LWVMA Climate and Energy Solutions Series Webinar

Pipeline to the FUTURE
Delivering Safe, Renewable Geothermal Energy to Massachusetts

Opening remarks
Senator Cynthia Creem, Senate Majority Leader

Panelists
Audrey Schulman, HEET co-founder and Executive Director
Zeyneb Magavi, HEET Director
Agenda

- HEET
- GeoMicroDistrict
- The F.U.T.U.R.E. Act
To cut carbon emissions NOW by driving systems change.
MA Gas Pipe Replacement

- >25% gas mains leakprone
- ~20 year plan
- $9 billion cost
- 40 years depreciation
- Emission mandates: 80% by 2050
5 years of pipe replacement plans
Cost: $100,000
4 Homes
➢ Don’t work everywhere
➢ Large burden on electric grid
➢ Inequity of access
➢ Requires collapse of gas industry
Design Principles for the ENERGY SHIFT.

➢ Safe
➢ Renewable & resilient & reliable
➢ Low cost for consumers
➢ Workers keep their jobs
➢ Minimal legislative & regulatory change
➢ Scalable & flexible
The GeoMicroDistrict

Service to Customer

Thermal Loop

Vertical Borehole Array
Heat Pumps
Heat pumps aren’t new technology.
They can be trusted
How they work

They contain a fluid that works like a sponge for heat.

When they expand, they absorb heat.

When compressed they “reject” heat.
Efficient

A boiler creates heat through fire.

A heat pump moves existing energy.
Air Source Heat Pumps

They are all around us today.
Ground Source Heat Pump
Winter

28°
Winter: Heat turned on

28°
Summer

90°
Summer: AC turned on

Uses stored energy & geothermal
Systems sized for worst heating load/year

Can get very expensive
Economies of Scale
GeoMicroDistrict Feasibility Study
Granite and metamorphic rock, which provide a greater rate of heat extraction, found frequently through Massachusetts.
End Use Energy Consumption

The resulting end use profiles were used to estimate heating and cooling loads for a street-scale geothermal system.

Source: BuroHappold analysis; MA DOER; U.S. DOE; U.S. EIA; EPRI
Prototype Street Segments

Four prototype street segments created and analyzed are:

- Low density residential
- Medium density residential
- Medium density mixed-use
- High density mixed-use
GeoMicroDistricts were able to meet 100% of heating and cooling loads for 2 of the 4 Prototype Street Segments modeled.
A high level estimate of price for utility-provided geothermal heating/cooling is lower than both gas and electricity.

Source: BuroHappold analysis; U.S. EIA
Boreholes and service connections could be located between existing infrastructure.
Annual Greenhouse Gas Emissions

Medium Density Mixed-Use

GHG Emissions (tCO2e/yr)

- Existing
- GeoMicroDistrict 2020
- GeoMicroDistrict 2050

Legend:
- DHW
- Cooling
- Heating
- GCHP
What do these results mean?

- The concept works for a significant portion of MA
- The engineering and economics is reasonable
- The concept can get us to our climate goals
Benefits

- Provides long-term thermal storage
- Cuts summer electric grid peaks
- Adapts to changing climate
- Provides resilience
- Equitable access to renewable energy
How would it work in my home?

Just water is in the pipe.
Heat Exchanger
Connects to your existing system

Heat exchanger → Water pump → Radiator

Heat exchanger → Air handler → Vent
Heat Exchange

- 62°
- 85°
- 71°
- 55°
Emissions Decrease Over Time
F.U.T.U.R.E Act
Roadmap to renewables for gas utilities
Gas Leaks Allies & Large Coalition
MA Emissions

- TRANSPORTATION: 39%
- ELECTRICITY: 21%
- HEATING: 30%
- OTHER: 10%

Source: Achieve Renewable
Roadmap to Renewables for Electric Utilities

Source: MassCEC
Framework

Triage Current Gas System

Transition to Renewable Thermal
Gas Safety and Gas Leaks

- Prevents paving over shut off valves
- Notifies local fire chief within 1 hour
- Audit of gas company’s leak data

Dept. of Public Utilities

- Must consider public health, safety & climate impact.
- Improves transparency with maps of leaks, leakprone infrastructure, costs and plans

Empowers Municipalities
Framework

2020

Triage Current Gas System

2050

Transition to Renewable Thermal
Mandate Transition to Renewable Thermal

- Allows gas companies to sell renewable heating & cooling, not just gas
- Allows replacement of gas pipes with renewable thermal pipes
- **Must** provide more renewables each year to reach state goals
Meet mandate by:

- Energy efficiency
- Incentives for heat pump installation
- Installing renewable thermal infrastructure
Financial Mechanisms to Encourage Transition

Depreciation
- Gas companies CAN’T depreciate gas infrastructure past 2050
- They CAN depreciate renewable infrastructure past 2050

Funding
- Renewable energy surcharge for gas, equivalent to electricity surcharge

Financial Appeal
- A business model that does not rely on an explosive fuel from out of state with volatile pricing is appealing to gas companies.
Key Benefits: Green Economy

- Gas workers can transition
- Utility-scale reduces customer cost
- Keeps money in the state instead of buying gas
- Does not waste $9 billion on fossil fuel pipes
Key Benefits: Equity

- Must take health & safety into account
- Gives equitable access to clean non-explosive energy for all
- Stops low income households from getting stuck with bill for stranded assets
Key Benefits: Resilience

- Balances energy sources in MA and cuts electric system peaks
- Underground pipes safer in extreme weather
- Trees will last longer without gas leaks
Gas Companies

Current

Future

"Go. Evolve. Don’t worry about us."
Questions?