



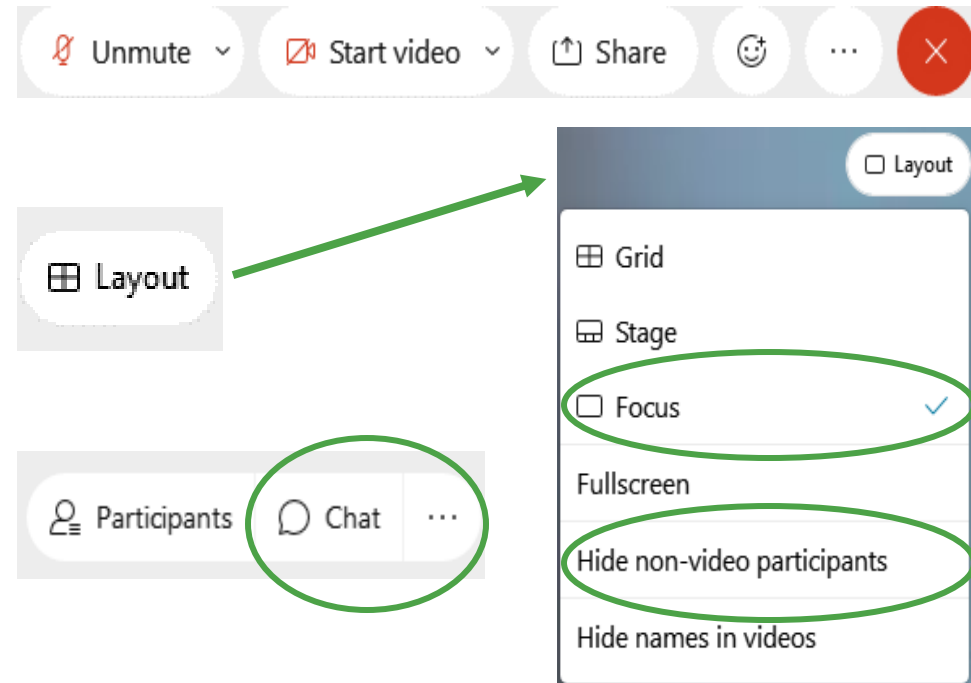
**Community
Preservation
Corporation**

**Ground Source Heat Pumps:
*Successful Applications and Opportunities for Expansion***

January 28th, 2025

AUDIENCE BEST PRACTICES

- Please ensure your microphone is **muted**.
- **For best viewing results:** View should be set to Focus or Stage View for shared content with non-video attendees hidden. The Layout options will appear at the top right of your screen.
- **Questions** should be submitted through the Q&A box OR the chat function **to the event Hosts**. The chat icon is located at the bottom right corner of your screen.
- Presentation slides and contact information will be shared with all attendees following the event.



TODAY'S AGENDA

**Welcome and
Introduction**

Danielle Donnelly and Izzy Nesci, Assistant Vice President of Sustainability Programs and Sustainability Associate, Community Preservation Corporation

**Introduction to
GSHPs and NYS case
studies**

John Ciovacco, President, Aztech Geothermal

**State programs and
initiatives, successful
RFPs, and funding
opportunities**

Donovan Gordon, Director, Community Thermal Networks, NYSERDA
Sue Dougherty, Program Manager, Community Thermal Networks,
NYSERDA

Open Q&A

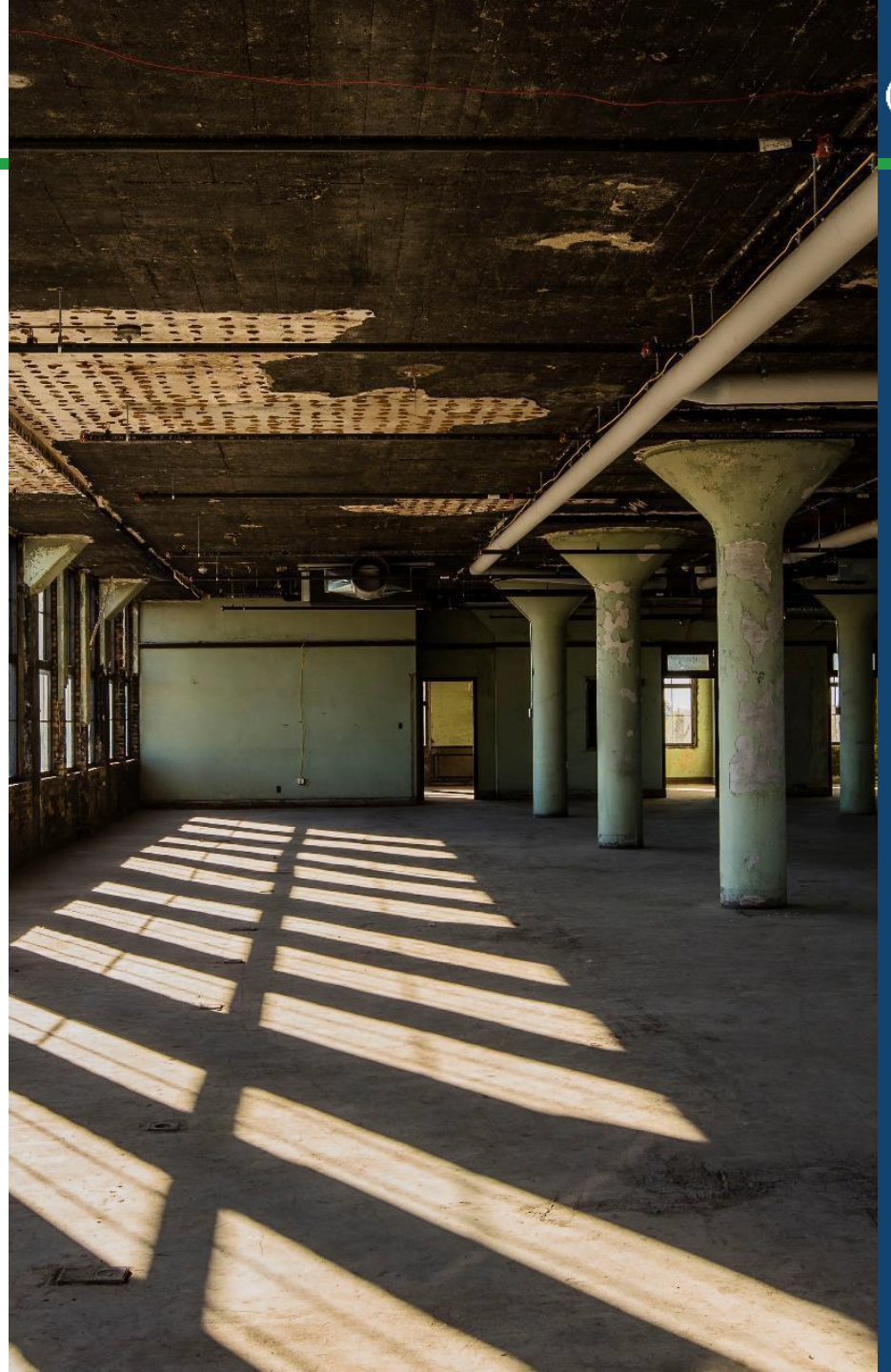
MISSION-DRIVEN SINCE 1974

CPC believes housing is central to transforming underserved neighborhoods into thriving and vibrant communities.

CPC is a nonprofit affordable housing and community revitalization finance company providing flexible capital solutions, fresh thinking and a collaborative approach to the complex issues facing communities.

Our goal is to be more than just a lender. At CPC, we work as a partner to provide technical expertise and hands-on support to help meet the capital needs and broader community revitalization goals of our customers, local stakeholders and the communities we serve.

Adaptive Reuse
500 Seneca Street
Buffalo, NY



INVESTING IN OUR MISSION

CPC believes housing is central to transforming underserved neighborhoods into thriving communities. Today, CPC uses its unique expertise in housing finance and public policy to:



Expand housing access and seek new ways to lower the cost of producing affordable housing



Invest in closing the racial wealth gap, and increase diversity and equity in the development industry

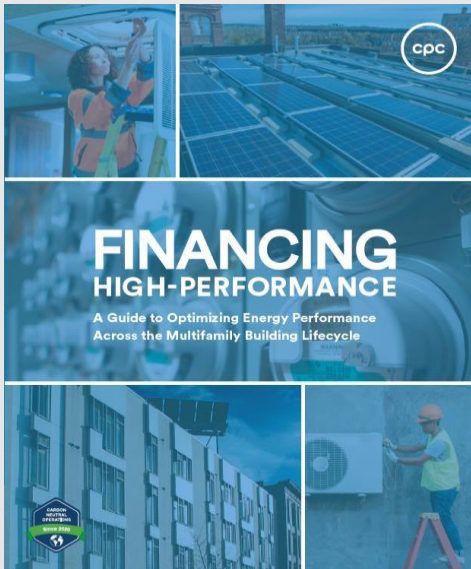


Commit to and expand investment in the green economy and lessen the impact of climate change

EDUCATION

Through its sustainability initiative, CPC has engaged partners, clients, and peers to provide important information about local and state policy, underwriting strategies, and financing opportunities for buildings incorporating energy efficiency.

CPC has conducted trainings and webinars to bring “underwriting savings” to a broader lending audience, published a white paper on Passive House performance, and convened a summit to address New York’s shift to a carbon neutral economy.



Financing High-Performance Guide, 2020

1

CREATING CAPITAL SOLUTIONS

CPC pioneered the “underwriting savings” approach and cemented the methodology with the release of Underwriting Efficiency guide.

Following the creation of its sustainability initiative, CPC has continued to explore creative ways to finance energy efficiency and high-performance building measures and bring these practices to the forefront of affordable housing development.



Capital Solutions for High-Performance Construction, Troy, NY

2

DATA & TRACKING

The backbone of CPC’s sustainability initiative is the impressive portfolio of loans that employ one or more Sustainability Criteria.

Tracking these loans, tagging the completed criteria, and benchmarking performance allow us to analyze long term performance and improve our lending practices.

Information from CPC’s sustainability portfolio has helped our private and public partners to innovate and inform policy decisions and state funded programs.



Electric Metering from Financing High-Performance, 2020

3



SPECIAL INITIATIVES - CPC'S ROLE IN FINANCING DECARBONIZATION



- **Climate United's Greenhouse Gas Reduction Fund (GGRF) Award**

- Climate United is a coalition formed by CPC, Calvert Impact, and Self-Help, to manage an award from the \$14 billion National Clean Investment Fund. On April 4th, 2024, Climate United was awarded nearly \$7B from the EPA.
- Climate United's strategy focuses on demonstrating the benefits of the clean energy transition through investments in the program's three priority areas: **distributed power generation and storage, building decarbonization, and electric transportation.**
- CPC has established CPC Climate Capital to lead the coalition's multifamily market strategy through the deployment of low-cost subordinate debt financing

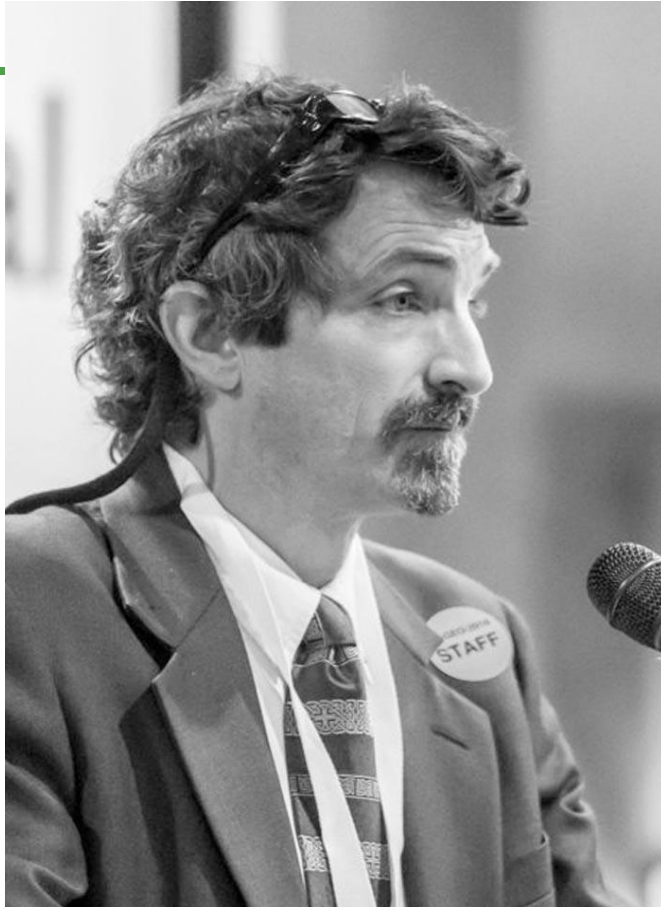
- **Climate Friendly Homes Fund (CFHF)**

- The CFHF, administered by CPC following a competitive Notice of Funding Availability (NOFA), provides financing for existing, 5-50 unit buildings in New York State (NYS) with a focus on replacing older and less energy-efficient systems with **all-electric, high-performance heating, cooling, and hot water heating systems.**
- With **\$250 million** in funding, CPC and NYS Homes and Community Renewal (HCR) aim to finance electrification retrofits in at least **10,000 units of multifamily housing that serve economically disadvantaged communities.**
- Funds must be committed by **March 2027.**

BUILDING PERFORMANCE WEBINAR SERIES

- Through our building performance webinar series, CPC provides important information about local and state policy, underwriting strategies, and financing opportunities for buildings incorporating energy efficiency

<p>Community Preservation Corporation Heat Pumps in Your Home: Installation Dos and Don'ts to Improve Performance July 10th, 2024</p> <p>WEBINAR Heat Pumps in Your Home: Installation Dos and Don'ts to Improve Performance</p>	<p>Community Preservation Corporation Electrifying Transit: Accessible EV Charging for Multifamily Renters and Owners April 30th, 2024</p> <p>WEBINAR Electrifying Transit: Accessible EV Charging for Multifamily Renters and Owners</p>	<p>Community Preservation Corporation Local Law 97 Compliance: Guidance for Regulated Buildings and Low-Lift Big Impact Measures to Reduce GHG Emissions February 14th, 2024</p> <p>WEBINAR Local Law 97 Compliance: Guidance for Regulated Buildings and Low-Lift Big Impact Measures to Reduce GHG Emissions</p>	<p>Community Preservation Corporation Optimizing Energy Efficiency in Large Multifamily Buildings</p> <p>WEBINAR Optimizing Energy Efficiency in Large Multifamily Buildings</p>
<p>WEBINAR Climate Friendly Homes Fund Info Session</p>	<p>WEBINAR Sustainable Affordable Housing</p>	<p>WEBINAR Webinar: Optimizing Building Envelopes and Ventilation</p>	<p>WEBINAR Practical Solutions for Multifamily Building Decarbonization</p>



JOHN CIOVACCO

President

Aztech Geothermal

Ground-Source Heat Pumps: *Successful Applications & Opportunities for Expansion*



*Steamboat 20
Albany Housing Authority*



*Zero Place
New Paltz, NY*

Presenter: John Ciovacco



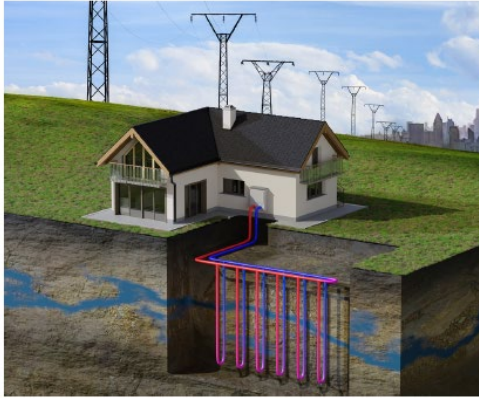
- Co-Chair NY-GEO Annual Conference

- President Aztech Geothermal
- NY-GEO Board Member
- AEE Certified GeoExchange Designer (CGD) & IGSHPA Accredited Geothermal Installer
- Served as NYS DPS Strategic Advisory Group for EE & Building Electrification
- Consulting to 7 Utilities involving ~9+ TEN projects
- Advisory Board, HEET
- ME from Union College (NY)

DOE Geothermal Heat Pump Studies – 11/2023 & 1/2025

ORNL/TM-2023/2966

Grid Cost and Total Emissions Reductions Through Mass Deployment of Geothermal Heat Pumps for Building Heating and Cooling Electrification in the United States



Xiaobing Liu
Jonathan Ho
Jeff Winick
Sean Porse
Jamie Lian
Xiaofei Wang
et al.

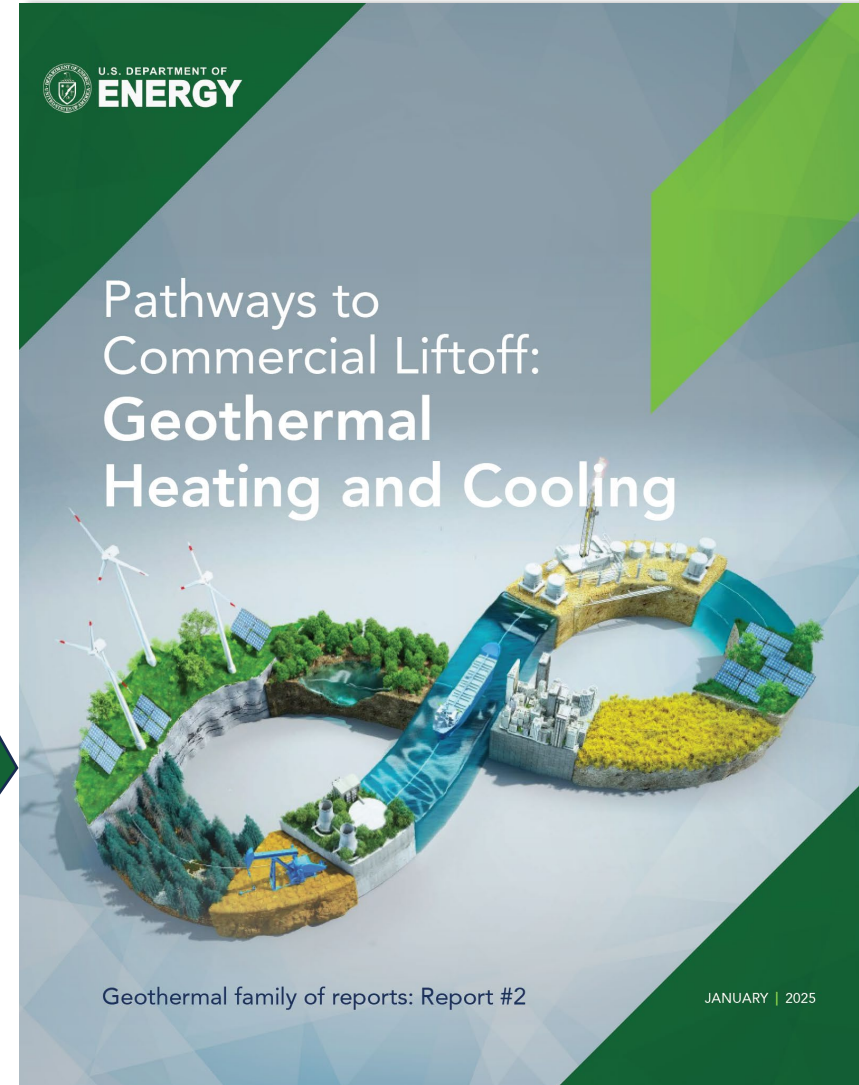
November 2023

 OAK RIDGE
National Laboratory

ORNL IS MANAGED BY UT-BATTELLE LLC FOR THE US DEPARTMENT OF ENERGY

“...the mass deployment of GHPs can electrify the building sector without overburdening the US electric power system.” – US DOE

“Geothermal heating and cooling technologies can reduce peak electricity demand, increase resilience, and lower ratepayer energy bills.” – US DOE



https://liftoff.energy.gov/wp-content/uploads/2025/01/LIFTOFF_DOE_Geothermal_HC.pdf

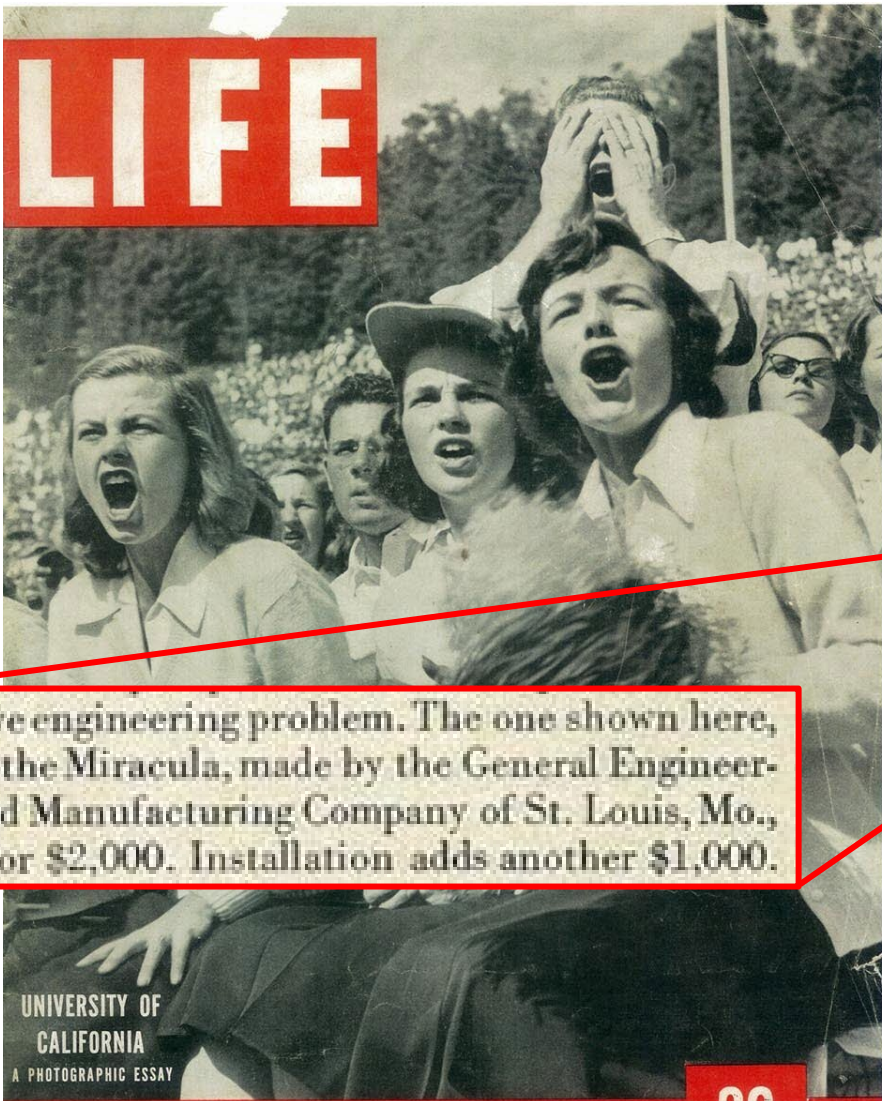
https://i0.wp.com/aztechgeo.com/wp-content/uploads/2024/01/DOE-Geothermal-Impact-Study_2023.jpg?w=706&ssl=1



Aztech G E O T H E R M A L

www.aztechgeo.com

LIFE



expensive engineering problem. The one shown here, called the Miracula, made by the General Engineering and Manufacturing Company of St. Louis, Mo., sells for \$2,000. Installation adds another \$1,000.

UNIVERSITY OF CALIFORNIA
A PHOTOGRAPHIC ESSAY

OCTOBER 25, 1948 **20** CENTS
YEARLY SUBSCRIPTION \$6.00

For those that are concerned about the "new" technology we call Geothermal

FIRELESS FURNACE

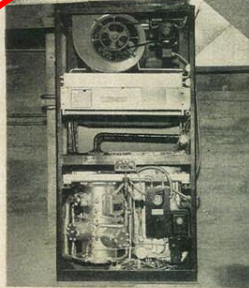
It pumps heat from earth to house

The machine shown at the bottom of the page and explained in the diagram at right burns no fuel, yet it can heat a house in winter, cool it in summer and is at the same time a humidifier. It produces no ashes, soot or smoke and needs no chimney. It is called a heat pump.

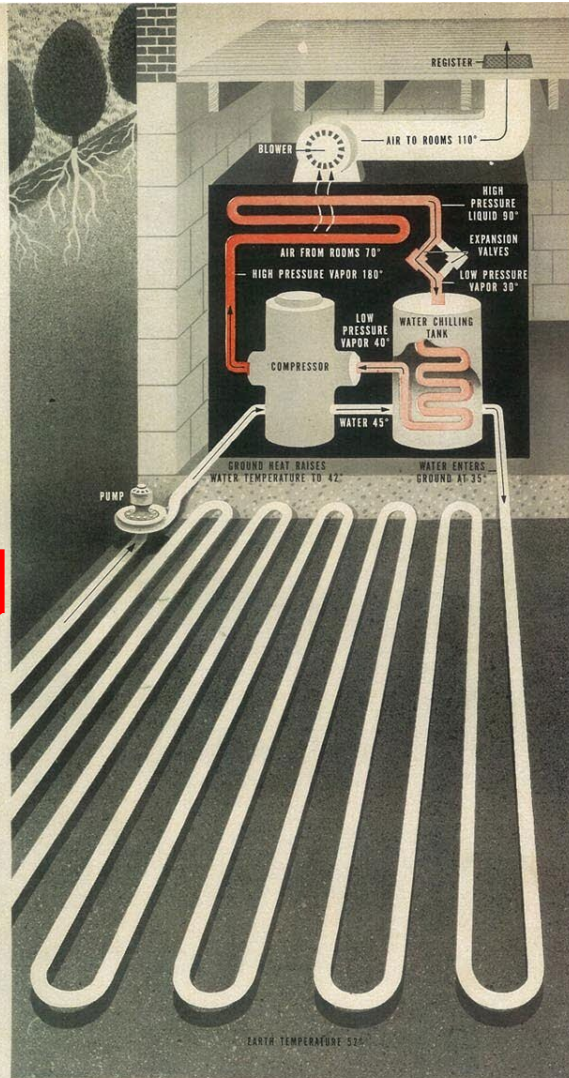
Powered by an electric motor, it works on the same principle as a home refrigerator. Just as a refrigerator takes heat from the food and air inside it and deposits it in the kitchen, the heat pump, when cooling a house, takes heat from the house and deposits it in the earth through pipes buried in the soil. To warm a house the heat pump uses the low temperature heat constantly contained in the earth, increases its temperature and puts it in the house. This is done as follows: water circulating through pipes in ground enters a tank in which are pipes carrying a cold refrigerant, Freon. The Freon, being colder than the water, picks up some of its heat, then goes through a compressor. This compression makes the Freon hot. This heat is used to heat house. Freon is then allowed to expand suddenly and as a result again becomes cold. Next it passes back through the water tank, once more picking up additional heat from the ground-warmed water.

It will be some time before most home owners can buy a heat pump right off a dealer's floor. To-day such best pumping installations constitute an expensive engineering problem. The one shown here, called the Miracula, made by the General Engineering and Manufacturing Company of St. Louis, Mo., sells for \$2,000. Installation adds another \$1,000.

At present the heat pump costs signify more to operate than an ordinary furnace except in areas of especially low electric rates. In many places, too, installation is totally impractical. However as the efficiency of getting heat from the earth improves, it is almost certain that eventually the heat pump will be able to compete successfully with conventional heat in most localities. Many large companies have heat pumps under development. Even conservative General Motors admits informally that it is working on a Frigidate version of the heat pump for the consumer market.



EXPOSED VIEW OF HEAT PUMP shows parts diagramed at right. Compressor is at bottom left, chilling tank at bottom right and blower at top center. Unit is 6 feet 3 inches tall, occupies 6.3 square feet of floor space.



HOW HEAT PUMP WORKS in winter is shown by this diagram. Water circulates through ground pipes, picks up ground heat plus heat from compressor. This warmed water heats special Freon vapor in chilling tank

(pink coils). Warmed Freon goes to compressor, becomes hot. Hot Freon goes through coils at top, warms house air. Freon returns to chilling tank through expansion valve. For summer cooling Freon flow is reversed.

CONTINUED ON NEXT PAGE 83

Fireless Furnace CONTINUED



GROUND PIPE for heat pump is laid in deep trench dug by jeep-drawn ditch digger. Pipe is buried below frost line where year-round temperature remains nearly constant. Here in Jeffersonville, Indiana this temperature is about 52°F.



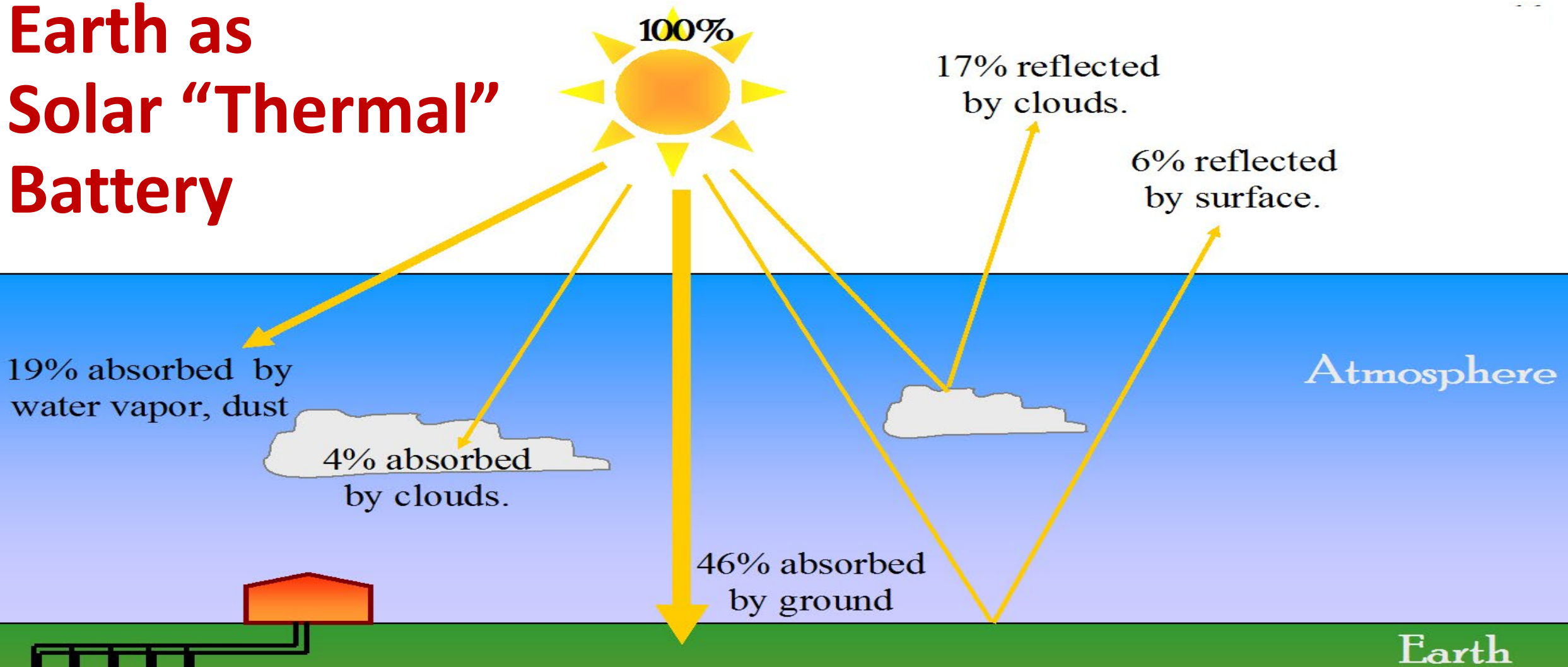
PIPE TRENCHES cover whole lawn in this heat pump installation. Men are the crew necessary to install the Miracula. Miracula can also get source of heat from pipes to wells, lakes or streams, and in warm areas from the air itself.



Aztech GEOTHERMAL

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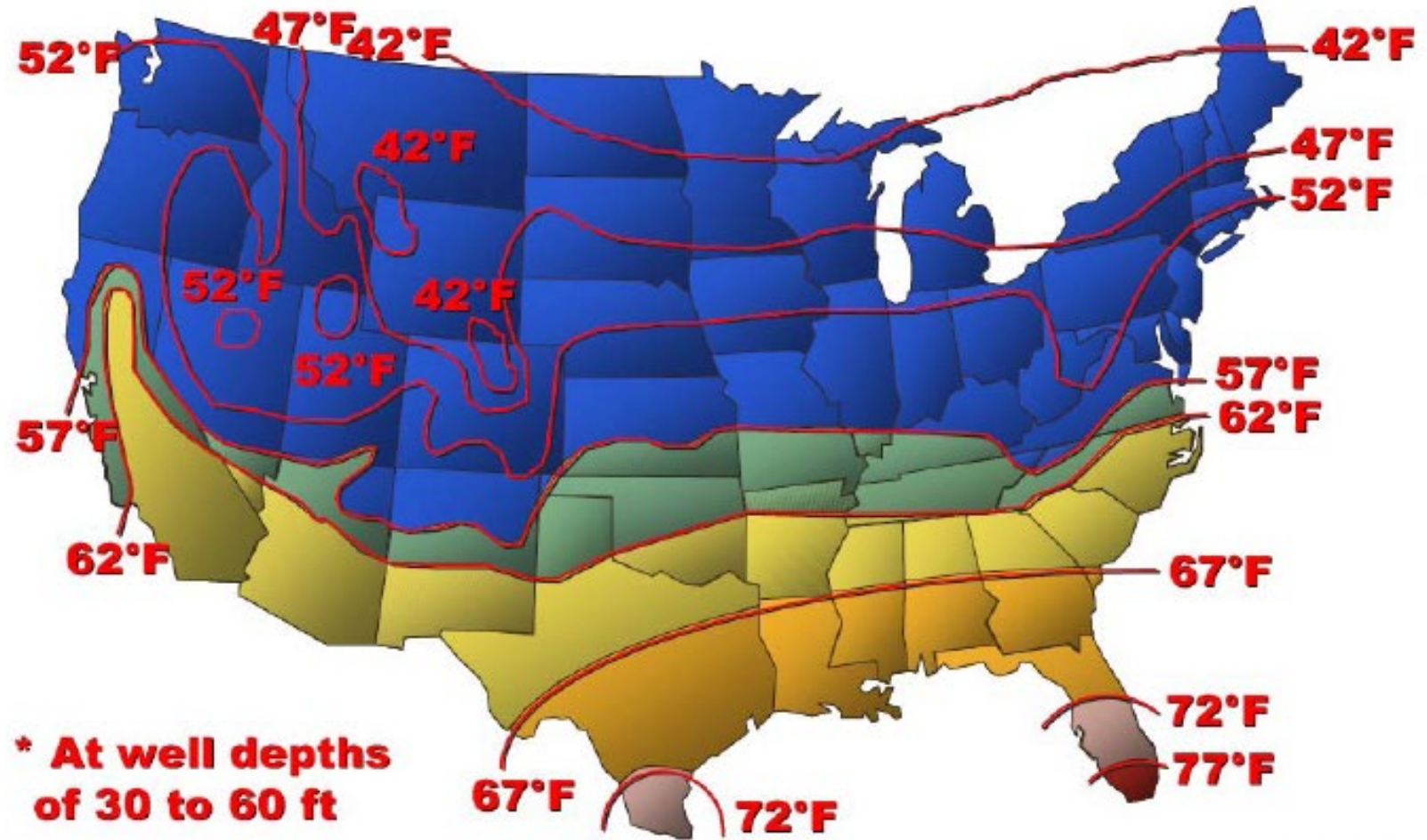
Earth as Solar “Thermal” Battery



The earth is like a solar battery absorbing nearly half of the sun's energy. The ground stays a relatively constant temperature through the seasons, providing a warm source in winter & a cool heat sink in summer.

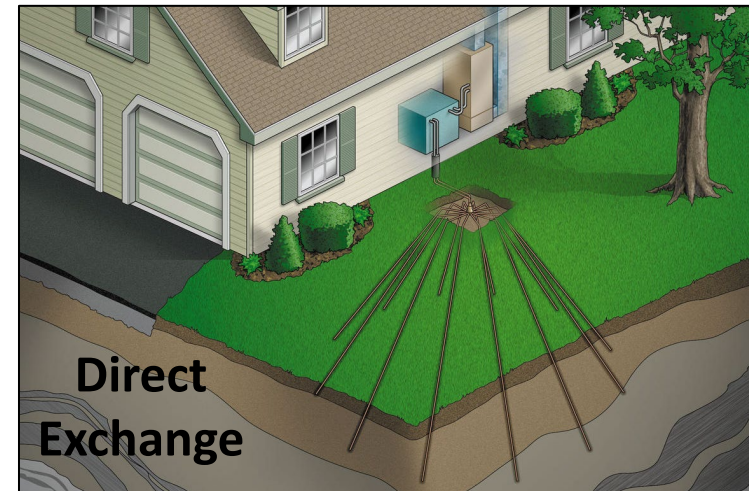
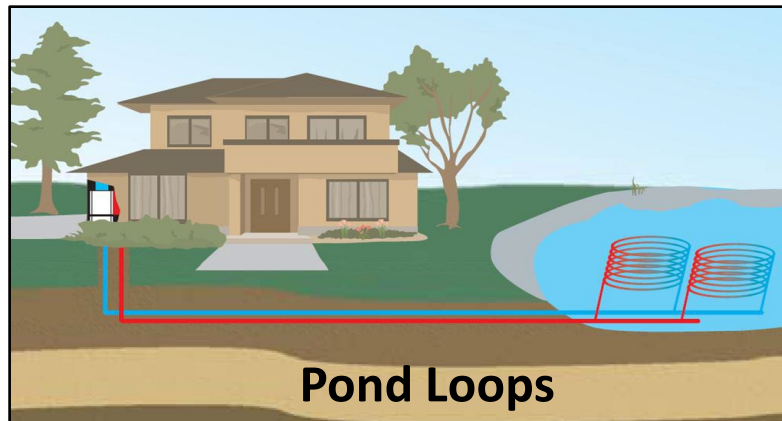
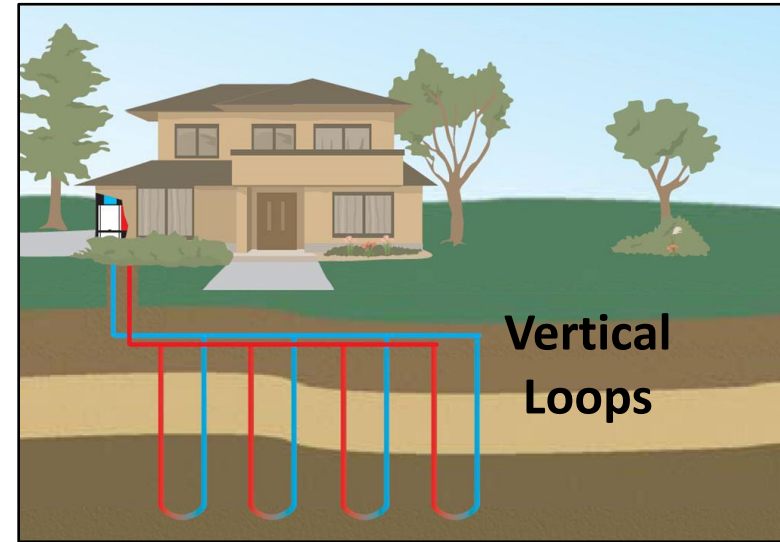
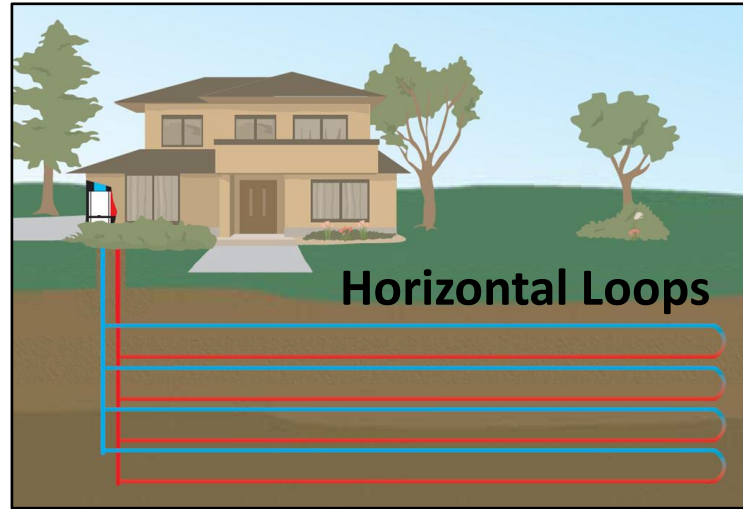
Ground Source Heat Pump - US Ground Temperatures

This is
the
GSHP Map.



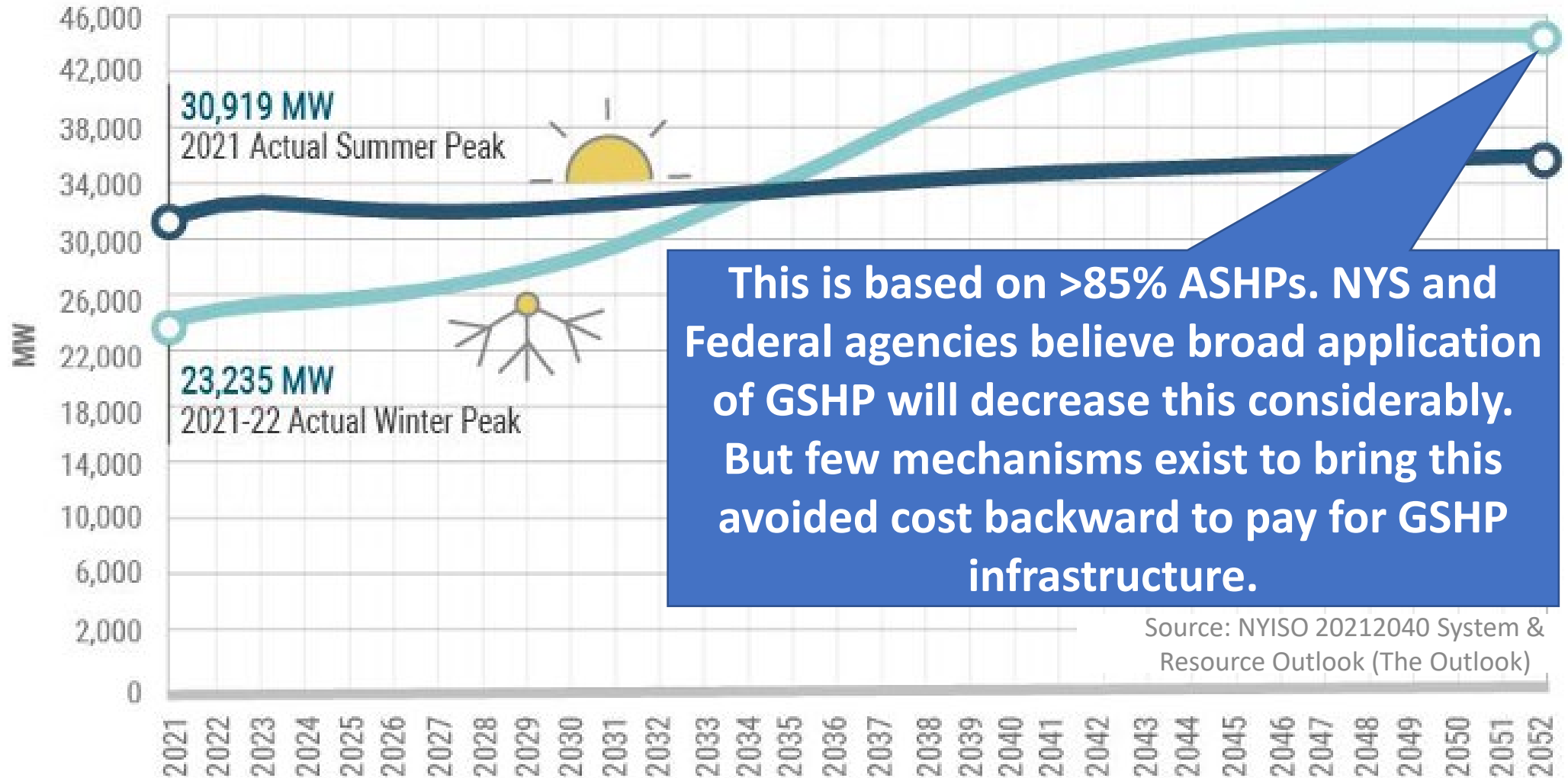
© DPCE 2002

Ground Source Heat Pump Closed Loop Options



Electric - Winter Peak Approaching – Updated to 2034

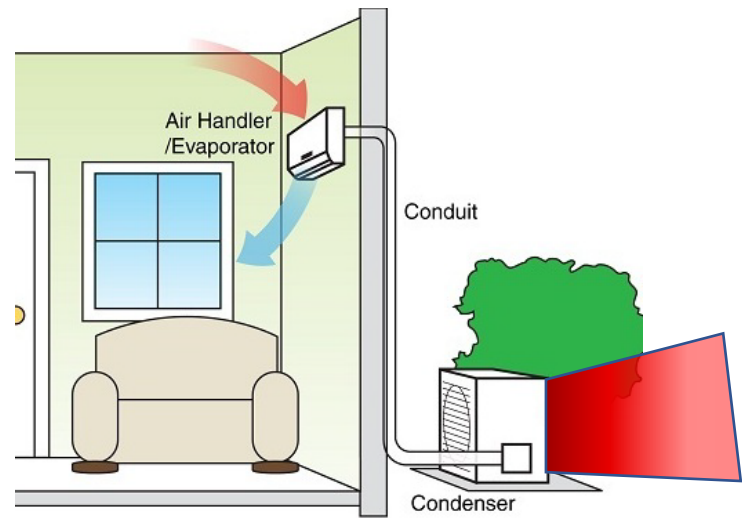
Figure 5: Electric Summer and Winter Peak Demand – Actual & Forecast: 2021-2052



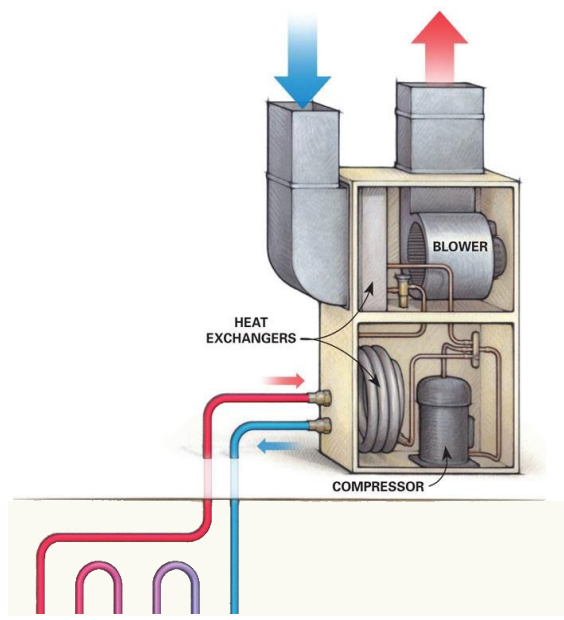
Electric Heat Options



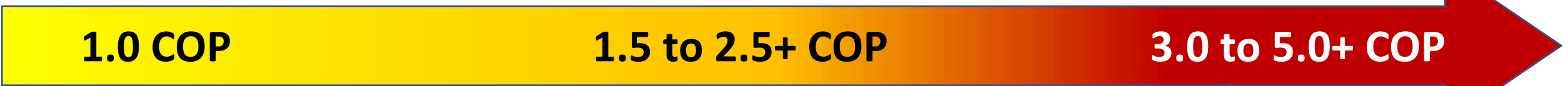
Electric Resistance



Air Source Heat Pumps (ASHP)



Water/Ground Source HPs (WSHP/GSHP)



1.0 COP

1.5 to 2.5+ COP

3.0 to 5.0+ COP

\$\$\$\$

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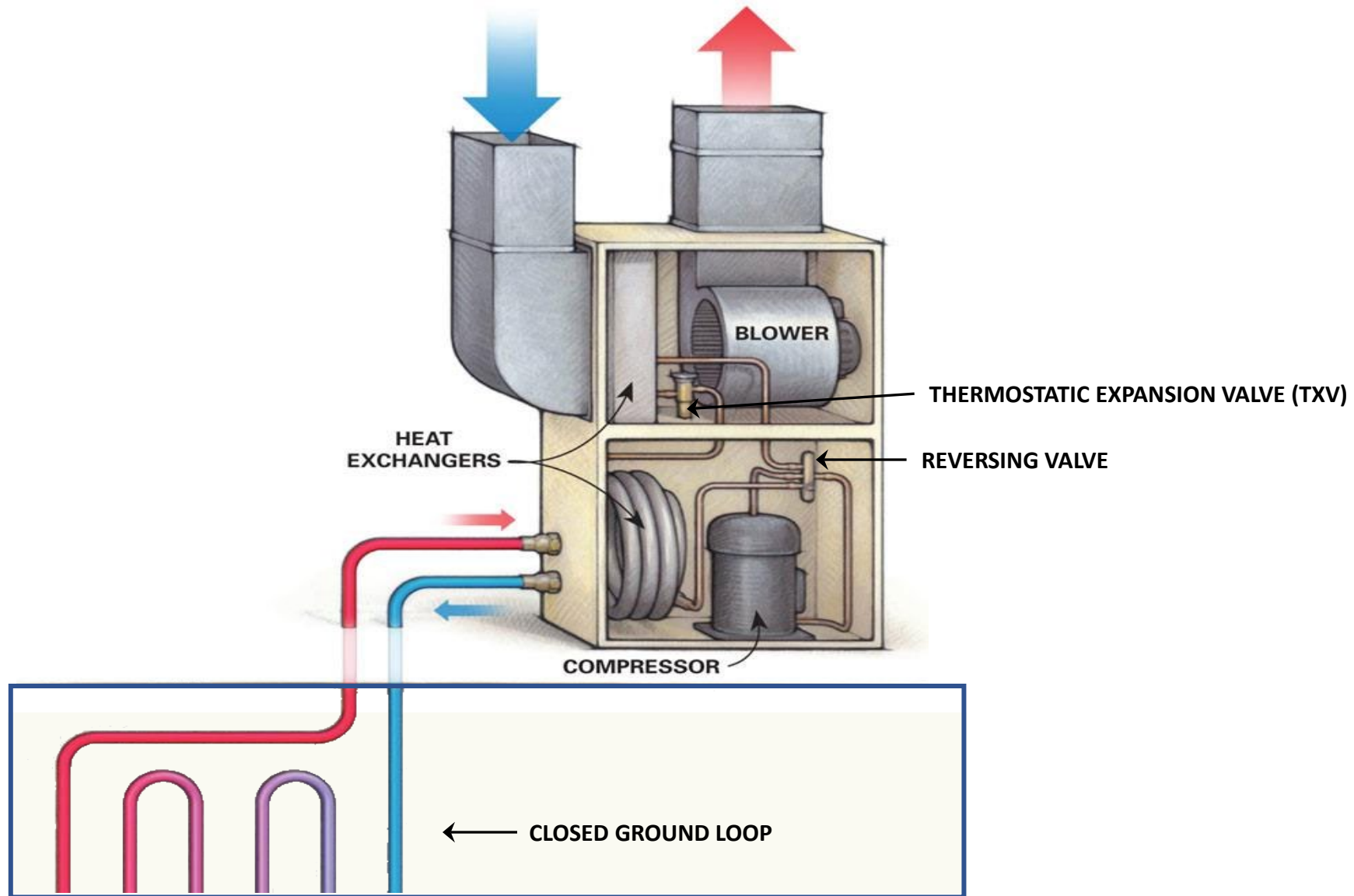
Relative Operating Cost

(Propane & Oil)

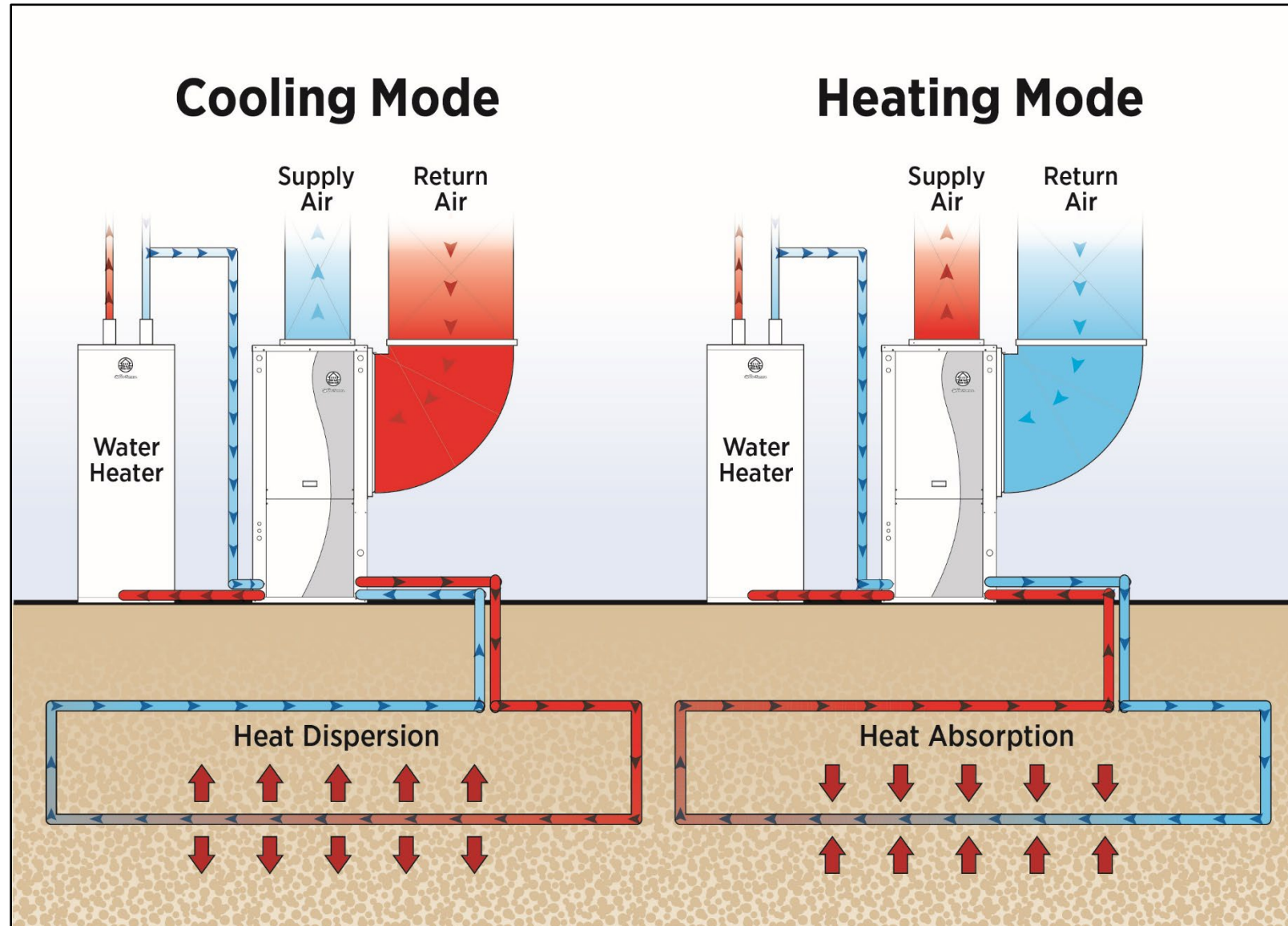
Efficiency
Coefficient of Performance

(Natural Gas)

Basic Water-to-Air GSHP System



Systems are Reversible

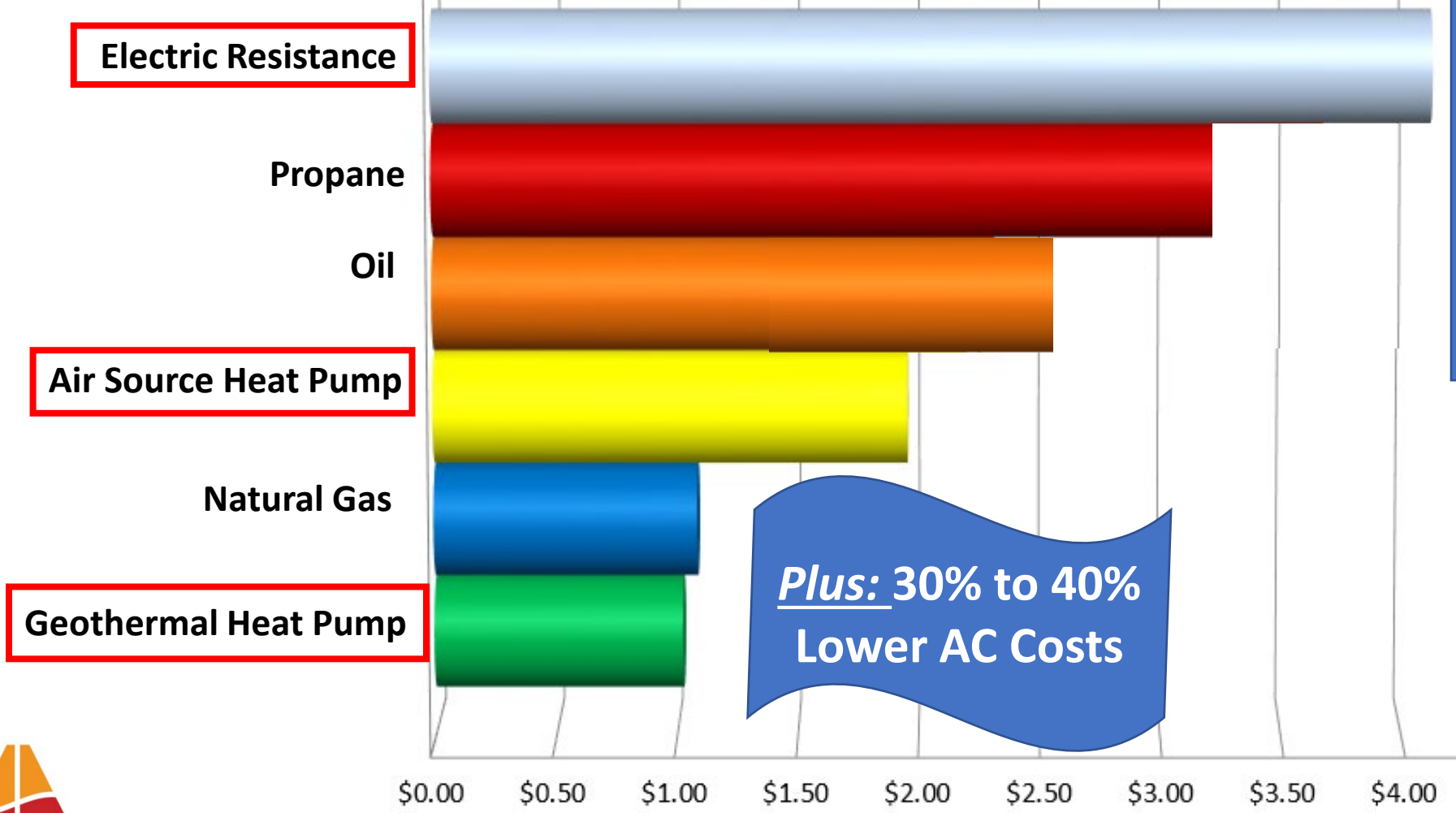


Heating Operating Cost Comparison

1 Therm = 100k BTU → ~30 kWh

Electric Heating Options

Cost of Heat per Therm NYS Capital Region



Energy rate cost allocation and related rates (\$) will need to change to increase savings for GSHPs vs. Natural Gas

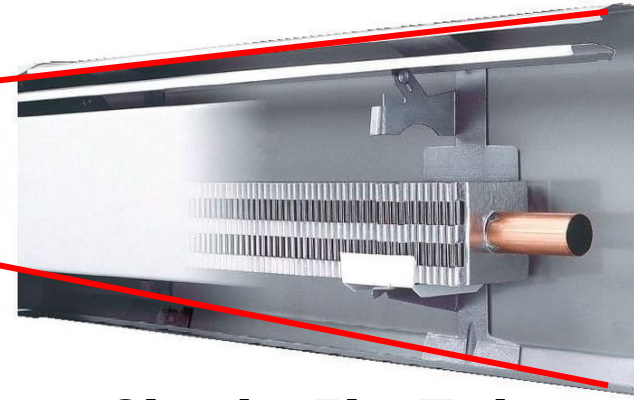
Plus: 30% to 40% Lower AC Costs

Oil @ \$2.97/gal
Propane @ \$2.69/gal
Natural Gas @\$1.00/therm
Geothermal @ \$0.14/kWh
Electric @ \$0.14 kWh
Air Source HP @ \$0.14/kWh

High Temperature Distribution Systems (Existing)



Hot Water Baseboard
Single Fin Tube (right)



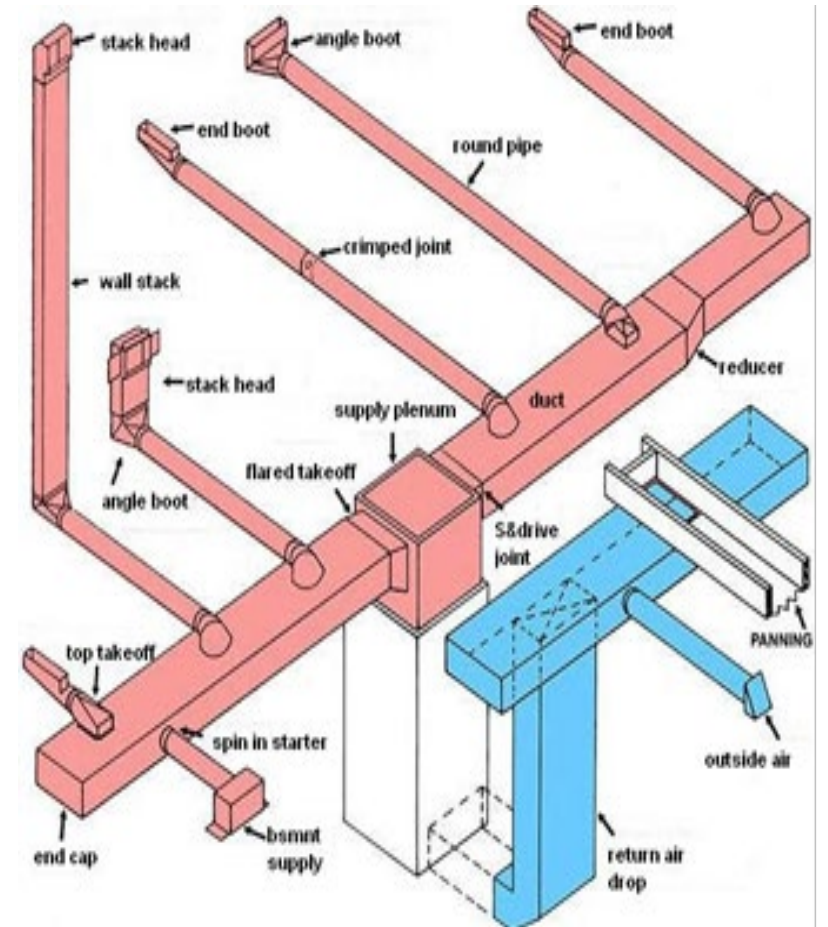
Single Fin Tube
(160°F – 180°F)



Steam Radiators
(212°F+)



Hot Water Radiators
(160°F – 180°F)



Ductwork
(refrigerant or water coils)

Lower Temperature Heat Distribution Systems

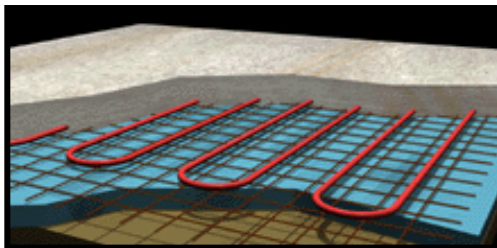
Heating Only Options



High Efficiency Radiant Panels



High Efficiency Baseboard



Radiant Floors

Heating & Cooling Options

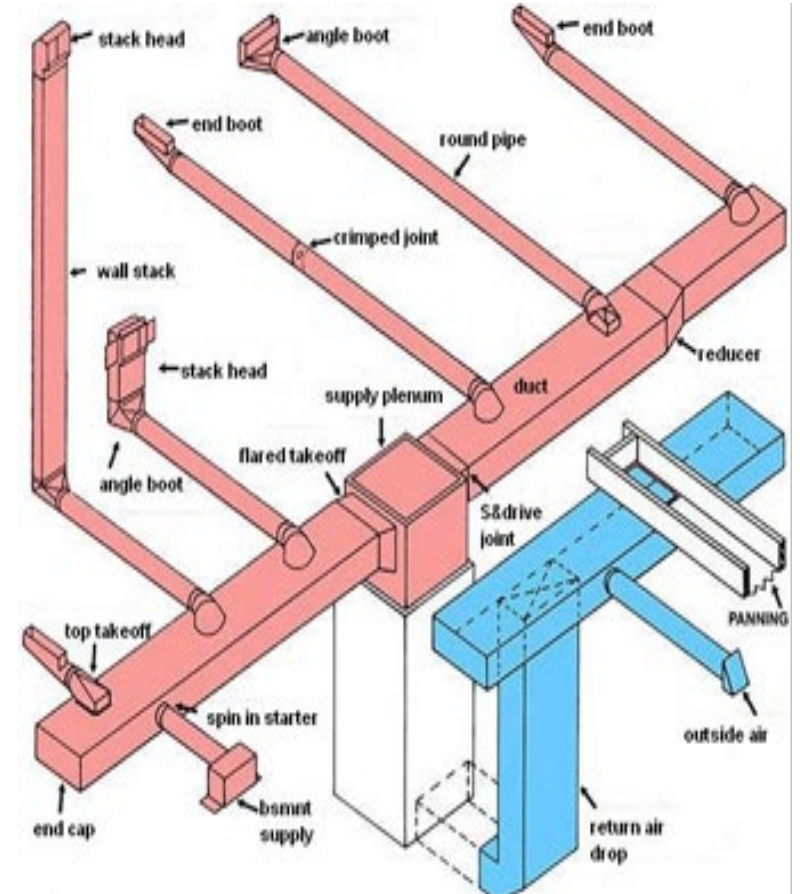


Ductless Hi-Wall
(refrigerant or water)



Ductless Console Units

Heat Pump (water-source)
Fan Coil (refrigerant or water)

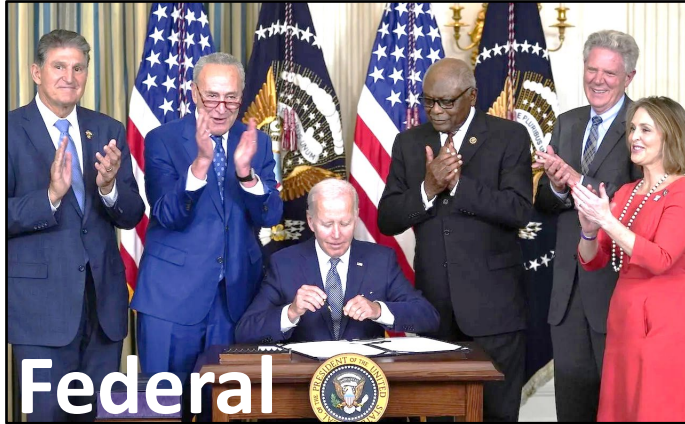


Ductwork

Air Handlers (refrigerant or water)

From Worst to First !

Recent changes to Federal and State laws are favoring GSHPs!!



Inflation Reduction Act (IRA)

Signed into Federal law by President Biden on August 16, 2022

Requires Prevailing Wage with Certified Apprenticeship Program

New York State



Utility Thermal Energy Network & Jobs Act (UTEN)

Signed into NYS law by Gov. Hochul on July 5, 2022

Requires Prevailing Wage with Apprenticeship

S.9422 /A.10493

Deeper Geothermal Drilling Regulations – 500'+

Signed into NYS law by Gov. Hochul on September 22, 2023

S.6604/A.6949

Inflation Reduction Act & NYS Clean Heat

– *Record level incentives for GSHPs*

- **Residential Geothermal Heat Pump Systems**

- 30% Federal Income Tax Credit – 2022 thru 2032
- 25% NYS Geothermal Tax Credit – **with cap of \$5,000**
- ~10% Utility Rebate (NYS Clean Heat)

- **Commercial Geothermal Heat Pumps Systems**

For-Profit Owned Systems - Investment Tax Credit (ITC)

- 30% ITC plus 85% basis MACRs depreciation
- Add 10% ITC for Domestic Content (whole system)
- Add 10% ITC for Energy Communities (Limited areas!)

Tax-Exempt Owned Systems

- Direct Pay Option same % as tax credits shown above

NYS Clean Heat – Utility Rebate Program

- ~10% Utility Rebate (NYS Clean Heat)

Homes
~ 45% -50%



Commercial
Big Range – 40% to 50%+*

*Due to accelerated depreciation, LIHTCs, or other applicable tax credits.

www.aztechgeo.com

Steamboat Square Revitalization - Phase 1



STEAMBOAT SQUARE REVITALIZATION -PHASE 1

- 20 Rensselaer Street is the first phase in the preservation of the Steamboat Square neighborhood.
- 88 one- and two-bedroom apartments.
- **Geothermal Heat Pumps for:**
 - Heating
 - Air Conditioning
 - Domestic Hot Water – with CO2 Refrigerant Heat Pumps!
- **32 closed loop boreholes @ 499 feet deep**
 - 16 borehole under each of the two adjacent parking lots
- **Individual heat pumps for each apartment (heat/cool)**
- **Central CO2 Refrigerant Heat Pumps**
 - Higher temperature capabilities
 - Extremely low Greenhouse Warming Potential (GWP = 1)



Steamboat Square Revitalization Project Team

- **Albany Housing Authority** – Owner/Operator & Developer
- **Edgemere Development** – Development Partner
- **MR2 Construction Services** - Owner's Construction Rep
- **SWBR** – Architect **Engineered Solutions** – MEP Engineer
- **AOW Construction** – General Contractor
- **Collett Mechanical** – Mechanical Contractor
- **Claverack Pump Service** – Geothermal Driller
- **Sustainable Comfort** – Green Building Consultant
- **Aztech Geothermal** – Geothermal Consultant



ALBANY HOUSING
AUTHORITY



SWBR



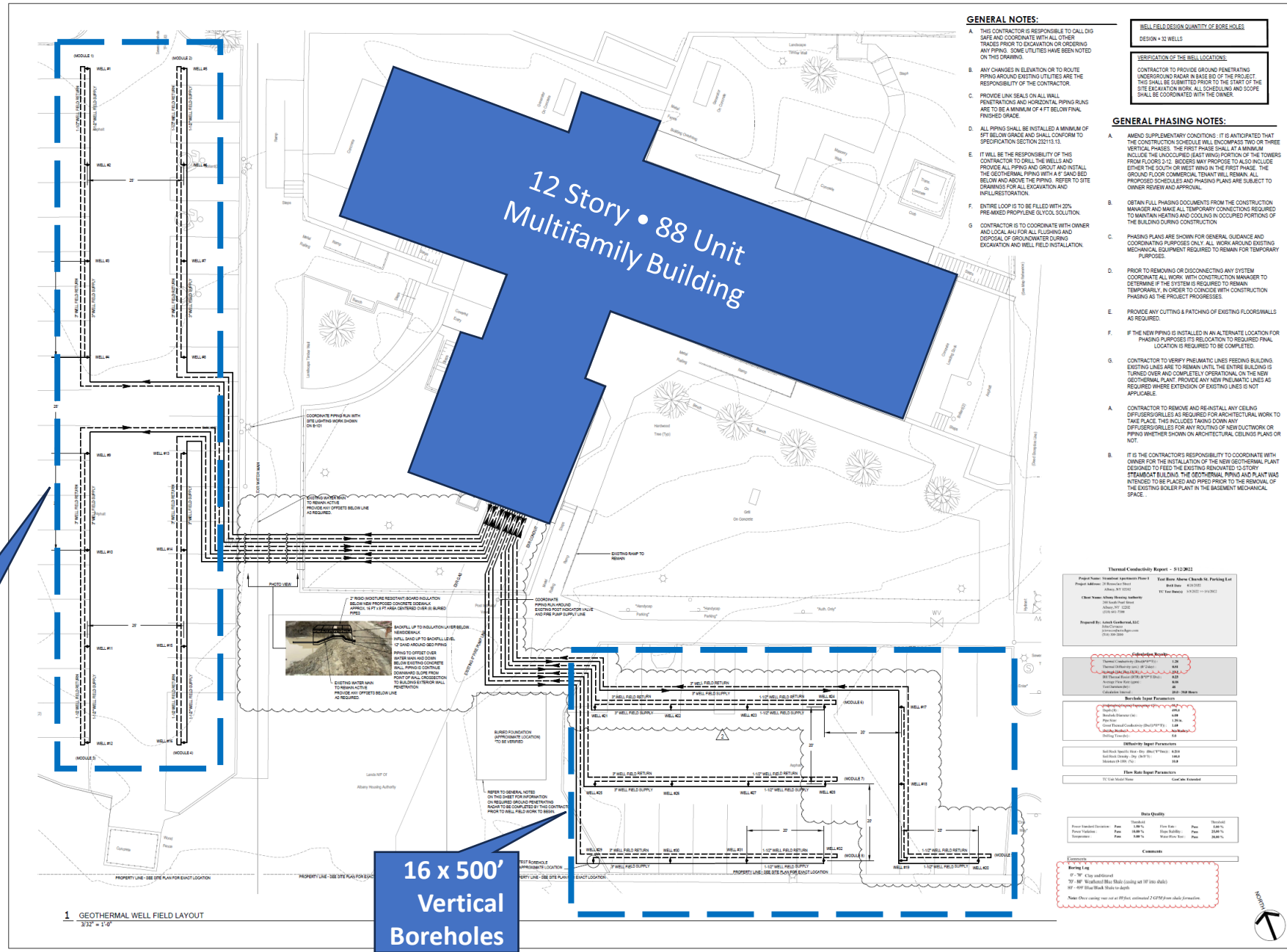
ALBANY HOUSING
AUTHORITY

Ground Heat Exchanger (GHX) Layout

- GHXs under two parking lots
- 32 x 500-foot boreholes

16 x 500' Vertical Boreholes

16 x 500' Vertical Boreholes



GENERAL NOTES:

- THIS CONTRACTOR IS RESPONSIBLE TO CALL DIG SALES AND COORDINATE WITH ALL OTHER TRADES PRIOR TO EXCAVATION OR ORDERING ANY PIPING. SOME UTILITIES HAVE BEEN NOTED ON THIS DRAWING.
- ANY CHANGES IN ELEVATION OR TO ROUTE PIPING AROUND EXISTING UTILITIES ARE THE RESPONSIBILITY OF THE CONTRACTOR.
- PROVIDE LINK SEALS ON ALL WALL PENETRATIONS AND HORIZONTAL PIPING RUNS ARE TO BE A MINIMUM OF 4 FT BELOW FINAL FINISHED GRADE.
- ALL PIPING SHALL BE INSTALLED A MINIMUM OF 8 FT BELOW GRADE AND SHALL CONFORM TO SPECIFICATION SECTION 3301.1.1.
- IT WILL BE THE RESPONSIBILITY OF THE CONTRACTOR TO DRILL THE WELLS AND PROVIDE ALL PIPING AND GROUT AND INSTALL THE GEOTHERMAL PIPING WITH A 6\"/>

GENERAL PHASING NOTES:

- AMEND SUPPLEMENTARY CONDITIONS: IT IS ANTICIPATED THAT THE CONSTRUCTION SCHEDULE WILL ENCOMPASS TWO OR THREE VERTICAL PHASES. THE FIRST PHASE SHALL AT A MINIMUM INCLUDE THE UNOCCUPIED EAST WING PORTION OF THE TOWERS FROM FLOORS 2-12. BIDDERS MAY PROPOSE TO ALSO INCLUDE EITHER THE SOUTH OR WEST WING IN THE FIRST PHASE. THE GROUND FLOOR COMMERCIAL TENANT WILL REMAIN. ALL PROPOSED SCHEDULES AND PHASING PLANS ARE SUBJECT TO OWNER REVIEW AND APPROVAL.
- OBTAIN FULL PHASING DOCUMENTS FROM THE CONSTRUCTION MANAGER AND MAKE ALL TEMPORARY CONNECTIONS REQUIRED TO MAINTAIN HEATING AND COOLING IN OCCUPIED PORTIONS OF THE BUILDING DURING CONSTRUCTION.
- PHASING PLANS ARE SHOWN FOR GENERAL GUIDANCE AND COORDINATING PURPOSES ONLY. ALL WORK AROUND EXISTING MECHANICAL EQUIPMENT REQUIRED TO REMAIN FOR TEMPORARY PURPOSES.
- PRIOR TO REMOVING OR DISCONNECTING ANY SYSTEM COORDINATE ALL WORK WITH CONSTRUCTION MANAGER TO DETERMINE IF THE SYSTEM IS REQUIRED TO REMAIN TEMPORARILY IN ORDER TO COINCIDE WITH CONSTRUCTION PHASING AS THE PROJECT PROGRESSES.
- PROVIDE ANY CUTTING & PATCHING OF EXISTING FLOOR SLABS AS REQUIRED.
- IF THE NEW PIPING IS INSTALLED IN AN ALTERNATE LOCATION FOR PHASING PURPOSES ITS RELOCATION TO REQUIRED FINAL LOCATION IS REQUIRED TO BE COMPLETED.
- CONTRACTOR TO VERIFY PNEUMATIC LINES FEEDING BUILDING EXISTING LINES ARE TO REMAIN UNTIL THE ENTIRE BUILDING IS TURNED OVER AND COMPLETELY OPERATIONAL ON THE NEW GEOTHERMAL PLANT. PROVIDE ANY NEW PNEUMATIC LINES AS REQUIRED WHERE EXTENSION OF EXISTING LINES IS NOT APPLICABLE.
- CONTRACTOR TO REMOVE AND RE-INSTALL ANY CEILING DUCTS/GRIDDLES AS REQUIRED FOR ARCHITECTURAL WORK TO TAKE PLACE. THIS INCLUDES TAKING DOWN ANY EXISTING GRIDDLES FOR ANY ROUNDING OF MECH/DUCTWORK OR PIPING WHETHER SHOWN ON ARCHITECTURAL CEILING PLANS OR NOT.
- IT IS THE CONTRACTOR'S RESPONSIBILITY TO COORDINATE WITH OWNER FOR THE INSTALLATION OF THE NEW GEOTHERMAL PLANT DESIGNED TO FEED THE EXISTING RENOVATED 13 STORY STEAMBOILER BUILDING. THE GEOTHERMAL PIPING AND PLANT HAS INTENDED TO BE PLACED AND PIPED PRIOR TO THE REMOVAL OF THE EXISTING BOILER PLANT IN THE BASEMENT MECHANICAL SPACE.

Thermal Conductivity Report - 3/12/2022

Project Name: Steamboat Square Phase 1 Rev 1
 Project Address: 21 Albany Street
 Job No: 21-0122
 1/2" Test Depth: 150' (150' - 160')

Client Name: Albany Housing Authority
 Client Address: 21 Albany Street
 Client Phone: 518-255-1234
 Prepared By: Aztech Geothermal, LLC
 Date: 3/12/2022

Subsurface Report

Depth (ft)	Soil Type	Moisture (%)	Temperature (°F)
0 - 10	CLAY	28	58
10 - 20	SAND	22	55
20 - 30	SAND	20	52
30 - 40	SAND	18	48
40 - 50	SAND	16	45
50 - 60	SAND	14	42
60 - 70	SAND	12	38
70 - 80	SAND	10	35
80 - 90	SAND	8	32
90 - 100	SAND	6	28

Flow Rate Report Parameters

Flow Rate (GPM)	Flow Rate (GPM)	Flow Rate (GPM)	Flow Rate (GPM)
100	100	100	100
200	200	200	200
300	300	300	300
400	400	400	400
500	500	500	500

Notes

1. 16 x 500' Vertical Boreholes

2. 16 x 500' Vertical Boreholes

3. 16 x 500' Vertical Boreholes

4. 16 x 500' Vertical Boreholes

SWBR

280 West Street, Troy, NY 12180
 518-255-1234

engineered solutions

444 Park Road #100
 Troy, NY 12180
 Phone: 518-285-2410
 Fax: 518-285-2441
 www.aztechgeo.com
 E: ETC@ESG

AS-BUILT 3.26.24

HCR SHARS NO. - 20210448

Drawn By: FVC
 Checked By: FVC
 Project Manager: FVCJK

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Revisions

No.	Date	Description
1	03/12/22	ADDendum #3
2	05/01/23	ASB 014

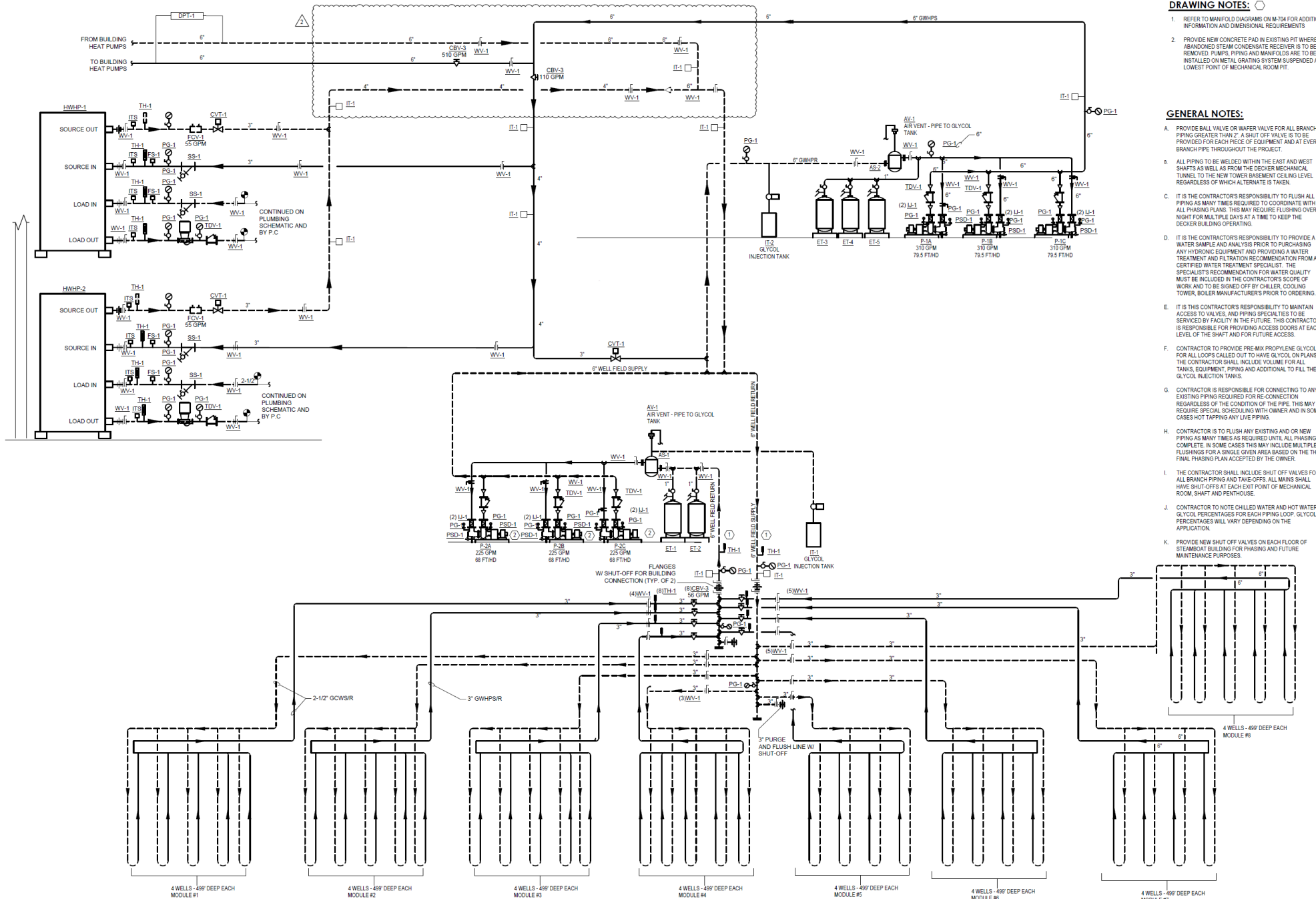
Steamboat Square Revitalization - Phase 1
 SWBR Project Number: 21122.00

Albany Housing Authority

M-101
 GEOTHERMAL WELL FIELD LAYOUT

7/26/22
 Construction Documents

GEO THERMAL PIPING SCHEMATIC



DRAWING NOTES:

- REFER TO MANIFOLD DIAGRAMS ON M-704 FOR ADDITIONAL INFORMATION AND DIMENSIONAL REQUIREMENTS
- PROVIDE NEW CONCRETE PAD IN EXISTING PIT WHERE ABANDONED STEAM CONDENSATE RECEIVER IS TO BE REMOVED. PUMP, PIPING AND MANIFOLDS ARE TO BE INSTALLED ON METAL GRATING SYSTEM SUSPENDED ABOVE LOWEST POINT OF MECHANICAL ROOM FIT.

GENERAL NOTES:

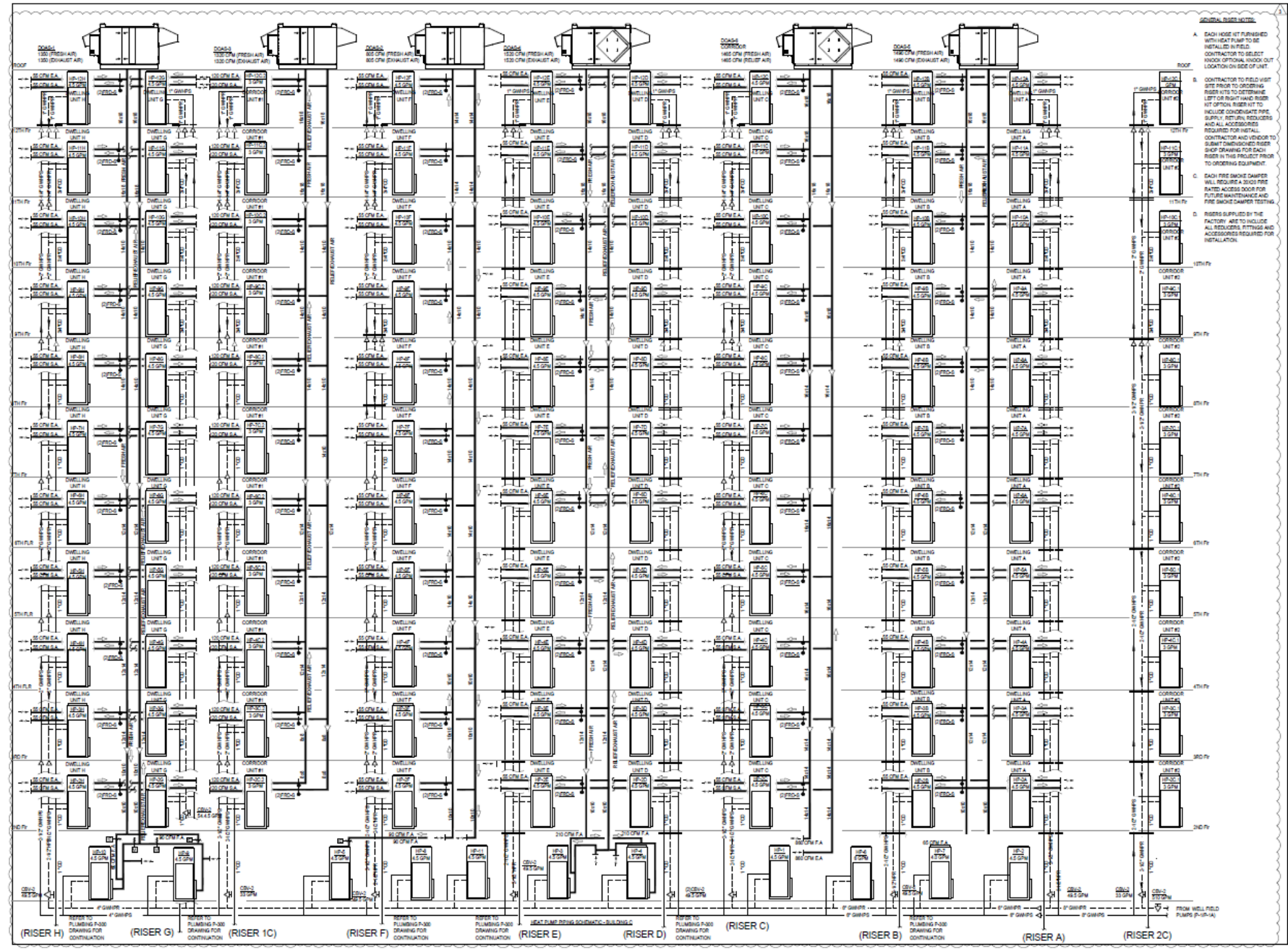
- PROVIDE BALL VALVE OR WAFER VALVE FOR ALL BRANCH PIPING GREATER THAN 2". A SHUT OFF VALVE IS TO BE PROVIDED FOR EACH PIECE OF EQUIPMENT AND AT EVERY BRANCH PIPE THROUGHOUT THE PROJECT.
- ALL PIPING TO BE WELDED WITHIN THE EAST AND WEST SHAFTS AS WELL AS FROM THE DECKER MECHANICAL TUNNEL TO THE NEW TOWER BASEMENT CEILING LEVEL REGARDLESS OF WHICH ALTERNATE IS TAKEN.
- IT IS THE CONTRACTOR'S RESPONSIBILITY TO FLUSH ALL PIPING AS MANY TIMES REQUIRED TO COORDINATE WITH ALL PHASING PLANS. THIS MAY REQUIRE FLUSHING OVER NIGHT FOR MULTIPLE DAYS AT A TIME TO KEEP THE DECKER BUILDING OPERATING.
- IT IS THE CONTRACTOR'S RESPONSIBILITY TO PROVIDE A WATER SAMPLE AND ANALYSIS PRIOR TO PURCHASING ANY HYDRONIC EQUIPMENT AND PROVIDING A WATER TREATMENT AND FILTRATION RECOMMENDATION FROM A CERTIFIED WATER TREATMENT SPECIALIST. THE SPECIALIST'S RECOMMENDATION FOR WATER QUALITY MUST BE INCLUDED IN THE CONTRACTOR'S SCOPE OF WORK AND TO BE SIGNED OFF BY CHILLER, COOLING TOWER, BOILER MANUFACTURER'S PRIOR TO ORDERING.
- IT IS THE CONTRACTOR'S RESPONSIBILITY TO MAINTAIN ACCESS TO VALVES, AND PIPING SPECIALTIES TO BE SERVICED BY FACILITY IN THE FUTURE. THIS CONTRACTOR IS RESPONSIBLE FOR PROVIDING ACCESS DOORS AT EACH LEVEL OF THE SHAFT AND FOR FUTURE ACCESS.
- CONTRACTOR TO PROVIDE PRE-MIX PROPYLENE GLYCOL FOR ALL LOOPS CALLED OUT TO HAVE GLYCOL ON PLANS. THE CONTRACTOR SHALL INCLUDE VOLUME FOR ALL TANKS, EQUIPMENT, PIPING AND ADDITIONAL TO FILL THE GLYCOL INJECTION TANKS.
- CONTRACTOR IS RESPONSIBLE FOR CONNECTING TO ANY EXISTING PIPING REQUIRED FOR RE-CONNECTION REGARDLESS OF THE CONDITION OF THE PIPE. THIS MAY REQUIRE SPECIAL SCHEDULING WITH OWNER AND IN SOME CASES HOT TAPPING ANY LIVE PIPING.
- CONTRACTOR IS TO FLUSH ANY EXISTING AND OR NEW PIPING AS MANY TIMES AS REQUIRED UNTIL ALL PHASING IS COMPLETE. IN SOME CASES THIS MAY INCLUDE MULTIPLE FLUSHINGS FOR A SINGLE GIVEN AREA BASED ON THE FINAL PHASING PLAN ACCEPTED BY THE OWNER.
- THE CONTRACTOR SHALL INCLUDE SHUT OFF VALVES FOR ALL BRANCH PIPING AND TAKE-OFFS. ALL MAINS SHALL HAVE SHUT-OFFS AT EACH EXIT POINT OF MECHANICAL ROOM, SHAFT AND PENTHOUSE.
- CONTRACTOR TO NOTE CHILLED WATER AND HOT WATER GLYCOL PERCENTAGES FOR EACH PIPING LOOP. GLYCOL PERCENTAGES WILL VARY DEPENDING ON THE APPLICATION.
- PROVIDE NEW SHUT OFF VALVES ON EACH FLOOR OF STEAMBOAT BUILDING FOR PHASING AND FUTURE MAINTENANCE PURPOSES.

1 STEAMBOAT SQUARE - GEOTHERMAL PIPING SCHEMATIC
NO SCALE



Heat Pump Riser Diagram

- Source water from GHX to 88 units + common space HPs
- No isolation – same water running through vertical GHXs



SWBR
201 New Street, Suite 1100
 01106 Northampton, MA

engineered solutions
100 South Main Street, Suite 200
 Northampton, MA 01060
 Phone: (413) 253-3333
 Fax: (413) 253-3341
 www.swbr.com

AS-BUILT 6.24.24

WBS SQUARE NO. - 221-1048

Drawn By: FVC
 Checked By: FVC
 Project Manager: FVJ/JK

Revisions
 1 - 02/10/22 - Addendum #1
 2 - 03/03/22 - Add. 08
 3 - 03/03/22 - Add. 08

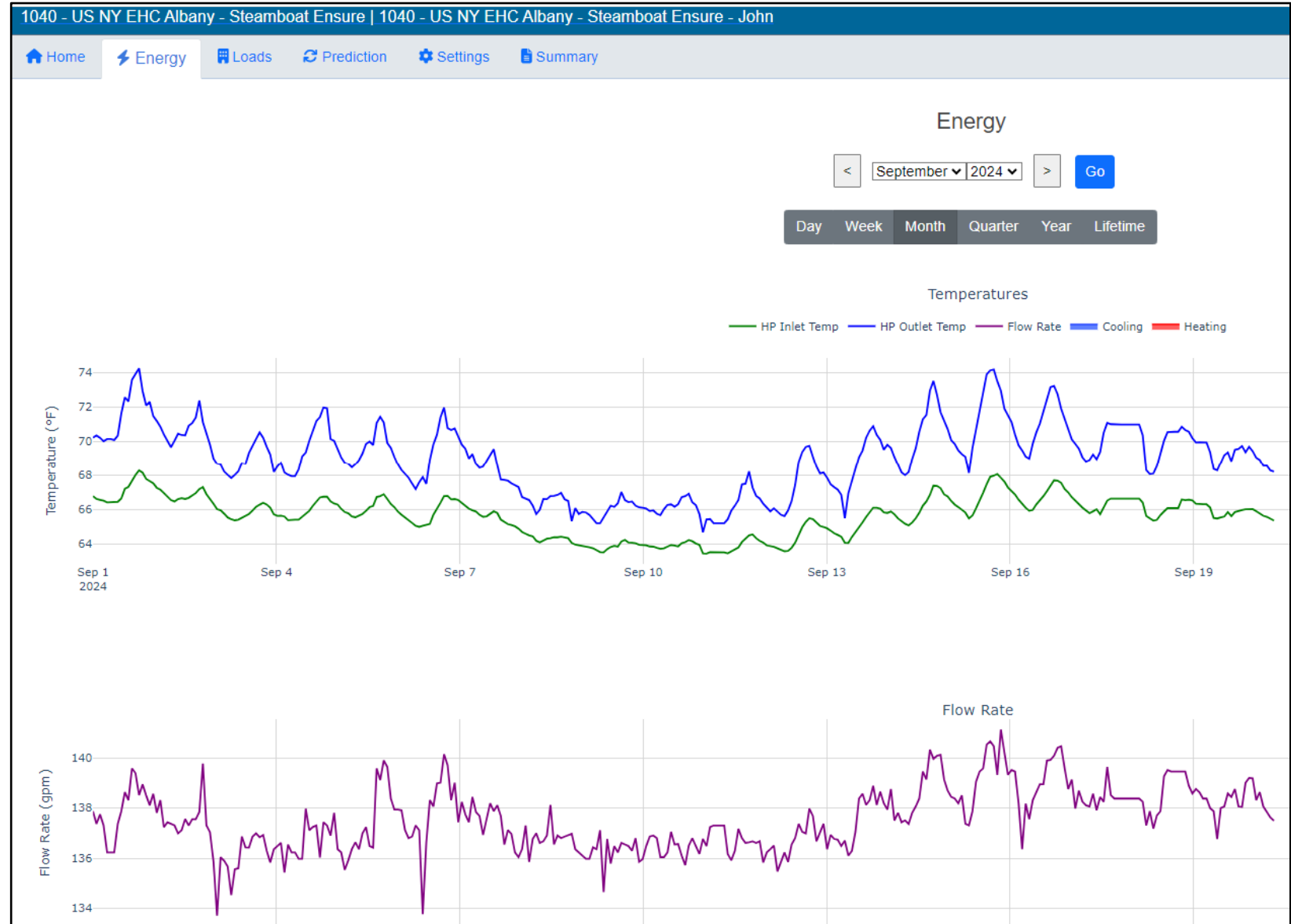
Streamboat Square Revitalization - Phase 1
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Albany Housing Authority

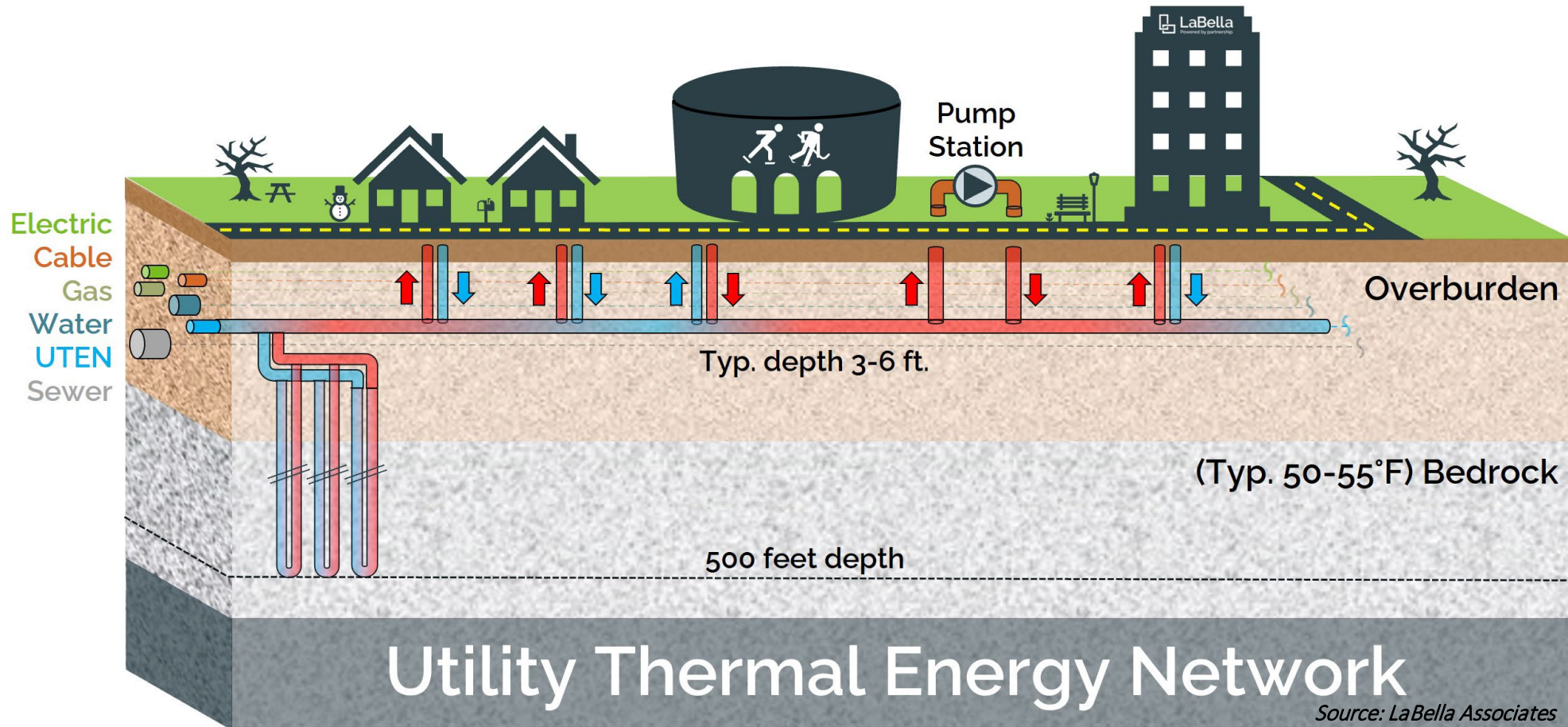
M-502
 VENTILATION & HEAT PUMP RISER DIAGRAMS
 7/26/22
 Construction Documents

GeoFease Loop Monitoring

- **Monitoring Ground Loop Temp and Flow Rate**
- **System compares to original design**
 - **Flags Trends**



Regulated Utilities Engage Networked Geothermal



Thermal Energy Network Basic Components

Source: NYSERDA Community Heat Pump Program

1. Building conversions to heat pumps

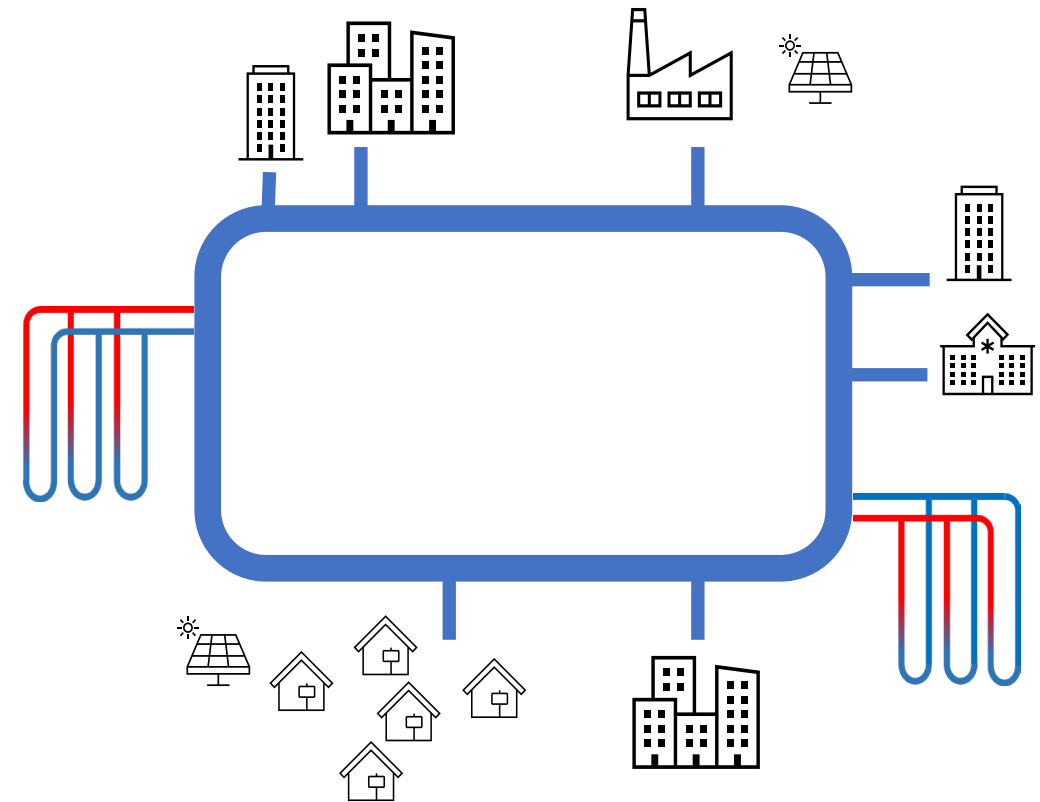
- Located in buildings or central energy plant
- Exchange (extract or reject) thermal energy with the loop

2. Thermal piping network / loop

- Connects multiple buildings to each other and to thermal sources / sinks
- Circulates water or a non-combustible fluid to transfer thermal energy

3. Thermal sources / sinks

- Geothermal boreholes / ground loops
- Surface water: river, lake, pond
- Waste heat: industrial facility, data center, refrigeration
- Wastewater
- Air



4. On-site renewable electric & storage

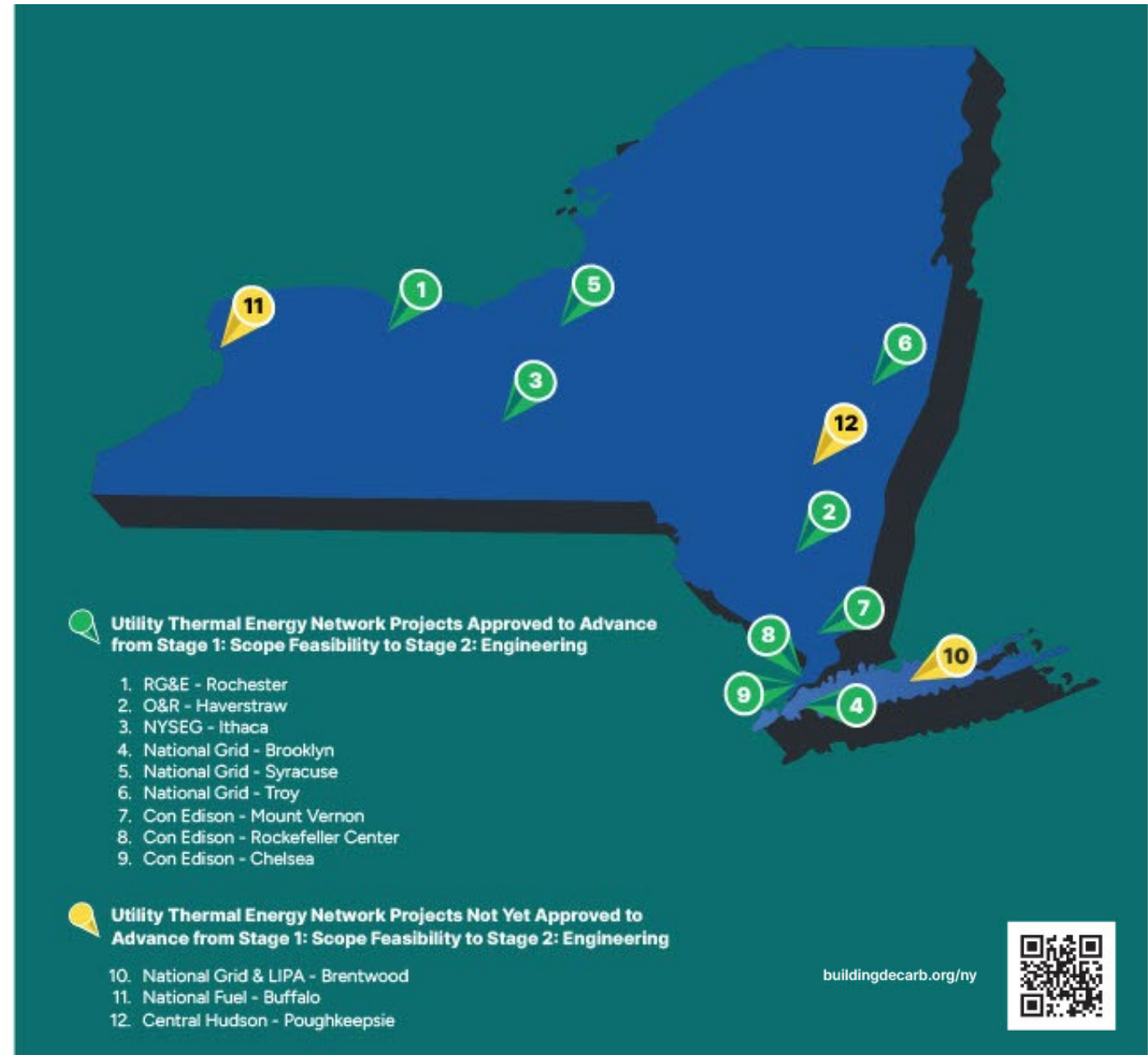
- Solar PV / Wind
- Battery storage

UTEN Pilots to Stage 2

Proposed Pilot Sites – April 2024

1. National Grid & LIPA - Brentwood
2. National Fuel - Buffalo
3. RG&E - Rochester
4. O&R - Haverstraw
5. NYSEG - Ithaca
6. National Grid - Brooklyn
7. National Grid - Syracuse
8. National Grid - Troy
9. Con Edison - Mount Vernon
10. Con Edison - Rockefeller Center
11. Con Edison - Chelsea
12. Central Hudson - Poughkeepsie

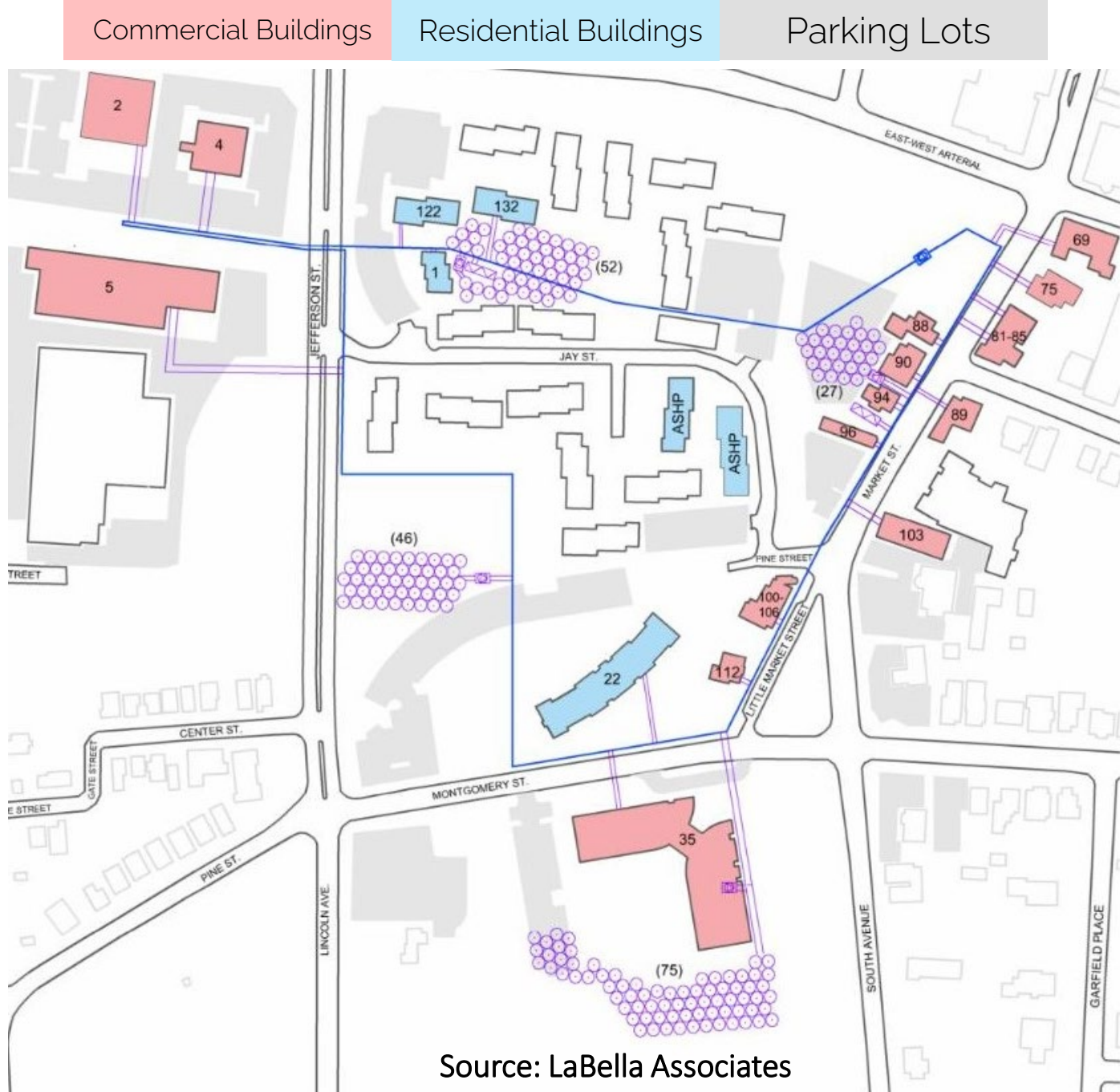
On April 9, 2024, Staff filed letters advancing nine of the twelve remaining UTEN pilot projects to Stage 2, the Pilot Project Engineering Design and Customer Protection Plan, while requiring additional information to ensure feasibility for the three remaining proposed projects.



Central Hudson's Poughkeepsie UTEN Proposed Project

- ❖ 15 commercial buildings
- ❖ 6 residential buildings
- ❖ Peak Load: 623 tons

Estimated Thermal Loads



Source: LaBella Associates

Networked Geothermal Heat Pump Systems / Alternative to Natural Gas

John P. Ciovacco

Eversource – Framingham Networked Geothermal Pilot

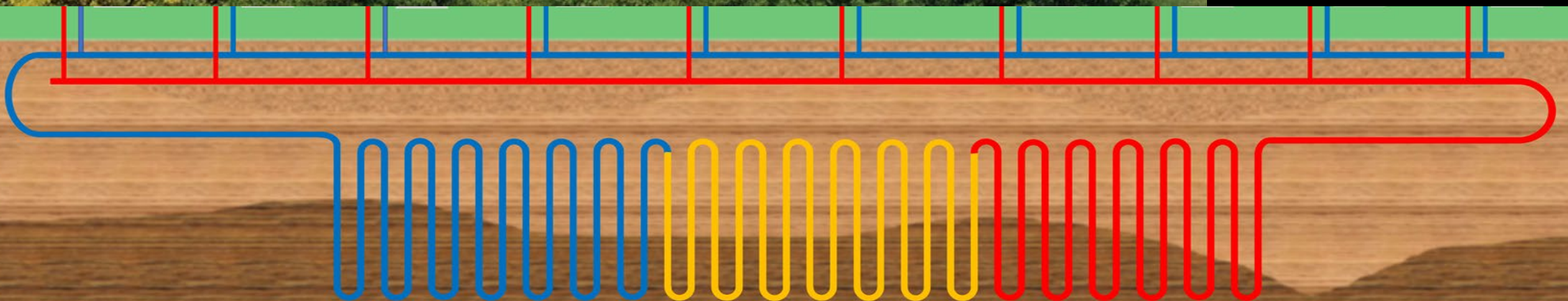
- Project began with rate case in 2020 and site section work starting in 2021
- One pipe system of ~ 1 mile of 8” main
- 37 buildings with 140 individual customers
- 90 boreholes to provide capacity of ~375 tons of load



Source: Eversource Energy
Geothermal Pilot Update
Webinar Oct. 18, 2023

Thank You & Questions?

John Ciovacco
Aztech Geothermal, LLC
(518) 309-2000
jciovacco@aztechgeo.com





DONOVAN GORDON

*Director, Community Thermal
Networks*

NYSERDA



SUE DOUGHERTY

*Program Manager, Community
Thermal Networks*



NYSERDA

Agenda

- Large-Scale Thermal definition
- Program evolution from Community Heat Pump Systems (aka TENs) to Large-Scale Thermal Systems
- PON 4614 multifamily geothermal construction projects
- NYSERDA programs to support geothermal and large-scale thermal

Large-Scale Thermal

Provides heating, cooling, and hot water to a single building or multiple buildings using **heat pumps** and **low-carbon thermal resources**:

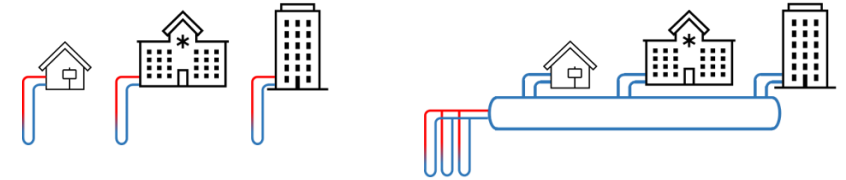
 <p>Geothermal / Ground</p>	 <p>Waste heat</p>	 <p>Surface water</p>
 <p>Wastewater</p>	 <p>Air</p>	 <p>Thermal storage</p>

Min. Conditioned Space

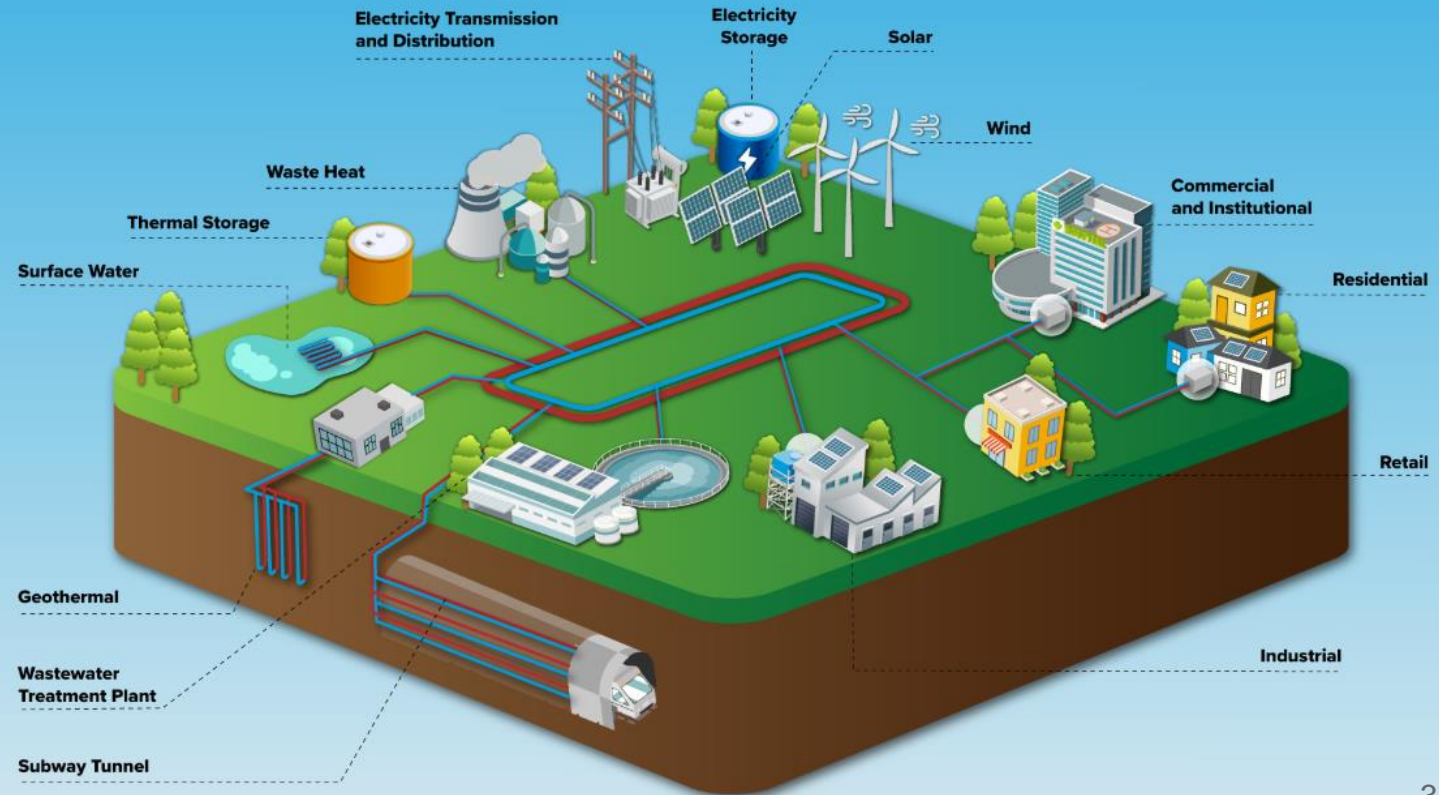
Standalone

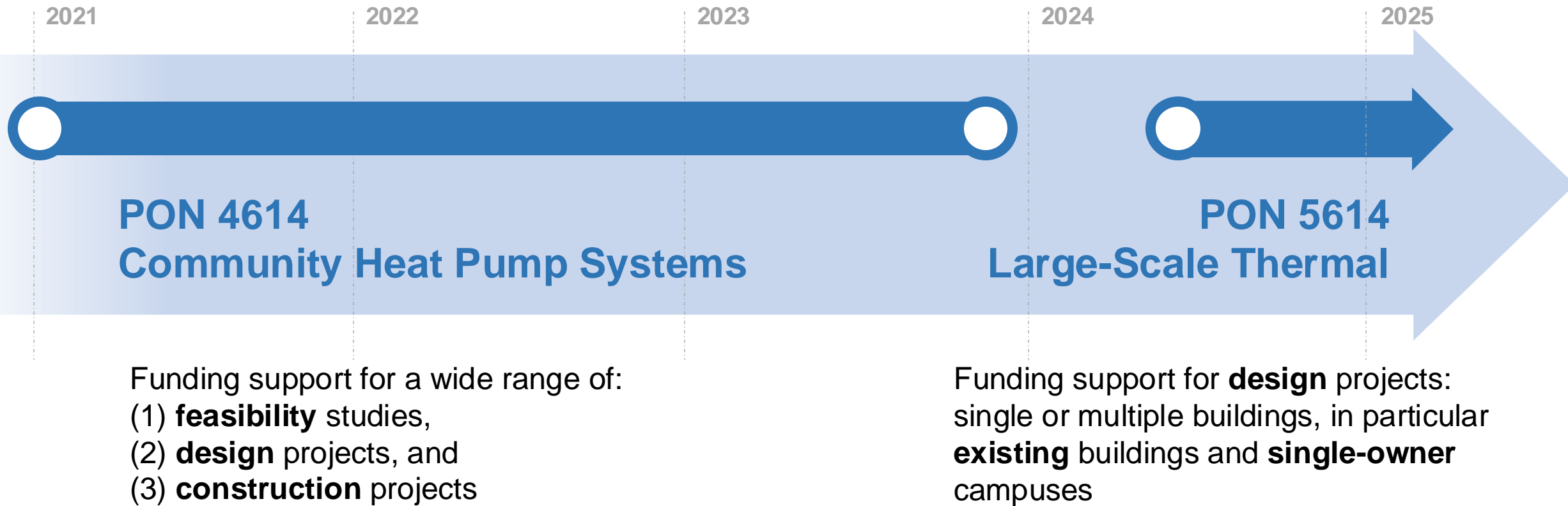
Networked

250,000 SF



150,000 SF





Building a Project Pipeline

PON 4614: Community Heat Pump Systems

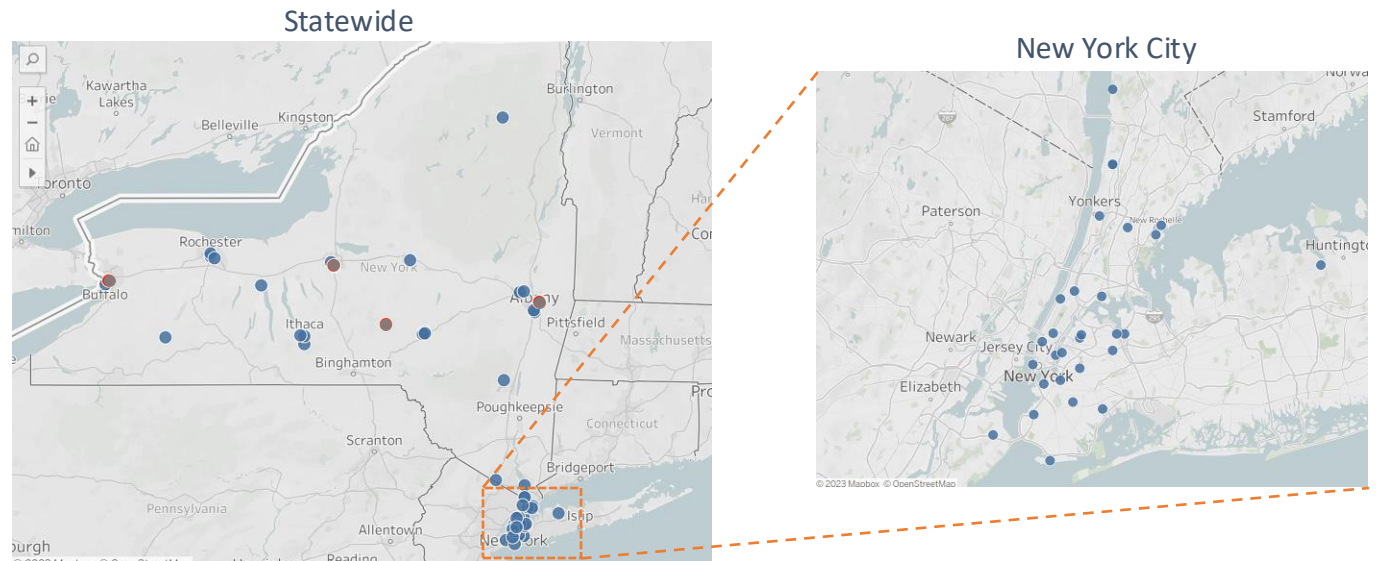
- Pilot program that funded feasibility, design, and construction of Community Heat Pump Systems (aka *Thermal Energy Networks* and *District Energy Systems*)
- 10 funding rounds from Q1 2021 to Q4 2023 (closed)
- Provided funding to 50+ project sites with min. 40,000 SF conditioned space
 - 48 Category A: Feasibility
 - 12 Category B: Design
 - 6 Category C: Construction

>40% of funded projects located in Disadvantaged Communities

>60% of funded projects are single-owner sites

- College/university campuses
- Medical campuses
- Multi-family residential complexes
- Commercial real estate

~33% of total conditioned space in PON 4614 is multi-family in NYC



<https://www.nyscrda.ny.gov/All-Programs/Large-Scale-Thermal/Winners>

1 Java St, Brooklyn

- Five new buildings, including two multifamily towers (37 and 20 stories)
- 557,00 SF conditioned space, residential and retail
- 834 residential units (30% affordable housing*)
- 100% electric buildings
 - Geothermal heating, cooling, hot water
 - 320 500-ft vertical boreholes
- ~\$55M geothermal system cost
 - \$3.9M PON 4614 Category C award
 - Avoids LL97 fines
- Geothermal borefield construction complete, building completion in 2026
- Owned by Lendlease real estate group



*Affordable New York Housing Program

16 Chapel Road, Buffalo

- Six multifamily buildings built in 1920s
 - 48,436 SF conditioned space
 - 60 residential units (affordable housing*)
- Conversion from natural gas furnaces to geothermal
 - Geothermal heating, cooling, hot water
 - 6 500-ft vertical boreholes
 - Additional envelope and efficiency measures to reduce thermal and electric loads
- ~\$2.1M geothermal system cost
 - \$1.07M PON 4614 Category C award
- Geothermal construction starting 2025
- Owned by e2i property manager



*Households with income below 80% Area Median Income

PON 4614 Multifamily Projects

Project	Project Phase	Location	Solution Provider	Project Description	Thermal Resources Evaluated
Spring Creek Towers	Feasibility	Brooklyn	Endurant Energy	Existing CHP for onsite electric and steam heat; affordable MF housing; 50+ buildings, ~7M SF	Wastewater, MTA discharge, geothermal
Innovation Queens	Feasibility	Queens	Endurant Energy	New construction, MF housing, school, office buildings; 12+ buildings, ~3M SF	Geothermal
Amalgamated Housing	Feasibility	Bronx	Egg Geo	Existing MF housing, hospital, grocery store, office, retail; 18 buildings, ~2M SF	Geothermal, waste heat recovery
Penn South	Feasibility	Manhattan	Egg Geo	Existing CHP; MF housing, restaurant, dormitory, lab, mall, classroom buildings; 29 buildings, ~6M SF	Geothermal, ATES, surface water, subway dewatering
Arverne East	Design	Queens	ZBF Geothermal	New construction, MF housing, hotel, restaurant, 14 buildings, ~2M SF	Geothermal

Large-Scale Thermal (PON 5614) Incentives

Funding for replicable large-scale thermal system **design** projects that significantly reduce GHG from heating, cooling, and hot water, primarily in existing buildings.

Single or Multiple Buildings	Minimum Conditioned Space (SF)	Maximum NYSERDA Funding Per Award	Required Proposer Cost-Share
Multiple	250,000	Up to \$500,000 (existing buildings ¹)	50% of total project cost
Single	150,000	Up to \$300,000 (new construction ²)	

- 1. Total conditioned space \leq 50% new construction
- 2. Total conditioned space $>$ 50% new construction

Getting Started with a Feasibility Study

- Site owner works with a solution provider to assist with site energy and decarbonization planning
- Solution provider performs a feasibility study to evaluate electrification options for heating, cooling, and hot water
 - Helps site owner determine the *optimal technical and economic* solution
- NYSERDA's FlexTech program offers cost-share for a study
 - May use a FlexTech solution provider or an independent solution provider

Program Opportunity Notice (PON) 5614 Feasibility Study Requirements

Attachment C

Project Site and Building Characteristics

- Describe the project site and rationale for selecting the buildings and project site.
- Describe how the project fits into the long-range master plan or goals of the project sites' representatives.
- Describe each building, including the building type (residential, commercial, industrial, mixed-use, educational, medical, other); construction type (existing, new, gut rehab); conditioned square footage; annual heating load for space heating, domestic hot water, and process heating (MMBtu); annual cooling load for space cooling and process cooling (MMBtu); existing primary fuel type (natural gas, oil, propane, electricity, other).
- Describe the building thermal efficiencies and how they compare to current codes and standards and plans for upgrades to the building envelopes and HVAC systems to become compatible with the proposed design solution, as applicable.
- Describe the existing thermal production and distribution systems used to serve the existing buildings (e.g., campus centralized natural gas boiler with steam distribution pipes and radiators in each building, individual natural gas furnaces in each building with forced hot air plenums, etc.).
- Describe the relative proximity of buildings to each other and energy density of the buildings connected to the system. Provide a plot plan or aerial image scaling the distances between buildings.
- Provide 8760 hourly loads for each building to be served by the system, as well as the 8760 aggregated loads for the buildings.
- For thermal energy network designs, describe how aggregating the individual buildings achieves a meaningful amount of "load smoothing" and thereby reduces the overall peak size of equipment needed.
- Describe site constraints, including potential challenges with accessing thermal resources or mobilization of construction equipment, including but not limited to rights-of-way to perform drilling, trenching, etc. (as applicable).

System Design

- Describe the engineering design basis.
- Describe the modeling method and software packages used.

NYSERDA Funding Opportunities

FlexTech (PON 4192)

- Supports technical services to perform energy studies and planning
 - Available for geothermal and large-scale thermal feasibility studies
- Open enrollment with minimum 50% proposer cost-share
 - Apply anytime

Large-Scale Thermal (PON 5614)

- \$10M budget
- Support for large-scale thermal design projects
- Competitive solicitation with minimum 50% proposer cost-share
 - Round 2 proposals due January 30, 2025 by 3:00 PM Eastern Time

NYSERDA Funding Opportunities

Buildings of Excellence Early Design Support (RFP 3928-D)

Low Carbon Pathways (PON 4701)

Partnerships w/ HCR and HPD to provide direct incentives for energy efficiency and electrification projects (*details in Appendix*)

BUILDINGS OF EXCELLENCE – EARLY DESIGN SUPPORT (RFP 3928 - D)

BOE Early Design Support Program Objectives:

- Technical support program providing direct funding to design firms
- Increase firm proficiency in carbon neutral design
- Increase the number of firms practicing in the space
- Reduce barriers and soft costs that design firms may face
- Assist in convincing more developers in buildings more climate friendly projects

Early Design Funding RFP offers:

- Open Enrollment Program open through November 15, 2025
- \$1.50/square foot up to a cap of \$150,000 per project
- Support for clean, energy-efficient multifamily buildings through efforts targeting carbon neutrality, architectural design, resiliency, non-energy co-benefits, embodied carbon and GHG reduction, innovations, and scalable economic effectiveness
- Two step application process:
 1. Design Firm Partner Proposal
 2. Carbon Neutral Project Proposals

Contact: vera.voropaeva@nyserda.ny.gov

**[Become an Early Design Support Partner](#)
[or learn more about the program](#)**



The Buildings of Excellence Competition

aims to accelerate the design, development, construction, and operation of carbon neutral multifamily buildings that supports Governor Hochul's two-million climate-friendly homes initiative.



Low Carbon Pathways (PON 4701)

- **Install up to four packages of recommended measures corresponding to major building systems:**
 - Envelope
 - Appliances
 - Heating/cooling electrification
 - DHW full or partial electrification
- **Packages designed to be modular:** Can implement one at a time
- **Providers:** Projects can work with FlexTech Consultant, Multifamily Building Solutions Provider, or Independent Services Provider
- **Incentives & Caps:** Depend on package and order packages installed
 - Not to exceed 50% of total costs of eligible measures per individual project OR
 - Not to exceed 75% for total costs of eligible measures for Affordable Housing OR
 - \$3.0M across corporate parent entity portfolio/parent company (whichever is lower)
- **Eligibility:** Existing Affordable and Market Rate Multifamily Properties
- **Learn More:** Visit [website](#) or reach out to MFLowCarbonPathways@nyserda.ny.gov



Questions?

Community Thermal Network Team
district.thermal@nyserda.ny.gov

Donovan Gordon
donovan.gordon@nyserda.ny.gov

Sue Dougherty
sue.dougherty@nyserda.ny.gov

For more on Large-Scale Thermal:
<http://www.nyserda.ny.gov/All-Programs/Large-Scale-Thermal>
(or scan QR code)



Appendix

Implementation:

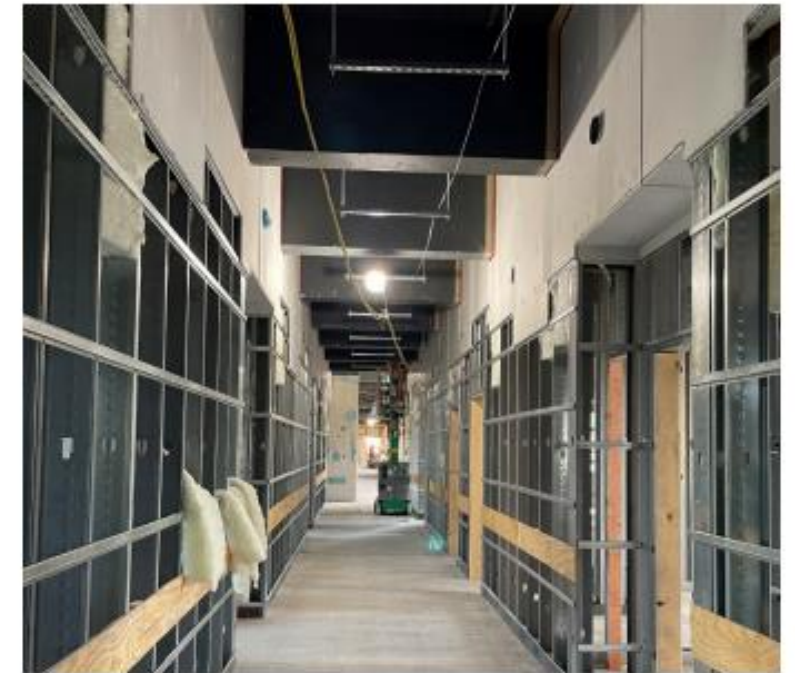
Clean Energy Initiative (CEI) – HCR partnership

- > NYSERDA partnered with NYS Homes and Community Renewal (HCR) to develop a model to **directly include efficiency and/or electrification grants and supplemental capital within HCR's financing processes.**
- > This funding is available to properties applying for and receiving either HTFC/DHCR 9% Low Income Housing Tax Credit (LIHTC) RFP, HFA 4% LIHTC Tax-exempt Bond Financing, or HCR Subsidy Financing.
- > **NYSERDA investment:** \$100M through 2025.
- > **Achievements to date:**
 - HCR in partnership with NYSERDA has awarded \$51.3M to date to carbon neutral ready new construction and adaptive reuse projects and electrification/decarbonization retrofit projects.
 - Includes support for integrated design to reduce project costs and enable scaling.
 - 10 technical assistance providers contracted to build capacity within HCR and assist project teams implementing CEI scopes.

CEI case study

> Tailor Square – Rochester

- Pioneering example of adaptive reuse – urban renewal project that converted a factory to affordable multifamily housing



> \$2.8M in CEI funds

- Building transitioned from central gas and electric systems to utilizing a ground source heat pump system for space and water heating

Upgrades Enabled by CEI		
Building Detail	Original Plans	CEI-enabled Scope
Heating, Cooling, & Domestic Hot Water	Natural Gas Central Boiler	Ground Source Heat Pump*
Building Envelope	Foam insulation only to be added under windows; roof insulation of R-30	Foam insulation on entire exterior wall; roof insulation improved to R-49
Windows	U-value of 0.35	U-value of 0.30
Ventilation	No ERV planned	ERV added to each unit
Renewables	None Planned	Solar to offset on-site energy costs

*Selected scope item as geothermal frees up roof space to take advantage of solar for additional renewable energy.

CEI case study



> Ithaca Housing Authority

- Transformed a 118-unit complex into an all-electric building

> \$1.5M in CEI funds

- Combination of new construction (Northside) and moderate rehab (Southview Gardens and Overlook Terrace)

Northside Building Scope of Work and Building Specifications		
Building Detail	Original Plans	CEI-enabled Scope
Heating and Cooling	Gas furnaces per apartment & split system AC	Ducted <i>electric</i> air-source heat pumps per apartment
Domestic Hot Water	Standard <i>gas</i> hot water system	<i>Electric</i> heat pump hot water heaters
Envelope	R-5 exterior insulation, R-21 foam interior insulation	Addition of double hung highly insulated windows and doors with advanced air sealing
Operating Costs	\$96,144/year	\$93,662/year

Southview and Overlook Buildings Scope of Work and Building Specifications		
Building Detail	Original Plans	CEI-enabled Scope
Heating and Cooling	Ducted <i>gas</i> furnace	Ducted <i>electric</i> air-source heat pumps per apartment*
Domestic Hot Water	<i>Gas</i> instant water heaters	<i>Electric</i> heat pump hot water heaters**
Operating Costs	\$59,542/year	\$58,211/year

*The operation of heat pumps is very different from previous systems tenants and operations staff have encountered. Efficient operation will depend highly on set points, which is why training and educational materials are critical.

**Heat pump hot water heaters generate cold air during operation which must be considered in design.

Resilient, Equitable Decarbonization Initiative (REDi) – HPD partnership

- **NYSERDA partnered** with NYC Housing Preservation & Development (HPD) to also directly include efficiency and/or electrification grants and supplemental capital within HPD’s financing processes.
- **NYSERDA investment:** \$39 million through 2028.
 - Pre-defined scopes and funding for partial & full electrification in common multifamily building types.
 - Technical assistance for affordable housing developers and housing agency staff.
- **Achievements to date:**
 - Launched \$24M electrification retrofit program in Q1 2022.
 - \$12M committed to projects to date, resulting in electrification scopes in ~1,000 units.
 - In Q1 2024, NYSERDA executed a direct funding MOU with HPD, allowing NYSERDA to provide HPD directly with incentive funds and providing an additional \$15M .
 - Due to NYSERDA-funded technical assistance, HPD has issued updated design guidelines for new construction and preservation projects, including electrification & decarbonization scope requirements.

Thank you!
Questions?

THANK YOU FOR TUNING IN

Contact Today's Speakers

Danielle Donnelly, CPC – ddonnelly@communityp.com

Izzy Nesci, CPC - inesci@communityp.com

John Ciovacco, Aztech Geothermal -
jciovacco@aztechgeo.com

Gordon Donovan, NYSERDA –
donovan.gordon@nyserda.ny.gov

Sue Dougherty, NYSERDA –
sue.dougherty@nyserda.ny.gov

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Learn more at [Sustainability - Community Preservation Corporation](#)

