THERMAL ENERGY NETWORKS ACROSS THE COUNTRY

Moderator: **Will Lange / *WaterFurnace International***

Speakers: **Ania Camargo / *Building Decarbonization Coalition***

Holly Braun / *NW Natural*

David Podorson / *Xcel Energy*

David Wang / *Department of Energy*

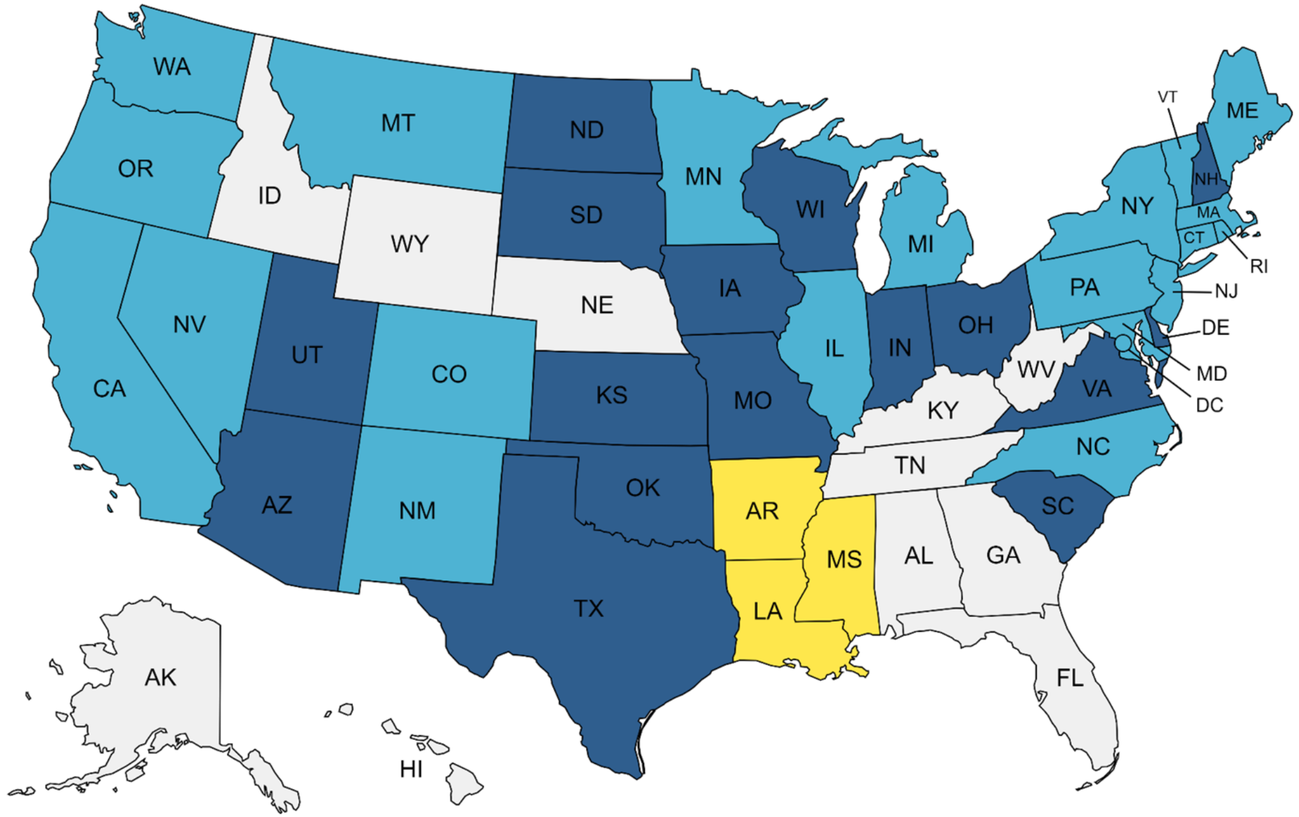
BUILDING DECARBONIZATION COALITION

National Landscape

Ania Camargo, BDC
Thermal Networks Sr Manager

October 22nd 2024

Emission Reduction Commitments



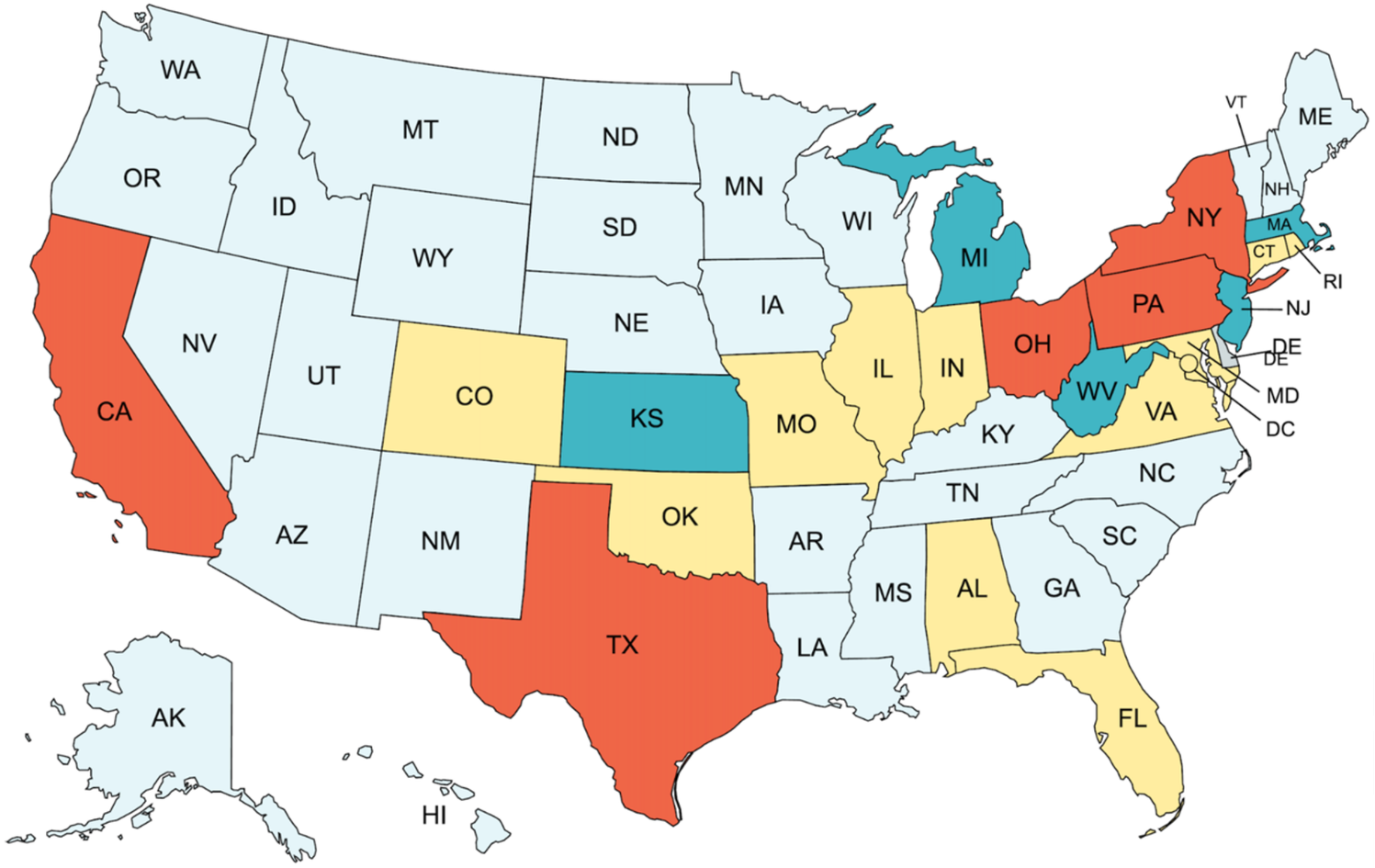
GHG and RPS/CEPS Commitments

RPS/CEPS only

Energy Efficiency Standard only

https://www.naruc.org/nrri/nrri-activities/clean-energy-tracker/

Miles of Leak Prone Pipe



NY > $28 billion to replace by 2043

MA > $34 billion to replace by 2039

Philadelphia > $8 billion to replace by 2055

IL > $80 billion

National Estimate > $740 billion by 2040

< 750 miles

750 to 1500 miles

2500 to 5000 miles

> 7000 miles

2020 PHMSA data

Utility TENs General Journey in the US

Advocacy

EJ & Rate Payer Advocates
Communities
Labor
Enviros
Legislators

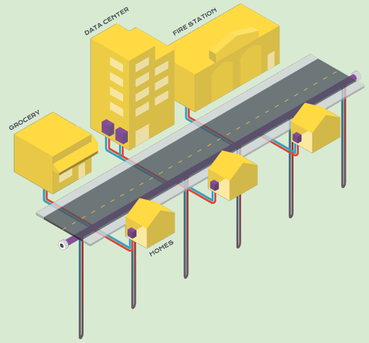
Future of Gas Proceedings

TENs Legislation

TENs Regulation

Utility Pilot Proposals:
Site selection, design, budget,etc

Construction

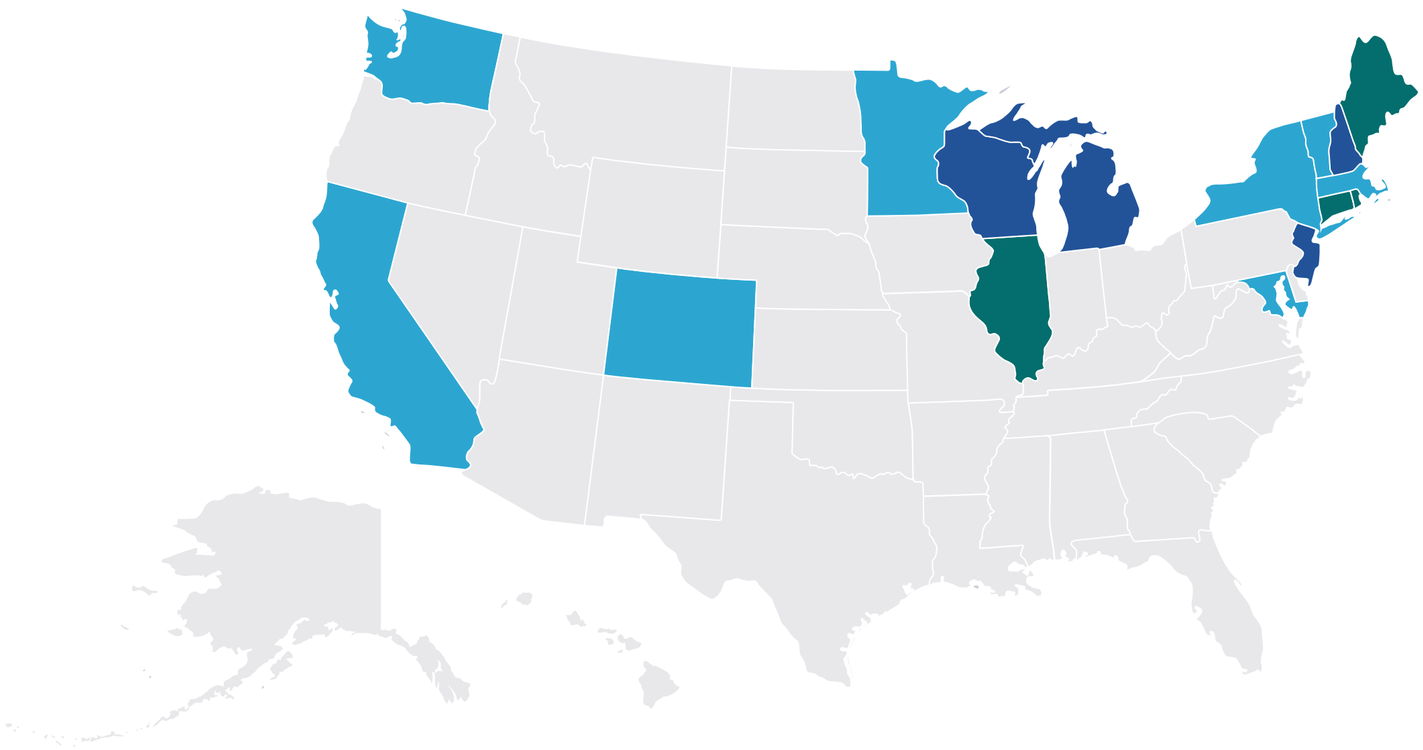


Research & Data

Deployment Readiness
Feasibility studies, workforce
community outreach
supply chain

BDC

Thermal Energy Network Legislation



Passed Legislation **Filed Legislation** **Considering Legislation**

MA - An Act Driving Clean Energy (2021-2022)

MN - Natural Gas Innovation Act (2021 + 2 bills with TENs in 2024)

NY - Utility Thermal Network & Jobs Act (2022)

CO - Thermal Energy Act (2023)

WA - Promoting the Establishment of Thermal Energy Networks (2024)

MD - WARMTH Act (2024)

VT - Act relating to Thermal Energy Networks (2024)

CA - Gas corporations: ceasing service: priority neighborhood decarbonization zones (2024)

Updated 9/15/2024

BDC heet

Thermal Energy Network Legislation Detail

Provisions	MA	MN	NY	CO	WA	MD	VT	CA
Can utilities sell thermal energy?	Comission can allow	Allowed for pilots	Allowed for pilots	Allowed for pilots	Allowed for pilots	Allowed for pilots	Allows utilties & other entities to obtain Commission authorization	Allows up to 30 neighborhood scale electrification pilots
Pilots / Demonstration Projects	Allowed	15% budget minimum for utilities > 800k customers	Mandated for 7 largest utilities (1 to 5)	Mandated for large utilities > 500,000 customers	Allowed for gas utilities	1-2 mandated for gas utilities > 75,000 customers	Allowed	Allowed
Rate Structure and Cost Recovery	Utility Commission to sort out	Utility Commission to sort out	Utility Commission to sort out	Utility Commission to sort out	Allows cost recovery for pilots through rates	Allows cost recovery for pilots through rates	Utility Commission to sort out	Allows cost recovery for pilots through rates
Who can own the thermal energy network?	Assumes gas utility	Assumes gas utility	Gas and electric can own and operate	Part of proceeding to evaluate ownership models	Gas and electric utilities can own and operate	Gas, electric, water utilities can own	Utilities and other entities can own and be regulated by Commission	Assumes gas utility
Filing Timing	File within 24 months		File 1-5 within 3 months	File 1 within 15 months	File intention within 12 months	File 1-2 proposals within 15 months	Commission report by 12/1/2025	Filed prior to 2030
Labor Provisions		Required in PUC workgroup	For utility pilots	For state agencies and universities	Consideration for Commission	For utility pilots		For utility pilots
EJ & Consumer Protection Provisions	✔	✔	✔	✔	✔	✔		✔
Alignment with climate mandates	✔	✔	✔	✔	✔	✔		✔
Data Reporting	✔		✔	✔	✔	✔		✔
Plans for gas pipes	✔			✔	✔	✔		✔
Additional Funds				✔	✔	✔		
Amends the Obligation to Serve					✔			✔

BDC

As of Sept 2024

Thermal Energy Network Legislation & Regulation

First rounds of legislation
(2021-2025)

Future legislation
(2025-2030)

Demonstration

- Allow or mandate pilots
- Align with climate mandates
- Ensure equity & affordability
- Include workforce
- Require data collection and reporting
- Cost recovery for pilots

Development

- Set regulatory framework
- Remove barriers: expand obligation to serve
- Plan for gas pipes
- Prioritization of sites

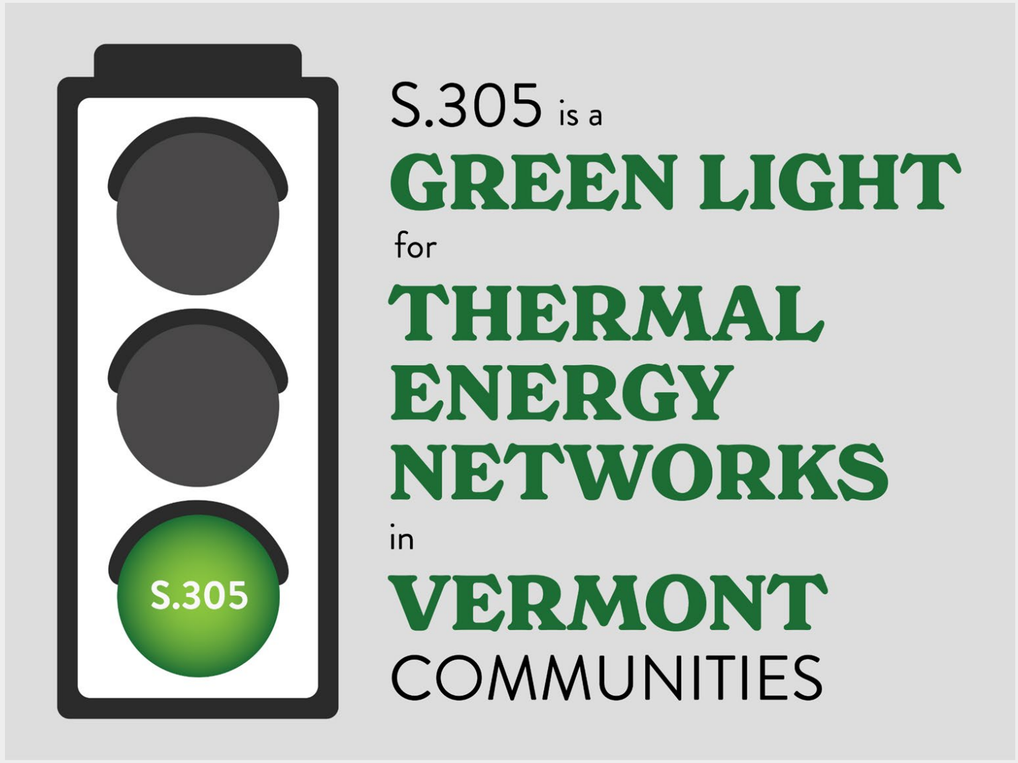
Deployment

- Integrated planning
- Disincentivize new gas infrastructure
- Non-gas pipeline alternatives
- Define ownership models
- Financing & rate design
- Transition reporting

BDC heet

SIGNED INTO LAW MAY 30, 2024

Vermont's Thermal Energy Networks Act



Authorizes all municipalities to build Thermal Energy Networks and establish thermal energy utilities without Public Utility Commission approval or regulation, just as municipal water and sewer utilities operate under local control.

Why a community -driven approach?

Leverage existing local thermal resources

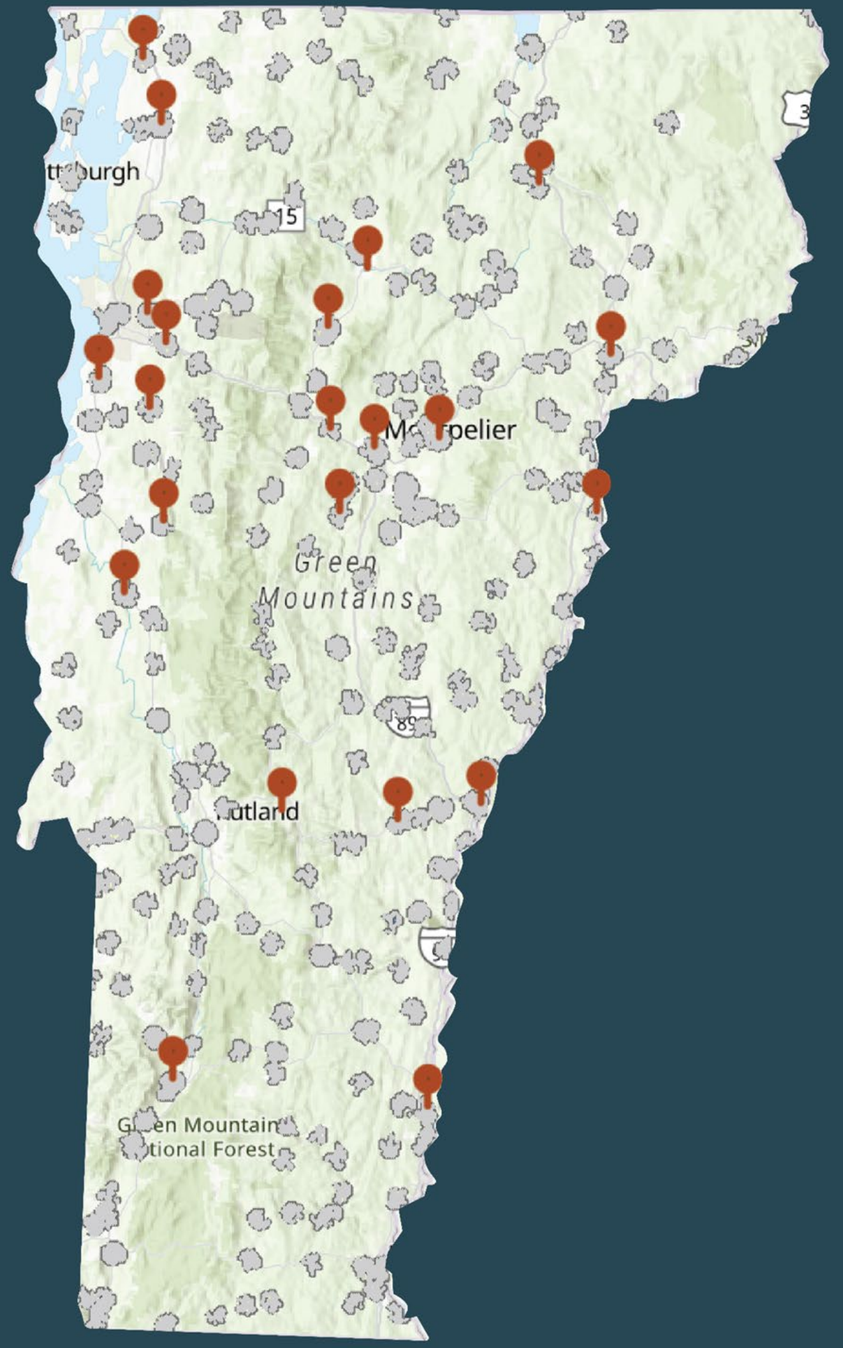
Create accessibility and affordability through shared infrastructure

Keep energy dollars invested locally

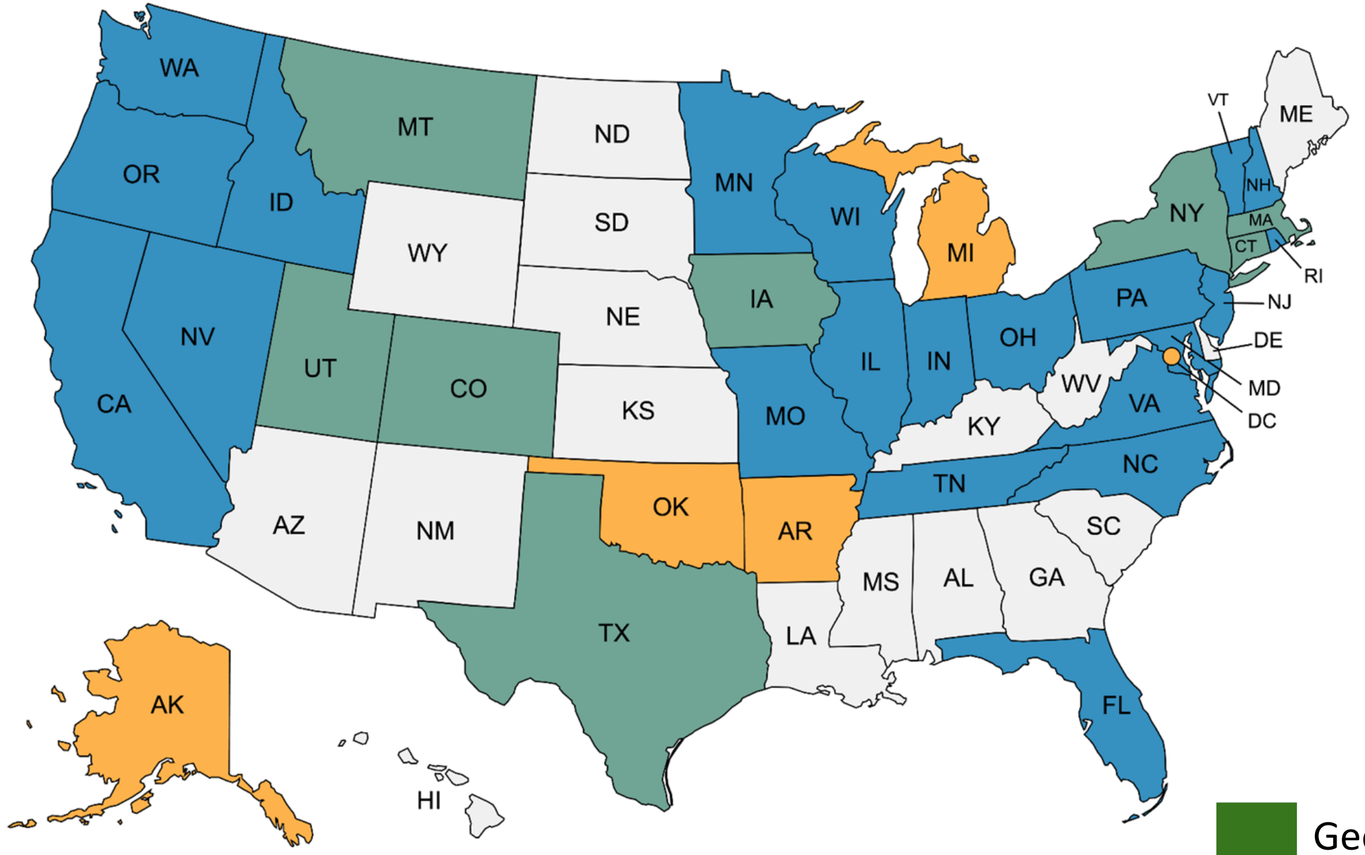
Support local priorities and economic development

Relieve reliance on oil and propane outside of limited gas utility territory

Take advantage of other infrastructure work to enhance resilience and cut costs



U.S. Thermal Energy Network Sites > 100



Geothermal Networks (GEN)

Geo District Energy 4G

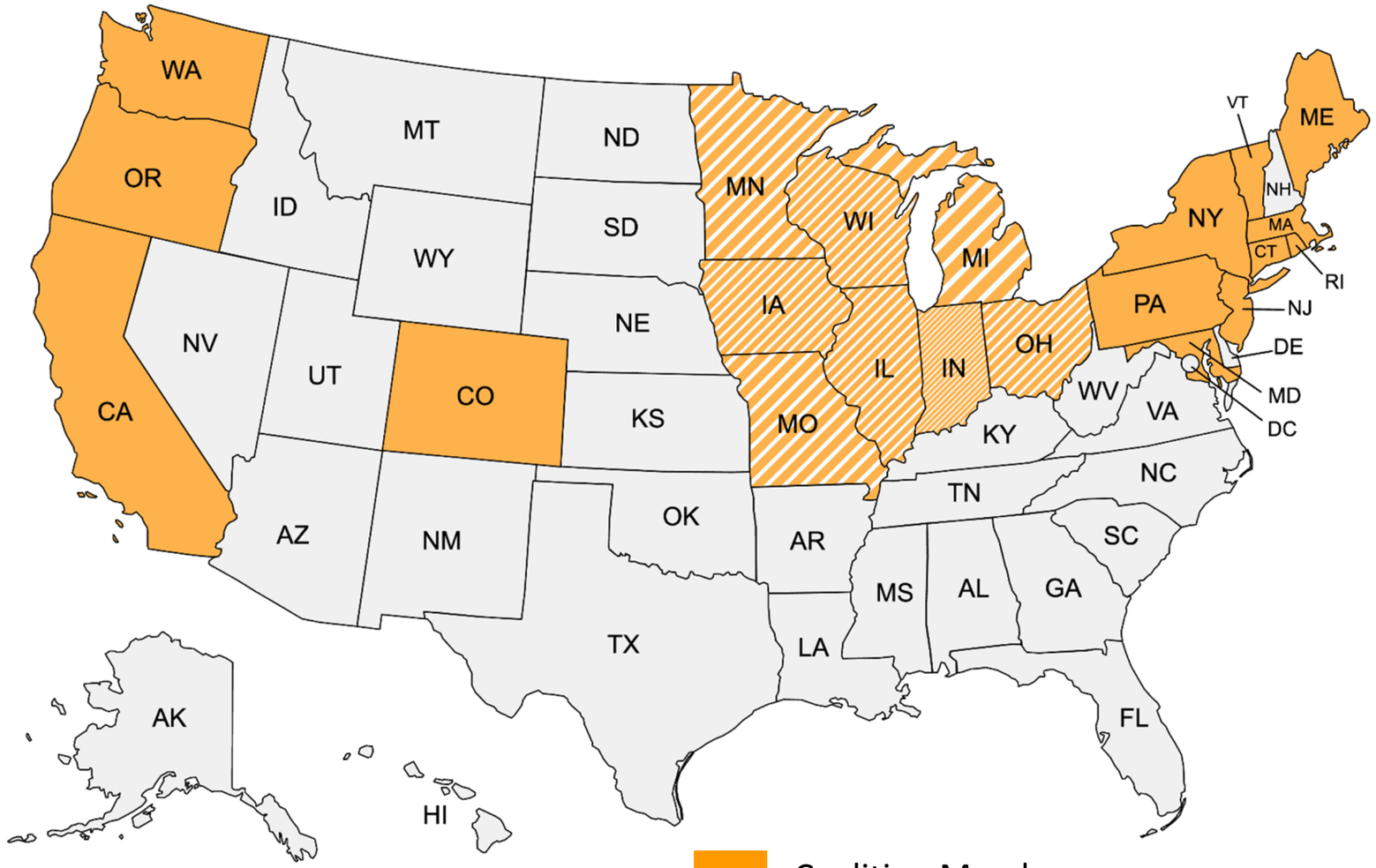
Feasibility & No GEN or 4G

Feasibility Studies

- >35 NY
- > 30 CO
- 13 MA
- Washington, DC
- Philadelphia, PA
- Marquette U., WI
- DOE Grants:
  - Framingham MA
  - Ann Arbor, MI
  - Milwaukee, WI
  - Chicago, IL
  - Duluth, MN
  - Wallingford, CT
  - Carbondale, CO
  - Middlebury, VT
  - Seward, AK
  - Nome, AK
  - Shawnee, OK

As of Oct 1,, 2023

TENs Advocate Coalition

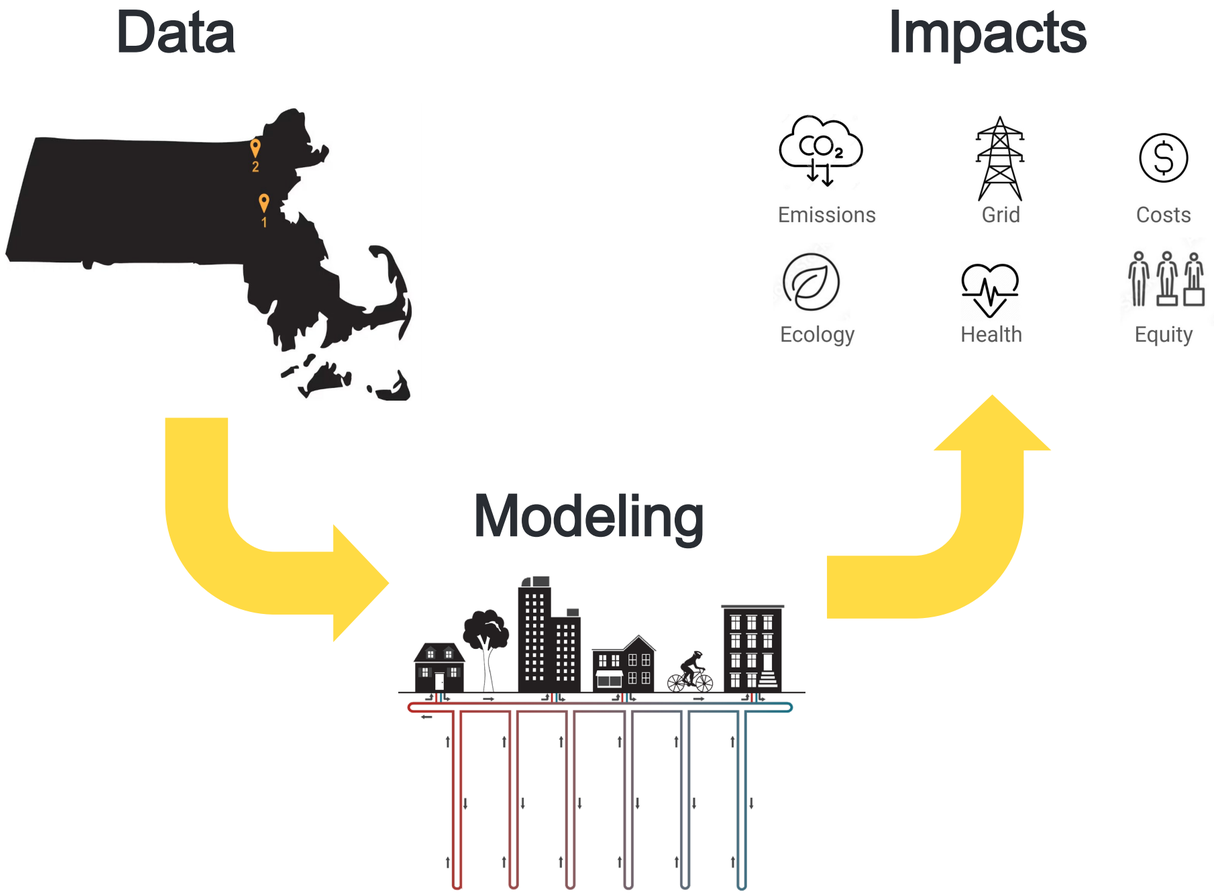


Coalition Members

Midwest BDC states

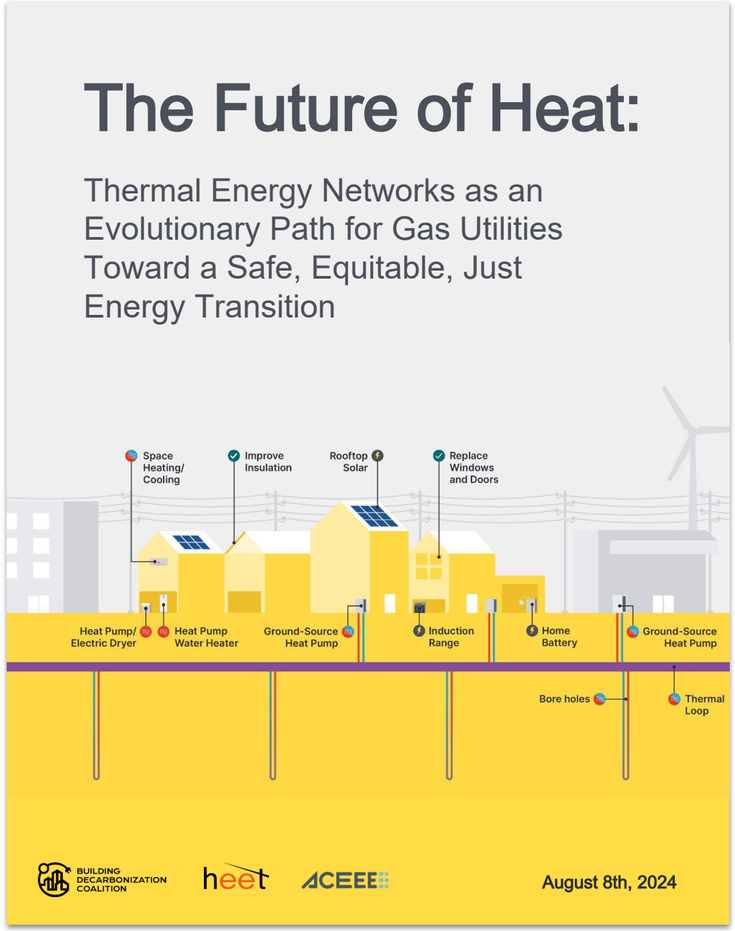
As of 6/10/2024

Research and Data



- Learning from the Ground Up (LeGUp)
- Utility Pilots
- DOE Design Grants
- Oakridge Lab: GSHP mass deployment impact on electric grid

For more information:



BDC Website: buildingdecarb.org/resource-library/tens

Ania Camargo: ACamargo@buildingdecarb.org

Jess Silber -Byrne: JSilberByrne@buildingdecarb.org

TENs Activity in North America
Utility Networked Geothermal Collaborative

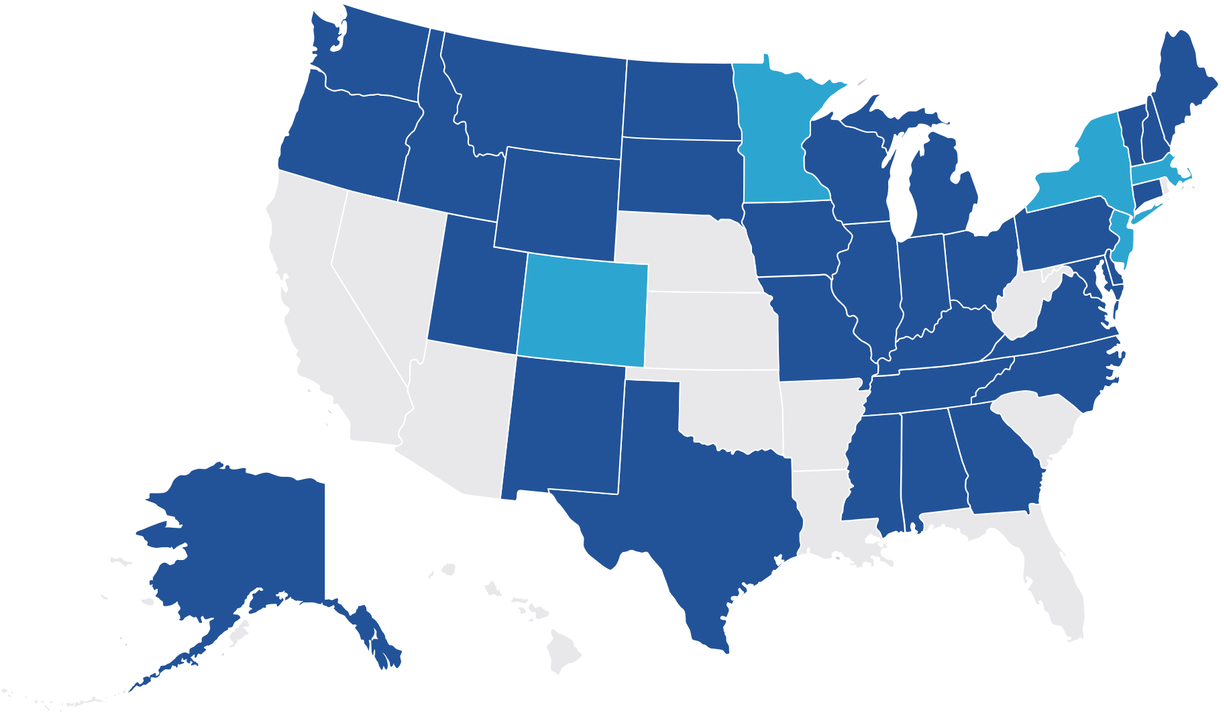
October 22, 2024
NY-Geo, Brooklyn, NY
Holly Braun, Business Development & Innovation Manager, NW Natural

NW Natural®

Agenda

1. UNGC – 2 years later
2. WA State TENs bill
3. NW Natural TENs process

UNGC and Pilot ~46% of NG customers represented



Gas Utility Pilots

Utility NetGeo Collaborative

FORTIS BC

AVANGRID

nationalgrid

National Fuel

spire

AVISTA

PGW

Xcel Energy

CenterPoint Energy

Southern Company Gas

conEdison

BGE An Exelon Company

NiSource

Consumers Energy Count on Us

Liberty

PSE PUGET SOUND ENERGY

Unitil

Washington Gas

Cascade Natural Gas Corporation A Subsidiary of MDU Resources Group, Inc.

NW Natural

New Jersey Natural Gas

CMS ENERGY

Nicor Gas

VGS

EVERSOURCE ENERGY

Richmond Gas Works

ENBRIDGE

BDC

UNGC
Working Together

Policy needed to accelerate adoption

Financial

- Business model and rate structure congruent with the utility model
- Funding mechanisms outside utility rates

On site

- Ascertaining the best sites
- Physically doing one of these projects

General

- Resources in this space
- Support network
- How we can work with the other geo coalitions

Collaborative wins

- **Treasury issue:** IRS amendment disallowing split ownership for ITC – rallied together for quick comments.
- **Accessible network:** ready access to answers and resources, enabling answers to get the legislation passed.
- **Regulatory:** Learnings to ease advancement through regulatory process
- **Tours:** Making it real- City of Troy and Framingham
- **2.0:** Leverage GTI for Innovation opportunities

Looking ahead: 2025

MONTHLY MEETINGS

WEBSITE

IN-PERSON
CONFERENCE ADD-ON

POSSIBLE NON-
PROFIT STATUS

WA HB 2131 Highlights

Gas and electric utilities invited to develop, own and operate Thermal Energy Networks in their respective service territories

Utility “obligation to serve” now includes thermal energy networks

Gas utilities’ advantage:

12-month head start to identify sites
$25M in grant funding from Commerce

Effective date: June 5, 2024

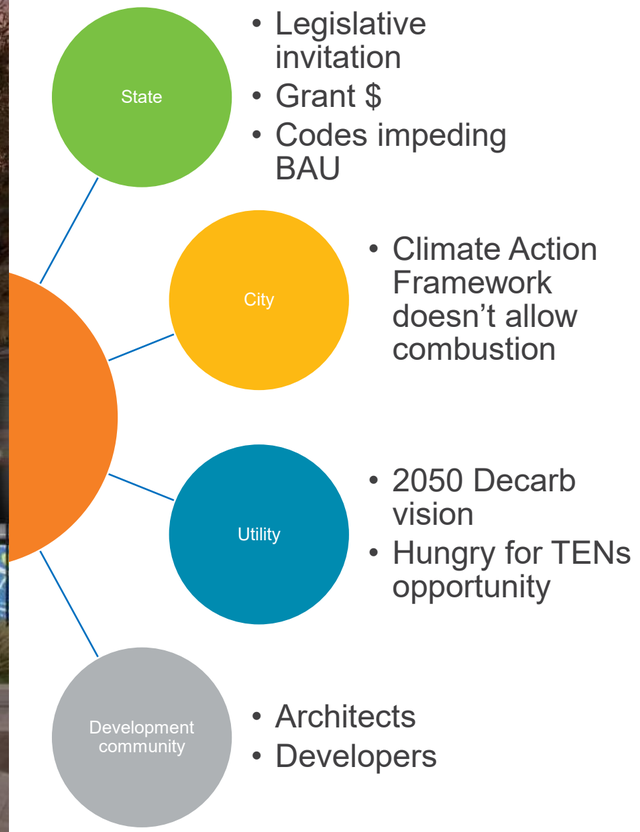
Construction complete by Dec 5, 2026

Option to request extension if showing solid progress

Our Process

- Internal approval and direction
- Site identification 6/5/25 deadline
- 30% design work and construction estimates
- Commission filing, wait for approval
- Grant application, wait for approval
- 100% design
- RFP for construction vendor
- Construction 12/5/26 deadline

Alignment


State
• Legislative invitation
• Grant $
• Codes impeding BAU
City
• Climate Action Framework doesn't allow combustion
Utility
• 2050 Decarb vision
• Hungry for TENs opportunity
Development community
• Architects
• Developers

NW Natural®

Let’s create the future we imagine.

Community Ground source Heat Pump Demonstration Project Update

David Podorson, Sr. Product Developer

October 22nd, 2024

Legislation

- File a demonstration project in CO
- Must contain either a DIC community, a mountain community, or a region of gas capacity constraint
- No cost cap

CO HB23-1252
Thermal Energy Services

- Identifies communities interested in piloting gas alternatives projects
- Utility and local government jointly file a neighborhood-scale alternatives project

CO HB24-1370
Reduce Cost of Use of Natural Gas

- Allow natural gas utilities to meet Minnesota's greenhouse gas reduction and renewable energy goals through innovative resources
- ~10M cost cap on district energy projects for XE

MN 23-518
Natural Gas Innovation Act

- PUC to establish a Thermal Energy Network Deployment Work Group to examine (1) the potential regulatory opportunities for thermal energy networks and (2) the potential barriers to development

MN 24-275

Proposed CGSHP Demonstration Project Timeline - CO

Q1 2024

Initial Community Outreach
Submitted State of CO Grant Application for Siting Study
Siting Analysis RFP Completed

8.30.2024

Phase 1 Filing includes:

- Desired Sites
- Approval and Cost Recovery for Design & Engineering Phase
- Indicative Budget & Bill Impact Analysis

2026

Phase 2 Filing includes:

- Final Location(s) Design and Engineering
- Final Costs Estimates
- Proposed Rate Design

Site Selection Vendor Chosen & Process Begun

Clean Heat Market Innovation Fund (accepted)

CO State Grant Decision (denied)

Q2/Q3 2024

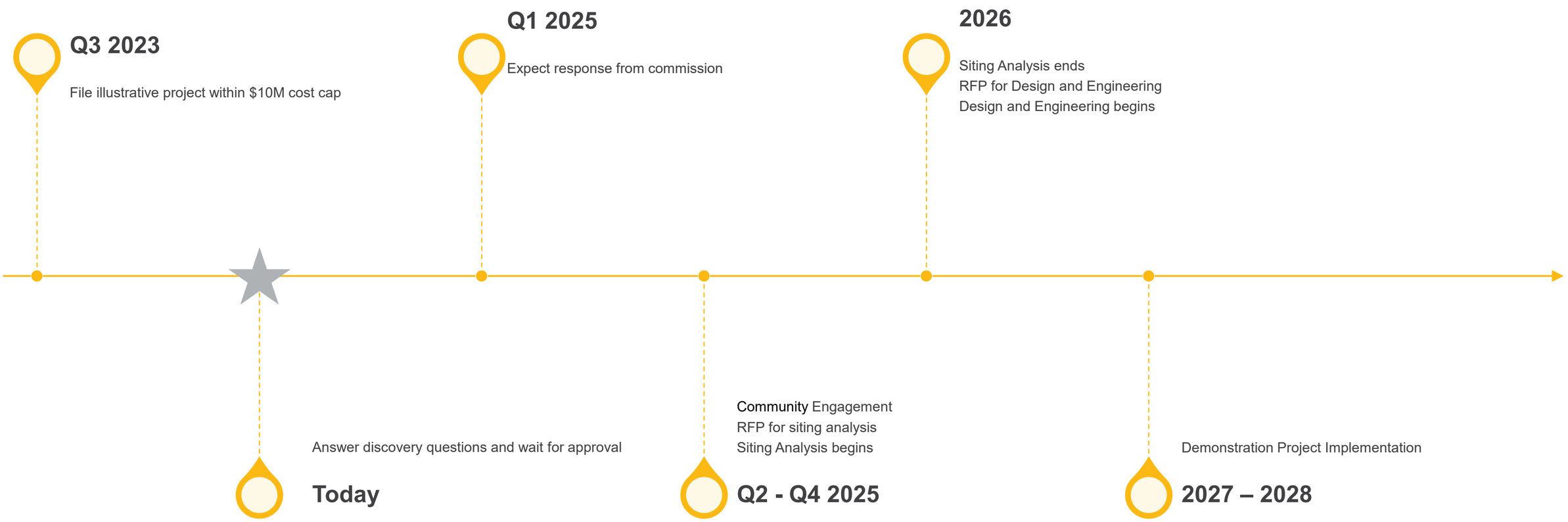
Customer Engagement
RFP for Design and Engineering firm
Down-selection of anchor customers in chosen sites
Anticipated approval for Phase I filing

Q4 2024 – Q2 2025

Demonstration Project Implementation

2027 – 2028

Proposed CGSHP Demonstration Project Timeline - MN



River Mile Project

Opportunity that could be a backbone for expansion in the future

Current home to Elitch Gardens Amusement Park is in the process of being redeveloped.

The development is by far the largest in Denver, with a total planned square footage of over 12,000,000 square feet of residential, office, retail, and hotel space.

CGSHP system would mitigate large electric distribution capacity concerns while still heating and cooling the community electrically

Thank you

David Podorson
Xcel Energy
Senior Product Developer
1800 Larimer St, Suite 1400, Denver CO, 80202
P: 303-285-3481
E: David.m.podorson@xcelenergy.com

U.S. DEPARTMENT OF ENERGY

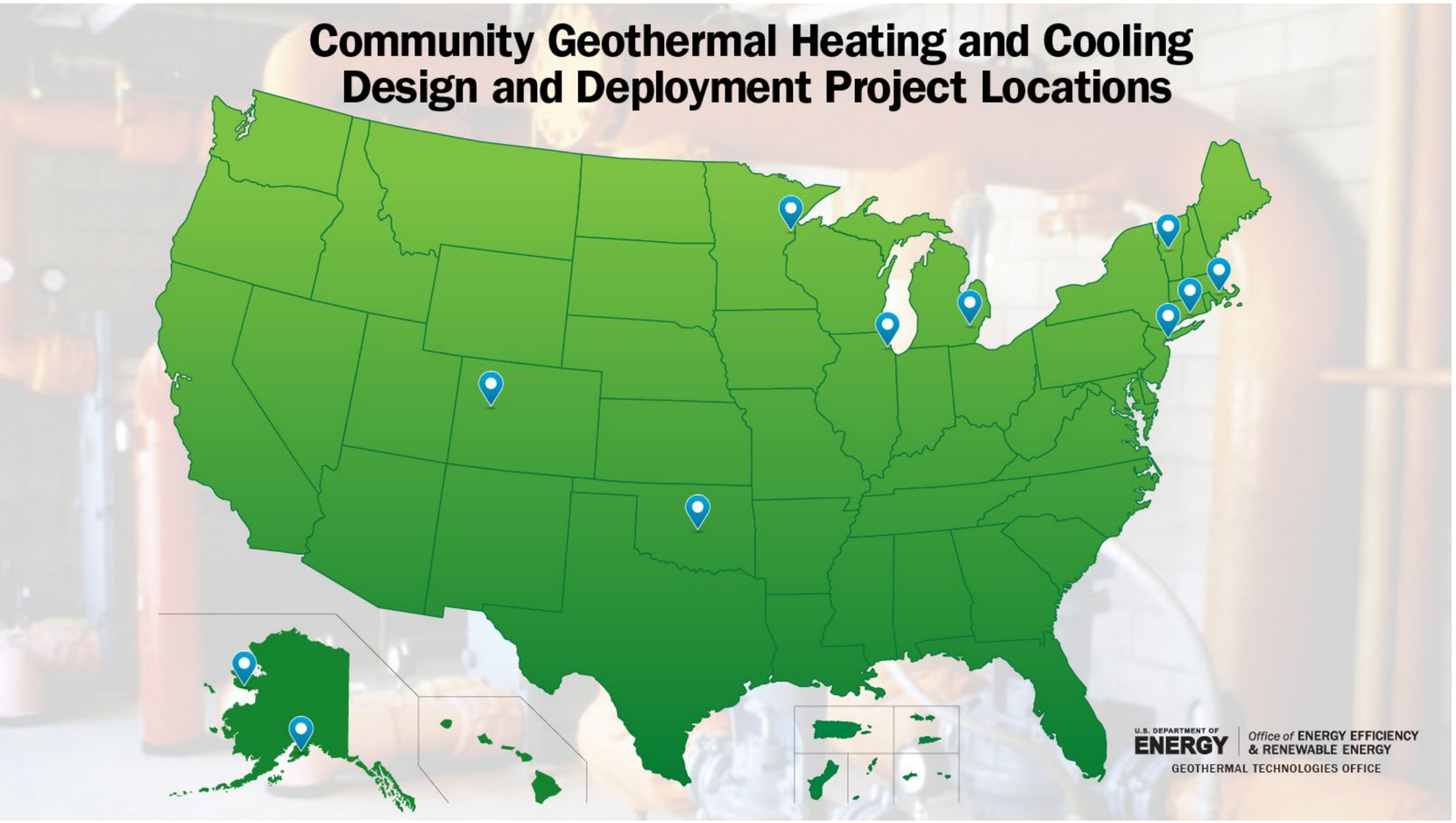
Office of ENERGY EFFICIENCY & RENEWABLE ENERGY

Thermal Energy Networks and Clean Heat: Tools For Efficiency And Emission Reduction

DOE/GTO Actions and Initiatives Highlights

David T. Wang
Engineer
Geothermal Technologies Office (GTO)
October 22, 2024

Community Geothermal Phase I (2023–2024)



energy.gov/eere/geothermal/community-geothermal-heating-and-cooling-design-and-deployment

GTO selected 11 communities in 10 states to assess and design community-scale geothermal heating and cooling systems

Urban/Suburban
- Ann Arbor, MI
- Chicago, IL
- Duluth, MN
- Framingham, MA
- New York City, NY
- Wallingford, CT

Rural
- Carbondale, CO
- Middlebury, VT
- Seward, AK
- Shawnee, OK

Remote
- Nome, AK

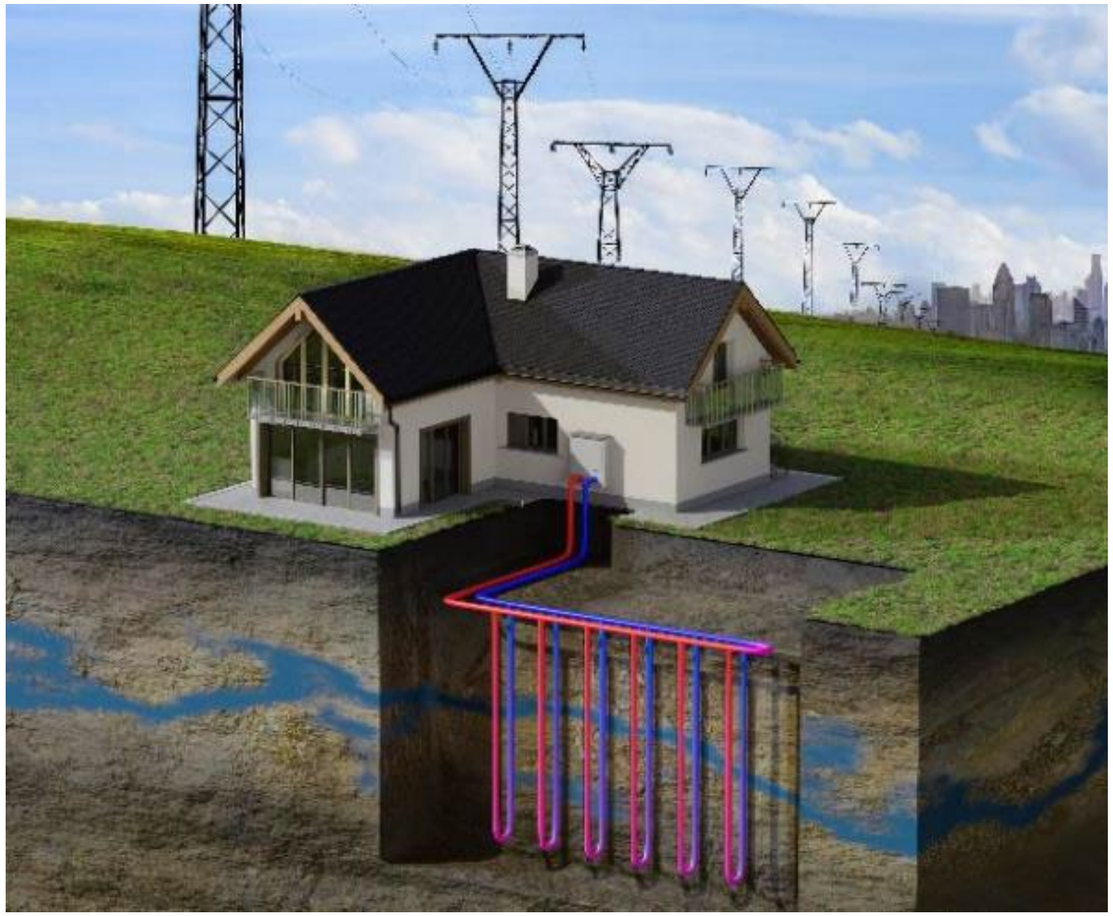
Icons via Flaticon.com

GHP Impacts Analysis (2023)

GTO funded an analysis by Oak Ridge National Laboratory and National Renewable Energy Laboratory to assess how mass deployment of geothermal heat pumps (GHPs) can provide cost and carbon reductions at the grid.

Aimed to quantify:

- Effects on building electricity use and emissions resulting from mass deployment of GHPs
- Impacts to the bulk power system under various carbon policy, electrification, and sensitivity scenarios

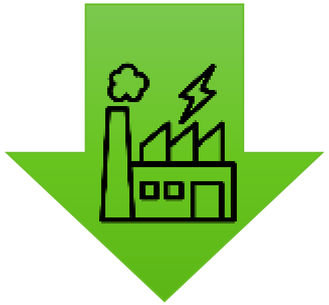


The analysis considered GHPs at the individual building level, so networked deployment in community-scale systems could likely provide **even greater benefits**.

Grid Cost and Total Emissions Reductions Through Mass Deployment of Geothermal Heat Pumps for Building Heating and Cooling Electrification in the United States https://www.osti.gov/biblio/2224191 (Liu et al., ORNL/TM-2023/2966, November 2023)

GHP Impacts Analysis (2023)

Eliminate the need for up to **43,600 miles** of new interregional transmission infrastructure – equivalent of up to 44 SunZia transmission projects



Reduce up to **410 GW** of nationwide generation capacity requirements – bolstering seasonal U.S. grid resilience

Eliminate more than **7 gigatons** of carbon – equivalent to all U.S. emissions produced in 2022

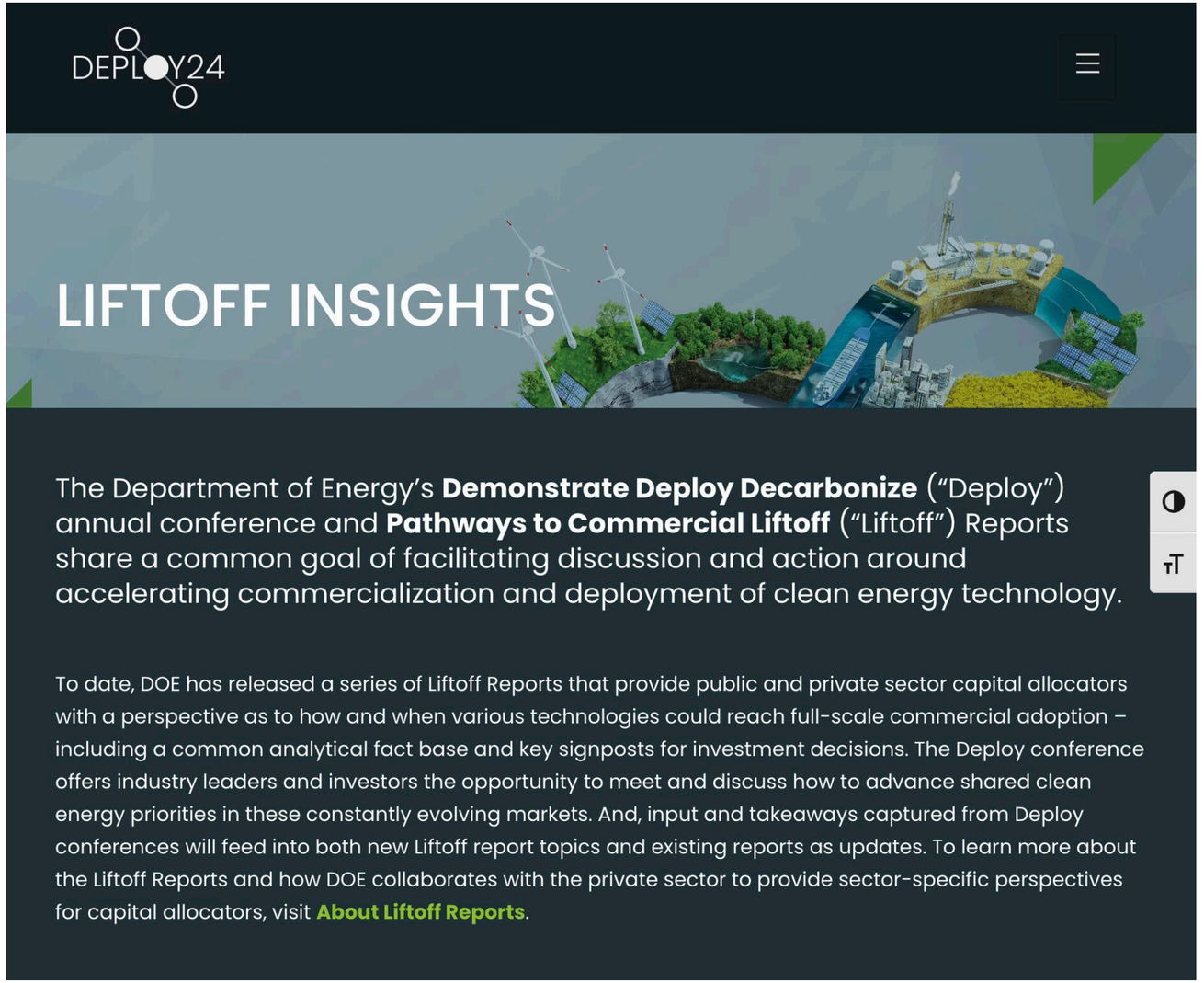
Grid Cost and Total Emissions Reductions Through Mass Deployment of Geothermal Heat Pumps for Building Heating and Cooling Electrification in the United States https://www.osti.gov/biblio/2224191 (Liu et al., ORNL/TM-2023/2966, November 2023)

Pathways to Commercial Liftoff: Geothermal Heating and Cooling

- Cross-office collaborative DOE report
- Liftoff Reports take a technology or suite of technologies and build a common understanding with the private sector and broader ecosystem around the current state, pathways to commercial liftoff, and challenges and solutions to unlock scale
- **Anticipated late 2024 release** of Liftoff Report focused on **Geothermal Heating and Cooling** technologies

LIFTOFF.ENERGY.GOV

Deploy24, Dec 4–5 @ Walter E. Washington Convention Center, D.C.



www.deploytogether.com
https://www.linkedin.com/showcase/demonstrate-deploy-decarbonize/

Partnerships to Accelerate Training & Hiring (PATHs) for Geothermal Heat Pumps Prize

The **GHP PATHs Prize** aims to catalyze regional outreach-focused partnerships to improve geothermal heat pump workforce pipeline development.

Nov/Dec 2024!

www.HeroX.com/GHPPATHS

About the Prize

The Partnerships to Accelerate Training and Hiring for Geothermal Heat Pumps (GHP PATHs) Prize is a $3,000,000 prize aimed to catalyze regional, outreach-focused partnerships to improve Geothermal Heat Pump workforce pipeline development.

Partnership

Different stakeholders in the GHP training and employment process will work together to either create or improve the GHP workforce pipeline in their region.

Training and Certification

Teams will determine a reasonable number of trainees that can complete new trainings, and develop a timeline and budget for their completion.

Hiring

Local GHP employers commit to hiring these trained workers for a minimum amount of time or projects.

Follow GHP PATHs Prize

American-Made Challenges

1,674 Share Follow (39)

Partnerships to Accelerate Training & Hiring for Geothermal Heat Pumps

The GHP PATHs Prize aims to catalyze regional outreach-focused partnerships to improve Geothermal Heat Pump workforce pipeline development.

Education | Energy, Environment & Resources | Engineering

Stage: **Registration Opens**

Prize: **$3,000,000**

FOLLOW CHALLENGE

Summary | Timeline | Forum | Teams 39 | Entries | Resources | FAQ

www.herox.com/GHPPATHs

Incentives and Resources

GHPs in the Inflation Reduction Act

- **Residential:** 30% tax credit for ENERGY STAR-rated GHPs through 2032 (§25D), staging down in 2033 and 2034. Claimed on Form 5695.
  https://www.energystar.gov/productfinder/product/certified-geothermal-heat-pumps/

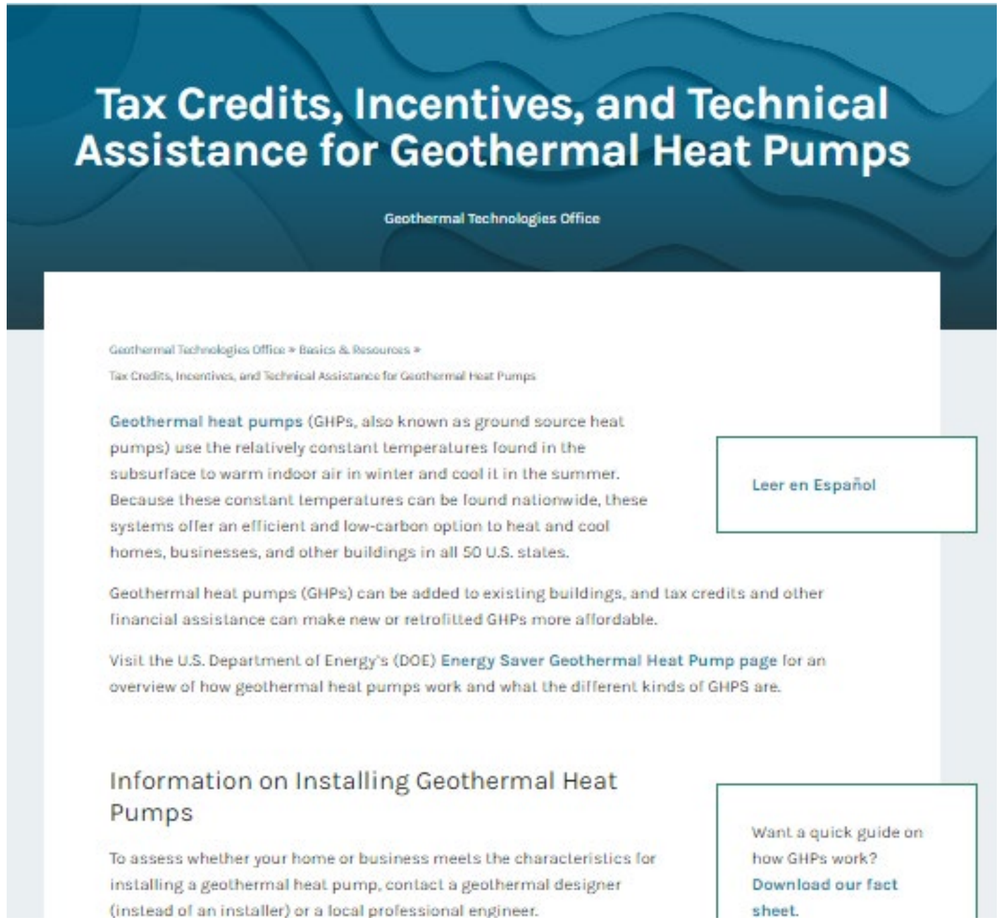
- **Commercial:** Investment Tax Credit (§48 ITC) for geothermal heat pump property having beginning of construction before January 1, 2035. For geothermal, base ITC is 6% through 12/31/2032 (staging down in 2033 and 2034); credit increases to 30% for projects meeting labor, content, and locations criteria (or below 1MW), with additional 10%-20% available for projects qualifying for Energy Communities or Domestic Content bonuses. Direct pay available for certain entities.
  https://energycommunities.gov/ (includes Tax Credit Bonus Mapping tool built by DOE's National Energy Technology Laboratory (NETL))

Energy Efficient Commercial Buildings Deduction (179D) – Provides a deduction for energy improvements made on new and refurbished property based on meeting certain standards. Base rate of $0.50 per square foot for a building with 25% energy savings, up to $1.00/sf for a building with 50% energy savings; rate is 5× if PWA requirements met.

Building Decarbonization Coalition

Maintains a web page of states that have implemented legislation advancing or promoting TENs: buildingdecarb.org/resource-library/tens-state-leg

Disclaimers: This page provides an overview of certain Inflation Reduction Act (IRA) tax provisions for general informational purposes only. It does not constitute professional tax advice or other professional financial guidance. Please refer to guidance issued by the IRS for detailed information on the rules associated with Inflation Reduction Act tax provisions. Reference to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not constitute or imply its endorsement, recommendation or favoring by the U.S. Government or any agency thereof.



GTO's website features numerous resources, including a tax credits, incentives, and technical assistance web page with more information, and more content is coming in FY25!

energy.gov/eere/geothermal/tax-credits-incentives-and-technical-assistance-geothermal-heat-pumps

Better Buildings and ASHRAE Decarbonizing Thermal Systems Guide

Decarbonizing Building Thermal Systems: A How-to Guide for Heat Pump Systems and Beyond

- Design guidance for heat pumps (which includes air-source, ground source, and hot water heating)
- Based on input from ASHRAE experts, NREL analysis, Better Buildings Design and Construction Allies and Better Climate Challenge Partner experiences
- Expanded content coming in FY2025

https://www.nrel.gov/docs/fy24osti/87812.pdf

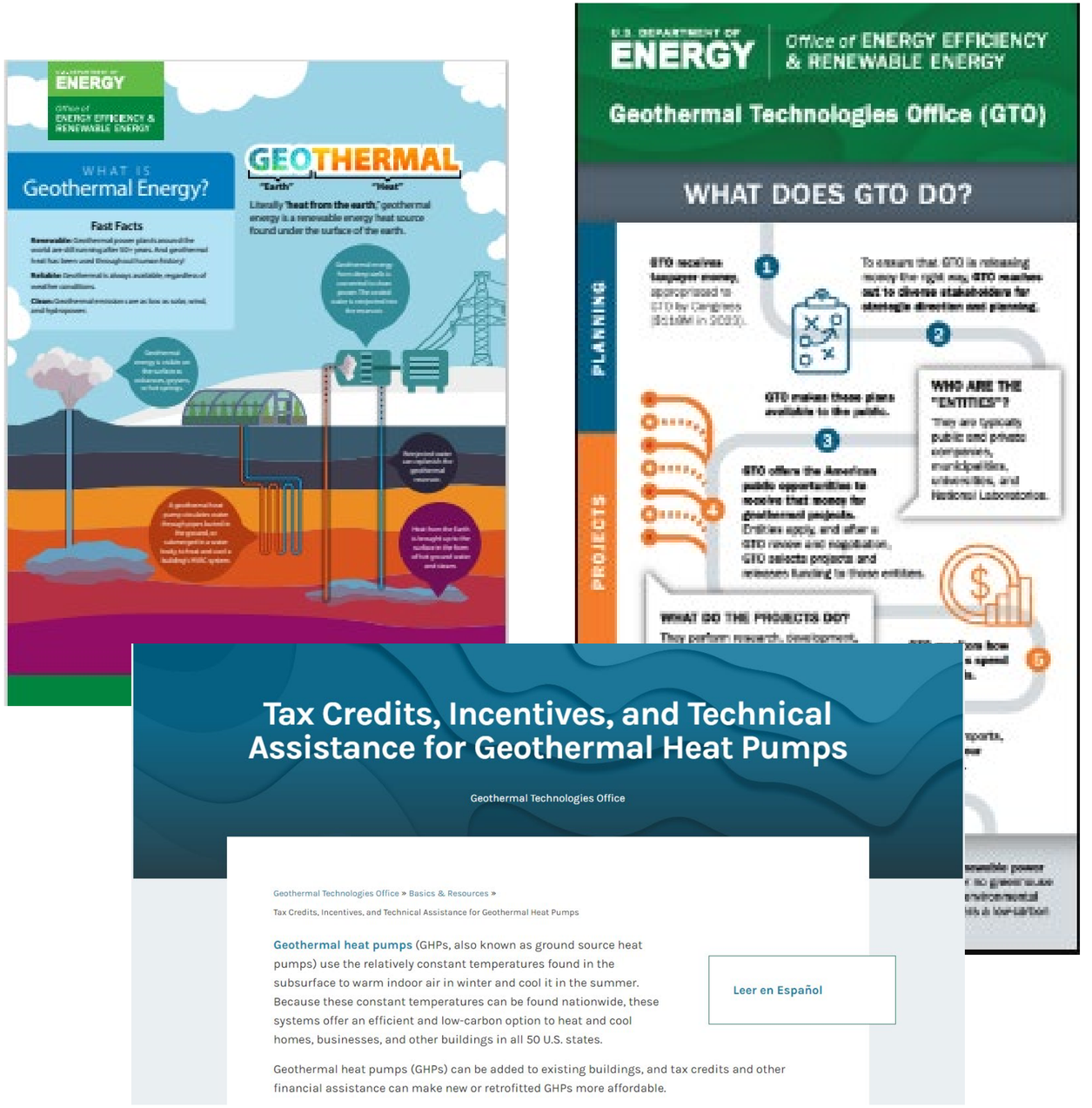
More Resources and Thank You!

GTO has additional tools and resources available to learn about geothermal energy, find funding opportunities, and more.

- Funding Opportunities
- Fact Sheets
- The Drill Down Newsletter
- Stakeholder Toolkits
- Infographics
- Project Postcards

Get the hottest geothermal news from ***The Drill Down***, GTO's monthly newsletter!

Sign up today: geothermal.energy.gov



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