

The logo for HEET, consisting of the word "heet" in a lowercase, sans-serif font. A diagonal line strikes through the top of the letter 'e' from the upper right.

The Future of Gas

Audrey.Schulman@HEET.org

10



Putnam
Foundation



Winslow
Foundation





Community Activist

Utility Executive

Steelworkers Union
Leader

MIT academic

Networked Leadership

State Regulator

Geothermal Expert

Governor's Office

2 "Gas is the Bridge Fuel"
originator



HEET's Research

GEO MICRO DISTRICT

Feasibility

heet 2219-1551
LEARNING FROM THE GROUND
 GeoMicroDistrict Pilot: Installation, Evaluation and
 Audrey Schulman, Business Manager
 Zeyneb Magavi, Principal Investigator

GeoMicroDistrict

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

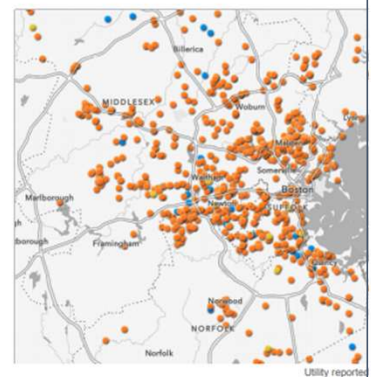
1. **Evaluate the pilot GeoMicroDistrict capacity** a) meet and exceed demands for an approximately 100,000 sf dense, mixed-use development b) minimize energy use and costs through optimization and borehole thermal energy storage c) positively interact with the grid to increase resilience and reduce 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



heet Significant Environmental Impact (SEI) Natural Gas Leaks

Shared Action Plan Year 1 (2020-2021)
 Utilities Enacting the Leak Extension
 April 27th 2021



ENVIRONMENTAL Science & Technology

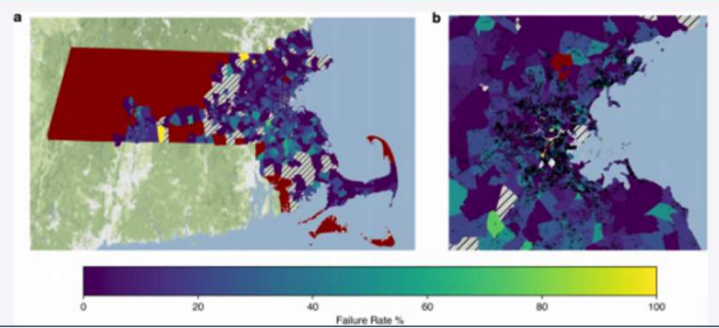
1 Repair Failures Call for New Policies to Tackle Leaky Natural Gas Distribution Systems

3 Morgan R. Edwards,^{1*} Amanda Giang,^{2*} Gregg P. Macey, Zeyneb Magavi, Dominic Nicholas,
 4 Robert Ackley, and Audrey Schulman

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

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Gas Decarbonization Planning



The Commonwealth of Massachusetts

DEPARTMENT OF PUBLIC UTILITIES

D.P.U. 20-80
Investigation by
local distributors

PGW ANNOUNCES ADVANCED EFFORTS TO CUT METHANE EMISSIONS BY 2050

Posted on: Jun 03, 2021

Company's new action plan bolsters City's carbon neutrality efforts

PHILADELPHIA (June 3, 2021) – Philadelphia Gas Works (PGW) has released their latest action plan to reduce methane emissions by 80 percent by 2050. PGW's plan includes modernizing infrastructure and implementing energy efficiency programs for all Philadelphia residents.

Governor Cuomo Announces New York Will Explore Potential Role of Green Hydrogen as Part of Comprehensive Decarbonization Strategy

State Collaborating with National Renewable Energy Laboratory and Additional Partners to Study Possible Applications for Green Hydrogen, Making \$12.5 Million Available for Long Duration Energy Storage Solutions

July 08, 2021

Governor Andrew M. Cuomo today announced that New York plans to explore the potential role of green hydrogen as part of the State's comprehensive decarbonization strategy. To support this effort to study

GAS RESOURCE AND INFRASTRUCTURE PLANNING FOR CALIFORNIA

A Proposed Approach to Long-Term Gas Planning

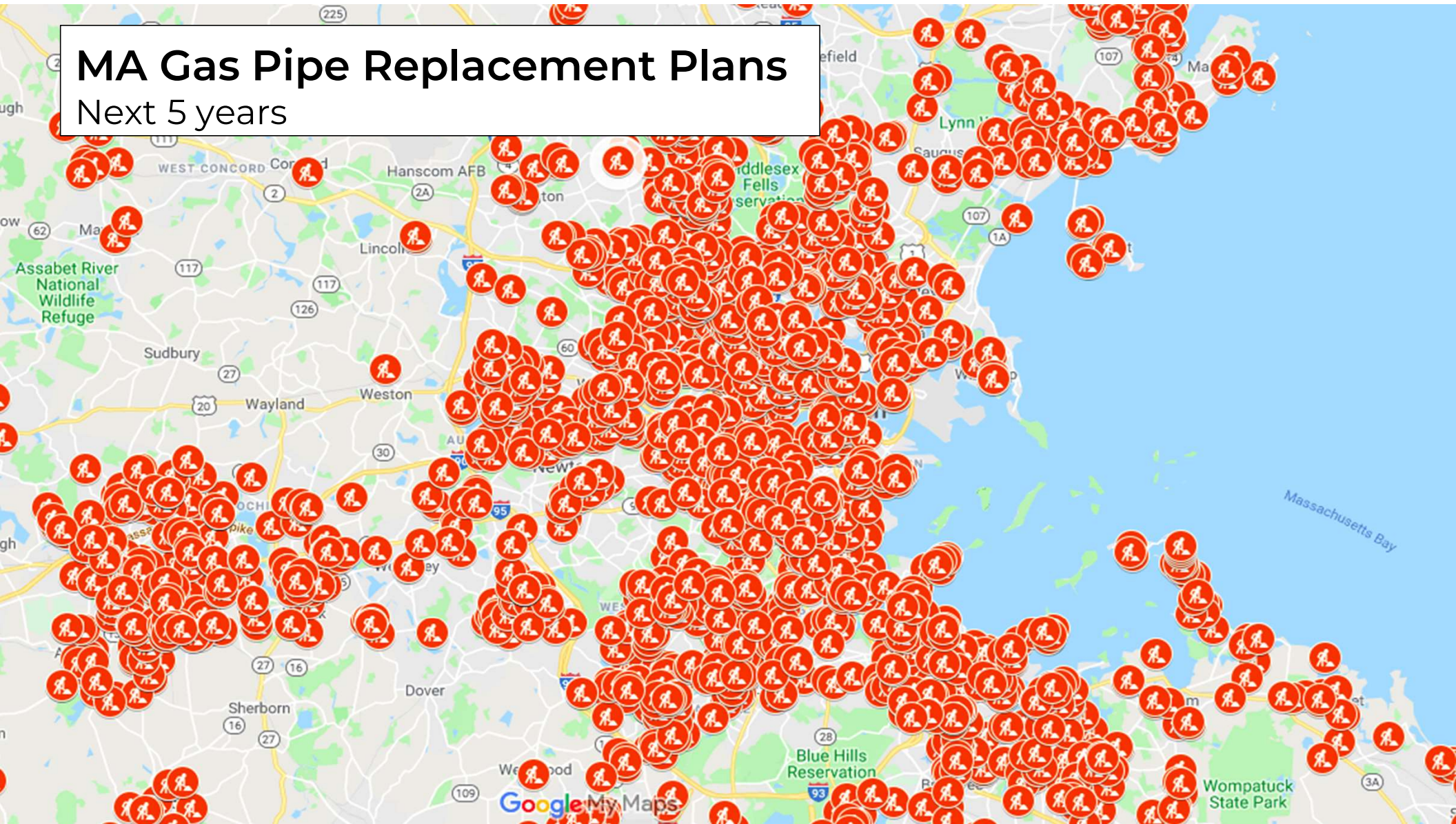
JANUARY 2021



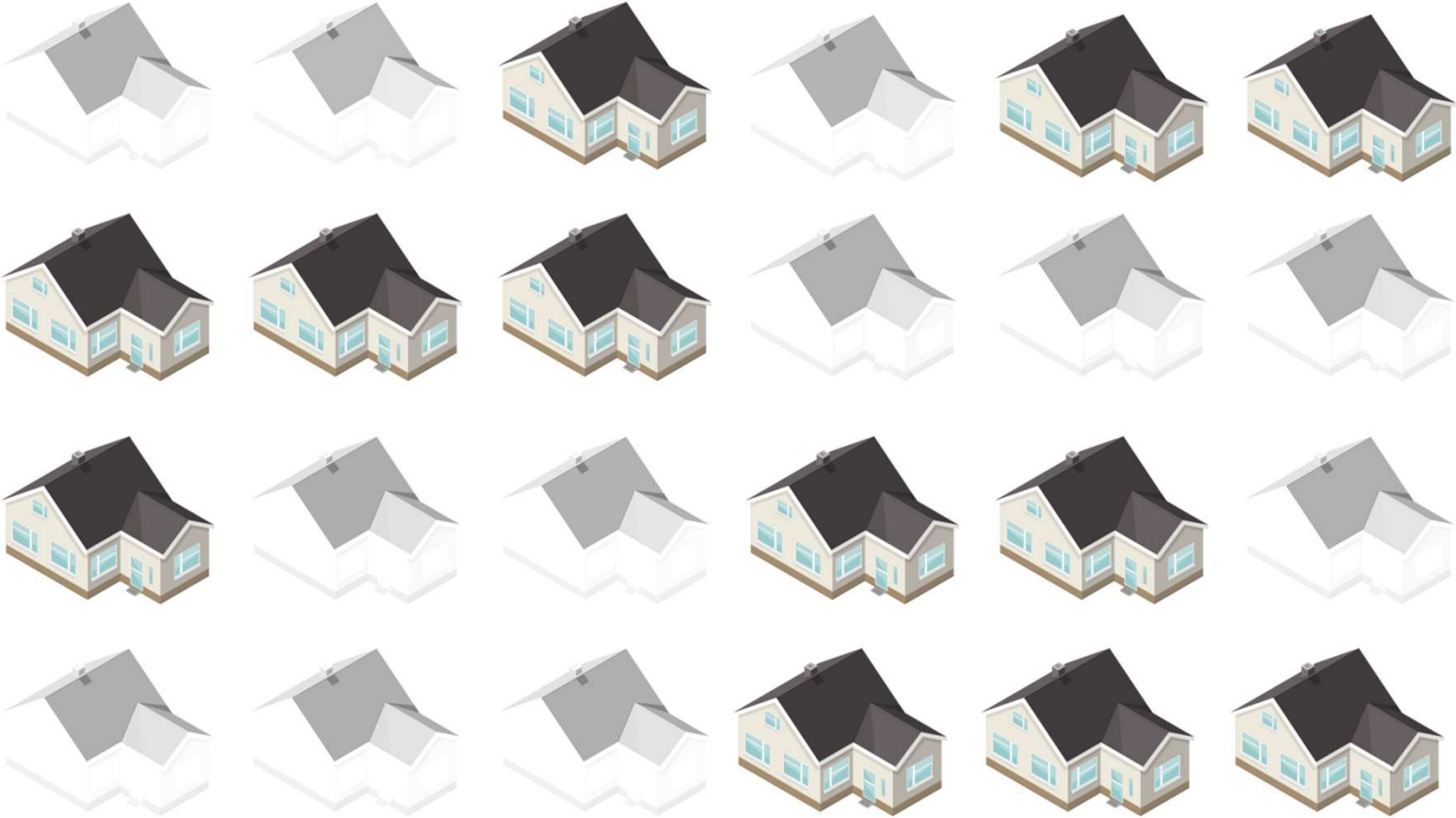
Heating Sector Transformation in Rhode Island

Pathways to Decarbonization by 2050

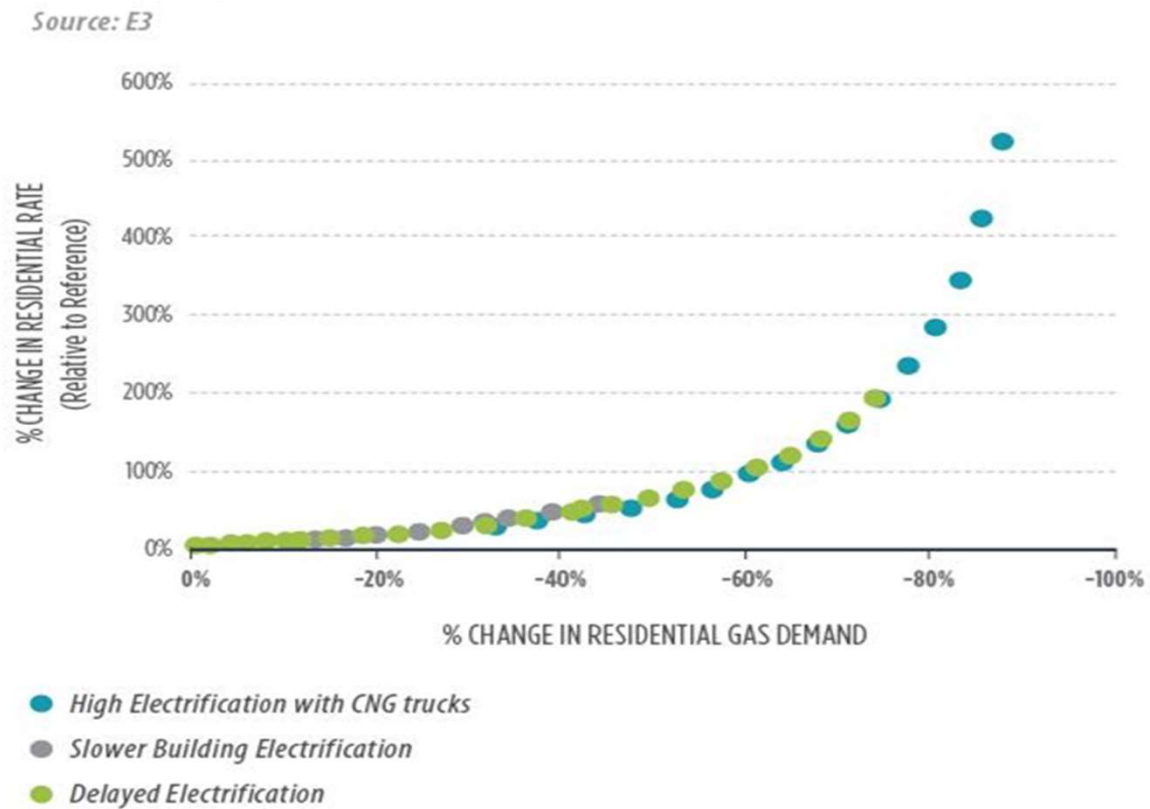
MA Gas Pipe Replacement Plans Next 5 years



Fleeing Customers, Increasing Gas Bills



CA Projected Gas Price as Rate Base Declines

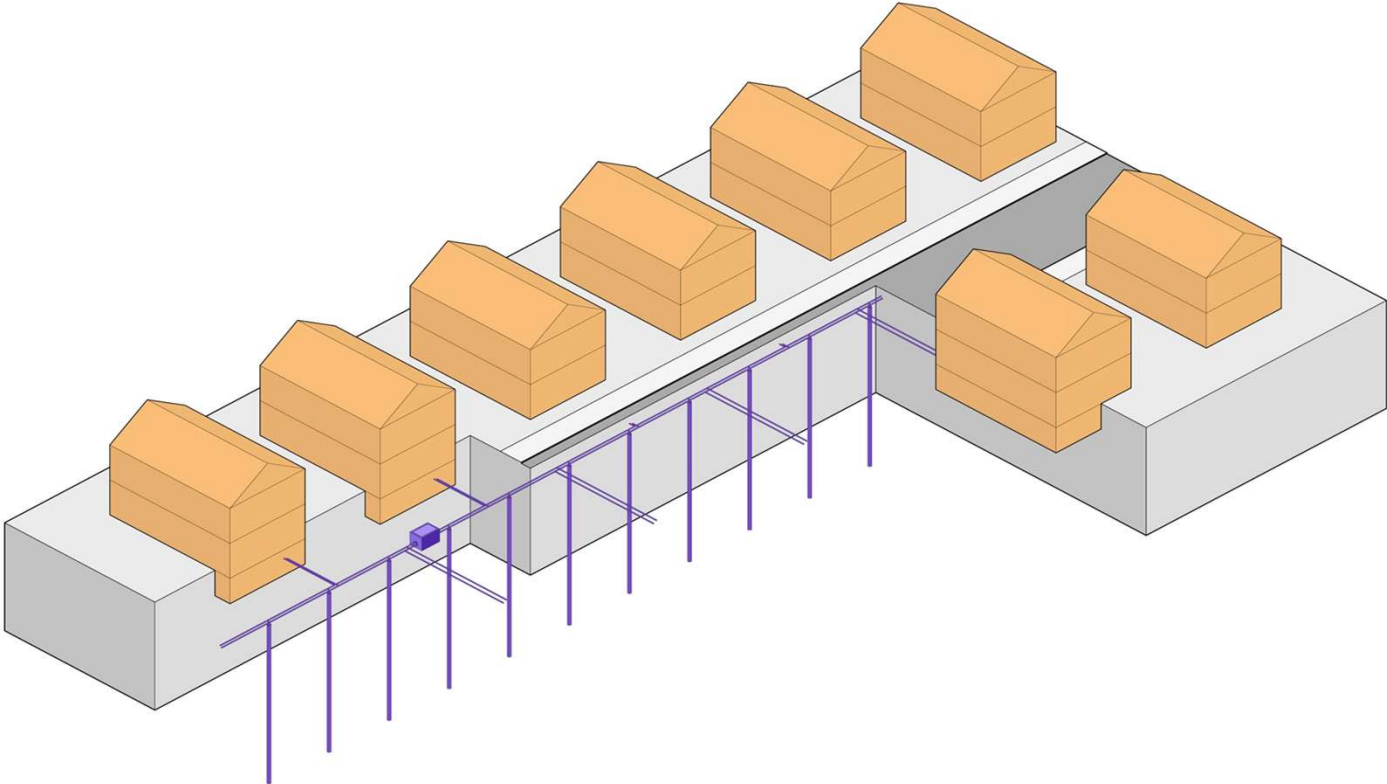


Why It's Important



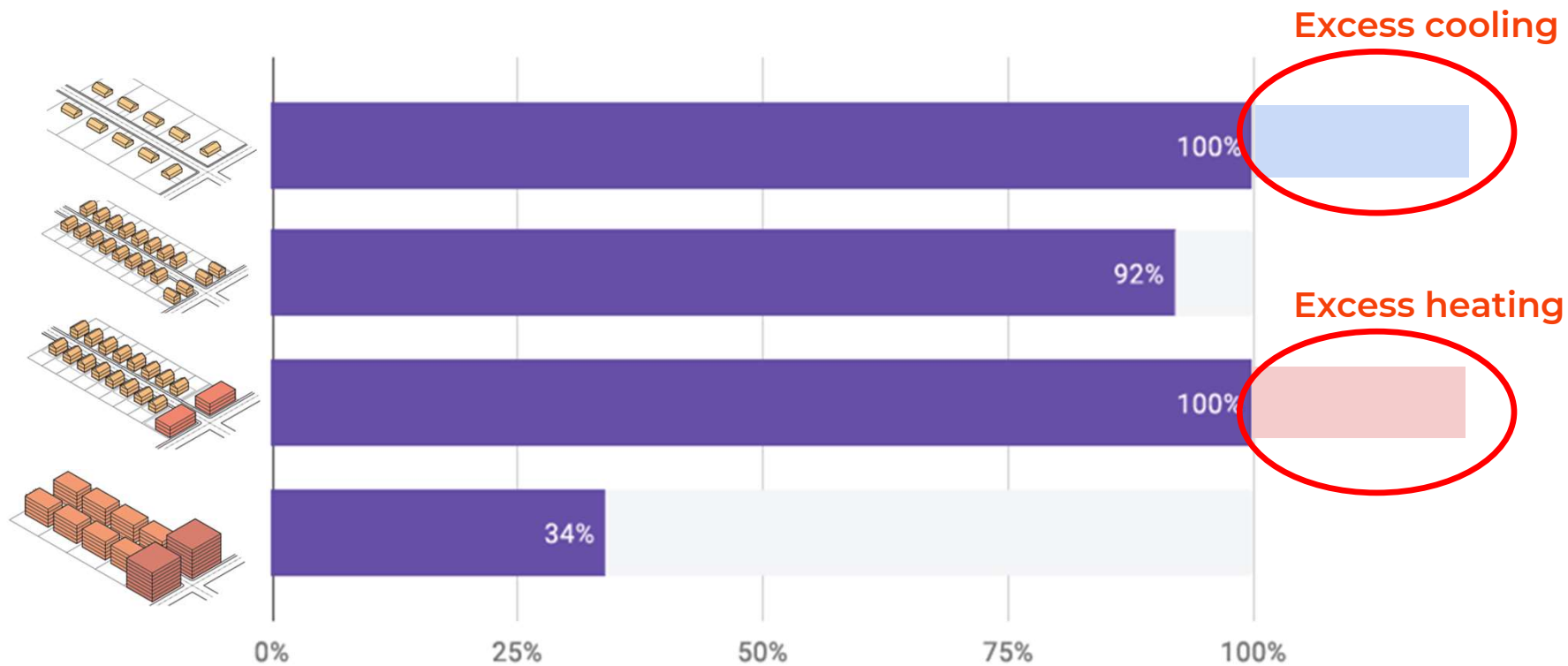
Possible Solution

HEET's GeoBlock[®]



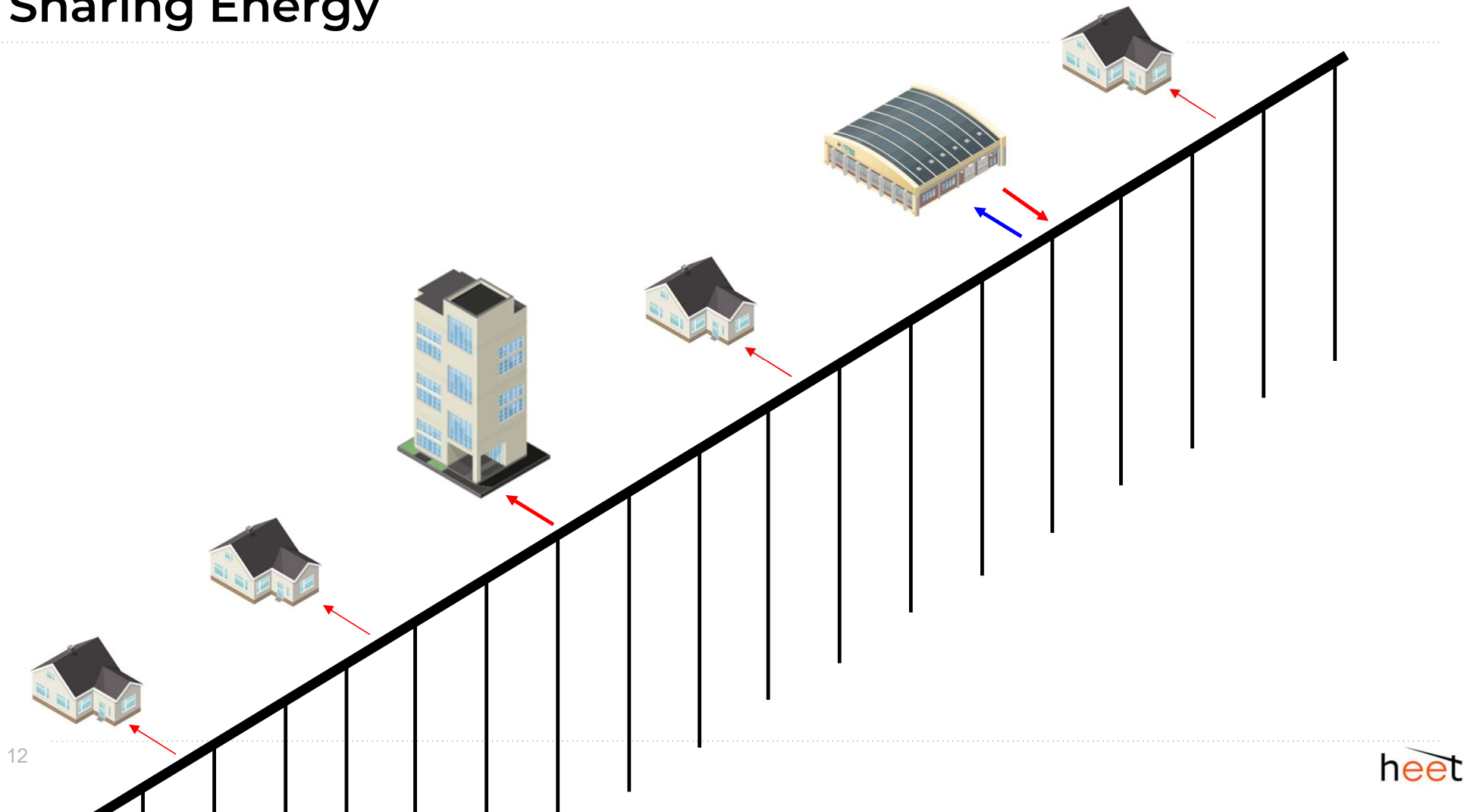
Technical Feasibility (by street segment)

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

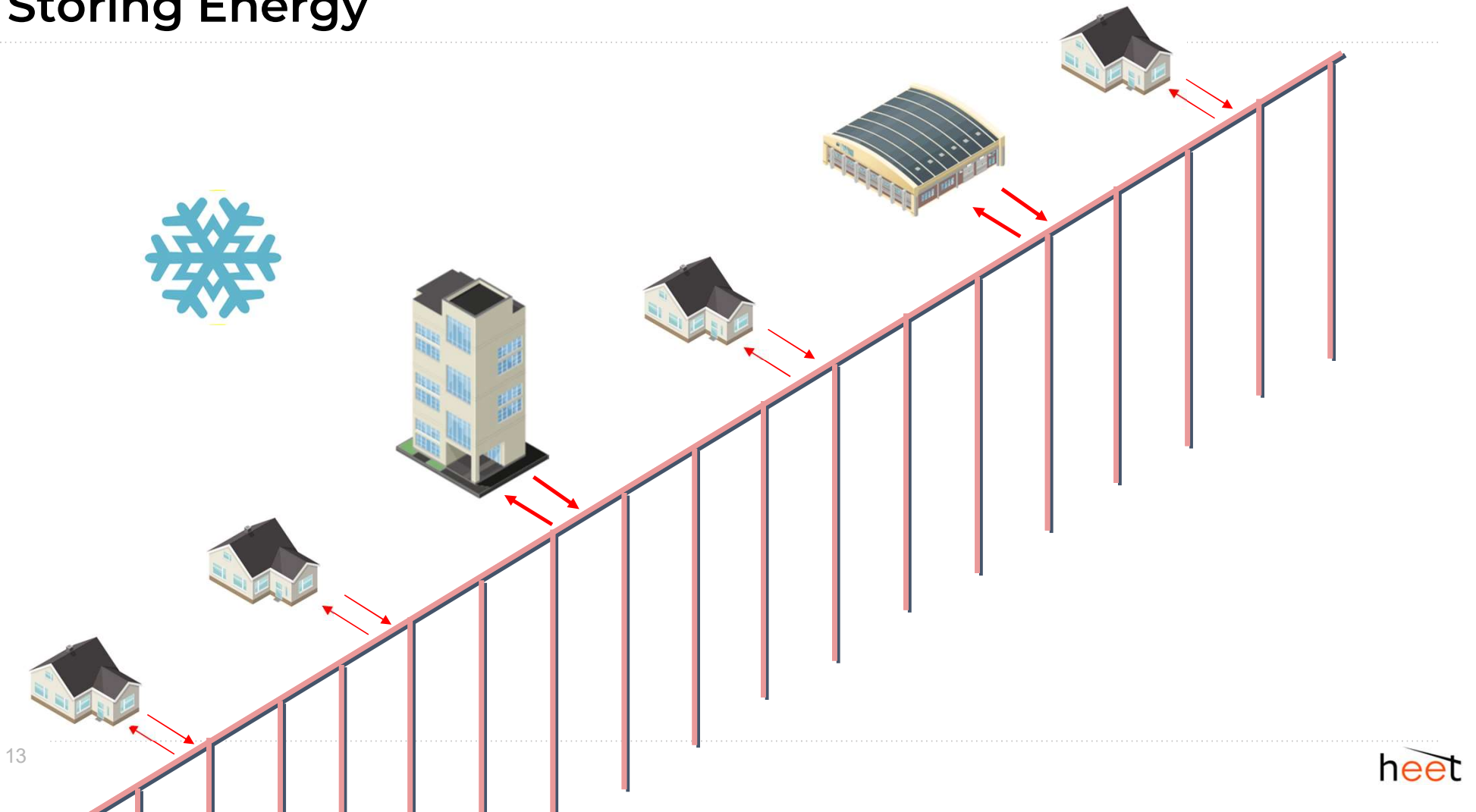


**GEO
MICRO
DISTRICT**
Feasibility Study

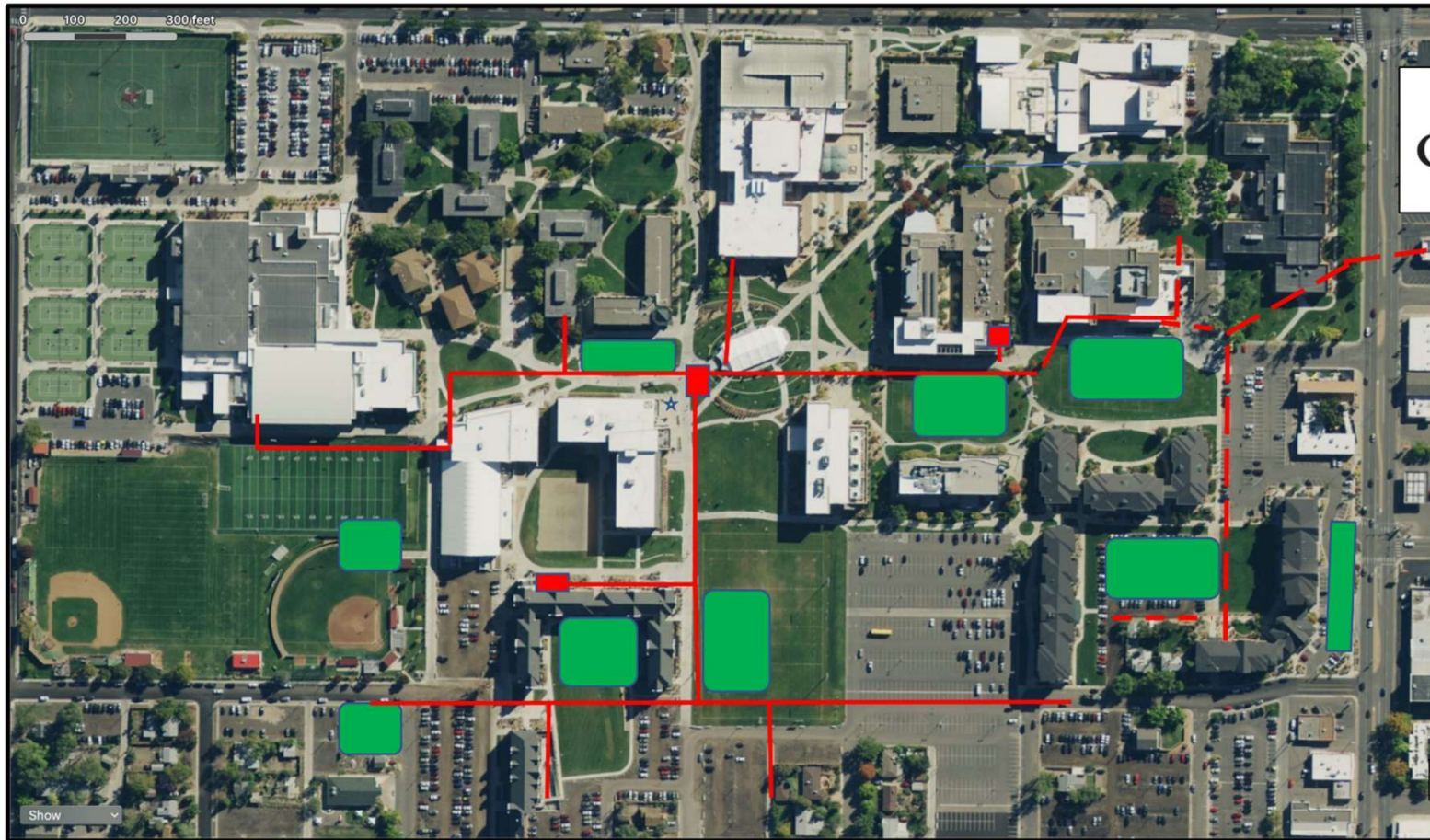
Sharing Energy




Storing Energy



Case Study



Borefields
(121,000 ft) 

Vaults &
Mechanical Rooms 

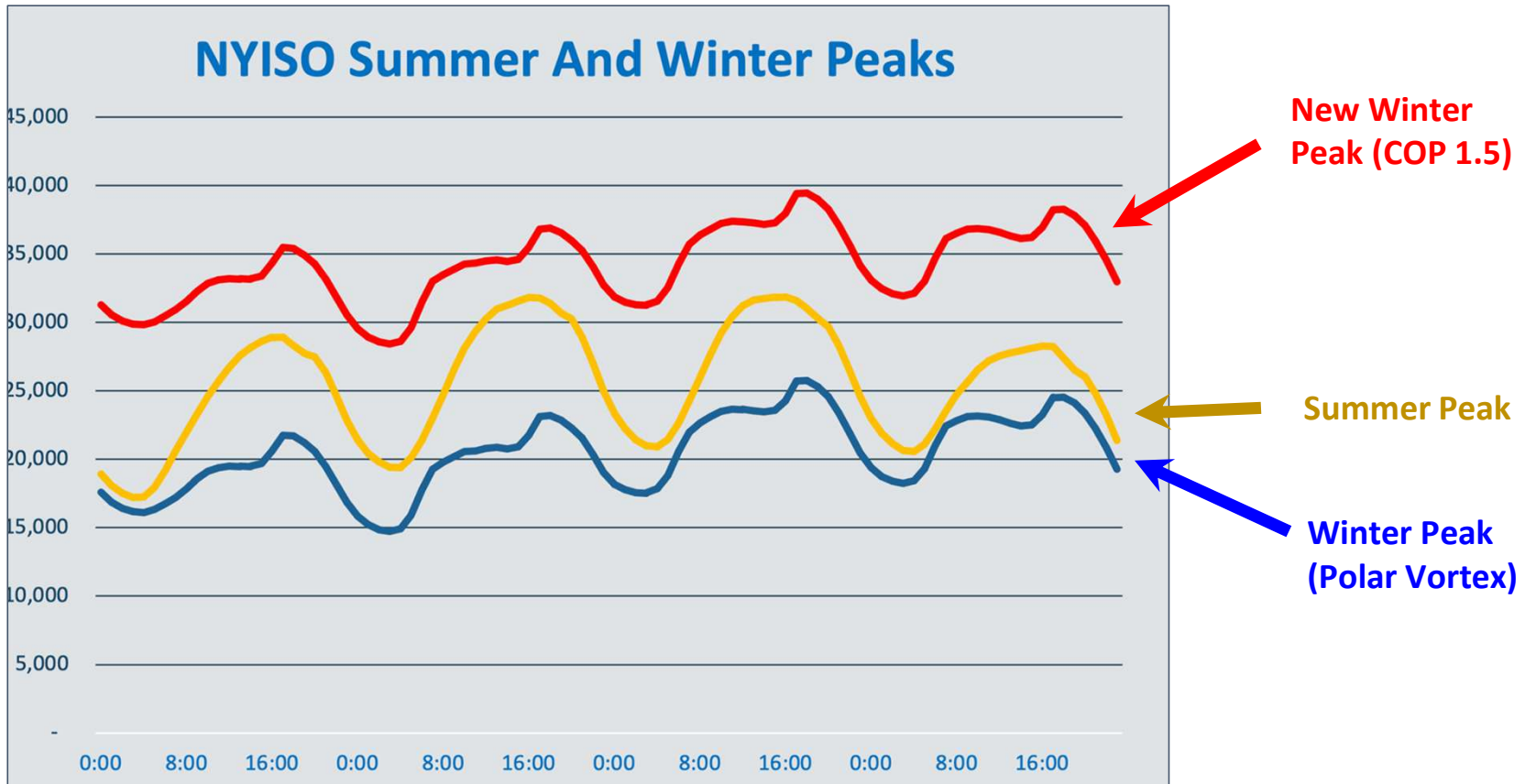
Shared loop:

18" Pipes 

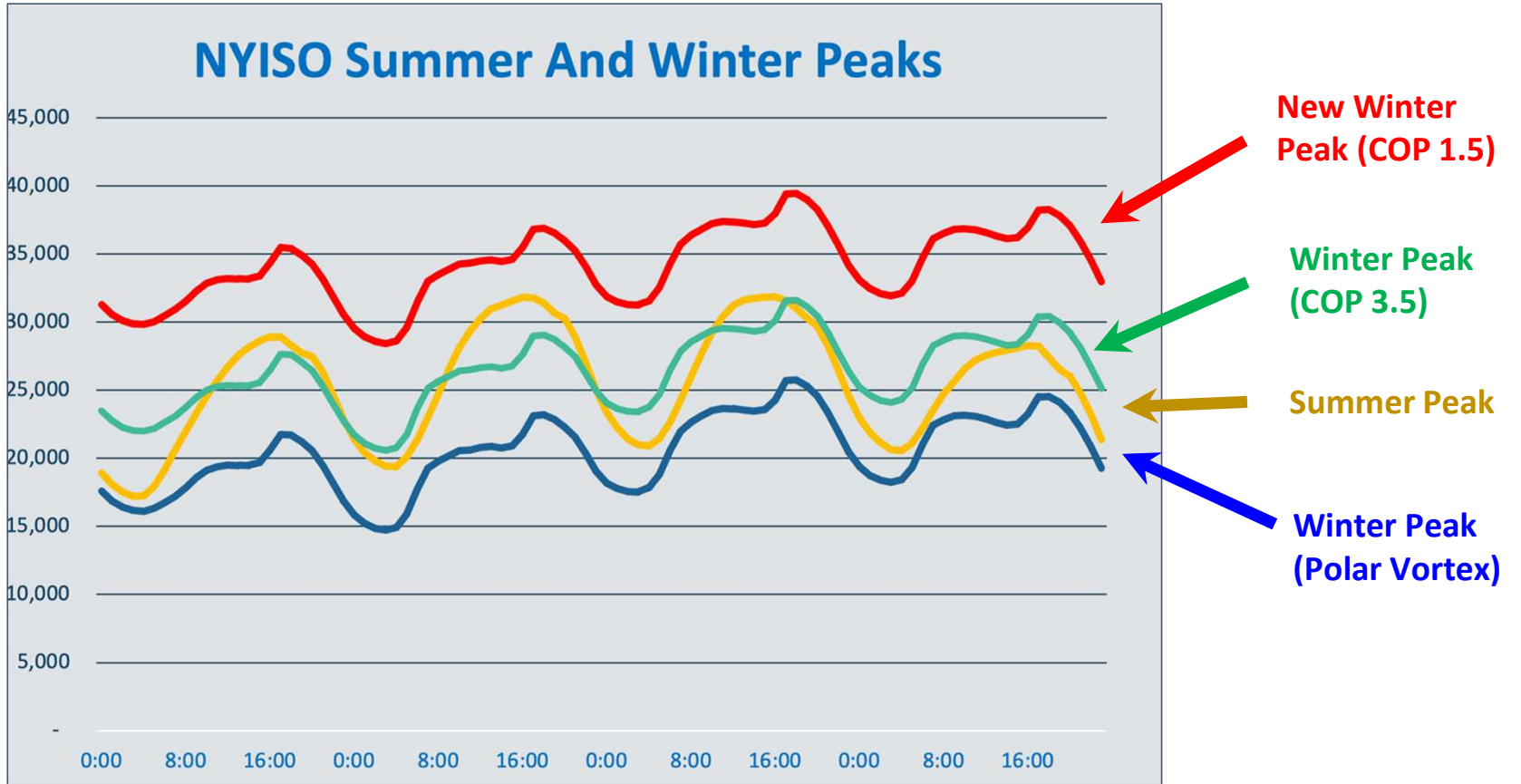
12" & 10" Pipes 

Courtesy of The GreyEdge Group©

Impact



Impact



MA Regulatory Mandates

➤ Safer

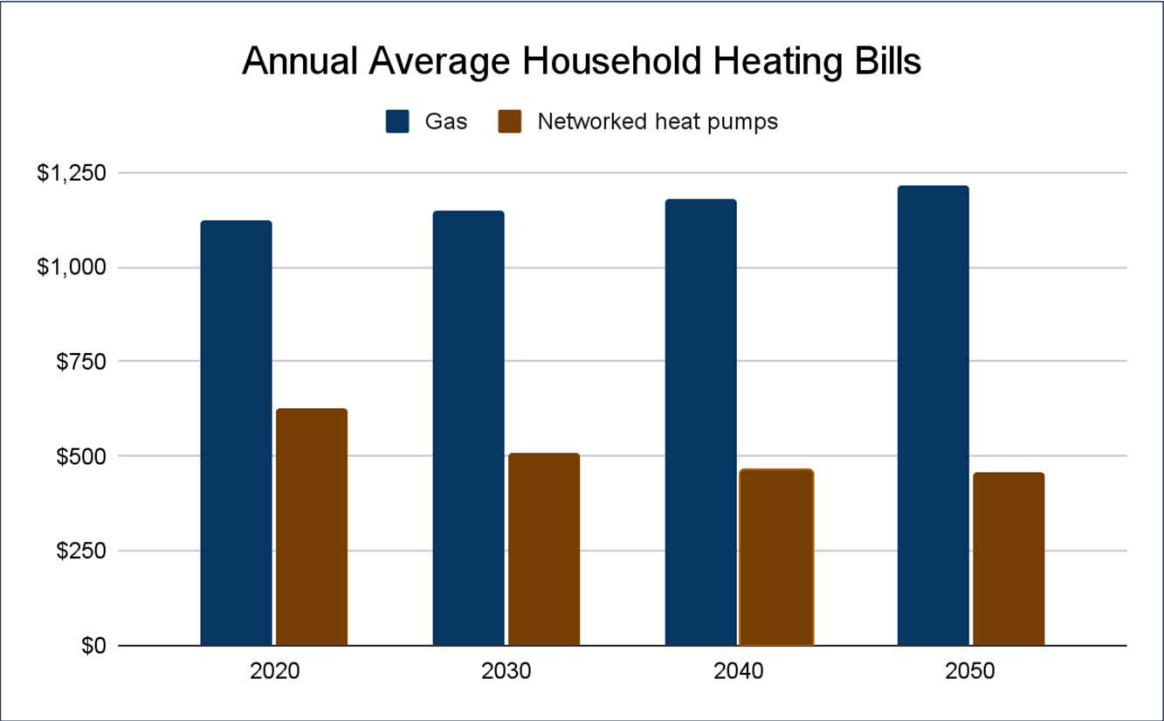
Merrimack Valley Gas Disaster 2018



MA Regulatory Mandates

- Safer
- Cost

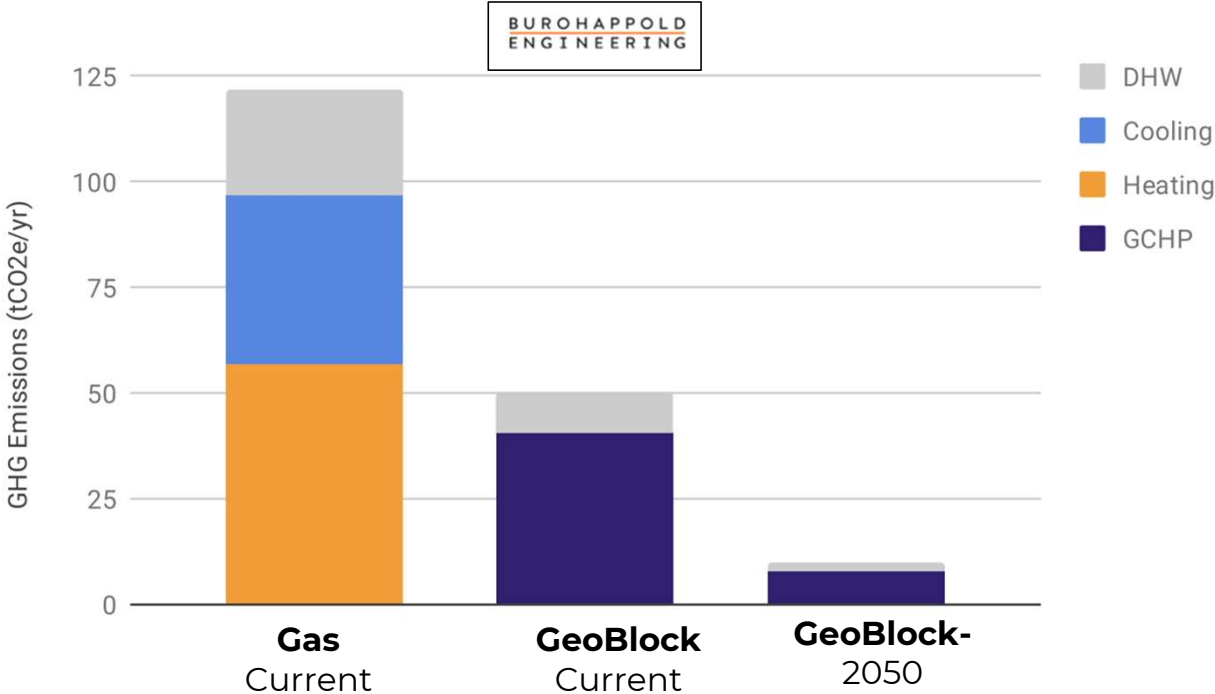
MA Energy Bill Projection (Applied Economics Clinic Brief)



MA Regulatory Mandates

- Safer
- Cost
- Emissions

GeoGrid Emissions Reductions



Medium Density Mixed Use

MA Regulatory Mandates

- Safer
- Cost
- Emissions
- Equity



MA Regulatory Mandates

- Safer
- Cost
- Emissions
- Equity

Gas Pipes



Water Pipes



Initial Installations, Over \$30 Million Committed

MA

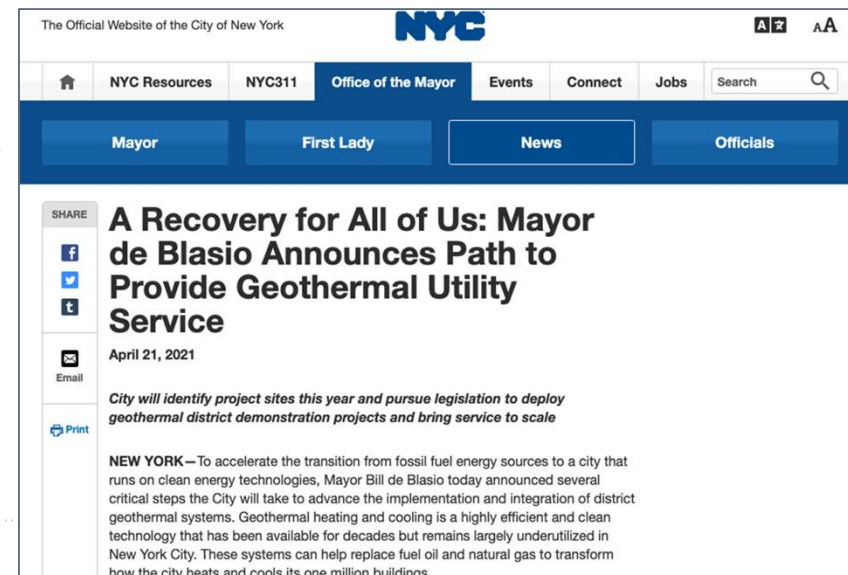
- **Eversource:** Approved, urban environment, ~100 homes & businesses
- **Merrimack Valley:** Approved, competitive grant by AGO & DOER
- **National Grid:** Filed, 100 to 200 units (businesses & homes)

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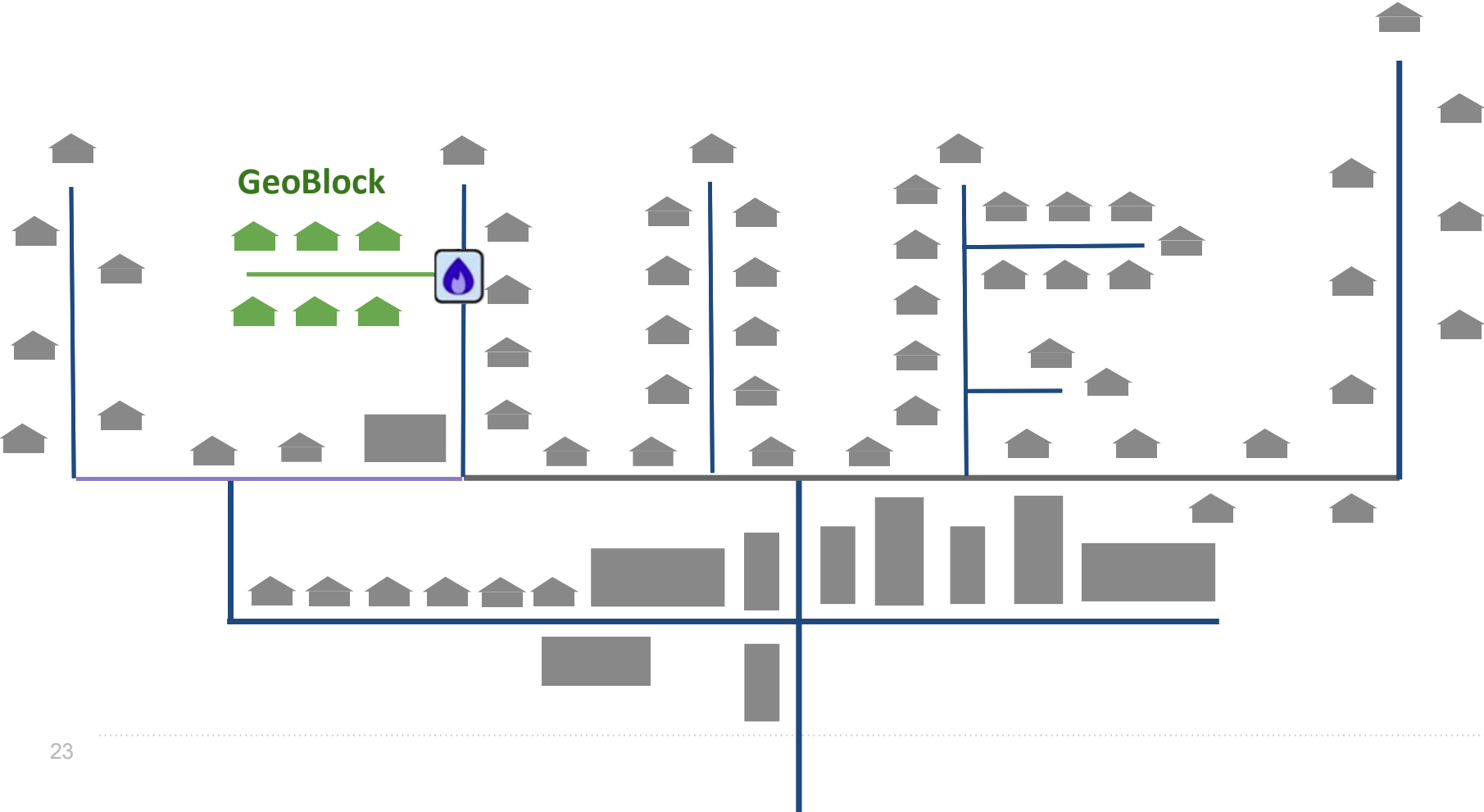
A Recovery for All of Us: Mayor de Blasio Announces Path to Provide Geothermal Utility Service

April 21, 2021

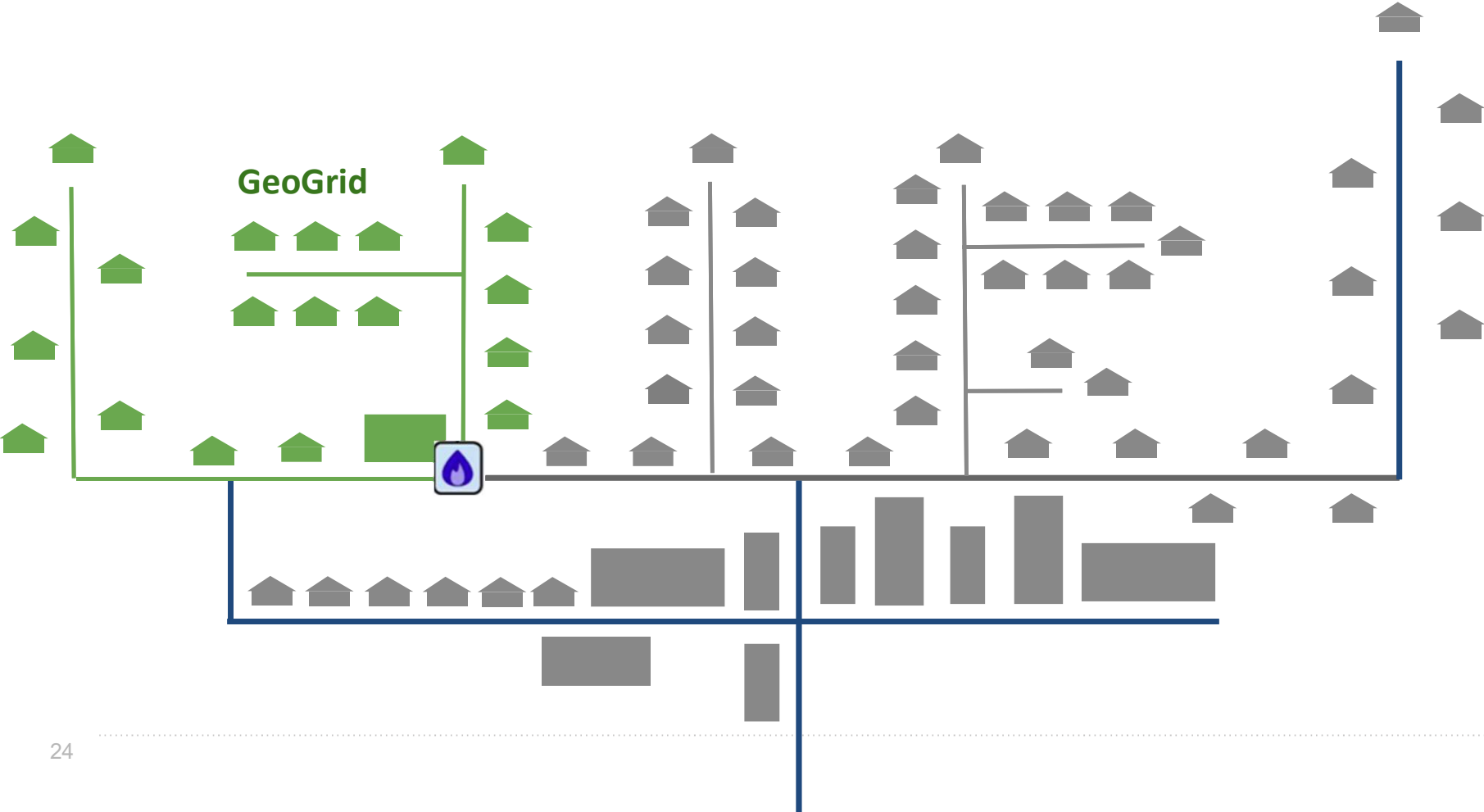
City will identify project sites this year and pursue legislation to deploy geothermal district demonstration projects and bring service to scale

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



Iterating & Interconnecting



Geo/Gas Hybrid Rate Base



HEET Research Team

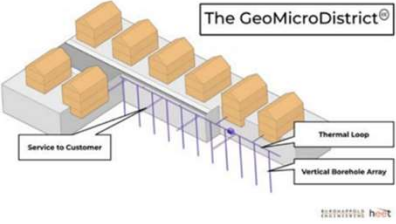
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LEARNING FROM THE GROUND UP
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1. **Evaluate the pilot GeoMicroDistrict capacity** a) meet annual heating and cooling demands for an approximately 100,000 sf dense, mixed-energy-use street segment b) 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.

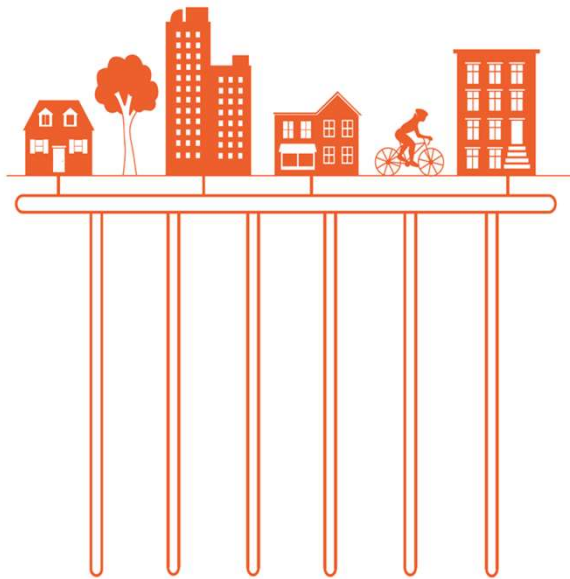
GeoMicroDistricts use bidirectional borehole thermal energy storage (BTES) as the prime source of thermal energy for buildings. A subsurface ambient temperature water loop, maintained at 40-80°F across seasons, delivers that temperature through service lines to buildings. The use of an ambient-loop interface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



The diagram, titled 'The GeoMicroDistrict', illustrates the system's components. It shows a row of buildings on a street level. Below the buildings, a network of pipes is shown. A 'Thermal Loop' is depicted as a horizontal line of pipes connecting the buildings. A 'Vertical Borehole Array' is shown as a series of vertical pipes extending into the ground. A 'Service to Customer' line is shown connecting the thermal loop to the buildings. The diagram is credited to 'geothermal heet'.

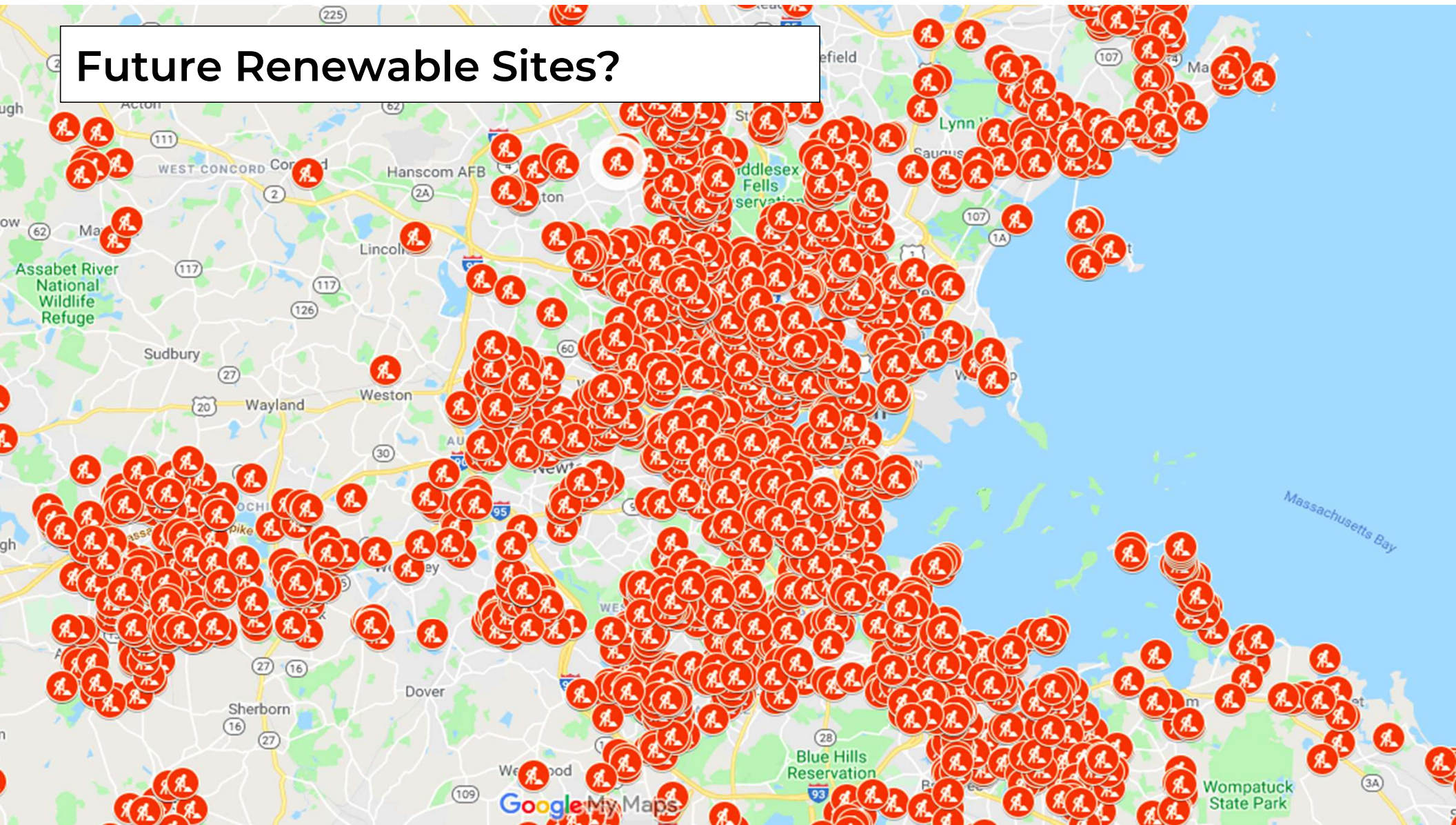
- Harvard, MIT & 2 national labs
- Design review
- Data collection & sensors
- Data transparency
- Scaled-up impacts
- Resource library of best practices

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?





heet

Cutting carbon emissions NOW by driving system change

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