

The Business Council, NYSERDA, and National Grid Webinar Series:

Building Electrification and Clean Heating and Cooling: **Business Strategies for a Carbon Constrained Economy**

Donovan Gordon – Director of Clean Heating and Cooling, NYSERDA

Jennifer Cross – Senior Program Manager, National Grid

Venetia Lannon – Vice President, Matrix New World Energy



**The
Business
Council**



NYSERDA

nationalgrid

February 27, 2020

Donovan Gordon

Director, Clean Heating & Cooling

NYSERDA

New York State Clean Energy Agenda in Alignment

- > Heat Pump Technologies – how they work
- > Legislation, Policy, and Regulations
- > Programs
- > Next Steps

Heat Pump Technologies

Heat Pumps

- > Move heat rather than generate heat, heat pumps can provide equivalent space conditioning at as little as one quarter of the cost of operating conventional heating or cooling appliances

Geothermal (ground-source or water-source) Heat Pumps (GSHP)

- > Achieve higher efficiencies by transferring heat between your house and the ground or a nearby water source

Air Source Heat Pumps (ASHP)

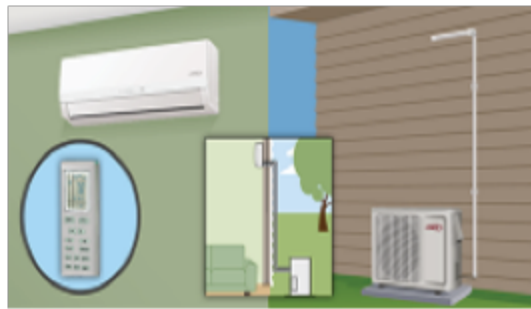
- > Transfer heat between your house and the outside air

Clean Heating & Cooling Technologies

Air Source Heat Pumps



Central Ducted



Ductless Mini-Split

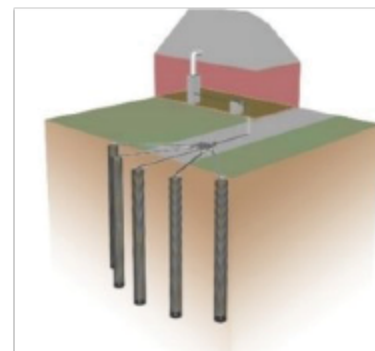


Heat Pump Water Heater

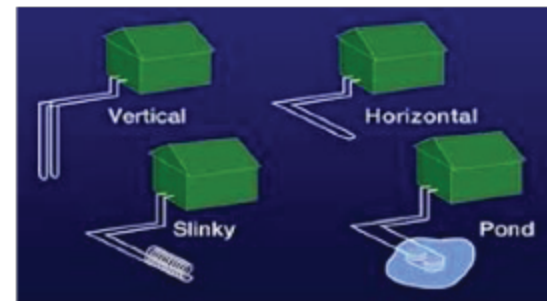


Variable Refrigerant Flow (VRF)

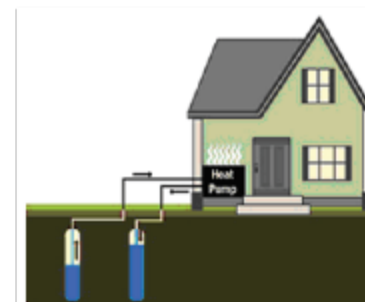
Ground/Water Source Heat Pump Systems



Direct Exchange



Closed-Loop Geothermal Systems



Open Loop System

Legislation

Climate Leadership and Community Protection Act (CLCPA)

- > Established to adopt measures that put New York on a path to reduce statewide greenhouse gas emissions by 80% by 2050 and net zero emissions in all sectors of the economy
- > By exercising a global leadership role on greenhouse gas mitigation and climate change adaptation, New York will position its economy, technology centers, financial institutions, and businesses to benefit from national and international efforts to address climate change
- > Develop measures to achieve reductions in energy use in existing residential or commercial buildings, including beneficial electrification of water and space heating in buildings, establishing appliance efficiency standards, strengthening building energy codes, requiring annual building energy benchmarking, and disclosing energy efficiency in home sales

New York City Local Law #97

- > The most ambitious in the world to tackle emissions from existing buildings and impacts over 57,000 buildings over 25,000 square feet across the city (59% residential and 41% commercial) with the goal of reducing building-based emissions 40% by 2030 from a 2005 baseline
- > Sets increasingly stringent limits on carbon emissions per square foot in 2024 and 2030

Policy

Order Authorizing Utility Energy Efficiency and Building Electrification Portfolios Through 2025 (Issued on January 16, 2020)

- > The Order transfers responsibility for heat pump targets and incentives to the utilities effective April 1, 2020
- > Budget of \$454M and a target of 3.6 TBtu's in energy savings through 2025
- > NYSERDA will focus on and support market enablement activities (budget TBD)
- > Including but not limited to:
 - Workforce development
 - Consumer education and awareness
 - Low- to moderate-income consumers
 - Supply chain development
 - Clean Thermal District Systems

Appendix C - Table C1

2020-2025 Heat Pump Budgets and Targets (Gross MMBtu)

	2020	2021	2022	2023	2024	2025	2020-2025 Total
--	------	------	------	------	------	------	-----------------

Central Hudson

Base Budget	\$ 3,354,852	\$ 5,559,173	\$ 7,049,949	\$ 8,265,836	\$ 9,186,504	\$ 9,804,997	\$ 43,221,312
Base Target	17,728	30,183	38,850	48,190	56,479	63,863	255,292

Con Edison

Base Budget	\$18,037,338	\$29,128,534	\$35,884,450	\$42,823,631	\$48,526,394	\$ 52,915,488	\$ 227,315,834
Base Target	72,921	119,716	151,334	186,941	219,927	249,162	1,000,000

Niagara Mohawk

Base Budget	\$ 6,983,416	\$11,891,672	\$14,789,044	\$16,424,789	\$17,190,980	\$ 17,118,933	\$ 84,398,834
Base Target	71,239	132,010	172,203	210,694	245,889	280,647	1,112,681

NYSEG

Base Budget	\$ 6,204,522	\$10,605,014	\$13,173,160	\$14,628,326	\$15,300,267	\$ 15,219,288	\$ 75,130,577
Base Target	63,614	117,911	153,328	187,944	219,558	250,383	992,737

O&R

Base Budget	\$ 1,236,326	\$ 1,973,311	\$ 2,397,539	\$ 2,828,131	\$ 3,164,633	\$ 3,403,947	\$ 15,003,888
Base Target	6,440	10,421	13,027	16,109	18,912	21,748	86,657

RG&E

Base Budget	\$ 747,986	\$ 1,278,915	\$ 1,611,466	\$ 1,799,548	\$ 1,900,472	\$ 1,909,389	\$ 9,247,775
Base Target	7,541	14,206	18,304	22,468	26,422	30,282	119,223

Total Heat Pumps

Base Budget	\$36,564,440	\$60,436,619	\$74,905,608	\$86,770,261	\$95,269,250	\$100,372,042	\$ 454,318,220
Base Target	239,482	424,448	547,045	672,345	787,186	896,085	3,566,590

Next Steps

- > Joint Utilities and NYSERDA file the New Efficiency: New York Implementation Plan to DPS on 3/16/2020 for approval to roll out the new incentive programs on 4/1/2020
- > NYSERDA submits Investment Plans for the Market Enablement Plans to DPS on 3/16/2020 for approval to start developing programs on 4/1/2020
- > Continued engagement with stakeholders

Jennifer Cross

Senior Program Manager

National Grid

Expanding Heat Pumps 2020 and Beyond

- > New Efficiency New York
- > Who is Eligible
- > How Heat Pumps Contribute
- > How Heat Pumps Work
- > Environmental and System Benefits
- > Market Eligibility
- > Customer Economics
- > How to Get a Rebate

New Efficiency New York

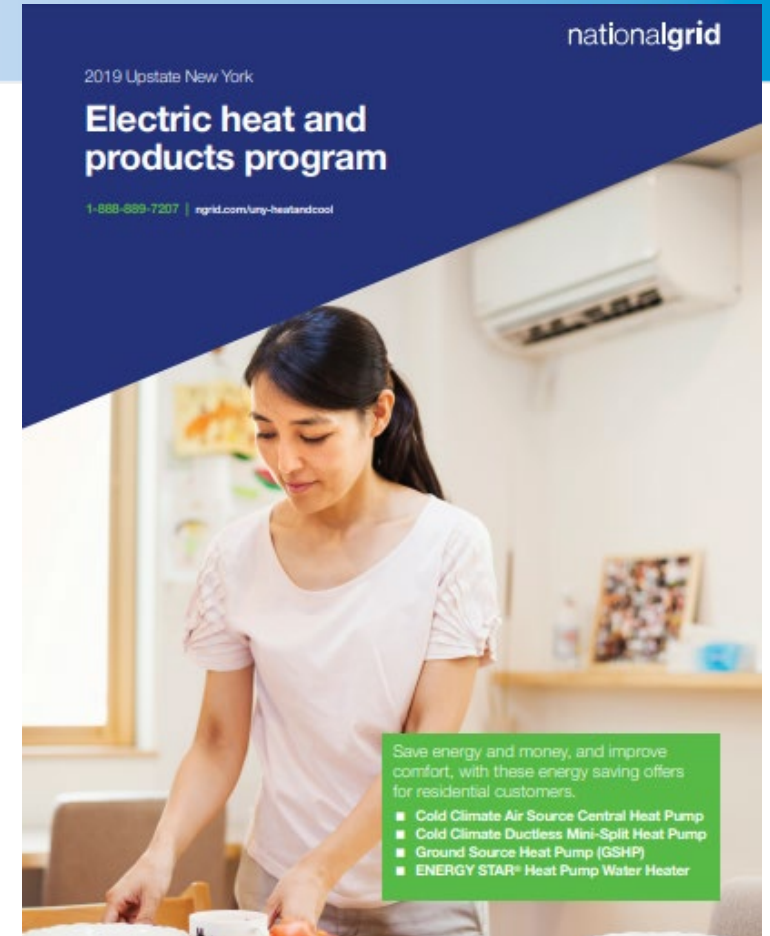
- > The Order has directed the Joint Utilities to adopt a minimum 3.6 TBtu savings target through 2025
- > Approximate costs are \$454 million
- > Targets and budgets will be subject to a 2022 review and may be revised upward at that time

2020–2025 Heat Pump Budgets and Targets (Gross MMBtu)

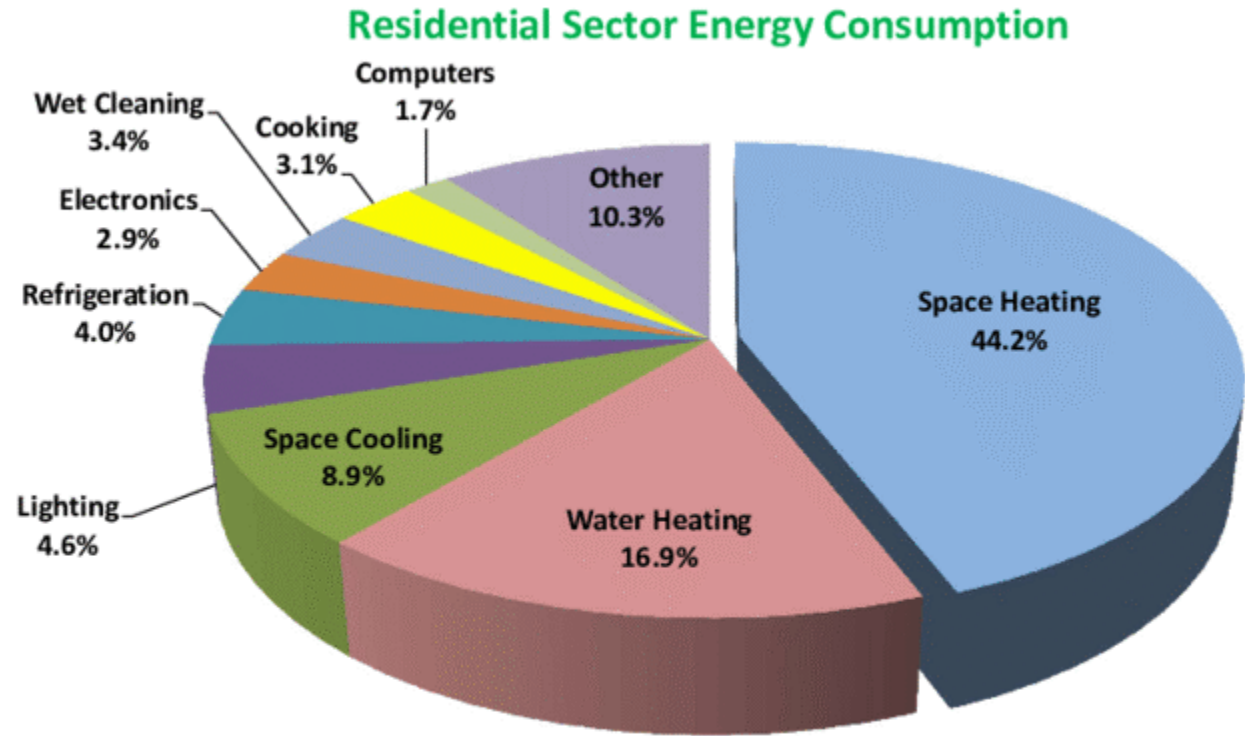
	2020	20201	2022	2023	2024	2025	Total
Base Budget	\$6,983,416	\$11,891,672	\$14,789,044	\$16,424,789	\$17,190,980	\$17,118,933	\$84,398,834
Base Target	71,239	132,010	172,203	210,694	245,889	280,647	1,112,681

Who is Eligible?

- > Prescriptive approaches will be used for residential and small commercial Heat Pump applications
- > Custom savings approaches will be used for large commercial and large multifamily applications
- > All customer sectors, regardless of existing heating fuel, will be eligible
- > Existing buildings and new construction will be eligible



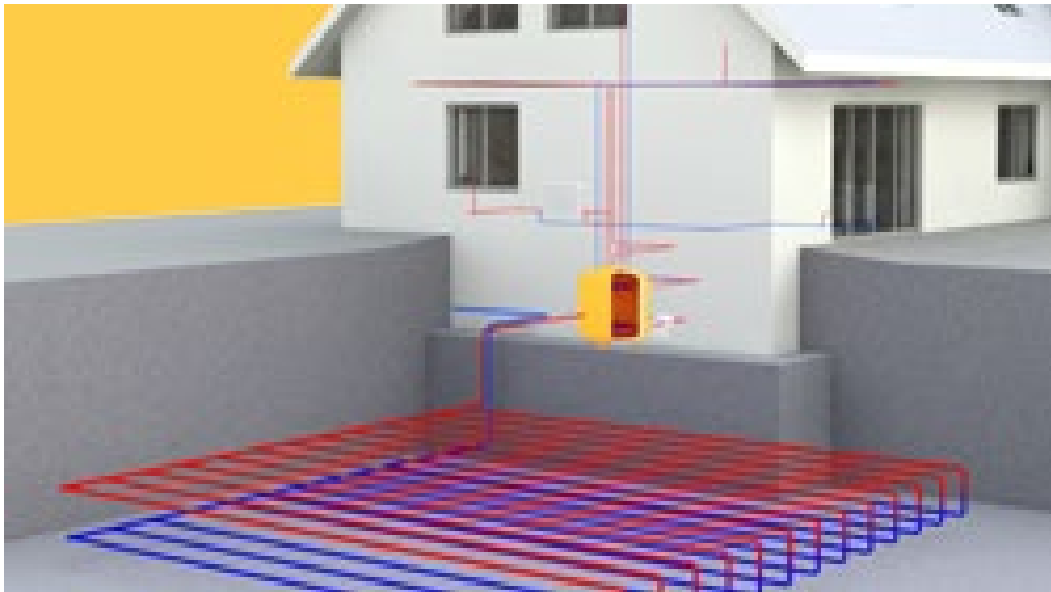
How Heat Pumps Contribute



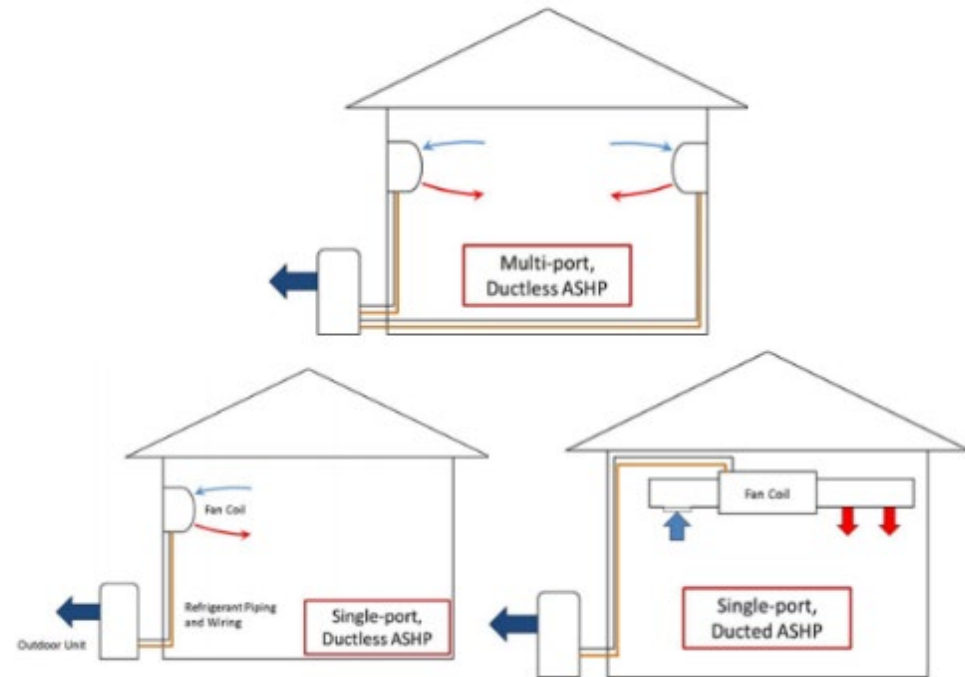
2015 Residential Energy End-Use Splits

Heat Pump Options

Ground Source (geothermal)



Air Source Heat Pumps



Source: 3 nysenrda.ny.gov/ny/sun-pumpe

Source: 4 Northeast/Mid-Atlantic Air-Source Heat Pump Market Strategies Report, NEEP, January 2014. Schematic of several air source heat pump configurations

Heat Pump Benefits

Environmental & System

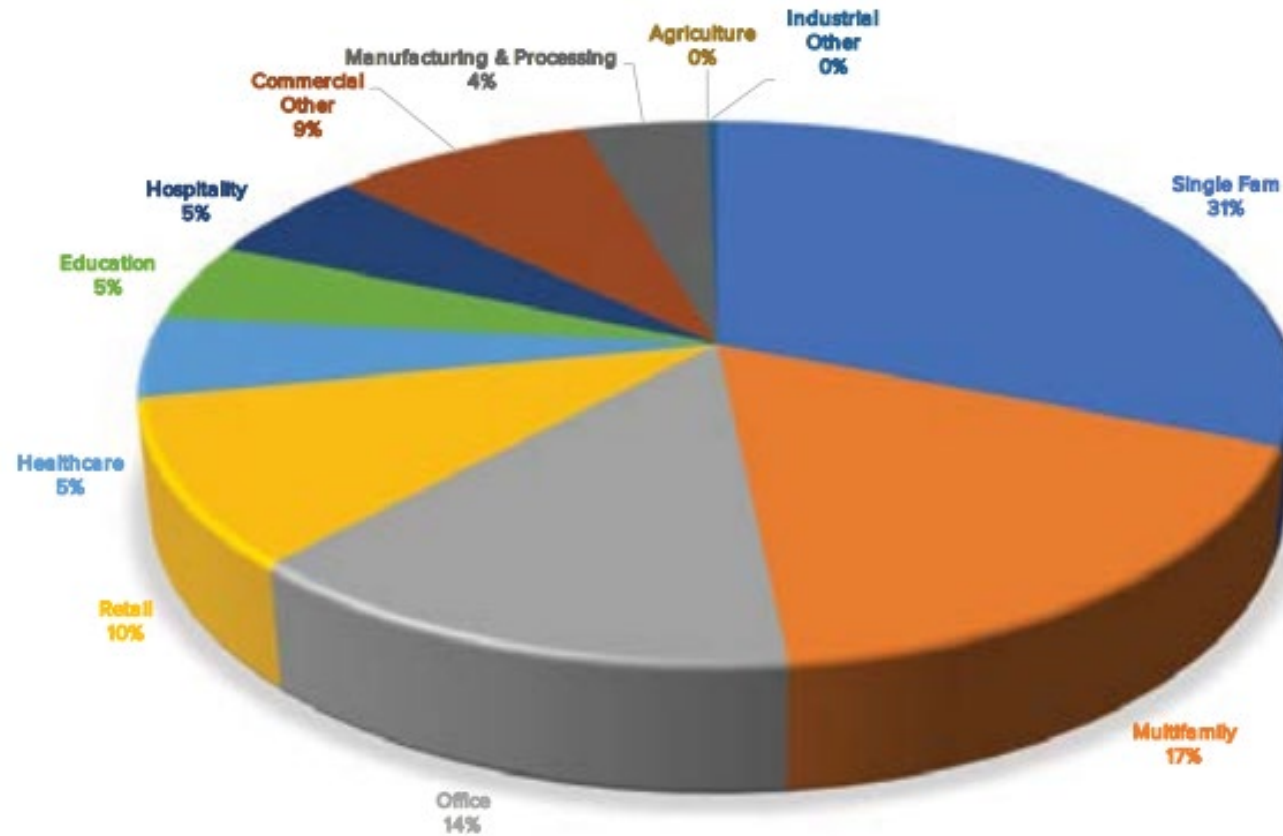
- > Heat pumps create meaningful improvements in overall efficiency and reduce carbon emissions
- > Additionally, as the State addresses customer heating needs in natural gas supply-constrained areas, electrification can be a viable alternative
- > Heat pumps are smart options that can replace both heating and cooling equipment by being warmer, cooler, comfier, easier, cleaner, healthier and safer

The **WARMER, COOLER, SMARTER, CLEANER** way to heat and cool.

Source: 1 Order Authorizing Utility Energy Efficiency and Building Electrification Portfolios through 2025

Source: 5 nationalgridus.com/upstate-ny-home/energy-saving-programs/heating-your-home

Market Eligibility



Source: 6 Energy Efficiency Achievable Savings Potential by Market Vertical – NYSERDA analysis based on the Energy Efficiency and Renewable Energy Potential Study of New York State

Customer Economics

Oil ~ \$1,900
per heating season
(100 DTH heat load per year = 725
gallons oil X \$2.65/gallon)



Typical Replacement Cost:
\$8,000

Savings ~ \$925
per heating season

Savings ~ \$600
per heating season



Geothermal ~ \$975
per heating season
(100 DTH heat load per year
= 6,500 kWh * \$0.15 /kWh)
Typical Cost: **\$35K**



Air-Source ~ \$1300
per heating season
(100 DTH heat load per year
= 8,700 kWh * \$0.15 /kWh)
Typical Cost: **\$18K**

How to Get a Rebate

- > Select a participating contractor
- > Heat Pumps must be installed by a participating contractor to be eligible for a rebate
- > All current NYSERDA participating contractors will be grandfathered into the Program
- > Obtain rebate applications at ngrid.com/uny-heatandcool



Venetia Lannon

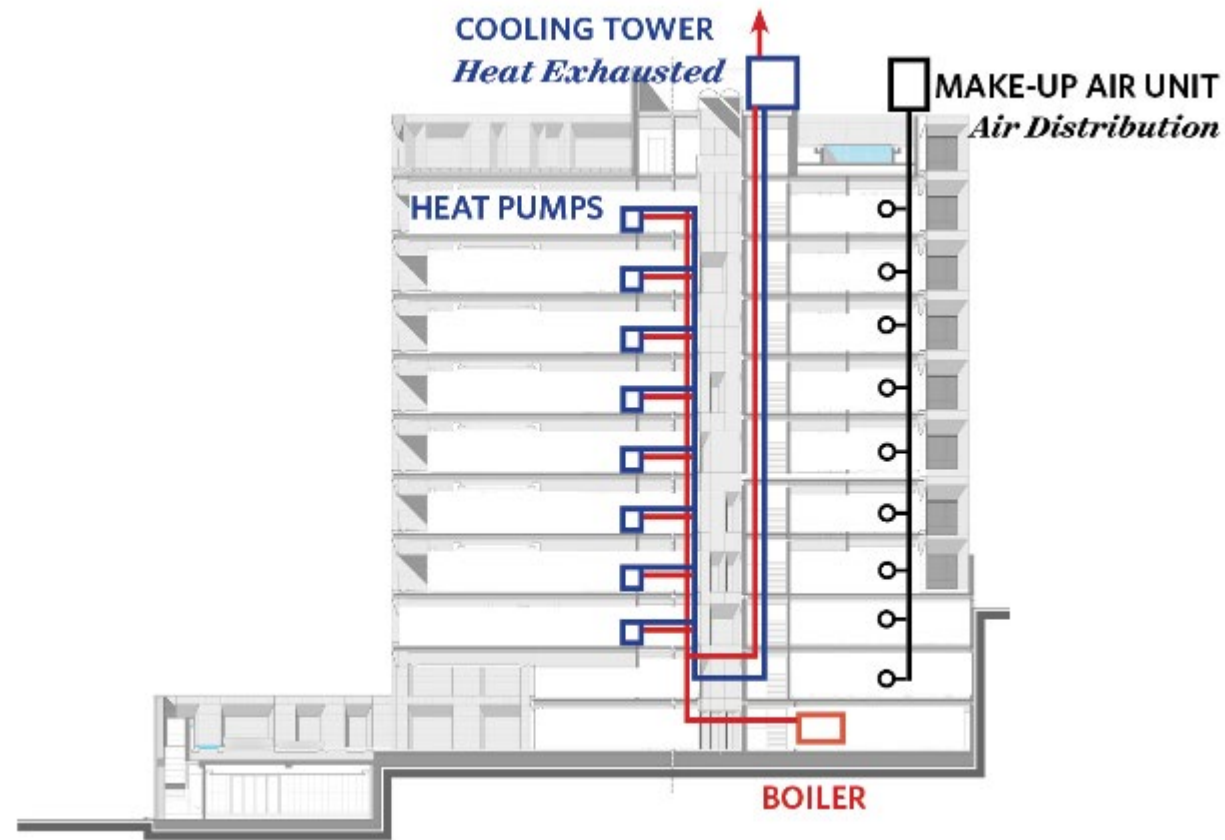
Vice President

Matrix New World Engineering

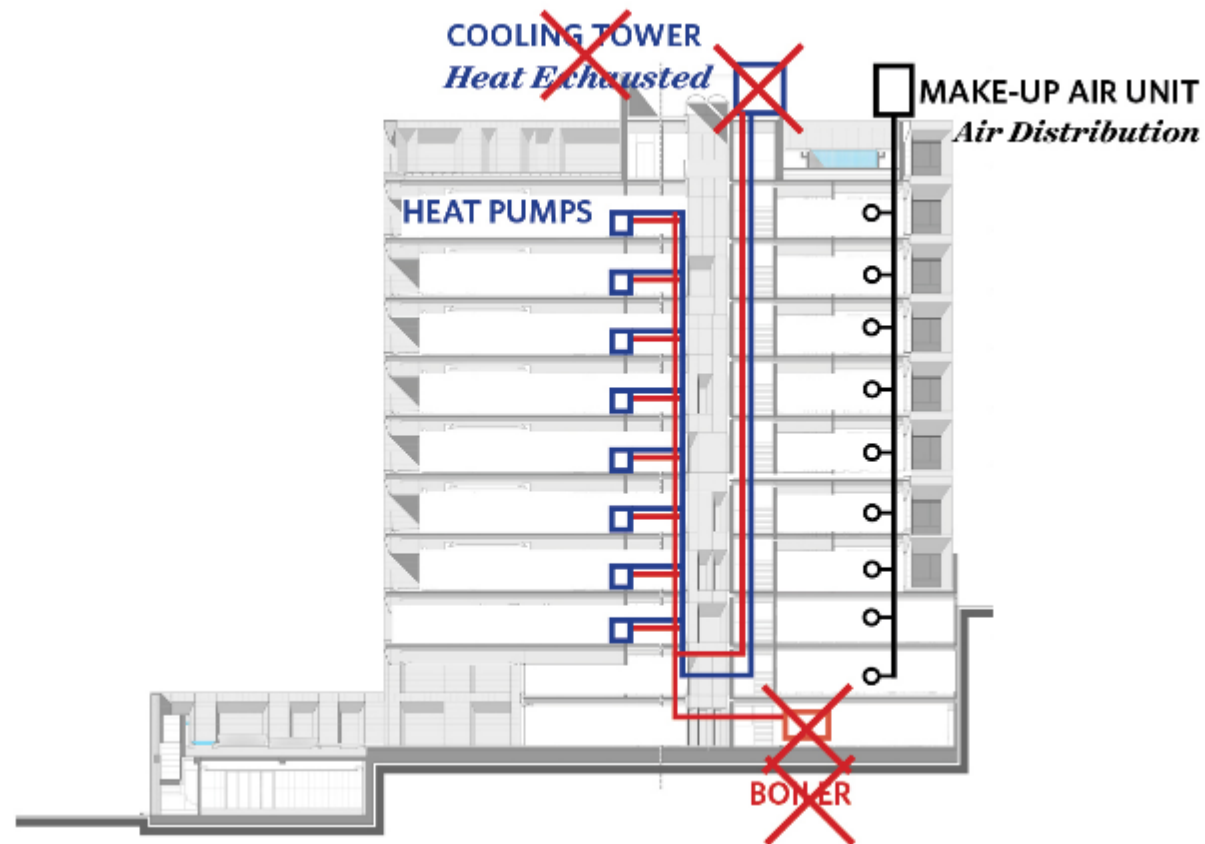
Geothermal Energy as a Replacement for Natural Gas in Multifamily Developments

- > Geothermal Energy vs. Natural Gas in Multifamily Buildings
- > Cost Savings
- > Success Stories: Examples from NYS and Beyond
- > Our Team: Matrix New World and Buffalo Geothermal
- > Appendix: GHG Comparison for Heating Buildings

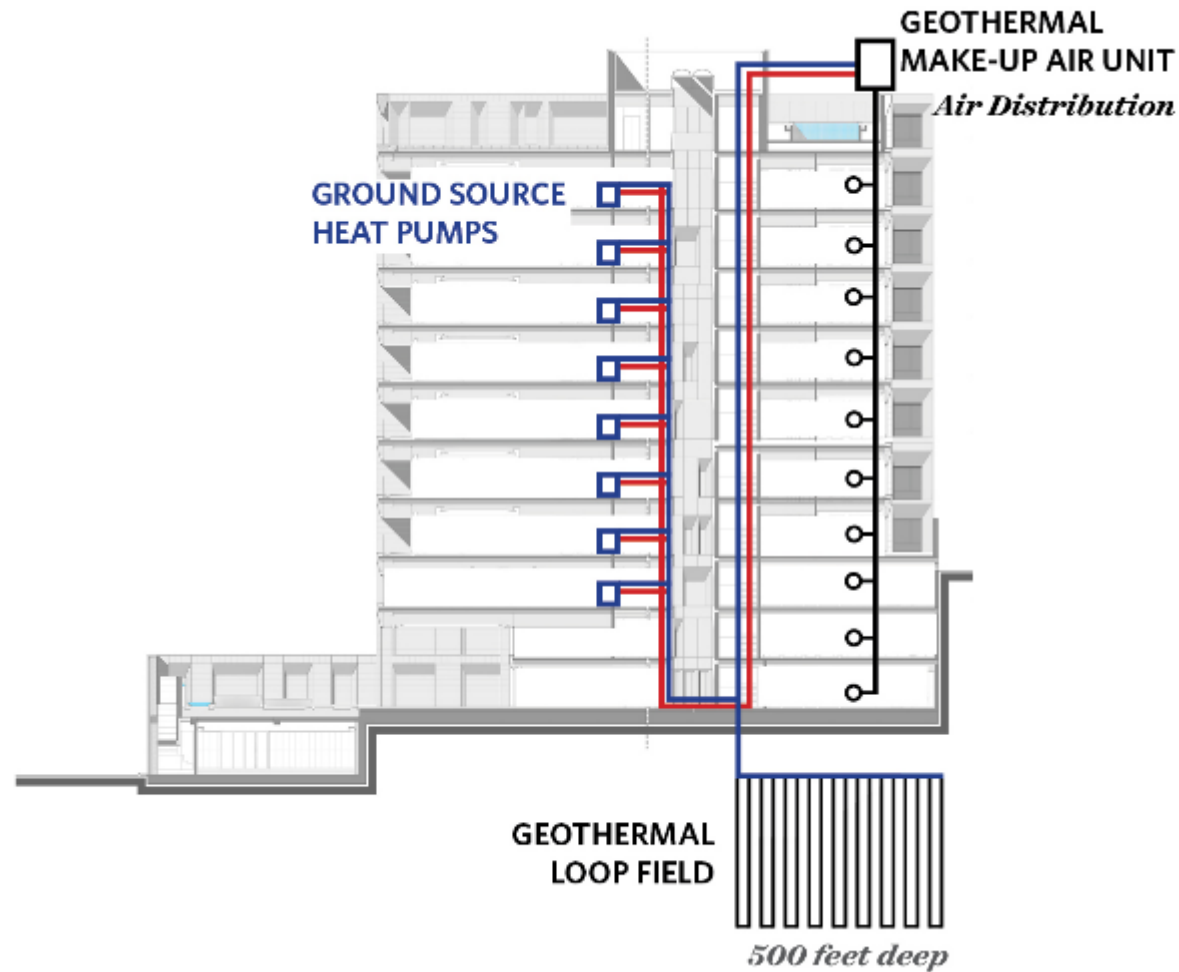
Geothermal vs. Natural Gas



Geothermal vs. Natural Gas



Geothermal vs. Natural Gas



Cost Savings: NYS and Fed Incentives

NYSERDA's Ground Source Heat Pump Rebate Program

> Large systems in areas impacted by a gas moratorium = \$1,500 per ton of cooling capacity up to \$5M per project

Federal govt. energy tax credit provides 10% tax credit

> All commercial geothermal system-related expenses, broadly defined (heat pumps, hot water plumbing, GC expenses, etc.)

Federal govt. also offers 1-5 year accelerated depreciation

> For all costs associated with geothermal installations provides tax savings of 25% (on corporate income) in the first year after construction is completed or it can be spread out over 5 years

Cost Savings: Example 400-Unit Building

Capital Costs and Subsidies

	Natural Gas	Geothermal
Upfront System Equipment	\$13M	\$19M
Cost Avoidance	na	-\$2.5M
NYSERDA Rebate	na	-\$1.5M
10% Federal Tax Credit	na	-\$1.6M
2020 Tax Benefit	-\$0.4M	-\$3.8M
Total Cost	\$12.6M	\$9.6M

Cost Savings: Example 400-Unit Building

Annual Operating Costs

	Natural Gas	Geothermal
Power for boilers, domestic hot water, make-up air units	\$205K	\$30K
Water/power cooling tower	\$67K	na
Electricity for heat pumps	\$250K	\$250K
Maintenance	\$100K	\$50K
Total Cost	\$622K	\$330K

Success Stories: Examples from NYS

Zero Place, New Paltz

Type:

New Construction

Lot Size/Wells Drilled:

15,000 sf; 15 wells < 20% of lot; 500' deep

Use:

42 apartments, 6 commercial spaces

Completion:

Fall 2019

NYSERDA Rebate:

\$109K



Success Stories: Examples from NYS

Siano Building, Buffalo

Type:

New Construction

Lot Size/Wells Drilled:

4,000 sf; 9 wells ~ 20% of lot; 230' deep

Use:

11 apartments, 3 commercial spaces

Completion:

2017

NYSERDA Rebate:

\$38K



Success Stories: Examples from NYS

Autumn Garden Complex, Lockport

Type:

New Construction

Lot Size/Wells Drilled:

10 acres; 39 wells ~15% of lot; 225' deep

Use:

72 residential units in multiple buildings

Completion:

2017

NYSERDA Rebate:

\$92K



Success Stories: Examples from NYS

Pierce Arrow Building, Buffalo

Type:

Retrofit

Lot Size/Wells Drilled:

40,000 sf; 50 wells 350' deep

Use:

127 apartments, 2 restaurants

Completion:

Winter 2019

NYSERDA Rebate:

\$398K



Success Stories: Beyond NYS

Modello, Burnaby, British Columbia

Type:

New Construction

Height:

37 stories

Use:

163 residential units

4-story commercial podium

238 underground parking spaces

Completion:

2017



Success Stories: Beyond NYS

Compass at Seylynn Village, North Vancouver BC

Type:

New Construction

Height:

28 stories

Use:

247 residential units
pool and underground parking

Completion:

2018



Success Stories: Beyond NYS

The Exchange, Vancouver BC

Type:

New Construction/Restoration

Height:

31 stories

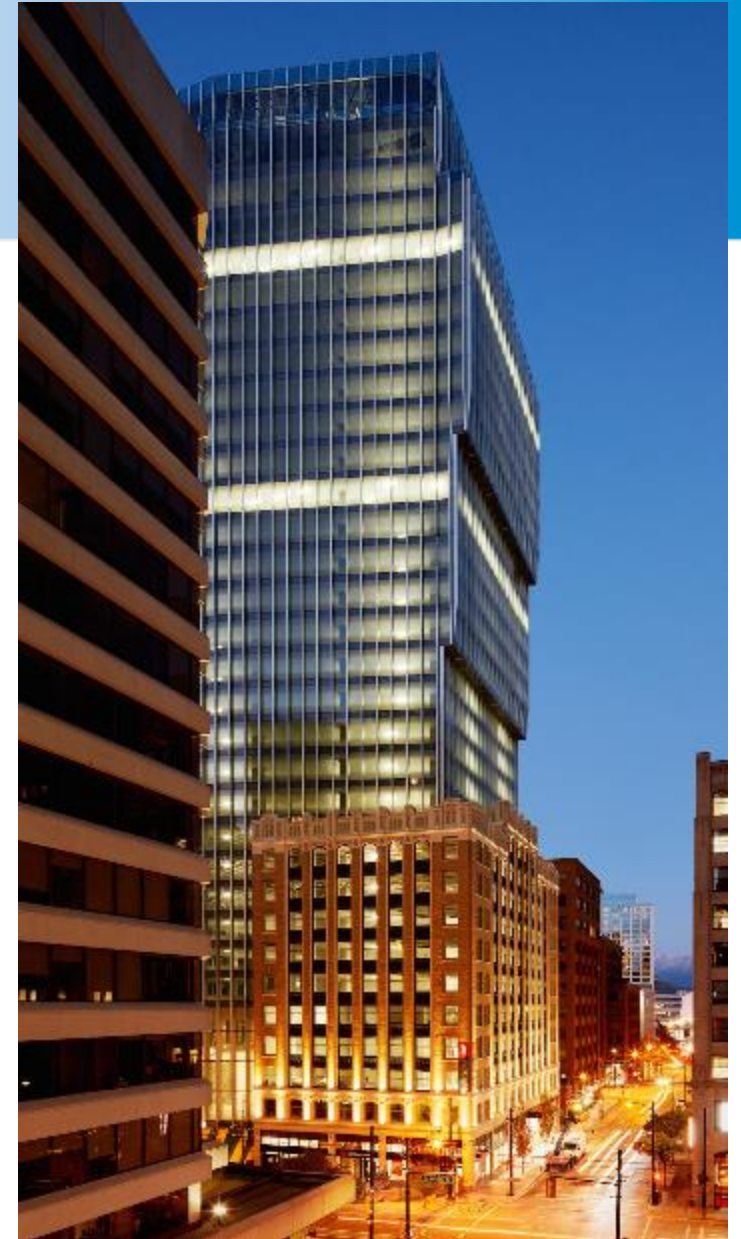
Use:

372K sq. ft new office tower

202-room hotel in restored historic Old Stock Exchange building

Completion:

2017



Our Team

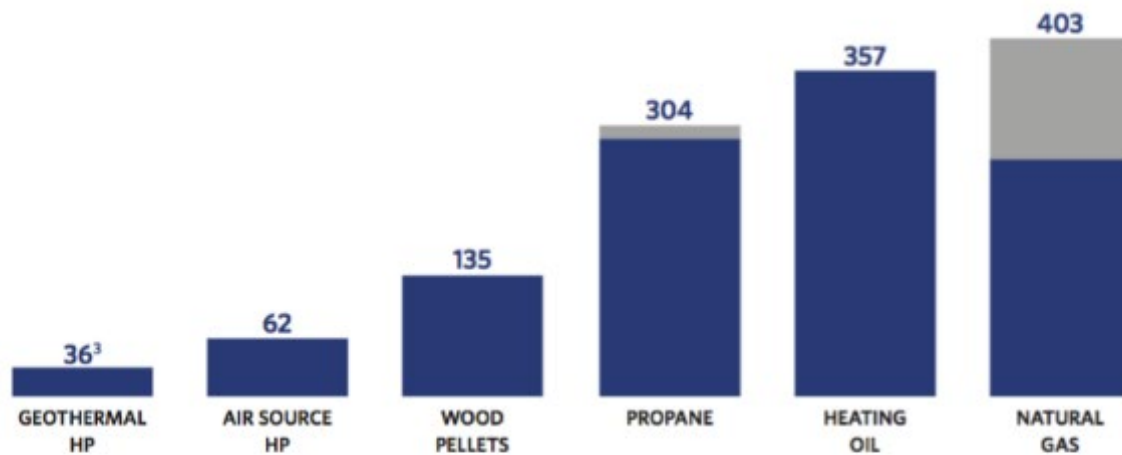
Matrix New World Engineering

- > Complete project management services from our Manhattan office
- > Wholly owned construction subsidiary Blue World experienced in site work and all aspects of construction management
- > Deep understanding of regulatory landscape

Buffalo Geothermal

- > Designed and installed 600+ geothermal systems in NYS
- > Proven track record of obtaining NYSERDA rebates and fed incentives

Greenhouse Gas Emissions for Residential Heating Options (grams per kilowatt hour)¹



the grey bar indicates additional emissions accounting for distribution loss and associated methane release for propane (0.2%) and natural gas (2%)²

¹T. Bucholz et al. "Greenhouse Gas Emissions of Local Wood Pellet Heat From Northeastern US Forests." *Energy* vol. 141, December 15, 2017.

²R.A. Alvarez et al. "Assessment of Methane Emissions From the U.S. Oil and Gas Supply Chain." *Science* vol. 361, issue 6398, July 13, 2018, pp. 186-188.

³Indicates the greenhouse gas emissions from electricity used to power geothermal heat pumps; derived by the NY Geothermal Energy Association from New York State's energy grid emissions data. See <https://www.eia.gov/electricity/state/newyork/>

For more information please visit:
nyserdera.ny.gov/putenergytowork/chc



NYSERDA