

STATE OF CONNECTICUT  
PUBLIC UTILITIES REGULATORY AUTHORITY

DOCKET NO. 18-05-10

APPLICATION OF  
YANKEE GAS SERVICES COMPANY d/b/a EVERSOURCE ENERGY  
TO AMEND ITS RATE SCHEDULES

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TESTIMONY OF  
THOMAS L. HART  
ON BEHALF OF  
YANKEE GAS SERVICES COMPANY d/b/a EVERSOURCE ENERGY

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JUNE 15, 2018

## Table of Contents

I.	Introduction .....	1
II.	Overview of Yankee’s Capital Program .....	3
III.	Capital Projects in New Business and Basic Business .....	8
IV.	Reliability, System Resiliency and Leak-Prone Infrastructure Replacement .....	11
	A. Gate and Regulator Station Projects .....	14
	B. System Integrity Projects .....	15
	C. System Resiliency Program.....	17
	D. Replacement Programs and Projects .....	24
V.	Flood Hardening Program .....	48

1 **I. Introduction**

2 **Q. Mr. Hart, please state your name and business address.**

3 A. My name is Thomas L. Hart. My business address is 107 Selden Street, Berlin,  
4 Connecticut 06037.

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

6 A. I am employed by Eversource Energy Service Company (“Eversource Service  
7 Company”) as the Director of Gas Engineering. Eversource Service Company  
8 provides financial, administrative and technical support to the subsidiaries of  
9 Eversource Energy (“Eversource”), including Yankee Gas Services Company  
10 (“Yankee” or the “Company”). My current duties include oversight of Yankee’s Gas  
11 Engineering department, including system planning, risk management, investment  
12 planning, project engineering, gas procedures, geographical information system  
13 and Quality Assurance/Quality Control (“QA/QC”) program.

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

15 A. I have worked in the natural gas industry for over 35 years. I graduated from the  
16 University of Connecticut with a Bachelor of Science degree in Civil Engineering,  
17 and subsequently earned a Master of Business Administration degree and a  
18 Master’s in Human Resources and Industrial Relations, both from Rutgers  
19 University. I joined Eversource in 1998 as Director – Strategic Planning. Since  
20 1999, I have been the Director of Gas Engineering, or have held positions within  
21 the organization with similar responsibilities (e.g., Director of Gas Asset

1 Management). Prior to joining Eversource, I worked at Ernst and Young Utility  
2 Consulting, and at Public Service Electric & Gas in New Jersey.

3 **Q. Have you previously testified before the Connecticut Public Utilities**  
4 **Regulatory Authority or other regulatory agencies?**

5 A. Yes. I testified before the Public Utilities Regulatory Authority (“PURA” or the  
6 “Authority”) on behalf of Yankee in Docket No. 17-04-10 in connection with the  
7 Company’s proposal to implement compliance with new federal regulations for  
8 excess flow valve installations.

9 **Q. What is the purpose of your testimony?**

10 A. My testimony provides an overview of the Company’s capital program for the rate  
11 years ending December 31, 2019, 2020 and 2021 (the “Rate Years”), including a  
12 description of the major categories of capital investment planned by the Company  
13 and the principal drivers for the levels of investment needed in each category. In  
14 particular, my testimony discusses the Company’s capital projects for reliability,  
15 system resiliency and replacement of leak-prone infrastructure pursuant to its gas  
16 distribution integrity management program (“DIMP”). My testimony also supports  
17 Yankee’s proposal to modify the DIMP to further accelerate the removal of leak  
18 prone pipe and expand the types of aging infrastructure targeted for replacement  
19 under the program based on Yankee’s experience to date and its evaluation of  
20 program results. My testimony also explains the Company’s capital spending plan  
21 in relation to a critical flood hardening initiative, which, as explained below, is  
22 proposed to be included as a component of the DIMP Reconciliation Mechanism.  
23 My testimony focuses on the operational and engineering aspects of the DIMP

1 investments. Company witness Douglas P. Horton and the Rates Panel testimony  
2 describe in more detail the mechanics of the ratemaking proposal associated with  
3 the DIMP Reconciliation Mechanism.

4 **Q. How is your testimony organized?**

5 A. My testimony is organized into the following sections.

- 6 • Section I is the introduction.
- 7 • Section II provides an overview of the capital program and the planned levels  
8 of investment in the Rate Years.
- 9 • Section III describes the proposed capital projects for New Business and Basic  
10 Business investments.
- 11 • Section IV discusses the Company's planned investments for Reliability,  
12 System Resiliency and Leak-Prone Infrastructure Replacement, including  
13 Yankee's DIMP and its proposal to accelerate and expand the removal of aging  
14 infrastructure on its system.
- 15 • Section V presents the Company's proposed Flood Hardening Program.

16 **II. Overview of Yankee's Capital Program**

17 **Q. What are the guiding principles of Yankee's capital planning process?**

18 A. Yankee's capital plan is developed based on a five-year forecast that is updated  
19 annually. The Company follows a rigorous framework to guide decision-making,  
20 evaluation and approval of all capital project spending, and to enable it to identify

1 key spending initiatives and optimize the utilization of corporate financial  
2 resources. The Company's annual capital plans are prepared through a detailed  
3 analysis and prioritization process identifying the appropriate mix of work that will  
4 best address system-related safety and reliability issues and opportunities for  
5 growth. From an overall perspective, the Company's objective is to arrive at a  
6 capital plan that is the optimal balance in terms of making the investments  
7 necessary to maintain and improve the performance of the system while also  
8 ensuring a cost-effective use of resources. Simultaneously, Yankee must maintain  
9 a level of flexibility inherent in the budget process to ensure that it is in a position  
10 to deal with contingencies that inevitably occur during the year. Accordingly, all  
11 prioritization decisions are ultimately evaluated by the Company's senior  
12 executives through an extensive budget-review process.

13 **Q. Once the capital investment plan is developed, does the Company have**  
14 **measures in place to control costs as projects are designed and**  
15 **constructed?**

16 A. Yes, the Company has a number of measures to ensure cost control and efficient  
17 use of resources. For example, Yankee uses a procurement process in which it  
18 obtains unit cost pricing for vendors and materials. The process ensures that  
19 pricing is based on competitive bids, resulting in costs that reflect market rates.  
20 Yankee also conducts monthly project review meetings that include the project  
21 management team along with key members of the gas senior leadership,  
22 construction, planning and scheduling, and finance teams. The monthly project  
23 review meetings provide the opportunity to determine if projects that have been

1 included in the capital plan should be altered or delayed based on the most current  
2 available system and cost information. If it is determined that changes to the  
3 capital plan or budgeted amounts may be necessary, project managers submit  
4 their recommendations to the Gas Project Sanctioning Committee for review and  
5 approval. On an overall basis, these measures provide management a high level  
6 of oversight and cost control of ongoing and planned capital projects.

7 **Q. As a result of this process, does Yankee's capital plan identify the levels of**  
8 **investment necessary to support safe and reliable service and customer**  
9 **growth in the Rate Years?**

10 A. Yes. Through the rigorous planning process described above, the Company's  
11 capital program has been developed to fulfill Yankee's commitment to delivering  
12 gas in a safe, reliable and efficient manner to both existing customers and new  
13 customers. As noted, the capital plan is developed based on a 5-year forecast  
14 that is updated annually, and therefore the current plan includes the Rate Years  
15 2019, 2020 and 2021. The capital plan is comprised of three major categories of  
16 capital investments, which are New Business, Basic Business and Reliability.

17 **Q. What types of projects are covered in each of these categories?**

18 A. The New Business category primarily includes installation of new mains and  
19 services associated with connecting new customers to the gas distribution system.  
20 The Basic Business category includes emergency replacements to address leaks,  
21 replacements to resolve conflicts between gas facilities and state and municipal  
22 infrastructure projects (typically road/paving projects), and meter replacements  
23 and installations. The Reliability category comprises the largest segment of the

1 capital plan. Reliability investments include programs and projects to improve the  
2 safety and reliability of the distribution system and reduce risks due to aging  
3 infrastructure and leak-prone pipe, as identified in the Company's DIMP. This  
4 category also includes gate and regulator station projects, system integrity projects  
5 and system resiliency projects.

6 **Q. From an overall perspective, what are the factors driving the level of capital**  
7 **investment that is required in the Rate Years?**

8 A. Yankee's capital plan is designed in furtherance of the mandated objectives of  
9 maintaining a safe and reliable distribution system, including the replacement of  
10 aging and leak-prone infrastructure, enhancing resiliency and increasing capacity  
11 to accommodate new customer growth. The Company continues to focus its  
12 capital expenditures on addressing the most important day-to-day performance  
13 and operational needs of the system to serve its customers. Consistent with this  
14 obligation, the Company must continuously invest in its distribution system to  
15 ensure safe and reliable operation. Yankee has made substantial capital  
16 investments in its system since its last rate case, yet the Company's capital  
17 requirements are increasing to meet customer and system demands. The  
18 Company has made steady progress on the replacement of leak-prone facilities  
19 but there continues to be a significant amount of leak-prone facilities remaining on  
20 the system that need to be replaced. Yankee conducts an active leak-  
21 management program in compliance with state and federal pipeline safety  
22 regulations. As a result, the investment requirements of the system are continuous  
23 and increasing.

1 In the Rate Years, the investment requirements in New Business, Basic Business  
2 and Reliability are driven by a number of factors. Capital investments in New  
3 Business reflect the Company's forecast of new customer connections and  
4 estimates the associated capital investments needed to provide those  
5 connections. In the Basic Business category, the capital investment requirements  
6 in the Rate Years are expected to be relatively flat year-over-year, based on  
7 forecasts developed from historical data and the Company's knowledge of  
8 upcoming municipal projects. Lastly, the investment needs in the Reliability  
9 category are increasing in the Rate Years to ensure sufficient funding for safe  
10 operation of gas distribution assets, compliance with federal and state regulations,  
11 proactive threat identification, and risk mitigation.

12 **Q. Has there been a substantial level of investment in gas plant by the Company**  
13 **in recent years?**

14 A. Yes. From July 1, 2013 (the end of the second rate year in the Company's most  
15 recent rate case) through December 31, 2017 (the test year in this proceeding),  
16 Yankee invested a total of \$515.7 million in gross rate-base additions. The  
17 additions to plant-in-service during that time period was \$457.2 million, net of all  
18 adjustments.

19 **Q. What are the projected level of investments in Yankee's current capital plan?**

20 A. As noted above, the Company's capital plan is designed to provide the critical  
21 distribution system investments required for safety, reliability, resiliency and new  
22 customer growth. In the Rate Years, Yankee is planning total annual investments  
23 in the amounts of \$211.8 million in 2019, \$223.6 million in 2020 and \$232.8 in 2021

1 across the categories of New Business, Basic Business and Reliability. Table 1  
 2 below provides the capital investments in each category for each of the Rate Years  
 3 2019, 2020 and 2021:

4 **Table 1: Projected Capital Spending and Plant In Service**

<b>Program</b>	<b>Rate Year 1</b>	<b>Rate Year 2</b>	<b>Rate Year 3</b>
	2019	2020	2021
New Business (Note A)	\$ 40,875	\$ 42,275	\$ 43,775
DIMP Eligible Service Replacement	\$ 10,000	\$ 10,000	\$ 10,000
Other Basic Business	33,139	33,478	33,977
Total Basic Business	\$ 43,139	\$ 43,478	\$ 43,977
DIMP-Eligible Reliability Investments	\$ 61,100	\$ 75,200	\$ 85,400
System Resiliency	39,600	35,200	32,600
DIMP-Eligible System Integrity Investments (flood hardening)	6,100	6,100	6,100
System Integrity	16,500	16,500	16,700
Gate and Regulator Station	4,500	4,800	4,200
Total Reliability	\$ 127,800	\$ 137,800	\$ 145,000
Total Capital Spending	\$ 211,814	\$ 223,553	\$ 232,752
Plant in Service (Note B)	\$ 198,271	\$ 209,601	\$ 218,344

Note A: Represents total spending for system expansion, less the non-firm margin credits, which reduce rate base.

Note B: See SFR B-2.1 reflecting this level of plant additions in each of the Rate Years. Capital expenditures are different than plant placed in service due to the timing of when each capital project was started versus when it is expected to be completed and in-service, among other factors.

5

6 **III. Capital Projects in New Business and Basic Business**

7 **Q. Please describe in more detail the types of capital projects included in the**  
 8 **New Business category.**

9 A. Capital investments in this category predominantly include the installation of new  
 10 mains and services associated with connecting new customers. This category  
 11 includes projects for certain portions of cities and towns, as well as large new

1 customers. Projects in towns such as Darien, Groton, Torrington, Stamford and  
2 New Canaan have been included in the forecast as they are projects commencing  
3 in 2018. In developing the forecast for the capital program, the Company assesses  
4 potential new customer connections and estimates the associated capital  
5 investments needed to provide those connections.

6 **Q. What are the primary factors for the expected increase of expenditures in the**  
7 **New Business category in the Rate Years?**

8 A. In developing the expected level of expenditures in this category, the primary  
9 drivers are related to ongoing work from previous multi-year projects, the  
10 Company's new firm customer forecast, and the Company's identification of  
11 special projects. In 2019, much of the ongoing expenditures are based on the  
12 continuation of off-main projects commenced in 2018. The Company intends to  
13 install approximately 200,000 feet of new business expansion main in 2018. The  
14 Company expects that new business expansion main growth will continue at the  
15 same or similar level as 2018 for each of the Rate Years. The projected Rate Year  
16 growth has been escalated from the 2018 projection by the rate of inflation. In  
17 addition, the Company has projected new expansion customer service line and  
18 manifold expenditures that are derived from the level of the new firm customer  
19 forecast for 2018. The level of new firm customer growth for the Rate Years is  
20 consistent with the 2018 forecast, which in the Company's experience is an  
21 appropriate basis for this projection.

1 **Q. What is the Company projecting for customer growth in the rate years?**

2 A. Since the commencement of the Company's Gas Expansion Plan beginning  
3 January 1, 2014, the Company has been tracking actual new customers in  
4 comparison to customer targets that were presented in the 2013 Plan. In 2014  
5 and 2015, the Company exceeded the Plan customer targets, but in 2016 it saw a  
6 decline in new customer connections versus the Plan target due to the overall  
7 Connecticut economy and the narrowing of the spread in oil and gas  
8 prices. Based on the current customer market, the Company forecasts  
9 approximately 4,700 new heating customers in 2018 and anticipates that future  
10 customer growth will continue at a similar level 2019 – 2021. The new business  
11 capital investment that the Company has included in this filing is consistent with  
12 this new customer forecast.

13 **Q. Please describe the types of capital investments included in the Basic**  
14 **Business category.**

15 A. Capital investments in this category include emergency replacements to address  
16 leaks, replacements to resolve conflicts between gas facilities and state/municipal  
17 infrastructure projects (typically road and paving projects), and meter  
18 replacements and installations. This category includes projects such as the City  
19 of Waterbury's planned replacement of the East Liberty Street bridge. Currently  
20 scheduled for 2019, this project would require pipe removal for bridge construction  
21 and then the installation of new pipe on the newly constructed bridge. Capital  
22 investment forecasts for this category are developed primarily based on historical  
23 data and the Company's knowledge of upcoming municipal projects.

1 **Q. What are the primary factors for the expected level of expenditures in the**  
2 **Basic Business category in the Rate Years?**

3 A. As previously discussed, forecasts for this category are primarily based on  
4 historical data, as emergent work generated outside of the Company's plan is the  
5 primary driver for expenditures within this category. Whether it is replacing  
6 facilities due to a gas leak or a conflict with the state's or a municipality's road  
7 reconstruction project, the specific projects in this category are not planned within  
8 the five-year forecast. Spending for all sections within this category are monitored  
9 and trended to facilitate the establishment of the projected budget. Gas meters  
10 are also a significant component within this category. The Basic Business  
11 category includes the purchase of replacement meters for existing customers and  
12 new meters for new customers. Therefore, this line item mirrors with gas  
13 expansion as well as the Company's required periodic meter testing program.

14 **IV. Reliability, System Resiliency and Leak-Prone Infrastructure Replacement**

15 **Q. Please discuss the types of capital investments included in the Reliability**  
16 **category.**

17 A. The capital investments in this category target programs and projects to improve  
18 the safety and reliability of the distribution system and reduce risk. The Reliability  
19 category includes projects such as the following:

- 20 a. Gate and regulator station projects;
- 21 b. System integrity projects;
- 22 c. System resiliency program projects; and
- 23 d. Replacement programs and projects.

1 Programs and projects are identified for inclusion in the capital plan based on the  
2 Company's integrated Gas Asset & Risk Management Program, which is further  
3 described below. In addition, projects are identified through a system planning  
4 process that selects projects based on modeling analysis, where the projects are  
5 designed to achieve specific system goals, including increased reliability, system  
6 capacity, and/or redundancy.

7 **Q. Please elaborate on how the Company identifies necessary capital**  
8 **investments in the Reliability category.**

9 A. Yankee determines necessary investments in reliability through its Gas Asset &  
10 Risk Management Program, which serves to manage the gas distribution assets  
11 in a timely and efficient manner; ensure compliance with federal and state  
12 regulations and requirements; proactively identify threats; evaluate and rank risks;  
13 and develop mitigation programs to reduce those risks.

14 As part of this program, the Company has developed seven Gas Asset teams:

- 15 1. Leak Prone Mains and Services;
- 16 2. Cathodically Protected Mains and Services;
- 17 3. Gate Stations;
- 18 4. District Regulators;
- 19 5. Greater than 100 psig Mains and Services;
- 20 6. Plastic Mains and Services; and
- 21 7. Meters.

22 The Gas Asset teams annually review the unique risks that each segment may  
23 encounter, and each team develops a risk-based approach to managing and

1 mitigating those risks. The programs they develop are the foundation for the  
2 Company's Reliability capital budget.

3 System resiliency projects are identified through the system planning process  
4 described above, independent of the Gas Asset teams, with results then integrated  
5 into the Gas Asset & Risk Management Program.

6 **Q. How does the Gas Asset & Risk Management Program facilitate the**  
7 **allocation of capital resources to address reliability needs?**

8 A. The programs developed by the Gas Asset teams are presented to Company  
9 management, which then uses the data on each program, including the risks  
10 targeted by each program and the capital resources required for each program, to  
11 prioritize programs for implementation and capital investment. For example,  
12 hazardous leaks impose substantial operating risk, and therefore the capital  
13 allocation is heavily weighted toward leak-prone facilities given the immediacy of  
14 action required to address these leaks. As a result, the Leak Prone Mains and  
15 Services asset team requires the largest share of the capital budget for its  
16 mitigation plan, consistent with DIMP requirements, and the balance of funding is  
17 allocated to the remaining Gas Asset teams based on their needs. The Gas Asset  
18 team approach is referenced in the Company's DIMP and the intention is to  
19 distribute capital dollars to address a multitude of operating risks across the  
20 system. To summarize, the Company's management considers input from the Gas  
21 Asset teams and reviews risks across all asset classes in distributing available  
22 capital funds in the optimal manner.

1 **Q. Can you provide a breakdown of Reliability investments in the Rate Years?**

2 A. Yes. Table 2 provides the Rate Year investments for Gate and Regulator Station  
3 projects, System Integrity projects, System Resiliency projects, and Replacement  
4 programs:

5 *Table 2: Proposed Reliability Investments (000's)*

<b>Program</b>	<b>Rate Year 1</b>	<b>Rate Year 2</b>	<b>Rate Year 3</b>
DIMP-Eligible Reliability Investments	\$ 61,100	\$ 75,200	\$ 85,400
System Resiliency	39,600	35,200	32,600
DIMP-Eligible System Integrity Investments (flood hardening)	6,100	6,100	6,100
System Integrity	16,500	16,500	16,700
Gate and Regulator Station	4,500	4,800	4,200
6 Total Reliability	\$ 127,800	\$ 137,800	\$ 145,000

7 **A. Gate and Regulator Station Projects**

8 **Q. Please provide a brief description of the gate and regulator station projects**  
9 **included in the Reliability category.**

10 A. The capital investments in this category support the building, replacement,  
11 improvement, and retirement of gate stations and district regulator stations.  
12 Specific projects are selected through the Gas Asset & Risk Management Program  
13 process.

14 **Q. What are the main factors contributing to the level of investment needed in**  
15 **the Rate Years for gate and regulator station projects?**

16 A. Subject matter experts (“SMEs”) evaluate the condition and relative importance of  
17 individual stations as part of the Gas Asset & Risk Management Program process.  
18 Stations that are in the greatest need of improvement and most critical to  
19 customers are prioritized for projects. Additionally, SMEs may identify issues or

1 components that require immediate remediation, and if so, these are given top  
2 priority. Thus, the primary factors contributing to project investment for gate and  
3 regulator stations are aging/obsolescence of equipment and increasing customer  
4 need.

5 **Q. Please provide some examples of gate and regulator station projects in the**  
6 **Rate Years.**

7 A. The Kneen Street gate station in Shelton is scheduled to be rebuilt in 2019. This  
8 project will upgrade regulators, outlet piping and the heating system in order to  
9 increase station capacity and lower noise. An example of a regulator station  
10 project is the West at Gridley regulator project in Bristol, also scheduled for 2019.  
11 This project will relocate the existing pits to a new location, better aligning the load  
12 requirements to the system and further facilitating the expansion of an intermediate  
13 pressure system.

14 **B. System Integrity Projects**

15 **Q. Please provide a brief description of the system integrity projects included**  
16 **in the Reliability category.**

17 A. Reliability projects include general system integrity capital projects, as well as  
18 smaller, targeted repair and replacement integrity projects. The general system  
19 integrity projects are selected based on the results of a modeling analysis, which  
20 seeks to determine necessary improvements to ensure no loss of customers under  
21 winter design conditions. The analysis reviews system performance and matches  
22 that to the network model in order to recommend system looping, increasing pipe

1 sizes or even transferring load from a lower pressure system to a higher-pressure  
2 system.

3 The smaller, targeted repair and replacement projects include corrosion repairs,  
4 qualified cast iron bell joint sealing and replacement, cutoff of stubs and  
5 replacement of other equipment with known defects which may lead to higher leak  
6 rates. These projects all serve to repair and replace facilities with known leak or  
7 integrity issues.

8 **Q. What are the main factors contributing to the level of investment needed in  
9 the Rate Years for system integrity projects?**

10 A. The main factors that determine the necessity of a system integrity project are flow  
11 and pressure. Flows are calculated at each regulator; regulators with actual flows  
12 approaching design flows are corrected with system integrity projects. Pressures  
13 are monitored for potential issues, utilizing field data and model data. Adequate  
14 pressures must be maintained at inlet to regulators all the way to the ends of the  
15 systems.

16 **Q. Please provide some examples of system integrity projects in the Rate  
17 Years.**

18 A. One of the Company's current projects involves the installation of 12" steel in  
19 Torrington to deliver gas from the gate station, located on the east side of town, to  
20 the load center in downtown Torrington. This project is scheduled to conclude in  
21 2019. An additional example involves the replacement of low pressure pipe with  
22 intermediate pressure pipe in the vicinity of Colony Street, Bristol, where a short

1 section of existing 6" protected steel main needs to be upgraded to accommodate  
2 the new pressure. This segment will be tested and safely established to be able  
3 to deliver natural gas at the new intermediate pressure.

4 In addition, as described later in this testimony, the Company projects to spend  
5 \$6.1 million annually on flood hardening initiatives such as: relocating regulator  
6 stations, installing vent line protectors and upgrading systems within the flood zones  
7 to higher pressures, all as part of its proposed DIMP Reconciliation Mechanism  
8 eligible investments. These are included in the total System Integrity category of  
9 spending in Tables 1 and 2 above.

10 **C. System Resiliency Program**

11 **Q. Please describe Yankee's System Resiliency Program.**

12 A. The System Resiliency Program selects projects to increase the resiliency of the  
13 distribution system, such as projects that improve the system's ability to adapt to  
14 changing conditions, withstand threats, and quickly recover from incidents by  
15 increasing system redundancy. There are two layers of redundancy relevant to  
16 the System Resiliency Program: (1) distribution-system-level redundancy, which  
17 requires that service to a specific area can be provided by multiple gate stations;  
18 and (2) transmission-system-level redundancy, which requires that sufficient gas  
19 capacity to a specific area can be provided by multiple transmission companies or  
20 alternate gas sources such as LNG.

21 On the distribution system level, the Connecticut gas distribution system is  
22 fragmented, with almost 17 percent of Yankee's customers relying on a single gate

1 station source. The system is also fragmented in the sense that approximately 33  
2 percent of Yankee’s customers rely on a single transmission-level source. For  
3 these reasons, projects in the System Resiliency Program serve to create a  
4 distribution system with greater network capability and minimize the number of  
5 customers that receive gas from a single distribution-system-level or transmission-  
6 system-level source.

7 **Q. What benefits does this program provide?**

8 A. The primary benefit of the System Resiliency Program is to increase the overall  
9 reliability of the natural gas system, which the Authority recognized “is a  
10 fundamental public policy goal, essential to the state’s economic vitality and  
11 protection of the public health, safety and welfare.”<sup>1</sup> Although reliability “does not  
12 mean perfect, guaranteed or fail-safe service,”<sup>2</sup> the proposed projects for system  
13 resiliency will help mitigate the risk of single source failure and potential customer  
14 interruptions. By providing redundancy on both the distribution system level and  
15 the transmission system level, Yankee’s system will be more reliable in response  
16 to outages on its own system, as well as those that occur on the transmission lines.  
17 Yankee recognizes that its customers rely on natural gas every day to warm their  
18 homes, provide hot water and cook meals. Natural gas is also an essential part of  
19 Connecticut’s energy portfolio. Yankee’s system resiliency projects are an integral

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<sup>1</sup> Docket No. 05-05-10, DPUC Consolidated Investigation to Complete Connecticut’s Gas Local Distribution Companies’ Unbundling of Gas Services to Commercial and Industrial Customers (May 10, 2006) at 28.

<sup>2</sup> Id. at 2.

1 part of the Company's work to modernize its infrastructure to provide a clean, safe  
2 and reliable system for its customers.

3 **Q. Are there other factors contributing to the level of investment needed in the**  
4 **Rate Years for the System Resiliency Program?**

5 A. There are three additional near-term trends that are driving increased investments  
6 in system resiliency projects: (1) an increased number of customers with an  
7 increased dependence on natural gas as a primary source of energy; (2) increased  
8 threats of outside attacks to gas infrastructure; and (3) increased pipeline reliability  
9 issues resulting from constraints in the Northeast driven by lack of firm contractual  
10 capacity for gas generation, thus resulting in increased operational flow orders and  
11 restrictions, increasing required transmission pipeline maintenance/construction;  
12 and severity of potential force majeure incidents. For these reasons, Yankee is  
13 strengthening its gas distribution system to improve system reliability and  
14 resiliency, similar to a number of other gas distribution companies across the  
15 country. Major projects similar to Yankee's proposed System Resiliency Program  
16 are proposed, planned or ongoing in the Northeast (e.g., the South Jersey Gas  
17 Cape Atlantic Reliability project,<sup>3</sup> the Southern Reliability Link at New Jersey  
18 Natural Gas,<sup>4</sup> the Reliability Projects at Columbia Gas of Massachusetts<sup>5</sup>), and

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<sup>3</sup> Further information on the South Jersey Gas Cape Atlantic Reliability project is available at the following link: <http://capeatlanticreliability.com/faq/>

<sup>4</sup> Further information on the Southern Reliability Link is available at the following link: <https://www.njng.com/about/southern-reliability-link/faqs.aspx>

<sup>5</sup> Further information on the Reliability Projects is available at the following link: <https://www.columbiagas.com/en/about-us/newsroom/news/2017/11/07/columbia-gas-of-massachusetts-plans-reliability-projects>

1 throughout the country (e.g., the Pekin Reliability Enhancement Project at  
2 Ameren,<sup>6</sup> the Pipeline Safety and Reliability Project at San Diego Gas & Electric<sup>7</sup>)  
3 as other utilities respond to similar trends.

4 **Q. Please explain your point that Yankee is seeing an increasing dependence**  
5 **on natural gas.**

6 A. The many benefits of natural gas are causing Yankee’s customer base to become  
7 more dependent upon natural gas as their primary energy source. Natural gas is  
8 a domestic product with an abundant supply, so the cost of natural gas is lower  
9 than other energy sources. This has led to a greater demand for natural gas, as  
10 well as support for natural gas expansion in the state’s Comprehensive Energy  
11 Strategy (“CES”).<sup>8</sup>

12 Additionally, Yankee is seeing a greater number of customers installing distributed  
13 generation, such as fuel cells, which rely on natural gas. Customers have  
14 indicated an interest in fuel cells due to their relatively low overall capital costs, low  
15 operating costs, and minimal emissions, as well as state and federal incentive  
16 programs. In 2017, Yankee extended natural gas service to a recent fuel cell  
17 project that now provides electricity to the Naugatuck Wastewater Treatment Plant,  
18 which reportedly has a projected savings to the customer of \$4 million over 20

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<sup>6</sup> Further information on the Pekin Reliability Enhancement Project is available at the following link:  
<https://www.ameren.com/ILLINOIS/PEKIN-PROJECT>

<sup>7</sup> Further information on the Pipeline Safety and Reliability Project is available at the following link:  
<https://www.sdge.com/pipeline>

<sup>8</sup> The 2017 CES is available at the following link:  
[http://www.ct.gov/deep/lib/deep/energy/ces/2017\\_draft\\_comprehensiveenergystrategy.pdf](http://www.ct.gov/deep/lib/deep/energy/ces/2017_draft_comprehensiveenergystrategy.pdf)

1 years and required no capital outlay from Naugatuck based on the contract  
2 structuring.<sup>9</sup> The Company anticipates that the number of such fuel cell  
3 installations will increase in the next several years as others look to follow this  
4 approach. Like the Naugatuck project, reliable natural gas service to meet the  
5 demand of fuel cells will be paramount.

6 **Q. Please explain your point regarding an increased threat of outside attacks to**  
7 **gas infrastructure.**

8 A. Although natural gas infrastructure may be less susceptible than electric  
9 infrastructure to weather or other events such as hurricanes, it is vulnerable to risks  
10 such as unauthorized access to pipeline operations, cyber-attacks, and failure or  
11 unplanned outages on transmission pipelines that can lead to a catastrophic  
12 incident. On December 9, 2016, the federal Pipeline and Hazardous Materials  
13 Safety Administration (“PHMSA”) issued an Advisory Bulletin (ADB-2016-0137)  
14 following recent incidents in the United States that highlighted these threats to gas  
15 infrastructure. The advisory reinforced the need for gas companies to monitor and  
16 protect against the real threat of unauthorized access to pipelines and persons  
17 manipulating the system. The consequences of an incident like this could lead to  
18 potential loss of supply to large areas of Yankee’s distribution system and cause  
19 economic harm, as well as endangering public safety.

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<sup>9</sup> See article at: <https://www.mycitizensnews.com/news/2017/10/fuel-cells-to-help-power-plant/>

1 **Q. Lastly, please explain your point regarding the risks associated with an**  
2 **increase of transmission pipeline restrictions.**

3 A. It is long recognized that the Northeast region has substantial pipeline constraints,  
4 including pipeline-capacity paths through New York, New Jersey, and most  
5 chronically New England. A 2013 Department of Energy report entitled  
6 “Assessment of the Adequacy of Natural Gas Pipeline Capacity in the Northeast  
7 United States” described the New England region’s pipeline capacity as  
8 “problematic” and under “severe constraint” even when compared to the rest of the  
9 Northeast.<sup>10</sup> The transmission companies from which Yankee receives natural gas  
10 have been operating at very high load factors due to heavy demand in large part  
11 from generators that do not have long term capacity contracts with the pipelines.  
12 As a result, in order to protect system integrity, the pipelines have routinely  
13 imposed tighter operating conditions. The number of Operational Flow Orders  
14 (“OFOs”) from all three transmission companies serving the state have increased  
15 over the past several years. Additionally, there are recent instances where Yankee  
16 has been impacted by transmission pipeline outages, such as compressor station  
17 failures, construction activity, or emergency repairs after an integrity test. Other  
18 significant failures, such as the event that transpired in April 2016 when a  
19 transmission line exploded in Salem County, Pennsylvania (which took

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<sup>10</sup> The Assessment of the Adequacy of Natural Gas Pipeline Capacity in the Northeast United States report is available at the following link:  
[https://www.energy.gov/sites/prod/files/2013/11/f5/NE\\_Natural%20Gas%20Pipeline%20Study%202013-11-26\\_Final.pdf](https://www.energy.gov/sites/prod/files/2013/11/f5/NE_Natural%20Gas%20Pipeline%20Study%202013-11-26_Final.pdf)

1 approximately eight months to resolve), create gas restrictions in the Northeast,  
2 and therefore also have the potential to impact gas availability.

3 OFO's and restrictions are also imposed due to transmission company  
4 maintenance or construction which, while typically not in the peak months/days,  
5 can occur at any time of the year. In April 2018, cold weather capacity restrictions  
6 were imposed related to maintenance on the Algonquin Gas Transmission System  
7 and resulted in primary capacity cuts up to 71 percent for certain shippers. The  
8 consequences of these events can result in reductions in capacity and system  
9 curtailments. As distribution systems rely on transmission pipelines to deliver  
10 quantities of supply at appropriate pressures, disruption to these lines has the  
11 potential to result in a major disruption to natural gas service to Yankee's  
12 customers. This risk is exacerbated by the fact that restoration of transmission line  
13 service is outside the control of Yankee, and therefore not only do its repair and  
14 restoration efforts in these events require additional coordination with the  
15 transmission company, but also final restoration can only occur after the  
16 transmission line disruption has been resolved. These additional complications  
17 increase the likelihood of an extended service outage in the event of a transmission  
18 line disruption. For these reasons, it is important for Yankee to have a resilient  
19 system that can withstand or adapt to the consequences of a catastrophic event.

20 **Q. What is the timeframe and cost of the System Resiliency Program?**

21 A. The program is divided into several regional projects, with overlapping timelines  
22 and a total timeframe of 8 years. The program has a total estimated cost of \$256.4

1 million over the 8-year period. The System Resiliency Program is presented in the  
 2 following Table 3:

3 *Table 3: System Resiliency Program (000's)*

Project	2017 Actuals	2018 Budget	2019 Plan	2020 Plan	2021 Plan	2022 Plan	2023 Plan	2024 Plan
<b>Resiliency</b>	<b>\$ 24,100</b>	<b>\$ 43,700</b>	<b>\$ 39,600</b>	<b>\$ 35,200</b>	<b>\$ 32,600</b>	<b>\$ 31,200</b>	<b>\$ 33,000</b>	<b>\$ 17,000</b>
Central (Wallingford-Middletown)	\$ 13,600	\$ 20,400	\$ 9,100					
Eastern (Franklin-Plainfield)	\$ 6,300	\$ 5,800	\$ 5,200					
Western (Danbury)	\$ 4,200	\$ 2,800						
Southwest (Stamford - Danbury)		\$ 14,700	\$ 9,400	\$ 17,800	\$ 14,400	\$ 17,200	\$ 17,000	\$ 3,100
Southeast (Middletown - Montville)			\$ 15,900	\$ 15,600	\$ 14,200	\$ 14,000	\$ 16,000	\$ 13,900
Southeast 2 (Montville - Waterford)				\$ 1,800	\$ 4,000			

5 **D. Replacement Programs and Projects**

6 **Q. Has the Company adopted an infrastructure replacement program that is**  
 7 **consistent with federally-mandated DIMP regulations?**

8 **A.** Yes. Like other natural gas local distribution companies (“LDCs”), the Company  
 9 has adopted a distribution integrity management program, defined by federal  
 10 regulation as “an overall approach by an operator to ensure the integrity of its gas  
 11 distribution system”<sup>11</sup> to meet the federal code requirements under CFR Part 192  
 12 Subpart P—Gas Distribution Pipeline Integrity Management. DIMP is the program  
 13 developed by Yankee to meet the requirements of this regulation.

14 DIMP encompasses many activities related to the assessment of the integrity of  
 15 distribution system assets and risks to those assets. Among the requirements is  
 16 that the Company’s integrity management program evaluate all risks associated  
 17 with operating a natural gas distribution system. The Company’s current DIMP  
 18 identifies bare steel and cast iron main as two of the leading threats to the

11 <sup>11</sup> CFR Title 49 §192.1001.

1 distribution system. Therefore, the existing replacement program for abandoning  
2 cast iron and bare steel is the DIMP's largest mitigation program.

3 **Q. What has resulted from the Company adopting a DIMP to address the Gas**  
4 **Distribution Pipeline Integrity Management regulation?**

5 A. The federally mandated DIMP requires the Company to identify threats to the  
6 distribution system and conduct an assessment to rank and prioritize the risks  
7 associated with these threats and develop mitigation methods to address the  
8 highest risks. This regulation has resulted in more frequent leak surveys,  
9 additional leak repairs, accelerating the replacement rate of leak prone facilities,  
10 additional field data collection and record keeping, as well as additional reporting  
11 requirements.

12 **Q. Did the Authority establish guidelines for Yankee's spending level on the**  
13 **replacement of leak-prone infrastructure in the Company's last rate case?**

14 A. Yes. On June 29, 2011, PURA issued its final order in Docket No. 10-12-02 and  
15 directed the Company to spend no less than \$40 million annually on bare steel  
16 ("BS") and cast iron ("CI") replacement. Order No. 19 from that decision  
17 specifically stated as follows:

18 Yankee shall spend approximately \$28.0 million during RY1, and  
19 approximately \$40.0 million in RY2 on system integrity projects, following a  
20 risk based system replacement methodology, targeting cast iron mains,  
21 bare steel mains, and bare steel services. Yankee shall continue to spend  
22 no less than \$40.0 million over each calendar year, effective January 1,  
23 2013, on such integrity projects until the Department approves any  
24 alternative following Yankee's next rate application.

1 Consistent with PURA's directive, the Company has spent over \$40 million  
 2 annually for the past six years on the replacement of these material types, as  
 3 shown on Table 4 below:

4 *Table 4: Bare Steel & Cast Iron Replacement Spending - 2012-2017 (000's)*

	2012	2013	2014	2015	2016	2017
Replacement Program	\$ 43,042	\$ 38,095	\$ 44,340	\$ 40,522	\$ 45,982	\$ 37,959
Emergent Replacements	\$ -	\$ 3,234	\$ 2,748	\$ 3,647	\$ 3,691	\$ 3,288
Selected Service Replacements	\$ -	\$ -	\$ -	\$ -	\$ 8,657	\$ 6,950
Total BS & CI Capital Spending	\$ 43,042	\$ 41,329	\$ 47,087	\$ 44,168	\$ 58,330	\$ 48,197

5  
 6 **Q. Has the Company made progress under the current program to replace its**  
 7 **leak-prone infrastructure?**

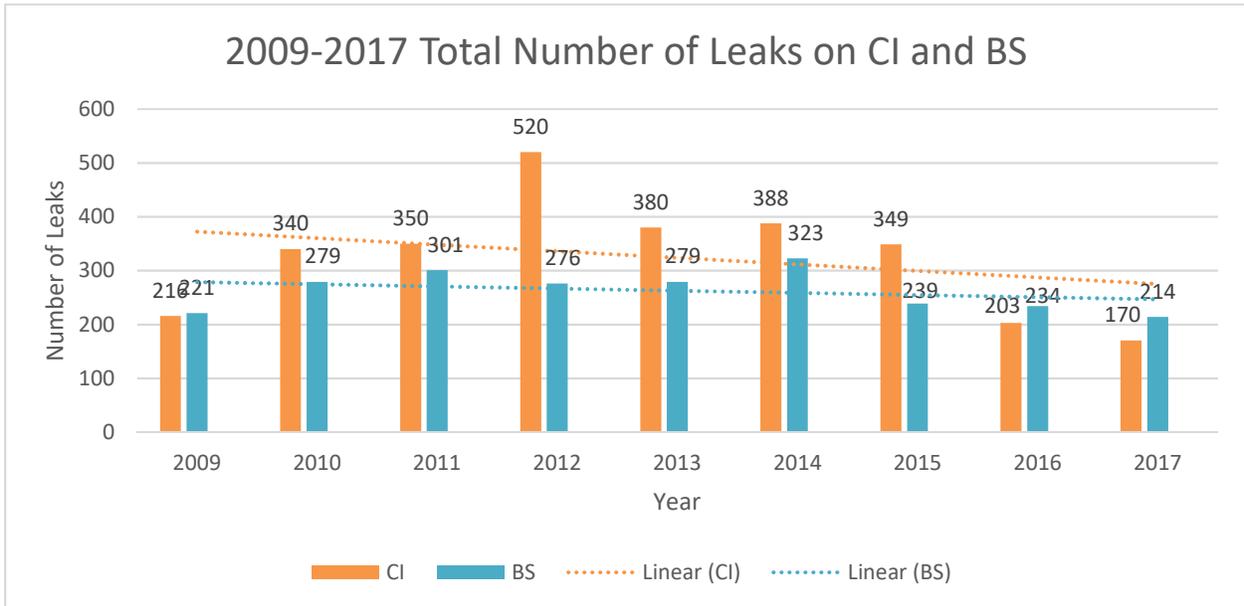
8 A. Yes. Although leak rates can be affected by many factors, it is evident that several  
 9 years after implementing its replacement program in 2011 the Company's total  
 10 leak rate began to diminish. Over the past three years, the total number of leak  
 11 repairs has been decreasing. This trend can also be seen in a steady decrease in  
 12 BS and CI leaks, which have been reduced by 52 percent since 2012.

13 **Q. Do you have data that demonstrates this decrease?**

14 A. Yes. The Company trend is shown in the following Figure 1:

1

**Figure 1: Total Leaks on Mains and Services for CI and BS (2009-2017)**



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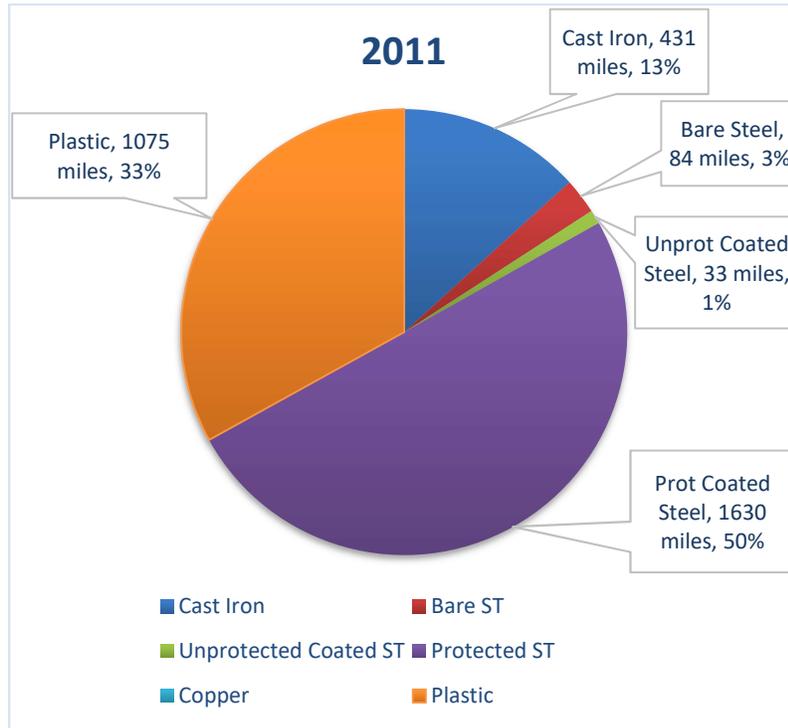
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In addition, Figure 2 and Figure 3 below show the decrease in CI and BS in the Company's inventory from the beginning of the existing replacement program in 2011 to 2017 (the latest year available). The significant decreases in CI and BS (both in total miles and as a percentage of Yankee's inventory) can be attributed primarily to the current replacement program.

1

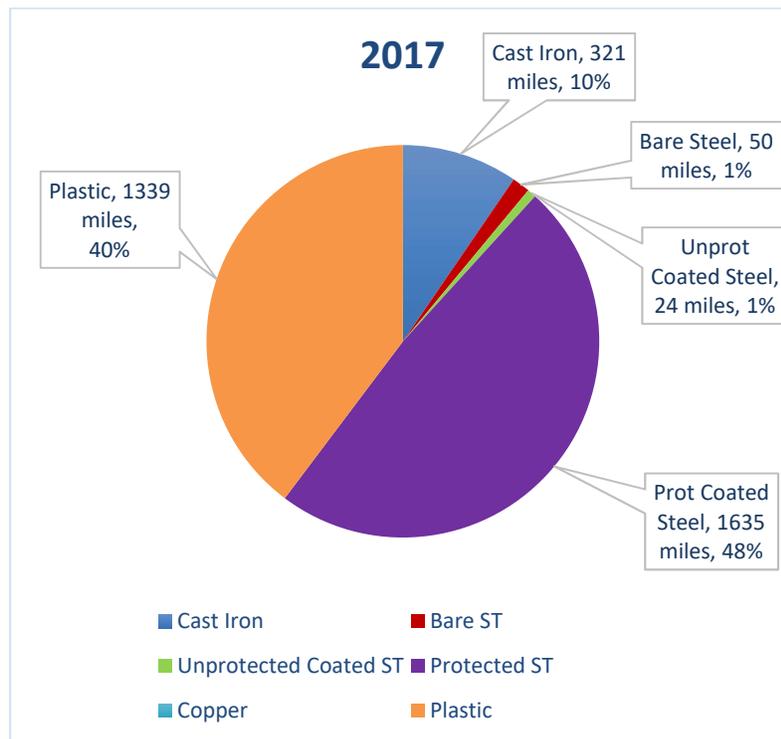
**Figure 2: 2011 Total Miles of Gas Mains: 3,253**



2

3

**Figure 3: 2017 Total Miles of Gas Mains: 3,369**

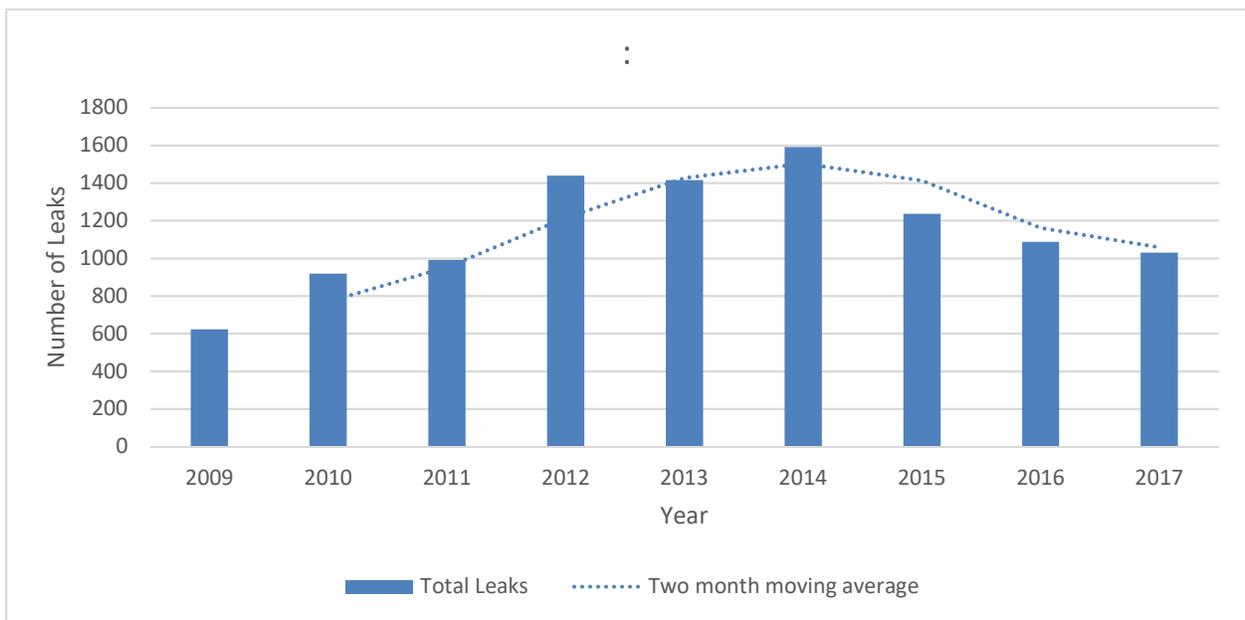


4

1 **Q. Do you have additional data to demonstrate this trend?**

2 A. Yes. In the years before the existing replacement program was implemented in  
3 2011, the number of total leaks increased year over year due to the aging of the  
4 infrastructure. The effect of the current program took several years to influence  
5 the leak totals, but over the past three years the number of leak repairs has been  
6 decreasing, both when considering all materials (as shown in Figure 4 below) and  
7 when considering only cast iron and bare steel (as shown previously in Figure 1).

8 **Figure 4: Total Leaks Repaired on Mains and Services for all Materials (2009-2017)**



9

10 **Q. In this rate case, does Yankee have a proposal to modify the replacement**  
11 **program to expand on the progress made to date?**

12 A. Yes. While the trends under the current program are positive, Yankee is proposing  
13 modifications to enable the Company to further increase the reliability and safety  
14 of its distribution system. The Company is proposing to (1) accelerate the pace of

1 removal of leak-prone infrastructure and (2) expand the types of infrastructure  
2 covered by the program based on its experience over the last several years.

3 **Q. If leak numbers are decreasing, why is it appropriate now to accelerate the**  
4 **existing replacement program?**

5 A. The overall main and service leak rates for Yankee are high within the U.S., as  
6 shown in the leak repair rates calculated from the 2016 DOT gas distribution  
7 annual report. Yankee is in the bottom (worst) quartile for highest main leak rate.  
8 This poses substantial additional risk to Yankee's customers that should be  
9 mitigated, and because this high leak rate is primarily caused by the high level of  
10 leak prone facilities in the service territory, these materials should be removed and  
11 replaced as quickly as possible.

12 Given that the replacement of these leak prone facilities is critical to public safety,  
13 and that the established goal is the complete elimination of these facilities in the  
14 gas distribution system, the replacements should be completed as quickly as  
15 reasonably possible. The Company's experience with the existing replacement  
16 program leads it to conclude that additional annual replacements of cast iron and  
17 bare steel are appropriate and necessary.

18 **Q. Have there been any events that support the acceleration and expansion of**  
19 **the Company's current program?**

20 A. Yes. In 2009, Department of Transportation ("DOT") Secretary Ray LaHood  
21 issued a Call to Action, and in 2011 the PHMSA issued a subsequent White Paper

1        on State Pipeline Infrastructure Replacement Programs,<sup>12</sup> which urged the  
2        expanded and accelerated use of such programs. Several states, including  
3        Connecticut, developed infrastructure replacement programs in response. The  
4        existing replacement program was implemented after the Call to Action but before  
5        the subsequent White Paper. The Company’s proposal to accelerate and expand  
6        the investments targeted at mitigating system risks and removing leak-prone  
7        infrastructure will better meet the expectations outlined in the White Paper,  
8        including addressing those facility types beyond cast iron and bare steel. Former  
9        PHMSA Administrator, Cynthia Quarterman, urged in the White Paper that  
10       infrastructure replacement programs be considered “critical to public safety”, which  
11       is the impetus of the expansion and acceleration of the program.

12       The success and experience gained through the implementation of the existing  
13       replacement program also supports the Company’s proposal. Based on this  
14       experience, the Company has determined that an accelerated replacement  
15       timeline is feasible, given a five-year ramp-up period.

16       **Q.     Why does the acceleration of the existing replacement program require a**  
17       **ramp-up period?**

18       A.     It will take approximately five years to fully develop, train and qualify a sufficient  
19       number of internal resources and contractor personnel in the construction and  
20       installation of natural gas pipelines. The Company will need to hire, train and  
21       qualify additional field personnel and Company inspectors to oversee the

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<sup>12</sup>       The White Paper on State Pipeline Infrastructure Replacement Programs is available at the following link: <https://www.phmsa.dot.gov/sites/phmsa.dot.gov/files/docs/PHMSA%20111011-002%20NARUC.pdf>

1 replacement work being conducted by contractors. Internally, the Company will  
 2 also need to hire back office personnel to manage the intake and closing of the  
 3 work orders associated with the accelerated replacement of leak prone  
 4 infrastructure. Additionally, during the ramp-up period, the Company will be able  
 5 to monitor and evaluate its DIMP Reconciliation Mechanism eligible investments  
 6 to ensure the quality and compliance of replacements and to identify any  
 7 necessary changes to its strategy.

8 **Q. What are the proposed expenditures for this program?**

9 A: Table 5 **Error! Reference source not found.** below presents the proposed  
 10 expenditures for 2019 through 2021 for the replacement program.

11 *Table 5: Proposed DIMP Reconciliation Mechanism Eligible Investments for 2019-2021*

Program	Rate Year 1	Rate Year 2	Rate Year 3
	2019	2020	2021
DIMP Eligible Service Replacement	\$ 10,000	\$ 10,000	\$ 10,000
DIMP-Eligible Reliability Investments	61,100	75,200	85,400
DIMP-Eligible System Integrity Investments (flood hardening)	6,100	6,100	6,100
Total DIMP Reconciliation Mechanism Capital Spending	<u>\$ 77,200</u>	<u>\$ 91,300</u>	<u>\$ 101,500</u>
Total DIMP Reconciliation Mechanism Plant in Service	<u>\$ 67,286</u>	<u>\$ 81,179</u>	<u>\$ 90,945</u>

Note A: DIMP-Eligible Investments include the following: 1) cast iron and bare steel; 2) copper services; 3) unprotected coated steel mains and services; 4) small diameter coupled steel mains; 5) coupled steel services; and 6) flood hardening initiatives.

12  
 13 **Q. What are the specific modifications that Yankee is proposing to the current  
 14 replacement program?**

15 A. The Company is proposing to modify the current replacement program in two  
 16 ways. First, the Company is proposing to accelerate the replacement cycle for

1 bare steel and cast iron pipe from 19 years to 11 years. Second, the Company is  
2 proposing to expand the definition of leak prone facilities to include additional  
3 facilities that have demonstrated an increasing leak rate within the program,  
4 including copper services, unprotected coated steel mains and services, small  
5 diameter coupled steel mains, and coupled steel services. All of these assets are  
6 leak prone and data indicates they should be replaced on an accelerated basis.  
7 Total investments for all DIMP eligible assets included in the Rate Years and DIMP  
8 Reconciliation Mechanism are summarized in Table 5, above.

9 **Q. How does the timeframe for the Company's DIMP Reconciliation Mechanism**  
10 **investments compare to the current program?**

11 A. Under the Company's proposal, the Company would eliminate the entire inventory  
12 of BS and CI in 11 years and the other high-risk assets at an accelerated pace. Of  
13 the other high-risk assets, the small diameter coupled steel mains and services  
14 would take the longest to eliminate at approximately 14 years.

15 Under the existing replacement program, the annual amount of retired bare steel  
16 and cast iron would decline slightly each year relative to the past three year  
17 average of just over 19 miles of retired bare steel and cast iron main. Thus, the  
18 existing replacement program would require a minimum of another 19 years, to  
19 completely eliminate all cast iron and bare steel from the Company's service  
20 territory, at least eight years longer than under the Company's accelerated  
21 replacement proposal. The full completion of the Company's proposed plan, which  
22 includes additional high-risk assets, would still be completed approximately five  
23 years sooner than the current replacement program.

1 **Q. Based on the amount of cast iron and bare steel remaining on the Yankee**  
2 **system, why is this right time to accelerate the pace of the program?**

3 A. The current replacement program was developed and approved before PHMSA  
4 Advisory Bulletin ADB-2012-05<sup>13</sup> published in March 2012 and before the Pipeline  
5 Safety, Regulatory Certainty, and Job Creation Act of 2011<sup>14</sup> was signed into law  
6 in January 2012, both of which urged the replacement of leak prone natural gas  
7 infrastructure. Furthermore, the program was developed and approved before  
8 August 2011, when LDCs were required to have implemented a DIMP. In  
9 response to the PHMSA bulletin, the new law, and their own DIMPs, many LDCs  
10 have implemented or accelerated their own aging infrastructure replacement  
11 programs since Yankee's current replacement program began. The programs at  
12 other LDCs can be used to benchmark the Company's proposed replacement  
13 timeframe of 11 years, which is based on Yankee's seven years of experience with  
14 the current replacement program.

15 In general, only LDCs with 1000 or more miles of main targeted for replacement  
16 have implemented programs over timeframes of 15 years or more. Yankee's 2018  
17 value of 372 miles of cast iron/bare steel main puts the Company well below this  
18 category of LDCs; instead, it is more similar to TECO People Gas (550 miles over  
19 10 years, and the Metropolitan Utilities District of Omaha, 387 miles over 10

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<sup>13</sup> PHMSA Advisory Bulletin ADB-2012-15 is available at the following link:  
<https://www.gpo.gov/fdsys/pkg/FR-2012-03-23/pdf/2012-7080.pdf>

<sup>14</sup> The Pipeline Safety, Regulatory Certainty, and Job Creation Act of 2011 is available at the  
following link: <https://www.gpo.gov/fdsys/pkg/PLAW-112publ90/pdf/PLAW-112publ90.pdf>

1 years).<sup>15</sup> Therefore, a proposed 11-year schedule for a complete elimination of  
2 these facilities within the Company's distribution system is in line with infrastructure  
3 replacement programs implemented in other states at LDCs with similar amounts  
4 of main to be replaced.

5 **Q. Does the data also show that it is appropriate to expand the existing**  
6 **replacement program to target additional types of leak-prone facilities?**

7 A. Yes. The Company performs risk assessments through DIMP and the Gas Asset  
8 & Risk Management Program, as previously described. As part of this review,  
9 several additional leak prone facility types were identified. Particularly important is  
10 that this review demonstrated that these facility types have been exhibiting an  
11 increase in leak rates over time, even though the overall leak numbers and rates  
12 for all facilities have been decreasing. In order to remain in compliance with the  
13 DIMP regulations, these risks need to be mitigated. To accomplish this, the DIMP  
14 Reconciliation Mechanism will include the following additional types of facilities that  
15 have been identified as leak prone:

- 16 • Copper Services
- 17 • Unprotected Coated Steel Main and Services
- 18 • Small Diameter Coupled Steel Mains
- 19 • Coupled Steel Services

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<sup>15</sup> An article which summarizes several aging infrastructure replacement programs is available at the following link: <https://pgjonline.com/2017/04/03/replacing-aging-pipe-remains-a-big-source-for-work/>

1 Overall, the Company's fundamental obligation is to maintain its distribution  
2 infrastructure in a manner that is in compliance with all applicable state and federal  
3 pipeline safety regulations in order to provide safe and reliable service to its  
4 customers. However, the challenge of meeting these obligations is magnified by  
5 the amount of leak prone pipe identified in the system. Replacing leak prone pipe  
6 in the system is therefore necessary to meet Yankee's obligations to its customers.

7 **Q. Please provide a summary of the various types of leak-prone facilities**  
8 **currently on the system.**

9 A. Table 6 below shows the current inventory of leak prone facilities which are  
10 targeted for replacement:

11 *Table 6: Current Inventory of Leak Prone pipelines*

Material	Miles of Main	# Services
Cast Iron	321	22
Bare Steel	50	11,547
Unprotected Coated Steel	24	3,649
Copper	0.13	397
Coupled Steel	135	2,106
Total Targeted in Proposed DIMP Reconciliation Mechanism	530	17,721

13 **Q. Are there additional reasons why the Company has included the additional**  
14 **categories of leak-prone facilities in the DIMP Reconciliation Mechanism?**

15 A. Yes. As explained previously, the DIMP and Gas Asset and Risk Management  
16 Program reviews identified several facility types that have been exhibiting an  
17 increase in leak rates, thus presenting a risk which must be mitigated.  
18 Furthermore, the findings of these teams are supported by recommendations put  
19 forth by PHMSA in a December 19, 2011 letter from then PHMSA Administrator,

1 Cynthia Quarterman, to the National Association of Regulatory Utility  
2 Commissioners. This letter included the previously discussed White Paper as an  
3 attachment; thus, these recommendations were published after the  
4 implementation of Yankee's current replacement program. The letter and White  
5 Paper outlined several vulnerable assets that should be part of a replacement  
6 program:

- 7 • Cast Iron gas mains;
- 8 • Plastic pipe manufactured in the 1960s, 1970s and 1980s with a  
9 particular manufacturing defect;
- 10 • Mechanical couplings used for joining and pressure sealing pipe;
- 11 • Bare steel pipe without adequate corrosion control (i.e., cathodic  
12 protection or coating);
- 13 • Copper pipe; and
- 14 • Pipelines with inadequate assessment results to verify their integrity.

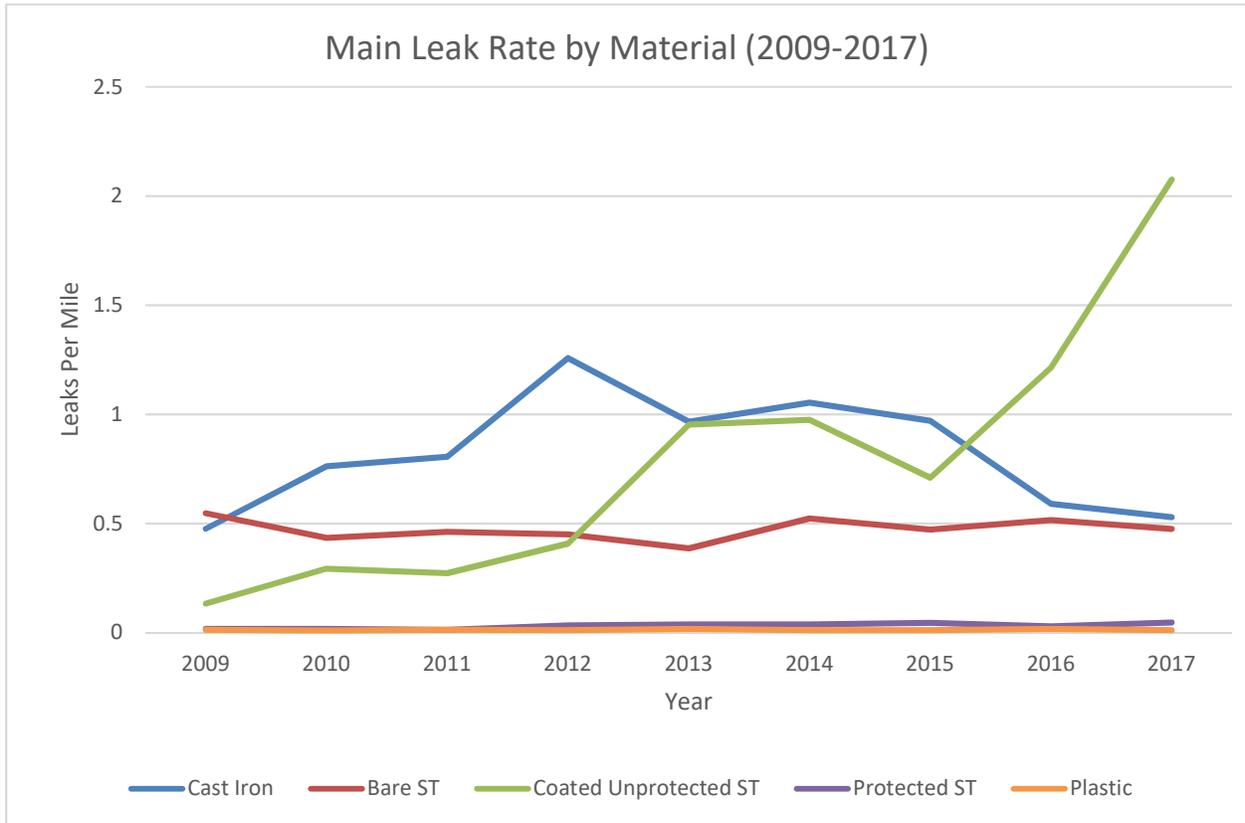
15 Of these suggested facility types, Yankee is proposing to include those that were  
16 also identified as leak prone through its own analysis: copper pipe, two subsets of  
17 pipes with mechanical couplings (small diameter coupled steel mains and coupled  
18 steel services), and unprotected coated steel pipe. The proposed accelerated  
19 replacement program will enable Yankee to better respond to PHMSA  
20 recommendations and industry best practices, based on the specific conditions  
21 that exist today on the Company's distribution system.

1 **Q. Do you have data to support your statement that leak rates are increasing on**  
2 **the types of leak prone facilities Yankee is proposing to add to its**  
3 **replacement program?**

4 A. Yes. Supporting data is provided below for each of the leak-prone facility types as  
5 compared to plastic and properly protected welded steel. The following  
6 subsections of my testimony focus on the individual asset types. On an overall  
7 basis, Figure 5 below shows the trends in main leak rates for unprotected coated  
8 steel, bare steel, cast iron, protected steel, and plastic from 2009 to 2017. As  
9 expected, the leak rates for protected steel and plastic are much less than for the  
10 leak-prone facility types. The coated unprotected steel leak rate has also increased  
11 significantly over this timeframe, and as of 2016 has superseded both cast iron  
12 and bare steel as the facility type with the highest leak rate. It can also be seen  
13 that the leak rate for protected steel is higher than that for plastic; this is primarily  
14 due to the leak-prone coupled steel which is included in this facility category, as  
15 discussed further in the subsection below on small diameter coupled steel mains  
16 and services.

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Figure 5: Main Leak Rate by Material (2009-2017)



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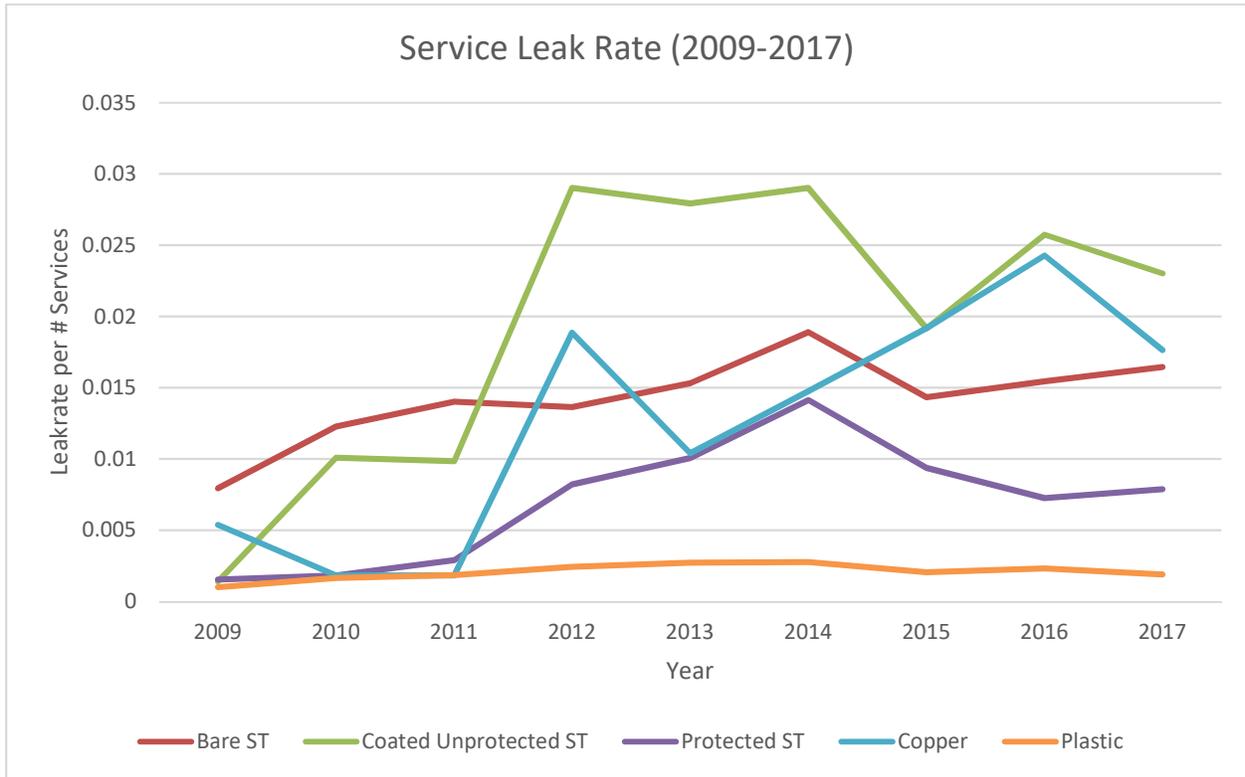
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Similarly, Figure 6 below shows the same information on leak rates for unprotected coated steel, bare steel, copper, protected steel, and plastic, in this case for services instead of mains. Many of the same general trends can be observed, but with some notable differences. In particular, the leak rate for protected steel services is significantly higher than that for plastic, again as explained by the inclusion of leak-prone coupled steel in this facility category. The coated unprotected steel leak rate does not show as much of an increasing trend, although it is consistently high and is often higher than the other two leak-prone facility categories: bare steel and copper.

1

Figure 6: Service Leak Rate by Material (2009-2017)

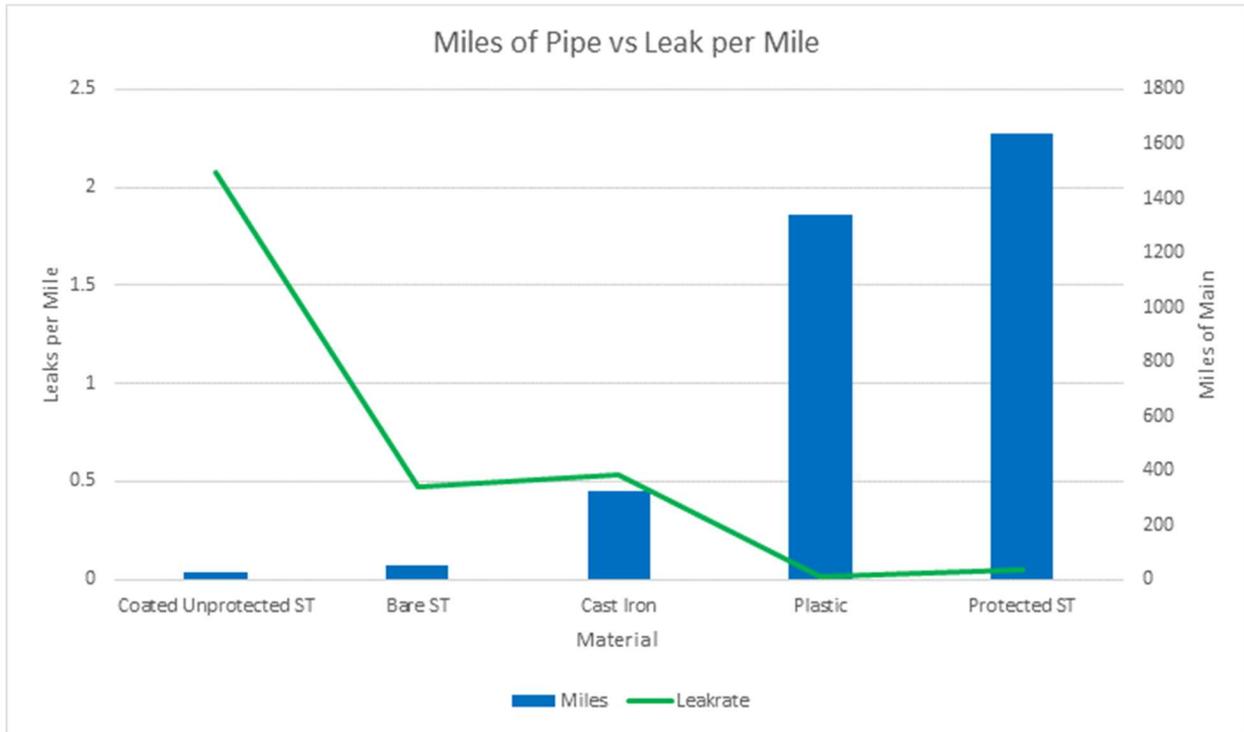


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3 Figure 7 below shows the current main inventory and leak rates for 2017 for  
4 unprotected coated steel, bare steel, cast iron, protected steel, and plastic, where  
5 again the first three materials are shown to have much higher leak rates and much  
6 lower inventories than the two materials.

1

**Figure 7: Miles of Main and Main Leak Rate by Material**



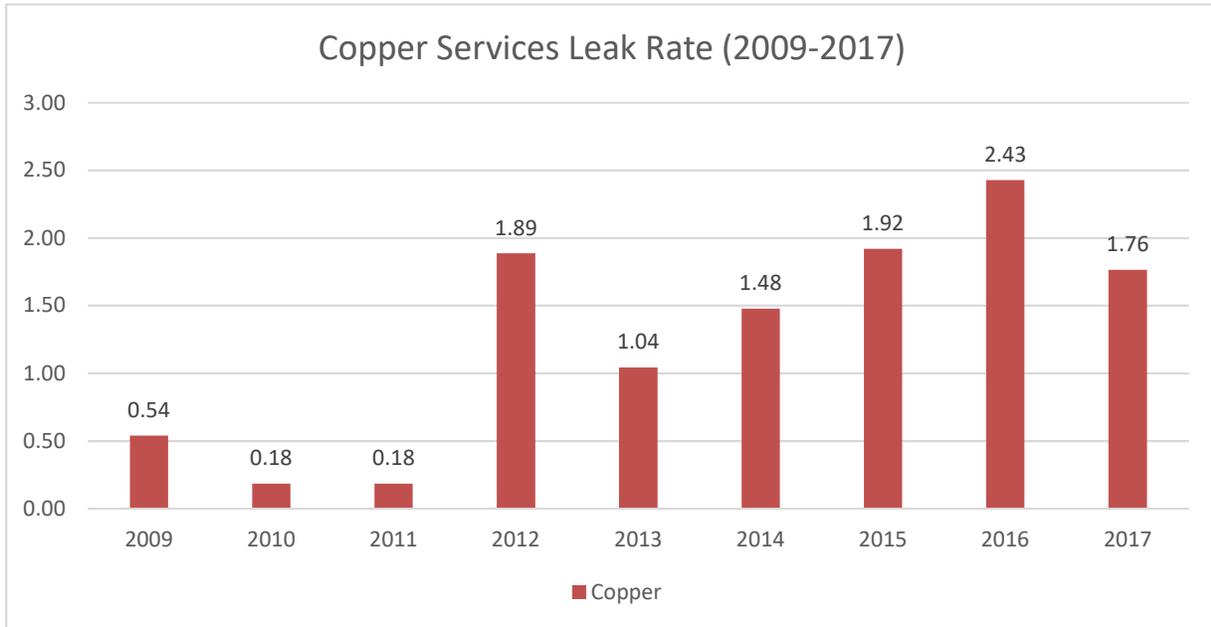
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3 **Q. What does the Company's data show with respect to copper services?**

4 A. Over the past five years the leak rate on copper services has been increasing, as  
5 shown in Figure 8 below. Because there are only 397 known copper services  
6 within the Yankee distribution system, the Company is planning to eliminate them  
7 in the early years of the DIMP Reconciliation Mechanism.

1

**Figure 8: Copper Services Leak Rate (2009-2017)**



2

3 **Q. What does the Company's data show for unprotected coated steel?**

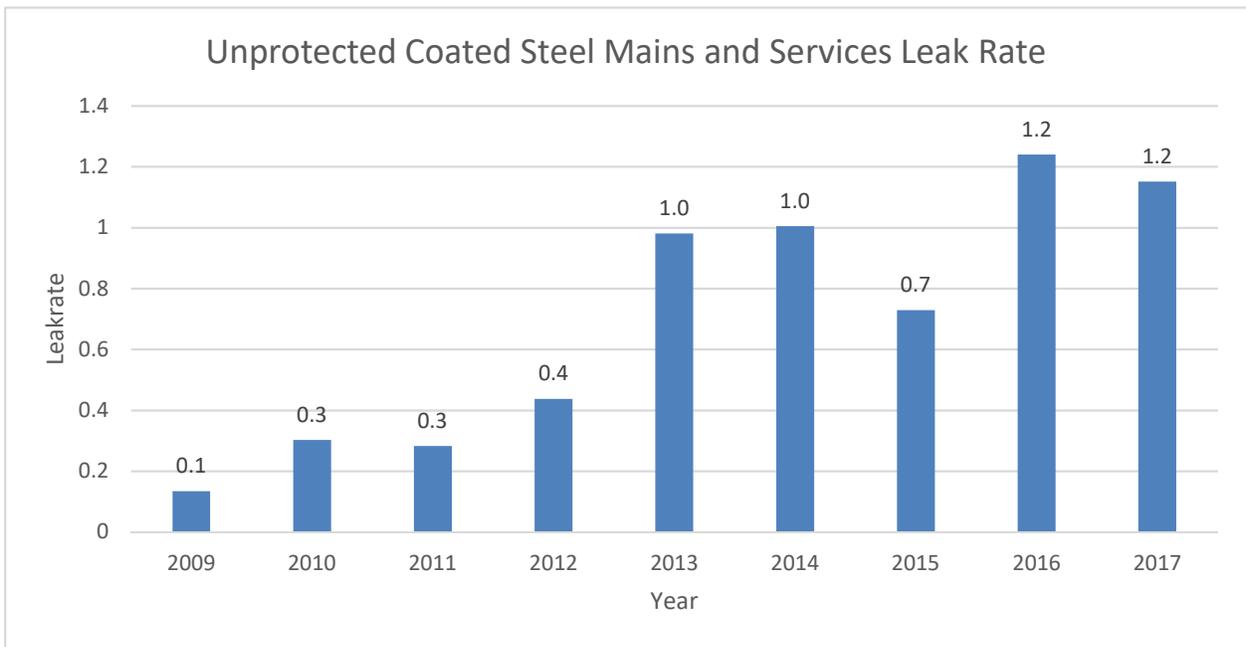
4 A. The unprotected coated steel leak rate has been on the rise, as shown in Figure 9  
5 below, and in 2017 it was the category of material with the highest leak rate.

6 Unprotected coated steel pipe on the Yankee system includes 24 miles of main  
7 and 3,649 services installed between 1960-1971. This pipe has never been  
8 protected with cathodic protection and because of this is now considered to be  
9 beyond its useful life. Also, the construction and manufacturing practices at the  
10 time preclude the installation of effective cathodic protection on these facilities.

11 The Company seeks to include unprotected coated steel pipe in the DIMP  
12 Reconciliation Mechanism because it exhibits traits similar to that of bare steel  
13 pipe, which also suffers from a lack of cathodic protection. Combining these two  
14 types of facilities is common throughout the industry, including in the PHMSA  
15 regulations (which no longer allow the installation of either of these types of

1 facilities), in Department of Energy reporting on this issue,<sup>16</sup> and the Environmental  
2 Protection Agency’s Greenhouse Gas Inventory (which defines emissions factors  
3 for steel pipes with and without cathodic protection, with no distinction between  
4 coated and uncoated steel).<sup>17</sup> It is generally accepted by corrosion experts and  
5 within the industry that bare steel and coated steel with inadequate cathodic  
6 protection are subject to the same modes of corrosion failure, with leaks expected  
7 to increase exponentially over time.

8 **Figure 9: Unprotected Coated Steel Mains and Services Leak Rate (2009-2017)**



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<sup>16</sup> The Department of Energy Report is available at: <https://energy.gov/sites/prod/files/2017/01/f34/Natural%20Gas%20Infrastructure%20Modernization%20Programs%20at%20Local%20Distribution%20Companies--Key%20Issues%20and%20Considerations.pdf>

<sup>17</sup> The EPA report is available at: <https://www.epa.gov/ghgemissions/us-greenhouse-gas-inventory-report-archive>

1 **Q. Please describe the Company's findings with respect to small diameter**  
2 **coupled steel mains and services.**

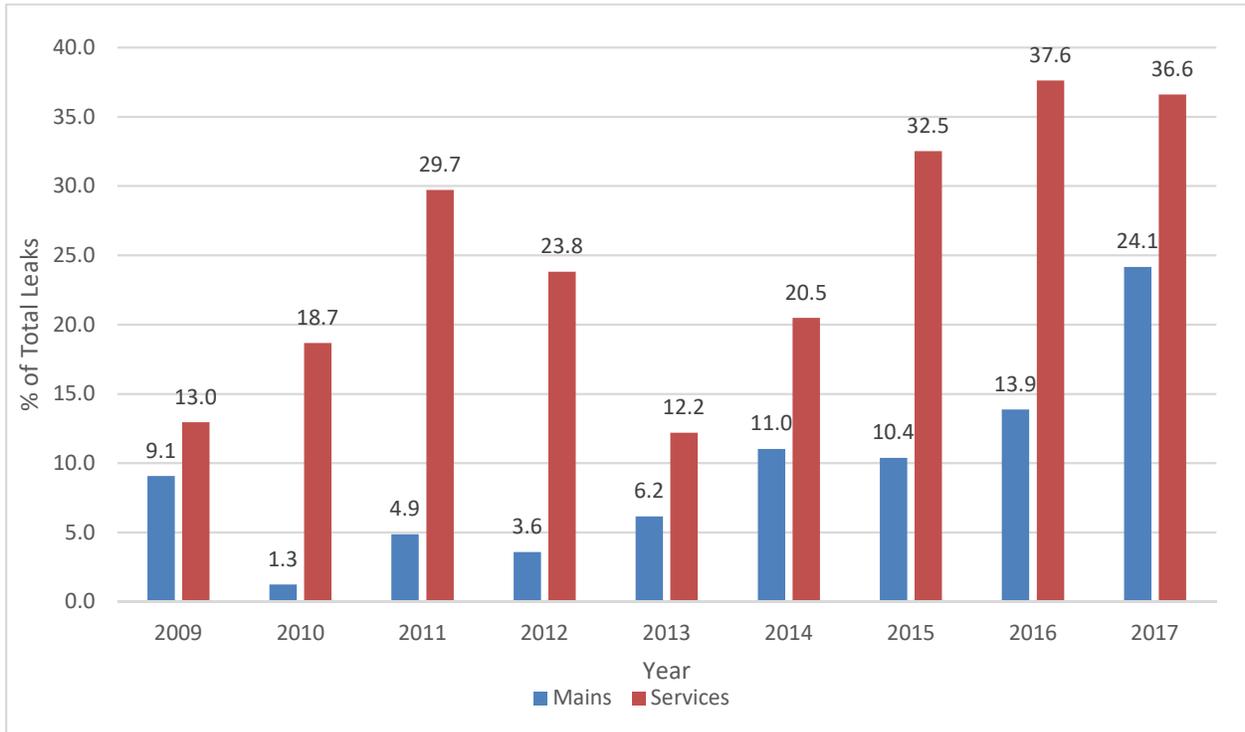
3 A. Pipe joined by mechanical couplings have been an issue throughout the natural  
4 gas industry. So much so that when the DIMP regulation came in effect, it required  
5 Operators to report mechanical coupling failures to the federal government on an  
6 annual basis. PHMSA also issued an advisory bulletin, ADB-86-02,  
7 recommending measures for LDCs to take action regarding mechanical  
8 couplings.<sup>18</sup> The elastomer seals within these couplings have been found to shrink  
9 under cold temperatures, causing natural gas to leak. The percentage of leaks  
10 from mechanical couplings has been increasing at Yankee. In 2017, over 36  
11 percent of the service leaks were found on these fittings, and over 24 percent of  
12 the main leaks can be attributed to these couplings, as shown in Figure 10.

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<sup>18</sup> PHMSA Advisory ADB-08-02 is available at the following link:  
<https://primis.phmsa.dot.gov/dimp/docs/CompressionCouplingAdvisory2008.pdf>

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Figure 10: Mechanical Fittings Leaks on All Materials (2009-2017)



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Annually, all distribution companies file a report with the DOT outlining many aspects of their systems. In 2011, the reporting requirement changed to include mechanical fitting failures, and since that time Yankee is ranked in the bottom (worst) quartile in the nation with respect to the number of failures.<sup>19</sup> The issue regarding inclusion of mechanical couplings in the program is that the actual inventory of mechanically joined pipe is unknown. Not all couplings are represented on GIS, making it extremely difficult to quantify the problem. Therefore, the Company is proposing to ramp up and replace an additional 10-18

<sup>19</sup> Data on mechanical fitting failures for all gas distribution operators is available for download on the following PHMSA website: <https://www.phmsa.dot.gov/data-and-statistics/pipeline/mechanical-fitting-failure-data-gas-distribution-operators>

1 miles annually of mechanically coupled pipe until all known segments have been  
2 eliminated. It is anticipated that this could take an additional 14 years to complete.

3 **Q. Does the Company's accelerated replacement program for DIMP**  
4 **Reconciliation Mechanism eligible investment provide environmental**  
5 **benefits?**

6 A. Yes. Another benefit of the program is the additional reduction of environmental  
7 impacts. The benefit of the accelerated replacement of leak-prone infrastructure  
8 on the environment would be substantial and direct, given that leaks have the  
9 effect of releasing natural gas to the atmosphere, and leaks would be substantially  
10 reduced through the program. A principal component of natural gas is methane,  
11 which is a naturally occurring greenhouse gas. As part of the Company's  
12 commitment to safety, reliability, environmental leadership and stewardship,  
13 Yankee has taken a leadership role with local, state and federal agencies to reduce  
14 methane emissions throughout the service area. In 2016, Eversource joined the  
15 USEPA Methane Challenge as a founding member. As part of the challenge, the  
16 Company aims to reduce methane emissions through main replacement projects  
17 eliminating CI and BS, damage prevention programs and improved practices  
18 involving blow down procedures. The U.S. Environmental Protection Agency  
19 ("EPA") estimates the impact of methane emissions rates on CI and BS and  
20 calculates an annual equivalent leakage in tons of CO<sub>2</sub>. Since the existing  
21 replacement program began in 2011, there has been a 6 percent decrease in CO<sub>2</sub>  
22 equivalent emissions and the Company is predicted to have nearly a 70 percent  
23 decrease in emissions by 2030. In 2018, the Company has forecasted that there

1 will be a 1,200-metric ton reduction in CO2 emissions due to the replacement of  
2 the CI and BS with plastic pipe. The accelerated and expanded replacement work  
3 as part of the DIMP program will have a direct impact on reducing our carbon  
4 footprint and protecting the environment.

5 **Q. Are there other benefits from expanding and accelerating the Company's**  
6 **existing replacement program?**

7 A. Yes. A majority of the Company's replacement projects replace the low pressure  
8 cast iron pipe and bare steel pipe with new intermediate pressure plastic pipe. The  
9 pressure class is significant in today's environment with high efficiency equipment  
10 that does not operate properly with traditional low-pressure deliveries. It also  
11 facilitates the use of emergency stand-by generators that require more than the  
12 traditional low pressure. Also, by simplifying the system and eliminating regulator  
13 stations, risk of a failure is eliminated, and overall system reliability is increased.

14 The conversion to the intermediate pressure class also allows for additional  
15 installations of excess flow valves in the Yankee distribution system. In 2016,  
16 PHMSA passed a new regulation expanding the use of excess flow valves, CFR  
17 Title 49 §192.383, Excess flow valve installation, which seeks to improve system  
18 safety. These safety devices can only be utilized on intermediate pressure  
19 systems, so again with the expansion of intermediate pressure systems Yankee  
20 will be installing many more of these safety devices throughout the system to meet  
21 the new PHMSA regulation.

1 **V. Flood Hardening Program**

2 **Q. Is the Company's system vulnerable to damage from severe weather events?**

3 A. Yes. Although the natural gas infrastructure in the United States is mostly buried  
4 below grade and less prone to damage from weather events than above-ground  
5 infrastructure, Hurricanes Sandy and Katrina exposed the industry to the possible  
6 devastation that can be caused by flooding. These storms disrupted, and in some  
7 places totally decimated, natural gas distribution systems. Since that time, there  
8 have been several additional storms that have also significantly impacted gas  
9 distribution systems. Yankee serves shoreline towns like Norwalk, Stamford and  
10 New London that have old systems operating at low pressures that are particularly  
11 vulnerable to this type of damage.

12 **Q. Is the Company proposing an initiative to harden its system to prepare for  
13 these types of events?**

14 A. Yes. The Company is proposing to implement a Flood Hardening Program as part  
15 of its DIMP Reconciliation Mechanism.

16 **Q. Please describe the Flood Hardening Program.**

17 A. The definition of hardening is the ability to protect facilities against weather events  
18 by making them more resilient to withstand significant damage. The Company has  
19 developed the Flood Hardening Program as a 14-year plan that is designed to  
20 materially improve the reliability of the distribution system so that Yankee is  
21 prepared for significant weather events. Throughout the country and across all  
22 industries, an increase in weather related damage has precipitated the need to  
23 improve the resiliency and hardening of infrastructure.

1 There are numerous issues that materialize when a flood occurs, such as water  
2 infiltration, gas leaks and failures at regulator stations. The Flood Hardening  
3 Program targets those elements within the Yankee distribution system that are  
4 most threatened by flooding. The program will include the following initiatives:

- 5 • Replace or upgrade almost 80 miles of low pressure main in flood prone  
6 areas of Connecticut. Low pressure main is susceptible to water infiltration  
7 during floods, and by replacing the low pressure and leak prone main (cast  
8 iron and bare steel) in the flood zone with state of the art pipe at an  
9 intermediate pressure, the issue of water infiltration in cracked/brittle pipe  
10 can be reduced.
- 11 • Install safety valves on regulator vents in flood prone areas of Connecticut.  
12 Safety valves will prevent water from entering the house piping on  
13 regulators within the flood zone.
- 14 • Relocate or harden 28 regulator stations currently within the 500-year flood  
15 zone. This measure will ensure that the energy source is secure and  
16 available during post-flood repair and recovery.

17 By hardening the system against these flooding issues, the Company can better  
18 ensure continued service to customers in extreme weather events.

19 **Q. Please explain why the proposed Flood Hardening Program is necessary and**  
20 **will help to reduce risk on the distribution system.**

21 A. According to the 2014 Connecticut Natural Hazards Mitigation Plan Update, not  
22 only is flooding “the most frequently occurring natural hazard that impacts  
23 Connecticut,” but also flooding is projected to become more frequent and extreme

1 as a result of climate change.<sup>20</sup> As described above, the Company’s service  
2 territory includes flood-prone and coastal areas, and flooding poses a known threat  
3 to providing safe and reliable gas service. Flooding is recognized within the  
4 industry as a significant risk to gas distribution infrastructure; for example, several  
5 recent PHMSA advisory bulletins direct operators on the need to minimize,  
6 mitigate, and prevent flood damages to gas distribution systems.<sup>21</sup> The proposed  
7 Flood Hardening Program seeks to mitigate flooding impacts and thereby address  
8 the following recommendation from the 2012 Report of the Two Storm Panel:  
9 “Connecticut’s infrastructure needs to be better hardened to withstand natural  
10 disasters, and such work should begin as quickly as possible.”<sup>22</sup>

11 **Q. How does flooding impact the gas distribution system?**

12 A. The immediate impacts of flooding to the natural gas distribution system are  
13 extended service outages and damage to equipment. Shutting off services before  
14 flood events occur can prevent damage to equipment and loss of containment, but  
15 this process—especially if it requires manual shut off—can be time-consuming and  
16 may not be completed before flooding prevents utility personnel from accessing  
17 necessary sites. For safety reasons, restoration of gas service is always manual,  
18 so impacted customers must be visited individually as a part of flood recovery.

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<sup>20</sup> The report is available at:  
[http://www.ct.gov/deep/lib/deep/water\\_inland/hazard\\_mitigation/ct\\_nhmp\\_adopted\\_final.pdf](http://www.ct.gov/deep/lib/deep/water_inland/hazard_mitigation/ct_nhmp_adopted_final.pdf)

<sup>21</sup> Recent PHMSA advisory bulletins are available at the following links:  
<https://www.gpo.gov/fdsys/pkg/FR-2016-01-19/pdf/2016-00765.pdf>; <https://www.gpo.gov/fdsys/pkg/FR-2015-06-23/pdf/2015-15401.pdf>; <https://www.gpo.gov/fdsys/pkg/FR-2015-04-09/pdf/2015-08148.pdf>;  
<https://www.gpo.gov/fdsys/pkg/FR-2013-07-12/pdf/2013-16754.pdf>; <https://www.gpo.gov/fdsys/pkg/FR-2011-07-27/pdf/2011-19029.pdf>; <https://www.gpo.gov/fdsys/pkg/FR-2011-09-01/pdf/2011-22343.pdf>.

<sup>22</sup> The Two-Storm Panel report is available at:  
[http://www.governor.ct.gov/malloy/lib/malloy/two\\_storm\\_panel\\_final\\_report.pdf](http://www.governor.ct.gov/malloy/lib/malloy/two_storm_panel_final_report.pdf)

1 Where equipment has been damaged, that must first be repaired before the  
2 restoration process can begin. Thus, storm hardening seeks to minimize the  
3 number of outages, minimize equipment damage, and expedite restoration of  
4 service.

5 Furthermore, service outages that result from flooding, especially when caused by  
6 extreme weather events, tend to impact communities already suffering from other  
7 storm impacts including power outages, telecommunications outages, unsafe road  
8 conditions, closures of schools and businesses, over-extended local emergency  
9 management services, and critical community facilities operating under their  
10 emergency plans.

11 Gas service outages both exacerbate and are exacerbated by these other  
12 conditions. For example, some sites may be rendered truly inaccessible due to  
13 flood and post-flood conditions which pose a threat to employee safety, including  
14 erosion, debris, and similar impacts. New Jersey Natural Gas noted in its storm  
15 hardening program proposal that “[one] of the important lessons from Superstorm  
16 Sandy is that it may be impossible to physically reach portions of [the] service  
17 territory to access distribution facilities, even for a period of weeks after a major  
18 storm or weather event has passed through the area.”<sup>23</sup> As a result, some  
19 customers were without natural gas service for 8 weeks after that storm.<sup>24</sup>

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<sup>23</sup> See <https://www.njng.com/regulatory/pdf/gr13090828-njng-nj-rise-filing-9-3-2013.pdf>

<sup>24</sup> Ibid.

1 For comparison, CenterPoint Energy’s natural gas system in Houston is better  
2 hardened, as it does not contain low-pressure gas lines (unlike most systems in  
3 the Northeast).<sup>25</sup> As a result, CenterPoint Energy’s system did not experience  
4 widespread outages during Hurricane Harvey; equipment damage was generally  
5 limited to that caused by flood debris, resulting in fewer and more localized  
6 outages.

7 **Q. Do outages that result from flooding have an impact on costs and**  
8 **resources?**

9 A. Yes. A final critical aspect of emergency response and recovery operations is that  
10 they are more expensive and less safe than operations and projects undertaken  
11 during normal conditions. Post-flood repair and restoration efforts are time-critical  
12 and require resources already under strain, including extraordinary employee  
13 deployments and deployment of mutual aid crews. During and after flooding  
14 events, restoring service and public safety is paramount, and costs cannot be  
15 managed in the same way as for planned projects. For example, planned  
16 infrastructure projects, as opposed to post-flood emergency repair projects, can  
17 benefit from economies of scale, synergies with local construction, and scheduling  
18 optimization, all of which allow for cost-effective investments. The proposed flood  
19 hardening plan seeks to benefit Yankee’s customers both during the flood and after

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<sup>25</sup> See article at the following link: <https://www.elp.com/articles/2017/08/ercot-power-utilities-respond-to-tropical-storm-harvey.html>

1 by ensuring that the system is better able to withstand flood damage, prevent  
 2 outages, and minimize costly restoration and recovery efforts.

3 **Q. What is the timeframe and cost of the Flood Hardening Program?**

4 A. The Flood Hardening Program is designed in four phases, with a total timeframe  
 5 of 14 years. The program has a total estimated cost of \$87,096,000 over the 14-  
 6 year period. Much of the inventory targeted by the Flood Hardening Program is  
 7 also considered leak-prone mains and services, and, as a result, a portion of the  
 8 spending (approximately \$37 million of the total Flood Hardening Costs of \$87  
 9 million) is included in the “Reliability Investment” category in Table 5, above. As  
 10 such, there is approximately \$50 million additional flood hardening investment  
 11 projected over the 14-year plan. Each of the four phases targets a different  
 12 category of flood-prone area, as shown in Table 7. Additional details on the  
 13 improvements to be made in each phase are also included in Table 77.

14 *Table 7: Flood Hardening Program Phases 1 Through 4*

Description	Number of Years	Miles of Replacement	Miles of Upgrading	Service Replacements	Vent Protector Installations	Regulator Station Rebuilds	Estimated Cost (000s)
Phase 1 - 100 year flood boundary, shoreline communities	4	9.5	15.5	1807	945	4	\$ 33,121
Phase 2 - 100 year flood boundary, inland communities	3	10.1	8.3	1271	1018	9	\$ 26,568
Phase 2 - 500 year flood boundary, shoreline communities	3	6	8.4	282	437	6	\$ 9,686
Phase 2 - 500 year flood boundary, inland communities	4	9	11.3	206	1154	9	\$ 17,721
<b>Total Flood Hardening</b>	<b>14</b>	<b>34.6</b>	<b>43.5</b>	<b>3566</b>	<b>3554</b>	<b>28</b>	<b>\$ 87,096</b>

15  
 16 **Q. In summary, what benefits will result from the Flood Hardening Program?**

17 A. The primary benefit of the Flood Hardening Program will be to make the  
 18 Company’s distribution system better able to withstand flood damage, thereby

1           minimizing number of outages and time to restore service following extreme  
2           weather events. The Company's customers will also benefit from the reduced  
3           susceptibility to service outages and damage requiring costly repairs and  
4           restoration efforts.

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

6   **A.   Yes.**