Applied Economics Clinic
Economic and Policy Analysis of Energy, Environment and Equity

POLICY BRIEF

Joshua R. Castigliego, Tanya Stasio, and Liz Stanton, PhD

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Fixing Massachusetts' Leaky Pipes: When Will It Be Paid Off?

This Applied Economics Clinic policy brief—prepared in response to a question posed by Gas Leak Allies (a coalition of over 20 non-profits, researchers, and experts)—finds that it would take over 90 years to fully pay off the $15.5-$16.6 billion required to replace Massachusetts' leak-prone gas infrastructure. To stay on track to meet the Commonwealth's 2050 climate goals, the gas industry needs a managed transition geared towards the most efficient and equitable outcomes for customers.

Climate Goals and the Future of Gas

As Massachusetts makes the changes needed to achieve net-zero emissions by 2050, households and businesses that use gas today will need to transition to other energy sources with lower greenhouse gas emissions.

In the near term, fixing Massachusetts' leaky gas distribution system is necessary to ensure public safety, provide service reliability, and protect the environment. However, gas distribution investments made today may be abandoned in the near future—so-called "stranded assets"—as Massachusetts works towards achieving its long-term climate goals.

AEC calculated the costs (including financial returns to investors) of repairing Massachusetts' leaky gas system. Gas pipeline replacement is estimated to cost between $15.5-$16.6 billion in today's dollars, and would take over 90 years to pay off using the $5 per month "GSEP charge" currently paid by each customer (see Figure 1).[1]

Gas Leaks and Pipeline Repairs

Gas leaks pose a significant threat to public safety, service reliability, and the environment. In 2018, gas utilities reported nearly 33,000 leaks from Massachusetts' distribution system, amounting to an estimated 52,000 metric tons of methane (CH_4) released at ground level.[2]

Although gas distributors repair leaks every year, new leaks form faster than existing ones are fixed, causing a backlog of needed repairs. By the end of 2018, nearly 17,500 gas leaks were waiting to be fixed in the Commonwealth.

Figure 1. Monthly gas system repair costs required to recover $15.5-$16.6 billion (2019$)

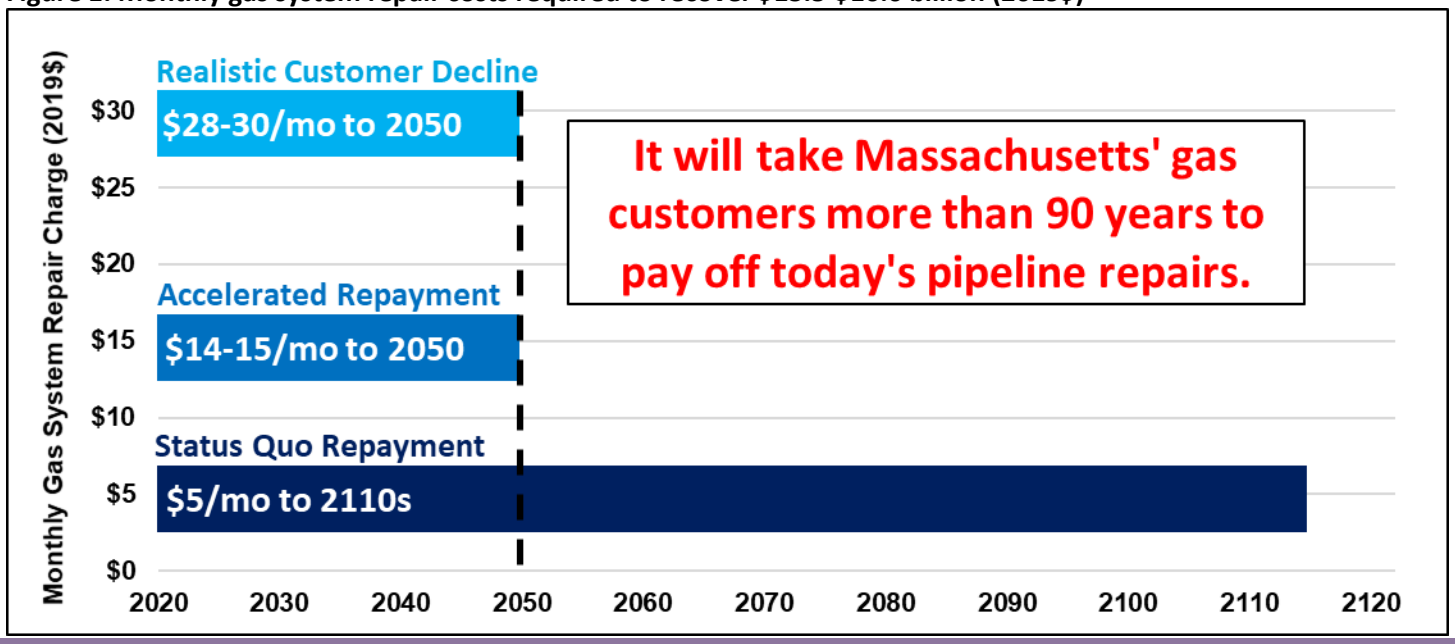

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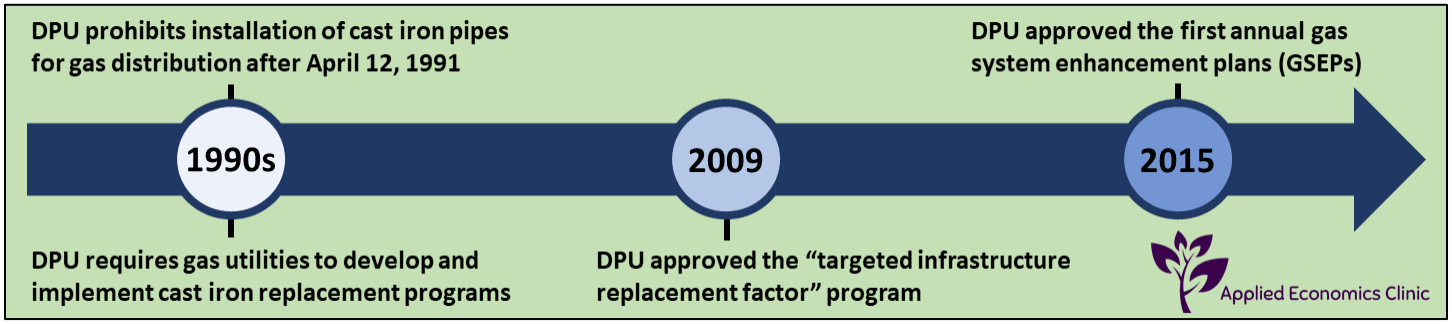
Figure 2. Timeline of leak-prone pipe replacement efforts in Massachusetts



Massachusetts' high number of leaks is the result of an aging, leak-prone gas pipeline infrastructure (e.g., uncoated steel, cast iron, wrought iron, among other materials), sections of which date back to the Civil War. Within the last few decades, DPU has recognized the importance of replacing the Commonwealth's leak-prone gas infrastructure (see Figure 2).

In 2015, DPU approved the annual gas system enhancement plans (GSEPs) that each gas utility is still required to file annually. The explicit aim of the GSEP program is to replace more than 6,000 miles of aging, leak-prone infrastructure over a 20-year period and reduce the amount of methane released to the atmosphere.[3]

Table 1. Summary of gas system repair costs

Leak-Prone Pipe Replacement (2019$, billions)	
Already Spent Through 2019	
Capital	$1.6
Return to Investors	$1.2 - $1.4
Recovered Costs-to-Date	-$0.7
Already Spent Sub-total	$2.1 - $2.3
Additional Costs Starting 2020	
Capital	$7.7
Return to Investors	$5.6 - $6.5
Additional Costs Sub-total	$13.4 - $14.3
Total Costs	**$15.5 - $16.6**

Fixing Leaky Pipes is Expensive

Between 2015 and 2019: Gas utilities have replaced roughly 1,200 miles of the Commonwealth's leaky pipes (or about 20 percent of the GSEP goal). Massachusetts' utilities have spent an estimated **$2.8-$3.0 billion** to replace leak-prone pipes over this 5-year period. The GSEP $5 monthly charge on customer bills has collected roughly $0.7 billion to date, leaving $2.1-$2.3 billion in outstanding costs (see Table 1).

Between 2020 and 2034: Gas utilities must replace the remaining 80 percent of the state's leak-prone gas infrastructure. To accomplish this task, utilities must spend an additional **$13.4-$14.3 billion** over the next 15 years.

In total: Replacing Massachusetts' leak-prone gas system will cost **$15.5-$16.6 billion**: $2.8-$3.0 billion has already been spent; $0.7 billion has already been collected.

In 2020, Massachusetts' utilities charged customers 7 cents per therm (or $5 per month for an average 70 therm per month customer) for gas system replacement. Collecting funds at this rate, it would take more than 90 years to fully recover the $15.5-$16.6 billion in costs under **Status Quo Repayment** (see Figure 1 above). New gas pipelines have an estimated lifetime of just 50 years, leaving customers paying for these investments long after they have been retired and replaced.

To fully pay off repairs by 2050, utilities would need to triple the GSEP charge on customers' bills: **Accelerated Repayment** would cost customers $14-$15 per month.

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Massachusetts plans to move one-third of home heating customers off of fossil fuel heating and onto efficient electric heat pumps by 2030[4]—a share that will rise as new policies and programs are put into place to meet the state's net zero by 2050 greenhouse gas emission limit. Without some policy intervention, the customers left using gas will be those that can least afford to change heating systems: low- and moderate-income families and small businesses.

It is inevitable that the number of gas customers will shrink dramatically over the next two to three decades. With fewer customers each year sharing the cost of gas system replacement, remaining customers will have to shoulder these costs. We estimate that with **Realistic Customer Decline** a $28-$30 per month GSEP charge starting in 2020 would make up for customer losses. (Alternatively, utilities could charge an even higher rate each year to fewer customers.)

What is the Future of Gas?

A transition away from gas and towards zero-emission heating will require planning and coordination to achieve the most efficient and equitable outcomes. Several U.S. states—including Massachusetts—have started planning for a managed transition.

MASSACHUSETTS

In June 2020, the Massachusetts Office of the Attorney General (AGO) filed a petition requesting that DPU assess the future of gas in the Commonwealth given its commitment to net-zero greenhouse gas emissions by 2050. In particular, the AGO asked DPU to investigate what industry, regulatory, and policy changes are needed to achieve the 2050 mandate while also maintaining a safe and reliable gas system moving forward. In October 2020, DPU voted to open an investigation into the role of gas utilities with respect to the Commonwealth's 2050 climate goals in Docket No. 20-80.[5]

The AGO provided the following set of topics for consideration to help guide the investigation:

- Ratepayer protection, equity and fairness;
- Planning, forecast and supply;
- Capital investments and GSEPs; and
- Other considerations that assess the role of energy alternatives such as renewable natural gas from biofuels or "power to gas" (P2G), energy efficiency programs, geothermal sources, and other technologies that could aid in carbon reduction.

EXAMPLES FROM OTHER STATES

The Public Utilities Commissions of California, New York, and Rhode Island, among others, have recently initiated their own proceedings on the future of gas.

In January 2020, California Public Utilities Commission issued a rulemaking (CA PUC R.20-01-007) to address the challenges facing the gas system as the State transitions away from gas-fueled technologies to meet their emissions targets. The rulemaking aims to update gas reliability standards, determine relevant policy changes, and implement a long-term planning strategy for California's decarbonization goals.

In March 2020, the New York Public Service Commission issued an order in NY PSC Case No. 20-G-0131 to develop gas planning and operational practices to support the State's emissions targets while maintaining reliable, safe, and adequate service to customers.

In July 2019, Rhode Island Governor Gina Raimondo signed Executive Order 19-06 launching a Heating Sector Transformation effort to reduce emissions while maintaining system reliability. This effort includes the development of a future state framework for the heating sector, resolving regulatory barriers, and consideration of innovative partnerships and new technologies.

Methodology

MASSACHUSETTS LEAK-PRONE INFRASTRUCTURE

The extent of leak-prone gas infrastructure was estimated based on the composition of each utilities' system as reported in the 2015 GSEP filings. Using the utilities' definition of leak-prone infrastructure (including pipes composed of uncoated steel, cast iron, wrought iron), 30

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percent (roughly 6,200 miles of gas mains and 240,000 associated services) of the distribution system was composed of leak-prone infrastructure in 2015 and 24 percent (5,000 miles and 188,000 services) in 2020.

RECOVERED GAS SYSTEM ENHANCEMENT COSTS

GSEP recovered an estimated $657 million from 2015 to 2019. Total estimated recovered costs are the 2019 GSEP adjustment factor ($0.049 per therm) multiplied by the gas delivery volumes (in therms) for each utility with a GSEP. U.S. EIA gas delivery volumes were used for 2015 through 2018, while 2019 gas volumes were derived from projections in each utilities' 2019 GSEP filings.

GAS SYSTEM REPLACEMENT COSTS

The total cost of replacing leak-prone gas infrastructure in the Commonwealth was estimated using a detailed capital revenue requirement calculation including: all realized and estimated replacement costs;[6] depreciation and rate of return on the undepreciated balance using a depreciation period of 15 years;[7] a range for "pre-tax" rate of return of 8.69 to 10.07 percent;[8] and an assumed escalation rate of 2 percent.[9] We used actual replacement costs incurred for 2015 through 2018 and the utilities' replacement cost estimates for 2019.

From 2020 to 2034, replacement costs were calculated as total remaining leak-prone infrastructure multiplied by average replacement costs from the historical period ($/mile or $/service). Replacement costs were distributed evenly across the 15-year period and escalated at an assumed rate of 2 percent. We model real (inflation adjusted) dollars throughout our analysis to facilitate summation of dollar values across time periods.

Conservation Law Foundation's December 2020 white paper presents comparable results to our analysis, stating that it would cost Massachusetts' gas utilities $10.4-$13.4 billion to fully replace leak-prone pipes.[10] AEC's estimates are slightly more expensive due to the assumption of a more rapid depreciation period ending in 2050.

Notes

[1] All dollar values presented in 2019 dollars, converted (when necessary) using the CPI-U.

[2] Using the 100-year global warming potential for methane, the 52,000 metric tons of CH_4 emitted by gas leaks in 2018 is equal to 1.3 million metric tons of carbon dioxide equivalents (CO_2e).

[3] Colonial Gas plans to complete leak-prone infrastructure replacements over an 11-year period, and NSTAR Gas and Boston Gas a 25-year period. Blackstone Gas does not have any leak-prone infrastructure in its distribution system. Source: MA DPU Dkt.No.19-GLR-01 page 4

[4] Massachusetts Department of Energy Resources. December 12, 2018. *Massachusetts Comprehensive Energy Plan*. Available at: https://www.mass.gov/doc/massachusetts-comprehensive-energy-plan-0/download

[5] MA DPU Dkt.No.20-80. *Petition of the [AGO] Requesting an Investigation into the impact on the continuing business operations of local gas distribution companies as the Commonwealth achieves its target 2050 climate goals.*

[6] Other GSEP-approved cost items, such as property tax expenses, deferred tax reserves, and operation and maintenance offsets, were excluded from this analysis. AEC focused exclusively on capital-related revenue requirements since they constitute the majority of costs to be recovered.

[7] The 15-year depreciation period is based on the assumption that the gas system will be obsolete before the end of its lifetime as Massachusetts works towards its 2050 net-zero emission goal—meaning that customers will not continue paying off these investments past 2050.

[8] The "pre-tax" rates of return were derived from the cost of capital calculations in Berkshire Gas and National Grid's most recent rate cases. Source: MA DPU Dkt.Nos. 17-170 and 18-40. *Petition for approval of general increase in gas rates, pursuant to G.L. c. 164, § 94 220 C.M.R. § 5.00.*

[9] The assumed escalation rate of 2 percent is based on the typical inflation and escalation rates used by utilities and is consistent with the historical inflation rate. As a reference, Berkshire Gas used an inflation rate of 2.1 percent in its most recent rate case. Source: MA DPU Dkt.No.18-40

[10] Conservation Law Foundation. December 2020. *Getting off gas: transforming home heating in Massachusetts*. Available at: https://www.clf.org/wp-content/uploads/2020/12/CLF_GasWhitepaper_GettingOffGas.pdf

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