



**District Geothermal: Clean Heating
& Cooling at Community Scale**

Get AMPED Forum

September 15th - 12:00-1:00 pm

Agenda

- Introductions & webinar goals
- AMPED campaign overview
- Local Showcase
 - LaBella
 - Rochester District Thermal
 - Dutton Properties
- Q&A

Presenters



Aaron Schauger
Energy Engineer,
LaBella Associates



John Duchesneau
General Manager,
Rochester District
Heating



Bill Coe, P.E.
VP & Director of
Project Development,
EMCOR Services
Betlem



Luke Dutton
Owner & Project Lead,
Dutton Properties

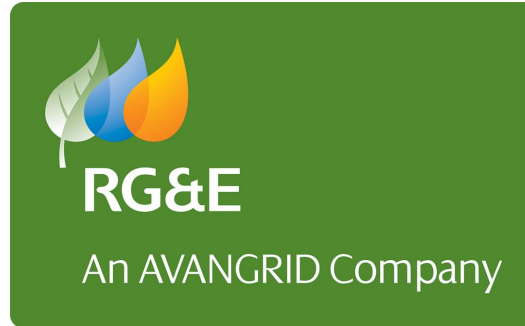
Webinar Goals

- Hear about completed and in progress community heat pump projects in our area
- Get an inside perspective on challenges and benefits
- Understand how to get started



Mitigating the impacts of climate change by reducing carbon pollution caused by fossil fuels through the promotion of beneficial electrification in the Genesee/Finger Lakes region.

Funders



Climate Solutions Accelerator

of the Genesee-Finger Lakes Region



Steering Committee Members

Causewave Community Partners
Center for Community Health & Prevention
Common Ground Health
Dutton Properties
EMCOR Betlem
Empire State Development
Gallina Development
Genesee/Finger Lakes Regional Planning Council
Genesee Transportation Council
Greater Rochester Chamber of Commerce

Monroe County
PathStone Corporation
Piekunka Systems Inc.
Rochester Gas and Electric Corporation
Rochester Institute of Technology
Rochester Housing Authority
Rochester Regional Health
Regional Transit Service
SWBR
University of Rochester



LaBella



LaBella

Powered by partnership.

PRESENTATION ON
DISTRICT GEOTHERMAL SYSTEMS

September 15, 2022



AGENDA

- ❖ About LaBella
- ❖ District Geothermal Systems
- ❖ Upcoming Brighton Project



PRESENTING TODAY



Aaron Schauger, PE, CEM, CPHC
Energy Engineer at LaBella Associates

ABOUT US



TOTAL STAFF

With 1,300+ employees, our presence is national with a diverse group of professionals.



NEW YORK STATE

Headquartered in Rochester, we have 12 additional offices in NYS alone that are ready to service your needs with approximately 850 employees.



LaBella
Powered by partnership.



Official Architecture & Engineering Partner of the Buffalo Bills



DIVERSITY OF SERVICES

Architecture & Interior Design

Buildings Engineering

Civil Engineering

Construction Services &
Support

Environmental Consulting

Landscape Architecture

Planning

Power Systems Engineering

Program & Project

Management

Survey & Mapping

Transportation Engineering

Waste & Recycling Services

ENERGY SERVICES

Since 2004, LaBella has been providing energy and commissioning services to our clients. Whether it's energy audits, distributed/renewable generation, master plans, or retro-commissioning, our energy staff works closely with each client to achieve the maximum amount of energy savings and incentives.



BUILDING EFFICIENCY

- Energy Audits
- Turnkey Energy Upgrades
- Facility Condition Surveys
- Benchmarking & End-Use Disaggregation



ENERGY PLANNING

- Procurement Services
- Energy Master Planning
- Electrification & Net-Zero Feasibility Studies
- Energy Modeling



DISTRIBUTED GENERATION

- Solar/PV Design & Analysis
- Microgrid Design & Analysis
- District Geothermal Design & Analysis



COMMISSIONING

- New Construction
- Retro-Commissioning
- Code Required
- Design Phase Services

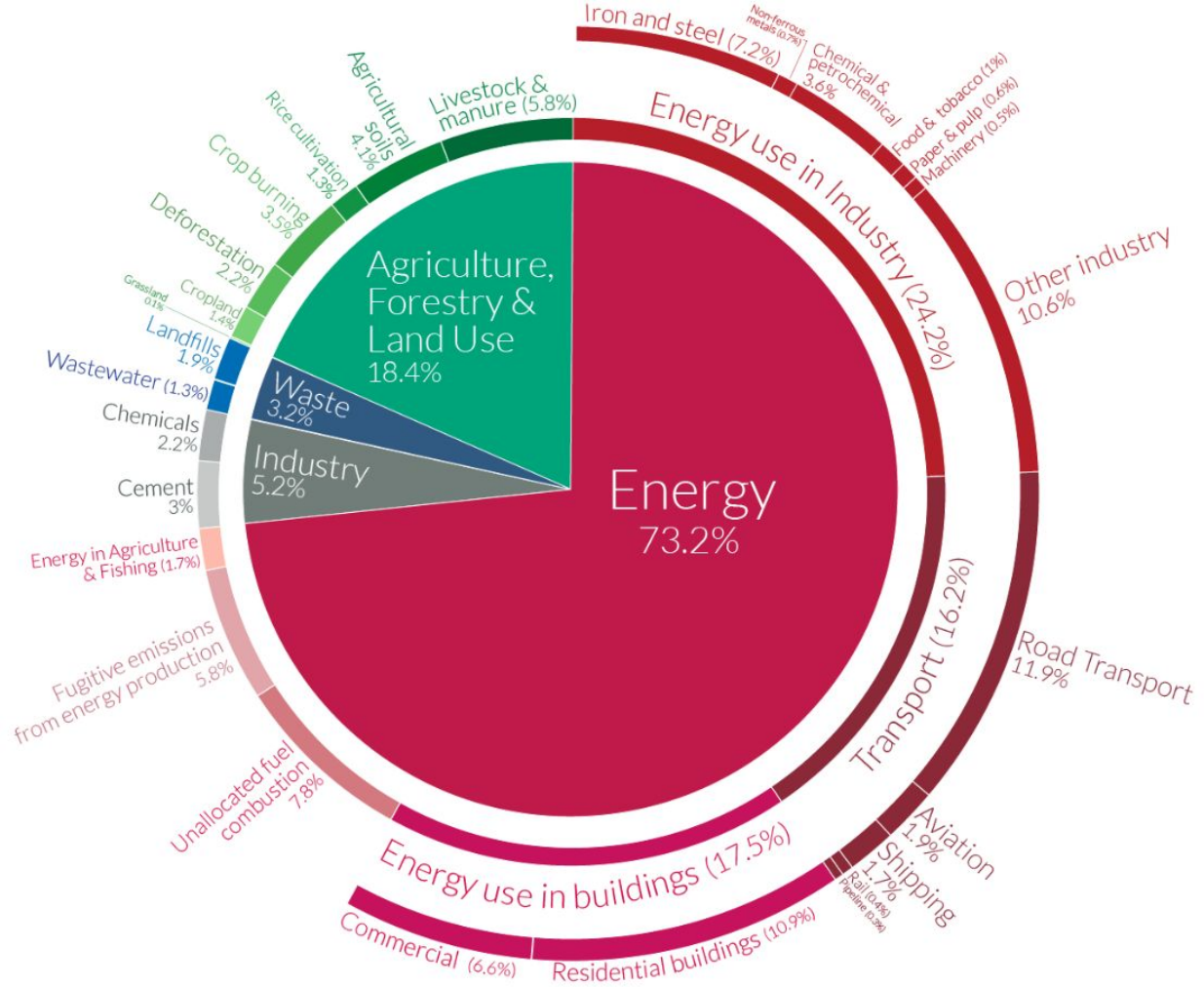
An aerial, semi-transparent view of a house and its yard. A geothermal loop field is visible in the yard, consisting of a network of red and blue pipes. The pipes form a rectangular loop around a central garden bed and then extend into a larger rectangular area where they are laid out in a series of parallel, U-shaped loops. The house has a dark tiled roof and a light-colored exterior. The overall scene is dimly lit, with a dark green and grey color palette.

DISTRICT GEOTHERMAL

WHAT IS IT?

WHAT IS THE PROBLEM

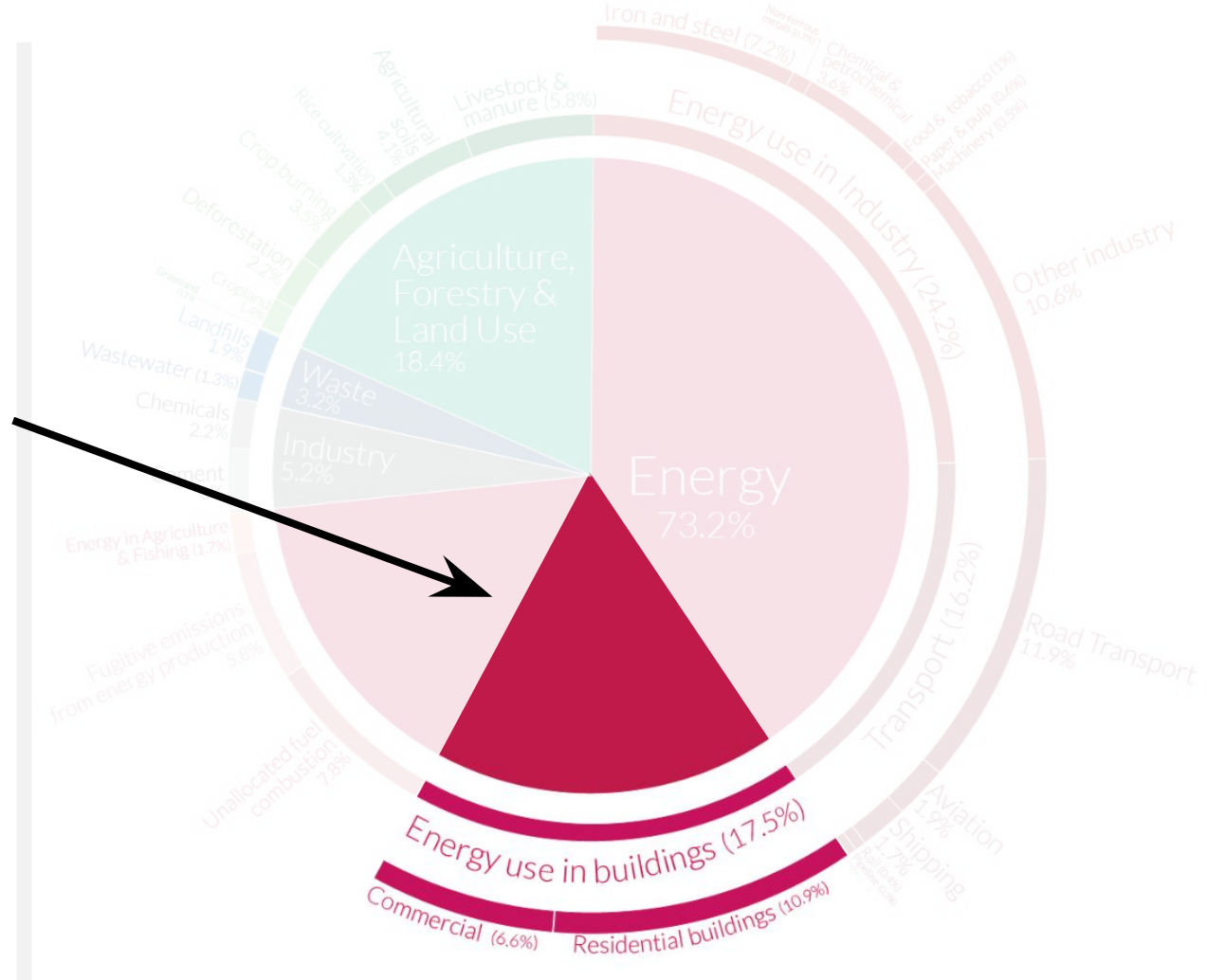
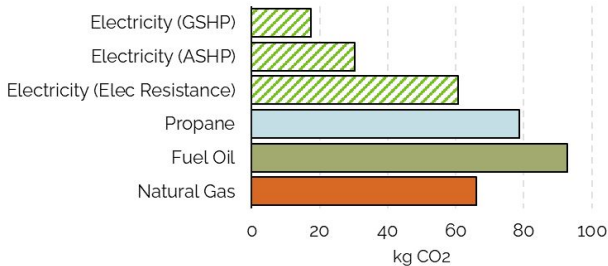
- Global push for reduction in emissions to combat climate change
- Major drive of emissions is from energy



WHAT IS THE PROBLEM

- 40% of commercial energy use in US attributed to space conditioning (heating, cooling, ventilation)
- Fossil fuels are predominant source of heating, which have largest emissions on site

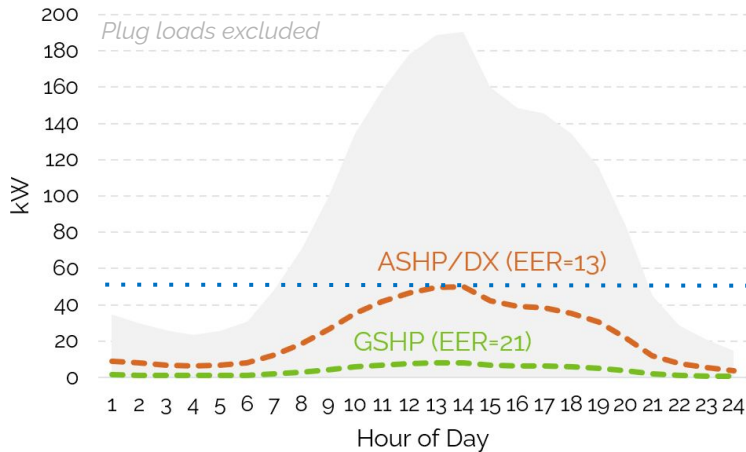
CO₂ Emissions from Generating 1 MMBtu of Heat



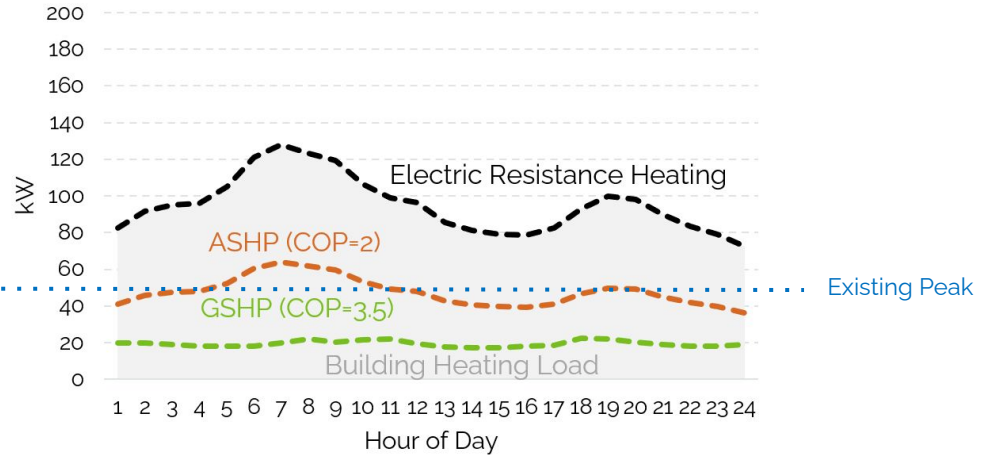
ELECTRIFICATION/ DECARBONIZATION

- Transitioning from fossil fuels to electric heating has potential to strain electric grid
- Ground can be leveraged as heat exchanger to make buildings operate more efficiently and eliminate need for electric upgrades

Building Cooling Load Profile

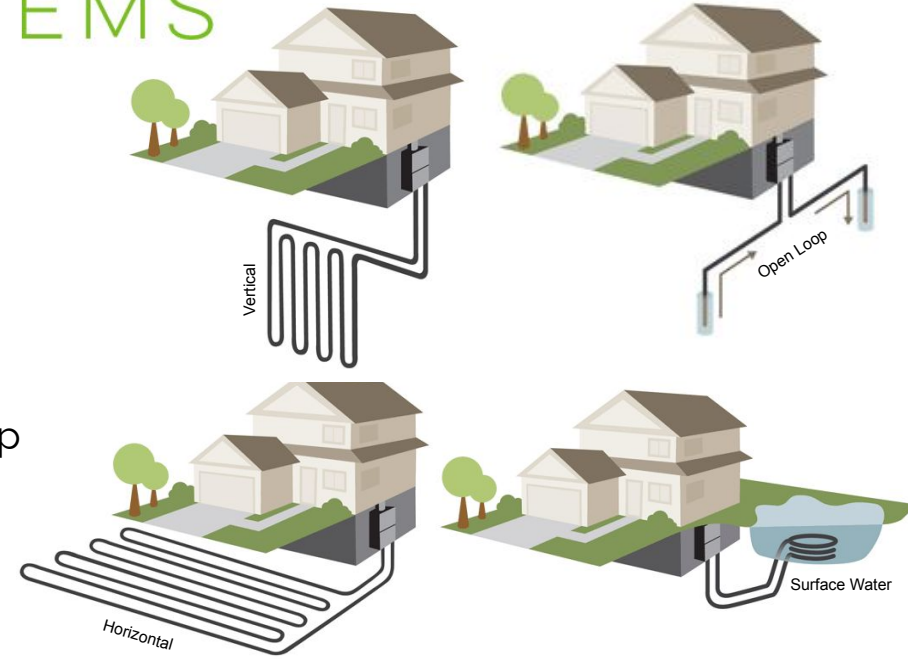
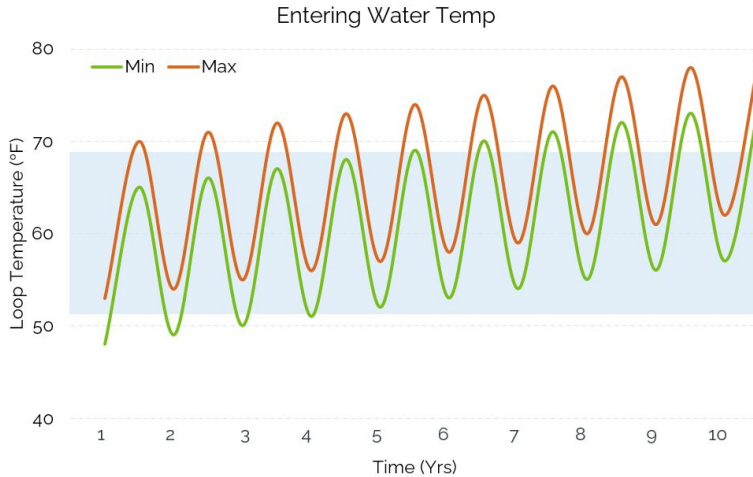


Building Heating Load Profile



GEO THERMAL SYSTEMS

- Common sources of thermal energy include:
 - Vertical boreholes
 - Horizontal wellfields
 - Surface water
 - Open Loop (ex. well)
 - Wastewater heat recovery
- Water typically piped into building to a heat pump to transfer heat to the air to condition spaces



“Saturated Loop” leads to less efficient operation of building equipment

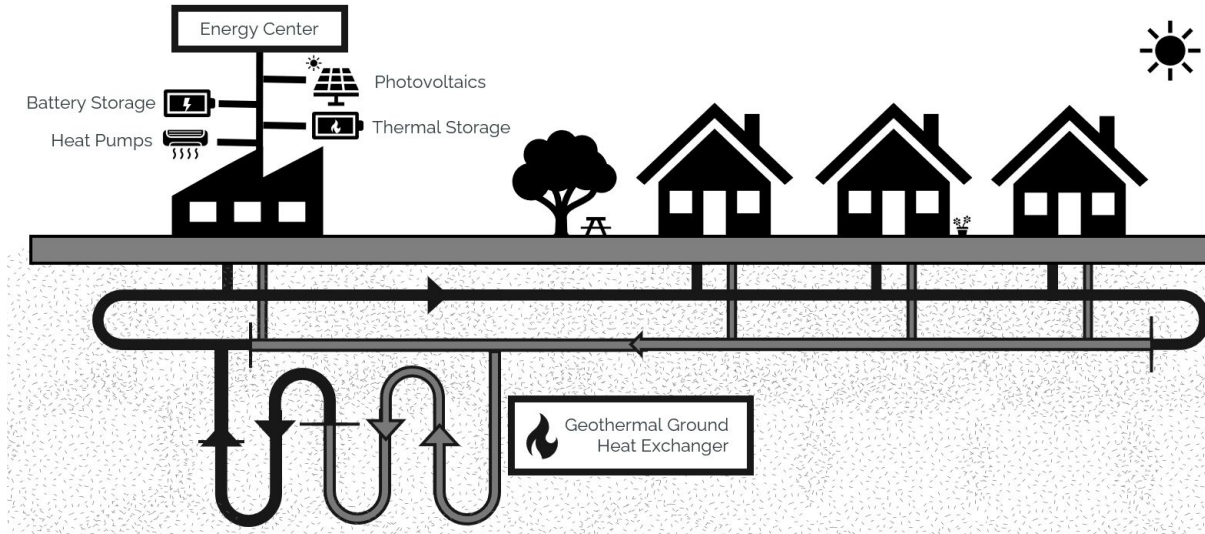
DISTRICT GEOTHERMAL

WHAT IS IT?

Series of buildings connected to central water loop that share common thermal source

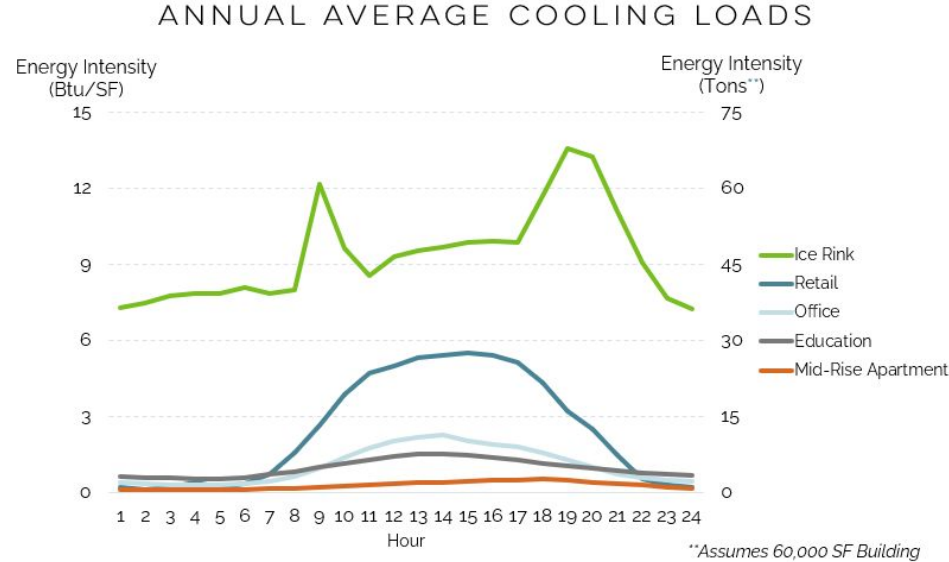
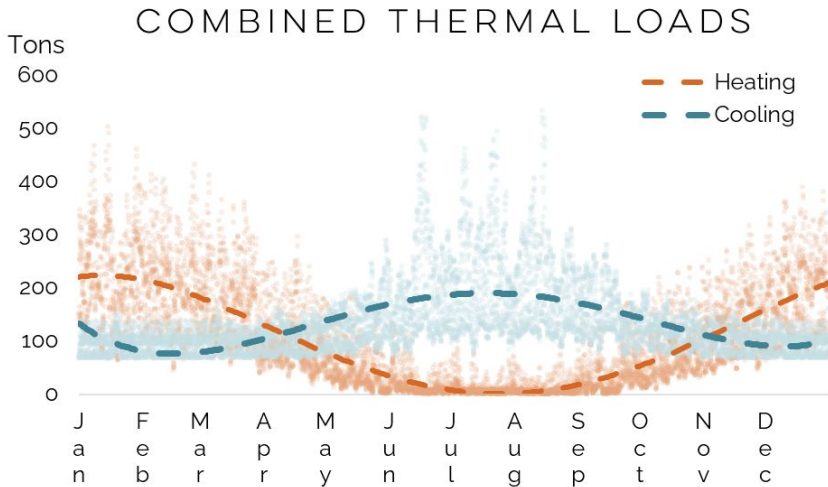
BENEFITS

Shared cooling and heating load allows for reduced number of boreholes, reducing cost of system while still providing energy savings and reduction in emissions



DISTRICT GEOTHERMAL

- Buildings can share thermal loads in order to limit upfront capital costs (less boreholes)
- District Loops in NYS with buildings with high cooling loads beneficial in balancing loop.

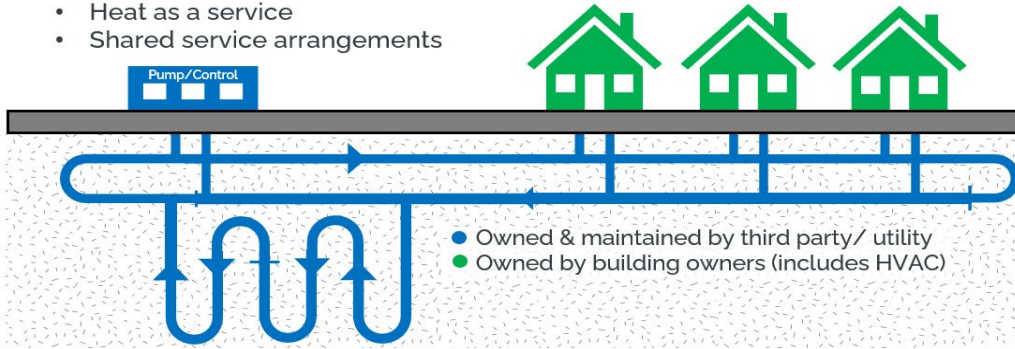


***Assumes 60,000 SF Building*

OWNERSHIP & INCENTIVES

Potential Ownership Models:

- Heat as a service
- Shared service arrangements

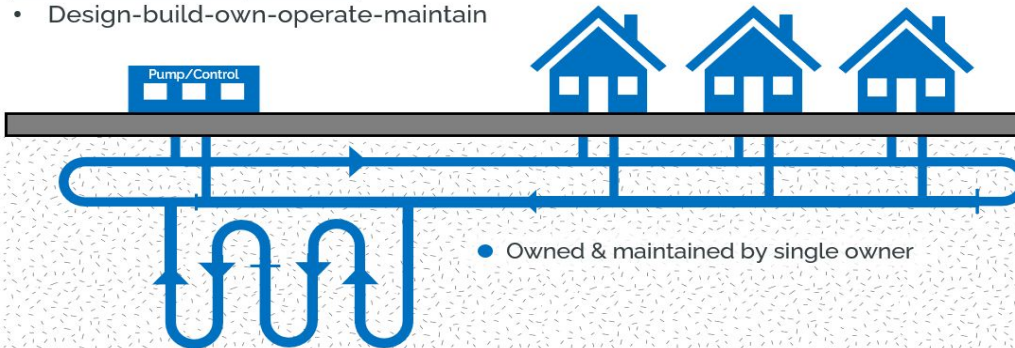


Incentives & Rebates

- NYSERDA Community Heat Pump Systems (PON 4614)
 - Cat. A: Scoping Studies
 - Cat. B: Site-Specific Detailed Design
 - Cat. C: Construction
- NYSERDA Clean Heat Program
- Tax Rebates from Inflation Reduction Act

Potential Ownership Models:

- Design-build-own-operate-maintain

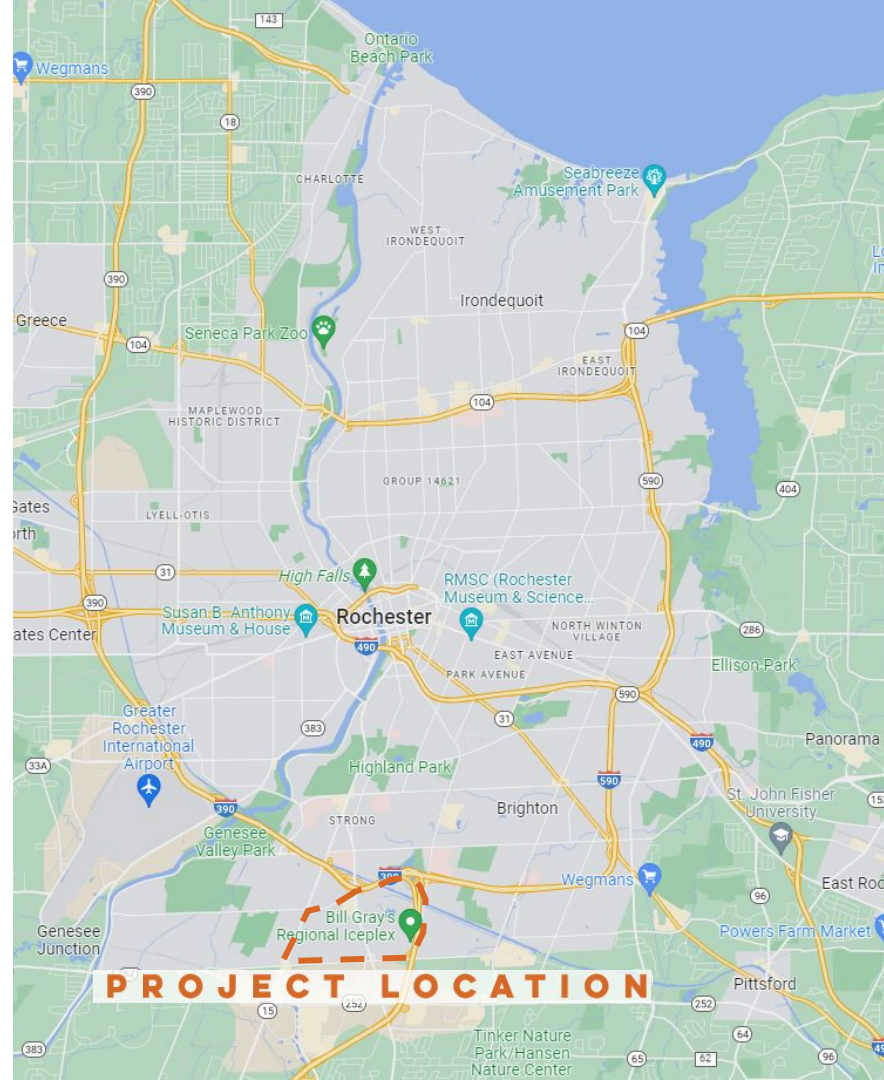


A 3D architectural rendering of a geothermal system installation. On the left, a portion of a house with a dark tiled roof and light-colored walls is visible. To the right, a rectangular area of ground is shown with two sets of parallel, serpentine pipes laid out in a grid pattern. One set of pipes is blue and the other is red. The pipes are connected to a central unit located near the house. The background is a dark, muted green, suggesting a lawn or garden.

UPCOMING PROJECT

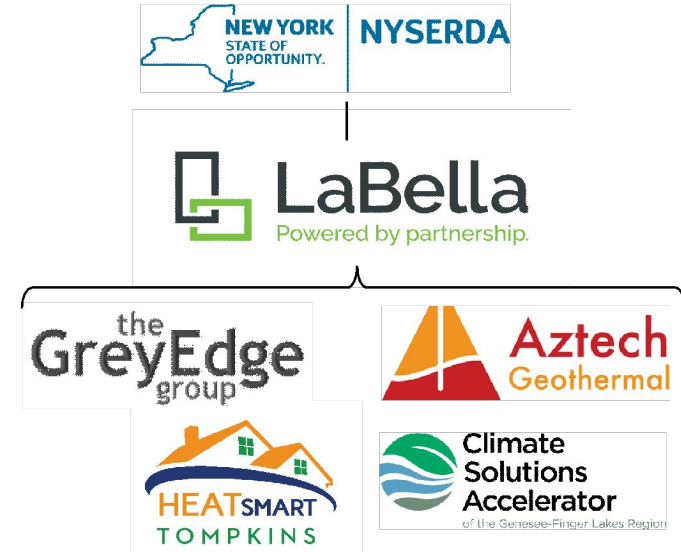
BRIGHTON DISTRICT
GEOTHERMAL SYSTEM

PROJECT LOCATION



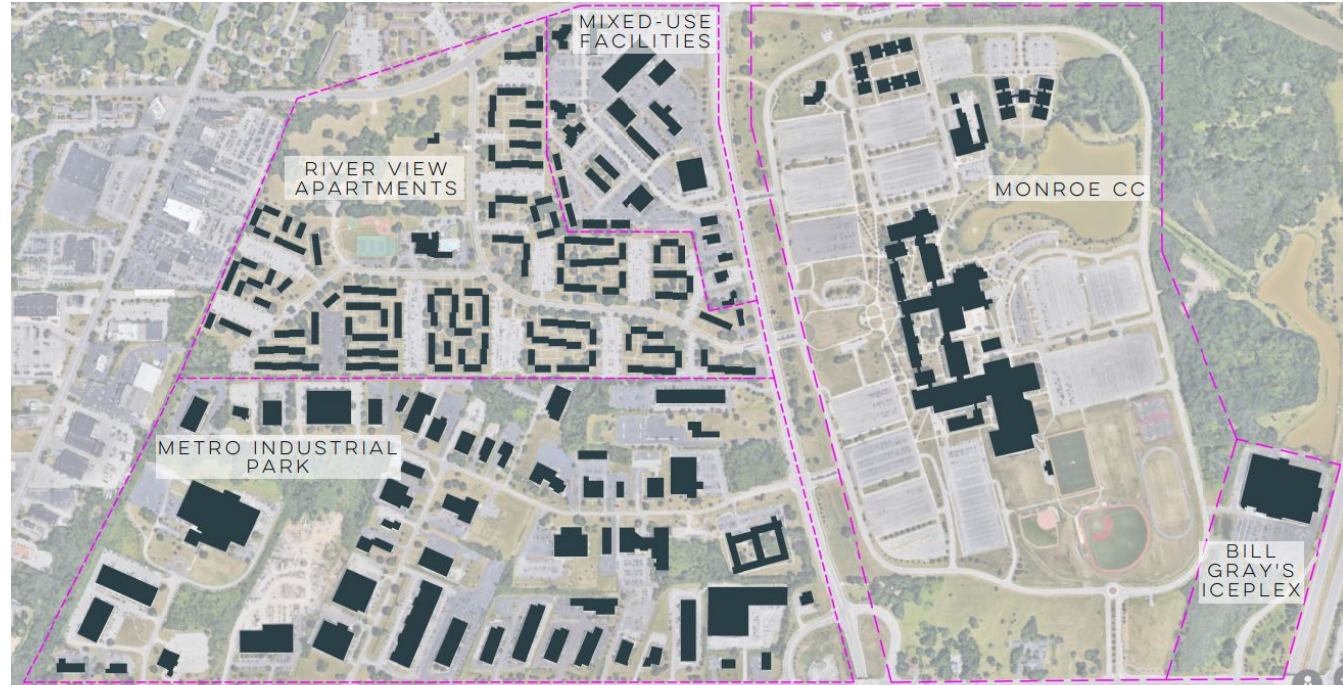
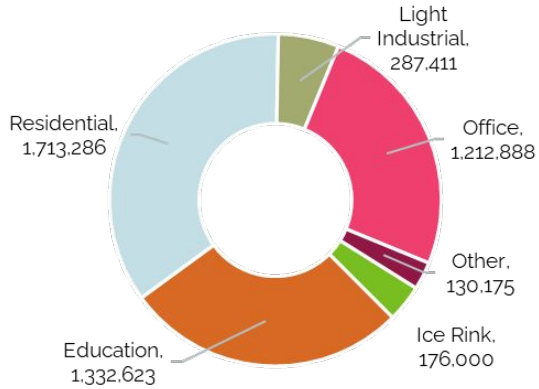
SCOPE OF WORK

- Category A Scoping Study
- Evaluate technical feasibility of District Geothermal System
 1. Evaluate building thermal loads
 2. Determine HVAC compatibility with low-temp water
 3. Identify thermal sources (wellfields, heat recovery)
 4. Determine phasing approach, district loop layout
 5. Opportunities for additional technologies (PV, battery storage, EV charging)
 6. Model energy performance of system
 7. Permitting & regulatory review
 8. Develop economic analysis for all stakeholders, multiple ownership models



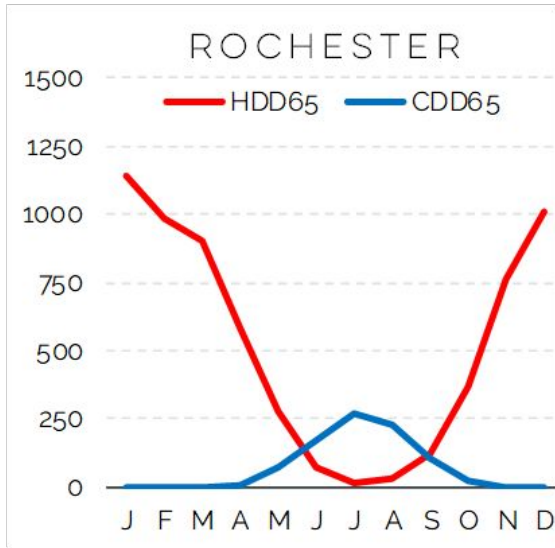
BUILDINGS INCLUDED

Square Feet by Facility Type

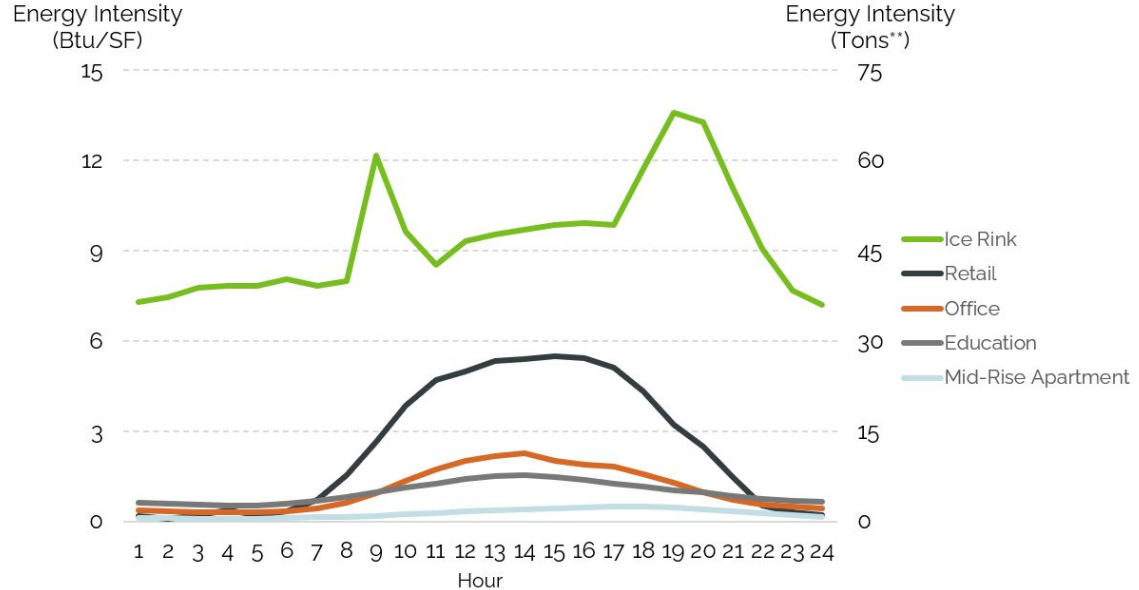


LOAD BALANCE

- Ice Complex provides excellent source of cooling to balance out heating/cooling loads



ANNUAL AVERAGE COOLING LOADS



NEXT STEPS & TIMELINE

- Cat. A Study funding Awarded
- Contract review in-progress
- Study estimated completion end of Jan 2023
- Community/stakeholder outreach to be completed near end of feasibility stages, before design phases

PROJECT TIMELINE	October				November				December				January			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Task 1: Establish Baseline Criteria and Develop Energy Profile	█															
Task 2: Develop Conceptual Design					█											
Task 3: Perform Economic Analysis									█							
Task 4: Perform Assessment of Additional Technologies									█							
Task 5: Permitting and Regulatory Review													█			
Task 6: Draft Final Report													█			



THANK YOU

Rochester District Thermal

Rochester District Thermal

A Community Approach to Electrification and Decarbonization



Carbon-Free
Electrification

Decarbonization of
Buildings

Sewer Heat Recovery

GEO-Exchange

Scalable and
Repeatable

5G Ambient Loop

Heat Pumps and High
COP Technology



Introductions

John M. Duchesneau – General Manager

Rochester District Heat

- Responsible for the or the total management, supervision, operations, and strategic direction of RDH since 2011
- Master of Science in Management and ISM Lifetime Certified Purchasing Manager
- Over 23 years with Xerox in project management, facilities, power plant operations and the procurement of Energy and Construction for North American operations

Bill Coe, PE, CEM – Vice President, Director or Project Development

EMCOR Services Betlem

- Engineering and Construction Manager for EMCOR Services Betlem
- BS, Mechanical Engineering, Kettering University
- ME, Mechanical Engineering, Rochester Institute of Technology
- Team provides energy analysis, mechanical engineering, design/build construction projects for customers across Upstate New York

Rochester District Heating



- With nearly 40 years experience, RDH is UNIQUELY qualified to own, operate and maintain a community based, district thermal energy system
- RDH aligns our business with the state CLCPA/CAC and federal goals towards Decarbonization and Electrification of buildings

Partnership with EMCOR



EMCOR Services Betlem has been in business for over 99 years, designing, building, and servicing HVAC, refrigeration, controls, and piping systems for new construction, renovation, and retrofit projects.

Partnership with Rochester District Heat

- 2012 – NYSERDA FlexTech Study – Central Plant Upgrades
- 2019 thru 2021 - On-Site Energy Manager (NYSERDA)
- 2022 – Rochester District Thermal - Community Heat Pump Scoping Study (NYSERDA)

These energy conservation measures turned into ~\$7MM in delivered projects.

Rochester District Thermal

- Concept – Create an Urban Community Based thermal energy network to provide a solution to decarbonize and carbon-free electrification of heating and cooling
 - Utilize renewable, waste energy sources to achieve decarbonization goals
 - Environmentally and economically disadvantaged communities
- Scope – Southwest section of the inner-loop
 - Community based, not building by building or block by block
- Technologies Investigated
 - Sewer Waste Energy Recovery
 - GEO-Exchange
 - Heat Pumps
 - Building Energy Exchange
- Member Building Deep Energy Retrofits

Goal: Develop a proof-of-concept project that is both scalable and repeatable

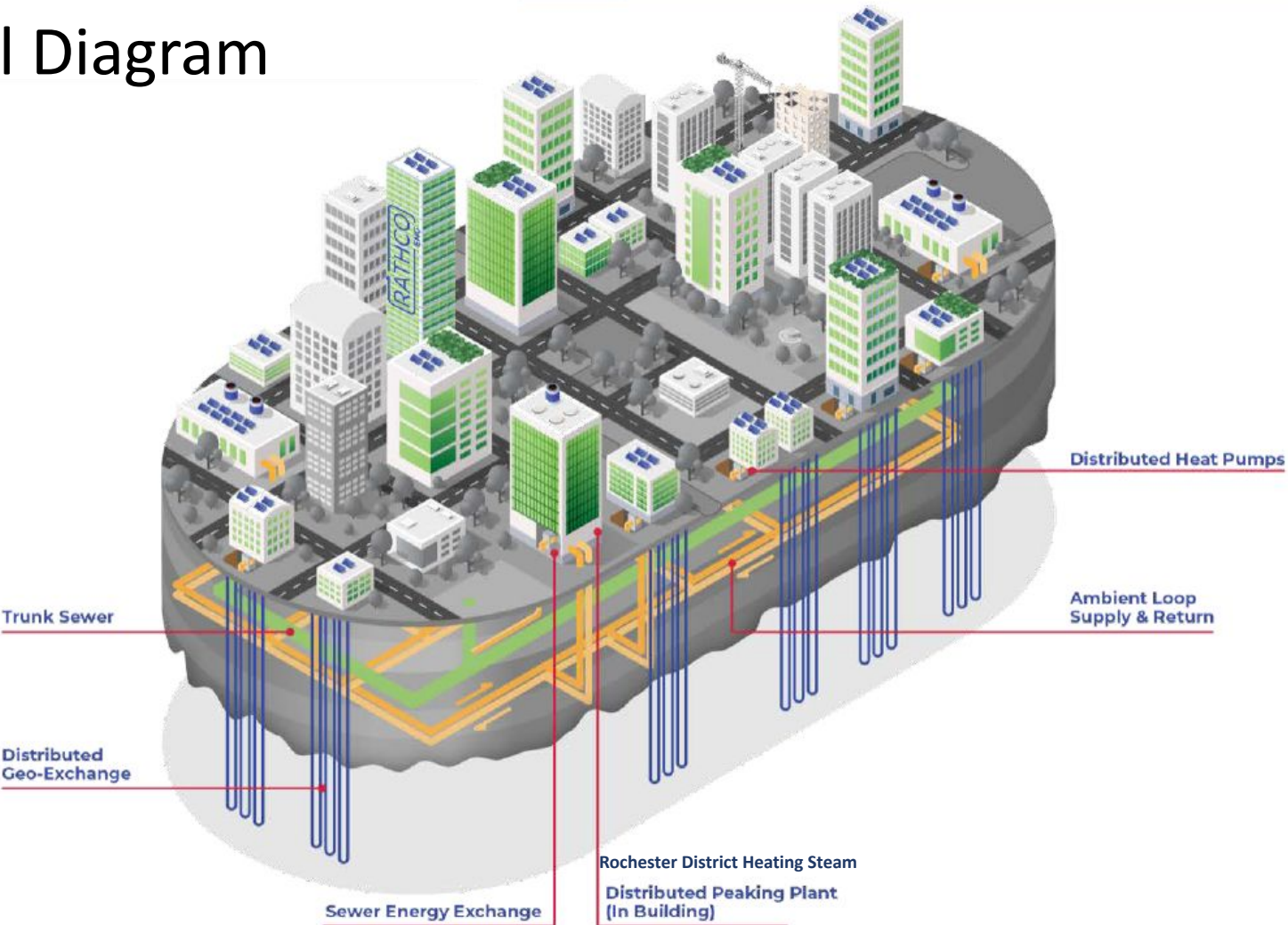


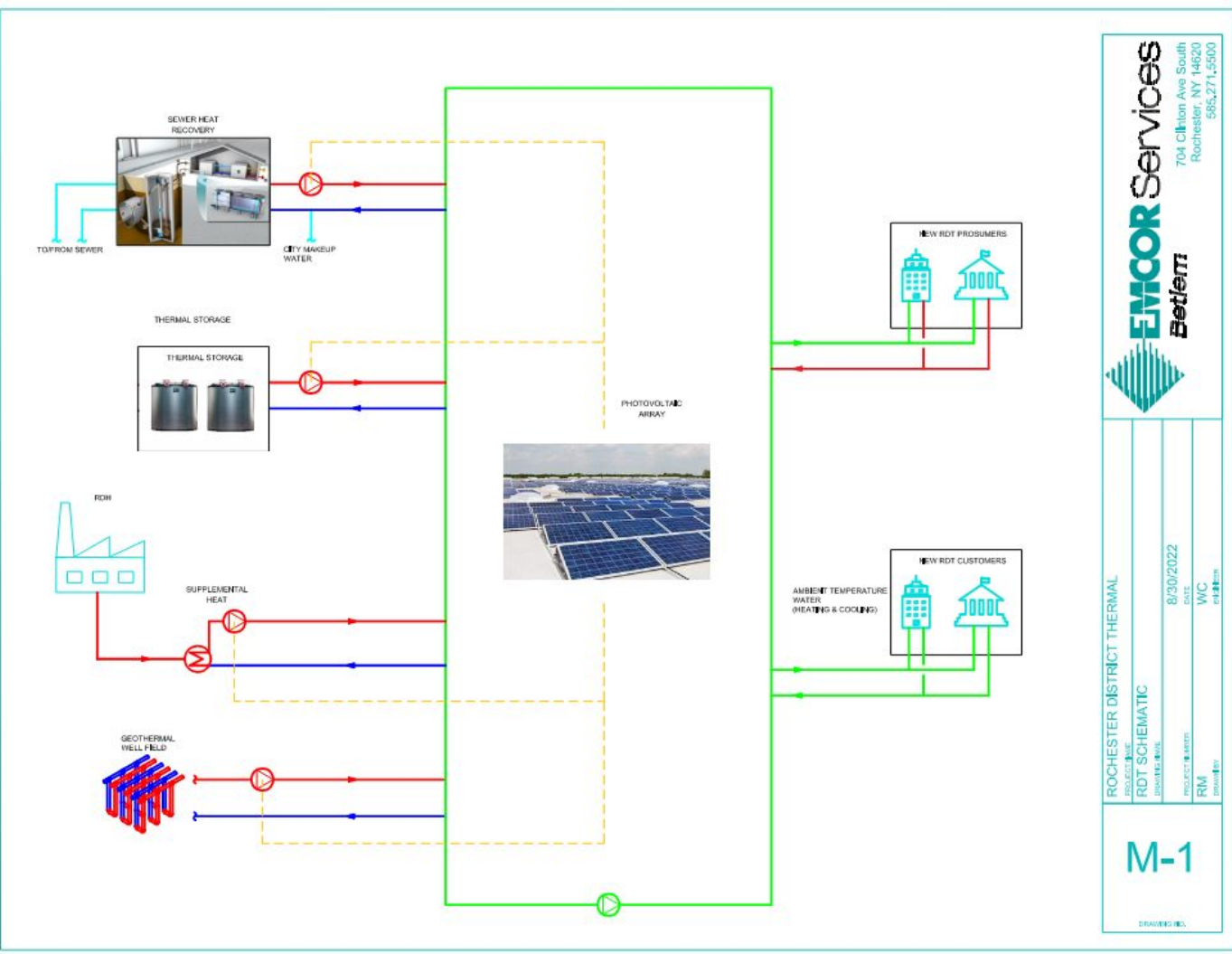
NYSERDA-Funded Scoping Study



- NYSERDA PON 4614 – Community Heat Pump Systems
 - Competitive solicitation to evaluate community style heat pumps to share heating water among a cluster of buildings.
 - Categories:
 - ✓ Category A: Site-Specific Scoping Study
 - Category B: Site-Specific Design Study
 - Category C: Site-Specific Implementation Project
 - Category D: Market Studies / Best Practices Guidebooks
- Rochester District Thermal Started Category A in November 2021
 - Progress
 - ✓ Task 1 –Member Outreach, AHJ Discussions, Preliminary Benefit Review - COMPLETE
 - ✓ Task 2 – Building Thermal Analysis, System Pre-Design- COMPLETE
 - Task 3 – Systems and Technologies – Due November 2022
 - Task 4 – Business Model – March 2023
 - Task 5 – Summary of Project Report – April 2023

Conceptual Diagram





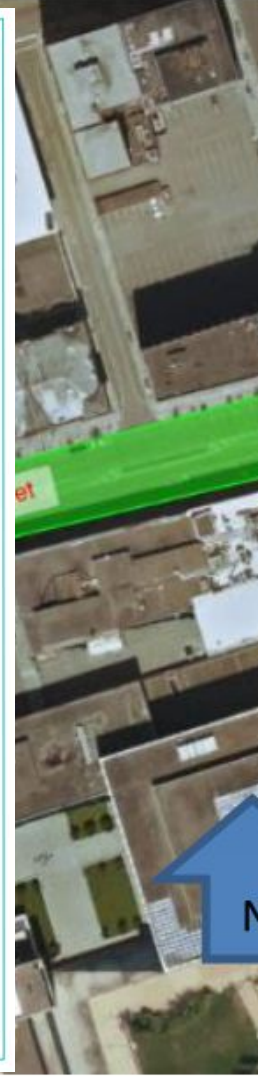
EMCOR Services
Betterm

704 Clinton Ave South
 Rochester, NY 14620
 565.271.3500

ROCHESTER DISTRICT THERMAL	
PROJECT NAME	RDT SCHEMATIC
ISSUANCE DATE	8/30/2022
PROJECT NUMBER	WIC
REVISION	1
DATE	8/30/2022
BY	RM
CHECKED BY	

M-1

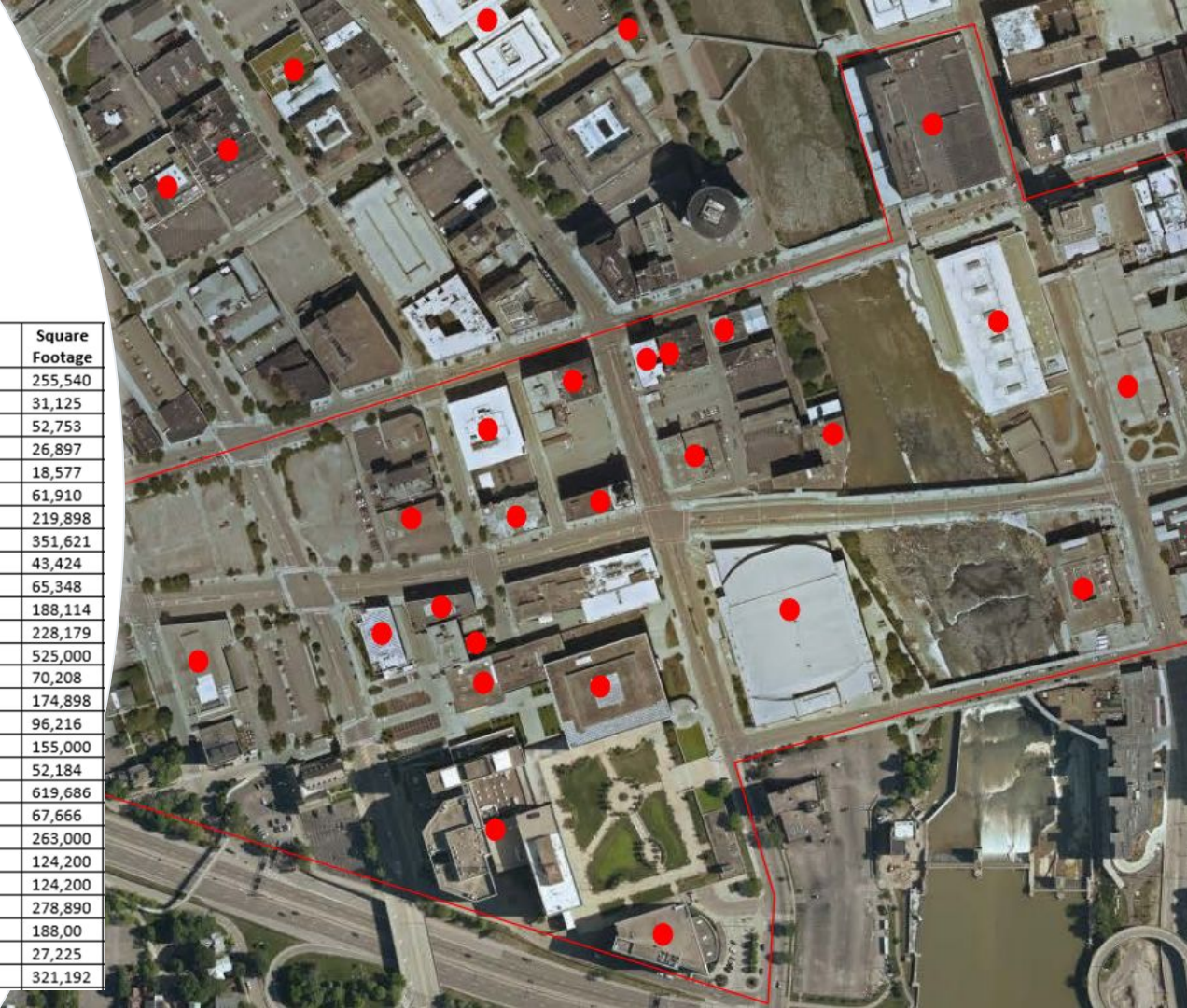
DRAWING NO.



Initial Building Portfolio

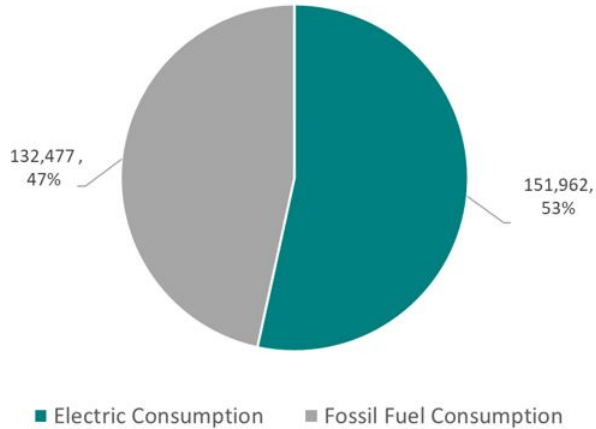
- 5.3M Sq Ft

Property Address	Owner	Square Footage
100 Exchange Boulevard	City of Rochester	255,540
31 East Main Street	Forester Corporation	31,125
44 Exchange Boulevard	Riverview Rochester LLC	52,753
23-27 East Main Street	RochesterVille 2 LLC	26,897
17-21 East Main Street	EM17 LLC	18,577
1-9 East Main Street	Wilder 4 Corners Associates	61,910
130 Plymouth Avenue South	County of Monroe (Public Safety)	219,898
99 Exchange Boulevard	County of Monroe (Hall of Justice)	351,621
85 West Broad Street	County of Monroe (Crime Lab)	43,424
47 South Fitzhugh Street	County of Monroe (Watts Building)	65,348
130 South Plymouth Avenue	County of Monroe (Old Jail)	188,114
130 South Plymouth Avenue	County of Monroe (New Jail)	228,179
70 South Fitzhugh Street	County of Monroe (Parking Garage)	525,000
37 South Fitzhugh Street	Terminal Building Roc LLC	70,208
39 West Main Street	County of Monroe Office Buildings	174,898
131 West Broad Street	City of Rochester (RCSD)	96,216
185 Exchange Boulevard	City of Rochester	155,000
242 West Main Street	Bridge Square Landlord LLC	52,184
39 Stone Street	City of Rochester (Parking Garage)	619,686
30 Church Street	City of Rochester (City Hall)	67,666
69 Andrews Street	City of Rochester (Crossroads Garage)	263,000
114 South Avenue	City of Rochester (B&L Library)	124,200
115 South Avenue	City of Rochester (Rundel Library)	124,200
194 Court Street	City of Rochester (Court Street Garage)	278,890
123 East Main Street	City of Rochester (Convention Center)	188,00
120 Plymouth Avenue North	Frontier Communications	27,225
120 East Main Street	Rochester Riverside Hotel	321,192



Member Building Energy Use

Existing Data
Electric vs Fossil Fuel Consumption
(MMBtu)



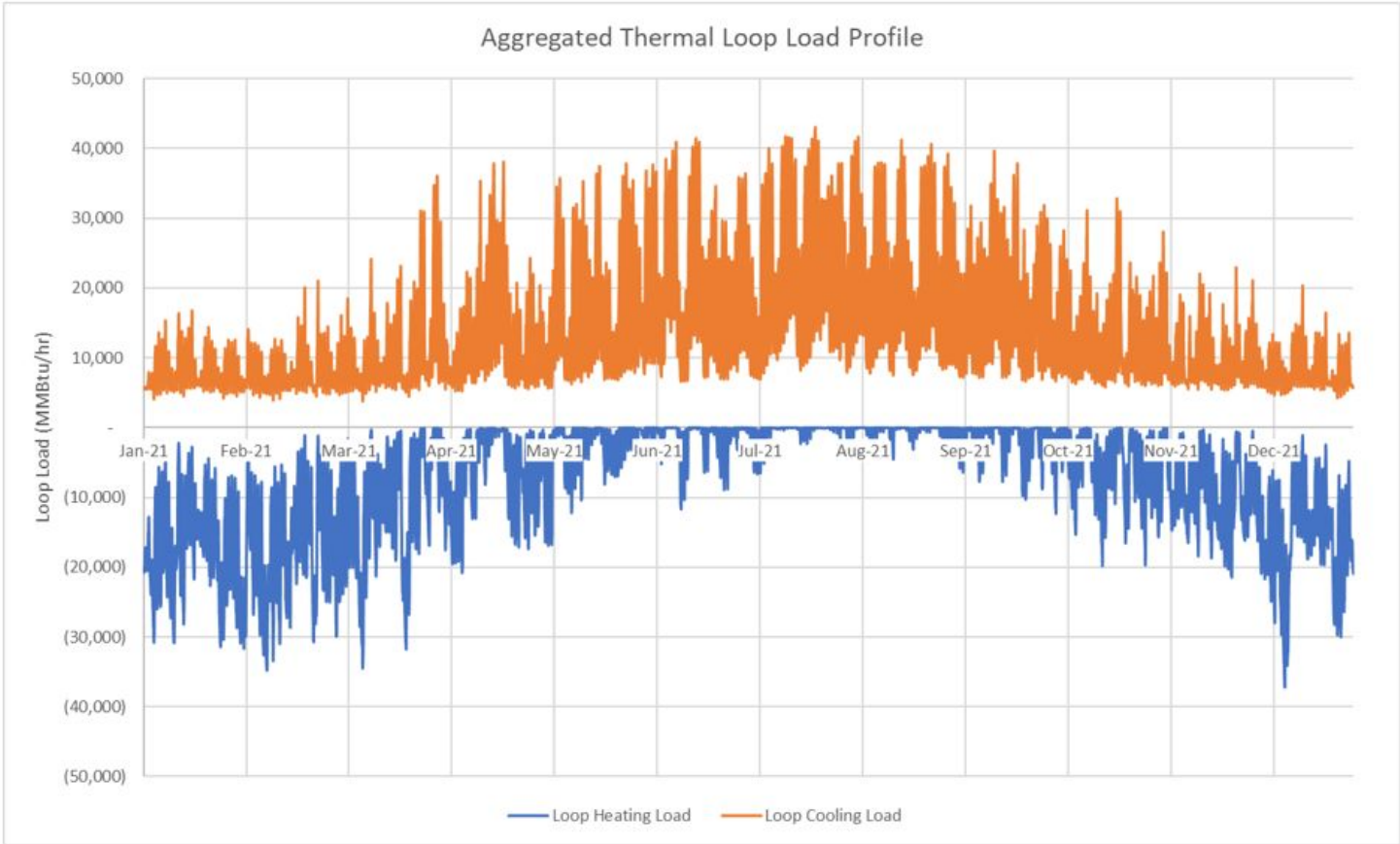
	Fossil Fuel Consumption (MMBtu)	Electric Consumption (MMBtu)	Electric Demand (kW)
Existing Data	132,477	151,962	8,739
Modeled Data	164,086	193,053	16,196
Percent Change	19%	21%	46%

Table 1: Actual and Modeled Energy Consumption Results

Total Cooling Load: 42,851 kBtu/hr
3,570 tons
8.2 btu/sq. ft.

Total Heating Load: 51,595 kBtu/hr
1,540 BHP
53,130 lb/hr steam
9.9 btu/sq. ft.

Member Building Aggregated Energy Use



Future Project Expansion



Planned Capacities

- Heating:
 - 51,595 kBtu/hr
 - 1,540 BHP
- Cooling:
 - 42,851 kBtu/hr
 - 3,570 tons

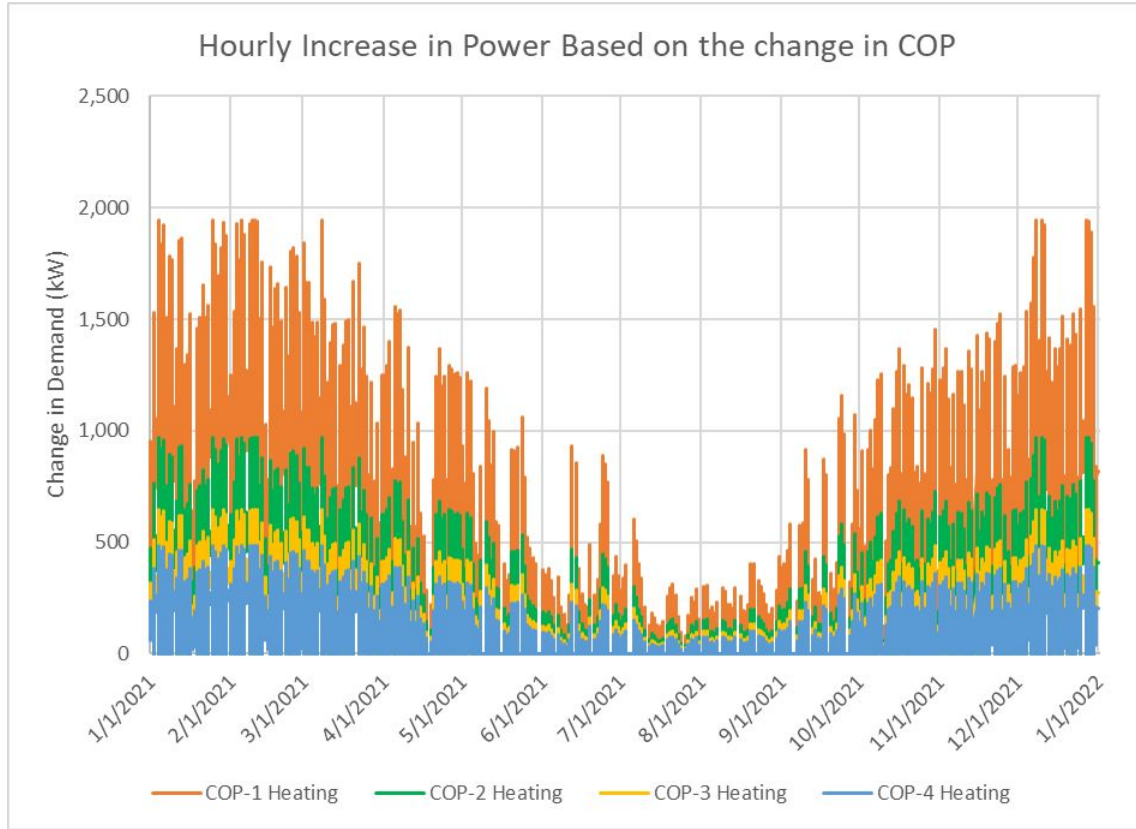
Expanded Capacities

- Heating:
 - 48,331 kBtu/hr
 - 1,443 BHP
- Cooling:
 - 39,985 kBtu/hr
 - 3,332 tons

Total Capacities

- Heating:
 - 99,026 kBtu/hr
 - 2,983 BHP
- Cooling:
 - 81,001 kBtu/hr
 - 6,750 tons

Effects of the Coefficient of Performance (COP)



Current	
COP	Power (kW)
1	15,122
2	7,561
3	5,041
4	3,780

Expanded	
COP	Power (kW)
1	14,165
2	7,082
3	4,722
4	3,541

Total	
COP	Power (kW)
1	29,287
2	14,643
3	9,762
4	7,322

Preliminary GHG Emission Data

	Existing GHG Emissions (tons of CO2)	Baseline GHG Emissions (tons of CO2)
Current Loop	14,278	11,946
Expanded Loop	10,845	9,074
Total	25,123	21,020

RDT with COP of 4.0

Min. 79% Reduction in GHG's

- GHG Reduction of 19,686 Mtons
- 23,512 acres of U.S. Forest in 1 Yr
- 4,281 Gasoline Cars
- 21,982,183 pounds of coal burned

Potential Financing Sources

Social Cost of Carbon
Value

NYSERDA PON

Inflation Reduction
Act

NY Green Bank

State, Federal Grants

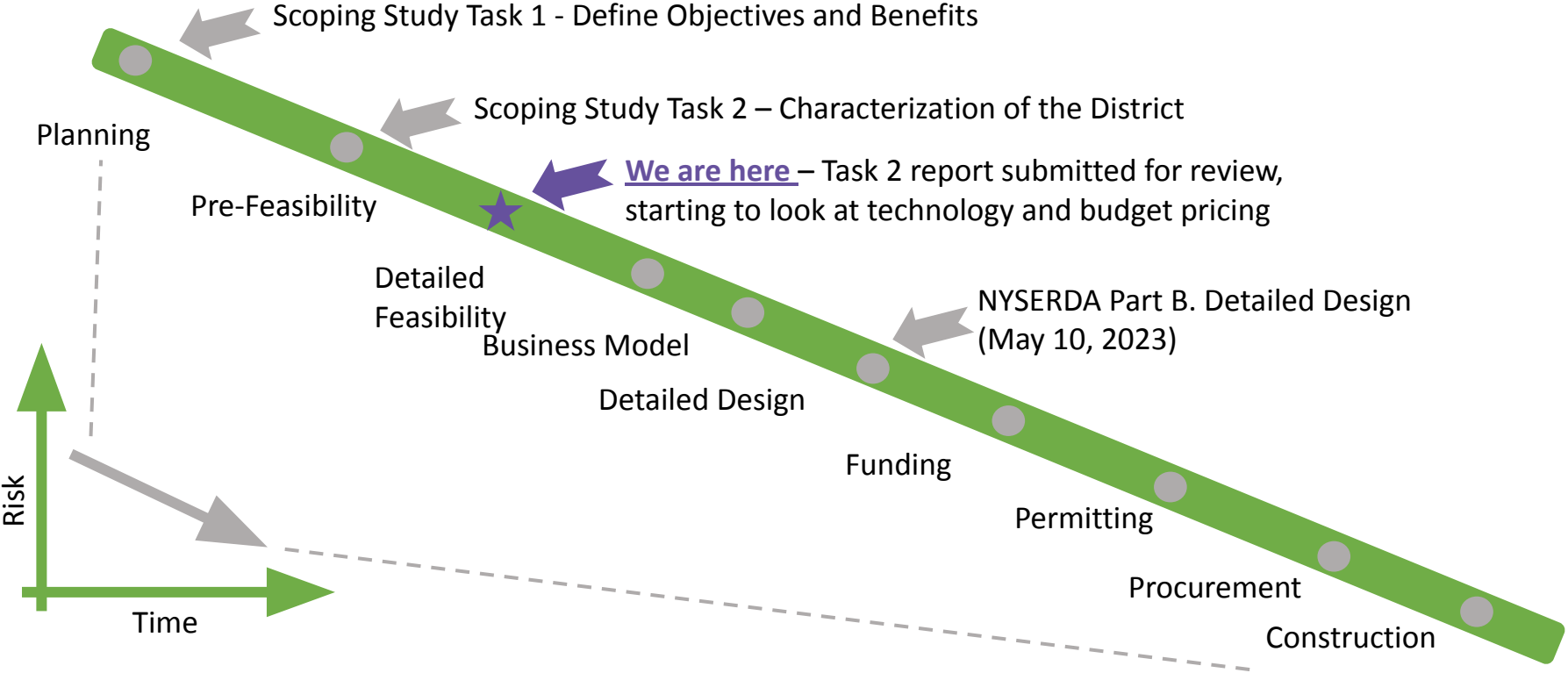
Philanthropy

Financing

Equity Partners

Production Tax
Credits

Project Sequence



Next Steps and Schedule

- Working on Task 3- Systems and Technologies
 - Geo-Exchange Pre-design
 - Sewer Heat Recovery
 - Solar PV
 - Thermal Storage
- Scoping Study – Completion by April 2023
- Would love to provide AMPED an update as we progress through the scoping study

Dutton Properties

NOTA

District Geothermal

Introduction:

Luke Dutton: Co-Owner Dutton Properties

Real Estate Developer

18 Years Experience.

Specialize in the construction of adaptive reuse of existing structures with a focus on green energy integration and building electrification.

Managed the design, coordination and installation of several larger scale geothermal projects in the Rochester area.



How District Geothermal Works

Electric geothermal heating and cooling equipment of separately metered tenant spaces are tied into an interconnected closed piping network that allows each space to inject heat into the water network (cooling) or extract heat from the water (heating) depending on demand. This allows spaces throughout the district to be in different demands and share energy.

For example the coolers in restaurants throughout our district are always injecting heat into the water network (making the water warmer than when it entered increasing the temperature of the district water). In the heating season this helps increase the heating capacity of the network and can heat more spaces without the need for fossil fuels and reduces energy waste.

What Comprises the NOTA District Geothermal District?

5 privately held buildings located between Elton Street and Russell Street in the Neighborhood of The Arts (NOTA).

Currently consists of:

Roughly 196,200 cubic square feet of residential space and 881,600 cubic square feet of mixed commercial space ranging in uses from large restaurants like Nosh to the creative corporate headquarters of Optic Sky. Each tenant space is tied into our common piping distribution system that allows the geothermal energy from 31, 499' vertical wells to be shared from one tenant to another depending on their demand. The system has been operating for over 5 years.





Petit Poutinerie

Old Pueblo Grill
DoorDash Delivery

Lash Doll Studio LLC
Beauty salon

Nosh
New American • \$\$\$

Elton Street

Fiamma Centro
Italian • \$\$

Scratch Bakeshop

Russell St

Tru Collective

Gallery Salon

Assembly Member
Harry Bronson

HBT Architects

University Ave

University Ave

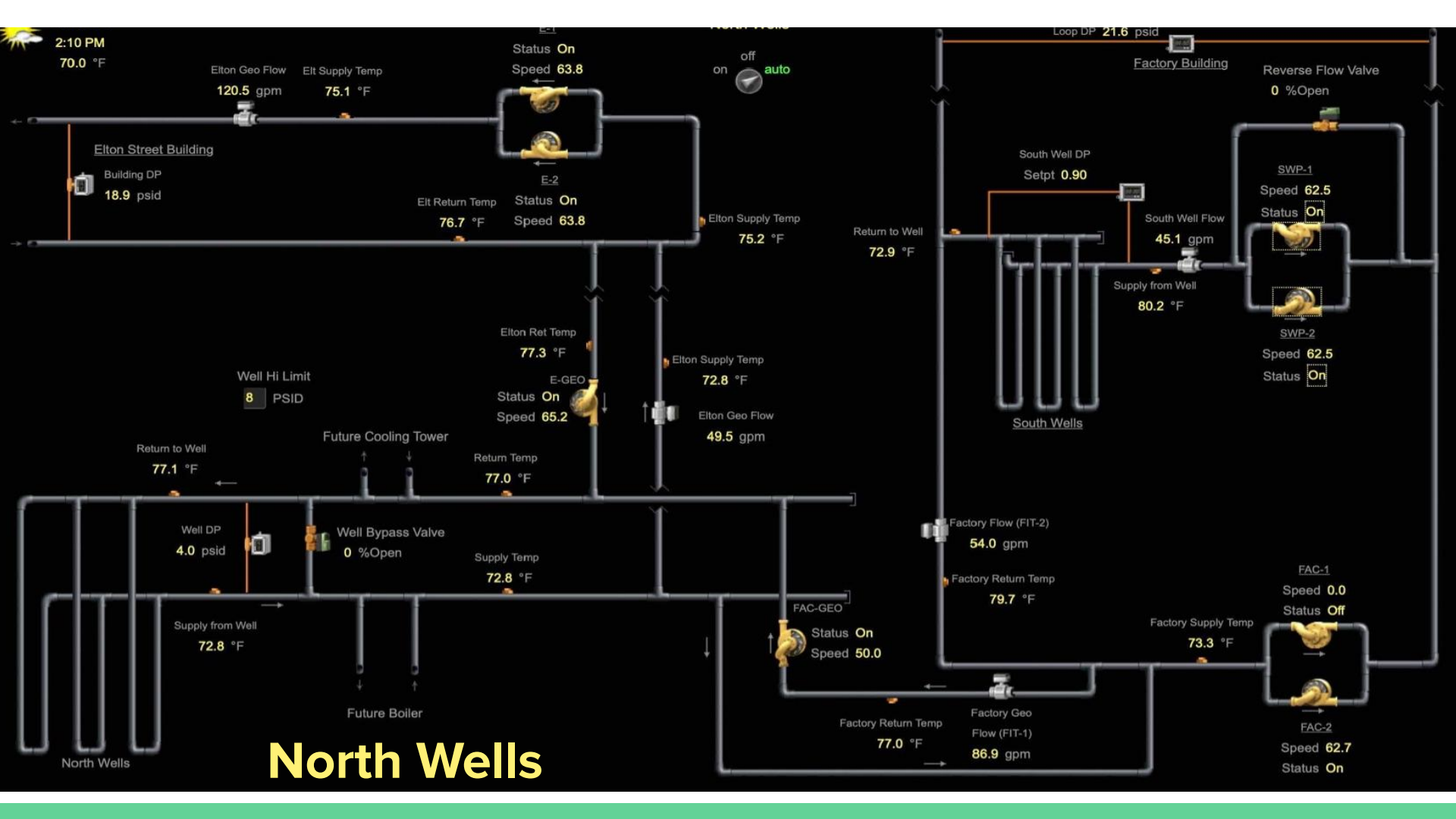
Russell St

Neighborhood of the Arts Apartments

Comfort

Kaman AU

Adva
& Fir



2:10 PM
70.0 °F

Elton Geo Flow 120.5 gpm
Elton Supply Temp 75.1 °F

Status On
Speed 63.8

on off auto

Elton Street Building
Building DP 18.9 psid

Elton Return Temp 76.7 °F
Status On
Speed 63.8

Elton Supply Temp 75.2 °F

Elton Ret Temp 77.3 °F

Elton Supply Temp 72.8 °F

Elton Geo Flow 49.5 gpm

Well Hi Limit 8 PSID

E-GEO
Status On
Speed 65.2

Return to Well 77.1 °F

Future Cooling Tower

Return Temp 77.0 °F

Well DP 4.0 psid

Well Bypass Valve 0 %Open

Supply Temp 72.8 °F

Supply from Well 72.8 °F

Future Boiler

FAC-GEO
Status On
Speed 50.0

Factory Flow (FIT-2) 54.0 gpm

Factory Return Temp 79.7 °F

Factory Supply Temp 73.3 °F

FAC-1
Speed 0.0
Status Off

FAC-2
Speed 62.7
Status On

Loop DP 21.6 psid

Factory Building

Reverse Flow Valve 0 %Open

South Well DP Setpt 0.90

South Well Flow 45.1 gpm

Supply from Well 80.2 °F

SWP-1
Speed 62.5
Status On

SWP-2
Speed 62.5
Status On

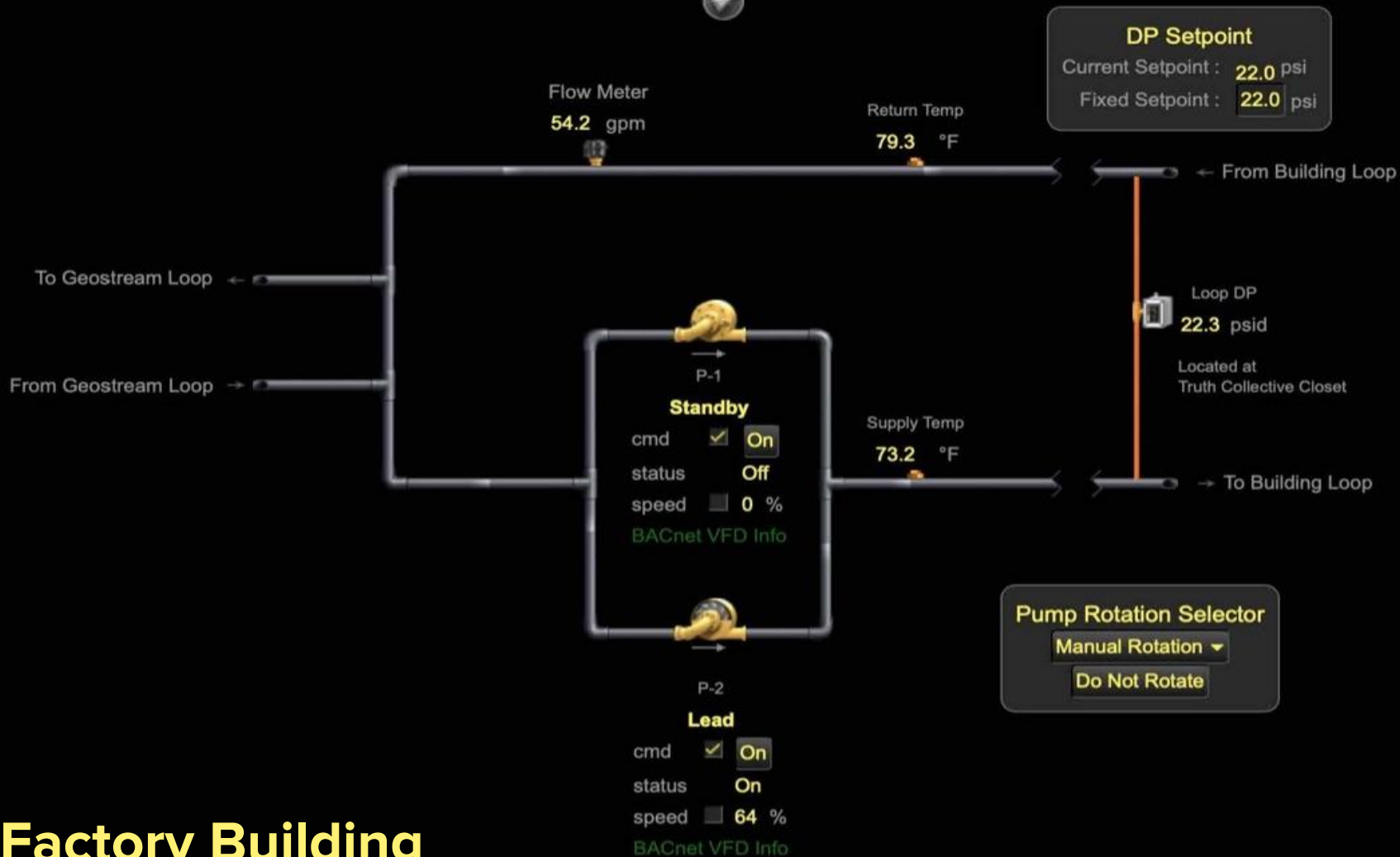
South Wells

North Wells

North Wells

Factory Return Temp 77.0 °F

Factory Geo Flow (FIT-1) 86.9 gpm



Factory Building

70.0 °F

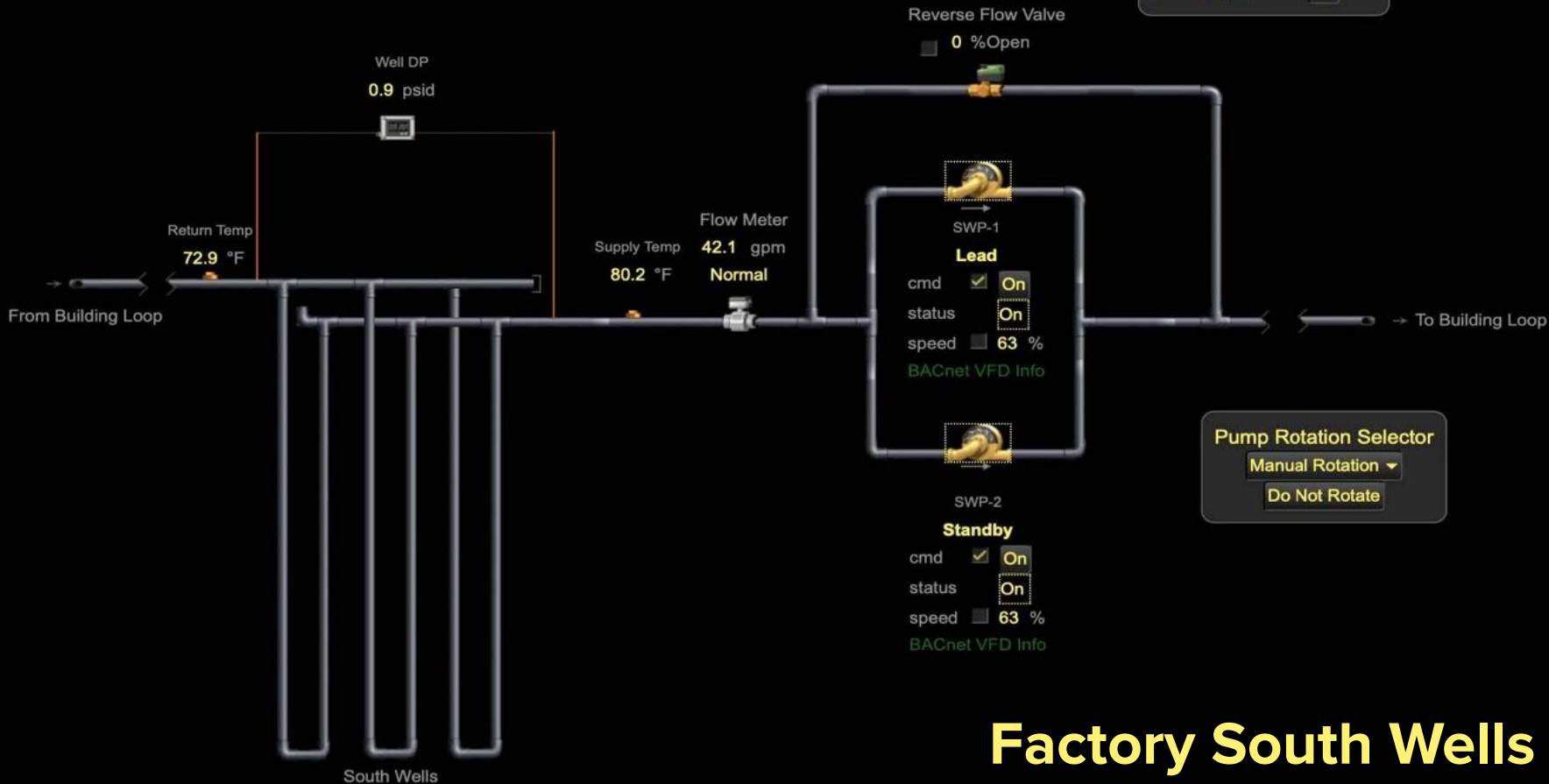
on off **auto**

Reverse Flow Mode

Enable Off

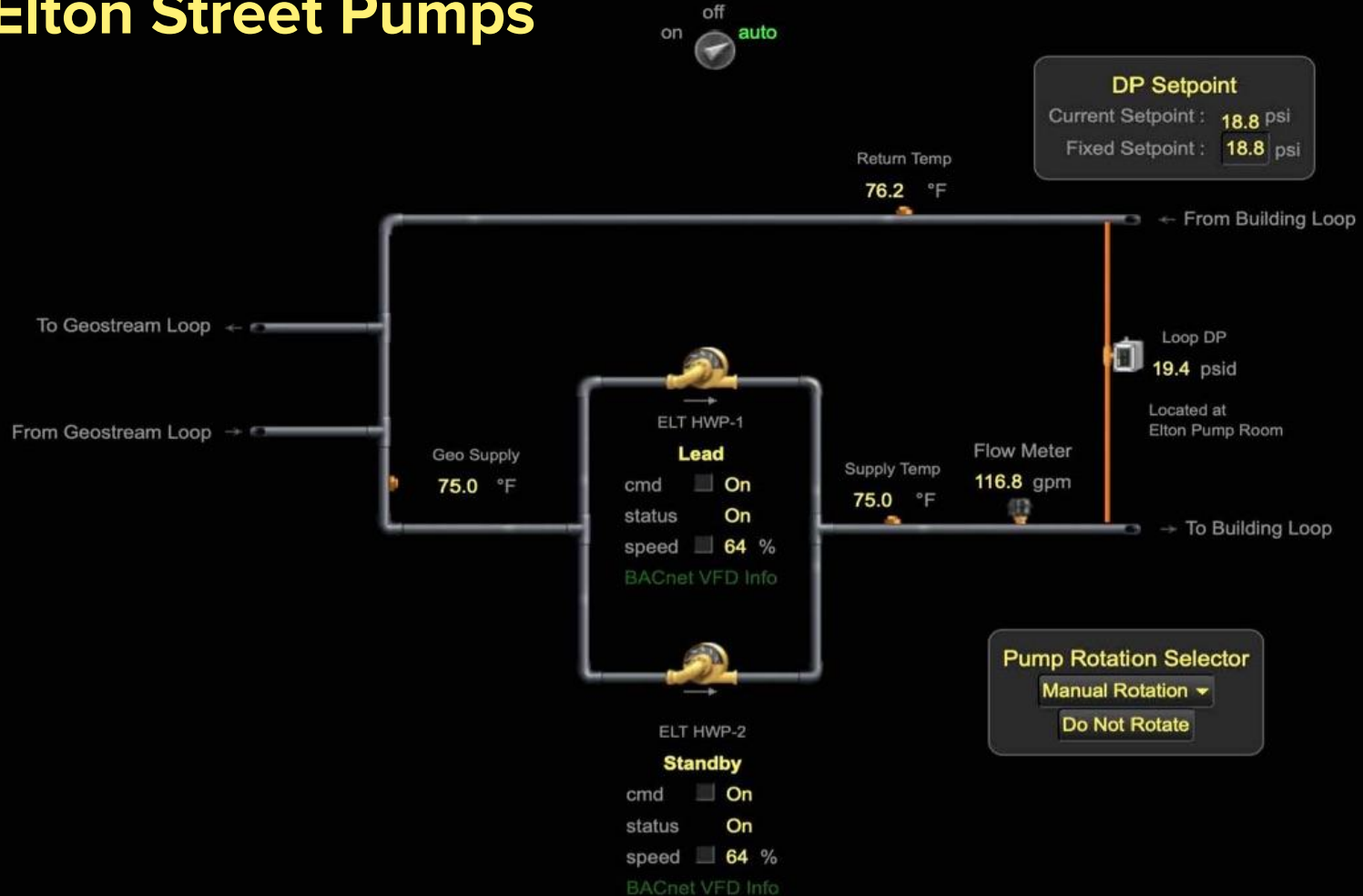
Valve Position 0 %Open

GPM Setpoint 35



Factory South Wells

Elton Street Pumps

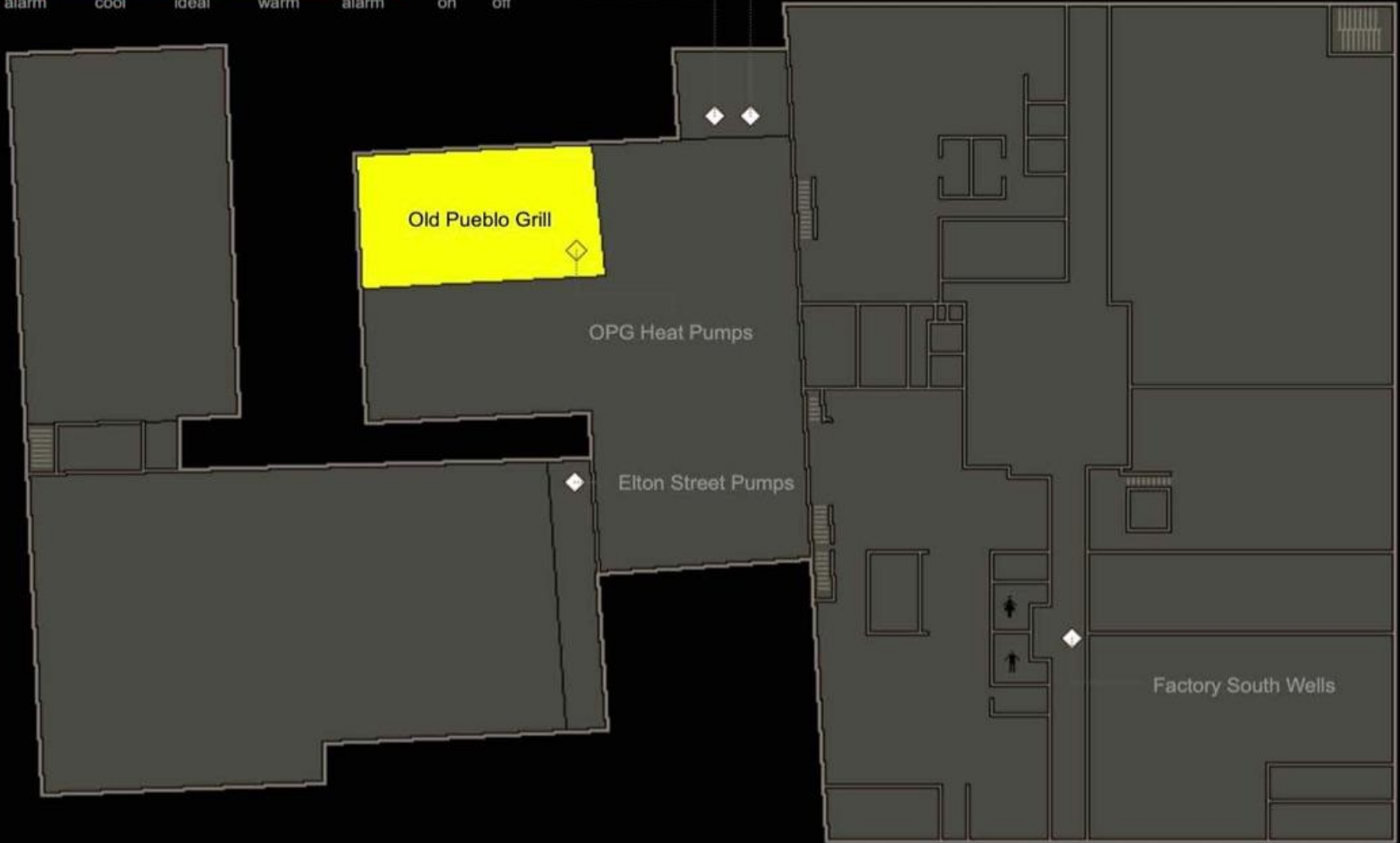


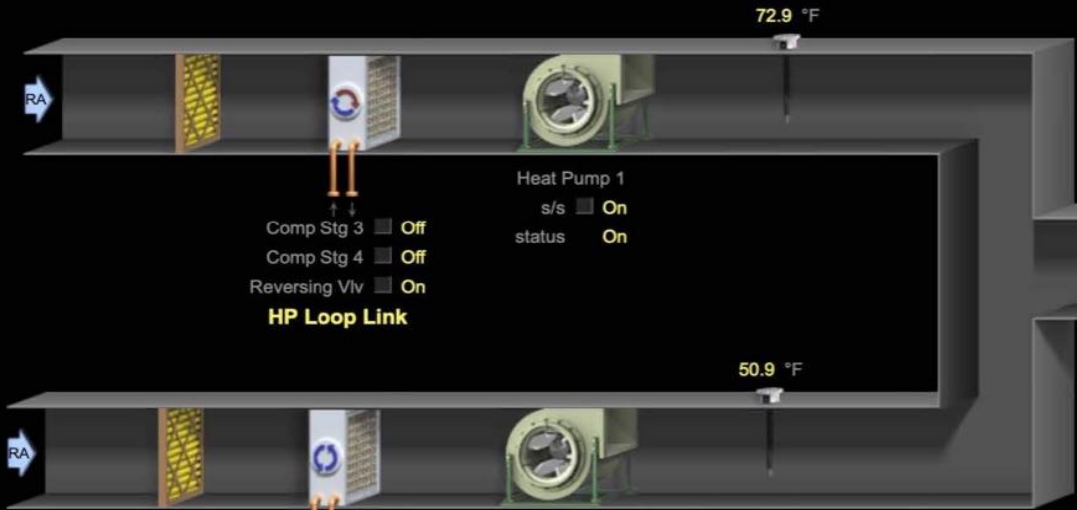
Benefits of District Geothermal

- Ability to have users in different heating / cooling demands at the same time throughout the district. (One user could be in cooling while another is heating).
- Excess heat is used to make domestic hot water for residential users.
- Reduced reliance on fossil fuels.
- Energy efficiency.
- Clean energy.
- Flexibility on placement of heat pumps inside buildings.
- No External Equipment.

alarm cool ideal warm alarm on off

Factory Building Pumps





Heat Pump 1
 s/s On
 status On

Comp Stg 3 Off
 Comp Stg 4 Off
 Reversing Vlv On

HP Loop Link

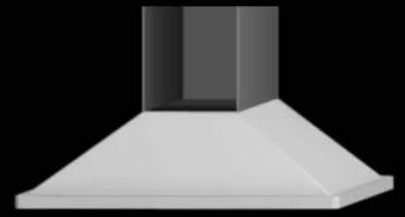
Heat Pump 2
 s/s On
 status On

Comp Stg 1 On
 Comp Stg 2 Off
 Reversing Vlv On

HP Loop Link



Electric Reheat
 cmd 0 %

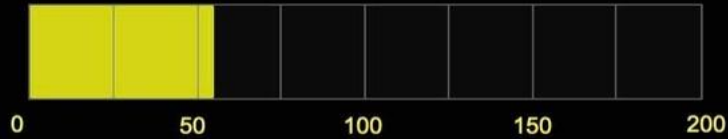


Kitchen Exhaust Status On



setpoint adjusted by +1.0 °F
 Occupied until 12:00 AM

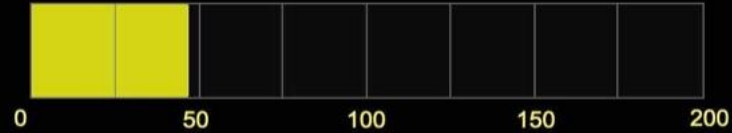
Factory North Flow
55.5 GPM



Factory DP
21.5 PSID

Elton DP
18.8 PSID

Factory South Flow
47.3 GPM



Elton Flow
110.7 GPM



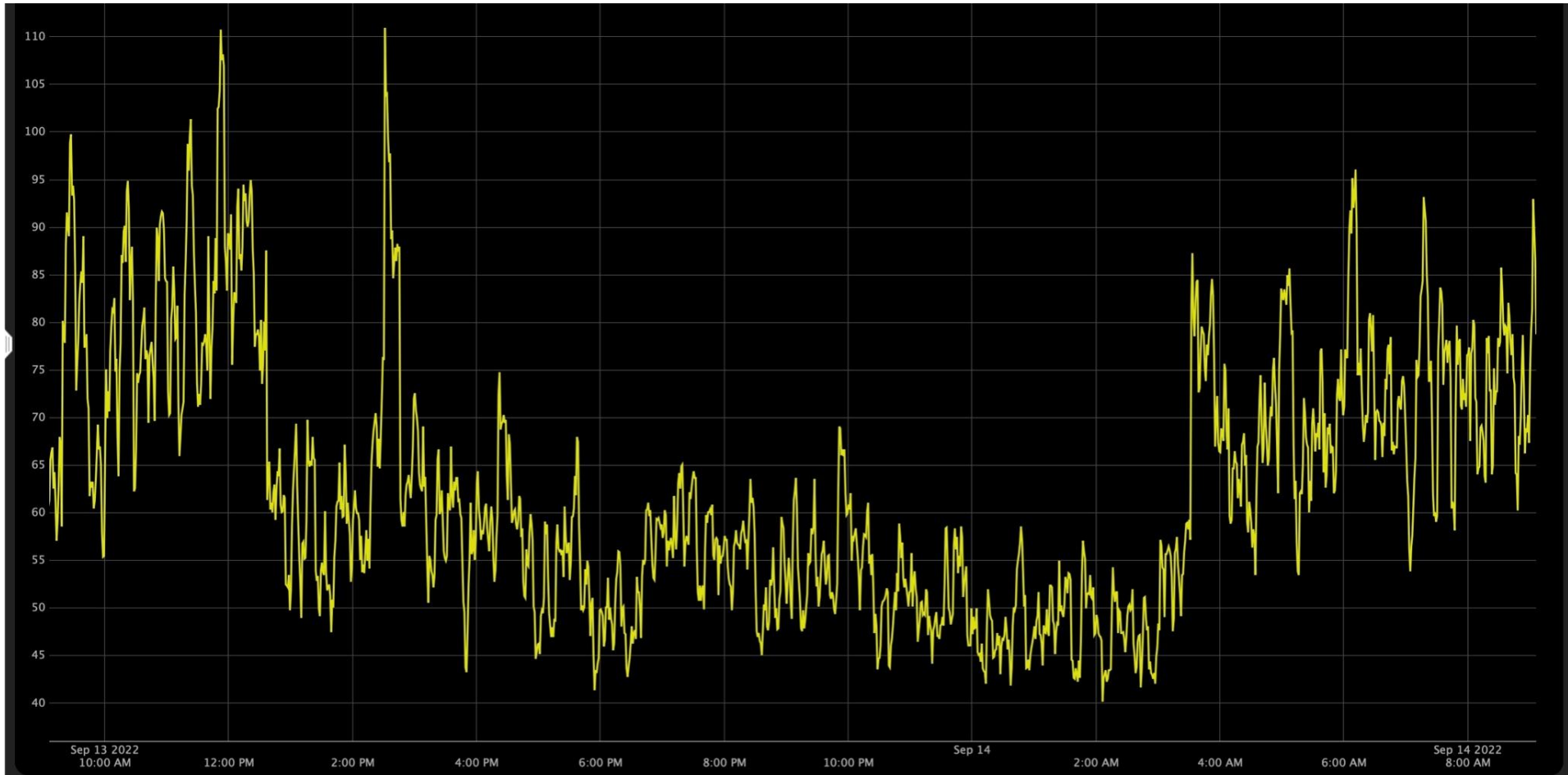
Factory Geo Flow
86.2 GPM



Elton Geo Flow
52.2 GPM



North Pump Room

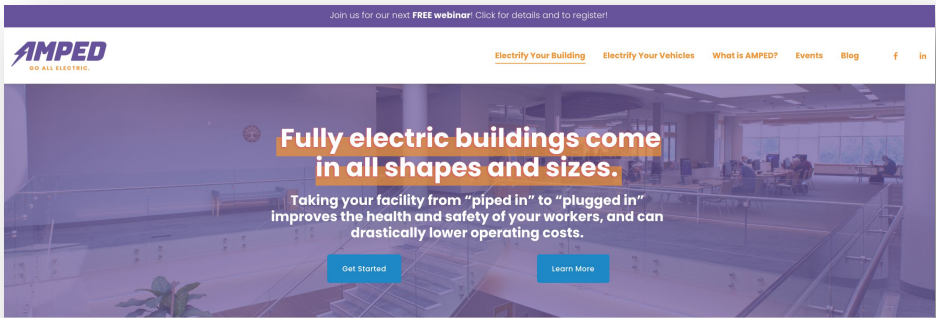


Interesting NOTA Geothermal District Facts

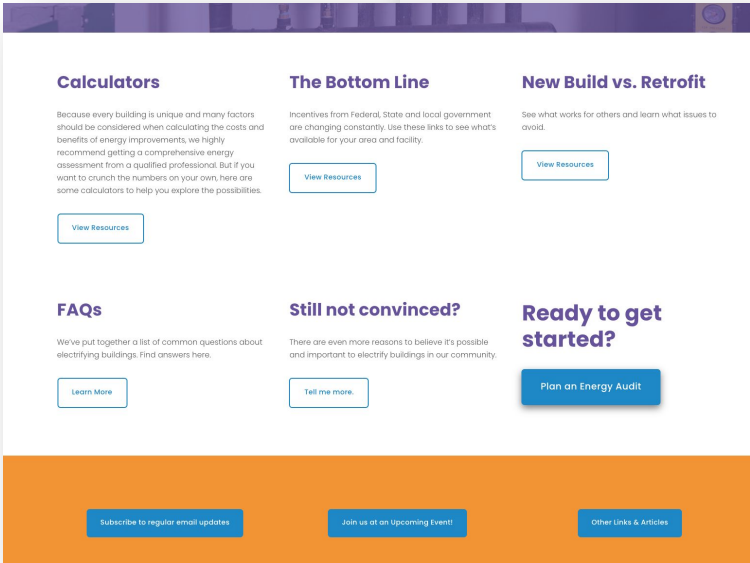
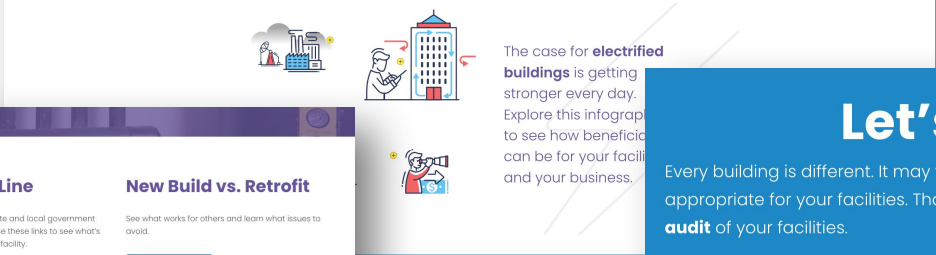
- ❑ In Nosh during the heating months, we capture the excess heat from the kitchen exhaust hoods through a heat exchanger and inject it into our district water which helps supplement heat demand throughout our district.
- ❑ The majority of ice cubes in Nosh are from a Geothermally cooled ice cube machine.
- ❑ One of the oldest antique flower coolers in Rochester has been converted to cool through Geothermal technology in Stacy K.
- ❑ There are over six miles of geothermal piping in our network.
- ❑ Our system moves hundreds of gallons of water per min depending on demand.

Q&A

AMPED Resources



Website with information and resources



Let's get started!

Every building is different. It may take some expertise to know which technologies are most appropriate for your facilities. That's why the best place to start is a **comprehensive energy audit** of your facilities.

An energy audit will identify areas of your facility and operation where energy can be saved. This process will deliver you a report filled with energy- and cost-saving recommendations ranging from lighting to large-scale capital improvements. This gives you actionable advice to make informed investment decisions.

Thankfully, there are **incentives, tax credits, and financing options** available — from New York State Energy Research and Development Authority (NYSERDA) and others — to help businesses get started! If you need help to determine which option is right for your business, contact the HeatSmart Energy Advisor!

Schedule a meeting with a HeatSmart Energy Advisor

OR

Explore Energy Assessment Programs through NYSERDA

HeatSmart is a trusted partner of the AMPED Project, offering free energy assessments, unbiased expert advice, vetted installers, and timely information on local, state, and federal incentives.

Social Media





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November 17th, 12:00–1:00