The Role of Non-Pipeline Alternatives in the Future if Gas

LDC NPA Working Group
December 4, 2024

Groundwork Data is a public-interest advisory, research, and technology firm supporting a clean, equitable, and reliable energy transition.

State & Local Integrated Decarbonization Planning

Gas Pipeline Economics & Policy

Urban Infrastructure

→

Future of Heat

Gas Transition Planning

Smart Use of Sustainable Fuels

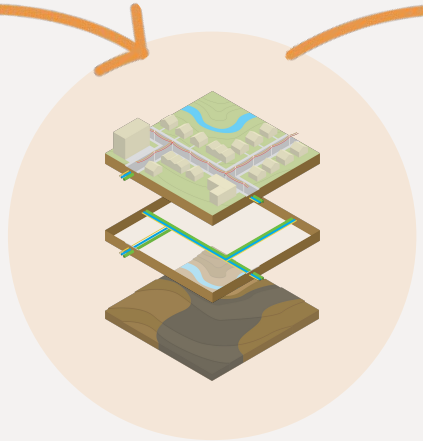
https://www.groundworkdata.org/research

https://thefutureofheat.com/

FoHI

Supporting NPA Analysis and Targeted Electrification

Elicitation of public-sector information needs



Technical assistance on NPA Working Group and EMT FAWG

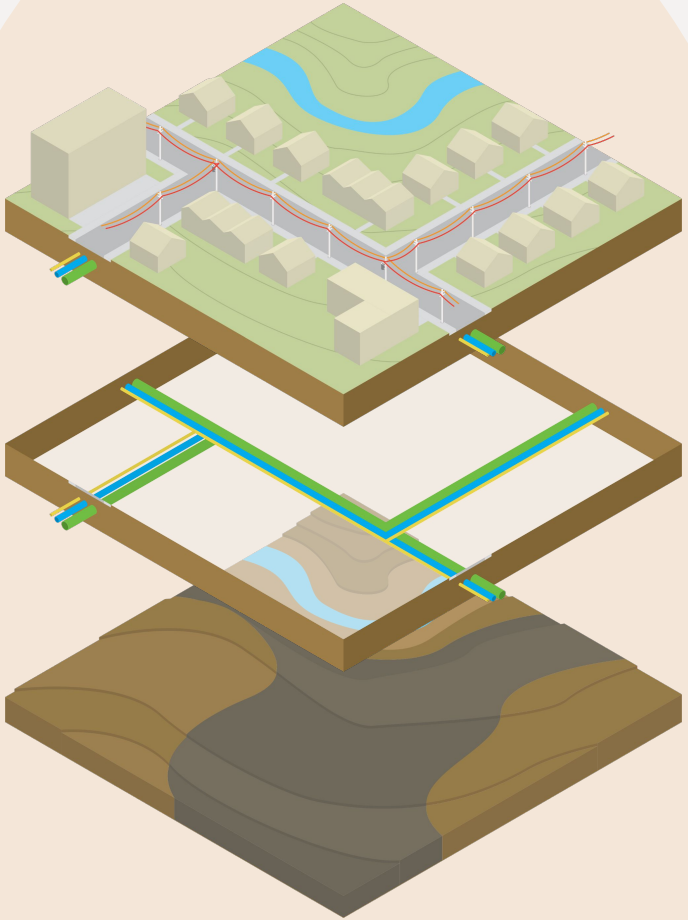
Development of tools for analysis of targeted electrification

Improve engagement capability for the Commonwealth

MassCEC seeks to **accelerate equitable building decarbonization** through targeted **neighborhood-scale action**. It is sponsoring Groundwork Data to conduct research that supports support State agencies and other key stakeholders in this effort.

Agenda

1. Growing Costs of Gas
2. Understanding NPAs

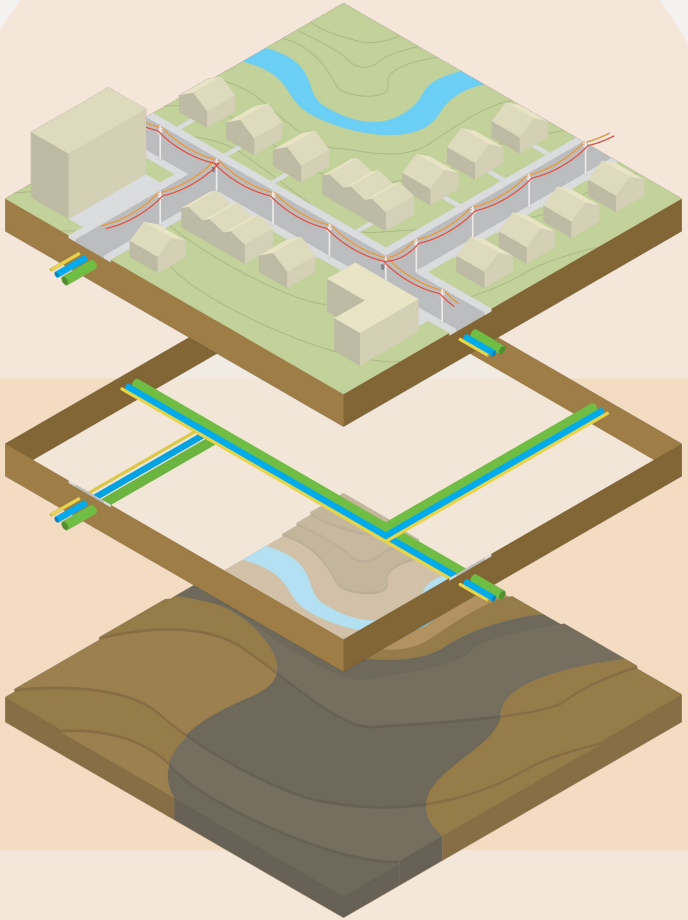


Agenda

1 Growing Costs of Gas

Key Take-A-Way:

Rising infrastructure costs, *climate action* at all scales, and *increasing competition* leads to growing customer costs



Replacement @ High Haith Rd, Arlington

2” Cast Iron

635 feet

$483k project cost

$68,940 per home

Potential NPA, entire scope

D.P.U. #24-GSEP-03 Exhibit NH-GPP-4

Some GSEP Projects have NPA Potential

National Grid (Boston and Colonial)			
NPA Potential	Cost ($M)	Miles	#Projects
No - Critical Main	$42.82	8.8	20
No - Impact to System Integration	$149.78	33.9	88
Yes - Potential NPA, partial scope	$71.65	21.7	45
Yes - Potential NPA, entire scope	$23.08	7.5	32

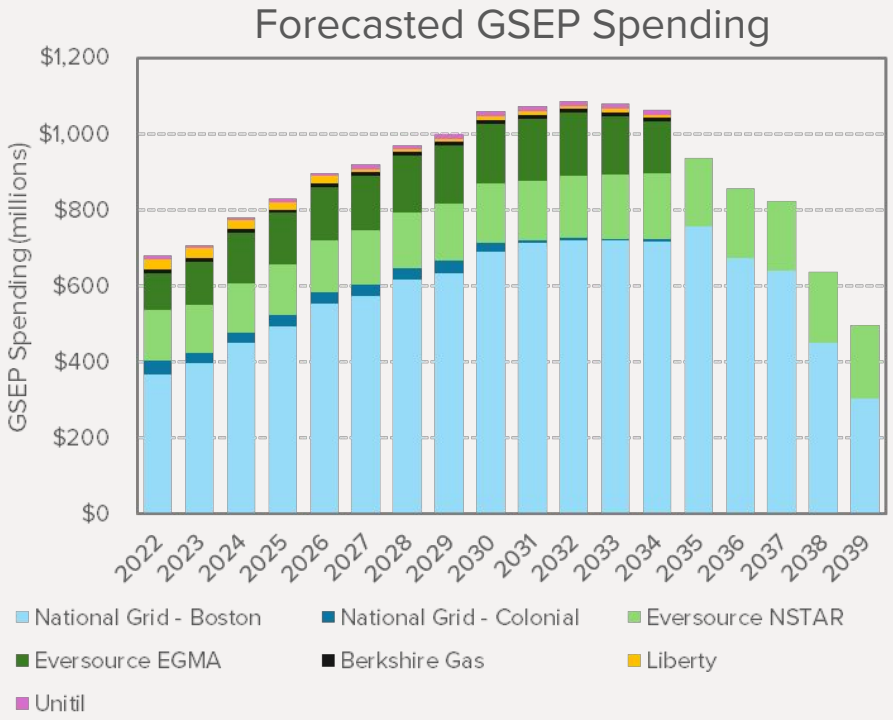
Berkshire Gas			
NPA	($M)	Miles	#
No	$22.50	12.2	54
Yes	$0.19	0.1	1

Eversource (EGMA & NSTAR)			
NPA	($M)	Miles	#
No	$227.49	112.53	285
Yes	$1.00	0.53	2

Unitil Gas		
Essential	Miles	Meters
Yes	2.90	304
No	2.54	314

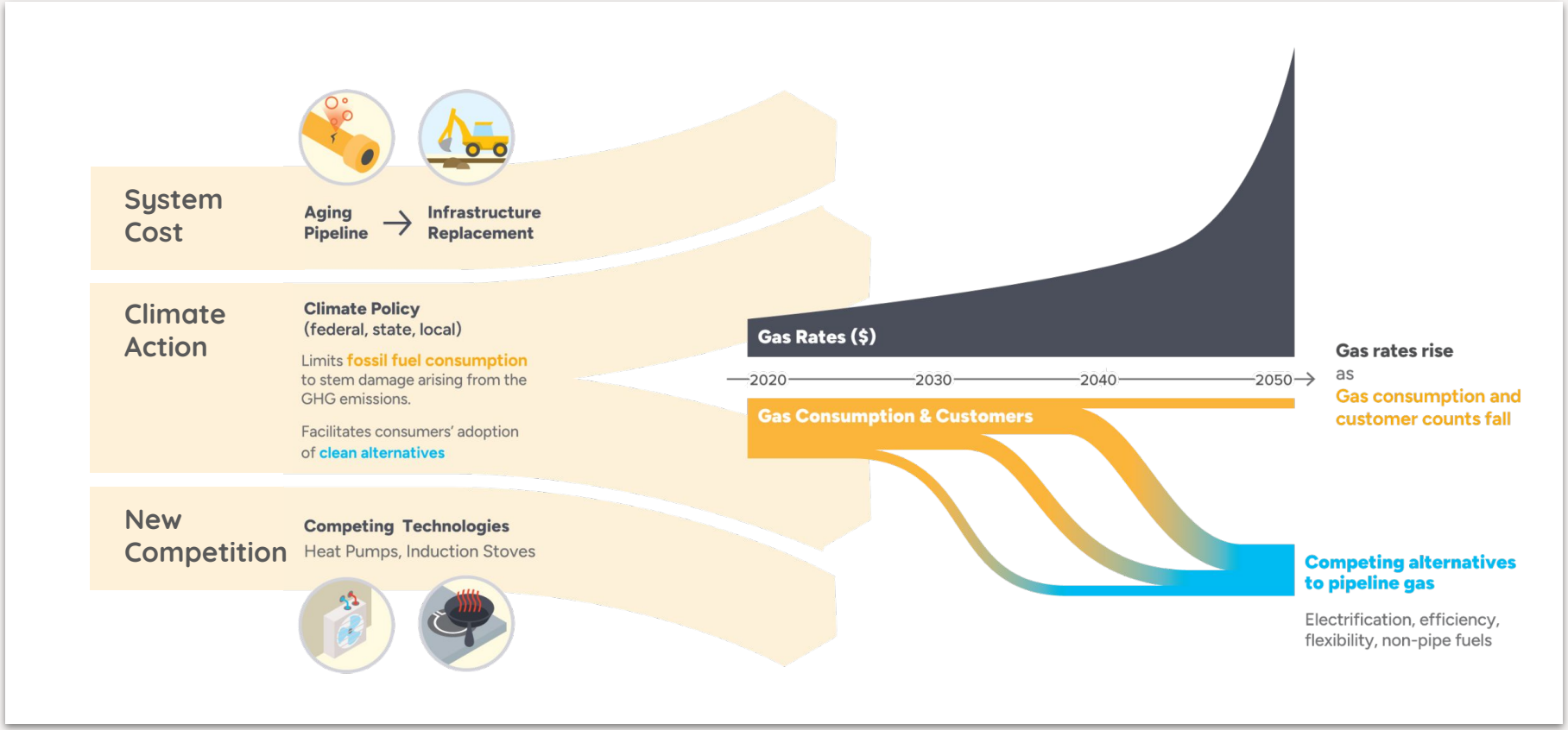
Gas Main Replacement Costs are Growing

- **$15.9 billion** in total capital spending 2022-2040 *before rate of return, opex and other costs are factored in.*
- Doubles combined LDC revenue requirement
- National Grid (Boston Gas) proactive main replacement cost now exceeds **$4M per mile**



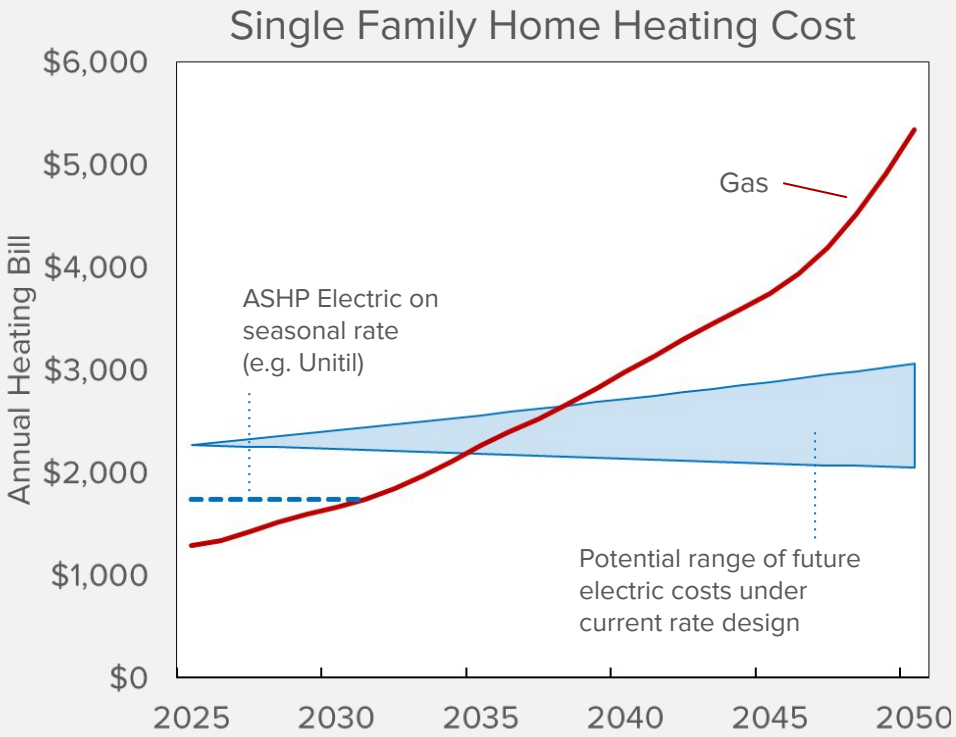
20-80 Pathways Analysis input data provided by LDCs

The Three Disruptors of Pipeline Gas



Disruption Challenges Affordability

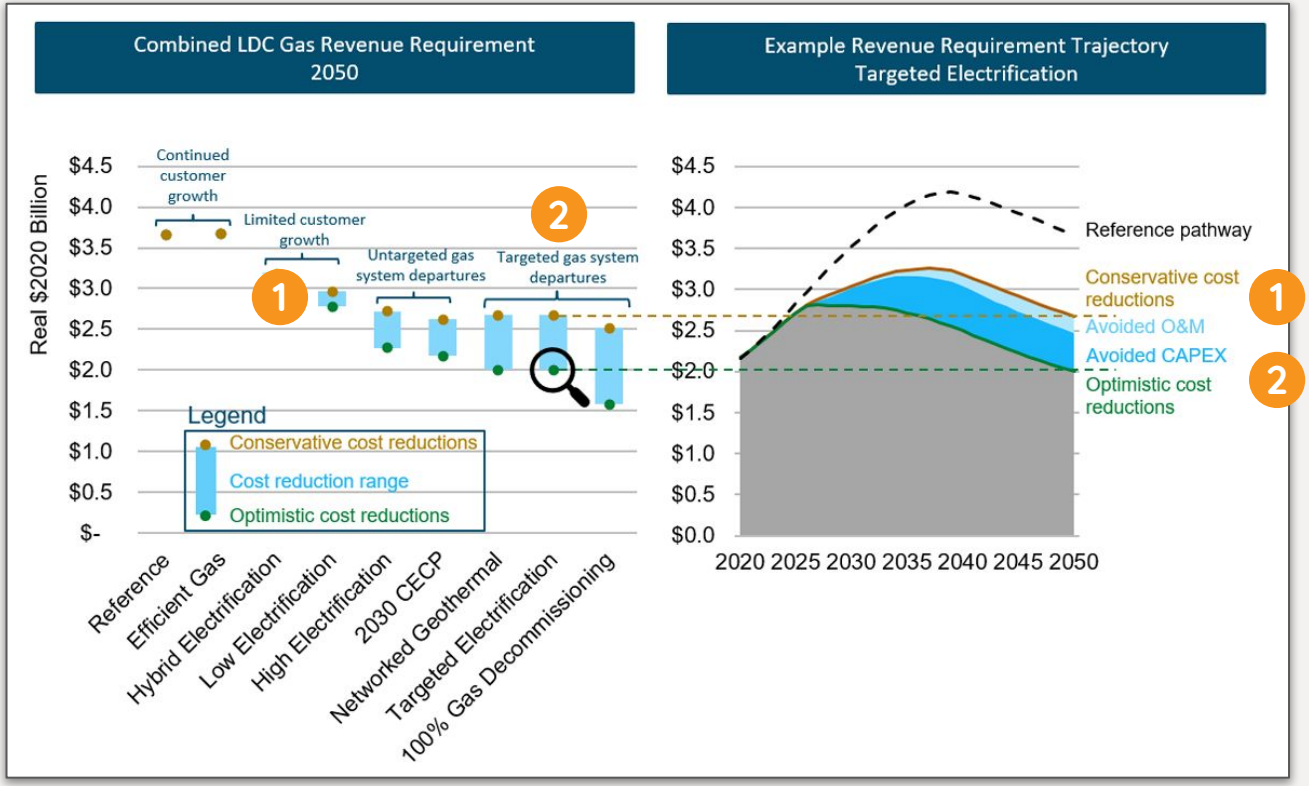
- **Gas will never be as affordable as it is today.**
- **Those with the least agency to leave the gas system** will bear the growing costs of the system.
- **Preserving affordable heat** requires more active infrastructure planning and management from the building to energy networks



Illustrative data based on 20-80 Pathways Analysis & MA Decarb Roadmap. No building efficiency assumed

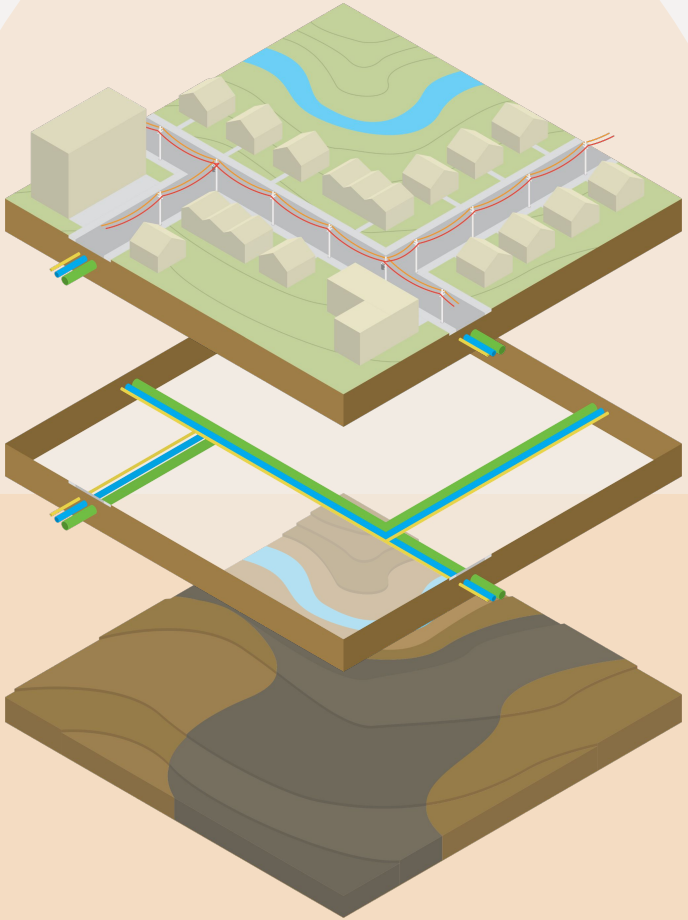
Where Can We Find Potential Cost Savings?

1. **Avoid Growth**
2. **Avoid Reinvestment**



Agenda

2 Understanding NPAs

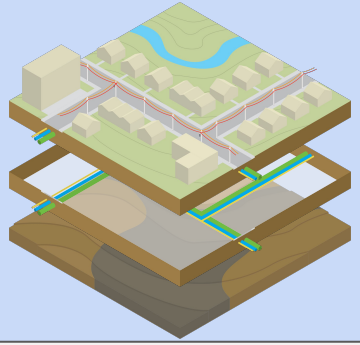


Key Take-A-Way:

A flexible approach to NPAs can *accelerate climate goals* while *delivering customer benefits* and *reduced costs*

Opportunity of NPAs

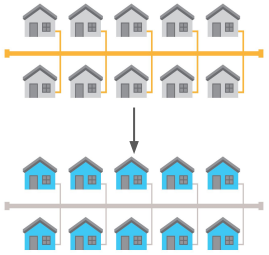
Start: Identify & characterize pending investment (out ~20 years), monitor system for issues.



Timing Matters:

Waiting until a segment enters a capital project reduces its potential to be an NPA

NPA 1: Retire



NPA 2: Reline

NPA 3: Repair

Replace

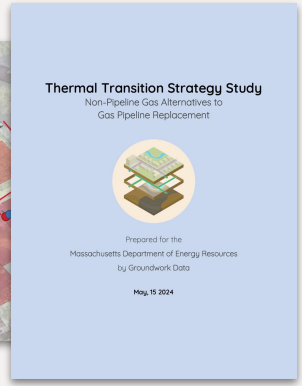
Primary Goal: Avoid Spending

Thermal Transition Strategy Study

Legislature-commissioned study for DOER to examine targeted electrification (May 2024)

Explored cost, energy, emissions impacts for the following scenarios:

- Main & Service Replacement:
  - *Continued pipeline gas*
  - *Hybrid pipeline gas*
  - *Unmanaged Electrification*
- Main & Service Retirement
  - *Hybrid tank fuel*
  - *Accelerated electrification*



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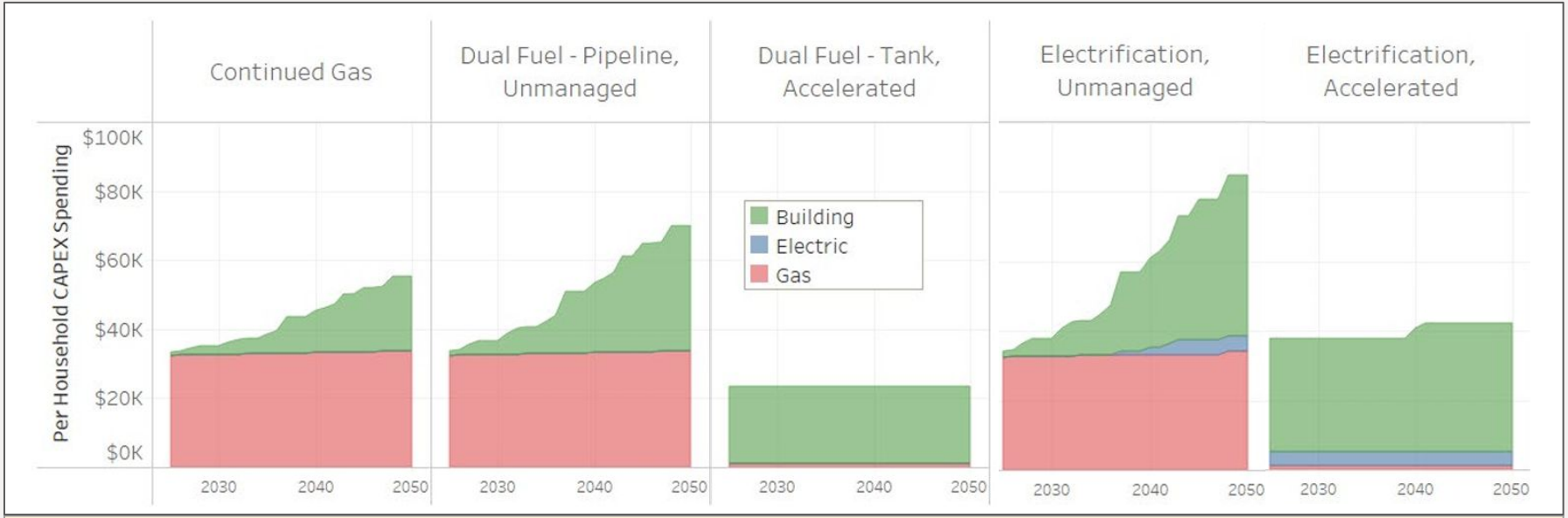
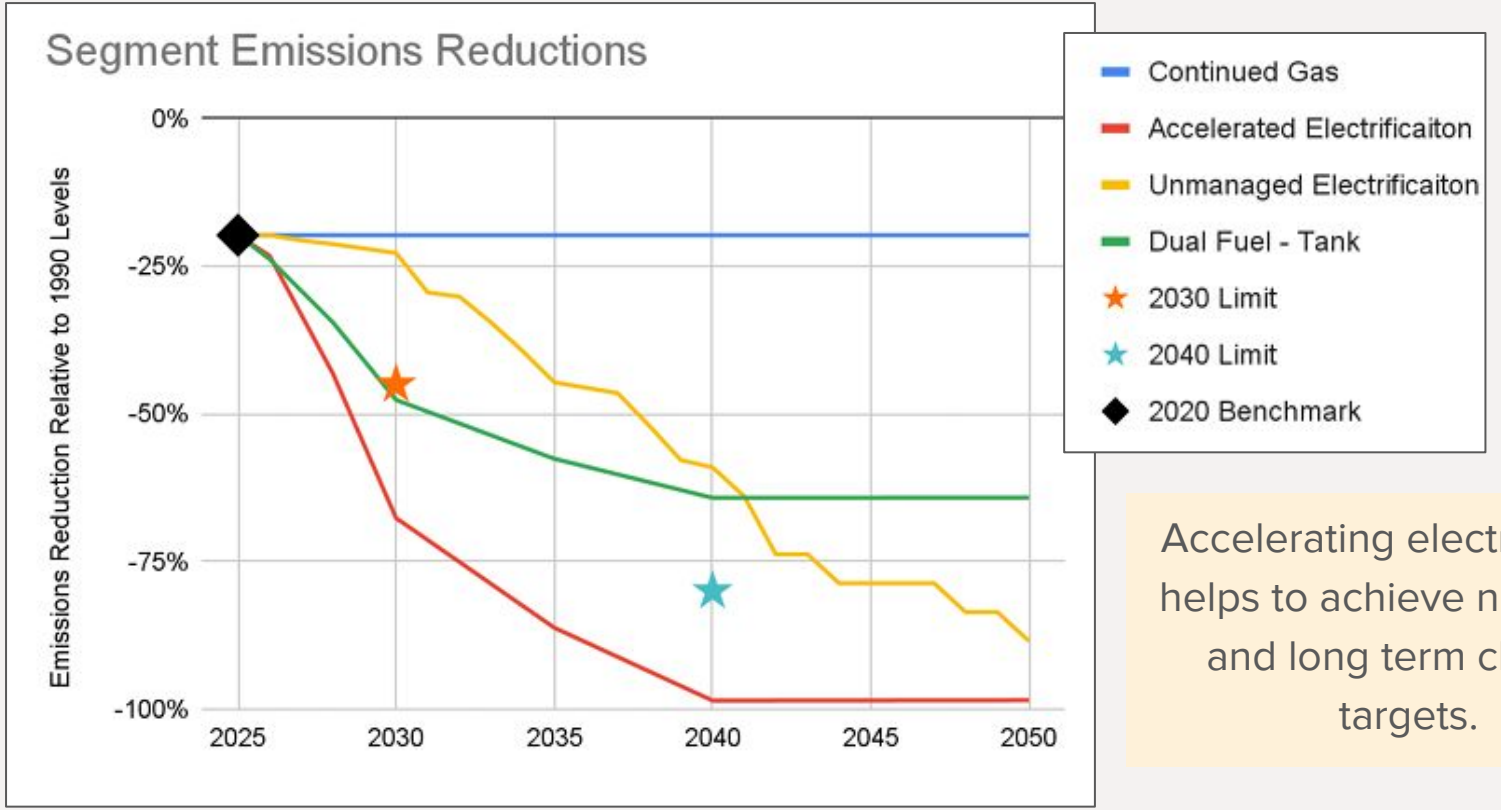


Gas Main	*Replaced*	*Replaced*	*Retired*	*Replaced*	*Retired*
Building HVAC	*Like-for-like @ end-of-life*	*Hybrid - gas @ end-of-life*	*Hybrid - LPG @ gas retirement*	*ASHP @ end-of-life*	*ASHP @ main retirement*
Climate Goals	*No*	*No*	*Near-term only*	*Long-term only*	*Yes*

Accelerating Emissions Reductions



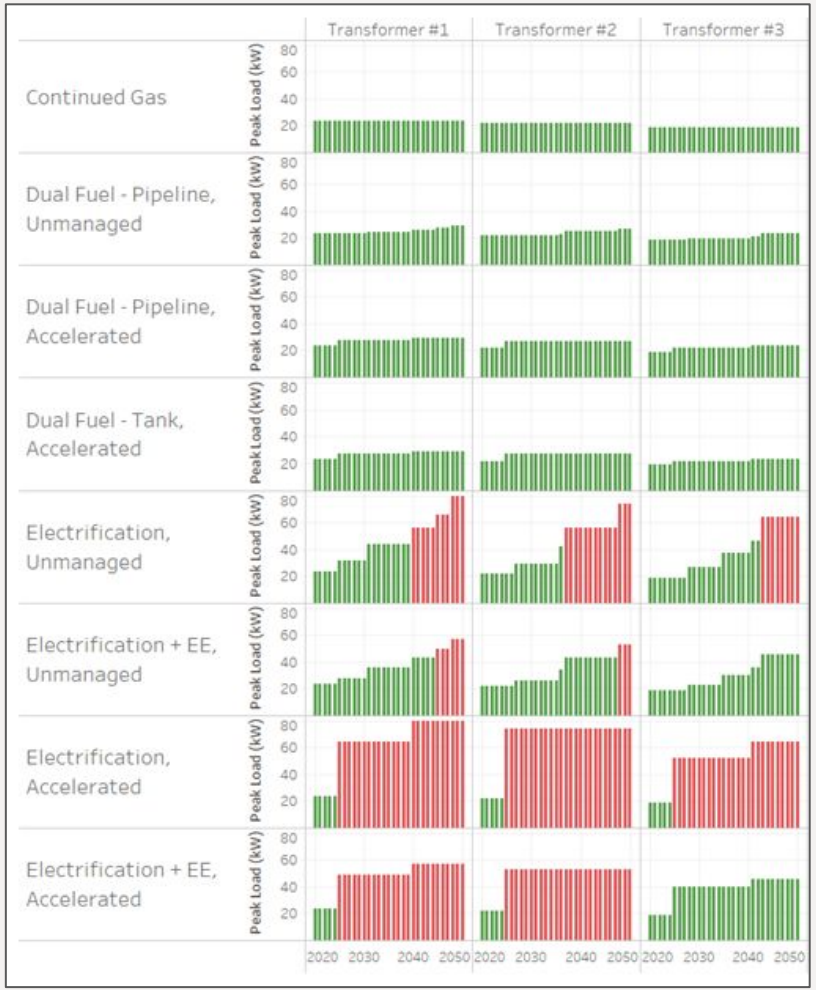
Accelerating electrification helps to achieve near-term and long term climate targets.

Managing Growing Electrical Loads

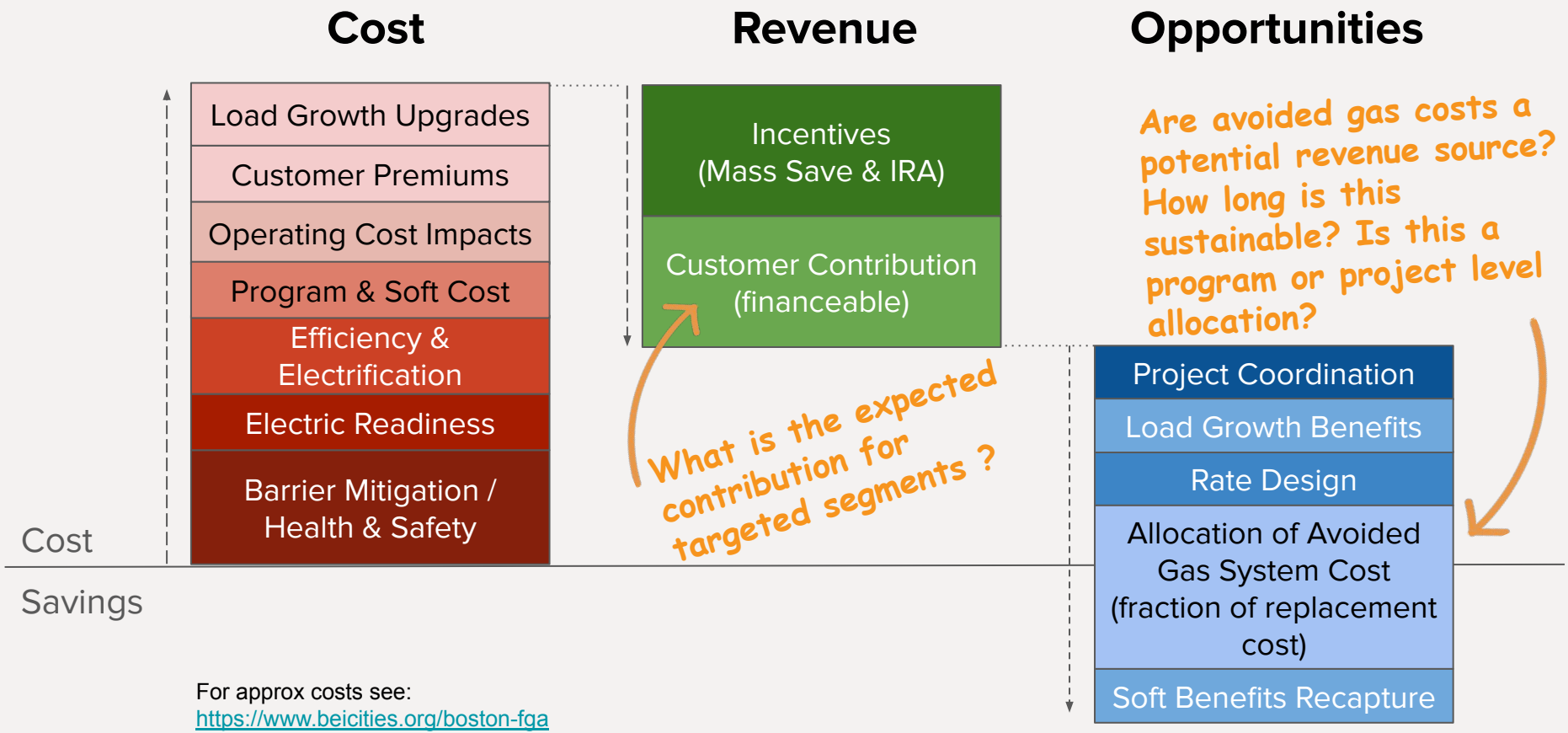
Accelerating electrification leads to earlier grid modernization needs.

Many feeders have sufficient headroom for new winter load, but some may require new transformers.

Efficiency, storage, and even backup tanked fuels can all play a role while expanding customer value

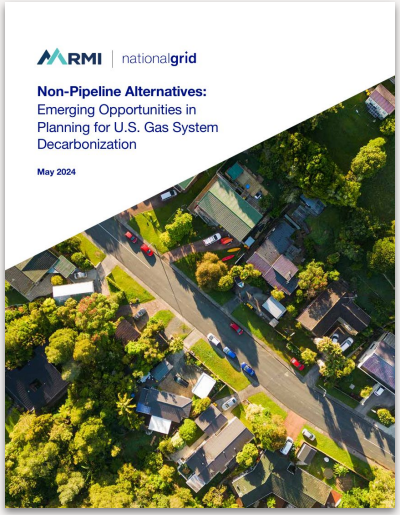


Managing Costs

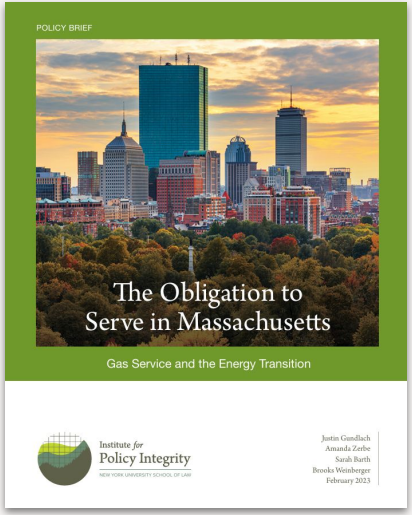


For approx costs see:
https://www.beicities.org/boston-fga

Supporting Customer Migration



“100% participation is not a scalable NPA approach.” “Policy change will be needed to evolve the…obligation to serve”

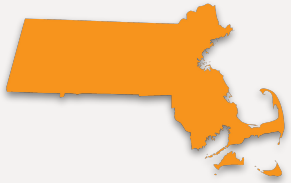


Customers have a right to “**gas *or* electricity**”. DPU may be able to make decisions in the public interest as long as it gives “**reasonable regard**” to existing customers.

Potential Pathways to Provide “Reasonable Regard” for existing customers

- Ensure customers are left better off
  - Cover costs; offer-turnkey retrofits; barrier mitigation
  - Superbonus or other incentives
  - Cover electric costs
- Limited use of backup fuels
  - LPG conversions for gas stoves and new equipment in feasible areas.
  - Propane has higher costs, insurance requirements, delivery needs.
  - Added benefit of avoided electric upgrades.

Targeted Electrification Across The States



20-80 Order: LDCs to develop NPA Framework and propose pilots

Groundwork Data NPA studies

2024 Leg: GSEP expanded to include other measures in addition to pipe replacement

BG&E Targeted Electrification RFP

Multiple Regulatory Cases focused on NPAs, thermal networks and targeted electrification.

RI PUC Orders RIE to Develop Framework

Gas Decommissioning Northern California Pilot

SB1221: Requires gas utilities to implement 30 pilots across CA. Requires ⅔ of customers to consent - lowering the current threshold from 100% participation.

NPAs as a Tool to Advance Equity

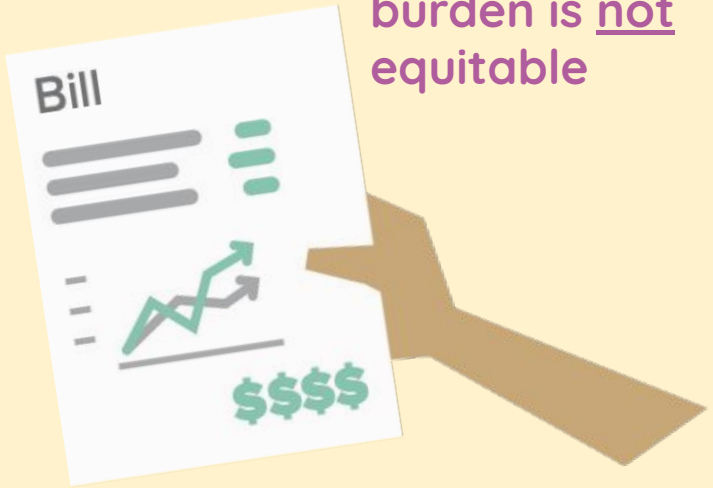
Contain transition costs

Neighborhood-scale electrification is a mechanism for **preserving affordability** for directly-electrified customers while slowing the growth in gas system costs borne by remaining gas customers.

Build experience to scale equitable transition

Early pilot efforts should seek to **electrify a diverse cohort of neighborhoods** to better understand the barriers and opportunities for scaling coordinated retrofits.

✕ Growing energy burden is <u>not</u> equitable



Environmental justice considerations need to go beyond the location of a project.

Summary: Reflections for this Process

LDCs should evaluate NPA opportunity beyond capital plans

20-80 Orders emphasize the need to evaluate NPAs for capital projects, however it also leaves open consideration for NPAs to be applied to broader gas infrastructure.

Customer participation needs to be clarified to ensure maximum benefits

How can potential early NPA projects leave customers better off? How does this need to evolve over time?

Advance NPAs broadly, and focus on identifying the least-cost, best fit solution for a given situation

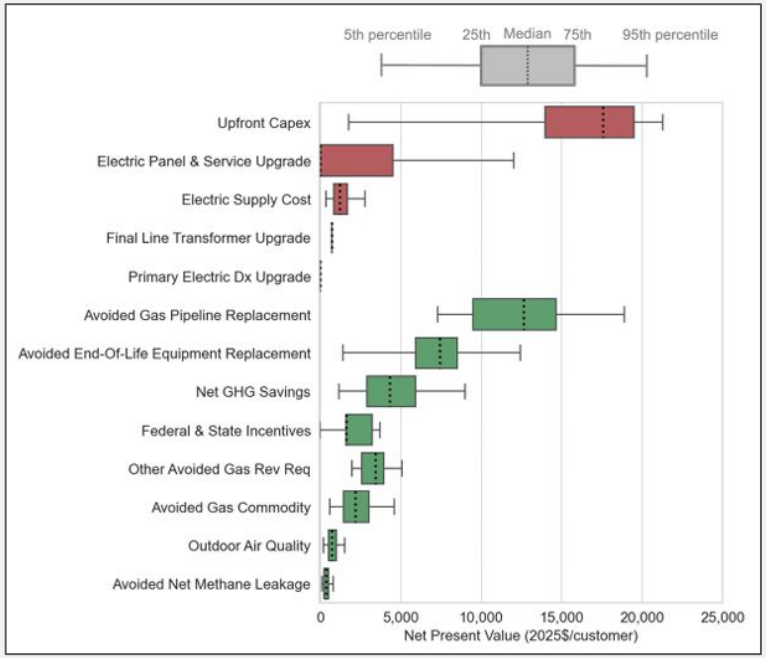
The rationale for NPAs at the system level is clear. Analysis needs to focus on finding the best solution where an NPA is practical.

Innovative financing mechanisms are needed to better align costs & benefits

NPAs will save ratepayer money, but cross-sector costs may be a barrier. How can this be overcome at the project or program level? How does this need to evolve?

Other Information

Uncertainty in Benefit-Cost Assessment



E3 and CACEC *Benefit-Cost Analysis of Targeted Electrification and Gas Decommissioning in California* (December 2023)

- Large degree of customer optionality and value creation
- Upfront electrification CAPEX (immediate)
- Avoided Gas Distribution Costs (who benefits**?**)
- Customer appliance replacement timelines (**?**)
- Customer OPEX costs & rate design (**?**)
- Air quality
- Net GHG savings (Social cost of CO_2**?**)
- Methane leakage (20 vs 100y GWP**?**)
- Electric system utilization (**?**)
- Choice of discount rate (**?**)
- Evolving policy: Clean Heat, CO_2 Price (**?**)

Can uncertainty can be overcomed to make BCA meaningful? Should we presume that feasible pipes are a least cost systems solution and identify best fit solutions?

What Assets Should be Stranded?

	Stranded Gas Pipes as Buildings Electrify	Accelerated Retirement of Building Gas Equipment When Gas Main is Retired
Owner	*Gas Utility*	*Building Owner*
Location	*"Front of the meter"* *(meters, services, mains)*	*"Behind the meter"* *(furnaces, stoves, water heaters, etc.)*
Initial Asset Cost	$20K - $100K for GSEP main and service work per service	$5K - $25K per household Higher for commercial
Customer impacts	Replaced gas pipes maintain existing customer service	Elec. can cost more than new gas equipment, but can deliver new customer value. Tank fuels can be used to avoid stranding and maintain certain services.
Recovery of stranded asset value	Accelerated depreciation Securitization, tax base	Policy & program design can compensate for stranded value

Role of Tank Fuels

Tank fuels such as LPG and CNG can substitute for utility gas where existing assets or customer needs merit continued utilization of gas fuels.

RI PUC's FoG study conducted by E3 showed that tank fuels lowered barriers and resulted in some of the lowest cost transition scenarios.

Limit electric peaks while supporting electric system utilization

Substitutable with existing piped gas with sufficient space and modest equipment modification

Higher carbon intensity (+17% for LPG) can be managed first through smart hybridization and limited use of renewable fuels or offsets

Higher operating costs can be managed by smart hybridization and financial support

Limited in urban areas due to fire codes; increases insurance costs

Implications of Continued Reinvestment

Increasing pipeline replacement costs

+

Leveling / declining consumption & customers

↓

Growing per customer costs and stranded assets

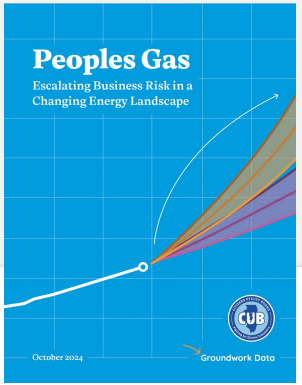
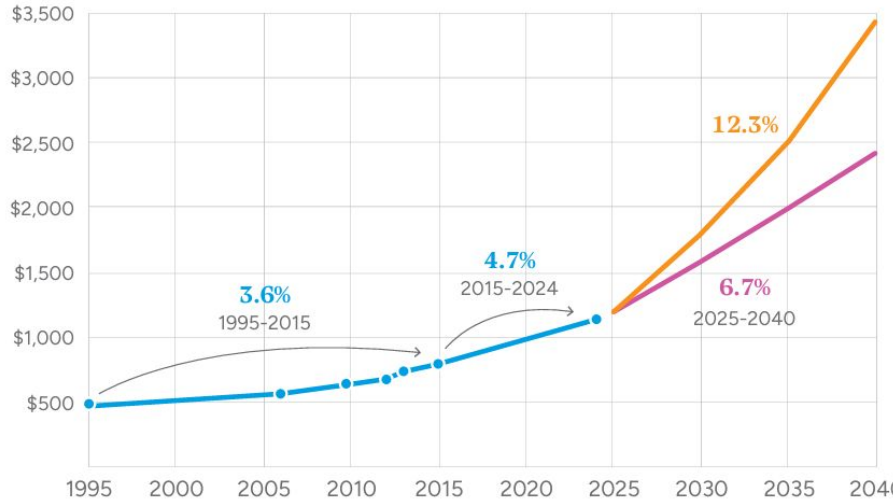


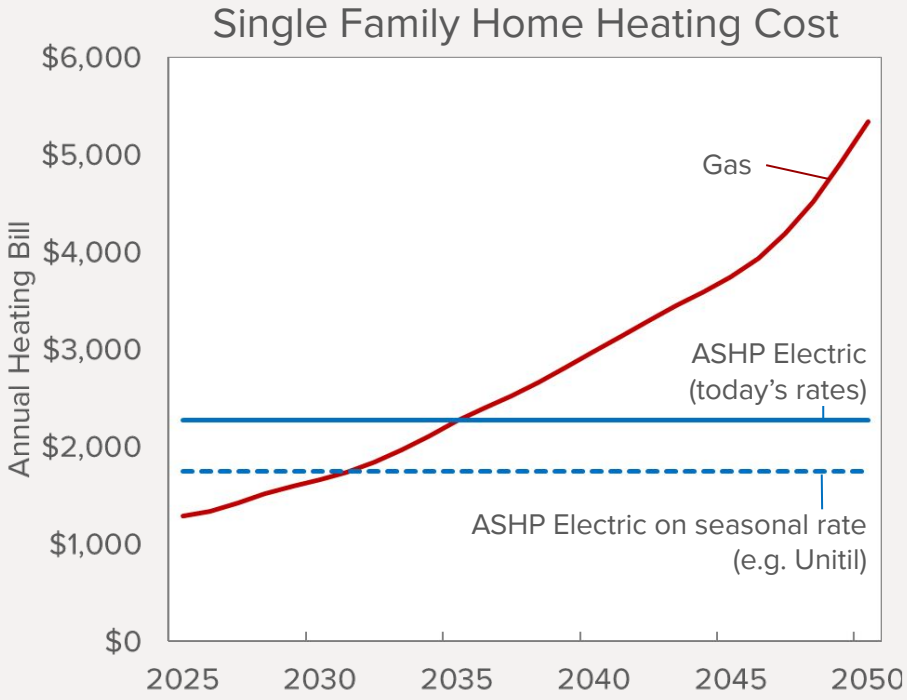
Figure 3.15: Historical trends in PGL delivery cost per customer vs. future increases required for Full SMP with & without customer decline



Sources: For 1995-2024, ICC final rate case orders (Appendix A or B) for Docket Nos. 95-0032, 07-0242, 09-0167, 11-0281,12-0512, 14-0225, 23-0069 and ICC, Comparison of Gas Sales Statistics (various years); for 2025-2040, GWD modeling. Note: Percentages refer to average year-over-year increases in delivery costs per customer.

Equity Challenge 1: Affordability

- Gas has been the most affordable heating source but **it will never be more affordable than it is today**.
- Under current policy and practice, those with the least agency to leave the gas system will increasingly bear growing costs of the system.
- Electrification, plus low electric system costs, smart rate design and more aggressive energy efficiency, are the most effective strategies for **preserving affordability**.
- Gas costs will need to be carefully tweaked via various mechanisms to balance affordability, fairness & climate.

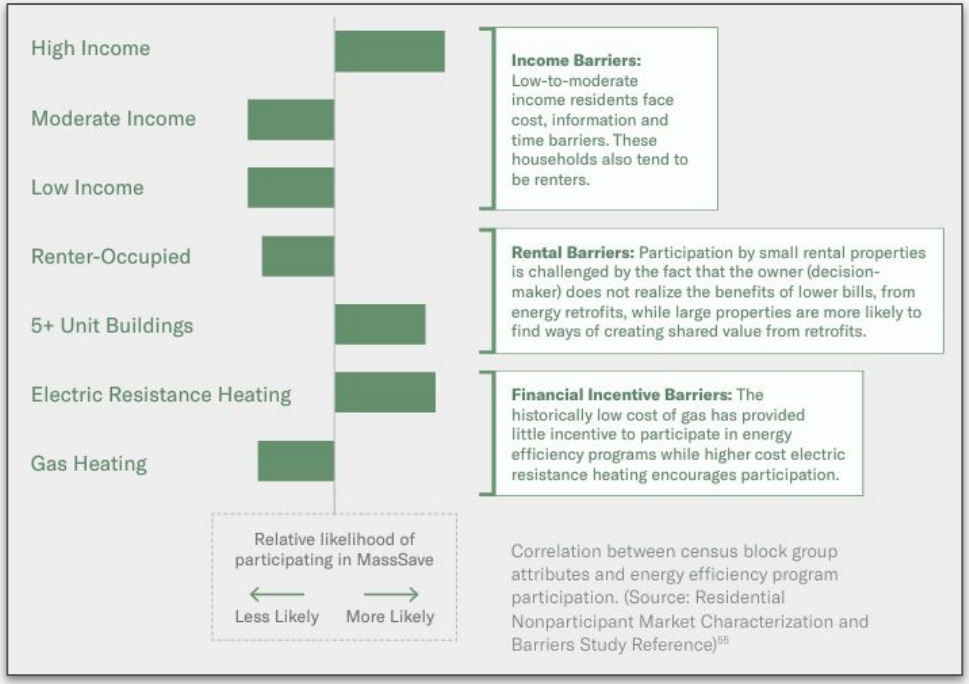


Illustrative data based on 20-80 Pathways Analysis,
No building efficiency assumed

Equity Challenge 2: Technology Adoption

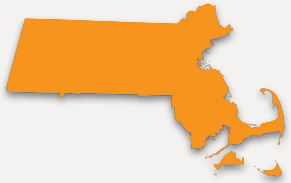
- Systemic barriers to adoption that have challenged MassSave *especially in the small multifamily segment.*
- LEAN & Mass Save have increased focus on LMI customer participation.
- Cost of electrification, as well as healthy and safety needs of underinvested-in housing are considerable.
- Early adoption by affluent households de-risks new technology, accelerate change, and lowers entry costs.

Question: How can coordination be used to overcome LMI barriers?



2022 Boston Climate Progress Report (Statewide Mass Save Data)

Targeted Electrification Across The States



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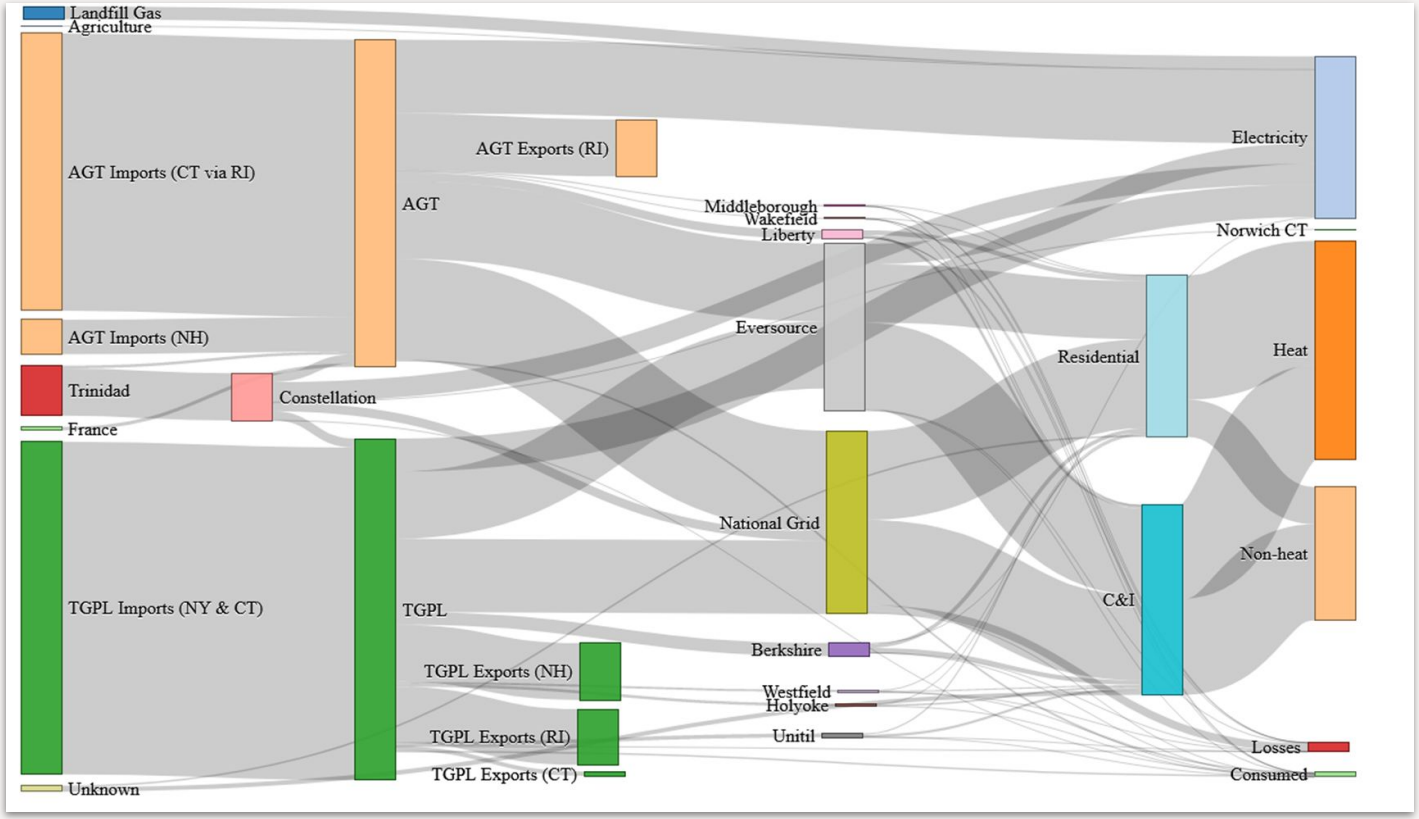
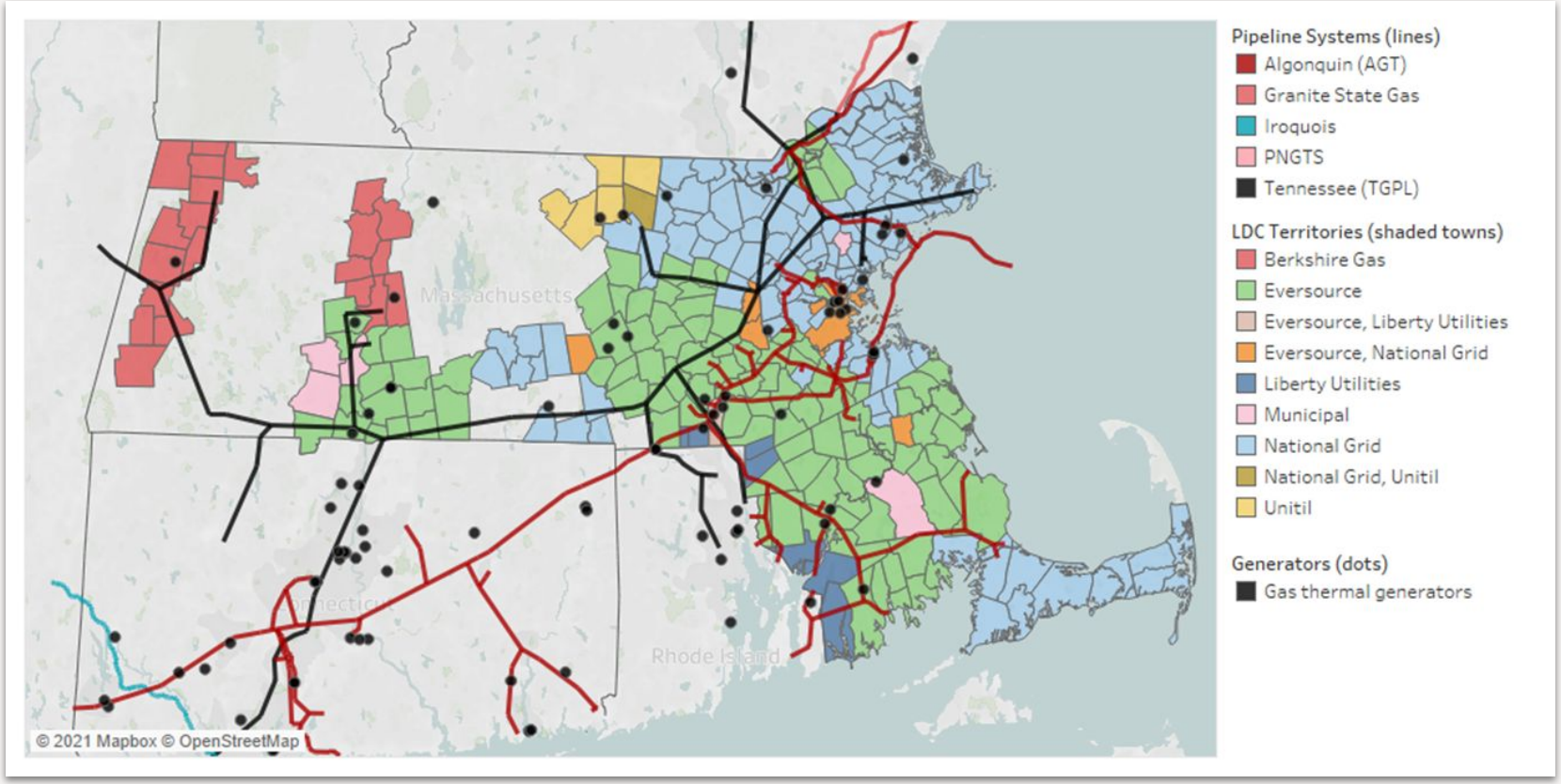
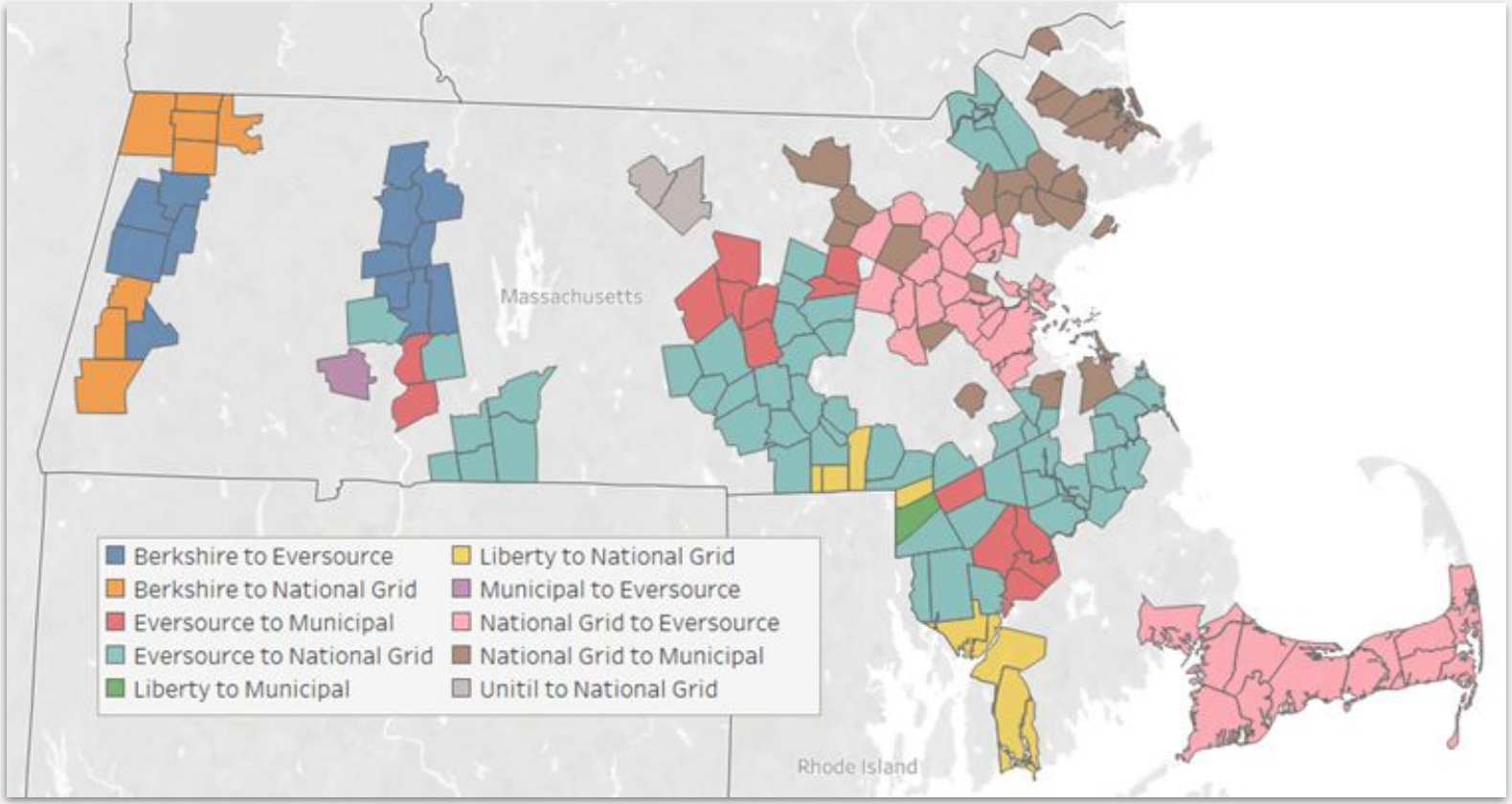
Gas Flows in MA



Transmission System, LDC's & Generators

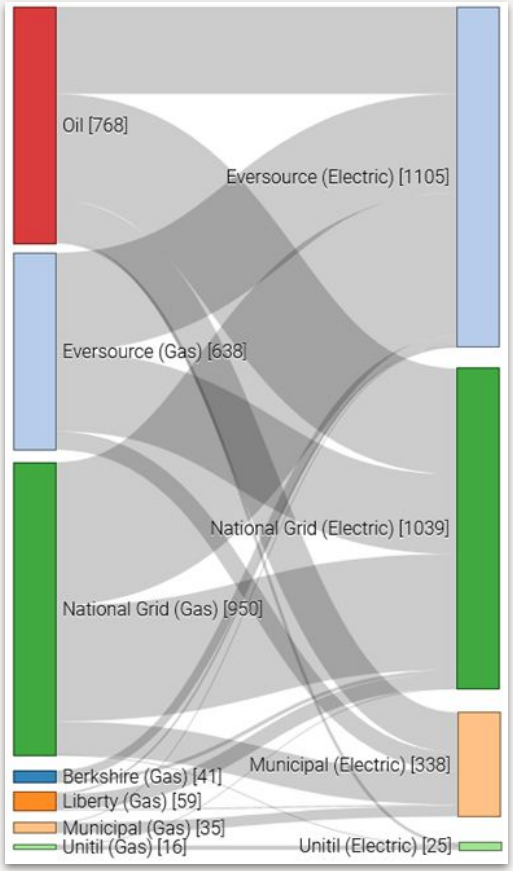


Gas to Electric Territory Mapping

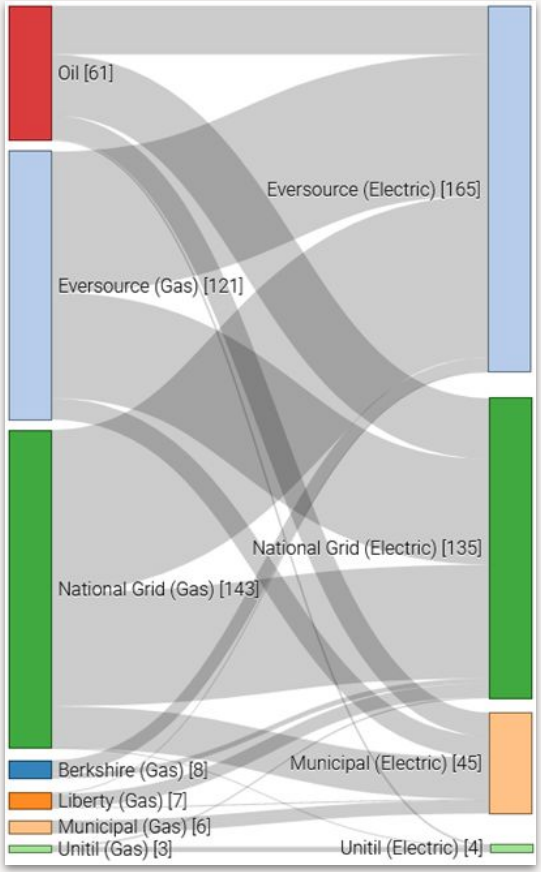


Gas to Electric Utility Mapping

Customers (‘000s)

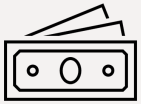


Consumption (TBtu)



Energy & Gas Transition

Net-Zero Planning Intersects with a Large Number of Objectives



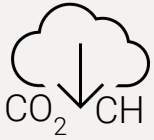
Low
Cost*

Convenient for
Customers

Healthy

Enriching
Employment

Equitable



Emissions
Eliminating

Reliable*

Resilient

Safe*

**Historic mandate of public utilities commissions*

Systems Principles of Net Zero Planning

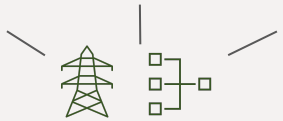
Fuel Saving

Renewable Electricity

Energy and Material **Efficiency**

Widespread **Electrification**

- ➔ Low cost energy during most hours.
- ➔ Reduces pollution.
- ➔ New customer value propositions.
- ➔ Replaces energy imports with local capital assets and create jobs.



Increased **Integration**

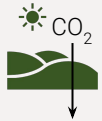
- ➔ More optimally share energy and resources across space and time.

High Temp., Firming & CO_2 Management

Bio-wastes & H_2 →

Alternative Fuels for Hard-to-Electrify Sectors

Limited use of **Fossil fuels**



Carbon Dioxide Removal

- ➔ High cost but fills gaps.
- ➔ Reduce net flow of GHGs into the atmosphere to halt warming.
- ➔ Remove CO_2 from the atmosphere to reverse dangerous warming.

Adapted from: Princeton Net Zero America Study, 2021 https://netzeroamerica.princeton.edu/
Net-zero emissions energy systems: What we know and do not know, Energy and Climate Change, 2021 https://doi.org/10.1016/j.egycc.2021.100049
Northeast Roadmaps (NYS Scoping Study, MA Decarbonization Roadmap and 2050 Clean Energy and Climate Plan, etc.)

Driver 1: Ratepayer Impact of Continued Gas Investment

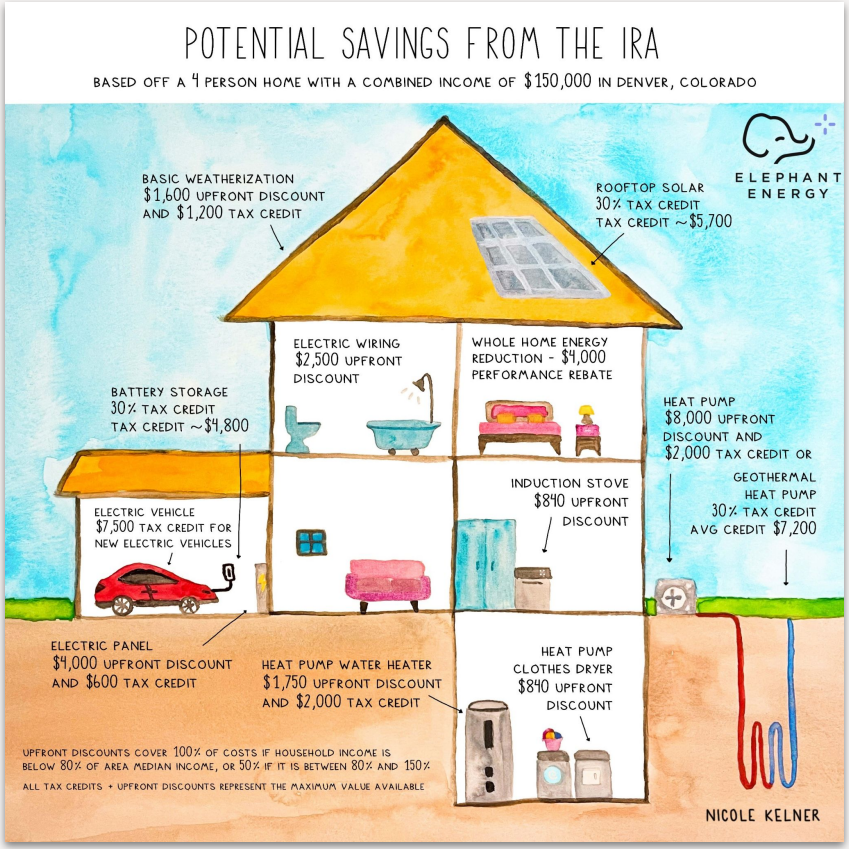
- **Increasing cost of new customers**. Avoiding new customers will save $500M in MA and $90M in RI in future annual gas system costs (13% and 18% respectively)
- **Cost to replace leak prone pipe** in NY and MA is an avg. of $3m per mile
- Recent filings show that some projects now approach $10m per mile.
- Lifetime customer costs can be more than double.

Table 2. Simplified breakdown of a present-value revenue requirement for a representative 1-mile gas main replacement project

Item	Cost	% of Installation Cost
Main Installation	$3,000,000	100%
Net Salvage	$1,950,000	65%
Taxes	$949,500	31.65%
Operations & Maintenance (annual)	$67,500	2.25%
Regulated Rate of Return	$210,000	7%
Total Cost	**$6,177,000**	**206%**

Data Source(s): LDC filings to the commission; PHMSA. Analysis: Ground-work Data

Driver 2: Climate Policy



Climate Policy lowers the cost of alternatives to gas

- Capital Costs:
  - IRA & State Incentives
  - Equipment standards
  - Electrification-friendly rate design.
- Operational Costs:
  - $200 per ton social cost of carbon implies a $10.6 per MMBtu of gas cost
  - RNG cost is $20-$40 per MMBtu
    - Fossil gas costs: $2-$4 / MMBtu
  - Clean heat standards being developed in various states.
- Local laws: NYC LL97, BERDO, etc.