Measuring Success:
The Data We Need

Presented Live at the NY-GEO 2023 Conference Albany, New York on April 27, 2023

Moderator:

Angie Alberto Escobar / *HEET*

Panel:

Brian Urlaub / *Salas O'Brien*

Cary Smith / *The GreyEdge Group*

William Beattie / *Orange & Rockland Utilities*

Mitch DeWein / *CHA Consulting*

A BIG THANK YOU to This Year's Sponsors!

PLATINUM - PRESENTING

NEW YORK STATE | NYSERDA

GOLD

WaterFurnace
Smarter from the Ground Up™

Climate Control Group
A NIBE GROUP MEMBER

ClimateMaster · IEC International Environmental · CLIMACOOL

SILVER

CELSIUS ENERGY

NEW YORK STATE LABORERS' ORGANIZING FUND
LiUNA! NEW ENGLAND REGION

Stark TECH

NYSEG RG&E
Part of the AVANGRID Family

TOP JOBS

GEOSTAR
AFFORDABLE RENEWABLE CLEAN

CORECHEM
ESSENTIAL CHEMISTRY. INNOVATIVE SOLUTIONS.

ROBCO SPECIALTIES

BRONZE

New York State Pipe Trades Association
We do it right the first time

GROUNDHEAT
GEOTHERMAL PIONEERS.....SINCE 1985

MIX N MINGLE

CDM Smith

WIFI

SRS ENTERPRISES INC

LUNCH

Brightcore
BUILDING ENERGY PERFORMANCE™

DANDELION GEOTHERMAL

EXHIBITOR BINGO

nationalgrid

BREAKFAST

ENERTECH
ENERGY + TECHNOLOGY

CHA

COFFEE BREAK

Pathfinder
Engineers & Architects

subterra
RENEWABLES

VERSAPROFILES

We Couldn't Do It Without You! • www.ny-geo.org

The Birth of Thermal Utilities: Measuring Success: The Data We Need

heet

ENERGY FOUNDATION
building a new energy future

Barr Foundation

PUTNAM FOUNDATION

MASSACHUSETTS CLEAN ENERGY CENTER

E4 THE FUTURE

WINSLOW FOUNDATION

Angie Alberto Escobar

Director, HEET

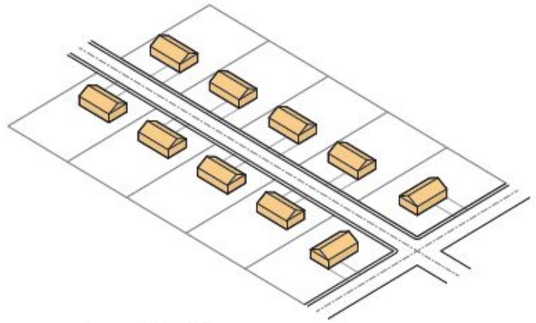
Gas to Geo Transition

Cary Smith

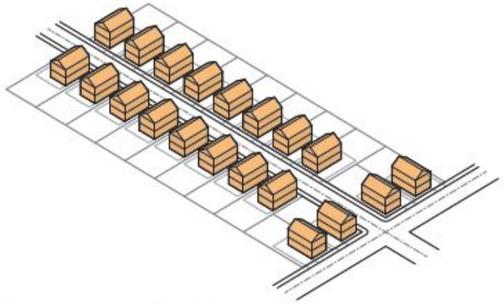
The GreyEdge Group

Colorado Mesa University

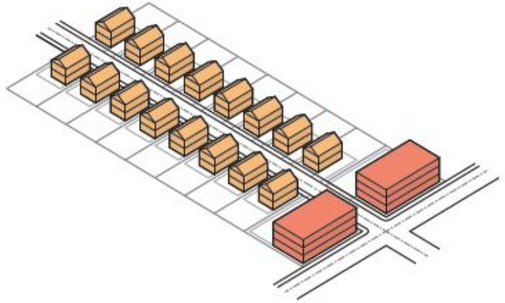
Energy *harvested*, *moved*, and *reused*



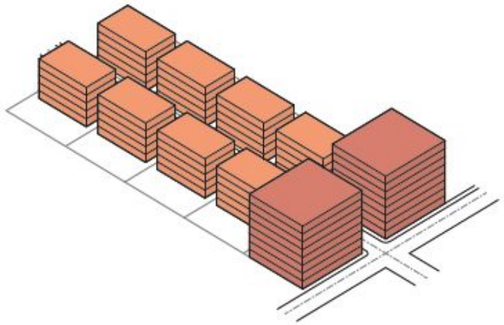
Low Density Residential



Medium Density Residential



Medium Density Mixed-Use



High Density Mixed-Use

Powered by R-718 Technology ©

The Grey Edge Group
and
Sound Geothermal Corporation
Cary Smith

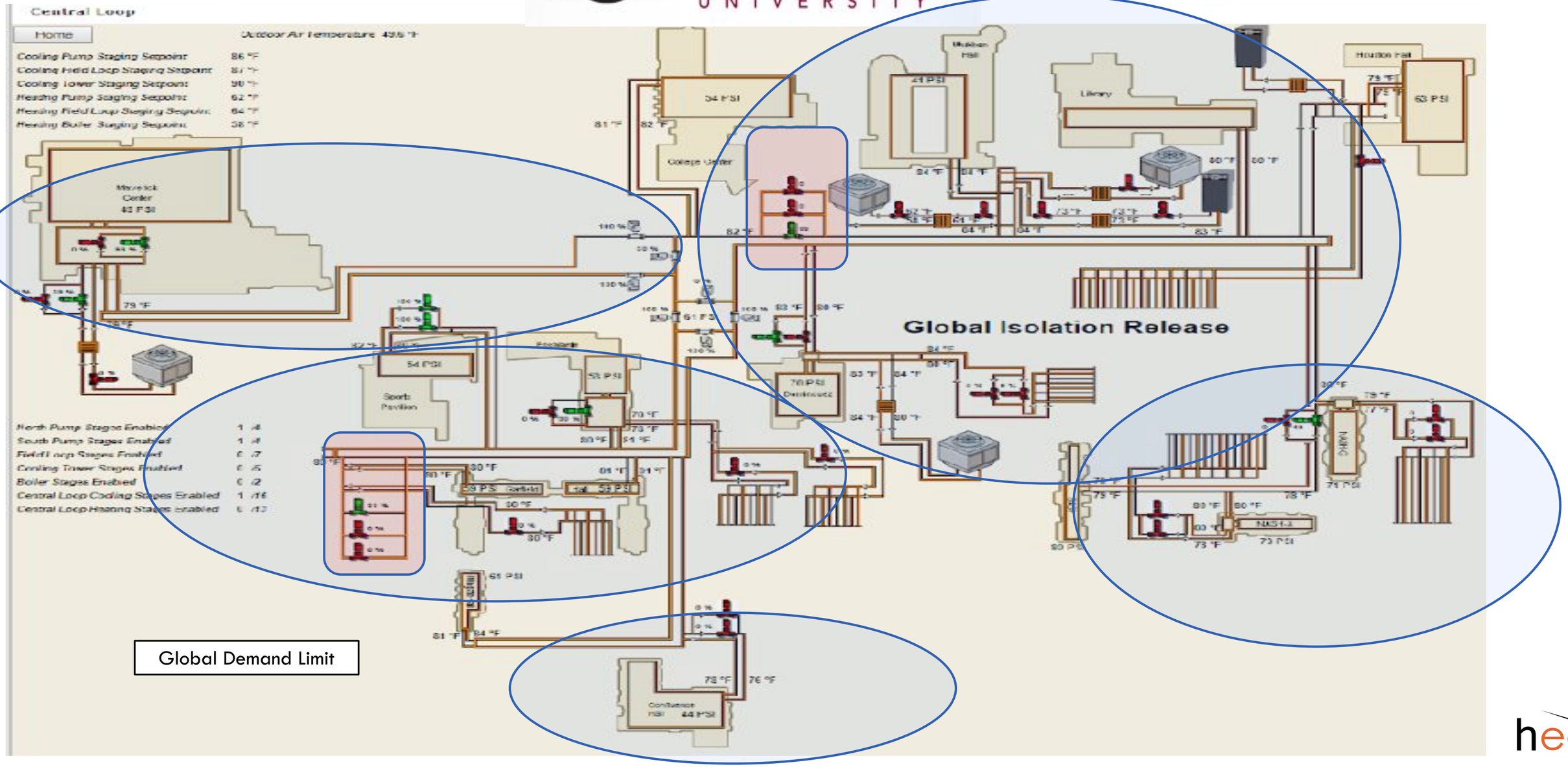
dcsmith@soundgt.com
csmith@greyedgegroup.com

SGT Sound Geothermal Corporation

the GreyEdge group

CMU's Central Loop & GMS

COLORADO MESA UNIVERSITY



heet

Name of Flagship Project: Colorado Mesa University	
Climate zone **Cooling degree days, Heating degree days**	**Zone 6b – (-5F to 0 F)** **5548 HDD 1183 CDD**
System size in tons	**3,500 -4,000 tons cooling – 3,000 tons heating**
Conditioned space in sqft	**1,300,000 sqf – 17 buildings and expanding**
Years in operation	**Start in 2007 with 4 buildings**
Who owns the system? **Eg. Single-owner campus, Multi-owner, Utility-owned, privately owned, public-private partnership**	**Campus, State of Colorado, Colorado Mesa University**
Back up thermal sources? **Loop or Building level?** **Has it been used?**	**Loop fields, irrigation, potable water. Boilers in retrofit buildings kept for back-up. Not fired since 2012 except to top off DHW. Boilers in individual buildings and can feed the ATL (1,500 tons). 1,800 tons of cooling towers, 6-towers staged, located on buildings and tied to both the building and the ATL, used at night, staged during the day, if necessary, and for unexpected peaks**
Glycol or water?	**Water**
Net Cost (over useful life)	**ATL - $20,000,000. ~3.25 miles of 18” main. (NEW)**
Retrofit or new building?	**Both**
Infrastructure costs **Includes HVAC? Why or why not?**	**All added buildings converted to heat pumps or designed with heat pumps**
Maintenance costs	**Not available. Normally, two men are dedicated to handle the system.**

heet

Additional information to collect:

- Type of distribution, New ATL piping or use of existing piping such as an existing chilled water system
- Open or closed loop assets
- Closed Loop - Source/sink or storage, Deep Earth Temperature, TC, diffusivity
- Total Length of bore field, number of fields, spacing/location of fields, configuration.
- # of microdistricts, pumping configuration, size of ATL, Length of ATL, Volume of ATL and fields
- Plug and play components (Irrigation, PVT or ST, potable water, etc.)
- Special or unique additions to the system such as CHP, phase change material, special thermal storage
- Normal temperature of the loop by season and normal pumping data. [CMU spends 70 % of the time at lowest pump speeds (20 hz) and a 2 degree delta T across the loop]
- MORE?

heet

What are your top recommendations for new installs?

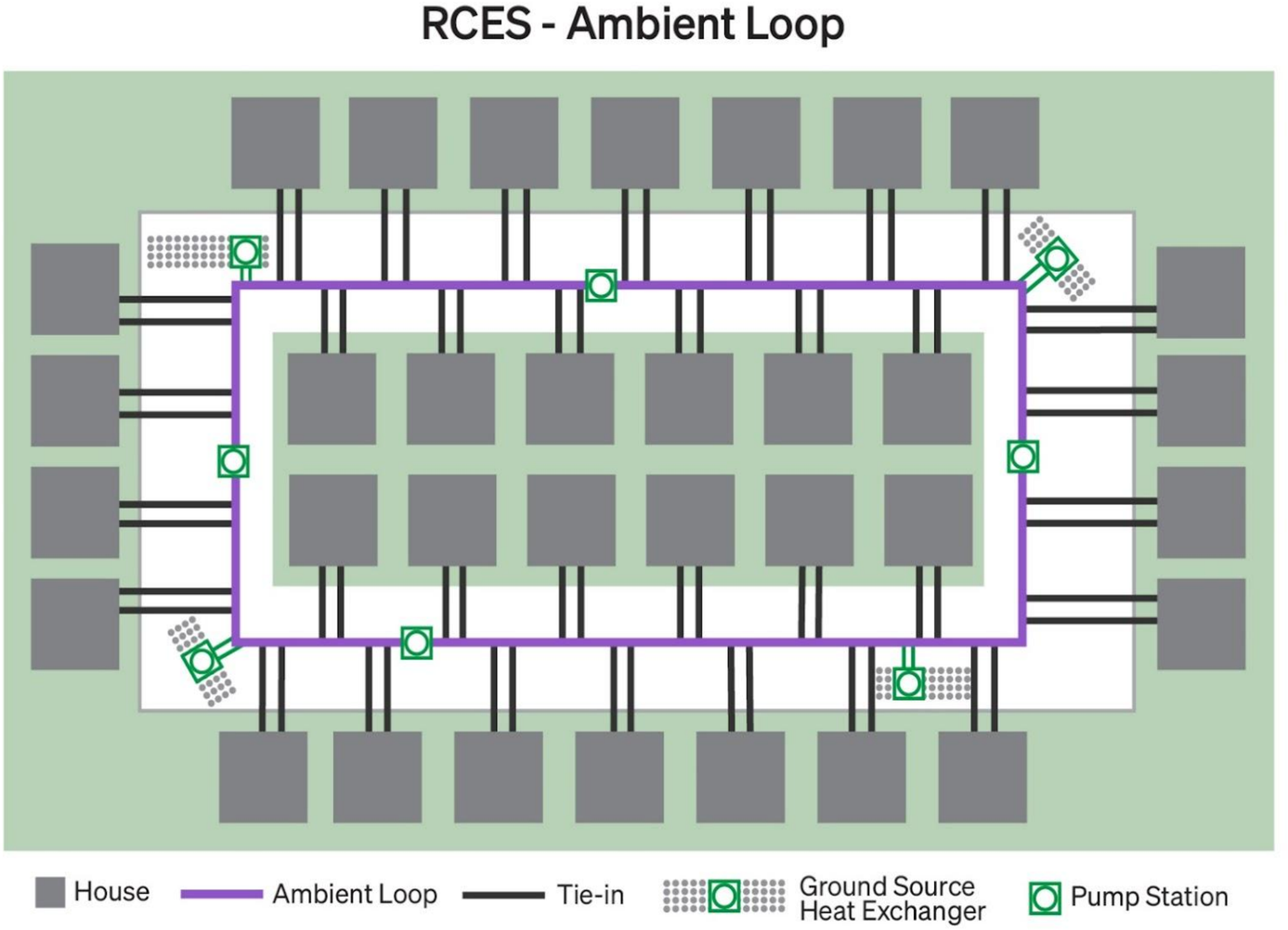
- Design the system to be expandable and link to other microdistricts / networked systems
- Estimate the system diversity but plan for the peaks
- Track system circulating volumes and temperatures

Brian Urlaub

Salas O’Brien

- **Name of Project:**
  Berczy-Glen
- **UTEN Company:**
  Enwave Energy
- **Developer:**
  Mattamy Homes
- **Engineer of Record**
  Salas O'Brien

One-Pipe Ambient Geothermal System



Name of Flagship Project: Berczy-Glen Residential Development	
Location	**Markham, Ontario**
System size in tons	**650**
Conditioned space in sqft	**500k SF**
Years in operation	**1.5**
Who owns the system? Eg. Single-owner campus, Multi-owner, Utility-owned, privately owned, public-private partnership	**Single Family/MF Homes – privately owned** **UTEN – Enwave Energy**
Back up thermal sources? Loop or Building level? Has it been used?	**100% Geothermal for Heating & Cooling** **Electric resistance heat for backup locally in each heat pump**
Glycol or water?	**25% PG**
Net Cost (over useful life)	
Retrofit or new building?	**New Construction**
Infrastructure costs Includes HVAC? Why or why not?	**$12mil – not including building HVAC (new homes needed a system)**
Maintenance costs	**Zero to date**

heet

Bill Beattie

Orange & Rockland Utilities, Inc.

Orange & Rockland Utility Thermal Energy Network Pilot

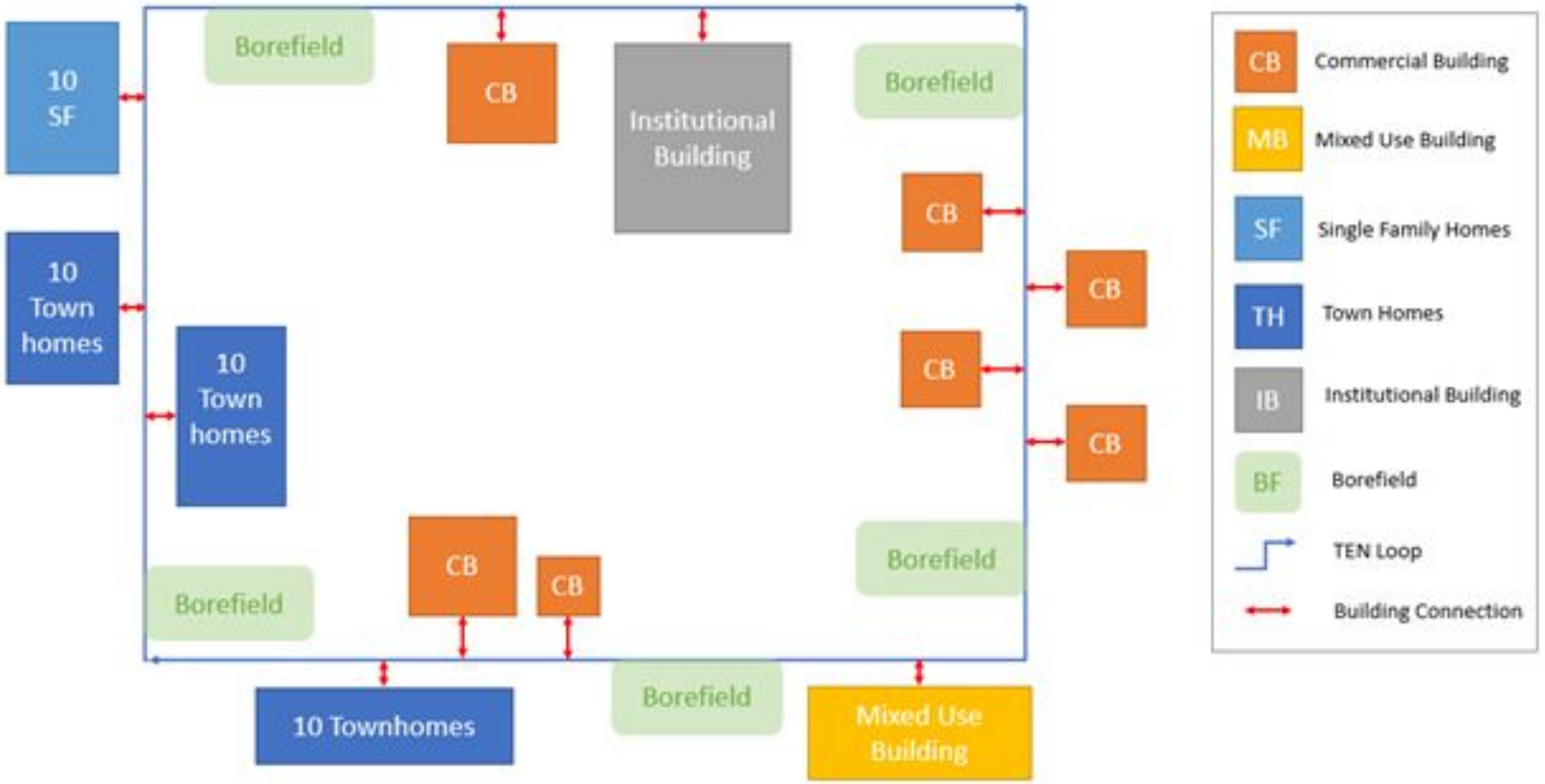
Bill Beattie

Project Specialist, Utility of the Future

O&R Proposed Community UTEN Pilot Project

heet

Representative UTEN One-Line Diagram[1]



[1] Theoretical UTEN Diagram from ORU January 9th 2023 filing. Specific sites are being selected through an RFI process.

O&R UTEN Pilot Projects

Climate zone **Cooling degree days, Heating degree days**	**Zone 5A; CDD – 989; HDD – 4,850**
System size in tons	**Two pilot projects ranging size from 150 tons to 750 tons**
Conditioned space in sqft	**Targeting 110,000 to 700,000 sq-ft per pilot**
Years in operation	**To be constructed in the near future**
Who owns the system? **Eg. Single-owner campus, Multi-owner, Utility-owned, privately owned, public-private partnership**	**O&R will own the UTEN infrastructure and services. Customer owns and maintains HVAC equipment.**
Back up thermal sources? **Loop or Building level?** **Has it been used?**	**Building level resistance heat (in heat pumps)**
Glycol or water?	**Water/Glycol mix**
Net Cost (over useful life)	**TBD**
Retrofit or new building?	**Both**
Infrastructure costs **Includes HVAC? Why or why not?**	**Retrofit incentives to be included**
Maintenance costs	**TBD**

heet

Performance Metrics

Technical

- System temp
- System flow
- Rate of leaks
- Rate of customer outages
- Duration of customer outages
- Duration of time UTEN operating outside of temperature range
- Duration of time UTEN operating outside of min flow
- Electricity consumption (customer and UTEN)
  - Normal operation
  - Peak
- Bore field temp
- Asset tracking (i.e., pipe sizes, materials, age, commodity)

Financial

- Customer billing impact of UTEN compared to previous energy costs
- Company's operating expenses required to run & balance UTEN system
- Company's capital expenses per customer and/or BTU loading capacity
- Customer subsidy cost per customer acquisition into UTEN
- Cost Comparisons
  - Customer electrifying with ASHP system
  - Cost estimate of UTEN systems with no customer-sided EE upgrades

Customer

- Customer satisfaction surveys
- Call center queries (number, concern, and resolution)
- Customers exiting or entering the pilot after construction complete
- Tracking of energy efficiency upgrades to UTEN
- Impact of Customer's total energy usage, peak, and bill after converting to UTEN system
- Customer acquisitions

Safety/Societal

- OSHA Incident Rate – UTEN Related Work
- Contractor excavation damages
- Facility failure reports
- Equipment failures
- Excavation damages
- Emergency response time
- GHG reduction
- Jobs impact

heet

Mitch DeWein

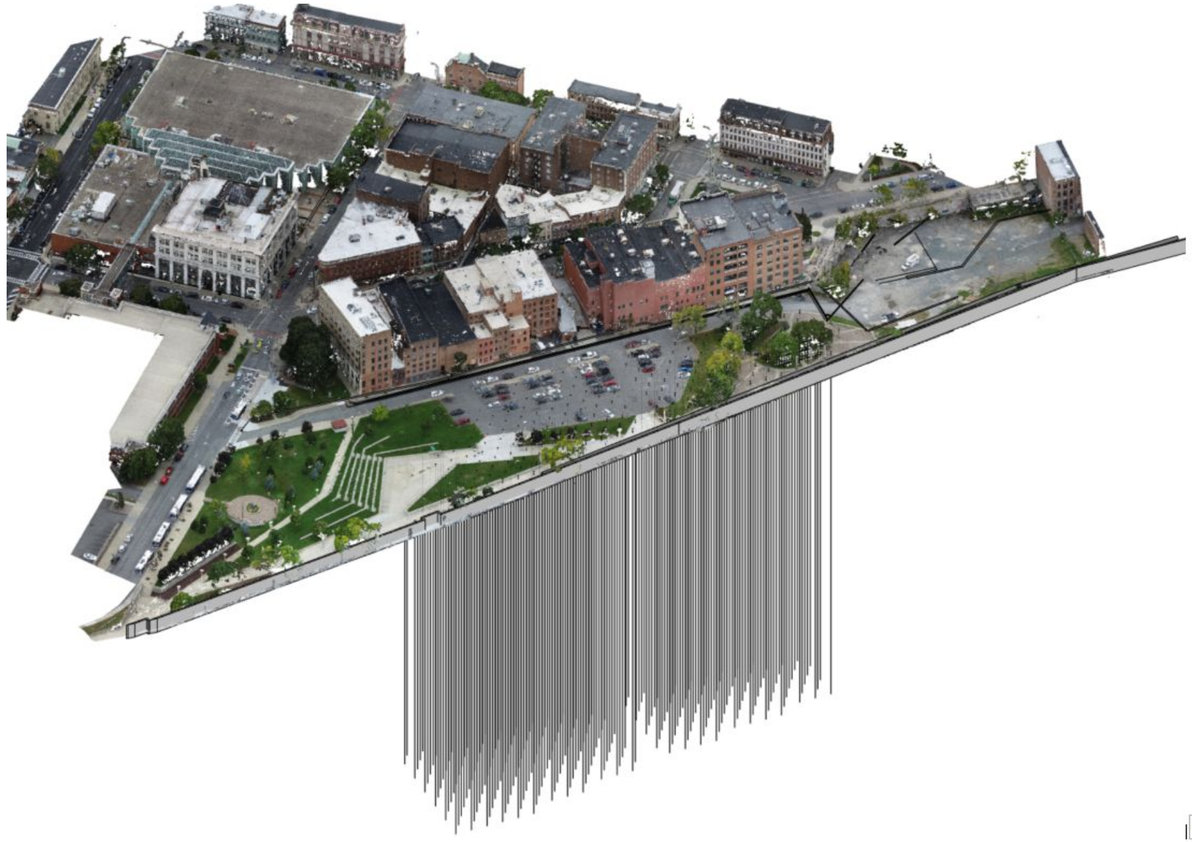
CHA Consulting

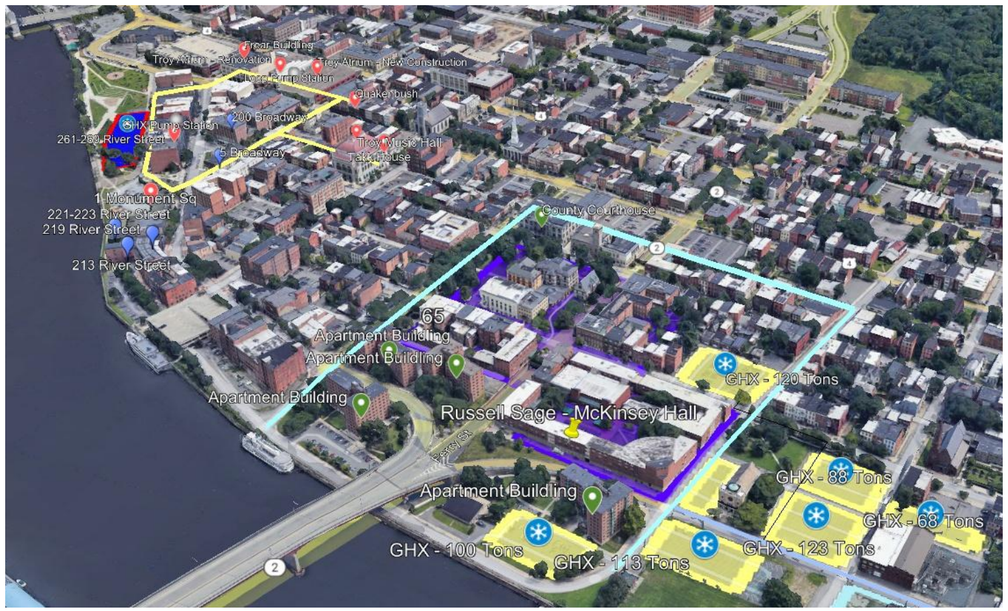
CHA Consulting, Inc.

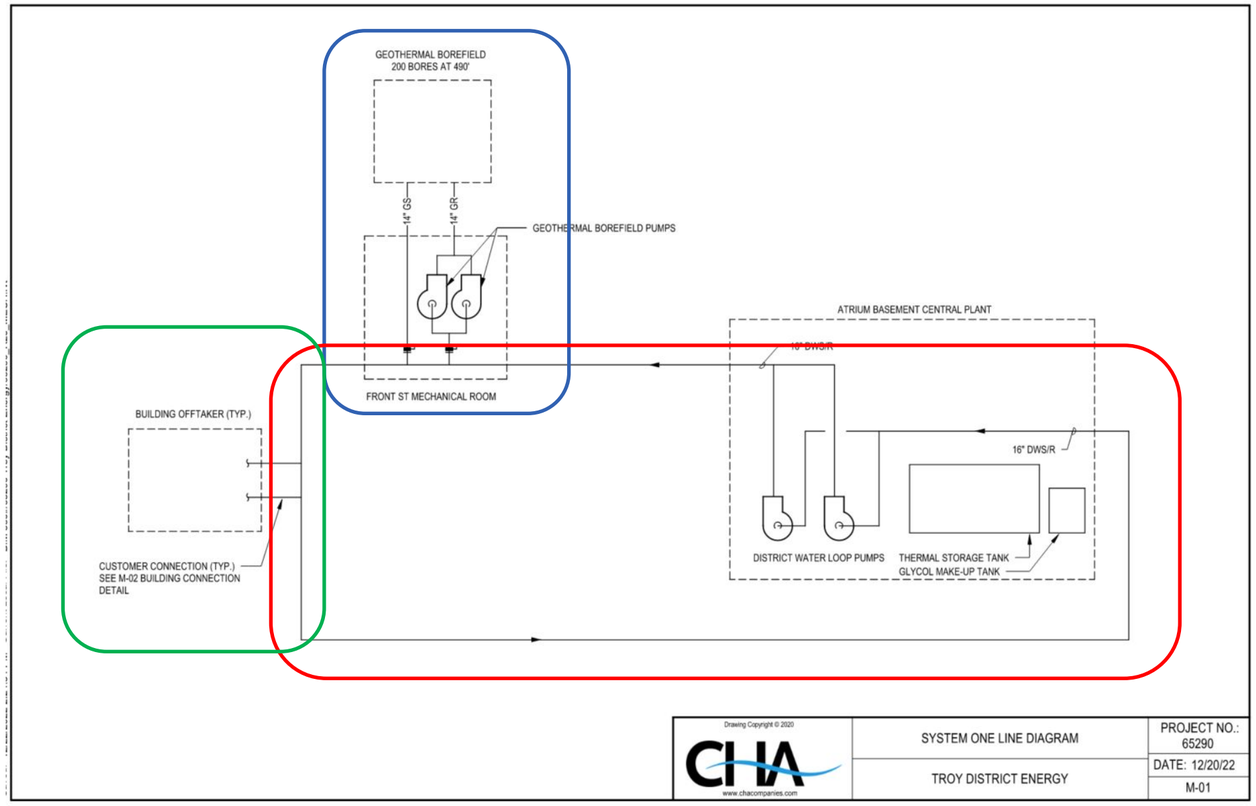
Presented by:

- Mitch DeWein
  Associate Vice President
  Energy & Renewables Team Leader

- **City of Troy, NY**




Troy Atrium - Renovation
Tower Building
Troy Atrium - New Construction
Tower Pump Station
Quake Rush
GHX Pump Station
200 Broadway
261-263 River Street
5 Broadway
Troy Music Hall
Tenement House
1 Monument Sq
221-223 River Street
219 River Street
213 River Street
County Courthouse
65
Apartment Building
Apartment Building
Apartment Building
Russell Sage - McKinsey Hall
GHX - 120 Tons
GHX - 88 Tons
GHX - 68 Tons
Apartment Building
GHX - 100 Tons
GHX - 113 Tons
GHX - 123 Tons


GEOTHERMAL BOREFIELD
200 BORES AT 490'
14" GS
14" GR
GEOTHERMAL BOREFIELD PUMPS
FRONT ST MECHANICAL ROOM
BUILDING OFFTAKER (TYP.)
CUSTOMER CONNECTION (TYP.)
SEE M-02 BUILDING CONNECTION
DETAIL
ATRIUM BASEMENT CENTRAL PLANT
16" DWS/R
16" DWS/R
DISTRICT WATER LOOP PUMPS
THERMAL STORAGE TANK
GLYCOL MAKE-UP TANK
Drawing Copyright © 2020
CHA
www.chacompanies.com
SYSTEM ONE LINE DIAGRAM
TROY DISTRICT ENERGY
PROJECT NO.:
65290
DATE: 12/20/22
M-01

Name of Flagship Project: City of Troy, NY – Phase 1 Thermal Network	
Climate zone **Cooling degree days, Heating degree days**	**Climate Zone 5, 6,054 HDD / 1,094 CDD**
System size in tons	**~600T**
Conditioned space in sqft	**+/- 400,000**
Years in operation	**N/A Construction Pending Fall '23**
Who owns the system? **Eg. Single-owner campus, Multi-owner, Utility-owned, privately owned, public-private partnership**	**Multiple owners:** **1) City of Troy Local Development Corporation (LDC)** **2) Third-party distribution network ownership** **3) Private utility customer heat pumps**
Back up thermal sources? **Loop or Building level?** **Has it been used?**	**Proposed back up thermal source at loop level being considered (Electric Boiler/EDG)** **Building level considerations as well, case-by-case basis** **Anticipate potential need in early build out of project depending on customer connection timelines**
Glycol or water?	**Glycol**
Net Cost (over useful life)	
Retrofit or new building?	**Both retrofit and new buildings**
Infrastructure costs **Includes HVAC? Why or why not?**	**Approximately $25 million with limited building HVAC** **HVAC upgrades responsibility of customer primarily, more closely following Utility/Customer arrangement currently in place**
Maintenance costs	**U/CTEN System very low, ~$25k/yr placeholder**

heet

What data do we wish we had?

We built a business model – is it the right one?

Behavioral/Customer Data:

- Customer adoption rate/timelines
- Model contracts
- Average acquisition costs

Financial Model Data:

- Ownership models
- Customer rate structures
  - Flat rate
  - Demand/energy rate
  - Reimbursement capabilities (loads acting as thermal sources)
- Revenue generation accomplished – ultimate net local benefits

Rapid Fire Questions

System COP?

Electric Grid Impacts?

Audience

What outcomes are important to you to evaluate future systems?

Given outcomes - What metrics do you want to see measured?

Examples:

Outcome	Affordability	Equity	Water Use Change
Metric	cost/ton for useful life	Change in energy burden	Change in gals/year
Example of a Data point	Drilling cost per foot	Customer energy bills	Customer water bills allocated to chiller use System fill volume Water use for energy system, compared to legacy system

Thank you!

info@heet.org | gastogeo.wiki | heet.org

Join us! Champagne & signing of the **Declaration of Thermalfication!**

5:00 PM, Empire Room

heet