The Future of Gas

Audrey.Schulman@HEET.org

Barr Foundation
Putnam Foundation
E4 THE FUTURE
Winslow Foundation
ENERGY FOUNDATION
MASSACHUSETTS CLEAN ENERGY CENTER

Community Activist

Utility Executive

Steelworkers Union Leader

MIT academic

Networked Leadership

State Regulator

Geothermal Expert

Governor's Office

"Gas is the Bridge Fuel" originator

HEET's Research

GEO
MICRO
DISTRICT

Feasibilit

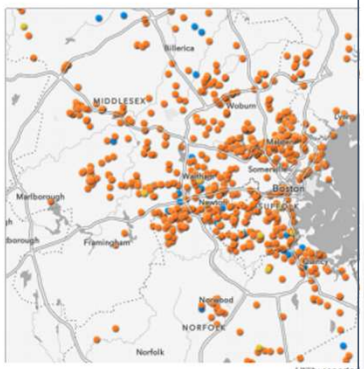
heet

Significant Environmental Impact (SEI)
Natural Gas Leaks

Shared Action Plan Year 1 (20

Utilities Enacting the Leak Extent

April 27th 2021



Utility reported

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HEET 2219-1551

LEARNING FROM THE GRO

GeoMicroDistrict Pilot: Installation, Evaluation ar

Audrey Schulman, Business Manager
Zeyneb Magavi, Principal Investigator

oDistrict

HEET is an award-winning Massachusetts nonprofit that c
concept and that aims to achieve two goals over the thre

1. **Evaluate the pilot GeoMicroDistrict capacity** a) meet a
demands for an approximately 100,000 sf dense, mixed-
minimize energy use and costs through optimization and
borehole thermal energy storage c) positively interact wi
resilience and reduce overall cost.

2. **Establish a standard method of GeoMicroDistrict research and evaluation** to inform policy makers and utilities of significant engineering and economic considerations and impacts of GeoMicroDistricts. By driving down costs and risks, the aim is to develop a business case for utilities to install networked geothermal systems, driving rapid market transformation.

GeoMicroDistricts use bidirectional borehole thermal energy storage (BTES) as the prime source of thermal energy for buildings. A subsurface ambient temperature water loop, maintained at

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ENVIRONMENTAL Science & Technology

pubs.acs.org/est

Policy Analysis

Repair Failures Call for New Policies to Tackle Leaky Natural Gas Distribution Systems

Morgan R. Edwards,* Amanda Giang, Gregg P. Macey, Zeyneb Magavi, Dominic Nicholas, Robert Ackley, and Audrey Schulman

Cite This: https://doi.org/10.1021/acs.est.0c07531

Read Online

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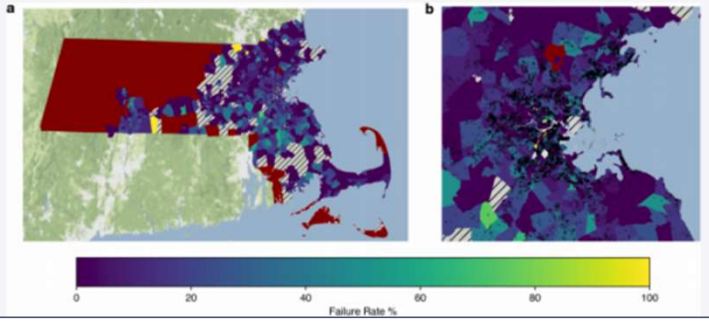

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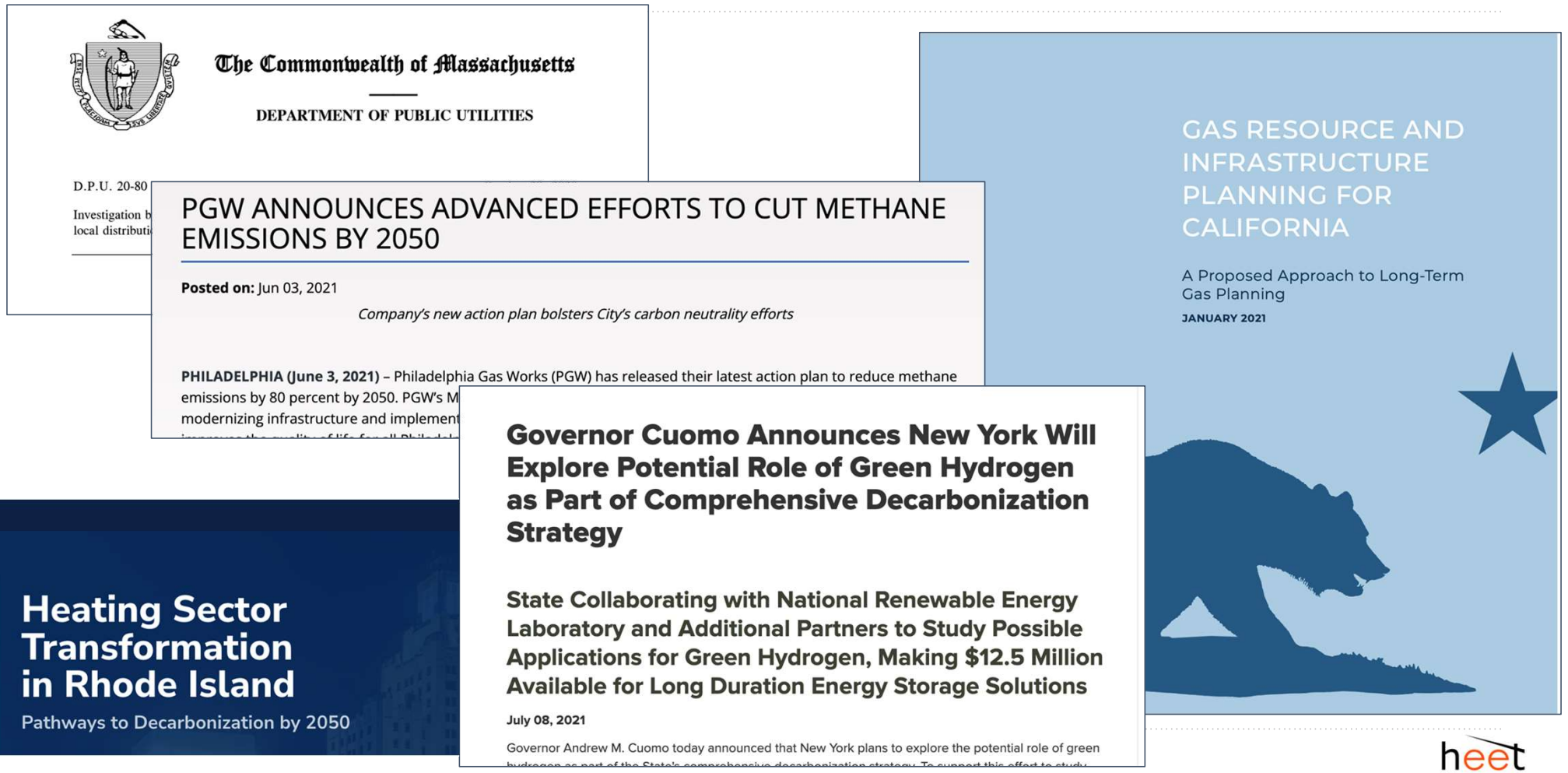
Gas Decarbonization Planning



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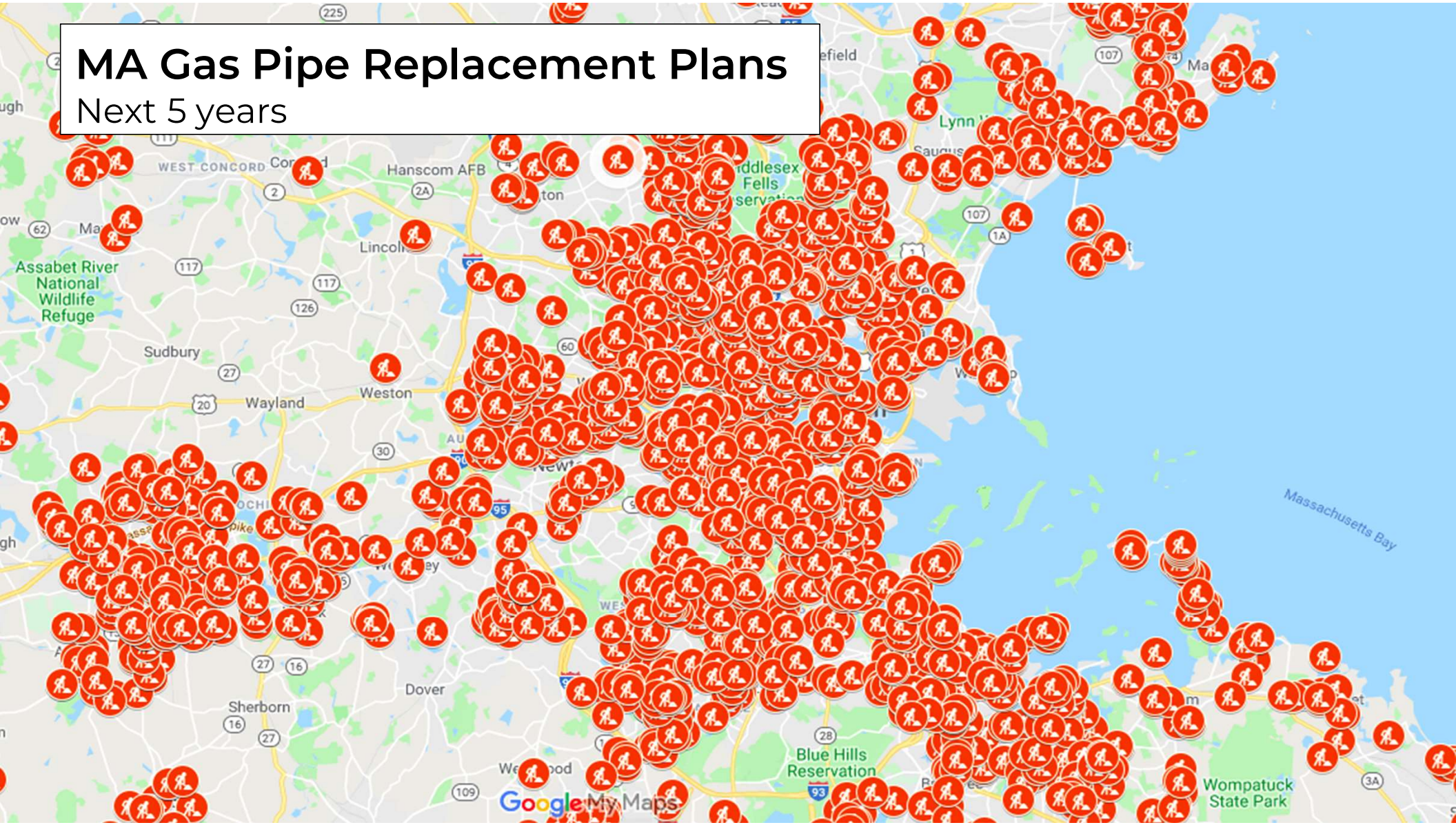
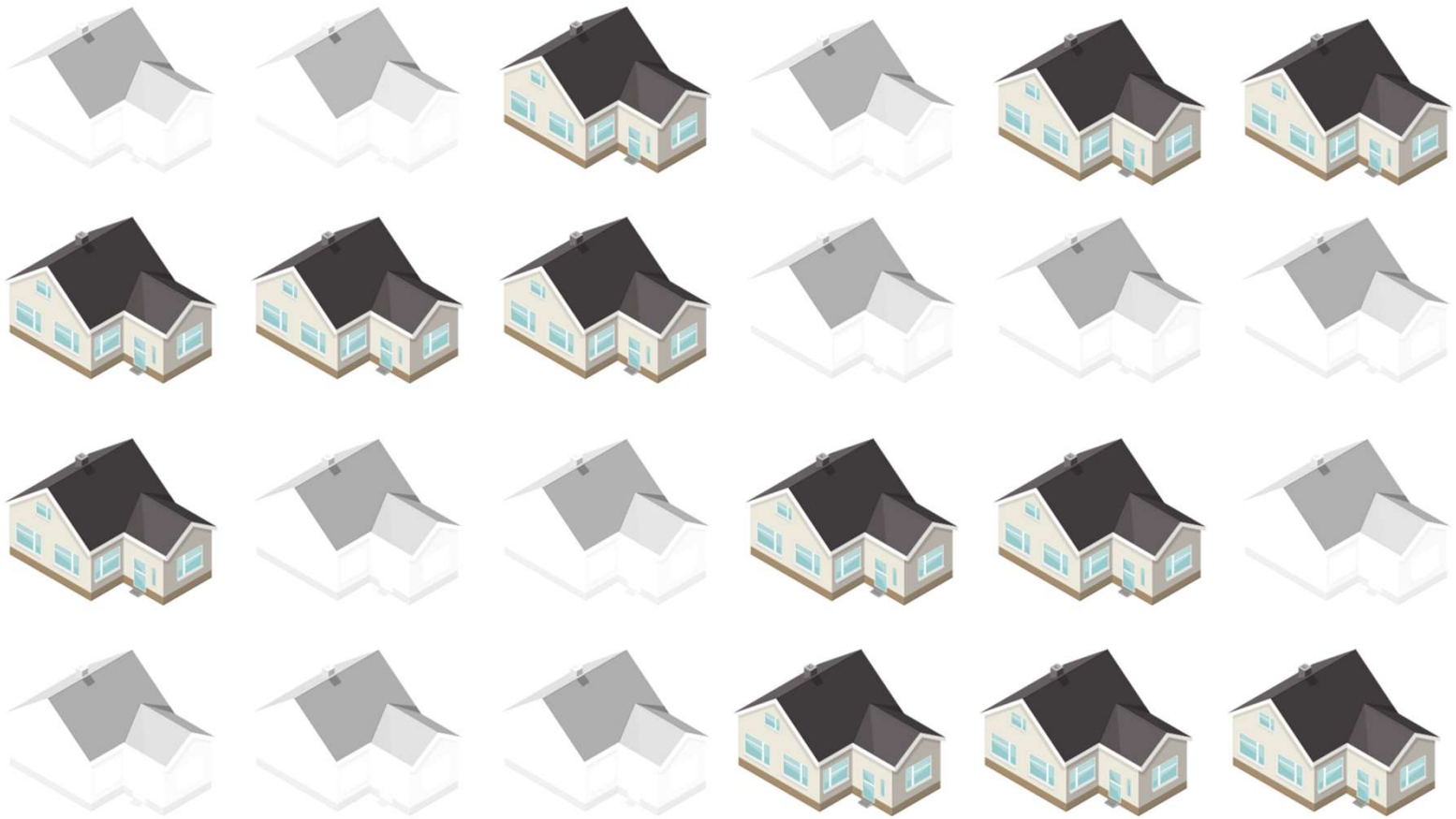
MA Gas Pipe Replacement Plans

Next 5 years



Fleeing Customers, Increasing Gas Bills



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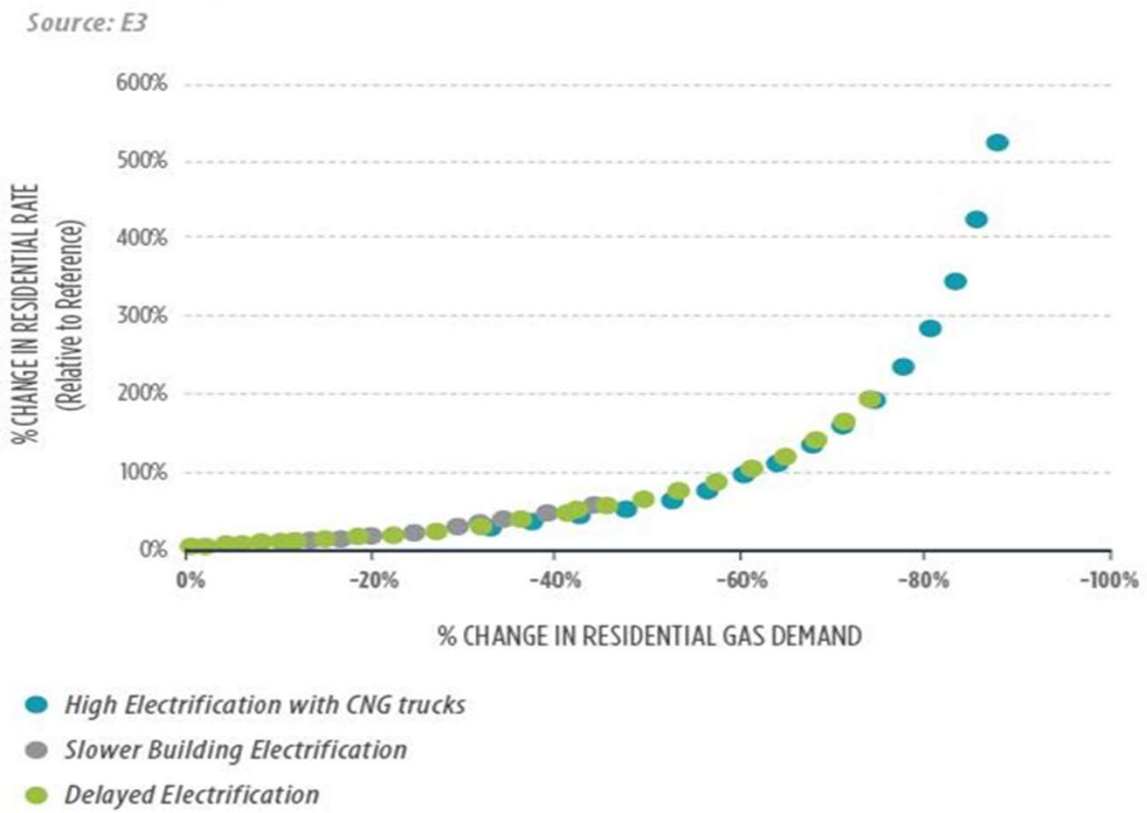
CA Projected Gas Price as Rate Base Declines



Gridworks GRIP Briefing Deck webinar 2/12/2021

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Why It’s Important

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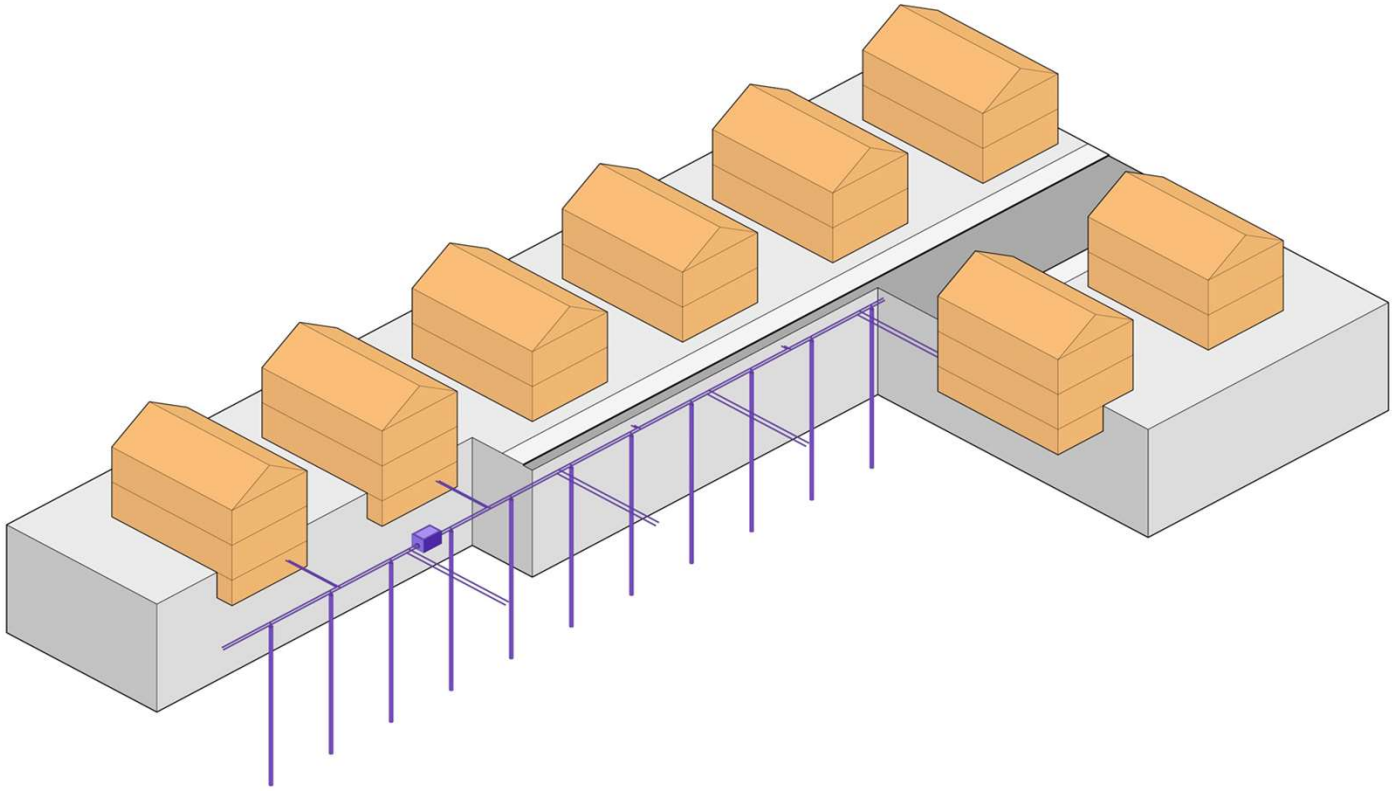
Possible Solution

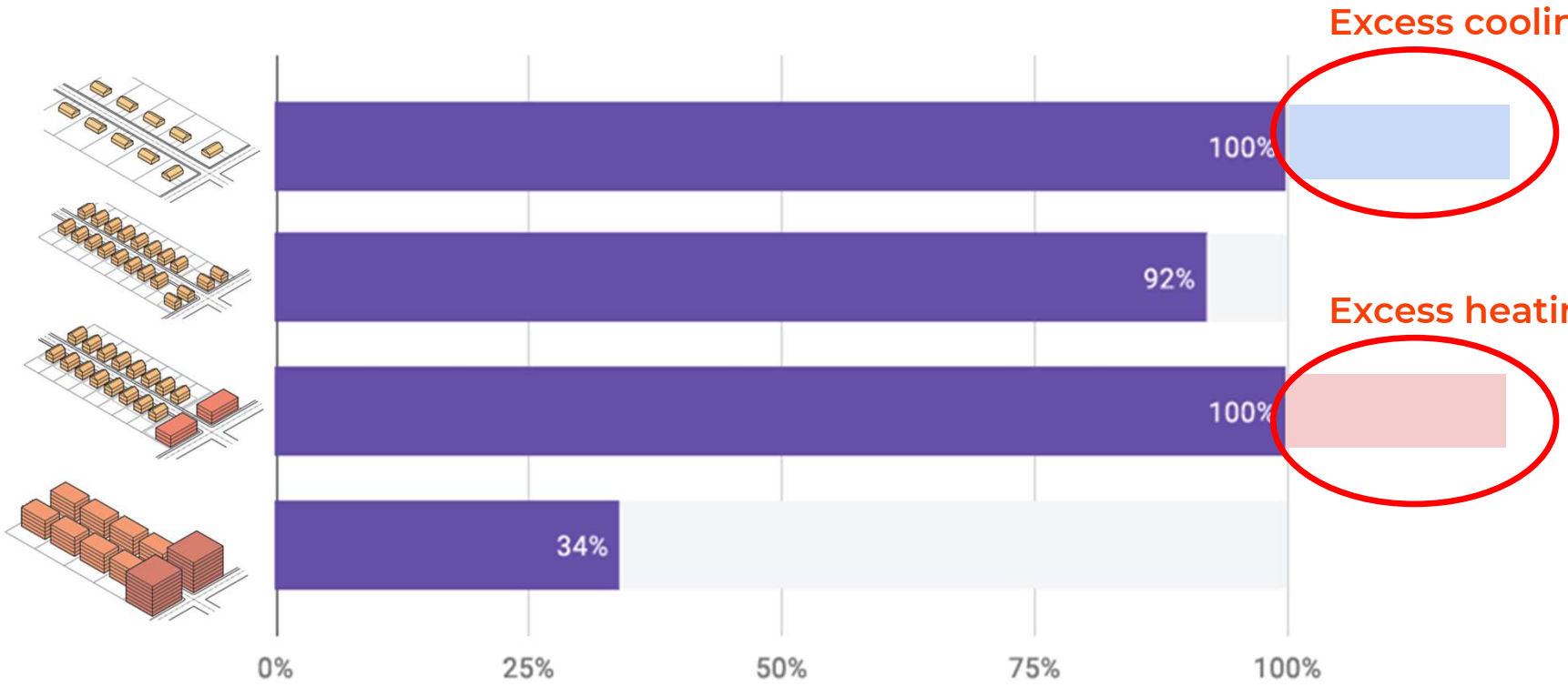
HEET's GeoBlock©



BUROHAPPOLD ENGINEERING heet

Technical Feasibility (by street segment)

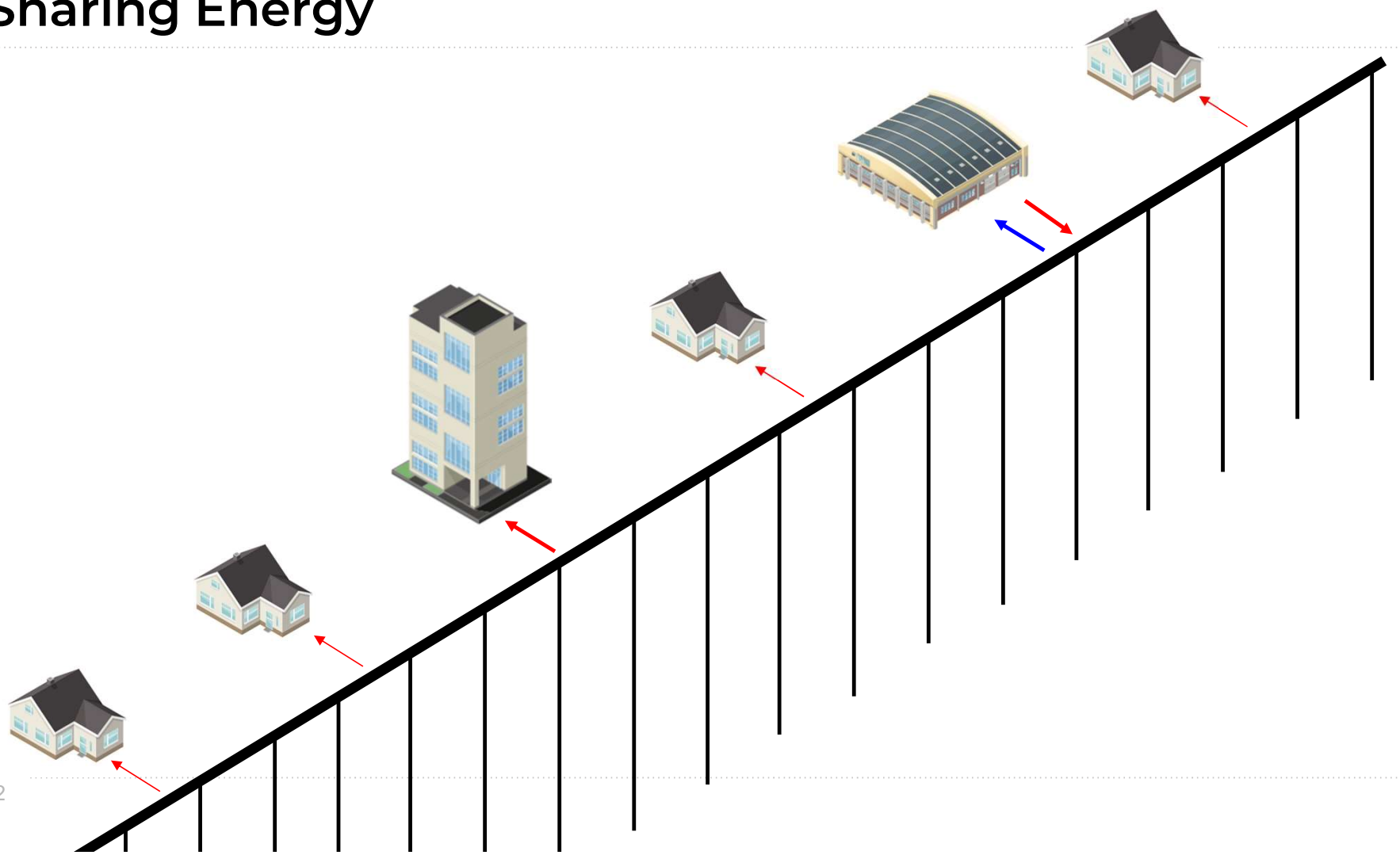
Ability to meet energy demand through ‘shallow’ boreholes in the street only



GEO
MICRO
DISTRICT

Feasibility Study

Sharing Energy



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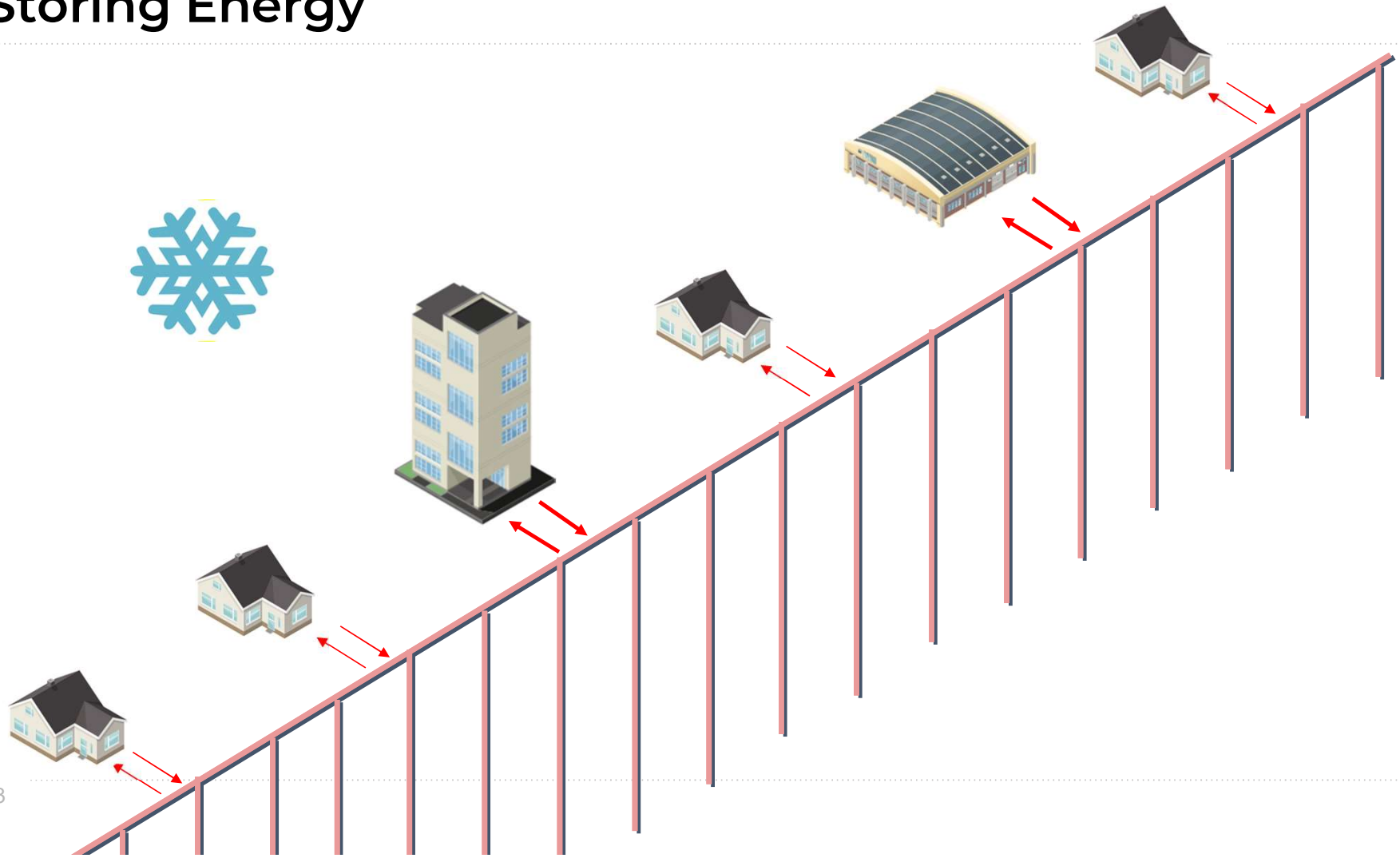
Storing Energy



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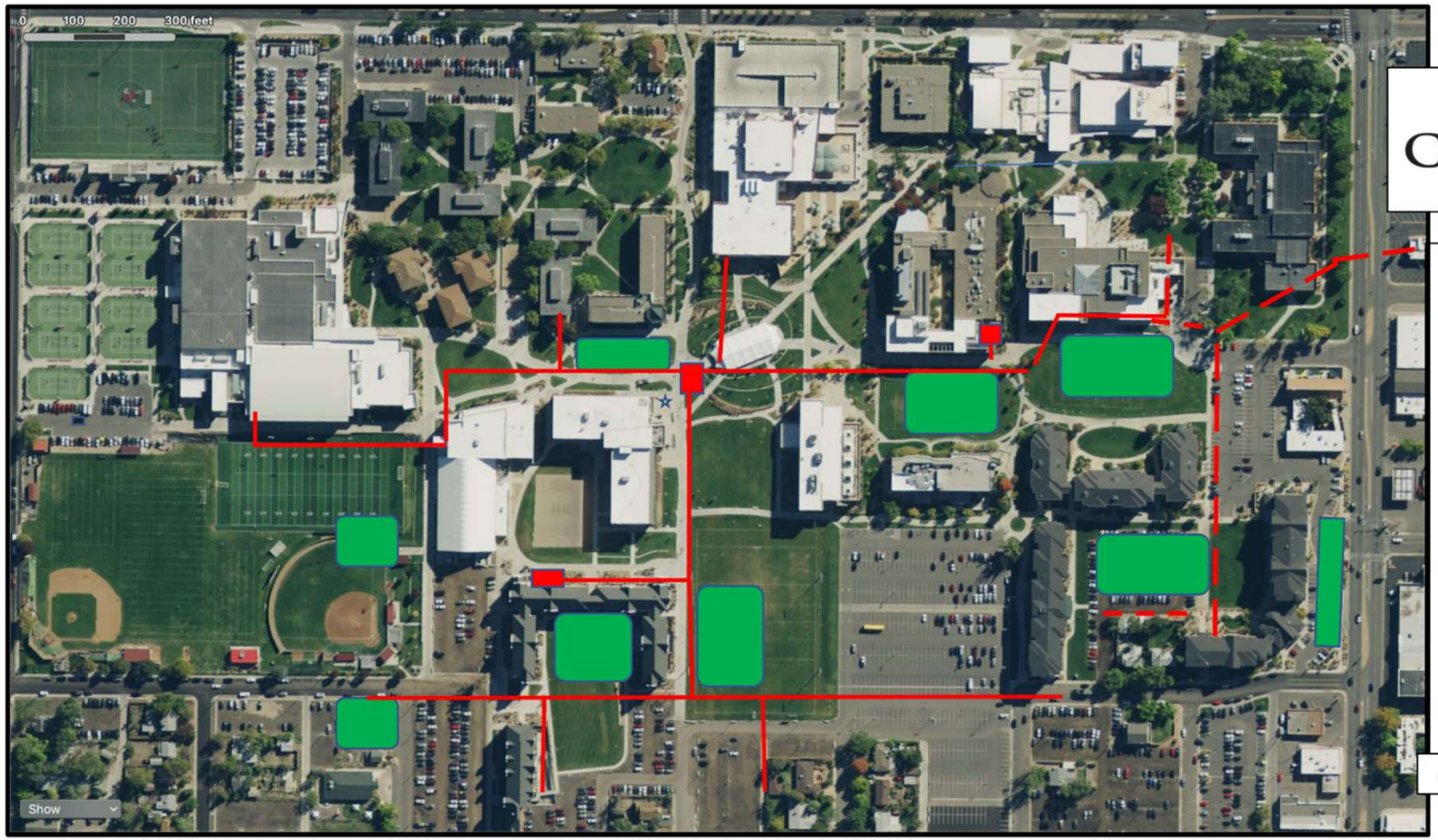
Case Study



COLORADO MESA UNIVERSITY

Borefields (121,000 ft)

Vaults & Mechanical Rooms

Shared loop:

18” Pipes

12” & 10” Pipes

Courtesy of The GreyEdge Group©

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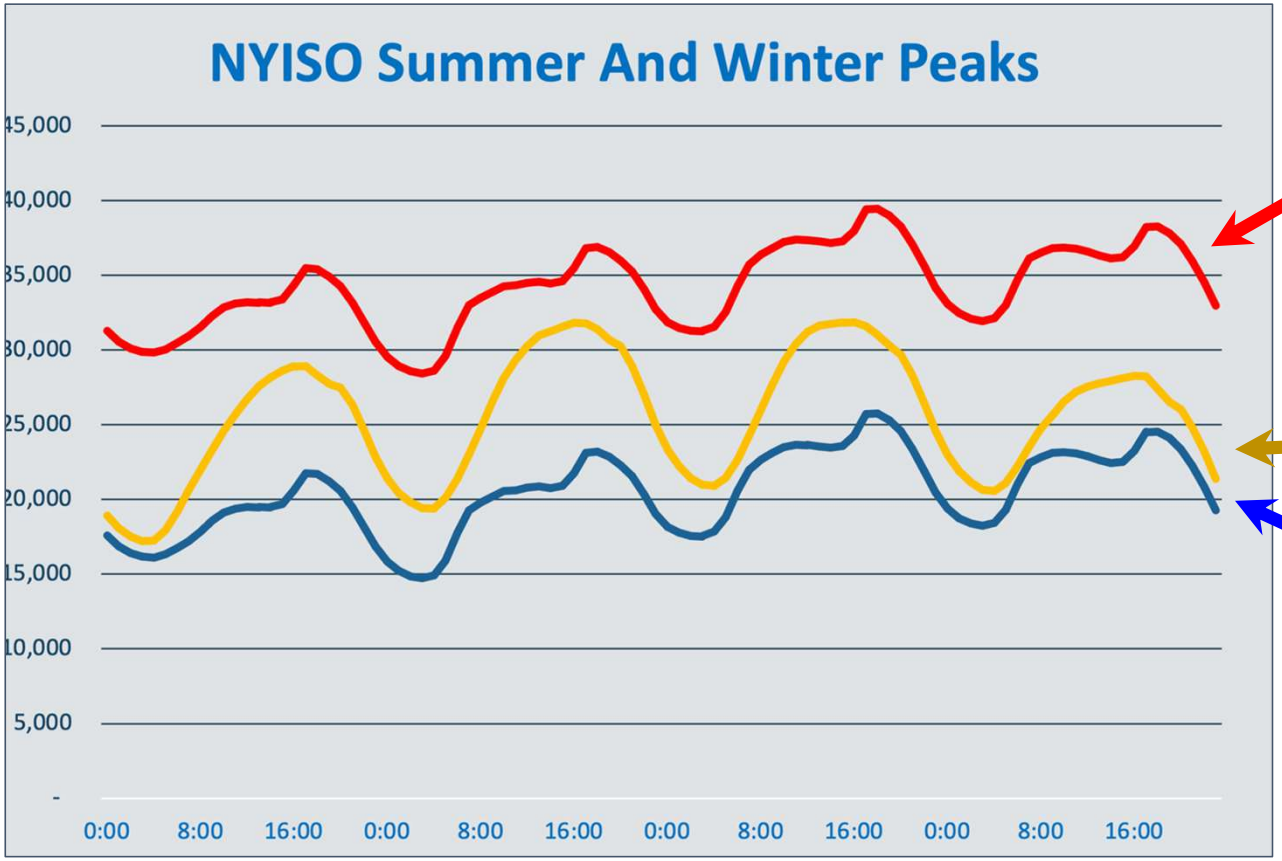
Impact



Credit: Mark Kleinginna, Integral Energy, GeoRising Conference, 2021

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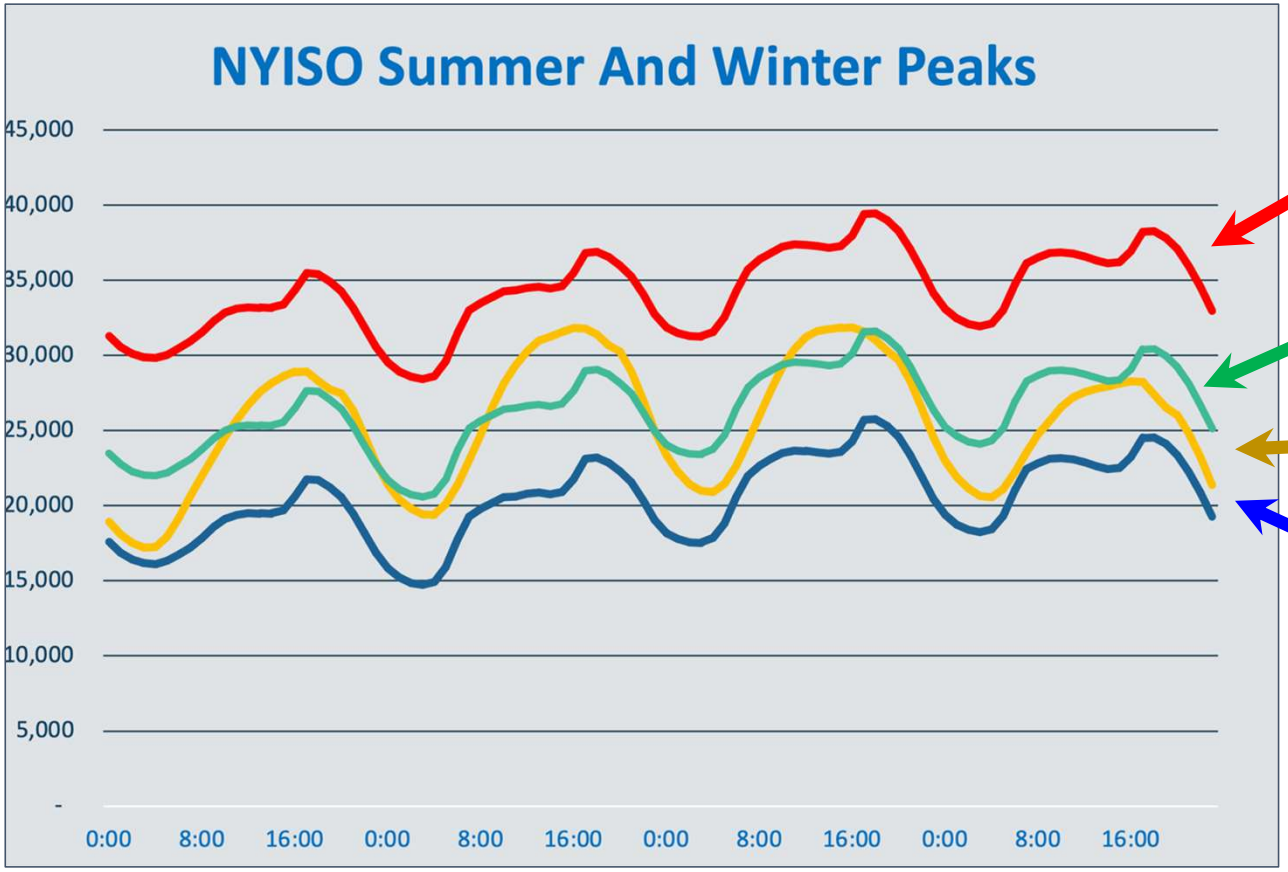
Impact



Credit: Mark Kleinginna, Integral Energy, GeoRising Conference, 2021

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MA Regulatory Mandates

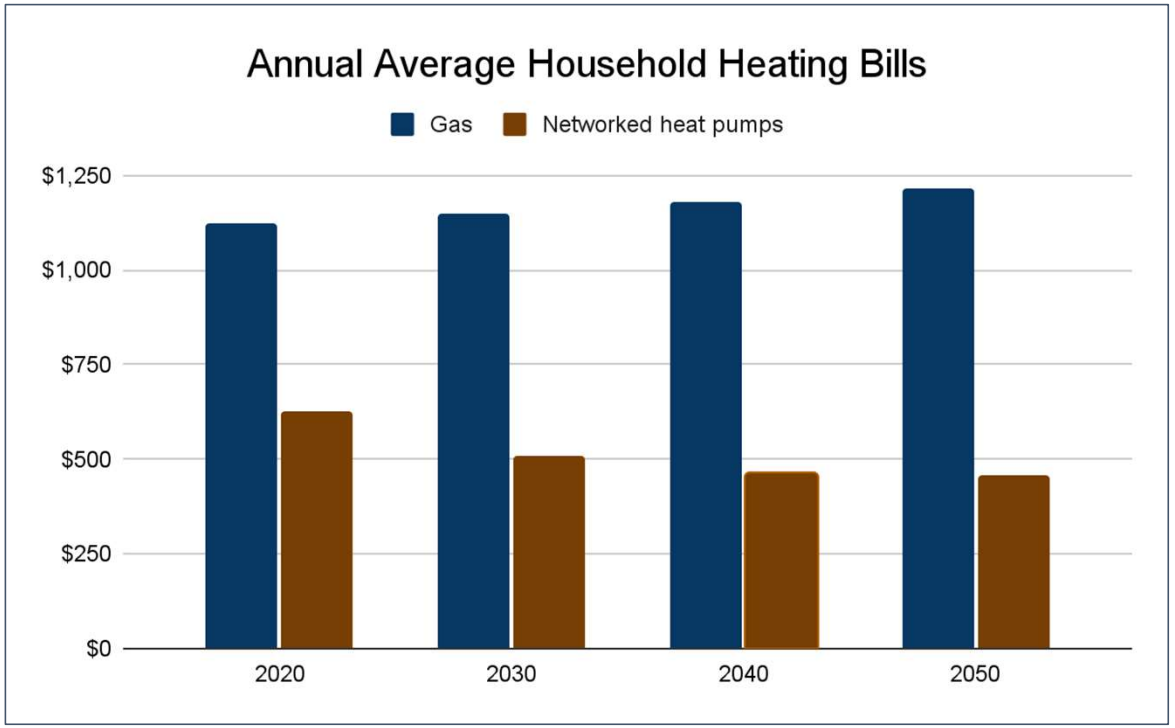
- Safer

Merrimack Valley Gas Disaster 2018

MA Regulatory Mandates

- Safer
- Cost

MA Energy Bill Projection
(Applied Economics Clinic Brief)



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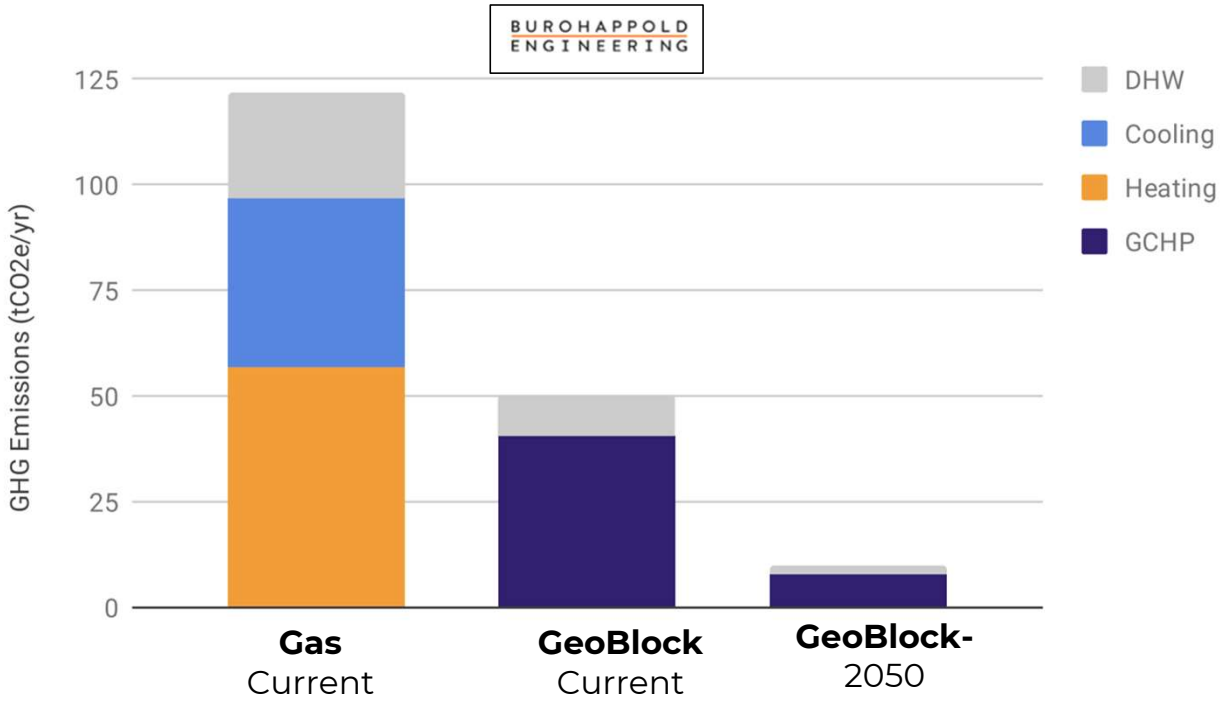
MA Regulatory Mandates

- Safer
- Cost
- Emissions

GeoGrid Emissions Reductions



Medium Density Mixed Use

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MA Regulatory Mandates

- Safer
- Cost
- Emissions
- Equity

heet

MA Regulatory Mandates

- Safer
- Cost
- Emissions
- Equity

Gas Pipes

Water Pipes

heet

Initial Installations, Over $30 Million Committed

MA

- **Eversource**: Approved, urban environment, ~100 homes & businesses
- **Merrimack Valley**: Approved, competitive grant by AGO & DOER
- **National Grid**: Filed, 100 to 200 units (businesses & homes)

NY

- **Con Edison**: Approved
- **New York City**: Commits to geothermal utility
- **NYSERDA**: Committed $15 million
- **Niagara-Mohawk**: Filed

CT

- **Bridgeport**: Municipal installation, approved


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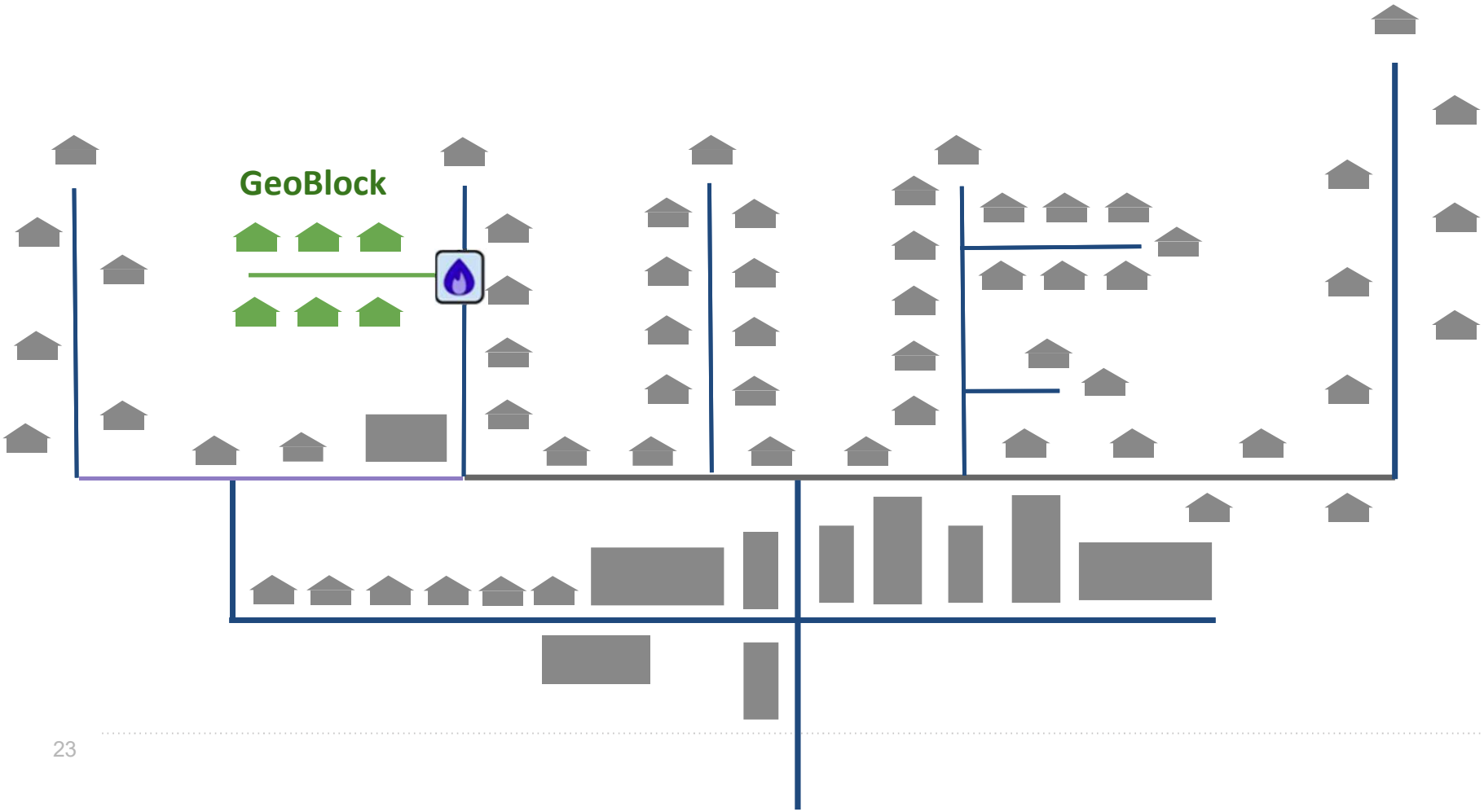
A Recovery for All of Us: Mayor de Blasio Announces Path to Provide Geothermal Utility Service

April 21, 2021

City will identify project sites this year and pursue legislation to deploy geothermal district demonstration projects and bring service to scale

NEW YORK—To accelerate the transition from fossil fuel energy sources to a city that runs on clean energy technologies, Mayor Bill de Blasio today announced several critical steps the City will take to advance the implementation and integration of district geothermal systems. Geothermal heating and cooling is a highly efficient and clean technology that has been available for decades but remains largely underutilized in New York City. These systems can help replace fuel oil and natural gas to transform how the city heats and cools its one million buildings.

Initial Demonstration



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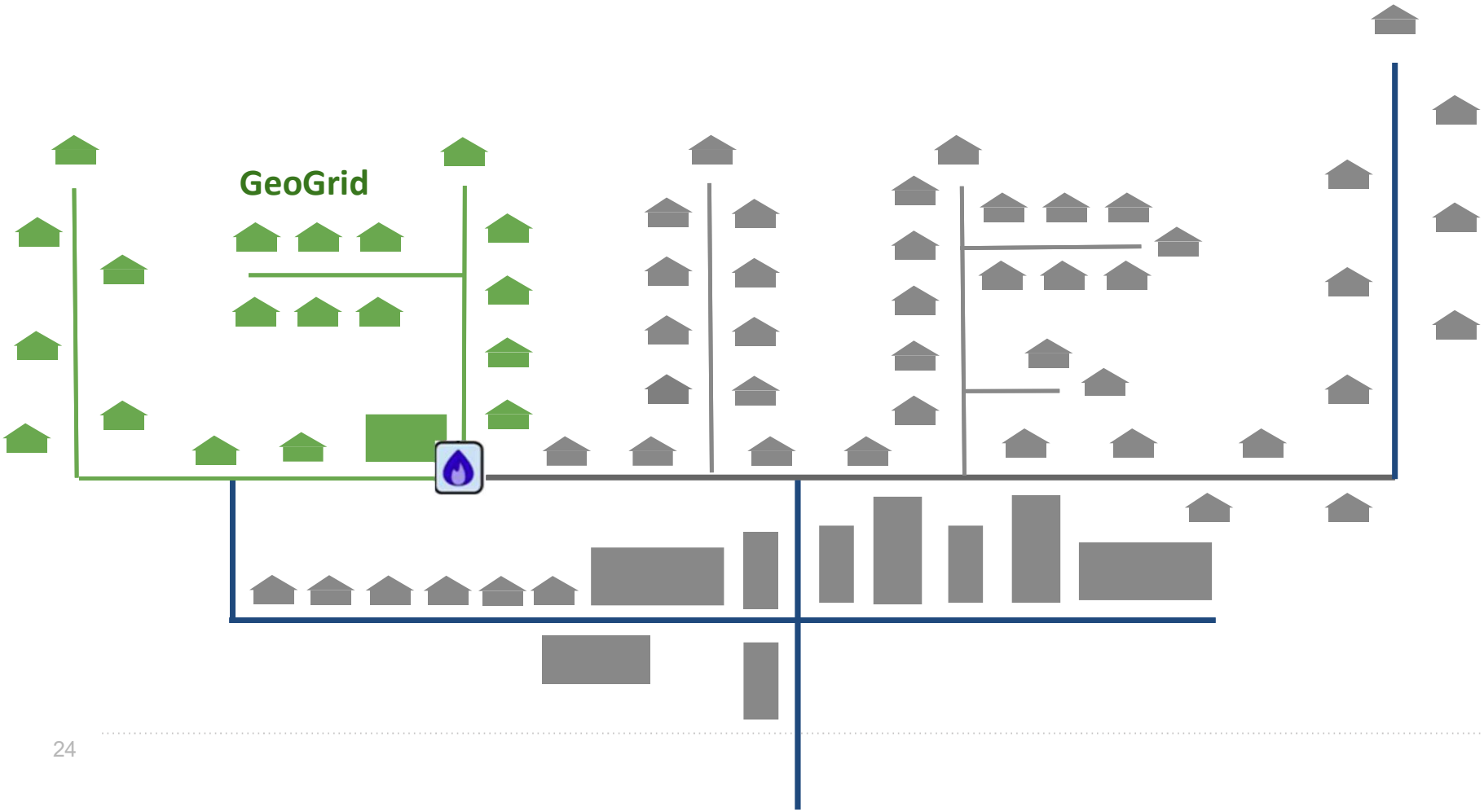
Iterating & Interconnecting



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Geo/Gas Hybrid Rate Base

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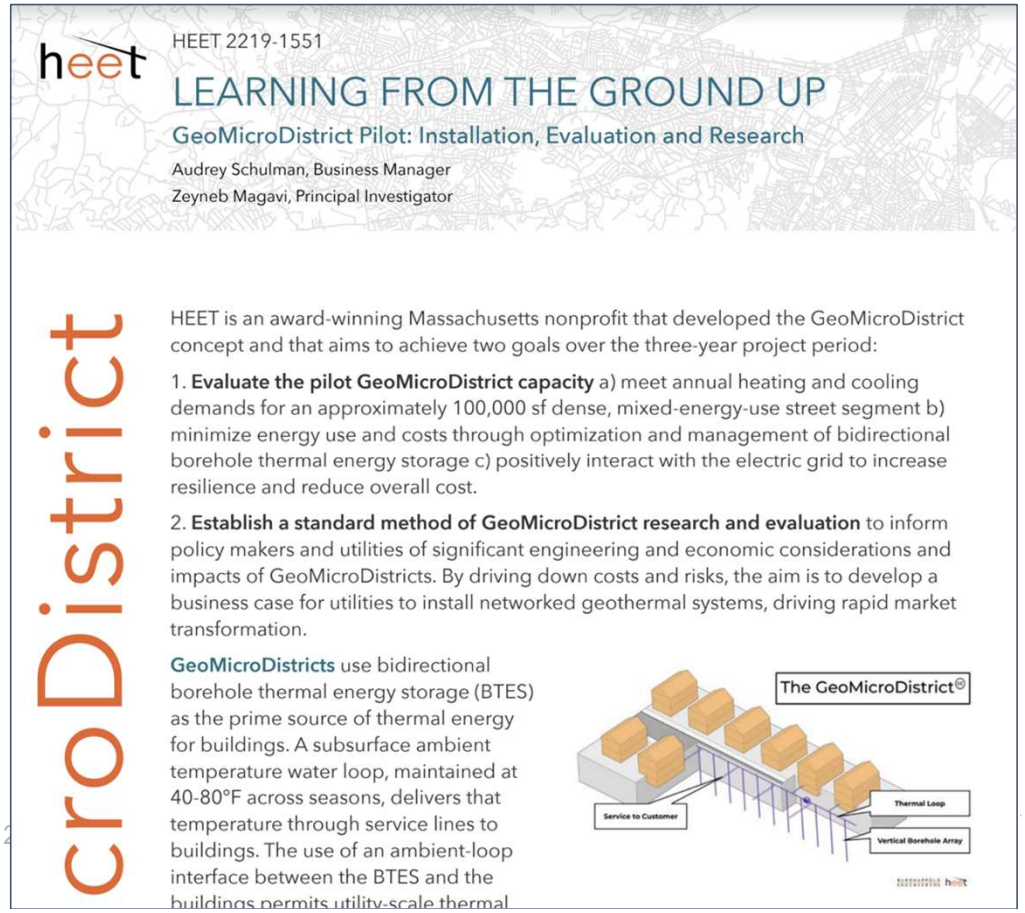
HEET Research Team



HEET 2219-1551

LEARNING FROM THE GROUND UP

GeoMicroDistrict Pilot: Installation, Evaluation and Research

Audrey Schulman, Business Manager
Zeyneb Magavi, Principal Investigator

croDistrict

HEET is an award-winning Massachusetts nonprofit that developed the GeoMicroDistrict concept and that aims to achieve two goals over the three-year project period:

1. **Evaluate the pilot GeoMicroDistrict capacity** a) meet annual heating and cooling demands for an approximately 100,000 sf dense, mixed-energy-use street segment b) minimize energy use and costs through optimization and management of bidirectional borehole thermal energy storage c) positively interact with the electric grid to increase resilience and reduce overall cost.

2. **Establish a standard method of GeoMicroDistrict research and evaluation** to inform policy makers and utilities of significant engineering and economic considerations and impacts of GeoMicroDistricts. By driving down costs and risks, the aim is to develop a business case for utilities to install networked geothermal systems, driving rapid market transformation.

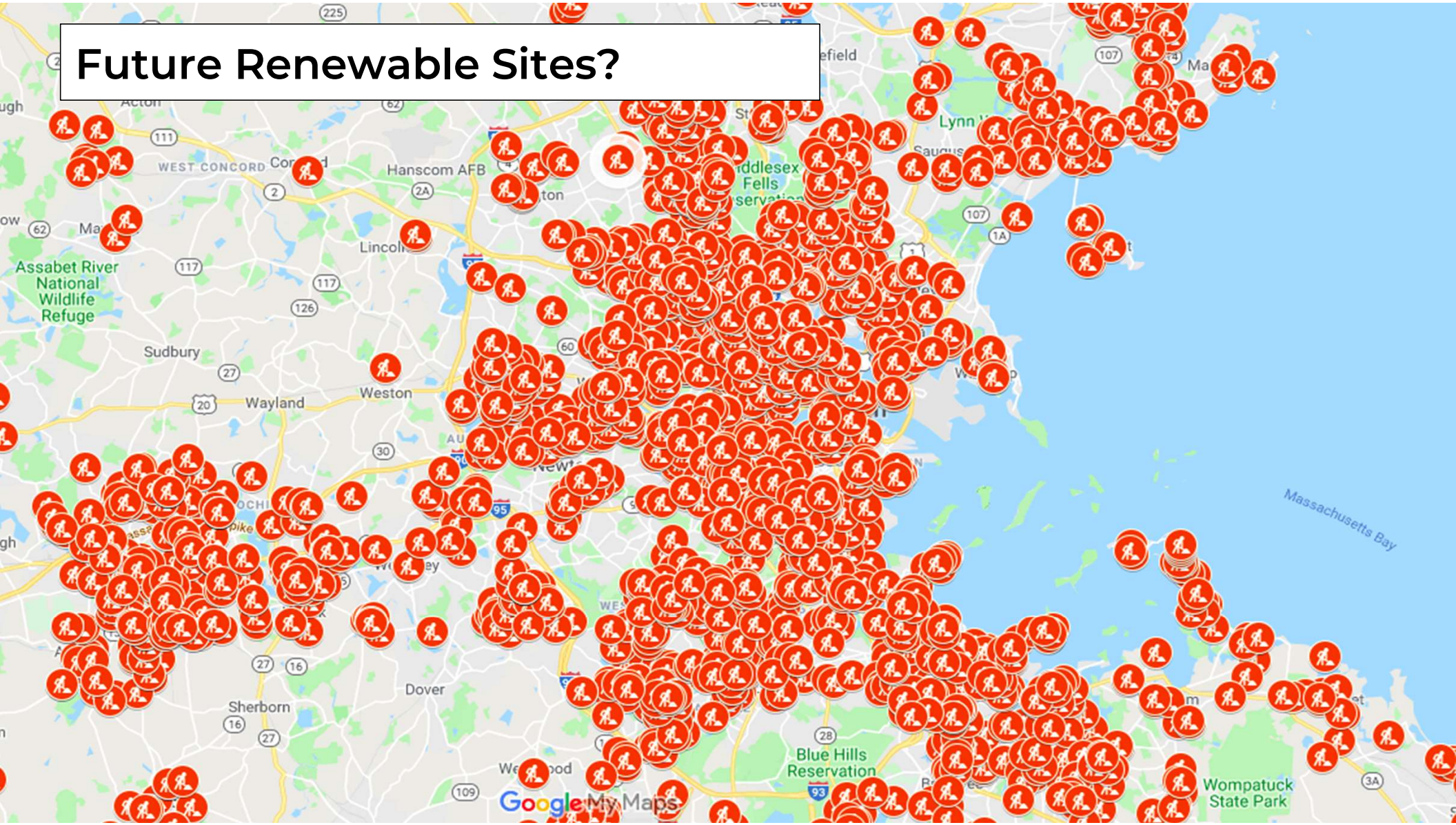
GeoMicroDistricts use bidirectional borehole thermal energy storage (BTES) as the prime source of thermal energy for buildings. A subsurface ambient temperature water loop, maintained at 40-80°F across seasons, delivers that temperature through service lines to buildings. The use of an ambient-loop interface between the BTES and the buildings permits utility-scale thermal

- Harvard, MIT & 2 national labs
- Design review
- Data collection & sensors
- Data transparency
- Scaled-up impacts
- Resource library of best practices

MA Future of Heat Legislation (Sen. Creem SD.2340 & Rep. Ehrlich HD.3472)

- Can install renewable thermal pipes
- Can sell heating & cooling
- Limits gas pipe depreciation past 2050
- Does NOT limit renewable pipe depreciation
- Securitizes long-term debt
- Savings pay for worker retraining & low-income retrofits

Future Renewable Sites?



Cutting carbon emissions NOW by driving system change

Audrey.Schulman@HEET.org