

Before the Public Service Commission

THE BROOKLYN UNION GAS COMPANY d/b/a NATIONAL GRID NY

Direct Testimony

of

Gas Infrastructure and Operations Panel

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Timothy S. Graham
Caroline Hon
Srividya Madhusudhan**

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1 **I. Introduction and Qualifications**

2 **Q. Please introduce the members of the Gas Infrastructure and Operations**
3 **Panel.**

4 A. The Panel consists of Ross W. Turrini, Timothy S. Graham, Caroline Hon, and
5 Srividya Madhusudhan.

6
7 **Q. Mr. Turrini, please state your name and business address.**

8 A. My name is Ross W. Turrini. My business address is 25 Hub Drive, Melville,
9 New York 11747.

10

11 **Q. By whom are you employed and in what capacity?**

12 A. I am employed by National Grid USA Service Company, Inc. (“National Grid
13 Service Company”), a subsidiary of National Grid USA (“National Grid”), as
14 the Group and US Chief Gas Engineer. I oversee approximately 800 employees
15 and more than \$9.5 billion of gas infrastructure assets serving over 3.6 million
16 customers in New York, Massachusetts, and Rhode Island.

17

18 National Grid owns and operates three gas distribution companies in New York
19 that provide retail gas service to more than 2.4 million customers in three
20 service territories: Niagara Mohawk Power Corporation d/b/a National Grid
21 (“Niagara Mohawk”) serves areas of eastern and central New York; The

1 Brooklyn Union Gas Company d/b/a National Grid NY (“KEDNY” or
2 “Company”) serves Brooklyn, Staten Island, and parts of Queens in New York
3 City; and KeySpan Gas East Corporation d/b/a National Grid (“KEDLI”) serves
4 customers on Long Island and the Rockaway Peninsula in Queens. I am
5 responsible for all aspects of the performance of National Grid’s New York gas
6 networks, including emergency response, gas engineering, construction
7 activities, operation and maintenance of gas transmission and distribution
8 facilities, gas network strategy, including the gas capital investment strategy,
9 and gas pipeline safety management.

10

11 **Q. Please describe your educational background and business experience.**

12 A. I received a Bachelor of Science in Civil Engineering from the United States
13 Military Academy at West Point in 1985. I have worked for National Grid and
14 its predecessor companies (the Long Island Lighting Company and KeySpan
15 Corporation) for 25 years in various roles in engineering, operations, and
16 procurement. Prior to joining National Grid, I spent five years as an Officer in
17 the United States Army Corps of Engineers and three years in engineering and
18 construction roles at Brown & Root Services Corporation, an international
19 engineering, procurement, and construction company.

20

1 **Q. Have you previously testified before the New York Public Service**
2 **Commission (“Commission”)?**

3 A. Yes. I testified before the Commission on behalf of KEDNY and KEDLI in
4 Cases 16-G-0058 and 16-G-0059 (the “2016 KEDNY and KEDLI Rate
5 Cases”). I also testified most recently on behalf of Niagara Mohawk in Case
6 17-G-0239 (the “2017 NMPC Rate Case”).

7

8 **Q. Mr. Graham, please state your full name and business address.**

9 A. My name is Timothy S. Graham. My business address is 300 Erie Boulevard
10 West, Syracuse, New York 13212.

11

12 **Q. By whom are you employed and in what capacity?**

13 A. I am employed by National Grid Service Company as the Vice President for
14 Gas Field Operations. I oversee approximately 2,300 employees and am
15 responsible for the maintenance of KEDNY, KEDLI, and Niagara Mohawk’s
16 gas distribution systems. This includes gas metering, construction, and field
17 activities to carry out mandated safety programs, leak response, leak repair,
18 instrumentation and regulation, damage prevention, and inspection programs.

19

1 **Q. Please describe your educational background and experience.**

2 A. I received a Bachelor of Engineering in Electrical Engineering from the State
3 University of New York at Buffalo. I also have a Master's in Business
4 Administration from Lemoyne College in Syracuse, New York. I have worked
5 for National Grid and its predecessor companies (Niagara Mohawk) for 32
6 years in various roles in engineering and operations.

7

8 **Q. Ms. Hon, please state your full name and business address.**

9 A. My name is Caroline Hon. My business address is 40 Sylvan Road, Waltham,
10 Massachusetts, 02451.

11

12 **Q. By whom are you employed and in what capacity?**

13 A. I am employed by National Grid Service Company as the Vice President for
14 Gas Resource Management. I oversee approximately 400 employees and am
15 responsible for the planning, scheduling, dispatch, dependency management,
16 and clerical support for the capital, maintenance, and repair work across
17 National Grid's gas network.

18

19 **Q. Please describe your educational background and professional experience.**

20 A. I received a Bachelor of Science in Chemical Engineering from the
21 Massachusetts Institute of Technology in 2001. I have worked for National

1 Grid for nine years in various roles in operations, finance, and shared services.
2 Prior to joining National Grid, I worked as a consultant for eight years in
3 Accenture's Utilities Transmission and Distribution practice, focused on work
4 management process optimization and system implementation.

5
6 **Q. Ms. Madhusudhan, please state your name and business address.**

7 A. My name is Srividya Madhusudhan. My business address is 40 Sylvan Road,
8 Waltham, Massachusetts, 02451.

9
10 **Q. By whom are you employed and in what capacity?**

11 A. I am employed by National Grid Service Company as the Vice President of
12 Property and Fleet. I oversee all the Facilities, Fleet and Property activity in
13 support of National Grid Operating companies including KEDNY, KEDLI, and
14 Niagara Mohawk. This includes buying, selling, leasing, licensing,
15 administration of rights of way, Management of Rights of way and maintenance
16 of fleet. I also oversee development of the facilities and fleet plans to support
17 KEDNY and KEDLI's gas businesses and related capital forecasts.

18
19 **Q. Please describe your educational background and professional experience.**

20 A. I received a Bachelor of Law from Chennai, India in 1991. I also have a Masters
21 in Environmental Management from Rensselaer Polytechnic Institute and an

1 MBA from the University of Connecticut. I have worked at National Grid since
2 May of 2017 prior to which I worked at Eversource Energy for 18 years in
3 various roles in environmental, Operations and Real Estate and Facilities.
4

5 **II. Purpose of Testimony**

6 **Q. What is the purpose of the Gas Infrastructure and Operations Panel's**
7 **testimony?**

8 A. The purpose of the Panel's testimony is to provide a forecast of the capital
9 investments of the Company for the twelve-month period ending March 31,
10 2021 ("Rate Year"), and the three subsequent twelve-month periods ending
11 March 31, 2022 ("Data Year 1"), March 31, 2023 ("Data Year 2"), and March
12 31, 2024 ("Data Year 3") (Data Year 1, Data Year 2, and Data Year 3 are
13 collectively referred to as the "Data Years"). The Panel also presents a forecast
14 for the fifteen-month period ("Gap Period") between December 31, 2018,
15 which is the end of the Company's Historic Test Year, and the beginning of the
16 Rate Year.
17

18 The Panel discusses direct capital expenditures that will (i) increase the safety
19 and reliability of the Company's gas network, (ii) modernize the Company's
20 gas transmission and distribution infrastructure to reduce emissions while
21 continuing to meet customer needs, and (iii) enhance resiliency and the

1 Company's ability to respond to future weather events. The Panel will also
2 discuss the Company's practices and policies for maximizing the efficiency of
3 its capital delivery program from planning and budgeting through the
4 completion of construction.

5
6 The Panel's testimony provides an overview of the significant projects in the
7 Company's capital plan, including retirement of leak prone pipe ("LPP") and
8 new safety programs to identify and address system risks. The Panel's
9 testimony also presents an overview of the Company's pipeline integrity and
10 reliability programs that will improve the overall safety and reliability of the
11 Company's gas system, and will also address recently enacted, as well as
12 pending, pipeline safety regulations administered by the U.S. Department of
13 Transportation ("DOT"), Pipeline and Hazardous Materials Safety
14 Administration ("PHMSA"). The Panel discusses the Company's plans and
15 infrastructure projects necessary to ensure that the Company can reliably serve
16 its existing customers as well as forecast demand for new customer connections
17 within the Company's operating territory.

18
19 The Panel also presents the Company's indirect capital investments, including
20 supply chain, inventory management/investment recovery ("IM/IR"), and fleet
21 investments. The Company is also proposing significant investments in

1 facilities during the Rate Year and Data Years that are necessary to: support the
2 Company's O&M and gas safety programs; make needed upgrades to aging
3 facilities; and create more modern and efficient customer support and employee
4 work spaces.

5
6 **Q. Does the Panel's testimony also address the Company's operations and**
7 **maintenance ("O&M") programs?**

8 A. Yes. In addition to capital investments in gas infrastructure, the Panel describes
9 incremental labor (full time equivalent positions or "FTEs") and non-labor
10 O&M expenses that the Company proposes in the Rate Year and Data Years,
11 the costs of which are not fully reflected in the twelve-month period beginning
12 January 1, 2018 and ending December 31, 2018 ("Historic Test Year"). These
13 expenses represent known and measurable changes from Historic Test Year
14 expenses that are necessary to (i) improve system safety and reliability, (ii)
15 address new and emerging safety regulations, (iii) enhance customer service,
16 and (iv) support the Company's capital investments. The Panel will also discuss
17 the Company's staffing plan for the proposed new FTEs.

1 Exhibit __ (GIOP-6): Demonstration of Variability in City/State Construction
2 O&M.

3 Exhibit __ (GIOP-7): Projected Indirect Capital Expenditures (Supply Chain,
4 Fleet, and Facilities) for the Gap Period, Rate Year, Data
5 Year 1, Data Year 2, and Data Year 3, and Data Sheets
6 for Significant Facilities Investments.

7 Exhibit __ (GIOP-8): Incremental O&M Expenditures: Rate Year, Data Year
8 1, Data Year 2, and Data Year 3.

9 Exhibit __ (GIOP-9): Incremental FTE Positions by Function in the Rate Year,
10 Data Year 1, Data Year 2, and Data Year 3.

11

12 The capital expenditures presented throughout the testimony and in the exhibits
13 include cost of removal (“COR”), as applicable.

14

15 **Q. How is the Panel’s testimony organized?**

16 A. The testimony is organized into the following sections:

17 Sections I and II are introductory sections outlining the Panel’s testimony.

18 Section III provides an overview of the Company’s capital investment and
19 O&M program priorities and objectives, strategy to address increasing
20 costs, and significant capital programs, such as the retirement of leak prone

1 mains and services, and other key capital investments in gas pipeline safety
2 and reliability.

3 Section IV provides details on the Company's proposed direct capital
4 investment program for the Rate and Data Years, including the Company's
5 spending rationales, categories of capital investment, and specific work
6 activities within each category.

7 Section V describes the Company's indirect capital investment plan, which
8 includes facilities, fleet, and supply chain (IM/IR) investments.

9 Section VI describes the Company's O&M programs, including those
10 necessary to carry out the Company's proposed capital programs and those
11 targeted at current and emerging safety regulations and implementation of
12 gas pipeline-safety best practices. Section VI also describes the status of
13 the Company's Local Law 30 compliance program, which concludes at the
14 end of the Rate Year. With respect to gas pipeline safety, several of the
15 O&M expenditures presented in the Panel's testimony and set forth in
16 Exhibit ___ (GIOP-8) and Exhibit ___ (GIOP-9) are presented in more detail
17 in KEDNY and KEDLI's Gas Safety Panel testimony.

18 Section VII describes the NESE project, its relationship to KEDNY's
19 capital investment plan, and the important safety and reliability projects and
20 programs that could not proceed in the absence of NESE.

1 **III. Capital and O&M Plan Objectives and Priorities**

2 **A. Plan Objectives**

3 **Q. Please describe the Company’s overall objective of its infrastructure and**
4 **operations programs.**

5 A. The Company designs its gas infrastructure and operations programs to provide
6 safe and reliable gas delivery service to customers at reasonable costs. Over
7 the last several years, the Company has significantly increased investment to
8 modernize and enhance the resiliency of its gas assets. Significant capital
9 investment over the next several years is required to ensure that the gas system
10 continues to operate safely while meeting the demands of customers and to
11 enable further modernization of the Company’s facilities and operations in a
12 manner that achieves meaningful methane emissions reductions in furtherance
13 of the Company’s Future of Heat strategy. The proposed plan includes capital
14 and O&M spending to meet both customer needs and satisfy state and federal
15 regulatory requirements and goals, including retirement of LPP, gas pipeline
16 safety enhancements, and deployment of non-pipeline alternatives. While
17 significant investments are required to meet these needs and objectives, in
18 developing its capital and O&M plans, the Company balanced the need for
19 spending to achieve safety and service objectives with the need to manage costs
20 and minimize impacts on customer rates.

21

1 **Q. What are the Company’s projected direct and indirect capital forecasts?**

2 A. A summary of the Company’s total capital plan forecast for the Rate Year and
3 Data Years is provided in Table 1.

4
5 **Table 1: Indirect and Direct Capital Plan**
6 **(Includes COR)**

(\$000)	FY 2021	FY 2022	FY 2023	FY 2024
Direct CapEx	\$952,053	\$934,990	\$931,812	\$1,008,451
Indirect CapEx	\$9,884	\$7,459	\$6,659	\$5,350
Total Capital Plan	\$961,937	\$942,449	\$938,471	\$1,013,801

7

8 **Q. Why is the scale of the Company’s capital investment plan increasing?**

9 A. Several developments have required that KEDNY and other natural gas
10 distribution utilities increase their annual capital expenditures. Notably,
11 pipeline safety incidents, such as the tragic events in San Bruno, California,
12 Allentown, Pennsylvania, East Harlem, New York, and the more recent incident
13 in Merrimack Valley, Massachusetts, have appropriately increased focus on
14 pipeline safety and the need to carefully monitor and replace aging pipeline
15 infrastructure. Weather events, such as Superstorm Sandy and the Polar Vortex,
16 and the expectation that similar events will continue to occur, require the
17 Company to find ways to protect its facilities from severe weather.

18

1 In response to these events, the industry has adopted new safety requirements
2 and is implementing best practices to modernize and protect gas facilities. For
3 example, since the 2016 KEDNY and KEDLI Rate Cases, (i) new Commission
4 safety regulations and directives now require additional safety inspections of
5 inside service lines and plastic fusions; (ii) PHMSA is implementing new safety
6 requirements related to transmission system integrity management and
7 verification this year; and (iii) the New York State Legislature is currently
8 considering a bill that would require licensed professional engineers (“PEs”) to
9 review and certify gas facility design plans. The Commission and utility
10 industry review of recent incidents has also resulted in recommendations for
11 safety best practices, including overpressure protection improvements and
12 enhanced contractor oversight. These mandated and recommended
13 improvements require significant additional investments and compliance
14 resources.

15
16 **Q. How will the Company support the increased level of capital investment?**

17 A. As the Company developed plans to modernize its gas assets, it also began to
18 build and enhance its operations, engineering, resource planning, work
19 management, and quality control organizations and capabilities to deliver
20 increasing levels of capital investment. The Company will continue to develop
21 these capabilities in the Rate Year and Data Years by adding incremental labor

1 resources to execute the capital plan and support the increased operations
2 workload (discussed in Section VI). The capital investment plan includes
3 additional field training resources, facilities, and tools to enhance the
4 development of the internal work force.

5
6 Regarding contractor resources, over the past several years, the Company
7 developed a procurement strategy that supports sustainable growth in qualified
8 contractors to meet the work plan increases. To ensure adequate levels of
9 qualified, skilled labor, and to address the challenges around developing
10 qualified contractors, the Company has worked to:

- 11 • Establish longer term contracts to enable contractors to plan and invest
12 in hiring, training, facilities, and equipment to meet the Company's
13 construction needs
- 14 • Provide greater work plan visibility to contractors on forecast crew
15 requirements, which will enable them to develop the required capacity
- 16 • Manage the work plan to limit seasonal variability to support a stable
17 contractor workforce and promote worker retention
- 18 • Continue partnerships with community colleges, trade schools, and
19 veterans group to attract and develop new sources of skilled labor to
20 build the workforce

1 **Q. Does the Company require additional personnel in the Rate Year and Data**
2 **Years to execute its capital and O&M programs?**

3 A. Yes. The Company forecasts the need for an additional 346.7 FTE positions by
4 Data Year 3 to support the additional capital investment, increasing O&M
5 workload due to new and pending regulatory requirements, new programs
6 discussed below, and the gas safety programs presented in the Gas Safety
7 Panel’s testimony. These FTEs include positions in contractor oversight, gas
8 pipeline safety management, corrosion control, field operations,
9 instrumentation and regulation (“I&R”), gas control, gas system engineering,
10 and gas system management. The cost of these FTEs will be charged to both
11 capital and O&M programs based on the job function and nature of the work.
12 Exhibit __ (GIOP-9) identifies the incremental FTE positions by function and
13 the need for each position. KEDNY’s Revenue Requirements Panel presents
14 the labor O&M associated with these FTEs.

15
16 **B. Cost Pressures and Cost Mitigation**

17 **Q. What explains the significant increases reflected in the investment plan?**

18 A. The Company’s investment plan reflects increases in both the scope of work
19 (units) and the costs elements to perform this work (unit costs). As discussed
20 above, there are several factors that are collectively increasing the size of the
21 Company’s investment plan over the next several years, including incremental

1 work driven by federal and state regulatory mandates and the need to upgrade
2 aged infrastructure and replace dated facilities. At the same time, the Company
3 is experiencing increasing unit costs resulting from new work requirements and
4 enhanced safety practices, and the rising costs of materials and contractors, in
5 part due to increasing demands for these resources across the industry
6

7 Indeed, a primary driver of increases in the capital plan is significantly higher
8 unit costs for main installation work across multiple mandated programs,
9 including the proactive and reactive main replacement, customer connections,
10 corrosion, and city/state construction (“CSC”) programs. The unit cost
11 increases are explained in more detail, below, and unit cost component
12 increases for main replacement are shown on Exhibit __ (GIOP-2).
13

14 Another driver of the capital investment plan is a significant increase in the
15 volume of work in the Company’s CSC program, which involves the relocation
16 and/or protection of gas facilities that conflict with municipal public works
17 projects. As described in detail below, the CSC program scope is continuing to
18 grow as New York City is investing billions of dollars to improve its water and
19 sewer systems. As a result of the sharp increase in scope and scale of the City’s
20 public works programs, the CSC program now represents more than a third of

1 the Company's total capital investment plan, and the work requirements and
2 timing of this program are not within the Company's control.

3
4 **Q. What factors are contributing to the Company's unit cost increases?**

5 A. Exhibit __ (GIOP- 2) shows the components that have contributed to the main
6 installation unit cost increase. The primary source of increased costs is New
7 York City's new restoration and paving requirements that became effective in
8 April 2017. Specifically, changes to Highway Rules §§ 2-01 through 2-09, 2-
9 11 through 2-14, and 2-20 ("Paving Rules") now require significantly more
10 restoration work, including:

- 11 • Increasing the size of the area that must be re-paved following an
12 excavation. Under the new Paving Rules, the final restoration area is based
13 on the largest dimension of the excavation. Under the prior regulations,
14 KEDNY was authorized to pave the area of individual bell holes. The
15 Paving Rules require KEDNY to pave the bell holes in addition to the area
16 in between those holes. In some cases, this requirement doubles or triples
17 the area needing to be repaved.
- 18 • Requiring that base material be replaced in kind or better, which means that
19 concrete roadways must be replaced with concrete instead of the less
20 expensive binder material that was previously utilized. In that regard,
21 approximately 65 percent of New York City streets are concrete; and

- Requiring more saw cutting of roadway excavations instead of more efficient and cost-effective jackhammering.

The Historic Test Year was the first full year in which these new paving costs were effective, during which the Company performed tens of thousands of individual paving jobs in the City at a considerably increased cost. Indeed, in calendar year (“CY”) 2017 to CY 2018, paving restoration costs accounted for approximately 46 percent (\$526) of the total main replacement unit cost (\$1,147).

Other factors contributing to an increase in the Company’s main replacement unit cost, as shown on Exhibit __ (GIOP-2), include:

- Higher base labor (contractor costs): recently renegotiated long-term contractor agreements resulted in higher base labor contractor costs
- Mains Size: work scope includes more large-diameter main at higher replacement costs
- Increased time and materials (“T&M”): increasingly restrictive municipal stipulations that limit work time in streets and increasing costs to comply with arborist regulations (protection of trees on sidewalks proximate to work sites)

1 **Q. What is the Company doing to moderate the size of its investment plan?**

2 A. As set forth in more detail in Section IV, the Company develops its proposed

3 capital and O&M investment plans through close coordination among the Asset

4 Management, Field Operations, and Investment and Resource Planning teams.

5 Major programs and investments undergo a robust options analysis to identify

6 the most cost-effective solution. The alternatives considered and project benefit

7 information for major capital investments are set forth in the data sheets

8 included in Exhibit __ (GIOP-5). Additionally, the Company recently created

9 a Capital Delivery organization tasked with enhancing the Company’s ability

10 to develop and execute its capital plan more efficiently for complex projects

11 (Phase 1) and eventually for the entire capital program (Phase 2). As part of

12 this effort, which is currently in the first year of Phase 1, Capital Delivery is

13 working to identify efficiencies and opportunities for better ways of working

14 that may reduce costs. Capital Delivery is also in the process of identifying and

15 implementing targeted efficiency initiatives in support of National Grid’s

16 aspirational savings program, known as “Accelerate.” The Revenue

17 Requirements Panel describes the Accelerate Program.

18

1 **Q. Please describe how the Company reflected Capital Delivery initiatives in**
2 **the capital investment plan.**

3 A. In recognition that efficiencies are expected over the term of the Rate Year and
4 Data Years, the Company is making reasonable budget adjustments to the
5 capital plan to reflect savings that have been identified to date, while
6 maintaining a mechanism to return to customers the benefits of additional
7 efficiencies achieved over the term of the rate plan. To that end, the Company
8 proposes to reflect capital efficiencies in two ways:

9 • Targeted Efficiencies Adjustment: The Company included a line-item
10 reduction to the overall capital investment plan in the amount of \$0.6
11 million in the Rate Year, \$2.7 million in Data Year 1, \$1.4 million in
12 Data Year 2, and \$1.8 million in Data Year 3 to reflect savings that the
13 Company believes are reasonably achievable across a portfolio of
14 capital projects. The line-item reduction is shown on Exhibit __ (GIOP-
15 1) as “Complex Capital Delivery Initiative – Savings.” The calculation
16 of this adjustment is discussed in more detail below.

17 • Net Plant Capital Tracker: The Company proposes to continue the net
18 plant capital tracker mechanism that was approved in the 2016 KEDNY
19 and KEDLI Rate Cases as part of a multi-year rate plan. Any capital
20 efficiencies realized through the Company’s Accelerate Program will be

1 returned to customers through the operation of the downward-only
2 capital tracker.

3

4 **Q. Please explain how the Company calculated the Complex Capital Delivery**
5 **Initiative – Savings line item reduction to the capital plan.**

6 A. The Company estimated potential savings that the Company reasonably expects
7 to achieve across a portfolio of complex capital projects that are currently
8 moving through Capital Delivery’s project stages. The projects are pressure
9 regulation station re-builds, LNG projects, IMP, IVP, and transmission station
10 integrity projects, and system reinforcements. Estimated savings are not
11 attributable to specific projects but are representative based on recent
12 experience across the portfolio. The Company applied a five percent reduction
13 to the five-year forecasts for these projects to derive the savings estimate for
14 each year.

15

16 **Q. Is the Company proposing unit cost productivity incentives to encourage**
17 **additional efficiencies?**

18 A. Yes. The Company is proposing to continue the unit cost productivity incentive
19 for the Proactive Main Replacement Program, as adopted in the 2016 KEDNY
20 and KEDLI Rate Cases. The Company is also proposing a similar incentive for
21 the Customer Connections program, which is also a unit-cost driven program.

1 The Company proposes to recover both incentives through the existing Gas
2 Safety and Reliability Surcharge, consistent with the current unit cost incentive.
3 The GSRS, including the proposed incentive mechanisms, is presented in
4 Exhibit __ (GIOP- 3). These productivity incentives align with the Company's
5 efforts to identify and realize efficiency benefits through its Accelerate
6 Program.

7
8 **Q. How are the unit cost targets for the productivity incentives derived?**

9 A. The unit cost targets are based on the Company's total costs for main and
10 service replacements, including the costs of related safety programs that will be
11 charged to the work orders for main replacements. For purposes of presentation
12 of the capital investment plan in the rate case, Exhibit __ (GIOP-1) presents the
13 costs of these additional programs, such as plastic fusion inspections, as
14 separate line items for clarity of costs attributed to each program. However, in
15 the interest of setting productivity incentives that reflect all elements of unit
16 costs and are easily tracked and reported using program work orders, unit cost
17 targets must include a full allocation of costs for the related safety programs to
18 reflect the total costs for main and service replacements.

19
20 As shown on page 11 of Exhibit __ (GIOP-3), unit costs for the LPP
21 productivity incentive include the costs for the Proactive Main Replacement

1 Program, plus allocated costs for plastic fusion inspections, low pressure main
2 valve installations, replacement of high-density polyethylene (“HDPE”)
3 services, and contractor safety inspections. As shown on page 12 of Exhibit __
4 (GIOP-3), unit costs for the Customer Connections – Mains productivity
5 incentive include the costs of the Customer Connections – Install Main
6 program, plus allocated costs for plastic fusion inspections and contractor safety
7 inspections.

8
9 **Q. Are there emerging safety and regulatory changes that are not included in**
10 **the Company’s investment plan that may further increase capital and**
11 **O&M requirements during the Rate Year and Data Years?**

12 A. Yes. The Company’s investment plan does not include costs to comply with:
13 (i) the anticipated legislation to require professional engineering (“PE”)
14 certification of engineering designs for gas facilities, and (ii) the Commission’s
15 proposed new requirements for gas company operator qualification programs
16 (see “Notice of Proposed Rulemaking,” issued March 27, 2018 in Cases 14-G-
17 0212 and 17-G-0318). There is uncertainty regarding when these proposals
18 might be adopted as final, whether there will be changes to the scope and
19 requirements prior to final adoption, and the timing of implementation
20 following final adoption. Even if these new requirements are adopted without
21 substantive changes to the current proposals, these items were introduced too

1 recently to allow the Company to complete the thorough analysis of estimated
2 implementation costs necessary for inclusion in this rate filing.

3
4 **Q. What is the Company's proposal regarding the anticipated PE and**
5 **operator qualification requirements?**

6 A. To the extent the PE and operator qualification requirements are finalized
7 during the pendency of this rate proceeding, the Company intends to update its
8 filing to include the costs of these mandated programs. If these new
9 requirements are finalized after rates are established in this case, the Company
10 proposes to recover prudent costs to implement the PE and operator
11 qualification requirements through the Company's GSRS. Under either
12 scenario, the unit cost targets for the productivity incentive would need to be
13 updated to address these new costs.

14
15 **C. Significant Capital Programs**

16 **Q. Please describe some of the significant and notable programs included in**
17 **the capital plan.**

18 A. The capital plan represents the investments required to provide safe and reliable
19 service to the Company's customers. KEDNY's major capital programs and
20 projects include the following:

- 21 • Proactive Main Replacement (LPP) Program

- Integrity Management Program (“IMP”) and Integrity Verification Process Program (“IVP”)
- Transmission Station Integrity Program
- CSC
- Completion of the Company’s ongoing Metropolitan Reliability Infrastructure (“MRI”) Project

The Company also proposes an innovative program to enable renewable natural gas projects to more cost effectively interconnect to the Company’s system. These programs and projects are described in detail below and are included in Exhibit __ (GIOP-5).

i. Proactive Main Replacement (LPP) Program

Q. Please describe the inventory of LPP existing on the Company’s system.

A. LPP in KEDNY’s service territory is comprised of twelve-inch and smaller main and associated services that are (i) unprotected (*i.e.*, non-cathodically protected) steel pipe whether bare or coated and (ii) cast and wrought iron pipe, (iii) unprotected steel/wrought iron services, and (iv) copper and pre-1974 HDPE services. As of the end of CY 2018, the Company has approximately 1,458 miles of LPP in its remaining inventory.

1 **Q. What is the Company’s proposal regarding retirement of LPP?**

2 A. To reduce the risk of leaks and breaks, improve system safety, performance,
3 and reliability, meet the Company’s commitment to enhance customer
4 satisfaction, and reduce methane emissions, the Company has prioritized the
5 retirement of poor performing and higher-risk gas infrastructure – specifically,
6 LPP and associated services – that disproportionally contributes to leaks on
7 KEDNY’s system. The Company’s current rate plan funds LPP replacements
8 of 55 miles in CY 2017, 60 miles in CY 2018, and 65 miles in CY 2019.

9
10 The Company’s proposal is to continue accelerating LPP retirement by five
11 miles per year from the current, CY 2019 target of 65 miles, as depicted in Table
12 2. The performance metrics for LPP replacement, including minimum mileage
13 targets, are set forth in more detail in the Companies’ Gas Safety Panel
14 testimony.

15 **Table 2: LPP Retirement Rate Allowance**

Miles	CY 2020	CY 2021	CY 2022	CY 2023
Target	70	75	80	85

16
17 The proposed LPP retirement rate will position the Company to fully retire its
18 remaining LPP inventory in 20 years.

1

2 **Q. Why is the Company proposing to continue accelerating LPP retirement**
3 **by five additional miles per year?**

4 A. As would be expected, the Company has observed a significantly higher leak
5 rate on its LPP inventory as compared to all other distribution facilities. While
6 the current LPP inventory represents only 35 percent of KEDNY's distribution
7 system, LPP is responsible for 96 percent of leak repairs, excluding excavation
8 damages. The current leak rate for all distribution piping is 0.81 leaks per mile.
9 The 2018 leak rate for LPP was 2.23 leaks per mile, representing an increase
10 from the 2017 leak rate for LPP of 1.97.

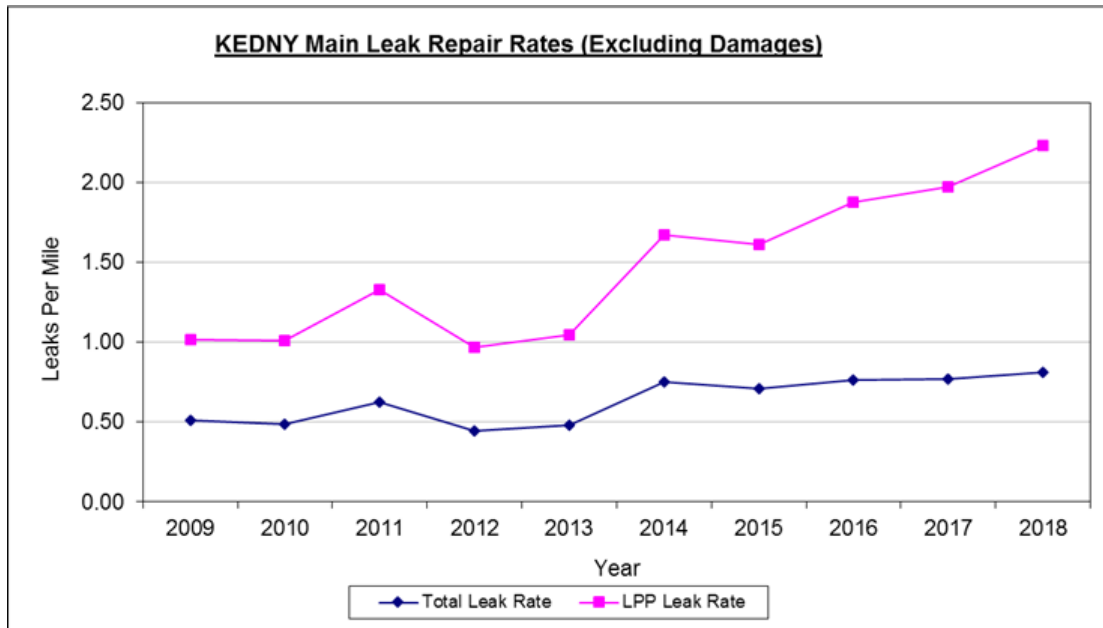
11

12 Significantly, in KEDNY's service territory, the leak rate for LPP has continued
13 to increase over the past several years, as shown in Table 3. In fact, the 2018
14 LPP leak rate was the highest in the past ten years. Thus, KEDNY's proposal
15 to continue accelerating LPP retirement is warranted. Exhibit __ (GIOP-4)
16 provides projected leak rates for LPP for various main replacement strategies.

17

1

Table 3: KEDNY Historic Leak Rate



2

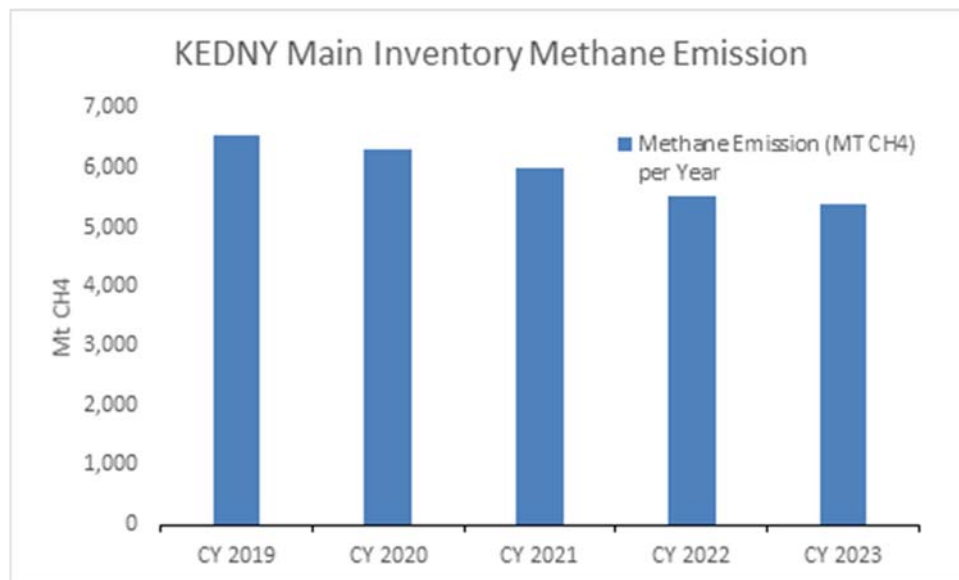
3

4 **Q. Is there an environmental benefit associated with the retirement of LPP?**

5 A. Yes. As is noted in the Company's Future of Heat Panel testimony, KEDNY
6 and KEDLI are establishing a target to reduce methane emissions from the gas
7 distribution system 60 percent (from 1990 levels) by 2035, and retirement of
8 LPP is a major component toward reaching this ambitious goal. Specifically,
9 retirement of LPP reduces gas losses and fugitive emissions of methane. Table
10 4 provides a high-level estimate of potential methane emissions reductions over
11 the next several years based on the Company's current facilities assuming the
12 retirement of LPP pursuant to KEDNY's proposed program.

13

1 **Table 4: Estimated Methane Emissions Reduction Through LPP Retirement**



2
3
4 Additionally, the Company's LPP retirement algorithm prioritizes retirement of
5 pipe segments with Type 3 leaks and service leaks when other risk factors are
6 equal, thereby enhancing the emissions reduction benefits of its Proactive Main
7 and Service Replacement Program.

8
9 **Q. Do other capital programs contribute to retirement of LPP to meet the**
10 **planned targets?**

11 A. Yes. Several miles of LPP are retired through the CSC and Gas System
12 Reliability Programs, but the bulk of LPP retirement occurs through the
13 Company's Proactive Main Replacement Program. The Proactive Main
14 Replacement Program also includes retirement of the associated services.

1 **Q. How does the Company prioritize the retirement of main segments for the**
2 **Proactive Main Replacement Program?**

3 A. Each year, the Company prioritizes retirement of LPP segments by using a risk-
4 ranking algorithm that is part of the Company's Distribution Integrity
5 Management Plan ("DIMP") and the Company's Gas Operating Procedure for
6 the Identification, Evaluation and Prioritization of Distribution Main Segments
7 for Replacement (ENG04030). The Company's risk model calculates a relative
8 risk score for each LPP segment based on specific performance data and
9 localized incident probabilities and consequences, combined with calculated
10 risk factors for the asset classes under evaluation. This risk-based algorithm,
11 along with the Company's engineering judgment, which takes all factors and
12 risks into consideration in each case, form the foundation of the LPP retirement
13 strategy.

14
15 The Company is proposing to target more cast iron main for retirement where
16 possible in consideration of other risk factors, due to increased age and risk of
17 this material. Additionally, as a result of the Storm Hardening Collaborative
18 following the 2016 KEDNY and KEDLI Rate Cases, the Company added flood
19 zone factors to its risk ranking algorithm such that, where other risk factors are
20 equal, the Company will target LPP retirements in Federal Emergency
21 Management Agency ("FEMA") 100 and 500-year flood zones.

1 **Q. What level of investment in the Proactive Main Replacement Program is**
2 **required in the Rate Year and Data Years to achieve the Company’s LPP**
3 **retirement goals?**

4 A. Annual program spending for the Proactive Main Replacement Program is
5 \$250.1 million in the Rate Year, \$304.8 million in Data Year 1, \$347.9 million
6 in Data Year 2, and \$407.6 million in Data Year 3. The capital cost of the
7 Proactive Main Replacement Program is based on a forecast LPP replacement
8 unit cost of approximately \$1,280 per foot in the Rate Year. As shown on
9 Exhibit __ (GIOP-1) and Exhibit __ (GIOP-3), costs for safety programs that
10 impact main replacements are presented separately in the capital investment
11 plan, but ultimately will be charged to main replacements.

12
13 **Q. How does the Company manage the costs of its Proactive Main and Service**
14 **Replacement Program?**

15 A. To mitigate costs, retirement of LPP is coordinated with other programs (such
16 as the public works, reinforcement, and reliability programs) to capture
17 efficiency savings and cost avoidance. KEDNY will look for more of these
18 opportunities to deploy construction resources more efficiently and will identify
19 areas of the gas network where entire LPP systems can be retired efficiently and
20 cost effectively.

21

1 **Q. What is the Company’s proposal to recover the cost of incremental**
2 **proactive replacement of LPP?**

3 A. The Company currently utilizes the GSRS adopted by the Commission in the
4 2016 KEDNY and KEDLI Rates case to recover a return on investment and
5 depreciation expense associated with incremental investment in proactive LPP
6 replacements. The Company proposes to continue use of the GSRS to recover
7 costs of incremental proactive LPP replacements, as shown on Exhibit __
8 (GIOP- 3). The recovery of costs for incremental proactive LPP replacements
9 will work in conjunction with the Company’s net plant tracker. The surcharge
10 mechanism ensures that KEDNY will recover LPP replacement costs only to
11 the extent it is successful in delivering its program and encourages the Company
12 to replace more than the mileage targets.

13
14 **Q. Is the Company planning to change the depreciation of existing LPP**
15 **assets?**

16 A. Yes. As described in the testimony of Company Witness Paul M. Normand,
17 the Company is proposing to depreciate existing LPP assets over the remaining
18 20-year term of the Proactive Main and Services Replacement Programs.

19

1 **Q. Does the Company propose to continue reporting on LPP retirement?**

2 A. Yes. The Company will continue to provide Department of Public Service Staff
3 (“Staff”) with visibility to the status of LPP retirement. The Company proposes
4 to report to Staff on a quarterly basis, including main retired (feet, location),
5 cost data, opportunistic retirements, and the status of the Company’s LPP
6 retirement work plan.

7

8 **ii. Gas Safety Integrity Management and Integrity Verification: IMP**
9 **and IVP Programs**

10 **Q. What is the Company’s IMP?**

11 A. The Company’s transmission pipeline IMP is a safety program mandated by the
12 Pipeline Safety Improvement Act of 2002 and corresponding DOT regulations.
13 The IMP identifies and addresses potential issues affecting the physical
14 soundness of Company facilities before they become safety or performance
15 issues. The Company conducts baseline and periodic reassessments of
16 transmission facilities to identify and evaluate potential threats to “Covered
17 Segments” of pipelines, *i.e.*, transmission pipelines that could affect High
18 Consequence Areas (areas where a pipeline failure could have significant
19 adverse consequences), as well as remediation of significant defects discovered
20 during such assessments. In regions of the United States where older gas

1 distribution systems are common, IMPs have become a key component of gas
2 pipeline safety through improving pipeline integrity.

3
4 **Q. Please describe the IMP capital investments.**

5 A. Currently, IMP assessments may be accomplished through either external
6 corrosion direct assessment (“ECDA”) or in-line inspection (“ILI”) technology,
7 which uses a robotic device known as a “pig” to evaluate the condition of the
8 inside of the pipeline. ILI is considered superior to ECDA because of the ability
9 to identify condition problems originating internally. IMP investments are
10 necessary to: (i) support in-line inspections (*e.g.*, installation of pig launchers
11 and receivers, and pipe reconfiguration/replacement), and (ii) to resolve issues
12 discovered during pipeline inspections conducted through either method.

13
14 The construction activities associated with these expenditures involve the
15 installation of “hot tap” fittings, the reconfiguration of such fittings to allow ILI
16 passage, the construction of access points to allow tethered in-line inspection
17 and, in some cases, the replacement of pipeline segments.

1 **Q. Please describe the IMP capital investment needs for the Rate Year and**
2 **Data Years.**

3 Currently, 21 percent of the Company's DOT pipeline is ILI enabled, increased
4 from 17 percent when the 2016 KEDNY and KEDLI Rate Cases was filed.
5 Over the long term, the Company's plan is to reach 80 percent ILI enablement
6 of the Company's DOT piping. The Company's IMP capital investments in the
7 Rate Year and Data Years will drive toward this goal and will significantly
8 improve the Company's ability to identify integrity issues.

9

10 **Q. How are the IMP workplan and associated IMP capital investment forecast**
11 **determined?**

12 A. The workplan began in 2002 based on initial assessments using the Company's
13 existing risk model. Segments were prioritized for ILI enablement over a multi-
14 year workplan based on a combination of their risk score and other relevant
15 factors, such as facility characteristics or geography, to determine what work to
16 do when. Some segments must be re-assessed in certain years according to
17 when they were initially assessed. The workplan is updated annually and as
18 required assessments are completed. Additionally, ILI projects typically
19 consist of two years of design and procurement work followed by construction
20 in the third year.

21

1 IMP spending can fluctuate significantly year to year depending on the projects
2 identified for inclusion in the workplan. Because the work must be done by
3 segment, the length, geographic location, and characteristics of the segments
4 that need to be addressed each year contribute to different costs such that
5 historic program costs are not indicative of future program needs. Once
6 segments to be addressed by the workplan are identified, cost forecasts are level
7 one project estimates based on prior projects of similar size and scope adjusted
8 for known variables. Additionally, some larger projects in the IMP are
9 separately budgeted on the capital investment plan.

10
11 The IMP workplan for the Rate Year and Data Years is described in more detail
12 in the IMP data sheet in Exhibit __ (GIOP-5). The IMP capital investments
13 required to address known risks identified via assessments and to increase ILI
14 enablement are approximately \$5.5 million in the Rate Year, \$21.5 million in
15 Data Year 1, \$20.0 million in Data Year 2, and \$28.0 million in Data Year 3.

16
17 **Q. What is the status of the pending federal regulations in this area?**

18 **A.** In May 2016, PHMSA issued a Notice of Proposed Rulemaking (“NPRM”) that
19 proposes new pipeline safety regulations that include a requirement for
20 increased inspection of IMP-covered pipelines utilizing ILI technology and an
21 expanded definition of High Consequence Areas, as well as a host of other

1 requirements. To meet these requirements, transmission pipelines must be ILI
2 enabled.

3

4 The Company expects that regulations will become effective in the fall of CY
5 2019, and an implementation schedule will be included. Because the
6 Company's IMP workplan is risk based, and in light of PHMSA's new
7 regulations expanding IMP, the Company believes that its proposed IMP
8 program is a reasonable and conservative approach to managing pipeline
9 integrity during the Rate Year and Data Years.

10

11 **Q. What is covered in the Company's IVP Program?**

12 A. The Pipeline Safety Act of 2011 also mandates that PHMSA establish rules
13 requiring operators to demonstrate their pipelines are "fit for service" by
14 reviewing construction records for each pipeline segment to confirm it is
15 operating within design parameters. The May 2016 NPRM also proposes new
16 rules regarding the maximum allowable operating pressure ("MAOP") and
17 pressure testing requirements for existing pipelines, including (i) eliminating
18 the exemption for establishing the MAOP of pre-1970 "grandfathered" pipe
19 segments; (ii) mandating additional pressure testing or replacement for
20 pipelines without adequate pressure test records; and (iii) requiring operators
21 who lack certain records to establish material properties using approved

1 methods (*e.g.*, cutting and testing pipe samples). In advance of a final
2 rulemaking, PHMSA issued an advisory bulletin (ADB-11-01) directing
3 operators to perform a detailed threat and risk analysis that includes a records
4 review of their systems.

5
6 The Company's IVP program began in 2011 and includes thorough record
7 reviews, pipeline replacement, and retirement of non-essential pipeline
8 segments. As with the IMP, the IVP is primarily based on the Company's
9 assessment of system risks, while also incorporating PHMSA's proposed
10 rulemaking.

11
12 **Q What is the status of the Company's IVP records review and its IVP**
13 **Program proposal for the Rate Year and Data Years?**

14 A. Through its IVP to date, KEDNY has completed the MAOP records review on
15 100 percent of its DOT-jurisdictional pipelines. Going forward, the IVP
16 addresses transmission main replacements and testing necessitated by
17 incomplete records identified by the review and pressure testing and preparing
18 to comply with additional testing that will be required by the new rules. Where
19 the Company has identified incomplete records, pipelines will be replaced, or
20 records will be recreated through testing. This work is necessary to ensure
21 system integrity regardless of PHMSA's proposed requirements. The IVP work

1 plan is described in more detail in the IVP data sheet in Exhibit __ (GIOP-5)
2 and is levelized by year to manage spending at between approximately \$4 and
3 \$6 million in the Rate Year and each subsequent year.
4

5 *iii. **Transmission Station Integrity Program***

6 **Q. Please describe the Transmission Station Integrity Program.**

7 A. This program is similar to the Company's IVP, but the program addresses
8 transmission-connected pressure regulating stations and take stations
9 ("transmission stations"). PHMSA's 2016 NPRM, related advisory bulletins,
10 and discussions between PHMSA and industry stakeholders during the NPRM
11 process, have indicated that the proposed rules will apply to transmission
12 stations. Therefore, the Company is proposing a program for IVP records
13 review and, where records are inadequate to demonstrate that transmission
14 station facilities are fit for service, capital investments for station rehabilitation
15 or partial or full station replacements. Similar to the IMP and IVP Programs
16 for transmission pipelines, these investments are prudent in advance of the final
17 rulemaking to address risk presented by older pressure regulating facilities for
18 which there are inadequate records. The Company is beginning to ramp-up this
19 program in FY 2020, and reaches full implementation in Data Year 1, and the
20 spending is expected to levelize year to year after Data Year 1. The forecast for
21 this program is based on the number and vintage of transmission stations the

1 program is expected to address and level one estimates of similar station project
2 rehabilitation and replacement projects historically. The capital investments
3 required for this program are \$3 million in the Rate Year and over \$17 million
4 in each of the Data Years.

5
6 *iv.* CSC

7 **Q. Please describe what is included in the CSC Program.**

8 A. The CSC Program is a mandated program that represents 34 percent of
9 KEDNY's direct capital investment plan in the Rate Year. This program
10 consists of construction work performed to accommodate third-party,
11 municipal construction activity that could impact the integrity of the
12 Company's natural gas facilities. Typical third-party construction activities that
13 impact gas facilities include work on water, sewer, and drainage infrastructure,
14 street reconstruction, road realignment, and bridge replacement. State
15 regulations and Company procedures require the replacement of eight inch and
16 smaller cast iron gas mains if roadway or underground construction is being
17 performed in such a way that would impact the integrity of the Company's
18 mains. Non-cast iron gas mains (*i.e.*, steel and plastic) are not subject to the
19 same replacement regulations and are typically supported and protected if not
20 in direct conflict with third-party construction. Direct conflicts are addressed
21 through relocation regardless of material type.

1
2 Aging municipal infrastructure (buildings, schools, bridges, roadways,
3 transportation systems, water mains and sewer facilities) will require significant
4 upgrades in the coming years. Over the last several years, there has been an
5 increase in the level of municipal construction activity, as Superstorm Sandy
6 and recent gas incidents focused attention on the state of municipal
7 infrastructure. Going forward, New York City will invest billions of dollars to
8 upgrade its infrastructure, and many of these projects will directly impact
9 KEDNY's gas system. Thus, the CSC Program is one of the largest programs
10 in the mandated category in terms of costs. The forecast cost for this program
11 is approximately \$324 million in the Rate Year, comprised of reimbursable,
12 non-reimbursable, and a large project that is separately budgeted and described
13 in more detail below.

14

15 **Q. Are there opportunities to retire LPP during CSC projects?**

16 A. Yes. As part of the CSC construction program, the Company looks to identify
17 cost-effective opportunities to retire LPP when main replacements are required
18 to accommodate municipal construction. CSC projects present opportunities to
19 perform safety and reliability upgrades on the Company's infrastructure, the
20 costs of which can be offset by coordinating construction activities (shared
21 trenching and paving) and securing third party reimbursements. Of the

1 approximately 381,686 linear feet (72.3 miles) of CSC main replacements
2 forecast for FY 2020, approximately 163,680 linear feet (31 miles) of LPP is
3 expected to be retired.

4
5 **Q. How does the Company forecast CSC expenditures?**

6 A. KEDNY forecasts its CSC expenditures by reviewing the known and planned
7 work identified by municipalities, historical work volumes, and unit
8 information. In large part, the forecast is based on New York State and New
9 York City's current five-year construction plans. In CY 2018, approximately
10 317,948 linear feet (approximately 60.2 miles) of main replacement was
11 required to address municipal infrastructure improvements. Thirty percent of
12 this footage for this replacement work (equating to approximately \$108 million)
13 was subject to some level of reimbursement from third parties, while the
14 remaining 70 percent of the footage (approximately \$156 million) was non-
15 reimbursable main and service replacements. Large, complex construction
16 projects, such as the SE856 Phase 2 Transmission Offset Project at Sheffield
17 and New Jersey Avenue ("SE856 Project"), described in more detail below,
18 may be project managed by the Company's Capital Delivery organization and
19 are budgeted separately from the CSC Blanket Program.

20

1 While the Company's CSC forecasts are reasonable based on available
2 information, capital and O&M expenditures in this area are subject to a high
3 degree of variability because the scope and scheduling of municipal
4 construction projects are constantly revised. The New York City Department
5 of Design and Construction's ("DDC") work plan is dynamic and is subject to
6 change even within a fiscal year ("FY"). Because the Company does not
7 control the scope or timing of projects, large walk-in projects can require the
8 Company to undertake substantial unplanned capital work in any given year.
9 For example, in CY 2018, the Flatlands Transmission Offset project was added
10 to the DDC's workplan. This was not a known project that was included in the
11 Company's CSC program during the 2016 KEDNY and KEDLI Rate Cases.
12 The project was subsequently added to the FY 2020 work plan at an estimated
13 cost of approximately \$69.4 million. The project is expected to be complete
14 prior to the Rate Year.

15
16 There is similar volatility with respect to CSC Program O&M expenditures,
17 some of which are non-reimbursable "Support and Protect" expenditures. As
18 shown in Exhibit __ (GIOP- 6), the Company's actual spending on non-
19 reimbursable O&M varied from expected O&M expenditures based on DDC's
20 work portfolio by 75 percent between FY 2016 and FY 2017, and by 118
21 percent between FY 2017 and FY 2018. The dramatic year-to-year fluctuation

1 of the CSC Program's O&M requirements are a significant impediment to
2 creation of a reliable multiyear financial O&M forecast.
3

4 **Q. Does the Company's forecast reflect potential reimbursement from**
5 **municipalities and other third parties?**

6 A. Yes. KEDNY's forecast reflects reimbursable amounts for expenditures
7 pursuant to the Gas Facility Cost Allocation Act and other cost sharing
8 arrangements with municipalities. KEDNY forecasts expected reimbursements
9 total approximately \$57.8 million in the Rate Year, \$60.8 million in Data Year
10 1, \$63.1 million in Data Year 2, and \$64.9 million in Data Year 3. However,
11 typically there is a one-and-a-half-year lag in payment of invoices by the City.
12

13 **Q. Please describe New York City's joint bidding process and its potential**
14 **impact on CSC costs.**

15 A. In 2014, New York State adopted a "joint bidding" requirement for public
16 works projects in cities with populations of one million or more (N.Y.S.
17 Assembly Bill A10021B) that will impact KEDNY's CSC projects in New
18 York City. The City has not yet fully implemented this process. Currently,
19 utilities impacted by New York City public works projects are individually
20 responsible for performing their own relocation work, as well as negotiating all
21 support and protect work directly with the City's contractor. Under the "joint

1 bidding” model, the City will bid and manage the entire project. If the City’s
2 contractor is qualified by the Company to work on its gas facilities, the
3 contractor may perform the gas relocation work. If the City’s contractor is not
4 gas qualified, KEDNY will perform its own relocation work ahead of the
5 planned project. Each impacted utility will also be responsible for a portion of
6 the “shared costs” of work performed by the City’s contractors, including, for
7 example, maintaining the construction site, establishing field offices, setting up
8 transportation and managing contracts and expenses. It is unclear when the City
9 will fully implement the joint bidding process, but in recent months, the City
10 has increased discussions regarding implementation. It is likely that the process
11 will be fully implemented within the next few years, but the scope of its
12 application is currently unknown.

13
14 The City’s workplan for FY 2019 and FY 2020 includes approximately 18
15 projects, across multiple boroughs and utilities, using the joint bidding process.
16 Incremental costs of the joint bidding process for FY 2019 and FY 2020 appear
17 to be about \$0.5 million for each FY; however, the projects the City is jointly
18 bidding are not necessarily representative of future project scopes that may use
19 this process. Because the true cost implications on utilities of working through
20 the City’s selected contractors, as well as the impact of the shared costs

1 contribution, remains to be seen, the Company has not included additional costs
2 in its CSC forecast.

3

4 **Q. How does KEDNY address increasing costs in the CSC workplan and**
5 **reimbursements?**

6 A. KEDNY works closely with DDC's engineers, consultants, and contractors to
7 minimize direct conflicts to the Company's existing facilities to reduce support
8 and protect and replacement work as much as practicable and to address
9 changes to DDC's workplan. Regarding invoicing and payments, KEDNY
10 recently adopted process improvements to improve the timeliness of Company
11 invoices to the City and is actively negotiating with the City regarding the
12 payment backlog and other process issues related to administration of the CSC
13 program.

14

15 **Q. What changes is KEDNY proposing to the recovery mechanisms for the**
16 **CSC Program to address the variability in CSC forecasting and**
17 **reimbursements?**

18 A. In light of the increasing volatility and scope of unplanned CSC projects, such
19 as the Flatlands and SE865 projects, the Company is proposing to change the
20 existing CSC tracker mechanism to a full reconciliation of the difference
21 between forecast and actual spending (from the current 90 percent deferral

1 mechanism). The Company is not proposing any other changes to the
2 mechanism or reporting requirements. As set forth in the Joint Proposal
3 adopted in the 2016 KEDNY and KEDLI Rate Cases, the CSC capital
4 reconciliation will work in conjunction with the net utility plant tracker. A
5 demonstration of the CSC capital tracker mechanism is provided in the Revenue
6 Requirements Panel's Exhibit __ (RRP-9), Schedule 2.

7
8 Moreover, to address the similar variability in O&M spending demonstrated in
9 Exhibit __ (GIOP- 6), the Company is proposing to add an O&M tracker that
10 would fully reconcile the difference between forecast and actual spending in the
11 non-reimbursable "Support & Protect" O&M expense category. This tracker
12 will provide assurance that the Company's customers are not overcharged to
13 the extent expenses are lower than expected in any given year.

14
15 **Q. Please describe the status of the LaGuardia Airport Redevelopment**
16 **Project and the other significant CSC projects that are included in the**
17 **Company's capital investment plan.**

18 A. The Port Authority of New York and New Jersey's LaGuardia Airport upgrade
19 project, requiring KEDNY to relocate its gate and governor stations and install
20 a new gas distribution system, is ongoing and expected to be completed by the

1 end of the Rate Year. There is a small amount of capital funding included in
2 the Rate Year to complete this project.

3
4 The SE856 Project was recently added to the DDC workplan and involves
5 significant transmission and distribution work. The DDC will be installing new
6 water main, high level storm sewer and sanitary sewer on Flatlands Ave and the
7 vicinity in Brooklyn. This project could potentially require KEDNY to replace
8 4", 6", 8", 12" and 24" low pressure and 60psi gas mains. KEDNY could also
9 have to offset the 350-psi transmission gas main at three locations within the
10 scope of this project. The Company has not yet received from DDC the
11 preliminary drawings for the entire scope of the project. The transmission work
12 will be managed by the Capital Delivery organization and is budgeted
13 separately from the CSC blanket program. The distribution work is included in
14 the CSC blanket program but is shown as a separate line item on Exhibit ____
15 (GIOP- 1) to clearly identify the capital requirements of this significant project.
16 The capital investment plan includes approximately \$101.9 million in the Rate
17 Year and \$2.0 million in Data Year 1 for this project. The cost estimate for the
18 SE856 Project is preliminary, and the Company has not yet received the full
19 project scope for SE856 from the DDC. The Company is working closely with
20 DDC to attempt to minimize costs to the extent possible.

1 v. **MRI**

2 **Q. Please describe the Metropolitan Reliability Infrastructure (“MRI”)**
3 **Project.**

4 A. The MRI project was included in the 2016 KEDNY and KEDLI Rate Cases as
5 a major gas system reliability project to provide increased supply diversity,
6 pressure support, outage contingency, operational flexibility, and operational
7 autonomy. The project will maximize existing capacity and also will enable
8 proposed upstream capacity (*e.g.*, from Williams’ NESE Project) that will
9 better position the Company to meet customers’ long-term supply needs over
10 the next 15 to 20 years. Specifically, the MRI project will provide an
11 operational loop to the Brooklyn backbone system that will:

- 12 • Immediately improve reliability by increasing supply sources. Sources
13 from any directly connected supply point will be accessible and gas may
14 be moved to any point across the Company’s system. This will
15 significantly reduce the reliance on any individual gate deliveries, and
16 specifically dependence on gas from Consolidated Edison Company of
17 New York (“Con Edison”) at Newtown Creek.
- 18 • Allow the Brooklyn backbone system to be taken out of service for
19 system integrity work, while still maintaining gas operations.
- 20 • Enhance the effectiveness of remote control valves on the transmission
21 system by allowing increased utilization of remote valves in the event

1 of a system disturbance that requires a remote shut down (without
2 disrupting service to potentially thousands of customers).

- 3 • Provide for the movement of incremental supplies from both the
4 Narrows and the Lower New York Bay Lateral to any point across the
5 system, including transfer points with Con Edison.

6

7 The MRI Project will enable KEDNY to move an additional 850 dekatherms
8 each day by 2021.

9

10 **Q. What is the current status of the MRI Project, and what is required to**
11 **complete the project?**

12 A. The MRI Project is on target to complete the first two phases by the end of CY
13 2019. The main portion of the project, phases one through four, involves
14 installation of approximately 33,100 feet of transmission main and a pig
15 launcher/receiver and a significant sewer crossing at Linden Boulevard. Phases
16 one and two are nearing completion with approximately 20,000 feet of main
17 installed to date. Phases three and four are pending construction and are
18 expected to be in service before the 2020-2021 winter heating season. The
19 remaining work on the project, phase five, entails installation of approximately
20 7,000 feet of transmission main and a permanent pig launcher/receiver on the
21 Greenpoint facility. Phase five is expected to be in service before the 2021-

1 2022 winter heating season. The forecast to complete the MRI project is
2 approximately \$63.9 million in FY 2020, \$100.0 million in the Rate Year and
3 \$25.6 million in Data Year 1. There is no projected spending for this project in
4 Data Years 2 and 3.

5
6 **vi. Renewable Natural Gas (“RNG”) Interconnections Program**

7 **Q. Please describe KEDNY’s new RNG Interconnections Program.**

8 A. This is an innovative program that is part of the Company’s overall strategy to
9 encourage interconnection of third-party RNG projects to KEDNY’s natural
10 gas distribution system. High interconnection costs have proven to be a
11 significant impediment to the development and interconnection of new RNG
12 projects in KEDNY’s service territory. Through this program, the Company
13 will install and maintain some of the necessary interconnection equipment,
14 specifically meters, analyzers, and odorization equipment, that currently is the
15 sole financial and operational responsibility of project developers, thus
16 lowering interconnection costs. This program complements the Company’s
17 development of a standard RNG project interconnection agreement that resulted
18 from the 2016 KEDNY and KEDLI Rate Cases, as well as the Company’s
19 proposals toward decarbonizing the gas network (*e.g.*, a new green gas tariff
20 offering), as discussed in the Future of Heat Panel’s testimony.

1 **Q. What is the basis for the scope and forecast for the RNG Interconnections**
2 **Program?**

3 A. Based on the number of inquiries KEDNY has received from RNG project
4 developers over the past several years, and RNG projects currently under
5 development, the Company forecasts approximately two RNG projects per year
6 are likely to mature to the interconnection phase during the Rate Year and Data
7 Years. The capital forecast for this program of \$0.9 million per year based on
8 the cost of meters, analyzers, and otherization equipment for two projects per
9 year. A detailed description of the project and project costs is provided in the
10 data sheet in Exhibit __ (GIOP-5).

11
12 **IV. Gas Infrastructure Capital Investment**

13 **Q. How much is the Company planning to invest in its gas system assets in the**
14 **Rate Year?**

15 A. The Company plans to invest approximately \$952.1 million in its gas
16 infrastructure and other direct capital investments in the Rate Year, including
17 cost of removal. Exhibit __ (GIOP-1), which provides the actual or budgeted
18 direct capital investments for the Historic Test Year, Gap Period, Rate Year,
19 and Data Years, is segmented into four primary spending rationales (programs):
20 “Customer Connections,” “Mandated,” “Reliability,” and “Non-

Infrastructure.” Table 5 summarizes the planned direct capital investments for the Rate Year, and Data Years in each of these programs:

Table 5: Direct Capital by Spending Rationale

Spending Rationale	FY 2021 (\$000)	FY 2022 (\$000)	FY 2023 (\$000)	FY 2024 (\$000)
Customer Connections	80,612	114,263	138,471	144,024
Mandated	661,030	657,802	714,313	762,245
Reliability	200,469	154,881	70,881	93,880
Non-Infrastructure / Misc.	9,942	8,045	8,147	8,302
Total	952,053	934,990	931,812	1,008,451

*Inclusive of cost of removal

Each spending rationale is broken down further into sub-categories that identify specific programs.

Q. How were the projected capital estimates derived?

A. In accordance with the Company’s budgeting policies and procedures, capital budgets are prepared annually with a five year forward look. Budget projections are based on historical work levels and unit cost performance for

1 ongoing mandated and routine work and programs, plus any identified new
2 requirements, programs and projects. Projects that fall outside of routine work,
3 such as safety-driven programs (*e.g.*, the Company's LPP replacement program
4 in the Mandated Category), are developed by Engineering based on the most
5 recent material, labor and overhead costs.
6

7 **Q. What are the primary drivers of the difference in the Company's planned**
8 **capital spending in the Rate Year compared to historic capital spending?**

9 A. As Exhibit __ (GIOP-1) shows, the primary driver of the increase in planned
10 capital investment in the Rate Year compared to the Historic Test Year is
11 increased investment in the Mandated and Reliability programs. Investments
12 for Mandated programs in the Rate Year are approximately \$140 million higher
13 than Historic Test Year spending in this category. Investments in the Reliability
14 category in the Rate Year are approximately \$88 million higher than the
15 Historic Test Year in this category. The specific drivers for these increases are
16 discussed below.
17

18 **Q. Does the Company's revenue requirement in this case also include cost of**
19 **removal associated with the capital investment plan?**

20 A. Yes. Included in the capital costs discussed below, there is a level of cost of
21 removal required to implement the Company's infrastructure investment plan.

1 As reflected in Exhibit __ (GIOP-1), the Company is forecasting costs of
2 removal as follows: approximately \$95.1 million in the Rate Year, \$93.4
3 million in Data Year 1, \$93.1 million in Data Year 2, and \$100.7 million in Data
4 Year 3. The capital forecasts for each program presented below are inclusive
5 of cost of removal.
6

7 **Q. What types of activities are associated with cost of removal?**

8 The Company defines cost of removal as any work on an asset that results in it
9 being removed from the asset inventory, whether or not a different asset is
10 added in its place. This type of work would include, but is not limited to, the
11 activities associated with disconnection, removal and disposal (or retirement in
12 place) of gas mains, gas services, and related facilities.
13

14 **Q. What information is presented in Exhibit __ (GIOP-5)?**

15 A. Exhibit __ (GIOP-5) provides additional information for each of the significant
16 gas capital projects and programs expected to be performed during the Rate
17 Year. This additional information includes:

- 18 • Project or Program name
- 19 • Spending rationale
- 20 • Project or Program description
- 21 • Project or Program justification

- 1 • Estimated costs
- 2 • Customer benefits discussion
- 3 • Alternatives/Options Analysis
- 4 • Studies/references that support the program

5

6 **Q. Please describe some of the technologies and practices the Company uses**
7 **to reduce the total cost of its capital expenditures.**

8 A. As discussed in the testimony of Company Witness Christopher J. Connolly,
9 National Grid has undertaken a comprehensive effort to evaluate the technology
10 and business processes that support its gas businesses (referred to as the Gas
11 Business Enablement (“GBE”) Program). Among the core investments of the
12 GBE Program are new asset and work management, scheduling, geographic
13 information system, and field mobility solutions designed to improve the
14 Companies’ gas safety and operational performance. While GBE is in process,
15 the Company continues to employ a number of technologies and best practices
16 designed to increase the efficiency and reduce the cost of its capital
17 expenditures. These practices include:

- 18 • Increasing the amount of planned capital work (versus reactive work).
- 19 • Increasing coordination among capital programs to increase efficiencies
- 20 (e.g., leveraging LPP opportunities).

- 1 • Installing more small-diameter, high-pressure facilities that can be
2 installed at lower cost.
- 3 • Using smaller excavating equipment, increasing operating efficiency
4 and reducing instances of damage (because of decreased size and weight
5 of equipment).
- 6 • Using “coring and keyhole” technology to repair existing mains.
- 7 • Enhancing contractor management.
- 8 • On-site reporting for work crews in many large construction projects.
- 9 • Continuing to deploy CISBOT and CIP lining (as described in more
10 detail below).

11 In addition, as noted above, the Company’s Capital Delivery organization is in
12 the beginning stages of identifying opportunities for efficiencies that are
13 expected to reduce costs.

14

15 **A. Capital Planning, Budgeting, and Sanctioning Process**

16 **Q. Please describe the annual development of the Company’s capital plan.**

17 Each year, the Company develops a ten-year capital plan to achieve its
18 performance objectives of delivering safe and reliable service. Investment
19 Planning compiles proposed spending for programs and individual capital
20 projects. Programs and projects are categorized into one of four spending

rationales (Mandated, Customer Connections, Reliability, and Non-Infrastructure).

The Company currently uses a tool, C55 (known internally as “Copperleaf”), for the prioritization and optimization of capital investments through a risk scoring and prioritization methodology. This tool uses criteria aligned to a common scale to compare dissimilar inputs (*e.g.*, financial and non-financial inputs) to determine the set of investments, alternatives, and the timing of projects that have the highest potential value.

After the Companies rank the investments in C55, meetings are scheduled with budget sponsors to review value models, project rankings, and various scenarios produced through the optimization of investments to meet capital planning targets. Once plan targets have been approved by the Gas Business Unit, they are submitted to Finance for review.

In late fall, the capital plan is reviewed by the New York Jurisdictional President (Company Witness John Bruckner) and the Vice President, Finance, New York (Company Witness David Doxsee). The New York Jurisdictional President reviews the overall customer, service quality, and financial impacts

1 of the investment plan and may request changes to the level or mix of
2 investments.

3

4 In early winter, the capital plan is presented to the National Grid USA Board of
5 Directors and the National Grid plc Executive Committee and, in early spring,
6 the capital portfolio is presented to the National Grid plc Board of Directors for
7 review and approval.

8

9 **Q. Are there additional approvals needed before a project in the annual**
10 **capital plan may proceed?**

11 A. Yes. Aside from the capital planning and budgeting process, specific delegation
12 of authority (“DOA”) approval must be obtained for any project in the ten-year
13 capital plan to proceed. This process includes the sanctioning documentation
14 and review for projects over \$1 million and other levels of review for smaller
15 projects. Presently, all projects greater than \$1 million require some level of
16 sanctioning documentation and review. The U.S. Sanctioning Committee
17 (“USSC”) was established by the National Grid USA Board of Directors
18 specifically for this purpose. Projects between \$8 million and \$25 million are
19 reviewed and approved by the USSC. Projects between \$25 million to \$203
20 million are reviewed by the USSC and then are forwarded to a Senior Executive
21 Sanctioning Committee (“SESC”) for review and approval. For projects

1 between \$1 million and \$8 million, the USSC has delegated review to an
2 informal committee led by the Investment Planning group and including, but
3 not limited to, managers and directors from the Regulatory, Estimating, Asset
4 Management, and Procurement groups. The committee reviews and finalizes
5 sanctioning papers for these projects at a weekly meeting, and the committee
6 then forwards the final sanction documents to the executive sponsor of the
7 project for approval and signature. Projects less than \$1 million do not require
8 sanctioning and are approved through a supervisory delegation of authority
9 hierarchy based on certain established thresholds.

10

11 **Q. Please explain the difference between the DOA review and approval**
12 **(sanctioning) process and the approved five-year capital plan used to**
13 **forecast the Rate Year and Data Years.**

14 A. The timing of the sanctioning process is not aligned with the capital planning
15 process used to forecast the Rate Year and Data Years for purposes of the rate
16 filing. As described above, the Company develops a long-term investment plan
17 that is used as the basis for the forecast for the Rate Year and Data Year
18 proposals. Project sanctioning, however, normally occurs immediately prior to
19 the FY for which the investment is planned. For example, the FY 2020 capital
20 plan will be formally sanctioned in early 2019. Thus, the Company's currently-

1 sanctioned or partially-sanctioned projects do not yet represent the full capital
2 forecast proposed in the Rate Year and Data Years.

3
4 **Q. Please describe how the Company's DIMP impacts its capital investment**
5 **planning.**

6 A. The DIMP involves a risk-based assessment of the Company's distribution
7 system to identify threats in seven categories: corrosion, natural forces,
8 excavation damage, other outside force damage, material and weld failure,
9 equipment failure/malfunction and inappropriate operation. The DIMP
10 requires evaluation and prioritization of the risks that these threats pose, and the
11 implementation of measures to address the highest risks with an emphasis on
12 leak management, enhanced damage prevention, operator qualification to
13 reduce human error and system replacement. Consistent with the DIMP, the
14 Company prioritizes asset replacements in its investment plan based on a risk
15 ranking that considers, among other things, leak repair history, types of leak,
16 pipe material, surrounding geography, segment length, nearby construction
17 activity, field conditions, customer issues, open leaks and engineering
18 judgment. The risk ranking factors are carefully designed to consider known
19 differences in the performance of asset subclasses, extensive experience with
20 asset failures, current performance data for the asset subclasses for various

1 threat categories, and subject matter experts' analysis and opinions on the future
2 performance of the assets.

3
4 **B. Customer Connections Category of Spending**

5 **Q. Please describe what is included in the Customer Connections spending**
6 **category.**

7 A. The Customer Connections category of work accounts for approximately eight
8 percent (\$80.6 million) of the total planned capital investment in the Rate Year.

9
10 KEDNY is required by the Public Service Law, the Commission's regulations,
11 and tariff to extend service to new customers in its service territory in proximity
12 to the Company's facilities, and to install new distribution main, up to a 100-
13 foot tariff allowance per customer, to do so. Expanding the availability of
14 natural gas in KEDNY's service territory can bring significant economic
15 benefits in the form of energy cost savings for customers, job creation, and
16 increased local tax revenues. Moreover, there are environmental benefits
17 associated with conversion to natural gas from other, higher emission fuels such
18 as fuel oil. To enable new customer connections, the Company must make
19 significant capital investments in mains, services, and system reinforcements.
20 Customer Connection programs are designed to support forecast customer
21 demand and add new load by increasing system utilization in a cost-effective

1 way. Customer Connection programs involve the installation of new mains,
2 services, and meters and include system reinforcement.

3
4 The Customer Connections – Install Main, Install Services, Meter Purchases,
5 Install Meter, and Automatic Meter Reading (“AMR”) Programs and costs are
6 presented in Exhibit __ (GIOP-5).

7

8 **Q. Please describe recent customer demand trends in the Company’s service**
9 **territory.**

10 A. The updated customer demand forecast shows steady demand in the
11 multifamily and commercial conversion market, steady growth in the multi-
12 family new construction market, and an increase in the commercial new
13 construction market. In the residential sector, the forecast shows an expected
14 increase in demand in residential new construction, but a dip in residential
15 conversions due to saturation in the market. The completion of reliability
16 projects, including the Northern Queens Expansion Program and Brooklyn
17 Navy Yard projects, will enable new connections and are expected to increase
18 demand in previously under-served areas, subject to approval of the NESE
19 project, as discussed below.

20

1 **Q. If demand for new customer connections is expected to remain relatively**
2 **flat, what explains the increases in the Customer Connections forecasts?**

3 A. The increase is driven by higher unit costs for main and service installation due
4 the factors discussed in Section III, above. While units are not expected to
5 increase dramatically, the cost of main installation and reinforcements to serve
6 new customers increased as compared to prior years.

7

8 **Q. Please describe the Customer Connections – AMR Program.**

9 A. The AMR Program includes the purchase and installation of AMR equipment
10 for new customer connection installations. AMR equipment is not included in
11 the Company's Customer Connections Purchase Meters budget. Based on the
12 Company's forecast, the Company will need to install between 9,000 and
13 10,000 AMRs per year during the Rate Year and Data Years at costs of
14 approximately \$1.1 million each year.

15

16 **Q. Please describe the Gas System Reinforcement Program in the Customer**
17 **Connections category of spending.**

18 A. The Gas System Reinforcements Program contains projects intended to ensure
19 that minimum system pressures are maintained throughout the gas network
20 during periods of peak demand. The Company models peak demand based on
21 the sendout forecasts developed by Analytics, Modeling and Forecasting

1 (Company Witness Theodore Poe). As a result of demand for gas usage in its
2 service territory, KEDNY has determined that it is necessary to complete a
3 number of projects to ensure its ability to meet peak requirements. These
4 reinforcement projects are essential to ensure the Company can continue to
5 serve growing gas usage load. Without such reinforcements, the Company
6 estimates that more than 42,000 existing customers could experience loss of
7 service.

8
9 KEDNY experienced new records for sendouts during the last two winter
10 heating seasons. During the winter of 2017/2018, KEDNY recorded four of its
11 top ten sendout records, including a firm load record of 1,417,131, dekatherms
12 on January 6, 2018, when the average temperature was eight degrees Fahrenheit.
13 During the winter of 2018/2019, KEDNY recorded two of its top ten sendout
14 records, including a second highest firm load of 1387,550 dekatherms on
15 January 21, 2019 when the average temperature was thirteen degrees Fahrenheit.

16
17 As is discussed in Section VII, below, and in the testimony of Company Witness
18 Elizabeth A. Arangio, additional capacity expected from Williams' NESE
19 project is critical to meeting this level of increasing demand. Moreover, the
20 recent growth in peak sendout underscores the need to ensure that the

1 Company's gas distribution facilities are capable of maintaining minimum
2 system design pressures during periods of peak demand.

3

4 **Q. Please provide examples of System Reinforcement projects.**

5 A. Examples of System Reinforcement projects include:

- 6 • Replacing undersized mains with larger diameter mains. LPP is
7 targeted whenever practical during this work.
- 8 • Looping or connecting system endpoints by installing new main.
- 9 • System pressure uprates (*e.g.*, 15 pounds per square inch ("psi") to 60
10 psi).
- 11 • Installing new district regulators and replacing existing undersized
12 district regulators.
- 13 • Transferring existing low-pressure customers to an adjacent high-
14 pressure main (*i.e.*, load shedding).

15

16 **Q. What explains the fluctuation in the Gas System Reinforcement forecast**
17 **from year-to-year?**

18 A. The workplan for the Gas Systems Reinforcements Program is based on where
19 reinforcements are needed and, thus, is zero-based each year. Estimates are
20 derived based on the types of projects needed, creating uneven spending year-
21 to-year.

1 **Q. Please describe the Kew Gardens Gate and Belmont Gate Station projects**
2 **in the Customer Connections category of spending.**

3 A. These are major reinforcement projects that are separately budgeted and are
4 project managed by the Capital Delivery organization because they are complex
5 construction projects. The Kew Gardens Gate Station will install a new
6 regulator station in Kew Gardens, Queens to address system pressure issues and
7 reduce dependency on deliveries from Con Edison's transmission main. The
8 project began in CY 2018 and is scheduled to be completed during the Rate
9 Year and includes a total forecast of approximately \$22.7 million. The Belmont
10 Gate Station Project will rebuild an existing station that is undersized to
11 increase capacity and address integrity issues. The total cost of this project in
12 the Rate Years and Data Years is approximately \$26.4 million, but there are no
13 costs included in the Rate Year forecast because the project is scheduled to
14 begin in Data Year 1 with the bulk of spending occurring in Data Year 3.

15

16 **C. Mandated Category of Capital Spending**

17 **Q. What portion of the Company's capital investment plan is Mandated?**

18 A. The Mandated category of work accounts for approximately 69 percent (\$661
19 million) of the total planned capital investment in the Rate Year.

20

21 **Q. Please describe what is included in the Mandated spending category.**

1 A. Projects covered by the Mandated spending rationale are those needed to
2 comply with regulatory obligations and rate plan commitments, including: the
3 CSC Program (described above), the remaining Local Law 30 compliance,
4 code-required corrosion testing and mitigation or other pipeline integrity related
5 activity, proactive and reactive capital main and service replacement, plastic
6 fusion inspections, and required meter replacements. Exhibit __ (GIOP-5)
7 includes a summary description of each of the significant projects included in
8 the Company's Mandated spending rationale/category, along with the estimated
9 annual funding during the Rate Year and Data Years for each.

10
11 **Q. Is the Company proposing to continue its CISBOT and Large Diameter
12 Main Rehabilitation Programs for joint sealing and cast iron lining?**

13 A. Yes. The Company's capital plan includes continuation of two programs,
14 included in the 2016 KEDNY and KEDLI Rate Cases, that utilize a joint sealing
15 robot or ("CISBOT") and cured-in-place pipe lining ("CIP") to cost effectively
16 improve the safety and reliability of its large diameter mains. These
17 technologies are proven to extend the life of the main, improve system
18 performance, and reduce future joint leaks on treated pipeline segments for
19 years. As agreed in the Joint Proposal in the 2016 KEDNY and KEDLI Rate
20 Cases, the Company will continue to include main segments reconditioned
21 through CISBOT and CIP lining in the inventory of LPP for eventual

1 retirement. The Company intends to address approximately two and a half
2 miles of large diameter cast iron main in the Rate Year and each of the Data
3 Years at a cost of approximately \$5 million each year, adjusted for inflation.
4 The Large Diameter Main Rehabilitation Program will address two miles in the
5 Rate Year and each of the Data Years using CIP lining at a cost of
6 approximately \$14 million per year, adjusted for inflation.
7

8 **Q. Why is the Company proposing to line fewer miles each year at a higher**
9 **unit cost than reflected in the current rate plan?**

10 A. Issues arose in the execution of CIP lining program over the past three years
11 where an entire segment of main could not be continuously lined due to
12 configuration issues. In these instances, work had to be stopped and small
13 sections of main had to be replaced between segments that could be lined. As
14 a lesson learned, the Company has adjusted its strategy to plan for replacement
15 of small segments that cannot be lined. The proposed plan to line two miles is
16 more realistic and includes the time and funding to replace segments that cannot
17 be lined.
18

19 **Q. Please explain KEDNY's Cross Bore Remediation, Latent Damages, and**
20 **Atmospheric Corrosion Inside Inspections Programs.**

1 A. The Cross Bore Remediation and Latent Damages Programs are existing
2 programs involving safety enhancements undertaken when the Company is
3 performing other mandated work, such as main replacement. In the 2016
4 KEDNY and KEDLI Rate Cases, the Company included a program to perform
5 inspections on older installations for cross bores, instances when plastic main
6 inadvertently bores through a sewer lateral as a result of horizontal directional
7 drilling. The Company will complete inspections of historic HDD installations
8 by the end of CY 2020. Going forward, the costs to inspect for cross bores on
9 new installations is embedded in main installation unit costs; however, a small
10 budget is necessary to mitigate cross bores that may be revealed through routine
11 inspections. The capital investment plan includes \$0.2 million in the Rate Year
12 and each of the Data Years, adjusted for inflation to remediate cross bores. The
13 Latent Damages Program is a capital program to remediate third party damages
14 discovered during the course of normal operations. The Company seeks to
15 continue this program at a funding level based on historic damage rates. The
16 capital investment plan includes \$0.4 million in the Rate Year and each of the
17 Data Years, adjusted for inflation.

18
19 The Atmospheric Corrosion Inside Inspections Program is a similar proposed
20 program to address remediation required when inside service inspections result
21 in findings of substandard conditions. As a result of the Commission's 2017

1 Inside Service Line Inspections Order in Case 15-G-0244, baseline inspections
2 result in additional remediation work that must be completed within a year of
3 discovery. Although the majority of remediation work is O&M expense, some
4 remediation requires capital service replacements. The Company estimates that
5 capital funding of approximately \$0.7 million in the Rate Year (to address a
6 spike in remediation work anticipated from completion of baseline inspections),
7 and \$0.1 million per year in each of the Data Years, adjusted for inflation.

8
9 **Q. Please describe what is included in the Reactive Main and Reactive Service**
10 **Replacement Programs.**

11 A. The Reactive Main and Reactive Service Replacement Programs provide for
12 the replacement of gas mains and services and leak repair during urgent or
13 emergency situations that fall outside the normal scope of integrity,
14 reinforcement, reliability and public works programs. These replacements are
15 performed in lieu of repair in instances when repairing damaged facilities is not
16 possible, or where the pipeline segment is too short be covered by the Proactive
17 Program.

18
19 The Main Replacements (Reactive) – Maintenance Program provides Field
20 Operations the ability to quickly replace segments of main when emergent
21 conditions warrant. The forecast for this program is based on Historic Test Year

1 costs, plus an adjustment to include replacement of segments under 50 feet that
2 were previously expensed. This adjustment is made pursuant to a change in
3 capitalization policy that is discussed in detail in Section IV(F), below.

4
5 The Service Replacement (Reactive) - Leaks Program addresses unanticipated
6 service replacements due to leaks reported by the public and customers or
7 detected during programmed leak surveys. The capital investment plan
8 includes approximately \$5.1 million in the Rate Year and each of the Data
9 Years, adjusted for inflation.

10
11 The Service Replacement (Reactive) - Non-Leaks/Other Program addresses
12 primarily customer-driven service replacements necessitated by damages,
13 service abandonments, demolition requests, and service relocations. The
14 capital investment plan includes approximately \$5.2 million in the Rate Year
15 and each of the Data Years, adjusted for inflation.

16
17 **Q. In addition to the LPP replacement program, does the Company also have**
18 **a program to proactively replace gas services?**

19 **A.** Yes. KEDNY's Service Replacements - Proactive is the Company's existing
20 program to proactively replace its inventory of inside, high pressure,
21 unprotected (bare) steel services. Proactive replacement of these services is

1 warranted based on the Company's engineering risk assessment that suggested
2 high pressure, unprotected steel services present a higher risk of failure,
3 particularly at the "wall piece" where the service piping penetrates the
4 foundation wall of the building. The accelerated replacement of high pressure
5 bare steel services with meters/regulators located inside the building is also
6 supported by the risk assessment conducted pursuant to the Company's DIMP.
7 The current inventory is approximately 7,500 services, and KEDNY proposes
8 to continue to replace 250 services per year, maintaining the current pace of this
9 program. The cost of this program is approximately \$2.1 million in the Rate
10 Year and each of the Data Years, adjusted for inflation.

11
12 **Q. What is the status of the Company's New York City Local Law 30**
13 **Program?**

14 A. Local Law 30 is a New York City Building Code that requires every gas service
15 line in the City to have a gas service valve or other emergency shut-off device
16 installed outside for all gas services. Over the past three years, the Company
17 incurred tens of millions of dollars above the current rate plan allowance to
18 achieve significant completion of this work. The program is now in its final
19 stage and will be complete by the end of the Rate Year. Because this program
20 is ramping down in FY 2021, the O&M required for this program in the Rate
21 Year is significantly lower (\$16.3 million) as compared to the Historic Test

1 Year (\$63.9 million), and the capital forecast decreases to approximately \$11.4
2 million dollars in the Rate Year. There are no capital or O&M requirements for
3 this program in the Data Years.

4
5 **Q. Please describe what is included in the Corrosion Control Program.**

6 A. This program funds work consisting of field testing, monitoring, upgrades, and
7 repairs to existing corrosion control systems as mandated by Federal and State
8 Code requirements. Part of this program addresses above ground gas mains at
9 bridge locations, which includes complete recoating of existing aged, dis-
10 bonded, deteriorated or uncoated gas mains, as well as retirement of LPP where
11 it extends underground near these crossings. In addition, this program
12 addresses the installation and testing of cathodic protection systems on buried
13 piping. The Company's forecast for the Corrosion Control is based on the
14 Historic Test Year program unit cost applied to a three-year historic average of
15 units (CY 2016 – CY 2018), adjusted for inflation in each year. The Historic
16 Test year is more indicative of future costs because it was the first full year that
17 includes New York City's new restoration and paving requirements. The
18 capital investment plan includes approximately \$1.0 million in the Rate Year
19 and each of the Data Years.

20

1 **Q. Please describe what is included in the Valve Installation and Replacement**
2 **Program.**

3 A. Federal and state regulations require installation, inspection, operation, and
4 maintenance of critical pipeline valves on all gas distribution systems. The
5 purpose of these valves is to facilitate the rapid shutdown of distribution piping
6 during gas emergencies such as third-party damage or water intrusion. A
7 secondary purpose of these valves is to facilitate maintenance and pipe
8 replacement on associated distribution piping.

9
10 This program will strengthen the Company's emergency response capabilities
11 by improving the level at which Field Operations personnel can safely and
12 efficiently isolate sections of the distribution system while mitigating customer
13 impacts (*e.g.*, reducing the duration of future outages). Ensuring all critical
14 valves are properly maintained and operable is a key public safety function and
15 is essential to the effective operation of the Company's gas distribution system.
16 The Rate Year forecast of approximately \$0.1 million each year, adjusted for
17 inflation in each of the Data Years.

18

- 1 **Q. Please describe what is included in the Meter Changes Program.**
- 2 A. The Meter Changes program involves the labor to replace gas meters that are
- 3 retired from service due to required periodic testing, damage, failure, or any
- 4 other reason.
- 5
- 6 **Q. Please describe what is included in the Purchase Meters Program.**
- 7 A. This program includes the purchase, testing, processing and delivery of gas
- 8 meters and associated instrumentation needed to support the Meter Change
- 9 program, Customer Connections, and Customer Meter Service (“CMS”)
- 10 operations.
- 11
- 12 **Q. Why is there an increase in costs for the Purchase Meters Program**
- 13 **beginning in FY 2020?**
- 14 A. The Company has become aware that a certain population of meters installed
- 15 prior to 2003 contain cadmium, which can cause problems for testing lab
- 16 equipment. Therefore, the Company is no longer refurbishing any pre-2003
- 17 meters. This has increased the number of meters that may need to be replaced
- 18 each year going forward.
- 19
- 20 **D. Reliability Category of Capital Spending**
- 21 **Q. What portion of the Company’s capital investment plan is Reliability?**

1 A. The Reliability category accounts for approximately 21 percent (\$200 million)
2 of the total planned capital investment in the Rate Year.
3

4 **Q. Please describe what is included in the Reliability category.**

5 A. Investments in this category are intended to maintain safe, reliable service to
6 customers by ensuring that all facilities on the gas system are operating
7 efficiently and reliably. The Reliability category includes programs related to
8 gas control, heaters, reactive Instrument & Regulation (“I&R”), pressure
9 regulating facilities, valve installation/replacement, remote-controlled valves,
10 gas planning, system reliability, water intrusion, system automation and control
11 line integrity, special station projects (including over-pressure protection),
12 storm hardening (remote control valves), and reliability and storm hardening
13 upgrades to the Company’s LNG facilities. Exhibit __ (GIOP-5) includes a
14 summary description of significant projects included in the Reliability spending
15 rationale/category, along with the estimated cost during the Rate Year and Data
16 Years for each project. Additionally, two of the larger reliability projects are
17 described below: the Marine Park Regulator Station Project and the Elmhurst
18 Reliability Projects.
19

1 **Q. Please describe what is included in the I&R Reactive Program.**

2 A. The reactive I&R budget provides funding for capital investment in pressure
3 regulating and control stations. Typical projects in this category include
4 unplanned capital work resulting from emergency conditions, including the
5 replacement of station valves, regulators and relief valves, as well as related
6 capital work on station equipment.

7
8 In addition to the I&R Reactive program, the Company is proposing several
9 I&R-related capital and O&M programs to address lessons learned from the
10 Merrick Valley over pressurization issue. These programs are presented in
11 KEDNY and KEDLI's Gas Safety Panel Testimony.

12
13 **Q. Please describe the Gas Control Training Simulator Project.**

14 A. This program is for the purchase, design, and implementation of a real-time,
15 gas control system-modeled training simulator to meet Federal control room
16 management regulatory requirements for scenario based situational training of
17 gas system operators. The Company currently uses paper table-top exercises to
18 meet this requirement. Use of a training simulator will improve the
19 effectiveness of the training by enabling operators to mimic actual system
20 specifications while drilling actions under normal, abnormal, and emergency
21 operating conditions. The training simulator will benefit all National Grid's gas

1 local distribution companies; thus, KEDNY's forecast for this project
2 represents KEDNY's allocation of the total cost.
3

4 **Q. Please describe what is included in the Heater Installation and Pressure**
5 **Regulating Facilities Programs.**

6 A. There are 40 natural gas heaters currently operating on the Company's system.
7 Because high-pressure gas cools when reduced to a lower pressure, heaters are
8 required at pressure regulating stations to prevent freeze-ups that can impact
9 flow control devices. In addition, cold gas temperatures can lead to reduced
10 pipe toughness and increased potential for frost heave and cold temperature-
11 induced stresses. The heater program adds new heaters (where required) and
12 replaces existing heaters that have reached the end of their useful lives. The
13 Pressure Regulating Facilities category provides funding for replacement
14 and/or rebuilding and reconditioning of existing regulating and control stations.
15

16 The Pressure Regulating Facilities Program provides funding for replacement
17 and/or rebuilding and reconditioning of existing regulating and control stations.
18 Pressure regulating facilities (or stations) are designed to control system
19 pressures and maintain continuity of supply during normal operating conditions
20 and during periods of peak gas demand.
21

1 KEDNY has assessed regulating stations on its system, evaluating factors such
2 as pressure, location, including whether the station is located in a FEMA 100
3 year or 500-year flood zone, and the number of dependent customers for each
4 station. In addition, the assessment considered station condition, including pipe
5 corrosion, location and type of overpressure protection, automation, condition
6 of vaults, vault covers, wall sleeves, piping vents and ladders. The results of
7 the assessment were used to create an overall risk rating for each station that
8 serves as the basis for prioritizing projects in this program. The program
9 includes full or partial replacement of existing stations, and storm hardening
10 upgrades where necessary.

11
12 The investments in the Pressure Regulating Facilities Program do not cover the
13 special project capital improvements to specific stations that are separately set
14 forth in the investment plan and described below.

15
16 **Q. Please describe the pressure regulation special projects.**

17 A. Pressure Regulation Special Projects are capital investments to address
18 reliability issues at specific stations that are separately budgeted and are not
19 included in any other blanket reliability programs. These projects are described
20 in detail in the “Pressure Regulation Special Projects” data sheet included in
21 Exhibit __ (GIOP-5). The projects target facilities that have the highest

1 potential customer impact. Depending on the asset, these projects include
2 station replacement or rebuild, incorporation of odorization, gas quality
3 validation, pressure regulation, overpressure protection, storm hardening
4 improvements, and addition of process pre-heating equipment.

5
6 **Q. Please describe what is included in the System Automation category.**

7 A. This program will install Remote Terminal Units (“RTUs”) at multiple city gate
8 and regulator stations. RTUs provide temperature, pressure and flow data back
9 to the Gas Control Room. RTUs can also monitor gas detectors and intrusion
10 alarms and allow Gas Control Operators to adjust flow and pressure set points
11 at regulator stations. The benefits include enhanced calibration of network
12 models from automation and telemetry data, improved accuracy of network
13 analysis, and enhanced ability to forecast the need for capital reinforcements,
14 which will lead to more efficient capital planning. Automation allows Gas
15 Control Operators to selectively close valves, raise or lower pressures, and shut
16 down take stations. System alarms also alert Gas Control Operators to system
17 issues and allow quick pinpointing of the source.

18
19 PHMSA regulations regarding Control Room Management require Operators
20 to ensure that “practices and procedures within their control rooms are adequate
21 to maintain pipeline safety and integrity.” These rules indicate that Operators

1 should have telemetry to monitor pipelines, as it would increase system
2 awareness and enable a proactive response to abnormal operating conditions.
3 The System Automation program complies with these regulations by providing
4 for increased deployment of telemetry on the Company's system.
5

6 **Q. How is system performance monitored currently?**

7 A. Currently, 67 percent of the pressure regulation stations are equipped with some
8 form of telemetry, while the 33 percent of the system relies on paper chart
9 recorders. KEDNY's System Automation program adds automation
10 capabilities to low pressure regulator stations. RTUs installed under the System
11 Automation program will provide enhanced ability to monitor system
12 performance and remotely adjust pressures on the gas system. The program
13 will also replace aging and obsolete telemetry equipment.
14
15

16 **Q. Please describe what is included in the Gas System Reliability – Gas**
17 **Planning/Remote Controlled Valve ("RCV") Program.**

18 A. This program includes capital projects required to maintain system minimum
19 pressures on the gas network in the event of an abnormal operating condition
20 (failure involving a regulator station, gate station, critical main or other major
21 pressure facility on the system). Gas System Planning ensures that customers

1 continue to have reliable service and that no customers experience interruptions
2 as a result of an unplanned outage of a facility under normal winter conditions.
3 The program also involves the installation of additional RCVs on transmission
4 pipelines to improve emergency response capability and reduce the risk of gas
5 releases. In the event of a pipeline failure, RCVs allow control room operators
6 to stop the flow of gas and to remotely isolate and shut down a portion of the
7 system. Currently, most transmission pipelines can only be shut down using
8 manually-controlled isolation valves, which can take longer to close and result
9 in a larger customer impact. Improving response time through the expanded
10 deployment of RCVs reduces the quantity of gas released and can limit the harm
11 to the public and property.

12
13 **Q. Please provide examples of Gas Planning Reliability projects.**

14 A. Examples of Gas Planning Reliability projects include: eliminating distribution
15 systems fed by a single district regulator or main, integrating distribution
16 systems with the same operating pressures through pipeline connections,
17 expanding supply diversity, and projects targeting areas of the system where
18 large numbers of customers would experience a service interruption if a single
19 gas facility became inoperable when the average daily temperature is five
20 degrees Fahrenheit.

21

1 **Q. Why does the Company propose to include installation of RCVs in the**
2 **capital investment plan?**

3 A. The PHMSA regulations promulgated in response to the Pipeline Safety Act of
4 2011 will mandate the installation of additional RCVs. But even in the absence
5 of the PHMSA regulations, investment in RCVs is prudent given the safety and
6 reliability benefits. As highlighted by recent industry events, there are
7 significant operational benefits associated with the increased deployment of
8 RCVs, such as enhanced pipeline shutdown capabilities.

9

10 **Q. Please describe what is included in the Water Intrusion Program.**

11 A. The Water Intrusion program is designed to address water entering the gas
12 distribution system and protects against main obstructions, freeze and thaw
13 issues, poor pressure and/or freezing customer services. This program targets
14 the retirement of LPP that is susceptible to water intrusion but is not prioritized
15 for replacement under the Main Replacement programs because of the absence
16 of leaks and/or historical leak repair activity.

17

18 **Q. Please describe the Storm Hardening – Remote Service Shutoff Valves**
19 **Program.**

20 A. In the 2016 KEDNY and KEDLI Rate Cases, the Company included a proposal
21 for a Storm Hardening Program to install remote service shutoff valves on

1 approximately 25,000 gas services within the FEMA's designated flood zones
2 over five years beginning in CY 2017. Because there was no viable shutoff
3 valve mechanism commercially available for use on the system, the Company
4 was unable to timely launch this program. The devices became available from
5 the manufacturer during February of 2019, and the Company plans to begin
6 installations in FY 2020. Because of the significant benefits of these devices,
7 the Company is renewing its proposal for this program to address an increased
8 scope of approximately 29,000 gas services from FY 2020 and FY 2024.

9
10 **Q. What are the benefits and costs of this program?**

11 A. The remote shutoff valves add a layer of protection for services that are
12 especially susceptible to storm surge and flooding that could cause over-
13 pressurization of the gas facilities connecting customers' premises. The
14 impacts of recent severe storms (*i.e.*, Superstorm Sandy and Hurricane Irene)
15 demonstrate the need for the Company to harden its infrastructure to provide
16 greater protection from future storms. These valves will operate on a fixed
17 communication network that will allow for remote operation and monitoring.
18 Automated valves stop the flow of gas as soon as flooding is detected. This
19 will prevent regulator over-pressurization and stop gas from flowing to
20 premises with damaged equipment and/or extinguished pilot lights, mitigating
21 the risk of a potential incident. Automated valves also provide a real-time count

1 of services impacted by flooding to inform the Company's storm response
2 about the resources needed to restore the affected customers expeditiously.
3 Lastly, in areas where flooding prevents physical access to valves and
4 regulators, remote shut-off valves will allow the Company to interrupt only
5 those services impacted by flooding, which could spare entire neighborhoods
6 or larger areas from losing gas service because of access issues. Installation of
7 the communication networks through which the valves operate can also be
8 leveraged in the future for additional smart devices, such as methane detectors
9 that are being developed.

10
11 The Company is proposing to ramp-up the program in FY 2020 and the Rate
12 Year, installing approximately 500 valves in FY 2020 and approximately 4,000
13 valves in the Rate Year, with the bulk of the communications network systems
14 in the Rate Year as well. The Company intends to install approximately 8,000
15 valves per year in each of the Data Years. Program costs in the Rate Year are
16 approximately \$7.4 million in the Rate Year.

17
18 **Q. Please describe the Marine Park Regulator Station Project and the**
19 **Elmhurst Reliability Project.**

20 **A.** These are two of the larger project-managed reliability projects that are included
21 in KEDNY's capital investment plan. The Marine Park Regulator Station

1 Project includes installation of a new regulator to enable increased supply
2 delivery at the Floyd Bennet Field supply point that was constructed as part of
3 the Brooklyn Queens Interconnection project. This project is necessary to
4 ensure adequate service to firm customers and to avoid stranded supply at Floyd
5 Bennet Field. The project is scheduled to commence in FY 2020, and the
6 capital plan includes approximately \$1.0 million in the Rate Year and \$22.8
7 million in Data Year 1.

8
9 The Elmhurst Reinforcement and Reliability Project is required to support an
10 increase in forecast demand in the 2nd Ward of Queens, including at LaGuardia
11 Airport. The project involves creation of an interconnect that can be used to
12 prevent outages in the event of a system emergency and will reduce dependence
13 on supply from Con Edison. The project is scheduled to begin in Data Year 2,
14 and the capital plan includes approximately \$1.0 million in Data Year 2 and
15 \$35.0 million in Data Year 3.

16
17 **Q. Please describe the compressed natural gas (“CNG”) investments included**
18 **in the KEDNY’s capital plan.**

19 A. The CNG investments included in the capital plan support the Company’s fleet
20 of CNG vehicles. These investments include upgrades necessary to maintain
21 safe and reliable operation of the Company’s CNG fueling stations, including

1 partial or full replacement of existing stations, replacement of station
2 equipment, and/or installation of telemetry, safety design, and reliability
3 improvements.

4
5 **Q. Please describe the Company's LNG programs.**

6 A. KEDNY maintains on-system supply through its LNG facility at the Greenpoint
7 LNG Plant. This plant is a critical component of KEDNY's gas supply portfolio
8 and gas operating network and plays a critical role in meeting peak demand.
9 The Greenpoint LNG Plant is capable of supplying 290 million cubic feet of
10 gas per day, which is critical for meeting KEDNY's peak day demand.
11 Refilling the tanks is accomplished through liquefaction during the summer
12 period when gas supplies are available and less expensive. The liquefaction
13 system can refill at a rate of about 7 to 8.5 million cubic feet of gas per day and
14 it takes between 150 and 200 days to refill both tanks. The Greenpoint LNG
15 Plant is a cost-effective means of meeting peak demand, because gas is liquified
16 during the summer months when prices are lower and stored for use in the
17 winter during peak demand conditions. KEDNY's various LNG capital
18 programs are necessary to ensure the continued safe, reliable operation of the
19 Greenpoint LNG Plant.

20

1 **Q. Please describe the Company’s proposed capital investments for the LNG**
2 **programs during the Rate Year and Data Years.**

3 A. The Greenpoint LNG Plant has been in service for more than 50 years and
4 requires significant investment to support continued safe and reliable operation.
5 Over the past three years, the Company developed major projects to upgrade
6 certain facilities at the Plant that were approved in the 2016 KEDNY & KEDLI
7 Rate Cases, namely LNG tank modernization project and a new Salt Water
8 Pump House. The Company’s proposed capital plan includes funding to
9 complete these ongoing projects, blanket funding to replace aging equipment
10 and unexpected needs, and proposals for a number of continued and new special
11 projects necessary to upgrade and storm harden critical facilities and equipment
12 at the Plant, and to support safety systems.

13
14 **Q. What is covered in the LNG Blanket Program?**

15 A. The LNG Blanket Program provides funding for near-term and emergent capital
16 projects needed to maintain safety and reliability at the Greenpoint LNG facility.
17 Projects typically address equipment that is at or near the end of useful life.
18 Examples of projects in this category include: upgrades to mechanical
19 equipment and systems; upgrades and replacement of electrical and control
20 systems; structural improvements of plant and facilities; procurement of capital
21 tools and equipment; preliminary engineering and design of capital projects;

1 and retirement and decommissioning of equipment, plant and facilities. These
2 projects will extend the service life of the facility and improve operational
3 performance of plant equipment.

4
5 **Q. Please describe the LNG Special Projects.**

6 A. In addition to the LNG Blanket Program work, KEDNY has identified a number
7 of significant, discrete capital projects to be completed in the Rate Year and
8 Data Years. These projects are discussed in more detail in the “LNG Special
9 Projects” data sheet that is included in Exhibit __ (GIOP-5). Several of these
10 projects were identified during the Company’s Storm Hardening Collaborative
11 that resulted from the 2016 KEDNY and KEDLI Rate Cases and involve
12 projects to address identified flood and climate change related risks to critical
13 components or systems at the plant. Several projects are carry-overs from the
14 current rate plan that are in various stages of completion, including projects
15 deferred due to re-prioritization, changes in project scope, or delays in
16 permitting approvals from municipal entities.

17
18 **Q. Please described the status of the Salt Water Pump House Project that was**
19 **included in the 2016 KEDNY and KEDLI Rate Cases.**

20 A. The Salt Water Pump House Project will provide a dedicated source of salt
21 water for two major systems, the deluge system and the fire hydrant system.

1 The Company began this project in 2016, but experienced delays and scope
2 changes resulting from unexpected Fire Department of New York permitting
3 requirements and stipulations. The bulk of construction work is anticipated to
4 occur during the Rate Year. The capital investment plan includes
5 approximately \$35.1 million in the Rate Year and \$15.3 million in Data Year 1
6 to complete this important reliability project.
7

8 **Q. What is the status of the Tank Modernization Project?**

9 A. The Greenpoint LNG Tank #1 (0.6 billion cubic feet (“bcf”)) was put into
10 service in 1968 and Tank #2 (one bcf) was put into service in 1971. In the 2016
11 KEDNY and KEDLI Rate Cases, the Company proposed a project to
12 temporarily take Tank #2 out of service to allow entry into the tank to perform
13 a major tank upgrade. However, execution of this project was dependent on the
14 NESE project. Delays in Williams’ NESE project resulted in delays to the
15 planned Tank 1 and 2 upgrades. The Company’s proposed capital investment
16 plan includes funding to deliver this project in Data Years 1 through 3, based
17 on the assumption that the NESE project will move forward in the next two
18 years.
19

1 **Q. Please explain the LNG Vaporizers 7 and 8 Refurbishment Project.**

2 A. The Greenpoint LNG Plant includes six submersible combustion vaporizers
3 that vaporize the liquified gas into the Company's gas transmission system.
4 Two of the vaporizers, known as vaporizer numbers 7 and 8, have been in
5 service for nearly 40 years and despite modifications that have been made to
6 improve and maintain these units, conditions are deteriorating such that
7 replacement is necessary. This project funds replacement of the vaporizers to
8 ensure continued operability of the plant at existing levels. The capital
9 investment plan includes approximately \$10.2 million in Rate Year, \$10.1
10 million in Data Year 1, and \$3.0 million in Data Year 2.

11

12 **E. Non-Infrastructure and Other Capital Spending**

13 **Q. What portion of the Company's capital investment plan is Non-**
14 **Infrastructure and Other?**

15 A. The Non-Infrastructure and Other category of work accounts for approximately
16 one percent (\$10 million) of the total planned capital investment in the Rate
17 Year. Other Capital includes special projects not included in the Company's
18 other investment programs, most notably KEDNY's investment in automated
19 meter reading. The Non-Infrastructure budget also includes funds for the
20 purchase of tools and equipment that meet the criteria for capitalization.

21

1 **Q. Please describe the Company’s Telecommunications Program.**

2 A. The Company operates a two-way radio system that provides communications
3 support to Gas Field Operations, CMS, Security, and other departments. This
4 system also serves to support communications during emergencies when
5 commercial communications systems are not operational. These systems
6 contain ageing components and must be repaired or replaced upon failure. The
7 Telecommunications Programs provide reactive funding for smaller
8 replacement projects in three categories that collectively cover funding needs
9 for towers at remote sites, radios installed in vehicles, and for general damages
10 and failures.

11

12 **Q. What is included in the Tools and Equipment program?**

13 A. The Tools and Equipment program captures the items that are not used for
14 specific projects but support the safe, efficient and on-going day-to-day
15 operations of the gas business. Examples include tools (hand, power,
16 pneumatic, hydraulic), specialty equipment, PPE, office machines, electronic
17 data processing equipment and software applications, shop and garage
18 equipment, and communications devices.

19

1 **Q. What is included in the Company’s Learning and Development (“L&D”)**
2 **Materials Tools and Equipment Program?**

3 A. Historically, L&D has a limited stock of tools for use in training and has relied
4 upon tools borrowed from Field Operations to supplement its supply and
5 conduct required training of in-house and contractor employees. With
6 workload and training requirements increasing, Field Operations can no longer
7 spare tools and equipment sufficient for training purposes, and the limited stock
8 of available tools is beginning to deteriorate. The proposed L&D Materials
9 Tools and Equipment Program will purchase new tools and equipment for
10 training purposes. The program will follow an innovative approach whereby
11 the new tools will be used for training during the annual training sessions at the
12 beginning of each year, and then the new tools will be sent into the field for use
13 by the newly-trained employees. Following annual training, Field Operations
14 will send its in-use tools back to L&D for refurbishment and use in
15 supplemental training throughout the year. This tool swap enables better
16 training because training will occur on the equipment that will actually be used
17 in the field, enhances the quality of tools used in the field, and ensures that L&D
18 has a sufficient inventory of tools to conduct supplemental training during the
19 year after annual training has concluded. The program also increases the useful
20 life of field tools that are swapped back into L&D for refurbishment that
21 otherwise may have failed earlier in the field due to continuous use.

1

2 **Q. Please describe the Company’s Non-Infrastructure AMR Installation and**
3 **AMR Replacement Programs.**

4 A. The AMR Installation Program will complete KEDNY’s five-year AMR
5 deployment program that began in CY 2017. As of the beginning of FY 2020,
6 the Company will have roughly 110,000 encoder receiver transmitters
7 (“ERTs”) to install to complete the program. The Company anticipates that
8 AMR deployment in KEDNY’s service territory will be complete by the end of
9 the Rate Year.

10

11 The AMR Replacement Program funds the purchase of the
12 ERT units to support the Company’s mandated meter changes program and to
13 replace existing units nearing the end of useful life or that have failed. The ERT
14 units are not included in the Purchase Meters Program. KEDNY currently has
15 an installed AMR population of approximately 1.4 million units and estimates
16 that approximately 23,000 AMR units will require replacement during the Rate
17 Year and each Data Year. This program does not include funding for ERTS to
18 support meter installations for new customers; those are funded in the Customer
19 Gas Connections – AMR Program.

20

1 **Q. What is included in the Meter Testing Equipment Program?**

2 A. The Meter Testing Equipment Program replaces meter test lab equipment that
3 has reached its useful life that is needed to carry out the mandated meter testing
4 program.

5

6 **F. Capitalization Policy Change – Main Installation**

7

8 **Q. Is the Company proposing any changes to its capitalization policies for**
9 **main installation?**

10 A. Yes. Accounting for installation of segments of main under 50 feet in length is
11 currently expensed by the Company. This threshold is arbitrary; moreover,
12 there is no similar threshold for main replacement in Niagara Mohawk's service
13 territory. Applicable accounting principles and regulations permit
14 capitalization of new main installations, and there is no minimum threshold.
15 The Company is proposing to remove the 50-foot threshold and capitalize all
16 main installation activities in accordance with the FERC Chart of Accounts –
17 Gas – Operating Expense Instructions, Accounts 367 Mains and 376 Mains.
18 This change will standardize the accounting treatment of these work activities
19 between National Grid's New York gas distribution companies. As discussed
20 in the testimony of the Revenue Requirements Panel, the Company has
21 normalized its Historic Test Year to reflect the change from expense to capital

1 for distribution and transmission main installation, and the Company's capital
2 investment forecasts also reflect this capitalization change.

3
4 **V. Indirect Capital**

5 **Q. Is the Company allocated indirect capital costs?**

6 A. Yes. KEDNY is allocated a portion of indirect costs such as facilities, fleet
7 services, and supply chain. The Company's indirect capital investment plan is
8 presented in Exhibit __ (GIOP-7).

9
10 **Q. Please describe the Fleet and Supply Chain investments included in the**
11 **Rate Year and Data Years.**

12 A. The proposed fleet and supply chain expenditures will provide required
13 upgrades to the Company's critical operating facilities in support of its capital
14 and O&M programs. Fleet requirements in the Rate Year and Data Year
15 include construction of fleet bays in Springfield, required re-certification of a
16 fuel tank system in Staten Island to meet environmental regulations;
17 replacement of truck lifts that have reached their useful lives in Greenpoint,
18 Canarsie, and Staten Island; a fleet offices refurbishment in Canarsie;
19 installation of electric vehicle charging stations; and as-needed replacements of
20 tools, equipment, and miscellaneous items required for upkeep of the

1 Company's fleet, such as shop equipment, tire lifts, *et cetera*. The fleet forecast
2 includes approximately \$0.7 million in the Rate Year.

3
4 Supply Chain investments support the service centers that are used to stage and
5 deploy the Company's field workforce, store vehicles, equipment and materials,
6 and provide various utility functions (*e.g.*, meter shop) in support of the
7 operation and maintenance of KEDNY's system, including inventory
8 management and warehousing. Supply chain needs during the Rate Year
9 include paving, security cameras, and inventory racking. The supply chain
10 forecast includes approximately \$0.6 million in the Rate Year.

11
12 **Q. Please describe the Company's proposed Facilities investments for the Gap**
13 **Period, Rate Year, and Data Years.**

14 A. The Company's Facilities investments are set forth in Exhibit __ (GIOP-7) and
15 include a baseline facilities plan of approximately \$5.7 million in the Gap
16 Period, between \$3.0 million and \$3.6 million in the Rate Year and Data Years
17 1 and 2, and \$4.6 million in Data Year 3 for general property improvements and
18 necessary upgrades, and several larger projects that are described below and in
19 data sheets included in Exhibit __ (GIOP-7). The Company is making
20 significant investments in facilities required to support the Company's capital
21 and O&M programs, enhance the customer experience, and ensure optimized

1 and efficient office workspaces. The total facilities investment plan for the Rate
2 Year and Data Years for KEDNY is approximately \$8.6 million in the Rate
3 Year, \$5.9 million in each of Data Years 1 and 2, and \$4.6 million in Data Year
4 3.

5
6 **Q. Please briefly describe the Company's significant Facilities projects.**

7 A. There are five large projects included in the Company's Facilities capital plan
8 for the Gap Period, Rate Year, and Data Years as follows:

- 9 • Pitkin Customer Office Remodeling: The Company will remodel the
10 Pitkin Avenue Customer Office and Outreach Center to improve the
11 work area for customer-facing payment center employees and walk-in
12 customers, and including carpet and ceiling tile replacement, full
13 painting, and general wear and tear repairs. The Company forecasts
14 \$0.5 million in capital expenditures in the Gap Period for this project.
15 This project is discussed in the testimony of the Shared Services Panel.
- 16 • NYC Training Centers (Queens/Brooklyn and Staten Island): KEDNY
17 will develop two 3,000 square foot Company-owned training facilities,
18 one in Queens/Brooklyn and one in Staten Island, to accommodate
19 growth in the amount of technical training required to ensure the
20 competence of National Grid's gas workers and to validate the
21 training/competency of the contractor workforce in KEDNY's service

1 territory. The Training Centers will also support New York State
2 regulatory commitments for implementing First Responder training in
3 New York City, and will better enable the Company to educate its
4 workforce concerning revised PHMSA pipeline safety standards and
5 enhanced engineering oversight standards. The new facility will permit
6 the Company to deliver enhanced classes and hands on training to both
7 employees and contractors. The Training Centers will include
8 classrooms, lab-bench technical, and office facilities designed to meet
9 increased training and evaluation demands. Forecast capital
10 expenditures for this project are \$13.6 million in the Gap Period and
11 \$2.4 million in the Rate Year.

- 12 • Greenpoint Electrical Project: The Company will perform multiple
13 upgrades and modifications to the existing outdated and aged electrical
14 distribution systems feeding the various buildings on the Greenpoint
15 Gas Operations and LNG site, including reducing the number of
16 electrical services to the site, removal of unnecessary feeders,
17 installation of up-to-date switchgear and sub-metering systems, and
18 modifying systems for redundancy and emergency power protection.
19 These upgrades will improve the safety and efficiency of the site's
20 electrical system. Projected capital expenditures are \$0.5 million in the

1 Gap Period, \$0.6 million in the Rate Year, and \$0.8 million in Data Year
2 1.

- 3 • Canarsie Roof and Facades Project: KEDNY will replace the roofs and
4 perform significant façade improvements, including window
5 replacements, on all buildings at the Canarsie Operations Site to
6 maintain the integrity of the buildings. The Company had the roofs and
7 facades at the site inspected by a professional engineering firm, which
8 recommended that repairs and replacements be conducted in the 2015-
9 2020 timeframe. Forecast capital expenditures for this project are \$1.9
10 million in the Gap Period, \$2.3 million in the Rate Year, \$1.5 million in
11 Data Year 1, and \$2.3 million in Data Year 2.
- 12 • Canarsie Parking/Paving Project: The Company will remove and
13 reconstruct the employee parking lot adjacent to its Canarsie Operations
14 Center. The reconstruction of the East 83rd Street lot will consist of
15 removal of all existing asphalt and fencing, re-grading the entire lot, and
16 the installation of a new drainage system, pavement, curbing, fencing,
17 and landscaping. The Company will also remove and replace
18 deteriorated asphalt in the interior lot. These improvements are needed
19 to remedy the severe state of disrepair in the lots, which can cause
20 vehicle damage and creates unsafe walking hazards. The drainage
21 system repairs are required by New York City to address hazardous

1 impacts to the public. Forecast capital expenditures for this project are
2 \$0.8 million in the Gap Period and \$0.3 million in the Rate Year.
3

4 **Q. Are additional Facilities investments planned for the Gap Period, Rate**
5 **Year, and Data Years?**

6 A. Yes. National Grid is proposing a plan of facilities replacement for general
7 facilities improvements and upgrades of \$34.1 million in the Gap Period, \$38.8
8 million in the Rate Year, \$11.8 million in Data Year 1, \$6.8 million in Data
9 Year 2 and \$6.8 million in Data Year 3. These facilities are National Grid
10 Service Company investments and the costs are set forth in KEDNY's Revenue
11 Requirements Panel's Exhibit __ (RRP-11), Workpapers to Exhibit RRP-3,
12 Schedule 9, Workpapers 4, 7, 10, and 13. The large Facilities investment
13 projects include:

- 14 • Replacement of the Hicksville Office and Operating Site: National Grid
15 currently occupies 237,000 square feet of the 515,000 square feet
16 available at this site. PSEG-LI occupies the remainder of the site.
17 National Grid plans to relocate its operations to a 100,000 square foot
18 site and, in so doing, achieve savings through a reduction in the total
19 footprint and the elimination of inefficiencies that arise from the joint
20 occupation of the current site. Forecast capital expenditures associated
21 with the relocation for National Grid Service Company total

1 approximately \$3.1 million in the Gap Period, \$19 million in the Rate
2 Year, \$0.5 million in Data Year 1, \$0.5 million in Data Year 2, and \$0.5
3 million in Data Year 3.

4 National Grid has been sharing this site with PSEG-LI since it assumed
5 responsibility for the administration of the Long Island Power
6 Authority's transmission and distribution systems in 2014. Sharing
7 major operations facilities is not optimal for the Company from an
8 efficiency, safety or security perspective. Moreover, sharing a major
9 operations site makes it more difficult to promote and brand National
10 Grid to the public. In addition, it creates issues with respect to
11 recruiting, training and retaining employees. Relocating National
12 Grid's operations to a more efficient, Company-only site is clearly
13 beneficial from a company, employee, and customer perspective.

- 14 • Brooklyn, NY Office Relocation: National Grid will relocate existing
15 office personnel in the MetroTech office to another facility in Brooklyn,
16 reducing the Company's footprint. National Grid is examining potential
17 locations for this relocation at this time. However, a move to a smaller
18 footprint will reduce costs and enable the Company to make more
19 efficient use of space. As part of this plan, KEDNY's call center,
20 customer office, and Sustainability Hub will remain at the current
21 location and the Company will sublease the remainder of the space until

1 the end of the current lease term in February 2025. National Grid
2 forecasts capital expenditures of \$8.0 million in the Gap Period and
3 \$13.2 million in the Rate Year for this project. The Revenue
4 Requirements and Shared Services Panels further discuss the planned
5 MetroTech office relocation.

- 6 • IM Warehouse Project: – National Grid will consolidate and integrate
7 the Gas Distribution and Gas Transmission supply chain by moving
8 certain warehouse facilities from Greenpoint in Brooklyn to a new
9 location on Long Island. This integration supports a comprehensive
10 overall supply and inventory management program for the GBE
11 Program in the U.S. The facility will help to improve services provided
12 to Gas Transmission and Gas Distribution by enabling increased
13 delivery frequency of needed materials and permitting National Grid to
14 better optimize delivery routes. Forecast capital expenditures for this
15 project are approximately \$14.0 million in the Gap Period and \$1.1
16 million in the Rate Year.

- 17 • Reservoir Woods Office Project: – National Grid is reconfiguring the
18 corporate offices in Reservoir Woods, Massachusetts, which is utilized
19 by employees who provide services to KEDNY and other National Grid
20 affiliates, to create a more efficient space. Forecast capital expenditures
21 are \$6.0 million in the Gap Period.

1 **VI. Gas O&M Expenses**

2 **Q. Please summarize the Panel's testimony regarding the costs of operating**
3 **the gas system.**

4 A. The Panel addresses major expenses associated with operating the Company's
5 gas delivery system, and incremental O&M expenses the Company expects to
6 incur in the Rate Year and Data Years.

7

8 **Q. Please generally describe the nature of the Company's gas system O&M**
9 **expenses.**

10 A. O&M expenses relate to work performed to provide customer support, respond
11 to emergencies, perform safety inspections and other compliance activities,
12 restore service, and maintain the life of capital assets. The Company has a
13 significant maintenance program to ensure that system assets are utilized to
14 their fullest potential life expectancy. As gas facilities age, maintenance costs
15 increase. These costs include more frequent inspection and testing required by
16 regulatory changes, increased volume of repairs, more significant repair work,
17 increased emergency work, and gas pipeline safety enhancements. These
18 expenditures are required to prevent failure and maintain the life of the assets
19 until replacement occurs. The Company's O&M programs are also designed to
20 maintain the service commitments in its gas safety performance metrics, which
21 cover various aspects of its performance in the areas of reliability and safety,

1 including metrics measuring pipeline replacement, emergency response, leak
2 management, and damage prevention.
3

4 **Q. How does the projected Rate Year non-labor expense level compare to the**
5 **Historic Test Year non-labor expenses for operating the gas system?**

6 A. There is incremental non-labor O&M for individual projects and programs;
7 however, there is a net decrease in total non-labor O&M in the Rate Year and
8 in each of the Data Years as compared to the Historic Test Year. This is due to
9 the ramp down of the Local Law 30 Program that significantly decreases non-
10 labor O&M for this program in the Rate Year and Data Years as compared to
11 the Historic Test Year. Specifically, compared to the Historic Test Year, LL 30
12 Program O&M expense decreases by approximately \$47.6 million in the Rate
13 Year. Thus, considering the LL 30 offset, the Company projects its Rate Year
14 O&M associated with gas operations to be approximately \$24.7 million less
15 than its adjusted O&M non-labor expense for the Historic Test Year.
16

17 **Q. What are the projected incremental Rate Year O&M non-labor and labor**
18 **expenses for gas operations and gas safety programs?**

19 A. As shown on Exhibit __ (GIOP-8), the Company projects its incremental Rate
20 Year non-labor O&M expense to be approximately \$22.878 million. As shown
21 in Exhibit __ (GIOP-9), the Company also proposed to hire 159.7 total

1 incremental FTEs in the Rate Year. The costs for these FTEs are presented in
2 KEDNY's Revenue Requirements Panel testimony and exhibits.

3

4 **Q. Please summarize the projected incremental O&M expenditures.**

5 A. Increases in O&M expense are primarily driven by (i) the Company's
6 increasing capital investments and increased costs for executing the Company's
7 capital plan, (ii) changes to Company's O&M workload, and (iii) initiatives the
8 Company is undertaking in the Rate Year to address new or expanding safety
9 requirements and to implement lessons learned from recent industry gas system
10 incidents.

11

12 The New York City restoration/paving cost increases also impact O&M costs
13 of construction, leak repairs, and disconnects and reconnects. These costs are
14 reflected in the Historic Test Year, but generally have increased costs as
15 compared to prior years.

16

17 **Q. What is the Company doing to manage its O&M costs?**

18 A. The Company has implemented various initiatives to reduce its O&M expenses,
19 including:

- 20
 - Increasing the use of scheduled O&M work appointments to reduce
21 multiple unproductive field visits to complete work.

- Coordinating O&M activities required at each premise so that multiple maintenance requirements can be completed during a single visit.
- Increasing the use of coring and low-dig technology, reducing debris removal and paving restoration costs associated with smaller roadway excavations.
- Modifying shift schedules to more efficiently respond to higher leak volumes.
- Exploring new work management systems to optimize dispatch of resources.

Notably, during CY 2018, the Company undertook a re-organization of its Gas Business Unit to optimize the level of managers and FTEs to arrive at a more efficient balance of personnel.

A. Incremental O&M Costs Associated With Capital Investment

Q. Please describe the Company's need for incremental O&M costs associated with its planned capital investments.

A. As discussed above, the Company plans to increase its capital investment program during the Rate Year. As shown on Table 6 and in Exhibit ____ (GIOP-8), the Company estimates incremental O&M non-labor expense of approximately \$8.009 million in the Rate Year directly related to the Company's capital investments.

Table 6: Rate Year Incremental O&M and FTEs
Related to Capital Investments

Category (\$000)	FY 2021 Non- Labor	FTEs
Capital Support – General	--	18
Disconnects & Reconnects	\$53	--
IMP/IVP	\$7,178	4.5
Transmission Station Integrity	\$146	2
Storm Hardening	\$521	0.6
RNG Program	\$111	1.9*

* Included in new Future of Heat Engineering Group

i. Capital Support - General

Q. What O&M services will the various construction support functions provide to support the Company's increased capital investments?

A. Construction support functions include internal groups providing contract administration, project management, budgeting and resource planning. While the majority of costs from these functions are directly charged to capital projects, the Company incurs O&M expenses for items such as training, travel, conferences, licensing, new employee on-boarding, and costs for administering O&M contracts. The Company estimates that approximately 10 percent of construction support employees' time is O&M expense.

1 As KEDNY increases its capital expenditures, the Company will require
2 additional capital support resources, including gas system engineering
3 (estimators, designers, engineers), investment planning (clerks, inspectors,
4 program managers), operations support (permit clerks) and resource planning
5 (analysts, coordinators).

6
7 **Q. What are the incremental support requirements in the Rate Year?**

8 A. The Company forecasts approximately 18 FTEs for these support functions in
9 the Rate Year. A breakdown of the positions is provided in Exhibit __ (GIOP-
10 9).

11
12 ***ii. Disconnects & Reconnects***

13 **Q. Please describe the O&M costs associated with service line disconnects and**
14 **reconnects.**

15 A. Main replacements require the Company to disconnect gas service lines from
16 the main being removed, and then reconnect the service to the new main. A
17 2,000-foot main replacement can require dozens of disconnects and reconnects,
18 especially in densely populated, urban areas. The Company's capital plan
19 involves significant investment in main and service replacements, including the
20 accelerated retirement of LPP. This work will increase O&M costs for
21 disconnection and reconnection of gas services by \$0.053 million in the Rate

1 Year, \$1.891 million in Data Year 1, \$3.799 million in Data Year 2, and \$5.983
2 million in Data Year 3, as shown in Exhibit____(GIOP-8).

3
4 *iii. IMP/IVP*

5 **Q. Please describe the O&M requirements of the IMP and IVP Programs.**

6 A. Incremental non-labor O&M in the amount of \$7.178 million in the Rate Year,
7 \$2.097 million in Data Year 1, \$0.719 million in Data Year 2, and \$6.055
8 million in Data Year 3, as shown in Exhibit____(GIOP-8) and an additional 4.5
9 FTEs in the Rate Year and Data Years are required to conduct the required
10 inspections via ECDA on pipelines that are not ILI-enabled and to conduct ILI
11 on those that are already enabled. These costs include excavation and support
12 for ECDA inspections, evaluation of testing data and the costs of non-capital
13 repairs such as repair sleeves and on-site material testing. The costs for FTEs
14 are shown in Exhibit____(RRP-3), Schedule 27 and supported by the Revenue
15 Requirements Panel.

16
17 *iv. Transmission Station Integrity*

18 **Q. Please describe the O&M requirements of the Transmission Station**
19 **Integrity Program.**

20 A. Similar to the IVP and IMP program needs for non-station assets, incremental
21 non-labor O&M in the amount of \$0.146 million in the Rate Year, \$0.796

1 million in Data Year 1, \$0.771 million in Data Year 2, and \$0.787 million in
2 Data Year 3, as shown in Exhibit___(GIOP-8) and two incremental FTEs in the
3 Rate Year and Data Years are required to conduct records reviews and testing
4 of stations. The costs for FTEs are shown in Exhibit___(RRP-3), Schedule 27
5 and supported by the Revenue Requirements Panel.
6

7 **v. Storm Hardening – Remote Shutoff Valves**

8 **Q. Please describe the O&M requirements of the Storm Hardening – Remote**
9 **Shutoff Valves Program.**

10 A. The installation of storm hardening remote shutoff valves requires incremental
11 non-labor O&M in the amount of \$0.521 million in the Rate Year, \$0.709
12 million in Data Year 1, \$0.741 million in Data Year 2, and \$0.903 million in
13 Data Year 3, as shown in Exhibit___(GIOP-8), for pole rentals and information
14 systems running costs for communication equipment to operate the valves.
15 Additionally, the Company requires 0.6 incremental FTEs in the Rate Years
16 and Data Years to oversee system monitoring and valve location support,
17 investigate alarms, and replace valve components, as necessary.
18

19 **vi. RNG Interconnection Program**

20 **Q. Please describe the O&M requirements of the Company's RNG**
21 **Interconnection Program.**

1 A. The Company's RNG Interconnection program requires non-labor O&M for
2 ongoing maintenance of the interconnection equipment that the Company
3 installs in the amount of approximately \$0.111 million in the Rate Year, \$0.221
4 million in Data Year 1, \$0.332 million in Data Year 2, and \$0.442 million in
5 Data Year 3. The O&M for this program is shown in Exhibit___(RRP-3),
6 Schedule 27. Additionally, 2.4 incremental FTEs are needed in the Rate Year
7 and Data Years for the new Future of Heat Engineering Group that is described
8 in the Future of Heat Panel's testimony. Approximately 1.9 of the Future of
9 Heat FTEs will be dedicated to supporting administration of the Company's
10 RNG Interconnection Program.

11

12 **B. Changes to O&M Workload**

13

14 **Q. Please describe the non-safety program incremental O&M workload**
15 **expenses.**

16 A. There are two significant O&M programs where the Company projects
17 incremental expenses in the Rate Year that are not related to safety requirements
18 and initiatives: (i) the Traditional Research and Development ("R&D")
19 Program, and (ii) the Fixed Factor Meter Inspection Program.

20

1 **Q. Please describe the need for incremental O&M for the Company's**
2 **Traditional R&D Program.**

3 A. The Traditional Gas R&D Program is for short-term research associated with
4 gas operations, end use, natural gas appliances, supply related storage, safety,
5 and related measures that do not qualify for funding under the Millennium
6 Program. The Historic Test Year reflects minimal spending for Traditional
7 R&D in part due to departmental, budgeting, and personnel changes that
8 resulted in an inadvertent gap in Traditional R&D spending. Traditional R&D
9 may result in modernization of utility operations, reduced costs, improvements
10 to public, customer, and employee safety, and/or environmental benefits; thus,
11 the Company is committed to reinstating its Traditional R&D Program.
12 KEDNY proposes one incremental FTE in the Rate Year and Data Years, and
13 incremental non-labor O&M for Traditional R&D of approximately \$1.768
14 million in the Rate Year, \$1.460 million in Data Year 1, \$1.346 million in Data
15 Year 2, and \$1.374 million in Data Year 3, as shown in Exhibit___(GIOP-8),
16 for R&D projects to address:

- 17 • Advanced leak/methane detection equipment
- 18 • Auto/remote shut-off valves
- 19 • Communications
- 20 • Composite materials, liners, and related technologies
- 21 • Damage prevention and location technologies

- 1 • Gas venting
- 2 • Global navigation satellite system (GNSS); geospatial information
- 3 system (GIS), and asset tracking and traceability
- 4 • IMP/IVP technologies
- 5 • RMD technologies
- 6 • Virtual reality and augmented reality
- 7 • Large diameter plastic
- 8 • Live main insertion
- 9 • Main installation via plow

10

11 **Q. Please describe the Fixed Factor Meter Inspection Program and the**
12 **incremental O&M required for this program.**

13 A. Fixed factor meters are used in conjunction with pressure regulated installations
14 and that employ a correction method system, based on a billing multiplier, to
15 adjust the measured volume of gas delivered to standard pressure conditions.
16 KEDNY's Fixed Factor Meter Inspection Program conducts mandated
17 inspections to verify measurement accuracy for billing purposes. Pursuant to a
18 pilot program for extended inspection intervals, KEDNY and KEDLI currently
19 conduct fixed factor inspections annually of approximately one-fifth of the total
20 fixed factor meter population, such that the entire population is inspected over
21 five years. Niagara Mohawk conducts inspections of its entire population of

fixed factor meters annually. To better align fixed factor meter processes and resources across the three New York gas LDCs, KEDNY and KEDLI propose to conduct annual inspections of all fixed factor meters. KEDNY requires three incremental FTEs in the Rate Year and Data Years, specifically union field mechanics, to conduct the incremental inspections.

C. O&M Costs Related to Safety and Reliability Programs

Q. Please briefly describe the incremental O&M requirements for the Company's gas safety programs and initiatives.

A. The Company's safety programs address both new mandated safety inspection requirements (inside service line and plastic fusion inspections), and implementation of gas pipeline safety enhancements. These programs are described in detail in the Gas Safety Panel testimony. The O&M requirements of these programs are summarized in Table 7.

Table 7: Rate Year Gas Safety Programs Incremental O&M and FTEs

Category (\$000)	FY 2021 Non-Labor	FTEs
Plastic Fusions In-Process Inspections	\$102	0
Inside Service Line Inspections (mandated)	\$5,900	3.5
Contractor Safety Inspections	\$228	25
Inactive Accounts	--	78
I&R Training Lab	\$75	0
I&R Control Line Survey	\$1,496	2.5

Pipeline Safety Management	--	10.4
Damage Prevention	\$2,384	1
New Materials Test Lab	--	0.5
Single Meter Regulator Inspections	\$780	3
Gas Control SOP Training	--	2.3
First Responder Training	\$50	2
Field Training	\$50	2
Residential Methane Detection	\$1,896	--
Enhanced High Emitter Methane Detection (Google Vehicle)	\$250	0.4

1

2

3 **VII. Impact of Williams' NESE Project on KEDNY's Investment Plan**

4 **Q. Please briefly describe the Transco Northeast Supply Enhancement**
5 **("NESE") Project.**

6 A. As discussed in the testimony of Company Witness Elizabeth D. Arangio,
7 Williams' NESE Project will expand the existing Transco interstate pipeline to
8 provide an additional 400 million cubic feet of natural gas capacity per day to
9 the New York area by the 2020 winter heating season. National Grid has
10 contracted for 100 percent of the gas pipeline capacity that will be created by
11 the NESE Project. This capacity is critical to meeting increasing demand in
12 KEDNY and KEDLI's service areas. The NESE Project is currently awaiting
13 permit approval by the New York Department of Environmental Conservation
14 ("NYDEC").

15

1 **Q. What is the impact on the Company's capital investment plan if NESE is**
2 **not approved?**

3 A. The Company's capital investment plan assumes that the NESE Project will be
4 approved and placed in service. As stated in the testimony of Ms. Arangio, if
5 NESE is not approved, KEDNY will have no choice but to impose a
6 moratorium on new and additional gas service in affected areas of the
7 Company's service territories to maintain system reliability. Moreover, several
8 of the Company's planned Rate Year and Data Years capital programs and
9 projects will be drastically reduced, deferred, or removed altogether.
10 Specifically, the Company's customer connections programs would be
11 suspended, and planned system reinforcements needed to support increasing
12 demand would be reduced by approximately half. Notably, without additional
13 capacity from NESE, the Company will be unable to take its LNG tanks out of
14 service for sufficient time to complete needed repairs; thus, the capital project
15 described above to make critical repairs to the LNG tanks could not proceed.

16
17 The MRI project will be completed according to the Company's current plans
18 regardless of whether NESE is approved and in service. While a significant
19 benefit of MRI is to enable optimization of the additional capacity NESE will
20 provide, the MRI project is nearly complete and includes other important
21 reliability benefits independent of NESE, such as increased design day pressure

1 capability and redundancy to the Brooklyn Backbone. MRI will be completed
2 but will not provide all expected system benefits if NESE is not approved.

3

4 **Q. Does this conclude your testimony?**

5 A. Yes, it does.

Testimony of the Gas Infrastructure and Operations Panel

Index of Exhibits

Exhibit __ (GIOP-1):	Actual and Projected Direct Capital Expenditures: Historic Test Year, Gap Period, Rate Year, Data Year 1, Data Year 2, and Data Year 3
Exhibit __ (GIOP-2):	Charts Demonstrating Components of Unit Cost Increases
Exhibit __ (GIOP-3):	Gas Safety and Reliability Surcharge Including Unit Cost Incentive Proposals
Exhibit __ (GIOP-4):	Chart Summarizing Projected Leak Rates for LPP for Various Main Replacement Strategies
Exhibit __ (GIOP-5):	Data Sheets for Significant Capital Programs. This exhibit includes summaries of the Company's significant capital projects/programs
Exhibit __ (GIOP-6):	Demonstration of Variability in City/State Construction O&M
Exhibit __ (GIOP-7):	Projected Indirect Capital Expenditures (Supply Chain, Fleet, and Facilities) for the Gap Period, Rate Year, Data Year 1, Data Year 2, and Data Year 3, and Data Sheets for Significant Facilities Investments
Exhibit __ (GIOP-8):	Incremental O&M Expenditures: Rate Year, Data Year 1, Data Year 2, and Data Year 3
Exhibit __ (GIOP-9):	Incremental FTE Positions by Function in the Rate Year, Data Year 1, Data Year 2, and Data Year 3

Testimony of the Gas Infrastructure and Operations Panel

Exhibit __ (GIOP-1)

Actual and Projected Direct Capital Expenditures: Historic Test Year, Gap Period, Rate Year, Data Year 1, Data Year 2, and Data Year 3

The Brooklyn Union Gas Company d/b/a National Grid NY
Direct Capital Expenditures (CAPEX and COR)

	CY18 Historic Test Year	FY19 Jan-Mar	FY20	FY21	FY22	FY23	FY24
Customer Connections							
Customer Connections - Install Main	23,814,231	7,602,674	21,146,720	21,729,722	22,538,940	22,989,719	23,449,513
Customer Connections - Install Services	31,221,711	9,771,535	24,785,380	25,488,092	27,925,611	28,484,123	29,053,806
Customer Connections - Customer Contributions	(1,726,893)	(344,196)	(2,307,000)	(2,352,000)	(2,403,000)	(2,456,000)	(2,503,000)
Build it Back Program	1,032,769	175,260	-	-	-	-	-
LGA Delta Reconstruction	74,150	214,581	-	-	-	-	-
Gateway Development Brooklyn	959,149	(920,240)	-	-	-	-	-
Customer Connections - Meter Purchases	-	-	1,811,750	1,847,990	1,884,950	1,922,640	1,961,100
Customer Connections - Install Meter/Regulator	1,134,412	251,149	1,232,673	1,257,700	1,336,904	1,363,642	1,390,915
Customer Connections - Automatic Meter Reading (AMR)	-	-	1,042,000	1,062,090	1,083,330	1,105,000	1,127,100
Gas System Reinforcement	84,664,884	19,780,140	45,382,000	13,641,000	61,716,000	84,342,000	64,031,000
LTNY11751 - Kew Gardens Gate - PM	654,870	37,046	4,806,891	17,937,000	-	-	-
LTNY12025 - Belmont Gate Station - PM	-	-	-	-	180,000	720,000	25,514,000
Total Customer Connections	141,829,283	36,567,949	97,900,413	80,611,594	114,262,735	138,471,124	144,024,433
Mandated							
CSC/Public Works - Non Reimbursable	108,497,668	20,959,998	23,226,296	23,959,296	24,353,000	24,793,000	22,922,000
CSC/Public Works - Reimbursable	156,046,548	31,581,647	247,909,404	255,813,404	270,094,000	275,018,000	256,181,000
Flatlands - SE853 Phase 2 - Trans Offset Louisiana Ave & Georgia Ave	7,038,450	261,571	69,416,000	-	-	-	-
SE856 Phase 2 Trans. Offset Sheffield & New Jersey Ave. - Trans Work	-	50,000	10,550,000	60,000,000	-	-	-
SE856 Phase 2 Trans. Offset Sheffield & New Jersey Ave. - Dist Work	-	-	2,500,000	41,900,000	2,000,000	-	-
SE-851 -E-108 St Transmission Offset	(308,361)	-	-	-	-	-	-
SE851-Flatlands Ave Ph 1	114,696	-	-	-	-	-	-
SE851-Flatlands Ave Ph 2	1,934,774	2,480,983	-	-	-	-	-
SE851-Flatlands Ave Ph 3	10,783	-	-	-	-	-	-
SE851-Flatlands Ave Ph 4	146,362	-	-	-	-	-	-
SE851-Flatlands Ave Ph 5	(124,957)	-	-	-	-	-	-
SE852-Flatlands Ave Ph 4	64,020	-	-	-	-	-	-
LaGuardia Redevelopment	15,080,937	1,737,453	654,382	164,382	-	-	-
CSC/Public Works - Reimbursement	(35,432,977)	(10,033,991)	(43,379,825)	(57,842,236)	(60,806,915)	(63,063,400)	(64,902,762)
Main Replacements - (Proactive) - Leak Prone Pipe	166,857,628	33,839,856	196,552,000	250,061,000	304,804,000	347,927,000	407,571,000
CISBOT	640,894	327,715	5,236,499	5,336,499	5,400,000	5,500,000	5,600,000
Large Diameter Main Rehabilitation	16,835,708	2,201,341	13,620,628	14,088,000	14,376,000	14,671,000	14,975,000
Cross Bore Remediation	447,746	256,685	396,839	150,000	153,000	156,060	159,181
Latent Damage Inspections	-	-	408,000	416,000	424,000	432,000	440,640
Main Replacements - (Reactive) - Maintenance	3,502,318	2,629,243	5,336,797	6,941,127	7,184,715	7,348,454	7,497,927
Service Replacements - Proactive	1,648,997	182,201	1,961,847	2,053,847	2,239,000	2,275,000	2,320,500
Service Replacement (Reactive) - Leaks	5,089,587	1,564,350	5,049,905	5,148,762	5,350,989	5,469,719	5,574,019
Service Replacement (Reactive) - Non-Leaks - Other	6,584,236	1,303,952	5,116,495	5,216,717	5,424,897	5,545,267	5,651,008
Atmospheric Corrosion Inside Inspections	47,251	75,509	100,000	650,000	104,000	106,000	108,000
Restrictions for Elevated Gas Infrastructure	-	-	336,000	373,000	381,000	388,000	396,000
Buried Vent Lines	-	-	108,000	111,000	113,000	115,000	117,000
Plastic Fusion QA/QC Re-Digs	-	-	3,260,000	3,250,200	3,391,704	3,459,538	3,528,728
Plastic Fusion - In Process Inspections	-	-	301,500	307,530	313,680	319,954	326,353
Low Pressure Main Valve Installation	-	-	-	2,460,000	2,723,000	2,956,000	3,196,000
High Density Polyethylene Service	-	-	-	2,458,800	2,520,270	2,583,277	2,647,859
Contractor Safety Inspections	-	-	-	5,370,628	16,363,614	27,786,267	28,182,040
Local Law 30	48,868,605	15,627,928	37,200,000	11,400,000	-	-	-
Inactive Accounts	164,355	65,067	268,924	274,924	287,000	293,000	299,000
Corrosion	901,501	148,015	927,028	1,004,571	994,571	983,769	1,066,059
Pipeline Integrity - IMP	31,133	371,185	-	500,000	1,501,350	-	-
Pipeline Integrity - IMP - Jamaica Bay Line IL	4,575,307	-	-	2,000,000	10,000,000	10,000,000	10,000,000
Pipeline Integrity - IMP - Southern Line Robotic ILI	-	12,461	3,002,700	3,000,000	10,000,000	10,000,000	18,000,000
Pipeline Integrity - IVP	-	10,109	2,238,083	3,224,083	4,700,000	4,000,000	5,000,000
Pipeline Integrity - IVP Reactive Main Replacement	-	-	-	500,000	510,000	520,000	530,604
5.0.0.0.0.1 Launcher - Clove Lakes	1,123,718	24,882	-	-	-	-	-
5.0.0.0.0.2;3;4 Receiver - Clove La	3,598,743	1,016,590	-	-	-	-	-
Valve Installations/Replacements	-	80,000	142,000	142,000	146,000	146,000	149,000
Meter Changes	3,125,823	1,287,147	4,328,998	4,437,998	4,593,000	4,708,000	4,825,000
Purchase Meters (Replacements)	3,678,578	1,640,655	3,662,544	3,736,114	3,826,940	3,903,480	3,981,550
Transmission Station Integrity	-	-	180,000	3,000,000	17,000,000	17,340,000	17,687,000
Complex Capital Delivery Initiative - Saving	-	-	-	(577,500)	(2,663,850)	(1,367,000)	(1,784,350)
Total Mandated	520,790,071	109,702,552	600,611,043	661,030,147	657,801,966	714,313,384	762,245,355
Reliability							
I&R - Reactive	-	-	514,743	524,484	527,241	538,940	549,217
I&R - Training and Test Lab	-	-	-	800,000	1,000,000	-	-
Gas System Control	-	-	114,852	117,182	121,120	123,540	126,010
Gas System Control - Telemetry Upgrade 3G to 4G	117,663	82,427	198,977	-	-	-	-
Gas System Control - M2M Upgrade	-	-	-	-	-	-	-
Gas System Reliability - Gas Control (Training Simulator)	-	-	83,435	475,435	-	-	-
Heater Installation Program	-	40,340	-	500,000	2,500,000	750,000	750,000
Pressure Regulating Facilities	6,355,026	1,527,394	1,400,000	7,050,000	10,100,000	7,175,000	10,450,000
System Automation	715,632	524,371	1,394,307	1,394,307	1,700,000	1,734,000	1,734,000
Bay Ridge Gate Station Refurbishment	612,327	101,243	-	-	-	-	-
Shafer Narrows	722,705	40,354	200,000	-	-	-	-
Bowery Bay Station Upgrade	-	5,000	100,000	500,000	3,500,000	300,000	-
Canarsie Gate Refurbishment	-	-	-	-	-	-	-
Floyd Bennett Field M&R ROV's	742,869	(21,040)	-	-	-	-	-
McGuiness Mini Gate	-	-	-	-	250,000	3,500,000	250,000
Kings Plaza Mini Gate	-	-	-	-	250,000	3,500,000	500,000
Bush Terminal (IF-09)	-	-	-	-	-	250,000	3,600,000
Tetco Relief Valve Replacement	351,636	70,540	6,400,000	-	-	-	-
Citizens Gate - Bulkhead	179,100	203,560	7,060,000	3,100,000	-	-	-

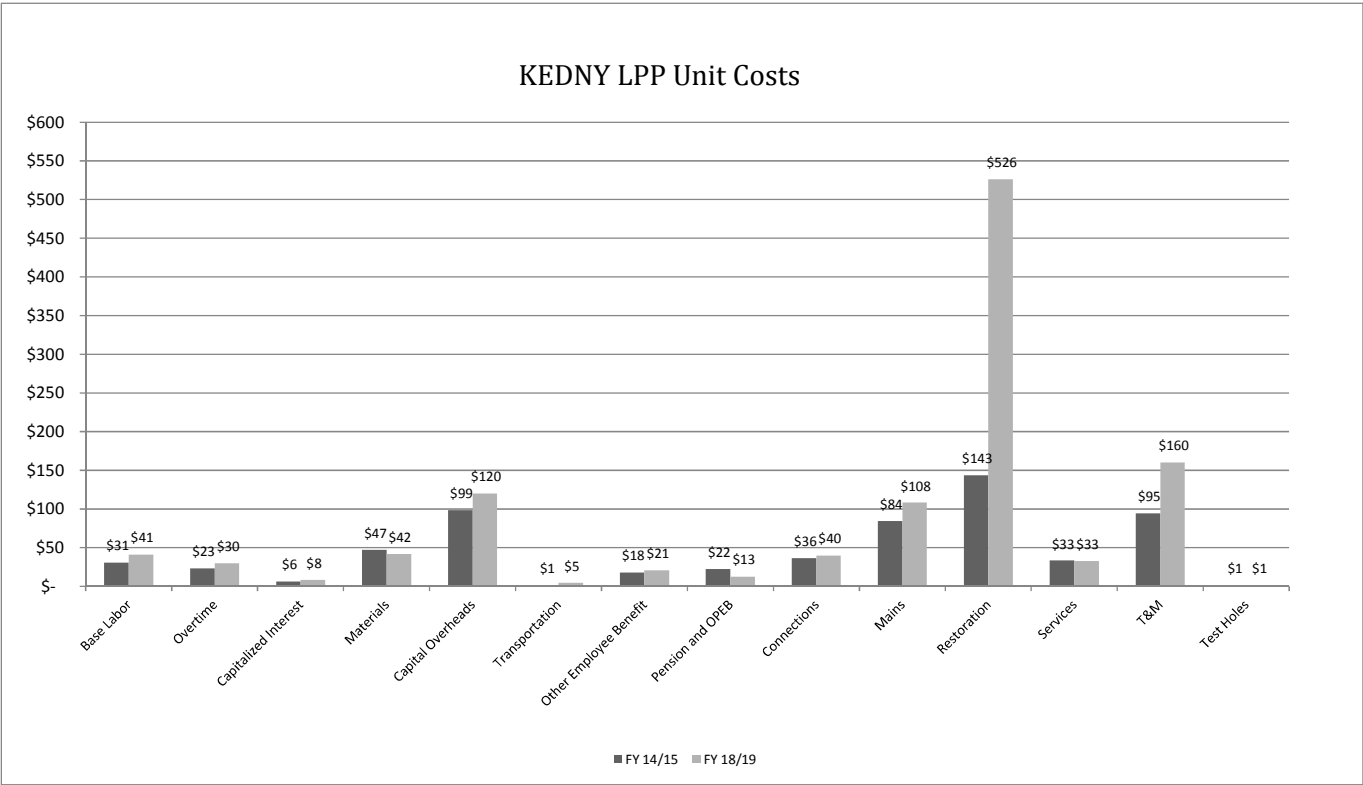
The Brooklyn Union Gas Company d/b/a National Grid NY
Direct Capital Expenditures (CAPEX and COR)

	CY18 Historic Test Year	FY19 Jan-Mar	FY20	FY21	FY22	FY23	FY24
Sheepshead Bay Mini Gate	-	-	-	-	-	200,000	3,600,000
PRE-Fresh Kills Methane Recovery	29,861	-	-	-	-	-	-
GOV 110	-	-	149	-	150,000	3,200,000	-
Hyman station	-	-	-	300,000	3,500,000	250,000	-
Varick Reg Station Retirement	424,596	684,681	1,624,000	-	-	-	-
North Brooklyn Mini Gate	184,784	40,609	2,100,000	3,800,000	300,000	-	-
PRE-Coney Island Heater + Mini Gate	280,443	-	-	-	-	-	-
Jamaica Gate	-	-	-	-	-	-	250,000
Kennedy Gate	-	-	-	-	-	-	250,000
Distribution Station Over Pressure Protection	-	-	922,000	928,000	263,000	269,000	276,000
PRE-SP-Maspeth St Decommissioning..	2,011,020	861	-	-	-	-	-
Gas System Reliability - Gas Planning /RCV Program	155,121	493,327	1,662,000	5,132,000	2,547,000	8,327,000	6,597,000
Water Intrusion	-	19,389	217,921	222,142	228,476	233,545	237,999
Storm Hardening - Remote Service Shutoff Valves	1,260,476	494,480	3,136,000	7,368,000	8,497,000	7,921,000	7,995,000
LTNY10240 - Grasmere Reliability - PM	-	8,333	49,664	100,000	5,142,000	-	-
LTNY11690 - LGA Backfeed - PM	-	-	-	50,000	328,000	8,654,000	-
LTNY12314 - Spring Creek - PM	12,560,266	1,039,888	4,070,467	213,467	-	-	-
LTNY10205 - MRI - PM - Main Phase 1-4	64,577,364	20,577,536	63,940,732	100,000,000	-	-	-
LTNY10205 - MRI - PM - Main Phase 5	-	-	-	-	25,600,000	-	-
LTNY12058 - Elmhurst Reliability - PM	-	-	-	-	-	1,000,000	35,000,000
LTNY13231 - Marine Park Regulator Station - PM	23,287	40,000	99,327	999,327	22,769,000	-	-
LTNY11165 - Northern Queens Gas T&D - PM	809,411	136,125	513,312	13,312	-	-	-
LTNYXXXXXX - Northern Line - PM	-	-	-	-	-	-	500,000
LTNYXXXXXX - Northern Queens Extension - PM	-	-	-	-	-	-	100,000
Citizens Tunnel - Upgrade	1,881,802	345,818	1,071,545	21,545	-	-	-
Newtown Creek	7,097,060	3,929,197	9,098,782	58,782	-	-	-
CNG - KEDNY Blanket	-	-	497,806	497,806	500,000	500,000	500,000
CNG - KEDNY Contract Closeout	-	-	-	400,000	-	-	-
CNG - NY KEDNY - New Mobile Compressor and Storage systems	-	-	-	-	-	-	-
CNG - NY Brooklyn (Canarsie) - Compressor Upgrade, New Controls	-	-	-	50,000	2,200,000	500,000	-
CNG - NY Brooklyn (Greenpoint) - Fueling Island Access	226	5,389	-	1,200,000	946,000	-	-
CNG - NY Brooklyn (Greenpoint) - New Compressors, Panels, and Controls	324	5,392	1,088,000	996,643	-	-	-
LNG - Blanket	-	470,362	2,599,086	2,648,113	2,653,763	2,712,646	2,764,373
LNG - Greenpoint LNG	3,371,330	-	-	-	-	-	-
LNG - Vaporizers 7 & 8 Replacement	-	-	600,000	10,200,000	10,127,000	3,000,000	-
LNG - Barge Piping Decommissioning	-	-	-	-	-	-	-
LNG - Ice Shield	1,736,107	28,315	-	-	-	-	-
LNG - Bulkhead Upgrade	-	-	-	700,000	-	700,000	-
LNG - Controls System Upgrade	-	-	19,865	769,865	978,000	1,712,000	-
LNG - Vaporizers 3 & 4 Replacement	3,801,499	4,316,753	21,183,000	2,000,000	-	-	-
LNG - Relocate Maintenance Area & New Control Building	-	149,174	-	1,406,000	6,000,000	3,000,000	1,250,000
LNG - Truck Load/Unload Station	329,614	31,840	1,865,000	2,100,000	12,265,000	510,000	-
LNG - Salt Water Pump House Upgrade	193,053	37,407	2,418,000	35,081,000	15,308,000	-	-
LNG - Geoweb Dike Replacement	827,726	1,403,315	1,800,000	-	-	-	-
LNG - Tank 2 Upgrade	-	-	-	-	100,000	1,500,000	1,500,000
LNG - Solar Panels	-	-	-	-	100,000	1,000,000	-
LNG - Liquefaction Critical Spares	-	-	49,664	949,664	-	-	-
LNG - Sub M-Sub L Interconnect	-	-	-	-	100,000	1,000,000	-
LNG - Instrument Air System Replacement	-	-	-	-	-	100,000	3,000,000
LNG - Stormwater Drainage	-	-	-	-	-	10,000	3,000,000
LNG - Hydrant & Deluge Piping Upgrade	216,178	97,757	1,800,000	4,700,000	1,500,000	-	-
LNG - Tank 1 Upgrade	-	-	-	-	50,000	1,500,000	500,000
LNG - Tank 1 Painting	173,960	-	-	-	-	-	-
LNG - Generators Upgrade	-	-	-	-	-	-	-
LNG - Hi Ex Foam System	-	-	49,664	892,664	2,349,000	500,000	-
LNG - Security System Upgrades	-	-	-	-	-	100,000	2,000,000
LNG - Nitrogen System Refurbishment	-	-	-	-	-	10,000	5,000,000
LNG - Tail Gas Compressor Upgrade	102,842	62,712	669,000	100,000	5,331,000	-	-
LNG - RNG Blanket	-	-	-	200,000	200,000	200,000	200,000
LNG - Piping Insulation Replacement & Inspector	-	-	-	499,664	500,000	500,000	500,000
LNG - Boiloff Heaters/Steam Boiler Upgrade	-	-	9,933	499,933	3,000,000	3,000,000	-
LNG - Plant Outlet Drip Leg	-	-	-	10,000	500,000	-	-
LNG - Vaporizers 9 & 10 Replacement	-	-	-	-	-	-	-
LNG - ReGen Heater Replacements	-	-	-	-	-	-	-
Renewable Natural Gas (RNG) Interconnections	-	-	-	900,000	900,000	900,000	900,000
Total Reliability	111,994,482	36,844,003	140,621,229	200,469,332	154,880,600	70,880,671	93,879,598
Non-Infrastructure							
Telecomm - Radio Capital Expenditures	41,315	83,895	44,226	45,176	49,420	50,410	51,420
Telecomm - Comm site upgrades	-	-	44,089	45,039	49,420	50,410	51,420
Telecomm - Damaged Failure	-	9,640	11,602	11,852	13,010	13,270	13,530
Tools & Equipment - All	4,529,878	1,627,882	3,566,122	3,639,064	3,948,226	4,035,831	4,112,789
Special project	79,776	14,558	-	-	-	-	-
Learning and Development - Materials, Tools and Equipment	-	-	-	375,000	250,000	187,500	187,500
AMR Installation	8,775,626	1,800,711	2,934,873	2,334,873	-	-	-
Meter Testing Equipment	58,393	89,244	103,441	105,441	106,000	108,000	110,000
Automatic Meter Reading (AMR) - Replacement	4,479,985	1,201,827	3,315,998	3,385,738	3,628,460	3,701,250	3,775,270
Total Non-Infrastructure	17,964,973	4,827,757	10,020,351	9,942,183	8,044,536	8,146,671	8,301,929
Total Capital Including Cost of Removal	792,578,809	187,942,261	849,153,036	952,053,257	934,989,837	931,811,850	1,008,451,315
Cost of Removal	76,856,733	16,209,148	84,830,388	95,110,120	93,405,485	93,088,004	100,744,286
Total Capital (Net of Removal)	715,722,076	171,733,113	764,322,648	856,943,136	841,584,352	838,723,846	907,707,029

Testimony of the Gas Infrastructure and Operations Panel

Exhibit __ (GIOP-2)

Charts Demonstrating Components of Unit Cost Increases



Testimony of the Gas Infrastructure and Operations Panel

Exhibit __ (GIOP-3)

**Gas Safety and Reliability Surcharge
Including Unit Cost Incentive Proposals**

The Brooklyn Union Gas Company d/b/a National Grid NY
Gas Safety and Reliability Surcharge
Example of All Components of Gas Safety and Reliability Surcharge (GSRS)
(000)

	Page Reference	Rate Year FY 2021	Data Year FY 2022	Data Year FY 2023	Data Year FY 2024
Recovery of Incremental LPP Proactive Replacement Costs	Page 2-4	\$674	\$742	\$1,463	\$1,496
Positive Revenue Adjustment - LPP Removal Incentive	Page 6	\$660	\$1,320	\$2,641	\$3,301
Positive Revenue Adjustment - LPP Productivity Incentive	Page 7	\$0	\$0	\$660	\$1,320
Recovery of Incremental Leak Repair Costs	Page 8	\$1,301	\$0	\$497	\$511
Positive Revenue Adjustment - Leak Repair Incentive	Page 8	\$1,650	\$0	\$330	\$660
Positive Revenue Adj - Customer Connections-Install Mains Productivity Incentive	Page 9	\$660	\$1,320	\$0	\$0
Positive Revenue Adj - Customer Connections-Install Services Productivity Incentive	Page 10	\$660	\$0	\$660	\$1,320
Total Gas and Safety Surcharge		<u>\$5,606</u>	<u>\$3,383</u>	<u>\$6,251</u>	<u>\$8,609</u>

Please note, Gas Safety Metrics are measured on an annual CY basis, but are being reflected in FY with the summary of all GSRS components as follows:
CY2020/FY2021; CY2021/FY2022; CY2022/FY2023; CY2023/FY2024

[illegible]

[illegible]

The Brooklyn Union Gas Company d/b/a National Grid NY
Gas Safety and Reliability Surcharge (GSRS)
Example of Recovery of Incremental Leak Prone Pipe (LPP) Proactive Repair
(000)

FY 2024	RATE ALLOWANCE-----										EXAMPLE FOR ILLUSTRATIVE PURPOSES-----										
	Rate Allowance - 56 Miles Proactive Replacement at \$1,436 Average Unit Cost					Example-3 Incremental Miles at \$1,435 Avg Unit Cost & D&R's at \$3,200 Avg Unit Cost					Maximum										
	Capital Expend.					Capital Expend.					Amount Subject to Surcharge (Note 4)										
	To Plant	Plant	Balance	Depreciation Expense 1.75% (Note 2)	Accumulated Depreciation Reserve Balance	Net Utility Plant (c)	Pre - Tax WACC 9.09% (Note 3)	Opex (g)	Total Revenue Requirement (h)	(c)+(d)+(g)	To Plant	Plant	Balance	Depreciation Expense 1.75% (Note 2)	Accumulated Depreciation Reserve Balance	Net Utility Plant (m)	Pre - Tax WACC 9.09% (Note 3)	Opex (o)	Total Revenue Requirement (p)	(k)+(n)+(o)	
Mar-2023	30,859	30,859	0	0	0	30,859	233	0	0	0	619	619	0	0	0	0	619	5	0	0	0
Apr-2023	28,257	59,116	45	-45	59,071	446	0	295,680	6,166	295,680	567	1,185	9	1	-1	1,185	9	330	2.1%	330	
May-2023	34,644	93,760	86	-131	93,629	708	0	33,171	6,166	33,171	695	1,881	2	2	-3	1,879	14	2,200	ok, under cap	2,200	
Jun-2023	25,625	119,385	137	-268	119,117	900	0	\$1,464	2%	\$1,464	514	2,395	3	3	-5	2,390	18	2%	Cap on Unit Cost	2%	
Jul-2023	43,019	162,404	174	-442	161,962	1,224	0				863	3,259	5	5	-9	3,250	25				
Aug-2023	35,190	197,594	237	-679	196,915	1,488	0				706	3,965	30	3	-14	3,951	30				
Sep-2023	57,087	254,681	288	-967	253,714	1,918	0				1,145	5,110	6	6	-19	5,091	38				
Oct-2023	30,792	285,473	371	-1,338	284,134	2,148	0				618	5,728	7	7	-27	5,701	43				
Nov-2023	38,627	324,100	416	-1,755	322,345	2,436	0				775	6,503	8	8	-35	6,468	49				
Dec-2023	24,762	348,861	473	-2,227	346,634	2,620	0				497	7,000	9	9	-45	6,955	53				
Jan-2024	31,797	380,658	509	-2,736	377,922	2,856	0				638	7,638	10	10	-55	7,583	57				
Feb-2024	43,820	424,479	555	-3,291	421,187	1,592	0				879	8,517	11	11	-66	8,451	32				
Mar-2024	\$424,479		\$3,291		204,741	\$18,570	\$19,549	\$41,411			\$22,018		\$66			4,088	\$373	\$1,057	\$1,496	\$1,496	
Miles	56		56								3										
Feet	295,680		295,680								15,840										
D&R's (forecast assumes 2.1% per foot)	\$1,436		\$1,436								\$1,390	ok, under cap				Incremental D&R's					
Unit Cost per Foot	\$1,464		\$1,464								\$1,464	2% Cap on Unit Cost				Actual D&R cost					
2% Cap on Unit Cost																2% Cap on Unit Cost					

Notes and Assumptions:

- 1) For this calculation the LPP Proactive Replacement capital expenditures include an allocation of Plastic Fusion QA QC Re-Digs, Plastic Fusion - In Process Inspections, Low Pressure Main Valve Installation, HDPE and Contractor Safety Inspections and other assumptions.
- 2) For this calculation the LPP Proactive Replacement capital expenditures include an allocation of Plastic Fusion QA QC Re-Digs, Plastic Fusion - In Process Inspections, Low Pressure Main Valve Installation, HDPE and Contractor Safety Inspections and other assumptions.
- 3) Revenue requirement assumes capital expenditures are placed in-service in the month spent.
- 4) Depreciation is based on the existing composite depreciation rate for mains and services based on 12/31/2018 plant balances.
- 5) Utilizes pre-tax WACC by calendar year with a ROE of 9.65%.
- 6) The amount subject to surcharge is limited to the Company's average costs of main replacement and for D&R's allowed in rate allowance, subject to a 2% cap
- 7) The FY 2021 incremental mileage spend will be rolled forward to the FY 2022 - FY 2024 surcharges, calculating a return on the net plant investment and associated depreciation expense.
- 8) The FY 2022 incremental mileage spend will be rolled forward to the FY 2023 - FY 2024 surcharge, calculating a return on the net plant investment and associated depreciation expense.
- 9) The FY 2023 incremental mileage spend will be rolled forward to the FY 2024 surcharge, calculating a return on the net plant investment and associated depreciation expense.

The Brooklyn Union Gas Company d/b/a National Grid NY
Gas Safety and Reliability Surcharge
D&R Cost of Incremental LPP Proactive Mileage in Rate Allowance

	CY18	FY21	FY22	FY23	FY24
LPP Proactive Miles		37	44	49	56
LPP Proactive Feet		195,360	232,320	258,720	295,680
Ratio of D&R to LPP Proactive Feet		2.1%	2.1%	2.1%	2.1%
Total D&R's		4,074	4,844	5,395	6,166
Unit Cost		\$2,988	\$3,048	\$3,109	\$3,171
Total Cost of LPP Proactive D&R's		\$12,171,606	\$14,763,829	\$16,770,368	\$19,549,457

The Brooklyn Union Gas Company d/b/a National Grid NY
Gas Safety and Reliability Surcharge
Example of for Leak Prone Pipe (LPP) Removal Incentive Positive Revenue Adjustment (PRA)

	<u>CY 2020</u>	<u>CY 2021</u>	<u>CY 2022</u>	<u>CY 2023</u>	
Total LPP Removal Target - Miles	70	75	80	85	
Example of Miles Removed	71	77	84	96	
Incentive Threshold - Miles	70	75	80	85	
Miles Eligible for Incentive	1	2	4	11	
Basis Point Allowed - 10 Maximurr	2	2	4	8	10
Estimate of Basis Point PRA	<u>\$330,090</u>	<u>\$660,180</u>	<u>\$1,320,360</u>	<u>\$2,640,720</u>	<u>\$3,300,900</u>

Please note, Gas Safety Metrics are measured on an annual CY basis, but are being reflected in FY with the summary of all GSRS components as follow
CY2020/FY2021; CY2021/FY2022; CY2022/FY2023; CY2023/FY2024

The Brooklyn Union Gas Company d/b/a National Grid NY
Gas Safety and Reliability Surcharge
Example of Proactive Leak Pipe (LPP) Productivity Incentive Positive Revenue Adjustment (PRA)
Using a 1.5% Savings Tier

INCENTIVE THRESHOLDS

Base	FY 2021 Proactive Main Replacement Unit Cost Incentive Mechanism					
	Tier 1	Tier 2	Tier 3	Tier 4	Tier 5	Tier 6
Unit Cost	\$ 1,304	<= \$1,285 > \$1,285	<= \$1,265 > \$1,265	<= \$1,246 > \$1,246	<= \$1,226 > \$1,226	<= \$1,207 > \$1,207
Savings From Base	0.00%	>= 1.50%	< 3.00%	< 4.50%	< 6.00%	>= 7.50%
Positive Incentive Pre-Tax Basis Point (BP)	0	2	4	6	8	10
Estimate of one BP	\$ 330,090	\$660,180	\$1,320,360	\$1,980,540	\$2,640,720	\$ 3,300,900

Base	FY 2022 Proactive Main Replacement Unit Cost Incentive Mechanism					
	Tier 1	Tier 2	Tier 3	Tier 4	Tier 5	Tier 6
Unit Cost	\$ 1,354	<= \$1,334 > \$1,334	<= \$1,313 > \$1,293	<= \$1,293 > \$1,273	<= \$1,273 > \$1,253	<= \$1,253 > \$1,233
Savings From Base	0.00%	>= 1.50%	< 3.00%	< 4.50%	< 6.00%	>= 7.50%
Positive Incentive Pre-Tax Basis Point (BP)	0	2	4	6	8	10
Estimate of one BP	\$ 330,090	\$660,180	\$1,320,360	\$1,980,540	\$2,640,720	\$ 3,300,900

Base	FY 2023 Proactive Main Replacement Unit Cost Incentive Mechanism					
	Tier 1	Tier 2	Tier 3	Tier 4	Tier 5	Tier 6
Unit Cost	\$ 1,404	<= \$1,383 > \$1,383	<= \$1,361 > \$1,340	<= \$1,340 > \$1,319	<= \$1,319 > \$1,298	<= \$1,298 > \$1,277
Savings From Base	0.00%	>= 1.50%	< 3.00%	< 4.50%	< 6.00%	>= 7.50%
Positive Incentive Pre-Tax Basis Point (BP)	0	2	4	6	8	10
Estimate of one BP	\$ 330,090	\$660,180	\$1,320,360	\$1,980,540	\$2,640,720	\$ 3,300,900

Base	FY 2024 Proactive Main Replacement Unit Cost Incentive Mechanism					
	Tier 1	Tier 2	Tier 3	Tier 4	Tier 5	Tier 6
Unit Cost	\$ 1,436	<= \$1,414 > \$1,414	<= \$1,393 > \$1,371	<= \$1,371 > \$1,349	<= \$1,349 > \$1,328	<= \$1,328 > \$1,307
Savings From Base	0.00%	>= 1.50%	< 3.00%	< 4.50%	< 6.00%	>= 7.50%
Positive Incentive Pre-Tax Basis Point (BP)	0	2	4	6	8	10
Estimate of one BP	\$ 330,090	\$660,180	\$1,320,360	\$1,980,540	\$2,640,720	\$ 3,300,900

EXAMPLE FOR ILLUSTRATIVE PURPOSES:

Unit Cost	FY 2021	FY 2022	FY 2023	FY 2024
Savings From Base	\$ 1,335	\$ 1,380	\$ 1,380	\$ 1,390
Positive Incentive Basis Point (BP)	-2.35%	-1.91%	1.68%	3.18%
Estimate of Basis Point PRA	0	0	2	4
			\$660,180	\$1,320,360

The Brooklyn Union Gas Company d/b/a National Grid NY
Gas Safety and Reliability Surcharge
Recovery of Incremental Leak Repair Costs and Leak Repair Incentive Positive Revenue Adjustment (PRA)

Example of Incremental Leak Repairs Above Rate Plan

HTY	CY 2020	CY 2021	CY 2022	CY 2023
Total Leak Backlog Target	3,100	2,950	2,800	2,650
Less: Leak Reduction Adjustment	0	250	0	50
Adjusted Leak Backlog Target	3,100	2,700	2,800	2,600
Leak Backlog - Example	2,800	2,725	2,500	2,500
Leaks Incremental to Backlog Target	300	-25	300	100
Actual Highest Emitting Type 3 Leak Repairs - Example	270	130	99	200
Min of Incremental or Highest Emitting Type 3 Leak Repairs	270	0	99	100

Recovery of Incremental Leak Repair Costs:

Min of Incremental or Highest Emitting Type 3 Leak Repairs		270	0	99	100
Average Per Unit Repair Cost Rate Allowance	\$4,596	\$4,820	\$4,918	\$5,016	\$5,112
Total Incremental Cost Subject to Recovery		<u>\$1,301,353</u>	<u>\$0</u>	<u>\$496,562</u>	<u>\$511,231</u>

Leak Repair Incentive PRA:

Min of Incremental or Highest Emitting Type 3 Leak Repairs	270	0	99	100	
Basis Point (BP) Limited to One BP for each 50 Leaks Repaired (Maximum of Five BP per Year)	5	0	1	2	
Estimate of Basis Point PRA	\$ 330,090	<u>\$1,650,450</u>	<u>\$0</u>	<u>\$330,090</u>	<u>\$660,180</u>

Leak Reduction Adjustment:

High Emitting Type 3 Leaks Repaired

0 - 49
50 - 99
100 - 149
150 - 199
200 - 249
≥ 250

Total Leak Reduction Adj. Factors	
0	0
50	50
100	100
150	150
200	200
250	250

Notes and Assumptions for Leak Repair Cost Recovery:

- 1) The Leak Repair incentive is dependent on meeting the annual backlog reduction targets.
- 2) The Average Per Unit Repair Cost Rate Allowance is used in calculating the recovery, regardless of the actual average unit repair cost.

Notes and Assumptions for Leak Repair Incentive:

- 1) The Leak Repair incentive is dependent on the meeting the annual backlog reduction targets.
- 2) The incremental leaks must be from the list of highest emitting Type 3 leaks
- 3) The Company can accrue a positive revenue adjustment of one basis point for each 50 Incremental Leaks Subject to Recovery up to a maximum of 5 Basis Points per year.

Please note, Gas Safety Metrics are measured on an annual CY basis, but are being reflected in FY with the summary of all GSRS components as follows:

The Brooklyn Union Gas Company d/b/a National Grid NY
Gas Safety and Reliability Surcharge
Example of Customer Connections - Install Mains Productivity Incentive Positive Revenue Adjustment (PRA)
Using a 1.5% Savings Tier

INCENTIVE THRESHOLDS

Base	FY 2021 Customer Connection - Install Mains Unit Cost Incentive Mechanism					
	Tier 1	Tier 2	Tier 3	Tier 4	Tier 5	Tier 6
Unit Cost	\$ 481	<= \$474	<= \$466	<= \$459	<= \$452	<= \$445
Savings From Base	> 1.50%	> 3.00%	> 4.50%	> 6.00%	> 7.50%	> 9.00%
Positive Incentive Pre-Tax Basis Point (BP)	0	2	4	6	8	10
Estimate of one BP		\$660,180	\$1,320,360	\$1,980,540	\$2,640,720	\$3,300,900

Base	FY 2022 Customer Connection - Install Mains Unit Cost Incentive Mechanism					
	Tier 1	Tier 2	Tier 3	Tier 4	Tier 5	Tier 6
Unit Cost	\$ 499	<= \$491	<= \$484	<= \$476	<= \$469	<= \$461
Savings From Base	> 1.50%	> 3.00%	> 4.50%	> 6.00%	> 7.50%	> 9.00%
Positive Incentive Pre-Tax Basis Point (BP)	0	2	4	6	8	10
Estimate of one BP		\$660,180	\$1,320,360	\$1,980,540	\$2,640,720	\$3,300,900

Base	FY 2023 Customer Connection - Install Mains Unit Cost Incentive Mechanism					
	Tier 1	Tier 2	Tier 3	Tier 4	Tier 5	Tier 6
Unit Cost	\$ 523	<= \$515	<= \$507	<= \$499	<= \$491	<= \$484
Savings From Base	> 1.50%	> 3.00%	> 4.50%	> 6.00%	> 7.50%	> 9.00%
Positive Incentive Pre-Tax Basis Point (BP)	0	2	4	6	8	10
Estimate of one BP		\$660,180	\$1,320,360	\$1,980,540	\$2,640,720	\$3,300,900

Base	FY 2024 Customer Connection - Install Mains Unit Cost Incentive Mechanism					
	Tier 1	Tier 2	Tier 3	Tier 4	Tier 5	Tier 6
Unit Cost	\$ 531	<= \$523	<= \$515	<= \$507	<= \$499	<= \$491
Savings From Base	> 1.50%	> 3.00%	> 4.50%	> 6.00%	> 7.50%	> 9.00%
Positive Incentive Pre-Tax Basis Point (BP)	0	2	4	6	8	10
Estimate of one BP		\$660,180	\$1,320,360	\$1,980,540	\$2,640,720	\$3,300,900

EXAMPLE FOR ILLUSTRATIVE PURPOSES:

	FY 2021	FY 2022	FY 2023	FY 2024
Unit Cost	\$ 470	\$ 480	\$ 520	\$ 525
Savings From Base	2.24%	3.74%	0.53%	1.11%
Positive Incentive Basis Point (BP)	2	4	0	0
Estimate of Basis Point PRA	\$660,180	\$1,320,360	\$0	\$0

The Brooklyn Union Gas Company d/b/a National Grid NY
Gas Safety and Reliability Surcharge
Example of Customer Connections - Install Services Productivity Incentive Positive Revenue Adjustment (PRA)
Using a 1.5% Savings Tier

INCENTIVE THRESHOLDS

	Base	FY 2021 Customer Connection - Install Services Unit Cost Incentive Mechanism					
		Tier 1	Tier 2	Tier 3	Tier 4	Tier 5	Tier 6
Unit Cost		\$ 16,349	> \$16,104	<= \$15,859	> \$15,613	<= \$15,368	> \$15,123
Savings From Base		0.00%	< 1.50%	>= 3.00%	< 4.50%	>= 6.00%	< 7.50%
Positive Incentive Pre-Tax Basis Point (BP)		0	2	4	6	8	10
Estimate of one BP	\$ 330,090		\$660,180	\$1,320,360	\$1,980,540	\$2,640,720	\$ 3,300,900

	Base	FY 2022 Customer Connection - Install Services Unit Cost Incentive Mechanism					
		Tier 1	Tier 2	Tier 3	Tier 4	Tier 5	Tier 6
Unit Cost		\$ 16,427	> \$16,180	<= \$15,934	> \$15,688	<= \$15,441	> \$15,195
Savings From Base		0.00%	< 1.50%	>= 3.00%	< 4.50%	>= 6.00%	< 7.50%
Positive Incentive Pre-Tax Basis Point (BP)		0	2	4	6	8	10
Estimate of one BP	\$ 330,090		\$660,180	\$1,320,360	\$1,980,540	\$2,640,720	\$ 3,300,900

	Base	FY 2023 Customer Connection - Install Services Unit Cost Incentive Mechanism					
		Tier 1	Tier 2	Tier 3	Tier 4	Tier 5	Tier 6
Unit Cost		\$ 16,755	> \$16,504	<= \$16,253	> \$16,001	<= \$15,750	> \$15,499
Savings From Base		0.00%	< 1.50%	>= 3.00%	< 4.50%	>= 6.00%	< 7.50%
Positive Incentive Pre-Tax Basis Point (BP)		0	2	4	6	8	10
Estimate of one BP	\$ 330,090		\$660,180	\$1,320,360	\$1,980,540	\$2,640,720	\$ 3,300,900

	Base	FY 2024 Customer Connection - Install Mains Unit Cost Incentive Mechanism					
		Tier 1	Tier 2	Tier 3	Tier 4	Tier 5	Tier 6
Unit Cost		\$ 17,090	> \$16,834	<= \$16,578	> \$16,321	<= \$16,065	> \$15,809
Savings From Base		0.00%	< 1.50%	>= 3.00%	< 4.50%	>= 6.00%	< 7.50%
Positive Incentive Pre-Tax Basis Point (BP)		0	2	4	6	8	10
Estimate of one BP	\$ 330,090		\$660,180	\$1,320,360	\$1,980,540	\$2,640,720	\$ 3,300,900

EXAMPLE FOR ILLUSTRATIVE PURPOSES:

Unit Cost		FY 2021	FY 2022	FY 2023	FY 2024
Savings From Base		\$ 16,000	\$ 16,200	\$ 16,500	\$ 16,500
Positive Incentive Basis Point (BP)		2.13%	1.38%	1.52%	3.45%
Estimate of Basis Point PRA		2	0	2	4
		\$660,180	\$660,180	\$1,320,360	\$1,320,360

Capex Forecast Per GIOP-1 (100% of Capex Forecast) - rounded to 000

Capex Forecast Per GIOP-1 (100% of Capex Forecast)Capital Forecast Allocated to Proactive LPP Program for GRS Unit CostProactive Feet of LPP Program[illegible]Proactive LPP Program Unit Cost per Foot

	FP20	FP21	FP22	FP23	FP24
FP20					
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FP137					

The Brooklyn Union Gas Company d/b/a National Grid NY
Gas Safety and Reliability Surcharge
Customer Connections - Install Main Average Unit Cost

Capex Forecast Per GIOP-1 (100% of Capex Forecast) - rounded to 000

	FY20	FY21	FY22	FY23	FY24
Customer Connections - KEDNY					
Mandated - KEDNY	\$ 21,147	\$ 21,730	\$ 22,539	\$ 22,990	\$ 23,450
Plastic Fusion QA/QC Re-Digs	\$ 3,260	\$ 3,250	\$ 3,392	\$ 3,460	\$ 3,529
Plastic Fusion - In Process Inspections	\$ 302	\$ 308	\$ 314	\$ 320	\$ 326
Mandated - KEDNY					
Contractor Safety Inspections	\$ 5,371	\$ 16,364	\$ 27,786	\$ 28,182	

Capex Forecast Per GIOP-1 (100% of Capex Forecast)

	FY20	FY21	FY22	FY23	FY24
Customer Connections - KEDNY					
Mandated - KEDNY	\$ 21,146,720	\$ 21,729,722	\$ 22,538,940	\$ 22,989,719	\$ 23,449,513
Plastic Fusion QA/QC Re-Digs	\$ 3,260,000	\$ 3,250,200	\$ 3,391,704	\$ 3,459,538	\$ 3,528,728
Plastic Fusion - In Process Inspections	\$ 301,500	\$ 307,530	\$ 313,680	\$ 319,954	\$ 326,353
Mandated - KEDNY					
Contractor Safety Inspections	\$ -	\$ 5,370,628	\$ 16,363,614	\$ 27,786,267	\$ 28,182,040

Capital Forecast Allocated to Customer Connections - Install Main for Unit Cost

	FY20	FY21	FY22	FY23	FY24
Customer Connections - KEDNY					
Mandated - KEDNY	\$ 21,146,720	\$ 21,729,722	\$ 22,538,940	\$ 22,989,719	\$ 23,449,513
Plastic Fusion QA/QC Re-Digs	\$ 231,794	\$ 229,436	\$ 236,055	\$ 230,417	\$ 223,927
Plastic Fusion - In Process Inspections	\$ 21,437	\$ 21,709	\$ 21,831	\$ 21,310	\$ 20,710
Mandated - KEDNY					
Contractor Safety Inspections	\$ -	\$ 379,121	\$ 1,138,872	\$ 1,850,662	\$ 1,788,385
	\$ 21,399,951	\$ 22,359,988	\$ 23,935,698	\$ 25,092,108	\$ 25,482,535

Customer Connections Feet of Install Main

	FY20	FY21	FY22	FY23	FY24
Customer Connections - KEDNY					
Mandated - KEDNY	46,478	46,507	48,000	48,000	48,000
Plastic Fusion QA/QC Re-Digs	46,478	46,507	48,000	48,000	48,000
Plastic Fusion - In Process Inspections	46,478	46,507	48,000	48,000	48,000
Mandated - KEDNY					
Contractor Safety Inspections	46,478	46,507	48,000	48,000	48,000
	46,478	46,507	48,000	48,000	48,000

Customer Connect-Install Main Unit Cost per Foot

	FY20	FY21	FY22	FY23	FY24
Customer Connections - KEDNY					
Mandated - KEDNY	\$ 455	\$ 467	\$ 470	\$ 479	\$ 489
Plastic Fusion QA/QC Re-Digs	\$ 5	\$ 5	\$ 5	\$ 5	\$ 5
Plastic Fusion - In Process Inspections	\$ 0	\$ 0	\$ 0	\$ 0	\$ 0
Mandated - KEDNY					
Contractor Safety Inspections	\$ -	\$ 8	\$ 24	\$ 39	\$ 37
Weighted Unit Per Foot	\$ 460	\$ 481	\$ 499	\$ 523	\$ 531

The Brooklyn Union Gas Company d/b/a National Grid NY
Gas Safety and Reliability Surcharge
Customer Connections - Install Services Average Unit Cost

Customer Connections - KEDNY	Capex Forecast Per GIOP-1 (100% of Capex Forecast) - rounded to 000				
	FY20	FY21	FY22	FY23	FY24
Customer Connections - Install Services	\$ 24,785	\$ 25,488	\$ 27,926	\$ 28,484	\$ 29,054

Capex Forecast Per GIOP-1 (100% of Capex Forecast)					
	FY20	FY21	FY22	FY23	FY24
Customer Connections - KEDNY					
Customer Connections - Install Services	\$ 24,785,380	\$ 25,488,092	\$ 27,925,611	\$ 28,484,123	\$ 29,053,806

Customer Connections Number of Services					
FY20	FY21	FY22	FY23	FY24	
1,558	1,559	1,700	1,700	1,700	

Customer Connect - Install Services Unit Cost per Service					
FY20	FY21	FY22	FY23	FY24	
\$ 15,908	\$ 16,349	\$ 16,427	\$ 16,755	\$ 17,090	

The Brooklyn Union Gas Company d/b/a National Grid NY
Gas Safety and Reliability Surcharge
Main Replacement Footage

Program	KIDNY - ALL MAIN					
	FY20 - Proposed	FY21 - Proposed	FY22 - Proposed	FY23 - Proposed	FY24 - Proposed	
Customer Connections	46,478	46,507	48,000	48,000	48,000	6.35%
Main Replacement Proactive - LPP	190,925	220,757	262,522	292,353	334,117	44.17%
Public Works (CSC)	350,000	350,000	350,000	350,000	350,000	46.27%
Gas System Reinforcement	30,000	13,345	3,500	4,500	1,265	0.16%
Gas Main Replacement	1,000	0	0	0	0	0.00%
Reactive - Leak	200	200	200	200	200	0.03%
Reactive - Non-Leak	2,222	2,190	700	700	700	0.09%
Water Ingression	1,000	1,000	1,000	1,000	1,000	0.13%
CISBOT	6,824	10,560	10,560	10,560	10,560	1.40%
Lining	18,047	10,560	10,560	10,560	10,560	1.40%
Total Footage	653,676	658,819	689,677	720,683	756,402	100.00%

Program	KIDNY - MAIN EXCLUDING CUSTOMER CONNECTIONS					
	FY20 - Proposed	FY21 - Proposed	FY22 - Proposed	FY23 - Proposed	FY24 - Proposed	
Customer Connections	190,925	220,757	262,522	292,353	334,117	47.16%
Main Replacement Proactive - LPP	350,000	349,997	350,000	350,000	350,000	49.41%
Public Works (CSC)	350,000	350,000	350,000	350,000	350,000	52.03%
Gas System Reinforcement	30,000	13,345	3,500	4,500	1,265	0.16%
Gas Main Replacement	1,000	0	0	0	0	0.00%
Reactive - Leak	200	200	200	200	200	0.03%
Reactive - Non-Leak	2,222	2,190	700	700	700	0.10%
Water Ingression	1,000	1,000	1,000	1,000	1,000	0.14%
CISBOT	6,824	10,560	10,560	10,560	10,560	1.49%
Lining	18,047	10,560	10,560	10,560	10,560	1.49%
Total Footage	607,198	612,309	641,677	672,683	708,402	100.00%

The Brooklyn Union Gas Company d/b/a National Grid NY
Gas Safety and Reliability Surcharge
D&R Unit Cost for Total Mains and Proactive LPP Mains

Proactive LPP Mains	KEDNY	FY20	FY21	FY22	FY23	FY24
Estimated Main Footage		159,928	195,360	232,320	258,720	295,680
D&R Ratio		2.1%	2.1%	2.1%	2.1%	2.1%
Total D&R Units		3,335	4,074	4,844	5,395	6,166
Unit Cost		\$ 2,929	\$ 2,988	\$ 3,048	\$ 3,109	\$ 3,171
Total Cost of all D&R's		\$ 9,768,711	\$ 12,171,606	\$ 14,763,829	\$ 16,770,368	\$ 19,549,457

D&R Ratio based on 2 yr. avg
for Proactive LPP Mains

	FY17	FY18	FY17/FY18
Footage	110,765	156,732	133,749
D&R	2,905	2,673	2,789
			2.1%

The Brooklyn Union Gas Company d/b/a National Grid NY
Gas Safety and Reliability Surcharge
Service Units

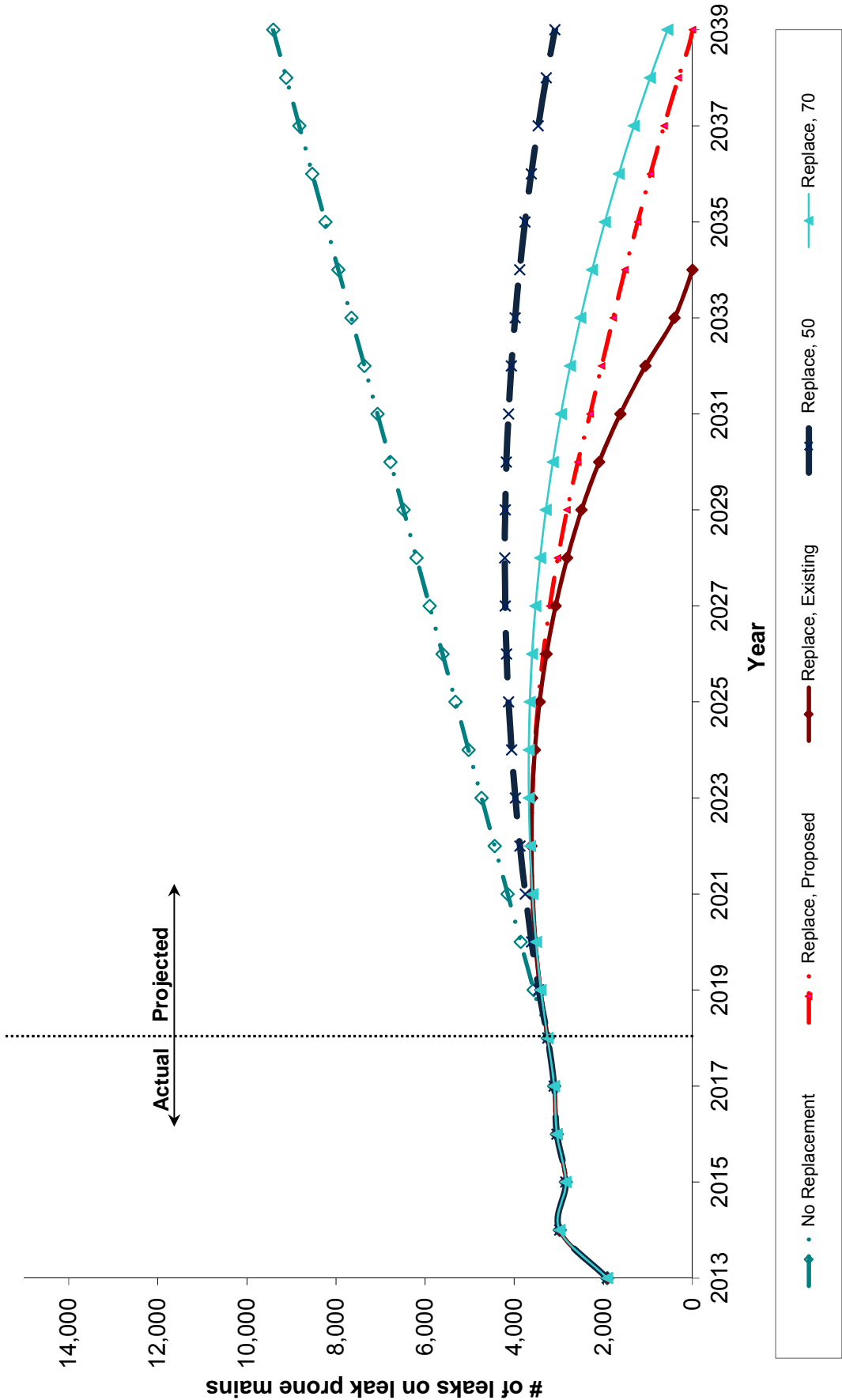
KEDNY - Service Units					
Program	FY20	FY21	FY22	FY23	FY24
Customer Connections	1,558	1,559	1,700	1,700	1,700
Main Replacement Proactive - LPP	6,372	7,106	8,134	8,868	9,886
Public Works (CSC)	8,306	8,065	8,161	8,113	8,451
Gas System Reinforcement	835	709	295	326	1
Gas Reliability	30	27	34	46	20
Reactive - Leak	700	700	700	700	700
Reactive - Non-Leak	1,400	1,400	1,400	1,400	1,400
Water Intrusion	60	60	60	60	60
Service Replacement - Proactive	250	250	250	250	250
Local Law 30	4,206	2,745	-	-	-
Total Services	23,717	22,621	20,734	21,462	22,468

Testimony of the Gas Infrastructure and Operations Panel

Exhibit __ (GIOP-4)

**Chart Summarizing Projected Leak Rates
for LPP for Various Main Replacement Strategies**

KEDNY - Projection based on 2013 - 2018 Actual Data



Testimony of the Gas Infrastructure and Operations Panel

Exhibit __ (GIOP-5)

Data Sheets for Significant Capital Programs

Program Title: Customer Gas Connections Capital Plan - KEDNY

Spending Rationale: ☐ Mandated ☒ Customer Connections

☐ Reliability ☐ Non-Infrastructure

Brief Description:

KEDNYS's Customer Connections program involves converting customers from oil to natural gas or high efficiency electric heating options. The program involves the installation of new main, services and meters that the Company is required to install pursuant to its tariff to serve projected customer gas requests in New York City. This program will also include education to help customers make informed decisions about all heating options available including geothermal, high efficiency heat pumps and natural gas.

This program provides significant customer and societal benefits. Implementation of this plan will result in \$52.30 million is annual customer energy savings, 184,990 tons of CO2 reduced and 36.20 million gallons of oil displaced.

Program Justification:

Conversions. The forecast shows steady demand in the multifamily and commercial conversion markets. Residential conversions are forecasted to decrease due to high saturation.

New Construction. Moody's is forecasting an increase in activity in the residential new construction market and the commercial new construction market. The multi-family market is forecasted to remain steady.

Clean Choice. The Clean Choice program provides alternatives to customers who want a cleaner fuel alternative to oil. The Company will develop a fuel switching calculator which will be web-based to help customers make informed decisions about their energy options.

Interruptible-Firm Rate Changes. The completion of the Northern Queens and Brooklyn Navy yard projects have allowed customers who previously could not be served due to capacity constraints to connect to natural gas.

The company will develop a benefit cost analysis to help customers make informed decisions, including providing information about all heating options available to help customers optimize their energy consumption.

The forecast considers the implications of (a) changes in the various market segments; (b) large project inventories; (c) rate/regulatory changes; and (d) system constraint. The forecast also considers factors that drive demand projections and the associated capital expenditures:

- Fuel Pricing – oil versus natural gas
- Inventory levels and turnover ratios
- Saturation levels
- Marketing Lead performance
- Designs and resourcing that supports the delivery of capital at efficient pricing.
- Economic Conditions / Building Starts
- Gas system constraints
- NYC permitting requirements that increase permitting/restoration costs.

Program Cost Breakdown:

CAPEX \$000	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Customer Connections - Install Main	21,147	21,730	22,539	22,990	23,449
Customer Connections - Install Services	24,785	25,488	27,926	28,484	29,054
Customer Connections - Customer Contributions	(2,307)	(2,352)	(2,403)	(2,456)	(2,503)
Customer Connections – Install Meter/Regulator	1,233	1,258	1,337	1,364	1,391
Services	1,600	1,600	1,700	1,700	1,700
Main Footage	48,000	48,000	48,000	48,000	48,000

Customer Benefits:

More than 1,600 gas service connections resulting in 7,000 new accounts in New York City have positive economic and environmental benefits, including:

- 284 tons of local emissions reduced (NOx, SO2, VOC, NH3 and PM2.5)
- 184,990 tons of CO2 reduced
- 36.2 million gallons of oil displaced (319,756 barrels)
- Same as taking 400,000 cars off the road
- \$52.3 million annual energy savings

- \$69.0 million annual GDP created
- \$82.4 million annual income created
- 535 annual jobs created
- \$5.6 million state and local tax revenues

Estimated per customer:

- \$7,478 annual energy savings
- 5,171 gallons of oil eliminated
- \$9,862 individual GDP created
- Equivalent emissions reduction to removing 57 cars off the road

Alternatives

Alternative 1: Tariff Change to Increase Contributions in Aid of Construction (CIAC)

Propose amending the tariff section to require smaller customers to pay for necessary reinforcements to provide service. This alternative is rejected because it increases customer costs.

Program Title: Gas System Reinforcement Program – KEDNY

Spending Rationale: ☐ Mandated ☒ Customer Connections

☐ Reliability ☐ Non-Infrastructure

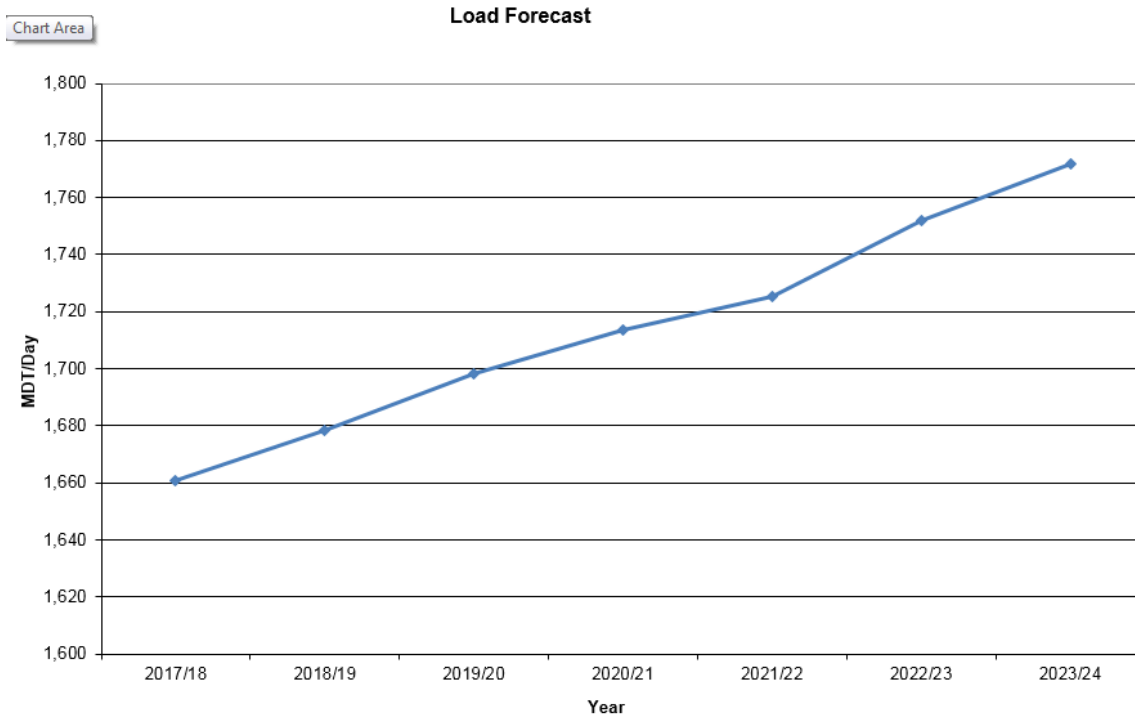
Brief Description:

The Gas System Reinforcement Program consists of capital reinforcement projects required to maintain pressure above system minimums on the gas network during periods of peak demand, thereby maintaining continuous service to all gas customers. This program is a five-year program covering the winter periods for 2019/20 through 2023/24.

Program Justification:

Federal (49 CFR 192.623) and New York State (16 NYCRR 255.623) regulations require the Company to maintain minimum pressures on the gas system necessary to maintain reliable service to all firm customers. The Gas System Reinforcement Program identifies projects required to maintain service under peak day, peak hour conditions. KEDNY's gas system is designed for a peak day with an average temperature equal to 0°F (65HDD – Heating Degree Days), with five percent of the daily send-out as a peak hour. The peak demand is based on the same forecast utilized to develop the gas supply portfolio, and the Gas System Reinforcement program is a critical component for enabling delivery of that gas supply to firm customers. In some cases, even small to moderate increases in the overall forecast can result in significant reinforcements due to certain regions experiencing higher increases in forecasted demand while other regions may be experiencing lower or decreasing system demands.

The Analytics, Modeling, and Forecasting (“AMF”) group's load forecast shows an increasing trend as demonstrated in the below graph.



Examples of distribution system reinforcement projects include, but are not limited to, the following:

- Replacing existing undersized mains with larger diameter mains. Leak-prone pipe is targeted whenever practical.
- Looping or connecting system endpoints by installing new main.
- Installing new district regulators as well as replacing and/or rebuilding existing undersized district regulators.
- Transferring existing customers supplied from low-pressure mains to adjacent high-pressure mains (*i.e.*, load shedding).

Program Cost Breakdown:

CAPEX \$000	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Gas System Reinforcement Program	45,382	13,641	61,716	83,342	64,031

Customer Benefit:

Installing these reinforcements will ensure that service is maintained to all firm gas customers on the system. Without the reinforcement program, as many as 42,850 customers are at risk of experiencing pressures below minimum design pressures and,

therefore, at risk of losing service. The estimated cost to relight these customers is \$42.85M (approximately \$1,000 per customer based on previous experiences). A secondary benefit of the program is the elimination of leak-prone pipe wherever practicable. For example, the program represents a replacement rate of about 50 percent, approximately 22,490 feet (4.3 miles), of leak-prone pipe in in the first year of the plan.

Alternatives:

Alternative 1: Do Nothing

This alternative is rejected because 42,850 customers are predicted to experience pressures below minimum design levels and be at risk of losing service if design conditions were to be experienced during the five-year heating season term under the current gas supply send-out forecast.

Program Title: LTNY11751 - Kew Gardens Gate - PM - KEDNY

Spending Rationale: ☐ Mandated ☒ Customer Connections
☐ Reliability ☐ Non-Infrastructure

Brief Description:

The Kew Gardens Gate Station project will install a new 350 psig to 15 psig regulator station in Kew Gardens, Queens to maintain pressure above system minimum on the gas network during periods of peak demand, thereby maintaining continuous service to all gas customers. The new regulator station will reduce dependency on deliveries from Con Edison through National Grid distribution regulator stations located in the second ward of Queens fed from Con Edison's transmission main. It is assumed that property purchase will be required to site the regulator station and heater.

The project is expected to be completed in the 2020/21 fiscal year.

Program Justification:

Federal (49 CFR 192.623) and New York State (16 NYCRR 255.623) regulations require the Company to maintain minimum pressures on the gas system necessary to maintain reliable service to all firm customers. KEDNY's gas system is designed for a peak day with an average temperature equal to 0°F (65HDD – Heating Degree Days), with five percent of the daily send-out as a peak hour. The peak demand is based on the same forecast utilized to develop the gas supply portfolio.

The Kew Gardens Gate Station project is required to maintain service under peak day, peak hour conditions, and reduce dependence on transferring gas from Con Edison at National Grid's regulator stations in the second ward of Queens fed from Con Edison's transmission main.

Program Cost Breakdown:

CAPEX \$000	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
LTNY11751 Kew Gardens Gate - PM	4,807	17,937	-	-	-

Customer Benefit:

Installing this reinforcement project will ensure that service is maintained to all firm gas customers on the system. Secondary benefits of the project include:

- Providing an additional source of gas in the second ward of Queens off KEDNY's transmission infrastructure which reduces flows from existing KEDNY regulator stations in the second ward of Queens fed from Con Edison's transmission mains.
- Reinforcing the Brooklyn/Queens high pressure system supports replacement of low pressure cast iron mains with high pressure plastic.

Alternatives:

Alternative 1: Non-pipe Alternative – Portable CNG Injection

Utilizing portable CNG injection was also considered and could temporarily improve system pressures and provide incremental localized supply. However, based on a high-level constructability assessment, this option would likely be very challenging from a siting perspective, raises process safety concerns, and would only be a temporary solution without sufficient capacity to meet the increase in demand projected in this area.

Alternative 2: Do Nothing

Without this project, a full-scale moratorium on customer connections in the second ward of Queens would be required. Gas Capacity Requests ("GCRs"), which represent larger loads, are currently being placed on hold until the project is completed.

Studies/References That Support the Program:

Studies were run on the Company's network models using Synergi, which is industry standard software. The models, which are validated on an annual basis, were loaded with the forecast provided by National Grid's Analytics, Modeling, and Forecasting (AMF) department. Additionally, AMF provided a forecast at a zip code level. There is a high degree of confidence in the accuracy of the modeling and forecast and that the appropriate reinforcement projects were identified.

Benefits
<u>Reliability Benefits</u>
<input checked="" type="checkbox"/> Avoids service moratorium: 2 nd Ward of Queens
<input checked="" type="checkbox"/> Supports demand forecast
<input checked="" type="checkbox"/> Addresses supply/capacity constraint or supply diversity needs
<u>Other Customer Benefits:</u>
<input checked="" type="checkbox"/> Improves Customer Satisfaction
<u>Societal Benefits/Externalities:</u>
<input checked="" type="checkbox"/> Reduces use of Alt. Fuel

Program Title: LTNY12025 - Belmont Gate Station – PM - KEDNY

Spending Rationale: ☐ Mandated ☒ Customer Connections
☐ Reliability ☐ Non-Infrastructure

Brief Description:

The Belmont Gate Station is an existing 350 psig to 15 psig regulator station in Brownsville, Brooklyn. The station is capacity constrained. The Belmont Gate Station Project rebuilds the regulator station to increase capacity to maintain pressure above system minimum on the gas network during periods of peak demand, thereby maintaining continuous service to all gas customers. It is assumed that the project will include temperature mitigation to account for the temperature drop associated with the increased flow experiencing a pressure drop, larger intermediate and outlet piping, and a backfeed to the inlet of the station. Additionally, any integrity issues at the existing station will be addressed.

The regulator station modification is expected to be completed before the 2023/24 winter season.

Program Justification:

Federal (49 CFR 192.623) and New York State (16 NYCRR 255.623) regulations require the Company to maintain minimum pressures on the gas system necessary to maintain reliable service to all firm customers. KEDNY's gas system is designed for a peak day with an average temperature equal to 0°F (65HDD – Heating Degree Days), with five percent of the daily send-out as a peak hour. The peak demand is based on the same forecast utilized to develop the gas supply portfolio.

The increased supply provided by the Belmont Gate Station project is required to maintain service under peak day, peak hour conditions.

Program Cost Breakdown:

CAPEX \$000	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
LTNY12025 - Belmont Gate Station – PM	-	-	180	720	25,514

Customer Benefit:

Completion of this project will improve pressures to customers on the 15 psig system in Brownsville, Brooklyn. The Belmont Gate Station Project will:

- Provide immediate pressure benefits to the 15 psig system by installing larger regulators and replaced undersized intermediate and outlet piping with appropriately sized piping
- Improve pressure and increase reliability by providing a backfeed to the inlet to the Belmont Gate Station which is currently undersized
- Identify and repair any integrity issues within the Belmont Gate Station facility

Alternatives:

Alternative 1: Non-pipe Alternative – Portable CNG Injection

Utilizing portable CNG injection was also considered and could temporarily provide incremental localized capacity, thereby improving system pressure. However, this option, based on a high-level constructability assessment, would likely be very challenging from a siting perspective, especially considering process safety concerns, and would only be a temporary solution.

Alternative 2: Do Nothing

A decision to do nothing would ultimately lead to a failure to comply with the regulations defined by Federal and New York State codes as conditions would continue to deteriorate resulting in customer outages. In addition, restrictions on sales activities would be required in constrained areas and the Company could find itself in violation of its tariff.

Studies/References That Support the Program:

Studies were run on the Company's network models using Synergi, which is industry standard software. The models, which are validated on an annual basis, were loaded with the forecast provided by National Grid's Analytics, Modeling, and Forecasting (AMF) department. Additionally, AMF provided a forecast at a zip code level. There is a high degree of confidence in the accuracy of the modeling and forecast and that the appropriate reinforcement projects were identified.

Benefits
<u>Reliability Benefits</u>
<input checked="" type="checkbox"/> Supports demand forecast
<u>Safety Benefits:</u>
<input checked="" type="checkbox"/> Enhances Public Safety
<u>Societal Benefits/Externalities:</u>
<input checked="" type="checkbox"/> Reduces use of Alt. Fuel

Program Title: CSC/Public Works Program – KEDNY

Spending Rationale: ☒ Mandated ☐ Customer Connections
☐ Reliability ☐ Non-Infrastructure

Brief Description:

The City/State Construction Program for KEDNY (“CSC”) consists of work driven predominantly by the NYC Department of Design and Construction (“NYCDDC”) and NYC Department of Transportation (“NYCDOT”), as well as various private entities in the Boroughs of Queens, Brooklyn and Staten Island. The CSC program is directed at replacing infrastructure that will be compromised by third party construction activities.

Major categories of work include:

- Planned Municipal Projects
- When & Where Water Projects
- Emergency Sewer Projects
- Complex Curb Projects
- Encroachments
- Support & Protection of Facilities

SE856 Project:

The SE856 Project was recently added to the NYDDC workplan and involves significant transmission and distribution work. The NYDDC will be installing new water main, high level storm sewer and sanitary sewer on Flatlands Ave and the vicinity in Brooklyn. The project design is not yet finalized. This project is expected to require KEDNY to replace 4”,6”,8”,12” and 24” low pressure and 60psi gas mains. KEDNY could also have to offset the 350-psi transmission gas main at three locations within the scope of this project. The transmission work will be managed by the Capital Delivery organization and is budgeted separately from the CSC blanket program. The distribution work is included in the CSC blanket program but is shown as a separate line item below to clearly identify the capital requirements of this significant project. The cost estimate for the SE856 Project is preliminary, and the Company has not yet received the full project scope for SE856 from the NYDDC.

Program Justification:

KEDNY facilities are often in direct conflict with proposed municipal infrastructure or are required to be relocated based on regulatory and code requirements.

The CSC program is subdivided into three components: Reimbursable, Non-Reimbursable and Reimbursements. Projects are categorized into these buckets based on

the project funding source. Capital projects initiated by the NYCDDC on behalf of the NYC Department of Environmental Protection (“NYCDEP”) are reimbursable and subject to the requirements of the NYC Gas Facility Cost Allocation Act (“Gas Cost Sharing Agreement”). As per the Gas Cost Sharing Agreement, relocation costs incurred by KEDNY on this project are eligible for reimbursement by the City of New York, on an age of main basis (depreciated book value). Conversely, projects funded by the NYSDOT, NYCDOT and private entities are not eligible for reimbursement.

The Encroachment category ensures the protection and/or replacement of cast iron piping eight inches in diameter or less, which may become exposed and undermined or otherwise be subjected to undue stresses because of its proximity to third-party excavations. Third Party Construction is defined as work performed by sewer, water, electric utility or any agency other than KEDNY or its contractors.

The Support and Protection work supports utility facilities during the performance of City of New York sponsored contracts. Examples include the support and protection of utility facilities during trench crossings, installation and removal of catch basins and catch basin chute connection pipes, special care for excavation and backfilling, etc.

As part of New York City’s implementation of NYS Assembly Bill A10021B - Joint Bidding on contracts for Public Works projects, KEDNY will be responsible for a portion of the “Shared Costs” of work performed by the City contractors. Examples of shared costs include: the maintenance of the construction site, field office, transportation, contract management and mobilization.

KEDNY works closely with NYCDDC’s engineers and consultants to minimize any direct conflicts to the existing gas infrastructure located in the boroughs of Queens, Brooklyn and Staten Island. This work reduces Support and Protect (O&M) costs, maximizes remuneration, and reduces risk exposure to the Company.

Program Cost Breakdown:

CAPEX \$000	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
CSC/Public Works – Non-Reimbursable	23,226	23,959	24,353	24,793	22,922
CSC/Public Works - Reimbursable	247,909	255,813	270,094	275,018	256,181
CSC/Public Works Reimbursements	(43,380)	(57,842)	(60,807)	(63,063)	(64,903)
SE856 Phase 2 Trans. Offset (Transmission Work)	10,550	60,000	--	--	--

SE 856 Phase 2 Trans. Offset (Distribution Work)	2,500	41,900	2,000	--	--
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Customer Benefit:

Minimal customer impact is expected during the construction of these projects; they are intended to ensure continuous service to customers.

Customers will benefit from the program in the following ways:

- CSC will contribute to LPP retirement to KEDNY's main replacement program in New York City (for example, approximately 163,680 linear feet (31 miles) in FY 2020).
- Synergistic opportunities are realized through integration with other Operational Program work including, but not limited to: Main & Service Replacement, Customer Driven Construction, Reliability, and Long Term Planning

Alternatives:

None – Mandated Program

Studies/References That Support the Program:

The program is supported by KEDNY's legal obligations under New York State code (including 16 NYCRR Part 255.755, Part 255.756, and Part 255.757), New York law (including NYS General Obligations Law Section 11-102 and Part 131 of NYSDOT Rules & Regulations, NYCRR Title 17 - Accommodation of Utilities within State Highway Right-of-Way) and the New York City Gas Facility Cost Allocation Act (Gas Cost Sharing agreement) which require replacement and/or support and protection of gas facilities during third-party construction.

Program Title: Main Replacement – (Proactive) – Leak Prone Pipe - KEDNY

Spending Rationale: ☒ Mandated ☐ Customer Connections

☐ Reliability ☐ Non-Infrastructure

Brief Description:

Leak prone pipe (“LPP”) in the KEDNY service territory is defined as including all 12 inch and smaller pipe that is (i) unprotected (*i.e.*, non-cathodically protected) steel pipe (whether bare or coated), (ii) cast and wrought iron pipe, and (iii) unprotected steel/wrought iron, vintage HDPE and copper services (“associated services”).

KEDNY’s existing rate plan (Case 16-G-0058) requires the Company to replace 99 miles of leak prone pipe proactively over three years (CY2017, CY2018 and CY2019).

For the reasons described below, the Company is recommending a proactive base LPP replacement target of 37, 44, 49 and 56 miles in CY2020 through FY2023 respectively. Accelerating replacement to the incentive target level will eliminate all LPP on KEDNY’s system in 20 years.

Fiscal Year	CY2020	CY2021	CY2022	CY2023
Proactive LPP, miles	37	44	49	56
Total LPP Replacement*, miles	70	75	80	85

Note: *LPP replacement includes, miles from City State Construction and Reliability programs

Program Justification:

The December 31, 2018 inventory of LPP of 12 inch and smaller pipe is 1,458 miles (290 miles of unprotected steel and 1,168 miles of cast iron/wrought iron), which represents approximately 35 percent of the distribution system in KEDNY’s territory. The current leak repair rate for all distribution piping on the KEDNY system is 0.81 leaks per mile excluding leaks due to damages, decreased from 0.84 leaks per mile in 2005. The current leak repair rate for LPP is 2.23 leaks per mile; however, the leak rate increased significantly during 2014 and early 2015 due to exceptionally cold weather in Northeast. The impact of cold weather on the system and the increasing leak rates warrant continued, accelerated retirement of LPP. The Company will continue to increase its LPP replacement mileage by 5 miles per year.

The proposed accelerated replacement of LPP is also supported by the Company’s Distribution Integrity Management Plan (“DIMP”), which specifies that the Company: (i) know its distribution piping system, (ii) understand the threats to the system, and (iii)

evaluate the risks and prepare replacement programs for its leak prone mains and services inventory to help mitigate those risks.

Leak predictive models show that main replacement levels below a certain threshold will cause leak rates to increase exponentially. Replacement levels below this amount will cause leaks to increase to a point where the Company may not be able to reasonable react to the quantity of new leaks in a timely manner. Furthermore, such increased leak activity will classify larger quantities of mains as actively corroding which will require replacement just the same. The model shows that there is a practical limit to how many leaks a system can have and continue to operate safely.

LPP is only 35 percent of the KEDNY distribution main inventory, yet LPP accounts for 96 percent of leak repairs (excluding damages). Accelerated replacement of this pipe will improve safety, reliability, and customer satisfaction. The key benefits of an accelerated replacement program for LPP include:

- Improved public safety by reducing the risk for gas related incidents
- Improved system reliability and customer satisfaction
- Compliance with federal and state code requirements, including new US Department of Transportation’s DIMP requirements
- Increased efficiency resulting from reduced commodity loss
- Reduction of methane emissions helping to reduce greenhouse gas emissions

Program Cost Breakdown:

CAPEX \$000	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Main Replacement – (Proactive) – Leak Prone Pipe	196,552	250,061	304,804	347,927	407,571

Note: The Company is proposing to continue Gas Safety Reliable Surcharge to recover the costs incurred to replace LPP miles above the base target.

Customer Benefit:

Customers can benefit from the program in the following ways:

- Improved public safety due to reduced risk of gas incidents
- Fewer unplanned service interruptions
- Fewer unplanned disruptions to traffic and roadways
- Fewer nuisance gas leaks and lowered greenhouse gas emissions

Alternatives

Alternative 1: Minimal Replacement

This option would replace only the quantity of main required to hold leak rates to present levels. This option increases safety risks and does not align with the Company's or the Commission's goals to continue to reduce leak rates.

Alternative 2: Do Nothing

No main replacement will result in increasing leak activity and increased risk to public safety. This will result in loss of credibility with regulators and put the Company in violation of its federally-regulated DIMP.

Studies/References that Support the Program:

This program is supported by the Company's recently developed DIMP, and complies with the requirement in Federal Code 49 CFR, 192.1005, 1007, 1009, 1011 and 1013. The proposed accelerated LPP replacement will reduce the replacement timeline from current 27 years to 25 years, starting from CY14.

Recent gas related incidents in the industry have emphasized the urgency of eliminating the aging infrastructure at a faster pace. The Company's Annual System Integrity Analysis, which reviews last 10 years of system trends, clearly demonstrates the benefits of leak reduction due to accelerated LPP main replacements

Program Title: CISBOT - KEDNY

Spending Rationale: ☒ Mandated ☐ Customer Connections

☐ Reliability ☐ Non-Infrastructure

Brief Description:

KEDNY utilizes several different types of main: cast iron, steel and, more recently, plastic. Cast iron mains were constructed with bell and spigot joints, and over time leaks have begun to develop at these connections, whereas steel mains typically develop leaks due to corrosion.

While there are cost-effective methods of repairing and reducing the leaks on small diameter mains, leak repairs on large diameter pipes (12 inch and larger) typically cost more due to the location and the depth of the excavations required to access the pipe joints. KEDNY is proposing to continue a program that leverages new technology to cost-effectively address large diameter cast iron joint leaks.

The program involves the use of a robotic internal sealing method known as CISBOT (Cast Iron Sealing Robot) for cast iron mains 16 inches to 36 inches. Unlike other methods of joint repair, CISBOT allows KEDNY to seal more than 80 joints from one excavation without shutting down the main. KEDNY is proposing to use CISBOT to address approximately two and half miles of large diameter cast iron per year beginning in FY 2021.

Program Justification:

The current leak repair rate of large diameter cast iron distribution piping on the KEDNY system is 2.7 leaks per mile (excluding damages), increasing from 1.6 leaks per mile in 2010. Leaks have increased significantly due to exceptionally cold weather during 2014 and early 2015 in the northeast US. The impact of cold weather on the system, and resultant leak rates, suggests that an accelerated response to large diameter pipe is warranted. However, the current LPP replacement program only addresses mains up to 12 inches.

This response to leak prone large diameter pipe is also supported by the Company's Distribution Integrity Management Plan (DIMP), which specifies that the Company should: (i) know its distribution piping system, (ii) understand the threats to the system, and (iii) evaluate the risks and prepare replacement programs for its leak prone mains and services inventory to help mitigate those risks.

KEDNY has more than 107 miles of large diameter cast iron. Most of the leaks on these mains are due to joint failures that can be addressed by CISBOT. CISBOT is the most cost-effective way to proactively seal the existing cast iron mains, reduce costs and minimize disruptions to the public.

Following are the key benefits of CISBOT:

- More cost-effective than replacing the large diameter pipe
- Improved public safety by reducing the risk for gas related incidents
- Improved system reliability and customer satisfaction
- Compliance with federal and state code requirements including new US Department of Transportation (USDOT) Distribution Integrity Management Program requirements (DIMP)
- Increased efficiency resulting from reduced commodity loss
- Ability to focus more resources on retiring small diameter main segments with higher risk profiles
- Reduction in methane emission

Program Cost Breakdown:

CAPEX \$000	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
CISBOT	5,236	5,336	5,400	5,500	5,600

Customer Benefit:

Minimal customer impact is expected during the construction of these projects. Customers can benefit from the program in the following ways:

- Improved public safety due to reduced risk of gas incidents;
- Fewer unplanned service interruptions; and
- Fewer unplanned disruptions to traffic and roadways.

Alternatives:

Alternative 1: Minimal reconditioning of pipe and cast iron joint sealing

This option would treat only the quantity of main required enabling the company to hold leak rates to present levels. This option will have negative financial consequences as it would require the more traditional repair methods to be used on the large diameter mains which are typically very expensive.

Alternative 2: Do Nothing

No proactive repair method would result in increasing leak activity and increased risk to public safety. This will also result in a negative financial incentive and loss of credibility with regulators and put the Company in violation of its federally-regulated DIMP.

Studies/References that Support the Program:

This program is in accordance with the Company's recently developed DIMP; complies with Federal Code 49 CFR, 192.1005, 1007, 1009, 1011 and 1013.

Program Title: Large Diameter Main Rehabilitation - KEDNY

Spending Rationale: ☒ Mandated ☐ Customer Connections

☐ Reliability ☐ Non-Infrastructure

Brief Description:

KEDNY utilizes several different types of main: cast iron, steel and, more recently, plastic. Cast iron mains were constructed with bell and spigot joints and over time, leaks have begun to develop at these connections, whereas steel mains typically develop leaks due to corrosion.

While there are cost effective methods of repairing and reducing the leaks on small diameter mains, leak repairs on large diameter pipes 12 inch and larger typically cost more due to the location and the depth of the excavations required to access the pipe joints. KEDNY is proposing to continue a program that leverages new technology to cost effectively address large diameter pipe leaks.

Where feasible, KEDNY is proposing to recondition large diameter cast iron and unprotected steel mains with cured-in-place (“CIP”) lining, which can extend the life of the main for more than 50 years. If it is impractical to utilize this technology, KEDNY will replace that section of large diameter pipe to maintain the integrity of the system.. This proven technology has been successfully used by the Company for several years. In congested metropolitan areas, where it is almost impossible to find another lane in the roadway to install new large diameter main, installation of CIP lining is the most cost-effective way to recondition the existing mains, reduce costs and minimize disruptions to the public. KEDNY is proposing to CIP line two miles per year from FY 2021 through FY 2024.

Program Justification:

The current leak repair rate of large diameter distribution piping on the KEDNY system is 2.7 leaks per mile (excluding damages), increasing from 1.6 leaks per mile in 2010. Leaks have increased significantly due to exceptionally cold weather during 2014 and early 2015 in the northeast US. The impact of cold weather on the system and increasing leak rates suggests that an accelerated response to large diameter pipe is warranted. However, the current LPP replacement program only addresses mains up to 12 inches.

This response to leak prone large diameter pipe is also supported by the Company’s Distribution Integrity Management Plan (“DIMP”), which specifies that the Company should: (i) know its distribution piping system, (ii) understand the threats to the system, and (iii) evaluate the risks and prepare replacement programs for its leak prone mains and services inventory to help mitigate those risks.

KEDNY has more than 107 miles of large diameter cast iron and unprotected steel main. Installation of CIP lining is the most cost-effective way to recondition the existing mains, reduce costs and minimize disruptions to the public.

Following are the key benefits of CIP lining:

- More cost-effective than replacing the large diameter pipe
- Improved public safety by reducing the risk for gas related incidents
- Improved system reliability and customer satisfaction
- Compliance with federal and state code requirements including new US Department of Transportation (USDOT) DIMP requirements
- Increased efficiency resulting from reduced commodity loss
- Ability to focus more attention on retiring small diameter main segments with higher risk profiles
- Reduction in methane emission

Program Cost Breakdown:

CAPEX \$000	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Large Diameter Main Rehabilitation	13,621	14,088	14,376	14,671	14,975

Customer Benefit:

Minimal customer impact is expected during the construction of these projects. Customers can benefit from the program in the following ways:

- Improved public safety due to reduced risk of gas incidents;
- Fewer unplanned service interruptions; and
- Fewer unplanned disruptions to traffic and roadways.

Alternatives:

Alternative 1: Minimal reconditioning of pipe and cast iron joint sealing

This option would treat only the quantity of main required enabling the company to hold leak rates to present levels. This option will have negative financial consequences as it would require the more traditional repair methods to be used on the large diameter mains which are typically very expensive.

Alternative 2: Do Nothing

No proactive repair method would result in increasing leak activity and increased risk to public safety. This will also result in a negative financial incentive and loss of credibility with regulators and put the Company in violation of its federally-regulated DIMP.

Studies/References that Support the Program:

This program is in accordance with the Company's recently developed DIMP; complies with Federal Code 49 CFR, 192.1005, 1007, 1009, 1011 and 1013.

Program Title: Main Replacement – Reactive - KEDNY

Spending Rationale: ☒ Mandated ☐ Customer Connections

☐ Reliability ☐ Non-Infrastructure

Brief Description:

This program funds the replacement of smaller sections of main segments and associated services that are identified during leak repairs and could not be repaired by leak clamps. This program provides Field Operations the ability to quickly make decisions on site to replace actively deteriorated segments of pipe. The program covers the Company's inventory of pipe that is (i) unprotected (*i.e.*, non-cathodically protected) steel pipe (whether bare or coated), (ii) cast and wrought iron pipe, and (iii) unprotected steel/wrought iron and copper services ("associated services").

Program Justification:

The December 31, 2018 inventory of LPP of 12 inch and smaller pipe is 1,458 miles (290 miles of unprotected steel and 1,168 miles of cast iron/wrought iron), which represents approximately 35 percent of the distribution system in KEDNY's territory. The current leak repair rate for all distribution piping on the KEDNY system is 0.81 leaks per mile excluding leaks due to damages, decreased from 0.84 leaks per mile in 2005. The current leak rate on LPP, 2.23 leaks per mile is more than double the system leak rate.

LPP is only 35 percent of the KEDNY distribution main inventory, yet LPP accounts for 96 percent of leak repairs (excluding damages). The goal of this program is to quickly replace the small sections of actively corroded mains and reduce the risk associated with LPP on KEDNY's distribution system. The replacement of LPP and associated services is also supported by the Company's Distribution Integrity Management Plan (DIMP), which specifies that the company implement measures to: know its system; understand the threats to its distribution piping system; and evaluate risks and prepare replacement programs to help mitigate the risks associated with its leak prone mains and services inventory.

Program Cost Breakdown:

CAPEX \$000	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Main Replacement – Reactive	5,337	6,941	7,185	7,348	7,498

Customer Benefit:

This program minimizes customer impact by enabling Field Operations to determine when a section of main cannot be repaired and must be replaced on site, minimizing the duration of Field Work and associated inconvenience to the public. The benefits of performing this work include improved community and government relations and reduced greenhouse gas emissions.

Alternatives:

Alternative 1: Reduce or eliminate the Reactive Main Replacement Program.

This alternative would result in increased O&M costs for leak response and repair and would delay the current plan for replacement of all LPP in the Company's territory. It would also increase the exposure to risk associated with LPP and may increase customer complaints.

Program Title: Service Replacement – Proactive – KEDNY

Spending Rationale: ☒ Mandated ☐ Customer Connections
☐ Reliability ☐ Non-Infrastructure

Brief Description:

KEDNY is proposing a replacement program for its inventory of high pressure, unprotected (bare) steel services with meters/regulators located inside the building. The program prioritizes replacement of high risk segments.

Program Justification:

Following an engineering assessment of KEDNY's steel gas service assets in 2007, a determination was made to replace all high pressure, unprotected steel services with meters/regulators located inside buildings. The engineering assessment included both detailed asset inventory analyses (*i.e.*, age, material, inside vs. outside), as well as pressure testing on services throughout the enterprise. Although test results varied throughout the enterprise, test program results indicate the "wall piece" is of concern. A total of 512 services were pressure tested in KEDNY's service territory with a failure rate of 0.40%.

The purpose of the service replacement program is to mitigate the risk of failure of the "wall piece," which is the section of service piping that penetrates through the foundation wall of the building. Because this section of pipe is embedded in the foundation wall (or in a sleeve in the foundation wall), it cannot be visually inspected, and there is the potential for undetected corrosion of the steel pipe to take place. In 2012, 166 services were tested and replaced through the service replacement program. As there were no failures, the Company achieved a 99% confidence level that there are no attributes that can be correlated with service failures. Thus, the program focus has shifted from testing to proactively replacing the remaining candidates at the current replacement rate. The current inventory level for these high pressure bare steel services is approximately 7500. KEDNY is proposing to replace 250 services a year.

The accelerated replacement of high pressure bare steel services with meters/regulators located inside the building is also supported by the Company's Distribution Integrity Management Plan ("DIMP"), which specifies that the Company: (i) know its distribution piping system, (ii) understand the threats to the system, and (iii) evaluate the risks and prepare replacement programs for its leak prone mains and services inventory to help mitigate those risks.

Leak predictive models show that replacement levels below a certain threshold will cause leak rates to increase exponentially. Replacement levels below this amount will cause leaks to increase to a point where it will not be feasible to timely react to the quantity of

new leaks. The model shows that there is a practical limit to how many leaks a system can have and continue to operate safely.

Following are the key benefits of an accelerated replacement program high pressure, bare steel services with meters/regulators located inside the building:

- Improved public safety by reducing the risk for gas related incidents
- Improved system reliability and customer satisfaction
- Compliance with federal and state code requirements including the DIMP
- Increased efficiency resulting from reduced commodity loss
- Reduction of methane emission which help reduce greenhouse gases

Program Cost Breakdown:

CAPEX \$000	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Service Replacement – Proactive – KEDNY	1,962	2,054	2,239	2,275	2,321

Customer Benefit:

Minimal customer impact is expected during the construction of these projects. Customers can benefit from the program in the following ways:

- Improved public safety due to reduced risk of gas incidents;
- Fewer unplanned service interruptions; and
- Fewer unplanned disruptions to traffic and roadways.

Alternatives:

Alternative 1: Minimal Replacement

This option would increase the risk of an incident associated with the bare steel, high pressure services with inside meter/regulators.

Studies/References that Support the Program:

This program is in accordance with the Company's recently developed DIMP; complies with Federal Code 49 CFR 192.1005, 1007, 1009, 1011 and 1013.

Program Title: Service Replacement (Reactive) Leaks - KEDNY

Spending Rationale: ☒ Mandated ☐ Customer Connections

☐ Reliability ☐ Non-Infrastructure

Brief Description:

The reactive service replacement program consists of non-discretionary work that is randomly generated through public leak reports, programmed leak survey, mandated activities, and customer generated requests.

Program Justification:

The goal of this program is to reduce the risk associated with leaks on existing services to enhance safety and reliability of the Company's system. The program provides funding for the reactive replacement of gas services to address work activities that fall outside the normal scope of the integrity, reliability, public works and customer connections programs. The proactive main and service replacement programs upgrade existing customer services prioritized in the mains replacement program by risk based on pressure, material, vintage, location, and select other variables. The reactive service replacement program addresses leakage and other maintenance activities on the remaining services.

The program budget consists of costs to replace leaking services, damages, service abandonments due to inactivity or demolition requests, customer driven relocations of existing services, and other substandard conditions.

Program Cost Breakdown:

CAPEX \$000	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Service Replacement (Reactive) Leaks - KEDNY	5,050	5,149	5,351	5,470	5,574

Customer Benefit:

This program will reduce the risk associated with these services and improve community and government relations.

Alternatives

None

Program Title: Service Replacement (Reactive) Non-Leaks - KEDNY

Spending Rationale: ☒ Mandated ☐ Customer Connections

☐ Reliability ☐ Non-Infrastructure

Brief Description:

The reactive non-leak service replacement program consists of non-discretionary work that is randomly generated through compliance needs and mandated activities.

Program Justification:

The goal of this program is to enhance safety and reliability of the Company's system by reducing the risks associated with damages, service abandonments due to inactivity or demolition requests, customer driven relocations of existing services, and other substandard conditions. The program provides approved funding for the reactive replacement of gas services to address non-leak work activities that fall outside the normal scope of the integrity, reliability, public works and customer connections programs.

The proactive main and service replacement programs upgrade existing customer services prioritized in the main replacement program by risk, based on pressure, material, vintage, location, and select other variables. The reactive service replacement program addresses deficiencies on remaining services.

The program budget consists of costs to replace services as a result of damages, service abandonments due to inactivity or demolition requests, customer driven relocations of existing services, and other substandard conditions.

Program Cost Breakdown:

CAPEX \$000	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Service Replacement (Reactive) Non-Leaks - KEDNY	5,116	5,217	5,425	5,545	5,651

Customer Benefit:

This program will reduce the risk associated with these services and improve community and government relations.

Alternatives

None

Program Title: Restrictions for Elevated Gas Infrastructure - KEDNY

Spending Rationale: ☒ Mandated ☐ Customer Connections
☐ Reliability ☐ Non-Infrastructure

Brief Description:

KEDNY is proposing a program to reduce the risk of public injury by restricting and/or deterring public access to the Company's elevated gas facilities.

Program Justification:

The purpose of this program is to reduce the risk of climb and fall injuries or fatalities. In 2014 in the United Kingdom, a fatality occurred resulting from a climb and fall accident on an elevated gas pipeline at a bridge crossing operated by a National Grid affiliate company. Currently, KEDNY has 8 locations where exposed gas pipelines are four feet or higher above the ground or across a body of water. Only 2 of these locations are not publicly accessible or have barriers or deterrents in place to discourage the public from climbing or accessing the facilities. This is a five-year program beginning in the Rate Year to install signs, fencing or other physical deterrents at the remaining 6 locations.

Program Cost Breakdown:

CAPEX \$000	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Restrictions for Elevated Gas Infrastructure - KEDNY	336	373	381	388	396

Customer Benefit:

This program improves public safety.

Alternatives:

Alternative 1: Raise public awareness through signage only

Raising public awareness of the risk associated with elevated pipelines through warning signs alone will reduce risk to a lesser extent than fencing or other physical barriers that restrict access.

Alternative 2: Do Nothing

This alternative does not mitigate the public risk of climb and fall accidents and fatalities.

Program Title: Buried Vent Lines - KEDNY

Spending Rationale: ☐ Mandated ☐ Customer Connections

☒ Reliability ☐ Non-Infrastructure

Brief Description:

KEDNY has more than 56,000 high-pressure (“HP”) services with inside meter sets, and approximately 0.5 percent of these services are estimated to have buried regulator vent lines. Buried vent lines are highly susceptible to corrosion and damage as the vent pipe is not coated and does not have cathodic protection. Corroded and/or damaged vent lines pose increased risk for gas migration into a building and a potential incident in the case of regulator over-pressurization. To mitigate the risk of a potential incident, the Buried Vent Line program will remediate all buried regulator vent lines currently installed in the Company’s operating system. The program proposes three different remediation solutions which will mitigate the risk of enhanced corrosion activity and damage on underground vent lines. The first remediation solution is to install new vent pipe and reroute the vent line so that its point of exit from the building is above grade. The second solution is to excavate and remove the existing buried vent line and install new coated vent pipe with cathodic protection from the wall fitting to the base of the above grade pipe. Depending on the feasibility of excavation and scenarios where rerouting the vent line would prove to be impractical, the third remediation solution is to relocate the service line and meter set outside of the customer premise entirely. Each of these remediation solutions will reduce the risk of corrosion and gas migration into the building.

Program Justification:

The Buried Regulator Vent Line Program will remediate the current underground regulator vent lines in KEDNY’s operating system in order to prevent water intrusion into the vent lines thus preventing potential incidents due to regulator over-pressurization. The program is in response to a gas incident in Brooklyn, NY during February 2016 where the incident investigation revealed a corroded underground regulator vent line that permitted water into the regulator which froze and locked the regulator in the open position, resulting in over-pressurization of the downstream piping. The buried vent lines in our system are currently being identified by the Service Line Inspection program which enables remediation of the buried vent lines as they are identified.

Program Cost Breakdown:

CAPEX \$000	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Buried Vent Lines	108	111	113	115	117

Customer Benefit:

Customers can benefit from the program in the following ways:

- Improved public safety due to reduced risk of gas incidents
- Fewer unplanned service interruptions from reducing probability of water intrusion
- Relocation of meter (when possible) at no out-of-pocket cost to the customer

Alternatives:

Alternative 1: Replace After Leak

The option does not address risk of an incident. This option also does not align with the Company's goals or DIMP. This option will increase Opex costs due to unnecessary leak investigations and repairs.

Alternative 2: Do Nothing

This option leaves buried vent lines vulnerable to corrosion and water intrusion. Allowing water to penetrate our system through buried vent lines increases risk to customers and public safety. This option also does not align with the Company's or the Commission's goals.

Studies/References that Support the Program:

Recent gas related incidents in the industry have emphasized the urgency of eliminating the buried regulator vents in our system at a faster pace. Recent Inspections and integrity reports on our system demonstrate the benefits of eliminating the risk that buried vent lines introduce to our system.

Program Title: Plastic Fusion QA/QC Re-Digs - KEDNY

Spending Rationale: ☒ Mandated ☐ Customer Connections
☐ Reliability ☐ Non-Infrastructure

Brief Description:

Department of Public Service (DPS) CASE 14-G-0212 Plastic Fusion Order (effective May 18, 2018), requires a Quality Assurance/Quality Control Program with a data-supported plan to randomly test discrete locations on construction work that has been deemed completed as defined in this Order.

The scope of the program includes the re-excavation and inspection of two hundred (200) plastic fusions installed on construction work deemed completed within 30 days to ensure quality based on visual inspection. The sample size of 200 inspections is defined by ANSI standard Z1.4 with an acceptable quality level of 2.5, based on an annual population of 40,000 fusions installed in 2018.

The implementation of this program will require two (2) incremental full-time employees to provide QA/QC inspection services to support the program. The Order requires that QA/QC inspectors be fully operator qualified to inspect in evaluating the acceptability of plastic pipe joints made under the applicable joining procedures, as well as other required construction tasks including, but not limited to, installation of tracer wire, depth of cover, clearance from other underground structures, etc.

Program Justification:

On May 18, 2018, the DPS issued an Order adopting further improvements in plastic fusion practices on natural gas systems, in part in response to the 2014 Con Edison East Harlem gas incident that involved a failed plastic fusion.

In accordance with the Order, the Company is adopting a QA/QC program that requires a statistically significant number of random checks be performed on work that has been deemed finally completed, and re-digging of completed jobs must occur to inspect the work sometime after the work was completed. A statistical sampling is the most appropriate and beneficial way to provide quality assurance of plastic fusions installed on our gas system.

Program Cost Breakdown:

CAPEX \$000	CY 2020	CY 2021	CY 2022	CY 2023	CY 2024
Plastic Fusion QA/QC Re-Digs - KEDNY	3,260	3,250	3,392	3,460	3,529

Customer Benefit:

Ensure quality of workmanship and pipeline safety in accordance with API RP 1173.

Alternatives:

None

Studies/References That Support the Program:

The program is supported by KEDLI's legal obligations under Department of Public Service CASE 14-G-0212 Plastic Fusion Order effective May 18, 2018.

Program Title: Plastic Fusion - In-Process Inspections – KEDNY

Spending Rationale: ☒ Mandated ☐ Customer Connections
☐ Reliability ☐ Non-Infrastructure

Brief Description:

To further reduce risks related to plastic fusions, KEDNY is proposing to implement an “in-process” plastic fusion inspection program for plastic fusions installed on its gas system.

Program Justification

This program will utilize the services of a third-party contractor system called, ControlPoint™, to remotely view a series of photographs taken during the fusion process at the jobsite by the installation crew. This includes photos of proper stab depth, surface cleaning, scraping, alignment, fusion time and temperature compensation, etc. that cannot be visually inspected after the fusion is completed.

Program Cost Breakdown:

Total program costs are based on an estimate of \$500 per control box, per month.

CAPEX \$000	CY 2020	CY 2021	CY 2022	CY 2023	CY 2024
In-Process Fusion Inspection-KEDNY	302	308	314	320	326

Customer Benefit:

Ensure quality of workmanship and pipeline safety in accordance with API RP 1173. Reduce risk of joint failure with associated costs and promote high-quality installations. Decrease costs associated with unnecessary remediation by conducting inspection of joints before they are buried. Provide control of authorized fusers/mechanics on the network, analyzing performance data and identifying training opportunities. Provide extensive visibility of assets on the network, including location, photographic evidence of joint assembly, fuse data and quality of installation. Provide full traceability for fittings and pipes used in the field, including batch numbers and according to ASTM 2897 standard.

Alternatives:

Third party inspectors could provide in process inspections as well, however, this would require 200 additional inspection personnel which would be a significantly higher cost alternative.

Program Title: Low Pressure Main Valve Installation – KEDNY

Spending Rationale: ☒ Mandated ☐ Customer Connections
☐ Reliability ☐ Non-Infrastructure

Brief Description:

KEDNY is proposing a safety enhancement program to reduce the risk of public injury by installing shut-off valves on low-pressure main.

KEDNY is proposing to install shut-off valves at approximately every 1,000 feet on low-pressure main in conjunction with the Company’s retirement of leak prone pipe (“LPP”).

Program Justification:

The purpose of these valves is to enable faster, and more effective reaction to an incident. Valves have been recognized as an important component toward improving the overall safety of low-pressure systems following the East Harlem, New York incident. During 2018, the KEDNY conducted a pilot to test installation design for shut off valves through installation of six shut-off valves on the low-pressure system between 64th Street and 66th Street in Brooklyn. Using lessons learned from the pilot program, the Company has modified the installation design to reduce costs. Based on KEDNY’s annual target mileage for LPP retirement, the program includes installation of between 290 and 330 valves on its system each year between CY 2020 and CY 2023.

Program Cost Breakdown:

CAPEX \$000	CY 2020	CY 2021	CY 2022	CY 2023	CY 2024
Low Pressure Main Valve Installation	-	2,460	2,723	2,956	3,196

Customer Benefit:

This program improves public safety.

Alternatives:

Alternative 1: Do Nothing

This alternative increases the response time, reducing the efficiency of first responders as well as company personnel during an incident, thereby hampering the safety of our customers and communities.

Program Title: Contractor Safety Inspections - KEDNY

Spending Rationale: ☒ Mandated ☐ Customer Connections
☐ Reliability ☐ Non-Infrastructure

Brief Description:

This program will expand KEDNY's current Contractor Safety/Compliance Inspections Program so that there is an inspector assigned to every contractor crew performing work on the Company's system. The program is phased over three year to ensure successful implementation and to distribute costs.

Program Justification:

KEDNY's current Contractor Safety/Compliance Inspector Program is staffed to provide one inspector to cover approximately four contractor crews. The contractor safety/compliance inspectors perform site inspection functions including but not limited to the following: Operator Qualification verification, jobsite and safe work practices, work methods and construction standards/procedure compliance, work scope documentation, customer interaction if necessary.

To implement safety process improvements, and in line with best practices deployed by other utilities operating in similar regions, the Company proposes adding resources to ensure that there is one inspector to cover every contractor crew. In KEDNY's service territory, 110 additional contractor inspectors and 15 supervisors are required. The hiring/implementation plan spans 3 years.

	Yearly Hiring Plan Allocation			
	year 1 (20%)	year 2 (40%)	year 3 (40%)	Total
KEDNY Supervisor	3.0	6.0	6.0	15.0
KEDNY Inspector	22.0	44.0	44.0	110.0
Total	25.0	50.0	50.0	125.0

Program Cost Breakdown:

CAPEX \$(000)	FY 2020	FY 2021	FY 2022	FY 2023	CY 2024
Contractor Safety Inspections	-	5,371	16,364	27,786	28,182

Customer Benefit:

Ensure quality of workmanship and safety in accordance to company procedures and policies.

Alternatives:

Perform inspection functions as present, on a percentage basis.

Program Title: Corrosion – KEDNY

Spending Rationale:

☒ Mandated

☐ Customer Connections

☐ Reliability

☐ Non-Infrastructure

Brief Description:

Corrosion can lead to failures in plant infrastructure and equipment which are usually costly to repair. Decisions regarding the future integrity of a structure or its components depend entirely upon an accurate assessment of the conditions affecting its corrosion and rate of deterioration. The Corrosion department performs field testing, monitoring, upgrades and repairs to existing corrosion control systems in accordance with Federal and State code requirements, specifically, Federal CFR Title 49- Transportation, Subpart I Pipeline Safety Part 192 and 16 NYCRR Part 255 Transmission and Distribution of gas and with industry standards. This includes, periodic testing, inspection, monitoring and diagnostic troubleshooting of existing corrosion control system. The department provides engineering standards as well as the design and development of new cathodic protection system and upgrades to existing cathodic protection systems.

Corrosion mitigation for buried piping requires two items:

1. Protective Coating / Barrier – can be installed and tested at the mill or in the field and provides a protective barrier from the elements and the naturally occurring corrosion process.
2. Installation of Cathodic Protection System and acceptance testing of buried piping which is typically performed during the installation of the piping or shortly thereafter.

In addition, there are two types of Cathodic Protection Systems

1. Galvanic Anode System - provide direct current (DC) for cathodic protection through the use of sacrificial anodes (typically 17 lbs. of magnesium) that corrode and are consumed to mitigate corrosion of the pipe.
2. Impressed Current Systems (Rectifiers) - provides cathodic protection through the use of an external power supply, converting AC to DC, while utilizing specialized anodes that support the higher current demands for larger piping systems.

In summary all cathodic protection systems require the following:

- Proper protective coatings
- Isolation from other metallic structures

- Test boxes with anodes & lead wires
- Periodic inspection and testing
- Periodic upgrades (remediation measures) to provide for extended life of the asset

Program Justification:

The work identified is in applicable corrosion control programs and mandated by Federal CFR Title 49- Transportation, Subpart I Pipeline Safety Part 192 and 16 NYCRR Part 255 Transmission and Distribution of gas.

The work can be either routine expense work or capital depending on the activity being performed. Typically testing and monitoring are normal operating expenses to maintain the asset. Capital work is consists of recoating of mains on bridges, installation of test stations with anodes, and installation of insulator joints on mains and services which substantially extends the life of the asset.

Program Cost Breakdown:

CAPEX \$000	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Corrosion	927	1,005	995	984	1,066

Customer Benefit:

Minimal customer impact is expected during the performance of these corrosion control programs and construction of these projects. Customers can benefit from the program in the following ways:

- Improved public safety due to reduced risk of gas incidents;
- Fewer unplanned service interruptions; and
- Fewer unplanned disruptions to traffic on roads

Alternatives

Alternative 1: Status Quo

Continue to perform corrosion control programs in accordance with code and industry standards.

Alternative 2: Discontinue the corrosion program

This is not an option because it conflicts with both state & federal pipeline safety codes.

Studies/References that Support the Program:

This program is in accordance with the Company's standards and complies with Federal CFR Title 49- Transportation, Subpart I Pipeline Safety Part 192 and 16 NYCRR Part 255 Transmission and Distribution of gas.

Program Title: Integrity Management Program (“IMP”) - KEDNY

Spending Rationale:

☒ Mandated

☐ Customer Connections

☐ Reliability

☐ Non-Infrastructure

Brief Description:

The IMP program covers projects related to the management of KEDNY gas transmission system, specifically, the projects that are components of the US Department of Transportation’s (“DOT”) mandated IMP.

The Pipeline Safety Improvement Act of 2002 (“2002 Act”) requires operators of DOT-reportable gas transmission systems to develop and implement an IMP for all pipelines operating above 20 percent specified minimum yield strength (SMYS) in a high consequence area (HCA). The Pipeline Safety, Regulatory Certainty, and Job Creation Act of 2011 (“2011 Act”) mandates that Pipeline and Hazardous Material Safety Administration (“PHMSA”) consider whether the existing transmission IMP should be expanded beyond the current requirements, including increased inspections of IMP-covered pipelines using in-line inspection (“ILI”) technology.

KEDNY proposes an updated IMP that incorporates the elements of the current IMP along with proactive programs such as retrofitting pipelines for ILI including free swimming, robotic and tethered tools. The proposed IMP enhancements provide the greatest amount of risk reduction, thereby improving system safety and reliability. Additionally, it is anticipated that the program will enable the Company to comply with PHMSA’s pending regulatory requirements that are anticipated to become effective prior to the beginning of the Rate Year.

Program Justification:

Pursuant to the 2002 Act, the DOT promulgated rules on managing the integrity of transmission pipelines used by the gas and hazardous liquids industries under 49 CFR Part 192.901 – 192.951, which became effective on January 14, 2004. These regulations require pipeline operators to develop and implement an IMP for “covered” transmission pipelines, which are defined as certain pipelines in HCAs. The program required that the first cycle of pipeline assessments be completed no later than 2012. Reassessments are required to be completed at intervals not exceeding seven years thereafter from the last assessment. The assessments are comprised of external corrosion direct assessment (ECDA) and ILI. The results of each operator’s program are summarized and reported to the DOT on an annual basis.

Pipeline safety laws and regulations constantly evolve driving progressive changes in utility operations and asset management. San Bruno and several other high-profile pipeline incidents have set in motion recommendations, proposed rulemaking, and the

2011 Act signed into law on January 3, 2012. The 2011 Act, and the regulations to follow, will create very significant compliance challenges for the gas LDCs. In 2016 PHMSA issued a Notice of Proposed Rulemaking (NOPR) that will address the 2011 Act mandates and implement a number of additional changes to the regulations for gas pipelines. The NOPR has proposed the following significant items that will affect the IMP:

- Make all pipeline segments operating at or over 20 percent SMYS ILI enabled
- Develop requirements for medium consequence areas (MCA)
- Consider reduction of the IMP reassessment time cycle
- Reduce or eliminate the use of ECDA
- Require advanced risk modeling, including quantitative assessments
- Enhanced anomaly repair criteria
- Revise definition of “Transmission Pipeline”
- Develop a “Crack Like Flaw” evaluation program
- Enhanced gas quality monitoring program

Proposed rulemaking by PHMSA in response to the 2011 Act is expected in the second quarter of 2019.

Program Cost Breakdown:

CAPEX \$000	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
CapEx	3,003	5,500	21,501	20,000	28,000

Customer Benefit:

The program seeks to further reduce the risk of operating the gas transmission system, which will improve public safety and the reliability of the gas delivery system.

Alternatives:

Alternative 1: Maintain Current IMP

Proceed with the current IMP utilizing current inspection methods until US DOT/PHMSA issues final rule making from the Pipeline Safety Act of 2011. Proceeding with the current IMP plan does not position the Company to improve on risk reduction or public safety.

This approach also fails to account for the likely impact of expected future rule making. Compliance with new code requirements will likely be required within a prescribed schedule. The established regulation time frame will likely require accelerated project and assessment schedules. Accordingly, the Company risks not meeting new established

deadlines or having to spend on an accelerated basis, which is not effective. The new proposed rulemaking also has provisions for large fines for non-compliance and not meeting deadline requirements.

Current vs Proposed Assessment Method Summary

Description	MAOP >124psig	DOT >20% SMYS	IMP
Transmission Pipe (Miles, Total)	98.15	69.6	69.6
Existing IMP			
ECDA	54.8 (56%)	54.8 (79%)	54.8 (79%)
ILI	14.8 (15%)	14.8 (21%)	14.8 (21%)
Sub Total	69.6	69.6	69.6
Proposed IMP			
ECDA	11.9 (12%)	11.9 (17%)	11.9 (17%)
ILI	60.3 (61%)	57.7 (83%)	57.7 (83%)
Sub Total	72.2	69.6	69.6

Studies/References That Support the Program:

Pipeline Safety, Regulatory Certainty, and Job Creation Act of 2011 (“Pipeline Safety Act of 2011”), signed into law by the President on January 3, 2012 (Public Law. No. 112-90).

Pipeline Safety: Safety of Gas Transmission Pipelines; Advance Notice of Proposed Rulemaking, Federal Register, Vol. 76, No. 165 (August 25, 2011).

NTSB Safety Study: NTSB/SS-15/01 PB2015-102735 (Integrity Management of Gas Transmission Pipelines in High Consequence Areas) – January 27, 2015

PHMSA Docket No. PHMSA-2011-0023 Revised Pipeline Safety Regulations (NPRM)

Appendix A

Project Breakdown

CAPEX \$000	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
<u>Pipeline Integrity - IMP - Brooklyn Backbone Newtown Crossing</u>	-	500	1,501	-	-
<u>Pipeline Integrity - IMP - Jamaica Bay Line ILI</u>	-	2,000	10,000	10,000	10,000
<u>Pipeline Integrity - IMP - Southern Line Robotic ILI</u>	-	3,000	10,000	10,000	18,000

Program Title: Pipeline Integrity (“IVP”) - KEDNY

Spending Rationale:

☒ Mandated

☐ Customer
Connections

☐ Reliability

☐ Non-Infrastructure

Brief Description:

This program covers projects related to the US Department of Transportation’s pending rules on IVP programs. The renewed Pipeline Safety Act of 2011 mandates that Pipeline and Hazardous Materials Safety Administration (“PHMSA”) establish rules requiring operators to demonstrate their pipelines are “Fit For Service.” This includes reviewing existing records to determine if prior strength tests (hydro static pressure tests) were completed at the time of construction, as well as other records that prove the pipeline is operating within design parameters. On January 10, 2011, PHMSA issued advisory bulletin ADB-11-01 directing operators to conduct a comprehensive records review and verification prior to issue of the final rule making.

KEDNY proposes an IVP Program that incorporates the elements of the proposed IVP rulemaking and PHMSA guidance document ADB-11-01 along with proactive programs, records review, pipeline replacement and the retirement of non-essential pipeline segments. The proposed IVP provides the greatest amount of risk reduction, thereby improving system safety and reliability. Additionally, it is anticipated that the program will better enable the Company to comply with PHMSA’s pending regulatory requirements.

Program Justification:

In 2016, PHMSA issued a Notice of Proposed Rulemaking (“NOPR”) that will address the 2011 Pipeline Safety Act mandates and implement a number of additional changes to the regulations for gas pipelines. Among the proposed are the establishment of maximum allowable operating pressure (“MAOP”) and testing mandates for existing pipelines. PHMSA has proposed eliminating the exemption clause for establishing the MAOP of pre-1970 “grandfathered” pipe, which allows certain pipelines to operate at the highest actual operating pressure to which they were subjected during the five years prior to July 1, 1970, without having to perform a pressure test. PHMSA has also proposed that all pipelines not previously pressure tested at or above 1.1 times MAOP should be required to be pressure tested in accordance with current regulations. Another initiative proposed is PHMSA’s IVP, which will require operators lacking certain records to conduct pressure tests to confirm MAOP, and require operators with missing records, inadequately validated or traceable material documentation (“TVC”) to design and implement a program to establish material properties by one or more of the following methods: (1) cutting out and testing pipe samples; (2) institute non-destructive testing; (3) field verification of code stamp for components such as valves, flanges, and fabrications; or (4) other verifications.

Some pipelines without adequate material and pressure test documentation will be required to be retired or replaced. The IVP will also require an operator to develop a “Fit for Service Program” to establish that all pipelines are operating within their design parameters. On January 10, 2011 PHMSA issued advisory bulletin ADB-11-01 directing operators to conduct a comprehensive records review and verification prior to issue of the final rule making.

The Act requires PHMSA to:

- Issue rules to eliminate grandfathering of non-hydrostatically tested pipe satisfying the following three criteria: (i) installed prior to 1970, (ii) having a MAOP >30% specified minimum yield strength (SMYS), and (iii) are located in HCAs. Such pipelines will now be subject to hydrostatic testing. (The threshold of 30% SMYS supports recent studies which have shown that pipe operating below the 30% level will fail as a leak as opposed to rupture.)
- Require operators to confirm the records they use to justify MAOP (TVC)
- Re-Hydro test pipe segments
- Run in-line inspection tools (ILI)
- Abandon/retire pipelines
- Replace pipelines
- Material sampling to establish properties
- Advance fit for service analysis
- Enhanced internal corrosion monitoring

Program Cost Breakdown:

CAPEX \$000	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Pipeline Integrity - IVP	2,238	3,224	4,700	4,000	5,000

Customer Benefit:

The program seeks to further reduce the risk of operating the gas transmission system, which will improve public safety and the reliability of the gas delivery system. The balanced approach focuses on smaller pipeline segments allowing levelized spending year to year.

Alternatives:

Alternative 1: Maintain current IVP

Do not proceed with the IVP Program until such time as USDOT/PHMSA issues the final rule based on the Pipeline Safety Act of 2011. Proceeding with the current IVP plan does not position the Company to improve on risk reduction or public safety. This approach also fails to account for the likely impact of expected future rule making. Compliance with new code requirements will likely be required within a prescribed schedule. The established regulation time frame will likely require accelerated project and assessment schedules. Accordingly, there is a risk of not meeting new established deadlines and could lead to spending on an accelerated basis which is not necessarily effective. The new proposed rulemaking also has provisions for large fines for non-compliance and not meeting deadline requirements.

Studies/References That Support the Program:

Pipeline Safety, Regulatory Certainty, and Job Creation Act of 2011 (“Pipeline Safety Act of 2011”), signed into law by the President on January 3, 2012 (Public Law. No. 112-90).

Pipeline Safety: Safety of Gas Transmission Pipelines; Advance Notice of Proposed Rulemaking, Federal Register, Vol. 76, No. 165 (August 25, 2011).

PHMSA Advisory Bulletin (ADB-11-01) 1/10/11

PHMSA Docket No. PHMSA-2011-0023 Revised Pipeline Safety Regulations (NPRM)

Appendix A

Project Breakdown Capex

CapEx (\$000)	FY 2021	FY 2022	FY 2023	FY 2024
Pipeline Integrity Verification Coney Island Spur - Replace BQ 1202	1,750	-	-	-
Pipeline Integrity Verification Coney Island Spur - Replace BQ 1104	250	2,000	-	-
Pipeline Integrity Verification Coney Island Spur - Replace BQ 1216	525	2,100	-	-

Pipeline Integrity - IVP - Spur - 20" Spur to South Staten Island Gate; Tie-in, Tee, and Station Piping	525	-	3,500	-
Pipeline Integrity - IVP - Jamaica Bay Valve 1117 & 1045	-	600	500	4,500
Reactive Main Replacement	500	510	520	530
Pipeline Integrity – IVP- Spur to ST Albans Gate	-			500

Program Title: Valve Installation and Replacement Program – KEDNY

Spending Rationale: ☒ Mandated ☐ Customer Connections
☐ Reliability ☐ Non-Infrastructure

Brief Description:

The Valve Installation and Replacement Program addresses valve replacements necessitated by ongoing annual inspections in addition to new valve installations that enhance system resiliency. The program will strengthen the emergency response capabilities of the gas organization by improving the level at which Field Operations can safely and efficiently isolate sections of the distribution system while ensuring minimum customer impact and will benefit KEDNY’s customers by reducing the duration of future outages.

Program Justification:

KEDNY is required by federal (49 CFR 192.181) and state (16 NYCRR 255.181) regulations to install, inspect, maintain and operate critical pipeline valves on all gas distribution systems. These valves facilitate the rapid shutdown of distribution piping or regulator stations during gas emergencies such as third-party damage, water intrusion, or other operational reasons. The valves also facilitate maintenance and pipe replacement activities on associated distribution piping. Ensuring all critical valves are properly maintained is a key public safety function and is critical to the effective operation of the Company’s gas distribution system.

In New York, the Instrumentation and Regulation group is responsible for performing annual valve inspections and any resulting repair and/or replacement work identified through the inspections. Program status and compliance is reported monthly. Gas Asset Management has enterprise-wide responsibility for the Valve Installation and Replacement Program. This includes valve selection criteria and determination, as well as development of system isolation districts. The Long Term Planning & Operations Engineering and Project Engineering & Design teams also provide ongoing support to Field Operations through diagnosis of inoperable valves, identification of alternate valves and selection of new valves.

Program Cost Breakdown:

CAPEX \$000	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Valve Installation Replacement Program KEDNY	142	142	146	146	149

Customer Benefit:

Successful execution of the program will ensure the safety and reliability of the gas assets while focusing on improvements in customer satisfaction. The primary driver for this program is to improve distribution system and customer reliability while maintaining the highest standards for safety of the gas distribution assets. The program will minimize the unplanned release of gas during restoration of damage to Company facilities.

Alternatives:

Alternative 1: Do Nothing

The valves found to be deficient will need to be managed on a case by case basis, creating process and investment inefficiencies. Lack of the ability to properly plan and employ uniform criteria to these issues increases risk to the Company and can portray a negative image of the organization to customers, investors and regulators.

Studies/References That Support the Program:

1. Outage Restoration Costs Study

Estimates for relighting customers and recovering from a system outage have been prepared to quantify the impact of outages related to insufficient system capacity during periods of peak demand and severe winter cold.

Actual relight costs have been captured from recent incidents to quantify company expenses related to restoring service. These were all related to outages that occurred for reasons other than insufficient system capacity and operations were conducted under benign weather conditions. It is likely that during severe winter weather, costs would increase.

The claims data related to burst pipes and equipment damage due to a lack of heat during severe cold weather was captured from National Grid incidents in other jurisdictions. The combined cost of relighting customers and resolving claims in those incidents averaged \$1,764 per customer. Recognizing the amount of variability in different incidents such as weather conditions, different types of neighborhoods, variable labor costs, economies of scale, etc., for purposes of evaluating the benefits of reinforcement projects, an average value of service restoration costs and claims of \$1,000 per customer is used.

Program Title: Gas Meter Change Program – KEDNY

Spending Rationale: ☒ Mandated ☐ Customer Connections

☐ Reliability ☐ Non-Infrastructure

Brief Description:

KEDNY’s Gas Meter Change Program is the capital labor required to replace gas meters that are retired from service due to required periodic testing, damage, failure, or any other reason.

Program Justification:

The Commission’s regulations require random sampling of gas meter performance on an annual basis. Meters are classified based on manufacturer/model, and the number of meters to be tested within each of these classifications is determined by the population size. The Commission’s regulations also require remediation of meters that do not meet the required level of accuracy. The Company is typically allowed eight years to remove and replace a “failed” meter population. The Commission has the discretion, however, to require utilities to remove the population at a faster rate. In addition, the regulations allow for the retirement of meter groupings. KEDNY currently has meters in each of the meter change program types (random, remediation, and retirement). The quantity of meters changed annually is based on the prior year’s performance and remediation program status.

In addition to the mandated programs, the Company also initiates requests to change meters based on performance. These meters are known as “change for cause” meters.

Program Cost Breakdown:

CAPEX \$000	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Gas Meter Change Program	4,329	4,438	4,593	4,708	4,825

Customer Benefit:

Testing and replacing meters supports accurate meter reading and customer billing.

Alternatives

None

Program Title: Meter Purchases – KEDNY

Spending Rationale: ☒ Mandated ☒ Customer Connections
☐ Reliability ☐ Non-Infrastructure

Brief Description:

This program includes the purchase, test, processing, and delivery of gas meters and associated instrumentation to support KEDNY’s Mandated Meter Test/Replacement Program, Customer Connections, and continued Customer Meter Service (CMS) operations. The estimated number of meters required to support these programs for FY20 – FY24 are:

CAPEX \$000	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Purchase Meters (Customer Connections)	1,812	1,848	1,885	1,923	1,961
Purchase Meters (Replacements)	3,623	3,736	3,827	3,903	3,982
Total	5,474	5,584	5,712	5,826	5,943

Each year, KEDNY is required to randomly select and remove from service a quantity of meters to be tested for accuracy. The number of meters removed and tested is sufficient to assure a statistical confidence level of 95%. Test results are entered into a program which performs the statistical calculations based upon an approved ANSI Standard. The NYS PSC has set accuracy limits for both Residential (AQL 10%), and Commercial (AQL 20%) meter types. Meter groups which fall beyond the specified limits are placed in a retirement program and are subsequently removed from service and retired.

This program only includes the cost of the meters and does not include the installation of meters (see Meter Change program). This program also does not include AMR meter equipment.

Program Justification:

The primary driver for meter and metering instrumentation purchases is compliance with state regulations governing meter accuracy and measurement of gas usage for customer bills.

New York State PSC requirements stipulate a random sample and associated remediation/ retirement program for installed gas meters.

In addition to the mandated meter change program, meters are required to support customer connections, as well as to support CMS operational requirements (load change, meter and/or service relocations, damage, and stopped meters).

Program Cost Breakdown:

CAPEX \$000	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Purchase Meters (Customer Connections)	1,812	1,848	1,885	1,923	1,961
Purchase Meters (Replacements)	3,663	3,736	3,827	3,903	3,982
Total	5,475	5,284	5,712	5,826	5,943

Customer Benefit:

- Metering and billing accuracy
- Fewer unplanned service interruptions
- Ensure meters meet safety standards

Alternatives:

Alternative 1: Partial deferral of meter replacements

This option is not viable as it would result in violation of regulatory requirements or result in our inability to support fiscal year customer connections.

Alternative 2: Do nothing

This option is not viable as it would violate regulatory requirements, adversely impact customer satisfaction, and result in our inability to support fiscal year customer connections.

Program Title: Transmission Station Integrity Program – KEDNY

Spending Rationale:

☒ Mandated

☐ Customer Connections

☐ Reliability

☐ Non-Infrastructure

Brief Description:

This program covers projects involving the pressure regulating facilities and heaters utilized on the Company's gas system and related to the US Department of Transportation's proposed rulemaking on Pipeline Safety: Safety of Gas Transmission and Gathering Pipelines. The renewed Pipeline Safety Acts of 2011 & 2016 mandate that Pipeline and Hazardous Materials Safety Administration ("PHMSA") establish rules requiring operators to demonstrate their pipelines are "Fit for Service." This includes reviewing existing records to determine if prior strength tests (hydro static pressure tests) were completed at the time of construction, as well as other records that prove the pipeline is operating within design parameters. On January 10, 2011, PHMSA issued advisory bulletin ADB-11-01 directing operators to conduct a comprehensive records review and verification prior to issue of the final rule making. On August 25, 2011, PHMSA issued an Advance Notice of Proposed Rulemaking regarding regulations governing the safety of gas transmission pipelines, and on April 8, 2016, PHMSA issued a corresponding Notice of Proposed Rulemaking to revise the Pipeline Safety Regulations applicable to the safety of onshore gas transmission and gathering pipelines. The mandates, advisory bulletin, and notices also apply to transmission-connected pressure regulating stations and take stations (hereafter, "stations"). KEDNY proposes this Transmission Station Integrity Program ("TSIP"), consisting of proactive programs, records review, and capital projects which focus on the rehabilitation, partial replacement, or full replacement of stations that do not meet the requirements of Fit for Service as set forth in the proposed rulemaking. The project will fund the project development phase for one station in FY 2021, and project development phase for one station and construction phase for one station in each of FY 2022, 2023, and 2024.

Program Justification:

The April 8, 2016 issuance of the Notice of Proposed Rulemaking (NPRM) by PHMSA addresses the 2011 Pipeline Safety Act mandates and proposes to implement a number of additional changes to the regulations for stations. Among the changes under consideration are the establishment of maximum allowable operating pressure (MAOP) and testing mandates for existing facilities. PHMSA is considering eliminating the exemption clause for establishing the MAOP of pre-1970 "grandfathered" pipe, which allows certain stations to operate at the highest actual operating pressure to which they were subjected during the five years prior to July 1, 1970, without having to perform a pressure test. PHMSA is also considering whether all stations not previously pressure tested at or above 1.1 times MAOP should be required to be pressure tested in accordance

with current regulations. Another initiative under consideration is PHMSA’s IVP, which may require operators lacking certain records to conduct pressure tests to confirm MAOP, and require operators with missing records, inadequately validated or traceable material documentation (“TVC”) to design and implement a program to establish material properties by one or more of the following methods: (1) cutting out and testing pipe samples; (2) In situ non-destructive testing; (3) field verification of code stamp for components such as valves, flanges, and fabrications; or (4) other verifications.

A portion of stations will not meet the requirements set forth for being Fit for Service and will be required to be retired or replaced. The proposed TSIP) will address these stations through a variety of projects including the rehabilitation of existing stations, the partial replacement of station components, or the complete replacement of entire stations, as determined on a case-by-case basis. As system performance and reliability allow, some stations may be retired rather than replaced.

Program Cost Breakdown:

CAPEX \$000	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Transmission Station Integrity Program – KEDNY - CAPEX	180	3,000	17,000	17,340	17,687

Customer Benefit:

The primary customer benefit is the continuous, safe, and reliable supply of natural gas without unplanned outages due to pressure regulating facility shutdowns. Each transmission-connected pressure regulating station supplies many thousands of customers.

Alternatives:

Alternative 1: Do not proceed TSIP

Do not proceed with the TSIP until such time as US DOT/PHMSA issues the final rule based on the Pipeline Safety Acts of 2011 & 2016. Proceeding without any plan does not position the Company to improve on risk reduction or public safety. This approach also fails to account for the likely impact of expected future rulemaking. Compliance with new code requirements will likely be required within a prescribed schedule. The established regulation timeframe will likely require accelerated project and assessment schedules. Accordingly, there is a risk of not meeting new established deadlines or spending on an accelerated basis which is not necessarily effective. The new proposed

rulemaking also has provisions for large fines for non-compliance and not meeting deadline requirements.

Studies/References that Support the Program:

The Protecting our Infrastructure of Pipelines and Enhancing Safety (PIPES) Act of 2016 signed into law by President Barack Obama on June 21, 2016 (Bill S.2276)

The Pipeline Safety, Regulatory Certainty, and Job Creation Act of 2011 signed into law by President Barack Obama on January 3, 2012 (Public Law. No. 112-90)

Pipeline Safety: Safety of Gas Transmission and Gathering Pipelines; Notice of Proposed Rulemaking, Federal Register, Vol. 81, No. 68 (April 8, 2016)

Pipeline Safety: Safety of Gas Transmission Pipelines; Advance Notice of Proposed Rulemaking, Federal Register, Vol. 76, No. 165 (August 25, 2011)

PHMSA Advisory Bulletin (ADB-11-01), issued January 10, 2011

Program Title: I&R Field Test & Training Lab- KEDNY

Spending Rationale: ☐ Mandated ☐ Customer Connections

☐ Reliability ☒ Non-Infrastructure

Brief Description:

This project is to design and build a company instrumentation and regulation (“I&R”) field test and training lab in the form of a pressure regulation facility centrally located in KEDNY’s service territory. This fully functioning station will operate on compressed air instead of natural gas and will provide valuable system and employee development using current gas industry configurations and varied operating conditions.

The sustainable design approach will allow plug and play of a variety of equipment and piping layouts identical to those found in actual stations, that will be used to simulate various field scenarios; *i.e.*, normal operations, routine maintenance practices, testing of current and new equipment types, methods of over pressure protection layers, simulated varied weather conditions, and other abnormal conditions (“AOCs”).

This lab environment will provide employees; including supervisors, field workers and design engineers, the opportunity to practice diagnosing and controlling emergencies and other AOCs in a safe and controlled manner, while increasing their knowledge and understanding of station operations and design.

Justification:

There is an increased focus on gas utilities to ensure they provide sufficient training and evaluation practices for any individual working on gas systems. Recent events that have occurred in the natural gas utility sector have prompted re-evaluation of a Company’s Operator Qualification Programs and learning and development methodologies.

This year-round, hands-on field lab will create an environment where employees can learn the equipment, recognize and diagnose malfunctions and AOCs, as well as teaching proper response methods in a controlled manner using a safe medium. This will further develop the workforce beyond traditional learning methods, with actual hands on examples, enhancing their development and complementing observed testing and on-the-job training backed by classroom modules.

KEDNY has a diverse workforce that will benefit from this lab environment; assisting and supporting:

- Field Workers - who operate and maintain the regulation facilities and components on a day to day basis
- Design Engineers - who design or influence the design of regulation facilities and component selection

- Field Management - who need to have a fundamental knowledge of how pressure regulating facilities function to maintain the integrity and safety of the system

This will result in employees feeling more engaged and confident about designing, supervising, performing and/or maintaining the system during normal operations and properly reacting to AOCs.

Program Cost Breakdown:

CAPEX \$000	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Design & Build Pressure Regulation Facility	-	800	1,000	-	-

Customer Benefit:

The primary customer benefit is the continuous, safe, and reliable supply of natural gas and ability to efficiently design, construct, and maintain pressure regulation facilities. Additional benefits include enhanced ability to respond to and manage emergency situations and equipment malfunctions, enhanced employee safety, and the ability to evaluate new technologies and equipment in a functioning test environment.

Alternatives:

1. Do Nothing.

Maintain field training programs on live stations. This option does not provide training enhancements. Training is limited to situations actually occurring in real time; various AOCs cannot be presented. Risk reduction benefits are lost, as training is occurring on live equipment instead of in a sandbox environment.

Program Title: Gas Control Training Simulator –KEDNY

Spending Rationale: ☒ Mandated ☐ Customer Connections
☐ Reliability ☐ Non-Infrastructure

Brief Description:

Under the Federal Control Room Management Regulations CFR 192.631, pipeline operators are required to incorporate the use of scenario based situational training exercises. Regulations encourage that the training utilize simulator-based technology in the training of the Gas System Operators. This real-time, technological approach to training will allow operators to mimic actual system specifications while drilling actions under normal, abnormal, and emergency operating conditions. Under the Gas Control Training Simulator project, the Company's Gas Control and Critical Network Infrastructure personnel will purchase, design and implement a real time system modeled simulator for the training of new and in-place Operators.

Program Justification:

Currently, KEDNY relies on paper-based tabletop scenarios. This includes discussion between experienced operators in a highly theoretical round-table type format. Though actions are discussed; to include appropriate response to system conditions, there is no ability for each individual operator to test their knowledge and hone the application of academic theory in real-time drill/scenario conditions. Workforce turnover within the Control Room is expected to continue to increase year-over-year. Therefore, Gas System Operators will need to streamline the transfer of technical knowledge and real-world experience to this changing workforce. The use of simulation training will allow for real world accuracy in the modeling of gas system operations and allow for the training of real time responses to changing conditions while drilling actual system situations. This will allow for the dissemination of knowledge in a controlled training environment to enhance system information and enhance cross training and knowledge sharing.

As the industry continually moves towards a more responsive, central operations center as the standard, it will become a necessity to train policy and procedure in identification of, and response to, catastrophic gas system emergencies – as was recently experienced in the Merrimack Valley. Control Rooms will be asked to handle more oversight of pipeline operations, while maintaining a likewise increased comprehensive understanding and foresight of potential abnormal operations that could lead to emergency operations. Through the ability to mimic those abnormal and emergency system conditions in a controlled environment that mirrors the actual production Control Center SCADA terminals, the operators will be able to practice these worst-case scenarios. Through continual training in the evolving system, their individual abilities to predict dangerous conditions will improve, diagnosis response times will be reduced, and dangerous

pipeline condition mitigation actions will be improved to increase the overall safety and reliability of the gas system.

Program Cost Breakdown

CAPEX \$000	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Gas Control Training Simulator –KEDNY	83	475	-	-	-

Customer Benefit:

The main benefit to using a simulator is the ability to provide users with real time feedback in real world systems. This will allow Gas System Operators to recognize, react and determine the correctness of their actions in real time to optimize gas system performance and to prevent real life emergency situations from occurring. The use of simulation will allow Gas System Operators to gauge the benefits of several operational decisions and their impacts on the systems they control with no impact to actual systems and with no impact to our customers. Simulators allow Operators to study problems at different levels with different outcomes; this allows them to understand the behaviors and interactions of the gas systems they control. Additionally, simulators are an effective means for teaching new Gas System Operators prior to actual operation of the gas system. Through the use of computer-based simulation we can dynamically show the behavior and relationship of all the simulated components and therefore better equip new operators with skills to succeed in a complex gas system.

Alternatives

Alternative 1: Do nothing

Doing nothing fails to deliver enhancements to operator training and does not allow operators to become more qualified to address all system operations and may result in the purchase of unneeded system supply. This alternative does not meet the company objective to train our controllers to actively manage system pressures, flows, normal, abnormal and emergency conditions and will adversely impact the safety and reliability of the KEDNY gas system.

Program Title: Heater and Regulator Station Management Program – KEDNY

Spending Rationale: ☐ Mandated ☐ Customer Connections

☒ Reliability ☐ Non-Infrastructure

Brief Description:

This program covers capital projects involving the pressure regulating facilities and heaters utilized on the Company's gas system. Regulating stations identified for full replacement are those that do not meet current company standards for design, including the following criteria:

- Severe corrosion; usually occurs where no cathodic protection was installed (*i.e.* Pre-DOT pipe; pre-1971)
- It is not cost effective to repair or modify
- Under capacity – the station is too small and would require new vaults, new piping with larger valves and regulators as identified by Gas System Planning
- Structural problems with vaults, coupled with flooding and traffic problems that need to be addressed

The program will also install new heaters to mitigate cold gas temperatures and to replace heaters nearing the end of their useful lives.

Using data from the annual Performance Testing ("PT"), Cathodic Protection ("CP") testing, risk assessments, on-site inspections, and technical assessments were made for each pressure regulating station taking into account pipe and equipment condition, regulator performance, corrosion data, heater and scrubber performance. In addition, Guided Bulk Wave Testing ("GBWT") has been used in regulator vaults to determine if there are any anomalies in the pipe within the vault penetrations. The results of these tests/assessments, combined with an analysis of the potential customer impact resulting from a station outage, were used to prioritize and schedule capital projects in the Heater and Regulator Station Management Program.

Program Justification:

Pressure Regulating Facilities: Planned replacements will eliminate regulating stations that no longer meet current company standards for design (*i.e.*, over pressure protection, vault penetrations, control lines) as well as regulatory requirements for the operation of the gas system – thereby improving public safety and enhancing the integrity of the gas system.

Collaboration with other programs such as the Main Replacement Program, System Reinforcements and System Reliability can change the scope of work for an existing

pressure regulation station by increasing flow, reducing flow or allowing the station to be retired.

An event at any vault could jeopardize the customers downstream through loss of supply or by over pressurizing the system. The program addresses corrosion issues, structural vault problems, obsolete pressure control valves, inadequate by-pass designs, accessibility and maintainability (automation is handled within a separate System Automation Program).

Pressure regulation rehabilitation to storm harden pressure regulating stations that are within the identified 100-year flood plain are part of the program. This program consists of making the vaults watertight by: installing Roxtec seals at all vault penetrations, water tight manhole covers, vent poles, water proof vault, and relocate telemetry to above grade cabinets.

Heaters: The Company's policy ("Management of Cold Gas Temperatures") recommends that heaters be considered for installations where pressure reductions of 200 psi or more occur. Because natural gas temperature will decrease approximately 14 degrees given a 200psi pressure drop, the temperature of the gas leaving a pressure regulating station can fall below freezing if heat is not added. On a cold day, flowing gas temperatures may average 40 degrees or less. After a 200psi pressure reduction, the gas will be flowing at 26 degrees or less. Frost heave can occur as ice forms below 32 degrees and piping can begin to lose strength (become more brittle) as temperature falls below 20 degrees.

The heaters in the program are earmarked for full replacement because they are reaching the end of their service lives. Natural gas heaters are made from carbon steel. They contain a glycol-water mixture, similar to the antifreeze in an automobile radiator. These heaters have a life expectancy of approximately 25 years, which can be extended or diminished according to maintenance practices. However, at some point, the integrity of the steel tubes within the heater can become compromised and may result in a leak. Since all of these heaters are connected to transmission piping, they are subject to higher pressures and the impact of a leak or tube failure can be catastrophic.

There have been past pipeline failures on KEDNY affiliates' systems due to increased stresses associated with cold gas being introduced into the distribution network. The higher stresses have created axial contraction, coupled with frost heave and lower pipe toughness, which has resulted in weld failures. The installation of additional heaters will help to address these issues.

The heater program will also address process safety by upgrade heater burner management systems.

Program Cost Breakdown

CAPEX \$000	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Pressure Regulating Facilities	1,400	7,050	10,100	7,175	10,450
Heater Installation Program	-	500	2,500	750	750

Customer Benefit:

The primary customer benefit is the continuous, safe, and reliable supply of natural gas without unplanned outages due to pressure regulating facility shutdowns. Pressure regulating stations supply from hundreds of customers for low pressure distribution stations to hundreds of thousands of customers for high pressure stations.

Alternatives – Pressure Regulating Facilities

Alternative 1: Full replacement. The entire station is replaced from the station inlet to the outlet. A full replacement is appropriate when:

- Severe corrosion; usually occurs where no CP was installed (i.e. Pre-DOT pipe; pre-1971)
- It is not cost effective to repair or modify
- Under capacity – the station is too small and would require new vaults, new piping with larger valves and regulators as identified by Gas System Planning
- Structural problems with vaults or buildings, coupled with flooding and traffic problems that needs to be addressed

Cost: \$4,000,000 - \$9,500,000 per station dependent on size and location

Alternative 2: Station rebuild in lieu of replacement

The station can be rebuilt and brought to current standards. This may require the following:

- Control line rework or replacement
- Add third layer of over pressure protection
- Minor work to ensure adequate sustained CP readings
- New regulators or replacement of “soft goods”
- New sleeves, ladders, vault covers, and pipe stubs

- Recoating of all exposed piping with epoxy
- Vault rehabilitation
- Building rehabilitation

Station rebuilds can extend the life of an existing station by twenty years or more and are cost effective.

Cost: \$1,500,000 - \$3,200,000 depending on size and condition

Alternatives – Heaters

Alternative 1: Rebuild existing heaters. The main components of gas heaters can be replaced; however, the manufacturers of older heaters are generally no longer in business after 25 years. For example, BS&B, and NATCO are heater manufacturers that have gone out of business in the last 20 years. This presents a unique problem as replacement parts are not available and large components would have to be custom fabricated. The cost to remove and replace large components in the field coupled with the availability generally makes the cost to rebuild a heater as high (or higher) than the replacement cost.

Studies/References that Support the Program:

The Company's Distribution Integrity Management Program was put in place in 2011. The program includes a risk ranked approach for ranking pressure regulating facilities according to Health & Safety Risks and the Technical risks associated with their age and condition.

TI 020040 - Management of Cold Gas Temperatures. This TI provides the Company's general strategy which is that all stations with a pressure drop of 200 psi or greater should have heaters where practical. It supports the operation of natural gas heaters and the need to add or replace heaters.

Program Title: System Automation & Control - KEDNY

Spending Rationale: ☐ Mandated ☐ Customer Connections

☒ Reliability ☐ Non-Infrastructure

Brief Description:

This program will install Remote Terminal Units (“RTUs”) at multiple city gate stations and regulator stations located throughout KEDNY’s service territory. RTUs are installed locally at city gate and regulator stations to provide temperature, pressure and flow data back to the Gas Control Room. Where required, the RTUs can also monitor gas detectors, intrusion alarms and allow Gas Control to adjust flow and pressure set points at the regulator stations. Data is transmitted via phone lines or cellular networks. The automation projects include raise/lower controllers to remotely adjust pressure on the gas system. Gas analyzer projects are also included to provide gas composition and BTU content of the gas.

The objective of the program is to increase operational understanding of the system to identify abnormal operating conditions and taking a proactive approach to alarm management in support of recent PHMSA requirements (i.e. Control Room Management). Project delivery serves to standardize operations, maintain custody check metering and increase control and monitoring at city gate stations and regulator stations. The program also adopts a best practice with respect to check metering and leak management.

Program Justification:

The system automation program is necessary to enhance system reliability. Increasing the level of automation at pressure regulating stations enhances the ability of Gas Control to recognize abnormal operating conditions, pinpoint problems and take corrective action. Changes in federal regulations for Control Room Management focus on increasing system awareness and providing proactive response to abnormal operating conditions. The proposed program supports compliance with these regulations. This program also supports the standardization of telemetry across KEDNY’s gas transmission and distribution system. Enhanced calibration of network models from automation and telemetry data improves the accuracy of network analysis and enhances the ability to forecast future capital investment in system reinforcements, which leads to more efficient capital investment. This program also enhances pressure management of the system within the maximum allowable operating pressure limits (“MAOP”).

Currently, the KEDNY gas system has a limited amount of system automation – 67 percent of the pressures regulating stations are equipped with some form of telemetry while 33 percent of the system relies on paper chart recorders. Some of this equipment, including modems and teledscadas and metameters was installed many years ago and has

become obsolete. Updating this obsolete equipment supports the standardization of telemetry across KEDNY's gas transmission and distribution system.

There are 315 governors (LP stations) in KEDNY's service area, of which 212 are automated (63%). Since the 2015 rate case 30 stations have been automated and 6 new stations were built and automated. The goal is to automate 16 stations per year.

The recent change from traditional Gulf gas supplies to Marcellus shale gas has brought about a significant need for new equipment to measure and monitor the gas quality at change of custody points. Where gas is introduced into the National Grid system, gas monitoring instruments are needed to monitor odorant levels, BTU, composition, hydrates, and hydrocarbon dew point ("HCDP"). This equipment will be installed at take stations (transfer of custody points).

Also, due to the increased scrutiny placed on system automation in the aftermath of the San Bruno pipeline incident, it is anticipated that federal regulations will require additional levels of system automation on both transmission and distribution systems.

Program Cost Breakdown

CAPEX \$000	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
System Automation & Control	1,394	1,394	1,700	1,734	1,734

Customer Benefit: More reliable system performance with fewer customer outages.

The advantages of system automation and telemetry are that the source and location of any system problem can be more readily and accurately identified from the Gas Control Center. Crews can be dispatched immediately to the location of the problem. This process saves valuable time and will reduce the need to wait for customers to call in and report a problem. In addition, the removal of paper chart recorders delivers a more accurate and timely record of station pressures and this information is also available for Gas Planning.

Alternatives:

Alternative 1: Do nothing

Doing nothing does not meet the long-term company objective to actively manage system pressures and leak activity. This alternative will leave approximately 33% of this region without the ability to remotely manage operating pressures.

Studies/References that Support the Program:

National Grid Policy PL 030002 – SCADA Instrument & Control

This policy requires that new telemetry points are approved by Gas Control in accordance with the U.S. Department of Transportation - Pipeline and Hazardous Materials Safety Administration (PHMSA) Control Room Management standards (49CFR 192.631)

Program Title: Pressure Regulation Special Projects - KEDNY

Spending Rationale:

☐ Mandated

☐ Customer Connections

☒ Reliability

☐ Non-Infrastructure

Brief Description:

This program covers special capital projects involving transmission pressure regulating stations and custody transfer stations that are not included in other program budgets. These facilities have the highest potential customer impact and have multiple elements that ensure adequate and safe delivery of natural gas to customers. Depending on the asset, these projects may include complete overhaul or partial rebuild of a station or replacement of obsolete equipment. Projects may also incorporate odorization, gas quality validation, pressure regulation, and process pre-heating equipment. Newly constructed sites will also include state of the art telemetry and remote operable equipment. This program also includes installation of additional layers of overpressure protection equipment at transmission pressure stations. This work reduces the risk of over pressurization and the consequences it would have on the Company's systems. A list of the proposed projects is included in the cost breakdown table, below.

Program Justification:

The Pressure Regulation Special Projects are complex projects typically located at city gate stations that operate at transmission pressure. A typical city gate station overhaul includes replacement of obsolete equipment, building improvements, and any required piping replacement or reconfiguration to meet load demand. In conjunction with the facility rebuild/replacement, the Company also may take improvements to enhance odorant spill containment systems and/or install updated gas analyzers and measurement equipment. These improvements are described in more detail below.

Using data from the annual Performance Testing ("PT"), Cathodic Protection ("CP") testing, risk assessments and on-site inspections, technical assessments were made for each station considering pipe and equipment condition, regulator performance, corrosion data and heater and scrubber performance. Additionally, Guided Bulk Wave Testing ("GBWT") has been used in regulator vaults to determine if there are any anomalies in the pipe within the vault penetrations. The results of these tests and assessments, combined with an analysis of the potential customer impact resulting from a station outage, were used to prioritize and schedule the special capital projects described below.

Odorant Systems

The odorant systems at city gate stations are responsible for adequately odorizing the natural gas before it is introduced to the distribution network. Adequacy and functionality of these systems is critical to ensure natural gas is supplied safely to

customers. Odorant system upgrades will replace dated odorant injection systems (i.e. wick odorant systems or aging pump systems). Additionally, emphasis will be put towards enhancing odorant spill containment systems by adding vacuum exhaust systems (with charcoal canisters at discharge ducts), mercaptan sensing equipment, and spill containment kits. These measures will mitigate the impact of any loss in containment of odorant by enabling improved response time, while reducing the potential for public incident.

Gas Quality Verification

Ensuring a high standard of natural gas entering the Company's system from suppliers is important to maintain safe and reliable operation of the Company's system. To ensure adequate gas quality, new water and hydrogen-sulfide detection systems will be installed at custody transfer stations. These installations will be telemetered to the SCADA system that will enable Company personnel to monitor the concentrations of these compounds. In addition to these detection systems, outdated chromatographs will be replaced when necessary to better ensure accurate reflection of gas composition and heating values.

Program Cost Breakdown:

CAPEX \$000	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Tetco Relief Valve	6,400	-	-	-	-
Varick Retirement	1,624	-	-	-	-
North Brooklyn Mini Gate Refurbishment	2,100	3,800	300	-	-
Bowery Bay Mini Gate Refurbishment	100	500	3,500	300	-
Citizens Gate Bulkhead Replacement	7,060	3,100	-	-	-
King Plaza Mini Gate Refurbishment	-	-	250	3,500	500
Hyman Facilities Refurbishment	-	300	3,500	250	-
McGuinness Mini Gate Refurbishment	-	-	250	3,500	250
Bush Terminal (IF-09)	-	-	-	250	3,600
Sheepshead Bay	-	-	-	200	3,600
Jamaica Gate Station	-	-	-	-	250
Kennedy Gate Station	-	-	-	-	250
Total	17,284	7,700	7,800	8,000	8,450

Customer Benefit:

The primary customer benefit is the continuous, safe, and reliable supply of natural gas without unplanned outages due to facility shutdowns. Critical pressure regulating stations and custody transfer stations can supply to hundreds of thousands of customers.

Alternatives:

Alternative 1: Full replacement. The entire station is replaced from the station inlet to the outlet. A full replacement is appropriate when:

- Severe corrosion; usually occurs where no CP was installed (i.e. Pre-DOT pipe; pre-1971);
- It is not cost effective to repair or modify;
- Under capacity – the station is too small and would require new vaults, new piping with larger valves and regulators as identified by Gas System Planning.;
- Structural problems with vaults, coupled with flooding and traffic problems that needs to be addressed.

Cost: \$4,500,000 - \$7,000,000 per station dependent on size and location

Alternative 2: Station Rebuild. The station can be rebuilt and brought to current standards. This may require the following:

- Control line rework or replacement
- Minor work to ensure adequate sustained CP readings
- New regulators or replacement of “soft goods”
- New sleeves, ladders, vault covers, and pipe stubs
- Storm harden, install roxtec seals at all through wall penetrations, install new vault lid and new vault chimney and seal seam
- Recoating of all exposed piping with epoxy
- Vault rehabilitation
- Building rehabilitation
- Addition of overpressure protection
- Update of odorant systems
- Update of gas quality verification systems

Station rebuilds can extend the life of an existing station by twenty (20) years or more and are cost effective.

Cost: \$1,800,000 - \$4,000,000 depending on size, condition, and extent of rebuild.

Studies/References that Support the Program:

The Company's Distribution Integrity Management Program was put in place in 2011. The program includes a risk ranked approach for ranking pressure regulating facilities according to Health & Safety Risks and the Technical risks associated with their age and condition.

Program Title: Gas System Reliability – Gas Planning/Remote Control Valve (“RCV”) Program – KEDNY

Spending Rationale: ☐ Mandated ☐ Customer Connections
☒ Reliability ☐ Non-Infrastructure

Brief Description:

The Gas System Reliability program includes capital projects required to maintain system minimum pressures on the gas network in the event of an abnormal operating condition (failure involving a regulator station, gate station, critical main or other major pressure facility on the system). This program includes new RCVs on transmission pipelines in high consequence areas to improve emergency response capabilities and reduce risk. In the event of a pipeline failure that results in a release of natural gas, RCVs will allow control room operators to stop the flow of gas, isolate and shutdown a portion of the system, and mitigate further consequences utilizing a remote command.

Program Justification:

Gas planning reliability concerns include transmission and distribution systems with a limited number of feeds (*i.e.*, take stations or regulator stations), systems that are either weakly integrated or consist of long single-feed laterals, networks that contain a wide variety of operating pressures, and varying design philosophies associated with system and supply redundancy (*e.g.*, production plants, take stations, regulator stations).

Gas safety concerns focus on the ability to quickly and efficiently shut down gas supply remotely following a pipeline failure resulting in the release of natural gas to ensure the safety of the first responders, impacted gas customers, and the public. The use of RCVs also eliminates the need to locate and excavate manual valves.

The Company also anticipates that federal regulations will eventually require the installation of RCVs. The Pipeline and Hazardous Materials Safety Administration’s (“PHMSA”) May 2016 Notice of Proposed Rulemaking (“NPRM”) delayed consideration of whether to require RCVs to allow for further consideration of the issue, but the NPRM also includes a rule that would require consideration of RCVs as part of an operator’s maintenance program. The Company’s RCV program follows PHMSA criteria and will position the Company for eventual compliance.

Program Cost Breakdown:

CAPEX \$000	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Gas System Reliability – Gas Planning/Remote Control Valve ("RCV") Program	1,662	5,132	2,547	8,327	6,597

This includes all standard Gas System Reliability projects, and RCVs for the following valves:

- BQ1243
- BQ1238
- BQ1014
- BQ1009
- BQ1010
- BQ1005
- BQ1019

Customer Benefit:

The Gas System Reliability program ensures that service is maintained in the event of a failure on a major pressure facility. Reliability is improved by adding supply flexibility, integrating single feed systems, making progress to eliminate single feed systems, and by installing RCVs. Without this program, greater numbers of customers are at risk of losing service in the event of a facility failure.

KEDNY's goal is to proactively upgrade the existing valves or install new valves in certain high-volume and high-risk locations to enhance reliability and safety by reducing the amount of time needed to stop the flow of gas in the event of a pipeline failure thereby mitigating the consequences of any such event. Installation of RCVs will be undertaken in a manner that will ultimately comply with regulatory guidance.

Alternatives:

Alternative 1: Do Nothing

Removal of the Gas Planning Reliability program increases risk of system failures including pressures below minimum design levels and possible customer outages. If RCVs are not installed, a pipeline failure would require a manual shutdown of the transmission pipe. This may result in longer times to contain the incident and could result in more damage. Also, by not adding any RCVs the isolation area could be large in some instances, resulting in a larger loss of service to customers. Given pending PHMSA regulations, this option would leave the Company in violation of industry code requirements.

Studies/References that Support the Program:

Studies were run on the Company's network models using Synergi, which is an industry standard software. The models, which are validated on an annual basis, were loaded with the forecast provided by the Analytics, Modeling, and Forecasting ("AMF") Department. Individual facilities were taken out of service, and reliability projects were then identified to bring pressures back above minimum.

Several studies have been conducted regarding the benefits of RCVs. Oak Ridge National Laboratory in their report "Studies for the Requirements of Automatic and Remotely Controlled Shutoff Valves on Hazardous Liquids and Natural Gas Pipelines with Respect to Public and Environmental Safety" issued in October 2012 have mentioned that the swiftness of valve closure has a potentially beneficial effect on mitigating fire damage to buildings and personal property located in Class 1, Class 2, Class 3, and Class 4 HCAs when combined with fire fighter intervention. The study emphasizes that "rapid detection of the break followed by immediate implementation of corrective actions including closing block valves to isolate the damaged pipeline segment reduces the total volume of natural gas released which in turn reduces the radiant heat flux produced by combustion of the released natural gas." National Transportation Safety Board ("NTSB") in its accident report "Pacific Gas and Electric Company Natural Gas Transmission Pipeline Rupture and Fire San Bruno, California September 9, 2010" concluded that the damage from the accident could have been reduced if the pipeline operator had installed either automatic shutoff valves ("ASVs") or RCVs and issued recommendation of requiring that ASVs or RCVs be installed in high consequence areas and in class 3 and 4 locations. It is evident from these studies that the true benefit of RCVs is to minimize the loss of natural gas after the incident had occurred minimizing the impact of the incident on the operation of the gas system (such as pressure collapse due to a rupture). In addition, RCVs may shorten the duration of the event (*i.e.* gas fueled fire) and that could help to reduce the amount of damage resulting from the event.

Program Title: Storm Hardening – Remote Service Shutoff Valves - KEDNY

Spending Rationale: ☐ Mandated ☐ Customer Connections
☒ Reliability ☐ Non-Infrastructure

Brief Description:

KEDNY has more than 29,000 services within the Federal Emergency Management Agency’s (“FEMA”) 500-year flood zones. Approximately four percent of the Company’s total services are susceptible to storm surge. To mitigate the risk of flood damage to the Company’s facilities, the Storm Hardening program will install remotely operated shutoff valves and flood sensors within the FEMA defined flood zones across the operating region. Additionally, the program will also install a fixed communication network setup throughout the operating territory and within the FEMA flood zones that will allow National Grid to monitor and control the shutoff valves. The schedule for valve and network hardware installation is as follows:

	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Valve Installations	500	4,041	8,292	8,292	8,292
Network Installations	50	180	57	0	0

This will address two important objectives in the event of flooding. The first objective will be to stop the flow of gas to dwellings that experience flooding through actuation of a remote shutoff valves, thereby preventing a potential incident and ensuring the safety of our customers. The second objective is to provide an accurate count of customers impacted by flooding in real time, which will inform the Company’s storm response with respect to the resources needed to restore the impacted customers expeditiously. Furthermore, these valves give the Company the ability to remotely interrupt customers impacted by flooding on an individual basis without shutting down entire neighborhoods. KEDNY will constantly monitor and evaluate available technologies to potentially improve the Storm Hardening total solution.

Program Justification:

The Storm Hardening Program will shut off gas to customers that experience flooding and provide an accurate count of customers impacted – this will enable improved emergency response in the event of flooding. This targeted approach minimizes customer interruption by isolating only the affected customers (as opposed to shutting down larger gas service districts) and will inform the customer of the shutoff and alert the Company of the loss of service in real time. This will enable improved management of storm

restoration with specific focus on the affected customers. During Superstorm Sandy, the Company had to shut down much larger service districts because of there were no remotely operated shut-off valves. This resulted in the loss of service to a larger number of our customers for a significantly longer amount of time than would have been the case if remote shut off valves were in place. This program will also facilitate swift decision making focused upon affected regions, thus generating efficient execution of service restoration work and allowing improved customer satisfaction while further ensuring the safety and reliability of the system.

Program Cost Breakdown:

CAPEX \$000	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Storm Hardening	3,136	7,368	8,497	7,921	7,995

Customer Benefit:

Implementing these storm hardening measures will further ensure the safety and reliability of the gas assets within the flood zone while focusing on improvements in service delivery. This program will address the gas service reliability of the customers within the flood zone in the event of storm surge. Customer satisfaction is negatively impacted due to disruptions of gas service, inconvenience and company cost associated with the relight process. Conducting targeted interruption of gas service will reduce the customer impact and water intrusion in mains that has a long-lasting impact on the system. The recommended program will resolve future, recurring disruptions to customers in a flood zone due to service freeze ups during winter. This program will also generate improvements in emergency planning, incident management and public safety.

Alternatives:

Alternative 1: Limit program to FEMA 100-Year Flood Zone

This option highlights the minimum capital investment and operating expense requirements to install remotely operated shutoff valves only within the 100-year flood zone. Two different sets of customers, (one set with remotely operated shutoff valves and another without these valves), two different methods of emergency response will be called for in the event of flooding that exceeds the FEMA 100-Year zone. This not only impacts the response time but also increases the customer outages and puts customers and public at risk.

Alternative 2: Do Nothing

This option does not adequately address increased risks due to expected climate change impacts. Furthermore, this option also does not align with the efforts of the NYC Storm Hardening Collaborative, which aims to improve resiliency, planning, and strategies addressing the risk-factors of climate change. The Company has a commitment with The City of New York (“City”) to continue ongoing efforts of making the gas utility grid more resilient within its operating territory and strengthen it against severe weather events. Not implementing this Storm Hardening solution will negatively impact the relationship National Grid has with The City and presents itself with the risk of not addressing the effects of climate change. The collaboration between National Grid and The City will serve as a solid foundation for addressing the current and future challenges posed to our gas infrastructure by rising sea levels, extreme weather, and other deleterious impacts of climate change; not continuing this positive and productive relationship with The City will be detrimental to the efforts of The Company to protect its customers, stake holders, and infrastructure.

Studies/References that Support the Program:

This program is part of the NYC Storm Hardening Collaborative which aims to improve resiliency, planning, and strategies addressing the risk factors of climate change. National Grid has a commitment with The City of New York (“City”) to continue ongoing efforts of making the gas utility grid more resilient within its operating territory and strengthen it against severe weather events. The collaboration between National Grid and The City will serve as a solid foundation for addressing the current and future challenges posed to our gas infrastructure by rising sea levels, extreme weather, and other deleterious impacts of climate change.

Program Title: Grasmere Reliability Project - KEDNY

Spending Rationale: ☐ Mandated ☐ Customer Connections
☒ Reliability ☐ Non-Infrastructure

Brief Description:

The Grasmere Reliability Project improves reliability by enabling the Staten Island portion of the KEDNY territory to receive gas supply from Transco at the Grasmere Gate Station, improving supply diversity in the event of an abnormal operating condition. Staten Island is normally fed solely from TETCO gas supply. The project involves reconfiguring the piping at the Grasmere Gate Station to allow gas to be alternately sourced from Transco's interstate pipeline and requires additional overpressure protection measures. System integrity work at the Grasmere Gate Station will be performed in conjunction with this work.

The Grasmere Reliability project is expected to be in service before the 2021/22 winter season.

Program Justification:

Federal Code 49 CFR 192.623 and New York State 16 NYCRR 255.623 require the Company to maintain minimum pressures on the gas system to uphold reliable service to all firm customers. The purpose of the Grasmere Reliability Project is to ensure that these requirements are met by improving reliability and supply diversity.

Program Cost Breakdown:

CAPEX \$000	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Grasmere Reliability Project	50	100	5,142	-	-

Studies/References That Support the Project:

Studies were run on the Company's network models using Synergi, which is industry standard software. The models, which are validated on an annual basis, were loaded with the forecast provided by National Grid's Analytics, Modeling, and Forecasting (AMF) department. Additionally, AMF provided a forecast at a zip code level. There is a high degree of confidence in the accuracy of the modeling and forecast and that the appropriate reinforcement projects were identified.

Program Title: LaGuardia Backfeed Project - KEDNY

Spending Rationale: ☐ Mandated ☐ Customer Connections

☒ Reliability ☐ Non-Infrastructure

Brief Description:

The LaGuardia Backfeed project is required to maintain system minimum pressures on the gas network in the event of an abnormal operating condition. It will loop the Bowery Bay 60 psig system with the LaGuardia 60 psig system, both of which are single feed systems, thereby improving reliability on both systems.

The LaGuardia Backfeed project is expected to be in service before the 2022/23 winter season, but the exact scheduling will be dependent on the schedule of redevelopment by the Port Authority of NY & NJ as the main will be constructed on airport property.

Program Justification:

The purpose of the LaGuardia Backfeed project is to improve reliability by providing a backfeed to both the Bowery Bay 60 psig system and the LaGuardia 60 psig systems by looping both single feed systems together.

Program Cost Breakdown:

CAPEX \$000	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
LGA Backfeed	-	50	328	8,654	-

Customer Benefit:

The LaGuardia Backfeed project ensures that service is maintained in the event of a failure on either the Bowery Bay 60 psig system or the LaGuardia 60 psig system, both of which are fed by a single regulator station off of Con Edison's transmission main. Further, by interconnecting these two stations, it provides operational flexibility in the event that Con Edison needs to take a shutdown on a section of the transmission main that feeds these stations.

Alternatives

Alternative 1: Do Nothing

Removal of the LaGuardia Backfeed project increases risk of system failures including pressures below minimum design levels and possible customer outages on both the Bowery Bay 60 psig system and the LaGuardia 60 psig system. Both 60 psig systems serve LaGuardia airport and the greater local distribution system.

Studies/References That Support the Project:

Studies were run on the Company's network models using Synergi, which is industry standard software. The models, which are validated on an annual basis, were loaded with the forecast provided by National Grid's Analytics, Modeling, and Forecasting (AMF) department. Additionally, AMF provided a forecast at a zip code level. There is a high degree of confidence in the accuracy of the modeling and forecast and that the appropriate reinforcement projects were identified.

Program Title: Metropolitan Reliability Infrastructure (MRI) - KEDNY

Spending Rationale: ☐ Mandated ☐ Customer Connections
☒ Reliability ☐ Non-Infrastructure

Brief Description:

The MRI project will provide an operational loop to the existing Brooklyn backbone system through the installation of approximately 39,000 feet of 30 inch, 350 psig transmission main from Linden Boulevard in Brownsville to Maspeth Avenue in Greenpoint. This project will enable KEDNY's system to move an additional 850 Mdt/day by 2021 as full expansion of the Lower New York Bay Lateral project occurs and capacity increases from the Transco system at Narrows. The MRI will significantly increase system reliability and operational flexibility in the area. Further, the MRI project will reduce dependency on deliveries from Con Edison at the Newtown Creek delivery point.

The phases 1-4 of the MRI project are expected to be in service before the 2020/21 winter season. Phase 5 is expected to be in service before the 2021/22 winter season.

Construction is underway. To date, the project has installed about 20,000 feet of main, is incident free, on schedule, and within budget despite some challenges encountered. Additionally, stakeholder and community outreach has been extremely effective in keeping the public informed with planned activities. While it was included in the original scope, it has been decided to omit the 350 psig to 15 psig regulator station from the MRI project scope due to the fact that the regulator station is not immediately required and finding real estate for citing the station has been extremely difficult. The regulator station will be constructed under a separate project in the future when the need arises. Other significant challenges encountered include a difficult sewer crossing and other underground utilities that are not included in surveys or maps.

Program Justification:

KEDNY's gas system is designed for a peak day with an average temperature of 0°F (65HDD – Heating Degree Days) with 5% of the daily sendout as a peak hour. The peak demand is based on the same forecast utilized to develop the gas supply portfolio.

The primary driver of this strategy is network and supply reliability. The MRI project has been developed as part of the overall Long-Term Supply and Strategic Infrastructure Plan designed to increase system reliability throughout National Grid's gas distribution systems.

The MRI project provides the Downstate NY system with increased supply diversity, pressure support, outage contingency, and operational autonomy by reducing dependence

on gas supplies delivered from Con Edison at Newtown Creek. The project also will provide the ability to maximize the utilization of existing and proposed upstream capacity which will better position the company to meet the long-term supply needs of its customers over the next 15-20 years.

Program Cost Breakdown:

CAPEX \$M	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
MRI	63,941	100,000	25,600	-	-

Customer Benefit:

Completion of this project in a timely manner will ensure the continued reliability of the downstate New York gas distribution system and provide long-term system reliability enhancements to the overall system. This project, in conjunction with the commitments undertaken on upstream pipeline projects, will provide access to long-term gas supply availability and diversity benefits to the downstate systems and their customers.

The MRI Project will:

- Provide immediate system reliability benefits as it will allow supplies to be sourced from any of the directly connected supply points and moved to any point across the National Grid NY system, significantly reducing the current reliance on individual gate deliveries.
- Complete the main transmission supply loop in Brooklyn which will allow system independence from Con Edison transfers at Newtown Creek, an operational concern as the Con Edison system continues to grow and it will also allow National Grid to flow supply into the Newtown Creek system to Con Edison if future New York Facilities System operations require it.
- Allow for outages on sections of the Brooklyn Backbone system (the Company's highest risk rated pipeline) necessary to complete planned system integrity work.
- Allow for the use of remote controlled valves in the event of any system disturbance requiring a shut-down, without initiating service outages to hundreds of thousands of customers.
- Eliminate the need for projected system reinforcement requirements estimated at over \$50 million.

- Provide the ability to move incremental supplies from new gate capacity at both Narrows and the Lower New York Bay Lateral to any point across the system, including transfer points with Con Edison.

Alternatives

Alternative 1: New East River Connection

An alternative considered was the installation of a new connection across the East River which would be coupled with upgrades to the Con Edison system. While this would achieve some of the objectives of the MRI project, this option would *increase* the dependence on transfers from Con Edison. Further, as National Grid has contracted for capacity on Transco (Lower New York Bay and Narrows), and not on the Spectra NJ/NY project, there would be no incremental supply benefit realized, undermining the ability to serve future market demand. Lastly costs for such a project would likely be similar to the costs for the MRI project, without the same benefits, and therefore it is not the preferred alternative.

Alternative 2: Backbone Loop up Third Avenue

Looping the system up Third Avenue was also considered and could meet some of the objectives that the MRI project provides. However, this option, based on a high level constructability assessment, would likely be more expensive and challenging from a routing and construction perspective, and would not provide as many benefits as the proposed project.

Alternative 3: Do Nothing

Although the least cost option, a decision to do nothing does not meet the objectives outlined herein. System reliability and flexibility will continue to be challenged as load increases, utilization of new upstream capacity will be limited by operational constraints, and the ability to serve long-term system demand will be restricted.

Studies/References That Support the Program:

Studies were run on the Company's network models using Synergi, which is industry standard software. The models, which are validated on an annual basis, were loaded with the forecast provided by National Grid's Analytics, Modeling, and Forecasting (AMF) department. Additionally, AMF provided a forecast at a zip code level. There is a high degree of confidence in the accuracy of the modeling and forecast and that the appropriate reinforcement projects were identified.

Benefits

Reliability Benefits

- ☒ Avoids customer outages:
437,660
- ☒ Avoids service moratorium:
Northern Brooklyn
- ☒ Supports customer connection's forecast
- ☒ Addresses supply/capacity constraint or supply diversity needs

Other Customer Benefits:

- ☒ Reflects efficiency savings of \$50M

Safety Benefits:

- ☒ Enhances response time to Emergency Gas Leaks
- ☒ Enhances employee safety
- ☒ Increases automation (reduces human error)
- ☒ Enhances Public Safety

Societal Benefits/Externalities:

- ☒ Reduces use of Alt. Fuel

Program Title: Elmhurst Reinforcement and Reliability - KEDNY

Spending Rationale: ☐ Mandated ☐ Customer Connections
☒ Reliability ☐ Non-Infrastructure

Brief Description:

The Elmhurst Reinforcement and Reliability project will support increase in forecasted demand in the 2nd Ward of Queens and improve reliability through the installation of approximately 8,000 feet of 20 inch, 350 psig transmission main from 98 St & 50 Ave in Corona to 97 St & Astoria Blvd in East Elmhurst. This project will enable the LaGuardia Gate Station to be fed from the KEDNY transmission system as well as the Con Edison transmission system that currently feeds it. An interconnection with custody transfer metering and remote control valves will enable bidirectional flow between KEDNY and Con Edison as conditions warrant.

The project is expected to be in service before the 2024/25 winter season.

Program Justification:

KEDNY's gas system is designed for a peak day with an average temperature of 0°F (65HDD – Heating Degree Days) with 5% of the daily send-out as a peak hour. The peak demand is based on the same forecast utilized to develop the gas supply portfolio.

The Elmhurst Reinforcement and Reliability project will support continued increase in demand in the 2nd Ward of Queens, including at LaGuardia Airport, while reducing dependence on transferring gas from Con Edison to National Grid in the second ward of Queens. This improves reliability for both KEDNY and Con Edison in Elmhurst, Queens, by creating an interconnect that can be utilized to prevent outages in the event of a system emergency or other abnormal condition.

Program Cost Breakdown:

CAPEX \$000	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024*
Elmhurst Reliability	-	-	-	1,000	35,000

*Additional \$28,629M spending expected in years following FY 2024.

Customer Benefit:

Completion of this project in a timely manner will reinforce and improve reliability of the gas system in Queens.

The Elmhurst Reinforcement and Reliability Project will:

- Support increase in demand in the 2nd Ward of Queens, including the expansion of LaGuardia Airport
- Allows the LaGuardia Gate Station in East Elmhurst, Queens, to operate independent of or in conjunction with the Con Edison system based on system conditions
- Improves reliability by providing an interconnect, with custody transfer metering, between Con Edison and National Grid that can be used under abnormal operating conditions to prevent customer outages

Alternatives

Alternative 1: Non-pipe Alternative – Portable CNG Injection

Utilizing portable CNG injection was also considered and could temporarily improve system pressures and provide incremental localized supply. However, this option, based on a high-level constructability assessment, would likely be very challenging from a siting perspective, especially considering process safety concerns, would only be a temporary solution, and would not be adequate to support the demand increase projected for this area.

Alternative 2: Do Nothing

Although the least cost option, a decision to do nothing does not meet the objectives outlined herein. Forecasted increase in system demand would be limited by the Con Edison system's ability to support load additions. System reliability and flexibility will continue to be challenged as the flow from the LaGuardia Gate Station will continue to have a single feed from Con Edison's transmission main in the second ward of Queens rather than two feeds and establishing a new bidirectional exchange point.

Studies/References That Support the Program:

Studies were run on the Company's network models using Synergi, which is industry standard software. The models, which are validated on an annual basis, were loaded with the forecast provided by National Grid's Analytics, Modeling, and Forecasting (AMF) department. Additionally, AMF provided a forecast at a zip code level. There is a high degree of confidence in the accuracy of the modeling and forecast and that the appropriate reinforcement projects were identified.

Benefits
<u>Reliability Benefits</u> <input checked="" type="checkbox"/> Avoids service moratorium: 2 nd Ward of Queens <input checked="" type="checkbox"/> Supports demand forecast <input checked="" type="checkbox"/> Addresses supply/capacity constraint or supply diversity needs <u>Societal Benefits/Externalities:</u> <input checked="" type="checkbox"/> Reduces use of Alt. Fuel

Program Title: Marine Park Regulator Station Project - KEDNY

Spending Rationale: ☐ Mandated ☐ Customer Connections
☒ Reliability ☐ Non-Infrastructure

Brief Description:

The Marine Park Regulator Station Project is required to increase supply deliverability of the Floyd Bennet Field supply point that was constructed as part of the BQI project, and utilize the incremental volumes supplied by the Transco Northeast Supply Enhancement project. The project involves installing a new 740 psig to 350 psig regulator to enable 350 psig pressure to be achieved at the tie-in location to the existing transmission infrastructure. In addition, the project will install valving on the existing pipe to be utilized as a bypass during pigging operations. The new piping constructed as part of BQI from the Floyd Bennet Field supply point to Avenue U, which was tested and certified to 740 psig MAOP currently operates 350 psig and will operate at 740 psig after the project is complete.

Program Justification:

Federal Code 49 CFR 192.623 and New York State 16 NYCRR 255.623 require the Company to maintain minimum pressures on the gas system to uphold reliable service to all firm customers. The purpose of the Marine Park Regulator Station Project is to ensure that these requirements are met by increasing supply deliverability of the Floyd Bennett Field supply point.

Program Cost Breakdown:

CAPEX \$000	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Marine Park Regulator Station	99	999	22,769	-	-

Customer Benefit:

Completion of this project will increase supply deliverability from the Floyd Bennet Field supply point to avoid stranding gas supply and utilize the increase capacity from the Transco Northeast Supply Enhancement project.

Alternatives

Alternative 1: Non-pipe Alternative – Portable CNG Injection

Utilizing portable CNG injection was also considered and could temporarily improve system pressures and provide incremental localized supply. However, this option, based on a high-level constructability assessment, would likely be very challenging from a siting perspective, especially considering process safety concerns, and would only be a temporary solution. Additionally, this option does not allow the transmission system to receive incremental contracted supplies from the Northeast Supply Enhancement Project at the Floyd Bennett Field Supply Point.

Alternative 2: Do Nothing

A decision to do nothing would ultimately lead to a failure to comply with the regulations defined by Federal and New York State codes as conditions would continue to decay resulting in customer outages. In addition, restrictions on sales activities would be required in constrained areas and the Company could find itself in violation of its tariff and unable to utilize contracted Transco supply.

Studies/References That Support the Project:

Studies were run on the Company's network models using Synergi, which is industry standard software. The models, which are validated on an annual basis, were loaded with the forecast provided by National Grid's Analytics, Modeling, and Forecasting (AMF) department. Additionally, AMF provided a forecast at a zip code level. There is a high degree of confidence in the accuracy of the modeling and forecast and that the appropriate reinforcement projects were identified.

Benefits:

Benefits
<u>Reliability Benefits</u>
<input checked="" type="checkbox"/> Avoids service moratorium: Brooklyn/Queens
<input checked="" type="checkbox"/> Supports demand forecast
<input checked="" type="checkbox"/> Addresses supply/capacity constraint or supply diversity needs
<u>Societal Benefits/Externalities:</u>
<input checked="" type="checkbox"/> Reduces use of Alt. Fuel

Program Title: Compressed Natural Gas Special Projects – KEDNY

Spending Rationale: ☐ Mandated ☐ Customer Connections

☒ Reliability ☐ Non-Infrastructure

Brief Description:

This program covers special capital projects involving Compressed Natural Gas (“CNG”) vehicle fueling stations that are not included in other program budgets. These facilities provide alternative fueling for KEDNY vehicles and customer fleet vehicles. Depending on the station or asset, these projects may include complete replacement or partial replacement of a station equipment. Newly constructed sites will also include state of the art telemetry, advanced safety design, and reliability improvements. This work reduces the both risks to operational impacts and safety risks associated with the storage and use CNG. A list of the proposed projects is included in the cost breakdown table.

Program Justification:

The CNG projects are complex projects usually located on company property. A typical project involves the complete replacement of unreliable and obsolete equipment including compressors, high pressure storage, controls, drying, and dispensing systems. Additionally, other improvements at the station may be completed to expand or remove vehicle fueling facilities or features for fueling of other mobile equipment CNG equipment.

Data from process safety risk assessments, condition assessments, and an analysis of the potential company and customer impact resulting from a station outage, were used to prioritize and schedule the special capital projects described below.

Canarsie, NY CNG Station

The current CNG station is a hybrid of two different equipment systems and storage packs. That station provides both fast fill to fleets and slow filling for company vehicles. The different filling uses require improved operation and safety upgrades. The station compressor, controls, drying, and dispensing systems will be completely replaced with reuse of current pressure standard CNG storage vessels. Civil improvements will be completed to improve internal fueling access.

Greenpoint, NY CNG Station

The current CNG station is the most active station for company and customer fleet vehicles. The station also has the oldest and least reliable equipment and has been operating without compressor redundancy for several years. The station experiences monthly service interruptions and results in increased travel time for company vehicles.

Additionally, the station is utilized by larger class 6 and class 8 trucks than originally designed for. The station compressor, controls, and drying systems will be completely replaced with reuse of current pressure standard CNG storage vessels. Significant improvements to controls and safety systems will be completed.

Greenpoint, NY CNG Station Fueling Island Access

The current CNG station is the most active station for company and customer fleet vehicles. The station also has the oldest and least reliable equipment. The station experiences monthly service interruptions and results in increased travel time for company vehicles. Additionally, the station is utilized by larger class 6 and class 8 trucks than originally designed for. The station fuel island and dispensing systems will be replaced with equipment appropriate for heavy duty vehicles, high usage, and with high reliability.

KEDNY CNG Contract Closeout

The contract closeout is a onetime charge associated with the ending the primary maintenance service agreement supporting the CNG stations. The charge is a deferment of capital improvements installed by primary operation and maintenance contractor.

KEDNY CNG Station Blanket

The Blanket program involves proactive equipment upgrades and replacements among CNG station to address emergency issues, operational concerns, and process safety requirements.

Program Cost Breakdown:

CAPEX \$000	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Canarsie, NY CNG Station	-	50	2,200	500	-
Greenpoint, NY CNG Station	1,088	997	-	-	-
Greenpoint, NY CNG Station Fuel Island Access	-	1,200	946	-	-
KEDNY CNG Contract Closeout	-	400	-	-	-
KEDNY CNG Station Blanket	498	498	500	500	500
Total	1,586	3,145	3,646	1,000	500

Customer Benefit:

The primary customer benefit is the continuous, safe, and reliable supply of CNG fuel for company vehicles and customer fleets vehicles. The company CNG fleet requires reliable CNG stations to maintain operational readiness and contribute to environmental objectives.

Alternatives:

Alternative 1: – Individual Equipment Replacement

Current NFPA codes and company policy for CNG Stations require process safety reviews for any substantial change in equipment, operation, or use of station. At all current CNG stations, those reviews result in the complete replacement of compressors, controls, and dispensing systems. Those systems require very tight interoperation, are designed and installed as unified systems working together. As a result, replacement of individual equipment is not feasible or cost effective.

Alternative 2: – Station Retirement without Replacement

CNG projects here are to support the fueling of existing and expected future company fleet vehicles using CNG. Retirement of stations would strand those vehicles without access to fueling and impact operational readiness. If stations are predicted to no longer be used, station retirements will be considered.

Program Title: LNG Blanket – KEDNY

Spending Rationale: ☐ Mandated ☐ Customer Connections

☒ Reliability ☐ Non-Infrastructure

Brief Description:

KEDNY's Liquefied Natural Gas ("LNG") Blanket Program provides for the safe, reliable and compliant operation of the Greenpoint LNG Facility through procurement, installation, modification and/or enhancements to equipment, systems and facilities. An effective LNG capital program allows for replacement of obsolete and/or deteriorating equipment, systems and facilities that are reaching the end of their useful lives, along with modifications to enhance the safe, reliable, compliant and efficient operation. This program will extend the service life of critical production facilities and institute process safety improvements for plant equipment. Capital investments in the program consist of projects identified and planned for the fiscal year as well as projects to address emerging issues during the year.

The capital work to be sanctioned under this program includes, but is not limited to, the following:

- Upgrades and improvements to mechanical equipment and systems
- Upgrades to and replacement of electrical and control systems including safety shutdown systems
- Structural improvements of plant and facilities
- Procurement of capital tools and equipment
- Preliminary engineering and design of capital projects
- Retirement and/or decommissioning of equipment, plant and facilities

Justification:

KEDNY operates the Greenpoint LNG plant which is an on-system peak shaving facility. LNG simply natural gas in liquid form. Natural gas cooled to -260 °F at which point it changes from a gaseous state to a liquid state and occupies approximately 600 times less volume. LNG is an ideal method for storing supply to be used during peak days. Greenpoint LNG has two storage tanks with a total capacity of 1.6 BCF (billion standard cubic feet) which supplies up to 290 MMSCFD (million cubic feet per day) on a given peak day. The LNG is warmed to supply the distribution system through the vaporization process and feeds both high pressure and low-pressure distribution systems.

The refilling operation today is done exclusively through liquefaction. The liquefaction system can refill at a rate about 7 to 8.5 MMSCFD. The liquefaction operation can take up to 200 days to refill both Greenpoint LNG tanks between the months of April through November and varies based on tank levels from the previous heating season.

The LNG Blanket Program provides funding for near-term and emergent capital projects needed to maintain safety and reliability at the Greenpoint LNG facility by:

- (i) replacing obsolete and/or deteriorating equipment, systems, and facilities that are near the end of their useful lives; and
- (ii) modifying/enhancing equipment needed to operate facilities safely and reliably.

Additionally, these projects are designed to maintain compliance with federal and state rules and regulations regarding the safe and reliable operation of LNG facilities. Operator noncompliance could result in penalties and forced removal from service as directed by federal and state regulators.

Program Cost Breakdown:

CAPEX \$000	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
LNG - Blanket	2,599	2,648	2,654	2,713	2,764

Customer Benefit:

The primary customer benefit is the continuous, safe, and reliable supply of natural gas without unplanned outages due to facility shutdowns. Serving as the principle source of “Peak Shaving” for New York City customers, the plant also plays a strategic role in the company’s gas supply portfolio. The facility has two (2) LNG storage tanks with a total design capacity of 1.6 BCF of LNG. Greenpoint LNG facility has a design output of 290 MMSCFD of natural gas. LNG peak shaving facilities operates intermittently, supplying natural gas pipelines during periods of peak need as required.

Alternatives:

Alternative 1: Portable CNG

The only comparable alternative to LNG is portable CNG. The Company currently utilizes portable CNG skids to manage low pressure conditions on the gas system. This is effective for boosting pressures at specific low points on the system. This alternative is rejected because replacing Greenpoint LNG with portable CNG is not feasible due to the number of units and CNG tanks required to match Greenpoint’s LNG output.

Alternative 2: Do nothing

If the LNG Blanket Program investments are not made, there is a risk that the Greenpoint LNG resources will become unavailable during the heating season. This would require

the purchase of higher cost city gate supplies (if available) and may result in financial penalties from pipelines if the Company cannot adhere to operational flow orders and other contractual requirements. The lack of LNG Plant availability could lead to customer outages during heating season resulting in a negative customer impact.

Any potential short-term savings of doing nothing are quickly outweighed by increased maintenance, operating and replacement costs. A “Do Nothing” alternative does not address potential reliability and safety risks associated with not replacing obsolete and/or deteriorating equipment, systems and facilities that are reaching the end of their useful life or modifying/enhancing equipment needed to operate facilities safely and reliably. These risks include:

- Deterioration of gas facilities/assets
 - severe reduction in useful service life
 - leaks – safety hazards and increased greenhouse gas emissions
 - unplanned maintenance and repairs
 - operator work around to continue system operations
- Potential loss or danger to customers and public

Program Title: LNG – Special Projects – KEDNY

Spending Rationale: ☐ Mandated ☐ Customer Connections

☒ Reliability ☐ Non-Infrastructure

Brief Description:

KEDNY has identified several special projects to be completed to ensure the continued safe and reliable operation of the Greenpoint LNG plant. Special Projects are those having a cost of approximately five hundred thousand (\$500,000) or greater. The list of Special Projects includes the following:

- LNG – Boiloff Heaters/Steam Boiler Upgrade
- LNG – Bulkhead Upgrade
- LNG – Controls System Upgrade
- LNG – Hi Ex Foam System
- LNG – Hydrant & Deluge Piping Replacement
- LNG – Instrument Air System Replacement
- LNG – Liquefaction Critical Spares
- LNG – Nitrogen System Refurbishment
- LNG – Piping Insulation Replacement & Inspection
- LNG – Relocate Maintenance Area & New Control Building
- LNG – Security System Upgrades
- LNG – Solar Panels
- LNG – Stormwater Drainage
- LNG – Sub M-Sub L Interconnect
- LNG – Tail Gas Compressor
- LNG – Truck Load/Unload Station

Justification:

LNG – Boiloff Heaters/Steam Boiler Upgrade

This project proposes to implement a new stream steam system for the plant. The use of process steam in the plant include heating boil-off vapor and cold flare system gas. Over the years, the plant has experienced a decrease in reliability in the system. The scope will include installing new pipping, heat exchangers and boiler for the system.

LNG – Bulkhead Upgrade

This project proposes to inspect and rehabilitate the existing bulkhead along Newtown Creek. Continuous inspection and upgrades at the bulkhead is required to ensure

structural integrity. The bulkhead is situated along Newton Creek and prevents land erosion from rising water level. The bulkhead may have hidden damage from past storms. This project was identified as a critical component during the Greenpoint Flood Study that resulted from the Company's Storm Hardening Collaborative, because it provides structural integrity along Newtown Creek.

LNG – Controls System Upgrade

This project proposes to upgrade the Control Systems for efficiency, reliability, maintainability and safety reasons. The components involved to do so include replacing the control board, upgrading the analog controls and upgrading the Human-Machine Interfaces (HMI's).

LNG – Hi Ex Foam System

This project proposes to implement a new high-expansion foam system. The system will be used for vapor control during LNG spills. When activated, the applicable process area(s) will have a blanket of high-expansion foam discharged to cover the LNG and mitigate the flammable consequence. The project proposes to strategically equip high-expansion foam suppression systems in process area(s) vulnerable to LNG spills.

LNG – Hydrant & Deluge Piping Replacement

This project proposes to provide adequate fire protection by upgrading the hydrant and deluge system piping and upgrading the risers and spray nozzles. The current salt water hydrant system has approximately 8,600 feet of piping (primarily 12" and 10"), 31 fire hydrants, 23 valves, and 4 monitors. The current deluge system is approximately 3,500 feet of piping (primarily 20" and 24") with steel risers and nozzles surrounding the LNG tanks.

LNG – Instrument Air System Replacement

This project proposes a replacement to the existing Instrument Air System. Instrument air is designed to provide pneumatic gas supply to control instrument and valve actuators. Instrument air needs to be clean and dry for pneumatic instrumentation to function effectively. The existing aging system has experienced decrease in reliability. An unreliable instrument air system impacts the LNG plant to control processes thus increasing the safety risk at the LNG facility.

LNG – Liquefaction Critical Spares

The liquefaction critical spares project proposes to analyze and order liquefaction spare equipment to have onsite in case of an emergency or flooding scenario. This project was identified as a critical component for the liability during the Greenpoint Flood Study that resulted from the Company's Storm Hardening Collaborative.

LNG – Nitrogen System Refurbishment

This project proposes a refurbishment of the existing nitrogen system. Over time, the nitrogen tanks and associated equipment are starting to deteriorate and leaks are becoming more frequent. The tanks are also prone to flooding and outside of the LNG main gate putting them at risk to third party damage. The nitrogen system was identified as a critical component during the Greenpoint Flood Study that resulted from the Company's Storm Hardening Collaborative. As a result, this project will consider solutions to storm harden the Nitrogen System.

LNG – Piping Insulation Replacement & Inspection

This project proposes for inspection and replacement of process piping in the LNG facility. Corrosion of process lines always poses a risk at LNG facility. Proactive inspection of process lines ensures operations as design specification. Corrosions can result in the primary causes of line breaks and pose significant safety risk for employee / contractors.

LNG – Relocate Maintenance Area & New Control Building

This project proposes to relocate the existing maintenance building, which located outside the LNG plant, to a new location within the plant. A new control building will modernize an antiquated control building for LNG Operations.

LNG – Security System Upgrades

The Security System Upgrade project entails the upgrade or installation of a new Intrusion Detection System (cameras, motion detectors, and real-time remote monitoring) at the LNG facility. The justification for this project is to protect personnel and assets to ensure continued system reliability.

LNG – Solar Panels

This project proposes install Solar Panels at the LNG facility. Installing solar farms at the site will have cost savings potential. Solar panels can generate electricity, become less reliant on electric utility thus reduce Greenpoint's electric bill.

LNG – Stormwater Drainage

The stormwater drainage project will ensure that wastewater effluent during rainfall events are effectively drained within the facility. The project should implement suitable erosion, sediment and flood control measures on site. This project was identified as a critical component during the Greenpoint Flood Study that resulted from the Company's Storm Hardening Collaborative.

LNG – Sub M-Sub L Interconnect

The liquefier substation (Sub-L) supplies electrical feed to only the liquefier. It has no capability to supply electrical to the remaining LNG facility and vice versa. The electrical power for the majority of the assets in the LNG facility comes from two independent feeds, Sub-A and Sub-C. Both substations are located on the southwest of the plant and lies in the lower elevation of the plant. Connecting Sub-M to Sub-L will storm harden the facility to allow an alternate electrical feed source to the LNG facility. This project is considered a storm hardening and reliability effort since the Sub-L is located at higher elevation.

LNG – Tail Gas Compressor

The tail gas compressor has seen a significant increase in maintenance costs and a significant decrease in reliability. The project is to replace the aging tail gas compressor with a new compressor to handle simultaneous flow from LP Flash Gas and Boiloff Gas. Furthermore, this project will storm harden the Jet Compressors and provide a more reliable piece of boil-off handling equipment in the event the Jet Compressors flood or are taken out of service.

LNG – Truck Load/Unload Station

This paper proposes a new truck loading/unloading station. The truck station will provide the capability to transfer LNG in the event of unplanned outage or emergency at the liquefaction unit. The truck station was identified as a critical component during the Greenpoint Flood Study as it provides an alternate source of LNG in the event of an outage at the liquidation unit.

Program Cost Breakdown:

CAPEX \$000	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
LNG – Special Projects (listed above)	4,463	12,618	32,123	12,142	14,750

Customer Benefit:

The primary customer benefit is the continuous, safe, and reliable supply of natural gas without unplanned outages due to facility shutdowns. Serving as the principle source of “Peak Shaving” for New York City customers, the plant also plays a strategic role in the company’s gas supply portfolio. The facility has two (2) LNG storage tanks with a total design capacity of 1.6 BCF of LNG. Greenpoint LNG facility has a design output of 291 dth/day of natural gas capable of supplying over 20% of National Grid’s New York City customers gas demands on peak days. LNG peak shaving facilities operates intermittently, supplying natural gas pipelines during periods of peak need as required.

Alternatives:

Alternative 1: Do Nothing/Defer Project

Doing nothing or deferring this project will leave major company assets in jeopardy. This could potentially disrupt the natural gas pipelines during periods of peak demand.

Program Title: LNG - Salt Water Pump House – KEDNY

Spending Rationale: ☐ Mandated ☐ Customer Connections

☒ Reliability ☐ Non-Infrastructure

Brief Description:

Relocation and storm hardening of the 1920's era Salt Water Pump house, including construction of a new system that provides protection for critical equipment and maintains operation of the fire protection system during and after a flood event.

Justification:

The salt water pump house and fire system pre-dates the LNG plant and has been in existence since the 1920's.

1. High maintenance costs
2. Susceptibility to flooding as seen during Super Storm Sandy
3. Dependency on electric power from Con Edison's distribution system
4. Aging electrical switchgear
5. A backup jet turbine that is maintenance intensive and not well suited for a marine environment designed to supply water to the deluge system (water curtains).
6. Extensive use of carbon steel piping, cast iron piping, and steel equipment supports, all of which have deteriorated from exposure to salt water.
7. LNG Operations has seen decreased reliability with the current Pump House. Furthermore, FDNY may not allow the facility to operate should the fire suppression system not be operable.

The fire suppression system provides a dedicated source of salt water for two major systems, the deluge system and the fire hydrant system. The deluge system consists of coated piping that surrounds each tank with an array of steel risers and nozzles surrounding the dike of each tank rising from the ground. High pressure water is pumped from the SWPH through the nozzles and is sprayed vertically to form a water curtain that surrounds the tanks. The water curtain requires approximately 12,000 gpm per ring of water and will rise to a height of approximately 60 – 70 feet. The purpose of this water curtain is to warm LNG vapor in case of a spill inside the inner dike and to reduce thermal radiation that would otherwise heat the tank in case of a nearby fire from another source including the second LNG tank. The new Salt Water Pump house is required because the NYC fire hydrant system is not adequately sized to provide this volume of water.

The new SWPH provides storm hardening/resiliency since the existing pump house sits below grade and was severely impaired during Superstorm Sandy which affected the availability of the plant. Tests on the NYC hydrant system in Greenpoint have shown that it can only produce a volume of about 300 gpm at a pressure of only 35 – 40 psig which is not nearly adequate to protect this facility. FDNY requirements for plant operation mandate that the saltwater fire suppression system be available.

Program Cost Breakdown:

CAPEX \$000	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
LNG - Salt Water Pump House	2,418	35,081	15,308	-	-

Customer Benefit:

This plant is a critical component of the Company's gas supply portfolio and gas operating network. The key driver for this project is to ensure the continued, safe operation and availability of the Greenpoint LNG as a natural gas supply point into the NY distribution system. This plant is critical to the NY gas supply portfolio. KEDNY's firm gas customers benefit from the availability of this less-expensive peaking supply because gas is liquefied during the summer and stored for use in the winter. The Greenpoint LNG plant has played a significant role in KEDNY's ability to supply unprecedented volumes of gas during record breaking cold spells over the past two winters. The plants inability to vaporize during peak winter weather conditions may result in the unplanned interruption of a significant number of gas customers. The replacement of the salt water fire protection system will assist in ensuring there is adequate fire protection available at the Greenpoint LNG Plant in the event of a fire emergency.

Alternatives:

Alternative 1: Do Nothing/Defer Project

Doing nothing or deferring this project will leave major company assets in jeopardy if the current fire protection equipment is unable to perform as designed in the event of a catastrophic fire. Furthermore, FDNY may not allow the facility to operate should the fire suppression system not be operable. The company's reputation, equipment and personnel could all be subject to irrefutable damage.

Alternative 2: Retire the Salt Water Pump House

This option would force the retirement of the LNG plant itself. Since this plant comprises a substantial amount of the peak day supply in NYC, this option is not feasible.

Program Title: LNG TANK 1 and Tank 2 Upgrade Projects – KEDNY

Spending Rationale: ☐ Mandated ☐ Customer Connections

☒ Reliability ☐ Non-Infrastructure

Brief Description:

The LNG Tank Projects are designed to improve the process safety and reliability of the Greenpoint LNG facility. A spill of LNG from the storage tank could lead to a major hazard or major accident. Moreover, an uncontrollable spill, such as a shear rupture from side entry/bottom tank nozzles, would be considered a catastrophic failure.

The LNG Tank 1 and Tank 2 Upgrade Projects will evaluate the current state of the LNG storage tanks and determine methods to upgrade the existing LNG storage tank system to reduce these risks. The primary component of the tank modernization project is aimed at retiring the external LNG pumps with new top entry/internal LNG pumps. Internal LNG pumps are immersed within pump columns and supported from the tank foundation. The purpose of this design is to move away from side entry/bottom tank nozzles. This alleviates concerns for line rupture below the liquid level within the piping system improving safety and reliability.

Justification:

The Greenpoint LNG facility has been in service for fifty years. Since the time of its construction, there have been changes in LNG storage facility design practices, code requirements and operations. Furthermore, after fifty years of service, an overhaul of various tank related systems and a detailed inspection of the tank itself is necessary to ensure continuation of the reliable service of this critical energy facility.

In its desire to maintain its assets and improve safety and reliability of its LNG plants, National Grid will be upgrading its LNG storage tanks to take advantage of industry improvements in tank design while conducting internal tank inspections. National Grid has identified several special projects to be completed to ensure safe and reliable operation in National Grid's LNG (liquefied natural gas) facilities in Downstate New York. The need for these special project stems from the Quantitative Risk Assessment (QRA) that was conducted in 2013 for the Greenpoint LNG facility. Risks that were identified to be above National Grid's tolerance level were identified. The proposed tank modernization projects were identified as a program to reduce the facility's risk and further advance National Grid's commitment to safety.

The Greenpoint LNG peak shaving facility has operated since 1968 is located in Brooklyn, New York. Serving as the source of "peak shaving supply" for New York City customers, the plant also plays a strategic role in the company's gas supply portfolio. The

Greenpoint LNG facility has two LNG storage tanks (Tank #1 and Tank #2) with a total capacity of 1.6 BCF. The facility is designed with a send-out capability of 291 dth/day of natural gas capable of supplying over 20 percent of National Grid's New York City customers gas demands on peak days. The facility is equipped with six (6) submerged combustion vaporizers, each capable of 60 MMSCFD. Greenpoint's two storage tanks feed the LNG pumps from side entry/bottom tank nozzles. LNG is pumped from the LNG Storage Tank and vaporizes to the 350-psi or 60-psi gas system.

Removable top entry/internal LNG pumps are common in large low-pressure storage tank systems where side and bottom penetrations in the tank are not desirable. Locating two internal LNG pumps eliminates wall penetrations below the liquid level. Submersible LNG pumps operate at the bottom of a pump column which is mounted inside the tank. The pump discharges upward through ports and liquid fills the column and discharges out the roof of the tank. The column contains lifting cables and power cables for the pump. The motor and hydraulic section of the pump is directly coupled with a common shaft, submerged in liquid, and free of oxygen. Having no oxygen present within the pump and column provides a safe environment for a submerged pump to operate. All pipes for loading or unloading the tank are through the roof and there are no other openings for access into the tank once the tank modernization is completed. This design eliminates the risk of a nozzle failure leading to a large spill of LNG into the surrounding dike.

When Tank #2 was originally constructed, the process design included 3x 50% (1 spare) LP LNG pumps. The discharge pressure from these pumps is controlled by recycling LNG back to the tank. Later, the facility installed 3x50% (1 spare) HP LNG pumps. The high-pressure pumps were also piped to recycle LNG back to Tank #2. However, to take advantage of the total vaporization capacity available from Tank #2, a recycle drum was installed to separate the high pressure and low pressure recycles flows. This segregated recycle flow was established by providing an independent recycle loop for the low pressure recycle flow to the recycle drum while maintaining the high pressure recycle flow directly to Tank #2. The Tank Upgrade project will reexamine the HP and LP process and determine if a simplified solution can be designed to eliminate the recycle drum while using less pumps.

The design of the tank foundation heating system is an important aspect in the overall design of LNG storage tanks. An adequately designed foundation heating systems helps maintain the safety and integrity of an LNG storage tank resting on grade. Foundation heating systems for tanks resting on grade are important in preventing the possibility of frost heave beneath the tank foundation.

Tank #2 in Greenpoint is designed with a ringwall style foundation. The design means that the center of the tank sits directly on the soil. Since the LNG temperature of the inner tank operates at approximately -260°F, these cold temperatures penetrate the subsurface of the foundation. As a result, supplemental heat is required otherwise heat will be pulled from the foundation which can cause freezing and may cause the foundation to heave.

In 2017, the Greenpoint LNG facility completed a replacement of the foundation heating system for Tank #2. This provided LNG operations personnel the capability to prevent frost heave formation under the tank, caused by ineffective heating elements. However, the repairs to the foundation heating system in 2016-17 was considered as a temporary solution. The tank modernization project will replace the current LNG tank foundation heating system conduits and heating elements to harden the system and prepare it for the future.

The Scope of Work includes contractors to furnish all engineering, equipment, labor, supervision, and material as required to perform the work in accordance with the LNG Tank Project.

The proposed Project requirements include, but are not limited to the following components and tasks:

- Installation of Internal LNG Pump/Columns
- Boiloff Compressor Upgrade/Potential Removal of Existing Cold Blowers
- Additional Relief Capacity for Roll Over Case
- Level Gauges / Density Measurement
- Retirement of LNG recycle drum and addition of recycle piping system
- Foundation Heater Inspection & Replacement of Conduits and Heaters
- Weld Inspection / Inner Annular Space
- Perlite Insulation removal and re-installation
- Tank Emergency Pressurization System
- Structural Tank Analysis/ Tank Latent Corrosion
- Tank Pressure Test
- Power Center Upgrade
- Piping and Pipe Supports
- Dike Sump Pump Systems
- Gas Detectors/Lighting/CO
- Ringwall Flange
- Snow Load Calculation
- Secondary Ladder
- Gas Service Impact
- Raw Gas Makeup

Program Cost Breakdown:

CAPEX \$000	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
LNG Tank 1 Upgrade	-	-	50	1,500	500
LNG Tank 2 Upgrade	-	-	100	1,500	1,500
TOTAL CAPEX	-	-	150	3,000	2,000

Customer Benefit:

An overhaul and modernization of this fifty-year-old facility along with a close inspection of the storage tank itself will ensure continued energy supply to the downstate NY region. Modernizing the LNG tanks will increase reliability and mitigate safety concerns that the existing equipment presents. Upgrading the facility also enables the facility to incorporate modern design standards gained in the last fifty years.

The modernization of the LNG tanks includes installing cryogenic submersible pumps immersed in the base of the storage tanks. Inspection of the weld integrity improves safety and reliability of the structural integrity of the LNG tanks. Reviewing relief valve capacity assures that the tanks can withstand severe barometric changes from weather events without risk of over-pressurizing the tanks.

Alternatives:

Alternative 1: Do Nothing/Defer Project

Doing nothing or deferring this project will leave major company assets in jeopardy if the protection equipment is unable to perform as designed.

Alternative 2: Retire the tank

This option is not feasible as LNG is a substantial component of the peak day supply in this region.

Program Title: LNG - Vaporizers 7 & 8 Replacement – KEDNY

Spending Rationale: ☐ Mandated ☐ Customer Connections

☒ Reliability ☐ Non-Infrastructure

Brief Description:

Vaporizers 7 & 8 need to be refurbished due to their age and condition to ensure the continued and reliable vaporization at the Greenpoint LNG facility. This project is to replace the obsolete vaporizer control system with a new PLC control system, replace the tube bundles in-kind, inspect and replace the down comer as needed, replace or repair the down comer support struts, replace the refractory, upgrade the fuel train, inspect and repair the water box as necessary, test and replace the breakers and feeder cables as needed and replace the pilots. Each vaporizer will supply 50 MMSCFD (100 MMSCFD total) of gas into the 350-psi transmission system. This project will bring the vaporizers into code compliance and extend their life by approximately 35 years.

Justification:

The Greenpoint LNG plant has six submersible combustion vaporizers (# 3, 4, 7, 8, 9, & 10). Vaporizers 7 & 8 Units were built in the 1970's and designed to vaporize gas into the 350-psi transmission system. Each vaporizer unit consist of four burners which transfers heat to LNG as it flows through the tube bundle.

Vaporizers 7 & 8 are approaching 50 years of service. Although it has been modified several times during its life cycle, there are several issues with the current vaporizers that justify a refurbishment. The issues include:

1. Aging LNG tube bundle
2. Outdated and obsolete relay logic control system
3. Antiquated burner management system (BMS)
4. History of repairs to the down comer support struts
5. Aging fuel train and control valves

Program Cost Breakdown:

CAPEX \$000	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
LNG – 7&8 Vaporizers	600	10,200	10,127	3,000	-

Customer Benefit:

Serving as the principle source of “Peak Shaving” for New York City customers, the plant also plays a strategic role in the company’s gas supply portfolio. The facility has

two (2) LNG storage tanks with a total design capacity of 1.6 BCF of LNG. Greenpoint LNG facility has a design output of 291 dth/day of natural gas capable of supplying over 20% of National Grid's New York City customers gas demands on peak days.

The refurbishment of Vaporizers 7 & 8 will assist in ensuring there is adequate gas supply in New York City. LNG peak shaving facilities operates intermittently, supplying natural gas pipelines during periods of peak need as required.

Alternatives:

Alternative 1: Replace Vaporizers 7 & 8 In-Kind

This alternative consists of replacing vaporizers (7 & 8) in-kind with an updated PLC control system. This alternative satisfies the reliability concern, but nearly doubles the cost.

Alternative 2: Replace Vaporizers 7 & 8 with Vertical Shell & Tube Type Vaporizers

This alternative consists of replacing vaporizers (7 & 8) with vertical shell & tube type vaporizers and an updated PLC control system. This alternative satisfies the reliability concern, while being less cost effective and alternative 1.

Alternative 3: Do Nothing/Defer Project

The consequence of not refurbishing or replacing the vaporizers (7 & 8) is the continued use of aged, outdated and unreliable equipment at the Greenpoint LNG facility. Doing nothing exposes the Company and its customers to a potential gas supply disruption during the coldest days of the year when the need for natural gas is at its highest. For these reasons, this alternative is not recommended.

Program Title: Renewable Natural Gas (“RNG”) Interconnections - KEDNY

Spending Rationale: ☐ Mandated ☒ Customer Connections

☒ Reliability ☐ Non-Infrastructure

Brief Description:

This program will aid the company in meeting its 80x50 goals for reducing greenhouse gas emissions (“GHG”) by 80% by the year 2050 by providing interconnect locations and funding for RNG developers to inject their biomethane derived from waste feedstocks into the KEDNY system to be delivered to the company’s customers.

The objective is to work with developers to fund and allow injection of RNG into the network by providing utility expertise in designing an interconnection that is safe and reliable for both the company and the developer. It is intended to apply the process described in NGA’s NYS Guidance Document for RNG Interconnections to plan and execute these projects. This process has been implemented on all potential projects to date.

Program Justification:

Due to the increased scrutiny on reduction of GHG nationwide, federal and state legislatures are enforcing decarbonization targets across the US. The company has set a goal of “80x50”, targeting an 80% reduction of the company’s GHG by the year 2050. This program supports achieving this goal by allowing renewable energy in the form of RNG to offset a portion of the typically sourced non-renewable natural gas needed in the company’s territory. It also has the potential to supply the company with an additional source of gas to accommodate peak demands when supply is short.

There are developers of RNG ready and willing to provide this gas to the utility. One potential financial hurdle for these projects is the large capital cost and long lead time for interconnection to the gas network. To encourage renewable energy use in the form of RNG, the company is proposing a capital program to offset some of these costs. Expected company resources include representatives devoted to each project from: Gas Asset Management, Gas Systems Engineering, Procurement, Regulatory, Legal, Customer Connections, and Capital Delivery. The chart below shows an estimate of the man-hour requirement to support a typical RNG project.

Charge Type	Departments/Roles	*Total Hours/Project	Charged to Customer in ESA	Overhead	TOTAL
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Direct Charge	Gas Quality Engineer Planning Engineer PE&D Engineer Regulatory Analyst Safety Engineer	858	\$78,809		
Overheads	PRE Director Planning Manager/Director Regulatory Director Procurement Legal Operations Capital Delivery PM Customer Connections	439		\$54,527	\$133,336

**assumes 2-year project*

To accommodate these developers thus far, the company has been implementing the process described in NGA's NYS Guidance Document for RNG Interconnections to plan and execute these projects. Currently, National Grid has seven potential RNG projects at various stages of this NGA process, not including the Freshkills Landfill and the Newtown Creek Wastewater Treatment Plant Upgrading Projects which are in service and in construction, respectively. The Freshkills Landfill has been in service for 30+ years and is a model example of the potential success of these projects.

Program Cost Breakdown:

In addition to the engineering and support services listed above, the developer must incur all utility related costs including installation of main (transmission or distribution), pressure regulation, metering, odorization, and gas quality monitoring. The RNG Interconnections capital program is intended to offset some of these costs by funding an RNG interconnection package, including the capex cost of meters and odorizer/analyzers as well as the opex costs associated with maintaining this equipment. With an estimated 2 projects per year in KEDNY's service area, the capex costs are as follows:

CAPEX \$000	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
RNG Interconnections		900	900	900	900

Customer Benefit:

Utility-aided opportunity to reach customer's GHG emission reduction goals. Removal of a financial impediment to developers' advancing RNG projects.

The advantages of encouraging RNG project interconnections include showing a concern for customer needs and providing opportunities to meet those needs, whether the need be supply during peak demand periods or reduction of customer carbon footprint. Additional benefits of these projects include providing both short-term construction and long-term jobs opportunities and utilizing the growing amounts of waste produced each year in the US.

Alternatives

Alternative 1: Do nothing

Developers would continue to be responsible for all interconnection costs. Because interconnection costs are a known deterrant toward advancing these projects, this option does not promote the company goals of 80x50 and sends a message of resistance to developers and customers. Not embracing RNG interconnections also contradicts the US goal of nationwide GHG emission reductions. Disregarding this alternate supply also closes opportunities to address the company's concerns during high demand periods.

Studies/References That Support the Program:

The company has formally adopted and filed with the NYS Public Service Commission NGA's NYS Guidance Document for RNG Interconnections. The company also has relayed that the document is intended to expand to other states in the company's service territory.

Vermont Gas has already adopted a Green Gas Policy where customers are able to voluntarily purchase RNG gas injected by a developer at a higher price to meet their targets and the company aims to adopt a similar policy in the future.

Program Title: Tools & Equipment – KEDNY

Spending Rationale: ☐ Mandated ☐ Customer Connections

☐ Reliability ☒ Non-Infrastructure

Brief Description:

The KEDNY capital Tools and Equipment program is for purchases of tools that meet the capitalization threshold and are not used for specific projects. These items support the safety of our employees, our customers and the general public. The items provide cost efficiencies across multiple mandated programs, commitments to customer needs and expectations, and will allow the potential increase of productivity for on-going day-to-day operations of the gas business unit.

This budget item is typically used to support process related initiatives and assure subsequent goals are achieved within the entire gas organization. These items relate to safety (*i.e.*: mechanized maintenance of traffic devices, worker safety enhancements etc.), climate change (*i.e.*: apparatus to minimize emissions through natural gas drawdown operations), support of new, emerging and on-going technologies (*i.e.*: capital spares and parts for trenchless and keyhole technologies) and the initiation of innovative applications that will lead to improved operations.

Program Justification:

Current Company policy capitalizes general tool and/or equipment purchases subject to predetermined minimal dollar thresholds (\$500 for KEDNY). Such general equipment includes tooling (hand, power, pneumatic, hydraulic, etc.), specialty equipment, PPE, office machines, electronic data processing equipment and software applications, shop and garage equipment and communications. The Tools and Equipment line item captures the above-mentioned items that are not used for specific projects but rather support the safe, efficient and on-going day-to-day operations of the gas business unit. Purchase of miscellaneous tools and equipment utilize project numbers that are budgeted based on historical funding due to the inability to associate this equipment with any one specific project.

Program Budget Methodology:

The program forecast is based on historical budgets and projected increases in conjunction with additional pipe replacement of mandated programs (*i.e.*: Leak Prone Pipe replacement). The volume of public safety equipment, road traffic plates and sheeting systems are just a few examples of additional tools and equipment needed to support mandated program increases.

Program Cost:

CAPEX \$000	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Tools and Equipment	3,566	3,639	3,948	4,036	4,113

Customer Benefit:

- Improved public safety due to mechanized maintenance of traffic devices and public safety enhancements.
- Noise reduction enhancements with new technology tooling.
- Productivity increases and potential unit cost reductions.
- Compliance with federal and state code requirements including new US Department of Transportation (USDOT).
- Reduction of methane emissions and reduction of greenhouse gases.

Alternatives:

Alternative 1: Reduce Request

Reducing the program forecast is not recommended because funds allocated here drive process changes that support new initiatives and productivity improvements throughout the Gas distribution organization. It will potentially drive a downturn in safety for the company, employees, customers and general public.

Alternative 2: Do Nothing

It will force the spending of these items to be allocated to specific projects and mandated programs resulting in inconsistent unit costs, excessive tool ordering (lack of controls) and jeopardize safety for the company, employees, customers and general public.

Program Title: Learning and Development – Materials, Tools & Equipment – KEDNY

Spending Rationale: ☐ Mandated ☐ Customer Connections
☐ Reliability ☒ Non-Infrastructure

Brief Description:

This program includes tool upgrades, new tools and equipment, equipment maintenance, and training resources to support Field Training and Evaluation.

Justification:

In order to conform to new requirements and increasing demands of the industry, Gas Technical Training (L&D) is in the process of increasing, enhancing, and improving its training resources. L&D has not previously been afforded a budget for the purchase of new products, tools or to perform the necessary maintenance on existing tools, resources, and training props. Gas Technical Training has always sought assistance from the lines of business it serves toward these needs, but resources have become limited and minimal. This proposal will allow the Academy to train and have employees demonstrate at a standard, rate and volume necessary for the safe operation of its employees and contractors on our infrastructure.

This proposal will allow for the purchase of new tools and equipment at the beginning of the Annual Expert Training season. This is required due to the number of employees and contractors trained and qualified during the season which far exceeds L&D's existing resources. The primary need for tools and equipment is for instruction on capital construction standards, procedures and installation methods for both internal employees and contractors.

L&D's program will include a tools swap out. At the conclusion of the training season, L&D will provide the internal workforce with newly purchased and maintained tools and equipment procured through this proposal. Field Operations will then provide L&D with their existing tools and equipment which will be maintained and restored to original operating condition. This provides a means for L&D to take in used equipment from the field, maintain it and retain the equipment for the duration of the construction season. This will allow L&D to continually train and qualify existing employees, contractors and new hires throughout the year. This also allows employees to utilize refreshed, new, state of the art equipment which they have been directly trained on for actual Capital Construction and Maintenance activities. L&D would repeat this process annually, to ensure a continued circulation of new tools following the main training season and refurbishment of existing tools.

Program Cost Breakdown:

CAPEX \$000	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Materials, Tools & Equipment	-	375	250	188	188

Customer Benefit:

This program provides allows continuous improvement on training curriculum development, and a means by which to ensure that tools are updated, maintained and refreshed.

This will increase the integrity of the installed infrastructure there by increasing Public safety.

Alternatives:

Alternative 1: Do Nothing

L&D's existing process of relying on Field Operations to supply tools for training is no longer sustainable. Benefits of training on new tools with updated technology and opportunity to refurbish older tools would be lost.

Program Title: Meter Testing Equipment – KEDNY

Spending Rationale:

- ☐ Mandated ☐ Customer Connections
☐ Reliability ☒ Non-Infrastructure

Brief Description:

This program includes the purchase of meter testing equipment to support the testing of gas meters and replacement of meter lab equipment to ensure safety, compliance and meter testing accuracy. State regulations require random sampling of gas meter performance on an annual basis. Meters are classified based on manufacture/model, and the number of meters to be tested within each of these classifications is determined by the population size. Accuracy and leak testing of KEDNY's gas meters is performed at the Company meter lab (note: this lab is not the same as the Materials Test Lab). This program provides funding for the purchase of meter testing equipment to support the testing of gas meters for accuracy, leaks and to replace meter testing equipment that has reached its end of life.

Program Justification:

The primary driver for meter testing equipment purchases is compliance with state regulations governing gas meter testing accuracy and the continued support of meter testing programs.

Program Cost Breakdown:

CAPEX \$000	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Meter Testing Equipment	103	105	106	108	110

Customer Benefit:

- Metering and billing accuracy
- Ensure meters meet safety standards

Alternatives:

None

Program Title: Automatic Meter Reading (“AMR”) Customer Connections & Replacement

Spending Rationale: ☐ Mandated ☒ Customer Connections
☐ Reliability ☒ Non-Infrastructure

Brief Description:

This program includes the purchase and installation of AMR equipment, encoder receiver transmitters (“ERTs”) to support KEDNY’s new customer connections (“Customer Connections”), and continued Customer Meter Service (CMS) operations for failed units in the field and proactive replacement (“Replacements”). The Company’s Purchase Meters program does not include purchase of ERTs. The estimated units required to support both programs for FY20 - FY24 are:

CAPEX (\$000)	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
AMR (Customer Connections)	9,198	9,382	9,570	9,761	9,956
AMR (Replacement)	41,660	42,493	43,343	44,210	45,094
Total	50,858	51,875	52,913	53,971	55,050

Program Justification:

Continuation of the AMR program will increase meter reading accuracy, reduce the number of estimated bills, and reduce the cost of meter reading.

Customer Connections:

The AMR requirements for customer connections is based on the forecast for demand and the number of new meters that will be required to connect new customers.

Replacements:

KEDNY currently has an installed AMR population of approximately 1.14M units. Each year, a quantity of AMR units is replaced in the field by CMS technicians as they either fail or have reached the end of their useful life. Recently, we matched the AMR population against a battery life model supplied by the Company’s AMR vendor to more accurately predict the number of AMR replacements that must be performed on an annual basis. Using this model, approximately 23,000 AMR units will require replacement each

year for the next four years. This program also includes the purchase of AMR units to support meter replacement and customer connection programs.

Program Cost Breakdown:

CAPEX \$000	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
AMR (Customer Connections)	1,042	1,062	1,083	1,105	1,127
AMR (Replacement)	3,316	3,386	3,628	3,701	3,775
Total	4,358	4,448	4,711	4,806	4,902

Customer Benefit:

- Provides actual meter readings for billing
- Reduces estimated bills
- Elimination of premise access every cycle to obtain an actual read
-

Alternatives:

Alternative 1: Do Nothing

This alternative is rejected. Without proactive replacement at the end of the useful lives of AMR units, the Company projects AMR unit failures for 50,000 units within 2 years. This failure rate will adversely impact meter read rates, customer satisfaction, and will result in labor inefficiencies.

Alternative 2: Reduce Scope

This alternative is rejected because failure to maintain/replace AMR units will result in the inability to realize the projected savings and efficiencies associated with the program.

Testimony of the Gas Infrastructure and Operations Panel

Exhibit __ (GIOP-6)

Demonstration of Variability in City/State Construction O&M

The Brooklyn Union Gas Company d/b/a National Grid NY
Gas Safety and Gas Infrastructure and Operations Panels
City/State Construction Expense Variability
(\$'s)

Variability in City/State Construction Non-Reimbursable O&M

City/State Construction KEDNY Opex Spend vs. DDC Budget

Line	NYC DDC Budget			
		<u>Non Reimb</u>	<u>Reimb</u>	<u>Total</u>
1				
2	FY16	\$108,000,000	\$1,300,000,000	\$1,408,000,000
3	FY17	\$90,000,000	\$1,400,000,000	\$1,490,000,000
4	FY18	\$96,000,000	\$1,275,000,000	\$1,371,000,000
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
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21				
22				
23				
24				
25				
26				
27				
28				
29				

Variability: KEDNY CSC Operating Expense as a Percent of NYC DDC Budget

Line	NG Opex % of DDC Spend			
	<u>Year</u>	<u>Non Reimb</u>	<u>Reimb</u>	<u>Total</u>
17				
18	FY16	6.48%	0.01%	0.51%
19	FY17	11.30%	0.20%	0.87%
20	FY18	24.66%	0.56%	2.25%
21				
22				
23				
24				
25				
26				
27				
28				
29				

Line Notes

19 Line 9 divided by Line 3
20 Line 10 divided by Line 4
21 Line 11 divided by Line 5
27 Line 20 divided by Line 19 minus 1
28 Line 21 divided by Line 20 minus 1

Testimony of the Gas Infrastructure and Operations Panel

Exhibit __ (GIOP-7)

**Projected Indirect Capital Expenditures (Supply Chain, Fleet, and Facilities) for
the Gap Period, Rate Year, Data Year 1, Data Year 2, and Data Year 3, and
Data Sheets for Significant Facilities Investments**

The Brooklyn Union Gas Company d/b/a National Grid NY
Indirect Capital Expenditures (CAPEX and COR)

	FY19 Jan-Mar	FY20	FY21	FY22	FY23	FY24
Facilities						
Base Spend	\$ 992,659	\$ 4,675,000	\$ 2,975,000	\$ 3,550,000	\$ 3,550,000	\$ 4,600,000
Pitkin Customer Office Expansion	\$ -	\$ 500,000	\$ -	\$ -	\$ -	\$ -
NYC Training Center (s)	\$ -	\$ 13,600,000	\$ 2,400,000	\$ -	\$ -	\$ -
Greenpoint Electrical	\$ -	\$ 500,000	\$ 600,000	\$ 800,000	\$ -	\$ -
Canarsie Roofs & Facades	\$ 514,941	\$ 1,351,000	\$ 2,300,000	\$ 1,500,000	\$ 2,300,000	\$ -
Canarsie Parking/Paving	\$ -	\$ 800,000	\$ 300,000	\$ -	\$ -	\$ -
Total Facilities	\$ 1,507,600	\$ 21,426,000	\$ 8,575,000	\$ 5,850,000	\$ 5,850,000	\$ 4,600,000
Fleet	\$ 19,439	\$ 675,000	\$ 650,000	\$ 950,000	\$ 450,000	\$ 450,000
Supply Chain (IM/IR)	\$ -	\$ 469,800	\$ 600,000	\$ 600,000	\$ 300,000	\$ 300,000
Future of Heat - Gas Demand Response	\$ -	\$ 235,840	\$ 58,960	\$ 58,960	\$ 58,960	\$ -
Total KEDNY Indirect CapEx/COR	\$ 1,527,039	\$ 22,806,640	\$ 9,883,960	\$ 7,458,960	\$ 6,658,960	\$ 5,350,000

Program Title: KEDNY– Pitkin Customer Office Expansion

Brief Description:

Plan to remodel the leased Pitkin Avenue customer office and Outreach Center, including development of a refreshed customer office of approximately 4,000 square feet that is similar to the Company’s Metro Tech Customer Outreach office that opened in 2018.

The detailed project plan for the program includes these key steps:

- Planning
- Lease renegotiation (Landlord Notice)
- Design
- Construction
- Move
- Occupancy

Program Justification:

The remodeled office will include an improved work area for customer-facing payment center employees and walk-in customers. Improvements would include carpet, full paint, ceiling tiles, and general wear and tear repairs. This project does not include mechanical system replacements or structural changes.

Program Cost Breakdown:

CAPEX \$000	FY 2020	FY 2021	FY 2022	FY 2023
Pitkin Customer Office Expansion	500	0	0	0

Customer Benefit:

- Improved customer service
- Ability to offer expanded customer services
- Increased efficiency and improve customer access to a menu of assistance programs

Alternatives:

1. **Do nothing** - Not considered based on National Grid Customer team identified need and current age/ condition of office
2. **Relocation from current place to a new site** - Considered, and rejected due to timing, tight rental market, and willingness of Landlord to blend and extend current lease obligation.

Program Title: KEDNY – NYC Training Centers

Brief Description:

This project is for two 3,000 square foot company-owned training facilities (Learning Academy Centers), one in Queens/Brooklyn and one in Staten Island, to accommodate growth in the amount of technical training required to improve the competency of National Grid's Gas workers and to validate the training/competency of the contractor workforce in downstate New York. This project also supports the anticipated new regulatory requirements related to First Responder training.

The new space fit-out will include a mix of classroom, lab-bench technical and office space to meet the increasing training and evaluation demand. Planning assumption is based on an owned facility. Co-location within existing owned sites is being considered subject to availability, permitting and zoning allowances.

The detailed project plan for the program includes these key steps:

- Site Selection
- Transaction execution
- Planning
- Design
- Bid/Award Negotiation
- Construction
- Move
- Occupancy

Program Justification:

The new Academy Learning Centers in NYC will enable enhanced classroom and hands on training/competency of gas employees and contractors as per our policies, procedures, standards and regulatory requirements/mandates. This facility will positively impact the overall skills and abilities of our gas workforce, both employees and contractors, while increasing efficiency, the reliability of our gas infrastructure, and improving overall public safety.

There is significant Federal and NY State regulatory focus in these areas in the PHMSA pipe-line safety and enhanced engineering oversight standards driving requirement to invest in new, best in class facilities.

Program Cost Breakdown:

CAPEX \$000	FY 2020	FY 2021	FY 2022	FY 2023
NYC Training Centers	13,600	2,400	0	0

Customer Benefit:

- Improving overall Public Safety
- Ensure new Federal and State standards are met and exceeded
- Deliver training to First Responders
- Increase efficiency by improving access more immediately to training within service territory

Alternatives:

1. **Do nothing-** Resources at the current learning center will be overburdened.
2. **Defer the project** – This option not recommended due to the increased demand for training and limited availability at other facilities.

Program Title: KEDNY - Greenpoint Electrical

Brief Description:

Perform multiple upgrades and modifications to the existing outdated and aged electrical distribution systems feeding the various buildings on the Greenpoint Gas Operations and LNG site, including but not limited to:

- Reducing the number of electrical services to the site (potentially from eight to six services)
- Removal and consolidation of feeders no longer necessary due to demolition of some of the buildings previous on site
- Installation of new up-to-date electrical distribution switchgear
- Re-sizing equipment to accommodate current loads
- Installing sub-metering system at LNG and Clean Energy equipment
- Modify systems for redundancy and emergency power protection
- Provide second commercial electrical feed to some buildings

The work will be done in a phased approach to minimize impact to the operations and the customer by distributing funding over the next 3 years.

Program Justification:

Modifying design and replacing outdated, wrong-sized equipment will improve the efficiency of the electrical system and reduce operations costs. Installation various protection elements, such as back feed protection, will reduce possibility of outages.

Sub-metering will allow more accurate cost allocations to National Grid cost centers and third-party entity billing.

Adding second commercial electrical feed will alleviate the stress of utilizing the emergency generator, unless a true commercial power loss occurs and will also minimize costs associated with redistributing the entire electrical system in the facility to maintain existing power redundancy.

Improvements will allow for easier, less costly repairs to system when issues occur.

Program Cost Breakdown:

CAPEX \$000	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Phase 1	500				
Phase 2		600			
Phase 3			800		
Greenpoint Electrical Total	500	600	800	0	0

Customer Benefit:

- Improves reliability of the electric system that supports the operation of our gas workers and thus, our ability to service our customers effectively and efficiently
- Compliance with federal, state, and local codes
- Reduces facilities operating costs

Alternatives:

1. Delay improvements

Delaying this work will pose additional risk of untimely equipment failure and delayed cost deference to be gained by more efficient equipment.

2. Do Nothing

If nothing is done, failure of aged equipment and loss of power to the site is probable. The company and its customers will not benefit from cost reductions resulting from installation of more efficient electrical system.

Program Title: KEDNY Canarsie Roofs & Facades

Brief Description:

Replace the roofs and perform significant façade improvements, including window replacements, on all the buildings on the Canarsie Operations Site in order to maintain the integrity and protection of the buildings.

Many of the buildings have two roof systems in place and areas of wet roofing materials so full removal and recovery with new roof assemblies is needed. Where this is not the case, recovery of the existing system may be possible.

The facades on the buildings consist of brick, stone, stucco and concrete. This program will include the refurbishment of the numerous locations of cracked and displaced brick, deteriorated mortar joints, cracked and displaced stone, spalled concrete and stucco, rusted lintels and failed window systems.

Program Justification:

Survey inspections of the facades and roofs have been conducted by professional engineering firms.

The overall condition of major sections of roofs is considered to be “poor” with some portions in a “failed” condition. Replacement has been recommended in the 2015-2020 timeframe. The worst roofs, on Buildings 29/30/31, were completed in 2016.

Deteriorated façade conditions have allowed water to penetrate the buildings. There is potential rusting of interior steel columns. Surficial solutions such as applications of stucco over cracks are no longer a viable option. Elements of the façade will need to be removed to address underlining issues. Missing or damaged components will need to be replaced.

The façade improvements and window replacement on Buildings 29/30/31 have been completed in 2018 and the Building 23/23A cladding project will be completed in early 2019.

The Kalwall window systems installed throughout the buildings are 20-30 years old. Moisture has infiltrated into the system and some components are damaged. Replacement of components is not possible as these window systems are no longer in production.

Numerous repairs have been done on the facades and roofs over the years with limited permanent success. Failure of these systems threatens the structural integrity of the buildings, condition of interior building elements and contents; and safety and health of the building occupants.

This program is to complete the remaining roofs and façade improvements over the next four years.

Program Cost Breakdown:

CAPEX \$000	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Bldg 23/23A Roof	1,351				
Bldg 40 Façade and Windows		2,300			
Bldg 40 Roof			1,500		
Bldg 24 & Guard House				2,300	
Canarsie Roofs & Facades Total	1,351	2,300	1,500	2,300	0

Customer Benefit:

- Improved public safety
- Improves morale, safety, and efficiency of company employees
- Compliance with federal and state code and public safety requirements

Alternatives:

Alternative 1: Delay improvements

Delaying improvements to the building envelopes will result in further deterioration of the roofs and facades. It will cause damage to the interior of the buildings and may impact the functionality of fire and electrical systems within the buildings. Employee health issues may arise due to mold development.

Alternative 2: Do Nothing

If nothing is done, buildings will continue to deteriorate and ultimately result in structural failure.

Program Title: KEDNY - Canarsie Parking/Paving

Brief Description:

Reconstruct employee parking lot on E 83rd Street adjacent to the Canarsie Operations Center, and replace deteriorated portion of parking lot inside the Operations Center.

The E 83rd Street lot reconstruction will consist of removal of all existing asphalt and fencing, re-grading the entire lot, and the installation of new drainage system, pavement, curbing, fencing and landscaping.

Work on the interior parking lot will consist of removal and replacement of areas of deteriorated asphalt to maintain the condition of the surface.

Program Justification:

The E 83rd Street parking lot is in a severe state of disrepair. The asphalt surface is completely broken up, and soils underneath have been exposed and undermined. Large depressions exist throughout the area. Conditions can cause damage to vehicle and create safety concerns. Rain and melting snow runs off the site and raises safety concerns regarding the public roadway. The City is requiring improvements be made to the drainage system to address impacts to the public.

The interior lot has potholes and surface cracking which threaten the integrity of the pavement as well as creating deteriorated conditions for vehicles and pedestrians.

Program Cost Breakdown:

CAPEX \$000	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
East 83rd St. Lot	800				
Interior Lot		300			
Canarsie Parking/Paving Total	800	300	0	0	0

Customer Benefit:

- Compliance with City public safety requirements
- Improves safety and efficiency of National Grid gas workers servicing our customers
- Reduces damage and cost of repair to vehicles
- Alleviates safety concerns

Alternatives:

1. **Delay improvements**

Delaying this work will cause additional deterioration of the asphalt resulting in worsted hazardous conditions and loss of the integrity of the paved surface (interior lot). Later restoration will be more extensive and costlier. Violations and/or fines may be imposed by the City if National Grid does not address the drainage problems impacting E83rd Street.

2. **Do Nothing**

If nothing is done, the E83rd Lot will likely need to be closed causing hardship to employees and add congestion to surrounding public parking.

Program Title: SERVCO- Hicksville Office Relocation

Brief Description:

The Hicksville Office program will relocate National Grid's Hicksville office locations (100 & 175 E. Old Country Rd) to a new 100,000 sq. ft. leased facility designed to the new Smart Workspace environment. National Grid's Hicksville office locations consist of approximately 515,000 sq. ft. of office space, with 278,000 sq. ft. of that space being leased by PSEG and the remaining 237,000 sq. ft. of space being occupied by National Grid.

The detailed project plan for the program includes these key steps:

- Site Selection
- Transaction execution
- Planning
- Design
- Bid/Award Negotiation
- Construction
- Move
- Occupancy

The program is part of a comprehensive property review by National Grid to transition employees to smarter, more efficient office workplace environments and targets completion in 2020. This move will improve employee engagement, improve collaboration and mission focus, and strengthen employee identity relative to National Grid's brand.

Program Justification:

The office relocation aligns with National Grid's property strategy to improve workspace efficiency, collaboration and lower cost. Traditional space standards, combined with low utilization and higher operating costs drive inefficiencies and a lower productivity working environment. The Company believes that the adoption of newer work standards and ways of working, as well as a move to a smaller (100,000 sq. ft. vs. 237,000 sq. ft.) leased location, can positively impact the overall performance of its space in support of its strategic agenda. Efficiency and space utilization gains could lower total occupancy cost.

Program Cost Breakdown:

CAPEX \$000	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Hicksville Office Relocation	3,119	19,038	500	500	500

Customer Benefit:

- Lower Cost of occupancy
- Reduced facilities operating costs
- Improved efficiency and productivity of employees

Alternatives:

1. **Do nothing-** If National Grid does nothing, existing space standards and amount of space under lease will continue to be at a higher cost. Thus, this alternative is not recommended
2. **Retrofit current location-** As part of a feasibility assessment, the Company reviewed the option of a retrofit and redesign of existing space; however, given the age and base design of floor plans, refitting in the existing space would be costlier. Building condition and significant deferred maintenance to be addressed in addition to any Smart Workspace fit out would increase cost to achieve. Additionally, the constraints on site space due to co-location with PSEG puts a strain on working efficiencies. No brand or mission focus benefit by improved single entity, contiguous occupancy would be achieved. Thus, this alternative is not recommended
3. **Defer the project** – This option not recommended due to favorable market conditions and likelihood that future costs to achieve will be higher

Program Title: SERVCO–Brooklyn NY Office Relocation -- DNY

Brief Description:

The Downstate NY program will relocate existing personnel in the MetroTech office site to another facility within the Brooklyn Borough and reduce the existing footprint. The plan includes subleasing the current space until the end of the end of lease term (2/2025). The call center, customer office and sustainability hub will remain at the current location until the end of the lease term.

The detailed project plan for the program includes these key steps:

- Site Selection
- Transaction execution
- Planning
- Design
- Bid/Award Negotiation
- Construction
- Move
- Occupancy

This program is part of a comprehensive property review by National Grid Service to transition employees to high performing, more cost-efficient workplace environments and targets completion in 2020.

Program Justification:

The office relocation fits National Grid's property strategy to improve workspace efficiency. The current lease for the Company's Brooklyn location is due to expire in 2025. With the current positive real estate market condition in terms of supply and variety, the timing is optimal to explore options that may yield lower leasing cost.

Additionally, National Grid believes that the move to a smaller square footage will positively impact the overall performance of its space in support of its strategic agenda including a more efficient, fit for purpose service levels that will deliver improved utilization and a lower overall cost of occupancy. The project anticipates a sublease of the current location.

Program Cost Breakdown for New Location:

CAPEX \$000	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Brooklyn Office Relocation	7,959	13,271	0	0	0

Customer Benefit:

- Lower Cost of occupancy
- Reduced facilities operating costs
- Improved efficiency and productivity of employees
- Alignment to support new ways of working
- Improved employee engagement and retention

Alternatives:

1. **Do Nothing** - Existing space standards and amount of space under lease will continue to be at a higher cost, and employees may be less engaged and productive.
2. **Reduction in Current Location** – Consideration has been given to retrofit and reduce the existing space; however, given the age and base design floor plates, refitting the existing space would be costlier.

Program Title: SERVCO – IM Warehouse Consolidation – KEDLI/ KEDNY

Brief Description:

Program to support the consolidation and integration of Gas Distribution and Gas Transmission supply chains. A new free-standing location on Long Island of approximately 85k sq ft to replace the current warehouse at Greenpoint, Brooklyn is proposed. Proposal is based on an owned solution given favorable availability in the Long Island real estate market.

This Property- Real Estate program supports a larger, more comprehensive overall supply and inventory management program for the Gas Business Enablement in US.

The detailed project plan for the real estate search and site development described includes these key steps:

- Site selection
- Transaction Execution
- Planning
- Design
- Bid/Award Negotiation
- Construction
- Move
- Occupancy

Program Justification

The consolidated warehouse will provide required functionality to meet materials traceability requirement. This will help to improve services provided to Gas Transmission and Gas Distribution partners as well as National Grid Gas Operations crews by enabling increased delivery frequency while optimizing routes and improving utilization. New warehouse facility will incorporate layout, equipment and inventory management practices directly aligned to the new Gas Business Operating model.

Program Cost Breakdown:

CAPEX \$000	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
IM Warehouse Consolidation	13,983	1,076	0	0	0

Customer Benefit:

- Improve service levels
- Enhance productivity and eliminate non-value add activities
- Reduced Operating costs
- Reduced capital cost
- Improved project delivery timelines

Alternatives:

3. **Do nothing** – Age/condition of current building limits use and further expansion
4. **Renovate or redevelop in place** – Not recommended based on existing environmental, process safety, drive/response time and yard congestion at the Greenpoint location.

Program Title: SERVCO– Reservoir Woods Office Project– Waltham, MA

Brief Description:

Program to reconfigure National Grid’s Reservoir Woods office to increase occupant capacity, align spaces to new ways of working, and improve utilization. The project includes reconfiguring the space to provide a mix of standard cubicles, collaborative and quiet spaces as well as the deployment of new technologies in support of the space.

This program is part of a comprehensive property review by National Grid Property Services to transition employees to high performing, more cost-efficient workplace environments and targets completion in 2020.

Major categories of work, commenced in 2018, include:

- Planning
- Design
- Construction
- Move
- Occupancy

Program Justification:

The office relocation fits National Grid’s property strategy to improve workspace efficiency by allowing higher assigned occupancy in its existing facility avoiding potentially leasing additional incremental space. This project allows National Grid to drive reduction in space allocated per FTE and improve alignment with the company’s strategic priorities including increased employee engagement, talent retention, and enhanced productivity.

Program Cost Breakdown:

CAPEX \$000	FY 2020	FY 2021	FY 2022	FY 2023
Reservoir Woods Office Project	6,023	0	0	0

Customer Benefit:

- Lower Cost of occupancy
- Reduced facilities operating costs
- Improved efficiency and productivity of employees
- Alignment to support new ways of working
- Improved employee engagement and retention

Alternatives:

1. **Do nothing-** If the company does nothing, it will not be able to accommodate the increased occupancy demand at Reservoir Woods.
2. **Defer the Project-** This option will likely result in increased project costs because of rising construction and material costs. This option is not recommended.

Testimony of the Gas Infrastructure and Operations Panel

Exhibit __ (GIOP-8)

**Incremental O&M Expenditures: Rate Year,
Data Year 1, Data Year 2, and Data Year 3**

The Brooklyn Union Gas Company d/b/a National Grid NY
Gas Safety and Gas Infrastructure and Operations Panels
Incremental Operating Expenses
(\$000's)

Panel / Program / Position	Rate Year 2021			Data Year 2022		
	Labor	Non-labor	Total	Labor	Non-labor	Total
Gas Safety						
Plastic Fusion Inspection	\$ -	\$ 102.5	\$ 102.5	\$ -	\$ 104.6	\$ 104.6
Service Line Inspection	436.6	5,900.0	6,336.6	446.2	6,077.0	6,523.2
Contractor Safety Inspection	537.1	227.5	764.6	1,645.6	659.7	2,305.3
Enhanced Inactive Accounts (Accelerate 60 to 30 days)	6,280.9	-	6,280.9	11,363.2	17,082.8	28,446.0
I&R Improvements	-	-	-	-	-	-
I&R - O&M regulator station training simulators	-	75.0	75.0	-	75.0	75.0
I&R - Site Specific Procedures	391.4	-	391.4	400.0	-	400.0
I&R - Survey & GPS map regulator station control lines	-	1,496.0	1,496.0	-	-	-
I&R Improvements Total	391.4	1,571.0	1,962.4	400.0	75.0	475.0
Enhanced Pipeline Safety Mgmt and Damage Prevention						
Damage Prevention- Damage Prevention Advisor Program	-	1,404.0	1,404.0	-	1,542.2	1,542.2
Damage Prevention FTE's - Supervisor	189.5	-	189.5	193.6	-	193.6
Damage Prevention- Markout Increases	-	980.2	980.2	-	1,232.8	1,232.8
Pipeline Safety Mgmt (API 1173 Implementation)	742.3	-	742.3	758.6	-	758.6
Enhanced Pipeline Safety Mgmt and Damage Prevention Total	931.8	2,384.2	3,316.0	952.2	2,775.0	3,727.2
Materials Testing Lab	47.8	-	47.8	48.8	-	48.8
Single Meter Inspection	362.0	780.0	1,142.0	369.6	780.0	1,149.6
Gas Control SOP Training	339.8	-	339.8	347.2	-	347.2
Training (1st Responder & Field)	-	-	-	-	-	-
Training - First Responder	289.8	50.0	339.8	296.2	50.0	346.2
Training - Field Evaluator	289.8	50.0	339.8	296.2	50.0	346.2
Training (1st Responder & Field) Total	579.7	100.0	679.7	592.4	100.0	692.4
Expanded Residential Methane Detection						
Residential Methane Detectors	-	1,674.0	1,674.0	-	1,674.0	1,674.0
Residential Methane Detectors- Education / Outreach	-	222.0	222.0	-	222.0	222.0
Expanded Residential Methane Detection Total	-	1,896.0	1,896.0	-	1,896.0	1,896.0
Enhanced High Emitter Methane Detection	53.1	250.0	303.1	54.2	255.0	309.2
Gas Safety Total	\$ 9,960.0	\$ 13,211.3	\$ 23,171.2	\$ 16,219.3	\$ 29,805.1	\$ 46,024.4
GIOP						
OpEx Support for Capital	\$ 530.0	\$ -	\$ 530.0	\$ 832.6	\$ -	\$ 832.6
D&R's related to Capital	-	53.2	53.2	-	1,891.1	1,891.1
IMP/IVP OpEx	-	-	-	-	-	-
Pipeline Integrity Support (IMP/IVP)	230.1	-	230.1	234.9	-	234.9
Pipeline Integrity- IMP (PHMSA Rules)	-	4,285.2	4,285.2	-	(853.9)	(853.9)
Pipeline Integrity- IVP (PHMSA Rules)	-	2,893.1	2,893.1	-	2,950.4	2,950.4
Capital IMP/IVP Projects Engineer (PHMSA Rules)	20.4	-	20.4	20.8	-	20.8
IMP -- ILI / ECDA (PHMSA Rules)	113.0	-	113.0	138.7	-	138.7
IMP Program Risk Model (PHMSA Rules)	67.9	-	67.9	69.3	-	69.3
IMP/IVP OpEx Total	431.3	7,178.4	7,609.7	463.8	2,096.5	2,560.3
Station Integrity						
Pressure Reg Eng - Trans Station Integrity Testing	-	146.0	146.0	-	796.0	796.0
Support PHMSA Rulemaking	174.4	-	174.4	178.3	-	178.3
Station Integrity Total	174.4	146.0	320.4	178.3	796.0	974.3
Storm Hardening						
Storm Hardening Program	-	520.6	520.6	-	708.7	708.7
Investigate alarms, Maintain valve components	36.2	-	36.2	37.0	-	37.0
System Monitoring, valve location, investigate alarms	30.7	-	30.7	41.8	-	41.8
Storm Hardening Total	66.9	520.6	587.5	78.7	708.7	787.4
Fixed Factor Inspection	479.6	-	479.6	489.8	-	489.8
Research and Development	183.0	1,768.2	1,951.2	187.0	1,460.2	1,647.2
GIOP Total	\$ 1,865.2	\$ 9,666.4	\$ 11,531.6	\$ 2,230.1	\$ 6,952.5	\$ 9,182.6
Grand Total	\$ 11,825.2	\$ 22,877.6	\$ 34,702.8	\$ 18,449.4	\$ 36,757.6	\$ 55,207.0

The Brooklyn Union Gas Company d/b/a National Grid NY
Gas Safety and Gas Infrastructure and Operations Panels
Incremental Operating Expenses
(\$000's)

Panel / Program / Position	Data Year 2023			Data Year 2024		
	Labor	Non-labor	Total	Labor	Non-labor	Total
Gas Safety						
Plastic Fusion Inspection	\$ -	\$ 106.7	\$ 106.7	\$ -	\$ 108.8	\$ 108.8
Service Line Inspection	458.7	6,304.0	6,762.7	466.1	6,470.0	6,936.1
Contractor Safety Inspection	2,816.1	1,074.6	3,890.8	2,861.6	1,025.4	3,887.0
Enhanced Inactive Accounts (Accelerate 60 to 30 days)	11,666.3	17,082.8	28,749.2	11,854.7	17,082.8	28,937.5
I&R Improvements	-	-	-	-	-	-
I&R - O&M regulator station training simulators	-	85.0	85.0	-	85.0	85.0
I&R - Site Specific Procedures	411.3	-	411.3	417.8	-	417.8
I&R - Survey & GPS map regulator station control lines	-	-	-	-	-	-
I&R Improvements Total	411.3	85.0	496.3	417.8	85.0	502.8
Enhanced Pipeline Safety Mgmt and Damage Prevention						
Damage Prevention- Damage Prevention Advisor Program	-	1,797.9	1,797.9	-	1,948.4	1,948.4
Damage Prevention FTE's - Supervisor	199.1	-	199.1	202.3	-	202.3
Damage Prevention- Markout Increases	-	1,560.8	1,560.8	-	1,986.7	1,986.7
Pipeline Safety Mgmt (API 1173 Implementation)	780.0	-	780.0	792.5	-	792.5
Enhanced Pipeline Safety Mgmt and Damage Prevention Total	979.1	3,358.7	4,337.8	994.7	3,935.1	4,929.9
Materials Testing Lab	50.1	-	50.1	50.9	-	50.9
Single Meter Inspection	379.5	780.0	1,159.5	385.6	780.0	1,165.6
Gas Control SOP Training	357.0	-	357.0	362.7	-	362.7
Training (1st Responder & Field)	-	-	-	-	-	-
Training - First Responder	304.6	50.0	354.6	309.4	50.0	359.4
Training - Field Evaluator	304.6	50.0	354.6	309.4	50.0	359.4
Training (1st Responder & Field) Total	609.1	100.0	709.1	618.8	100.0	718.8
Expanded Residential Methane Detection						
Residential Methane Detectors	-	1,674.0	1,674.0	-	1,674.0	1,674.0
Residential Methane Detectors- Education / Outreach	-	222.0	222.0	-	222.0	222.0
Expanded Residential Methane Detection Total	-	1,896.0	1,896.0	-	1,896.0	1,896.0
Enhanced High Emitter Methane Detection	55.8	260.1	315.9	56.6	265.3	321.9
Gas Safety Total	\$ 17,783.0	\$ 31,048.0	\$ 48,830.9	\$ 18,069.6	\$ 31,748.4	\$ 49,818.1
GIOP						
OpEx Support for Capital	\$ 1,187.3	\$ -	\$ 1,187.3	\$ 1,415.1	\$ -	\$ 1,415.1
D&R's related to Capital	-	3,798.8	3,798.8	-	5,983.2	5,983.2
IMP/IVP OpEx	-	-	-	-	-	-
Pipeline Integrity Support (IMP/IVP)	241.2	-	241.2	245.1	-	245.1
Pipeline Integrity- IMP (PHMSA Rules)	-	(2,290.3)	(2,290.3)	-	2,984.6	2,984.6
Pipeline Integrity- IVP (PHMSA Rules)	-	3,009.7	3,009.7	-	3,070.0	3,070.0
Capital IMP/IVP Projects Engineer (PHMSA Rules)	21.4	-	21.4	21.7	-	21.7
IMP -- ILI / ECDA (PHMSA Rules)	142.6	-	142.6	144.9	-	144.9
IMP Program Risk Model (PHMSA Rules)	71.3	-	71.3	72.4	-	72.4
IMP/IVP OpEx Total	476.5	719.4	1,195.9	484.1	6,054.6	6,538.7
Station Integrity						
Pressure Reg Eng - Trans Station Integrity Testing	-	771.0	771.0	-	787.0	787.0
Support PHMSA Rulemaking	183.3	-	183.3	186.2	-	186.2
Station Integrity Total	183.3	771.0	954.3	186.2	787.0	973.2
Storm Hardening						
Storm Hardening Program	-	740.7	740.7	-	903.5	903.5
Investigate alarms, Maintain valve components	37.9	-	37.9	38.6	-	38.6
System Monitoring, valve location, investigate alarms	42.9	-	42.9	43.6	-	43.6
Storm Hardening Total	80.9	740.7	821.5	82.2	903.5	985.7
Fixed Factor Inspection	502.8	-	502.8	510.9	-	510.9
Research and Development	192.3	1,345.6	1,537.9	195.4	1,373.8	1,569.2
GIOP Total	\$ 2,623.0	\$ 7,375.5	\$ 9,998.5	\$ 2,873.9	\$ 15,102.1	\$ 17,976.0
Grand Total	\$ 20,406.0	\$ 38,423.4	\$ 58,829.5	\$ 20,943.5	\$ 46,850.5	\$ 67,794.0

Testimony of the Gas Infrastructure and Operations Panel

Exhibit __ (GIOP-9)

Incremental FTE Positions by Function in the Rate Year, Data Year 1, Data Year 2, and Data Year 3

The Brooklyn Union Gas Company d/b/a National Grid NY
Incremental FTE's
Gas Safety and Gas Infrastructure and Operations Panels

Panel	Program	Position	Rate Year 2021	Data Year 2022	Data Year 2023	Data Year 2024
Gas Safety	Service Line Inspection	Analyst	0.5	-	-	-
		Field Inspector	3.0	-	-	-
	Service Line Inspection Total		3.5	-	-	-
	Contractor Safety Inspection	Inspector	22.0	44.0	44.0	-
		Supervisor	3.0	6.0	6.0	-
	Contractor Safety Inspection Total		25.0	50.0	50.0	-
	Enhanced Inactive Accounts	Call Center Representative	2.0	2.0	-	-
		Customer Service Representative	-	10.0	-	-
		Manager	-	1.0	-	-
		Meter Service Representative	60.0	35.0	-	-
		Supervisor	2.0	1.0	-	-
		Technician	14.0	6.0	-	-
	Enhanced Inactive Accounts Total		78.0	55.0	-	-
	I&R Improvements	Analyst	0.5	-	-	-
		Engineer	1.0	-	-	-
		Field Trainer	1.0	-	-	-
	I&R Improvements Total		2.5	-	-	-
	Gas Pipeline Safety	Pipeline Safety Management Specialist	10.0	-	-	-
		Regulatory Specialist	0.4	-	-	-
		Sr. Supervisor	1.0	-	-	-
	Gas Pipeline Safety Total		11.4	-	-	-
	Materials Testing Lab	Senior T&D Lead Man	0.5	-	-	-
	Materials Testing Lab Total		0.5	-	-	-
	Single Meter Inspection	Technician	3.0	-	-	-
	Single Meter Inspection Total		3.0	-	-	-
	Gas Control SOP Training	Engineer	0.3	-	-	-
		SOP Coordinator	2.0	-	-	-
	Gas Control SOP Training Total		2.3	-	-	-
	Training (1st Responder & Field)	First Responder Instructor	2.0	-	-	-
		Instructor/Field Evaluator	2.0	-	-	-
	Training (1st Responder & Field) Total		4.0	-	-	-
	Enhanced High Emitter Methane Detection	Engineer	0.4	-	-	-
	Enhanced High Emitter Methane Detection Total		0.4	-	-	-
Gas Safety Total			130.6	105.0	50.0	-
GIOP	OpEx Support for Capital	Contract Oversight Analysts	2.0	-	-	-
		Analyst	1.0	-	-	-
		Engineer	3.0	4.0	3.0	4.0
		Inspector	9.0	8.0	6.0	6.0
		Supervisor	2.0	-	1.0	-
		Welder	1.0	-	-	-
	OpEx Support for Capital Total		18.0	12.0	10.0	10.0
	IMP/IVP OpEx	Engineer	2.5	-	-	-
		Helper	1.0	-	-	-
		Sr. Technician	1.0	-	-	-
	IMP/IVP OpEx Total		4.5	-	-	-
	Station Integrity	Integrity Management Engineer	1.0	-	-	-
		Manager - Records Management	0.5	-	-	-
		Manager - Station Integrity	0.5	-	-	-
	Station Integrity Total		2.0	-	-	-
	Storm Hardening	Analyst	0.3	-	-	-
		Field Technician	0.3	-	-	-
	Storm Hardening Total		0.6	-	-	-
	Fixed Factor Inspection	Instrument Mechanic	3.0	-	-	-
	Fixed Factor Inspection Total		3.0	-	-	-
	Research and Development	Data Analyst	0.5	-	-	-
		Lead Engineer	0.5	-	-	-
	Research and Development Total		1.0	-	-	-
GIOP Total			29.1	12.0	10.0	10.0
Grand Total Incremental			159.71	117.00	60.00	10.00
Grand Total Cumulative Incremental			159.71	276.71	336.71	346.71