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 leak prone
➢ ~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

55°

68°
Winter

28°
Winter: Heat turned on
Summer

90°
Summer: AC turned on

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

Can get very expensive
Economies of Scale
Energy Diversity
GeoMicroDistrict Feasibility Study
Granite and metamorphic rock, which provide a greater rate of heat extraction, found frequently through Massachusetts.
The resulting end use profiles were used to estimate heating and cooling loads for a street-scale geothermal system.
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

- Existing
- GeoMicroDistrict 2020
- GeoMicroDistrict 2050

GHG Emissions (tCO2e/yr)

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

Source: Achieve Renewable
Roadmap to Renewables for Electric Utilities

Renewable Portfolio Standard

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

Triage Current Gas System

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

“Go. Evolve. Don’t worry about us.”
Questions?