

Commission for Energy Use and Climate Change

Meeting Minutes

August 12, 2020

Virtual Meeting

Attendees:

Eliza Johnston – Commissioner

Juliette Rooney-Varga – Commissioner

Julie Wood – Commissioner

Larry Yu – Commissioner

Oliver Sellers-Garcia – (member ex-officio) Director of Office of Sustainability and Environment

Aladdine Joroff

Elizabeth Long

Elizabeth Meek

Karen Rankin

Mary Mangan

Marya Axner

Tristan Doherty

Andrew DeBenedictis

Malcolm Cummings

Lanier Smythe

Sean Dew

Review and adopt the minutes from the July 8, 2020 meeting

- Approved

Next steps on priority climate change/pandemic items identified during May-July facilitated discussions

- This item was postponed to the September 2020 meeting.

Presentation by HEET (Home Energy Efficiency Team): *The GeoMicroDistrict: How geothermal can provide a novel path to electrification, one neighborhood at a time*

- Audrey Schulman and Zeyneb Magavi of HEET gave a presentation on repurposing gas lines for district thermal energy (slides attached).
- Eversource is planning three different pilot projects
 - Eversource pilots could be next spring

- Eversource will cover cost of ASHPs, will provide low fixed energy cost because don't know how to bill for this.
- Ideally, at scale, the building distribution system upgrades would be part of the financial structure of the gas line conversion to thermal
- In the pilots, they will leave the gas service in place.
- What are ideal characteristics for ideal segment?
 - New build
 - No steam heat (expensive retrofit because you can't provide temperature hot enough for steam)
 - Scale: 10-40 buildings
 - Eversource is looking for residential and mixed use areas with a balance of energy users

The GeoMicroDistrict

A Novel Path to Building Electrification

Audrey Schulman & Zeyneb Magavi, Co-Exec. Directors

Putnam
Foundation

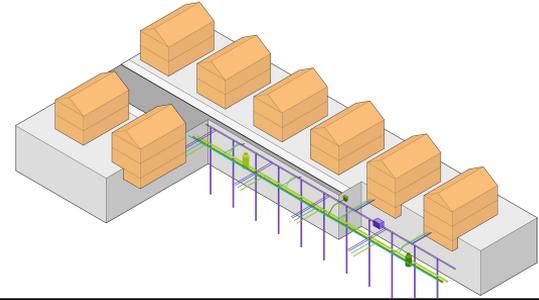


Barr
Foundation

HEET

To cut carbon emissions NOW
by driving systems change.

GeoMicroDistrict



Gas Leaks

Finding solutions to reduce methane emissions

[READ MORE](#)

Energy Efficiency

Helping nonprofits lower emissions and energy bills

[READ MORE](#)

Fracking



Problems with Gas

© Tim Shaffer/Reuters

Indoor Air Pollution



Gas stoves can generate unsafe levels of indoor air pollution

An accumulating body of research suggests gas stoves are a health risk.

By David Roberts | [@drvox](#) | [david@vox.com](#) | May 7, 2020, 10:30am EDT

Problems with Gas

Potentially Explosive

Columbia Gas Disaster, 2018



Problems with Gas

Emissions

(> 80 times as potent as CO₂, over 20 yrs)



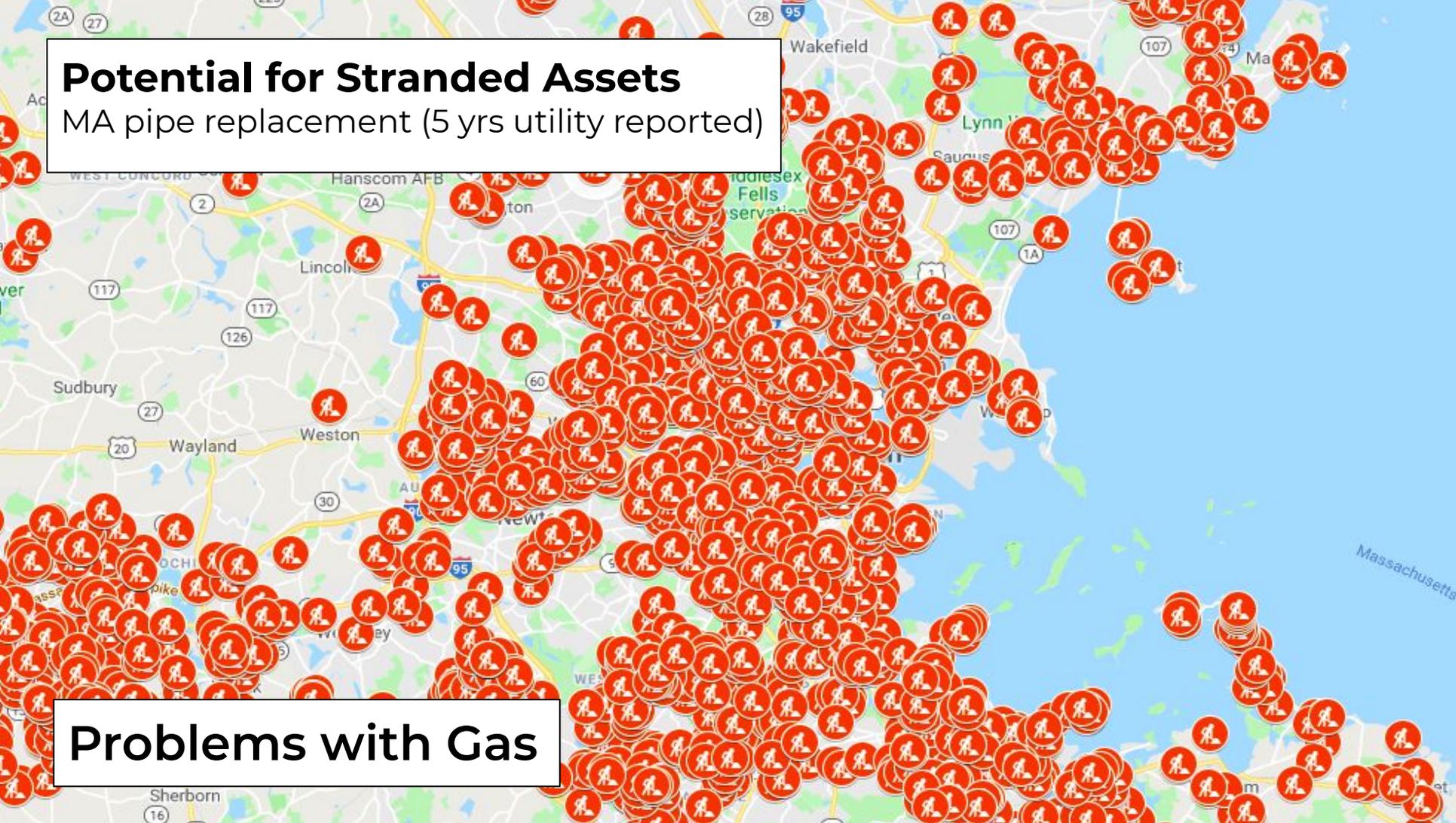
Problems with Gas

Jonah M. Kessel/The New York Times

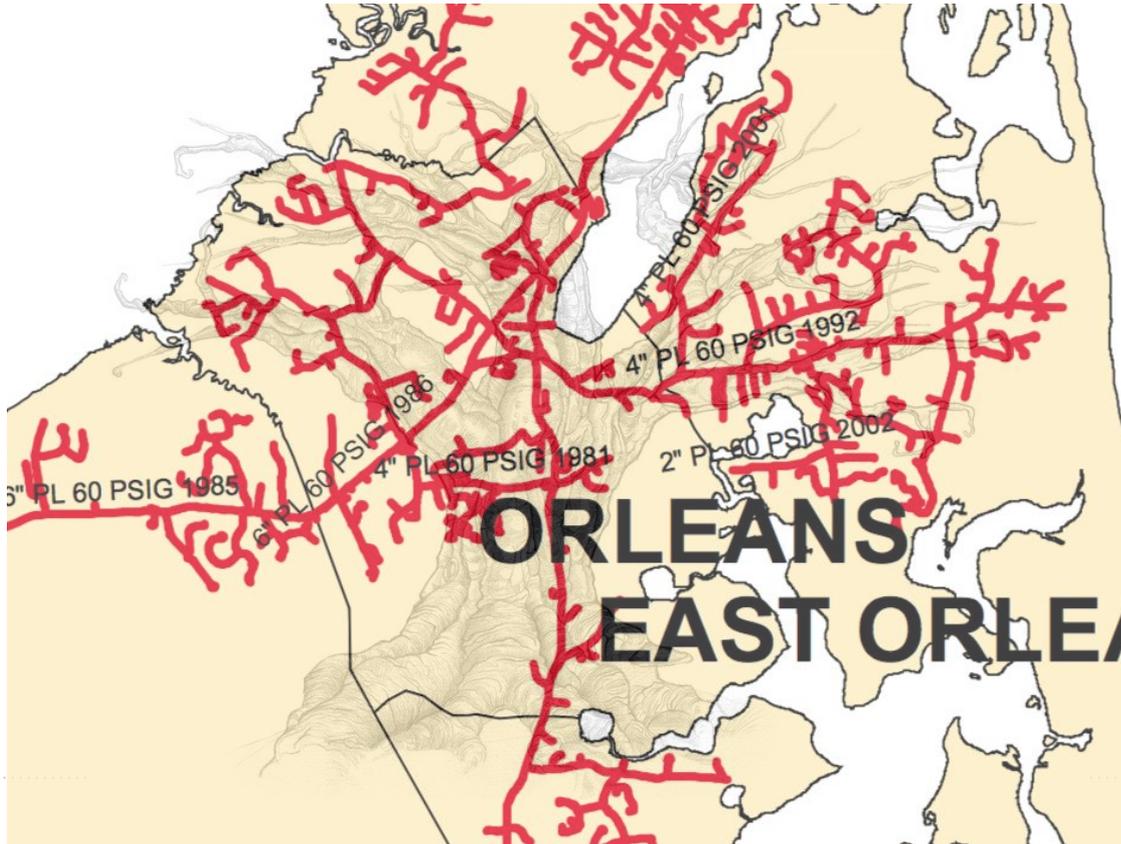
Potential for Stranded Assets

MA pipe replacement (5 yrs utility reported)

Problems with Gas



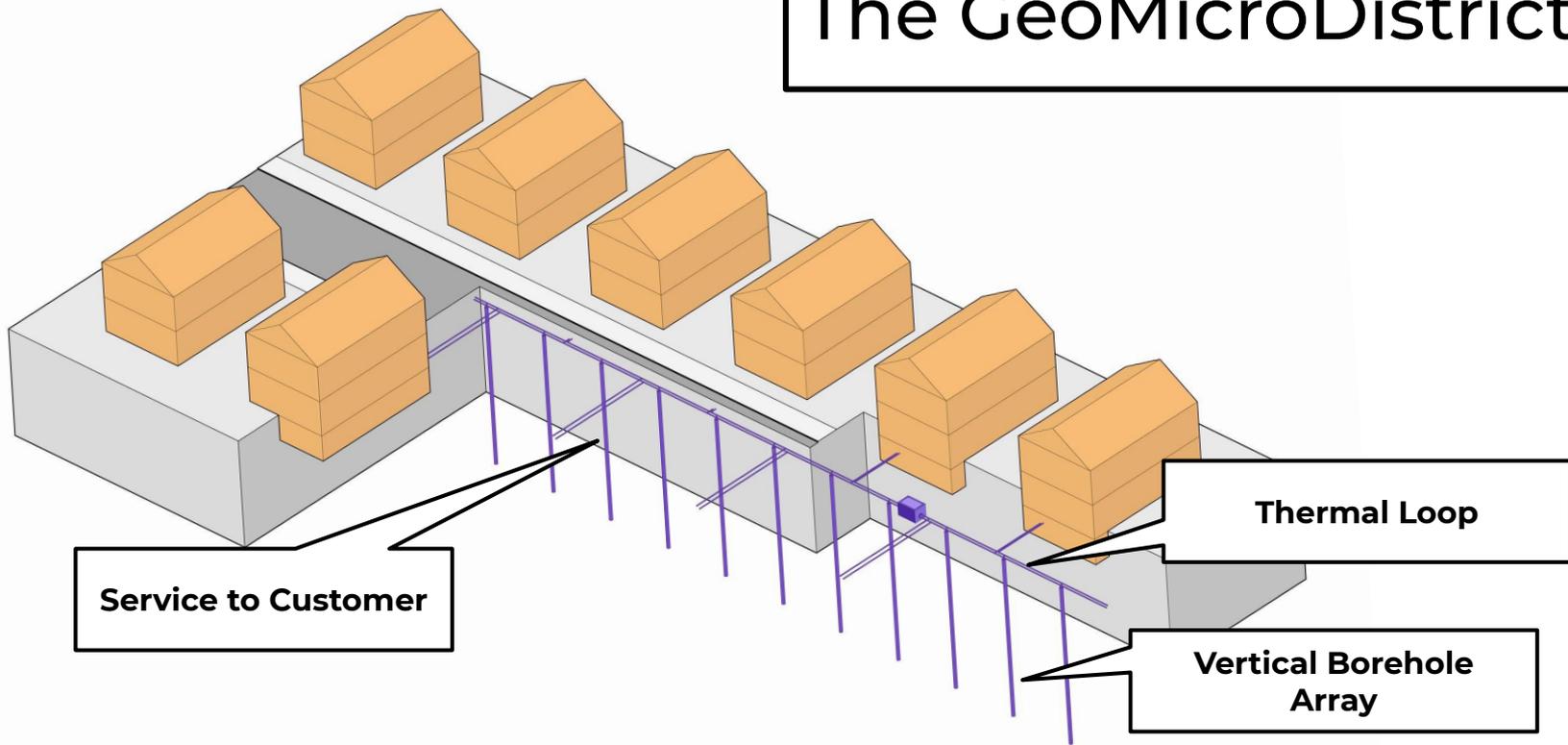
Pruning the Tree



One Method of Transition

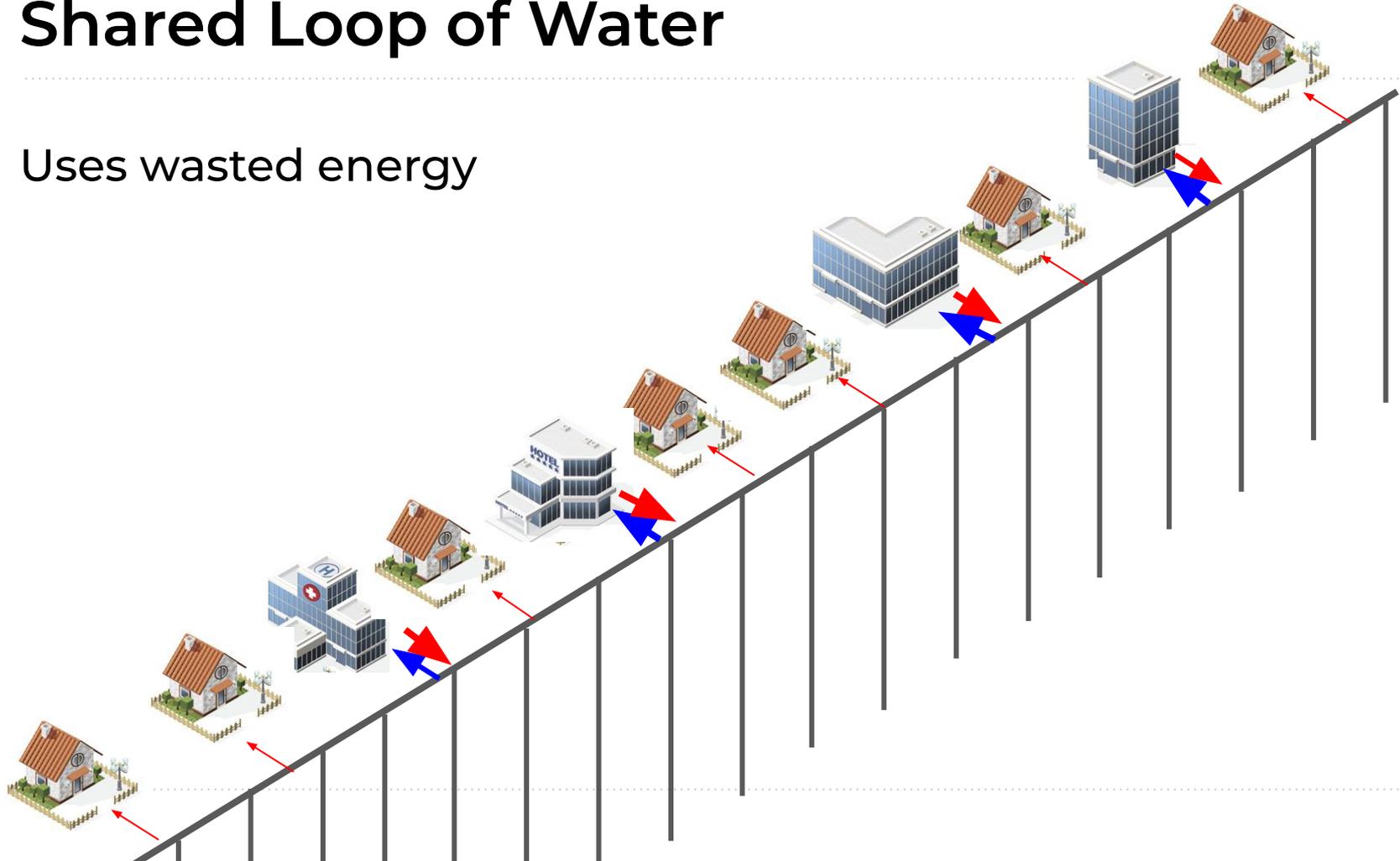


The GeoMicroDistrict ^{CC}



Shared Loop of Water

Uses wasted energy

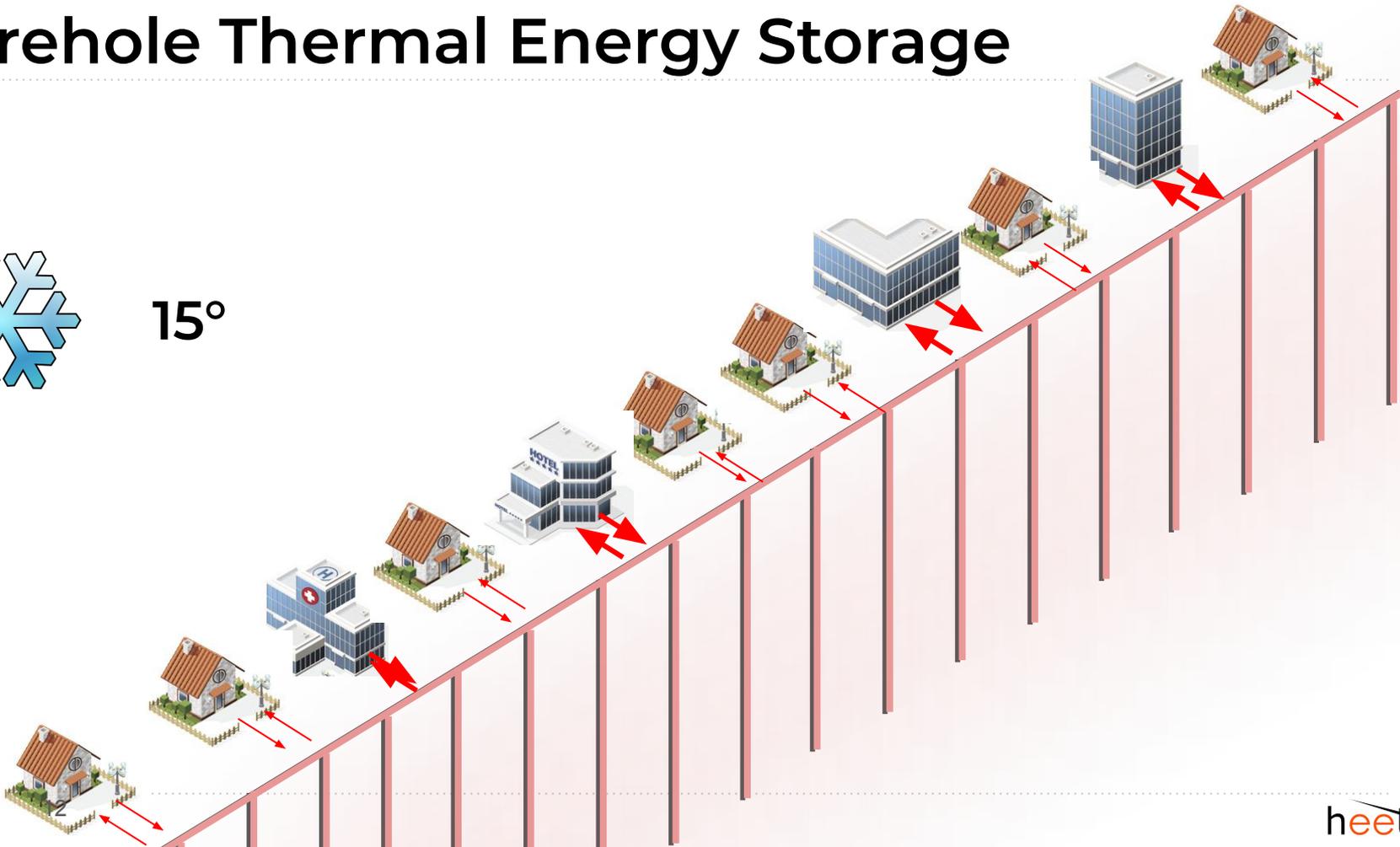


Borehole Thermal Energy Storage



15°

12

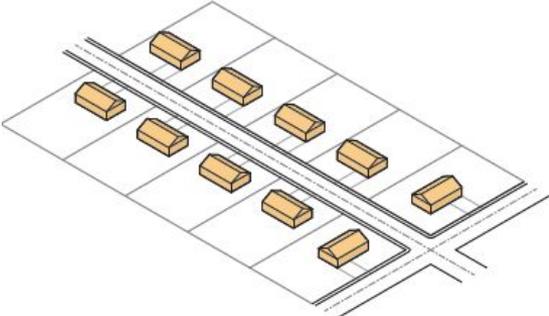


Feasibility Study

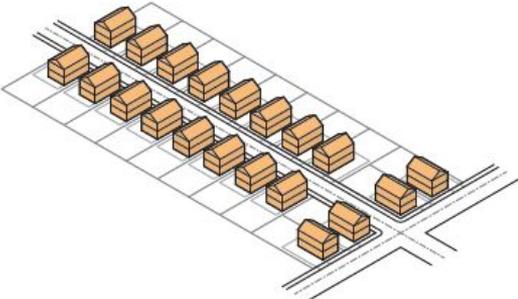
2019

BUROHAPPOLD
ENGINEERING

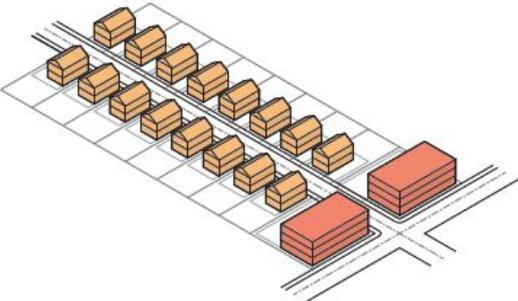
heetma.org/feasibility-study/



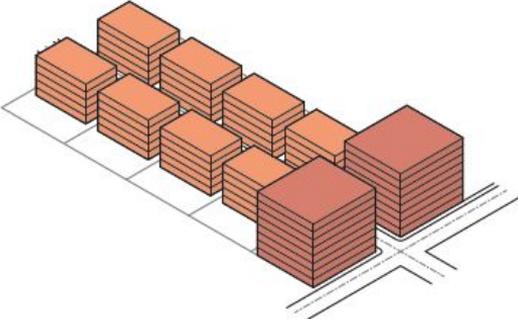
Low density residential



Medium density residential



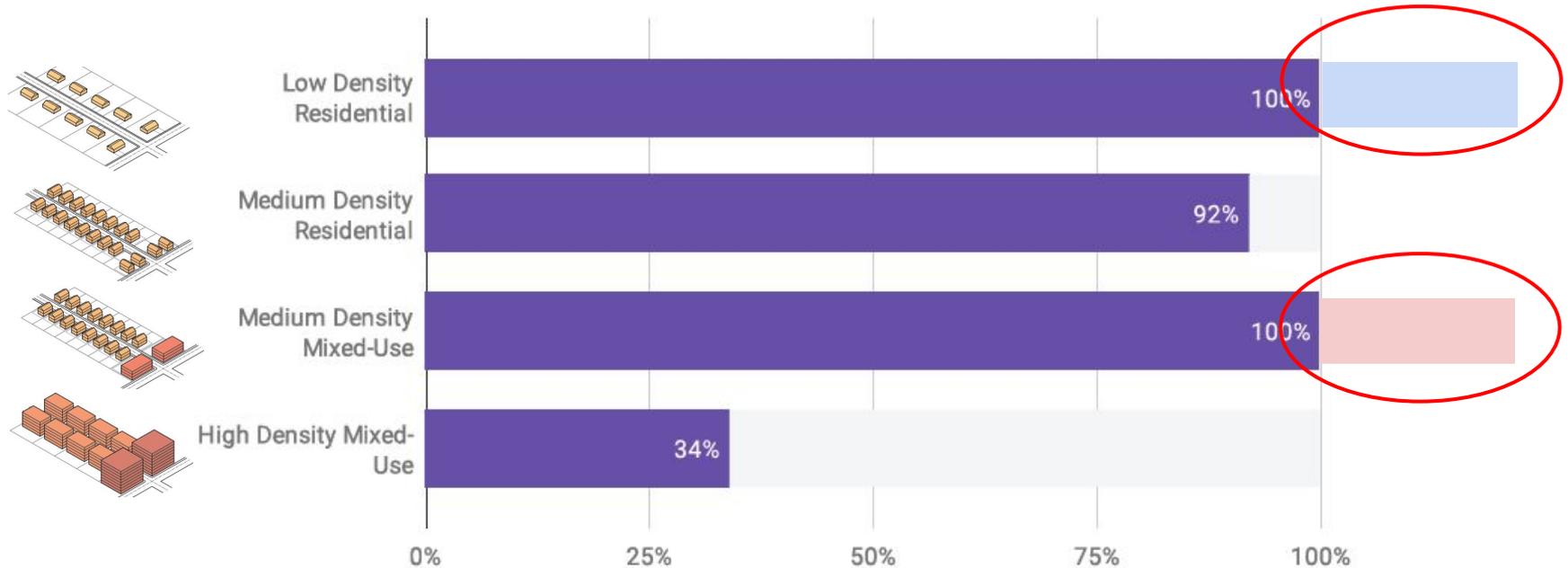
Medium density mixed-use



High density mixed-use

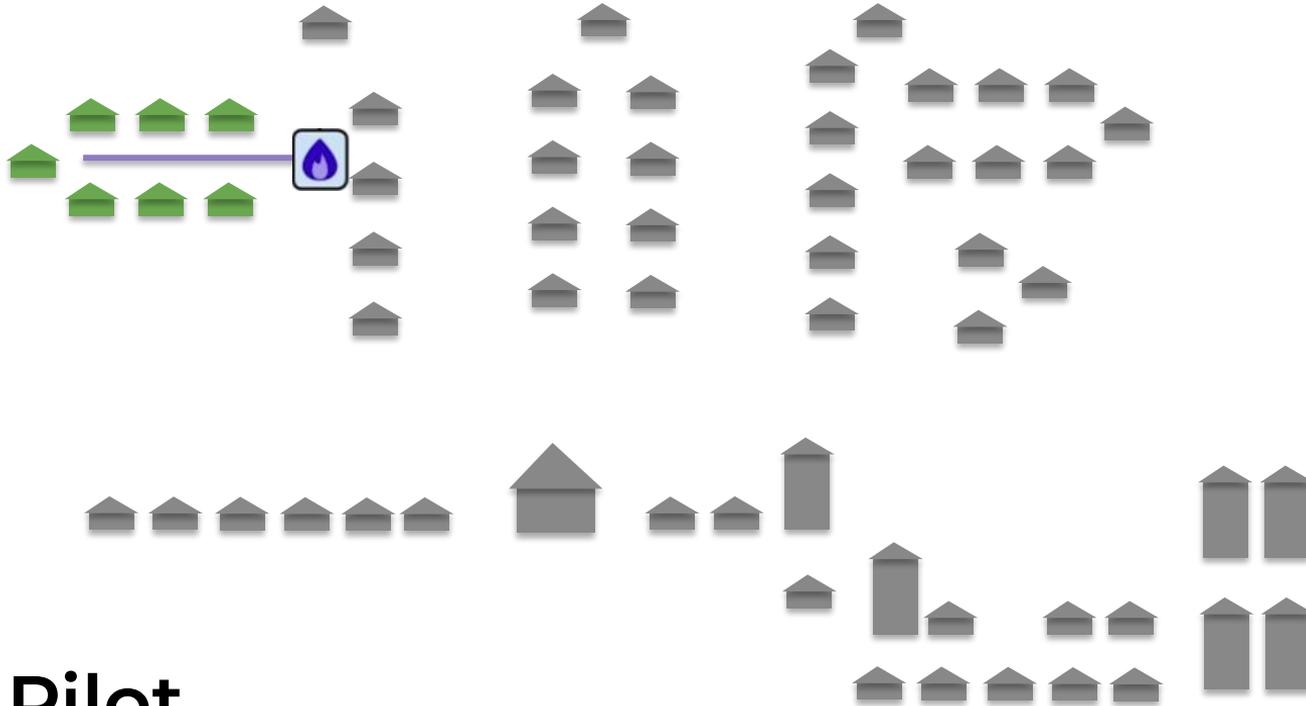
Technical Feasibility per Street Segment

The ability to meet energy demand through boreholes in the street only





Low Density
Residential

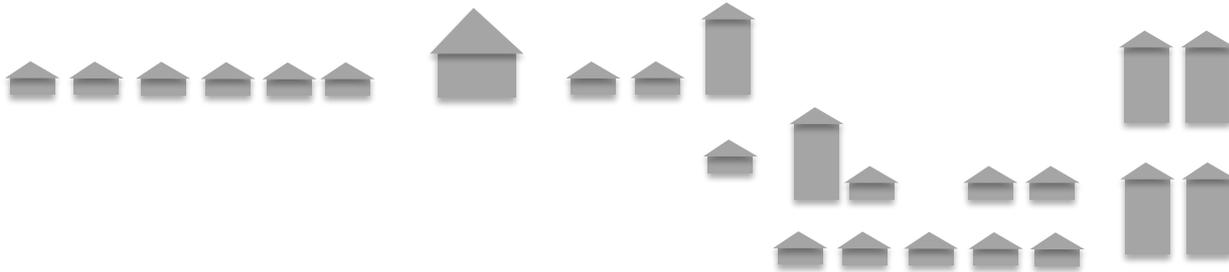
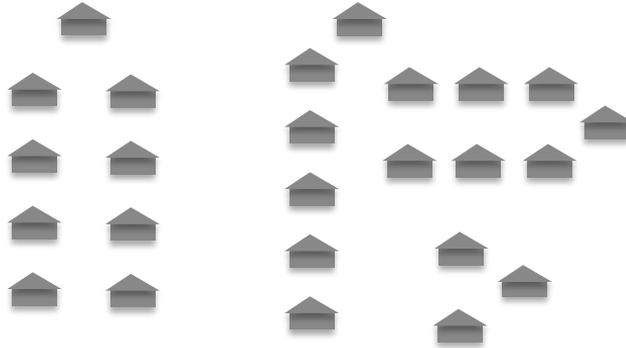
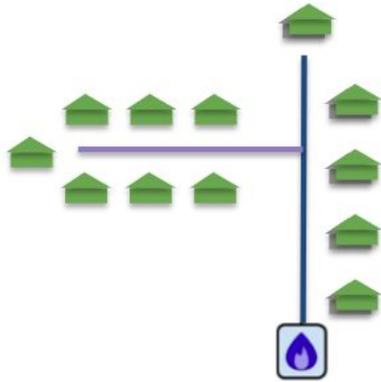


First Pilot

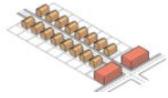


Medium Density Residential

92%

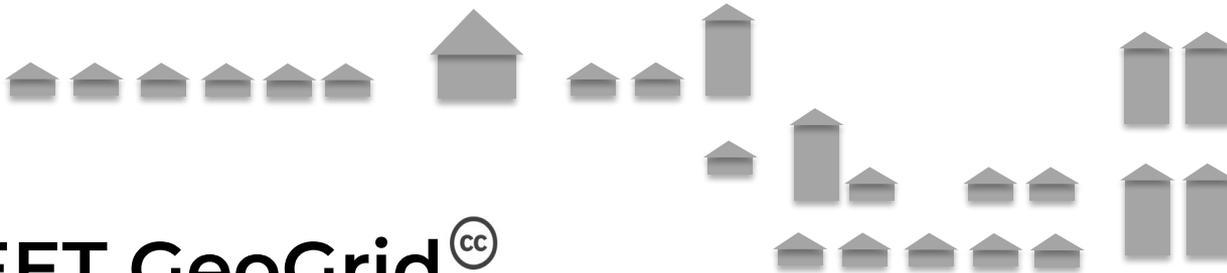
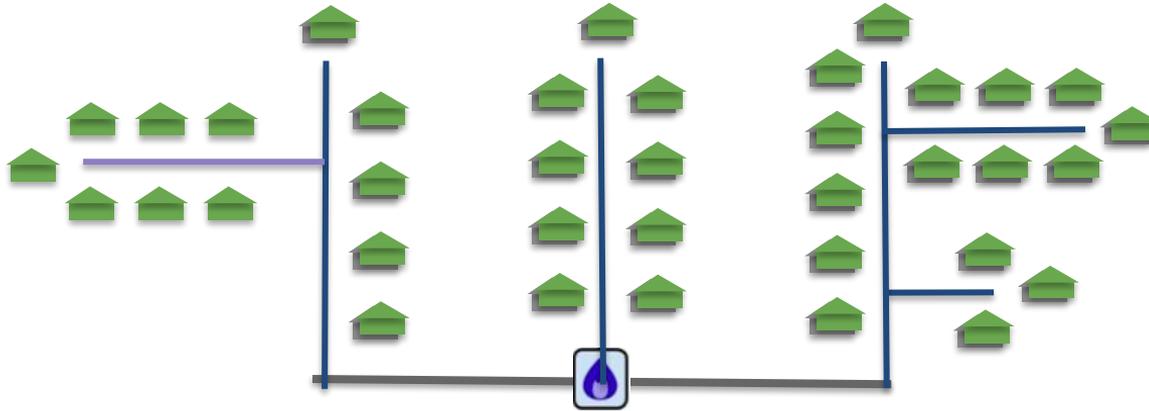


Iterate



Medium Density
Mixed-Use

100%



The HEET GeoGrid^{CC}

Other Methods of Thermal Management



Cooled Irrigation Water



Melted Snow on Sidewalks

Case Study



2006

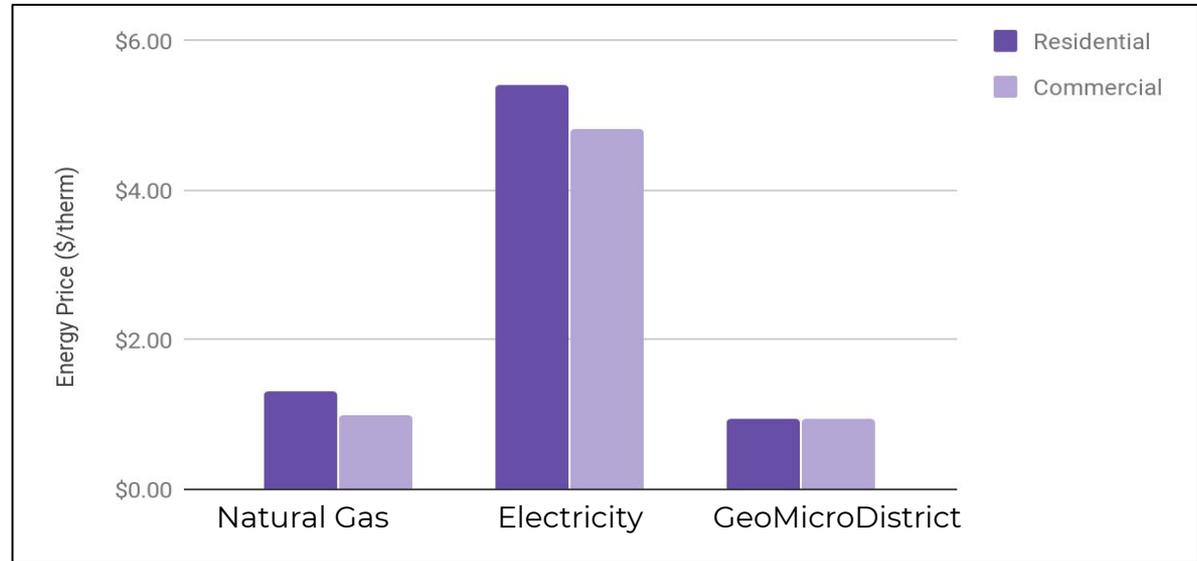
- 3,500 students
- 1st GeoMicroDistrict

2019

- 11,500 students
- 4 GeoMicroDistricts
- 1.2 million ft²

Outcomes

➤ Energy costs



Outcomes

- Energy costs
- Water savings

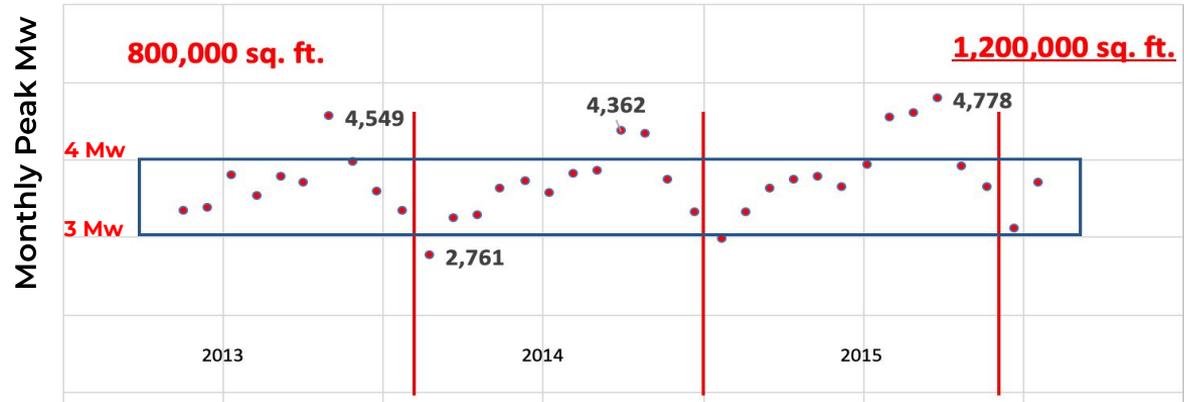


Outcomes

- Energy costs
- Water savings
- Electric peak



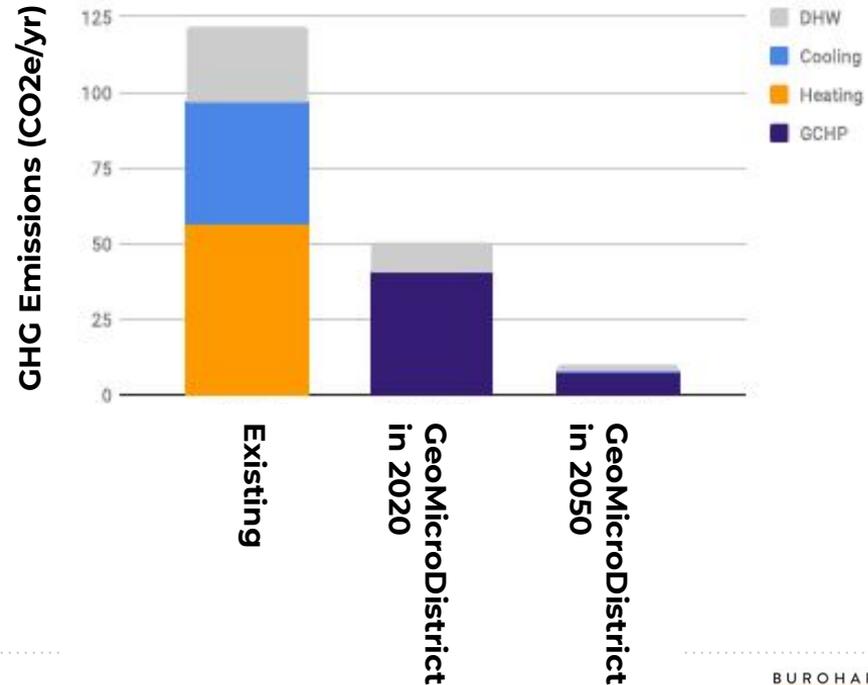
Monthly Peak as Campus Grows



Courtesy of The GreyEdge Group©

Outcomes

- Energy costs
- Water savings
- Electric peak
- Emissions



Outcomes

- Energy costs
- Water savings
- Electric peak
- Emissions
- Safety



Outcomes

- Energy costs
- Water savings
- Electric peak
- Emissions
- Safety
- Jobs



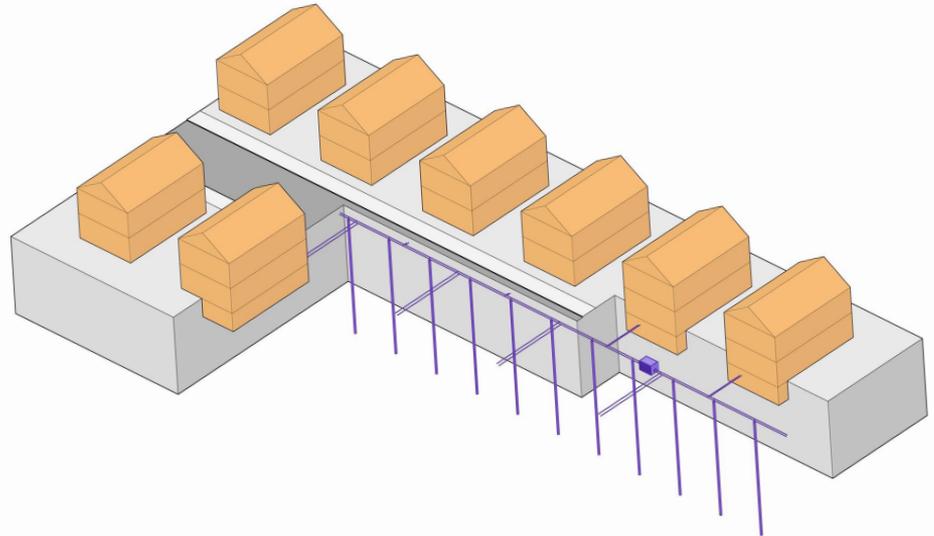
HDPE SDR-11
(High Density Polyethylene)

MA Multiple Potential Pilots

- Eversource Gas - requested 3 pilots
- Columbia Gas Settlement - likely \$4 million pilot
- National Grid - announced rate based request in fall

Interest Outside of MA

- NYSERDA
- Con Ed
- Rhode Island
- Minn.
- Bridgeport, Conn.



HEET Pilot Research & Evaluation Team

- **MIT** Sloan School , System Dynamics
- **Harvard** T.H.Chan School of Public Health, C-CHANGE Institute
- **BuroHappold** Engineering
- Massachusetts **DEP** (Department of Environmental Protection)
- **Berkeley National Lab**, Earth and Environmental Science
- University of California, **Berkeley**, Civil & Environmental Engineering
- **National Renewable Energy Laboratories**
- Massachusetts **CEC** (Clean Energy Center)

HEET Community Charrettes

Quarterly meetings of utilities, gas workers, geothermal experts, regulators, activists, municipalities, academics, energy wonks, community groups and others.



A Gas to GeoGrid Plan for Somerville? (for MA?!)

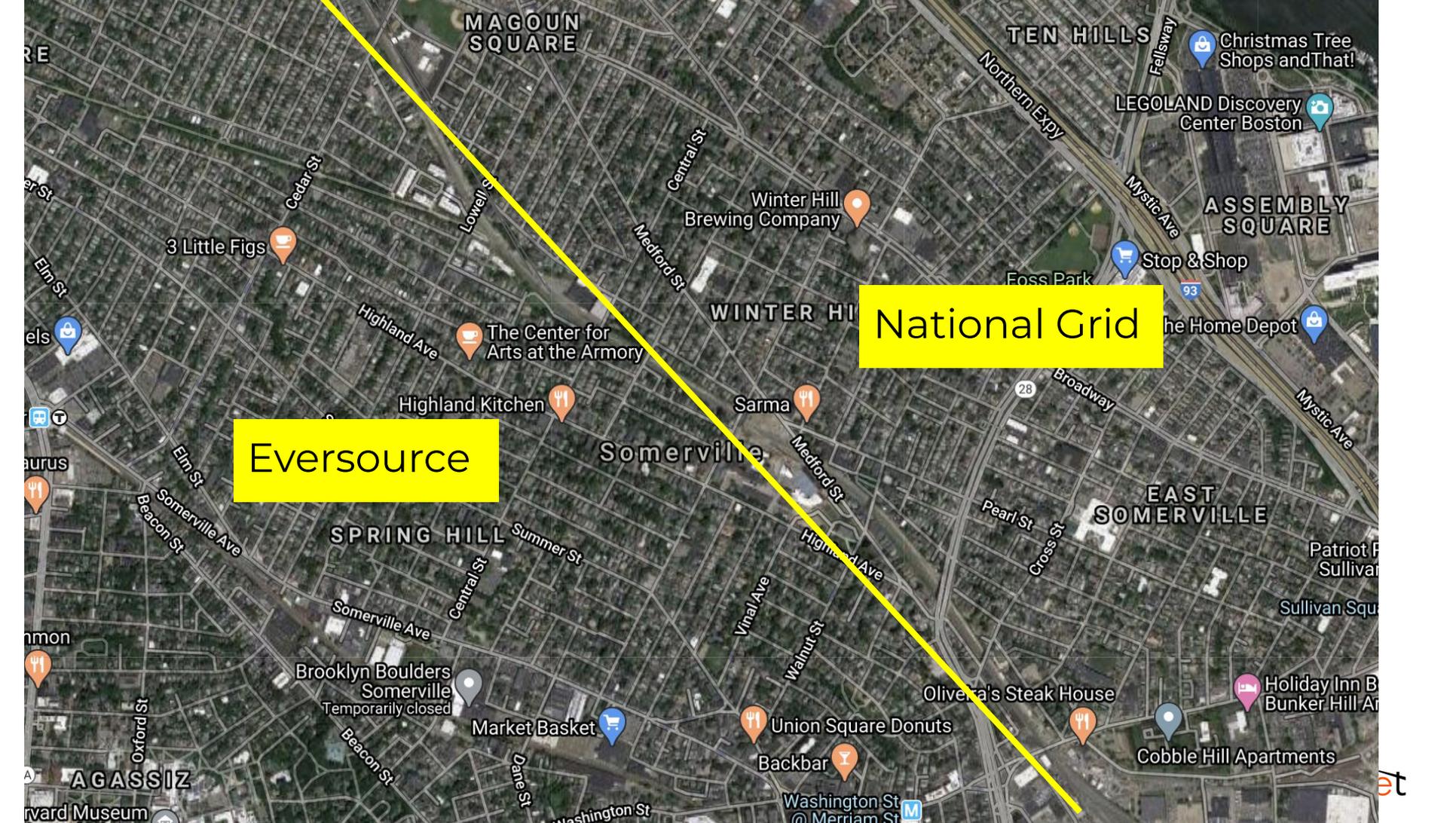
1. Learn & educate others
(DPW, developers, residents)
2. Identify pilot sites for Somerville to lead!
3. Think decades ahead, reduce risks, make a plan:
(strategic abandonment, evolution & maintenance)

#BeyondGas #SafeEnergy4All #MAGasPlan

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REFERENCES & RESOURCES

1. [“GeoMicroDistrict Feasibility Study”](#), Buro Happold & HEET, 2019
2. [Eversource Gas geothermal pilot ratecase DPU 19-120](#)
3. [AG Healey’s Petition to Consider the Future of Gas](#)
4. [Applied Economic Clinic policy brief](#)
5. [‘Energy Shift — A Utility-Scale Path From Gas To Renewable Thermal,’](#) Zeyneb Magavi and Audrey Schulman, Building Energy Magazine, Nov. 2019.
6. Schulman, A., 2020. [Pipes or Wires](#), Rocky Mountain Institute blog.
7. Skarphagen, H. et al, 2019. ‘Design Considerations for Borehole Thermal Energy Storage (BTES): A Review with Emphasis on Convective Heat Transfer,’ *GeoFluids, Hindawi*. <https://doi.org/10.1155/2019/4961781>.
8. Bunning, F. et al, 2018. ‘Bidirectional low temperature district energy systems with agent-based control: Performance comparison and operation optimization.’ *Applied Energy*. <https://doi.org/10.1016/j.apenergy.2017.10.072>
9. Buffa, S. et al, 2019. ‘5th generation district heating and cooling systems: A review of existing cases in Europe.’ *Renewable and Sustainable Energy Reviews*. <https://doi.org/10.1016/j.rser.2018.12.059>



Eversource

National Grid