

# Chicago Closed Loop Geothermal System Case Study

Break-Out A2 | Notes from the EE  
Underground

Dustin Langille  
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# Who am I?



Dustin Langille,  
Principal

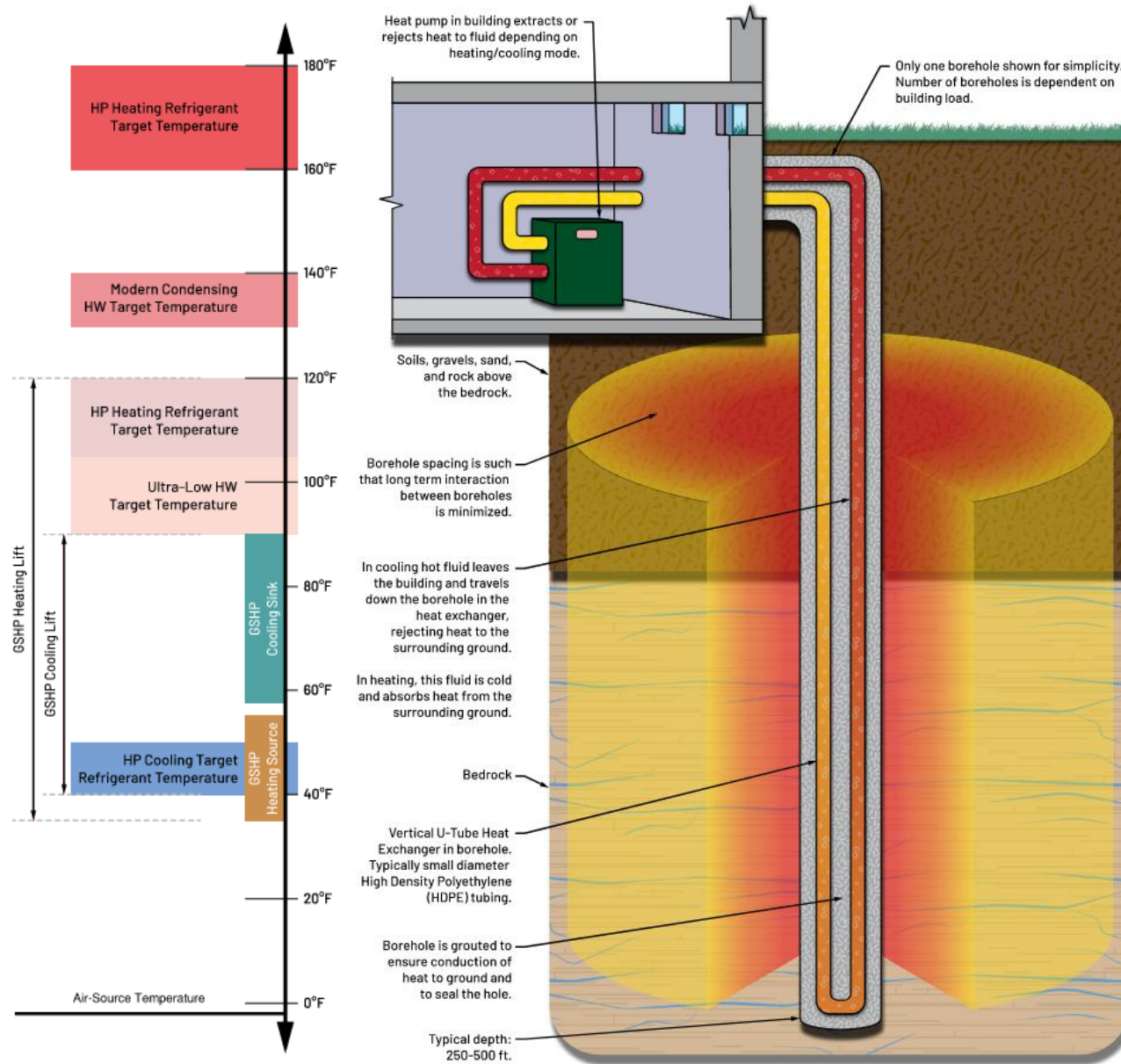
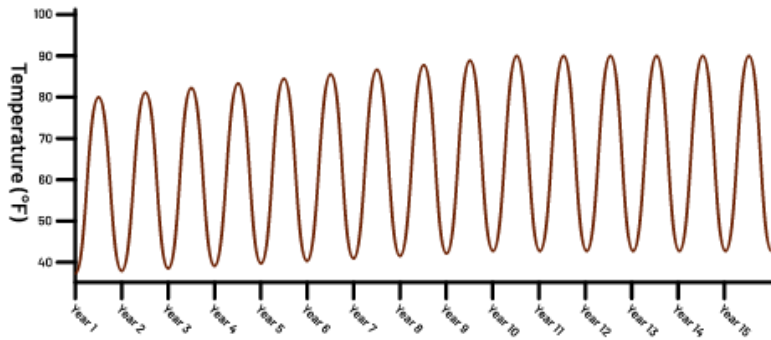
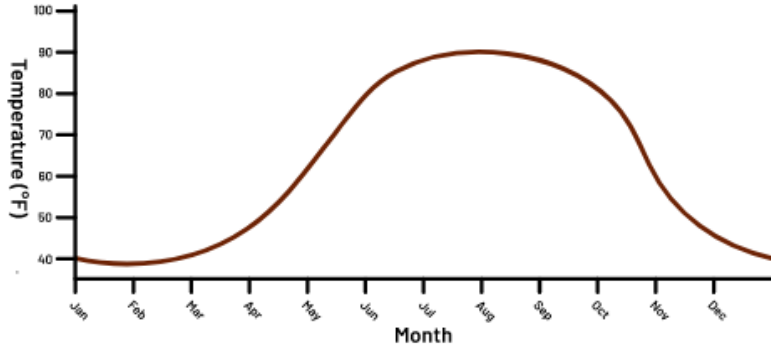
## BEMP, HBDP, LEED AP

- BS Mechanical Engineering: Miami University
- MS Renewable and Clean Energy: University of Dayton
  - Graduate research in ground-source systems
- Higher Education Practice Leader
- Geothermal Design Technical Lead
- 15 Years of Geothermal Design Experience
  - 17 projects in Chicago area
  - Over 1.5 million square feet of building
  - 100 miles of vertical pipe
  - 25% of projects within Chicago

# What is Ground-Source Heating/Cooling?

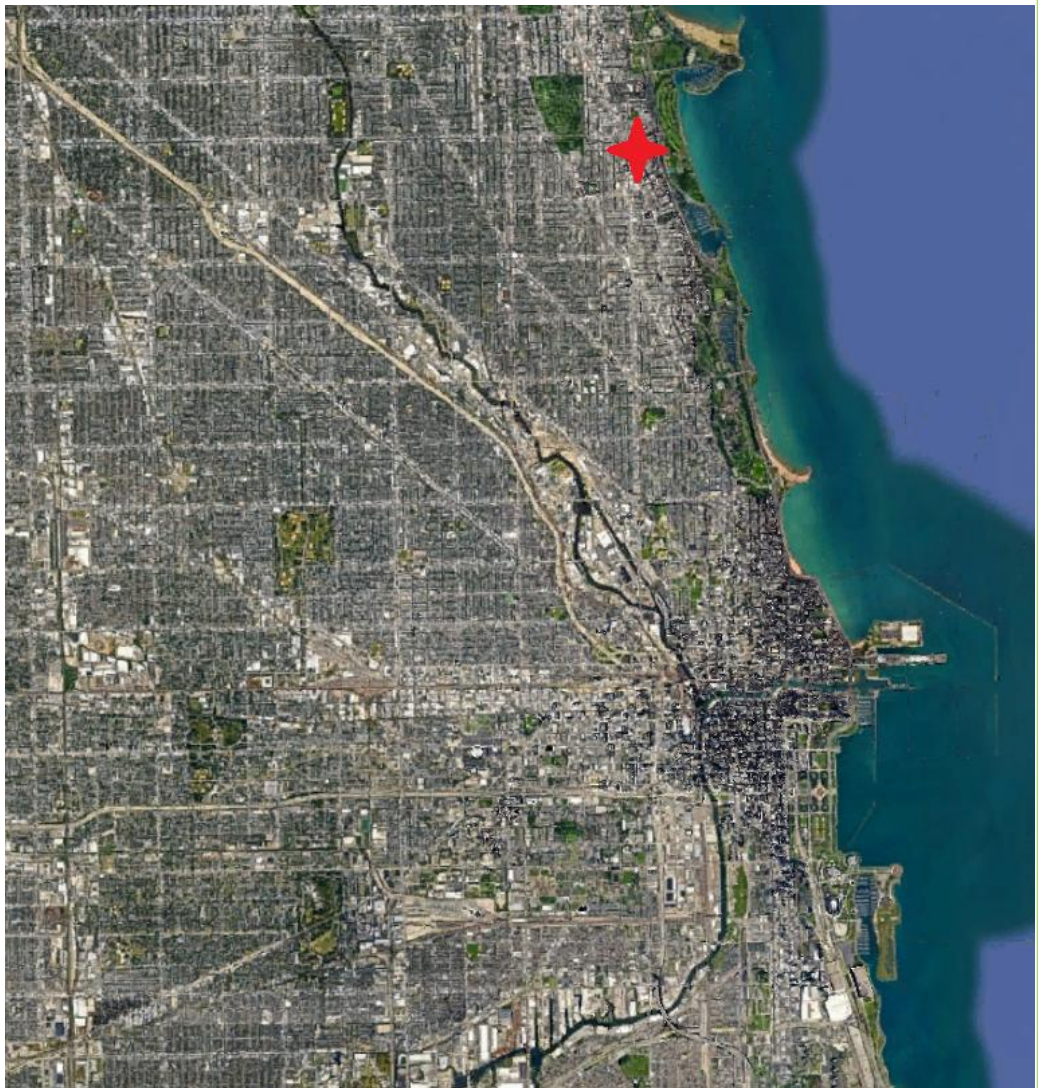
## A Quick Overview

Fluid Return Temperature From Bore Field



# The Eagle Building

3833 N Broadway Ave, Chicago IL



# A Hybrid GSHP for a Constrained Urban Site

3833 N Broadway Ave, Chicago IL

## BUILDING

8-story 229,000 ft<sup>2</sup> (21,274 m<sup>2</sup>) mixed-use building with 134 apartments and ~20,000 ft<sup>2</sup> (1,858 m<sup>2</sup>) of retail.

## GROUND-SOURCE FIELD

60 vertical boreholes, 500 ft (46 m) deep, installed entirely under the building footprint.

## HYBRIDIZATION STRATEGY

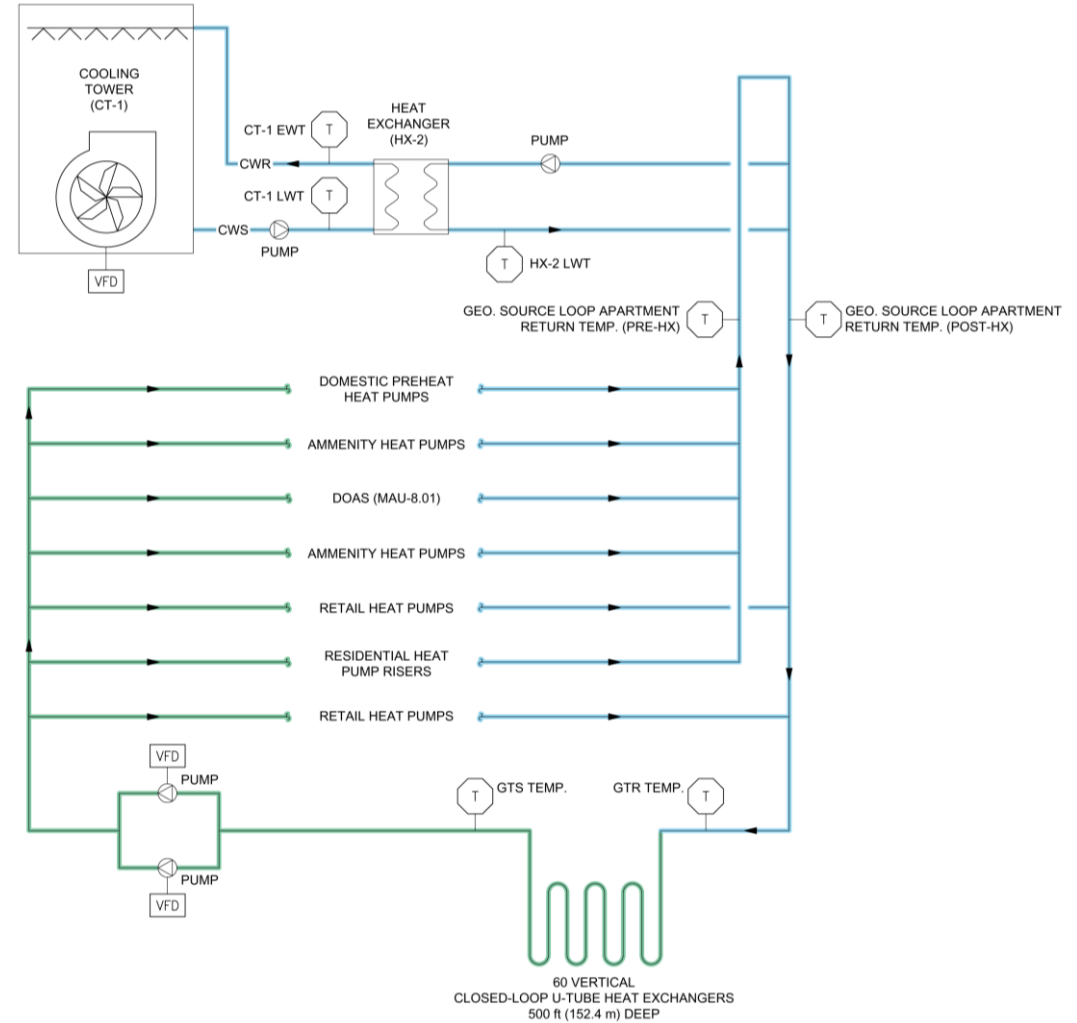
A nominal 60-ton (263 kW) cooling tower for supplemental heat rejection

## PRIMARY LOADS

Serves space conditioning for all apartments, retails spaces, DHW preheating, and ventilation loads.

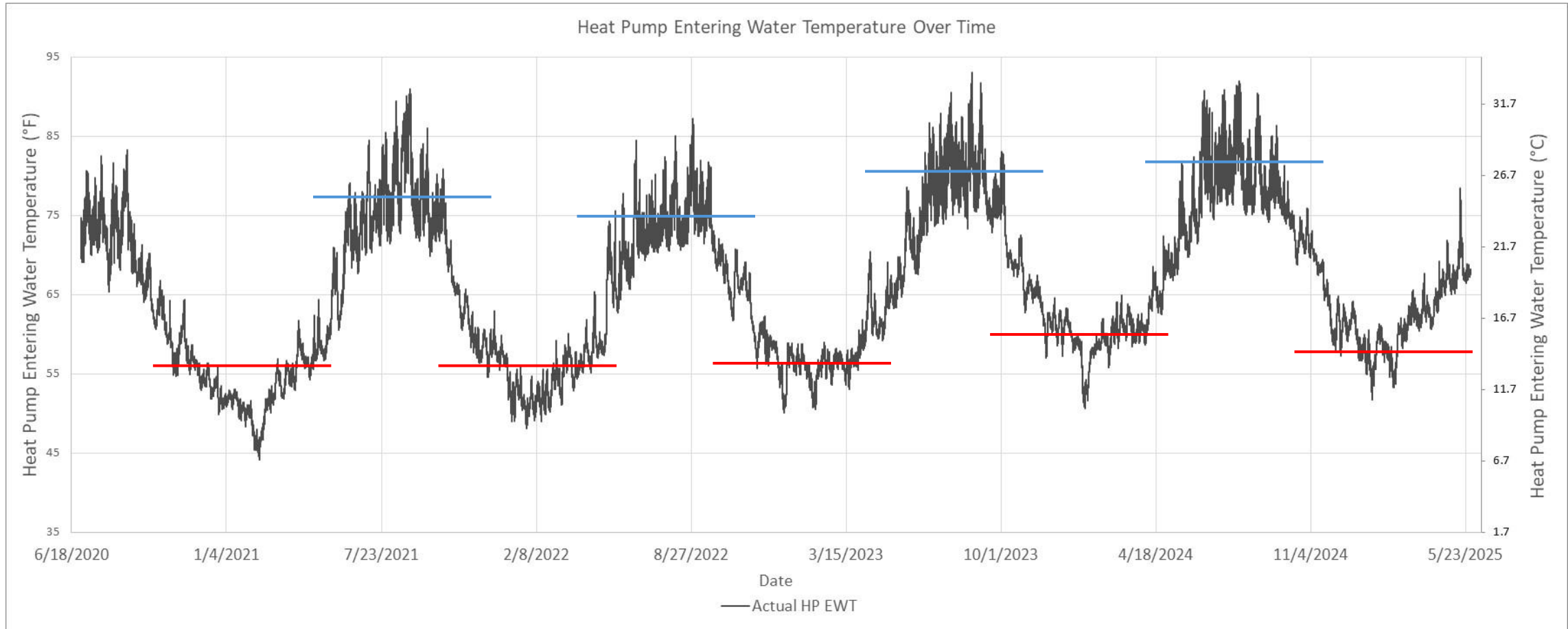
## EFFICIENCY

Operating with an EUI of 40 kbtu/ft<sup>2</sup>/year including a brewery



# The Eagle Building

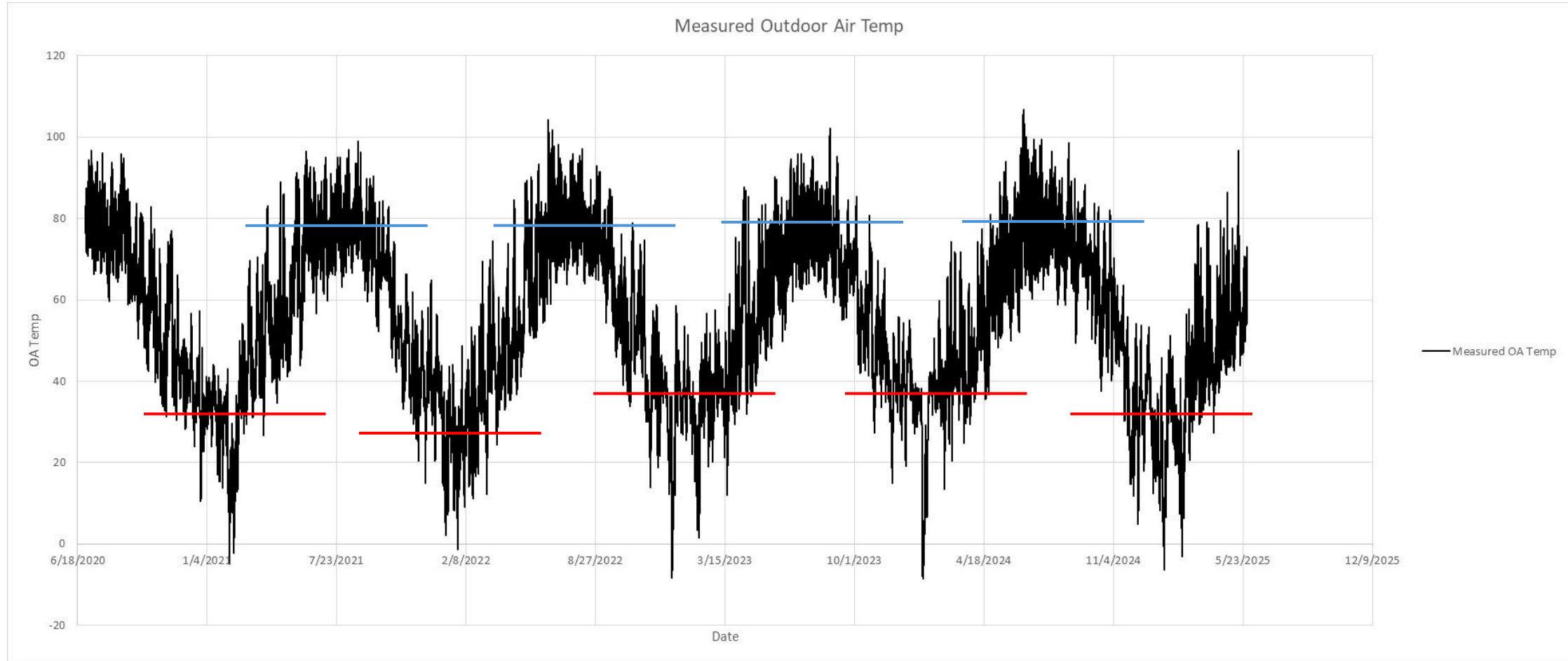
## Geo Temps



Geo Cooling Source Temp.: 77°F Average; 90°F Peak  
Geo Heating Source Temp.: 57°F Average; 50°F Peak

# The Eagle Building

## Outdoor Air Temps



Air-Source Cooling Source Temp.: 80°F Average; 105°F Peak

Air-Source Heating Source Temp.: 32°F Average; -8°F Peak

# The Eagle Building

## Results

### What Does this Mean for Demand?

- A negligible difference in summer peak demand
- A comparable winter peak demand to cooling
  - ~50% reduction in HVAC heating peak demand compared to air-source heat pumps.
  - ~75% reduction in HVAC heating peak demand compared to electric resistance.

### How about Energy?

- 50% less energy than an all electric baseline

# Chicago Geo Challenges

1. Owner, contractor, engineer knowledge and system trust
2. Driller/installer availability
3. Permitting ease and timing
4. Construction schedule
5. Upfront costs and incentive stability