The Birth of A New Utility

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ENERGY FOUNDATION
building a new energy future

Barr Foundation

PUTNAM FOUNDATION

MASSACHUSETTS CLEAN ENERGY CENTER

E4 THE FUTURE

WINSLOW FOUNDATION

HEET's mission:

To cut carbon emissions now by driving systems change

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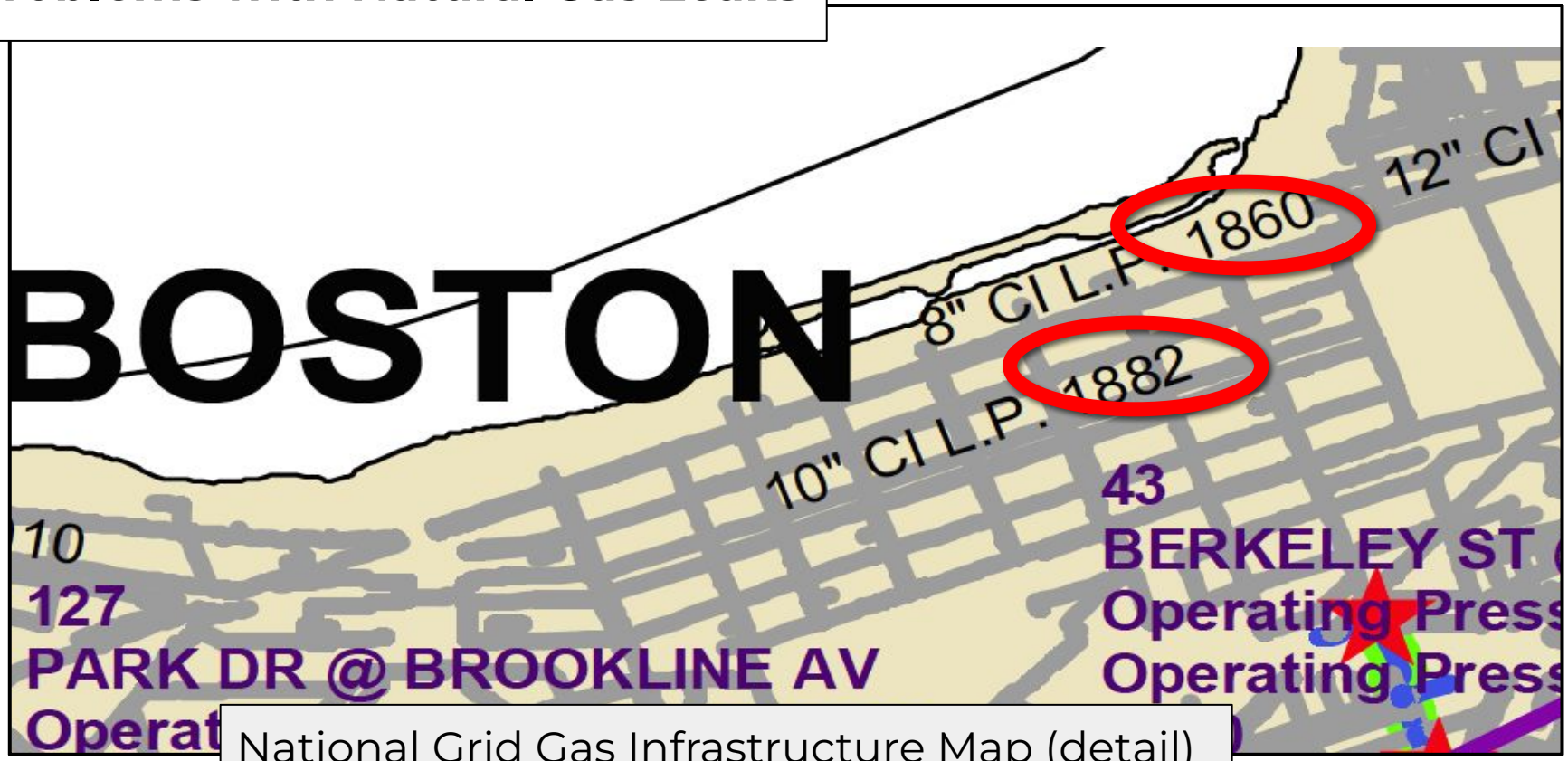
Problems with Natural Gas Leaks



National Grid Gas Infrastructure Map (detail)

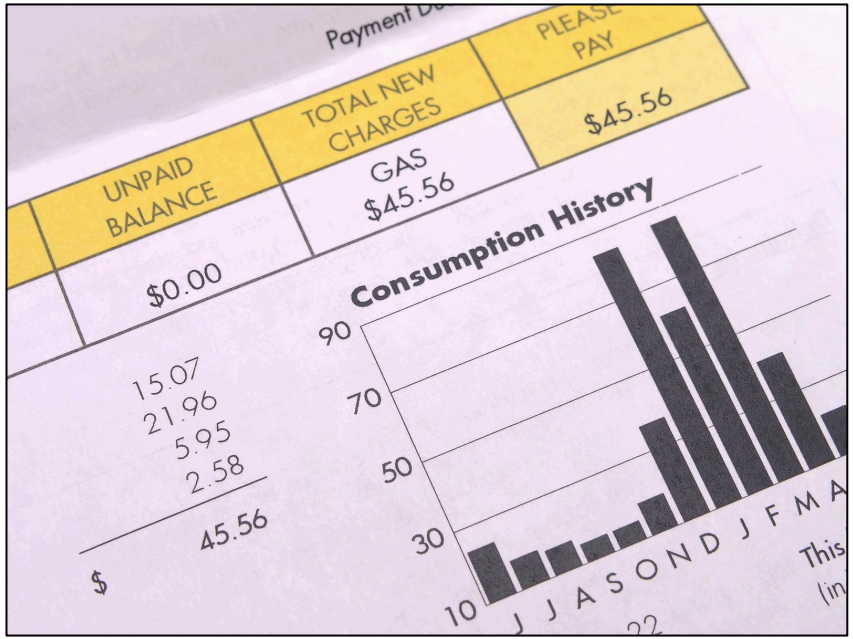
Problems with Natural Gas Leaks

Merrimack Valley Gas Disaster (Sept. 2018)

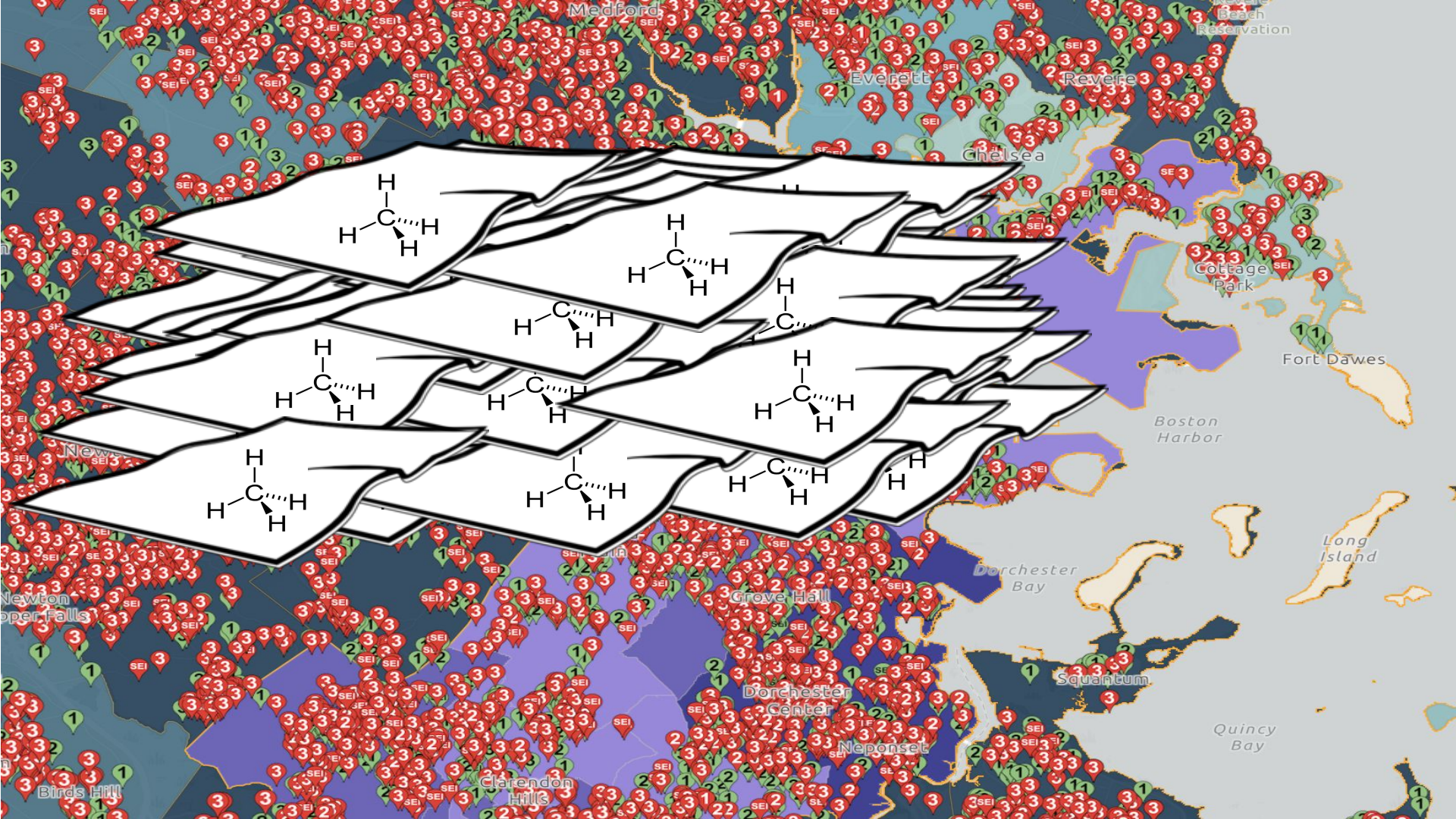
Problems with Natural Gas Leaks

Gas leaks kill trees.

Problems with Natural Gas Leaks

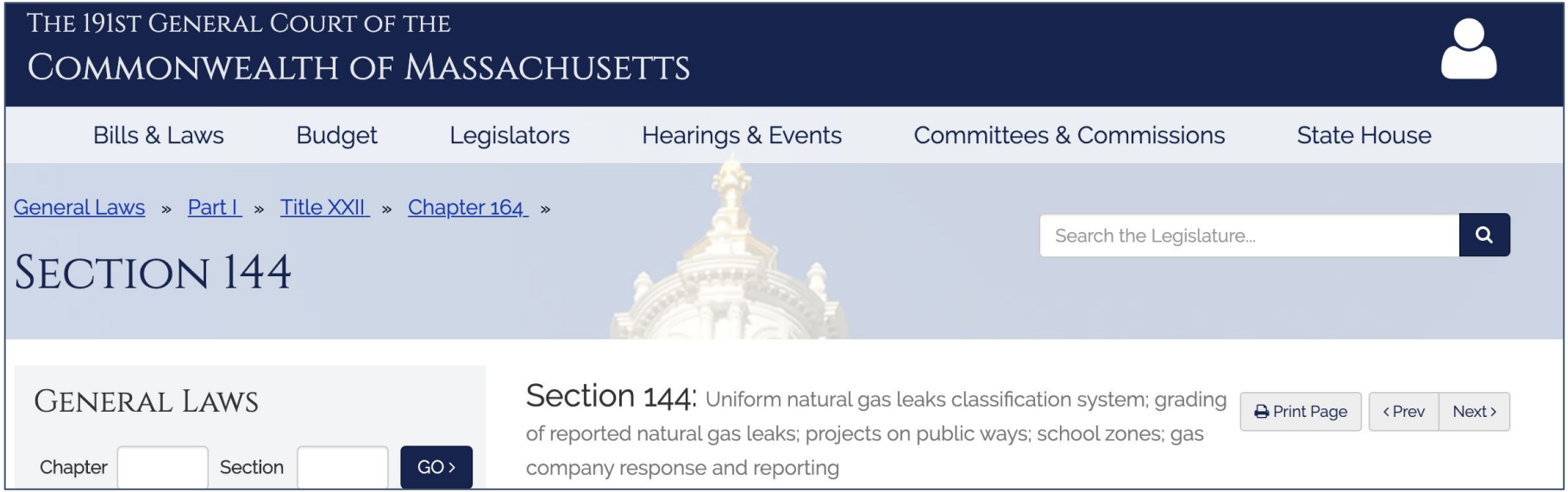


Customers pay for leaked gas.


Medford
Everett
Revere
Beach Reservation
Chelsea
Cottage Park
Fort Dawes
Boston Harbor
Long Island
Dorchester Bay
Grove Hall
Dorchester Center
Squantum
Quincy Bay
Neponset
Clarendon Hills
Birds Hill
Newton Upper Falls

Significant Environmental Impact leaks (SEIs)

2016 law passed - Leaks of Significant Environmental Impact must be repaired.



Shared Action Plan

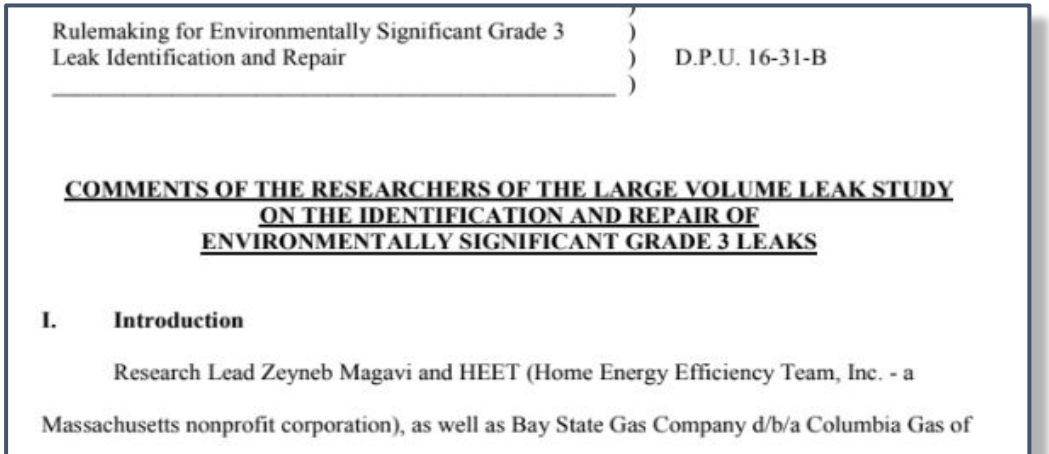
Identification - use Leak Extent Method to identify SEIs

Repair - within well defined times, depending on size and local plans

Verification - random selection verified by HEET

Reporting - DPU file room

Reassessment - for 5 years



Rulemaking for Environmentally Significant Grade 3 Leak Identification and Repair) D.P.U. 16-31-B

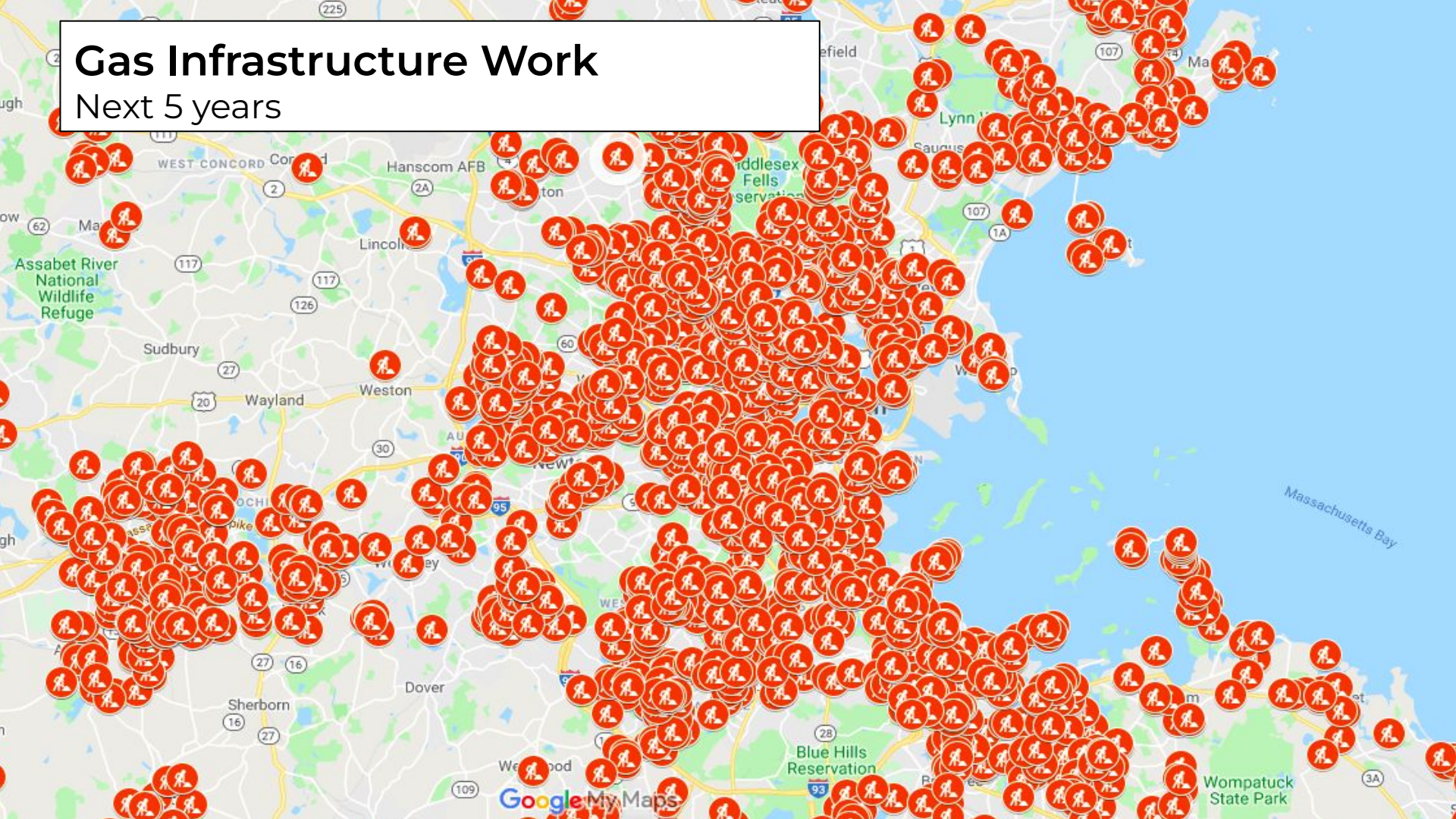
COMMENTS OF THE RESEARCHERS OF THE LARGE VOLUME LEAK STUDY ON THE IDENTIFICATION AND REPAIR OF ENVIRONMENTALLY SIGNIFICANT GRADE 3 LEAKS

I. Introduction

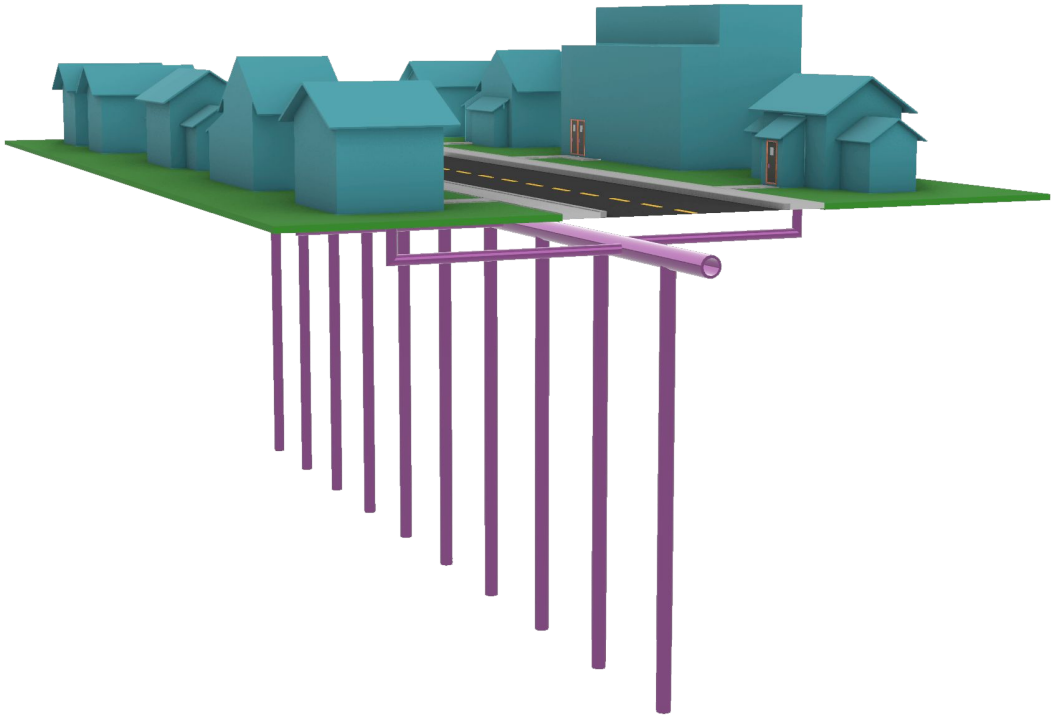
Research Lead Zeyneb Magavi and HEET (Home Energy Efficiency Team, Inc. - a Massachusetts nonprofit corporation), as well as Bay State Gas Company d/b/a Columbia Gas of

Gas Infrastructure Work

Next 5 years

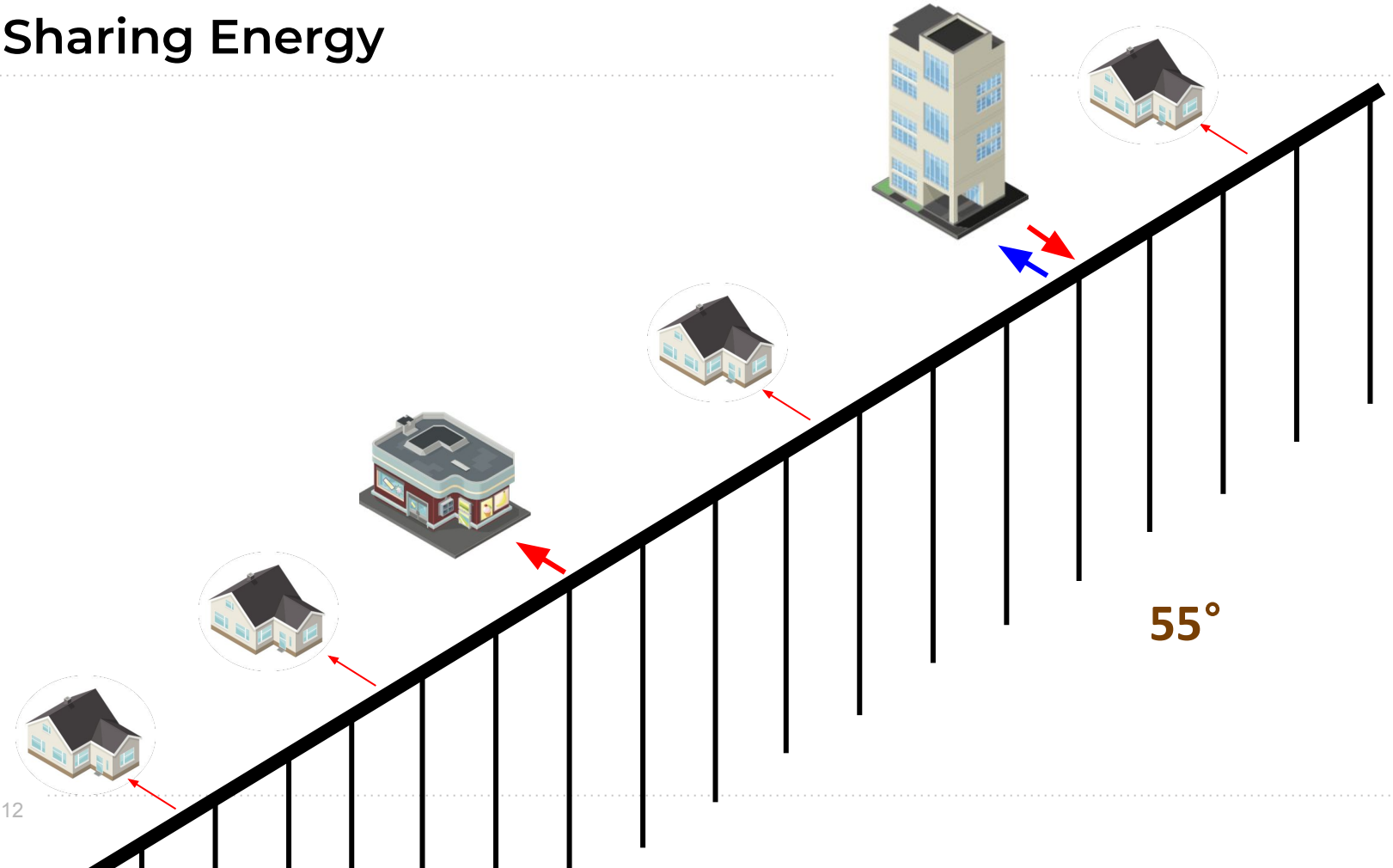


Networked Geothermal (ground source heat pumps)



- Infrastructure in the street
- “Shallow” boreholes
- Ambient temperature
- Single pipe
- No glycol
- Active thermal management

Sharing Energy



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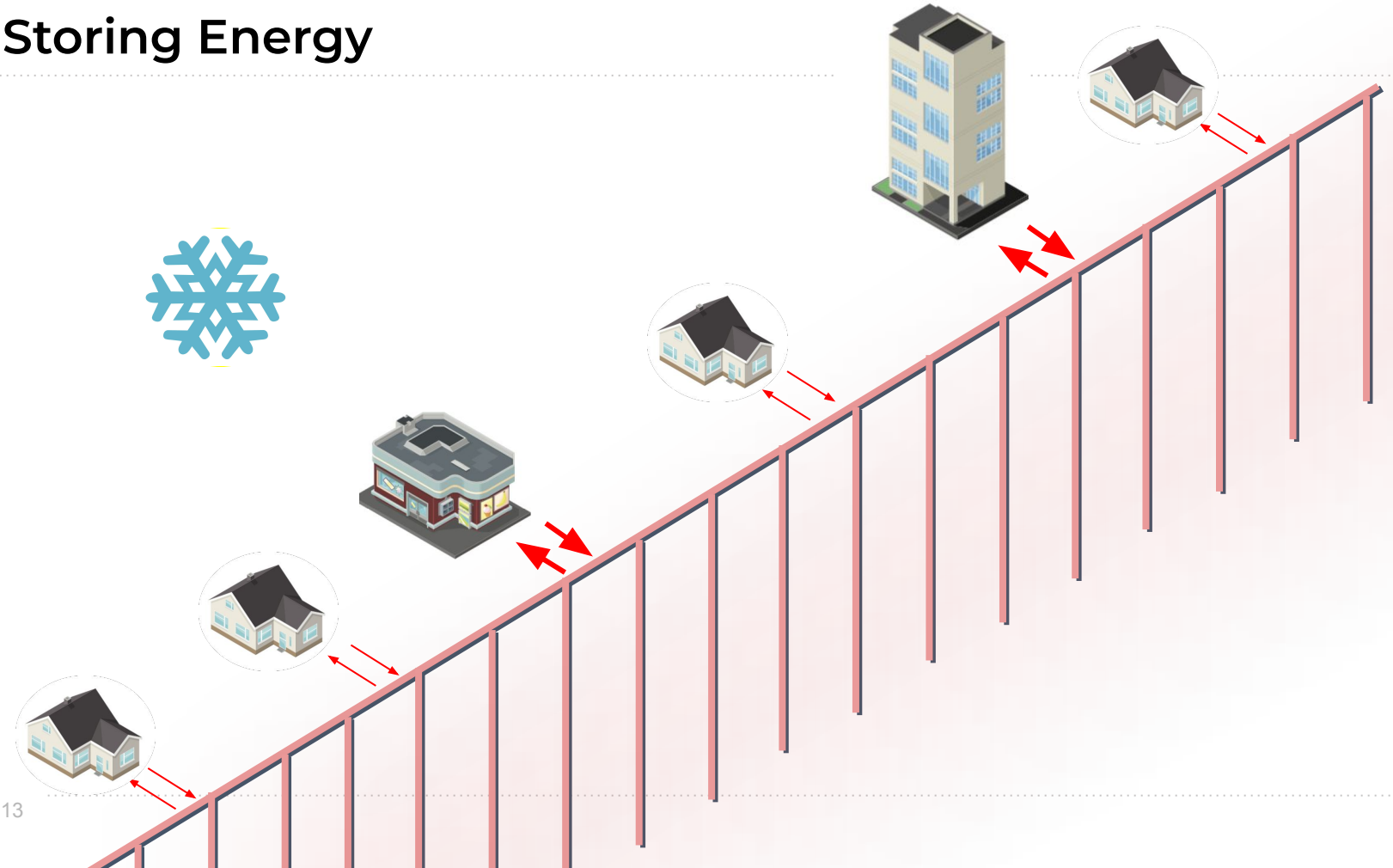
Storing Energy



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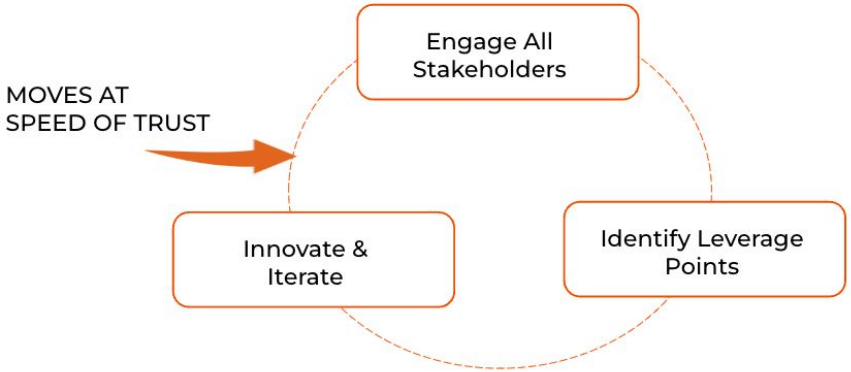
HEET Methods



Outcomes

- Safer

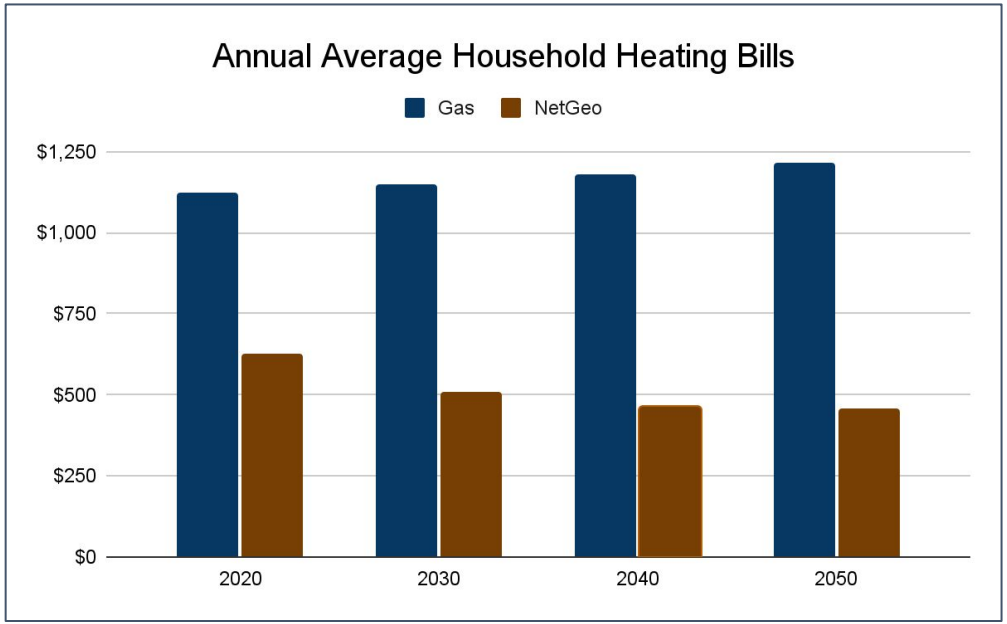
Merrimack Valley Gas Disaster 2018

Outcomes

- Safer
- Lower customer heating bills

MA Energy Bill Projection (gas vs. networked geothermal)

(Applied Economics Clinic Brief)



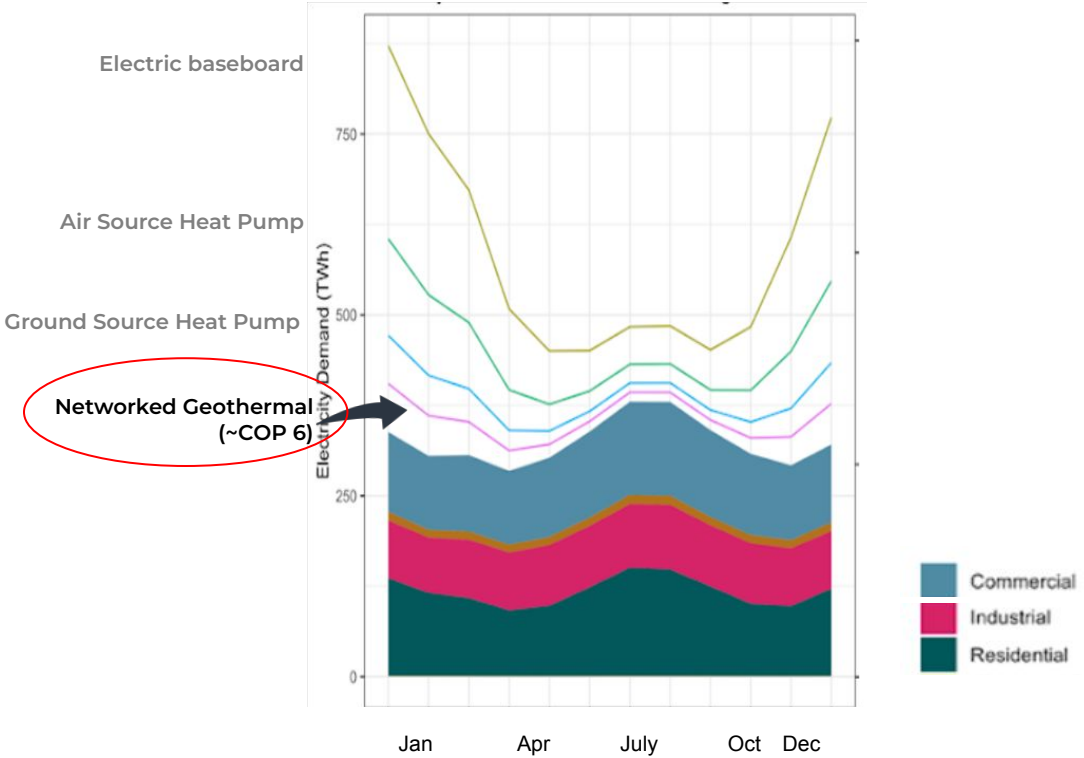
Inflection Point: When Heating with Gas Costs More; Applied Economic Clinic Jan 2021

Outcomes

- Safer
- Lower customer heating bills
- Lower electric peaks

Future US Seasonal Electric Peaks

(as we electrify)



Buonocore, J., Salimifard, P., Magavi, Z., Allen, J., "The Falcon Curve: Implications of Seasonal Building Energy Use and Seasonal Energy Storage for Healthy Decarbonization" DOI: 10.21203/rs.3.rs-1054606/v1

Outcomes

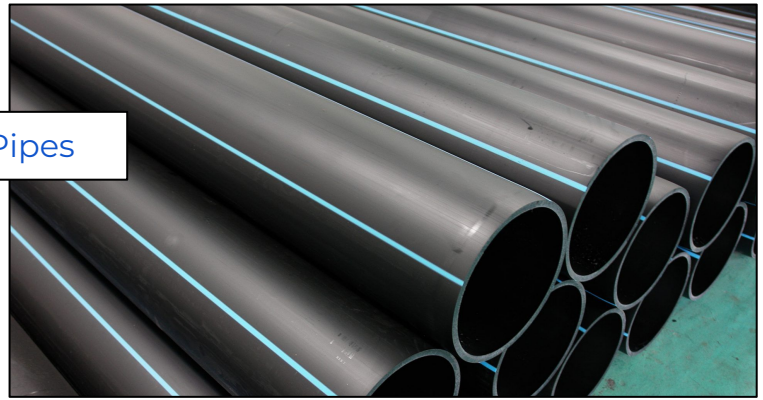
- Safer
- Lower customer heating bills
- Lower electric peaks
- Equitable

Outcomes

- Safer
- Lower customer heating bills
- Lower electric peaks
- Equitable
- Workforce can transition

Gas Pipes

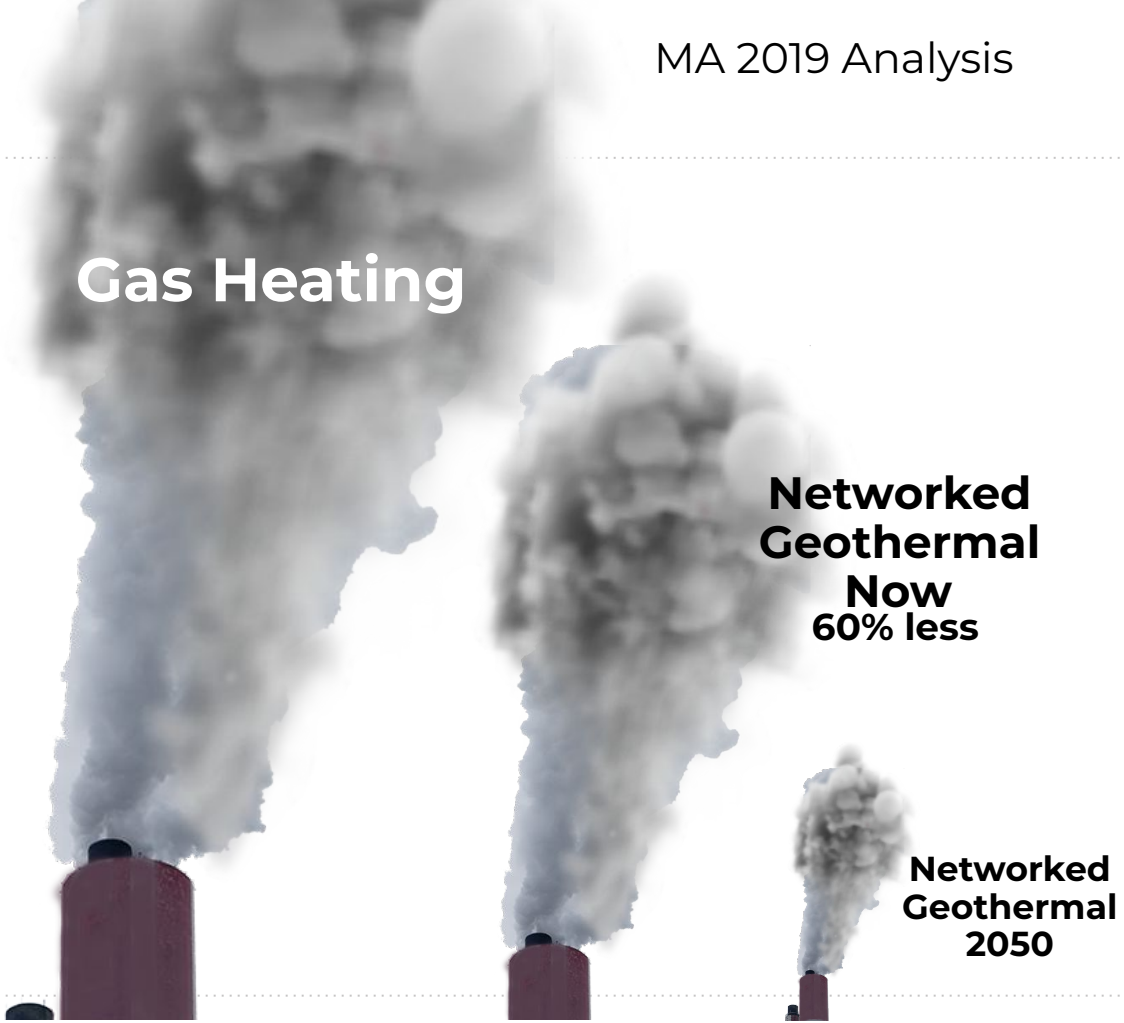
Water Pipes



Outcomes

- Safer
- Lower customer heating bills
- Lower electric peaks
- Equitable
- Workforce can transition
- Lower emissions

MA 2019 Analysis



GeoMicroDistrict Feasibility Study, Buro Happold Engineering, 2019

Eversource & National Grid Installations

Eversource

- 1 installation approved
- Site selected in Framingham
- Fire station, school, a few businesses, and homes including low-income
- Test boreholes completed, install complete 2023

National Grid

- 4 installations approved
- First site selected in Lowell
- Test boreholes completed
- 100% electrification

Framingham, MA

HEET Research Team

- NREL, LBNL, MIT
- Databank
- Best practices
- Optimization model

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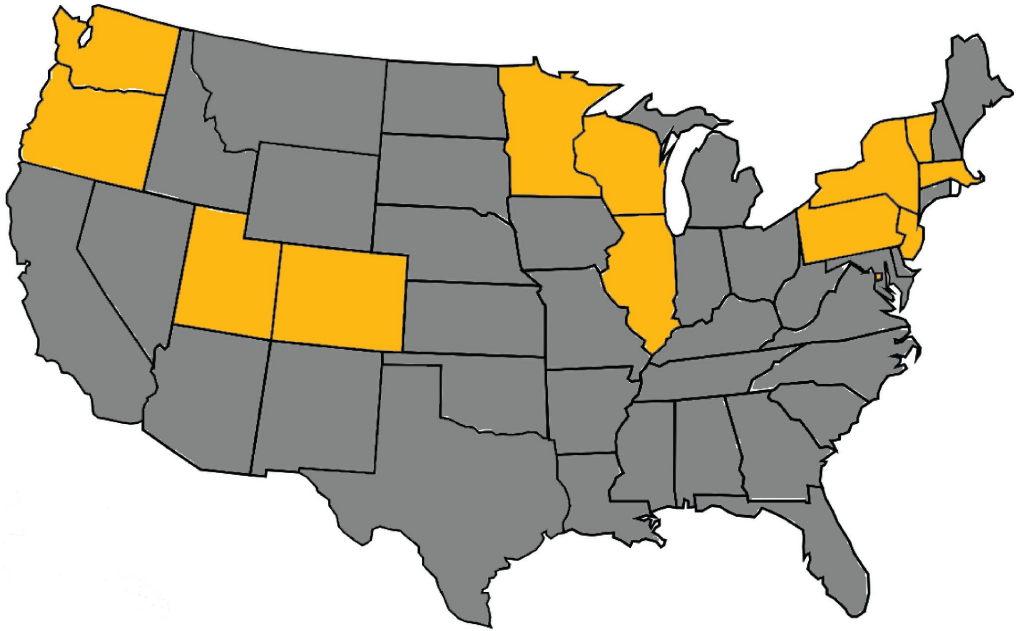
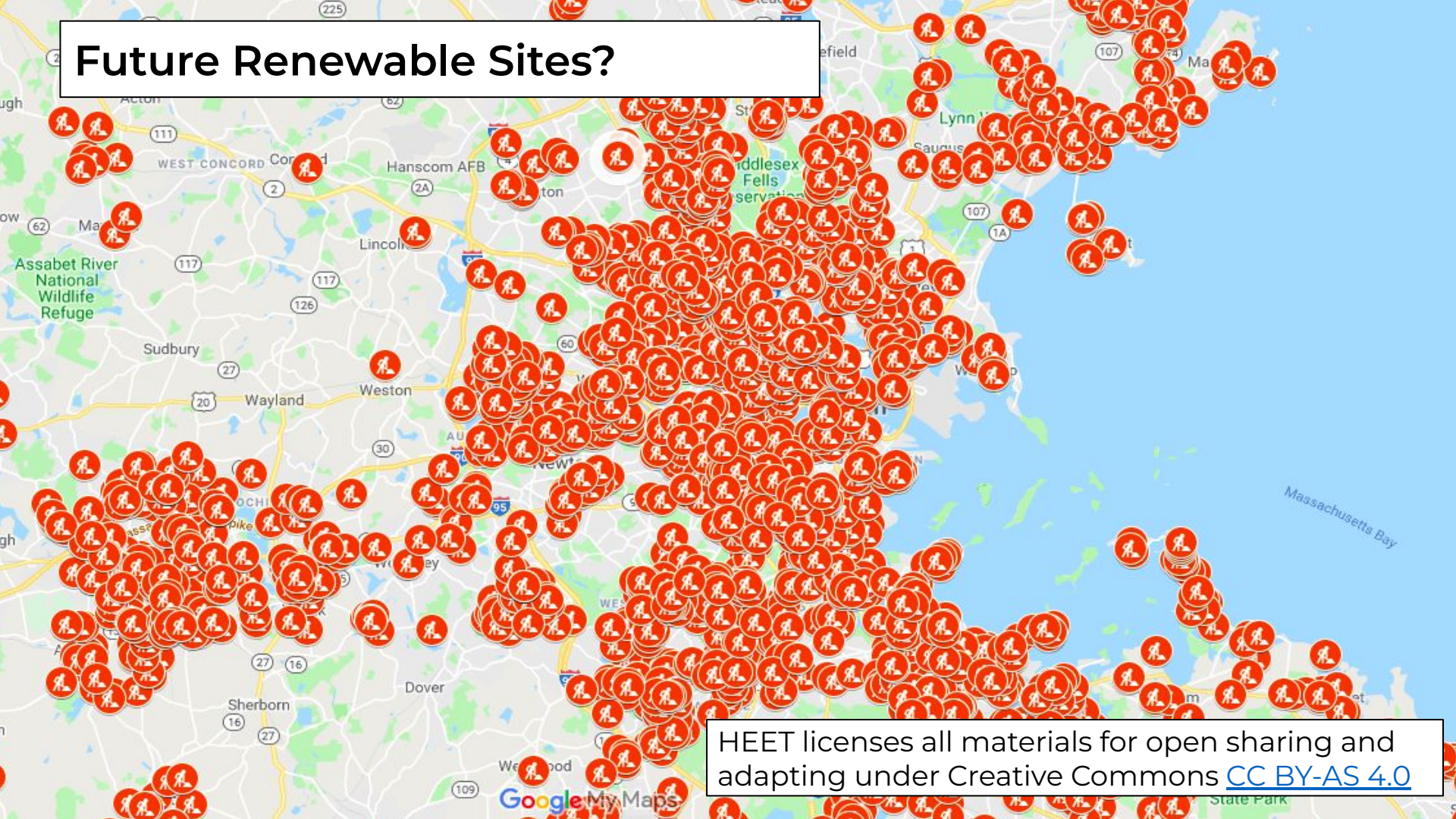
National Progress

13 states, 14 utilities
Feasibility studies on networked geothermal
Legislation to allow gas utilities to become thermal utilities



Future Renewable Sites?



“Super-emitting” Gas Leaks

ELSEVIER

Environmental Pollution
Volume 213, June 2016, Pages 710-716

Short communication

Fugitive methane emissions from leak-prone natural gas distribution infrastructure in urban environments ☆

Margaret F. Hendrick [a], Robert Ackley [b], Bahare Sanaie-Movahed [a, 1], Xiaojing Tang [a], Nathan G. Phillips [a]

Show more

https://doi.org/10.1016/j.envpol.2016.01.094

Significant Environmental Impact leaks (SEIs)

2016 law passed - Leaks of Significant Environmental Impact must be repaired.

Question:
How to identify the SEIs?

Large Volume Leak Study

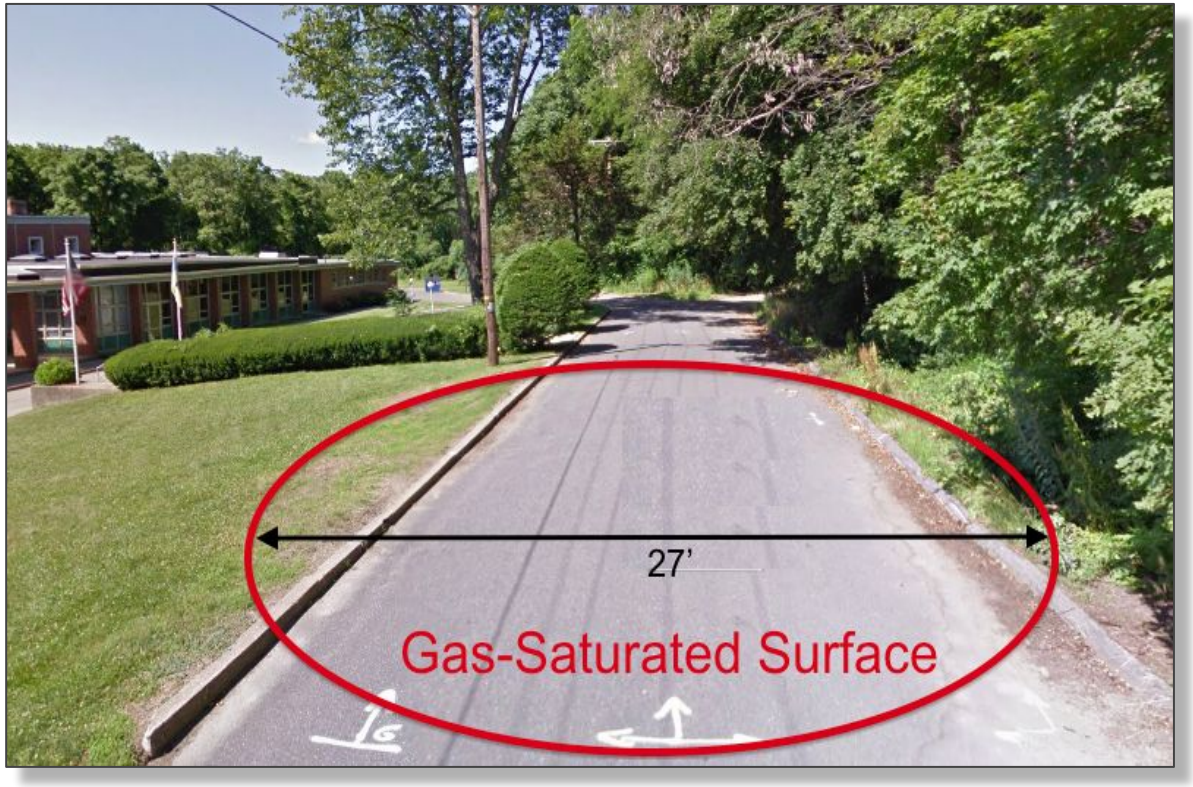
HEET's study

- National Grid
- Columbia Gas
- Eversource

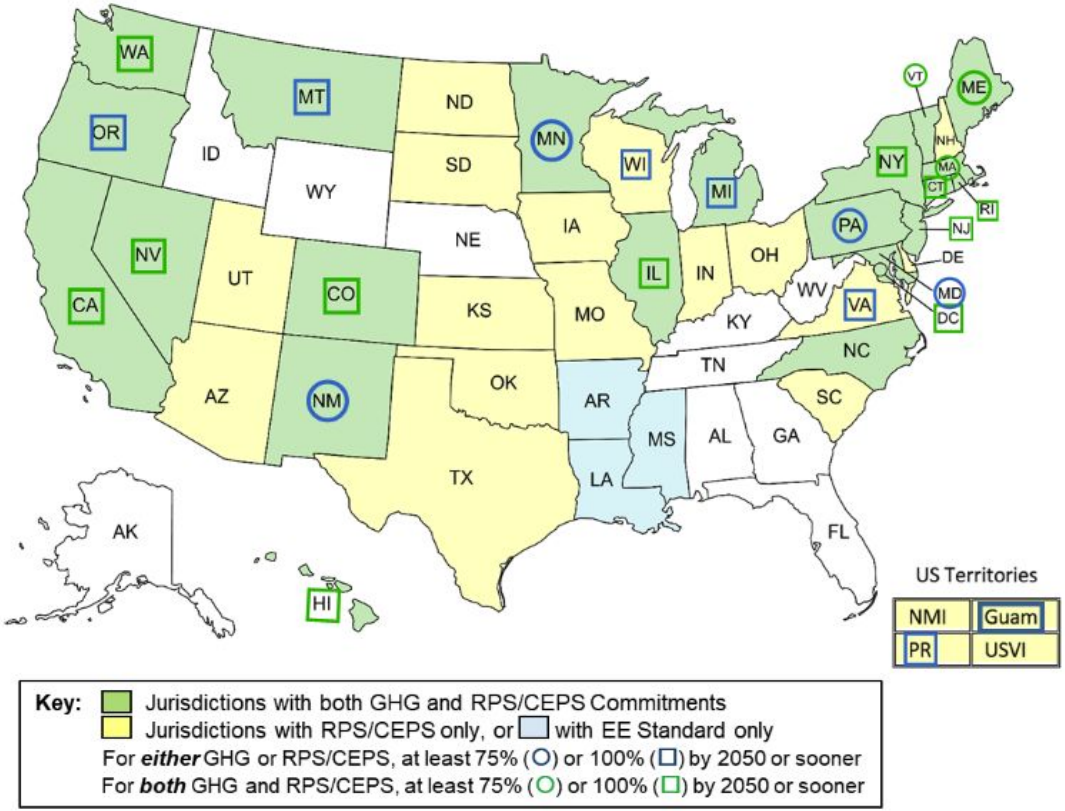
Determine identification method.

Leak Extent Method

2,000 sq. ft. gas-saturated surface area

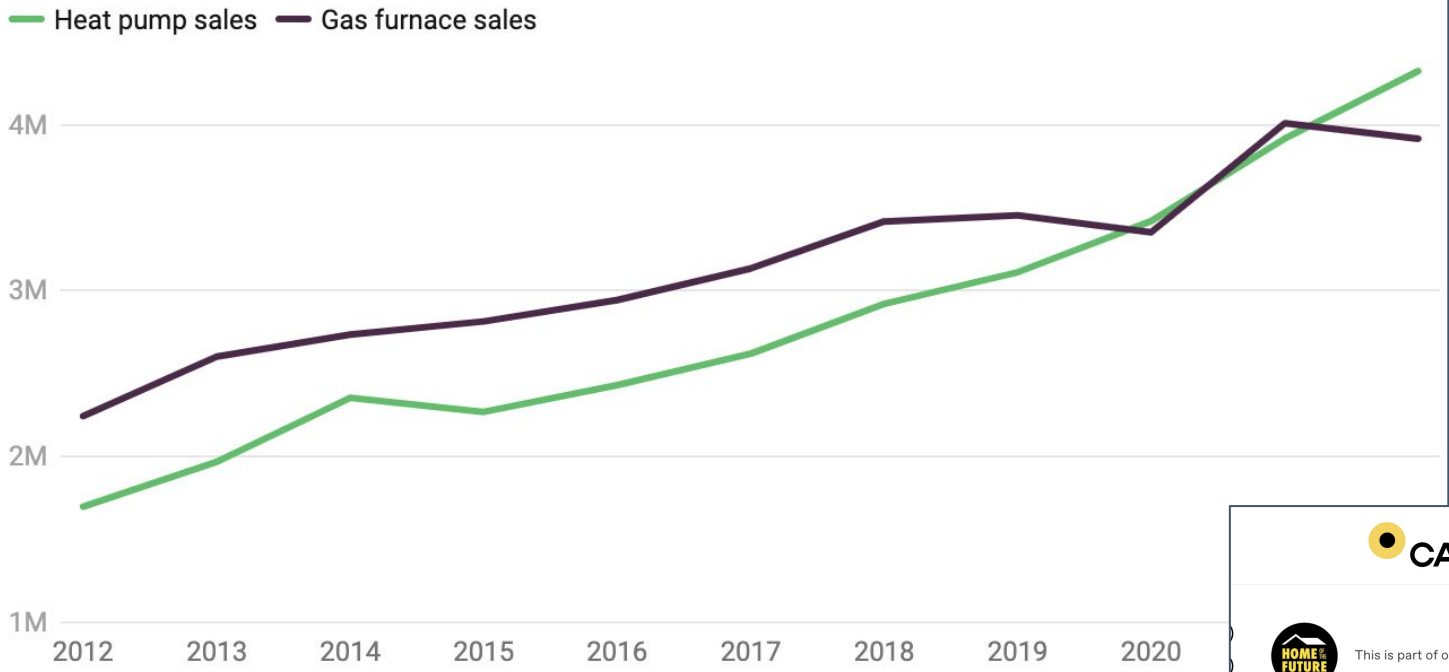


Decarbonization Commitments



https://www.naruc.org/nrri/nrri-activities/clean-energy-tracker/

Heat pump sales in U.S. surged past gas furnaces in 2022



2022 figures include sales data for Jan–Nov and projected sales for Dec.

Chart: Canary Media • Source: Air-Conditioning, Heating, and Refrigeration Institute • Embed • Download image

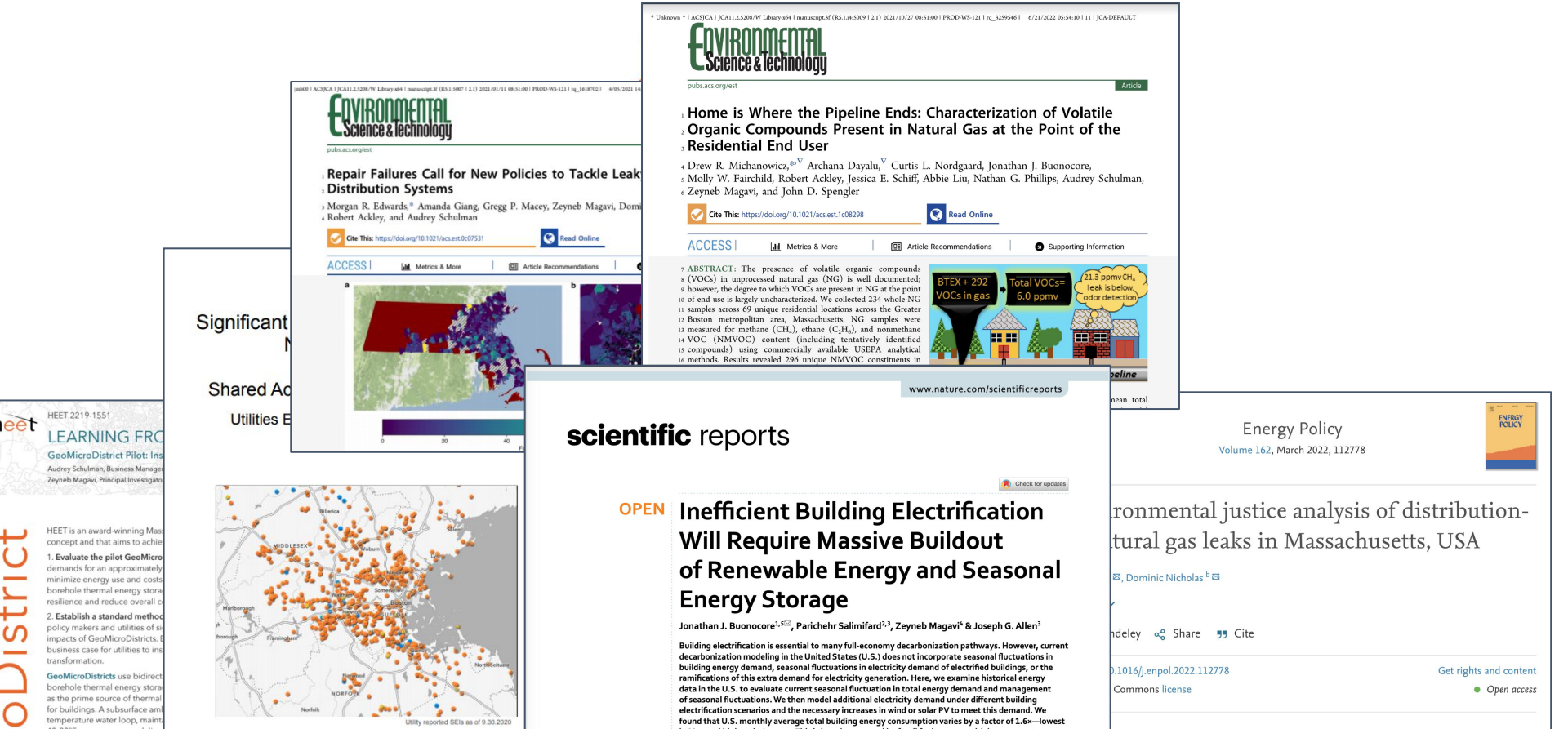
CANARY MEDIA

This is part of our special series "Home of the Future." Read more.

Chart: Americans bought more heat pumps than gas furnaces last year

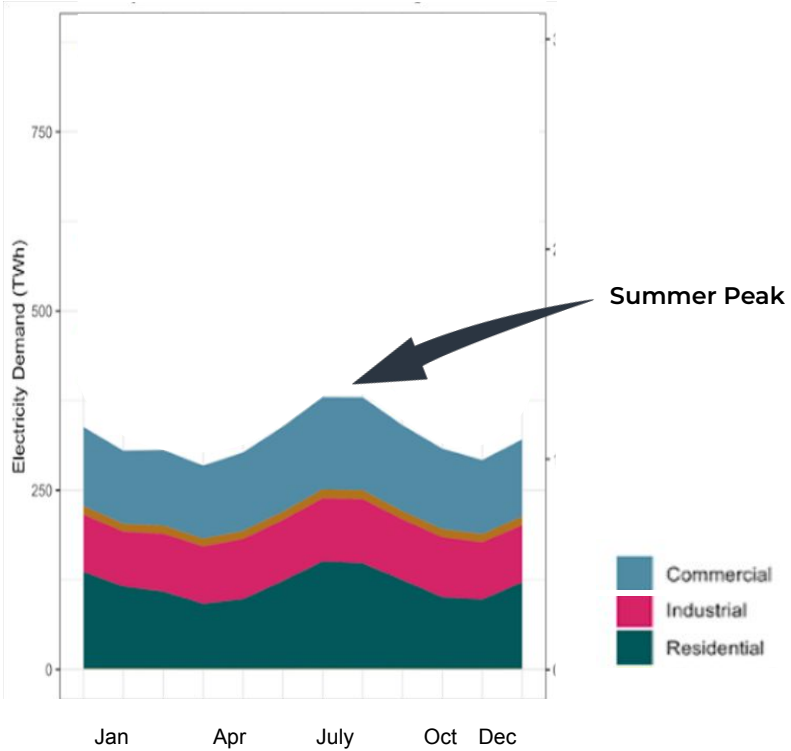
Even before Inflation Reduction Act incentives kicked in, Americans bought more heat pumps than ever before last year — well over 4 million.

HEET Methods



Current US Seasonal Electric Peaks

(for buildings)



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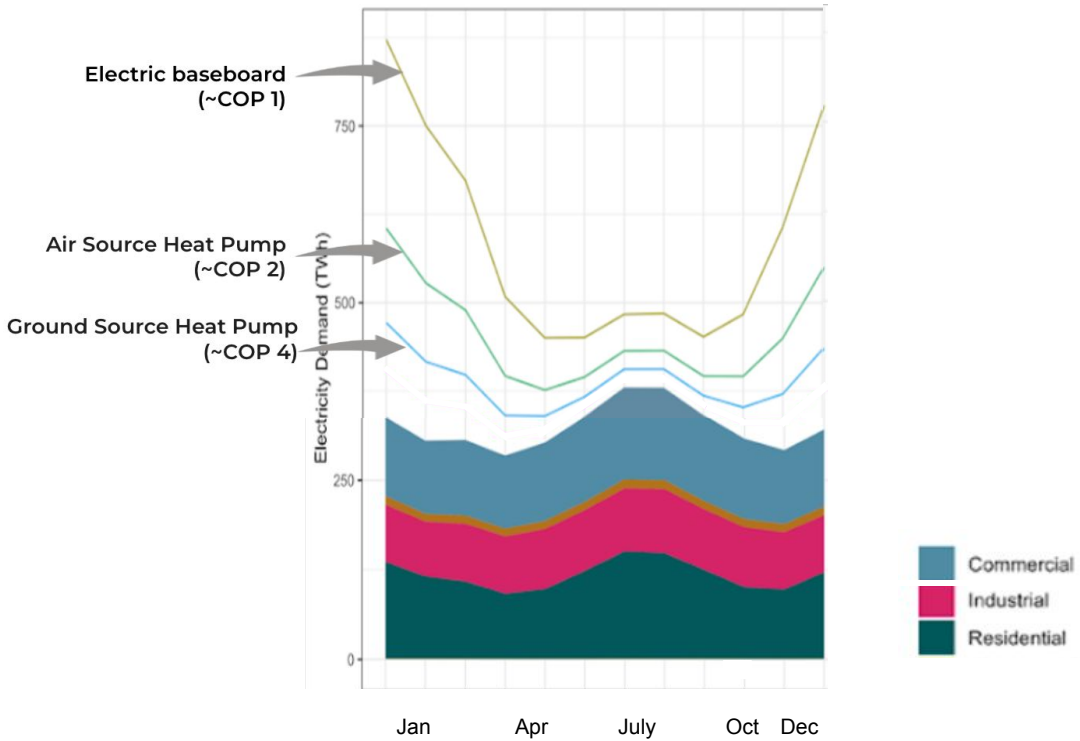
Future US Seasonal Electric Peaks

(for buildings)



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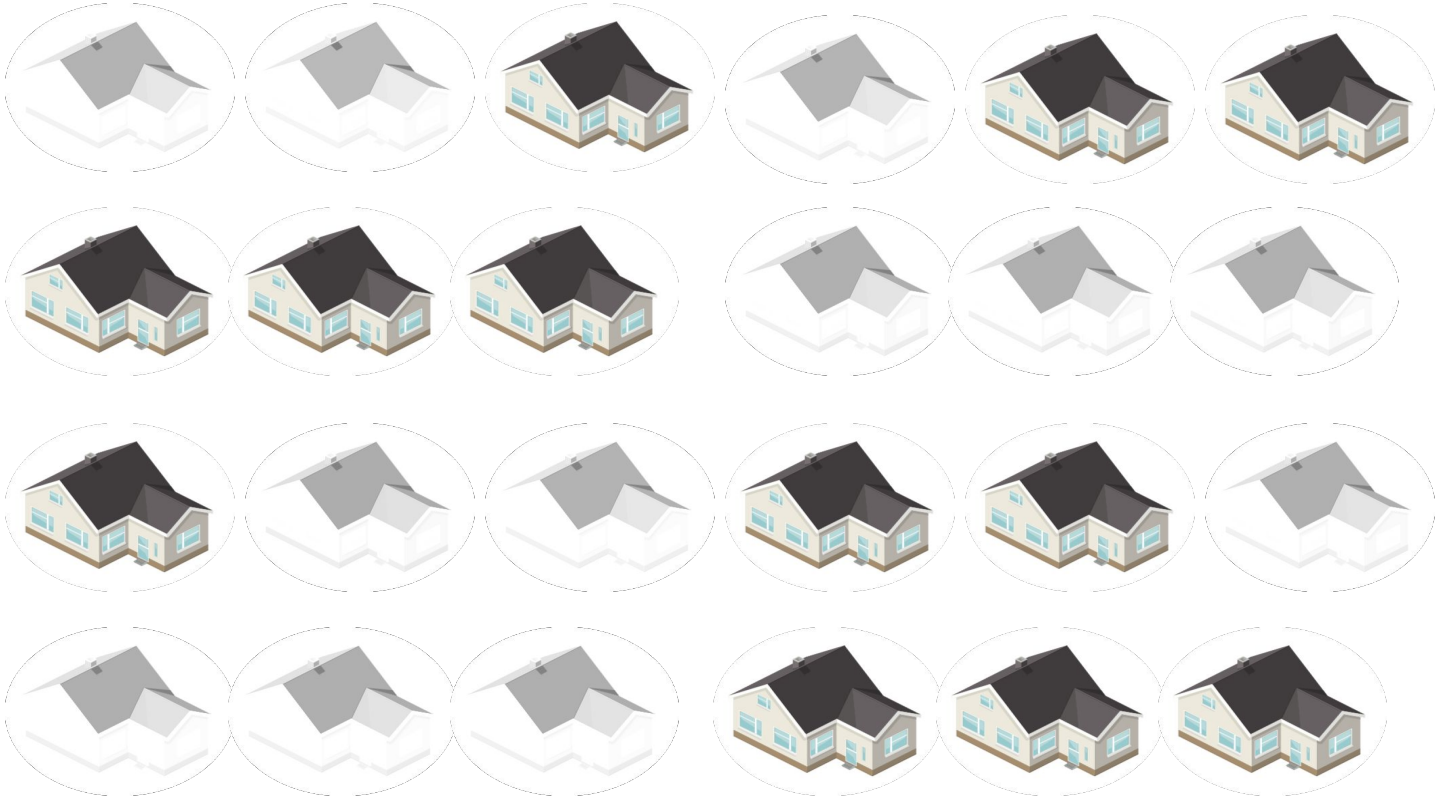
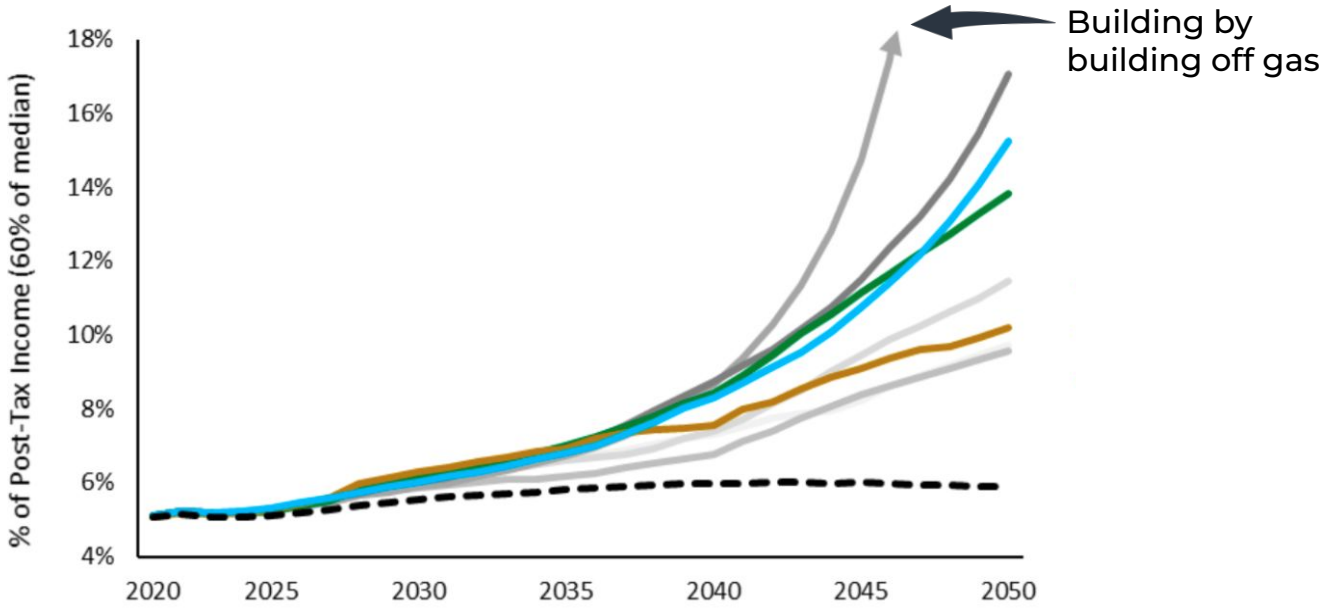
Fleeing Customers, Increasing Gas Bills



Increasing Energy Burden for Low-income Customers



Source: E3, Report for Massachusetts Gas Utilities, 2022

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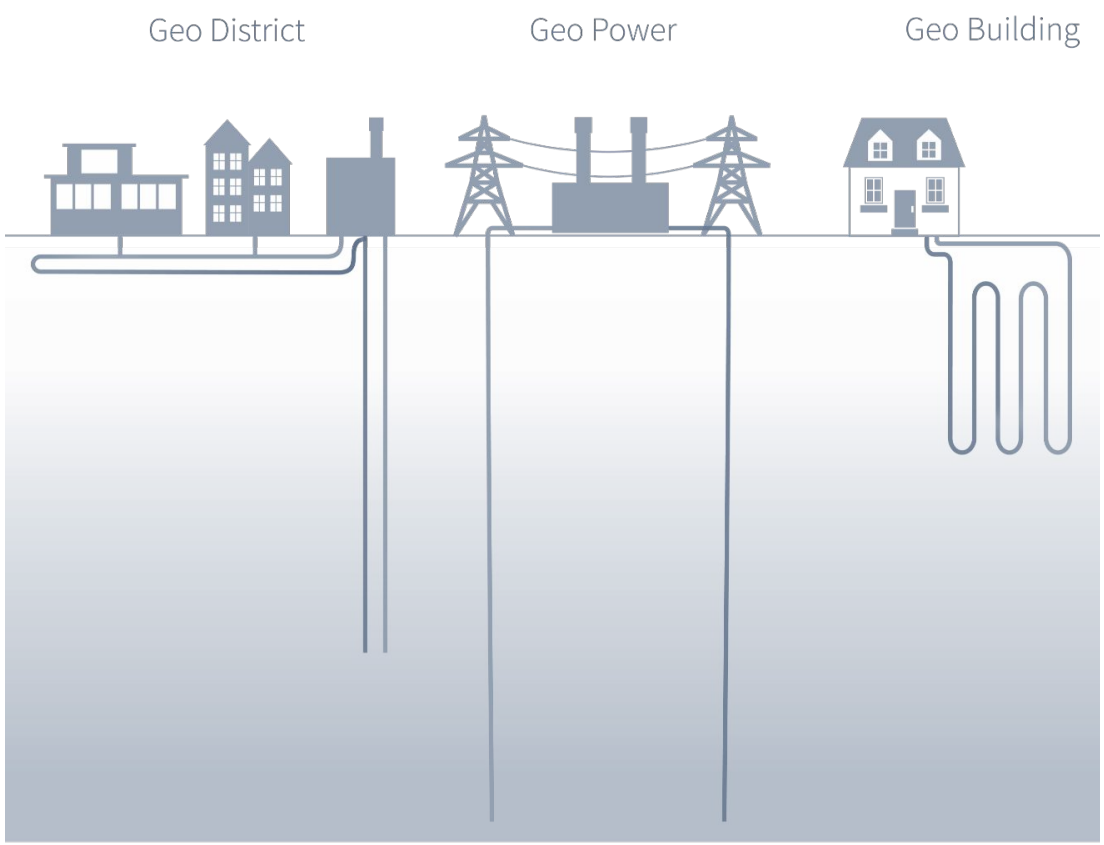

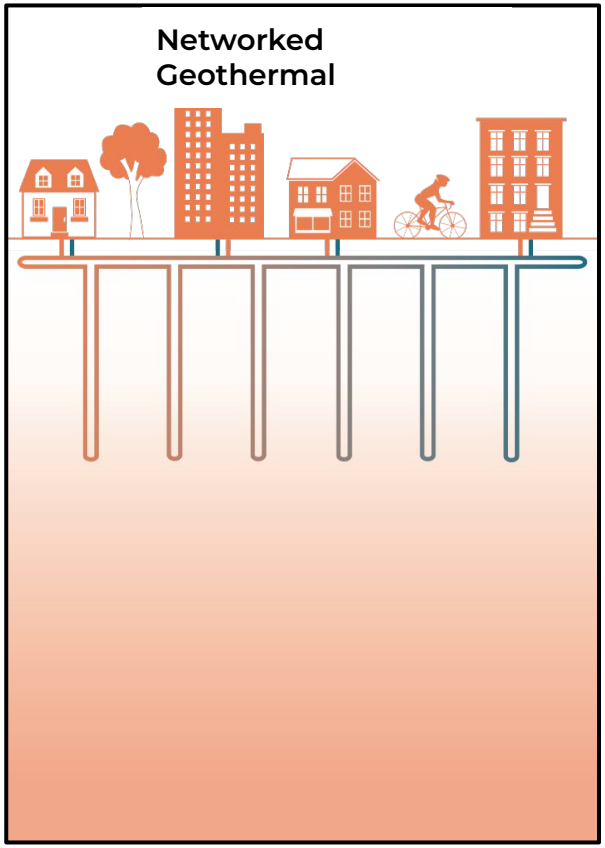

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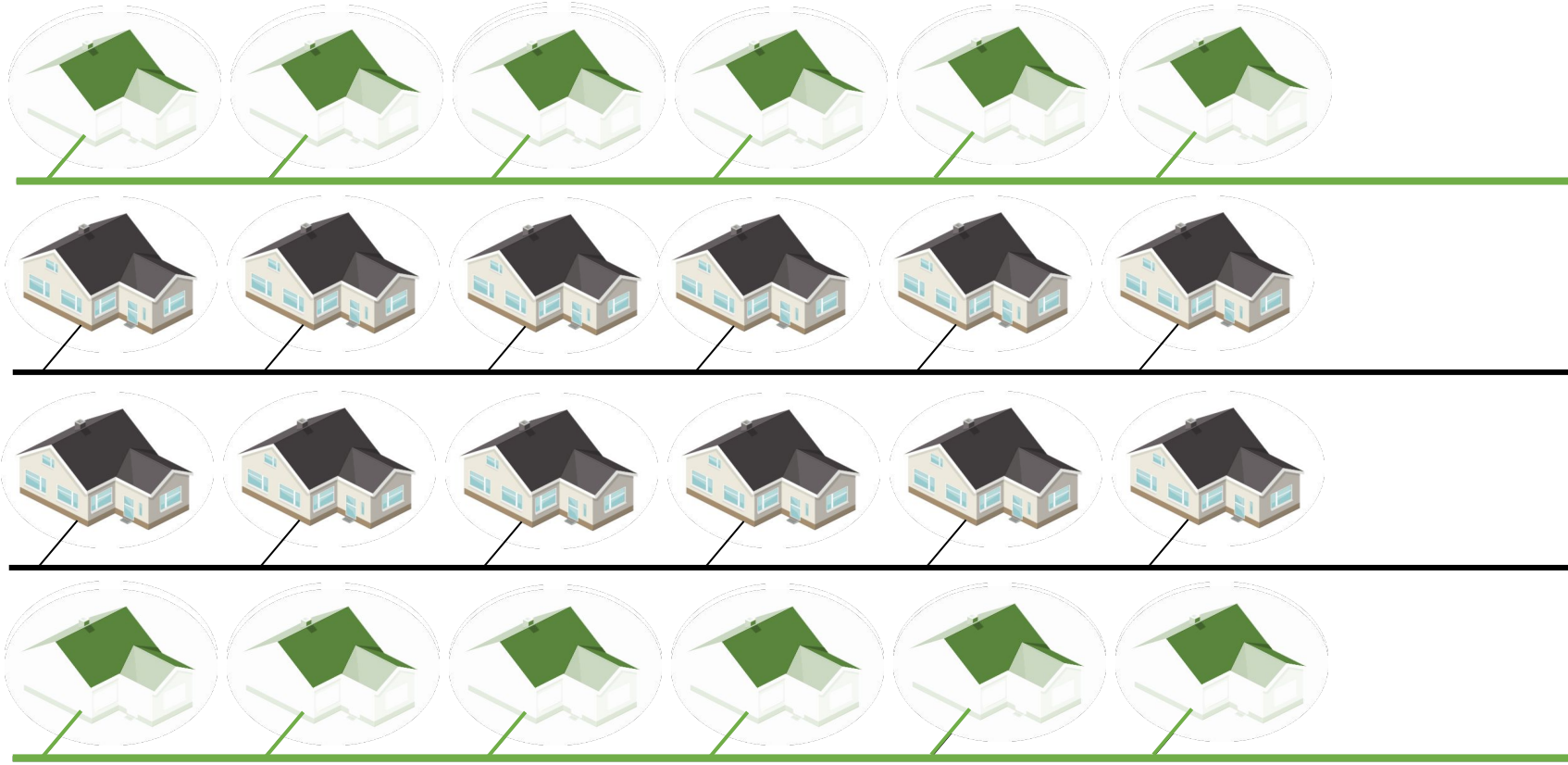
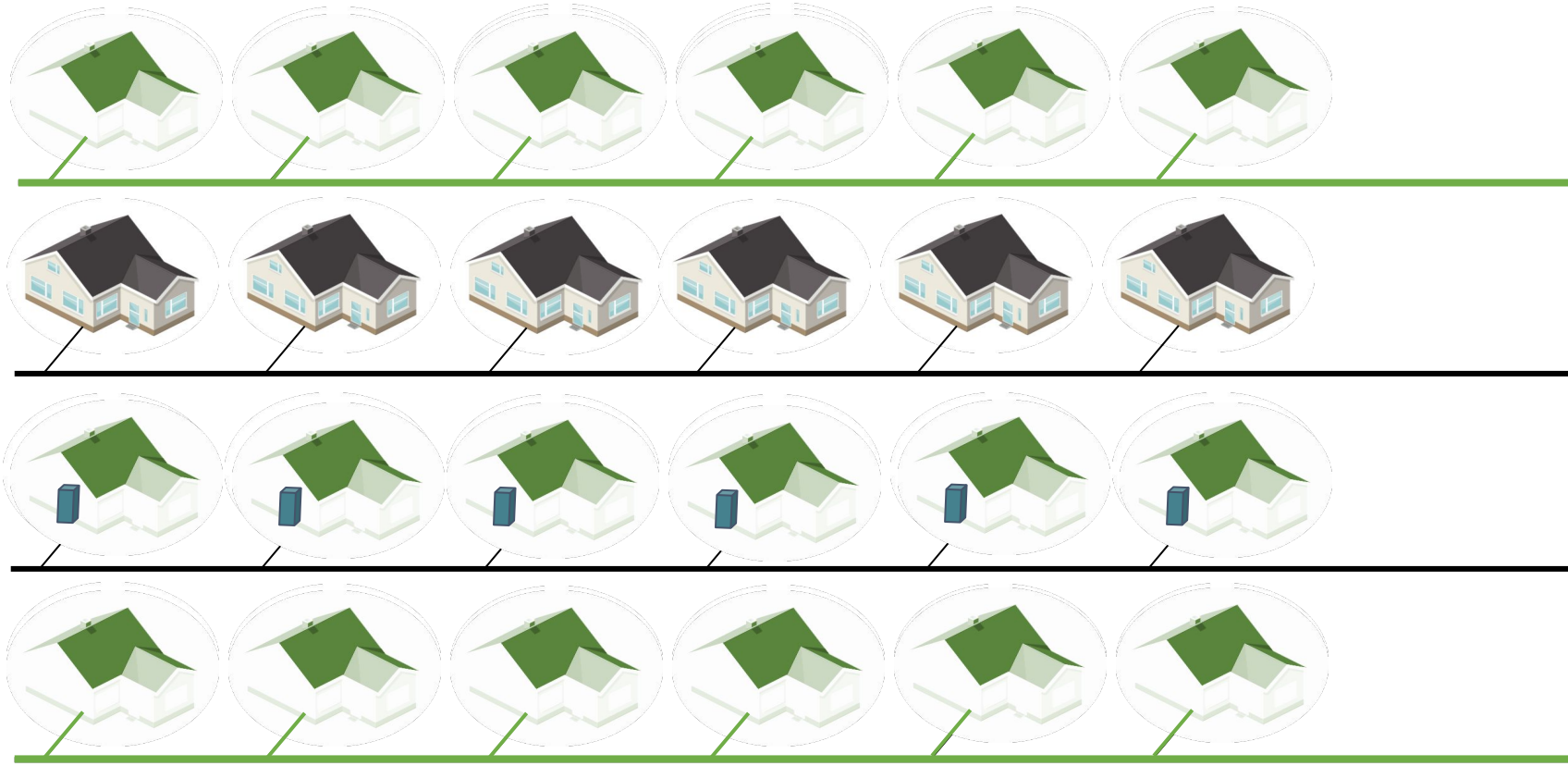
Merged Gas/Geo Rate Rase, Customer Bill Stays Low



Zonal Electrification



National Gas Utility Coalition

Stage	Utilities	Headwinds	Tailwinds
Curious	WGL PGW National Fuel Cascade	• Anti-gas/anti-gas utility sentiments • Complexity of Geo • Lack of helpful policy	• Industry progress • The logic of gas to geo
Researching	NWN Xcel	• Understanding/creating the biz case • Potentially helpful policy but lacking specific directive or demonstrated geo application • Lack of internal capacity and consistent understanding of geo	• Potentially helpful policy • Conceptually seen as a great solution to GHG/political challenges
Pilots submitted	NG Avangrid ConEd	• Determining where netgeo makes sense- feasibility studies expensive- can't do everywhere	• NY Order requiring pilot submissions – creates clarity and reduces utility risk
Pilots underway	VGS Eversource	• Work force availability: designers, drillers • Some municipal permitting	• Customers and jurisdictions lining up to be included in studies and installations

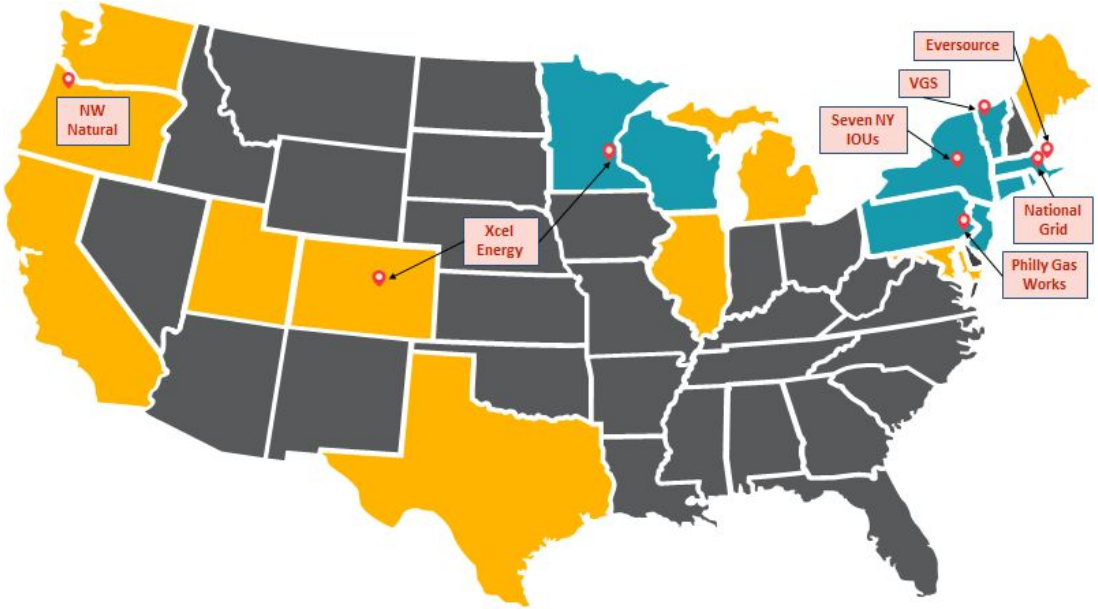
National Advocate Coalition

BUILDING DECARBONIZATION COALITION

Midwest Building Decarbonization Coalition

slipstream

PennFuture



Acadia Center

VERMONT COMMUNITY GEOTHERMAL ALLIANCE

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New Jersey Conservation FOUNDATION

National Progress

- DC - $4M installation
- Maryland - Proposed legislation & feasibility study
- Minnesota - Natural Gas Innovation law
- New York - >40 studies, 1 approved installations, Utility Thermal Energy Network & Jobs law
- Philadelphia - $500k to feasibility study
- Oregon - feasibility study
- Vermont - Installations requested