Targeted Electrification in New York State

An Alternative to Leak-Prone Pipeline Replacement

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About

WHO COMMISSIONED THIS REPORT?

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Introduction

New York State is the midst of rebuilding its aging natural gas distribution network.

The state's utilities are on track to replace 15% of the New York's aging gas pipelines by 2050, at a estimated cost of $34 to $65 billion. In 2022 and 2023 alone, New York utilities spent over two billion dollars on pipe replacement,[1] more than twice what the state spent to cut emissions from building gas combustion.[2]

Utilities would pay for these new pipes by raising customer gas bills for decades, despite the fact that these pipes will soon be underutilized: gas consumption by homes and businesses fell by 13% between 2019 and 2024, and sales will likely continue to decline as the climate warms and consumers electrify.

Moreover, utilities are requiring ratepayers to pay for infrastructure that delivers methane gas, a fossil fuel that must be phased out over the next 25 years to meet New York's legally-mandated decarbonization goals.[3]

The old metal pipes that utilities are replacing statewide are the most likely to leak the methane they carry, and therefore represent a safety concern and a source of potent greenhouse gas emissions.

However, utilities are entirely *replacing* all pipes built from outdated materials, rather than surgically *repairing* those that are actually leaking, a far less profitable way to solve the problem.[4]

This report focuses on a promising alternative to leak-prone pipe replacement: **targeted building electrification**. Instead of replacing a pipe segment, utilities would decommission it and swap the fossil fuel appliances of affected customers with new electric models, including heat pumps, heat pump hot water heaters, and induction stoves.

We find that targeted electrification is a cheaper alternative to replacing leak-prone pipe across much of the state—and that's before factoring the health and environmental costs of methane combustion.

In addition to often being a cheaper way to eliminate gas leaks, targeted electrification accelerates building decarbonization,

1 According to a recent report by Synapse Energy Economics (Synapse 2025) based on utility filings in PSC proceeding 20-G-0131.

2 Utilities and NYSERDA spent $1.1 billion on heat pumps, building shells, and gas efficiency in '22-'23 (Sarkissian and Velez 2024).

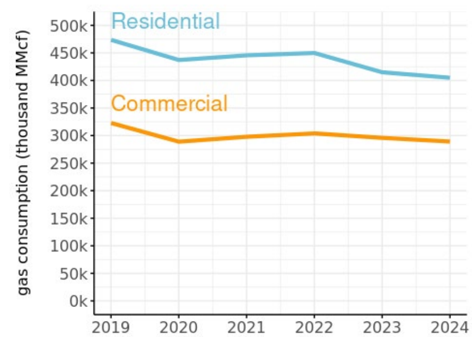


Figure 1: Residential and commercial natural gas consumption in NYS (2019-2024). Source - EIA Natural Gas Annual 2023.

3 The *(NYS Climate Leadership and Community Protection Act (S6599 / A8429)* 2019) mandates that the state reduce economy-wide greenhouse gas emissions by 40% by 2030 and 85% by 2050 from 1990 levels.

4 Utilities earn a percentage return on their capital investments. This incentivizes them to prefer capital-intensive solutions over cheaper alternatives such as lining pipes with plastic or using leak monitoring to guide targeted repairs.

advancing New York's climate goals rather than hiking rates to invest in fossil fuel infrastructure that faces dwindling demand and must soon be sunset.

Finally, by decommissioning gas pipes at the same time that customers electrify, targeted electrification would kickstart a managed transition of the gas system, helping to avoid skyrocketing costs for remaining gas customers.[5]

Executive Summary

This report analyzes the potential scale of targeted electrification to avoid leak-prone pipeline (LPP) replacements in New York State, and finds that:

- From 2011 to 2021, New York gas utilities spent **$15.7 billion** on expanding and upgrading their pipelines, much of it on leak-prone pipe replacement—and paying for these investments through rate hikes.[6]
- To fully replace all leak-prone pipe by 2050 (7,341 miles), we estimate that utilities will spend an additional **$43 billion**.[7]
- Targeted building electrification, implemented where feasible and cost-effective, could reduce this cost by an estimated **$4.7 billion**, while electrifying **313,331** households.[8]
- In areas where targeted electrification makes the most sense, it would cost an estimated **$10,465** less to electrify and weatherize each household (and upgrade the local distribution grid) than it would cost to replace its leak-prone pipe. The cost savings will grow to **$51,958** by 2050.
- Avoiding leak-prone pipe replacement with targeted electrification currently requires 100% opt-in by customers on affected pipe segments, which makes most projects infeasible.
- By reforming the obligation to serve, the **NY HEAT Act**[9] would remove this obstacle, unlocking the state's ability to curb gas rate hikes while accelerating decarbonization efforts.

5 As explained in (Walsh and Bloomberg 2023), when customers leave the gas system, fewer customers are left to pay the system's fixed costs, causing rates to rise and pushing more customers to leave.

6 (Walsh and Bloomberg 2023) derived this number from the change in book value of utilities' pipelines.

7 Our LPP replacement cost projections per household are based on utility rate cases, and our targeted electrification cost estimates are derived from NREL's ResStock EULP data. (NREL 2021)

8 In reality, the savings are likely to be larger, as we do not account for volume discounts or cost declines for heat pumps, or down-the-road costs for LPP replacement, including financing costs, repairs, leak detection, safety measures, and pipe decomissioning. (Walsh and Bloomberg 2023)

9 (*NY Heat Act* 2023) would eliminate the utility obligation to provide methane gas service to any customer within 100 feet of a gas pipeline.

Background

THE NEED TO DECOMMISSION NY'S GAS SYSTEM

Buildings are responsible for 31% of greenhouse gas emissions in New York State, over half of which come from methane gas combustion to create heat and hot water.[10]

The State Climate Scoping Plan has identified building decarbonization as a top priority as New York moves towards its goal of eliminating 40% of 1990-level greenhouse gas emissions by the year 2030 and at least 85% by 2050.[11]

Though the CLCPA does not place specific emission reduction requirements on gas utilities in the state, "meeting the CLCPA's emissions reductions targets for the entire economy will require emissions reductions from the gas distribution system," according to the Public Service Commission's 2022 Order Adopting Gas System Planning Process.[12]

10 According to (DEC 2024).

11 These mandates come from (*NYS Climate Leadership and Community Protection Act (S6599 / A8429) 2019*).

12 As stated in (PSC 2022).

THE GROWING COST OF NY'S GAS SYSTEM

While the PSC order calls for "minimizing infrastructure investments" and "consideration of gas alternatives" in utilities' planning processes,[13] utilities have only increased their pipeline investment (Figure 2):[14]

13 *ibid.*

14 Per (Walsh and Bloomberg 2023).

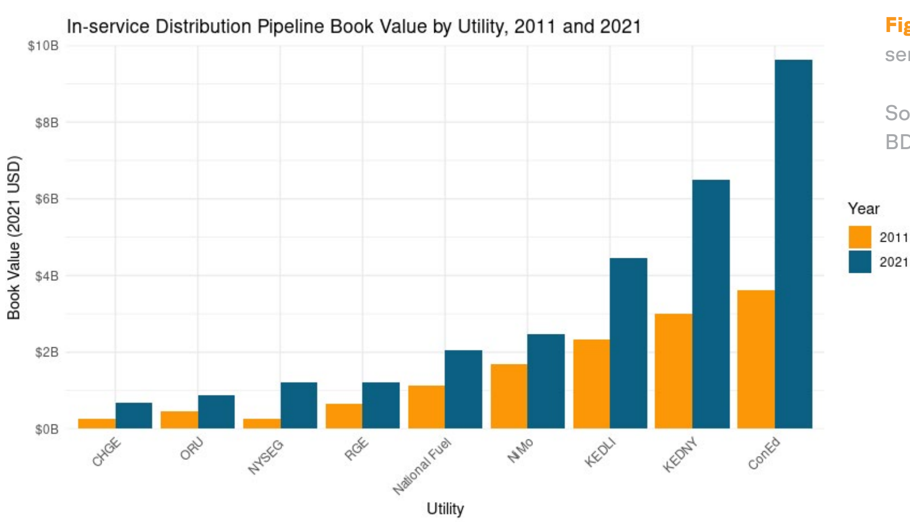


Figure 2: Book value of distribution plant-in-service in 2011 and 2021 by utility.

Source - LDC filings to NY PSC, as cited in BDC's Future of Gas Report (p. 15)

All gas utilities in New York state increased the value of their pipeline infrastructure between 2011 and 2021, allowing them to grow their profits.

Those increases were due to capital investments in new pipeline and especially in leak-prone pipeline replacement. Over that period, utilities collectively expanded their gas distribution mains by 1,833 miles, and replaced 4,807 miles of LPP. [15]

15 *ibid.*

Those investments have not slowed. Utilities are on track to spend $34 to $65 billion of dollars on leak-prone pipeline replacements over the next 26 years. (The range reflects uncertainty about future cost increases for LPP projects).

Leak-prone pipe
Pipe made out of cast iron, wrought iron, coated steel, or bare steel, which tends to be older and is more likely than newer materials to leak methane gas.

In fact, LPP replacement projects are the primary driver of rising gas bills for New York consumers.

According the Building Decarbonization Coalition's landmark Future of Gas in New York State report, "ratepayers' gas bills are increasing and will continue to do so in the coming years, irrespective of the influence of climate policies and building decarbonization efforts. The primary reason for rising costs is the continuous replacement of old cast iron and unprotected steel pipes that are considered 'leak-prone.'"[16]

16 *ibid.*

For example, in a 2021 rate case filing, the Orange and Rockland utility stated that it planned to spend roughly 70% of its proposed $2.1 billion in capital improvements over the following three years on replacing leak-prone pipelines.[17] In its 2023 rate case, National Fuel also stated that 70% of its roughly $120 million annual capital spending would continue to go into replacing leak-prone pipes, the cost of which rose 56% per mile between 2018 and 2023.[18]

17 Per (O&R 2021).

18 National Fuel Case 23-G-0627 into (National Fuel Gas 2024)

THE HIDDEN COST OF LPP REPLACEMENT

The **up-front costs** of pipeline replacement do not account for the actual cost over the lifetimes of these projects.

Once installed, pipelines have an average lifespan of 75 years. They depreciate over that period until they're no longer worth anything and cost money to decommission. This depreciation, along with taxes, maintenance, and other expenses, are among the costs utilities are permitted to recover from customers by increasing gas rates.

After factoring in these **down-the-road financial costs**, the Building Decarbonization Coalition estimates that the actual cost to gas customers is at least double the up-front cost of replacing pipelines.[19]

In addition to these **up-front** and **down-the-road** *financial* costs, LPP replacement perpetuates methane combustion in buildings, which warms the planet and harms human health. This report does not analyze these **externalized** costs.

Warning

For the purposes of this report, we are assessing only the **up-front capital improvement costs** of replacing leak-prone pipelines, but readers should keep in mind that this cost estimate is quite conservative, ignoring **down-the-road financial costs**, as well the **externalized costs** to human health and the environment.

19 BDC Future of Gas in NY to (Walsh and Bloomberg 2023)

TARGETED ELECTRIFICATION: AN ALTERNATIVE TO LPP REPLACEMENT

New York's utilities are hiking gas bills to upgrade a gas distribution network that is delivery less gas to homes and businesses every year. But there's another way forward: **Non-pipeline alternatives** (NPA).

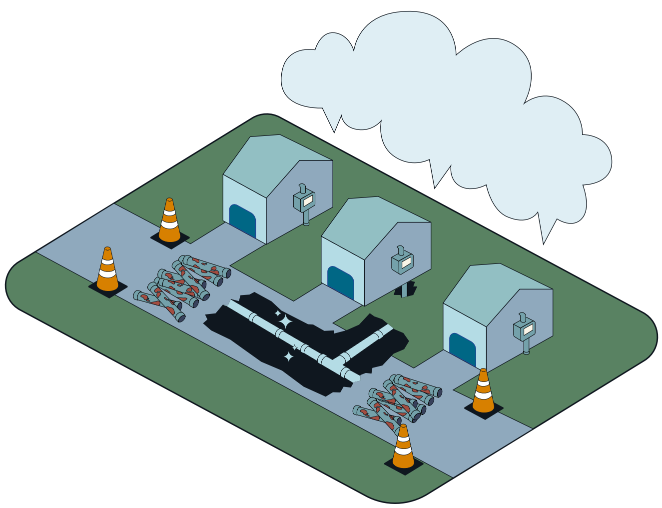
Non-pipeline alternative
Any investment or activity that defers, reduces, or removes the need to expand or upgrade a methane gas distribution network. (Nelson et al. 2023)

In 2023, New York's Public Service Commission began requiring gas utilities to assess whether planned LPP replacement could be avoided with NPA projects.[20]

Such projects include replacing gas systems with thermal energy networks,[21] using leak detectors that facilitate more targeted pipeline repairs, and installing energy efficiency measures that reduce customer gas consumption.

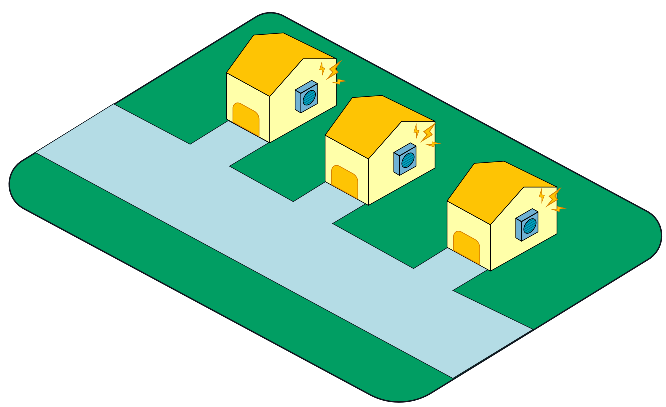
20 The PSC began this requirement in 2022 (PSC 2022). Con Edison (ConEd 2023), National Grid (National Grid 2024), and NYSEG (NYSEG 2020) identified opportunities for NPA projects.

21 (BDC 2025) provides an explanation of thermal energy networks.



Leak-prone Pipeline (LPP) Replacement

Completely replace old metal pipes with new plastic ones.



Targeted Electrification

Decommission old metal pipes, electrify and weatherize affected buildings.

In this report, we focus on a single non-pipeline alternative: decommissioning segments of leak-prone pipeline, and installing electric appliances in the households and commercial buildings that receive gas from those lines, an approach called **targeted building electrification**.

Targeted building electrification
Equipping buildings in specific geographical areas, like blocks or entire neighborhoods, with heat pumps and other electric appliances in order to avoid replacing the gas pipelines that serve those buildings. (Smillie et al. 2024)

Avoiding leak-prone pipe replacements has been identified as one of the most obvious near-term opportunities for targeted building electrification, so that is what we analyze in this report. However, there may be many other opportunities to pursue this strategy outside of LPP replacements.

HOW FEASIBLE IS IT TO DECOMMISSION LPP?

Because decommissioning leak-prone pipe may cut off gas to downstream areas with non-leak-prone pipe, it's not **hydraulically feasible** to avoid all LPP replacements with targeted electrification—unless all downstream pipes are also decommissioned.

For this reason, the LPP projects that are easiest to avoid are those that would replace pipes near the ends of service lines.

To maximize the number of avoided LPP replacement projects while minimizing the disruption to the network as a whole, large-scale decommissioning would need to begin at the ends of the network and progress inwards, proceeding in parallel to targeted electrification projects at aging pipe segments.[22]

To date, New York's utilities have not published the percentage of their leak-prone pipe segments that would be hydraulically feasible to decommission.

Given this uncertainty, this report assumes a *range* of miles of leak-prone pipeline that might be eligible for decommissioning. This assumption allows us to propose an initial estimate of the potential scale of targeted electrification, and the savings that could result.

Overall, this report finds that a large-scale, targeted electrification strategy could significantly reduce the amount of leak-prone pipelines in New York State, while delivering heat pumps, weatherization, and lower energy bills to hundreds of thousands of buildings.

22 According to (Smillie et al. 2024), which estimated the amount of pipeline that is hydraulically feasible to decommission in California.

Findings

NY'S LEAK-PRONE PIPELINE (LPP) INVENTORY

Replacing all New York's **leak-prone pipe** amounts to an enormous investment.[23]

23 We define miles of LPP as miles of cast iron, wrought iron, coated steel, or bare steel service mains reported to the federal Pipeline and Hazardous Material Safety Administration (PHMSA). Utilities may also consider some plastic and protected steel pipes "leak-prone".

We estimate that there are **7,341** miles of leak-prone pipeline that gas utilities plan to replace by 2050, or **15%** of all the gas distribution pipes in New York (Figure 3):

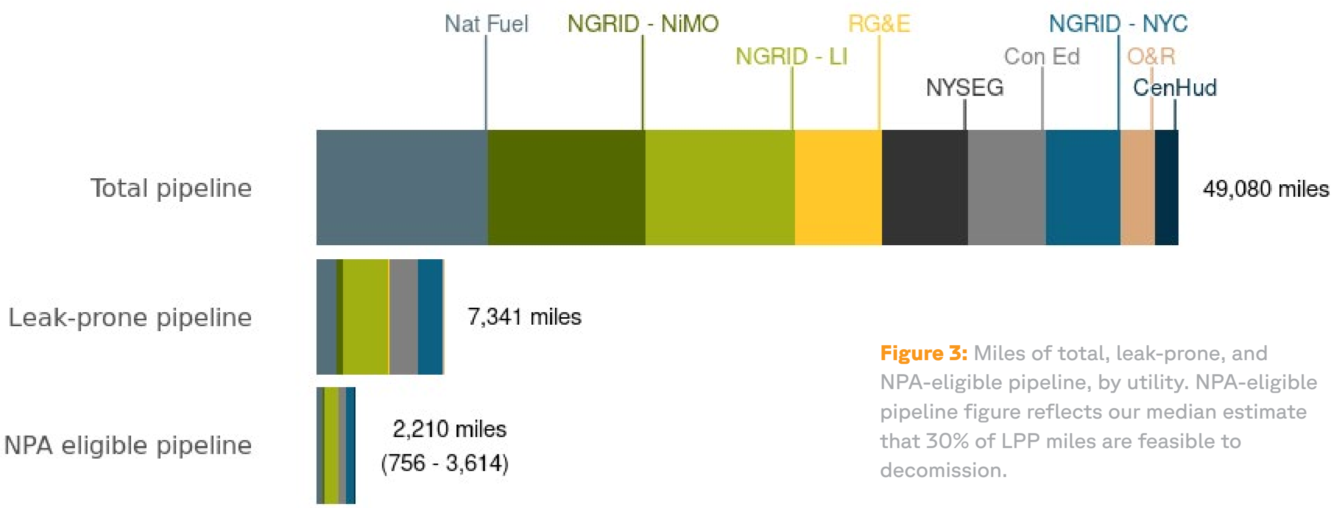


Figure 3: Miles of total, leak-prone, and NPA-eligible pipeline, by utility. NPA-eligible pipeline figure reflects our median estimate that 30% of LPP miles are feasible to decomission.

These pipes are not evenly distributed across the state (Figure 4):

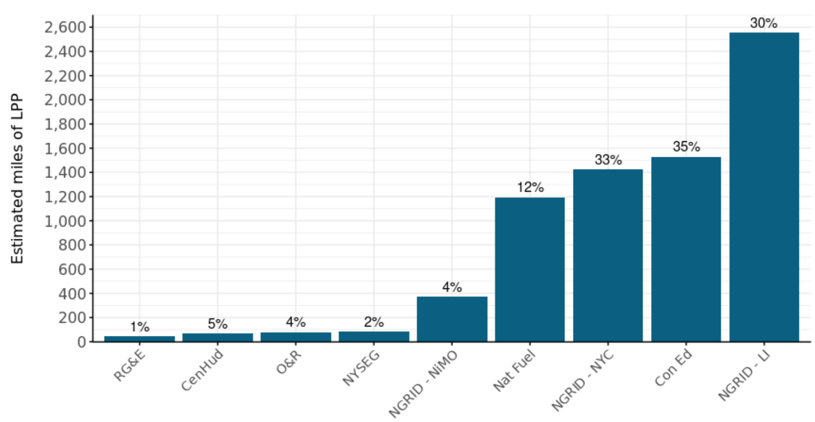


Figure 4: The estimated miles of leak-prone pipeline that have been identified for replacement in each utility service area. Percentages represent the share of each utility's pipelines that are leak-prone.

Some utilities, such as National Grid's subsidiaries in New York and Long Island, have a high percentage of LPP mains. Others, like Rochester Gas and Electric and Central Hudson Gas and Electric, do not.

Overall, most leak-prone pipe is concentrated around New York City and Buffalo.

Most of NY's utilities have identified the *speed* at which they plan to replace their current inventory of LPP, along with an end date (Figure 5):[24]

24 See Section 5.5.3 for specific rate cases.

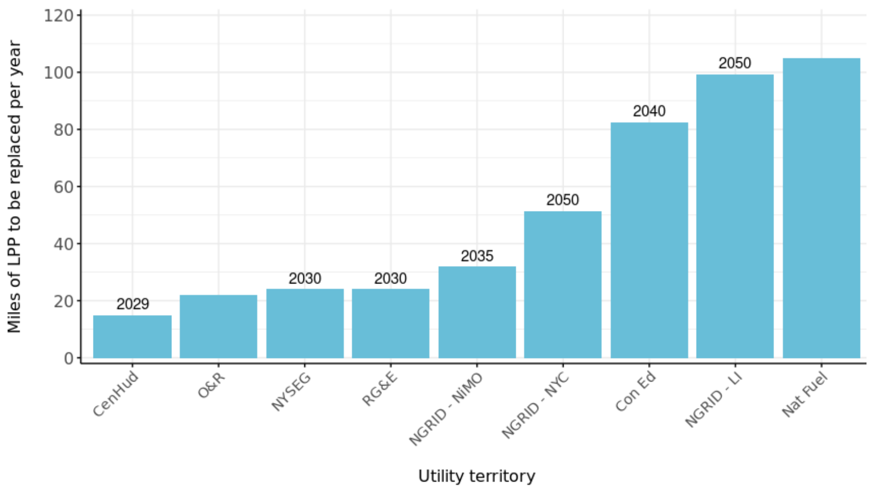


Figure 5: Reported miles of leak-prone pipeline planned to be replaced per year. End year is annotated at the top of each bar for utilities that have reported an end year.

This allows us to project how many LPP miles utilities will likely replace statewide, year by year, through 2050 (Figure 6):[25]

25 For utilities that did not report end dates, we assume they will stop LPP project when ther current inventory is replaced.

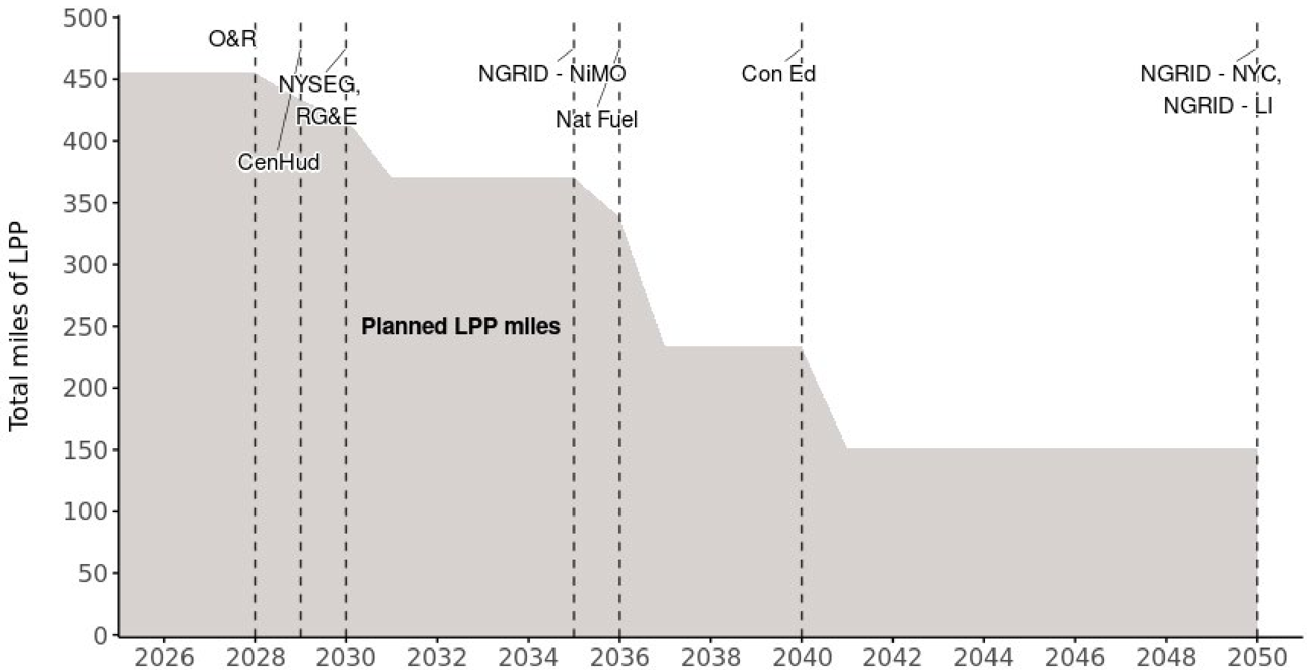


Figure 6: Median total miles of planned LPP (grey), LPP that is NPA eligible (light green). Dashed lines denote when utilities project to finish LPP replacement.

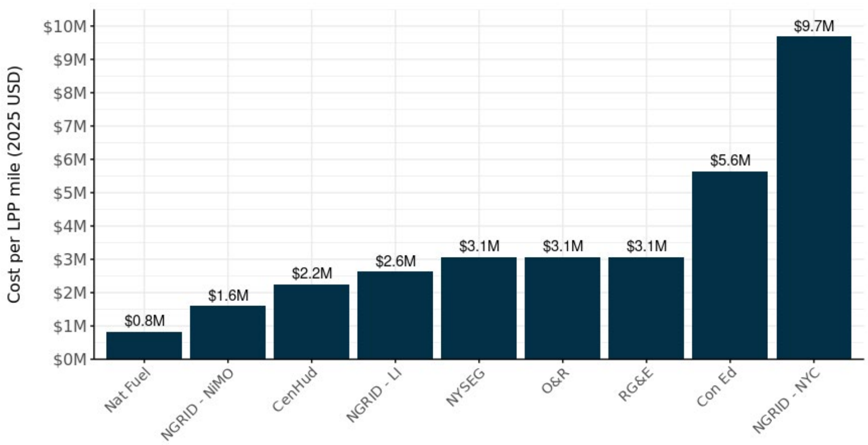
For instance, Consolidated Edison anticipates replacing its current inventory of LPP by 2040. Only National Grid's subsidiaries in New York and Long Island expect to still be working to replace their current inventory of LPP through 2050.

PER-MILE LPP REPLACEMENT COSTS

How much will it cost to replace all this leak-prone pipe?

To start, utilities report widely different average costs for replacing a mile of LPP (Figure 7):

Figure 7: Estimate cost to replace leak-prone pipeline per mile (2025 USD), by utility.



We estimate that the cost to replace a mile of pipeline in 2025 ranges from $0.83 - $9.68 million across utilities, with an average of $4.3 million per mile.[26]

26 6 out of 9 utilities reported per-mile LPP replacement cost in regulatory filings. We estimated costs for NYSEG, O&R and RG&E, see Section 5.6 for details.

In part, the dramatic cost differences across utilities reflects the geography of their service territories (Figure 8):

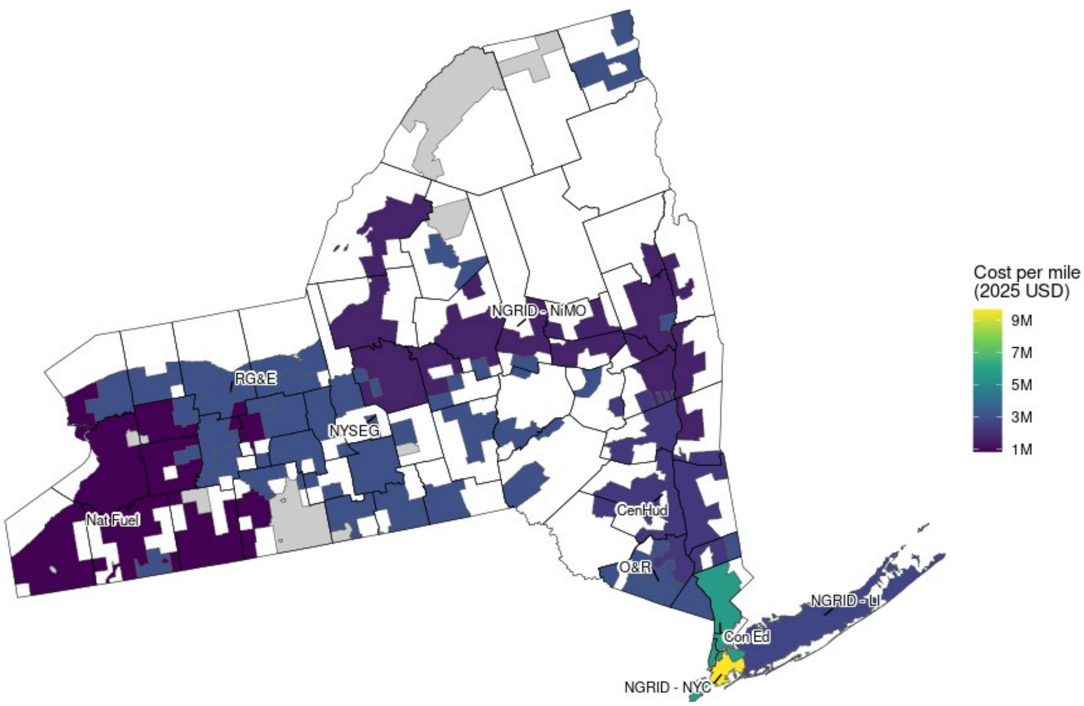


Figure 8: Map of LPP replacement costs per mile across utility service territories (2025 USD).

National Grid NYC and Consolidated Edison, both of which operate in New York City, have the highest costs per mile of pipeline replacement. (And although they serve similar areas, National Grid's per-mile replacement costs are nearly twice those of ConEd.)

National Fuel and National Grid Upstate, which have more rural service territories, report the lowest LPP replacement costs.

FORECASTS OF PER-MILE COST INCREASES

These per-mile costs are expected to rise by 2050. How large this increase will be is uncertain, however. LPP replacement cost projections vary widely, and have a huge impact on the final price tag because utilities replace hundreds of miles of LPP a year.

To capture this uncertainty in our estimates of how much utilities will spend to replace all LPP, we simulated a wide range of scenarios, from 3% to 10% annual increases LPP project costs.[27]

27 In rate case filings, some gas utilities have estimated what these annual cost increases might turn out to be. Our 3% to 10% range reflects previous research on the low end (Smillie et al. 2024), and an estimate from National Fuel in its rate case on the high end. (National Fuel Gas 2024)

TOTAL COST TO REPLACE NY'S LPP

To recap, we've estimated how much LPP each utility plans to replace each year (Section 4.1), how much it *currently* costs each of them to do so (Section 4.2), and a range of forecasts of how these costs might grow in coming year (Section 4.3).

We can now estimate how much ratepayer money New York utilities will likely spend on LPP replacements in total by 2050 (Figure 9):

Figure 9: Estimates of annual LPP spending through 2050 (2025 USD). Solid line represents the median estimate. Darker shaded region represents the middle 50% of simulations. Lighter shaded region represents the middle 95%. Dashed lines denote when utilities project to finish LPP replacement.

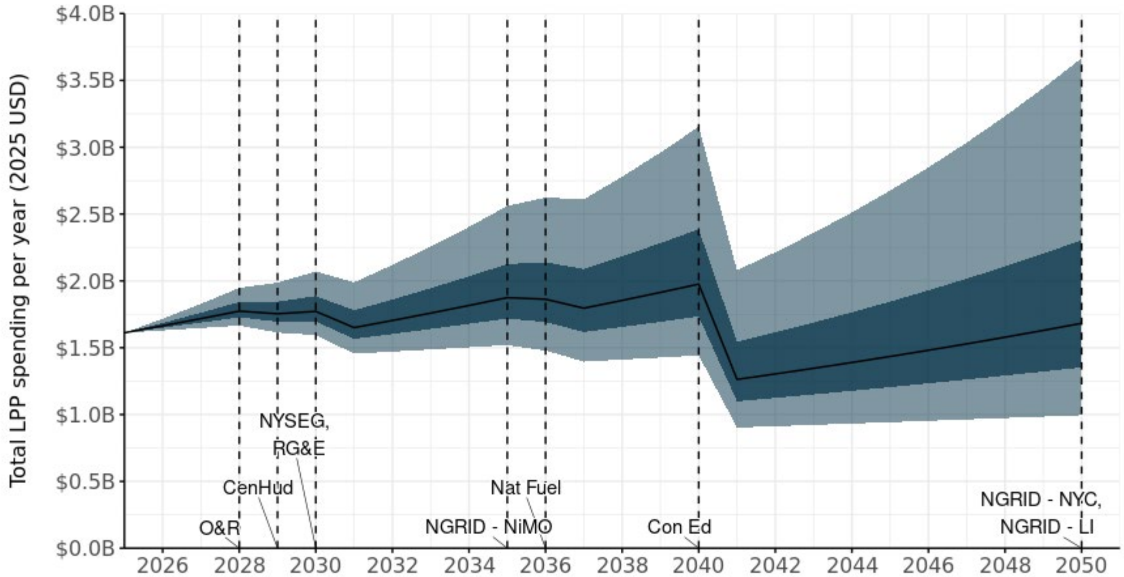


Figure 9 shows the results of our annual cost simulations:

- The **solid line** represents the *median* spending on LPP replacement by all utilities, per year. It ranges from $1.25 to $2 billion per year.
- The **shaded area** shows the range of outcomes that are possible, assuming LPP projects get between 3% and 10% more expensive each year.

Adding up the **median** annual spending in our simulation results, we estimate that replacing all of NY's LPP inventory will cost **$43 billion** over the next 26 years. Depending on what the annual cost increases for LPP replacement turn out to be, however, the total cost could be as low as $34 billion or as a high as $65 billion.

Warning

As gas infrastructure continues to age, we expect that more and more pipeline will come due for replacement, given the fixed lifespan of gas pipelines. Our model includes only the *currently* reported inventory of LPP.

In addition this cost only includes the amount gas utilities spend up-front to dig up LPP and lay new pipe. It does not account for taxes, maintenance, depreciation, and the regulated rate of return on investments that investors in private sector gas utilities are guaranteed.

Therefore, the final price tag will **very likely exceed** $43 billion.

HOUSEHOLDS PER MILE OF LPP

While the cost of LPP replacement will be borne by all ratepayers, only a small percentage of customers are connected to LPP segments. How many residential households are actually served by each mile of LPP?

In this study, we assume this figure is the same as the average number of households per mile of pipeline—leak-prone or not—in each utility's service territory (Figure 10):

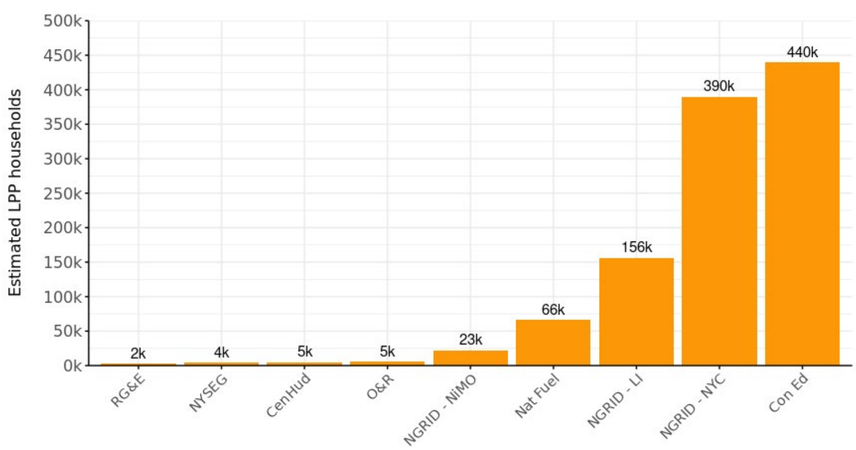


Figure 10: The estimated number of households that are served by leak-prone pipeline.

The estimated number of households served by LPP varies dramatically by utility, because some utilities have more LPP than others (see Section 4.1), and because they serve areas with vastly different population densities.

PER-HOUSEHOLD COST TO REPLACE LPP

In Section 4.4, we estimated how much utilities are planning to spend on LPP replacements overall. But how much will they be spending *per household* currently connected to each segment of leak-prone pipe?

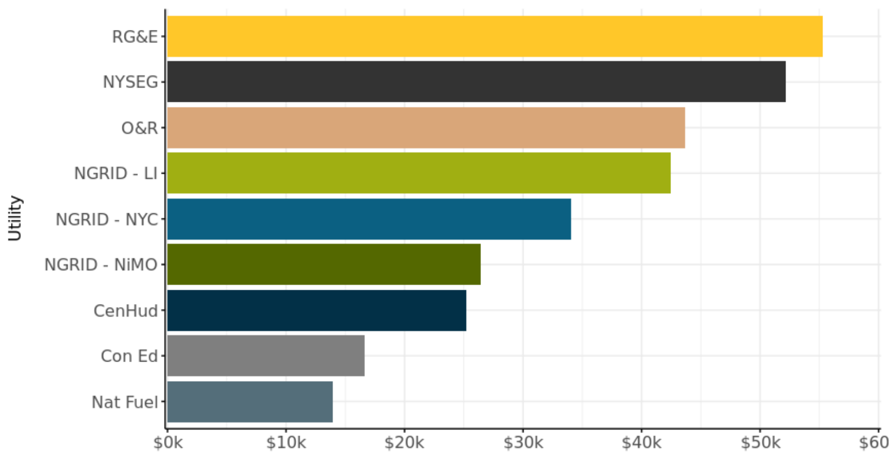


Figure 11: The median upfront cost per household to replace leak-prone pipeline in 2025 (2025 USD) by utility.

In 2025, the median up-front cost to replace a mile of LPP *per household served by this pipe* across the state is **$16,605** (in 2025), though this cost ranges from $13,932 for National Fuel to $55,284 for Rochester Gas & Electric.

These large variations in per-household LPP replacement costs are due to differences in each utility's LPP inventory (Section 4.1), LPP replacement costs (Section 4.2), and population density.

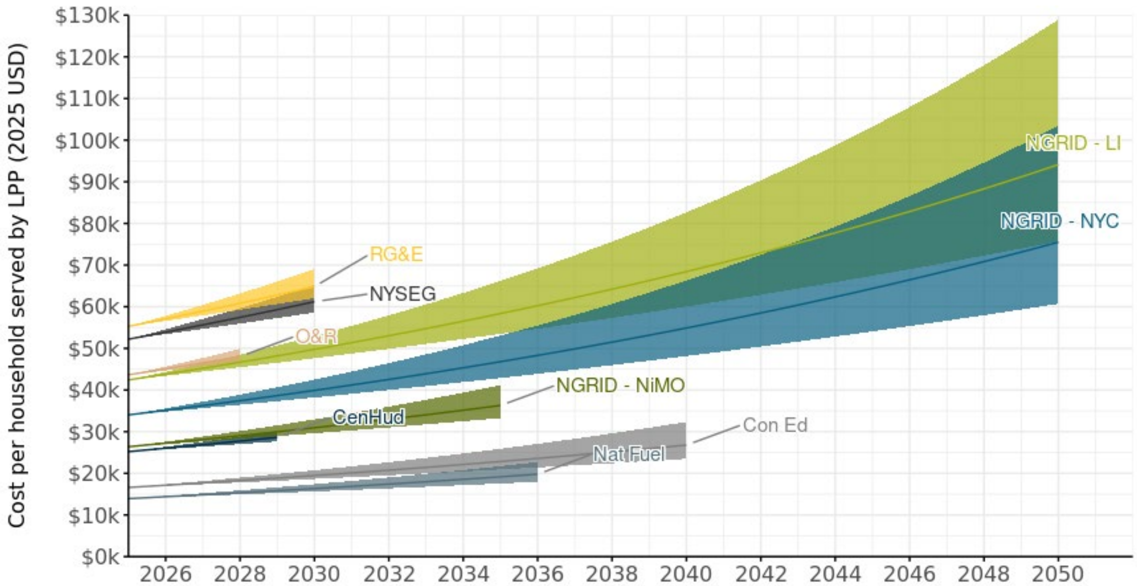
Con Edison—which serves Manhattan, Westchester, the Bronx, and parts of Queens—may need to spend a lot to replace a single mile of LPP, but that cost is spread out over a large number of residential customers, bringing the per-household cost down.

National Fuel, meanwhile, operates in less populous areas, but also reports a low LPP replacement cost, making its per household spending relatively low.

Other utilities, like RG&E, NYSEG, National Grid NY and National Grid Long Island—which serve rural, suburban, and less-dense urban areas—have relatively higher spending per household on LPP replacement.

Finally, each utility's per-household costs will increase over time, as LPP costs rise (see Section 4.3) and population density stays largely the same (Figure 12):

Figure 12: Up-front cost to replace LPP per household served by it, by utility (2025 USD). Shaded region shows middle 50 percent of simulated results.



FEASIBILITY OF TARGETED ELECTRIFICATION

The ultimate goal of leak-prone pipe replacement is to eliminate methane leaks.

Targeted electrification solves the same problem while providing additional benefits—lower energy bills for homes that electrify and making progress on the states climate goals—while avoiding counterproductive investment fossil fuel infrastructure.[28]

As we'll see, it's often a cheaper way to solve the problem, too. But before we can talk about cost-effectiveness, we have to establish targeted electrification's potential scale.

It won't be *hydraulically feasible* to avoid all leak-prone pipe replacements with targeted electrification projects:

- An unknown percentage of leak-prone pipes service industrial customers, some of which, at present, cannot be decarbonized with electricity.
- Hydraulic feasibility—how decommissioning a segment of pipeline might impact the network as a whole—is another constraint.

28 Switchbox's recent report, New York's Affordable Energy Future, finds that up to 85% of New York households could save money by electrifying and weatherizing their homes. (Smith et al. 2025)

At present, utilities do not provide the public with data on which pipelines are feasible to decommission. Moreover, this question hinges on how (and when) regulators choose to transition the rest of the network.

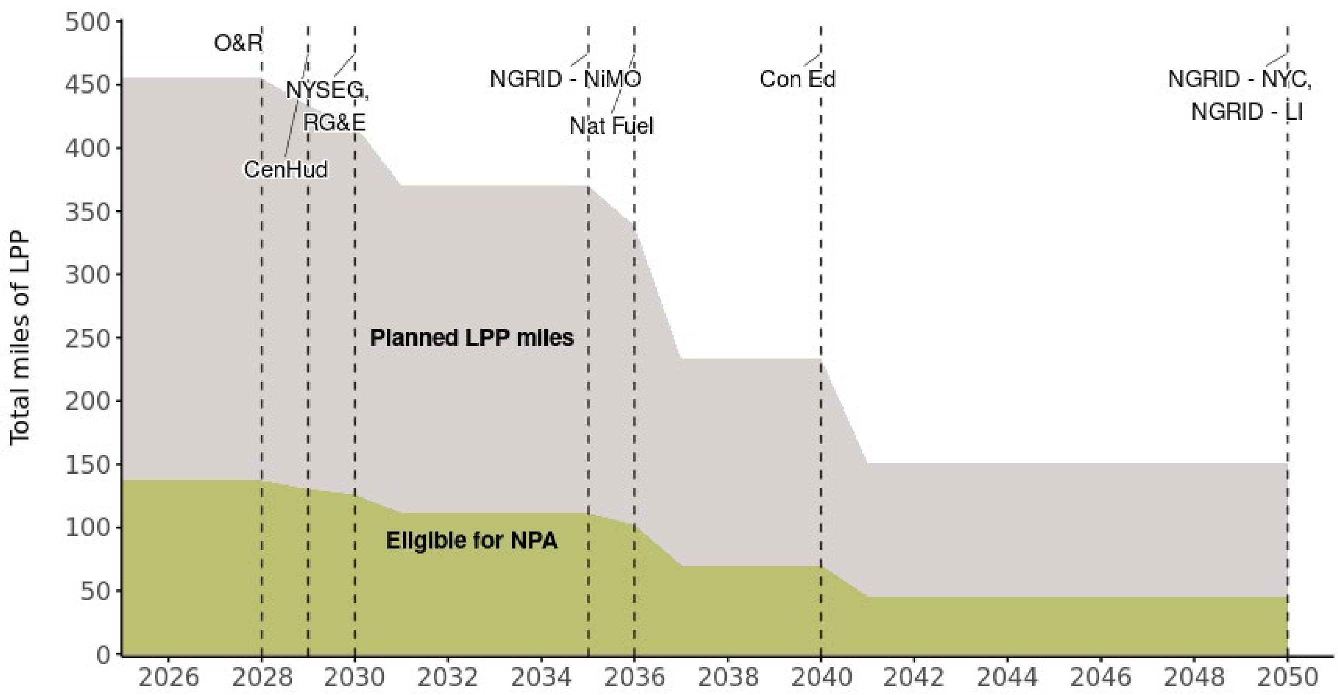
Given the scale of decommissioning required to meet the state's legally-mandated emissions targets, policymakers cannot take each LPP project's current hydraulic feasibility as a given.

To oversee a managed transition in the next 25 years, policymakers would need to maximize the number of LPP projects that can be replaced by NPAs, proactively decommissioning pipes that are downstream of planned LPP replacements through early retirement and targeted electrification.

To address this uncertainty, we simulated a range of scenarios, reflecting different assumptions about the percentage of LPP that may be hydraulically feasible to decommission across the state—from 10% to 50%.

Figure 13 shows the number of planned LPP replacement miles that would be eligible for an NPA, assuming 30% of leak-prone pipe segments would be hydraulically feasible to decommission:

Figure 13: Median total miles of planned LPP (grey), LPP that is NPA eligible (light green). Dashed lines denote when utilities project to finish LPP replacement.



In practice, the number of LPP miles eligible for decommissioning should grow as the gas delivery system shrinks.

COST OF TARGETED ELECTRIFICATION

Targeted electrification comes with its own costs.

Those costs include electric appliances for households that currently rely on gas for heating and cooking, including heat pumps, heat pump water heaters, and electric or induction stoves.[29]

In many cases, it may also include upgrades to the local distribution grid to accommodate increased demand for electricity.

Statewide, the median cost to electrify, by household, in 2025 is **$27,872**.

However, these costs vary significantly by geography (Figure 14), mostly due to differences in the price of labor, and the percentage of homes that must be weatherized for residents to enjoy lower bills after electrifying.

29 For some households, these costs include weatherization, to ensure that their new electric systems work efficiently and reduce the likelihood of increasing their monthly energy bills. For a more detailed exploration of weatherization requirements refer to Switchbox's Bucks for Boilers report (Shron and Velez 2024).

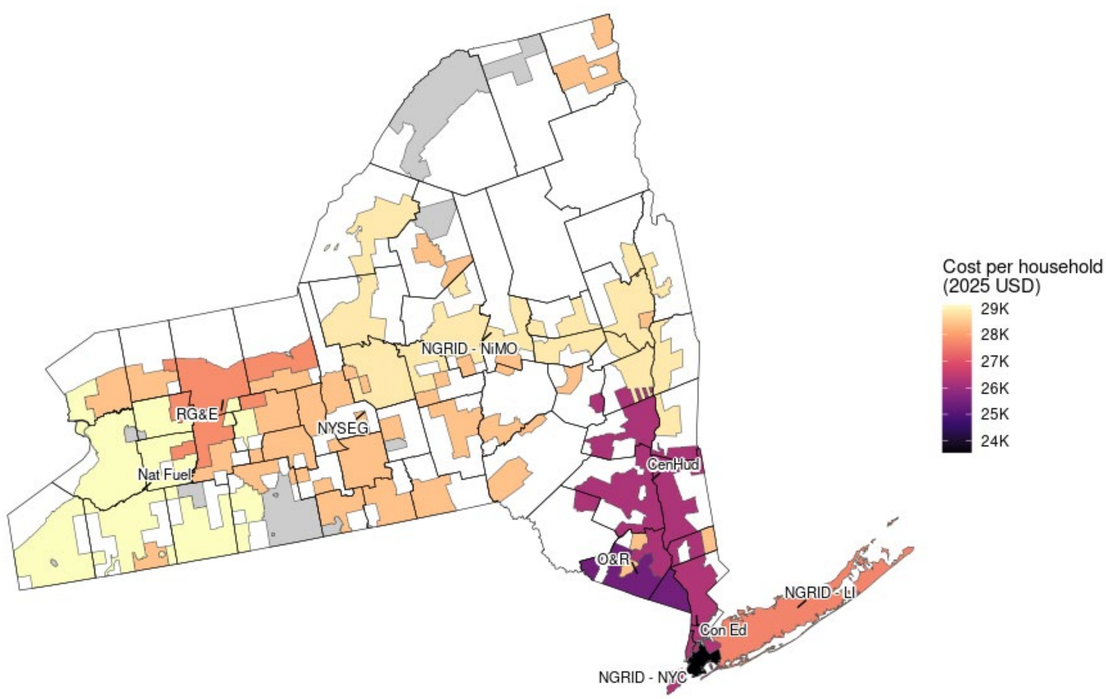


Figure 14: Geographic distribution of leak-prone pipeline replacement costs per mile across utility service territories (2025 USD).

As with the rising cost of LPP projects, we also expect the costs of targeted electrification to rise, albeit more slowly, and account for that fact in our simulations.

TARGETED ELECTRIFICATION VS. LPP REPLACEMENT COSTS?

While NPAs provide an alternative to pouring resources into stranded assets, it's important to consider the equivalent up-front costs of targeted electrification.

Warning

This report uses a very narrow definition of cost-effectiveness. We only compare the **up-front capital cost** of targeted electrification and LPP replacement, ignoring the latter's **down-the-road financial costs** and **externalized costs** to human health and the environment. (See Section 3.3 for details.)

Consequently, our estimates of how much LPP spending could be avoided through targeted electrification are very conservative.

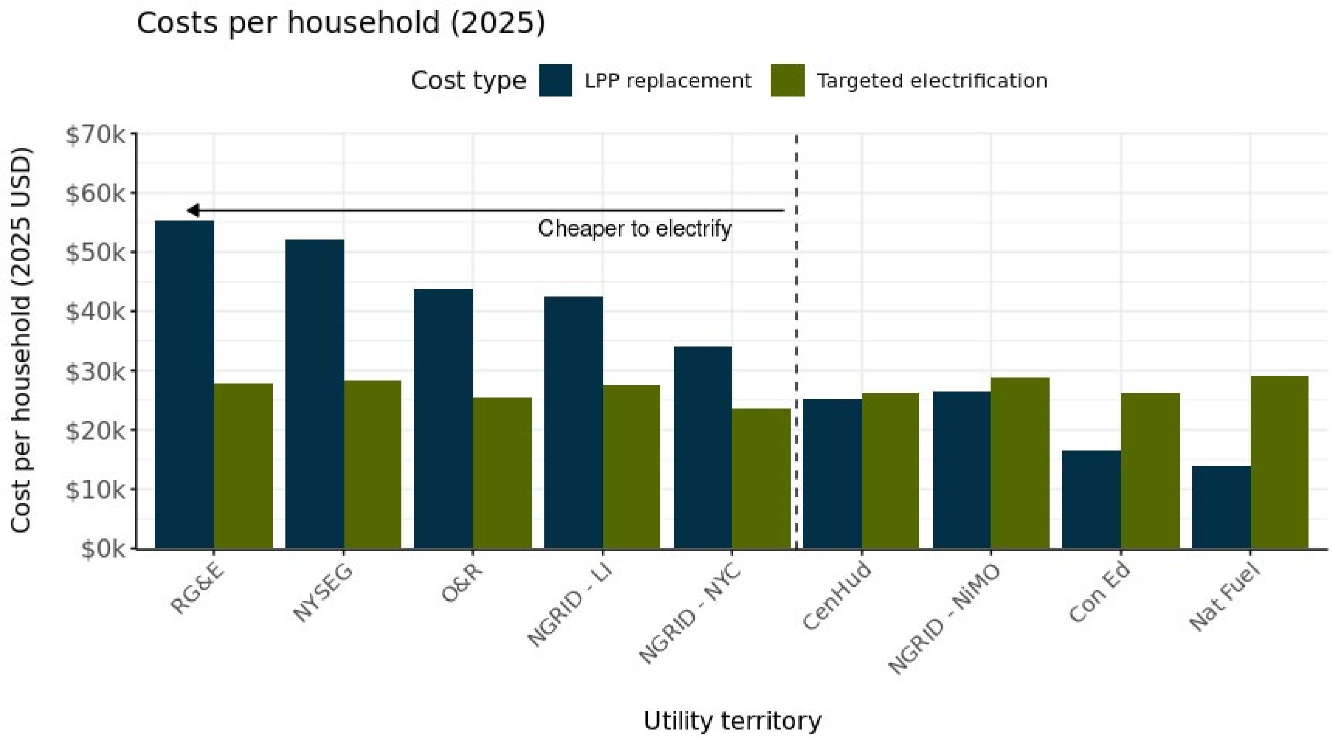
If utilities, as currently planned, continue to devote the bulk of their capital investments to replacing LPP, we project they will spend between $13,932 and $55,284 per household served by LPP in 2025. Alternatively, in 2025, the average cost of decarbonizing a fully gas-dependent household ranges from $23,564 to $29,132.

Over the course of 26 years, the median cost to replace NPA-eligible residential pipelines amounts to $12 billion. By contrast, it would cost $9 billion to instead pursue targeted electrification of these same pipes.

Recall that these figures totals only reflect the *initial* costs for replacing LPP, which comes with much higher down-the-road costs than electrification.

But even using our conservative estimate of LPP replacement costs, targeted electrification turns out to be less expensive in the long-run.

Figure 15: The average cost to electrify a household and cost per affected household to replace leak-prone pipeline in each utility service area in 2025. These costs will increase at different rates over time.

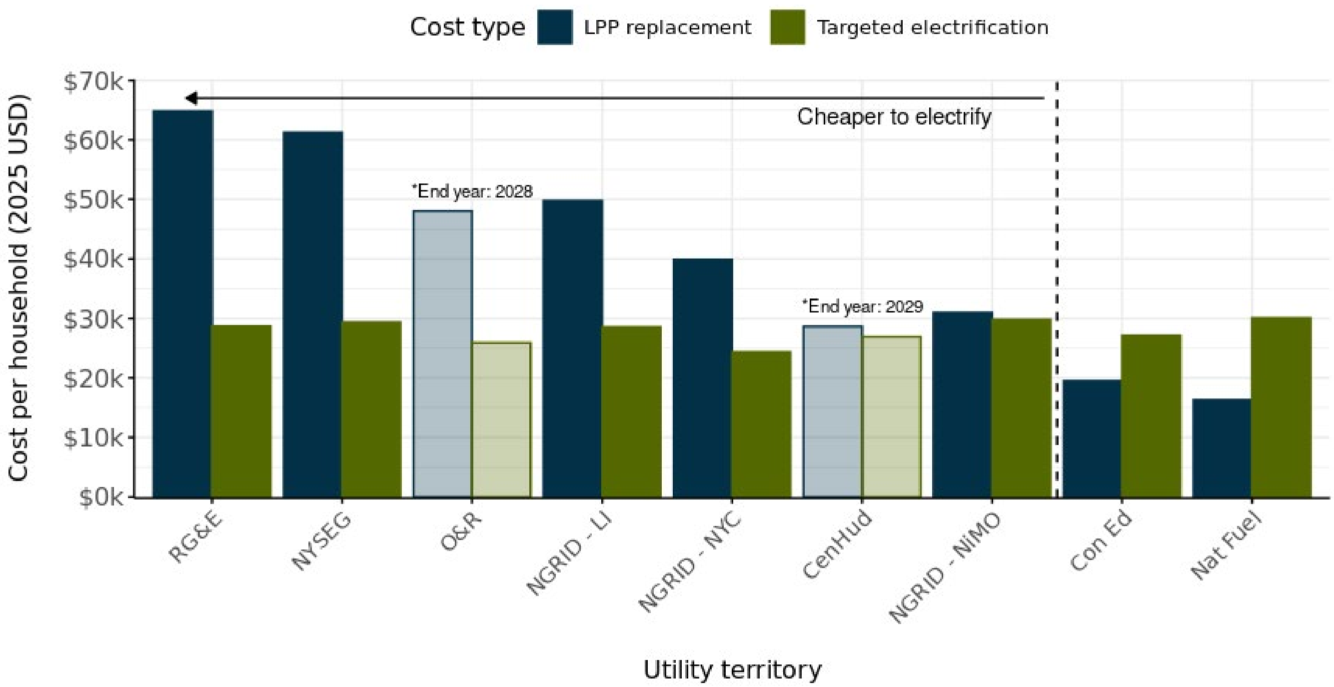


In 2025, replacing eligible LPP would be more expensive than decommissioning that pipeline and installing appliances for all serviced households, for 5 out of the 9 utilities.

Today, RG&E and NYSEG have the highest per-household savings potential from targeted electrification. For Central Hudson and National Grid Upstate, the average costs are nearly even, meaning a significant percentage of LPP in those utilities' territories are already cost-effective to decommission in favor of an NPA.

In fact, we estimate that targeted electrification will become cheaper LPP replacement for Central Hudson and National Grid Upstate by 2027 and 2029, respectively (Figure 16):

Figure 16: The average cost to electrify a household and cost per affected household to replace leak-prone pipeline in each utility service area in 2030 (or latest year of LPP replacement). Values for O&R and CenHud reflect their last projected year of LPP replacement, 2028, and 2029, respectively. All LPP cost refelect the median of our simulated values.



Why is this happening? The cost of electrification and of LPP replacement are both expected to rise over the coming years. But historically, the cost of LPP replacement has grown much faster.[30]

30 For instance, in a recent rate case, National Fuel stated that the cost to replace LPP rose at an average annual rate of 11.2% from 2018 to 2023. Over the same period, the cost of heat pump materials and labor increased 4.9% and 4.4% respectively.

Because of this, we forecast that the cost-savings of choosing targeted electrification over LPP replacement will grow steadily over the next three decades (Figure 17):

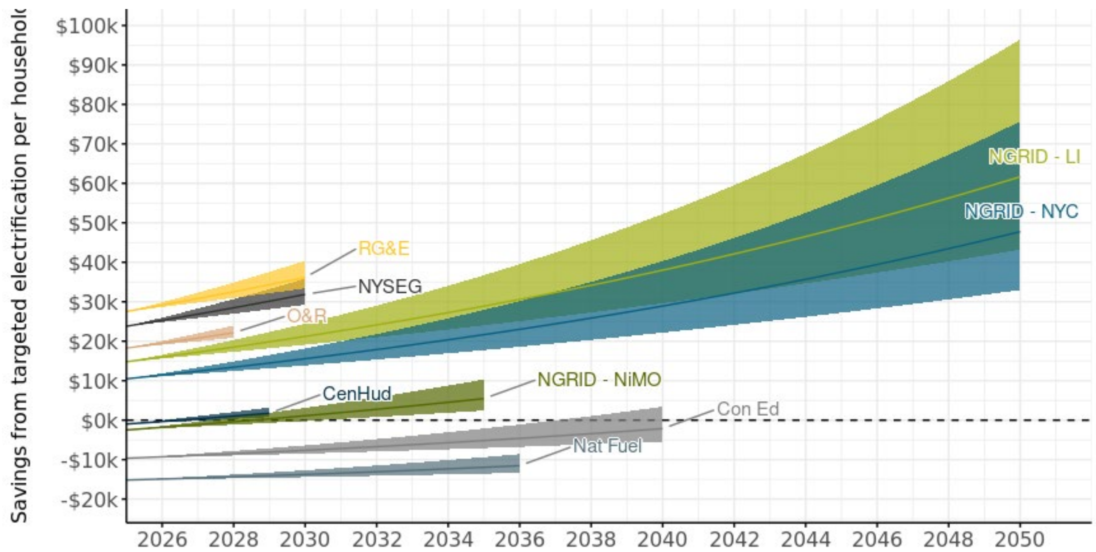


Figure 17: Median difference in cost replacing NPA eligible LPP versus targeted electrification per household (2025 dollars).

Range above the x axis represents potential savings from targeted electrification, the range below represents electrification costs that exceed LPP replacement costs.

The two utilities where electrification is not forecasted to become cheaper *on average* than LPP replacement are Con Edison and National Fuel.

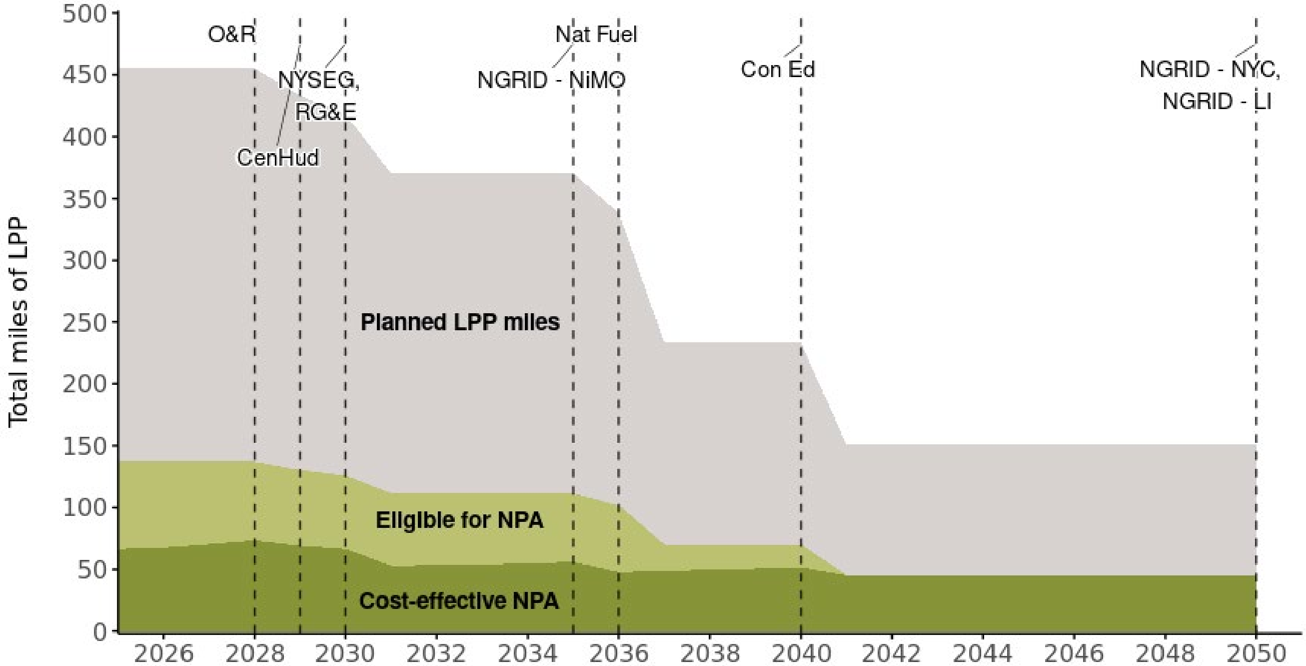
However, even in these utilities, targeted electrification may still be cost-effective in many areas: Con Edison, for instance, has a high population density along its gas mains in Manhattan, raising the average cost to electrify a single mile of pipeline.

But the company also provides gas services in considerably less dense areas of Westchester County, the Bronx, and Queens, which may present more cost-effective targets for electrification.

PER-HOUSEHOLD COST SAVINGS FROM TARGETED ELECTRIFICATION

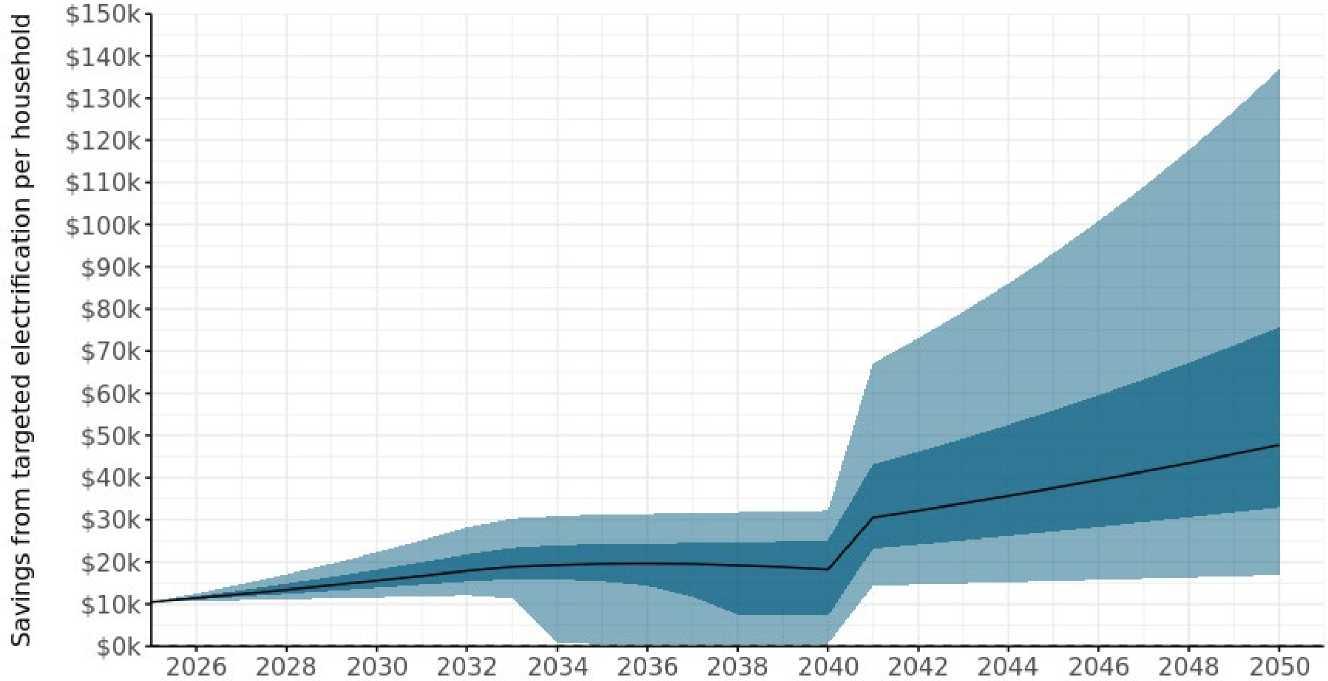
Across the entire state, we find that it would be cost-effective to electrify 42% of households served by decommissionable leak-prone pipe. This percentage would increase to 100% of households by 2050 (Figure 18):

Figure 18: Median total miles of planned LPP (grey), LPP that is NPA eligible (light green) and NPA eligible miles where average cost to elecetrify is cheaper (dark green). Dashed lines denote when utilities project to finish LPP replacement.



This increase reflects both the increasing cost of LPP and the completion of LPP replacement by utilities with lower average per household costs.

Looking solely at households in service areas where electrification is cheaper, per-household savings generally increase over time (Figure 19):



In 2025, those savings are already significant, a median of $10,465 per household. By 2050, those savings have grown to $51,958 per household.

Figure 19: Median per household savings from targeted electrification versus LPP replacement for NPA eligible households where electrification is cheaper.

This chart excludes households that would be more expensive to electrify. Darker shaded area represents the middle 50% of savings, the lighter shaded area represent the middle 95% range of savings.

TOTAL COST SAVINGS FROM TARGETED ELECTRIFICATION

If targeted electrification were implemented for 30% of LPP miles, and only where cost-effective, there would be $9.5 billion in avoided LPP replacement costs over the next 26 years.

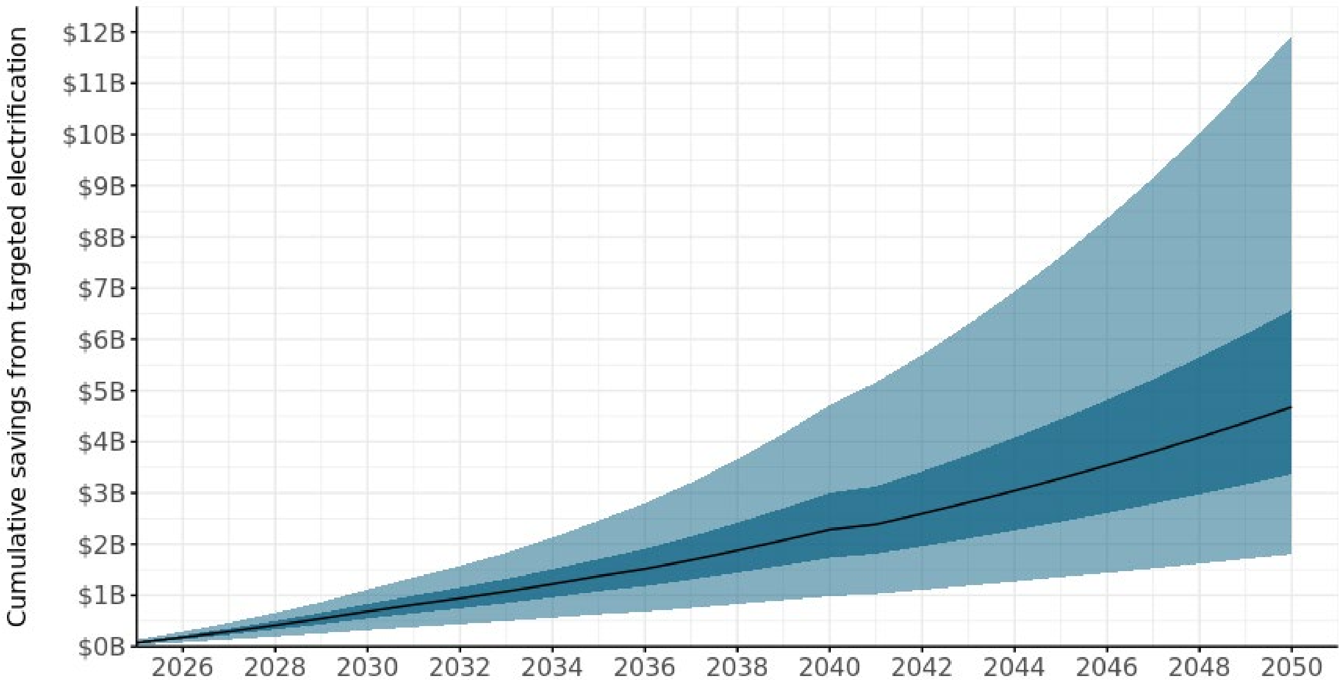


Figure 20: Cumulative savings from targeted electrification versus LPP replacement (2025 dollars).

Sum only includes simulations where electrification is cheaper than LPP replacement. Darker shaded region represents the middle 50% of simulations and the lighter shaded region represents the middle 95% of simulations."

This chart shows the buildup of savings over time that would be achieved by decarbonizing homes through targeted electrification instead of replacing eligible LPP.

Even with our conservative estimates of LPP costs, ratepayers could achieve billions of dollars in savings if utilities pursue targeted electrification.

Already in 2025, the median total savings amount to $75.5 million. By 2050, the cumulative total savings will grow to $4.7 billion. Depending on how labor and material costs rise over the coming years, those savings could be much higher.

If utilities continue to invest in LPP replacement, even in areas where electrification is cheaper, the total spending will amount to billions of dollars sunk into fossil fuel infrastructure that does nothing to further the state's climate goals.

THE POTENTIAL SCALE OF TARGETED ELECTRIFICATION IN NEW YORK STATE

The findings in this report rest on conservative assumptions.

In the preceding sections, we assumed that targeted electrification projects should only move forward when the per-household cost is cheaper than LPP replacement, and that only 30% of LPP segments are feasible to decommission. To understand the potential scale of targeted electrification in New York state, let's relax those assumption.

In targeted electrification is not required to be cost effective, and was implemented for 30% of LPP miles in New York, 16,271 households would be decarbonized in 2030 and a total of 313,331 households from 2025 to 2050, representing **6.4%** of natural gas heated households.

If 90% of planned LPP replacements in New York were avoided via targeted electrification—which would require proactive decommissioning of downstream pipes—the total number of decarbonized households would rise to 936,756, accounting for **19.1%** of natural gas households.

POLICY CONSIDERATIONS

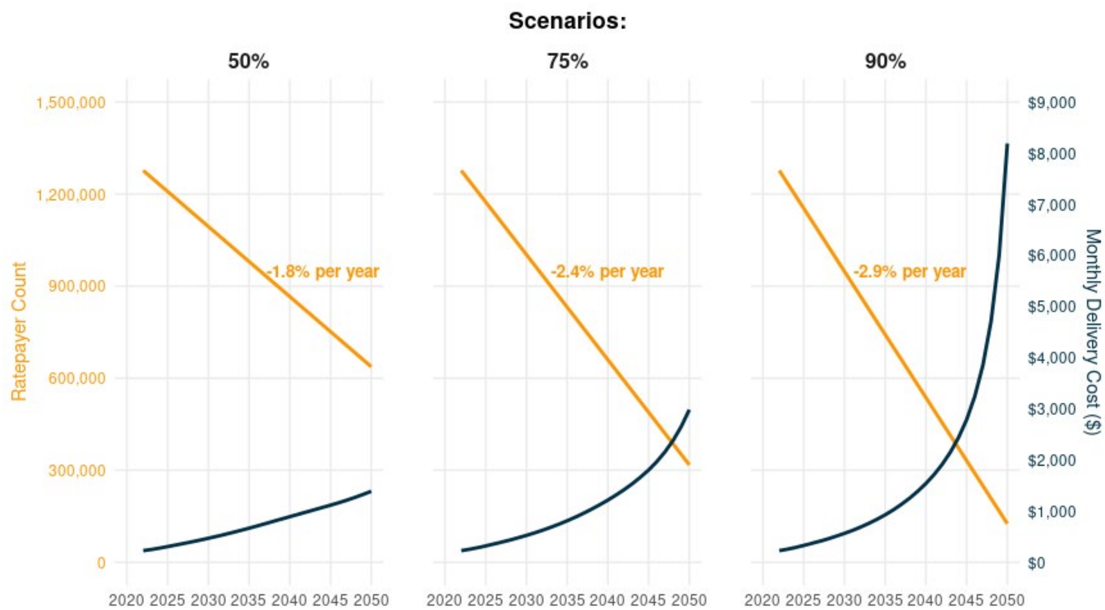
Utilities are spending billions to buttress a system to deliver fossil fuels that New York State law requires to be phased out in the next three decades. To pay for it, they're hiking gas rates on the state's ratepayers.[31] It makes policy sense to not sink more ratepayer resources into preserving the gas system. But that means those serviced by gas pipes will need help electrifying. In many cases, electrification costs less than replacing pipelines. New York's utilities have identified potential NPA projects in which they would use the cost savings from avoided pipeline replacements to pay for customers' electric appliances. However, New York's obligation to serve gas means that if one customer on a particular segment of pipeline refuses to participate and insists of being served gas, that refusal thwarts electrification for all the other customers on that segment of pipeline and results in a more costly gas investment instead.

31 LPP replacement dollars come directly from gas consumers, which raises the price of gas delivery and amounts to investments into a system that doesn't make sense for New York's climate future.

This will cause gas rates to rise, triggering further defections, requiring further rate hikes, and so on in a vicious cycle. Without a **managed transition** off of gas, this negative feedback loop—often called the gas system death spiral—is inevitable. As New Yorkers increasingly turn to heat pumps and other efficient electric appliances, the customer base for gas will shrink, leaving fewer and fewer customers to pay for the same network of pipes.

Managed transition
Decommissioning the gas system at the same rate that customers leave it, minimizing the need for gas rate hikes.

Figure 21: Effect of ratepayer and consumption decline on monthly delivery costs by 2050. Recreated with (Walsh and Bloomberg 2023) figure 3, with permission from Building Decarbonization Coalition and Groundwork Data.



If just 1.8% of customers voluntarily leave the system every year, the delivery part of gas bills will grow 4.3 times over the first 10 years, from $228 to $982 *a month*. At that rate, 50% of customers will have left the system by 2050, and the remainder would see an average of $1,389 per month.

Note that these trends would only apply to gas *delivery rates*—the part of the gas bill that pays for infrastructure—so customer bills would rise regardless of what happens to gas commodity prices.

If the system instead loses 2.9% a year, the outcomes are even more dramatic. The delivery part of the gas bill would grow 8 times over the first 10 years, reaching $1,915 a month. At that rate, 90% of customers will have left the system by 2050, and the remainder would see an average bill of $8,190.

As more and more pipelines age or leak and fall into the category of LPP, this problem will only grow. In order to avoid this, policymakers will need to change New York's obligation to serve gas, and enable managed mass-scale decommissioning.

Planning and scoping NPAs takes time and LPP replacement projects that lock the state into a gas future are already underway. The sooner the state can create a framework that facilitates NPAs like targeted electrification, the more pipeline replacement costs will be avoided.

Appendix

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ASSUMPTIONS

- **Up-front costs:** We only compare up-front costs for both LPP replacement and heat pumps / distribution grid upgrades. We do not account for the cost of financing and upkeep for both LPP replacement and heat pumps and do not make assumptions about who pays for the up-front costs.
- **Incentives:** We do not account for any existing incentives for electrification, including rebates, tax credits, or other incentives. Federal and state subsidy programs exist today that could reduce the cost of electrification, but the application of these incentives would depend on who pays for the electrification.
- **Electrical upgrades:** Due to the higher electrical loads resulting from heat pumps, some older buildings, particularly multi-family ones, may require new service lines, panels, or wiring. While some level of electrical upgrades will undoubtedly be necessary, we did not attempt to do so for these pre-electrification upgrades. This is due to two reasons:
    - **Missing electrical capacity data**: No systematic data exists on the electrical capacity of New York State buildings.[^ugc1]

- **Uncertain electrical capacity requirements**: Heat pump technology is moving so quickly that it is impossible to predict what electrical capacity will be needed to electrify New York's building stock. Today, the typical 1,000 square foot NYC apartment only needs a small heat pump system, which requires about 30 amps of current at full load. While an apartment with only 40 amp service would still need an upgrade to meet the electrical code[^ugc2], smart panels may obviate the need for this, and many buildings offer 60 amp service or above. And while induction stoves and window-unit cold-climate heat pumps used to require 240V lines, newer models[^-models] do not.

- **Hydraulically feasible LPP:** We assume the New York and California gas systems have a similar percent of LPP that is hydraulically feasible for non-pipeline alternatives.
- **LPP replacement:** The total number of miles of LPP pending replacement does not increase beyond what has already been identified.
- **Number of affected households:** Households are uniformly distributed across the service territory of each utility.

MODELING OVERVIEW

We compare two strategies for addressing New York's aging gas infrastructure: the status quo of replacing leak-prone pipelines, and one form of Non-Pipeline Alternatives (NPA), converting homes to all-electric systems through targeted electrification. For each utility company in New York, we estimate the cost of pipe replacement over time and the average amount spent per household serviced by those pipelines. Section 5.5 We then compare these against the average cost of converting those same households to heatpumps and electric appliances. Section 5.8

Our estimates account for regional cost differences, rising costs over time for both approaches, necessary electrical grid upgrades in areas with high electrification rates, and how population density affects cost-effectiveness. Section 5.6.2 To handle the uncertainty of future costs, we run the analysis under a range of assumptions about the annual increase in pipeline replacement costs. Because not all LPP is hydraulically feasible to decommission, we also model a range percentages of leak-prone pipes that could be eligible for NPA. Section 5.4.5

Saving are presented as the difference between the cost of LPP replacement and the cost of targeted electrification averaged per household. Section 5.4.4

CONCEPTS

Non-pipeline alternatives

There are many forms of non-pipeline alternatives to natural gas, and only some of them require decommissioning of pipeline. In our analysis, we focus on electrification as one option for New York.

Up-front costs: Targeted electrification

The up-front costs of targeted electrification are the cost to electrify the appliances and systems in homes that are currently using gas. We include the cost of electrifying heating systems, water heaters, stoves, and dryers as well as the cost labor and installation. Upgrade costs for homes whose annual heating costs would be higher with a heat pump than with gas include the cost of weatherization. Although there are a small percentage homes that may still be more expensive to heat, weatherization increases the efficiency of the heat pump and can sometimes lower the overall cost of electrification by allowing for a smaller unit.

We also include estimates of increased electric distribution grid costs which scale relative to home size in the targeted electrification scenario to provide a more balanced look at the infrastructure impacts. Though as with pipeline replacements we do not estimate the cost of financing or upkeep and only focus on up-front costs to keep the comparisons consistent throughout our analysis. Section 5.8

Up-front costs: LPP replacement

The up-front costs of LPP replacement are the cost to replace the pipeline. We use the cost per mile figures reported by utilities in rate case filings and do not estimate the cost of financing or upkeep and only focus on up-front costs to keep the comparisons consistent throughout our analysis. We also exclude the negative salvage value of the pipeline. Negative salvage reflects the fact that the cost to remove pipeline is greater than the value of the salvaged pipeline. Section 5.5

Cost savings

In order to compare the cost of replacing miles of pipeline to electrifying homes, we transform the LPP replacement cost per mile to a cost per household. We do this by first re-calculating the cost per mile to reflect only percent of LPP that services residential and small commercial customers, excluding industrial services. We then divide the cost per mile by the average number of households per mile. This is a simplification because it assumes households are evenly distributed along pipeline miles. The comparison is based on average densities, and average electrification costs. In reality, portions of operator service territories will have higher or lower densities, and electrification costs will vary by location. Section 5.6.2

Simulations (Monte Carlo approach)

We used a Monte Carlo simulation to model outcomes under a range of values for two key uncertain parameters in this analysis: the annual cost increase in LPP replacement and the percentage of LPP eligible for NPA. Rather than making a single guess about these uncertain values, this approach lets us explore thousands of possible scenarios. Instead of relying on a single prediction, we get a better sense of what might happen by looking at many possible outcomes. The two parameters varied independently from one another. By running 5,000 different scenarios, we can be more confident in our findings since they account for many possible futures rather than just one. Unless specified otherwise, we present the median values of these results. Section 5.6.1

Pipeline age and condition data

Pipeline age and condition data comes from the PHMSA's inventory of pipeline by decade and inventory of pipeline by material. We compared the PHMSA inventory of cast iron, wrought iron, unprotected steel, and bare steel with utilities' own reports of planned LPP replacement miles and the numbers were generally consistent.

LPP replacement rate and period

We collected planned annual miles of LPP replacement from rate case filings for each utility company. In cases where a company reported the year they expect to have completed LPP replacement, we used that as the end year of our analysis. For companies that did not report a year, we divided the estimated total miles of LPP by the annual replacement rate to estimate the end year.

Rate case data sources

Utility	Data Source
Central Hudson Gas & Electric Corp	Central Hudson Gas & Electric Corporation (2024)
Consolidated Edison Co of New York	Consolidated Edison (2022)
Keyspan Energy Delivery - NY City	KEDNY-KEDLI (2021)
Keyspan Energy Delivery - Long Island	KEDNY-KEDLI (2021)
Niagara Mohawk Power Corp	KEDNY-KEDLI (2021)
National Fuel Gas Distribution Corp - New York	National Fuel Gas (2024)
New York State Electric & Gas Corp	NYSEG (2022)
Rochester Gas & Electric Corp	RG&E (2022)
Orange & Rockland Utility Inc	O&R (2024)

We collected data from rate case filings to estimate the per mile cost to replace LPP. We were able to find data for 6 of the 9 utility operators we modeled. Some companies reported historical cost per mile data, some reported expected future costs, and others reported the percent of their total capital expenses used on LPP replacement. When the cost per mile was unavailable, we used a weighted mean of known costs, weighted by total number of pipeline miles. 5 operators with known LPP were excluded from this analysis due to lack of data, the 9 we modeled account for 98.8% of total pipeline miles in the PHMSA dataset.

We used the 15 year inflation rate (*i*) and a simulated range of annual cost increases (*r*) to apply an annual real growth rate to the cost per mile.

The real growth rate (*g*) is calculated using the Fisher equation:

$$g = \frac{1+r}{1+i} - 1$$

where:

- r is the nominal annual cost increase
- i is the 15 year inflation rate

To estimate the cost per affected customer, we divided the cost per mile by the average number of households per mile.

Data collected from rate case filings can be found here with links to original sources.

Simulated parameters

Some parameters in this analysis were uncertain. We saw a range of values reported for the expected annual cost increase in LPP replacement. We were also unable to find data on the percent of LPP that would be hydraulically feasible for non-pipeline alternatives. In order to address this uncertainty, we simulated a range of values for each parameter and report here on the central tendency of the results.

Annual cost increase

We simulated an annual cost increase between 3% and 10%. We used a triangle distribution for the annual cost increase with: - Minimum = 3% - Maximum = 10% - Mode = 5%

The triangle distribution is defined by the probability density function:

$$f(x) = \begin{cases} \frac{2(x-a)}{(b-a)(c-a)} & \text{for } a \leq x \leq c \\ \frac{2(b-x)}{(b-a)(b-c)} & \text{for } c < x \leq b \end{cases}$$

where:

- a is the minimum value (3%)
- b is the maximum value (10%)
- c is the mode (5%)

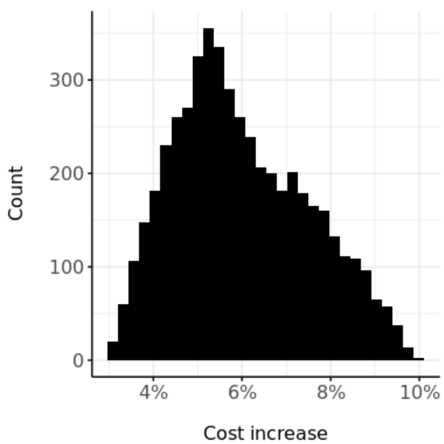
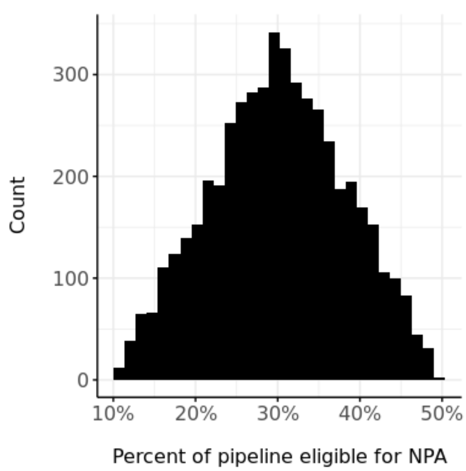


Figure 22: Distribution of cost increase parameter

Percent of LPP eligible for NPA

We simulated a percent of LPP eligible for NPA between 10% and 50% used a triangle distribution with a mode of 30%.

Figure 23: Distribution of percent of LPP eligible for NPA parameter



Number of simulations

We simulated 5,000 scenarios for each utility.

Number of households per service territory

We used the 2022 release of the ResStock EULP dataset to estimate the number of households in each service territory. We filtered the data to include only homes with natural gas as the primary heat source to estimate the number of natural gas households in each Public Use Microdata Area (PUMA). We calculate where PUMAs and utility territories overlap and estimate the percentage of the PUMA's area that is covered by each utility. We then calculate each utility's share of the gas-served area and, for each PUMA, distribute the total households to utilities based on each utility's share of the gas-served area.

For example: If a PUMA has 1000 households with natural gas, and Utility A covers 60% of the gas-served area in that PUMA, then Utility A would be assigned 600 households from that PUMA

This method assumes that households with natural gas are evenly distributed across the gas-served areas within each PUMA. While this is a simplification, it's a reasonable approach given the available data.

DATA: COST TO ELECTRIFY HOMES

To estimate the cost to electrify homes, relied on ResStock, an NREL optimization model that simulates energy consumption for a representative, synthetic sample of US households. Households are simulated at a rate of 1 in 242 compared to the actual population. The dataset resulting from these ResStock simulations is called End-Use Load Profiles (EULP) for the U.S. Building Stock. We used the 2022 release of EULP, version 1.1 run on weather year 2018. We filtered the data to include only homes with natural gas as the primary heat source. The EULP data tells us exactly which upgrades each household got under each scenario: the heat pump's BTU capacity, heat pump water heater's gallon capacity, whether they got a heat pump dryer, whether the roof was insulated with spray foam or cellulose, whether the basement was insulated, and so on.

But it doesn't tell us how much those upgrades actually cost to install. To calculate the up-font cost of each unit's upgrades, we gathered real-world prices for both equipment and labor from a multitude of sources (described below).

METHODS: COST TO ELECTRIFY HOMES

Once we had a mean cost to electrify per household in each county, we assigned a mean cost to electrify a household in each service area by taking a weighted average of the county costs, weighted by percent of the territory that each county makes up.[32]

Heating Systems: Heat Pumps

The cost of heat pumps varies based on capacity and model type. Using heat pump retrofit data from MA's MassSave Whole Home Electrification Pilot[33], we modeled total installation costs as a function of BTU capacity using linear regression, for both ducted and ductless systems.[34]

Heating Systems: Furnaces, Boilers, Electric Resistance

Calculating the heat pump premium required estimating the costs of re-installing existing heating systems, be they furnaces, boilers, or electric resistance heat.

- **Labor costs**: we assumed a flat $1000 for all heating systems installations, based on conversations with HVAC contractors.
- **Equipment costs**: the housing units in the baseline had a very wide range of heating systems, so our equipment cost estimates needed to take this into account. Using web searches, we collected prices for a few dozen models of furnaces and boilers (both oil and gas), as well as electric furnaces and baseboards. We modeled equipment costs as a function of system efficiency and capacity using linear regression. For a given household, we used this model to predict the equipment cost of replacing the existing heating system, based on its efficiency and capacity.

32 We calculated a 10 year historical compound rate of inflation for heatpump materials (2.9%) and labor costs (3.3%) and applied that to scale nominal costs for future years. We then applied the 15 year inflation rate to adjust the costs to real 2025 dollars.

33 Massachusetts Clean Energy Center ran a Whole-Home Heat Pump Pilot from May 2019 through June 2021, and produced a detailed dataset of 158 projects.

34 Specifically, we inflated equipment and labor costs using Q4 2024 inflation indices from FRED, the St. Louis Federal Reserve's economic portal, modeled and predicted each quantity separately, and combined the predictions to arrive at the estimated heat pump install cost for a given household with a natural gas heating system.

Water Heaters: Heat Pumps, Gas, Oil, Electric Resistance

The replacement heat pump water heaters varied by gallons and BTUs. To estimate the total up-front costs for water heaters, we used the same procedure as for (non-heat-pump) heating systems: a flat $1000 for labor costs, and regression models of market prices to predict equipment costs based on gallons and BTUs.

Stoves and Dryers

We used data collected by Rewiring America to estimate the cost of replacing gas stoves/ranges and dryers with electric alternatives. (America 2024) These costs are fixed and constant across the whole state, increasing annually at a nominal rate of 2.9% and adjusted to real 2025 dollars using the 15 year inflation rate. We only include the cost to replace stoves/ranges and dryers for households which are not already using electric models.

Weatherization

Our model includes weatherization as part of the electrification package for homes that would otherwise be more costly to heat with heat pumps relative to gas. We gathered parts and labor costs for each measure in scenario 3's weatherization package through interviews with numerous weatherization contractors:

measure	unit	cost per unit	measure applies when...
air sealing	unit footprint area (ft^2)	$3.00	ACH50 > 15
attic insulation (blow-in)	attic floor area (ft^2)	$2.50	attic is unfinished
attic insulation (spray foam)	attic floor area (ft^2)	$11.87	attic is finished, roof insulation is R-13 or less
wall insulation (drill-and-fill)	exterior wall area (ft^2)	$5.00	uninsulated wood stud walls
rim joist insulation (spray foam)	rim joist area (ft^2)	$4.75	foundation is heated basement or crawlspace
basement wall insulation (spray foam)	basement wall area (ft^2)	$4.75	foundation is unheated basement
crawlspace floor sealing (6mil plastic)	crawlspace floor area (ft^2)	$1.50	foundation is vented crawlspace

measure	unit	cost per unit	measure applies when...
duct sealing	duct length (linear ft)	$7.00	leaky ducts in unconditioned space
duct insulation	duct length (linear ft)	$12.00	uninsulated ducts in unconditioned space

Increases in fixed costs for electrical distribution

When a single home installs a heat pump, the net impact to the local distribution feeder which provides electricity to the home is minimal. New York State grids are "summer peak" grids, typically designed to handle maximum power draw in the hottest months when homes run air conditioning. Because heat pumps are generally equally or more efficient than central air conditioning systems, they don't add to the summer peak, and so there is often no need to upgrade the local distribution feeder.

Prior work (Protopapadaki and Saelens 2017) on properties of the electrical distribution system show that heat pump penetration rates as low as 20-30% can shift the peak sufficiently to cause mechanical or electrical failures in local feeders. We therefore account for upgrades to feeders which will almost certainly be required for neighborhood-wide NPA projects.

Though data on the long-run marginal cost (LMRC) of feeders in the New York area are hard to come by publicly, there is some available data (Hanser 2018), which gives a cost range from $60 to $243 per kW of draw (2018 dollars). To keep our analysis conservative, we use an inflation-adjusted $310/kW estimate for the increased cost to the distribution system.

Based on (Hanser 2018) we estimate the added kW load from cold-climate air source heat pumps to be 2.11 kW per 1,000 sq. ft for ductless heat pumps and 3.04 kW per 1,000 sq ft for ducted systems. Though this is a small study, and there are certainly outliers, it provides a rough estimate of the impact of adding heat pumps to the distribution grid. We use ResStock building configuration data to determine the total square footage of the residential unit, and whether the upgrades provided were ductless versus ducted heat pumps.

As an example, under these assumptions a typical 1,800 sq. ft home with a ducted system would incur $1,697 in added cost to the distribution grid. We include our estimates of increased distribution grid costs in the targeted electrification scenario to provide a more balanced look at the infrastructure impacts, though as with pipeline replacements we do not estimate the cost of financing or upkeep and only focus on up-front costs to keep the comparisons consistent throughout our analysis.

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