Update:

Clean Thermal Energy Networks

Donovan Gordon

Director of Clean Heating and Cooling

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

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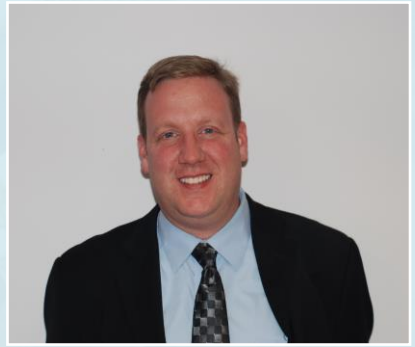
Clean Thermal Energy Networks (CTENs) Update

Donovan Gordon, Director, Clean Heating & Cooling

April 27, 2023 – NY-GEO Conference

NYSERDA Clean Heating and Cooling Team

Donovan Gordon
Director



Scott Smith
Program Manager

Sue Dougherty
Senior Project Manager

Marilyn Moore
Project Manager

Andrew Piper
Project Manager

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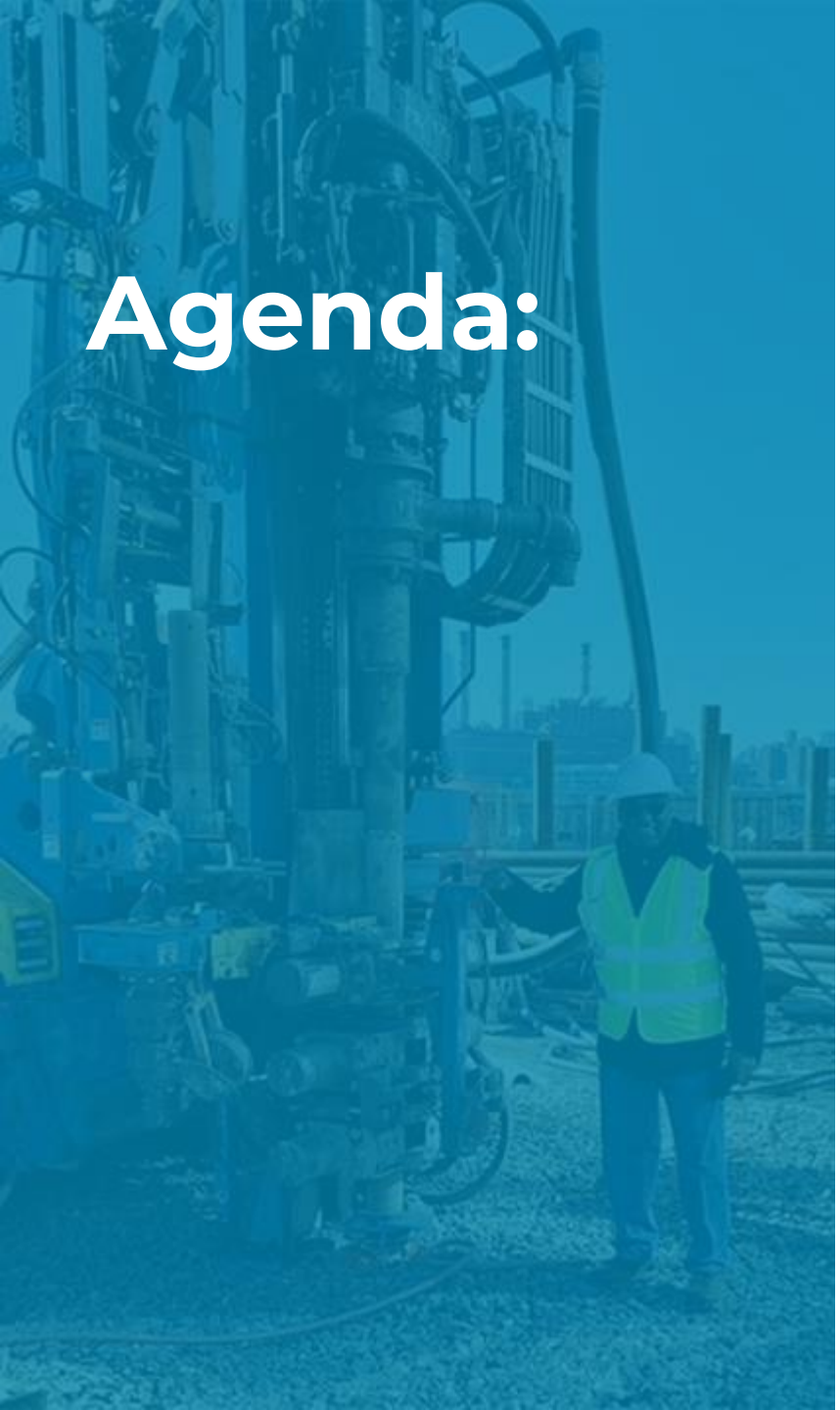
Project Manager

Desmond Volmar
Intern

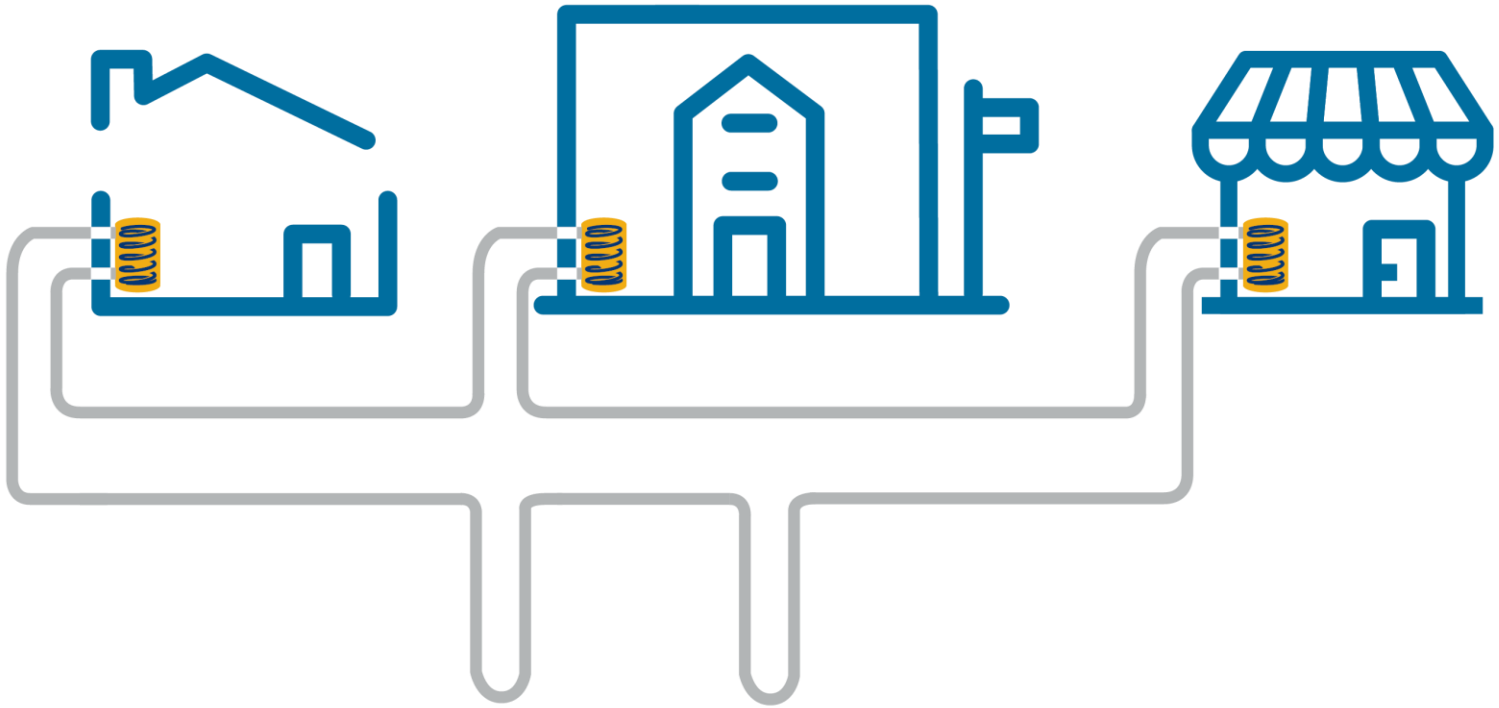


Agenda:

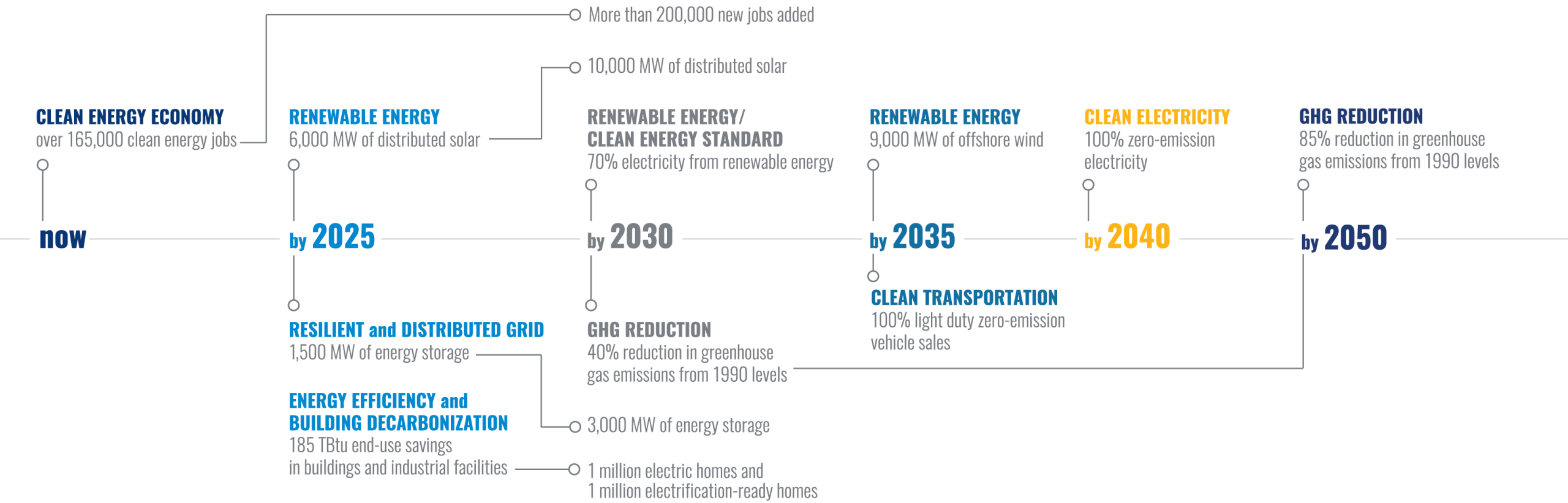
NYS Clean Energy Goals

Clean Thermal Energy Networks Update

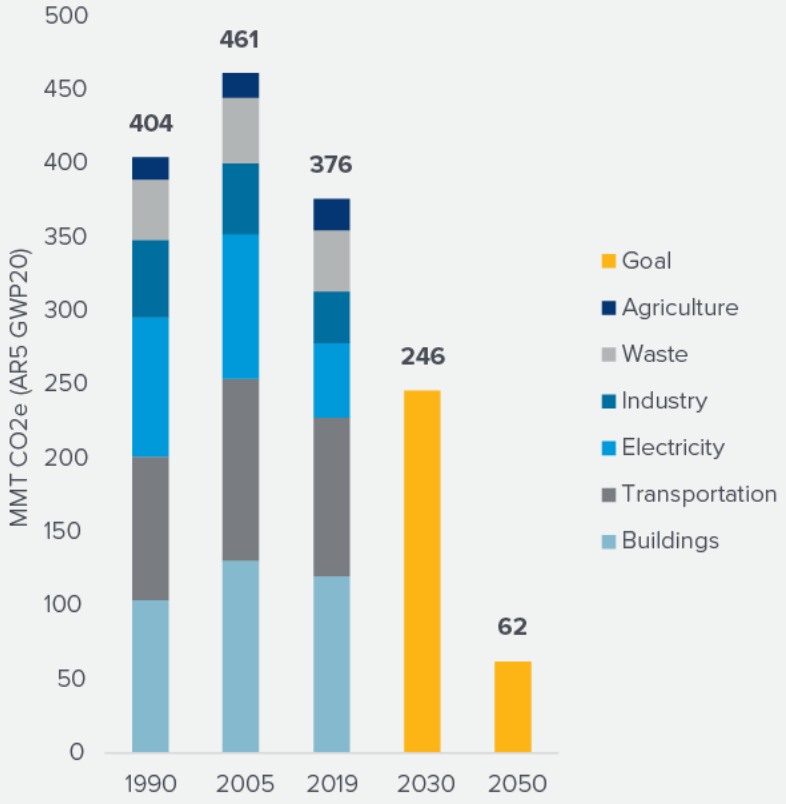
Looking Ahead



New York State Clean Energy Goals



GHG Emissions Reductions



2050 target:
85% reduction
from 1990 emissions baseline

NYSERDA's Role

> Support implementation of the CAC Scoping Plan policies and recommendations

> Guide and facilitate the State Energy Plan

> Identify and implement economy-wide GHG reduction strategies

> Support development and tracking of statewide greenhouse gas inventory

> Facilitate State agencies' efforts to lead by example

Energy Efficiency and Building Decarbonization

2025 target:
185 TBtu
of onsite energy savings*

ENERGY EFFICIENCY ACTIVITIES TOTAL SITE TBTU SAVINGS BY 2025 (CUMULATIVE ANNUAL, 2015–2025)

NYSERDA's Role

> Develop policy and strategic leadership
> Advance codes and standards
> Eliminate barriers
> Provide financing
> Support market and technology innovation

Future of Buildings

> **Carbon Neutral Buildings Roadmap (released)**
> **2023 releases:**
  - **Building Electrification Roadmap**
  - **Two Million Climate Friendly Homes Action Plan**

Clean Thermal Energy Network (CTEN)

Community Heat Pump Systems Pilot Program

PON 4614

Thermal Energy Networks

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

Heat pumps

> Located in buildings or central energy plant

> Exchange (extract or reject) thermal energy with the loop

Sources / sinks

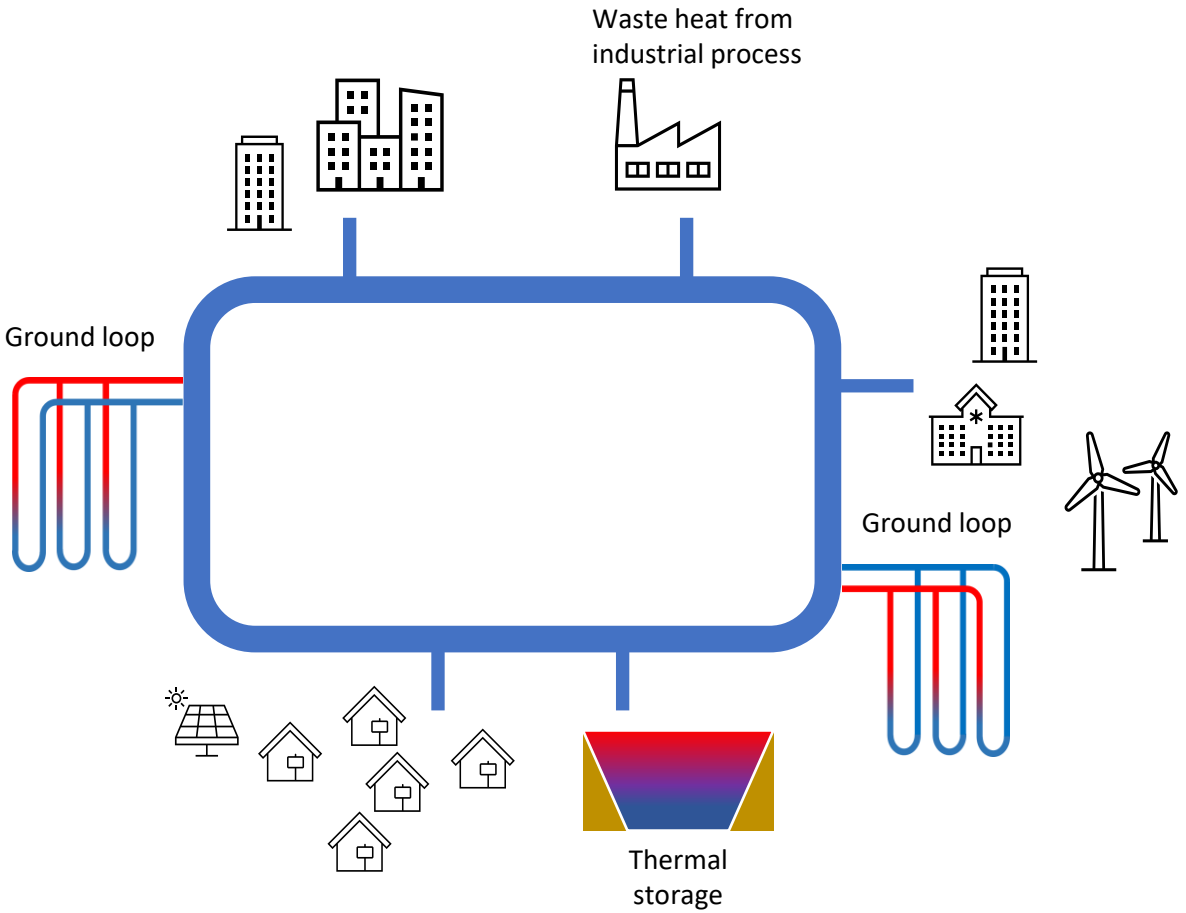
> Geothermal boreholes / ground loops

> Surface water: river, lake, pond

> Waste heat: industrial facility, data center, refrigeration

> Wastewater

> Air



PON 4614 Project Characteristics

PON 4614 launched in Q1 2021, 8 funding rounds to-date

>53 project sites awarded (some contracts still pending)

- **48 Category A:** Feasibility (4 contracts pending)
- **6 Category B:** Design (2 contracts pending)
- **3 Category C:** Construction (1 contract pending)

Category D projects: municipal charrettes, ATES study, market opportunities study, "project champions" guidebook

Sites cover >2,200 buildings, ~100M SF conditioned space

50% upstate, 50% downstate

>50% include Low- to Moderate-Income residential buildings and/or located in a Disadvantaged Community

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

40% new construction or gut-rehab

Project Site	Round	Category	Feasibility	Design	Construction
Children's Village	1,5	A,B			
City of Syracuse	1	A			
City of Troy	1	A			
City of Utica	1	A			
Community Center in Buffalo	1	A			
Eastern Emerald	1	A			
Innovation Queens	1	A			
Masonic Community New Rochelle	1	A			
Phelps Hospital	1	A			
Pratt Institute	1	A			
Pratt Landing	1	A			
Silo City	1	A			
Syracuse University	1	A			
The Peninsula	1	A			
University of Rochester	1	A			
Wagner College	1	A			
Willets Point	2	A			
SUNY Oswego	3	A			
Sheridan Hollow	3	A			
Coney Island	1	C			
1 Java Street	3,5	B,C			
Watchtower Bible &Tract Society	3	B			
Urban Villages	4	B			
[NYSERDA Contract Pending]	7	B			

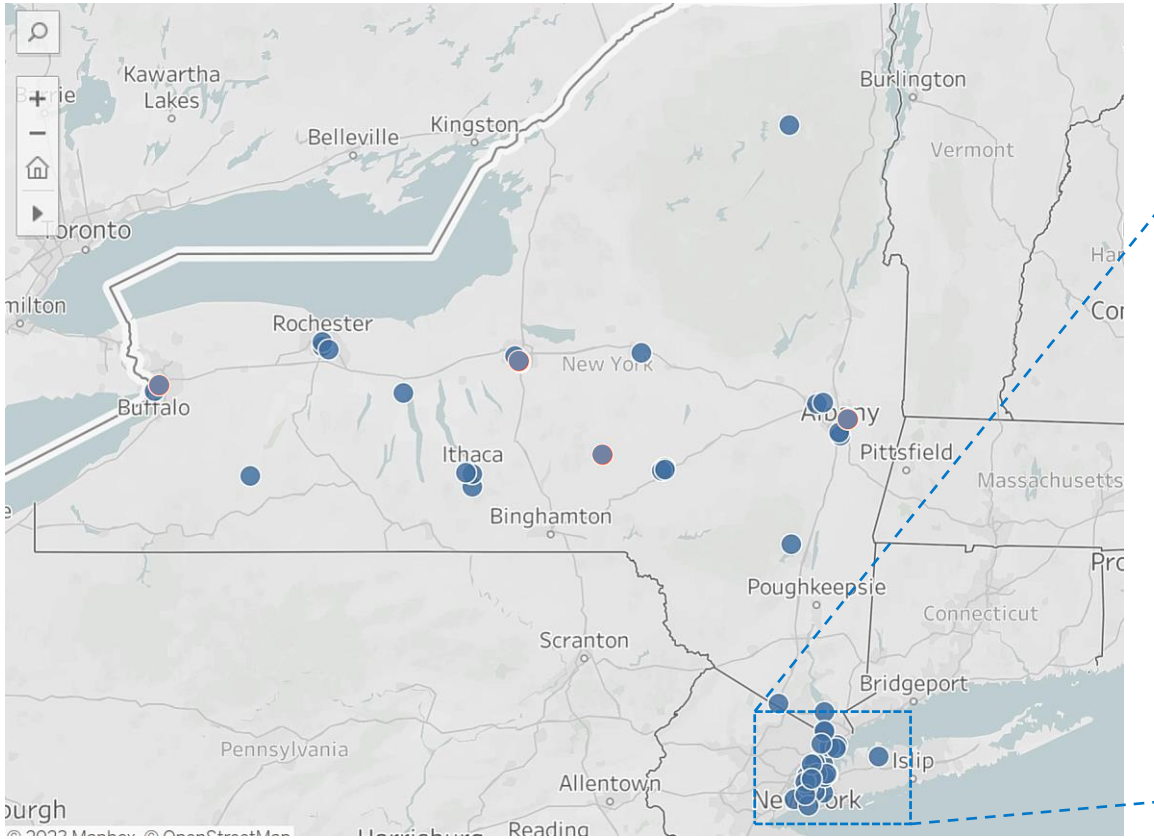
Project Site	Round	Category	Feasibility	Design	Construction
Barnard College	1	A			
City of Oneonta	1	A			
Gowanus Green	1	A			
Rockefeller Center	1	A			
Spring Creek Towers	1	A			
Oneonta Railyards	2	A			
Rochester Coop	2	A			
SUNY Oneonta	2	A			
Brookfield Place	4	A			
Houghton College	4	A			
Ithaca Southside	4	A			
Southeast Albany	4	A			
Ravenswood	5	A			
White Hawk Ecovillage	5	A			
Amalgamated Housing Corporation	6	A			
Cold Spring Harbor Laboratory	6	A			
Cornell AgriTech	6	A			
FROG District at EcoVillage Ithaca	6	A			
LeFrak City	6	A			
Mount Vernon	6	A			
New 15 Ward	6	A			
Penn South	6	A			
Saranac Lake	7	A			
Union College	7	A			
Woodstock	7	A			
[NYSERDA Contract Pending]	5	A			
[NYSERDA Contract Pending]	6	A			
[NYSERDA Contract Pending]	7	A			
[NYSERDA Contract Pending]	7	A			

Legend:

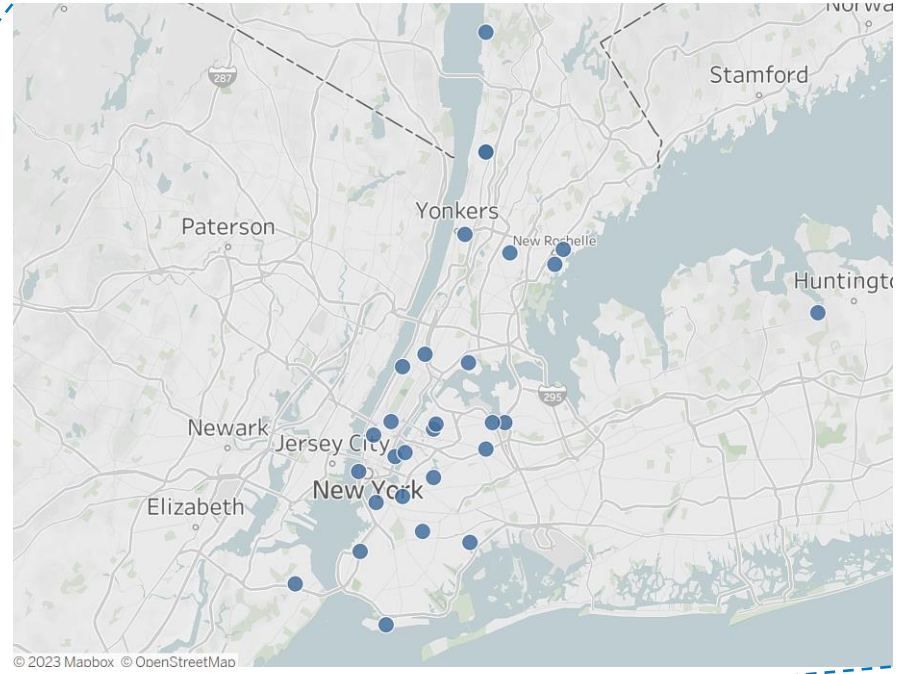
Status	Fill Pattern
Not Started	
In Progress	
Complete	

PON 4614 Project Locations

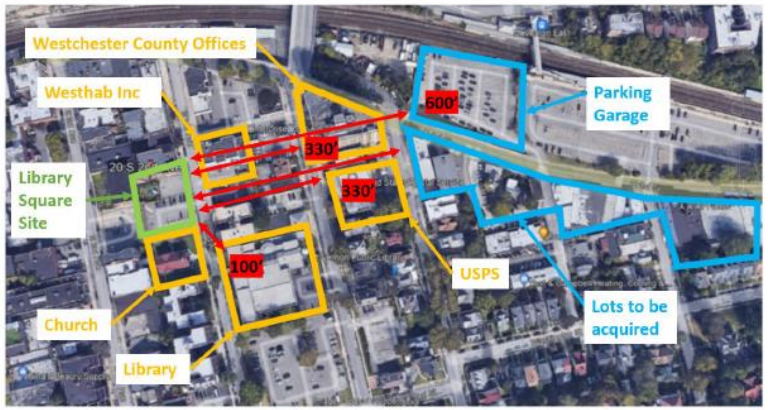
Statewide



New York City



PON 4614 Project Details



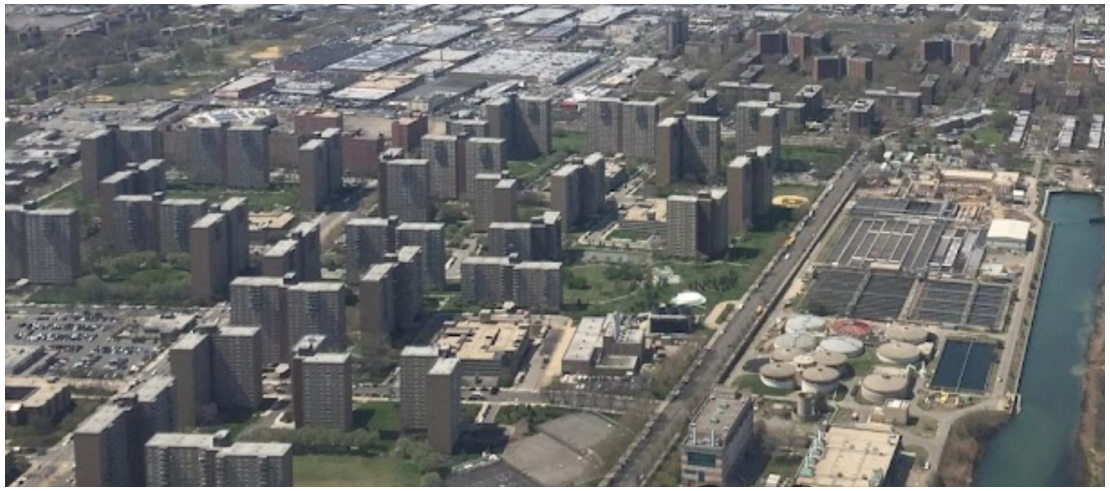
Mount Vernon (Feasibility)

> Joint venture between Westchester County, MWBE, energy provider, and building owners

> 625,300 square feet new construction and retrofit

> Commercial buildings and affordable housing in a DAC

> Studying ambient loop system using sewage heat exchange and ground source



Spring Creek Towers (Feasibility)

> Single-owner, retrofit in Brooklyn

> 46 towers, ~6 million square feet of LMI housing in a DAC

> Existing CHP plant with steam heat

> Studying conversion to water source heat pumps using MTA discharge water

PON 4614 Project Details

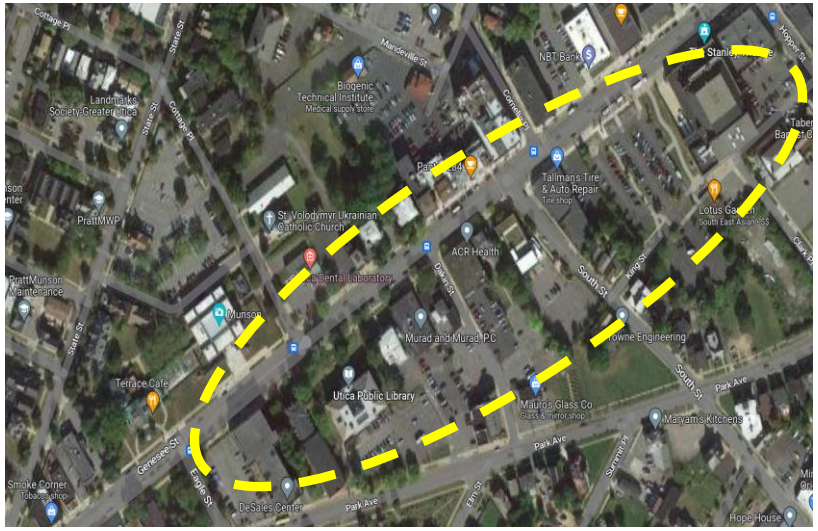
Saranac Lake (Feasibility)

> Multi-owner, retrofit in North Country

> 85 buildings, 920,000 square feet of residential, commercial, municipal, educational buildings

> No natural gas access, delivered fuels and electric heat

> Studying conversion to municipally-owned TEN with ground source, surface water, wastewater



City of Utica (Feasibility)

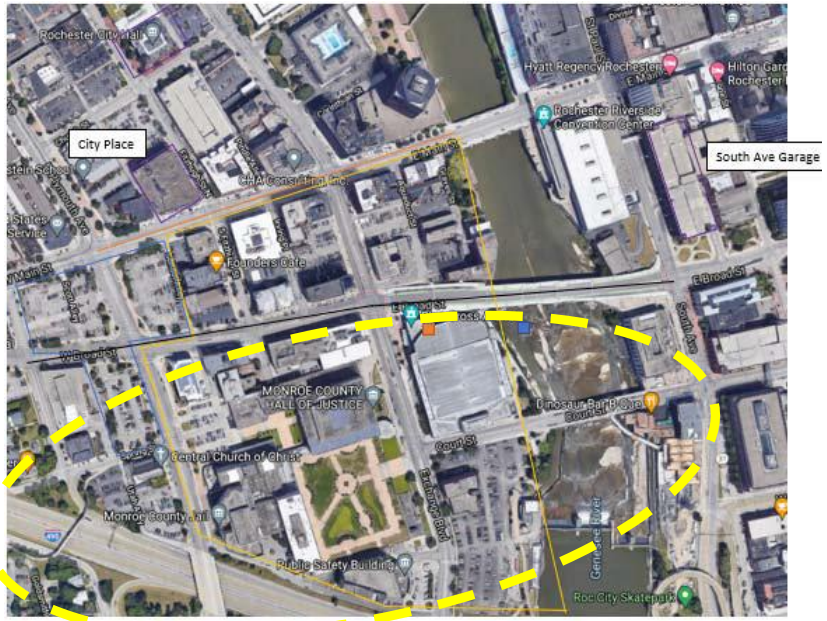
> Potential city-owned system located in downtown Utica, a DAC

> Energy infrastructure improvements to be coordinated with other city managed rehabilitation

> 8 buildings, 235,000 square feet including historic theatre, library, primary school, and commercial buildings

> Studying integration of geothermal, solar thermal, and long-term pit thermal storage

PON 4614 Project Details

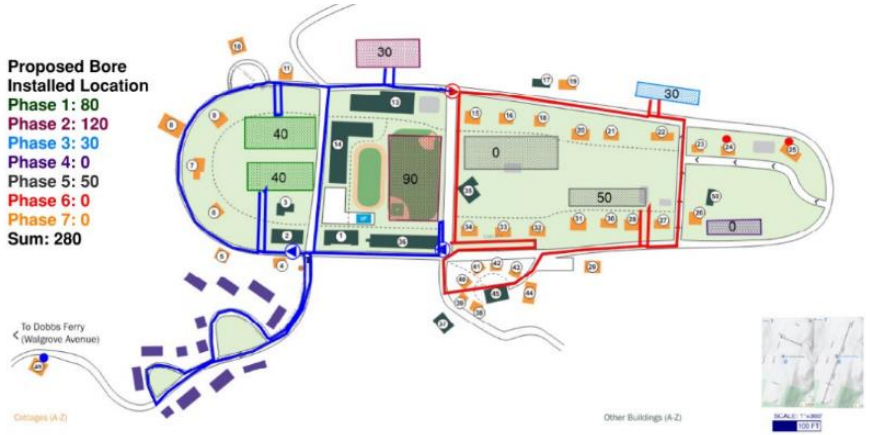


Rochester District Heating Cooperative (Feasibility)

> Currently using steam heat

> 5+ million square feet government and non-government owned building in a DAC

> Studying ambient loop system using ground source and sewer heat thermal resources



Children's Village (Design)

> Single-owner, non-profit organization dedicated to helping youth (6 to 20 years) receive education and economic support

> 60+ buildings, ~450,000 square feet of residential, academic, and recreational facilities using fuel oil

> Multi-phase approach using ambient loop system with distributed borefields

PON 4614 Project Details

Union College (Feasibility)

> Participant in NYSERDA's Clean Green Campuses (REV Campus Challenge), goal to reduce energy use intensity 50% by 2030

> ~150 buildings, 1.2+ million square feet

> Studying potential connection to nearby fire station, commercial buildings, and residences in adjacent DAC

Sheridan Hollow (Feasibility)

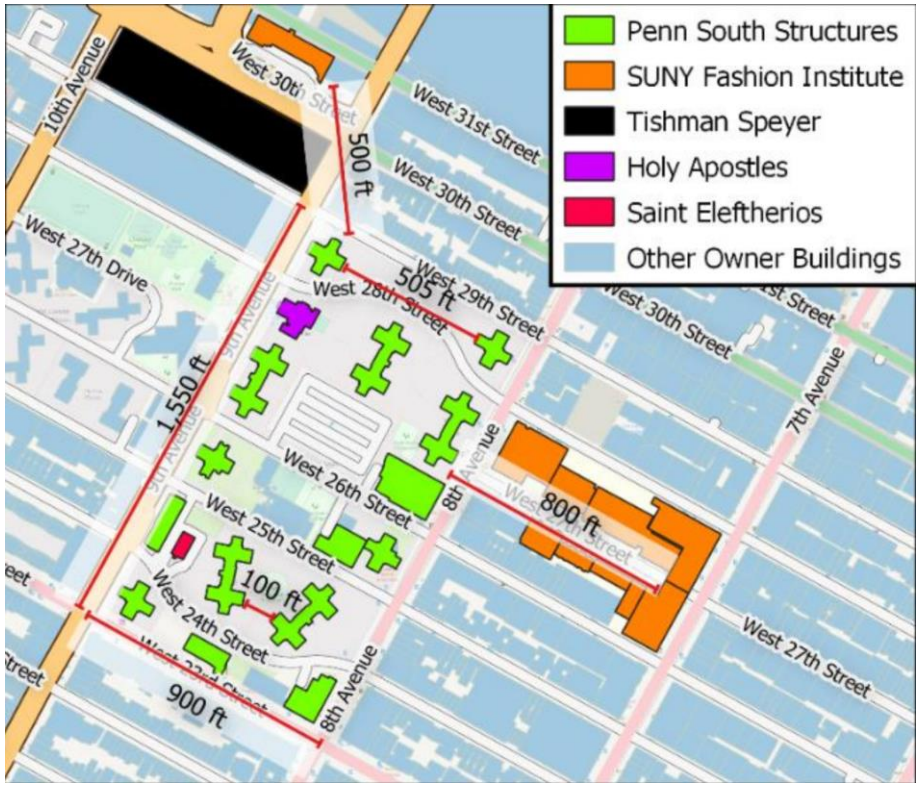
> Historic mixed-use neighborhood in City of Albany, located in a DAC

> 109 buildings, 448,000 square feet with single and multi-family residential

> Studying modular approach to networked geothermal across 4 city blocks, using parking lots and vacant areas for ground loops

> Initial phase will avoid repairs of natural gas system

PON 4614 Project Details



Penn South (Feasibility)

> Single-owner, limited-equity cooperative in DAC with affordable housing

> 29 buildings, 6+ million square feet of residential and commercial space

> Studying ground source, MTA dewatering, and sewage heat transfer

Observations

- New construction and campus-based projects are lowest hanging fruit
  - Easier to achieve buy-in from single entity
  - Eliminates need for crossing rights of way
- Electrification considerations that affect project feasibility
  - Capital costs related to building upgrades (HVAC and envelope)
  - On-site electrical capacity
  - Available footprint for boreholes and/or energy plant or access to clean thermal resource
  - Most NYC buildings are heated with steam
- Range of business/ownership models being pursued
- Most common thermal resources studied include geothermal and wastewater
- Shallow (500 ft) geothermal is the predominant thermal resource
  - NYS Dept of Environmental Conservation Division of Mineral Resources regulates wells deeper than 500 ft
    - >500 ft requires permit fee and financial security for well plugging and abandonment
- Optimal system design is site specific
  - Feasibility studies evaluate centralized and decentralized approaches using lifecycle cost analyses
  - Crowded rights of way affect piping/design configuration and feasibility of distribution piping
  - Limited land space in dense urban areas → geothermal boreholes under building for new construction
  - Availability of land space and in-building space affect location and size of heat pumps and thermal storage
- Low availability of drillers and drilling rigs in New York

Looking Ahead

Thermal Energy Networks in New York State

NYS Climate Action Council Scoping Plan

> Approved on 12/19/2022

> Framework for NYS to reduce GHG and ensure equitable clean energy transition

> **Chapter 12. Buildings: Strategy B6. Support Development of Thermal Energy Networks**

- Prioritize public sector support for thermal energy networks that serve LMI housing and buildings in Disadvantaged Communities
- Support public-private partnerships for geothermal and thermal energy network financing and development
- Streamline access to public and utility rights of way as well as heat sources/sinks
- Workforce training for gas sector workers to operate thermal energy networks
- Develop appropriate regulations and permit fees for geothermal wells greater than 500 feet

> **Chapter 18. Gas System Transition (18.1 Overview)**

Utility Thermal Energy Networks and Jobs Act

> Signed into NYS law on 7/5/2022

> To promote development of thermal energy networks and provide jobs to transitioning utility workers

- Allows utilities to own and operate thermal energy networks, as well as acquire and distribute thermal energy, with Public Service Commission (PSC) oversight
- Directs the PSC to develop a regulatory structure and oversee the launch of utility pilot projects

"One scenario that should be considered is seeking to move whole streets or neighborhoods at a time from gas infrastructure to a community-based thermal energy network that supports heat pumps"

CTEN and GSHP Market Development

Marketing, Outreach, and Education

- Continue publishing PON 4614 project reports on NYSERDA website
- Developing CTEN project case studies
- Marketing emails, social media spotlights
- Outreach to triaged list of campus opportunities (colleges, hospitals, multifamily, etc)
  - Emphasis on outreach to affordable housing, LMI, and DACs
- Education and planning resources for municipalities
  - Charrettes for municipal leaders to learn, plan, develop CTENs
  - Coordination with NY Conference of Mayors, NY Association of Counties, NY Association of Towns
- Developing guidebook for “project champions”
- Planning stakeholder meeting in Fall 2023 on financing
  - Share findings of financing structures and business models study
  - Matchmaking between project sites and financiers
- Education and training for CTEN and GSHP solution providers

CTEN and GSHP Market Development

Internal and External Coordination / Collaboration

> Internal NYSERDA coordination

- Financing strategies
- Energy and Climate Equity
- Policies, codes, standards
- Continue integration of geothermal and CTEN solutions with other programs

> Inter-agency coordination

- Financing strategies
- Drilling regulations
- TEN regulations
- Publicly operated infrastructure and thermal resources (wastewater heat recovery, etc)
- Support development of geothermal and CTENs in communities, DACs, affordable housing, institutions/campuses

> Strategic partnerships

- DOE: Low-cost financing for DAC projects
- NY-GEO
- IDEA
- IGSHPA
- IAPMO, CSA: Codes, standards

Additional Focus Areas

> NY-GEO Consortium Support

- Multi-year contract to help grow NY-GEO's revenue and sustainably serve the industry

> Driller roundtables

> Supply chain

> Workforce Development

> Thermal energy storage

Additional Resources

NYSERDA's Community Heat Pump Systems website

https://www.nyserda.ny.gov/All-Programs/Community-Heat-Pump-Systems

> PON 4614 project factsheets

> PON 4614 final project reports

> TEN market opportunity study

> Additional planning resources

NYSERDA/ASHRAE Community Heat Pumps Systems webinar series

https://www.ashrae.org/professional-development/chp-webinars/ashrae-nyserda-community-heat-pump-systems-webinar-series