

The Birth of A New Utility



PUTNAM
FOUNDATION



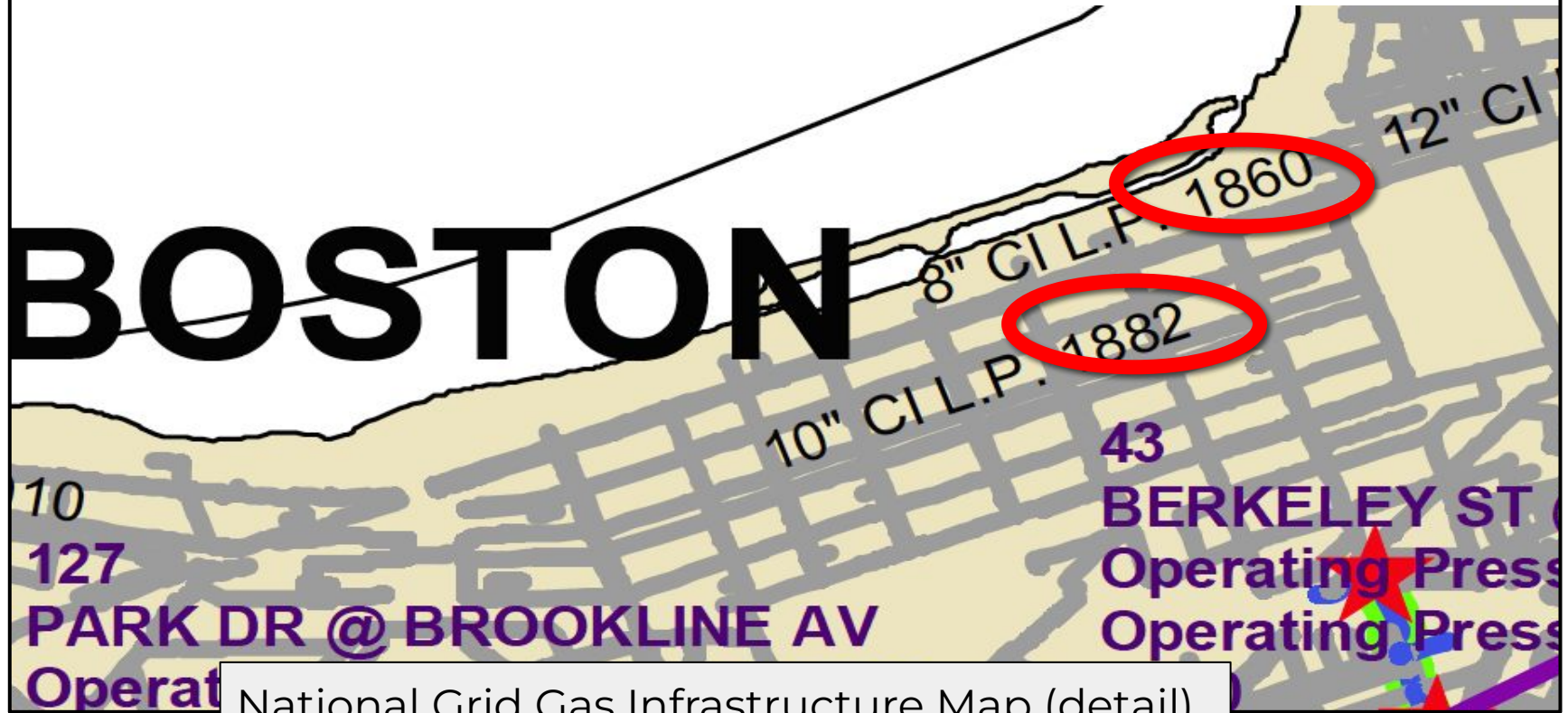
WINSLOW
FOUNDATION

HEET's mission:

To cut carbon emissions now by driving systems change



Problems with Natural Gas Leaks



National Grid Gas Infrastructure Map (detail)

Problems with Natural Gas Leaks



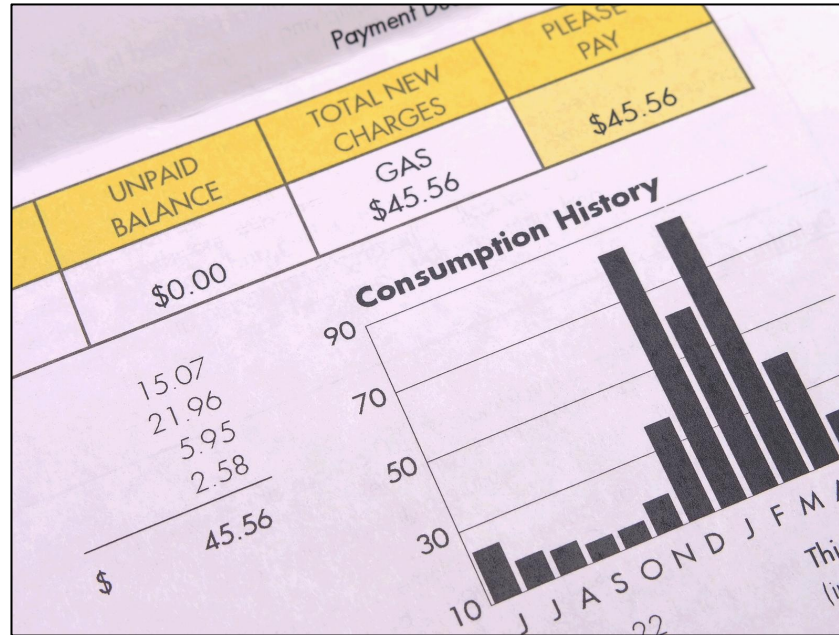
Merrimack Valley Gas Disaster (Sept. 2018)

Problems with Natural Gas Leaks

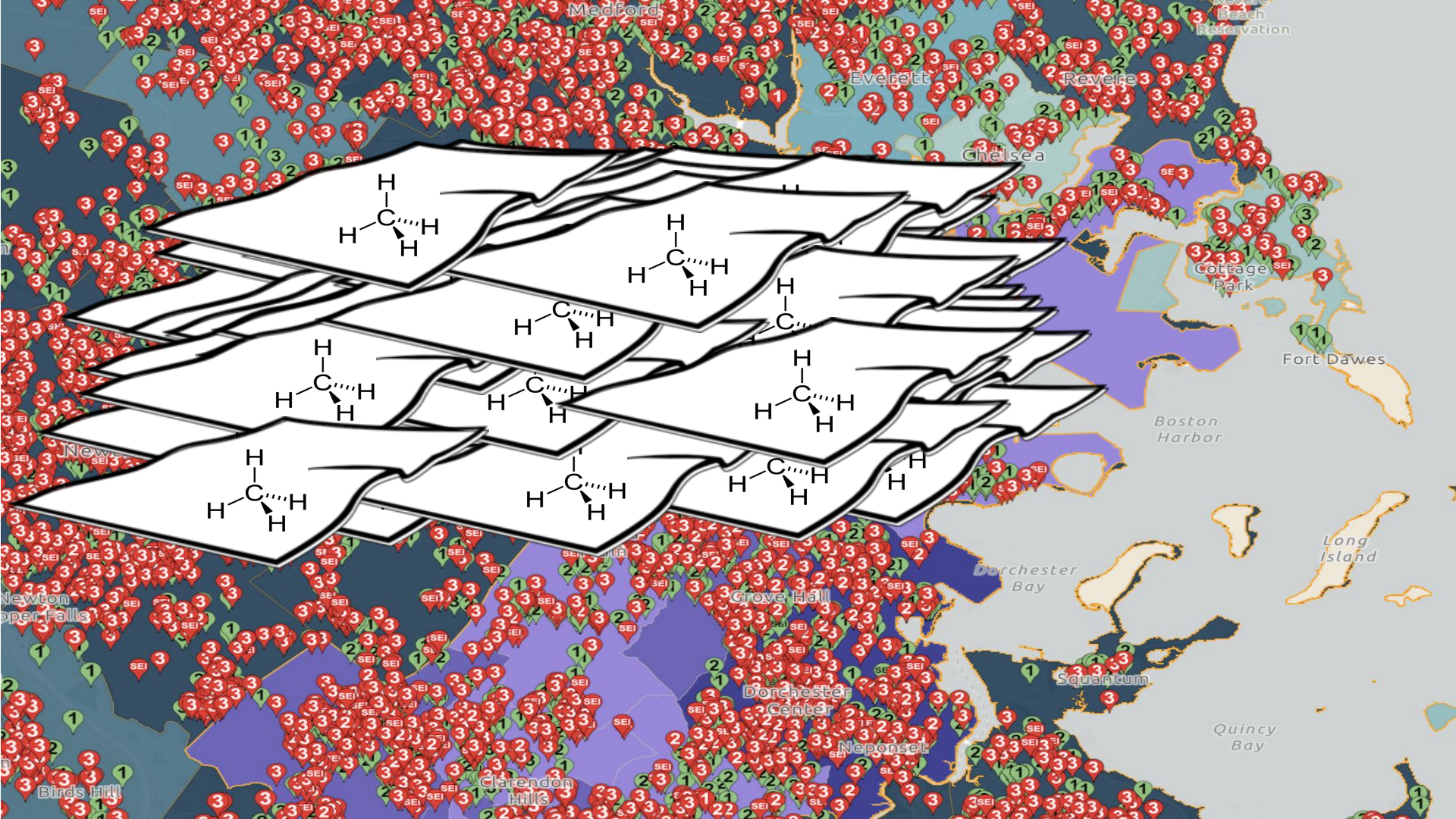


Gas leaks kill trees.

Problems with Natural Gas Leaks



Customers pay for leaked gas.



Significant Environmental Impact leaks (SEIs)

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

THE 191ST GENERAL COURT OF THE
COMMONWEALTH OF MASSACHUSETTS



[Bills & Laws](#) [Budget](#) [Legislators](#) [Hearings & Events](#) [Committees & Commissions](#) [State House](#)

[General Laws](#) » [Part I](#) » [Title XXII](#) » [Chapter 164](#) »



SECTION 144



GENERAL LAWS

Chapter

Section

GO >

Section 144:

Uniform natural gas leaks classification system; grading of reported natural gas leaks; projects on public ways; school zones; gas company response and reporting

Print Page

[< Prev](#)

[Next >](#)

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
)

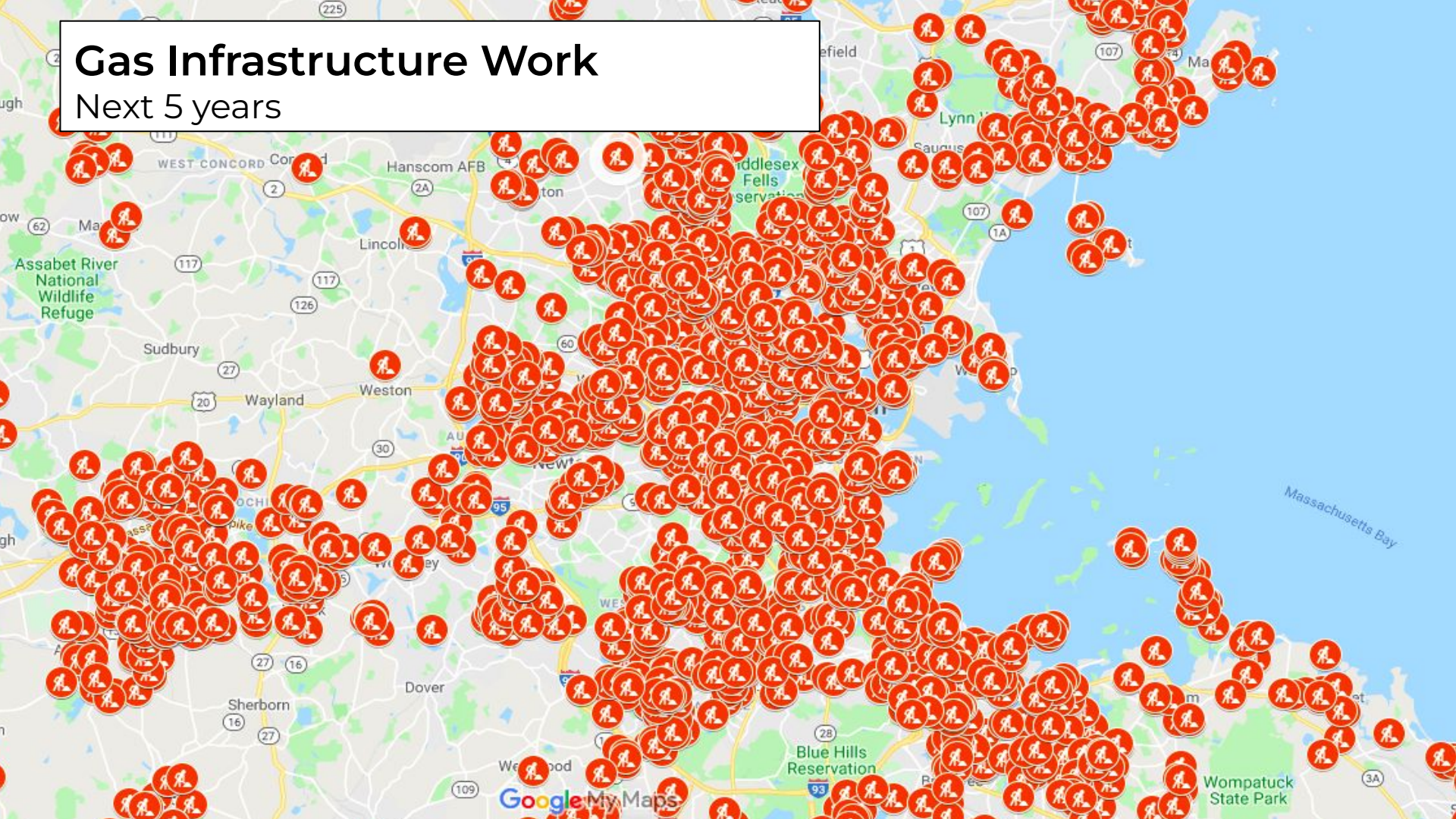
**COMMENTS OF THE RESEARCHERS OF THE LARGE VOLUME LEAK STUDY
ON THE IDENTIFICATION AND REPAIR OF
ENVIRONMENTALLY SIGNIFICANT GRADE 3 LEAKS**

I. Introduction

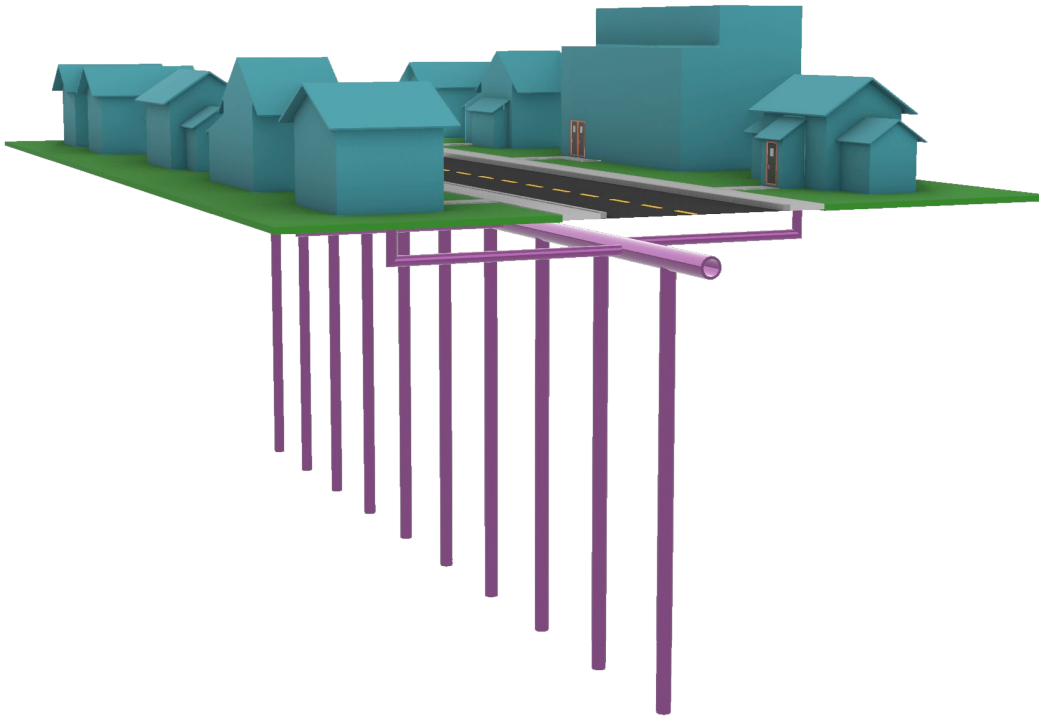
Research Lead Zeyneb Magavi and HEET (Home Energy Efficiency Team, Inc. - a Massachusetts nonprofit corporation), as well as Bay State Gas Company d/b/a Columbia Gas of

Gas Infrastructure Work

Next 5 years

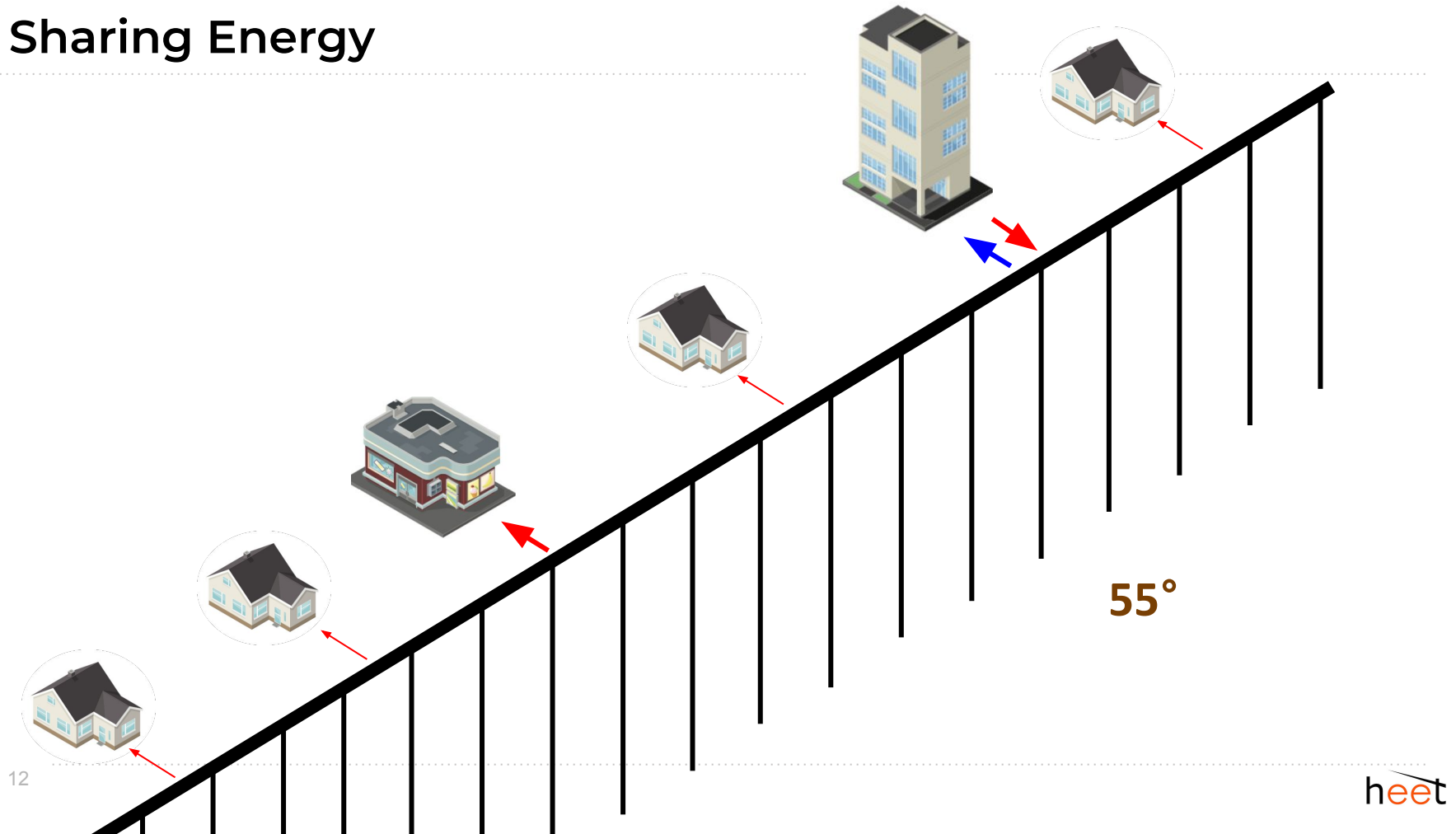


Networked Geothermal (ground source heat pumps)

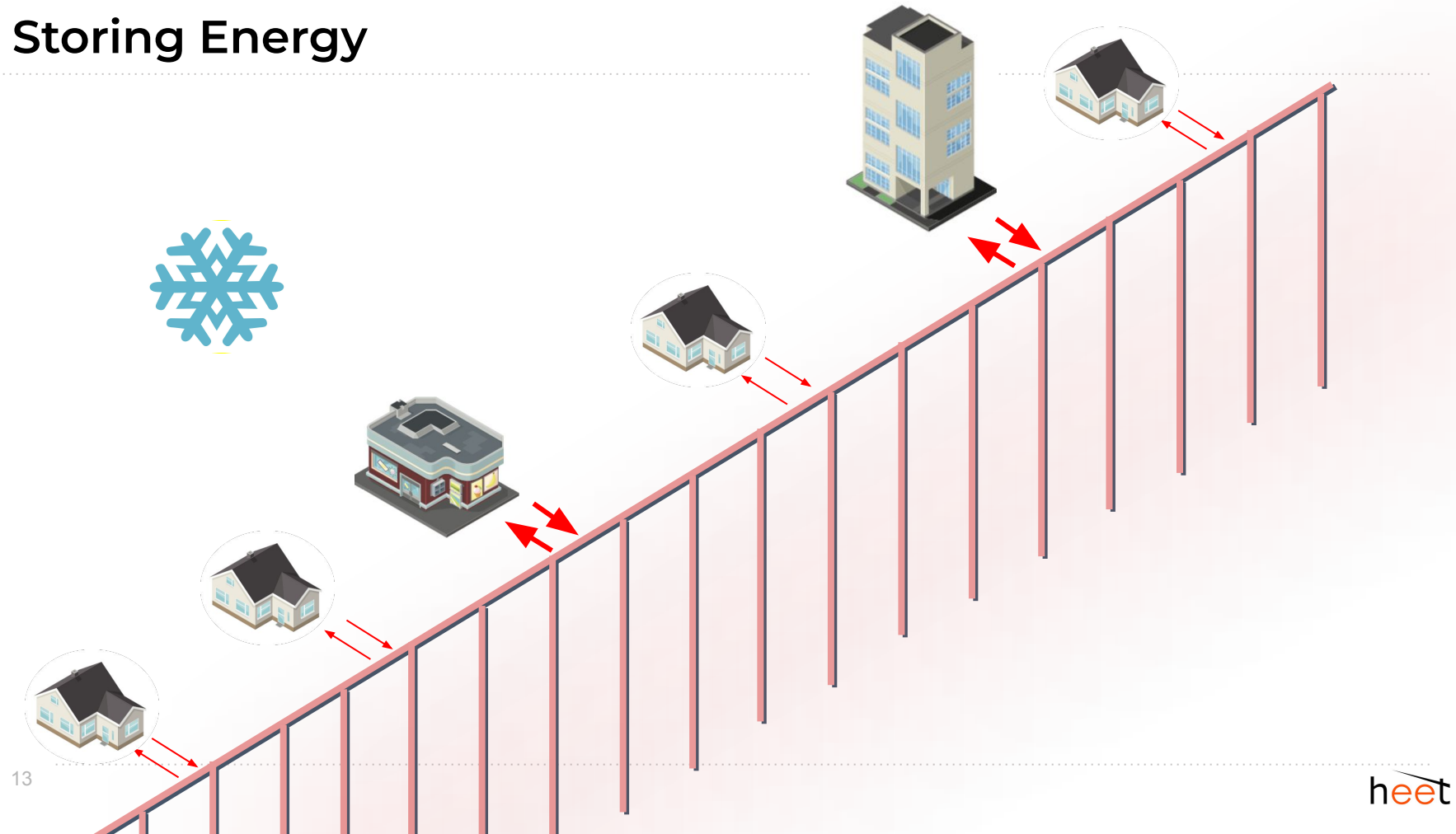


- Infrastructure in the street
- “Shallow” boreholes
- Ambient temperature
- Single pipe
- No glycol
- Active thermal management

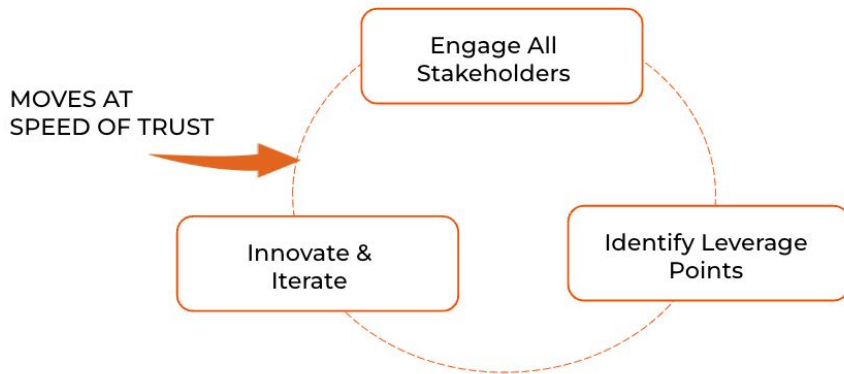
Sharing Energy



Storing Energy



HEET Methods



Outcomes

Merrimack Valley Gas Disaster 2018

- Safer

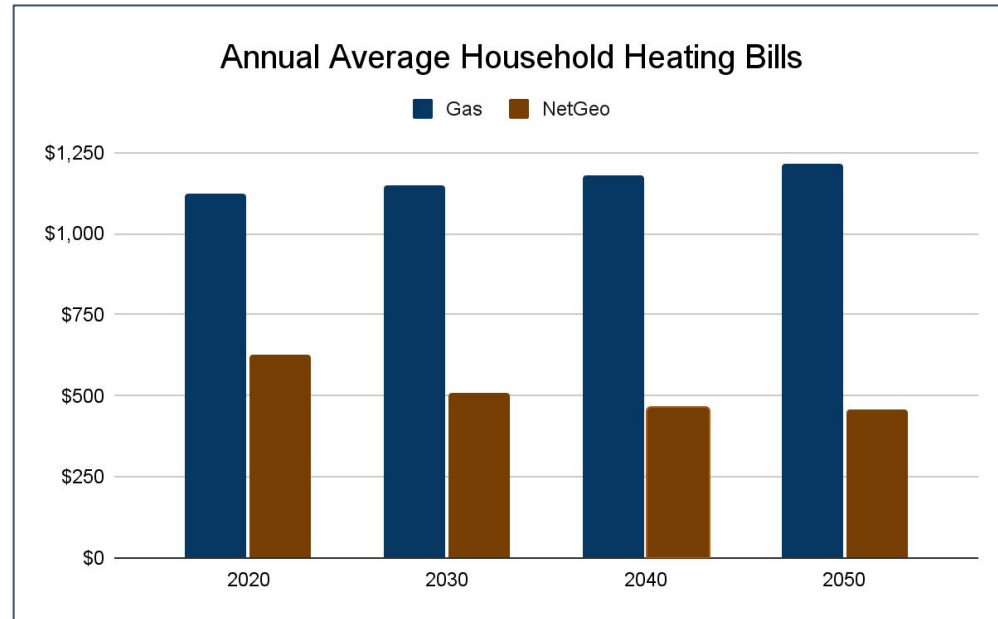


Outcomes

- Safer
- Lower customer heating bills

MA Energy Bill Projection (gas vs. networked geothermal)

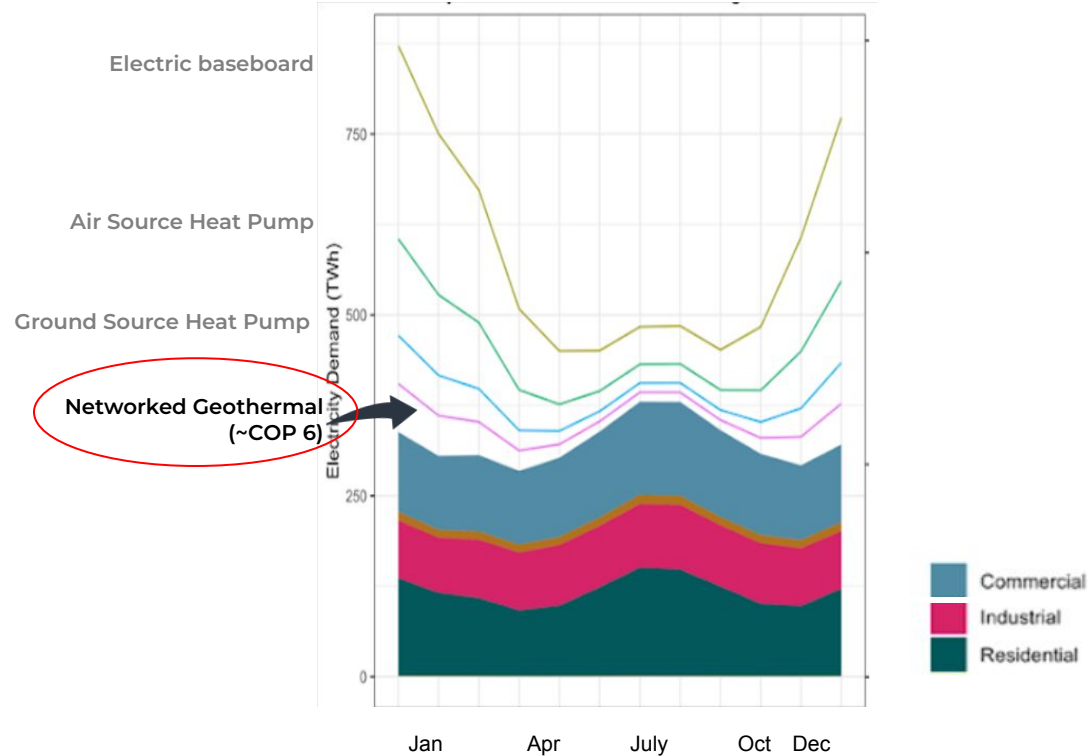
(Applied Economics Clinic Brief)



Outcomes

- Safer
- Lower customer heating bills
- Lower electric peaks

Future US Seasonal Electric Peaks (as we electrify)



Outcomes

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



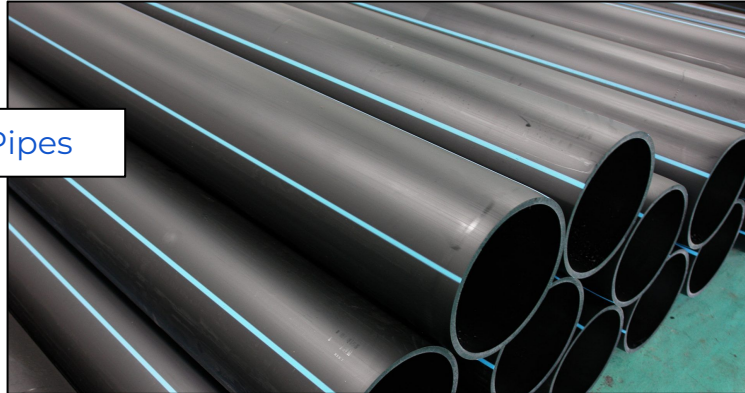
Outcomes

- 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

Gas Heating

**Networked
Geothermal
Now
60% less**

**Networked
Geothermal
2050**

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

HEET Research Team

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

Framingham, MA

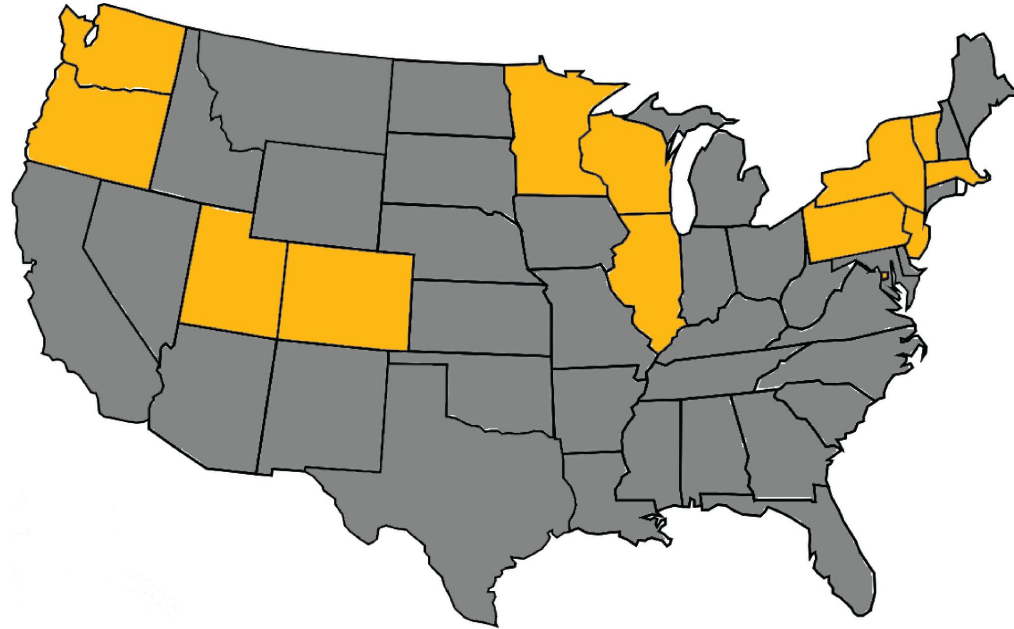


National Progress

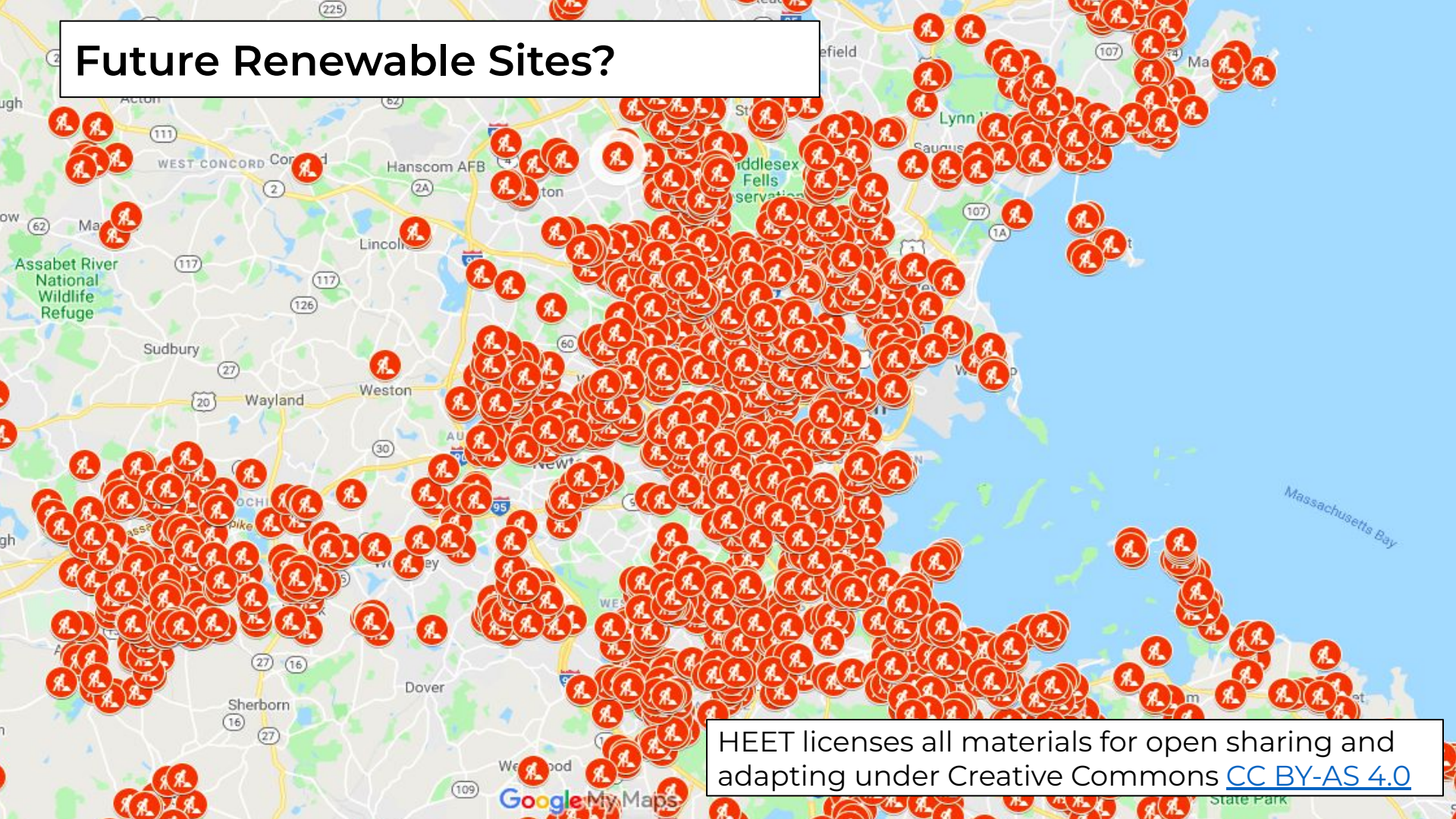
13 states, 14 utilities

Feasibility studies on networked geothermal

Legislation to allow gas utilities to become thermal utilities



Future Renewable Sites?



HEET licenses all materials for open sharing and adapting under Creative Commons [CC BY-AS 4.0](https://creativecommons.org/licenses/by-as/4.0/)

“Super-emitting” Gas Leaks



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>

[Get rights and content](#)



Significant Environmental Impact leaks (SEIs)

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

Question:
How to identify the SEIs?

THE 191ST GENERAL COURT OF THE
COMMONWEALTH OF MASSACHUSETTS



Bills & Laws

Budget

Legislators

Hearings & Events

Committees & Commissions

State House

[General Laws](#) » [Part I](#) » [Title XXII](#) » [Chapter 164](#) »

SECTION 144



GENERAL LAWS

Section 144: Uniform natural gas leaks classification system; grading

Print Page

< Prev

Next >

Large Volume Leak Study

HEET's study

- National Grid
- Columbia Gas
- Eversource

Determine identification method.

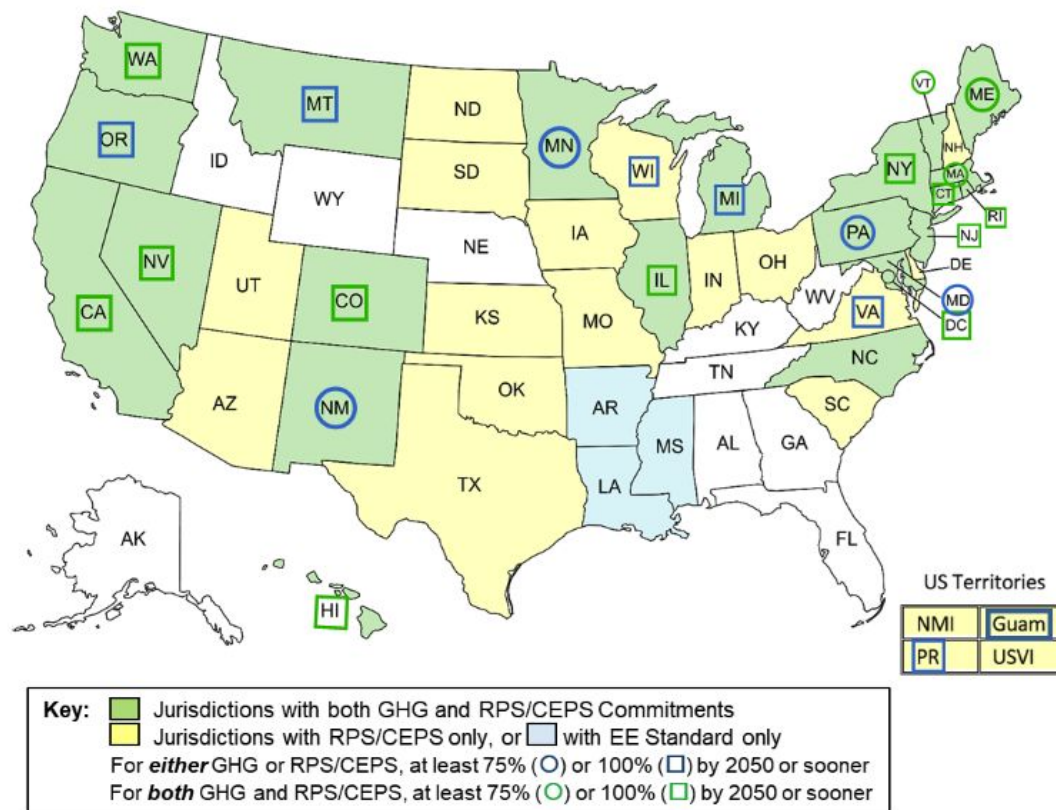


Leak Extent Method

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

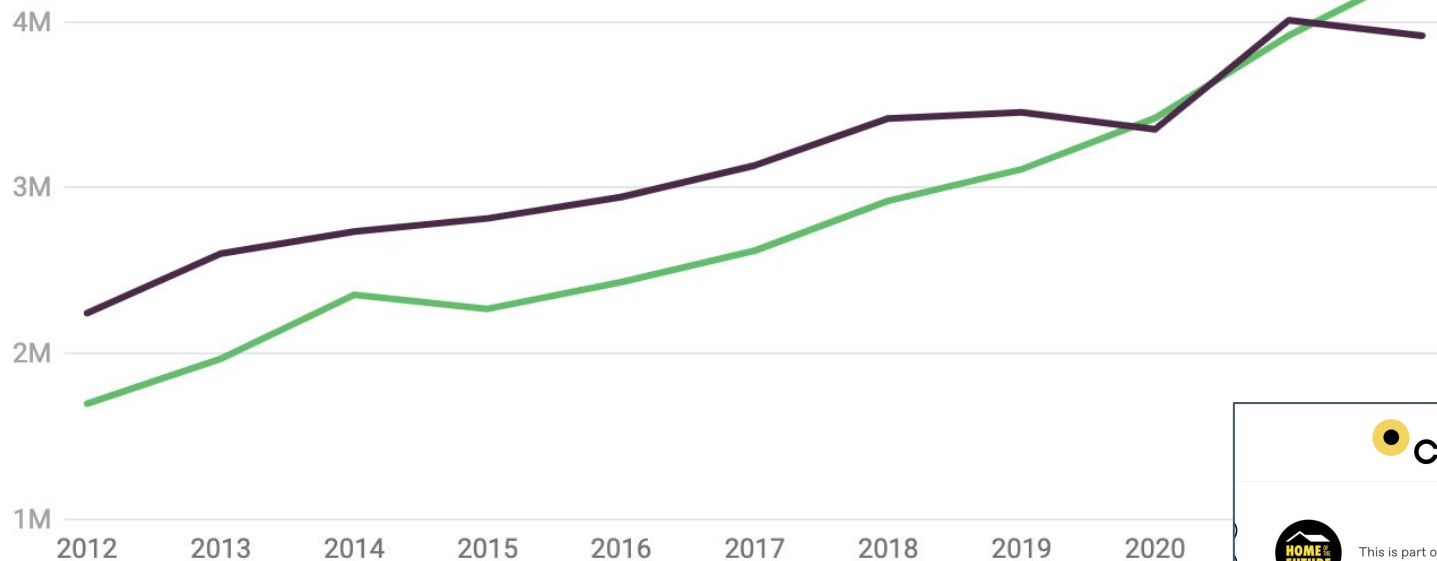


Decarbonization Commitments



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

Heat pump sales Gas furnace sales



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



HEET 2219-1551
LEARNING FROM
 GeoMicroDistrict Pilot: Insights from the
 Audrey Schulman, Business Manager
 Zeyneb Magavi, Principal Investigator

HEET is an award-winning Mass concept and that aims to achieve the following:

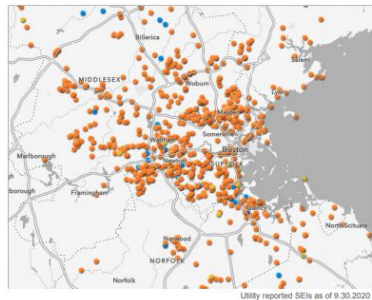
1. Evaluate the pilot GeoMicroDistrict demands for an approximately minimize energy use and costs, borehole thermal energy storage resilience and reduce overall costs.
2. Establish a standard method policy makers and utilities of use impacts of GeoMicroDistricts. E business case for utilities to invest transformation.

GeoMicroDistricts use bidirectional borehole thermal energy storage as the prime source of thermal for buildings. A subsurface ambient temperature water loop, maintains

Significant

Shared Ac

Utilities E



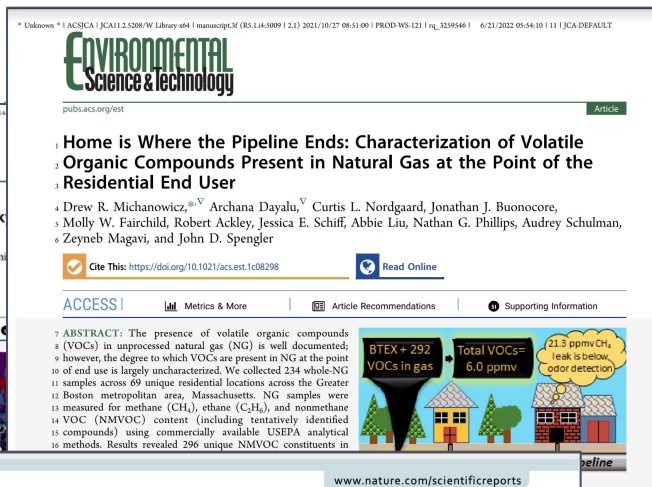
scientific reports

OPEN

Inefficient Building Electrification Will Require Massive Buildout of Renewable Energy and Seasonal Energy Storage

Jonathan J. Buonocore^{1,✉}, Parichehr Salimifard^{2,3}, Zeyneb Magavi⁴ & Joseph G. Allen¹

Building electrification is essential to many full-economy decarbonization pathways. However, current decarbonization modeling in the United States (U.S.) does not incorporate seasonal fluctuations in building energy demand, seasonal fluctuations in electricity demand of electrified buildings, or the ramifications of this system demand for electricity generation. Here, we examine historical energy data in the U.S. to evaluate current seasonal fluctuation in total energy demand and management of seasonal fluctuations. We then model additional electricity demand under different building electrification scenarios and the necessary increases in wind or solar PV to meet this demand. We found that U.S. monthly average total building energy consumption varies by a factor of 1.6x—lowest



Energy Policy
 Volume 162, March 2022, 112778

Environmental justice analysis of distribution-natural gas leaks in Massachusetts, USA

✉, Dominic Nicholas ✉

ndeley Share Cite

10.1016/j.enpol.2022.112778

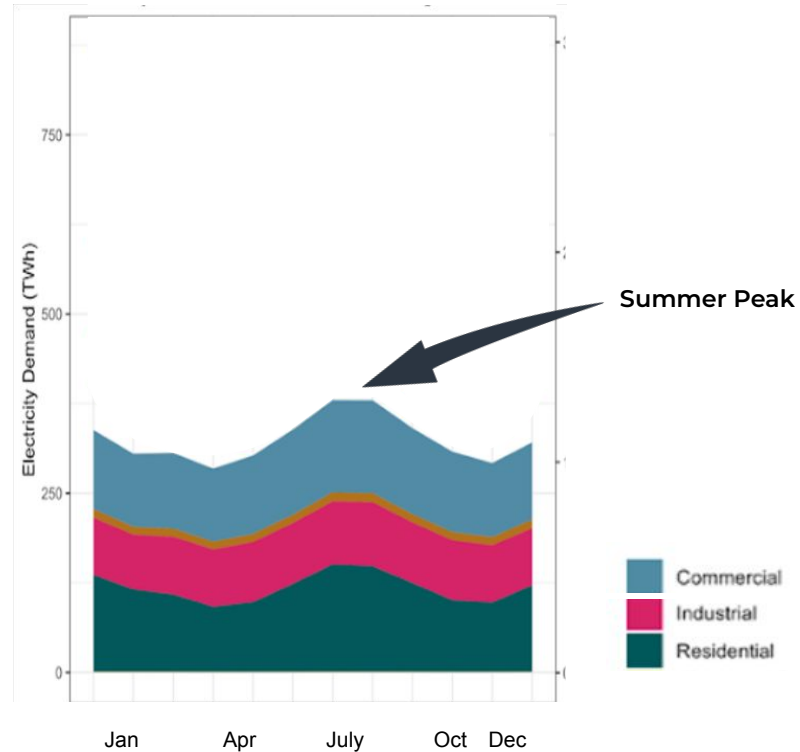
Commons license

Get rights and content

Open access

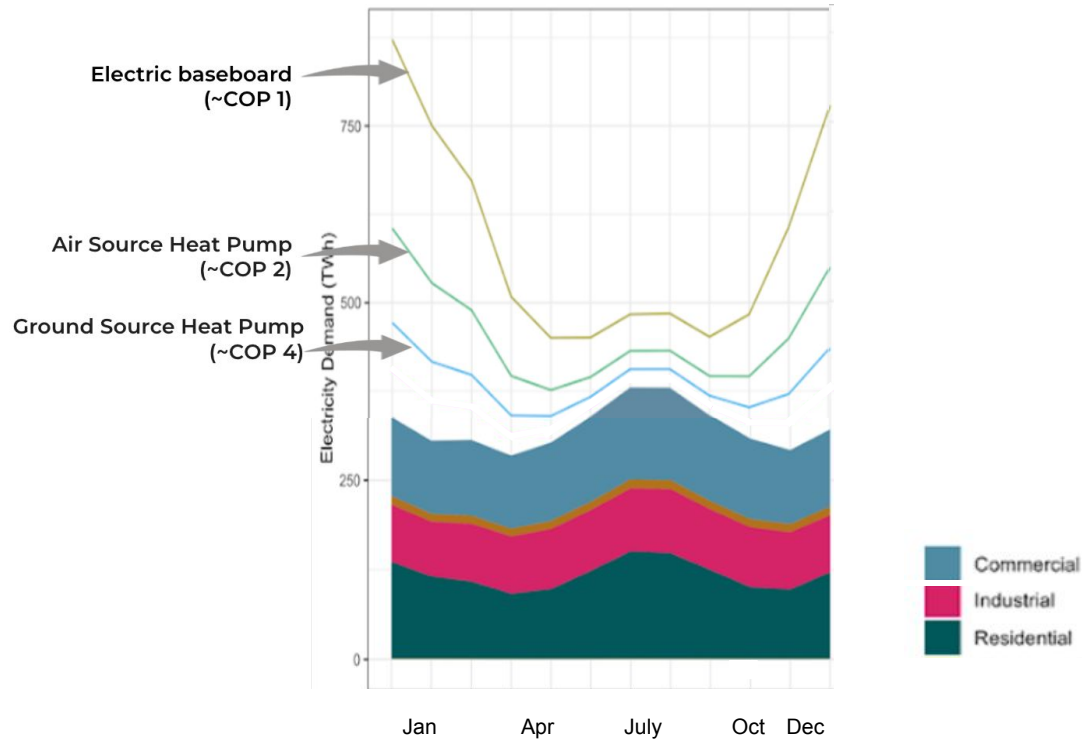
Current US Seasonal Electric Peaks

(for buildings)

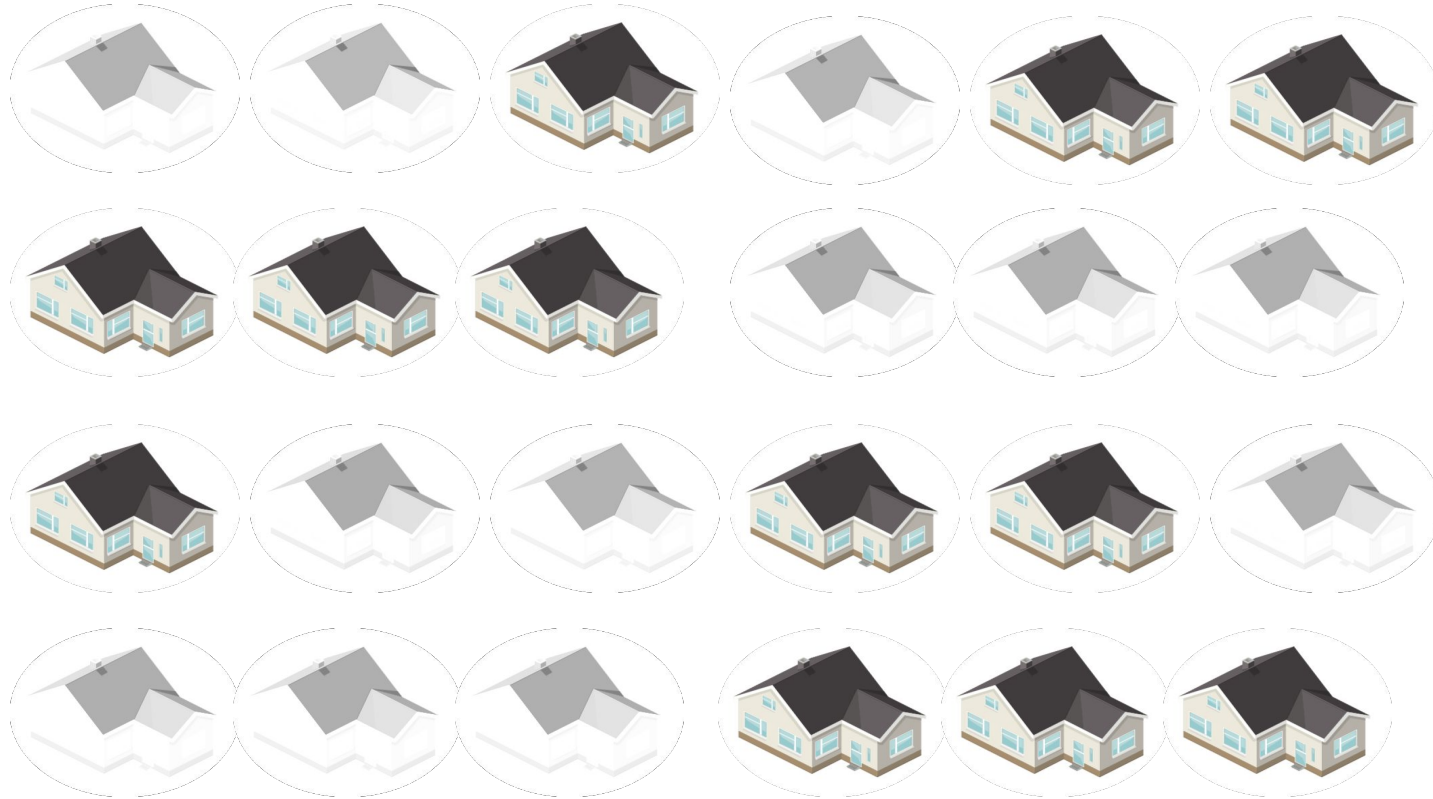


Future US Seasonal Electric Peaks

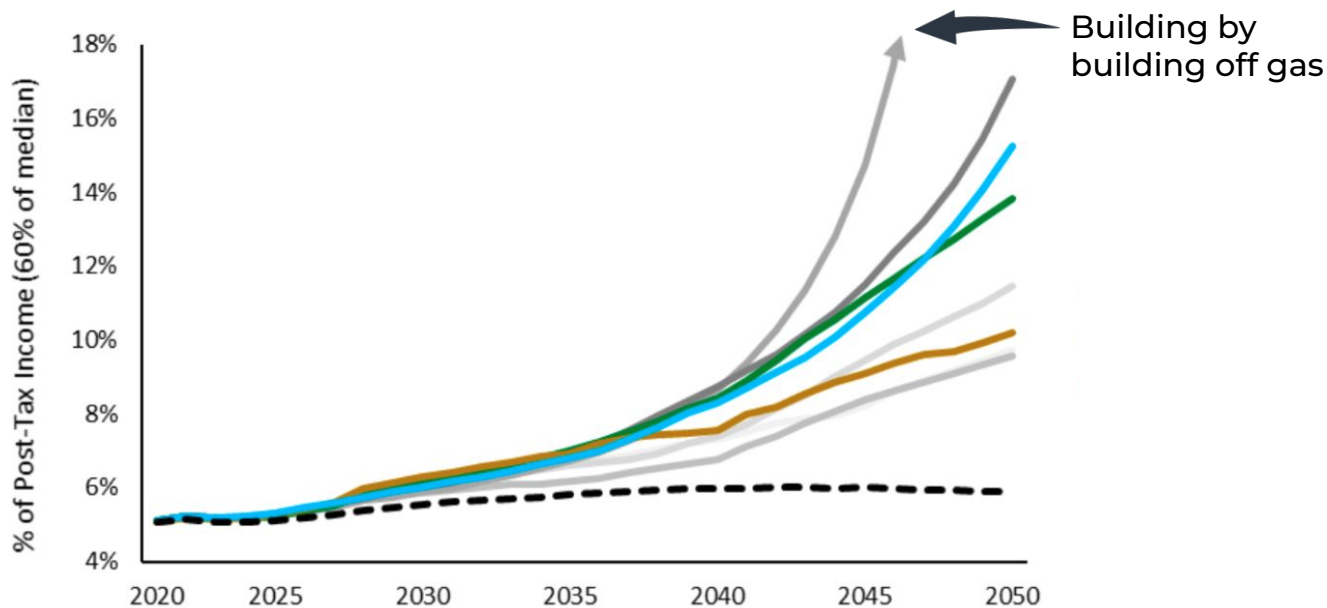
(for buildings)



Fleeing Customers, Increasing Gas Bills



Increasing Energy Burden for Low-income Customers

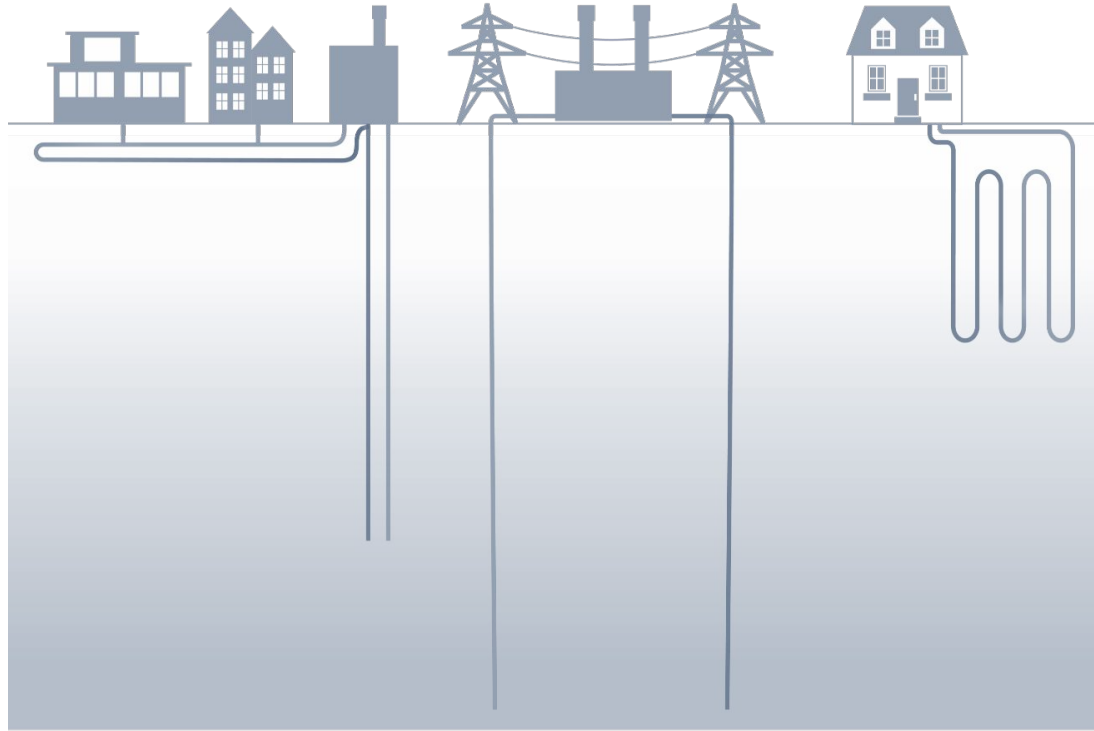


Source: E3, Report for Massachusetts Gas Utilities, 2022

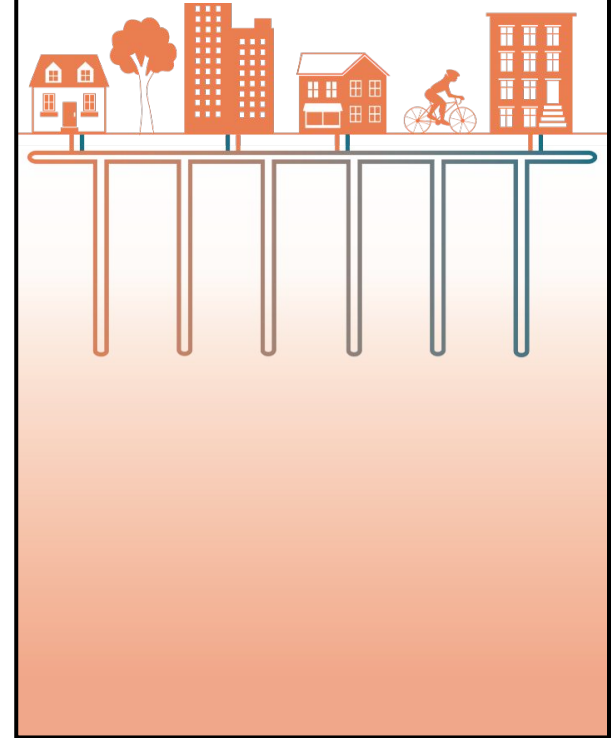
Geo District

Geo Power

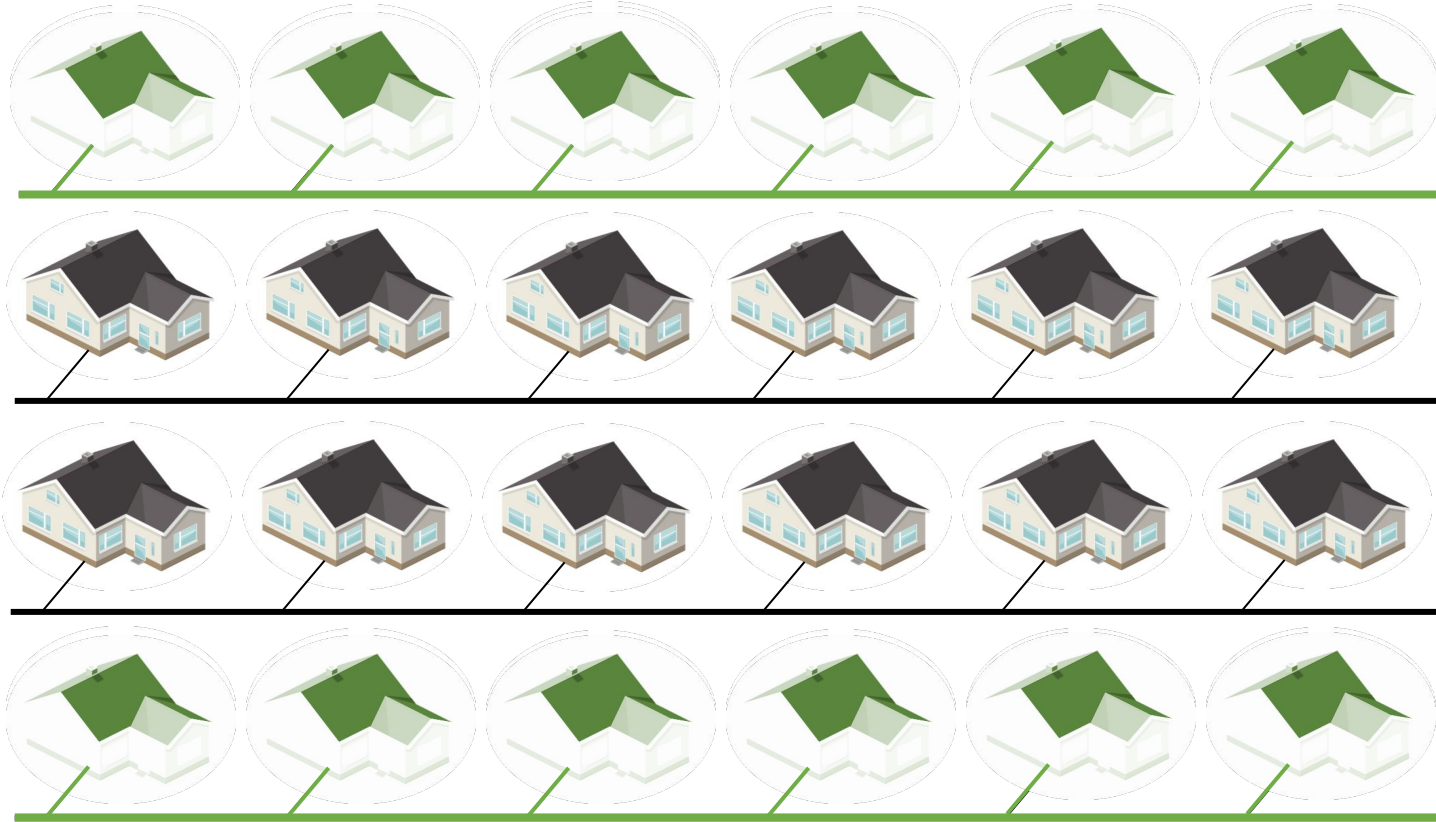
Geo Building



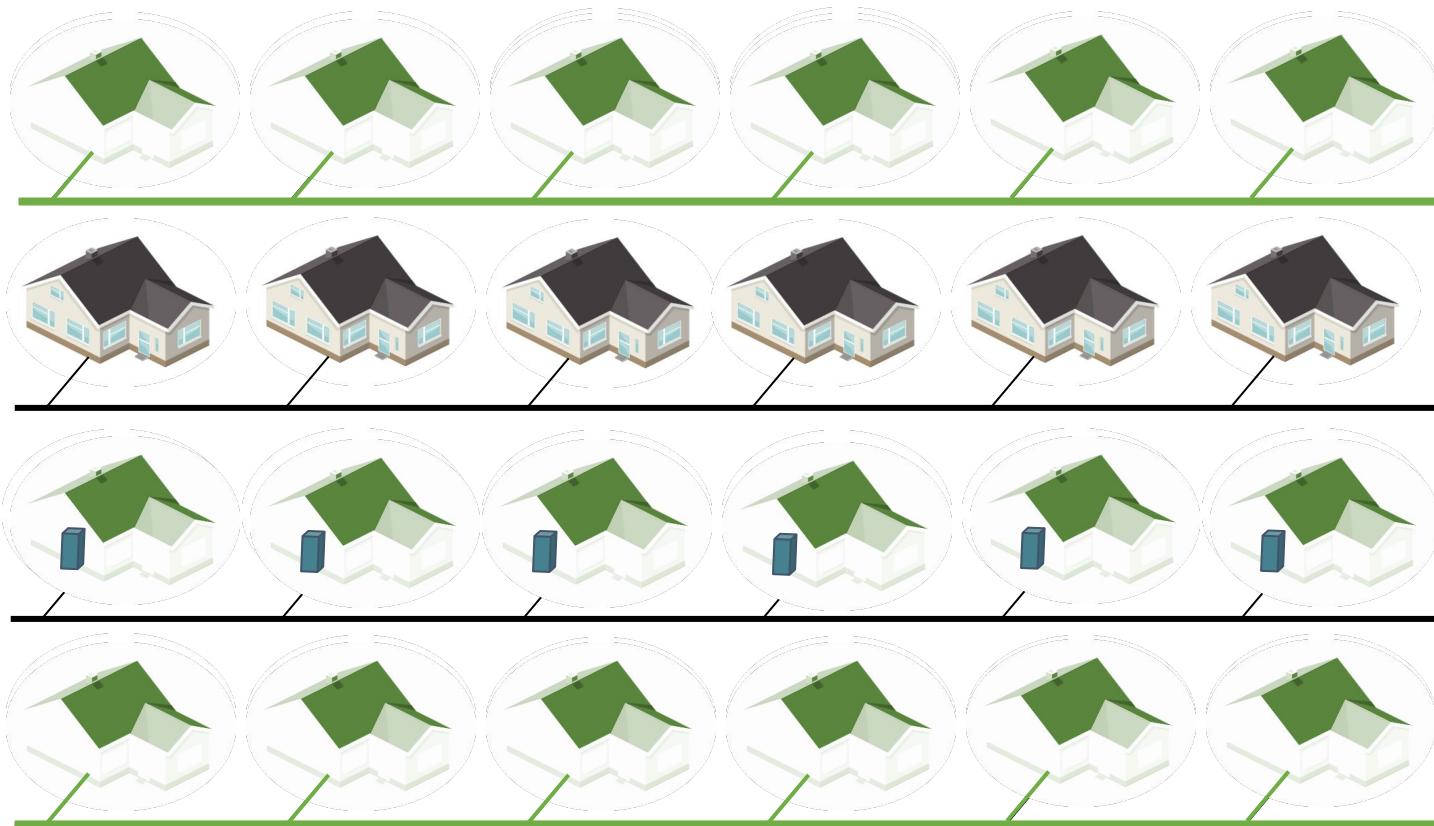
**Networked
Geothermal**



Merged Gas/Geo Rate Rase, Customer Bill Stays Low



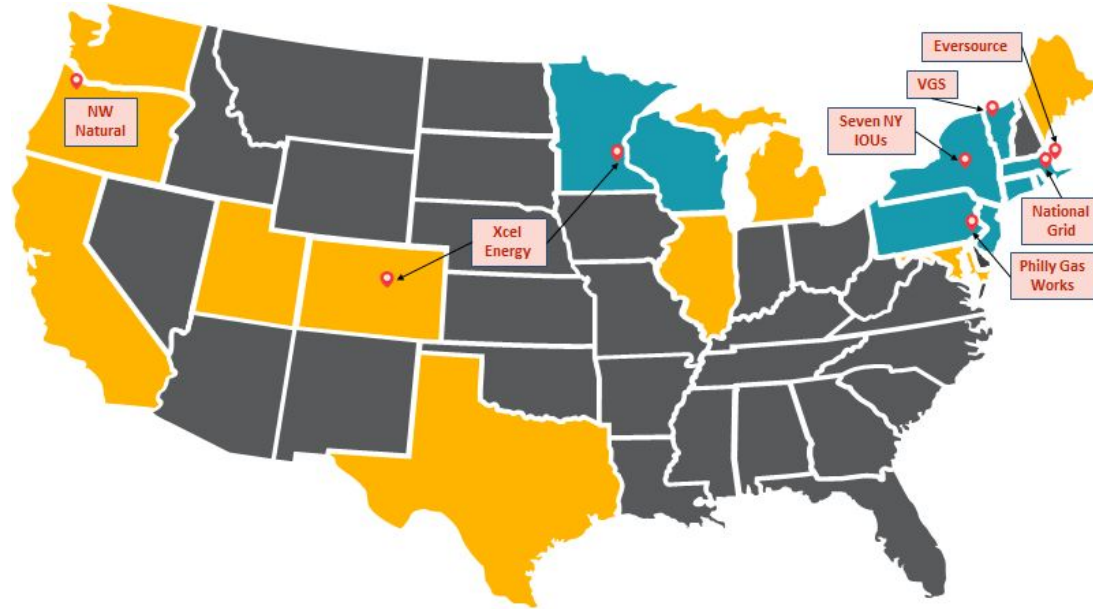
Zonal Electrification



National Gas Utility Coalition

Stage	Utilities	Headwinds	Tailwinds
Curious	WGL PGW National Fuel Cascade	<ul style="list-style-type: none"> • Anti-gas/anti-gas utility sentiments • Complexity of Geo • Lack of helpful policy 	<ul style="list-style-type: none"> • Industry progress • The logic of gas to geo
Researching	NWN Xcel	<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • Potentially helpful policy • Conceptually seen as a great solution to GHG/political challenges
Pilots submitted	NG Avangrid ConEd	<ul style="list-style-type: none"> • Determining where netgeo makes sense- feasibility studies expensive- can't do everywhere 	<ul style="list-style-type: none"> • NY Order requiring pilot submissions – creates clarity and reduces utility risk
Pilots underway	VGS Eversource	<ul style="list-style-type: none"> • Work force availability: designers, drillers • Some municipal permitting 	<ul style="list-style-type: none"> • Customers and jurisdictions lining up to be included in studies and installations

National Advocate Coalition



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

