8009	575.56	484.18
LEV 8018*	122.73	-
LUM 8012	589.78	482.00
MAD 8018	1,461.91	269.63
MAR 8003	49.00	1,315.13
MDF 8014	126.09	460.87
RUN 8004	324.68	1,511.00
SOH 8022	221.96	158.53
YRD 8022	179.50	628.10
**-Circuit did not experience an outage during Major Event in previous five years.*		

While additional information is still being gathered by PSE&G to further explain the performance of Energy Strong investments in recent Major Events, the IM is able to provide a few examples of how the Contingency Reconfiguration investments improved the service and reliability of critical facilities in these recent Major Events:

- American Water Jerusalem Road Tank and Well Field: experienced an outage on March 2, 2018 due to the Nor'easter event. Recloser operations allowed the facility to be returned to service in 81 minutes, while the remainder of the circuit that typically serves this facility was out for 363 minutes until repairs were completed.

- Essex County #1: experienced an outage on March 21, 2018 due to the Nor'easter event. Recloser operations allowed the facility to be returned to service in four minutes, while the remainder of the circuit that typically serves this facility was out for 70 minutes until repairs were completed.
- Princeton Medical Psych Hospital: experienced an outage on March 7, 2018 due to the Nor'easter event. Recloser operations allowed the facility to be returned to service in 29 minutes, while the remainder of the circuit that typically serves this facility was out for 1,346 minutes until repairs were completed.

Status of the Energy Strong Program

V. Electric Station Flood Mitigation

A. Current Status

During the first quarter of 2018, two additional stations were placed fully in-service: Cranford and Jackson Road. Thus, as of March 31, 2018, only two of the 26 electric substations remained in construction, with one of those two station (Essex) being placed fully in-service in April 2018, and the other remaining station (Port Street) expected to be completed by the end of the second quarter of 2018.

As noted in the IM 2017 Third Quarter Report, **Table V-1 – Status of Electric Station Flood Mitigation Projects**, which had been included in prior IM reports reflecting the phase of each substation, has been revised starting with the IM 2017 Third Quarter Report to specifically provide the status of the construction and in-service activities for the remaining active electric substations as shown in **Table V-1 – Status of the Electric Station Flood Mitigation Projects as of March 31, 2018**.

Table V-1 – Status of Electric Station Flood Mitigation Projects as of March 31, 2018

Project	Construction		Partial In-Service		Full In-Service	
	Q4 2017	Q1 2018	Q4 2017	Q1 2018	Q4 2017	Q1 2018
Cranford	✓	X	✓	X		✓+
Essex Switching	✓	X	✓	✓		
Hillsdale					✓	✓
Jackson Road	✓	X	✓	X		✓+
Jersey City					✓	✓
New Milford					✓	✓
Port Street	✓	✓				
Third Street*					✓	✓

✓ = ongoing status as previously reported
✓+ = new since prior quarter
X = removed since prior quarter (e.g. project transitioned out of construction)
*-*Third Street was eliminated, and thus out-of-service, not fully in-service.*

Additional information as to the status and accomplishments of the active projects in the Electric Station Flood Mitigation subprogram during the first quarter of 2018 and upcoming activities is provided below.

Bayway 4kV Substation

- Closeout completed on April 11, 2018.

Cranford Substation

- Placed fully in-service on January 18, 2018.

Essex Switching Station

- 26kV circuit cutovers completed.
- Placed fully in-service on April 25, 2018.

Howell Street Substation

- Closeout completed on April 6, 2018.

Hillsdale Substation

- Placed fully in-service on November 29, 2017.

Jackson Road Substation

- Demo of old switchgear/site restoration ongoing.
- Placed fully in-service on March 27, 2018.

Jersey City Substation

- Placed fully in-service on October 6, 2017.
- Closeout completed on April 6, 2018.

Marion Substation

- Closeout completed on April 6, 2018.

New Milford Substation 16/13kV

- Placed fully in-service on December 29, 2017.

Port Street Substation

- 13kV overhead bus installed.
- Testing and commissioning of switchgear ongoing.

Third Street Substation

- Placed fully in-service on November 21, 2017.

In prior IM quarterly reports, Table V-2 – Electric Station Flood Mitigation Estimating & Mitigation Status as of [the End of the Quarter for that Report] provided the status of the cost estimating level and the corresponding flood mitigation method for each of the 26 electric substations in the Electric Station Flood Mitigation subprogram. As noted in the IM 2017 Third Quarter Report, only the Jackson Road substation had not achieved the 90% Definitive level of cost estimate, PSE&G has since updated its cost estimate and submitted it to the URB as the 90% Definitive Cost Estimate which the URB approved on November 17, 2017.

As noted above, 24 of the 26 electric substations in this subprogram have achieved full in-service as of the end of the first quarter of 2018, with one additional station completed early in the second quarter of 2018, and the final station, Port Street, anticipated to be completed by the end of the second quarter of 2018. As noted in the IM 2017 Annual Report,[10] closeout work may continue beyond the completion or in-service date as final restoration activities are completed, trailing costs recorded, and internal closeout procedures at PSE&G are performed; however, any costs associated with this closeout effort are expected to be relativity small. As of the end of the first quarter of 2018, 12 of the 26 electric substations have had closeout completed, with an additional four having closeout completed early in the second quarter of 2018. Some projects have longer closeout periods than others based on specific project requirements, such as Cranford where removal of old equipment and completion of the landscaping plan (which was a

[10] See IM 2017 Annual Report, page 2

condition of approval) are examples of activities that take place after the project goes in-service but must be completed prior to closeout.

B. Cost Overview

Table V-2 – Electric Station Flood Mitigation Cost Status as of March 31, 2018 provides the breakdown of the cost estimates for each electric substation into their respective base cost, and risk and contingency (R&C) cost.[11] The first set of columns after the station name provides the initial estimate for each electric substation. This is the same initial estimate information that was provided in previous IM reports and serves as the initial estimate that is compared to the current estimate to calculate the variance for each substation. The second set of columns provides the information for the current estimate, as of March 31, 2018. The Stipulation amount for the Electric Station Flood Mitigation subprogram of the Energy Strong Program is $620 million. The initial estimate of $619.8 million when rounded represents the $620 million number. The final column in prior IM reports provided the estimate level for each of the projects, however, with each project previously achieving the 90% Definitive cost estimate level, that column has been removed.

As of March 31, 2018, the current PSE&G cost estimate for the entire Electric Station Flood Mitigation subprogram was $481.0 million, after a $5.2 million reduction to the subprogram estimate was approved during the first quarter of 2018. From a cost perspective, as with the other completed subprograms, PSE&G is managing the Electric Station Flood Mitigation subprogram as essentially one program, rather than 26 individual projects. That is, PSE&G is managing this subprogram to the Stipulation amount of $620 million. **Table V-2** shows that, as of March 31, 2018, the variance of the current PSE&G project estimates compared to the initial estimates is now negative $138.8 million compared to the initial estimates ($619.8 million total initial estimates compared to $481.0 million total current estimates), demonstrating the subprogram continues to be forecasted to be completed under budget.

Table V-2 – Electric Station Flood Mitigation Cost Status as of March 31, 2018[12]

Station Name	Initial Estimate*			Current Estimate			Current Estimate Variance to Initial Estimate	Actuals to Date	% of Actuals to Estimate
	Base	R&C	Total	Base	R&C	Total			
	(in thousands)								
Bayonne	$25,700	$16,600	$42,300	$29,500	$4,500	$34,000	($8,300)	$31,252	92%
Bayway 26kV	$16,200	$10,400	$26,600	$23,200	$0	$23,200	($3,400)	$23,152	100%
Bayway 4kV	$6,700	$4,400	$11,100	$8,300	$0	$8,300	($2,800)	$8,247	99%
Belmont	$1,600	$1,100	$2,700	$4,900	$0	$4,900	$2,200	$4,912	100%
Cranford	$13,800	$9,300	$23,100	$32,200	$3,200	$35,400	$12,300	$26,732	76%
Essex	$46,600	$30,000	$76,600	$37,500	$4,800	$42,300	($34,300)	$32,527	77%
Ewing	$6,400	$4,100	$10,500	$8,600	$100	$8,700	($1,800)	$7,671	88%

[11] For additional discussion on the estimating process and use of R&C, see the following IM reports: IM 2014 Annual Report, page 44; IM 2015 Second Quarter Report, page 30; IM 2016 First Quarter Report, pages 33 & 36; IM 2016 Second Quarter Report, page 41; IM 2016 Third Quarter Report, page 32; IM 2016 Annual Report, page 41; and, IM 2017 Second Quarter Report, page 31.

[12] **Table V-2** provides a comparison between the original Office-level estimates and the current budget as of the end of the first quarter of 2018; whereas **Table II-2** provides a comparison of annual estimates of the projects as of the end of the year, for each year, to the actual spend.

Station Name	Initial Estimate*			Current Estimate			Current Estimate Variance to Initial Estimate	Actuals to Date	% of Actuals to Estimate
	Base	R&C	Total	Base	R&C	Total			
	(in thousands)								
Garfield Place	$8,000	$5,100	$13,100	$11,900	$0	$11,900	($1,200)	$11,834	99%
Hackensack	$20,800	$13,700	$34,500	$32,300	$0	$32,300	($2,200)	$32,527	101%
Hillsdale	$15,700	$10,200	$25,900	$26,200	$2,600	$28,800	$2,900	$25,714	89%
Hoboken	$17,500	$11,300	$28,800	$27,100	$2,500	$29,600	$800	$24,920	84%
Howell Street	$15,800	$10,200	$26,000	$14,500	$2,200	$16,700	($9,300)	$9,031	54%
Jackson Road	$10,100	$6,500	$16,600	$10,900	$3,200	$14,100	($2,500)	$9,133	65%
Jersey City	$16,900	$10,900	$27,800	$12,900	$2,000	$14,900	($12,900)	$7,355	49%
Linden	$10,900	$7,100	$18,000	$15,500	$0	$15,500	($2,500)	$15,783	102%
Little Ferry	$1,700	$1,100	$2,800	$5,100	$0	$5,100	$2,300	$5,022	98%
Madison	$12,600	$8,100	$20,700	***Removed from Energy Strong***			($20,700)		
Marion	$11,700	$7,500	$19,200	$13,800	$0	$13,800	($5,400)	$14,751	107%
Marshall	$10,400	$6,700	$17,100	***Removed from Energy Strong***			($17,100)		
New Milford	$12,900	$8,300	$21,200	$16,900	$1,700	$18,600	($2,600)	$13,652	73%
Newark Airport	$5,300	$3,400	$8,700	***Cancelled***			($8,700)		
Port Street	$15,200	$9,800	$25,000	$13,700	$1,400	$15,100	($9,900)	$10,719	71%
Rahway	$3,900	$2,000	$5,900	$5,900	$0	$5,900	$0	$5,860	99%
River Edge	$4,600	$2,900	$7,500	$6,700	$0	$6,700	($800)	$6,405	96%
Sewaren	$13,600	$8,800	$22,400	$25,000	$0	$25,000	$2,600	$24,962	100%
Somerville	$6,600	$4,300	$10,900	$5,800	$0	$5,800	($5,100)	$6,041	104%
South Waterfront	$33,900	$21,900	$55,800	$50,900	$0	$50,900	($4,900)	$50,956	100%
St. Paul's	$1,700	$1,100	$2,800	$1,400	$0	$1,400	($1,400)	$493	35%
Third Street	$9,800	$6,400	$16,200	$9,100	$3,000	$12,100	($4,100)	$7,799	64%
Subtotal	**$376,600**	**$243,200**	**$619,800**	**$449,800**	**$31,200**	**$481,000**	**($138,800)**	**$417,418**	**87%**

As shown in **Table V-2**, overall 87% of the $481.0 million updated current estimate for the Electric Station Flood Mitigation subprogram has been spent as of March 31, 2018. This compares to 84% of the current estimate spent at the end of the fourth quarter of 2017. When compared to the $620 million Stipulation amount, the $417.4 million spent represents approximately 67% of the total amount. As noted earlier, PSE&G updated the subprogram estimate during the first quarter, specifically for the Bayway 4kV, Garfield Place, and Hackensack projects, with each seeing a reduced estimate as these projects went through closeout. Each of the updated project estimates is discussed as follows:

- Bayway 4kV: total estimate reduced from $8.8 million to $8.3 million. The $0.5 million reduction was comprised of a lower base estimate (reduced by $0.2 million) and lower risk and contingency ($0.3 million), which was made possible by cost efficiencies gained through sharing costs with a concurrent project on the same site (i.e. same contractor utilized, avoiding mobilization/demobilization costs).
- Garfield Place: total estimate reduced from $14.9 million to $11.9 million. The $3.0 million reduction was comprised of a lower base estimate (reduced by $1.5 million) and lower risk and contingency (reduced by $1.5 million), which resulted from lower actual COR costs than initially estimated.

- Hackensack: total estimate reduced from $34.0 million to $32.3 million. The net $1.7 million reduction was comprised of an increase to the base estimate of $1.1 million, and a reduction to risk and contingency of $2.8 million, reflective of the project going through closeout.

The quarterly cost variance is the difference between the amount forecast and the amount that was spent in a given quarter. **Table V-3 – Electric Station Flood Mitigation 2018 Q1 Cost Variance** provides the first quarter cost variance for each of the substation projects in the Electric Station Flood Mitigation subprogram. As in prior years, there was no January cost forecast as PSE&G completes its annual plan in January of each year and thus does not start forecasting until February of each year, therefore actual numbers were used in the January forecast column.

Table V-3 – Electric Station Flood Mitigation 2018 Q1 Cost Variance

Electric Station Flood Mitigation 2018 Q1 Cost Variance* *(in thousands)*									
Project	**Forecast**				**Actual**				**Variance****
	Jan-18^	***Feb-18***	***Mar-18***	***Q1 Total***	***Jan-18***	***Feb-18***	***Mar-18***	***Q1 Total***	
Bayonne	$448	$211	$188	$847	$448	$327	$158	$933	$86
Bayway 26kV	$4	$8	-	$12	$4	$3	$5	$12	$0
Bayway 4kV	$4	-	-	$4	$4	($5)	$1	$1	($3)
Belmont	-	-	-	$0	-	-	-	$0	$0
Cranford	$520	$346	$321	$1,187	$520	$388	$283	$1,192	$5
Essex	$407	$512	$421	$1,340	$407	$782	$412	$1,601	$261
Ewing	$21	$58	$3	$82	$21	$56	$16	$93	$11
Garfield	($66)	-	-	($66)	($66)	$6	$38	($22)	$44
Hackensack	$42	-	-	$42	$42	$31	$40	$112	$70
Hillsdale	$254	$243	$138	$635	$254	$335	$148	$737	$102
Hoboken	$317	$78	$25	$420	$317	$43	$15	$375	($45)
Howell St	$136	$10	$294	$440	$136	$78	$50	$263	($177)
Jackson Rd	$637	$48	$221	$906	$637	$141	$184	$963	$57
Jersey City	$29	$10	$10	$49	$29	($5)	$19	$43	($6)
Linden	$12	-	$5	$17	$12	($54)	$5	($37)	($54)
Little Ferry	$7	-	-	$7	$7	-	$3	$10	$3
Madison	-	-	-	$0	-	-	-	$0	$0
Marion	$15	$48	-	$63	$15	$10	$8	$34	($29)
Marshall	-	-	-	$0	-	-	-	$0	$0
New Milford	$183	$77	$40	$300	$183	$43	$58	$283	($17)
Newark Airport	-	-	-	$0	-	-	-	$0	$0
Port Street	$1,405	$973	$1,017	$3,395	$1,405	$923	$941	$3,269	($126)
Rahway	$1	-	-	$1	$1	$1	$1	$2	$1
River Edge	-	-	-	$0	-	-	-	$0	$0
Sewaren	-	-	-	$0	-	-	-	$0	$0
Somerville	-	-	-	$0	-	-	-	$0	$0
So. Waterfront	$13	-	-	$13	$13	$5	$4	$21	$8
St Paul's	$6	$5	$5	$16	$6	$4	$3	$12	($4)
Third Street	$83	$173	$41	$297	$83	$562	$60	$705	$408
Subtotal	**$4,477**	**$2,800**	**$2,728**	**$10,005**	**$4,477**	**$3,671**	**$2,450**	**$10,599**	**$594**

Electric Station Flood Mitigation 2018 Q1 Cost Variance* *(in thousands)*									
Project	**Forecast**				**Actual**				**Variance****
	Jan-18^	***Feb-18***	***Mar-18***	***Q1 Total***	***Jan-18***	***Feb-18***	***Mar-18***	***Q1 Total***	
-The Subtotal and Q1 Total amounts may not exactly total the sum of the individual amounts shown due to rounding.* *-Negative variance values indicate less spent than forecasted, positive values indicate more spent than forecasted for Q1.* *^-Due to PSE&G not using a forecast for the month of January, actual January numbers were used in the forecast column in order to demonstrate as complete a picture as possible for the first quarter as a whole.*									

Summing the 29 individual variances as shown in **Table V-3** indicates the total variance for the first quarter of 2018 resulted in an actual amount spend that was approximately $594,000 more than the forecasted amount. The majority of the variance is due to higher actual spending at the Essex and Third Street electric substations, somewhat offset due to lower than forecasted spending on Howell Street and Port Street electric substations. An explanation of the reasons for the higher individual month variances for all substations in the first quarter of 2018 is provided in **Table V-4 – Cost Variance Explanation for the First Quarter of 2018**. As more electric substations are completed and construction starts to wind down, the quarterly variances are expected to continue to remain fairly insignificant.

The IM reviewed and analyzed the cost information for the first quarter of 2018 to determine if any significant variances (greater than 10%) occurred from the forecast to the actual amounts spent during the quarter. For February and March (recalling that PSE&G does not forecast for January), **Table V-4** provides the explanation for the cost variance between the forecast and actual amount spent on a substation project basis, for those substations in construction, where that variance is significant. Those substations not listed in **Table V-4**, or have a "dash" in the box, indicate that they are no longer expending significant funds during the first quarter of 2018 and/or their cost variance was not significant.

Table V-4 – Cost Variance Explanation for the First Quarter of 2018

Project	February 2018	March 2018
Bayonne	An invoice was processed while the amount of the invoices was also incorrectly accrued resulting in a higher actual than forecast; this was corrected in March.	-
Bayway 26kV	-	-
Bayway 4kV	-	-
Belmont	-	-
Cranford	-	-
Essex	Variance is due to Division work ongoing associated with cutovers, additional crews were available to perform cutover work earlier than scheduled. 7 out of 12 circuits for switchgear #1 and 9 out of 13 circuits for switchgear #2 were completed.	-
Ewing	-	-

Garfield Place	-	-
Hackensack	-	-
Hillsdale	Testing and commissioning work performed in January was accrued, the invoices processed in February were higher than the amounts accrued in January.	-
Hoboken	-	-
Howell St	Civil and Electrical construction invoices came in higher than amounts previously accrued for work in January.	Forecast for March was not updated due to the Nor'easters; an updated forecast would have reflected a push out of trailing civil costs from March into April through July.
Jackson Rd	Relay Tech charges (from Metro Division) to support cutovers in the month of March were higher than forecasted.	-
Jersey City	-	-
Linden	Environmental Affairs did not forecast the salvage value added to the project for scrapping/recycling metal and oil from 9 transformers as part of the project. The scrap value was added to the project in February 2018.	-
Little Ferry	-	-
Madison	-	-
Marion	-	-
Marshall Street	-	-
New Milford	-	-
Newark Airport	-	-
Port Street	-	-
Rahway	-	-
River Edge	-	-
Sewaren	-	-
Somerville	-	-
South Waterfront	-	-
St Paul's	-	-
Third Street	An invoice paid to the Division underground contractor in February was not forecasted.	-

C. Findings & Observations

- As of the end of the first quarter of 2018, the majority of the Electric Station Flood Mitigation subprogram of Energy Strong has been completed, with 24 of the 26 substations having been placed in-service. One additional substation placed in-service early in the second quarter of 2018, with the final substation anticipated to be completed later in the second quarter, which will complete the subprogram (except for remaining closeout activities). 12 of the 26 substations have completed closeout as of the end of the first quarter of 2018, with an additional four completing closeout early in the second quarter of 2018, and the remaining 10 substations expected to have closeout completed in advance of the Stipulation completion date of May 23, 2019.
- The current cost estimate, as of March 31, 2018, to complete the entire Electric Station Flood Mitigation subprogram (less the cancelled Newark Airport project and the removed Madison/Marshall projects) is $481.0 million compared to $620 million in the Stipulation, or compared to the $573.5 million subprogram budget assuming removal of the initial project estimates for Newark Airport, Madison, and Marshall. This estimate was updated in the first quarter of 2018, reflecting updated project estimates that saw a reduced cost to the Bayway 4kV, Garfield Place, and Hackensack projects.
- The total amount spent, as of March 31, 2018 on the entire Electric Station Flood Mitigation subprogram was $417.4 million, which is approximately 87% of the current cost estimate of $481.0 million, compared to 84% spent as of December 31, 2017.
- Considering the progress made to date, the IM finds that the Electric Station Flood Mitigation subprogram should be completed well within the Stipulation amount of $620 million, even if adjusted for the removal of the Madison/Marshall and Newark Airport projects from the Energy Strong Program.

VI. Gas M&R Flood Mitigation

A. Current Status

As reported in the IM 2017 Second Quarter Report, the final two stations, Newark Airport M&R and Harrison M&R, within the Gas M&R subprogram were placed in-service in April and May 2017, respectively. Demolition work at the Newark Airport M&R station was completed as of October 6, 2017, and the remaining activity in the subprogram consists of closeout work and some restoration activities at the Newark Airport M&R station expected to be completed during the spring of 2018. In addition, the site lease and land use approvals with the City of Newark remain to be completed for the Newark M&R site.

B. Cost Overview

The Gas M&R subprogram was approved per the Stipulation in the total amount of $50 million. Subsequently, PSE&G has approved two transfers of funds from the Gas M&R subprogram to the UPCI subprogram that have reduced the Gas M&R budget to $30.0 million. The first transfer, in the fourth quarter of 2015, transferred $13.5 million, and the second transfer, in the second quarter of 2016, transferred $6.5 million. With all projects now placed in-service, a total of approximately $25.3 million has been spent in the Gas M&R subprogram to-date, which includes approximately $26,000 spend in the first quarter of 2018 related to restoration work at the Newark Airport M&R station.

C. Findings & Observations

- An overview of the IM's findings and observations regarding the completed Gas M&R subprogram was contained in the IM 2017 Annual Report at pages 59-76.
- Pending close out costs, the subprogram was completed at approximately 92% of the sum its project estimates, or within 84% of the approved budget for the subprogram.
- As of the date of this IM 2018 First Quarter Report, there have been no water intrusion events at any of the Gas M&R Flood Mitigation projects.

VII. UPCI Replacement

A. Current Status

As reported in the IM 2016 Third Quarter Report, construction and restoration activities were completed July 22, 2016, ahead of the Stipulation mandated completion date of May 23, 2017.

B. Cost Overview

In terms of the total subprogram, 100% of the sub-program forecast of $370 million (which reflects the transfer in investment funding of $20 million from the Gas M&R subprogram) has been spent – *i.e.* $370 million.

C. Findings & Observations

An overview of the IM's findings and observations regarding the completed UPCI subprogram was contained in the IM 2016 Annual Report at pages 51-54, and in the IM 2017 Annual Report at pages 76-84.

VIII. Advanced Technologies

A. Current Status

As reported in the IM 2017 Second Quarter Report, the Advanced Technologies subprogram put its remaining projects in-service during the second quarter of 2017, and ahead of the May 2017 planned completion date identified in the Stipulation. Closeout of the subprogram was completed as of March 20, 2018.

B. Cost Overview

During the first quarter of 2018, no additional funds were expended on the subprogram, with the total actual spend remaining at $106.2 million, or approximately 99% of the total subprogram budget of $107.0 million.

C. Findings & Observations

An overview of the IM's findings and observations regarding the completed Advanced Technologies subprogram was contained in the IM 2017 Annual Report at pages 84-91.

IX. Contingency Reconfiguration

A. Current Status

As reported in the IM 2017 Second Quarter Report, the Contingency Reconfiguration subprogram put its remaining projects in-service during the second quarter of 2017, and ahead of the May 2017 planned completion date identified in the Stipulation. Closeout of the subprogram was completed as of March 20, 2018.

B. Cost Overview

There was no additional spend in the Contingency Reconfiguration subprogram during the first quarter of 2018, and the total spend for the subprogram remains at $83.6 million, or approximately 90% of the $93.0 million subprogram budget.

C. Findings & Observations

An overview of the IM's findings and observations regarding the completed Contingency Reconfiguration subprogram was contained in the IM 2017 Annual Report at pages 91-98.

MADISON 4KV SUBSTATION PROJECT

INDEPENDENT MONITOR

2018 FIRST QUARTER REPORT

PREPARED AND SUBMITTED BY

PEGASUS GLOBAL HOLDINGS, INC. ®

12 JUNE 2018

PUBLIC VERSION

Table of Contents

List of Acronyms/Abbreviations

Board of Public Utilities	BPU
City of Hoboken	City
Delivery Projects & Construction	DP&C
Environmental Protection Agency	EPA
Independent Monitor	IM
Issued for Construction	IFC
Issued for Review	IFR
Licensed Site Remediation Professional	LSRP
Madison 4kV Substation Project	Madison Project
New Jersey Department of Environmental Protection	NJDEP
Pegasus-Global Holdings, Inc.	Pegasus-Global
Public Service Electric and Gas Company	PSE&G
Purchase Order	PO
Response Action Outcome	RAO
Self Implemented Plan	SIP
Utility Review Board	URB

I. Introduction

Pegasus-Global Holdings, Inc. (Pegasus-Global) was engaged by Public Service Electric and Gas Company (PSE&G) to provide independent monitoring services for PSE&G's Energy Strong Program. Under the Stipulation approved by the May 21, 2014 Order, PSE&G was required to hire a monitor to:

> *"[R]eview and report to Board Staff and Rate Counsel on the impact of the Energy Strong Program on overall system performance during severe weather events; cost effectiveness and efficiency; appropriate cost assignment; and other information deemed appropriate by the Company, Board Staff and Rate Counsel."*

The independent monitor (IM) scope of work revolves around three primary tasks:

1) Review and report on the impact of the Energy Strong Program on overall system performance during severe weather events;
2) Review and report on cost effectiveness and efficiency; and,
3) Review and report on appropriate cost assignment.

In a November 30, 2016 agreement, Rate Counsel, the Board of Public Utilities (BPU) Staff, and PSE&G reached an agreement that allows PSE&G to proceed with the project of raising and rebuilding both the Madison and Marshall electric substations at the Madison Substation site outside of the Energy Strong Program. As such, going forward this project will be formally referred to as the Madison 4kV Substation Project (Madison Project[1]). Among other things, the agreement contains several terms and conditions, including:

- PSE&G shall not undertake flood mitigation of the Madison and Marshall substations through the Energy Strong Program but may include the costs associated with the raise and rebuild of the Madison and Marshall substations in the filing of its next base case.
- PSE&G shall cooperate with the Energy Strong Monitor, the IM, in its review of this project in the same manner as if it was part of the Energy Strong Program, as long as the Monitor is available under identical or similar terms as in the Energy Strong Program.

This IM Madison 4kV Substation Project 2018 First Quarter Report is intended to convey the independent monitoring activities of the IM that have taken place during the first quarter of 2018 on the Madison Project. To the extent information is available after March 31, 2018 through the date of this report that will assist PSE&G, BPU, Staff, and Rate Counsel it has been included herein.

[1] For the purposes of this report, the project is generally referred to as the Madison Project, which is meant explicitly as the Madison 4kV Substation Project and does not make reference to the Madison 69kV Project that PSE&G is also executing.

II. Background[2]

A history of the Madison and Marshall substations can be found in prior IM reports on the Energy Strong Program.[3]

As of the end of the first quarter of 2018, there has been no change in the anticipated scope of work for the Madison Project. As previously described in the IM 2017 Second Quarter Madison Project Report,[4] this project will result in the installation of a new 4kV sheltered aisle switchgear at the Madison 4kV Substation that conforms to the FEMA flood zone advisory base flood elevation plus two feet flood mitigation as required by the City of Hoboken (City). Outside plant underground and overhead infrastructure will be constructed to transfer the Marshall Street substation load to the new Madison Street 4kV substation. The completion of this project will allow for the transfer of the load from the Marshall Street substation to the Madison Street 4kV substation while increasing the overall resiliency and reliability of the new Madison Street 4kV substation infrastructure.

The Madison Project, as with other similar substation projects within the Energy Strong Program, will be performed by the Delivery Projects & Construction (DP&C) group within PSE&G and will be subject to the same processes and procedures DP&C uses for those types of projects, including defining the scope of the project, preparing purchase orders, developing the project's key plan and its project execution plan, issuing drawings, obtaining all required permits, starting and managing construction, and commissioning and startup.

III. Property Transfer Status

A history of the Madison Project property evaluation, remediation, and transfer status leading up to this 2018 first quarter report can be found in prior IM reports on the Madison Project.[5]

PSE&G and the City entered into negotiations to address the remediation efforts that are required based on the results of the recent soil sampling tests of the Madison Project property. The applicable requirements provide for remediation a level of 25 ppm PCBs, rather than the 1 ppm level, under certain restrictions including minimal occupancy of the property. As an electric substation, the Madison Project would qualify for this, reducing the estimated cost of the remediation to $2.34 million (including risk and contingency).[6] Having determined the magnitude of the remediation cost, PSE&G and the City continued their negotiations.

Tentative agreement was reached with the City agreeing to split the estimated remediation cost of not to exceed $2.34 million, or approximately $1.17 million each, with PSE&G responsible for any costs beyond the $2.34 million estimate. In addition, the settlement with the City authorized PSE&G to join the

[2] Rate Counsel, BPU Staff, and PSE&G reached a settlement on November 30, 2016, that noted an agreement that PSE&G may proceed with the Madison Project outside the Energy Strong Program, raising and rebuilding both the Madison and Marshall electric substations at the Madison substation site, subject to certain terms and conditions.
[3] IM 2015 Annual Report, pages 44-48; IM 2016 First Quarter Report, pages 40-43; IM 2016 Revised Second Quarter Report, pages 45-47; IM 2016 Third Quarter Report, pages 37-38; IM 2016 Annual Report, page 46
[4] IM 2017 Second Quarter Madison Project Report, page 2
[5] *See* IM 2017 Second Quarter Madison Project Report, pages 2-3; IM 2017 Third Quarter Madison Project Report, pages 2-3
[6] Remediation to 1 ppm had an estimated cost of $12.2 million.

City in filing lawsuit, sharing expenses,[7] against the prior owner of the property, should PSE&G decide it is appropriate and reasonable to do so. With those parameters agreed between PSE&G and the City, the appropriate documents were prepared for presentation to the Hoboken City Council for its required approval, presented, and they were all approved on January 3, 2018.

Before any remediation work began, PSE&G submitted an application to the Environmental Protection Agency (EPA) on February 22, 2018 for its Self-Implemented Plan (SIP) describing the necessary remediation work to be performed. The SIP permit is required to allow for remediation to a level of 25 ppm PCBs, rather than the 1 ppm level, as noted above. The SIP permit from the EPA was received on April 5, 2018. As of the date of this report, PSE&G has remediated three of the four zones on the property, allowing some civil construction work to begin in the completed areas, with the full remediation anticipated to be completed by June 8, 2018.

Upon completion of construction, the existing Deed Notice on the property will be terminated via a "Termination of Deed Notice" (pre-approved by the New Jersey Department of Environmental Protection (NJDEP)) and a new Deed Notice reflecting current as-built conditions will be filed with Hudson County. Additionally, a final remediation document in the form of a Response Action Outcome (RAO) will be issued by the Licensed Site Remediation Professional (LSRP) and submitted to NJDEP.

The IM continues to be actively engaged in the process including receiving weekly updates from the PSE&G Madison Project team.

IV. Current Status

Given the criticality of the remediation work, some of the Madison Project schedule milestones dates are at risk including the partial and full in-service dates; as such, the IM cannot provide an assessment regarding the planned milestone completion dates, though the IM notes PSE&G has taken specific steps (as described below) that are intended to minimize schedule impacts and maximize schedule efficiency.

Table 1 – Madison Project Milestone Dates and Financial Summary as of March 31, 2018 presents the milestone schedule dates and financial status of the Madison Project based on the status of the project as of the end of the first quarter of 2018.

Table 1 – Madison Project Milestone Dates and Financial Summary as of March 31, 2018

Madison Project Milestone Dates			
Milestone	**Original Date**	**Current Date**	**Status**
Scope Locked	11/23/2016	11/23/2016	Complete
Kick-Off	3/2/2017	3/2/2017	Complete
Utility Review Board (URB) Approval for 2017	3/21/2017	3/21/2017	Complete
Issue Switchgear Purchase Order (PO)	6/1/2017	5/8/2017	Complete
Issue Capacitor Bank PO	6/1/2017	5/8/2017	Complete
Issue Remaining Major Equipment POs	6/1/2017	5/8/2017	Complete
Issue Purchase Order for Structural Steel	12/1/2017	2/12/2018	Complete
Civil Construction Start	12/8/2017	4/16/2018	At Risk / Remediation
Complete 70% Cost Estimate	12/29/2017	1/8/2018	Complete
Inside Plant Construction Start	1/2/2018	4/16/2018	At Risk / Remediation
Major Equipment Delivery - Switchgear	2/28/2018	6/30/2018	On Target

[7] Each party would pay for its own legal expenses.

Major Equipment Delivery – Capacitor Banks	2/28/2018	7/31/2018	On Target
Drawings – Final Issue for Review (IFR)	3/1/2018	4/10/2018	Revised – On Target
Electrical Construction Start	3/1/2018	9/1/2018	At Risk / Remediation
Drawings – Final Issue for Construction (IFC)	6/30/2018	6/30/2018	On Target
Startup Testing and Commissioning	11/30/2018	2/1/2019	At Risk / Remediation
Partial In-Service	12/31/2018	5/31/2019	At Risk / Remediation
Full In-Service*	12/31/2018	3/31/2020	At Risk / Remediation
Madison Project Financial Summary			
Item	**Amount in Thousands**		
Project Spend to Date	$23,085		
2018 URB Approval	$31,215		
2018 Year End Forecast	$31,203		
Q1 2018 Actuals	$3,163		
Q1 2018 Forecast**	$2,704		
Project Cost Estimate	*Base*	*Risk & Contingency*	*Total*
	$51,835	$16,695	$68,800

**-The new Madison 4kV Substation will be considered in service by PSE&G's definition when it is energized and carrying load, scheduled for December 2018. Additional load will be added through May 2019. At that point, the additional capacity created by the completion of the Madison 69kV Project, scheduled in December 2019, will be required to transfer any further load onto the new Madison 4kV switchgear in the new Madison 4kV Substation. The final cutover from Marshall, or the Energy Strong definition of "Full In-Service", is therefore March 2020. At that point, all current loads from both the Marshall Street and Madison Street substations will be carried by the new switchgear.*
***- Due to PSE&G not using a forecast for the month of January, actual January numbers were used in the forecast column in order to demonstrate as complete a picture as possible for the first quarter as a whole.*

As identified in **Table 1**, the first quarter of 2018 shows the actual spend on the Madison Project of approximately $3.2 million, approximately $0.5 million above the forecast, for a total project spend as of March 31, 2018 of approximately $23.1 million. The first quarter variance was due in part to activities conducted that were intended to minimize schedule impacts/maximize schedule efficiency, including: additional underground conduit work resource availability, an earlier start to preliminary site activities to minimize delay of inside plant civil construction work, and purchase of outside plant underground electrical material earlier than initially planned.

While the site remediation efforts began on April 25, 2018, other activities also progressed to support the Madison Project including receipt of the foundation/pile construction and structural steel permits from the City in March 2018. Inside plant civil construction was initiated on April 9, 2018 (slightly ahead of the March 31, 2018 forecasted date of April 16, 2018 identified in **Table 1** above), and pile driving activities subsequently commenced on May 9, 2018.

The IM will continue to monitor the schedule progress, cost estimates, and the actual spend on the Madison Project. The IM anticipates that as the Madison Project further develops there will be additional milestones, financial, and other information upon which the IM will discuss and report in future quarterly reports.

V. Findings and Observations

- PSE&G received an SIP permit from the EPA authorizing PSE&G to initiate remediation efforts in April 2018, to a low-occupancy 25 ppm level of PCBs, thereby reduced the estimated cost of overall remediation. Such remediation commenced at that time. To date, three out of four zones

on the property have been remediated with complete remediation anticipated to be finished by June 8, 2018. No unexpected issues have arisen during the remediation efforts.

- Considering that the PCB remediation work has yet to be completed, the Madison schedule continues to contain some uncertainty and risk. PSE&G has undertaken efforts, such as the commencement of civil construction in parallel with the remediation activities, to mitigate the schedule impact of the remediation issue that should mitigate some of the uncertainty and risk in the schedule.
- Since the Madison Project is not under the Energy Strong Program it does not have the Energy Strong Stipulation constraints with regard to cost and schedule. However, PSE&G has developed a cost estimate and a schedule that is being monitored by the IM as if they were Stipulation requirements.

June 1, 2018

VIA ELECTRONIC and FIRST-CLASS MAIL

Aida Camacho-Welch, Secretary
Board of Public Utilities
44 South Clinton Avenue, 3rd Flr.
P.O. Box 350
Trenton, New Jersey 08625-0350

Re: Energy Strong Program Quarterly Report

Dear Secretary Camacho-Welch:

Enclosed for filing are ten (10) copies of this letter and enclosures providing a report on the Energy Strong program for the first quarter of 2018, January 1, 2018 through March 31, 2018.

The Energy Strong program was addressed by a Board Order dated May 21, 2014 (May 21 Order) in Docket Nos. EO13020155 & GO13020156. That order adopted a Stipulation pursuant to which PSE&G is operating the program known as Energy Strong.

Paragraph 30 of that Stipulation requires reports on:

(a) the estimated quantity of work and the quantity completed to date or, if the project cannot be quantified with numbers, the major tasks completed;

(b) the forecasted and actual Energy Strong costs to date for the quarterly reporting period and for the program-to-date; and

(c) the estimated Energy Strong project completion date.

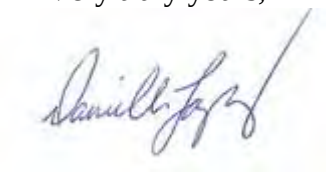
The reporting requirements listed in paragraph 30 of the Stipulation are addressed by the enclosed materials. Note that for part (c) above, the estimated project completion time frames are provided in the enclosed materials.

Paragraph 31 and 37 of that Stipulation provides that PSE&G shall report quarterly on the performance of Electric Stations and gas M&R Stations; Contingency Reconfiguration Strategies and Advanced Technology in a manner that compares the performance of the upgraded or new plant to pre-Energy Strong Plant. The data comparing the upgraded or new plant to pre-Energy Strong Plant performance is addressed in the enclosed materials.

Paragraphs 32 through 35 of the Stipulation address requirements to reduce the inventory of open leaks as well as the actions PSE&G must take if it does not meet those requirements. The Company committed to using best efforts to reduce its inventory of open leaks of 1,937 as of December 31, 2013 by 10% annually over the first three years of the program, or by 194 leaks per year. The status of the open leak reduction is addressed in the enclosed materials.

Please contact the undersigned with any questions or concerns.

Very truly yours,



Danielle Lopez

cc: Stefanie Brand (2 Hard Copies and e-mail)
Via E-Mail Only:
Max Chang
Jeremy Clark
Kim Coe
Paul Flanagan
Lisa Gurkas
Brian Lipman
Alex Moreau
Ami Morita
Stacy Peterson
Bethany Rocque-Romaine
Charles Salamone
Felicia Thomas-Friel
Caroline Vachier
Paul Flanagan
Noreen Giblin
Grace Strom Power

METRIC 1

For each Energy Strong subprogram:

A. Estimated quantity of work:

i. For the subprogram.

ii. Planned to-date.

B. The quantity completed to date or, if the project cannot be quantified with numbers, the major tasks completed, e.g., design phase, material procurement, permit gathering, phases of construction, etc.

Electric Energy Strong Program

- **Electric Station Flood Mitigation**

A. Estimated quantity of work:

i. **Project**: The estimated quantity of work for the entire flood mitigation subprogram includes implementation of flood mitigation measures at 26 substations. This reflects a reduction of 3 substations since the beginning of the Energy Strong Program. Notice was sent to the BPU and Rate Counsel of Newark Airport Breaker Station being cancelled or eliminated in a letter dated 2016-06-29. PSE&G and Rate Counsel agreed that PSE&G will proceed with the raising and rebuilding of Madison and Marshall electric substations in Base Spending rather than Energy Strong per the 2016-11-29 "Agreement Regarding Withdrawal of Objection." Notice of the Agreement was sent to the BPU and Rate Counsel on 2016-11-30.

ii. **Planned to-date**: It was anticipated that a total of 24 substation projects would be completed and fully in-service by the end of the quarter. Additionally, 2 substation projects would be partially in-service. It was also anticipated that a total of 2 substation projects would be in the Construction Phase. The Design & Engineering Phase would be complete for all 26 substation projects.

B. Quantity of work completed to date:

1. The Detailed Design & Engineering Phase, which includes engineering, design, site investigation work, licensing and permitting, has been completed for all stations.

2. 2 substation projects are in the Construction Phase, 1 of which is partially in-service:

    1. Essex Switching Station (partially in-service)
    2. Port Street Substation

3. 22 substation projects are complete and in-service:

    1. The elimination of the River Edge Substation is complete and fully in-service.
    2. The raise and rebuild of Somerville Substation is complete and is fully in-service.
    3. The raise and rebuild of Sewaren Substation is complete and is fully in-service.
    4. The raise and rebuild of Linden Switching Station is complete and is fully in-service.
    5. The raise and rebuild of Bayway Switching Station is complete and fully in-service.
    6. The raise and rebuild of Little Ferry Unit Substation is complete and fully in-service and the T3 transformer has been eliminated.
    7. The raise and rebuild of Belmont Unit Substation is complete and fully in-service.
    8. The raise and rebuild of South Waterfront Switching Station is complete and fully in-service.
    9. The raise and rebuild of Rahway Substation is complete and fully in-service and the 4012 circuit has been eliminated.
    10. The elimination of Garfield Place Substation is complete and fully in-service.
    11. The elimination of Bayway 4kV Substation is complete and fully in-service.
    12. The raise and rebuild of Hoboken Substation is complete and fully in-service.
    13. The raise and rebuild of Howell Street Substation is fully in-service.
    14. The raise and rebuild of Hackensack Substation is complete and fully in-service
    15. The raise and rebuild of Marion Switching Station is complete and fully in-service.
    16. The elimination of St. Pauls Unit Substation is complete and fully in-service.
    17. The raise and rebuild of Ewing Substation is complete and fully in-service.
    18. The raise and rebuild of Bayonne Switching Station is complete and fully in-service.
    19. The raise and rebuild of Jersey City Substation is complete and fully in-service.
    20. The elimination of Third Street Substation is complete and fully in-service.
    21. The raise and rebuild of Hillsdale Substation is complete and fully in-service.
    22. The raise and rebuild of New Milford Substation is complete and fully in-service.
    23. The raise and rebuild of Cranford Substation is complete and fully in-service.
    24. The raise and rebuild of Jackson Road Substation is complete and fully in-service.

Procurement (including delivery) has been completed for all 30 switchgear arrangements on 18 projects.

- **Electric Distribution Contingency Reconfiguration Strategies:**

A. Estimated quantity of work:

i. **Project**: 262 critical facilities have been identified and prioritized.

ii. **Planned to-date**: This subprogram was completed in the second quarter of 2017. No activities were planned in this quarter.

B. Quantity of work completed to date:

- 219 projects have been completed.
- 260 critical facilities have been addressed. One critical facility was removed from the subprogram as the facility was not ready to accept service. One critical facility was moved to No Action Required as it will be addressed as part of on-going work outside of Energy Strong.
- 465 reclosers have been installed.
- All work has been completed and placed in-service.

- **Advanced Technologies:**

A. Estimated quantity of work:

i. **Project**: 111 substation projects have been identified to date, which include an estimated 1176 relays, 51 Remote Terminal Units (RTU), 1 Supervisory Control and Data Acquisition (DSCADA) Station and 1 Pi Historian.

ii. **Planned to-date**: This subprogram was completed in the second quarter of 2017. No activities were planned in this quarter.

B. Quantity of work completed to date:

- 1176 relays have been installed.
- 51 Remote Terminal Units have been installed.
- 111 substation projects have been completed.
- DSCADA is installed and in-service.
- 1 Pi Historian is installed and in-service.
- All work has been completed and placed in-service.

Gas Energy Strong Program

- **Utilization Pressure Cast Iron (UPCI) Replacement:**

A. Estimated quantity of work:

i. **Project**: An estimated 239.6 miles of UPCI main will be installed in total.

i. **Planned to-date**: All work was completed as of the third quarter of 2016. Therefore, no work was planned for this quarter.

B. Quantity of work completed to date:

i. A total of 239.6 miles of main have been installed. All work associated with the Utilization Pressure Cast Iron (UPCI) Replacement subprogram is complete as of the third quarter of 2016. All closeout activities are complete for the subprogram.

- **Metering and Regulating (M&R) Station Flood Mitigation**

A. Estimated quantity of work:

i. **Project**: The estimated quantity of work for this subprogram includes implementation of flood mitigation measures at five M&R substations and three gas storage/production facilities. This remains unchanged from the beginning of the Energy Strong Program.

ii. **Planned to-date**: All stations in this subprogram were placed in-service as of the second quarter of 2017.

B. Quantity of work completed to date:

- The Construction Phase (demolition work) was completed at Newark Airport M&R Station in the fourth quarter of 2017.
- All 5 M&R stations and 3 gas storage/production facilities are complete and in-service:

1. Crown Central M&R Station
2. Piles Creek M&R Station
3. Harrison LPG peak shaving plant
4. Crown Central LPG Storage Facility
5. Burlington LNG Plant Station
6. West End M&R Station
7. Newark Airport M&R Station
8. Harrison M&R Station

METRIC 2

Anticipated Energy Strong subprogram completion dates.

	Timeline		
E/G	**Sub-Program**	**Sub-Program Total In-Service**	**Sub-Program Completion**
Electric	Flood Mitigation	6/06/2018	4/29/2019
Electric	Contingency Reconfiguration	5/21/2017	3/20/2018
Electric	Advanced Technologies	4/20/2017	3/20/2018
Gas	UPCI Replacement	6/10/2016	4/28/2017
Gas	M&R Flood Mitigation	5/12/2017	6/30/2018

METRIC 3

UPCI Annual leak reporting update:

Open Leaks 12/31/2013	1937
Completed PTD 3/31/2018	1879
Open Leaks as of 4/1/2018	58

Reporting Period	Start Date	End Date	Quarters
Report Quarter	1/1/2018	3/31/2018	2018 Q1
Year 1	1/1/2013	12/31/2013	2013 Q1 - 2013 Q4
Year 2	1/1/2014	12/31/2014	2014 Q1 - 2014 Q4
Year 3	1/1/2015	12/31/2015	2015 Q1 - 2015 Q4
Year 4	1/1/2016	12/31/2016	2016 Q1 - 2016 Q4
Year 5	1/1/2017	12/31/2017	2017 Q1 - 2017 Q4

	Completed Circuit Performance				
Div	Circuit Improved	Comp Ckt Rpt Per CAIDI	5 Yr Comp Ckt ME CAIDI	5 Yr ME Div CAIDI	5 Yr ME Co CAIDI
Cen	ADA 8013			87.43	288.59
Cen	ADA 8021			87.43	288.59
Cen	ALD 8013	283.39		87.43	288.59
Cen	BEN 8013	2,957.00		87.43	288.59
Cen	BEN 8021		218.61	87.43	288.59
Cen	BEN 8024			87.43	288.59
Cen	BRU 8013	151.00		87.43	288.59
Cen	C-393	N/A	N/A	87.43	288.59
Cen	CAT 4006			87.43	288.59
Cen	CAT 4008			87.43	288.59
Cen	CLI 8001		18.00	87.43	288.59
Cen	DOR 8023	74.00	39.24	87.43	288.59
Cen	DOR 8024		244.00	87.43	288.59
Cen	DOR 8033			87.43	288.59
Cen	DOR 8044	114.00	211.00	87.43	288.59
Cen	FAW 8021	424.40		87.43	288.59
Cen	FAW 8025	1,424.53	161.93	87.43	288.59
Cen	FIR 4003			87.43	288.59
Cen	FRA 8022	155.00		87.43	288.59
Cen	HAT 8021			87.43	288.59
Cen	I-113	N/A	N/A	87.43	288.59
Cen	I-555	N/A	N/A	87.43	288.59
Cen	K-193	N/A	N/A	87.43	288.59
Cen	K-375	N/A	N/A	87.43	288.59
Cen	K-479	N/A	N/A	87.43	288.59
Cen	K-531	N/A	N/A	87.43	288.59
Cen	KEA 4009			87.43	288.59
Cen	KIL 8032		24.00	87.43	288.59
Cen	L-402	N/A	N/A	87.43	288.59
Cen	LAF 8011	194.00	149.64	87.43	288.59
Cen	LAF 8012			87.43	288.59
Cen	LAF 8024	75.29	339.00	87.43	288.59
Cen	LEH 4007			87.43	288.59
Cen	MEA 8014	236.00	9.88	87.43	288.59
Cen	MEA 8021	523.00	242.41	87.43	288.59
Cen	MEC 4008			87.43	288.59
Cen	MIN 8012	9.14	61.00	87.43	288.59
Cen	MIN 8014		25.75	87.43	288.59
Cen	N-170	N/A	N/A	87.43	288.59
Cen	N-430	N/A	N/A	87.43	288.59
Cen	NBS 8023		6.00	87.43	288.59
Cen	NED 8012	1,424.55		87.43	288.59
Cen	NED 8014	1,470.84	140.83	87.43	288.59
Cen	NOT 8014			87.43	288.59
Cen	PIE 8025			87.43	288.59
Cen	POH 8013		95.45	87.43	288.59
Cen	POH 8014			87.43	288.59
Cen	Q-485	N/A	N/A	87.43	288.59
Cen	R-512	N/A	N/A	87.43	288.59
Cen	SOS 8015	787.53	503.25	87.43	288.59
Cen	SOS 8026	759.08	264.00	87.43	288.59
Cen	SPF 8026	1,125.50		87.43	288.59
Cen	V-516	N/A	N/A	87.43	288.59
Cen	WAN 8023			87.43	288.59
Cen	WFL 8023		86.93	87.43	288.59
Cen	WOR 8038			87.43	288.59
Met	BLO 8005			77.16	288.59

	Completed Circuit Performance				
Div	Circuit Improved	Comp Ckt Rpt Per CAIDI	5 Yr Comp Ckt ME CAIDI	5 Yr ME Div CAIDI	5 Yr ME Co CAIDI
Met	BRA 8012			77.16	288.59
Met	CED 8011	1,269.61	139.95	77.16	288.59
Met	CED 8022	138.00	22.79	77.16	288.59
Met	CED 8025		173.00	77.16	288.59
Met	CLF 8022	2,052.29	157.66	77.16	288.59
Met	COR 8014		52.50	77.16	288.59
Met	COR 8022			77.16	288.59
Met	COR 8035			77.16	288.59
Met	FOU 8014	182.88	690.00	77.16	288.59
Met	HNC 8014	507.00	51.27	77.16	288.59
Met	JAC 8012	883.42		77.16	288.59
Met	KUL 8012	1,648.56	33.00	77.16	288.59
Met	KUL 8022			77.16	288.59
Met	KUL 8024		8.53	77.16	288.59
Met	LAU 8011	922.92	164.00	77.16	288.59
Met	LAU 8014	941.77	256.22	77.16	288.59
Met	LAU 8015	351.00	60.31	77.16	288.59
Met	LAU 8035	982.98	8.00	77.16	288.59
Met	LAU 8044	810.70		77.16	288.59
Met	LAU 8046	2,117.87	272.72	77.16	288.59
Met	MAI 8011	3,018.89	161.71	77.16	288.59
Met	MAI 8012	234.24	246.16	77.16	288.59
Met	MAI 8021	513.75	171.89	77.16	288.59
Met	MAI 8024	739.00	199.13	77.16	288.59
Met	MCL 4009			77.16	288.59
Met	MOU 8001		81.15	77.16	288.59
Met	NUT 4002			77.16	288.59
Met	ORA 4004		106.71	77.16	288.59
Met	ORA 4007	1,216.81		77.16	288.59
Met	POR 4002		333.00	77.16	288.59
Met	POR 4003		333.00	77.16	288.59
Met	TOT 4003			77.16	288.59
Met	WEW 8012	2,783.67	275.00	77.16	288.59
Met	WEW 8013	2,076.00		77.16	288.59
Met	WEW 8021	1,157.79	77.14	77.16	288.59
Met	WEW 8022	2,016.93	90.00	77.16	288.59
Met	WEW 8024			77.16	288.59
Met	WEW 8025	13.00	56.00	77.16	288.59
Met	WEW 8042	562.76	789.00	77.16	288.59
Met	WEW 8043	553.07		77.16	288.59
Met	WOA 4010	580.00	764.00	77.16	288.59
Pal	A-547	N/A	N/A	88.18	288.59
Pal	BAO 8006			88.18	288.59
Pal	BAO 8022		56.96	88.18	288.59
Pal	BAO 8033		73.00	88.18	288.59
Pal	CON 8001			88.18	288.59
Pal	D-264	N/A	N/A	88.18	288.59
Pal	ENG 4001			88.18	288.59
Pal	ENG 4002			88.18	288.59
Pal	HID 8031	1,145.00	129.00	88.18	288.59
Pal	HID 8032	678.50	441.00	88.18	288.59
Pal	HOM 8001	143.74	70.00	88.18	288.59
Pal	HOM 8002			88.18	288.59
Pal	HOM 8021	104.00		88.18	288.59
Pal	I-269	N/A	N/A	88.18	288.59
Pal	KIN 8015		136.00	88.18	288.59
Pal	LEO 8006			88.18	288.59
Pal	LEO 8033			88.18	288.59
Pal	MAS 4001			88.18	288.59
Pal	MAS 4008			88.18	288.59
Pal	MDS 4008		154.00	88.18	288.59
Pal	NEW 8011	2,357.41		88.18	288.59
Pal	NEW 8023		105.00	88.18	288.59
Pal	NEW 8025		916.00	88.18	288.59
Pal	NEW 8045		26.66	88.18	288.59
Pal	NRB 8021		28.00	88.18	288.59

	Completed Circuit Performance				
Div	Circuit Improved	Comp Ckt Rpt Per CAIDI	5 Yr Comp Ckt ME CAIDI	5 Yr ME Div CAIDI	5 Yr ME Co CAIDI
Pal	NRB 8023			88.18	288.59
Pal	P-16	N/A	N/A	88.18	288.59
Pal	POL 4004			88.18	288.59
Pal	RGW 4004			88.18	288.59
Pal	RVR 8011			88.18	288.59
Pal	RVR 8012			88.18	288.59
Pal	SWT 8001			88.18	288.59
Pal	WAD 8012	398.52	120.00	88.18	288.59
Pal	WAD 8013	124.82	63.00	88.18	288.59
Pal	WAD 8022			88.18	288.59
Pal	WOD 4007			88.18	288.59
Pal	WOD 4009			88.18	288.59
Sou	BEA 8005		401.28	411.42	288.59
Sou	BEA 8006		196.07	411.42	288.59
Sou	BEA 8007	75.00		411.42	288.59
Sou	BEA 8008	1,279.25	336.56	411.42	288.59
Sou	BUS 8014	352.16	52.80	411.42	288.59
Sou	BUS 8021		894.00	411.42	288.59
Sou	BUS 8022	1,132.32	930.98	411.42	288.59
Sou	BUS 8024	652.17		411.42	288.59
Sou	C-133	N/A	N/A	411.42	288.59
Sou	CIN 8001	1,850.00	212.99	411.42	288.59
Sou	CIN 8011	405.82	1,259.20	411.42	288.59
Sou	CIN 8012	4,793.00	1,271.79	411.42	288.59
Sou	CIN 8042		56.55	411.42	288.59
Sou	CRX 8002	78.00	121.02	411.42	288.59
Sou	CRX 8004		27.82	411.42	288.59
Sou	CUT 8001			411.42	288.59
Sou	CUT 8003		306.79	411.42	288.59
Sou	CUT 8004	1,072.00	386.26	411.42	288.59
Sou	CUT 8005	266.50	157.70	411.42	288.59
Sou	CUT 8009	75.00	1,903.33	411.42	288.59
Sou	CUT 8031		8.50	411.42	288.59
Sou	CUT 8035		162.73	411.42	288.59
Sou	CUT 8041	397.42	3,596.00	411.42	288.59
Sou	DEA 4004			411.42	288.59
Sou	DFD 8008		134.96	411.42	288.59
Sou	DFD 8031	1,205.07	929.59	411.42	288.59
Sou	DFD 8033		234.59	411.42	288.59
Sou	FEN 8051	319.80	345.83	411.42	288.59
Sou	KUS 8002		128.67	411.42	288.59
Sou	KUS 8007		121.25	411.42	288.59
Sou	KUS 8031		24.00	411.42	288.59
Sou	KUS 8033		51.72	411.42	288.59
Sou	KUS 8035			411.42	288.59
Sou	KUS 8041		306.41	411.42	288.59
Sou	LAM 8001		360.25	411.42	288.59
Sou	LAW 8022		744.96	411.42	288.59
Sou	LAW 8023	92.52	2,204.00	411.42	288.59
Sou	LAW 8031		522.10	411.42	288.59
Sou	LAW 8033	1,057.41	114.18	411.42	288.59
Sou	LCE 8004			411.42	288.59
Sou	LCE 8005	1,147.39	439.29	411.42	288.59
Sou	LCE 8006	1,046.00	804.44	411.42	288.59
Sou	LCE 8042	38.19	245.76	411.42	288.59
Sou	LCE 8044		655.00	411.42	288.59
Sou	LEV 8004	188.93	310.46	411.42	288.59
Sou	LEV 8007	1,582.00	1,141.59	411.42	288.59
Sou	LEV 8008	1,928.42	1,089.06	411.42	288.59
Sou	LEV 8009	575.56	484.18	411.42	288.59
Sou	LEV 8018	122.73		411.42	288.59
Sou	LOC 8004			411.42	288.59
Sou	LUM 8011	106.00	238.20	411.42	288.59
Sou	LUM 8012	589.78	482.00	411.42	288.59
Sou	LUM 8013	2,487.92	1,277.29	411.42	288.59
Sou	LUM 8015	2,615.48		411.42	288.59

	Completed Circuit Performance				
Div	Circuit Improved	Comp Ckt Rpt Per CAIDI	5 Yr Comp Ckt ME CAIDI	5 Yr ME Div CAIDI	5 Yr ME Co CAIDI
Sou	M-507	N/A	N/A	411.42	288.59
Sou	MAD 8018	1,461.91	269.63	411.42	288.59
Sou	MAD 8021		597.29	411.42	288.59
Sou	MAD 8022	1,546.00	788.08	411.42	288.59
Sou	MAD 8038	263.00	40.65	411.42	288.59
Sou	MAR 8003	49.00	1,315.13	411.42	288.59
Sou	MAR 8006		355.70	411.42	288.59
Sou	MAR 8007		90.00	411.42	288.59
Sou	MAR 8019	376.00	821.03	411.42	288.59
Sou	MAR 8020	200.67	120.00	411.42	288.59
Sou	MDF 8014	126.09	460.87	411.42	288.59
Sou	MTL 8014		825.00	411.42	288.59
Sou	MTL 8023	260.00	312.42	411.42	288.59
Sou	MTL 8025	839.78	197.90	411.42	288.59
Sou	N-66	N/A	N/A	411.42	288.59
Sou	O-119	N/A	N/A	411.42	288.59
Sou	P-146	N/A	N/A	411.42	288.59
Sou	PEK 8013	1,465.00	199.29	411.42	288.59
Sou	PEK 8018	1,346.00		411.42	288.59
Sou	PEK 8019			411.42	288.59
Sou	PLI 8009	1,538.05	46.00	411.42	288.59
Sou	PRI 4001			411.42	288.59
Sou	R-122	N/A	N/A	411.42	288.59
Sou	RUN 8001			411.42	288.59
Sou	RUN 8003		1,427.80	411.42	288.59
Sou	RUN 8004	324.68	1,511.00	411.42	288.59
Sou	SOH 8022	221.96	158.53	411.42	288.59
Sou	THO 8012		242.91	411.42	288.59
Sou	THO 8022		1,046.50	411.42	288.59
Sou	W-387	N/A	N/A	411.42	288.59
Sou	WRY 4009		78.00	411.42	288.59
Sou	WYN 4004			411.42	288.59
Sou	YRD 8013	154.00	407.48	411.42	288.59
Sou	YRD 8022	179.50	628.10	411.42	288.59

Notes
All data is Major Event related
Reporting Period Period CAIDI = Performance of Completed Circuits During Reporting Period
5 Year CAIDI = Perfomance of Completed Circuits During 5 Years Prior to Reporting Period
5 Year Division CAIDI = 5 Year Division Aggregate CAIDI
5 Year Company CAIDI = 5 Year Company Aggregate CAIDI
Blank Cells indicate No Outage Data to Report
N/A - CAIDI not calculated for Subtransmission

Reporting Period	Start Date	End Date	Quarters
Report Quarter	1/1/2018	3/31/2018	2018 Q1
Year 1	1/1/2013	12/31/2013	2013 Q1 - 2013 Q4
Year 2	1/1/2014	12/31/2014	2014 Q1 - 2014 Q4
Year 3	1/1/2015	12/31/2015	2015 Q1 - 2015 Q4
Year 4	1/1/2016	12/31/2016	2016 Q1 - 2016 Q4
Year 5	**1/1/2017**	**12/31/2017**	**2017 Q1 - 2017 Q4**

Div	Circuit Improved	CAIDI	SAIFI	SAIDI	MAIFI
Cen	ADA 8013				
Cen	ADA 8021	43.95	0.11	4.83	1.02
Cen	ALD 8013	82.92	0.36	29.68	0.37
Cen	BEN 8013	12.61	0.92	11.64	1.66
Cen	BEN 8021	28.85	1.51	43.50	0.50
Cen	BEN 8024	86.00	0.02	1.40	
Cen	BRU 8013	89.48	0.86	77.17	2.01
Cen	C-393	N/A	N/A	N/A	N/A
Cen	CAT 4006				
Cen	CAT 4008				
Cen	CLI 8001		0.00	0.00	1.03
Cen	DOR 8023	41.98	1.37	57.62	0.56
Cen	DOR 8024	71.71	0.19	13.66	1.22
Cen	DOR 8033	25.35	1.47	37.27	1.47
Cen	DOR 8044	71.80	0.38	27.39	0.88
Cen	FAW 8021	24.90	2.01	50.16	6.41
Cen	FAW 8025	22.33	1.64	36.67	2.29
Cen	FIR 4003				
Cen	FRA 8022	436.00	0.02	10.63	1.00
Cen	HAT 8021	6.00	0.24	1.42	1.00
Cen	I-113	N/A	N/A	N/A	N/A
Cen	I-555	N/A	N/A	N/A	N/A
Cen	K-193	N/A	N/A	N/A	N/A
Cen	K-375	N/A	N/A	N/A	N/A
Cen	K-479	N/A	N/A	N/A	N/A
Cen	K-531	N/A	N/A	N/A	N/A
Cen	KEA 4009				
Cen	KIL 8032		0.00	0.00	
Cen	L-402	N/A	N/A	N/A	N/A
Cen	LAF 8011	118.81	0.33	39.41	1.96
Cen	LAF 8012		0.00	0.00	0.97
Cen	LAF 8024	137.85	0.92	127.30	4.53
Cen	LEH 4007				
Cen	MEA 8014	51.92	1.45	75.15	6.98
Cen	MEA 8021	113.46	0.17	19.38	2.89
Cen	MEC 4008				
Cen	MIN 8012	32.70	1.03	33.82	0.99
Cen	MIN 8014	129.93	0.60	78.02	1.18
Cen	N-170	N/A	N/A	N/A	N/A
Cen	N-430	N/A	N/A	N/A	N/A
Cen	NBS 8023		0.00	0.00	4.89
Cen	NED 8012	129.78	1.53	197.94	2.16
Cen	NED 8014	58.95	0.87	51.24	0.24
Cen	NOT 8014	43.25	1.37	59.27	1.13
Cen	PIE 8025				0.60
Cen	POH 8013	64.34	1.04	66.67	0.55
Cen	POH 8014	17.00	0.10	1.75	
Cen	Q-485	N/A	N/A	N/A	N/A
Cen	R-512	N/A	N/A	N/A	N/A
Cen	SOS 8015	60.37	1.25	75.55	1.56
Cen	SOS 8026	51.00	0.02	1.19	0.74
Cen	SPF 8026	38.37	0.90	34.43	2.40
Cen	V-516	N/A	N/A	N/A	N/A
Cen	WAN 8023	18.37	1.35	24.71	2.13
Cen	WFL 8023	81.82	0.31	25.77	2.29
Cen	WOR 8038	10.24	0.54	5.49	1.02
Met	BLO 8005				
Met	BRA 8012	63.45	0.51	32.05	1.90
Met	CED 8011	48.09	3.25	156.32	3.57

Div	Circuit Improved	CAIDI	SAIFI	SAIDI	MAIFI
Met	CED 8022	32.15	1.00	32.26	2.81
Met	CED 8025	42.07	0.48	20.27	
Met	CLF 8022	31.70	0.68	21.49	1.31
Met	COR 8014	81.01	0.45	36.06	1.01
Met	COR 8022	72.53	1.08	78.54	2.06
Met	COR 8035				
Met	FOU 8014	41.68	1.71	71.17	2.13
Met	HNC 8014	68.27	0.07	5.01	1.00
Met	JAC 8012	75.00	0.17	13.05	
Met	KUL 8012	63.84	1.08	68.74	1.56
Met	KUL 8022	25.89	1.44	37.29	2.01
Met	KUL 8024				
Met	LAU 8011	37.77	0.50	18.79	
Met	LAU 8014	24.40	0.27	6.64	1.01
Met	LAU 8015	40.02	0.53	21.06	0.44
Met	LAU 8035	81.12	2.98	242.09	2.45
Met	LAU 8044	118.71	0.75	88.52	
Met	LAU 8046	88.39	1.01	89.71	
Met	MAI 8011	50.13	2.83	142.12	3.55
Met	MAI 8012	61.18	0.66	40.07	1.52
Met	MAI 8021	25.79	0.39	10.15	1.73
Met	MAI 8024	37.55	0.93	34.76	2.60
Met	MCL 4009	122.00	0.14	17.54	0.38
Met	MOU 8001	68.80	1.02	70.04	4.32
Met	NUT 4002				
Met	ORA 4004	22.21	1.06	23.44	
Met	ORA 4007	89.75	4.20	377.17	
Met	POR 4002				
Met	POR 4003				
Met	TOT 4003	159.00	2.04	324.00	
Met	WEW 8012	75.46	1.23	92.67	1.07
Met	WEW 8013	32.04	0.43	13.65	1.82
Met	WEW 8021	42.64	1.91	81.37	2.96
Met	WEW 8022	317.00	0.11	35.51	1.05
Met	WEW 8024	56.46	0.60	34.08	1.76
Met	WEW 8025	92.07	0.04	3.36	1.34
Met	WEW 8042	83.97	0.56	47.30	1.00
Met	WEW 8043	43.14	0.46	20.05	2.14
Met	WOA 4010	55.98	1.60	89.44	
Pal	A-547	N/A	N/A	N/A	N/A
Pal	BAO 8006		0.00	0.00	
Pal	BAO 8022	17.79	0.67	11.99	1.04
Pal	BAO 8033	61.01	0.63	38.40	2.93
Pal	CON 8001	24.77	1.02	25.27	1.98
Pal	D-264	N/A	N/A	N/A	N/A
Pal	ENG 4001				
Pal	ENG 4002	15.00	1.00	15.00	
Pal	HID 8031	59.06	0.38	22.20	2.03
Pal	HID 8032	87.71	1.12	98.12	1.35
Pal	HOM 8001	89.52	0.24	21.87	4.31
Pal	HOM 8002				
Pal	HOM 8021				
Pal	I-269	N/A	N/A	N/A	N/A
Pal	KIN 8015	55.12	0.83	45.71	1.01
Pal	LEO 8006	67.45	0.95	64.30	0.87
Pal	LEO 8033	59.10	2.15	127.09	1.20
Pal	MAS 4001				
Pal	MAS 4008				
Pal	MDS 4008				
Pal	NEW 8011				
Pal	NEW 8023	107.00	0.02	2.01	
Pal	NEW 8025	361.38	0.73	263.29	1.61
Pal	NEW 8045	51.75	0.21	10.66	1.01
Pal	NRB 8021				
Pal	NRB 8023	101.44	1.28	129.84	2.50
Pal	P-16	N/A	N/A	N/A	N/A
Pal	POL 4004	68.00	1.01	68.36	
Pal	RGW 4004	196.00	0.04	8.32	

Div	Circuit Improved	CAIDI	SAIFI	SAIDI	MAIFI
Pal	RVR 8011	70.35	1.02	71.41	1.01
Pal	RVR 8012	429.55	0.21	90.28	
Pal	SWT 8001	32.60	1.06	34.39	0.66
Pal	WAD 8012	76.44	0.40	30.32	1.94
Pal	WAD 8013	95.86	0.22	21.55	
Pal	WAD 8022	200.49	0.10	20.65	1.33
Pal	WOD 4007				
Pal	WOD 4009				
Sou	BEA 8005	116.47	0.09	10.51	
Sou	BEA 8006	19.36	1.13	21.83	0.82
Sou	BEA 8007	41.86	1.27	53.04	
Sou	BEA 8008	118.20	0.02	2.66	1.21
Sou	BUS 8014	129.92	2.14	277.83	2.43
Sou	BUS 8021	125.78	1.22	154.07	
Sou	BUS 8022	38.13	1.61	61.41	0.66
Sou	BUS 8024	57.88	1.57	91.09	2.13
Sou	C-133	N/A	N/A	N/A	N/A
Sou	CIN 8001	25.13	0.59	14.90	2.12
Sou	CIN 8011	144.57	0.15	21.90	
Sou	CIN 8012	27.95	0.75	20.86	1.67
Sou	CIN 8042	162.01	0.15	24.05	1.12
Sou	CRX 8002	196.41	0.57	111.84	
Sou	CRX 8004	151.18	0.42	62.89	2.00
Sou	CUT 8001	49.22	1.11	54.64	1.62
Sou	CUT 8003	98.63	0.80	79.06	1.82
Sou	CUT 8004	131.51	1.72	225.62	2.19
Sou	CUT 8005	19.04	0.70	13.40	3.00
Sou	CUT 8009	53.31	1.03	55.10	2.14
Sou	CUT 8031				
Sou	CUT 8035	38.70	1.58	60.98	3.94
Sou	CUT 8041	104.94	2.72	285.34	2.46
Sou	DEA 4004	31.00	0.12	3.88	1.00
Sou	DFD 8008	52.30	0.83	43.53	1.29
Sou	DFD 8031	36.87	0.41	15.10	1.04
Sou	DFD 8033	95.91	1.37	131.02	1.08
Sou	FEN 8051	46.52	1.12	51.89	1.92
Sou	KUS 8002	17.25	1.56	26.94	1.01
Sou	KUS 8007	108.90	0.53	58.05	
Sou	KUS 8031	9.64	1.23	11.82	0.72
Sou	KUS 8033	66.56	2.13	141.57	1.35
Sou	KUS 8035	129.18	0.10	13.34	
Sou	KUS 8041	22.70	1.85	41.88	1.59
Sou	LAM 8001	129.00	0.00	0.52	4.05
Sou	LAW 8022	153.11	0.30	46.09	2.45
Sou	LAW 8023	8.03	2.11	16.97	2.00
Sou	LAW 8031	111.39	0.17	19.41	
Sou	LAW 8033	139.43	0.30	41.21	
Sou	LCE 8004	27.08	0.49	13.35	1.01
Sou	LCE 8005	57.49	1.21	69.61	0.12
Sou	LCE 8006	31.30	1.46	45.72	3.42
Sou	LCE 8042	33.48	1.69	56.69	0.77
Sou	LCE 8044	42.24	0.18	7.56	1.63
Sou	LEV 8004	71.48	0.89	63.85	1.94
Sou	LEV 8007	101.68	1.09	111.18	1.64
Sou	LEV 8008	50.90	1.11	56.68	0.85
Sou	LEV 8009	155.31	0.96	148.82	1.01
Sou	LEV 8018	15.62	1.09	16.95	1.97
Sou	LOC 8004	138.00	0.01	1.53	3.26
Sou	LUM 8011	93.10	1.24	115.43	1.83
Sou	LUM 8012	77.38	2.03	156.83	2.41
Sou	LUM 8013	190.27	0.11	20.77	1.72
Sou	LUM 8015	39.03	1.11	43.18	1.01
Sou	M-507	N/A	N/A	N/A	N/A
Sou	MAD 8018	45.94	1.93	88.82	5.07
Sou	MAD 8021	33.31	3.38	112.58	3.12
Sou	MAD 8022	133.38	0.61	81.27	
Sou	MAD 8038	103.17	0.51	52.71	2.44
Sou	MAR 8003	78.60	1.56	122.90	1.67

Div	Circuit Improved	CAIDI	SAIFI	SAIDI	MAIFI
Sou	MAR 8006	104.24	1.72	178.78	5.35
Sou	MAR 8007	154.86	0.73	113.11	2.31
Sou	MAR 8019	86.93	0.07	6.42	
Sou	MAR 8020	170.89	0.14	23.51	0.61
Sou	MDF 8014	245.21	0.17	41.94	0.91
Sou	MTL 8014	85.58	0.71	60.40	0.57
Sou	MTL 8023	126.55	0.41	51.69	1.59
Sou	MTL 8025	94.32	0.41	38.56	1.77
Sou	N-66	N/A	N/A	N/A	N/A
Sou	O-119	N/A	N/A	N/A	N/A
Sou	P-146	N/A	N/A	N/A	N/A
Sou	PEK 8013	27.88	1.34	37.23	1.01
Sou	PEK 8018	107.20	0.78	83.42	2.08
Sou	PEK 8019				
Sou	PLI 8009	25.03	1.29	32.37	1.07
Sou	PRI 4001				
Sou	R-122	N/A	N/A	N/A	N/A
Sou	RUN 8001	46.05	0.87	40.26	
Sou	RUN 8003	29.27	0.72	20.94	0.60
Sou	RUN 8004	69.28	0.06	4.00	
Sou	SOH 8022	46.42	1.41	65.42	1.71
Sou	THO 8012	13.20	0.89	11.72	0.98
Sou	THO 8022	102.98	0.32	33.01	2.69
Sou	W-387	N/A	N/A	N/A	N/A
Sou	WRY 4009				
Sou	WYN 4004				
Sou	YRD 8013	98.46	0.14	13.79	1.08
Sou	YRD 8022	55.96	0.66	37.11	0.60

Notes
All data is Non Major Event related
Blank Cells indicate No Outage Data to Report
N/A - Indices not calculated for Subtransmission
Reporting Period is the Year Prior to the Reporting Quarter

Reporting Period	Start Date	End Date	Quarters
Report Quarter	1/1/2018	3/31/2018	2018 Q1
Year 1	1/1/2013	12/31/2013	2013 Q1 - 2013 Q4
Year 2	1/1/2014	12/31/2014	2014 Q1 - 2014 Q4
Year 3	1/1/2015	12/31/2015	2015 Q1 - 2015 Q4
Year 4	1/1/2016	12/31/2016	2016 Q1 - 2016 Q4
Year 5	1/1/2017	12/31/2017	2017 Q1 - 2017 Q4

Major Event CAIDI

Circuit	Report Quarter	Year 1	Year 2	Year 3	Year 4	Year 5	5 Year Avg
Completed	575.23		488.84	398.32	156.23	157.92	300.33
Non Invested	497.01		211.87	485.62	126.86	132.88	239.31

Notes

All data is Major Event related

Reporting Period	Start Date	End Date	Quarters
Report Quarter	1/1/2018	3/31/2018	2018 Q1
Year 1	1/1/2013	12/31/2013	2013 Q1 - 2013 Q4
Year 2	1/1/2014	12/31/2014	2014 Q1 - 2014 Q4
Year 3	1/1/2015	12/31/2015	2015 Q1 - 2015 Q4
Year 4	1/1/2016	12/31/2016	2016 Q1 - 2016 Q4
Year 5	1/1/2017	12/31/2017	2017 Q1 - 2017 Q4

Major Event CAIDI

AT Status	Report Quarter	Year 1	Year 2	Year 3	Year 4	Year 5	5 Year Avg
Complete	276.12		16.42	235.29	154.71	43.61	112.51
Non Invested							

Notes

All data is Major Event related

Electric

	Quarter (Jan-Mar 2018) Actuals	Quarter (Jan-Mar 2018) Forecast	Program to Date Actuals	Program to Date Forecast
Contingency Reconfiguration				
Material			$ 21,210,460	$ 23,926,279
All Other Costs			$ 62,407,770	$ 77,230,864
	$ -	**$ -**	**$ 83,618,230**	**$ 101,157,143**

	Quarter (Jan-Mar 2018) Actuals	Quarter (Jan-Mar 2018) Forecast	Program to Date Actuals	Program to Date Forecast
Advanced Technologies				
Material	$ -		$ 15,978,008	$ 19,876,139
All Other Costs			$ 90,238,658	$ 94,902,308
	$ -	**$ -**	**$ 106,216,666**	**$ 114,778,447**

	Quarter (Jan-Mar 2018) Actuals	Quarter (Jan-Mar 2018) Forecast	Program to Date Actuals	Program to Date Forecast
Flood Mitigation				
Material	$ 304,796	$ 136,875	$ 110,511,721	$ 136,149,886
All Other Costs	$ 10,293,927	$ 9,868,096	$ 306,910,349	$ 425,763,582
	$ 10,598,723	**$ 10,004,971**	**$ 417,422,070**	**$ 561,913,468**

Gas

	Quarter (Jan-Mar 2018) Actuals	Quarter (Jan-Mar 2018) Forecast	Program to Date Actuals	Program to Date Forecast
UPCI				
Material			$ 9,230,916	$ 10,692,379
All Other Costs			$ 360,783,854	$ 345,346,805
	$ -	**$ -**	**$ 370,014,770**	**$ 356,039,185**

	Quarter (Jan-Mar 2018) Actuals	Quarter (Jan-Mar 2018) Forecast	Program to Date Actuals	Program to Date Forecast
M&R Flood Mitigation				
Material			$ 3,787,940	$ 6,380,062
All Other Costs	$ 32,571	$ 52,825	$ 21,496,351	$ 29,885,860
	$ 32,571	**$ 52,825**	**$ 25,284,291**	**$ 36,265,922**

* Quarterly forecast is as of February 1, 2018

July 27, 2018

VIA ELECTRONIC and FIRST-CLASS MAIL

Aida Camacho-Welch, Secretary
Board of Public Utilities
44 South Clinton Avenue, 3rd Flr.
P.O. Box 350
Trenton, New Jersey 08625-0350

Re: PSE&G GAS SYSTEM MODERNIZATION PROGRAM (GSMP)
Monthly Report – June 2018
Quarterly Report on Activity Related to Department of Energy's Quadrennial Energy Review ("QER")

Dear Secretary Camacho-Welch:

Enclosed for filing are ten copies of this letter and enclosures providing Public Service Electric & Gas Company's (PSE&G's) monthly report for June, 2018 on its Gas System Modernization Program (GSMP or the Program).

GSMP was approved by a Board Order dated November 16, 2015 in BPU Docket No. GR15030272. That Order adopted a Stipulation pursuant to which PSE&G is operating the Program. This report is filed pursuant to paragraph 25 of that Stipulation and is designed to address the first four items contained in Attachment C to that Stipulation.

The first three items are addressed in the attached materials. With regard to item 4, there were no funds or credits received from the United States government, the State of New Jersey, a county or a municipality, for work related to any of the Program projects.

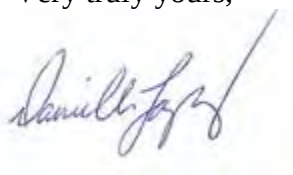
In addition, paragraph 26 of the Stipulation states that:

> The Company will monitor progress of the Department of Energy's Quadrennial Energy Review ("QER") initiative, and engage in communications with relevant stakeholders regarding potential funding made available to New Jersey ratepayers for gas main replacement. The Company will interact with the relevant stakeholders to support a position that promotes funding for New Jersey ratepayers. The Company agrees to provide quarterly updates to Board Staff and Rate Counsel of any QER developments of which it becomes aware.

The PSE&G report on the QER for the second quarter of 2018 remains as follows. During 2016, both houses of Congress passed different versions of a major energy bill (S. 2012), but no version of the bill

passed both houses. That legislation died in early January 2017 at the end of the 114th Congress. During the second quarter of 2018, to the extent possible, PSE&G continued to pursue discussions of the QER recommendation to provide federal funds toward replacement of gas infrastructure with stakeholders and staff on Capitol Hill but, at this time, there is no active consideration of this matter.

Very truly yours,



Danielle Lopez

cc: Stefanie Brand (two hard copies and e-mail)
Paul Flanagan (e-mail only)
Lisa Gurkas (e-mail only)
Brian Lipman (e-mail only)
Alex Moreau (e-mail only)
Stacy Peterson (e-mail only)
Bethany Rocque-Romaine (e-mail only)
Felicia Thomas-Friel (e-mail only)
Caroline Vachier (e-mail only)
Noreen Giblin (e-mail only)
Grace Strom Power (e-mail only)

PSE&G - GAS SYSTEM MODERNIZATION PROGRAM
ATTACHMENT C - MONTHLY REPORT

1) PSE&G's overall approved Program and Stipulated Base capital budget broken down by major categories, both budgeted and actual amounts.

GSMP Major Project Categories	Overall Approved Program	2018 June PTD Budget	2018 June PTD Actual
Replacement Main $	$ 487,800,000	$ 327,495,218	$ 359,544,846
Replacement Service $	$ 159,300,000	$ 123,496,222	$ 121,084,660
Regulator Elimination $	$ 2,900,000	$ 1,951,072	$ 914,043
Total	$ 650,000,000	$ 452,942,511	$ 481,543,549

Stipulated Base Major Project Categories	Overall Approved Program	2018 June PTD Budget	2018 June PTD Actual
Replacement Main $	$ 160,400,000	$ 158,936,257	$ 170,197,874
Replacement Service $	$ 35,000,000	$ 28,796,498	$ 33,605,667
Stipulated Meter Reconstruction $	$ 9,700,000	$ 2,879,806	$ 5,568,748
GSMP Meter Reconstruction $	$ 49,900,000	$ 12,895,206	$ 6,875,685
Total	$ 255,000,000	$ 203,507,767	$ 216,247,974

PSE&G - GAS SYSTEM MODERNIZATION PROGRAM
ATTACHMENT C - MONTHLY REPORT

2) b. Expenditures incurred to date and amounts transferred to plant in-service, by project.

Expenditures Incurred To Date GSMP Projects	June PTD Actual Material $	June PTD Actual Other $	June PTD Actual Total $	Amount to Plant In-Service
Replacement Main	$ 25,243,814	$ 334,301,032	$ 359,544,846	$ 349,448,122
Replacement Service	$ 4,635,930	$ 116,448,730	$ 121,084,660	$ 121,035,925
Regulator Elimination	$ 48,475	$ 865,568	$ 914,043	$ 405,030
Total	$ 29,928,219	$ 451,615,330	$ 481,543,549	$ 470,889,077

Expenditures Incurred To Date Stipulated Base Projects	June PTD Actual Material $	June PTD Actual Other $	June PTD Actual Total $	Amount to Plant In-Service
Replacement Main	$ 21,062,953	$ 149,134,921	$ 170,197,874	$ 164,459,422
Replacement Service	$ 1,519,396	$ 32,086,271	$ 33,605,667	$ 33,580,023
Stipulated Meter Reconstruction	$ 381,895	$ 5,186,853	$ 5,568,748	$ 5,568,748
GSMP Meter Reconstruction	$ 324,945	$ 6,550,740	$ 6,875,685	$ 6,875,685
Total	$ 23,289,189	$ 192,958,785	$ 216,247,974	$ 210,483,878

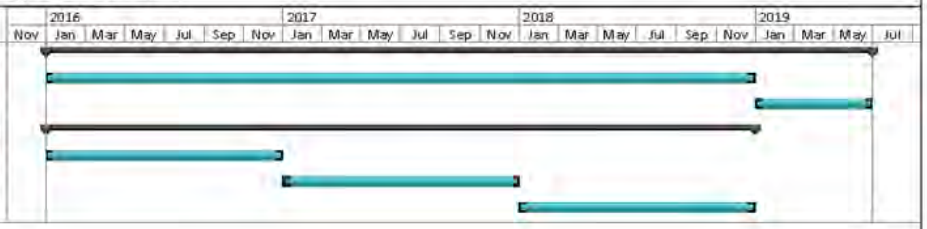
PSE&G - GAS SYSTEM MODERNIZATION PROGRAM
ATTACHMENT C - MONTHLY REPORT

REPORT DATE: JUNE 2018
2a - Description of projects
2c - Projected and actual miles of main installed
2d - Projected and actual number of services installed

	Project	Sub-Project	Project Completion Date	Units	Size Installed	Material Installed	2016 Quantity Completed	2017 Quantity Completed	Projected Quantity Jan 2018	Actual Quantity Jan 2018	Projected Quantity Feb 2018	Actual Quantity Feb 2018	Projected Quantity Mar 2018	Actual Quantity Mar 2018	Projected Quantity Apr 2018	Actual Quantity Apr 2018	Projected Quantity May 2018	Actual Quantity May 2018	Projected Quantity Jun 2018	Actual Quantity Jun 2018	2018 Estimated Quantity	Quantity Completed 2018 Year To Date	Total Program Quantity Completed To Date
GAS SYSTEM MODERNIZATION PROGRAM	Replace Facilities Blanket	Replacement Main	Dec-18	Feet of Main	2"	Plastic	**361,739**	**333,811**	-	13,451	-	21,484	-	8,750	9,315	6,641	11,426	5,406	14,998	18,147	***304,229***	**73,879**	**769,429**
					4"	Plastic	**182,371**	**113,501**	-	5,471	-	5,385	-	568	1,804	7,005	2,299	9,060	4,655	8,896	***107,783***	**36,385**	**332,257**
					6"	Plastic	**60,016**	**54,810**	-	1,783	-	1,406	-	1,684	2,039	3,456	1,194	2,021	1,372	1,460	***51,168***	**11,810**	**126,636**
					8"	Plastic	**13,461**	**24,762**	-	2	-	1,463	-	-	1,947	113	919	28	93	1,035	***16,550***	**2,641**	**40,864**
					12"	Plastic	**7,324**	**3,784**	-	-	-	-	-	-	-	-	-	-	-	-	**-**	**-**	**11,108**
					12"	Steel	**-**	**16,451**	-	45	-	-	-	-	-	-	-	-	-	-	***750***	**45**	**16,496**
					16"	Steel	**-**	**36**	-	-	-	-	-	-	-	-	-	-	-	-	**-**	**-**	**36**
	Replace Facilities Blanket	**Replacement Main**	**N/A**	**Feet of Main**	**N/A**	**N/A**	**624,911**	**547,155**	**-**	**20,752**	**-**	**29,738**	**-**	**11,002**	**15,105**	**17,215**	**15,838**	**16,515**	**21,118**	**29,538**	***480,480***	**124,760**	**1,296,826**
	Replace Facilities Blanket	Replacement Service	Dec-18	Services Replaced	≤ 2"	Plastic	**6,804**	**9,850**	500	770	500	850	500	624	750	777	750	571	750	599	***8,250***	**4,191**	**20,845**
					>2"	Plastic	**4**	**8**	-	1	-	-	-	-	-	1	-	-	-	-	**-**	**2**	**14**
	Replace Facilities Blanket	**Replacement Service**	**N/A**	**Services Replaced**	**N/A**	**N/A**	**6,808**	**9,858**	**500**	**771**	**500**	**850**	**500**	**624**	**750**	**778**	**750**	**571**	**750**	**599**	***8,250***	**4,193**	**20,859**
	Abandon Facilities Blanket	Abandon Regulator	Dec-18	Regulators Abandoned	N/A	N/A	**5**	**28**		-		2		1		1		1		2		**7**	**40**
	Abandon Facilities Blanket	**Abandon Regulator**	**N/A**	**Regulators Abandoned**	**N/A**	**N/A**	**5**	**28**		**-**		**2**		**1**		**1**		**1**		**2**		**7**	**40**
STIPULATED BASE	Replace Facilities Blanket	Replacement Main	Dec-18	Feet of Main	2"	Plastic	**155,411**	**38,376**	-	1,005	-	709	-	1,544	1,243	2,985	2,369	4,237	5,800	1,808	***29,799***	**12,288**	**206,075**
					4"	Plastic	**95,033**	**31,522**	-	274	-	259	-	954	757	-	1,304	848	3,700	3,543	***25,191***	**5,878**	**132,433**
					6"	Plastic	**34,296**	**11,052**	-	714	-	490	-	668	1,450	68	2,750	1,126	2,750	409	***12,097***	**3,475**	**48,823**
					8"	Plastic	**16,633**	**2,342**	-	1,600	-	75	-	10	4	-	10	-	-	444	***3,971***	**2,129**	**21,104**
					8"	Steel	**-**	**-**	-	-	-	-	-	-	-	-	-	-	-	-	**-**	**-**	**-**
					12"	Plastic	**7,099**	**-**	-	-	-	-	-	100	-	-	-	-	-	-	**-**	**100**	**7,199**
					12"	Steel	**56,113**	**16,392**	-	4,100	-	-	-	-	361	-	2,164	-	2,229	39	***27,043***	**4,139**	**76,644**
					16"	Steel	**10,331**	**50,778**	-	-	-	-	-	387	1,000	1,056	2,000	1,297	1,400	753	***7,500***	**3,493**	**64,602**
					20"	Steel	**111**	**-**	-	-	-	-	-	-	-	-	-	-	-	-	**-**	**-**	**111**
	Replace Facilities Blanket	**Replacement Main**	**N/A**	**Feet of Main**	**N/A**	**N/A**	**375,027**	**150,462**	**-**	**7,693**	**-**	**1,533**	**-**	**3,663**	**4,815**	**4,109**	**10,598**	**7,508**	**15,879**	**6,996**	***105,600***	**31,502**	**556,991**
	Replace Facilities Blanket	Replacement Service	Dec-18	Services Replaced	≤ 2"	Plastic	**3,153**	**2,492**	50	49	50	80	50	44	50	26	75	115	100	130	***1,625***	**444**	**6,089**
					>2"	Plastic	**3**	**2**	-	-	-	-	-	2	-	-	-	-	-	2	**-**	**4**	**9**
	Replace Facilities Blanket	**Replacement Service**	**N/A**	**Services Replaced**	**N/A**	**N/A**	**3,156**	**2,494**	**50**	**49**	**50**	**80**	**50**	**46**	**50**	**26**	**75**	**115**	**100**	**132**	***1,625***	**448**	**6,098**
	Abandon Facilities Blanket	Abandon Regulator	Dec-18	Regulators Abandoned	N/A	N/A	**-**	**-**		-		-		-		-		-		-		**-**	**-**
	Abandon Facilities Blanket	**Abandon Regulator**	**N/A**	**Regulators Abandoned**	**N/A**	**N/A**	**-**	**-**		**-**		**-**		**-**		**-**		**-**		**-**		**-**	**-**

GSMP/ Stip Base Timeline

ID	Task Name	Duration	Start	Finish
1	**GSMP**	**911 days**	**Fri 1/1/16**	**Sun 6/30/19**
2	GSMP Work	782 days	Fri 1/1/16	Mon 12/31/18
3	GSMP Completion and Restoration Work	130 days	Tue 1/1/19	Sun 6/30/19
4	**Stip Base**	**782 days**	**Fri 1/1/16**	**Mon 12/31/18**
5	Stip Base Year 1	262 days	Fri 1/1/16	Sat 12/31/16
6	Stip Base Year 2	262 days	Sun 1/1/17	Sun 12/31/17
7	Stip Base Year 3	261 days	Mon 1/1/18	Mon 12/31/18



Project: GSMP Timeline
Date: Wed 5/11/16

Task Milestone Summary Project Summary

Page 1

EXHIBIT P-3 R-2
Schedule JLC-4 (a) R-2

Electric Operations and Maintenance

in $000

	Actual July 2017 - Dec 2017	Actual Jan 2018 - June 2018	Test Year Total July 2017 - June 2018
Distribution Operations	$ 25,453	$ 39,692	$ 65,146
Distribution Maintenance	$ 55,858	$ 52,757	$ 108,616
Major Categories			
Vegetation Management	$ 15,306	$ 15,932	$ 31,238
Corrective Maintenance	$ 29,799	$ 40,471	$ 70,271
Buildings & Grounds	$ 7,218	$ 3,147	$ 10,365
Inspections	$ 7,601	$ 8,642	$ 16,244
	$ 59,925	$ 68,193	$ 128,118

EXHIBIT P-3 R-2
Schedule JLC-4 (b) R-2

Gas Operations and Maintenance

in $000

	Actual	Actual	Test Year Total
	July 2017 - Dec 2017	**Jan 2018 - June 2018**	**July 2017 - June 2018**
Distribution Operations	$ 34,438	$ 41,129	$ 75,567
Distribution Maintenance	$ 14,811	$ 18,646	$ 33,457
Gas Transmission	$ 2,637	$ 792	$ 3,429
Major Categories			
Safety	$ 25,597	$ 26,403	$ 52,000
Measurement	$ 5,545	$ 5,305	$ 10,851
Gas Markouts	$ 9,520	$ 10,175	$ 19,695
Inspections and Surveys	$ 4,619	$ 5,059	$ 9,677
Main & Service Maintance	$ 7,039	$ 11,629	$ 18,668
Gas Transmission Pipeline Intregrity	$ 2,637	$ 792	$ 3,429