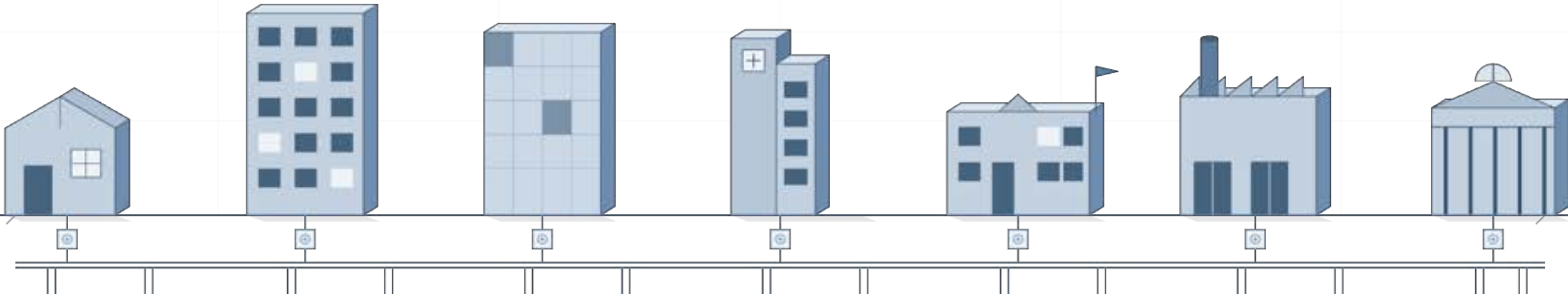




SCALING GEOTHERMAL HEATING AND COOLING WITH FEDERAL TAX CREDITS AND INNOVATIVE FINANCING

July 29 – 30, 2026 | Arlington, Virginia



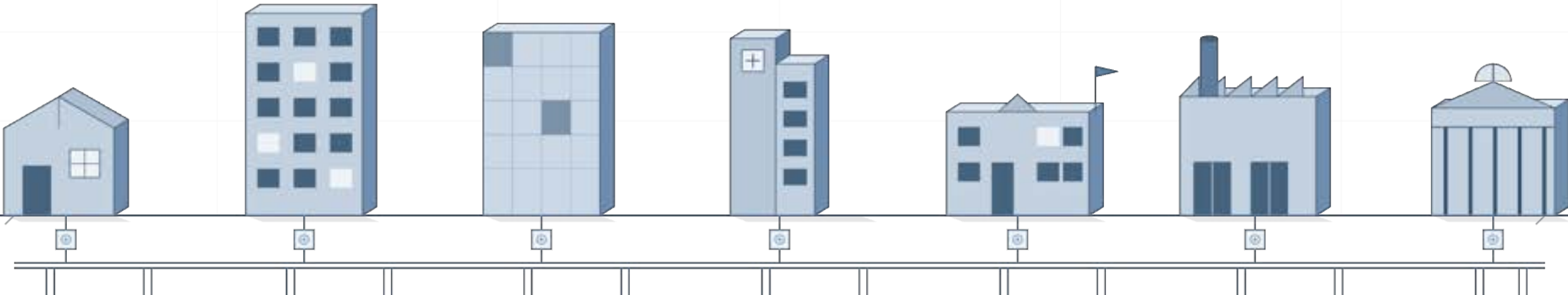
Connect to the Wi-Fi through the **MondayProperties_Wi-Fi** Network. No password needed.

THANK YOU



CMTA

A **LEGENCE** Company



Connect to the Wi-Fi through the **MondayProperties_Wi-Fi** Network. No password needed.

Federal Geothermal Heating and Cooling Tax Credits

Adam Heilbronner

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July 29, 2026

NASEO National Buildings Summit Morning Workshop

Geothermal Heating and Cooling Opportunity in Utah



UTAH OFFICE OF
ENERGY DEVELOPMENT

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Utah Office of Energy Development
energy.utah.gov

Things to Think About

What makes geothermal for heating/cooling work?

1. Investment: Upfront costs and long payback periods for geothermal make a challenging business case for commercial developers
 - Solution: Favorable ownership structure and accounting outcome
 - Gets you: maximum TCs and consolidates debt in right places
2. Risk: lack of commercial familiarity with the technology due to limited operational history in commercial environments
 - Issue: makes it difficult to communicate the benefits and opportunities for networked and non-networked systems
3. Strategy: suitable anchor load willing to withstand a long-term payback period
 - A lot of the upstream opportunities from geothermal are only realized when you have a suitable “first connection”



Stay Tuned

OED will be releasing two papers:

- 1. Geothermal roadmap for heating/cooling**
- 2. A commercial use case for a 630-acre district (networked) geothermal system**

Visit: energy.utah.gov (August 2026)



plante moran

**Renewable Energy Finance:
Leveraging Tax Credits for
Geothermal Heating and Cooling**

Investment Tax Credit (ITC) – § 48

ITC credits - §48	A credit available for investments in renewable energy technologies This is a one-time credit that is claimed when property is placed in service The ITC is calculated based on a percentage of the project owner's cost basis in an applicable project The creation of direct pay also created a path for non-taxpaying entities to claim it The creation of credit transferability also created a more direct path to transfer credits to another party
Credit Amount	The base credit starts at 6% and can increase to 30% if any of the conditions below are met: 1. Project construction began prior to 1/29/2023; 2. Prevailing wage and apprenticeship requirements; or 3. Project output is less than 1 megawatt (or <284 tons based on nameplate capacity) Additional bonus credits are available, including the Domestic Content Bonus, Energy Community Bonus, and Low-Income Community Bonus, which can increase the credit by up to 10% each.
Effective Date	Claimed in the tax year the property is placed in service Generally, §48 applies to projects that began construction before 1/1/25 and §48E applies to projects that began construction after 12/31/24. Geothermal heat pump technology is an exception to that rule and is maintained under the legacy §48 credit Geothermal heat pump (GHP) projects are eligible if construction begins before 1/1/35 A phase out begins in 2032 from a 6% base credit to 5.2% in 2033 and 4.4% in 2034 Projects must be placed in service within 4 years of beginning construction

Geothermal energy property requirements

Eligible property definitions	1. Geothermal energy property is equipment used to produce, distribute, or use energy derived from a geothermal deposit but only, in the case of electricity generated by geothermal power, up to (but not including) the electrical transmission stage. Geothermal equipment includes production equipment and distribution equipment. NOTE: Electricity producing geothermal energy properties are eligible for §48E credit if they begin construction after 12/31/24 and phase out in 2034 and are subject to FEOC restrictions 2. Geothermal heat pump (GHP) property is equipment that uses the ground, ground water, or other underground fluids as a thermal energy source to heat a structure or as a thermal energy sink to cool a structure.
Unit of Energy Property	An energy property includes a unit of energy property that is not excluded from energy property by the regulations and that is of an eligible type of energy property. Property owned by the taxpayer that is an integral part of an energy property is treated as part of that energy property. Property owned by a taxpayer is an integral part of an energy property owned by the same taxpayer if it is used directly in the intended function of the energy property and is essential to the completeness of the intended function. The term unit of energy property means all functionally interdependent components of property owned by the taxpayer that are operated together and that can operate apart from other energy properties within a larger energy project. The term functionally interdependent means that the placing in service of each component is dependent upon the placing in service of each of the other components in order to generate or store electricity, thermal energy, or hydrogen.
What is included?	Wells and heat pumps Distribution equipment including inverters, converters, and heating, ventilation, and air conditioning (HVAC) systems such as blowers and furnaces (integral and functionally interdependent property) Allocation of construction related soft costs

Bonuses and Adders

Prevailing wage	Requires workers constructing facilities to be paid at least a prevailing wage Extends to contractors and subcontractors Wage data by role and county are maintained on SAM.gov by the Department of Labor Will generally apply to facilities where construction begins after Jan. 29, 2023 Will need to account for this in contracts; higher upfront costs for long-time benefits
Apprenticeship hours	Requires a specified percentage of total labor hours to be completed by qualified apprentices Requires a daily ratio of apprentices to journeymen to be satisfied Total labor hours include contractors and subcontractors The required percentage phases in over time: 10% (2022 and before), 12.5% (2023), and 15% (2024 and beyond) A good faith exception is available if apprentices are formally requested but either denied or no response is received
Domestic content	Requires that any steel, iron, or manufactured product that is a component of the facility was produced in the United States. Some manufactured products can be sourced from outside the United States as long as at least a threshold percentage* of the total manufactured products and all structural steel and iron were produced in the United States. (*40% until June 15, 2025, 45% after June 16, 2025, 50% in 2026, and 55% in 2027) **Tax-exempt entities that fail to meet domestic content requirements (or an exception) will also face a 10% haircut on their calculated credit amount for projects beginning construction in 2024, 15% for projects beginning construction in 2025, and 100% for projects beginning construction in 2026 and beyond – there are certain exemptions available
Energy community	Brownfield sites under CERLCA Statistical areas that had coal, oil, or natural gas production and now has unemployment over the national average Census tracts in which a coal mine or coal-fired electric facility has been closed

Additional Considerations

Continuous Construction	Construction progress toward completion must be demonstrated Four year safe harbor Various “excusable disruptions”
Recapture	Property must continue to be eligible property for five years following the date it was placed in service or it may be subject to a graduated recapture of the credit
Retrofitted Property	Eligibility of additions to existing systems requires at least 80% of the total value to be related to new property placed in service in the tax year
Stackability	Projects may claim as many bonuses or adders as they are eligible for Generally, the ITC can be claimed on the same project as state and local incentives Exceptions: tax exempt bonds, some grants, restricted donations
Ownership	The taxpayer must own the property – there can be multiple owners, but fractional ownership must be of the entire property, not individual components The taxpayer must construct the property or may acquire it if the original use commences with the taxpayer (there are additional, more complex requirements for retrofitted property)

Monetization

Direct Pay	Provides a new mechanism for non-taxpaying entities to receive cash Mechanically, it operates as a deemed overpayment that is refunded New §6417 provides the rules for this Requires prefiling with the IRS
“Applicable entity”	Tax-exempt organizations, state or political subdivisions, Indian tribal governments, Alaska native corporations, the Tennessee Valley Authority, or any rural electric cooperative corporations.
Administrative requirements	Mechanism to collect refund is administered through the tax filing system Requires completion of substantive and procedural steps Cannot just apply and wait to see if approved
Transferability	Credits can be directly sold to an unrelated party for cash consideration Timing considerations – both parties need to make election in the tax year the project was placed-in-service Due diligence concerns – risk transfers to buyer New § 6418 provides rules for this Requires prefiling with the IRS

How to prepare for future scrutiny?

- The lucrative nature of IRA-based credits suggests that tax positions may be subjected to future review.
- Contemporaneous documentation is the key for defense.

What documentation is needed?

Project proposal materials outlining expected project specifications

Construction agreements

Budget projections/actual expense support

Other grant/incentive documentation (if applicable)

Prevailing wage and apprenticeship documentation:

Payroll records reflecting hours worked in each wage class along with actual wages paid to each worker constructing the facility.

Copies of written requests for apprentices or agreements with apprenticeship programs.

Records reflecting the daily ratio of apprentices to journey workers including payroll records.

Why complete an ITC study / tax package?

To support an ITC filing, a study or tax package is recommended.

Key items to be documented:

The costs eligible to be included in the basis of the project

The total amount of the credit to be generated by the project owner in relation to the energy project

Support for relevant dates including beginning of construction and placed in service

Support for wage and apprenticeship requirements

Support for location in an energy community

Support for domestic content requirements – bonus or phase out exceptions



Questions



Leveraging Energy Tax Credits to Modernize School HVAC Systems

NASEO Workshop on Geothermal Heating and Cooling Tax Credits
July 29, 2026

Who we are



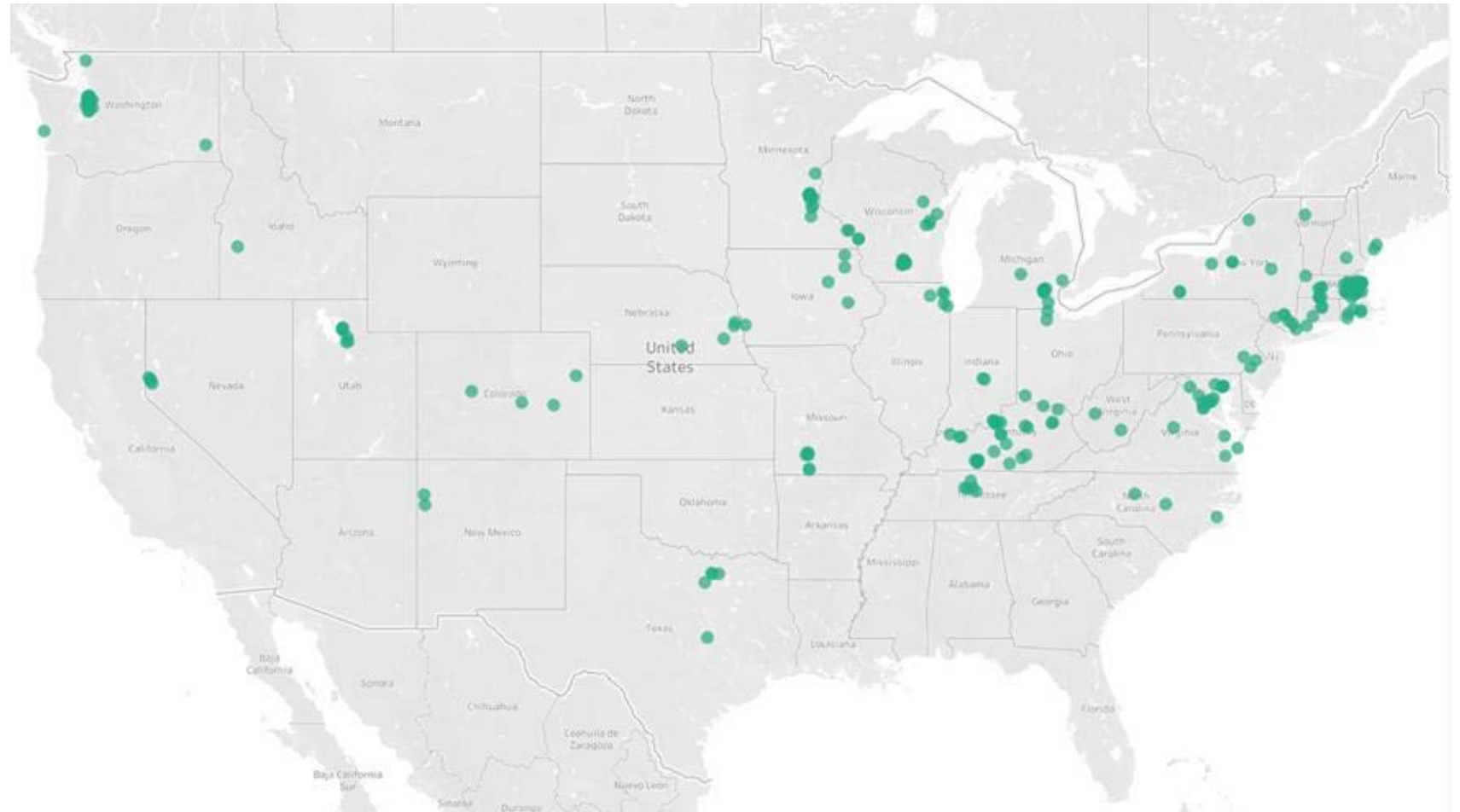
UndauntedK12 is a national nonprofit working to ensure that every student has the opportunity to attend a **safe, healthy, and resilient** school.



Billions in funding for better school HVAC systems

We are tracking
230+ K-12 GSHP
projects that are
eligible for energy
tax credits.

This represents
~\$500M in energy
tax credits for GSHP.



Elective pay has already delivered \$75M+ to schools



Jefferson County Public
Schools in Kentucky
receives a \$1,824,613
check!



Westwood Public Schools in
Massachusetts receives a
\$5,055,655 check!



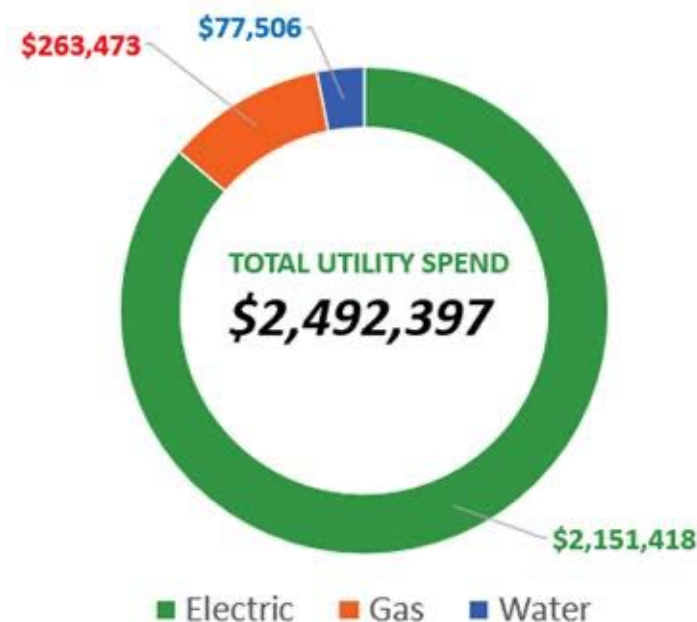
North Fayette Valley
Community School District
in Iowa receives a \$873,483
check!



Seattle Public Schools in
Washington receives a
\$7,970,439 check!

Why are school districts adopting GSHPs? The 3 C's

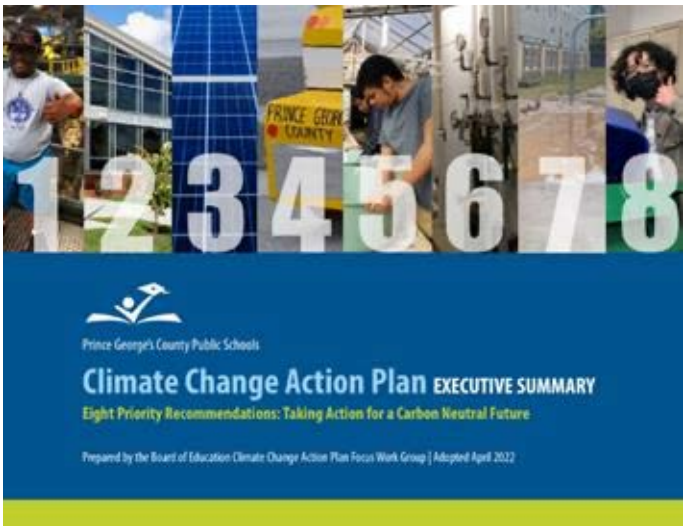
Cost



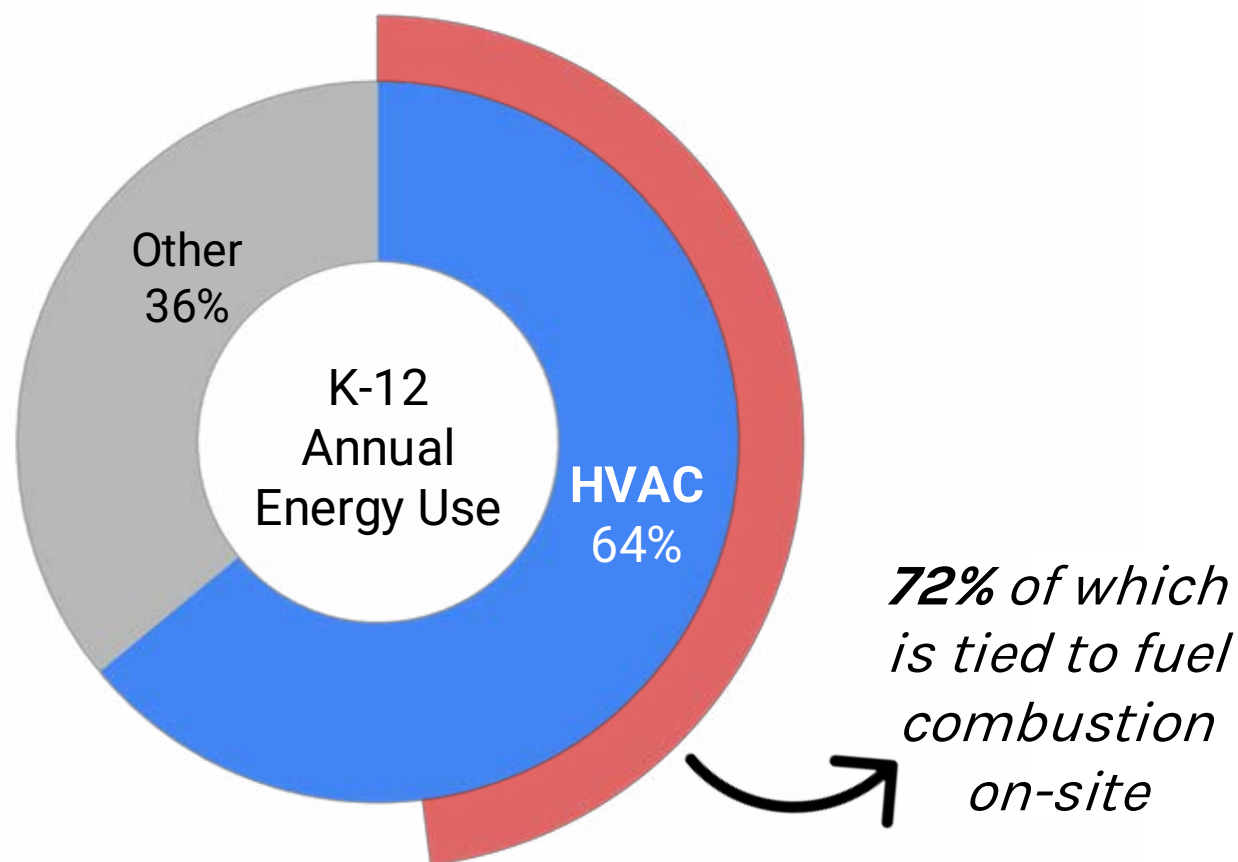
Cooling



Climate Commitments



HVAC systems drive energy use, utility bills, and carbon



Note: This data is for schools in the Northeast region collected through the Commercial Buildings Energy Consumption Survey of the US Energy Information Agency..

Source: <https://rmi.org/insight/hvac-choices-for-student-health-and-learning/>.

Schools face significant challenges w indoor air quality



Indoor Air Quality in Schools

EPA's Indoor Air Quality (IAQ) in Schools program provides free resources for schools to improve indoor air problems using straightforward activities and in-house staff.



Studies indicate that indoor levels of pollutants may be 2 to 5x — and occasionally 100x — higher than outdoor levels, **potentially impacting the 55 million children and 4 million teachers** (a sixth of the U.S. population) in schools.



Approximately **50% of school districts lack** IAQ management programs.



Negative impacts to health and productivity caused by poor IAQ is estimated to **cost the U.S. \$36-92 billion/year**.

EXPOSURE TO POOR IAQ HAS BEEN LINKED TO:



Spread of airborne bacteria and viruses like COVID-19.



Symptoms such as coughing, eye irritation and headaches, and more serious issues like allergic/asthma reactions, lung and heart diseases, cancers and death.

PROGRAM BENEFITS



Improves student health and attendance



Improves academic performance

For more information, please visit [Creating Healthy Indoor Air Quality in Schools](#) | US EPA



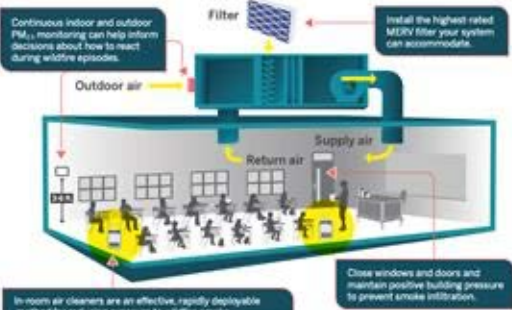
The Washington Post
Schools that never needed AC are now overheating. Fixes will cost billions.

Indoor Air Quality During Wildfires

SERIES: School Indoor Air Quality Fact Sheets
This fact sheet is one in a series. See Series Overview for background information.

Wildfire Basics

In recent years, the U.S. has experienced increasingly frequent and severe wildfire events, resulting in episodes of degraded air quality that can persist for days, weeks, or months. Wildfire smoke is a complex mixture of gases and particulate matter, with its composition depending on the materials being burned, their moisture content, fire temperature, and distance traveled. Fine particulate matter (PM_{2.5}) is commonly used as an indicator of smoke-related air quality because it poses significant respiratory and cardiovascular health risks, is a federally regulated pollutant that is routinely monitored, and consistently increases during wildfire events. ASHRAE Guideline 44 recommends building measures to minimize occupant health impacts from wildfire events, including developing a Smoke Readiness Plan with protocols to follow before, during, and after a wildfire.



Continuous indoor and outdoor (PM_{2.5}) monitoring can help inform decisions about how to react during wildfire episodes.

Install the highest rated MERV filter your system can accommodate.

Outdoor air

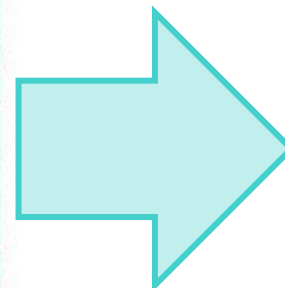
Return air

Supply air

In-room air cleaners are an effective, rapidly deployable method for reducing exposure to wildfire smoke.

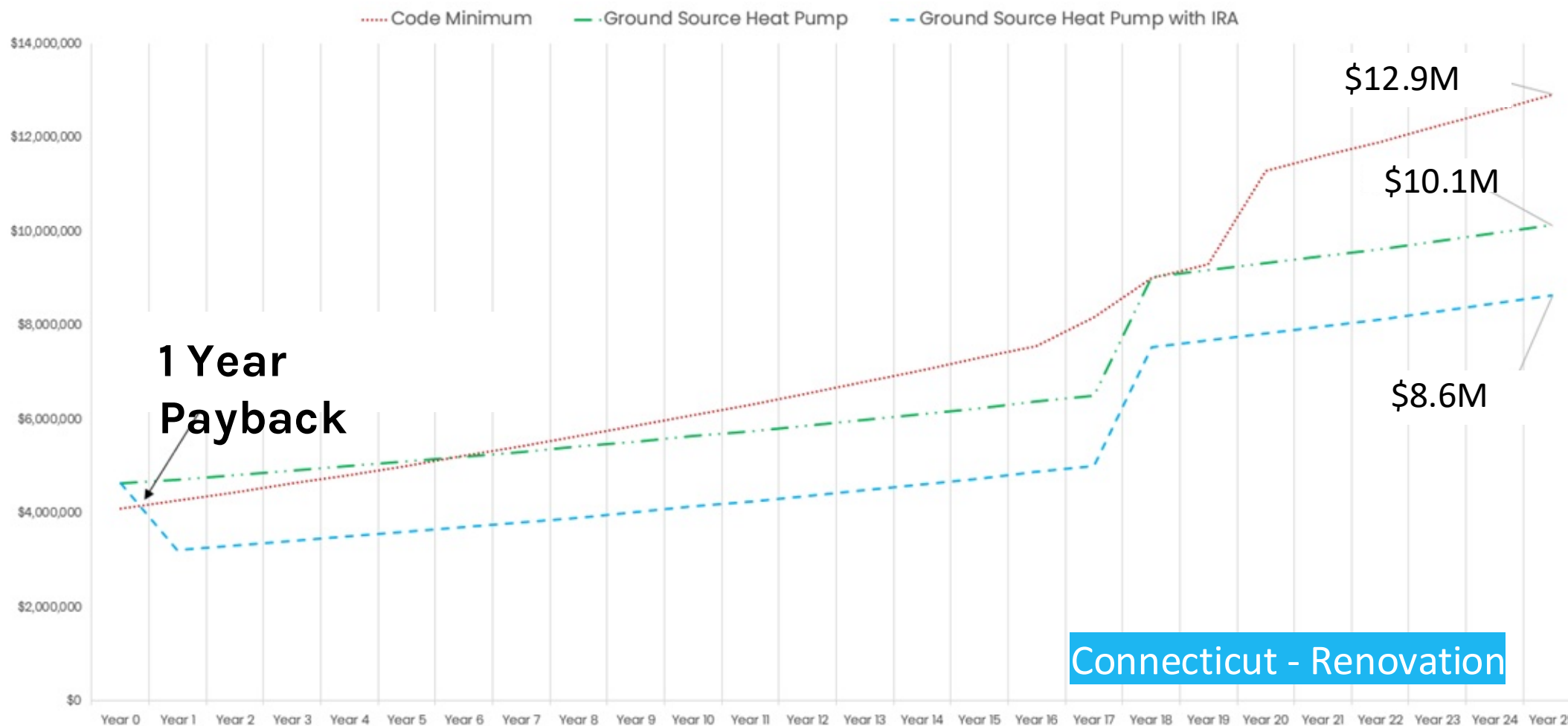
Close windows and doors and maintain positive building pressure to prevent smoke infiltration.

Tax credit is helping to drive this shift



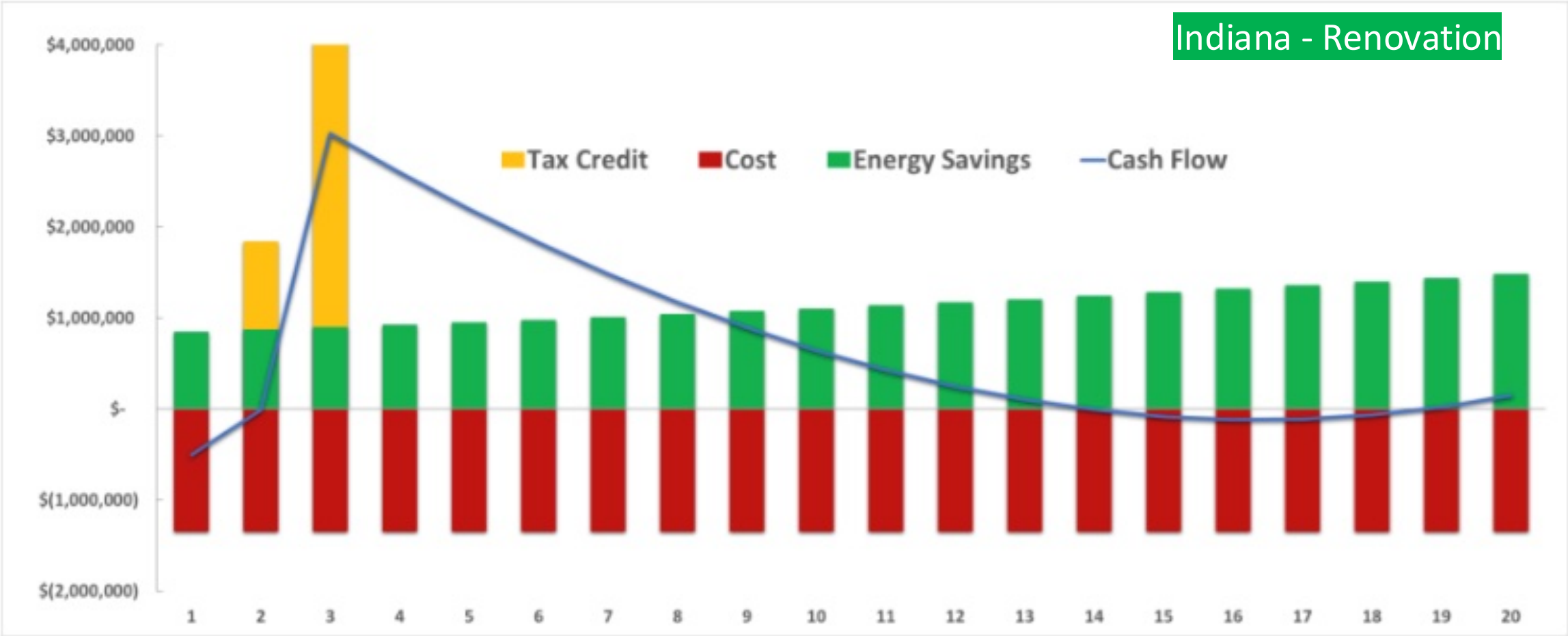
These options add cooling!

The financial case is transformed - even retrofits



ESPC powerfully pairs tax credit with energy savings

Indiana - Renovation



Source: Renovating for the Future, Feb 2026 presentation, <https://bit.ly/4fUKjqV>

Districts can assess their portfolios for GSHP feasibility

- Milwaukee Public Schools' portfolio has an average age of 82 years and only ¼ of buildings have cooling
- Goal to reduce greenhouse gas emissions by 45% by 2030 and 80% by 2050
- Worked with ESCO to assess 30 buildings in the portfolio for GSHP

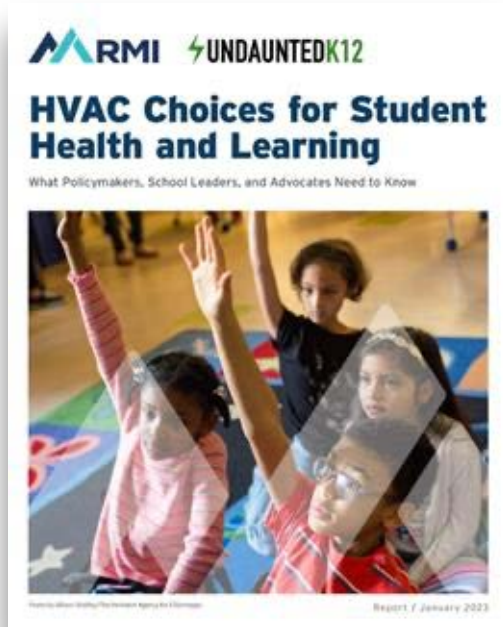
School Code	School	Square Footage	Wellfield Space	Needs Equipment Replacements	Reusable CHW Piping
003	Juneau/MacDowell HS	225,410	H		
014	Bradley Tech HS	277,410	A	✓	✓
016	Obama (Custer) HS	306,065	✓		
024	North Division HS	394,827	P + A	✓	✓
026	Pulaski HS	496,501	A	✓	
032	South Division HS	391,389	H / A	✓	✓
033	Vincent HS	431,769	✓		✓
038	MHSA HS	285,613	H / P + A	✓	
055	Douglas MS	218,300	H / P		
060	Reagan HS	182,959	P + A	✓	
061	Sara Scott/WCLL HS	133,653	P		✓
067	Golda Mier/MEC HS	233,184		✓	✓
089	Brown Street Academy ES	110,514	H / P	✓	
098	Burdick ES	73,100	P + A		
143	Eighty-First Street ES	57,645	P		
152	Engleburg ES	68,067	P		
155	Fairview ES	69,033	✓	✓	
167	Spanish Immersion ES	66,865	P		
185	Gaenslen ES	227,935	H / P	✓	✓
188	Lloyd Barbee ES	79,900	✓ / P	✓	
202	Greenfield ES	69,540	H / P		
226	Milwaukee Sign ES *	87,627	✓	✓	
277	Morgandale ES	84,050	P		
312	Starms ES	73,556	✓	✓	✓
334	Honey Creek ES *	44,192	✓	✓	
365	Townsend ES	71,349	P		
368	Trowbridge ES	52,623	P	✓	
377	Jackson ES	77,715	P		✓
398	Whittier ES	18,396	✓	✓	
501	Central Services ADMIN	179,465	PL	✓	✓

Wisconsin - Feasibility

Resources

“HVAC Choices” for grounding in core concepts

Why should we care?
(if we're not an engineer)



One-pager on benefits of modern HVAC systems



One-pager on the “big ideas”



<https://www.undauntedk12.org/hvac-rmi>

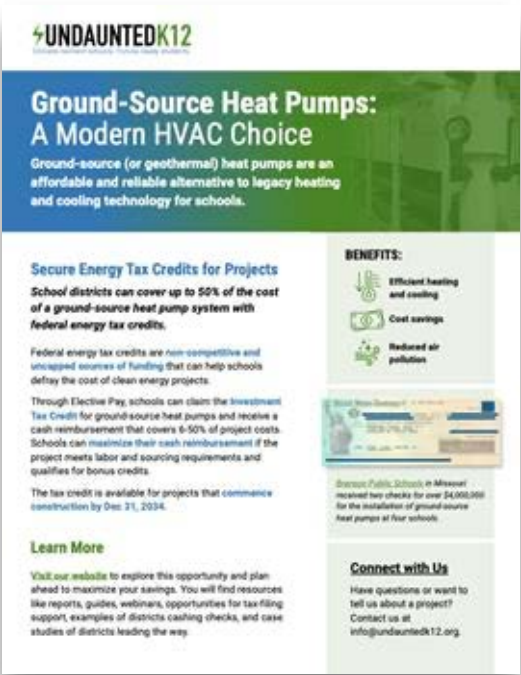
Understanding the tax credit opportunity

Shareable one-pager

Resource hub including a page on ground-source heat pumps



<https://www.undauntedk12.org/energy-tax-credits-for-schools-hub>



<https://bit.ly/3QAKwKL>

New case studies!



<https://bit.ly/4xksY00>



<https://bit.ly/43qPesL>

See GSHP projects eligible for tax credits in schools

UNDAUNTEDK12 Energy Tax Credits for Schools Hub Our Latest Where We Work In the News Solutions Center About Donate Now

Springfield Public Schools in Missouri receives a \$4,129,879 check!

Missouri • August 2025

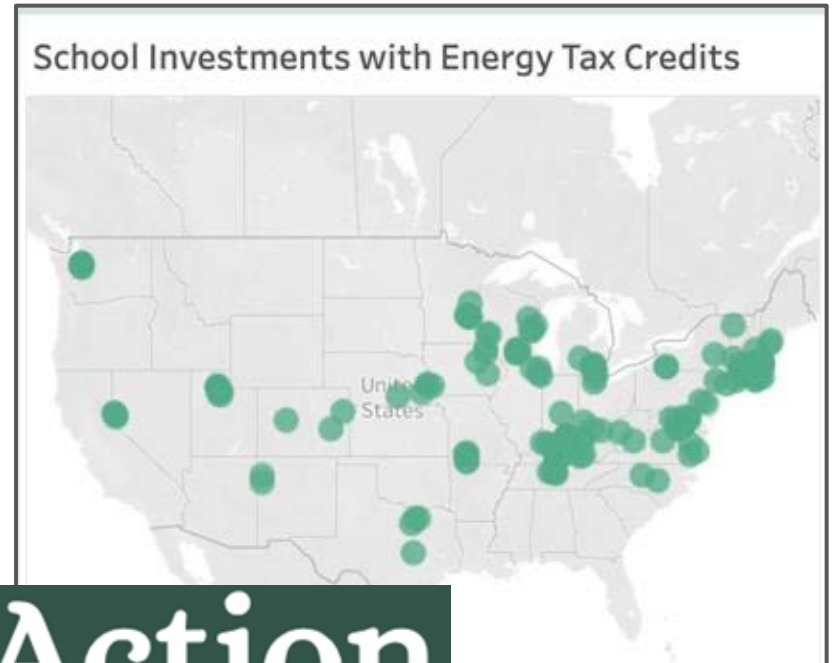
SPRINGFIELD, MO., August 2025 – On August 25, Springfield Public Schools in Missouri celebrated the receipt of a \$4,129,879.26 reimbursement check for installing ground-source heat pumps at Carver Middle School, Sequiota and Disney Elementary Schools.

The ground-source heat pumps provide affordable and reliable heating and cooling for the building, and qualify for energy tax credits through a funding mechanism called Elective Pay.

The district partnered with engineering and performance contracting firm Veregy to pursue a Guaranteed to help fund the projects.



Learn more at 10:36.

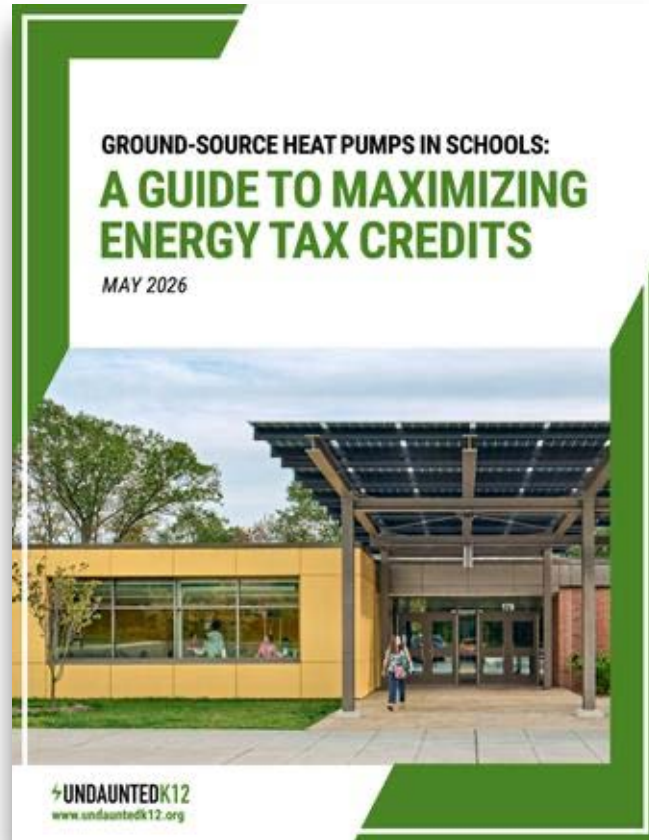


Elective Pay in Action

<https://www.undauntedk12.org/elective-pay-in-action>

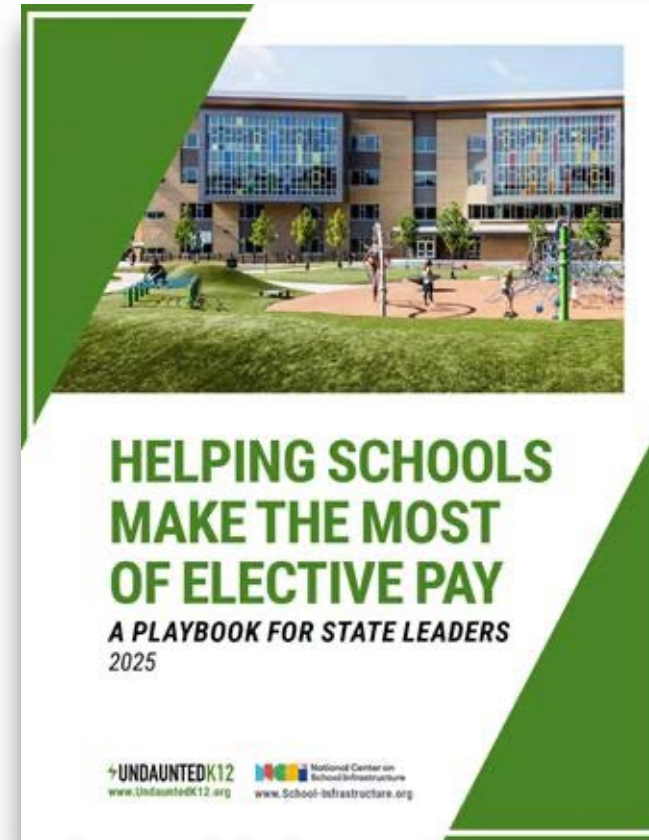
Maximize the tax credit opportunity

*For
districts!*



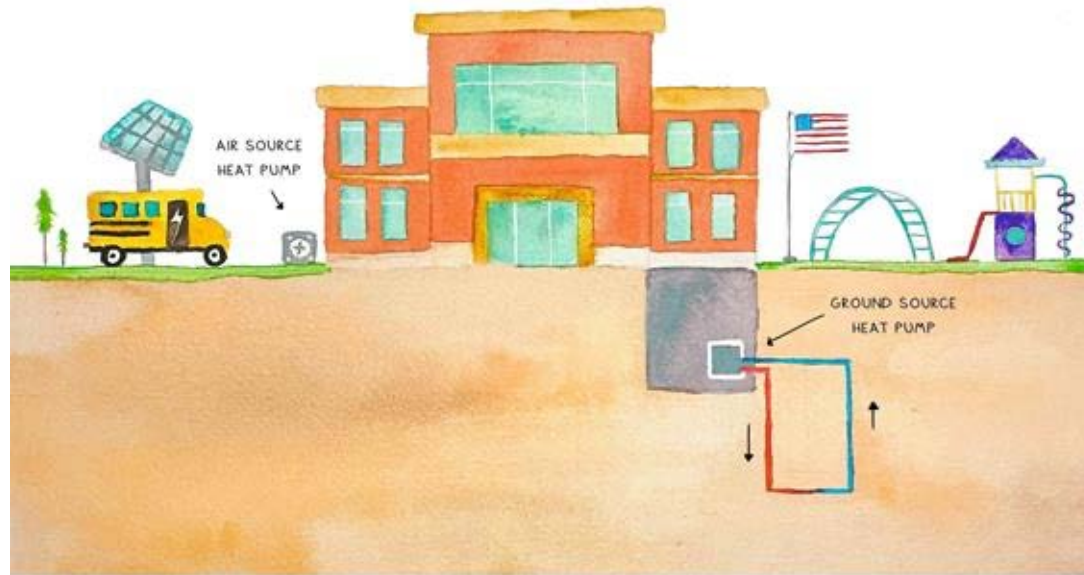
[https://www.undauntedk12.org/ourwork/
new-resource-modern-hvac-guide](https://www.undauntedk12.org/ourwork/new-resource-modern-hvac-guide)

*For
states!*



[https://www.undauntedk12.org/playbook
-for-state-leaders](https://www.undauntedk12.org/playbook-for-state-leaders)

COOL SCHOOLS HAVE HEAT PUMPS



⚡UNDAUNTEDK12
NICOLE KELNER

Questions?

Sara Ross, Co-founder
sara@undauntedk12.org

@UndauntedK12



Thank you!

How state energy offices can help

Expand awareness and understanding of the GSHPs, the tax credit, & Elective Pay	• Identify and support the first cohort of qualified projects • “Broadcast” through statewide communications channels • Target outreach districts • Highlight first movers
Support planning and analysis to GSHP implementation	• Require and support life cycle cost analysis with state agencies that fund school construction • Support consideration of GSHPs and Elective Pay in planning • Fund decarbonization roadmaps for districts
Align and increase state investment in GSHP implementation	• Avoid crowding-out federal credits with state authorities that support facilities grants • Ensure projects have access to bridge financing • Create financial & programmatic supports for heat pump retrofits 

How state energy offices can help

Align and increase state investment in GSHP implementation
(cont.)

- Enable private sector investment in school facilities
- Encourage utility co-investment and collaboration
- Replicate Elective Pay as a state program 

Foster supportive conditions for districts to implement GSHPs

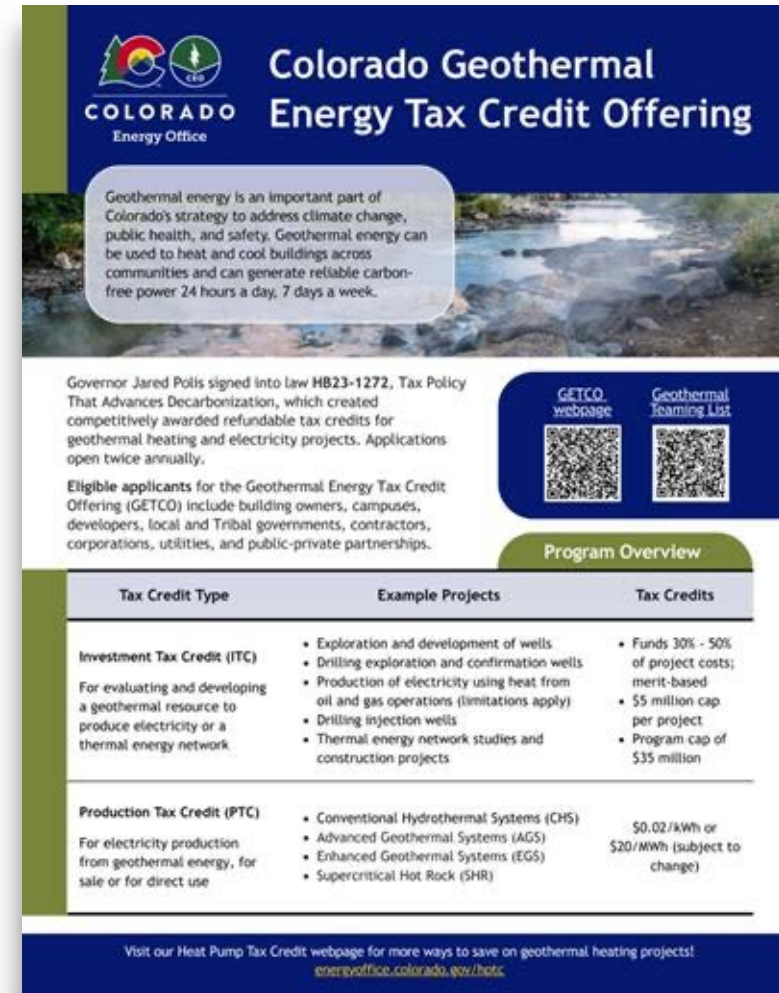
- Grow and expand registered apprenticeship programs (with workforce development and labor offices)
- Incentivize high-performance buildings

Build capacity of district and state leaders to implement GSHPs

- Build knowledge and staff capacity among state agencies
- Coordinate technical assistance and support capacity-building in districts
- Create dedicated leadership roles (e.g., dedicated staff or sub-offices)
- Support / contribute to the assembly of school facility data

Example: Colorado establishes refundable state tax credit

- In May 2023, Governor Polis signed HB23-1272, “Tax Policy That Advances Decarbonization”
- Established Colorado’s [Geothermal Energy Tax Credit Offering](#) (GETC)
 - Refundable, merit-based, competitive
 - 30-50% of costs, up to \$5M
 - Twice annual applications
 - Total funding of \$35M
- Eligible applicants are building owners, campuses, developers, local and Tribal governments, contractors, corporations, utilities, and public-private partnerships.



The flyer is titled "Colorado Geothermal Energy Tax Credit Offering" and features the Colorado Energy Office logo. It includes a photograph of a geothermal field with steam rising from the ground. A text box explains that geothermal energy is an important part of Colorado's strategy to address climate change, public health, and safety, and can be used to heat and cool buildings across communities and generate reliable carbon-free power 24 hours a day, 7 days a week.

Governor Jared Polis signed into law HB23-1272, Tax Policy That Advances Decarbonization, which created competitively awarded refundable tax credits for geothermal heating and electricity projects. Applications open twice annually.

Eligible applicants for the Geothermal Energy Tax Credit Offering (GETC) include building owners, campuses, developers, local and Tribal governments, contractors, corporations, utilities, and public-private partnerships.

GETC webpage: [energyoffice.colorado.gov/getc](#)
Geothermal Learning List: [energyoffice.colorado.gov/geothermal](#)

Tax Credit Type	Example Projects	Tax Credits
Investment Tax Credit (ITC) For evaluating and developing a geothermal resource to produce electricity or a thermal energy network.	• Exploration and development of wells • Drilling exploration and confirmation wells • Production of electricity using heat from oil and gas operations (limitations apply) • Drilling injection wells • Thermal energy network studies and construction projects	• Funds 30% - 50% of project costs; merit-based • \$5 million cap per project • Program cap of \$35 million
Production Tax Credit (PTC) For electricity production from geothermal energy, for sale or for direct use	• Conventional Hydrothermal Systems (CHS) • Advanced Geothermal Systems (AGS) • Enhanced Geothermal Systems (EGS) • Supercritical Hot Rock (SHR)	• \$0.02/kWh or \$20/MWh (subject to change)

Visit our Heat Pump Tax Credit webpage for more ways to save on geothermal heating projects!
[energyoffice.colorado.gov/hotc](#)

Example: Aspen School District receives \$5M for multi-building project

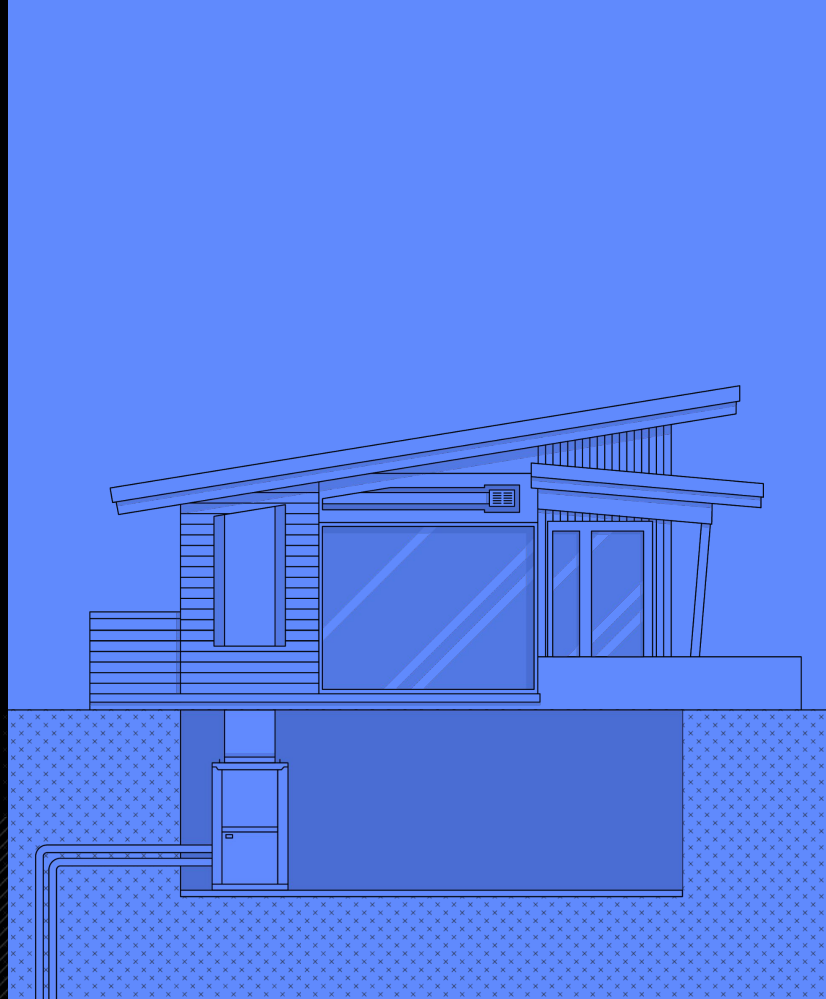
- Shifting existing HVAC systems to GSHPs as part of thermal energy network (TEN) to heat/cool over 400k sq ft of building space
- Colorado Energy Office Awarded [\\$5M](#) from state tax credit program to fund design phase
- \$20-35M project is also supported by
 - Estimated 30-40% federal tax credit
 - Energy savings from ESPC
 - Other state grants
 - Bond funds
- Project driven by public-private partnership



Leveraging Federal Tax Credits Through Third-Party Ownership

How Geothermal Leasing is Helping to Scale the Industry and What Role States Can Play

Brian Ferrarese | Regulatory Affairs Manager
bferrarese@dandelionenergy.com



About Dandelion

The nation's leading residential geothermal heating and cooling provider

Our background

Dandelion spun out of Google X in 2017 with the mission to scale geothermal for residential buildings.

Leading expertise

We have industry-leading expertise in ground-loop system designs. Our design engineers have designed over 15,000 single and multi-family geothermal systems.

Over 4,000 heat pumps installed, over 1M feet drilled

Dandelion pioneered small rig drilling in the U.S. to enable lower cost, smaller residential deployment of geothermal. We are bringing our solutions to large scale developers and homeowners across the country.

How Geothermal Works

It uses the Earth's naturally stable underground temperature to deliver efficient, safe, and reliable comfort, year-round.

1 Ground Loop

Ground loops absorb heat from the constant underground earth temperature

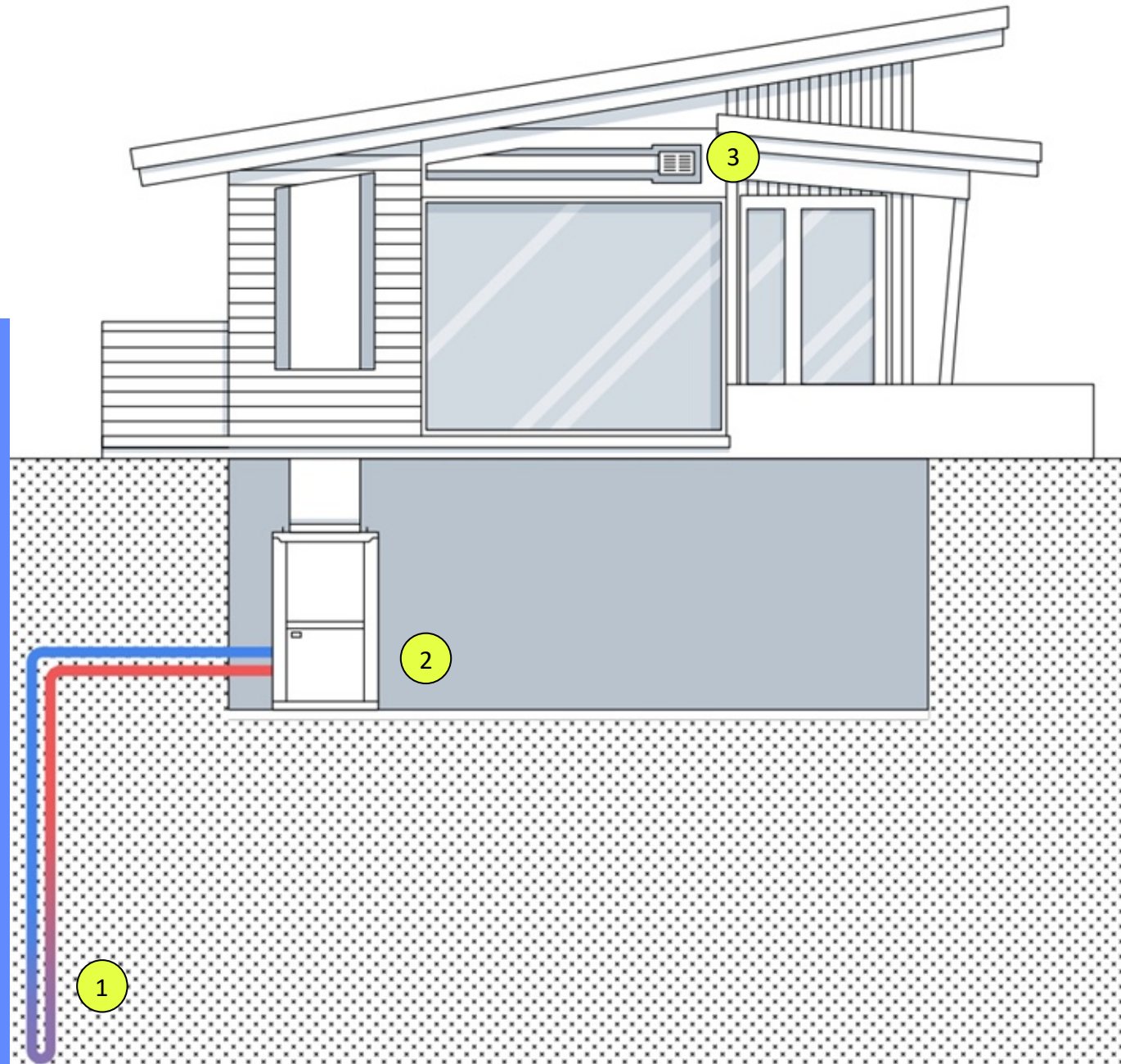
2 Heat Pump

Heat exchangers transfer heat from the ground loop to a refrigerant, which runs through our compressor, boosting the temperature

3 Distribution System

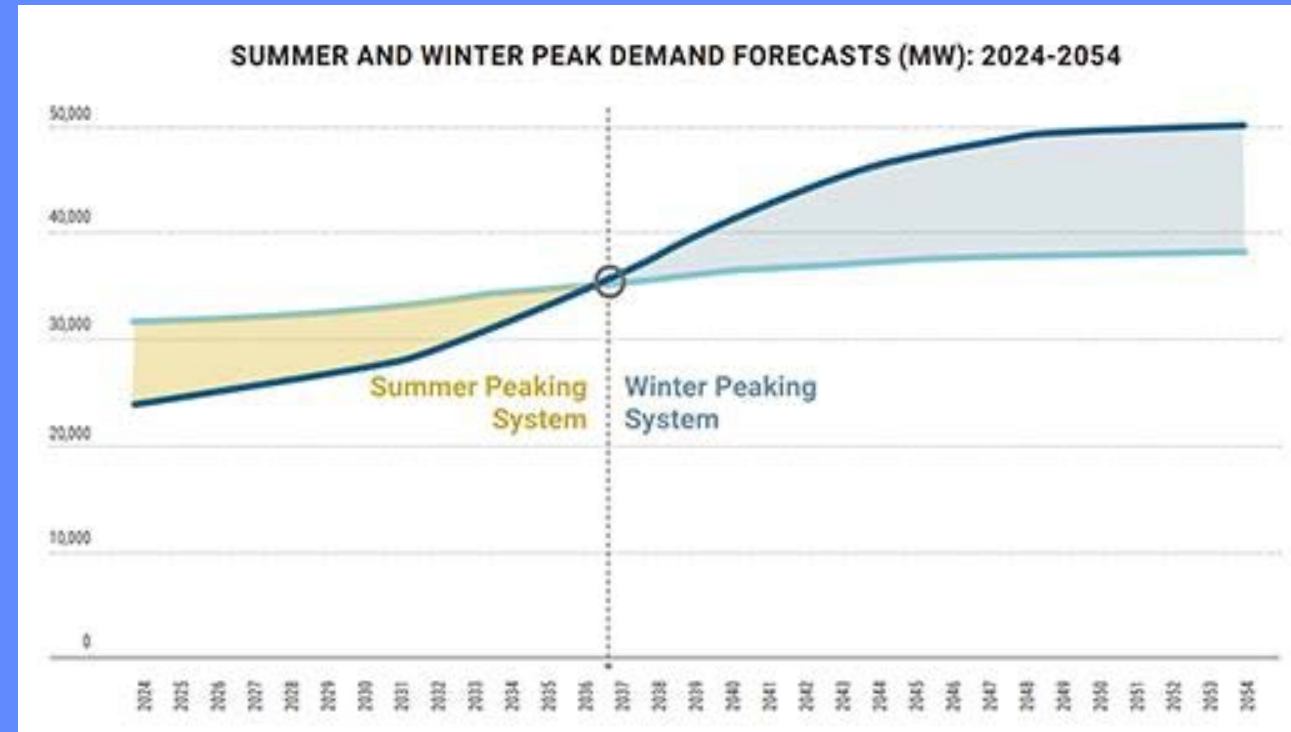
The hot refrigerant exchanges heat with air or water for circulation throughout the building

*Process is reversed in cooling mode



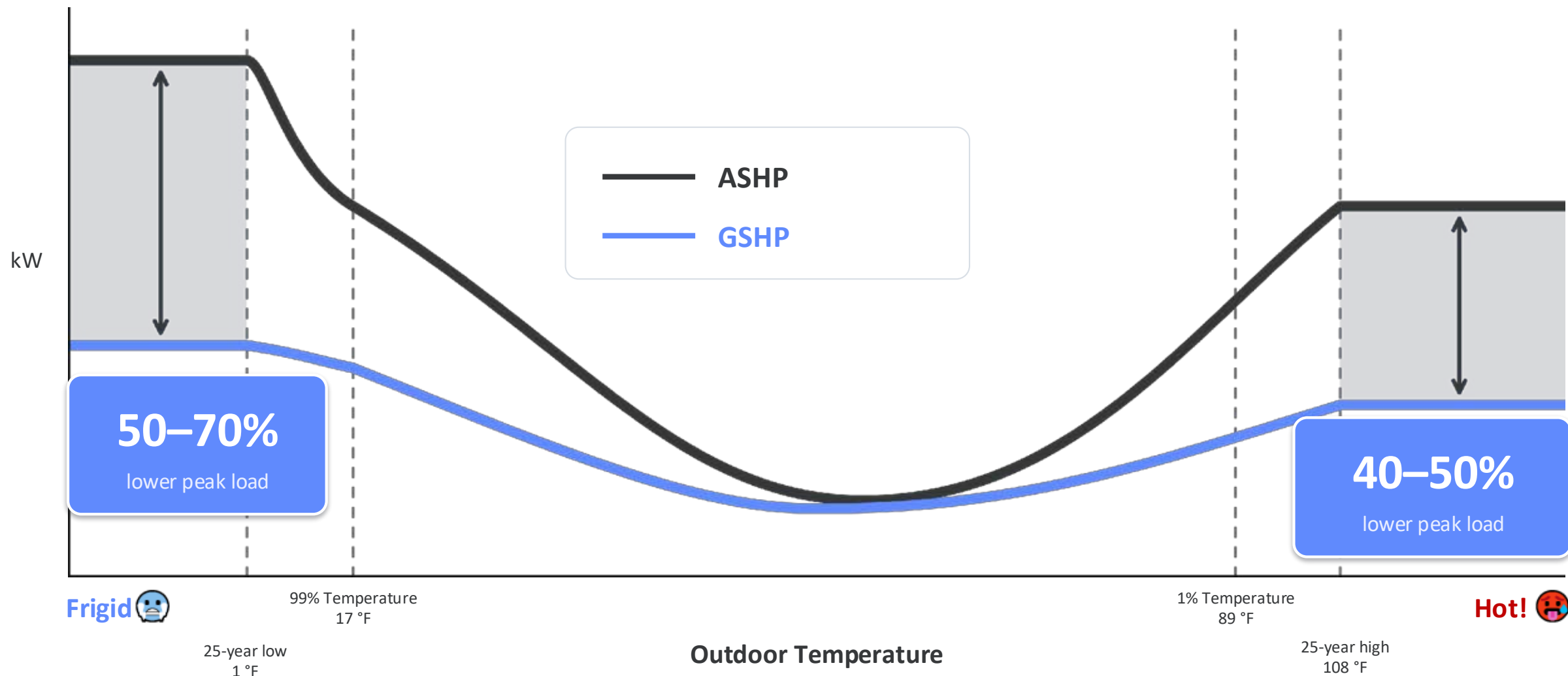
Geothermal Heating and Cooling and the Grid

- Consistent temperature of the ground acts as a thermal battery
- As state's electrify, expected to switch from primarily summer peaking to winter peaking
 - Example: New York expected to winter peak as soon as 2036
 - NYSERDA estimates that higher adoption of geothermal heat pumps could reduce New York system peak by 4-12 GW compared to ASHP reliant electrification
- **Geothermal reduces summer peak demand between 10-30% | winter peak 50-80%**



The Impact (Baltimore)

What geothermal means for the grid



Leasing Geo

Unlocking Federal Tax Credits with Third Party Ownership

H.R. 1 (OBBA): Termination of 25D 30% consumer tax credit, Section 48 commercial tax credit remains through 2034

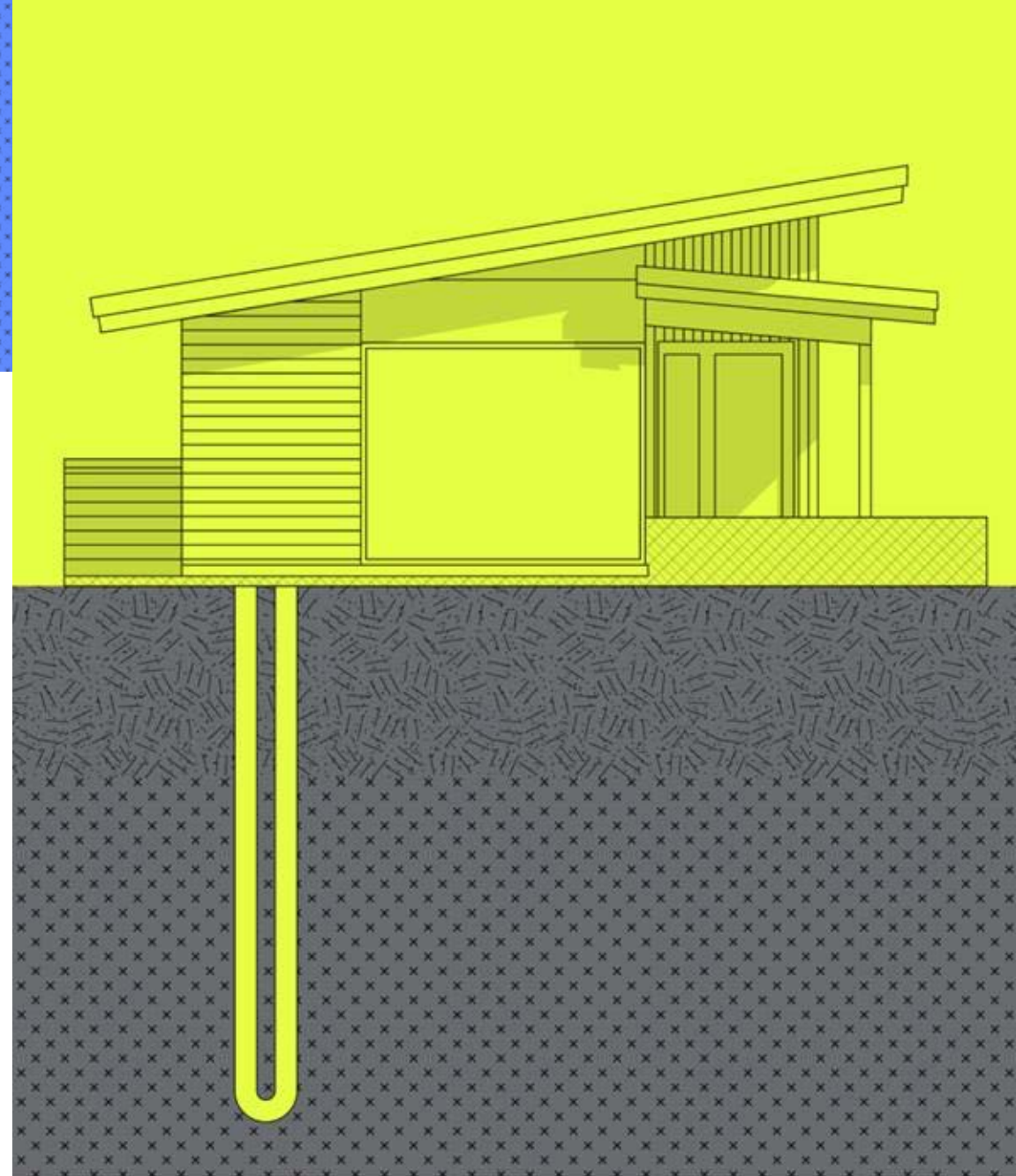
30-50% tax credit: projects owned by commercial entity under 1MW or meeting prevailing wage

30% = Baseline

40% = 30% Baseline + 10% Domestic Content Adder

50% = 30% Baseline + 10% Domestic Content Adder + 10% Energy Community Adder

Language added specifically to allow geothermal leasing



Builders adopting geo leasing

Federal tax credit and leasing is enabling more projects



Lennar

220 single family home
community in Clarksburg,
MD



Dream Finders

80-townhome community in
Laurel, MD



Ward Communities

48 new townhomes in
Elkton, MD



X



Upstream

Leasing Challenges (and myths debunked)

Capital Partner: Identifying a third-party financing partner that will fund geothermal systems upfront

Program Design:

- Length of lease agreements
- Buyout periods/options
- Warranty and maintenance structures
- Procedures for non-payment
- Learned from solar leasing

Leasing Perceptions Addressed:

- Homebuyers have a neutral or positive view of a leased geothermal system because of system benefits | Does not add any friction to the buying/selling process
- Benefits (energy and cost savings) greatly outweigh cost of ongoing lease payment

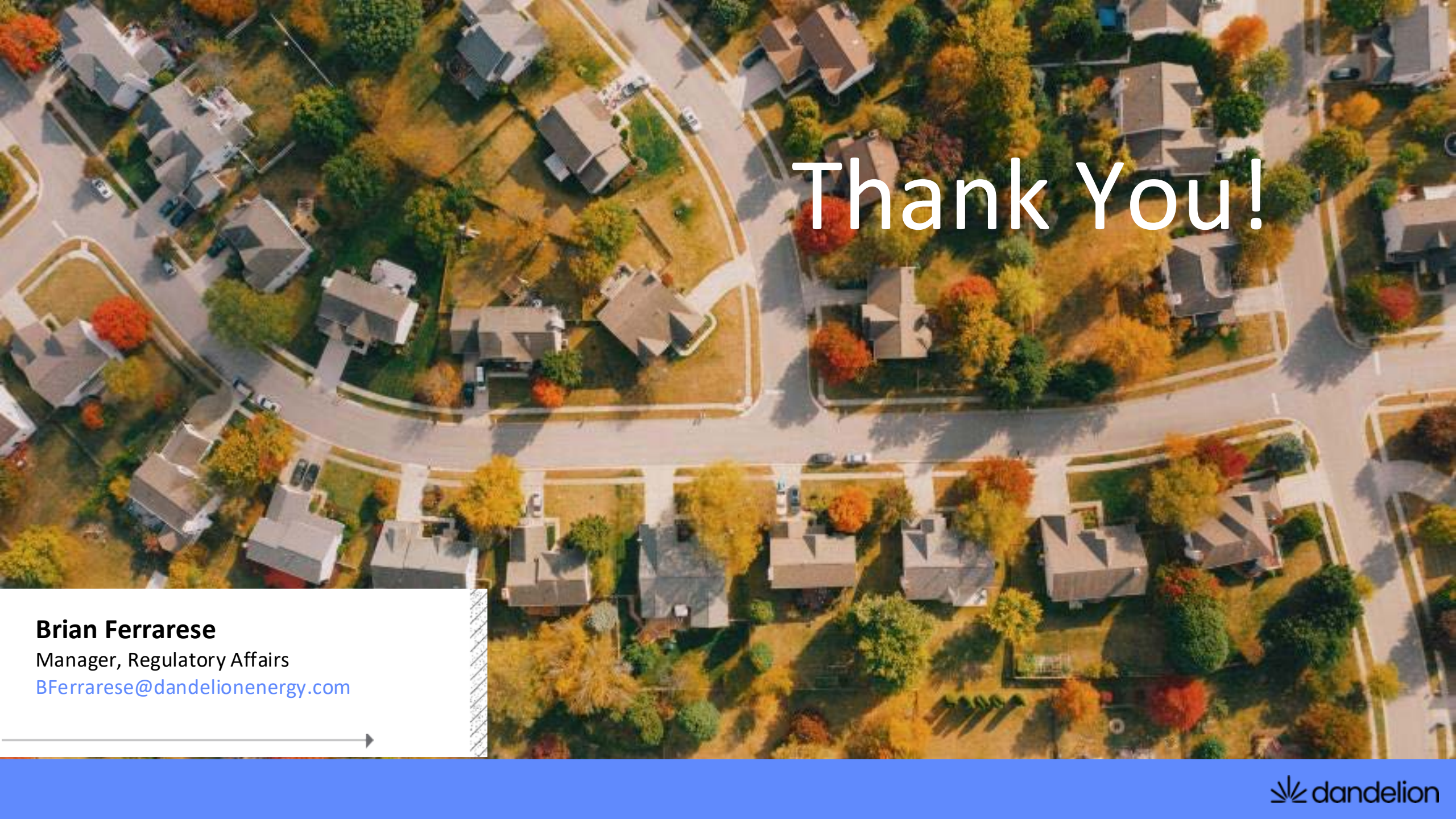


Policy Drivers

Public Policy to Support Scaled Adoption of Geothermal

- Energy Efficiency Rebates
 - Geothermal-Specific Incentives
 - Rebate Reservation Systems
 - CO, NY, MA
- Geothermal Renewable Energy Credits
 - Performance-based crediting/RPS carve out for Geo - provides ongoing or upfront cost offset
 - Maryland (in place), Illinois (passed/under dev.), Virginia (passed, effective 2027)
- Zoning/Code
 - Gas line extensions
 - All-electric or high efficiency code





Thank You!

Brian Ferrarese

Manager, Regulatory Affairs

BFerrarese@dandelionenergy.com

Innovations in Geothermal Heating and Cooling Financing

Bryce Carter

- Geothermal Program Manager, Colorado Energy Office

Brad Gratton

- Project Manager, CMTA, Inc.

Ryan Trauley

- Program Manager, Maryland Energy Administration

Zeyneb Magavi

- Executive Director, Home Energy Efficiency Team (HEET)

The Heat Beneath Our Feet

How Colorado Leveraged State Tools to Scale Geothermal



Introduction



BRYCE CARTER
Senior Geothermal Program Manager

Strategic Initiatives and Finance Team (SIFI)



The Value Proposition of Geothermal Heating & Cooling





Case Study: Colorado Mesa University

- **1.2 million sq feet networked with diversity of heating/cooling needs**
 - 3,113 ton cooling load
 - 2,728 ton heating load (boilers not used in recent years)
- **Compared to a conventional system:**
 - ~650 kW demand reduction (13%)
 - ~1.3 GWh energy savings (10%)
 - ~58,000 Dth natural gas savings (55%)
 - ~10 million gallons water savings
- **\$1.5 million savings per year have resulted in a 2% reduction of student tuition**



CMU networked geothermal efficiency vs. a standard system

	Networked Geo COP	Conventional COP
Spring	7.0	1.9
Summer	3.6	3.4
Fall	5.8	2.0
Winter	8.9	1.2
Overall	5.7	1.9

Source: Evaluating a Community Ground Source Heat Pump System at Colorado Mesa University, 2023





Case Study: Lennar Homes and Dandelion Energy



CANARY MEDIA

Clean energy journalism for a cooler tomorrow

Lennar will build 1,500 new Colorado homes with geothermal heat pumps



- One of the country's largest deployments of ground-source systems being built in Ken Caryl, a southwest Denver suburb
- Expected to save residents approximately \$30 million in energy costs over 20 years
- Will reduce anticipated peak electric demand by 6 MW, helping reduce costs for all utility ratepayers
- Leasing model may be as low as \$15/mo with stacked gov't and utility incentives



COLORADO
Energy Office



Brown Ranch Geothermal Study

STEAMBOAT
PILOT&TODAY

February 11, 2023

Brown Ranch to utilize
geothermal heating system



Figure 5-6
Life Cycle Cost Summary over 30 Years

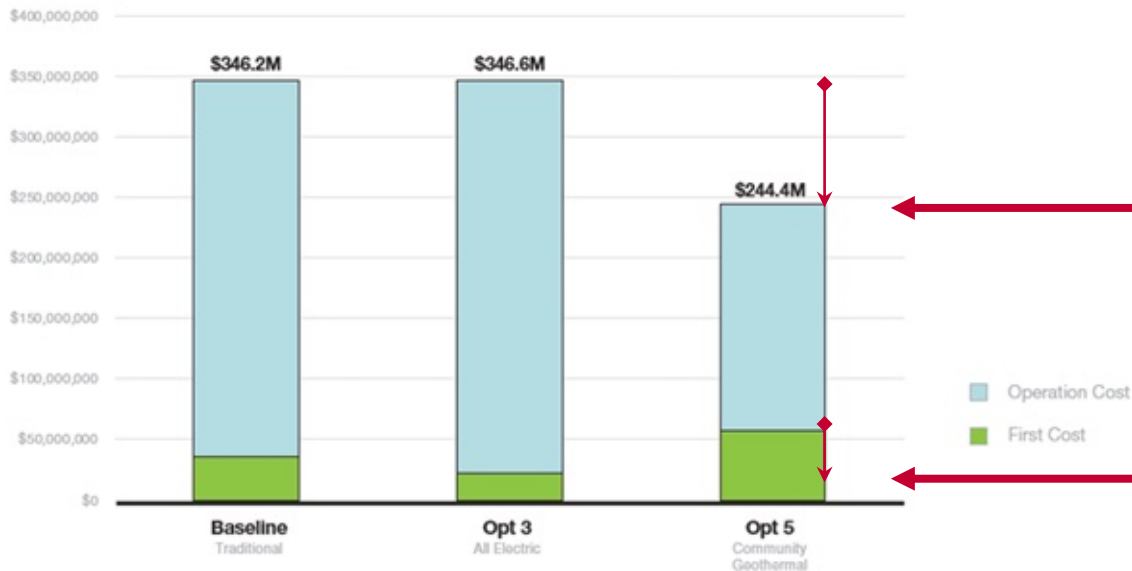


Image sources: [Brown Ranch Energy Master Plan](#)

- Proposed 1,100+ home community
- Study showed networked geothermal system has nearly double upfront cost, but-
- Community would realize \$100 million of savings over 30 years compared to a traditional or all electric approach with ROI of ~10 years
- Upfront cost may be reduced by half through federal incentives, not yet including available state incentives



Colorado Geothermal Enabling Policies



Colorado's Evolving Statute

- **HB19-1261 and SB23-016**: Statewide Greenhouse Gas (GHG) pollution reduction goals including net zero emissions economy-wide by 2050
- **SB21-264**: Clean Heat Framework to support gas to electric transition for utilities and consumers; reducing natural gas emissions by 22% by 2030
- **HB22-1381**: CEO Geothermal Energy Grant Program established with \$12 million
- **HB23-1252**: Gas utilities may create Thermal Energy Networks; Xcel TEN pilot project
- **HB23-1272**: Creation of Colorado Geothermal Energy Tax Credit Offering; Heat Pump Tax Credit
- **SB26-142**: Clarifies local government's ability to deploy TENs; requires Xcel solicitation of deep geothermal projects; resource data collection and create market recommendations

HB23-1272: State Geothermal Tax Credits

Geothermal Energy	2024 - 2033
Geothermal Electricity (Investment Tax Credit)	30% - 50% ITC, merit-based \$5 million cap per project
Thermal Energy Network (Investment Tax Credit)	30% - 50% ITC, merit-based \$5 million cap per project / study
Production Tax Credit	\$0.02/kWh

Heat Pump Technology (per residential unit)	2024 - 2025	2026 - 2029	2029 - 2033
Air-Source	\$1,500	\$1,000	\$500
Ground-Source, Water-Source, or combination system including either	\$3,000	\$2,000	\$1,000
Heat Pump Water Heater	\$500	-	-

The nonresidential building rate is the tax credit multiplied by the number of increments of 4 tons.

Thermal energy networks may combine the credit per connected residential unit and nonresidential building.

HB23-1272: Heat Pump Contractor Certification

- Contractors administering state tax credits must be certified by the CEO
 - Streamlines credit for consumers
 - Provides needed market data to better inform future policy to support the sector; workforce development
- Contractors may retain a percentage of the tax credit to support overhead
 - e.g. 66% or \$1,333 per GSHP in 2026



Image Credit: Bryce Carter

Financing and Incentive Programs



Collective Clean Energy Fund

Green bank - leveraged \$30M initial state seed into \$135.5M AUM across 145 clean energy loans



Commercial Property Assessed Clean Energy

Long-term, non-recourse property tax assessment financing \$330M+ across 141 projects



Energy Performance Contracting

Enables public buildings to fund facility improvements through energy savings; \$1.02B in investments, \$52M in annual savings, and 316 million kWh in energy reductions realized since 1997



Home Electrical and Appliance Rebates (HEAR) & Home Efficiency Rebates (HER)

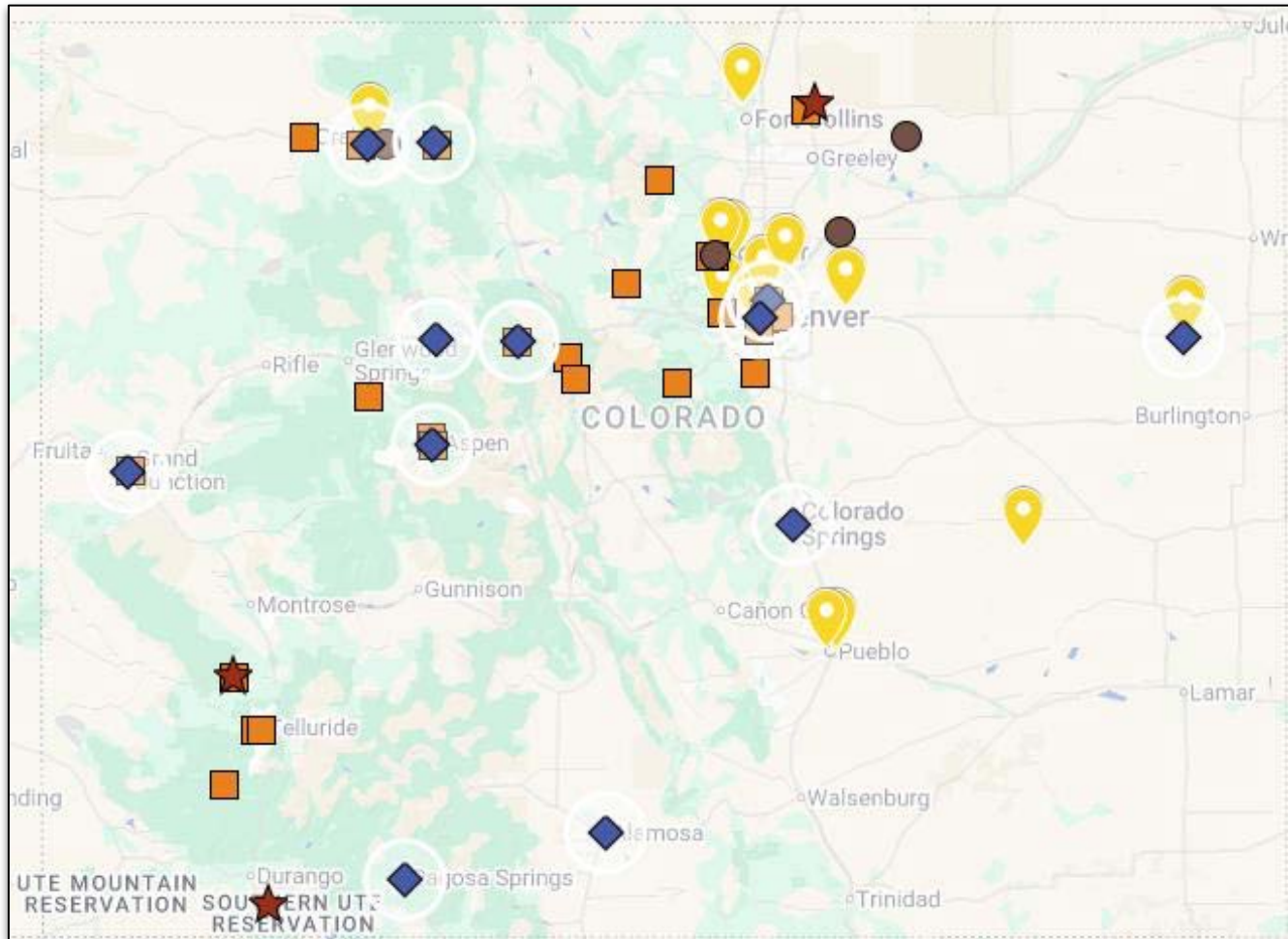
\$56 million HEAR program offers fixed appliance rebates up to \$8,000 for GSHPs in homes; \$56.2 million HER program provides project-based rebates for whole-home improvements achieving at least 20% modeled energy savings



Fostering a Collaborative Learning Community



Projects Utilizing Colorado's Geothermal Incentives



\$12 million in grants and \$70 million in tax credits to support the use of zero-emission, geothermal energy for electricity generation and space/water heating and cooling in homes, businesses, and communities.



**Single-Structure
Geothermal Installation**



**Thermal Energy
Network Study**



**Thermal Energy
Network Installation**



**Geothermal Electricity
Award**

As of May 2026, \$42.6 million has been awarded across 64 Colorado geothermal projects!

Colorado Geothermal Market Assessment

We aim to foster a learning community across our incentive awardees and the general market to:

- Establish publicly accessible baseline data to track ongoing market progress
- Build community trust and buy-in across geographic networks
- Establish and facilitate technical engagement framework
- Highlight opportunities for private sector leadership
- Will be published this September!



More Information

More information is available at:
geothermal.colorado.gov

Join us in Golden, Colorado:
[Geothermal Solutions Summit](#)
November 30 - December 3

Contact:

ceo_geothermal@state.co.us

bryce.carter@state.co.us



Stay grounded as Colorado
geothermal heats up:
[Join the CEO GEO](#)
[newsletter!](#)

Speaker



Bradley Gratton, PE
Project Manager, CMTA Energy Solutions



Let's Connect

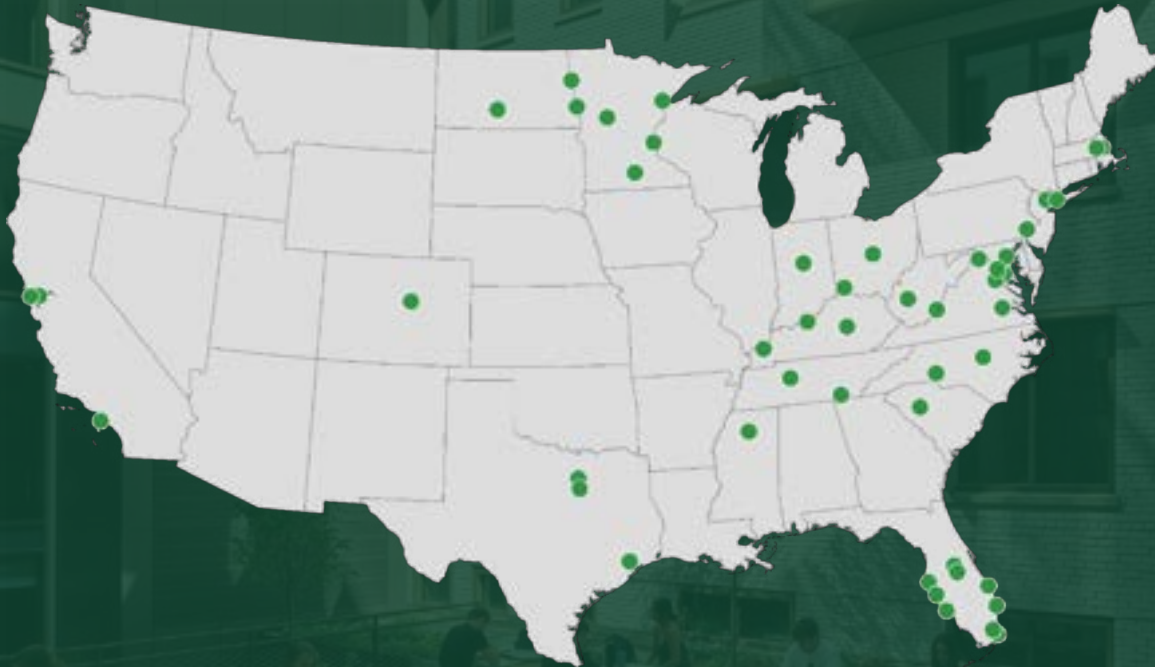
01

Introduction + About CMTA

Overview

MEP Design | Performance Contracting | Zero Energy | Technology | Commissioning

National Leader in High Performance Facilities
Top 20 Nationally



1,560

Employees

55

Offices Nationwide

401

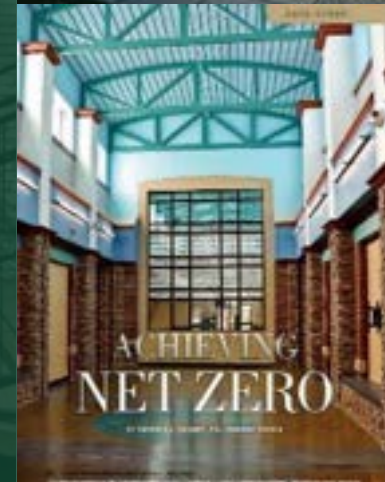
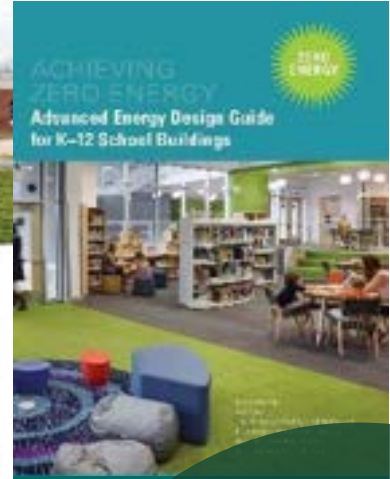
Professional Engineers

57

Years of Service



Most Technology Awarded Firm Globally



Nationwide Geothermal Experience

30+

Years of Geothermal Experience

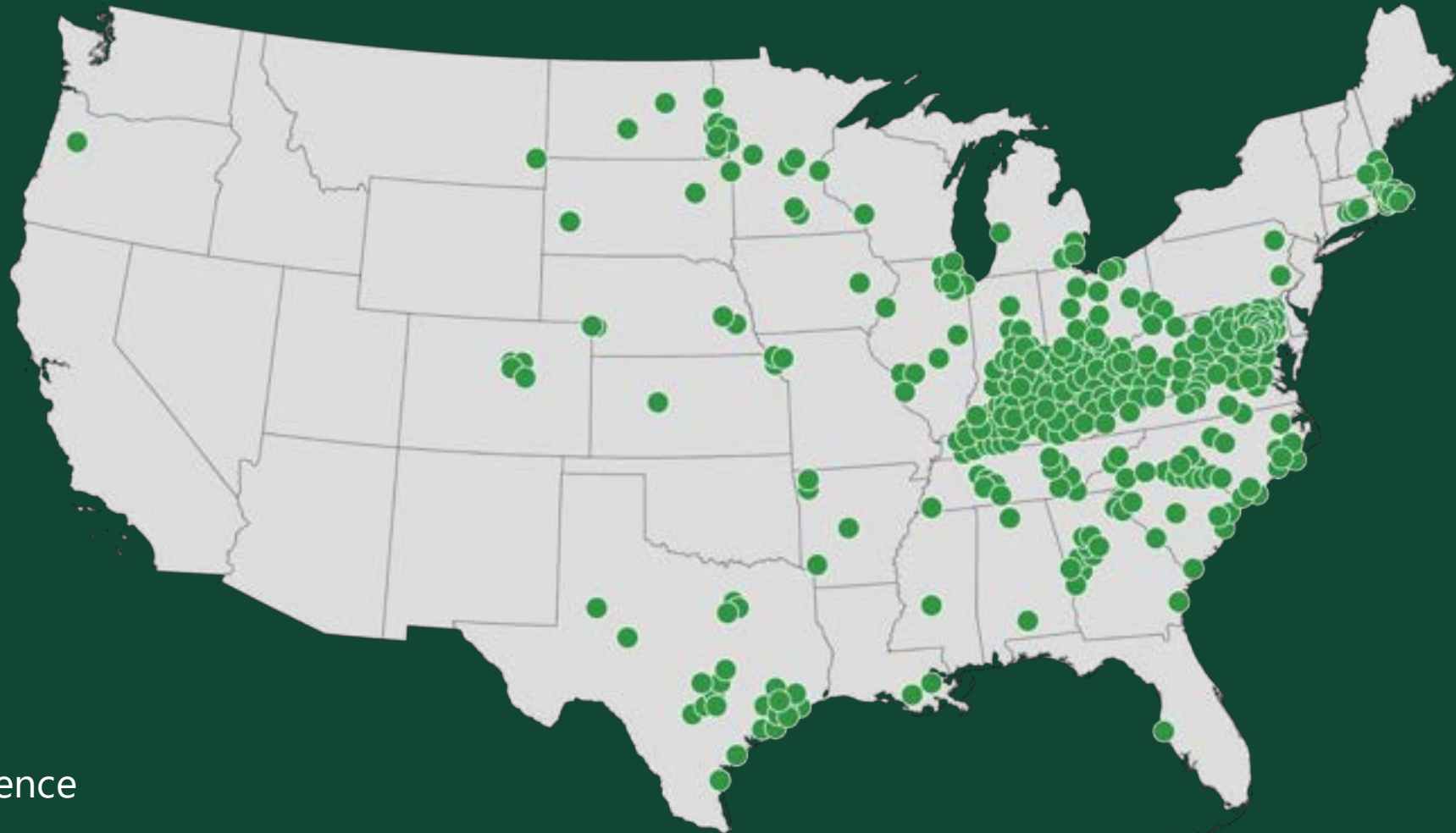
1B

ft² of HVAC Design / Renovation

6,750

Miles of Geothermal Well Experience

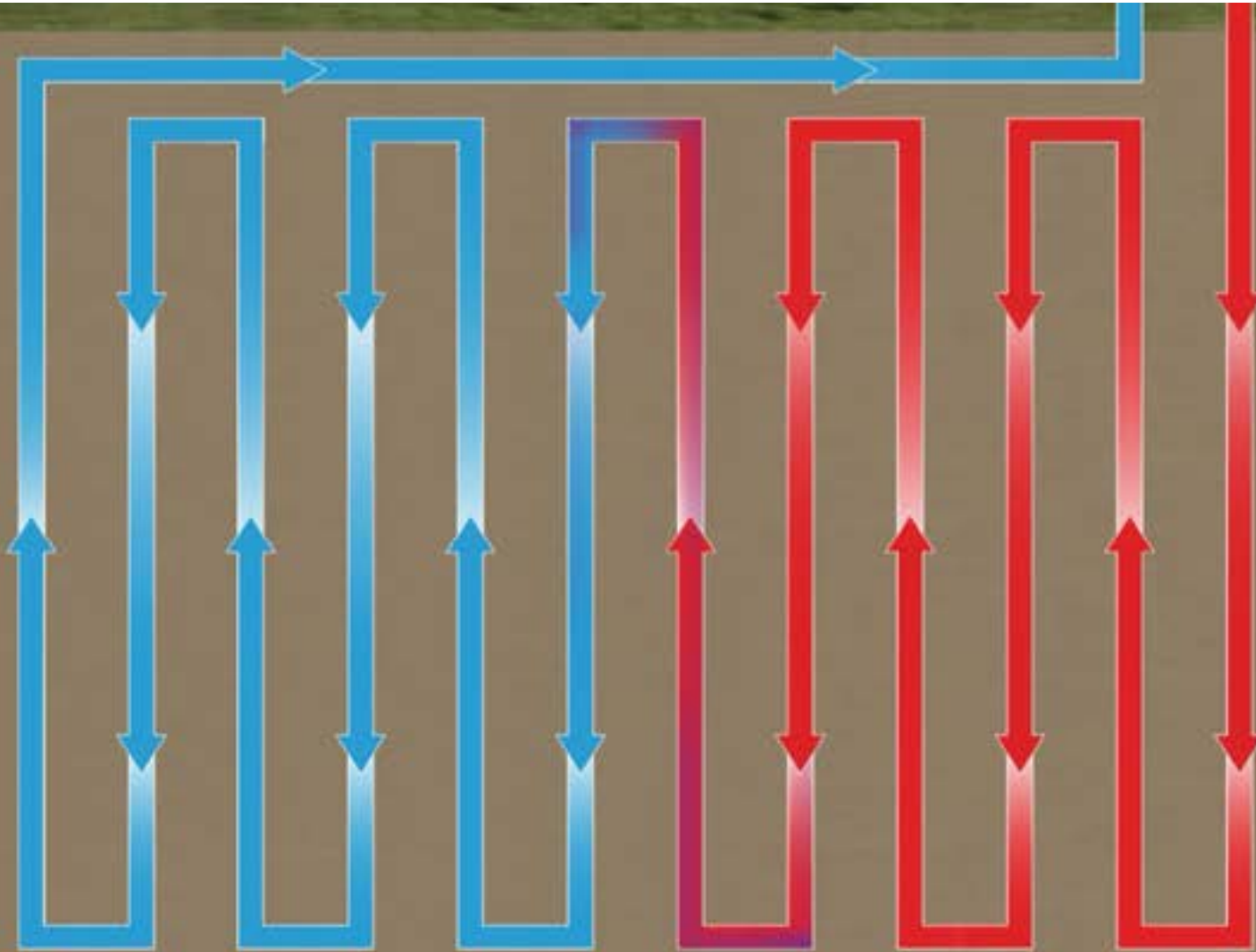
**Most in U.S.*



02

Geothermal Basics

Geo-Exchange Basics



How Does a Geothermal System Work?

The earth's constant underground temperature is a renewable resource that cools and heats water from the building. In the winter, the water is heated by the earth, then exchanged in the building.

In the summer, the water is cooled by the earth, then exchanged in the building.



Why Geothermal?

- **Most efficient commercial HVAC system technology available**
- **Lowest energy consumption (EUI)**
- **Lowest operating costs**
- **Lowest life cycle cost**
- **Least emissions implications / all electric**
- **Ease of maintenance**
- **Heat recovery (IT/refrigerators/freezers)**



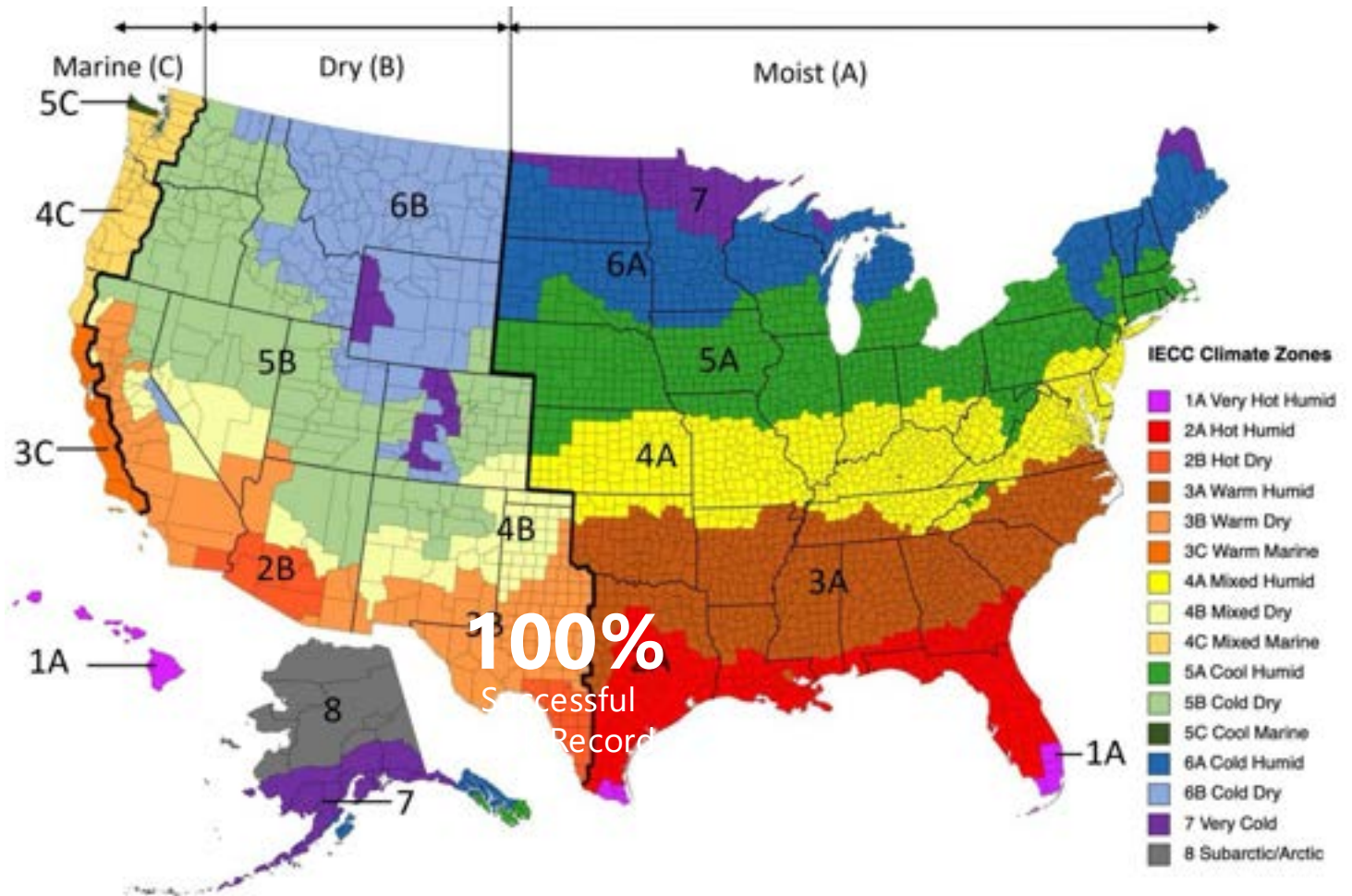
Where Does Geothermal Make Sense?

Geothermal Sense

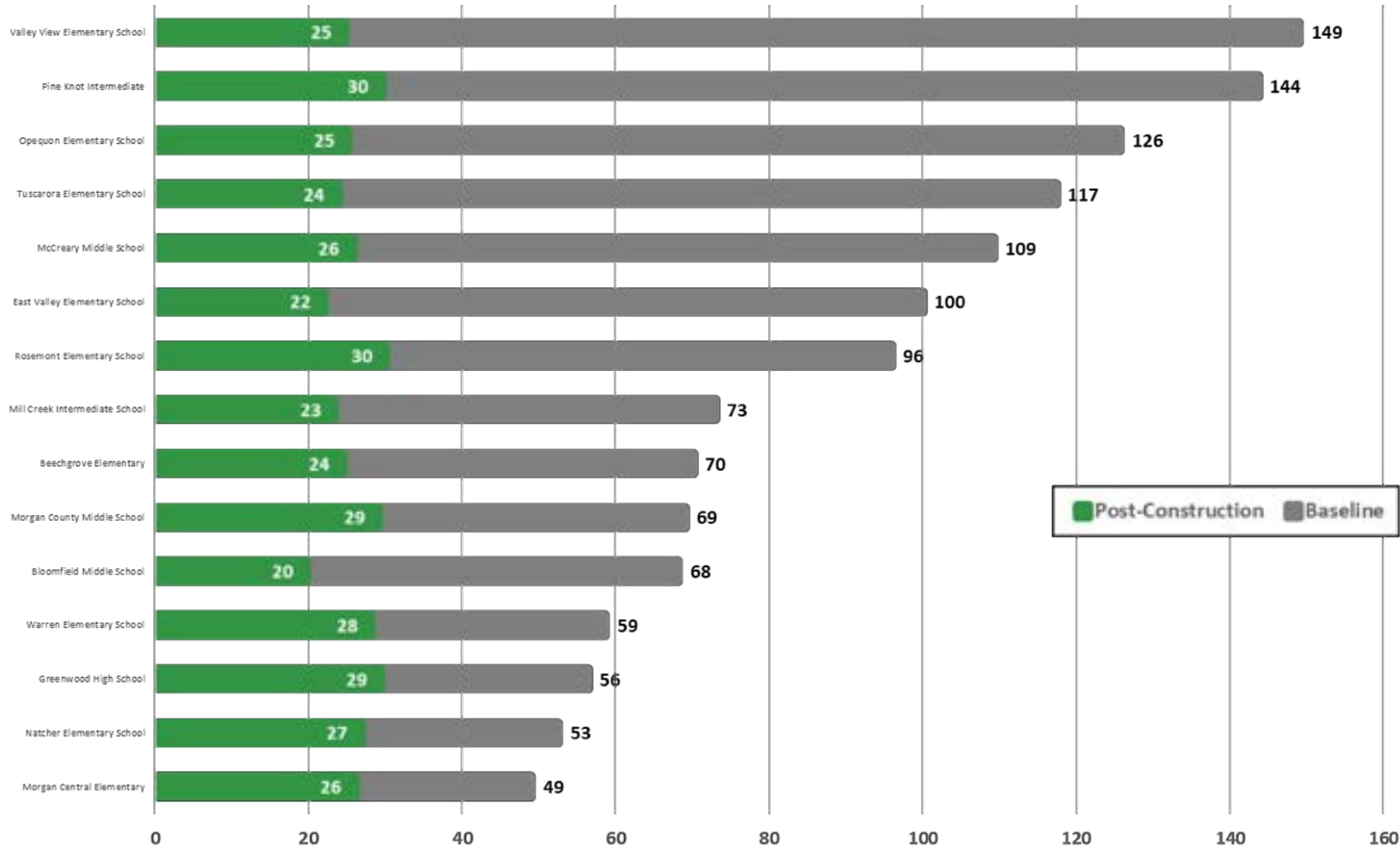
- Zones 3-6 Generally
- Others maybe
- Rocky Soils
- Clay/loam based soils
- Groundwater = great!

Geothermal Challenges

- (not necessarily impossible!)
- Extremely sandy soils
- Extreme environments
- Very unbalanced loads



System EUI Comparison – Renovations



The Department of Energy
Defines Net-Zero Capable as:
35 EUI or Less

**Geothermal HVAC
100% Achievable
within Budget**



Geothermal Approach

- **Evaluate & Model:** Assess existing systems, energy performance, and site feasibility for geothermal integration
 - **Perform Test Bore**
- **Bundle for Value:** Combine HVAC, envelope, lighting, and controls upgrades into one holistic energy-savings package
 - **Minimize HVAC Load First**
- **Design for Longevity:** Engineer holistic geothermal systems for efficiency, reliability, and reduced maintenance
- **Verify Results:** Monitor, measure, and guarantee performance through data-driven validation



03

Alternative Funding

Investment Tax Credits (ITC)



Investment Tax Credits

Geothermal HVAC

Solar

Energy Storage

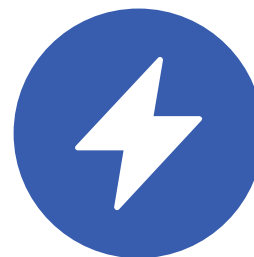


Low Income Community

Bonus 10% incentive



Direct-Payment to Not-for-Profit Owners



Energy Community

Bonus 10% incentive



30% Base Tax Credit

Installed efficiency / generation



Domestic Manufacturing

Bonus 10% incentive

GRECs

Geothermal Renewable Energy Credits

- 1 GREC = 1 MWh of Geothermal Heating/Cooling
- Established by State's Renewable Portfolio Standards (RPS)
 - Alternative Compliance Payment (ACP) creates demand & established value
- Creates revenue stream for system owners
 - Aggregators have upfront payment options
- GREC Markets
 - Maryland
 - Virginia
 - New Hampshire



Utility Rebates, Grants & Financing

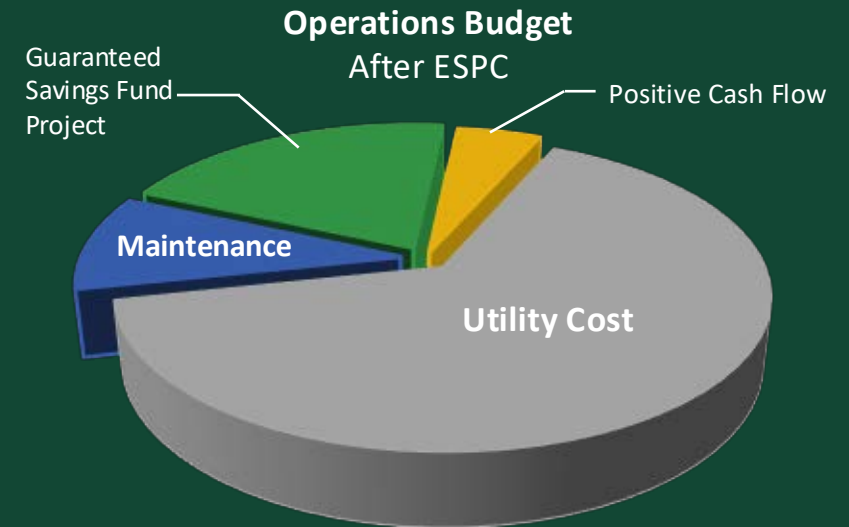
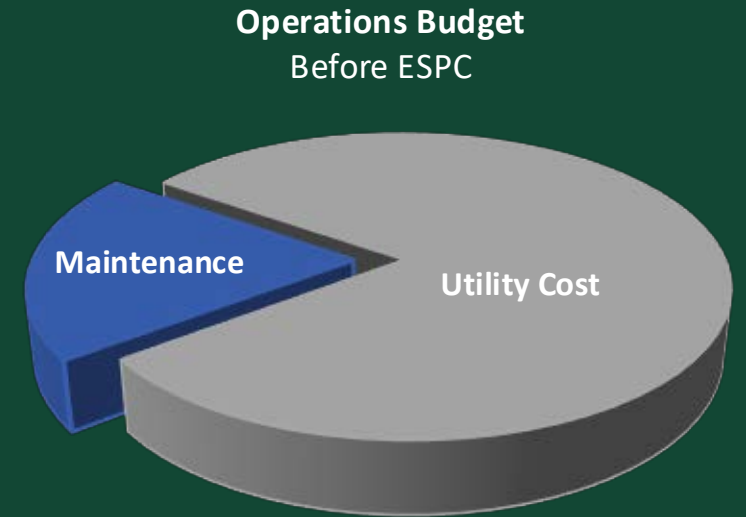
- **Utility Rebates**
 - Incentives for high efficiency HVAC systems
 - Incentives for electrification
 - CO2e Offset
 - Geothermal specific utility credits
- **Grants**
 - Decarbonization/Electrification Funding
- **Green Bonds & Banks**
 - Low interest financing

ESPC

Energy Savings Performance Contracting (ESPC)

- a financing tool used to reallocate utility cost savings to make facility improvements

- Funds are invested in facilities rather than paid to the utility company
- Preserve local funds for future major capital improvements
- Excess savings (in yellow) are 100% retained by school district
- Streamlined procurement method



Geothermal Project: Cost vs. Available Incentives

Stacking Incentives to Lower Net Project Cost



Values are estimates and may vary based on project specifics, utility programs, GREC market conditions, and ESPC terms.



Let's Connect.

Supporting Geothermal Deployment in Maryland

Maryland Energy Administration

Maryland Energy Administration Mission

*We promote **clean, affordable, reliable energy** and energy-related **greenhouse gas emission reductions** to benefit Marylanders in a **just and equitable** manner.*

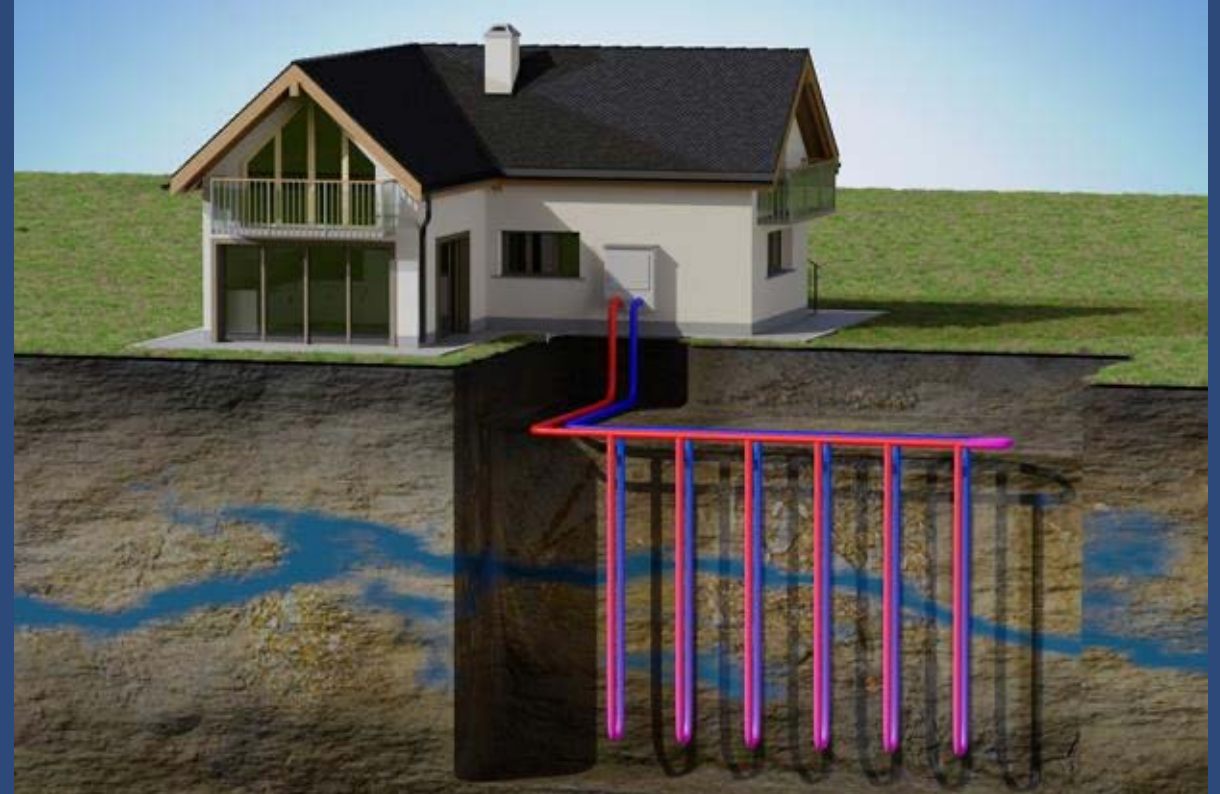
How? We advance impactful **energy policies** and **programs** to help achieve Maryland's clean energy and greenhouse gas reduction goals.

We feel the urgency to lower emissions and are driven by **2** **guideposts**: Net Zero Emissions (CSNA) and 100% Clean Energy (Governor Moore)



MEA Programming Supporting Geothermal

- FY26 Maryland Ground Source Heat Pump Advantage Pilot Program (MDGAP)
- FY26 MDOT MOU for geothermal deployment at TOD Sites
- FY25-FY26 Affordable Electrification Outreach Program (WARMTH)
- Decarbonizing Public Schools



Maryland Ground Source Heat Pump Advantage Pilot Program (MDGAP)

- New FY26 Program
- Incentives to builders/developers and housing authorities that install GSHPs in new construction residential developments.
- Approximately **\$12k** per GSHP installation
- **Geographic Focus:** LMI and/or Overburdened census tracts.
- **Goals:** lower upfront costs associated with GSHP installation and support market transformation.

FY6 MDGAP Awards

- Total Awards: **\$2.5M**
- Funding GSHP installations in **250+** new construction residential units.
- Upstream Lease + Dandelion Energy partnerships w/:
 - Ward Communities
 - Dream Finders Homes

Awardee	Award Amount	Project Scope
Garrett County Affordable Housing Land Trust	\$963,600.00	To install GSHP systems in each unit of a 73-unit new construction affordable housing development at Hemlock Grove in Grantsville, Maryland.
Redevelopment Authority of Prince George's County	\$240,000.00	To install GSHP systems in each unit of a 20-unit new construction affordable housing development in Fairmount Heights, Maryland.
Upstream Lease, LLC	\$513,600.00	To install GSHP systems in each unit of a 48-unit new construction affordable townhome development at The Summit at Walnut Hill in Elkton, Maryland.
Upstream Lease, LLC	\$810,000.00	To install GSHP systems in each unit of an 81-unit new construction affordable townhome development at Montpelier Highlands in Laurel, Maryland.

MDOT MOU for Geothermal at TOD Sites

- **\$4M** in funding for geothermal deployment at up to two mixed-use TOD sites.
- Funding for incremental costs associated with installing GSHP systems in new construction compared to conventional fossil-fuel powered HVAC systems.
- Up to **\$15k** per residential housing unit developed.
- Supporting GSHP installations in **250+** new construction residential units.

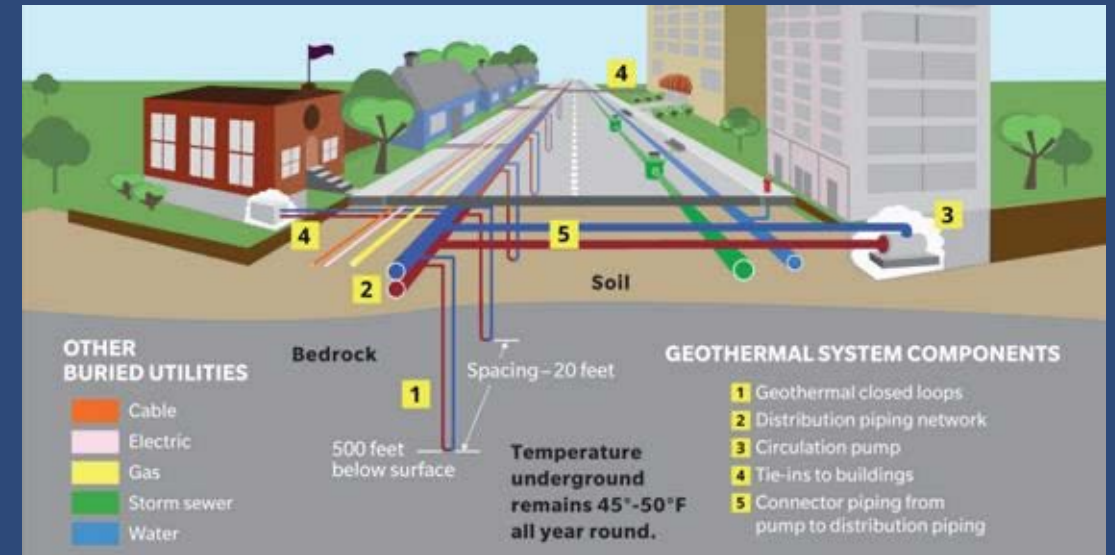
Other MEA Programming Supporting Geothermal

- **FY25-FY26 Affordable Electrification Outreach Program:** supports nonprofit outreach and education to communities selected for Maryland's WARMTH pilots.
- **Decarbonizing Public Schools Program:**
 - FY24-25: **\$5M+** in geothermal funding
 - FY26: **\$3M+** in geothermal funding



The WARMTH Act: Networked Geothermal

- Passed by MD General Assembly in 2024
- Requires gas companies to submit proposals for 1-2 TENs to PSC
- Must be retrofits
- Participating households must receive weatherization and full electrification
- At least 80% of participating households must be LMI
- BGE proposed two sites; WGL proposed one



PSC Ruling on WARMTH

- PSC issued ruling in December 2025
- Majority concerned about costs, but did not reject utility proposals outright.
- Ordered the hiring of a consultant to oversee process of revising proposals to lower costs.
- Dissenting opinion from two Commissioners: would have rejected the proposals w/o prejudice.
- **What's next:** hiring consultant and beginning proposal revision process.

Quick Overview: Maryland GRECs

- Administered and regulated by the Maryland Public Service Commission (PSC).
- Thermal equivalent of a solar REC - GRECs reward the renewable thermal energy and energy savings produced by the geothermal system.
- System owners receive credits that can be sold to electricity suppliers who need them for Renewable Energy Portfolio Standard (RPS).
- Authorized through Maryland's RPS.
- Both residential and non-residential geothermal systems are eligible.

Learn More About **MEA Programs**



FINANCING GEOTHERMAL ENERGY

with GasToGeo

Zeyneb Magavi
Executive Director, HEET



HEET MISSION

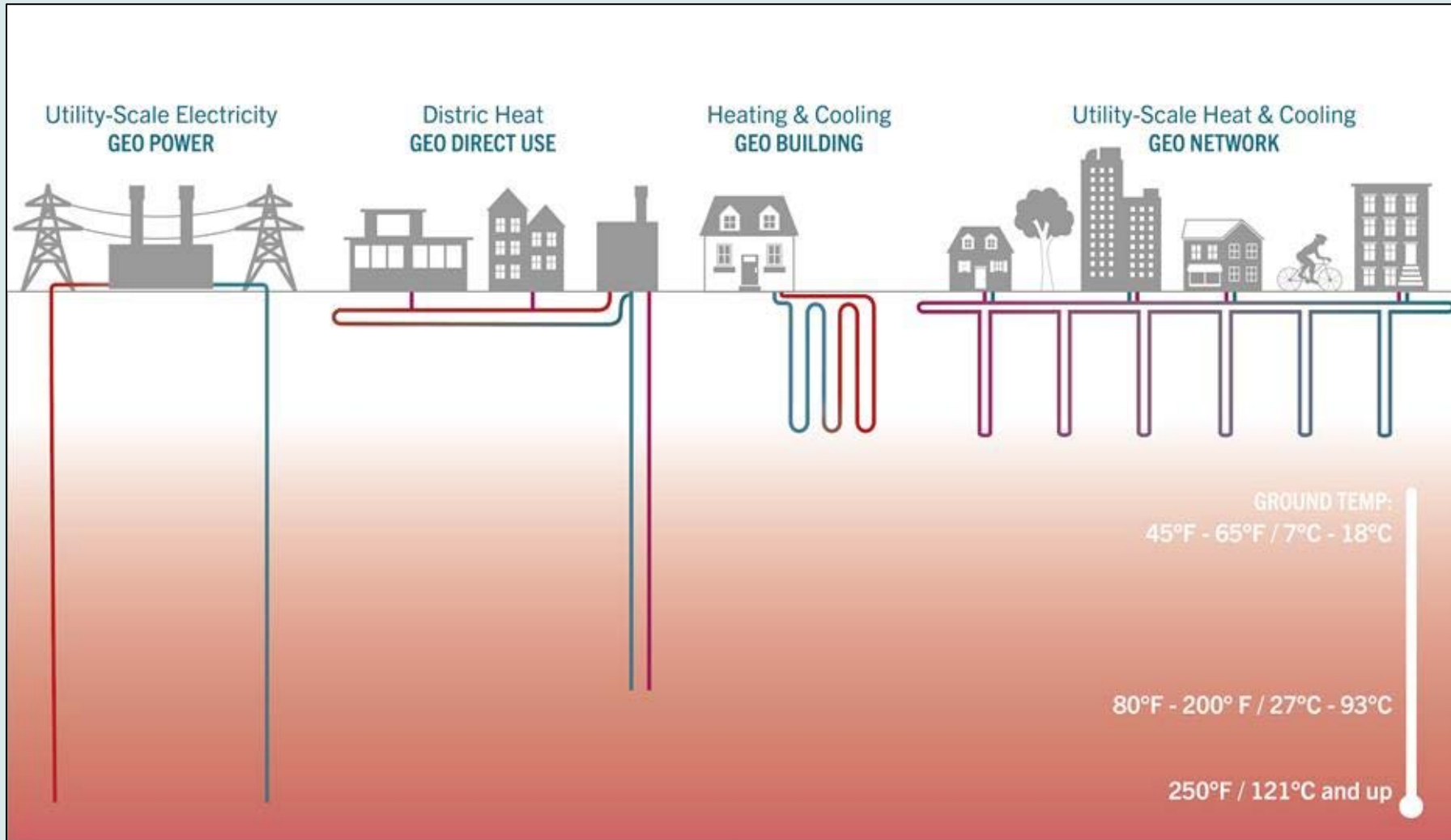
To evolve the energy system to meet the needs of our future



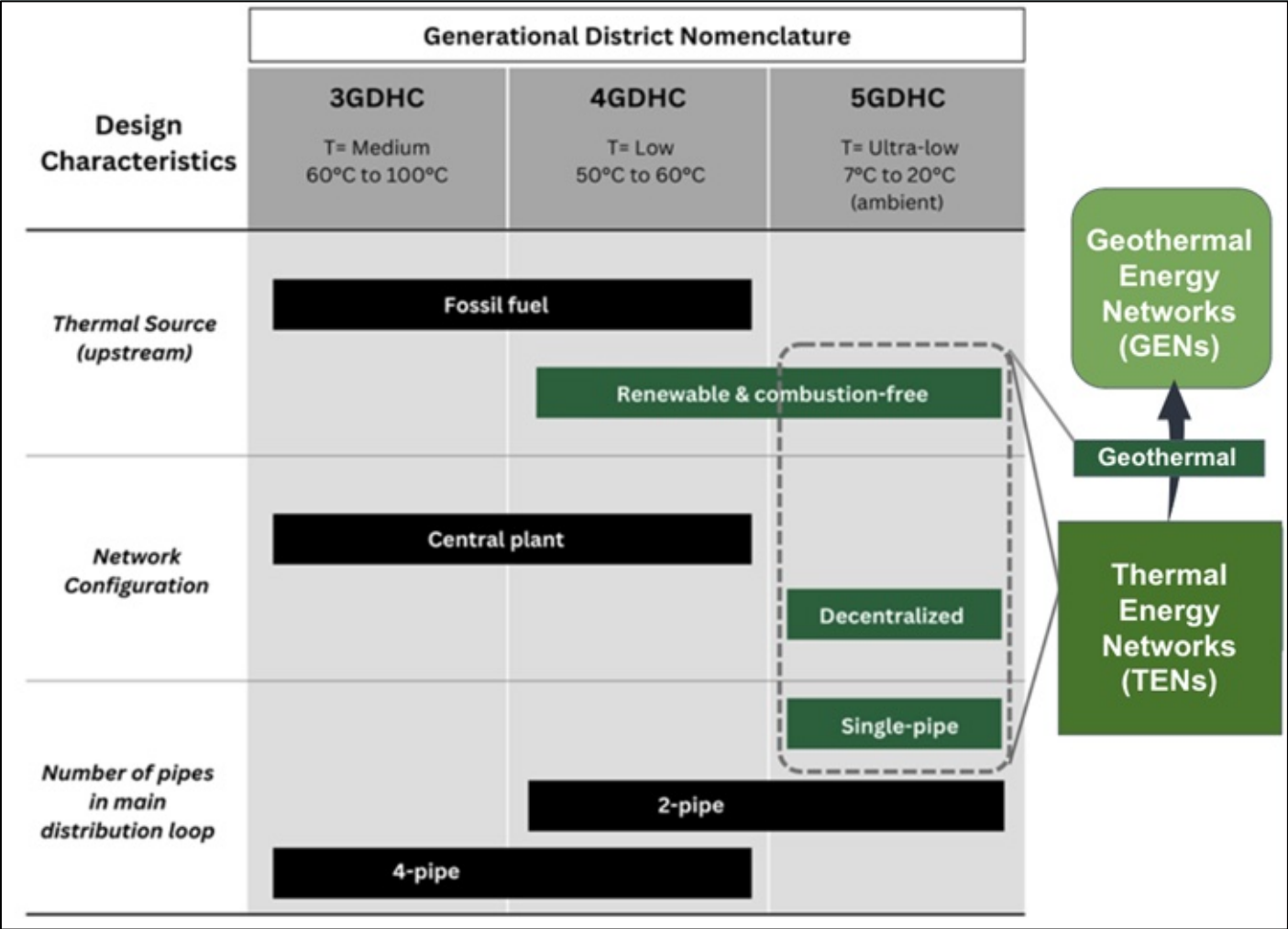
- ▶ **R&D**
- ▶ **POLICY**
- ▶ **WORKFORCE**
- ▶ **PROJECT DEVELOPMENT**
- ▶ **STAKEHOLDER NETWORKS**
- ▶ **THOUGHT LEADERSHIP & INNOVATION**

GEO THERMAL:

ENERGY or TECHNOLOGY ?

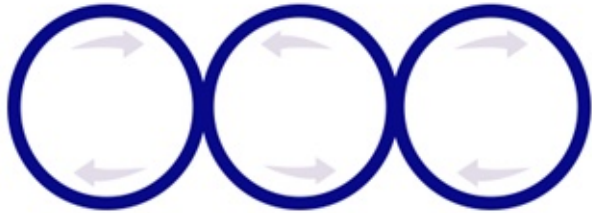


GEO COMMUNITIES: DISTRICT OR 'NEXT GEN' NETWORKS ?

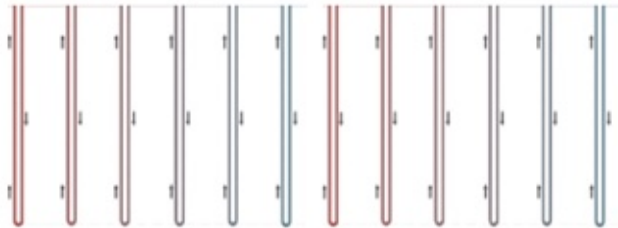




BUILDINGS:
(GEOTHERMAL HVAC)



DISTRIBUTION:
(THERMAL ENERGY
NETWORK)



THERMAL RESOURCES:
(GEOTHERMAL BOREHOLES)

Also . . .

WASTEWATER EXCHANGE
INDUSTRIAL WASTE HEAT
LAKES, RIVERS, PONDS
OTHER THERMAL . . .

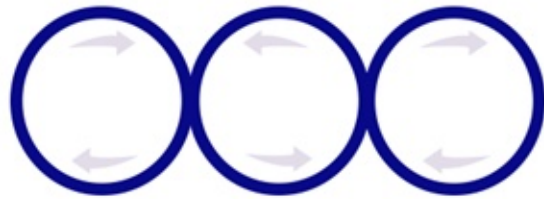
WHAT IS A THERMAL ENERGY NETWORK ?

An evolution of district energy that taps ambient thermal and moves it between buildings in pipes filled with water. Every component of a Thermal Energy Network contributes efficiencies. Together they are the most efficient heating and cooling.

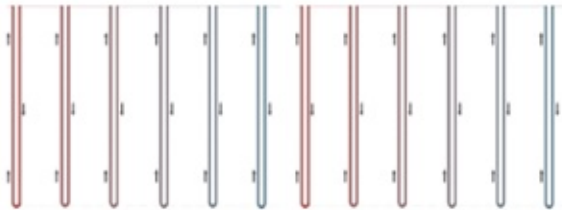
Each component is OLD TECH. Together they are NEW TECH.



BUILDINGS:
(GEOTHERMAL HVAC)



DISTRIBUTION:
(THERMAL ENERGY
NETWORK)



THERMAL RESOURCES:
(GEOTHERMAL BOREHOLES)

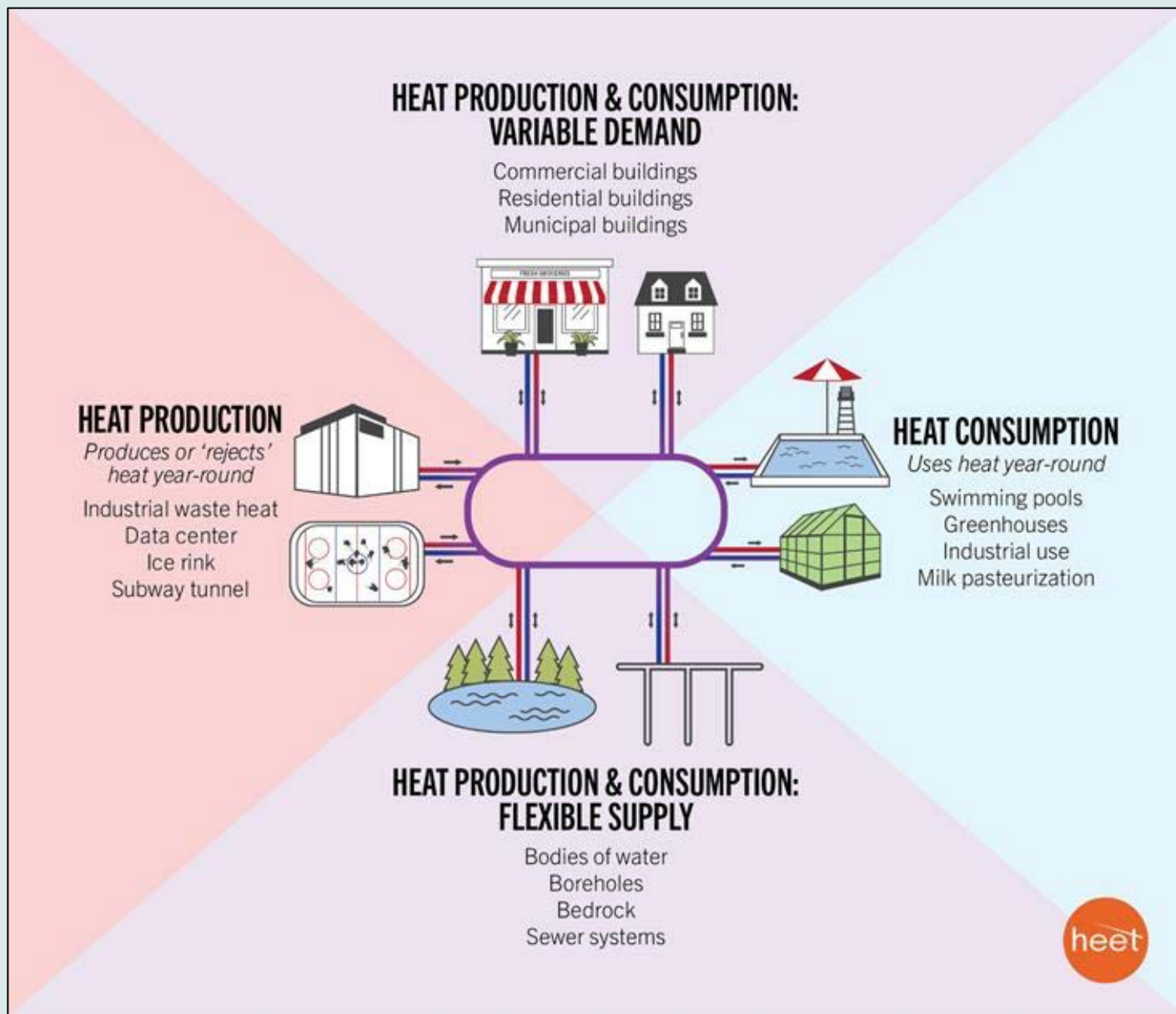
Also ...

WASTEWATER EXCHANGE
INDUSTRIAL WASTE HEAT
LAKES, RIVERS, PONDS
OTHER THERMAL ...

**BUILDING
INVESTMENT**

**SYSTEM
INVESTMENT**

**UTILITY
INVESTMENT**

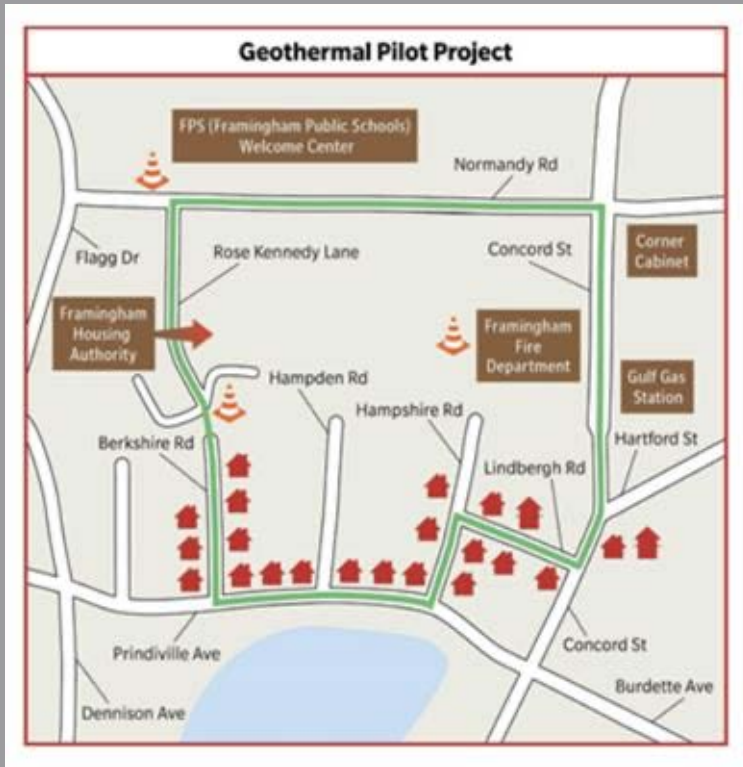


CREATING A THERMAL ENERGY MARKET

A thermal utility is responsible for optimizing the interconnection of thermal resources to thermal demands across space and time.

Prioritizing closest, least cost thermal resources relies on the defining parameters illustrated in four quadrants. The flexible supply quadrant is the MOST valuable resource.

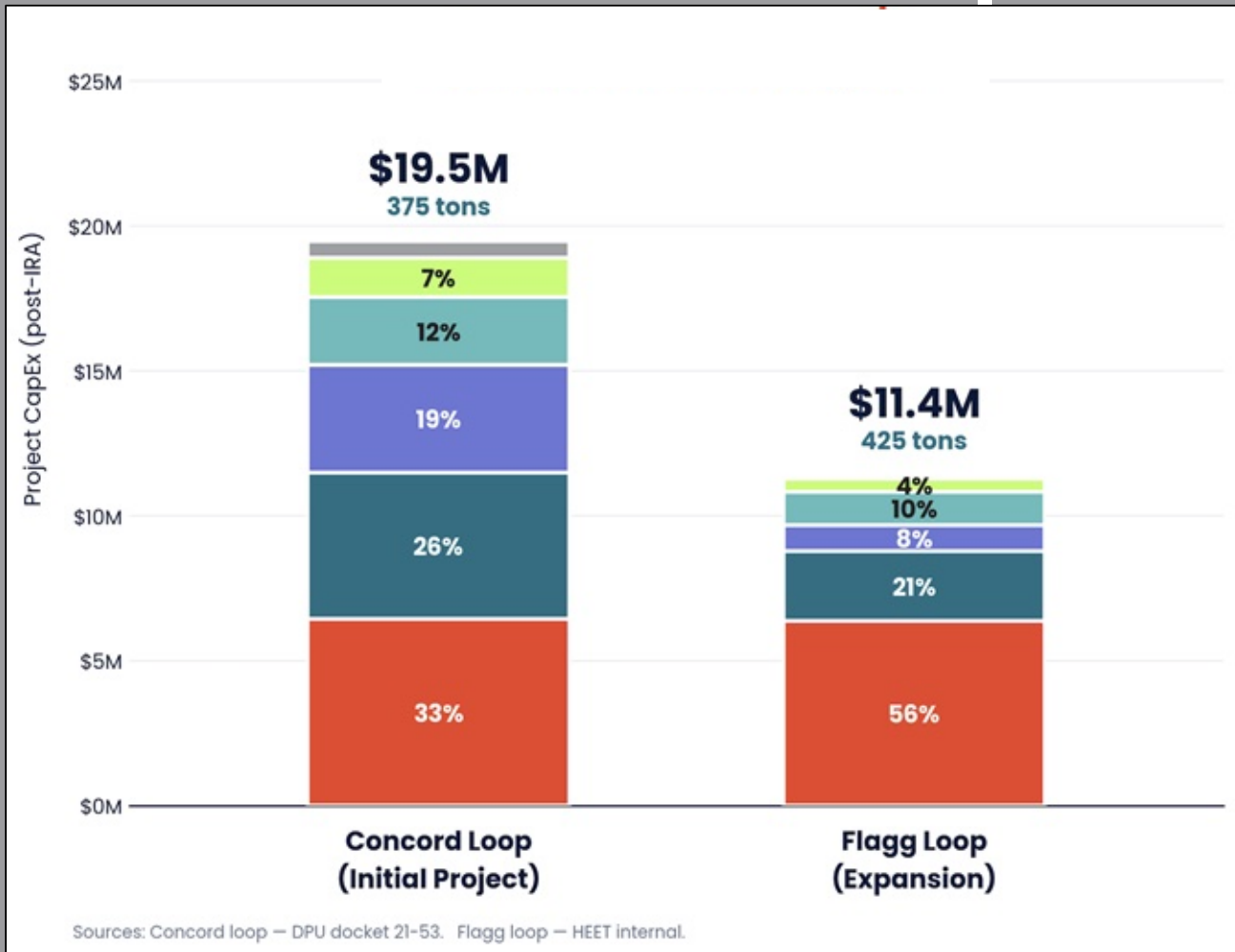
EVERSOURCE GAS's GEOTHERMAL NETWORK



Framingham, MA Neighborhood, Ribbon Cutting in 2024



Expected Cost Reductions in Expansion



**EXPECTED 50%
REDUCTION IN
COST/TON**





2020

2025

2035

DEMONSTRATION

- ❑ Pilots Permitted
- ❑ Workforce Engaged
- ❑ Pilots Completed
- ❑ Data Collected
- ❑ Regulatory Phases established & mapped
- ...

DEVELOPMENT

- ❑ Interim Ratemaking
- ❑ Data Collection Standardized
- ❑ Workforce Development
- ❑ Cost Framework
- ❑ Regulatory Framework
- ❑ Thermal Commons
- ❑ ~ 100 Projects
- ...

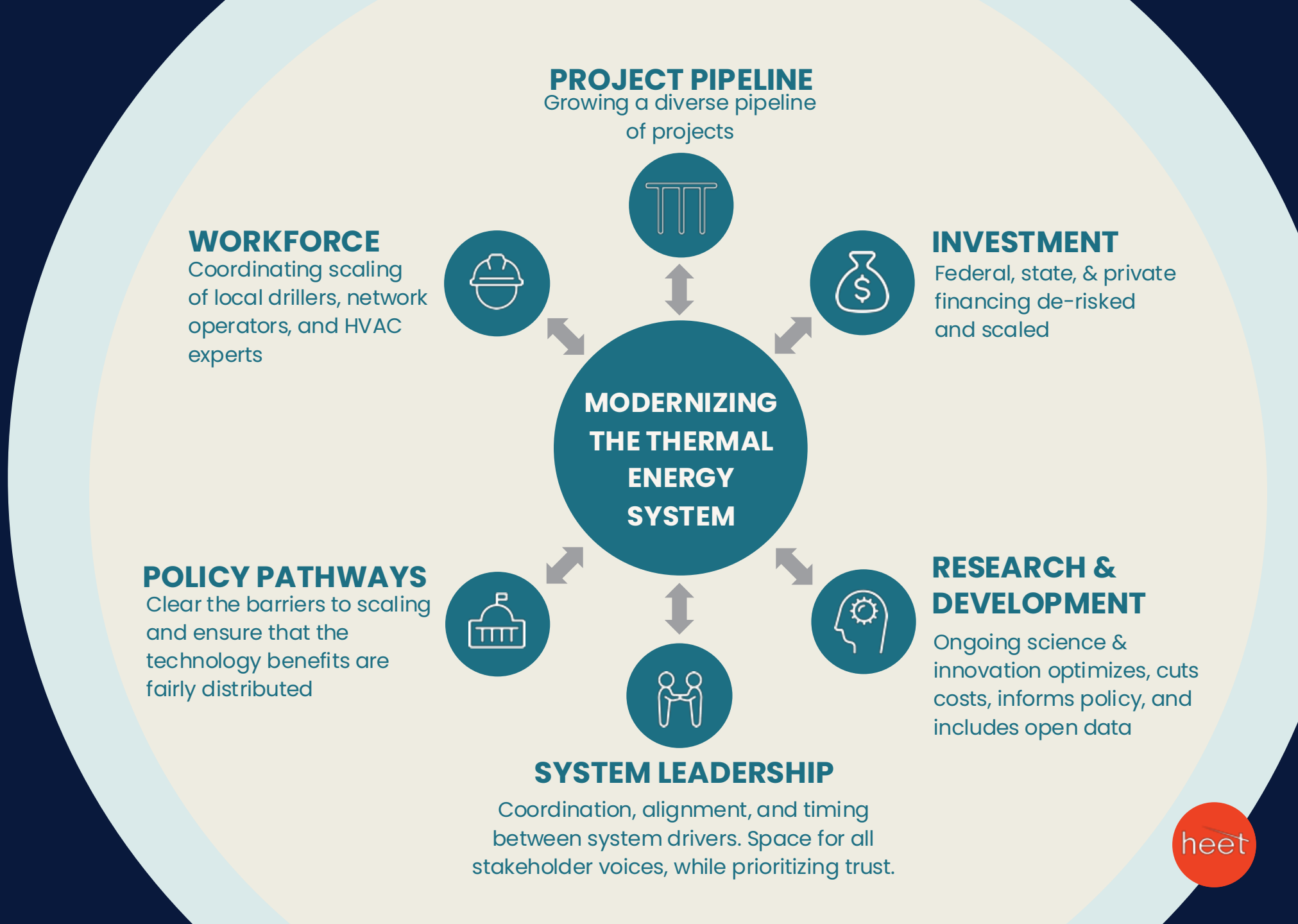
DEPLOYMENT

- ❑ Integrated Planning
- ❑ Ratemaking Final
- ❑ Performance Modeled
- ❑ Costs Understood
- ❑ Workforce Growth Prepared & Scaling
- ❑ Finance Model Known
- ❑ Thermal Regulation
- ❑ ~ 80% of buildings
- ...

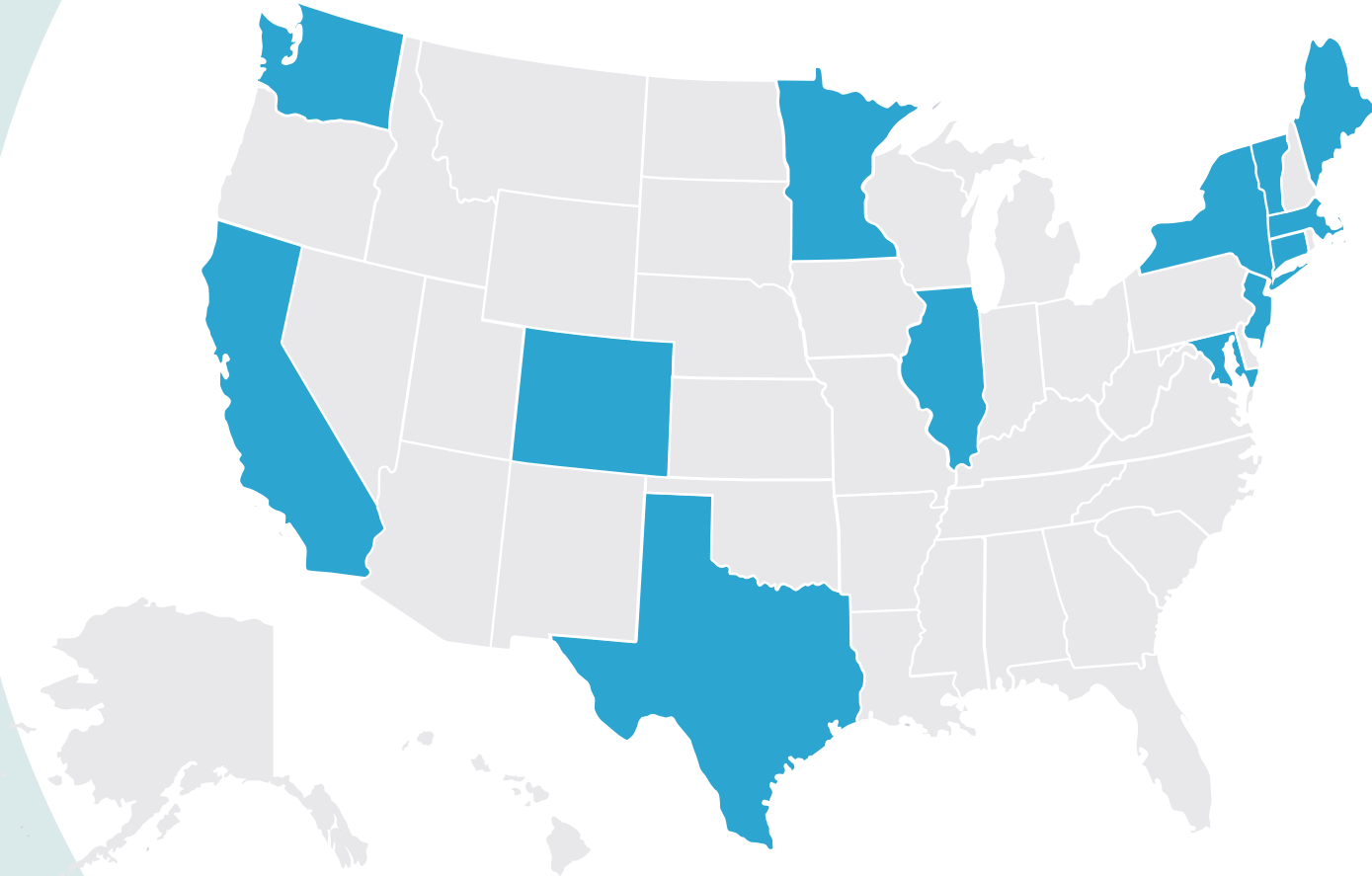
Education, Communication, Convening, & Stakeholder Alignment > Strategy

SCALING THE SYSTEM

HEET's current
strategic plan to
provide values
and data based
system
leadership







MA - 2021, 2022, 2024, 2025

MN - 2021, 2024, 2025

NY - 2022, 2025

CO - 2023, 2024, 2026

WA - 2024, 2025

MD - 2024

VT - 2024

CA - 2024

NJ - 2024 (study)

ME - 2025 (study)

TX - 2025

IL - 2025

CT - 2025

REGIONAL CENTERS OF EXCELLENCE

The new Geothermal Drillers Association has curriculum developed and two driller technician trainings complete as a 'Center of Excellence' is founded in Framingham, MA.



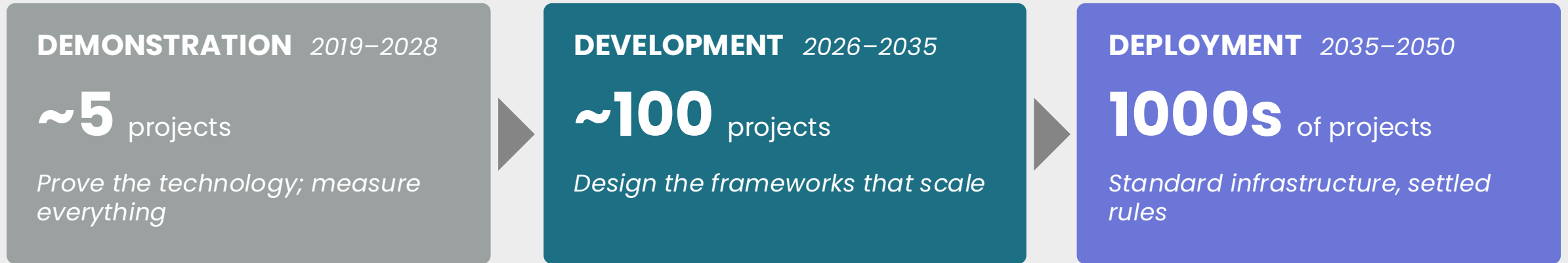
MASS
CLEAN ENERGY CENTER



heet

DEMONSTRATE, DEVELOP, DEPLOY

A Three-Stage Plan to Massachusetts Statewide Adoption by 2050



FIVE COORDINATED ACTION TRACKS

Policy phase-matched regulatory frameworks
pilot authority to scalability

R&D Geo DataBank; measured performance, cost,
and grid-impact studies

Workforce gas-to-geo skills transfer; drilling Center
of Excellence; geo-HVAC training

Finance cost categorization, used-and-useful
standards, funding stack at street scale

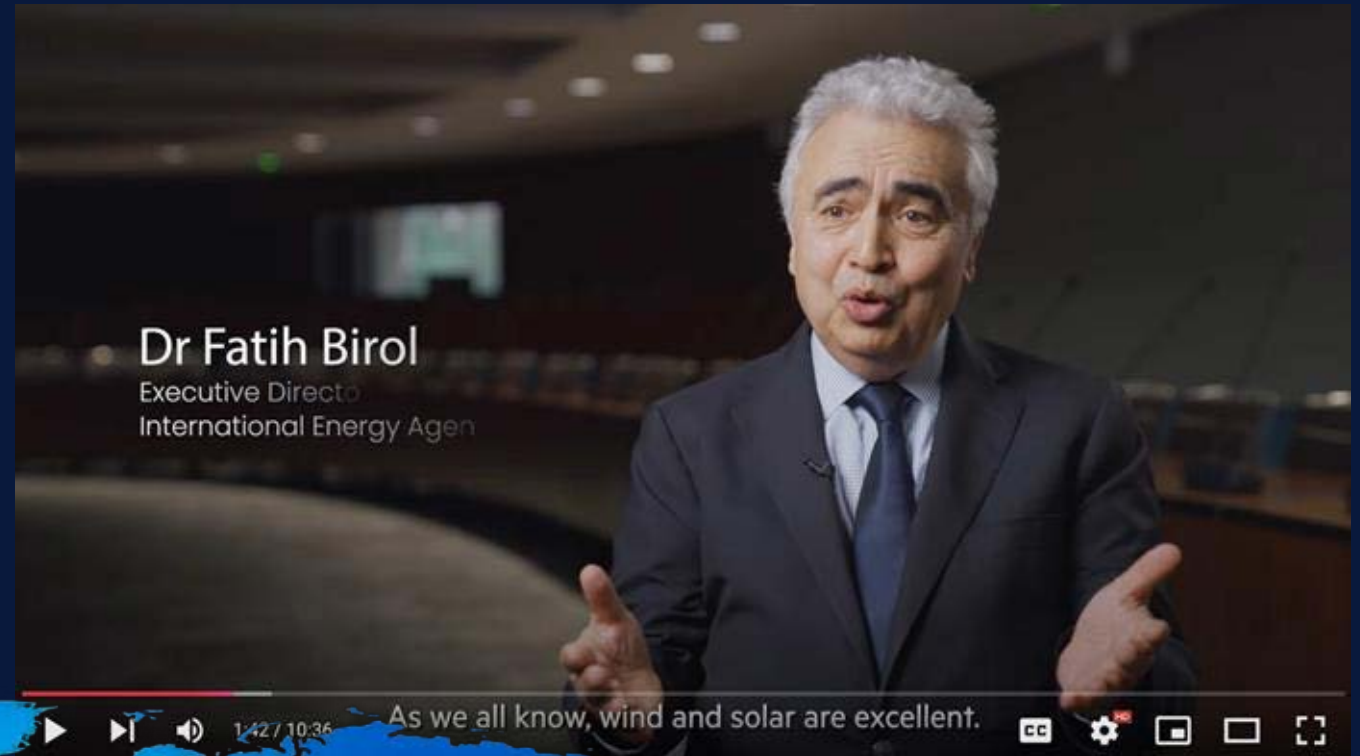
Project pipeline Framingham + Flagg Loop; utility pilots;
Kickstart communities, Franklin Fields

*Executive Order 654
(Mar. 2026) directs accelerated
geothermal deployment:
resource identification,
permitting models, licensing
pathways, and workforce.*



RISING GEO

In the past 2 years the U.S. Department of Energy published Geothermal LiftOff reports and the IEA published a first ever Geothermal Report, kicking off a surge in interest, excitement, investment, and a growing awareness of the coming geothermal century.



<https://www.youtube.com/watch?v=mvOoBL-et7U>

THINK THERMAL TOGETHER

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Opportunities for State Energy Offices to Promote Financing

Maddie Koewler

- Senior Program Director, Buildings, National Association of State Energy Officials

Anna Crouch

- Program Administrator, Minnesota Department of Commerce

Nick Manning

- Senior Clean Energy Policy Specialist, Energy Division, Washington State Department of Commerce

Ryan Dougherty

- President, The Geothermal Exchange Organization

WHAT DOES INDUSTRY NEED TO KNOW?

Resource and site suitability

- Subsurface resource profiles
- Groundwater and aquifer profile
- Climate and load needs
- Existing projects

Incentives and finance

- Rebates
- Financing structures

Permitting and regulation

- Permits
- Permitting process flow
- Environmental review
- Subsurface rights
- Water rights

Workforce and supply chain

- Available drillers, designers, installers
- Training and certification opportunities
- Licensing requirements

Codes and building performance standards

- Code adoption and status
- Building performance standards

Economics and Process

- Typical costs
- Case studies
- Pre-development checklist

Utility landscape

- Service territories
- Relevant rates
- Interconnection requirements
- Thermal Energy Network policies

Support

- Point of contact
- Partners



SCALING GEOTHERMAL HEATING AND COOLING WITH FEDERAL TAX CREDITS AND INNOVATIVE FINANCING

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