Construction and Commissioning of a GEN

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Network Overview

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- Single pipe design
- Neighborhood scale with interconnected properties
- Mix of commercial, residential, and low income apartment buildings
- 37 total buildings with approximately 140 individual customers throughout
- 90 boreholes across three borefields to provide capacity of approximately 375 tons of load
- Design is flexible with the ability to expand and add load in the future
- Central control and pumping from above ground pump-house

Construction Workstreams

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Ground Exchangers

- Borehole Drilling
- Site Work
- Headers and Piping

Distribution Loop

- Main / Service Installation
- Pump House and Equipment
- Vault and Exchanger Installation

Building Conversions

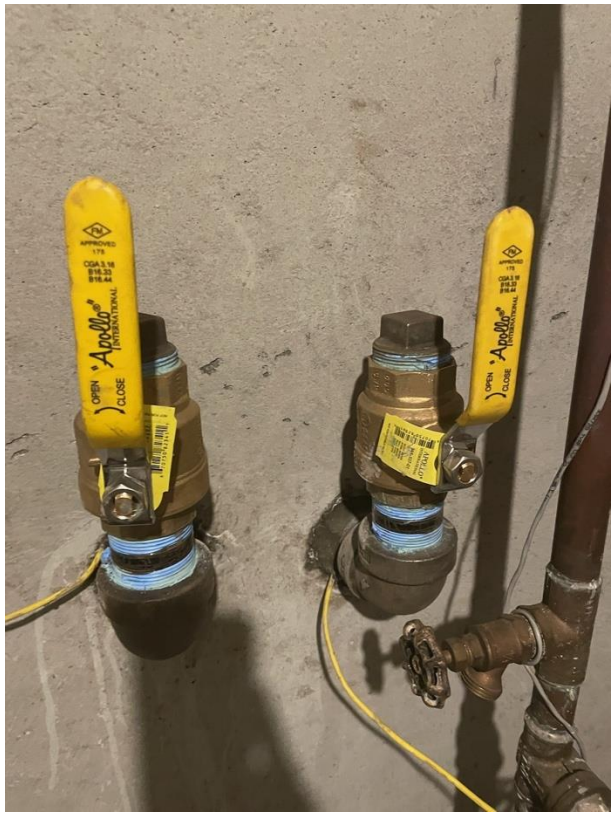
- Weatherization
- Ducting and Electrical
- Heat Pump Installation

Main Installation

- Installation method almost identical to water or gas line work in the public right of way
- HDPE pipe used for the distribution loop, fittings, and valves
- Similar timeline and budget to traditional utility work
- Installation completed by traditional gas construction firm RH White

Service Installation

- Single trench with 2x lines (inlet and outlet)
- Two curb valves with bypass
- Interior isolation valves within the building



Borefield Drilling

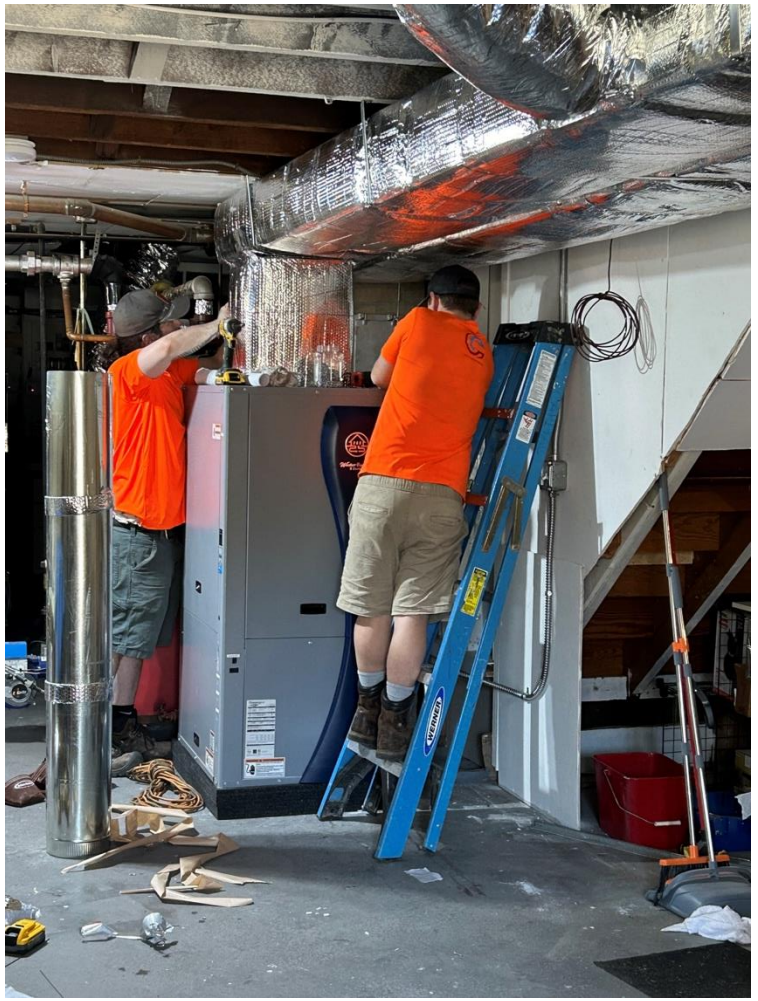
- Total of 90 boreholes drilled across 3x sites
- Drilling took place from August 2023 to January 2024
- Water management and spoils removal were critical to drilling operations
- All borefields located under parking / paved areas

Pump House

- Pump house installation took place in early 2024
- Pre-fabricated building with wiring, lights, HVAC included
- Mechanical work and equipment installation followed
- Instrumentation and monitoring equipment was the final step

Building Conversions

- Building conversions were a challenging part of the project
- Each building was unique and required input from HVAC professionals
- Equipment varied from force air to VRF and large commercial units
- In some cases, internal air distribution system was re-used with GSHP to condition the space
- This scope is not typically within the utility responsibility



Project Management for Residential Customers

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- Residential in-home work
  - Finding and Selected the vendor through RFP
  - Walkthrough with every customer to determine final design of the system
  - Sign off from every customer acknowledging the placement of ductwork, heating equipment, main electric panel upgrades, placement of supply and return, and all construction related work in their home.
  - Our Geothermal Community Partner worked closely with customers and our HVAC contractor to ensure change orders, updated schedules, and any other customer facing concerns were communicated in a timely manner.

Construction Lessons Learned

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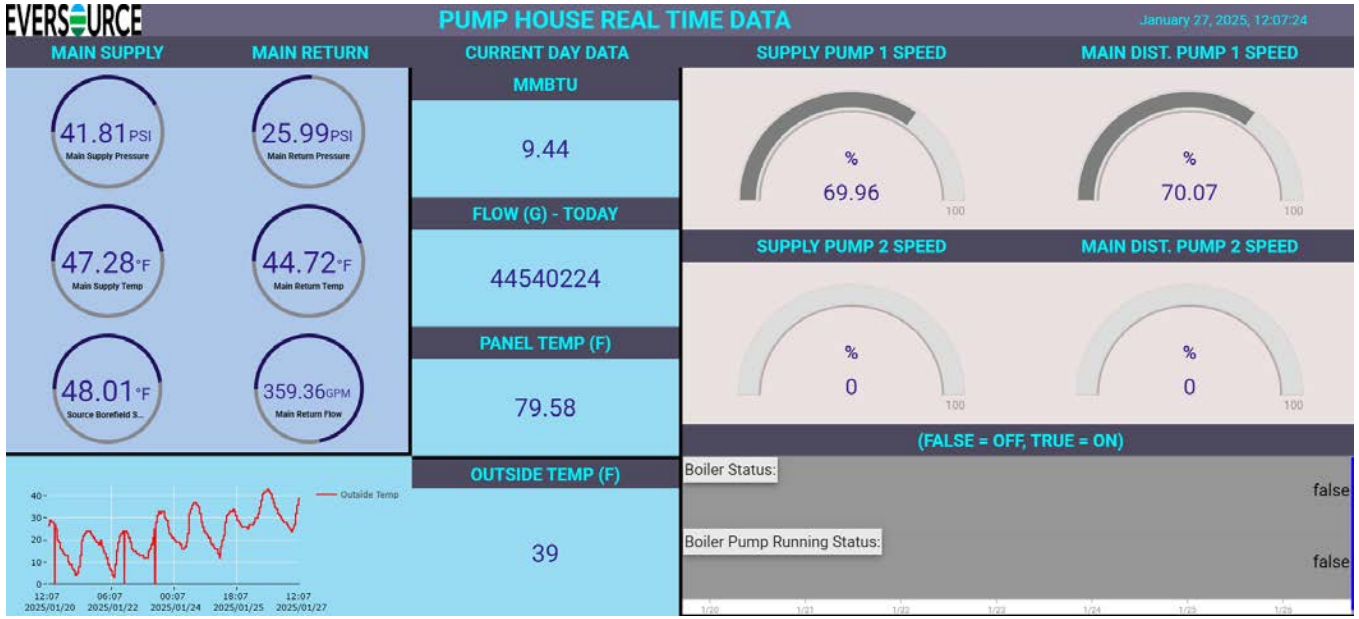
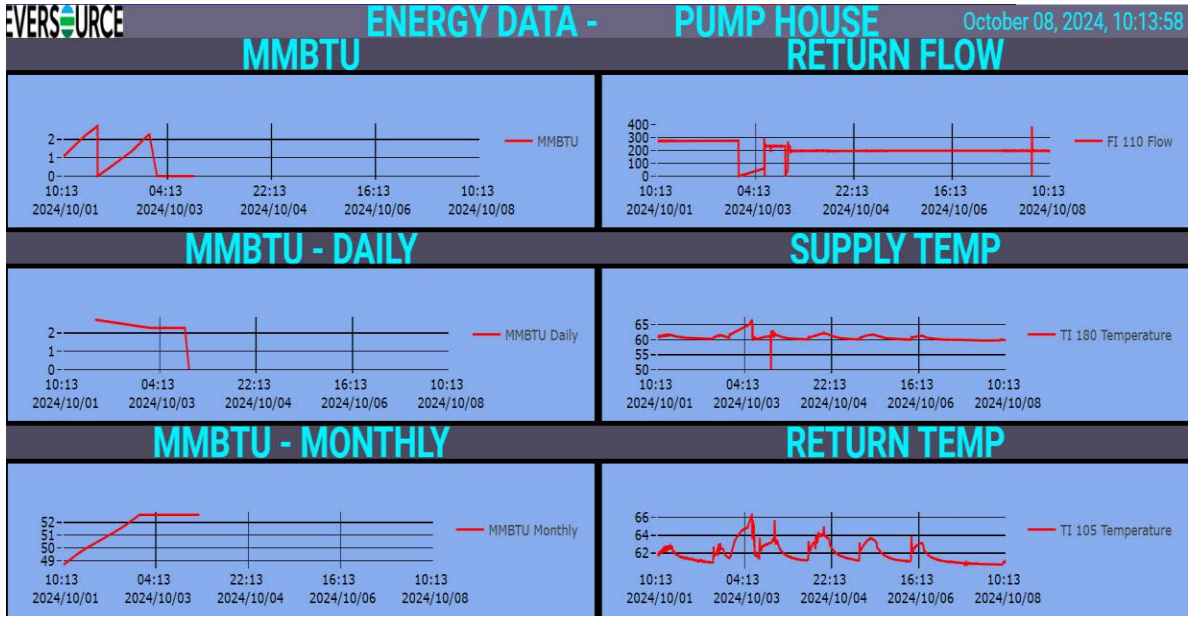
- Timeline and Parallel Workstreams
- Traditional Utility Challenges
- Geothermal Specific Challenges
- Site Access and Scheduling
- Unknown Building Conditions (Asbestos, Mold, Wiring, etc)

Commissioning and Operations

System Startup

- Borefield Flushing
- System filling and purging
- Air Traps
- Monitoring and Control Equipment

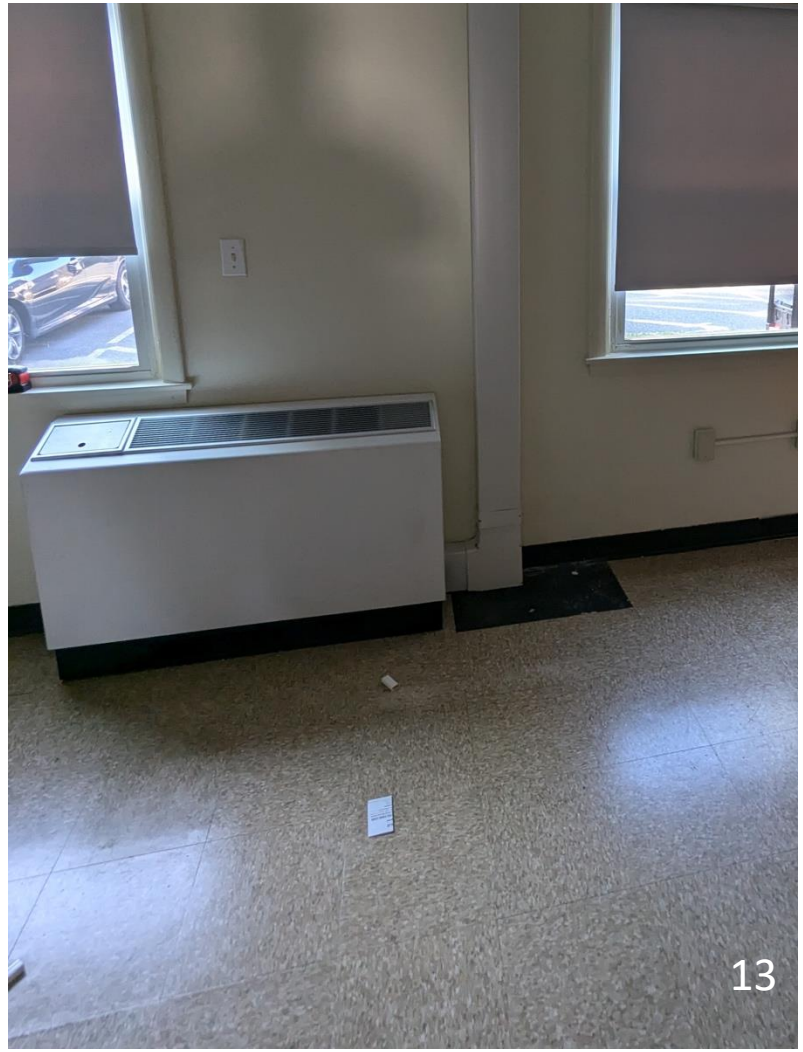




Building Commissioning

Once the loop is commissioned and running, buildings can be brought on as soon as their conversion work is completed.

- Valve Opening
- System Power On
- Flushing and Air Removal
- Thermostat setup
- Monitoring and Control Equipment



Commissioning Lessons Learned

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- Procedures and compliance
- Valve position verification
- Loop flushing and purging
- Troubleshooting Systems
- Temporary space conditioning

Discussion

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MIT OpenCourseWare
https://ocw.mit.edu/

RES.ENV 007 Geothermal Energy Networks (GENs): Transforming our Thermal Energy System

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