December 29, 2023

Memo to: Asa Hopkins and Phil Hanser, NCCE Co-Chairs
From: Peter J. Barrer and Denise Freed
Re: GSEP in Newton 2022 - an Investigation
Cc: Bob Persons, Ellie Goldberg, Nathan Phillips

Summary

The Newton Gas Pipes Team, a volunteer non-governmental group, has completed an investigation of National Grid's Gas System Enhancement Program (GSEP) plans and National Grid's pipeline replacement and leak repair projects in Newton for calendar year 2022. We initiated this investigation to evaluate whether National Grid's leak repair and pipeline replacement activities are in the interest of the City and its resident gas ratepayers.

We found that the present GSEP does not serve the interests of Newton and does not correspond to the City's Climate Action Plan goal of eliminating fossil fuel carbon emissions by 2050.

The City's priorities have changed since GSEP was first implemented in 2014. The City now recognizes that even leaks classified as non-hazardous can still pose significant risks to health and the environment and that the City needs a plan for retiring the gas system entirely.

Gas leaks are a significant contributor to Newton's greenhouse gas emissions. However, "leak-prone" pipe replacement dominates current GSEP expenses, and this pipe replacement has been ineffective in reducing existing gas leaks. Leak repair is less expensive and much more effective for leak reduction than pipe replacement. In coordination with National Grid, Newton should now prioritize repairing gas leaks as quickly as possible. To achieve this goal while minimizing ratepayer costs, the GSEP needs to be completely overhauled.

Massachusetts needs to entirely overhaul GSEP to align with the December 6, 2023 DPU Order 20-80-B. In contrast to the program's original concept, which envisioned operation of the gas system indefinitely, GSEP needs to provide incentives to accelerate the retirement of the residential gas infrastructure.

Detailed Highlights

- $24,544,500 was charged to GSEP in Newton in 2022.
- Only $124,595 was charged to GSEP for repairing non-hazardous, large emitting (grade 3SEI) leaks without replacing gas pipes.
- Almost all of the eliminated leak extent was treated by lower-cost leak repair and not by pipe replacement.

- Approximately $4,700,000 was spent on low priority work, (work that was not specifically based on the safety of the pipes).
- Over 30% of the money charged to GSEP was spent without appearing in GSEP plans. Such projects were due to new conditions in the field or coordination with public works projects.
- Some new leaks appeared on lengths of pipe (or the service lines connected to them) after the pipe had been replaced under GSEP.

As Newton residents work to eliminate carbon emissions, the leaky gas distribution system will be retired as it becomes obsolete. However, under GSEP, National Grid's outdated investments in new gas pipes will impose unnecessary costs on ratepayers and perhaps taxpayers.

Introduction

The Newton Gas Pipes non-governmental volunteer team compiles publicly available data about the Newton gas distribution system operated by National Grid. We have compiled public records of Gas System Enhancement Program (GSEP) plans, end-of-year accounting reports (GREC), end-of-year Service Quality reports (SQARs), and quarterly gas leak reports filed with the Mass. Department of Public Utilities (DPU), in addition to other data.

The pipe replacement program requires National Grid to evaluate leak-prone pipe segments in order to prioritize replacing pipes that are at significant risk of developing high-impact leaks that could be explosive. It requires National Grid to repair the dangerous leaks, and permits accelerated cost recovery for repairing leak-prone pipes. GSEP also permits accelerated cost recovery for pipes whose replacement can be coordinated with other public works jobs.

The Massachusetts legislature established GSEP in 2014 to increase the safety and reliability of the gas distribution system. This plan was made in the context of an aging system of pipes that would be used for the foreseeable future. GSEP provided a framework for classifying and repairing leaks that were deemed hazardous, replacing leak-prone pipes, and expanding the gas infrastructure to replace what were considered to be more-polluting energy sources. However, even "non-hazardous" leaks pose health risks and can contribute significantly to greenhouse gases and to extra costs to consumers. To address the leak problem, the legislature in 2017 added the repair of high-volume methane leaks to the GSEP scope. These leaks are classified as "non-hazardous" but as still having Significant Environmental Impact (SEI).

The DPU has defined the various gas leak grades. Grade 1 leaks are hazardous and must be repaired immediately. Grade 2 leaks are non-hazardous, but could become hazardous in the near future and must be repaired within a year. Grade 3 leaks are non-hazardous and are expected to remain non-hazardous. Grade 3 leaks initially designated after 1/1/2018 are required to be repaired or eliminated within 8 years. Grade 3 SEI are grade 3 leaks larger than

2,000 square feet as measured by the leak extent method[1] and are required to be repaired in 1-3 years.

As noted by Mayor Ruthanne Fuller in a letter to State officials on June 2, 2023,[2] the failure to effectively reduce Newton's high number of leaks, the number of new leaks, and the large amount of methane emissions suggest that GSEP needs to be reformulated.

We initiated this analysis to investigate whether GSEP work is in the interest of the City and its resident gas ratepayers.

Methodology

Data for this investigation were compiled from National Grid's filings submitted to the DPU. Most of these filings were downloaded from the DPU's website "file room."
Each fall NGrid files GSEP plans for the coming year and at the same time files less-detailed GSEP plans ("lookahead plans") for the following four years. We focused on the 2022 GSEP plan. However, allowing for the possibility of a previous GSEP installation being delayed, we searched all GSEP plans back to 2020. Allowing for an unexpected acceleration of a GSEP installation, we also searched GSEP "lookaheads" covering 2022 through 2027. We compiled GSEP plans for 2020, 2021, 2022, and 2023 into a single table, see linked Table L1. We compiled lookahead plans for 2022 to 2025, 2023 to 2026, and 2024 to 2027 in linked Table L2. These plans were collected with assistance from the Home Energy Efficiency Team (HEET), a nonprofit climate solutions incubator.

National Grid filed its Reconciliation "GREC" report for the 2022 GSEP expenses on May 1, 2023. To compile the cost data supporting this investigation, we downloaded from the file room (Docket 23-GREC-03) the CY 2022 GREC reports NG-AS/MT-2, 3, 5, 6, 7, 8, 13, and 15.

We obtained gas leak data from the best available source: the 2022 NG Service Quality Report dated March 1, 2023. The report lists all reported leaks and identifies which ones were

[1] Use of the leak extent method is described in this piece on the HEET website. A 2019 study showed that the Leak Extent Method was the most reliable proxy method for identifying high-emitting leaks.

[2] From Mayor Fuller's letter dated June 2, 2023: "There is one measure that can be taken immediately in order to address these safety, health, climate, and cost concerns; the Department of Public Utilities should revisit the Gas System Enhancement Program (GSEP), promulgated by DPU order [more precisely, legislative action] in 2014.
"GSEP preferences natural gas system replacement over pipeline repair. The theory behind GSEP made sense at the time—accelerate the replacement of the leaking system, instead of engaging in whack-a-mole pipeline repair. But, with the benefit of hindsight, this was not an ideal approach for two reasons: (1) now we know that the climate crisis requires the gas system to be eliminated or significantly limited sooner than was anticipated a decade ago, meaning that system-wide pipeline replacement will result in stranded assets; and (2) the prevalence of serious leaks poses serious health and safety risks, adds significantly to the State's greenhouse gas emissions, and imposes the cost of the leaking gas on gas Customers."

eliminated during the year. Unfortunately there is no comprehensive leak survey process, so that even the best source is only a partial description of leak extent in the City.

In addition, every quarter, National Grid submits to the DPU an accounting of gas leaks in its system; we obtained these reports covering December 31, 2021 to the present, using DPU records requests.

Regarding leak repair, GSEP also provides incentivised cost recovery for repair of G3SEI (Grade 3 significant environmental impact) leaks. We compiled and analyzed the GSEP plans for such repair in 2022 and the actual 2022 costs in the GREC filing.

We extracted Newton data from all the filed reports. We analyzed the 2022 GREC filings to determine what kind of work the 2022 costs actually funded. .

Lastly, we compiled reports of how leaks were eliminated in 2022.

Results: GSEP cost summary for Newton 2022

Table 1 below summarizes GSEP costs in Newton as reported in the GREC filing by National Grid. In addition to leak repair and pipe main replacement, GSEP also allows costs to replace "service" pipes to individual buildings. Note this table excludes $5.4 million for a pipe lining project that was partially in Newton; see the Appendix for detail.

Table 1 2022 GSEP costs in Newton

GSEP costs for repairing large leaks	$124,595	0.5%
GSEP costs for pipe replacements	$23,143,364	94.3%
GSEP costs for service replacements	$1,276,541	5.2%
Total	$24,544,500	100%

Results: Pipe replacement

<u>Analysis of 2022 GSEP pipe replacement costs as displayed in the GREC filing</u>
We separated the costs reported in the 2022 GREC into the following six categories of projects, displayed in Table 2.

A. Projects that were anticipated in the GSEP plans for 2022.
B. Projects that appeared in any other year's GSEPs or lookaheads.
C. Projects that did not appear in GSEP plans and were attributed to "encroachment."
D. Projects that did not appear in GSEP plans but responded to priority conditions during the year.

E. Projects that were not in GSEP plans, had no priority assessment, and were accomplished in accordance with Newton DPW coordination.

Table 2: Analysis of 2022 GSEP pipe replacement costs

Category	Number of projects	GSEP cost
A.	4	$2,967,699
B.	7	$12,714,525
C.	7	$1,629,481
D.	3	$1,096,110
E.	6	$4,735,549
Total	27	$23,143,364

Table 3 below consolidates results from Table 2.

Table 3 Consolidated analysis of 2022 GSEP pipe replacement costs

Description	GSEP cost	%
Projects with a priority number in the GSEP plans (and not attributed to field conditions) (A plus B)	$15,682,224	68%
Projects that were not in GSEP plans but were attributed to field conditions or encroachment from other utilities (C plus D)	$2,725,591	12%
Projects without GSEP prioritization that were completed in coordination with Newton Public Works. (E)	$4,735,549	20%
Total	$23,143,364	100%

Note that 20% of the costs originated in coordination with Newton Public Works in the context of maintaining the gas infrastructure for the indefinite future These Public Works projects were performed with limited or no attention to priority gas leak conditions.

Pipe replacement projects charged to GSEP in 2022 are shown in linked Table L3. The table lists each pipe replacement project. If the project appeared in a prior GSEP plan, the prior plan is also noted in the table.

Results - Leaks and GSEP in Newton

Analysis of the National Grid reporting of leaks and leak repair results in the following conclusions:

GREC over the year reported an expense of $124,595 to repair 21 G3SEI leaks comprising 125,157 sq. ft. measured according to the leak extent method.

Through pipe replacement, GSEP addressed 11 leaks comprising 4,267 sq. ft. leak extent. The cost of pipe replacement work orders that included at least one leak repair was $11,168,040. Almost all leak extent eliminated by pipe replacement came from only two work orders. None of the completed pipe replacement projects addressed grade 3SEI leaks, as far as we could determine. See linked Table L4 which displays leaks that were associated with GSEP pipe replacement projects.

In Table L4, we looked at all the reported leaks in the past 2.75 years along the locations where pipes were replaced. These leaks include Grade 1, Grade 2, and Grade 3 leaks. Eight Grade 1 leaks were first reported during the replacement period, which may indicate that these pipes were in a fragile state. At least three leaks were reported after the replacements were completed. These leaks might be in the service lines at those locations, instead of in the pipes. We also found that a new leak occurred at or near the locations of three of the 21 pipe leak repairs. We concluded that replacing or repairing pipes does not prevent all new leaks, which illustrates the fragility of the whole gas distribution system.

For the pipe replacement locations that appeared in a GSEP plan or lookahead (i.e. the 11 projects in categories A and B), we identified 28 reported leaks over the past 2.75 years, while for public works-related projects (the 6 projects in category E) we found only 4 reported leaks. This suggests that some of the projects included in GSEP plans do address dangerous pipes, while the public works projects generally do not.

The 2022 experience shows that GSEP expenditures to reduce leak extent by leak repair are much more cost-effective than expenditures by pipe replacement.

Results - Leaks in Newton during 2022

We analyzed the National Grid Service Quality Report to understand how all Newton leaks were treated in 2022 regardless of whether the cost appeared in GSEP or outside of GSEP. Our analysis found the following:

- Total reported leaks as of Jan 1, 2022: 649 leaks comprising 608,133 sq. ft. leak extent Table L5

- Total reported leaks as of Jan 1, 2023: 600 leaks comprising 486,884 sq. ft. leak extent Table L6

- A total of 427 leaks were eliminated during 2022, comprising 190,746 sq. ft. of leak extent. 86% of the eliminated leak extent was accomplished by leak repair.

- Only 2% of eliminated leak extent was accomplished by pipe replacement. The remainder, 11% of eliminated leak extent, resulted from a variety of circumstances including leaks that stopped being observable, duplicate leak accounting, or other circumstances.

- 378 new leaks were recorded during 2022 (600 + 427 - 649 = 378).

- 26 leaks that were non-hazardous in January 2021 were "upgraded" to a higher risk category during the year and quickly repaired.

Table L7 lists all the leaks that were eliminated during 2022 and how they were eliminated.
Table L8 lists leaks eliminated by leak repair without first being upgraded to a more hazardous category.
Table L9 lists leaks eliminated by pipe replacement (GSEP and non-GSEP)
Table L10 lists leaks "eliminated otherwise", such as by being upgraded first, by repair of a nearby leak, or by some circumstance other than repair
Table L11 aggregates National Grid's statement of how leaks were "Eliminated Otherwise"

Table 4 aggregates data by how leaks were eliminated, according to National Grid categories.

Table 4 Aggregation of how leaks were eliminated in 2022

How eliminated	count	Leak extent sq. ft.	% leak extent
Simple repair	318	143,154	75.0%
Pipe replacement	25	4,642	2.4%
Eliminated by leak repair of other leaks or after being upgraded	36	21,163	11.1%
Eliminated by circumstances other than leak repair or pipe replacement	48	21,787	11.4%
Total	427	190,746	100.0%

Results - Leak History in Newton since December 31, 2021

Table 5 summarizes the status of reported gas leaks in Newton at the end of each quarter. In the first quarter of 2023, Mayor Fuller stated a desire for Newton to reduce large leaks. She also reported a successful recent reduction in leak extent, which is evident in Table 5. Over the

course of two years, the extent of reported leaks was almost halved. However, since the Mayor's statement, leak extent reduction has lagged, particularly in 3Q of 2023. Newton has a valuable opportunity to review its coordination with National Grid to assure continuous elimination of large leaks.

Table 5 Newton Reported Leak History since January 1, 2022

National Grid Report Date	Number of unrepaired leaks	Total of Leak Extent sq. ft..	Leak Extent reduction in 3 months
12/31/2021	646	604,422	
3/31/2022	626	551,722	9%
6/30/2022	644	583,654	-6%
9/30/2022	626	533,031	9%
12/31/2022	598	485,158	9%
3/31/2023	580	376,770	22%
6/30/2023	571	339,935	10%
9/30/2023	552	335,992	1%

In Newton as of September 30, 2023, there were 44 unrepaired SEI leaks out of 552 total unrepaired leaks. The sum of SEI leak extent was 165,578 sq ft. which is almost half of the total leak extent in Newton (335,992 sq. ft). In other words, 8% of leaks, the SEI leaks, account for 49% of all the leak extent. Therefore, repairing SEI leaks is particularly effective in reducing methane releases to the atmosphere. However, roughly half of the leak extent in Newton is due to non-SEI leaks, which points to the importance of eliminating as many leaks as possible, even those less than the 2,000 sq. ft. definition of SEI leaks.

Conclusions

GSEP was originally formulated to promote safety by eliminating hazardous leak-prone pipe. Although the current GSEP is intended to both replace leak-prone pipes and reduce significant gas leaks, nearly all GSEP expenditures in Newton are for replacing pipes.

Gas leak repair is much more cost-effective short term for reducing gas leaks than replacing leak-prone pipes.

Current GSEP rules and implementation procedures permit costly replacement of pipes that are low priority according to program regulations (such as public works projects). Such low priority projects comprised 20% of National Grid GSEP costs in Newton in 2022.

In some cases, most notably the recurrent leaks along Boylston St.(as seen in Table L4), pipe replacement does address critical pipe safety issues. But, in most cases, the pipe replacement program does not address existing leaks, particularly G3SEI and other large grade 3 emitters.

Recommendations

Gas pipe work in Newton should heavily prioritize leak repair and other technologies, such as pipe lining, that cost much less than pipe replacements. Complete pipe replacement, which is currently mandated, is an expensive choice and should be avoided wherever possible.

Newton should strengthen its policy of encouraging National Grid to repair the largest leaks as quickly as possible because leaking methane is a significant current source of greenhouse gases. The plans and results for leak repair in Newton should be published quarterly for accountability.

GSEP should expand its cost recovery incentives to prioritize leaks even smaller than the current SEI definition of 2,000 sq. ft. leak extent. This would achieve significant emissions reduction for least cost.

GSEP should be entirely overhauled to align with the December 6, 2023 DPU Order 20-80-B. In contrast to the concept behind the original program, which envisioned operation of the gas system indefinitely, GSEP should provide incentives to accelerate the retirement of the residential gas infrastructure.

Newton should amplify its official advocacy to State officials for an overhaul of GSEP to reflect Newton's priorities. Newton's Climate Action Plan goals will require retiring the gas system entirely. GSEP needs to emphasize/prioritize the immediate reduction/repair of gas leaks and require a detailed plan for the retirement of the gas distribution system as ratepayers transition to electrification. An overhauled GSEP needs to provide a better balance among public safety, infrastructure cost, and speedy retirement of the gas system.

Appreciations

Thank you to HEET and to the Newton pipes team consisting of Zach Miller, Bob Persons, Yoshi Futai, Josh Nichols-Barrer, Olivia Sousa and Nicole Krieger.

APPENDIX

List of Tables

Pipe Lining project charged to GSEP

Table 1 excludes $5,399,306 charged to GSEP from a pipe lining project at “11-44 Thorton St,. & 5-35 Emerson St and Boyd”, NG project number 1191943 as documented in NG-AS/MT-15. Some portion of this work was in Watertown and some in Newton. The work eliminated two leaks in Newton: a Grade 2 leak #7373057 at 11 Thorton St., and a Grade 3 leak #7371043 at 34 Emerson St. with 510 sq. ft. leak extent.

Guide to GSEP program abbreviations for pipe replacement

Quoted from NGrid filing D.P.U. 23-GREC-03, Exhibit NG-AS/MT-1, May 1, 2023, Page 7

There are 11 types of programs included: (1) “BSMNRPL,” which indicates a bare steel main replacement project; (2) “CIMNRPL<10,” which is a cast iron main replacement project with pipe diameter less than 10 inches; (3) “CIRE101214,” which is a cast iron main replacement project with pipe diameter greater than 8” but less than or equal to 14”; (4) “ENCRCHMTPL,” which is a parallel main encroachment; (5) “PWNONREIM,” which is a public works non-reimbursable project; (6) “ENCRCHMTUM,” which is a main encroachment due to undermining of the existing facility; (7) “H2OINT,” a program that addresses recurring customer outages resulting from water intrusion into low-pressure distribution systems through the replacement of existing leak-prone pipe; (8) “REANONLEAK,” a program used to replace main that, based on conditions found in the field, is immediately prioritized for replacement regardless of leak history; (9) “ALDYRPL,” a program to replace pre-1985 vintage Aldyl-A plastic pipe; (10) “GPLNG,” which are system reliability main replacements; and, (11) BRIDGES.

END