



# NY - G E O 2 0 2 6

March 24-25, 2026 | Brooklyn, NY



## Finding Balance with Hybrid TEN Systems

**Moderator:** Diego Sanchez / *CHA Consulting*

**Panel:** Samuel Gerber / *CDM Smith*

Michael Barbasch / *LaBella Associates*

Joe DiSanto / *Ramboll*

Adam Shelly / *Ecosystem*

# Meet the presenter



**Sam Gerber, PE**  
Nashville, TN



**CDM Smith**

CDM Smith is a privately owned engineering and construction firm providing legendary client service and smart solutions in water, environment, transportation, energy and facilities. Passionate about our work and invested in each other, we are inspired to think and driven to solve the world's environmental and infrastructure challenges.



**MEP+Energy**

Design of 30+ geothermal heating and cooling systems, including 1515 Surf Ave, 1Java, and Eversource Framingham UTEN Pilot



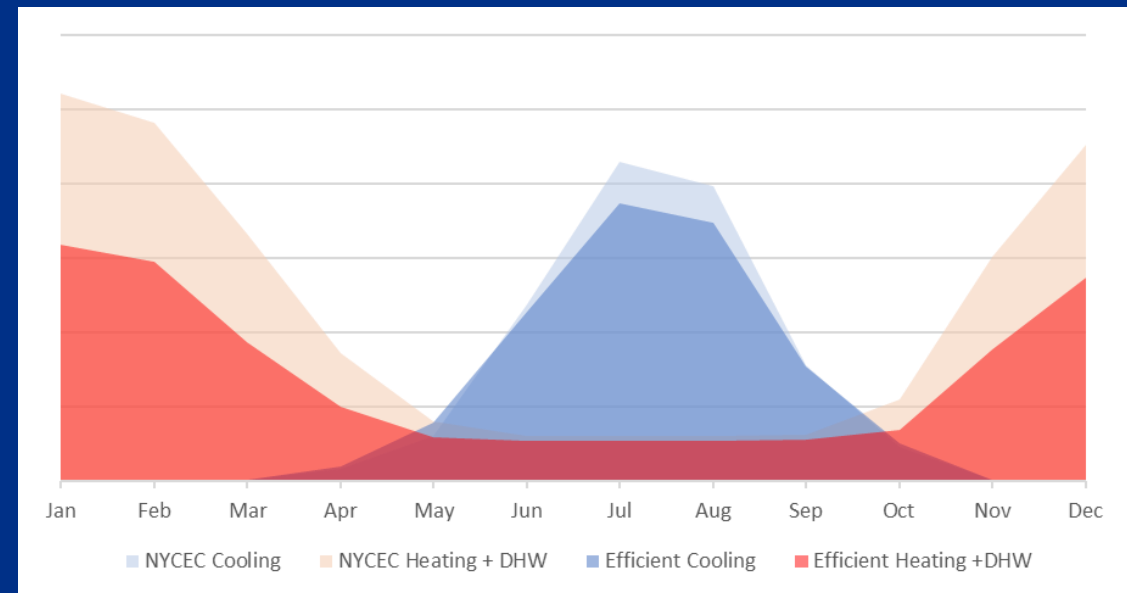
# Efficiency

Modern buildings tend to have:

- High-performance windows
- Improved insulation
- Low infiltration
- High efficiency ventilation heat recovery
- Efficient water fixtures

# Thermal Balance

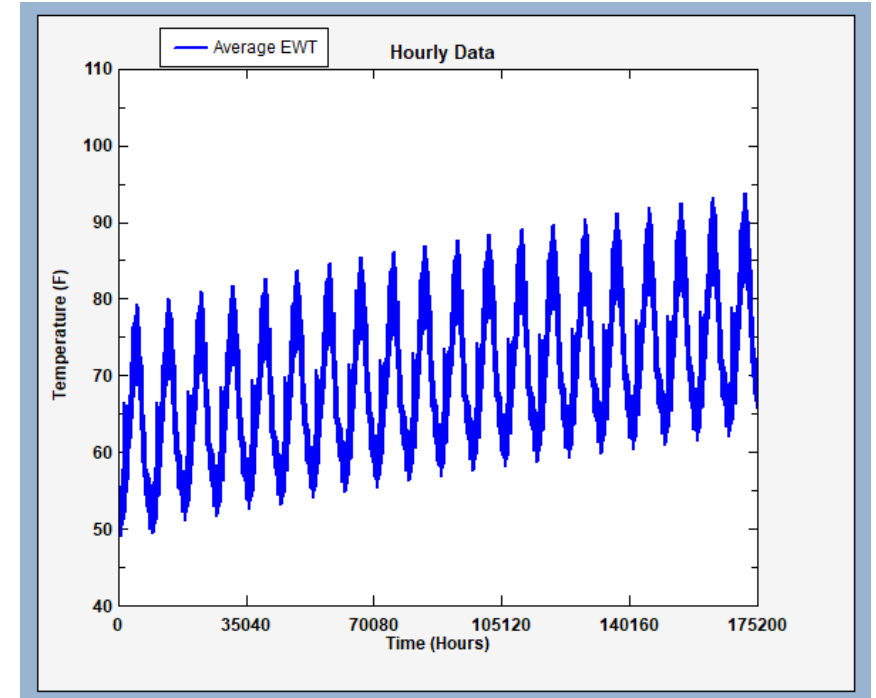
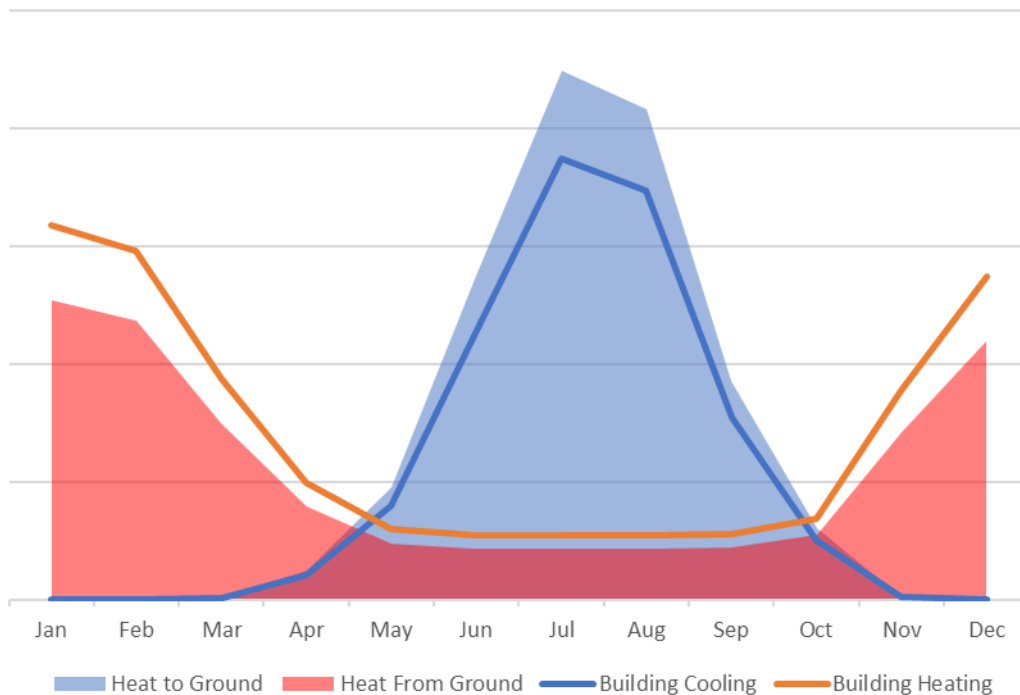
These all reduce energy usage and demand, but reduce heating loads more than cooling loads



Heating load goes from 2x cooling to 1.4x with efficiency measures

# Thermal Imbalance

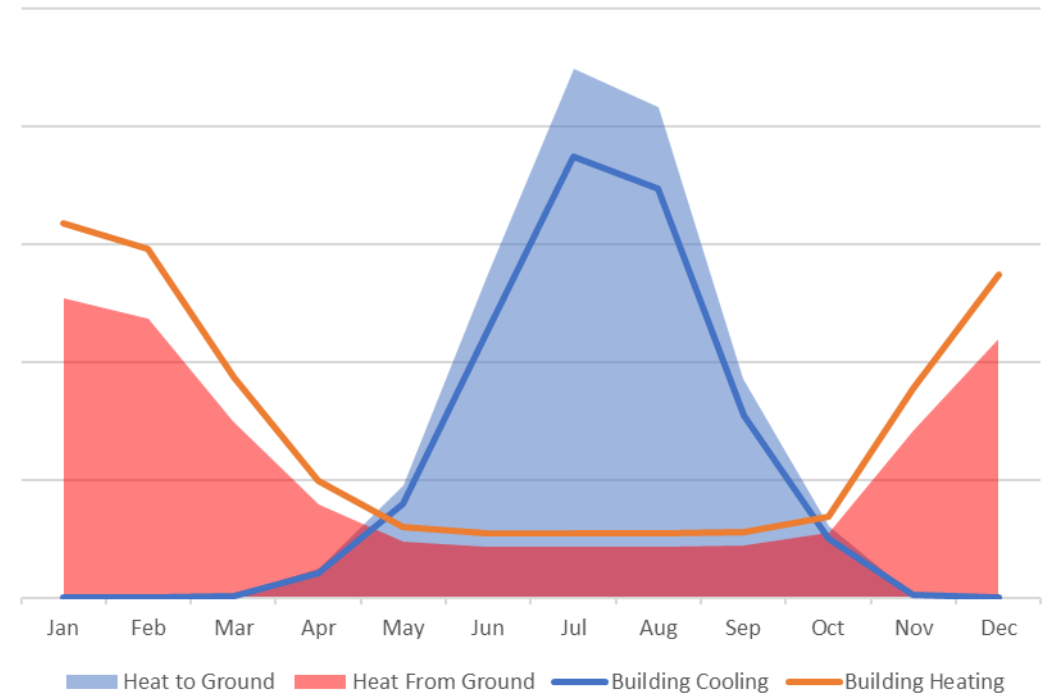
- Heat of compression further drives an imbalanced system towards cooling dominance



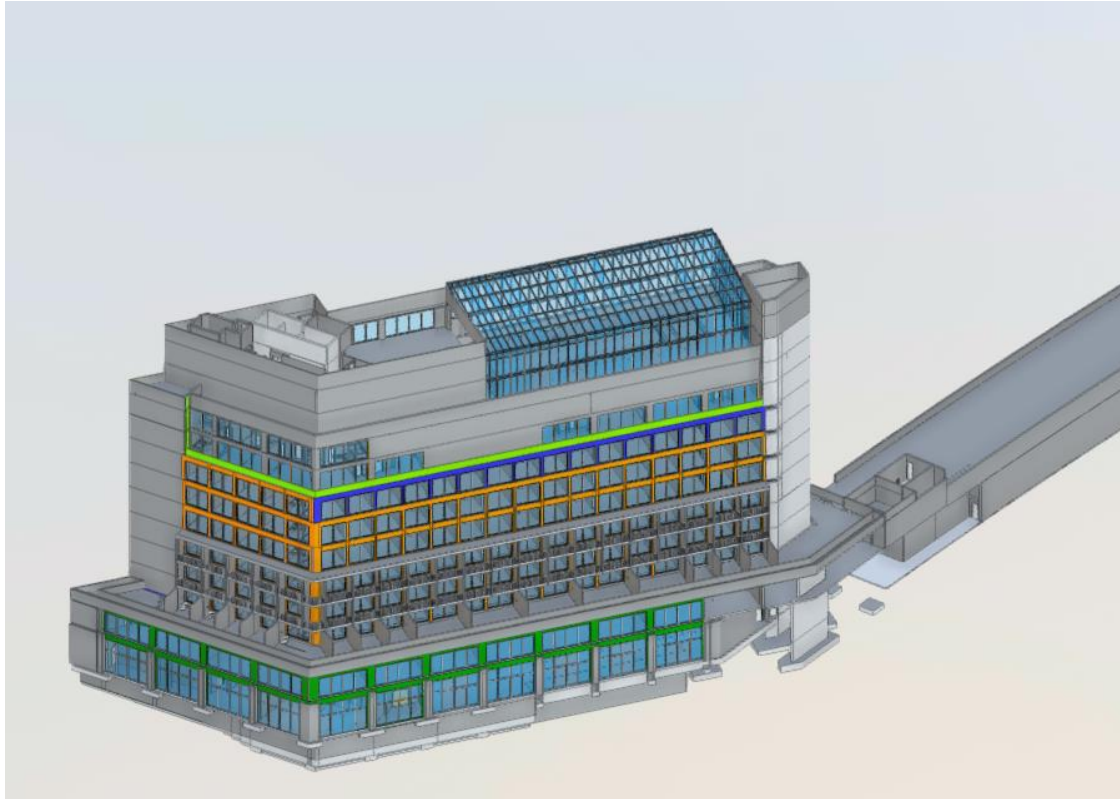
- If this imbalance isn't countered, the system will experience runaway "Thermal Drift"
- Increased temperatures will reduce efficiency and eventually lock out compressors

# Countering Thermal Imbalance – Peak Operation

- Borefield sized to meet the annual heating load and an equivalent amount of the annual cooling load, or vice versa
- The remainder of the load is met by chillers, sewer heat recovery, or other thermal resources



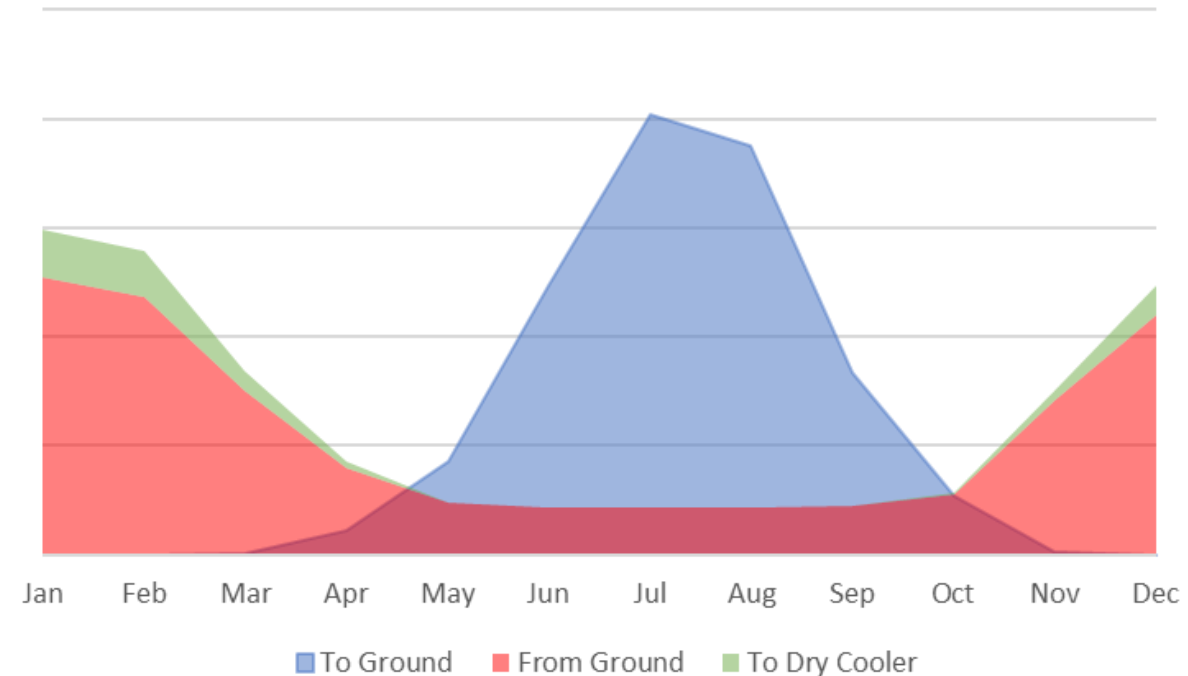
## Hybrid System – 25 Stewart Ave



- 11-Story hotel in Bushwick, limited space for boreholes on site
- System is balanced with 8 air-source reversible chillers that keep condenser loop temperatures in bounds

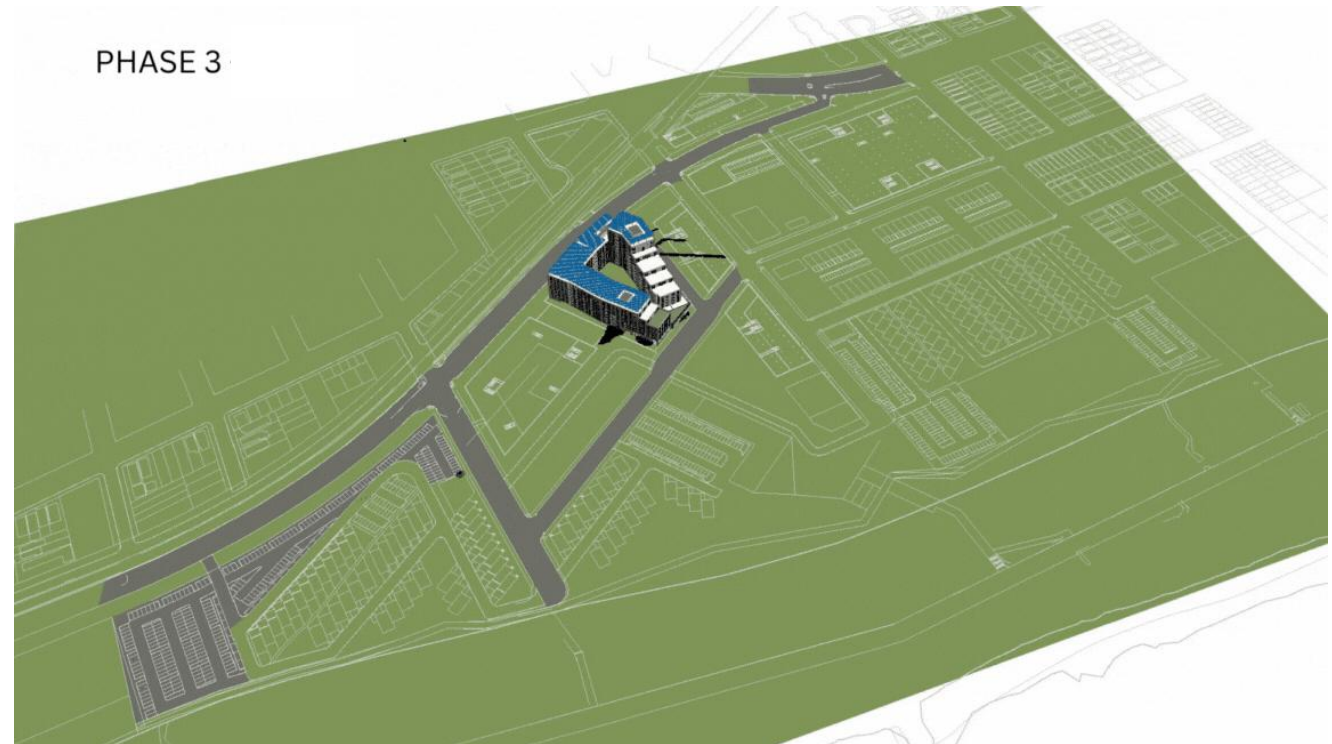
# Countering Thermal Imbalance – Hybrid Systems (Winter Operation)

- As an alternative, heat rejection can be scheduled for colder months
- Increases controls and design complexity, but is generally more efficient



# Hybrid System – Arverne East

- Single-pipe ambient loop system connecting a mix of multifamily, commercial, and low-rise residential.
- 9 proposed borefields across 10 total phases.
- 300 Tons of dry cooler capacity provides thermal balancing and flexibility for future building designs.



March 24<sup>th</sup>, 2026

# Hybrid Thermal Energy Network Systems

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NY-GEO 2026



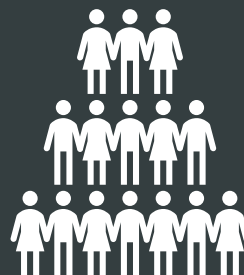
**LaBella**

Powered by partnership.



### Total Staff

With 2,000+ employees, our presence is national with a diverse group of professionals.



### New York State

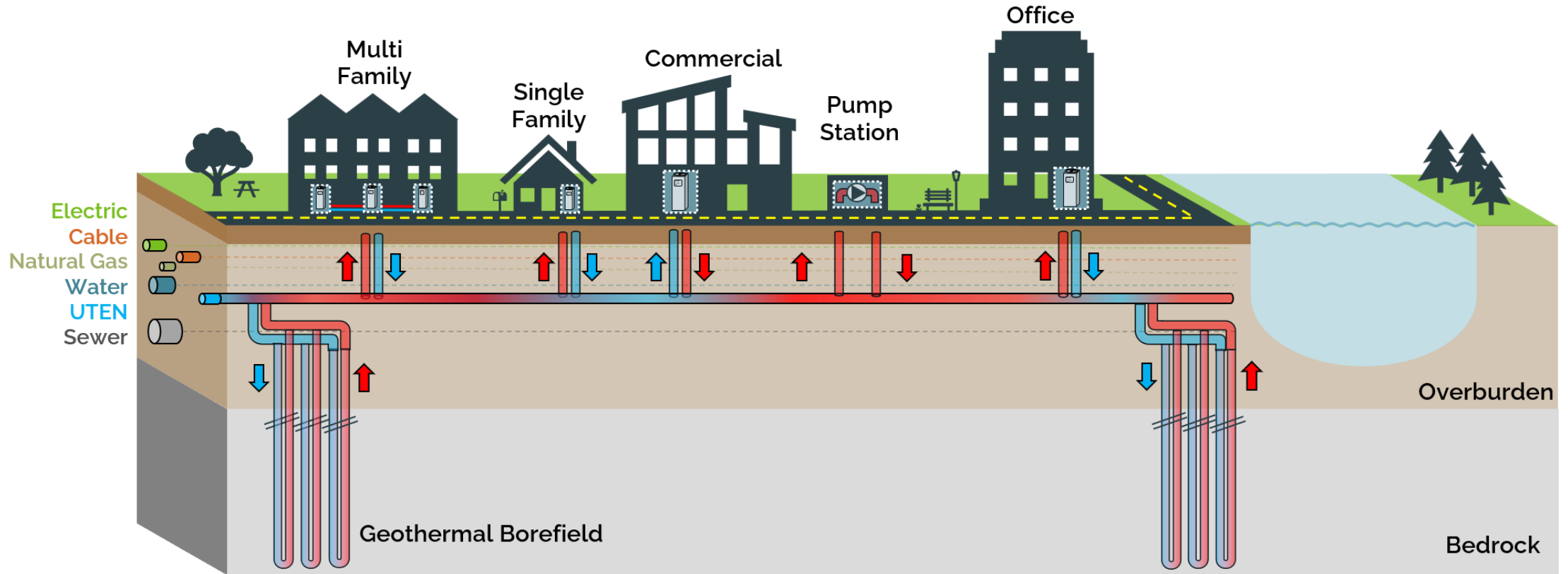
Headquartered in Rochester, we have 15 additional offices in NYS alone that are ready to service your needs with approximately 900 employees.



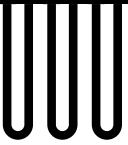
**MIKE BARBASCH**  
ENERGY DISCIPLINE LEADER, PE

# GEO THERMAL

Traditional geothermal systems are highly efficient, circulating water through borefields to provide heating and cooling to connected buildings. System efficiency is often **4x higher** than a fossil fuel system. Upfront cost, available land area, and lack of thermal diversity limit the widespread adoption of geothermal.



# BARRIERS TO BOREHOLES



Geothermal systems are more expensive than traditional fossil fuel systems or air-source heat pumps due to the added component of drilling. Grants and tax incentives such as the investment tax credit help **reduce upfront cost by up to 50%**, but they are susceptible to changes in state and federal policy.

- UPFRONT COST
- LIMITED LAND AREA
- THERMAL SATURATION

U.S. DEPARTMENT of ENERGY | Office of Energy Efficiency and Renewable Energy  
Geothermal Technologies Office

### Commercial Tax Credits for Geothermal Heat Pumps

Under the Inflation Reduction Act Investment Tax Credit (Section 48), installations of geothermal heat pumps (GHPs) in commercial buildings can be eligible for tax credits. Your credit is a percentage of the total improvement expenses in the year of the installation.

**If your GHP is placed in service during one of these timeframes, you may be eligible for this tax credit!**

Timeframe	2023	2024
Jan. 1, 2022 through Dec. 31, 2032	6%	4.4%

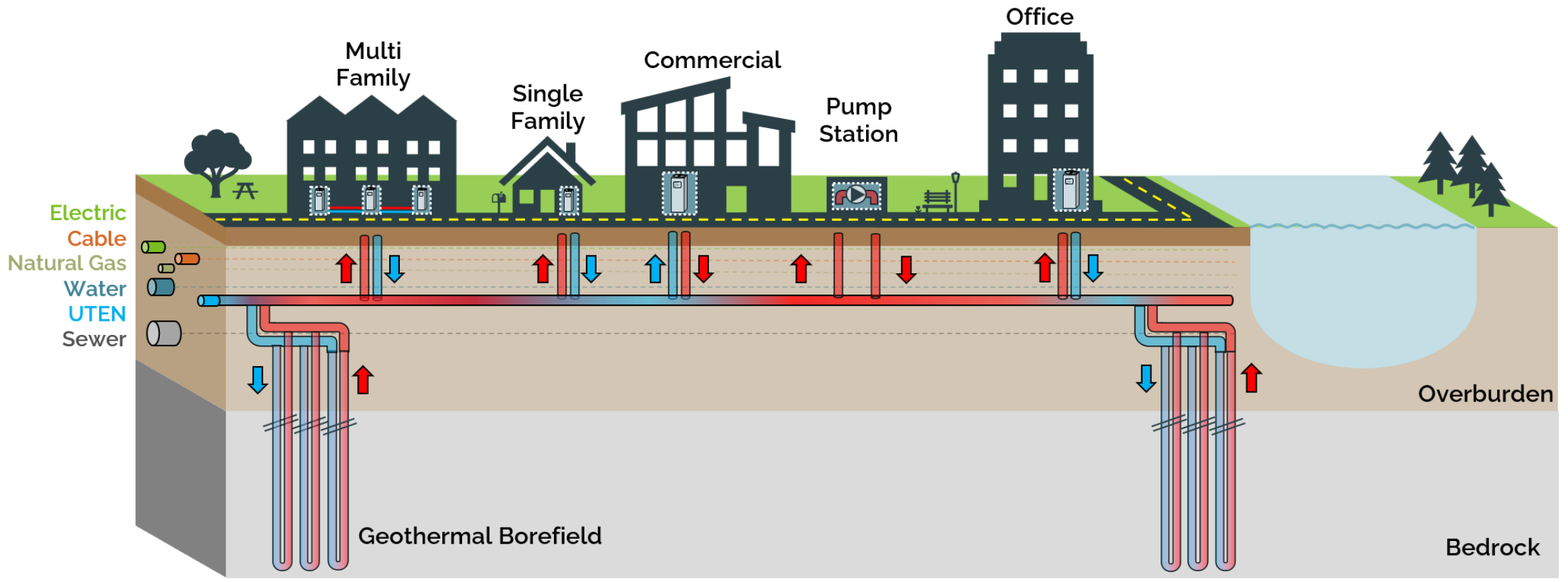
Businesses can be eligible for "bonus credits" of up to 30% total if their projects meet specific requirements. Visit [whitehouse.gov](https://www.whitehouse.gov) to download the Inflation-Reduction Act guidebook and learn more.

Source: U.S. Department of Energy

# BARRIERS TO BOREHOLES

- UPFRONT COST
- LIMITED LAND AREA
- THERMAL SATURATION

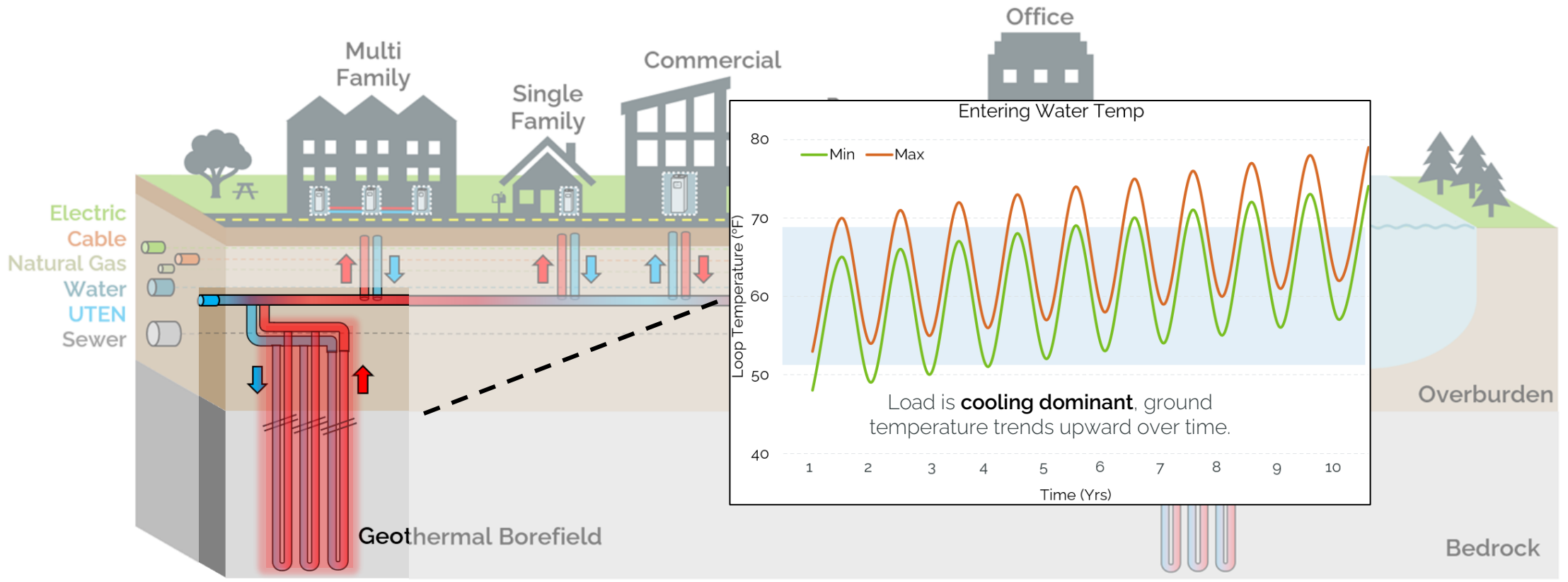
Geothermal systems, whether vertical boreholes or horizontal loops, **require land area**. Drilling deeper boreholes or incorporating different borefield strategies help reduce the required land area, but they bring about additional complications / regulations.



# BARRIERS TO BOREHOLES

- UPFRONT COST
- LIMITED LAND AREA
- THERMAL SATURATION**

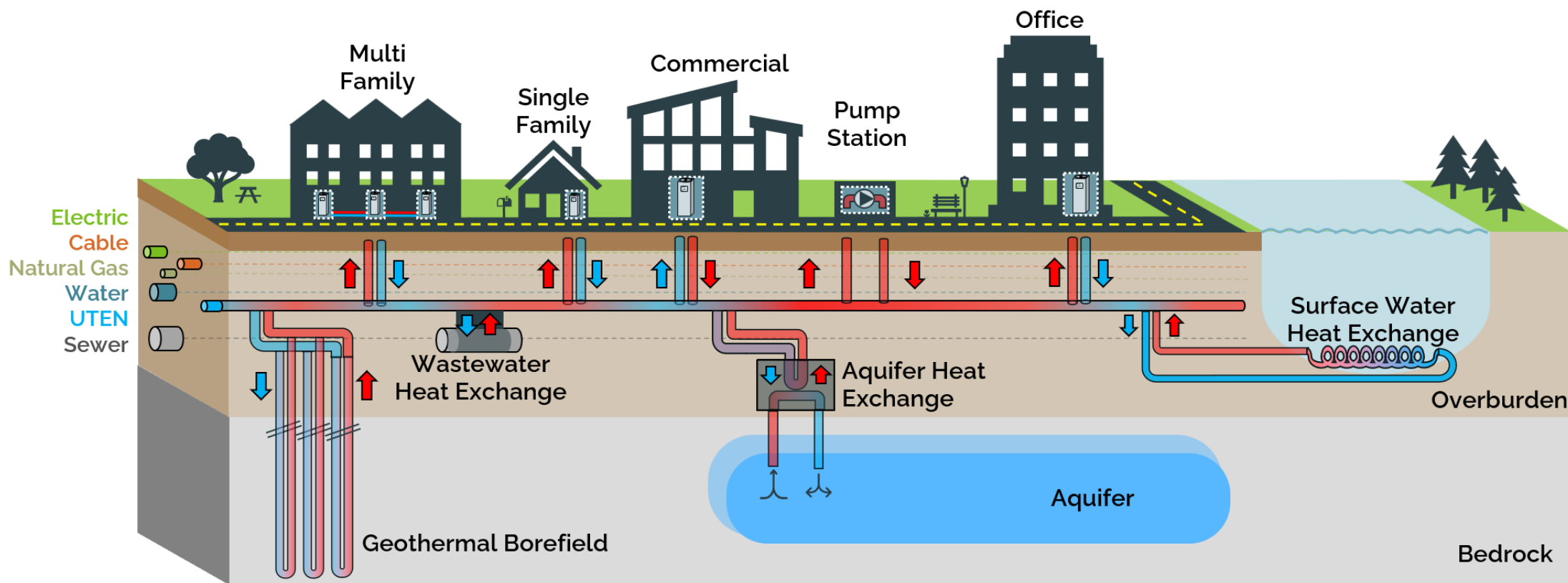
Poorly designed systems can potentially suffer **thermal saturation** of the ground heat exchanger. In this scenario, the ground either heats up or cools down due to an **unmitigated imbalance in thermal loads**. Over time, heat pump efficiency and capacity decreases.



# HYBRID GEOTHERMAL

A **hybrid system** typically reduces upfront cost and provides flexibility in required thermal diversity. Leverage thermal energy from other resources to lower cost and maintain a highly efficient system.

- ❖ Wastewater
- ❖ Surface Water
- ❖ Boiler
- ❖ Aquifer
- ❖ Heat recovery
- ❖ Cooling tower



# SUNY SULLIVAN

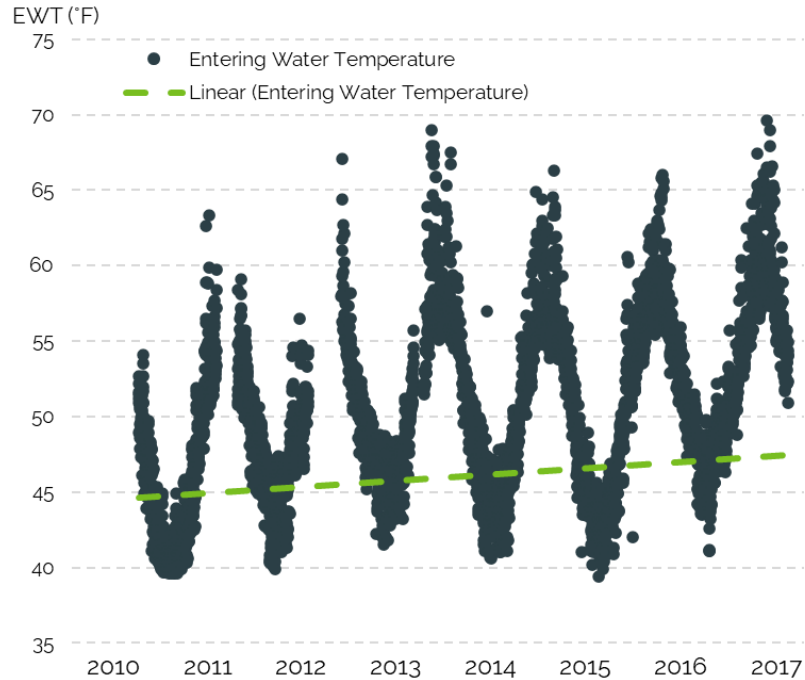


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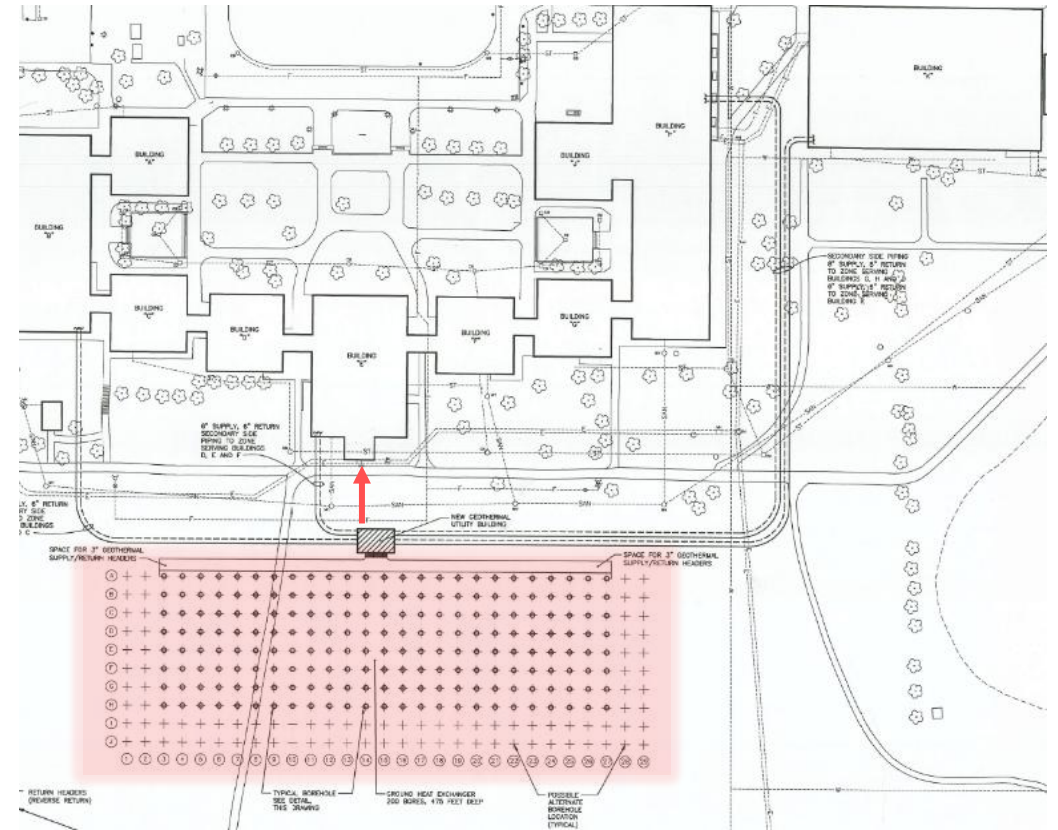
HEAT RECOVERY

Central 2-pipe ambient  
290 boreholes  
143 heat pumps  
10 buildings



## Problem:

College campus with existing district system was becoming thermally saturated from cooling dominant loads.



## Solution:

Designed and built a hybrid expansion pulling excess heat from ground loop for (2) 300-gallon domestic hot water systems.

# PERRY B. DURYEA

Single building  
417,000 square feet  
7,423 MBH heating  
698 tons cooling

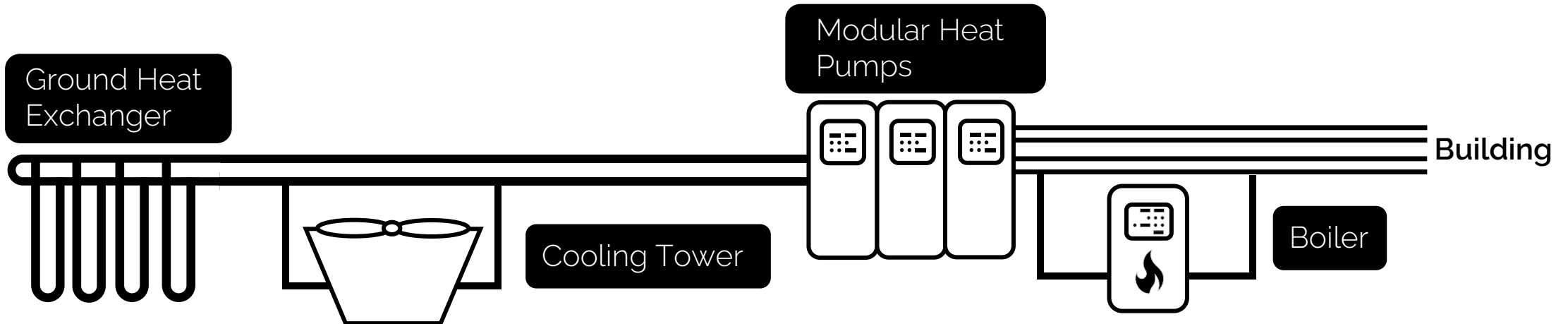


BOILER  
COOLING TOWER

State office building with limited land area in Hauppauge, NY interested in decarbonization with a reduced upfront cost. A geothermal hybrid system was designed and built for the 417,000 SF building. Hybrid system provided redundancy while maintaining high efficiency.



## System Components



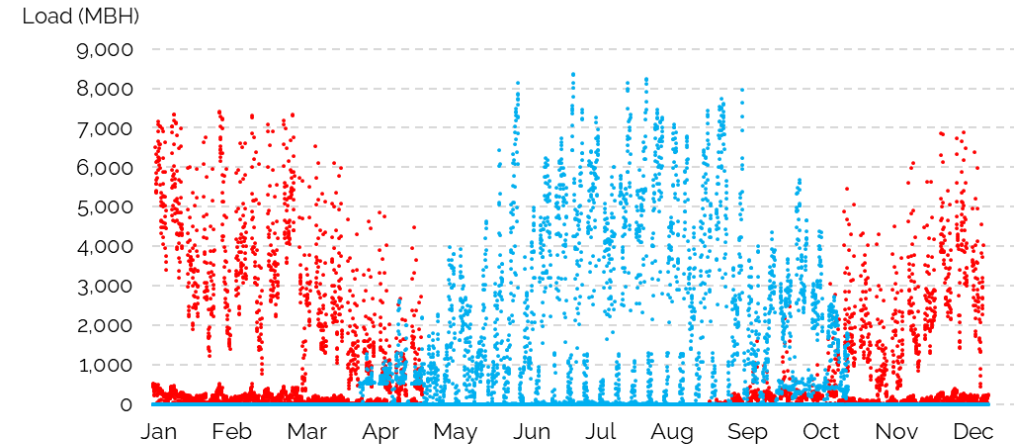
# PERRY B. DURYEA



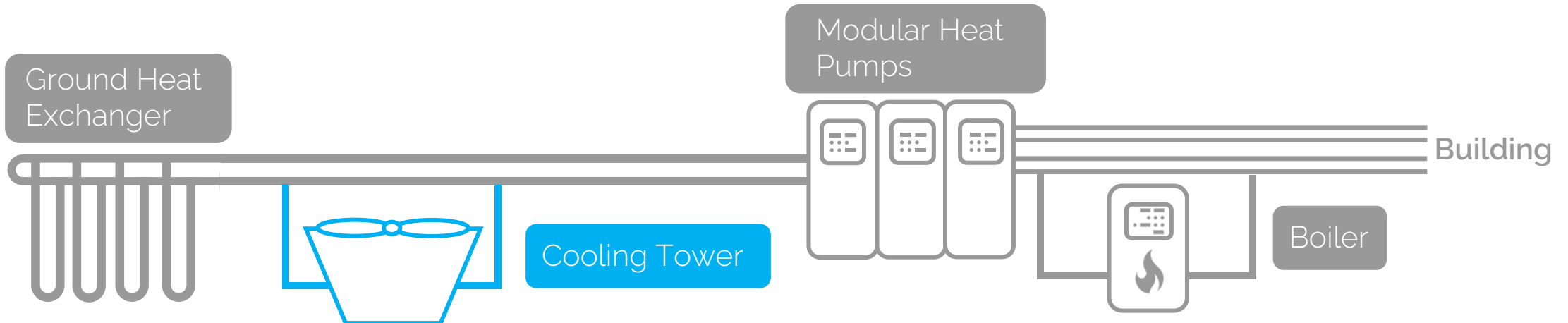
BOILER  
COOLING TOWER

Single building  
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7,423 MBH heating  
698 tons cooling

The cooling dominant load profile and limited land area led to the implementation of a hybrid system. The addition of a 418-ton cooling tower **removed (160) boreholes** and **reduced project cost by \$2.5m.**



## System Components

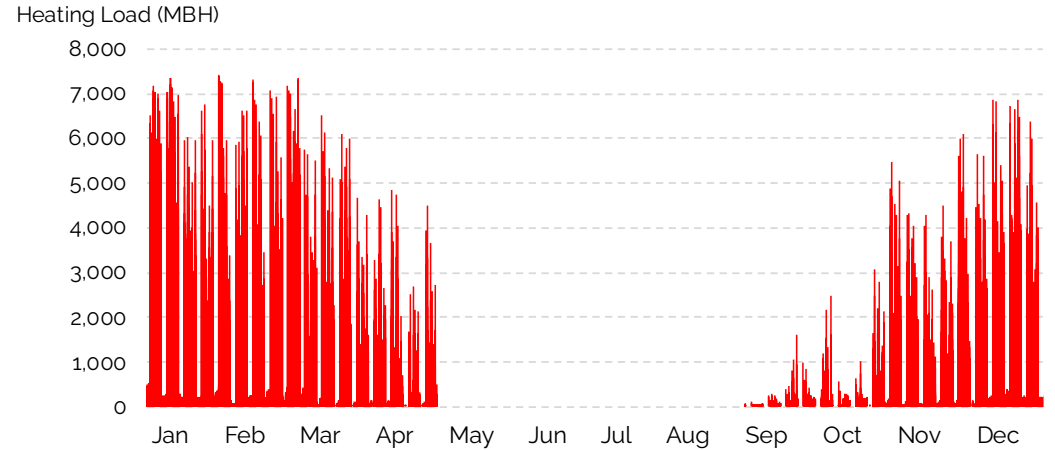


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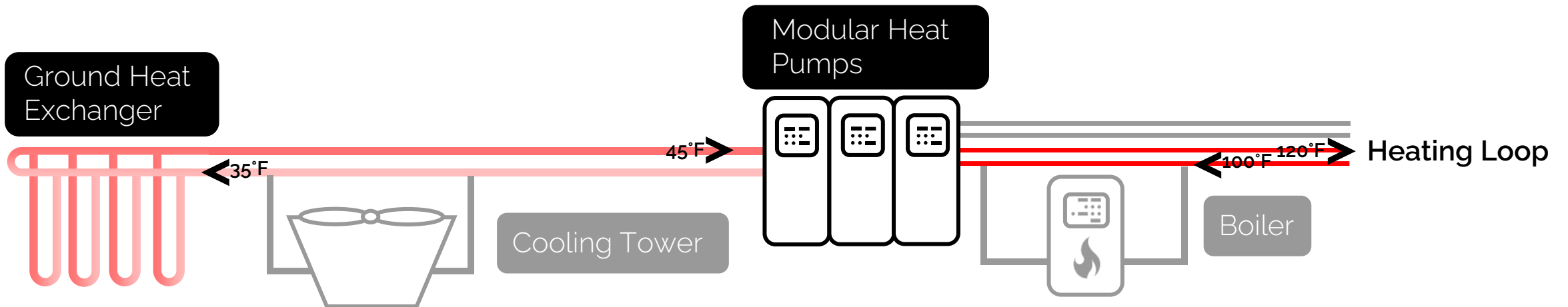
BOILER  
COOLING TOWER

Single building  
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## Winter Operation

During the winter, the ground heat exchanger meets the **entire heating load**. Two (2) boilers are kept as backup for redundancy.

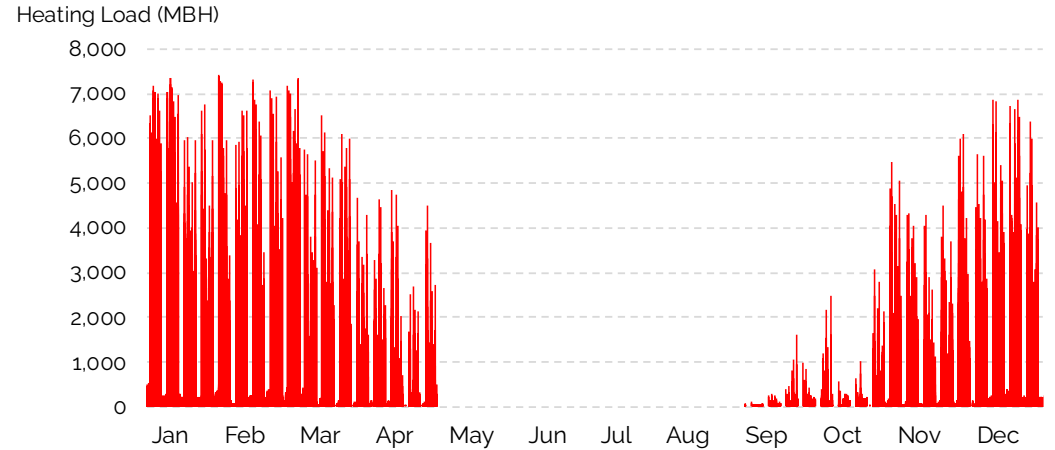


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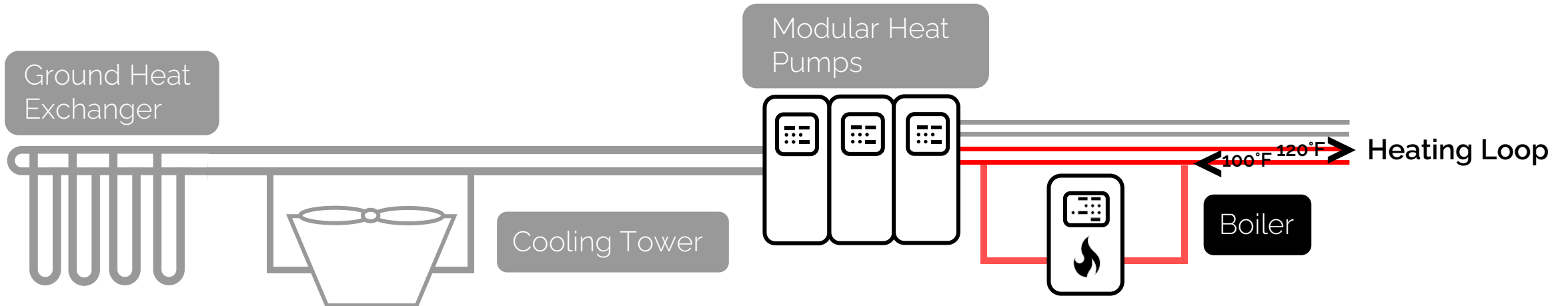
BOILER  
COOLING TOWER

Single building  
417,000 square feet  
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698 tons cooling



## Backup Winter Operation

If the ground heat exchanger or heat pumps need to be serviced, the boiler can meet the heating loop. Backup system was a requirement of the building owner.



# PERRY B. DURYEA

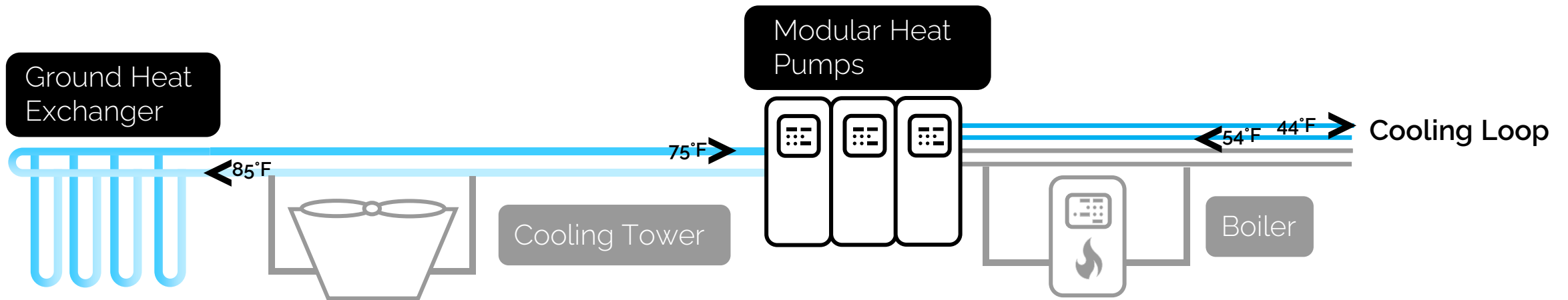
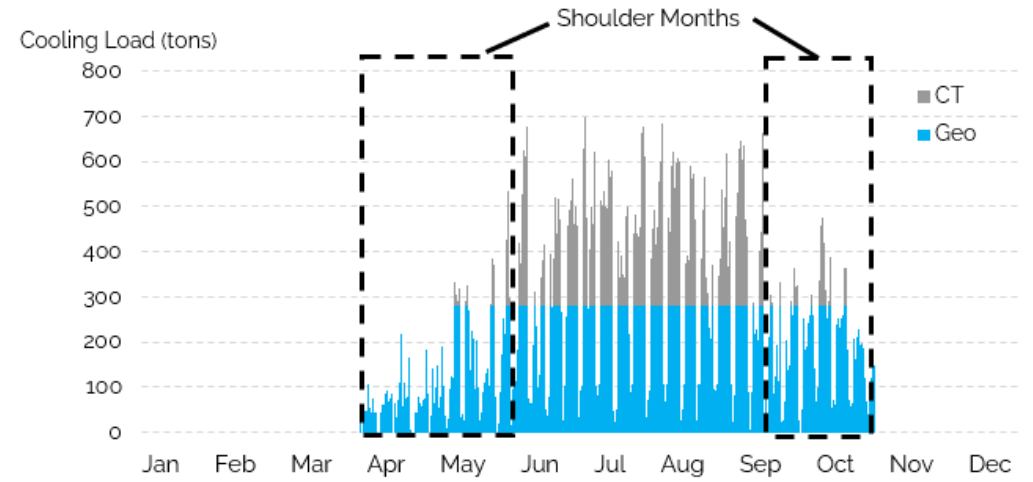


BOILER  
COOLING TOWER

Single building  
417,000 square feet  
7,423 MBH heating  
698 tons cooling

## Shoulder Cooling Operation

During the shoulder season, the ground heat exchanger meets **280 tons** of the cooling load.

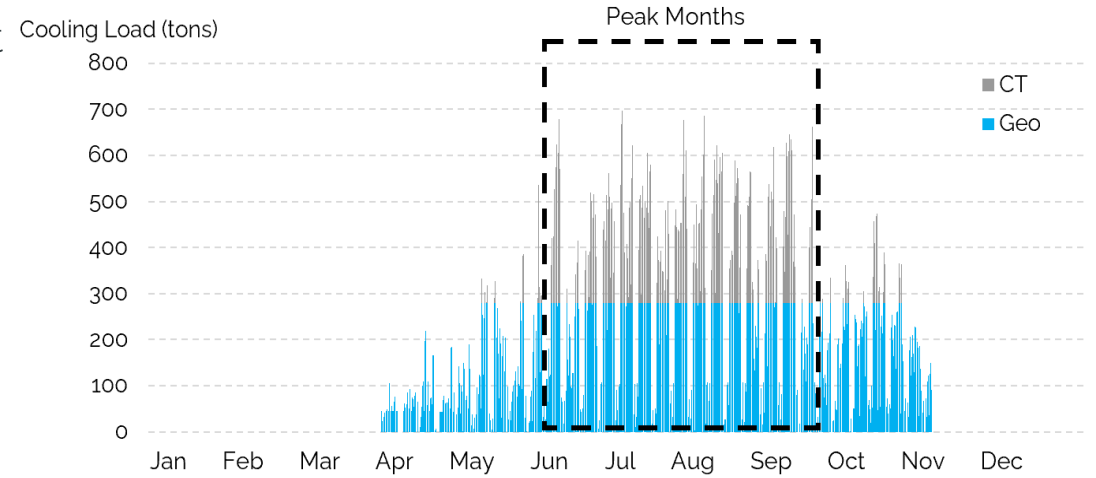


# PERRY B. DURYEA



BOILER  
COOLING TOWER

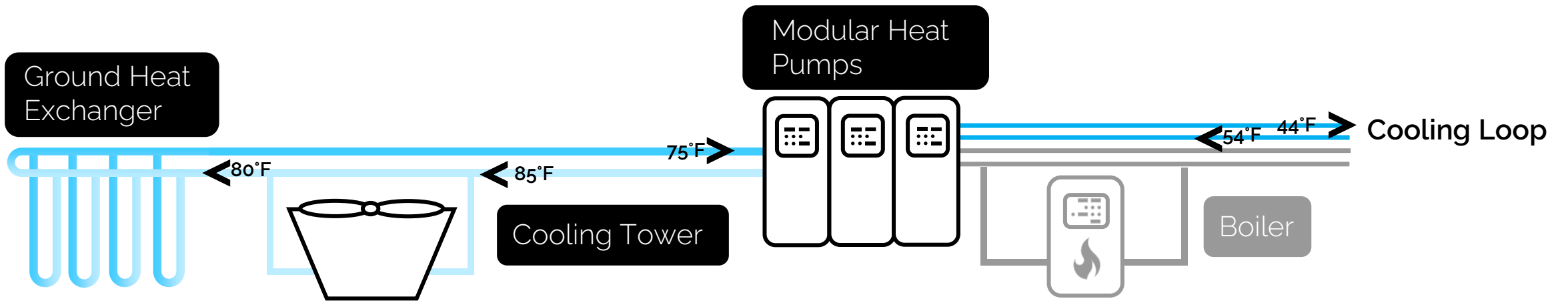
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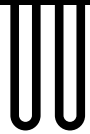
## Peak Cooling Operation

During the middle of the summer, the ground heat exchanger meets **280 tons** of the cooling load and the cooling tower meets any additional load by preconditioning the water entering the ground loop. Systems are isolated via a heat exchanger.

Hybrid system helped balance **cooling dominant** load profile. Sized for **60% of cooling peak** but only accounted for **25% of annual cooling load**.



# EPB BLACK CREEK



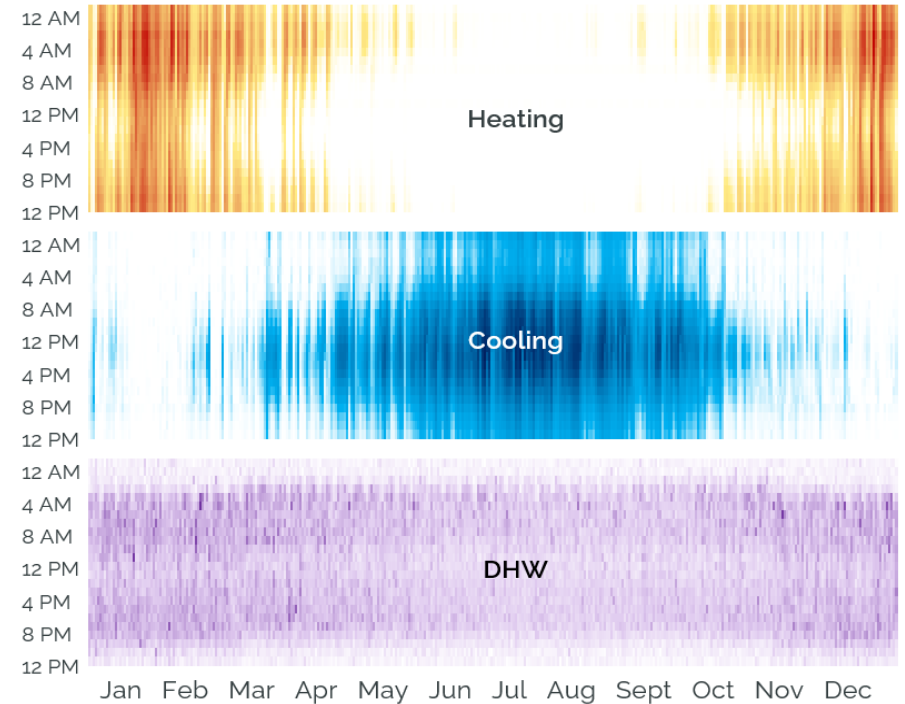
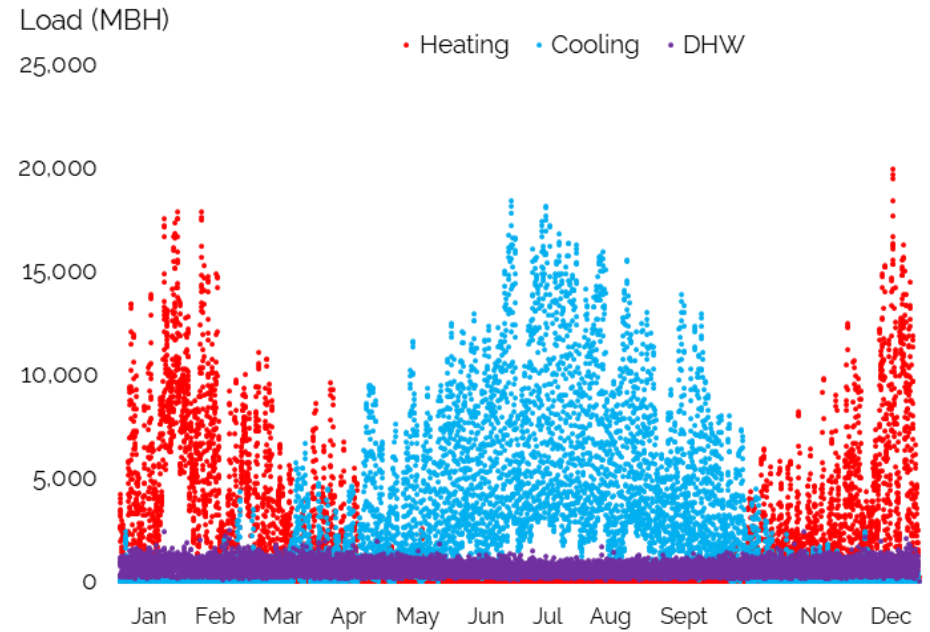
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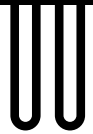
SURFACE WATER

Central 2-pipe ambient  
19,887 MBH heating  
1,531 tons cooling  
434 homes

Evaluated district geothermal feasibility of new construction housing complex in Chattanooga, TN. Limited access to flat ground, centrally located 10-acre lake, and a cooling dominant load profile. The 10-acre lake provided 9,000 MBH of supplementary thermal capacity. **Use of this hybrid resource regulated ground temperature impact and lowered upfront cost by \$6.5m.**



# EPB BLACK CREEK

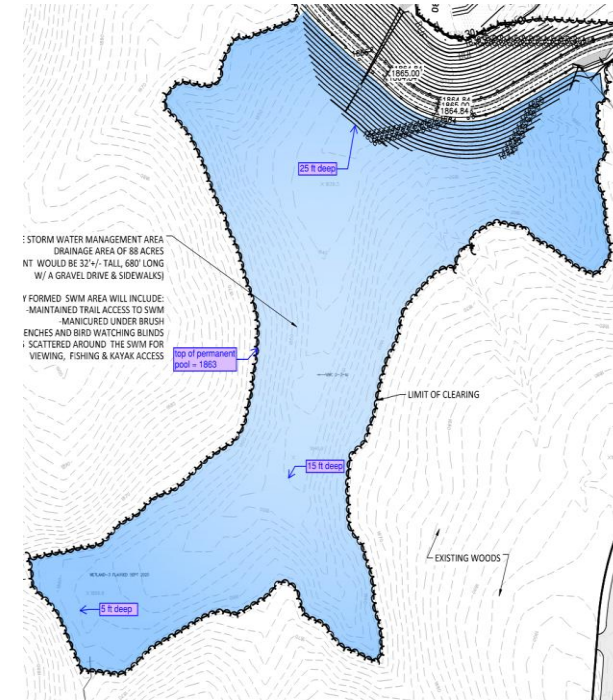


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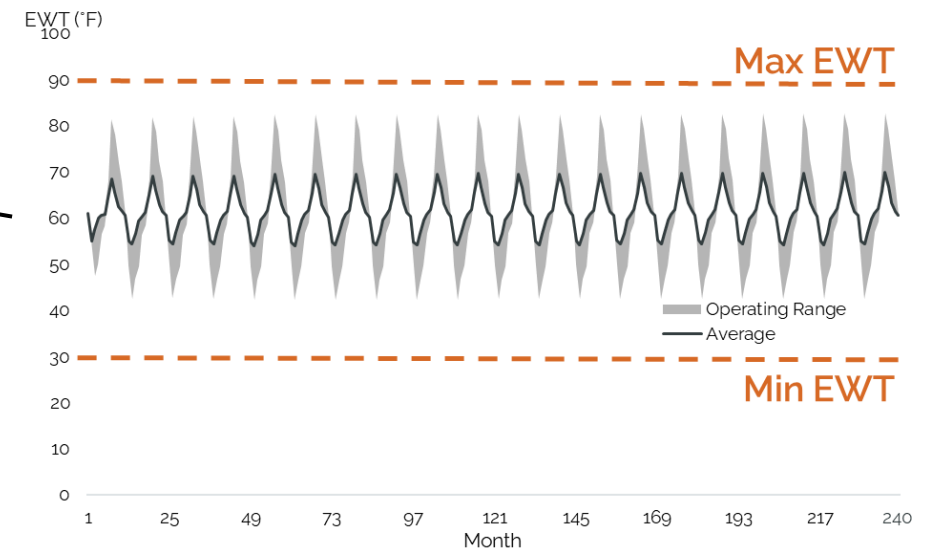


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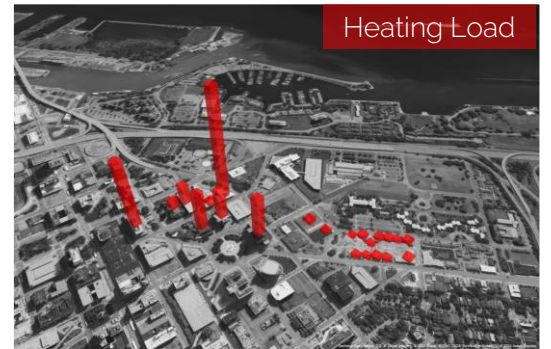
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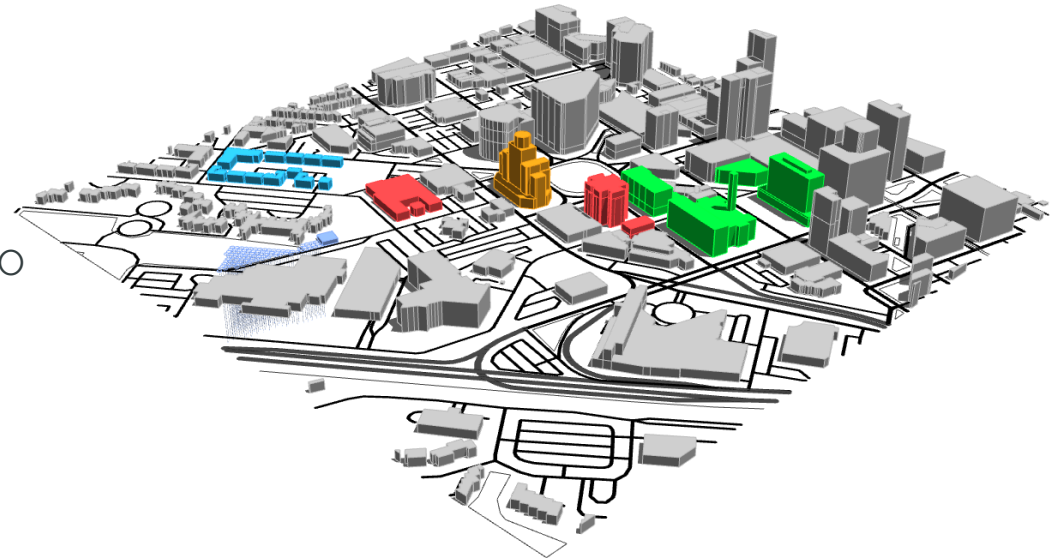
# NATIONAL FUEL UTEN



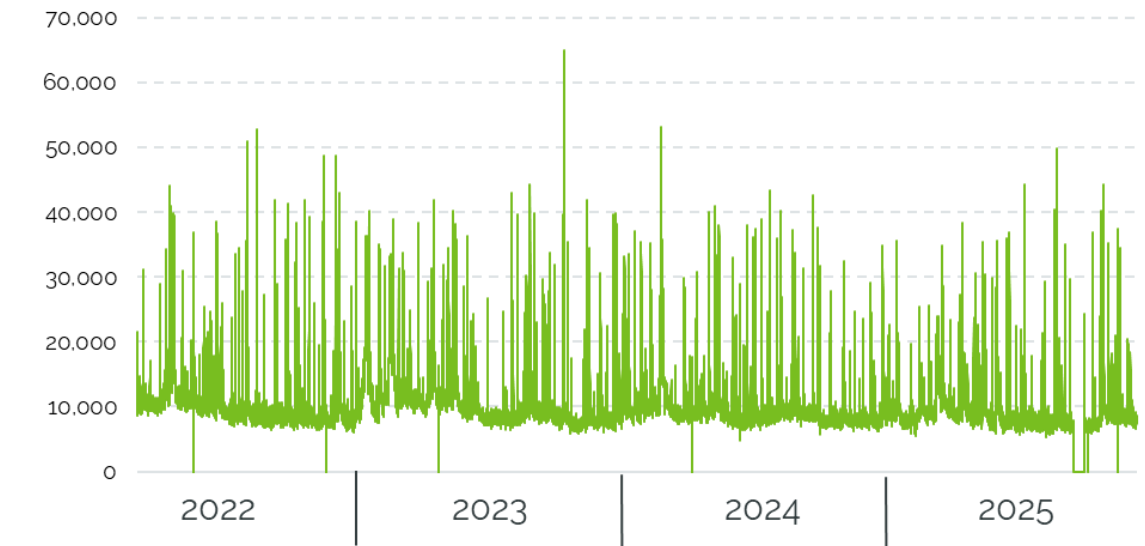
Central 4-pipe hot/chilled water  
Existing district plant  
8,765 MBH heating  
70 tons cooling (residential)



Geologic conditions were unfavorable for use of vertical boreholes to meet entirety of 8,765 MBH thermal load in dense urban environment (excessive brackish groundwater beyond 250 feet). Wastewater from nearby 96" combined sanitary storm sewer provided an optimal thermal resource to pair with vertical boreholes for central 4-pipe system design.



Sewer Flow (GPM)



Minimum ~10,500 GPM of wastewater flow equates to **32,000 MBH of thermal capacity**

BUSINESS CARD



**MIKE BARBASCH**

ENERGY DISCIPLINE LEADER, PE

Thank you

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NY-GEO 2026



**LaBella**

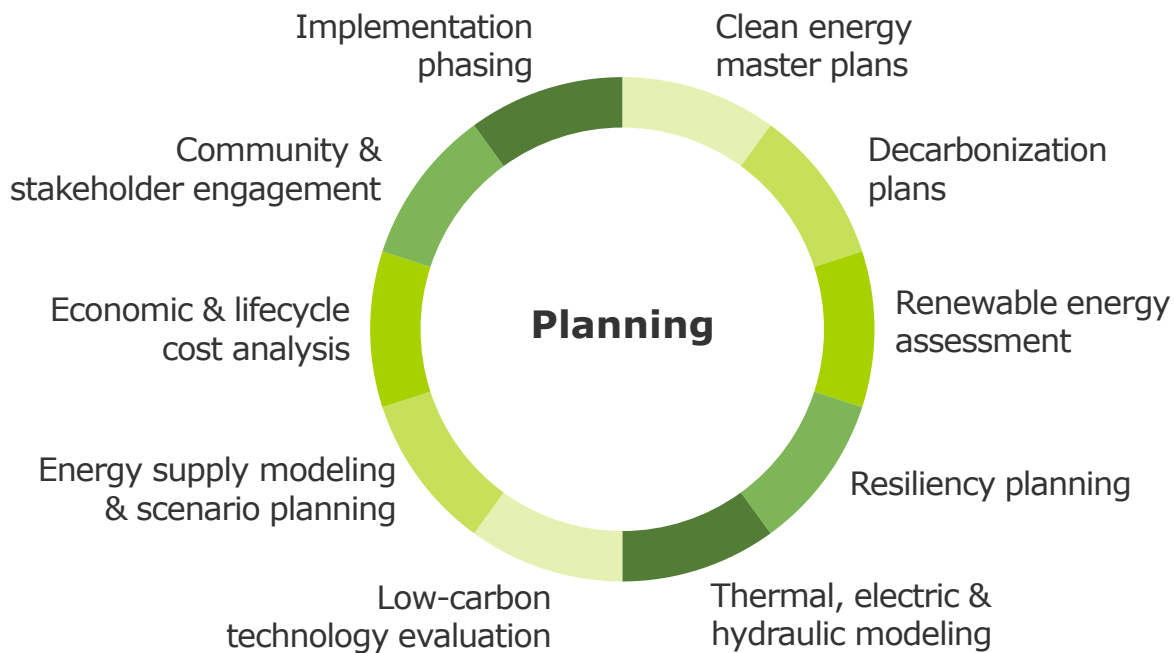
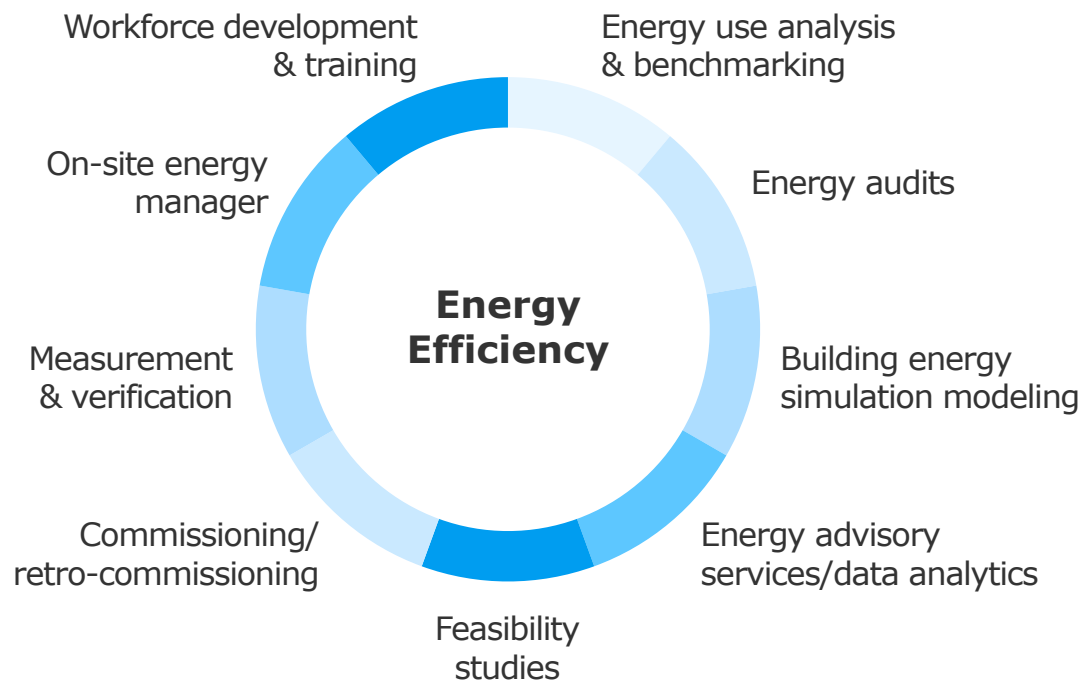
Powered by partnership.



## Joe DiSanto, PE, CEM Project Manager |

RAMBOLL

- Mechanical engineer specializing in campus and district-scale decarbonization
- Leads geothermal, district energy, and hybrid heating system feasibility studies
- Experience with clean energy master plans, net-zero strategies, and implementation phasing
- Focus areas include energy modeling, techno-economic analysis, and system optimization
- Supports higher-education institutions, public agencies, and large building portfolios

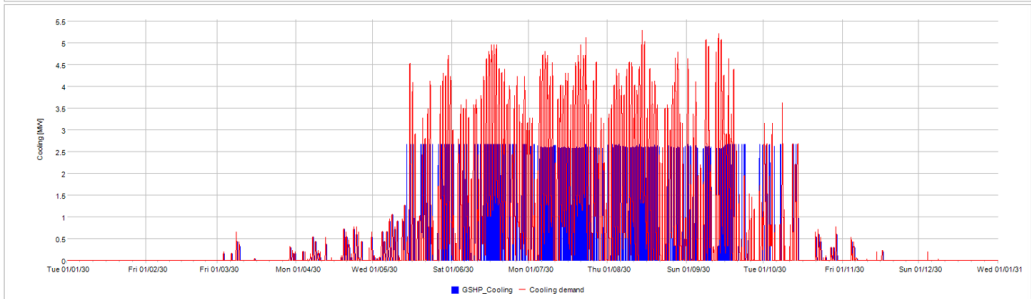
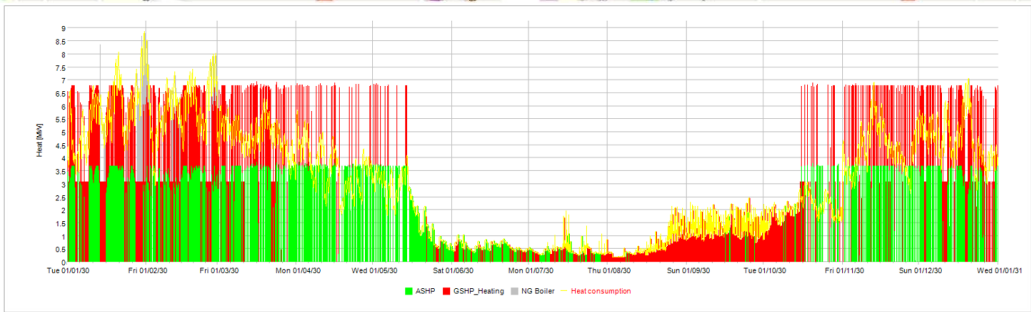
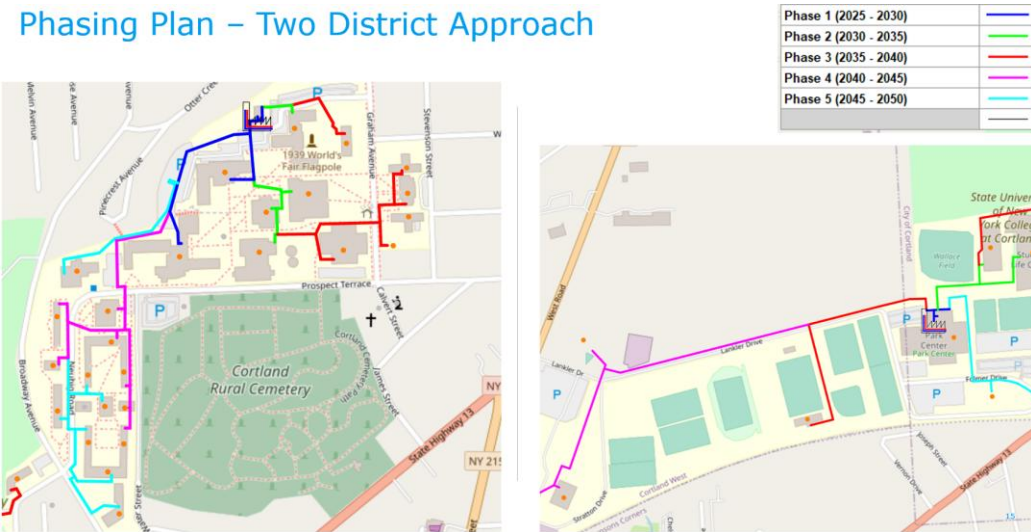




# SUNY Cortland

## Feasibility Study

### Phasing Plan – Two District Approach



- Developed parametric energy models to optimize economics
- Single network vs separate North & South networks
- Mix of GSHP & ASHP capacities serving the networks
- Three variations of base vs peak load sizing
- Three thermal storage tank sizes
- Electric or natural gas peaking
- Implementation phasing to meet goals and budgets
- Why Cortland wants hybrid?
  - Mix of ASHP with GSHP & gas peaking brought CAPEX down and avoided seasonal borefield imbalance (15% CAPEX reduction)
  - High GSHP utilization keeps OPEX low (18% lower than ASHP base load)
- Provides a mix of thermal sources the campus wants to try as the system progresses through phases



# London Underground

## Existing District Network

- Abandoned station transformed into heat extraction
- Fan extracts heat from subway tunnels
  - Can be reversed to help cool subways in summer months
- Adds additional 1,600 homes to existing Bunhill district heating network

# Denmark

## Existing District Networks



<https://www.man-es.com/docs/default-source/document-sync/esbjerg-heat-pump-reference-case-eng.pdf>

District Network	Fjernvarme Fyn	Taarnby Forsyning	DIN Forsyning, Aalborg Forsyning
City	Odense	Taarnby	Esbjerg, Aalborg
Production units	<ul style="list-style-type: none"> <li>Coal CHP</li> <li>Meta data center</li> <li>Wastewater</li> <li>Biomass CHP</li> <li>Waste to Energy</li> <li>Industrial waste heat</li> <li>Oil/Gas peak/reserve</li> </ul>	<ul style="list-style-type: none"> <li>Wastewater</li> <li>District cooling</li> <li>Heat recovery chillers</li> <li>Groundwater aquifer (planned)</li> </ul>	<ul style="list-style-type: none"> <li>Seawater heat pumps</li> <li>Biomass boiler</li> <li>Electric boiler</li> </ul>
Heat Pump			
• Refrigerant:	Ammonia	Ammonia	CO2
• Source:	Datacenter	Wastewater 42-60°F	Sea water: 33-59°F
• Capacity:	150 MMBtu/h heating	68 MMBtu/h heating	240 MMBtu/h (Esbjerg) 600 MMBtu/h (Aalborg)
• District Temperatures:	167°F / 113°F heating 59°F / 81°F datacenter cooling	158°F supply / 113°F return	194°F supply / 100°F return
• COP:	4.8 – 5.2	3.2 (at 52°F ww temp)	2.7 (37/34°F & 194/100°F)

# Thank you

Joe DiSanto  
Project Manager, Energy Consulting Services  
Joseph.DiSanto@Ramboll.com

**RAMBOLL**

Bright ideas.  
Sustainable change.



# Hybrid Geothermal Systems

## Investment Tax Credit Impacts

March 24, 2026



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# ABOUT ECOSYSTEM

Ecosystem has built a business that reconnects engineering design, construction and commissioning with a total focus on delivering results.

This way, we can contractually guarantee the outcomes that mean the most to our clients while acting as a single point of contact throughout each step of the journey.

With three decades of experience and over 200 specialists across North America, we do breakthrough work so our clients reach their ambitious decarbonization goals and achieve environmental, financial, and operational results.

316

1,828

\$1.6B+



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# OUR EXPERTISE



## Decarbonization

Reducing your greenhouse gas emissions



## Engineering to Solve Problems

Challenging convention to implement creative solutions that deliver targeted outcomes



## Project Management

Seamless implementation from design to verified performance



## Start-Up & Commissioning

Maximizing performance and mitigating long-term issues



## Training & Communications

Collaboration with staff and your community to enhance project value



## Measurement & Verification

Analyzing results to ensure long-term satisfaction

ECOSYSTEM  
**BY THE NUMBERS**

33

YEARS OF  
EXPERIENCE

316

PROJECTS  
& COUNTING

222

ENERGY  
PROFESSIONALS

1,828

RETROFITTED  
BUILDINGS

101

% GUARANTEED  
ENERGY SAVINGS  
ACHIEVED

770

MILLION \$  
SAVINGS  
DELIVERED

188

MILLION \$  
INCENTIVES  
SECURED

1.1M

MTONS  
GHG AVOIDED

CASE  
STUDY

CON EDISON-UTEN  
**ROCKEFELLER  
CENTER**

ESTIMATED CONSTRUCTION COST **\$150M+**

**OUTCOMES**

- Energy efficiency
- GHG reduction
- Improved local air quality
- Reduced electrical grid peak
- Greater access to clean energy



RESIDENTIAL + COMMERCIAL

CASE  
STUDY

# MONTREAL BIODOME

INVESTMENT **\$9.6M**

INCENTIVES **\$1.6M**

ANNUAL SAVINGS **\$1.3M**

ENERGY BILL REDUCTION **52%**

## MEASURES

- Heat recovery & transfer system
- Geothermal system
- Steam to hot water conversion
- Fan & pump optimization
- Lighting redesign & conversion
- Centralized controls optimization

**80%**  
GHG  
REDUCTION



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# Tax Credits for Energy Property

Eligible for ITC or PTC	Eligible for ITC	Eligible for PTC
<ul style="list-style-type: none"><li>▪ Multiple solar and wind technologies</li><li>▪ Municipal solid waste</li><li>▪ Geothermal (electric)</li><li>▪ Tidal</li></ul>	<ul style="list-style-type: none"><li>▪ Energy storage technologies (&gt;5 kWh)</li><li>▪ Microgrid controllers</li><li>▪ Fuel cells</li><li>▪ <b>Geothermal (heat pump and direct use)</b></li><li>▪ Combined heat &amp; power</li><li>▪ Microturbines</li><li>▪ Interconnection costs</li></ul>	<ul style="list-style-type: none"><li>▪ Biomass</li><li>▪ Landfill gas</li><li>▪ Hydroelectric</li><li>▪ Marine</li><li>▪ Hydrokinetic</li></ul>

- Investment Tax Credits: ITC
- Production Tax Credits: PTC

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# ITC Calculation

1. Identify eligible geothermal property
2. Identify eligible cost
3. Confirm tax rate structure
4. Iterate and optimize (Repeat Steps 1, 2, 3)

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# Dual-Use

**If a system serves both qualifying and non-qualifying uses, the ITC must be allocated proportionally.**

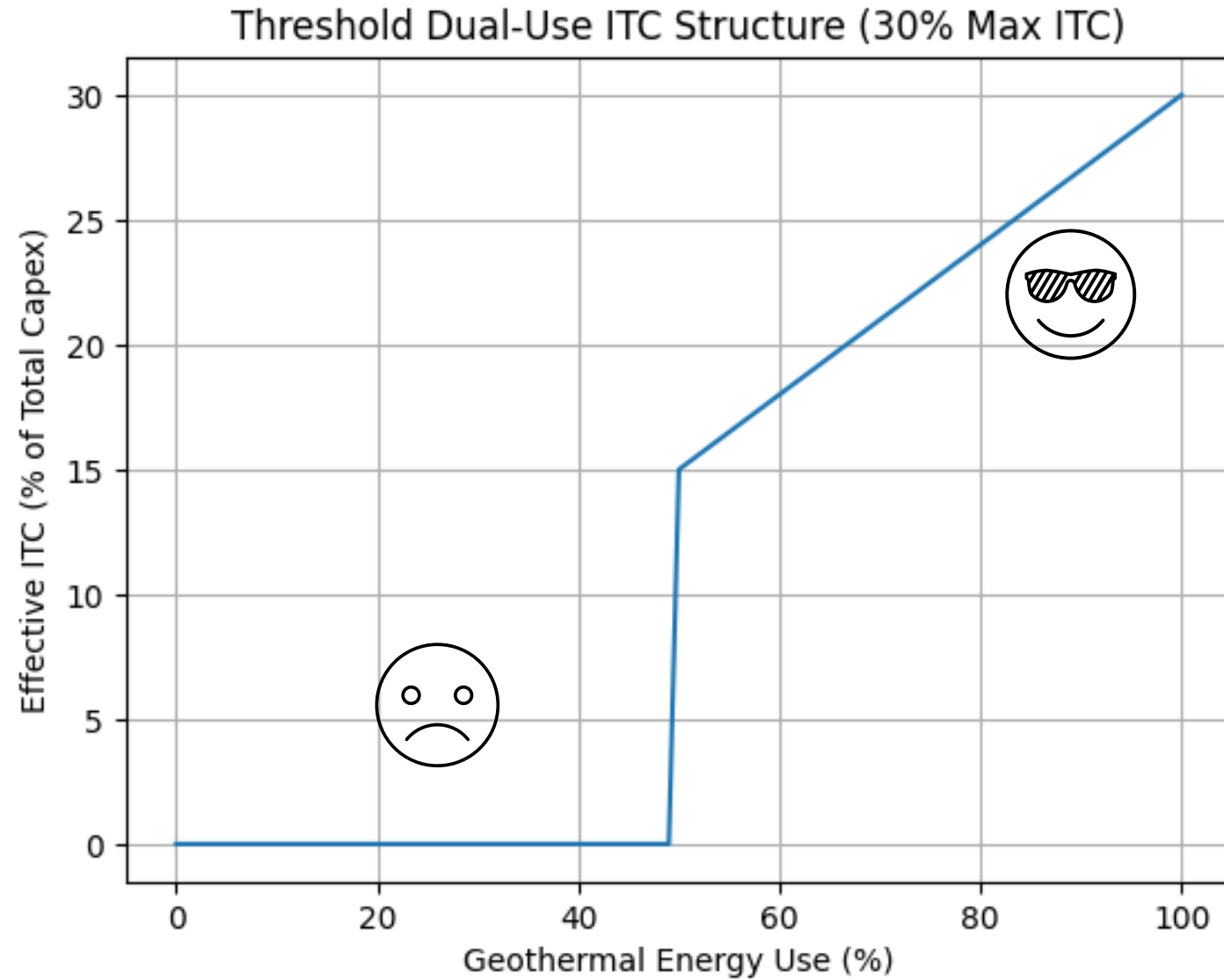
## **Examples in hybrid geothermal:**

- Heating (qualifying) vs. domestic hot water or process loads (sometimes non-qualifying)
- Shared borefields across multiple building types
- Networked systems serving both ITC-eligible and ineligible loads

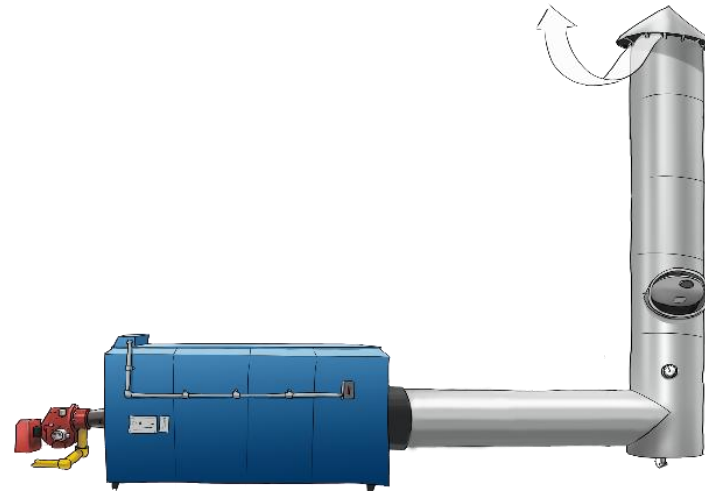
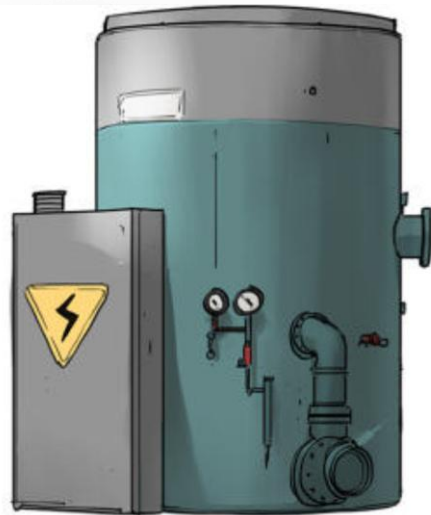
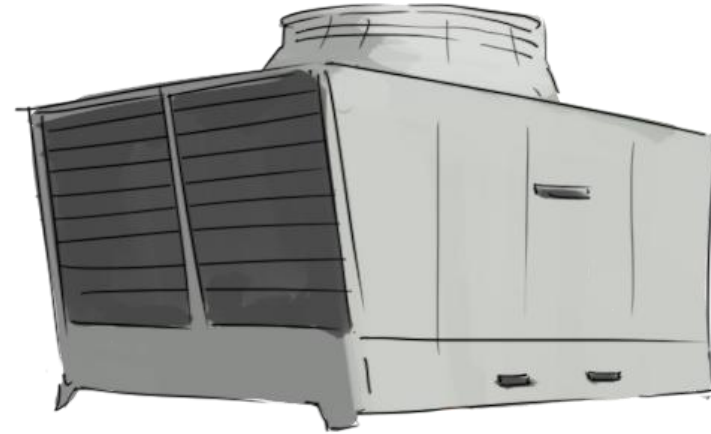
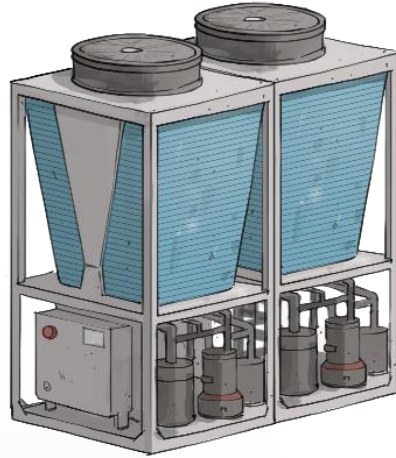
## **Typical allocation methods:**

- Energy output basis (MMBtu split)
- Cost segregation of components
- Metering-based allocation (strongest defensibility)

# Dual-Use



# Other Sources



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# Optimize the project for Energy Savings?

**No!**

“In hybrid geothermal, we don’t just optimize for LCOE or carbon.

We optimize for after-tax cost of energy.”

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## When 2% Matters the Most

The difference between 49% and 51% geothermal is not 2%.

It's the difference between \$0 and Millions

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# Integral to Energy Property

From Treasury Regulations and IRS guidance (including §1.48 and related interpretations across technologies), the consistent principle is:

**Only property that is integral to the energy generation, storage, or conversion process qualifies.**

This is applied across:

- Solar
- CHP
- Fuel cells
- Geothermal

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# A spectrum of defensibility

## **At a minimum:**

Borefield and heat pumps clearly qualify

## **Distribution:**

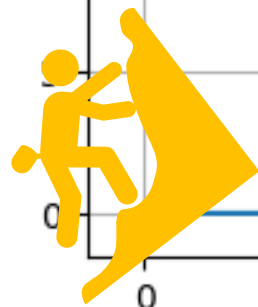
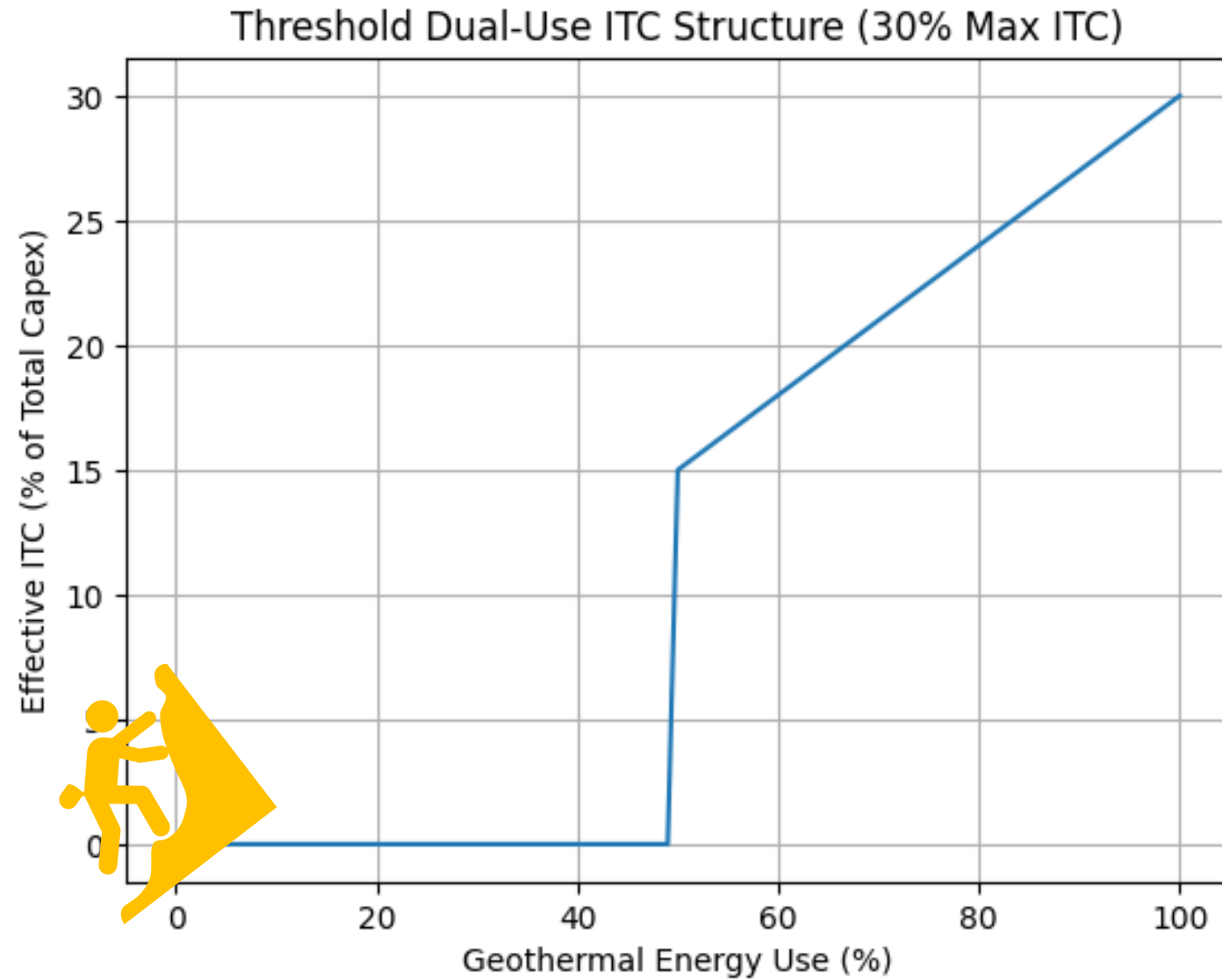
Often qualifies if integral

## **Terminal units:**

May be treated as building systems and excluded

But some developers take broader positions depending on structure and risk tolerance

# Dual-Use



# THANK YOU!

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## Finding Balance with Hybrid TEN Systems

**Moderator:** Diego Sanchez / *CHA Consulting*

**Panel:** Samuel Gerber / *CDM Smith*

Michael Barbasch / *LaBella Associates*

Joe DiSanto / *Ramboll*

Adam Shelly / *Ecosystem*