BUREAU OF ENERGY AND TECHNOLOGY POLICY

September 23, 2022

Building Thermal Decarbonization Support Strategies

Technical Session 3
CT 2022 Comprehensive Energy Strategy

Session is being recorded

Logistics & Housekeeping

- **This session is being recorded**
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- **To enter the queue to provide verbal comment, use Zoom's *raise hand* feature (more details will be provided later)**
- **Use the chat function to ask questions about presentations or procedures.**

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Today's Agenda – Technical Session 3

Introduction	1:00-1:15 pm
Public Comment	1:15-1:30 pm
Geographic Data	1:30-1:50 pm
Q&A	1:50-2:00 pm
Building Codes	2:00-2:30 pm
Q&A	2:30-2:40 pm
District Heating & Cooling	2:40-3:20 pm
Q&A	3:20-3:35 pm
Measure Delivery	3:35-4:20 pm
Q&A	4:20-4:35 pm
Public Comment	4:35-4:50 pm
Wrap Up	4:50-4:55 pm

Click on agenda section heading to jump to corresponding slides

UPCOMING TECHNICAL SESSIONS

Session 4: Building thermal decarbonization – Economic potential & technology targets

Thursday, Oct. 6, 2022, from 9 a.m. to 5 p.m. ET

Other sessions on

- **Electric Demand Response**
- **Alternative Fuels**

to be announced for October

More information on the CES webpage: https://portal.ct.gov/DEEP/Energy/Comprehensive-Energy-Plan/Comprehensive-Energy-Strategy

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Technical Session	Meeting Date(s)	Deadline for Written Comments
3	Sept. 23, 2022 1 p.m. - 5 p.m. ET	Oct. 7, 2022, at 5:00 p.m. ET
4	Oct. 6, 2022 9 a.m. - 5 p.m. ET	Oct. 21, 2022, at 5:00 p.m. ET

Written Comment Opportunities

- **After each technical session DEEP is accepting written comments – deadlines vary**
- **Please see the August 18th notice for submission instructions and specific questions for which DEEP is seeking responses**
- **More information on the CES web page: https://portal.ct.gov/DEEP/Energy/Comprehensive-Energy-Plan/Comprehensive-Energy-Strategy**

WELCOME & INTRODUCTIONS

Thanks for joining our technical session today!

Comprehensive Energy Strategy Scope & Objectives

- **Scope**: electricity, thermal energy, and fuels for transportation

- **Objectives:**
  - Examine future energy needs in the state and identify opportunities to reduce costs, ensure reliable energy availability, and mitigate public health and environmental impacts of CT's energy use
  - Provide recommendations for legislative and administrative actions to aid in achievement of interrelated environmental, economic, security, and reliability goals

BETP Mission: to manage energy, telecommunication, and broadband policy issues and program deployment with the goal of establishing a clean, economical, equitable, resilient, and reliable energy future for all residents.

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DEEP's Approach to the 2022 CES

5 Key Lenses

- **Climate** – meeting greenhouse gas reduction obligations under Global Warming Solutions Act
- **Equity** – energy decisions that produce equitable outcomes
- **Affordability** – energy decisions that produce affordable outcomes
- **Economic development** – workforce development; economic competitiveness
- **Reliability & Resilience** – energy system improvements and load balancing

Key Strategies

- Build on and/or modify findings and recommendations of 2013 and 2018 CESs
- Consider emerging issues not addressed in a prior CES
- Rely on results from recent, major quantitative studies where appropriate rather than duplicate efforts

3 Key Factors

- The carbon intensity of the electric grid
- Need for emission-reduction solutions that facilitate climate change adaptation, resilience, and energy security
- Fuel price volatility

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Tentative CES Development Timeline

- **September 2022** – Technical Sessions 1-3
- **October 2022** – Technical Sessions 4-6
- **November 2022** – Technical Sessions 7 & 8
- **October 2022 – January 2023** – Drafting & Public Comment Periods for at least 3 White Papers
  - White papers to be based on topics covered in technical sessions
- **Q1 & Q2 of 2023** – CES Drafting, Public Comment Opportunities, & Listening Sessions

Technical Session Topics

1. **Hard-to-Decarbonize End Uses**
2. **Heat Pump Market Barriers & Strategies**
3. **Building Thermal Decarbonization Support Strategies**
4. **Building Thermal Decarbonization – Economic Potential & Technology Targets**
5. **Electric Demand Response**
6. **Alternative Fuels**
7. **Natural Gas Planning & Policies**
8. **Carbon Pricing & Low-Carbon Incentives**

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Why devote several CES technical meetings to thermal decarbonization of buildings?

- Integrated Resources Plan issued in 2020 (and updated 2022) addressed electricity grid decarbonization
- EV Roadmap issued in 2020 addressed transportation decarbonization
- Combustion of fossil fuels in residential and commercial buildings accounts for nearly one-third of statewide greenhouse gas emissions
- CES will provide overarching strategy for building decarbonization

Deep reductions in use of thermal fossil fuels are needed for CT to satisfy the Global Warming Solutions Act (GWSA)

*Between 2001 and 2018, **residential** thermal emissions from combustion of fossil fuels fell 10.6% -- far less than the 26.4% reduction the GWSA's 2030 economy-wide target implies was needed.*

- *To bring emissions in line with the 2030 target will require reducing them 3.6 times faster between 2018 and 2030.*

*Between 2001 and 2018, **commercial** emissions from combustion of fossil fuels were essentially unchanged.*

- *This means that the full 45% reduction the GWSA's 2030 economy-wide target implies will need to be accomplished between 2018 and 2030.*

*In **both sectors**, fossil fuel emissions will need to continue decreasing sharply between 2030 and 2050.*

Non-climate benefits of thermal decarbonization

- Long-term energy affordability
- Health and safety improvements
- Enhanced comfort
- Regional workforce development

Unprecedented levels of federal funding are also expected to change the market

- Bipartisan Infrastructure Legislation (BIL)
- Inflation Reduction Act (IRA)

Support Strategies for Thermal Decarbonization

- Stretch Codes
- Workforce Development Initiatives
- Education & Outreach Strategies
- Data Access & Availability
- District Heating & Cooling Approaches

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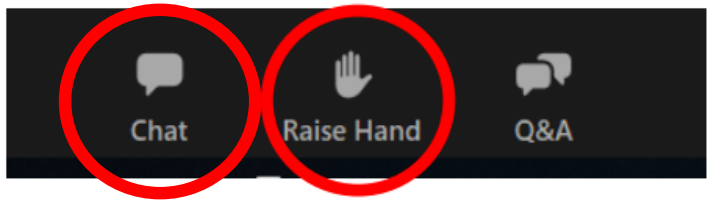
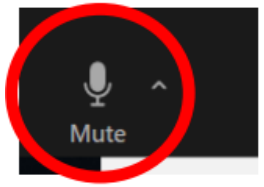
Questions and Comments





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At the conclusion of each panel DEEP will hold a brief question and answer period.

If you have a question for a presenter, please drop it into the chat to Jeff Howard. DEEP will pose as many questions as time allows to the speakers. Clarifying questions will be prioritized. Leading questions will not be accepted.

If you would like to make a comment during the public comment periods:

- Please use the “Raise Hand” feature if you would like to speak
- After any interested elected officials have provided their comments, you will be invited to provide your comment in the order the hands were raised
- Please unmute yourself, state your name and affiliation
- Given time limitations, please limit your comment to 2 minutes.
- After your comments, please remember to click the “Mute” button

General Public Comment

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Geographic Data

Caleb Smith – CT Green Bank

Jeff Howard – CT DEEP, Bureau of Energy & Technology Policy

(speaker order may vary)

Click on agenda section heading to jump to corresponding slides

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CT Green Bank

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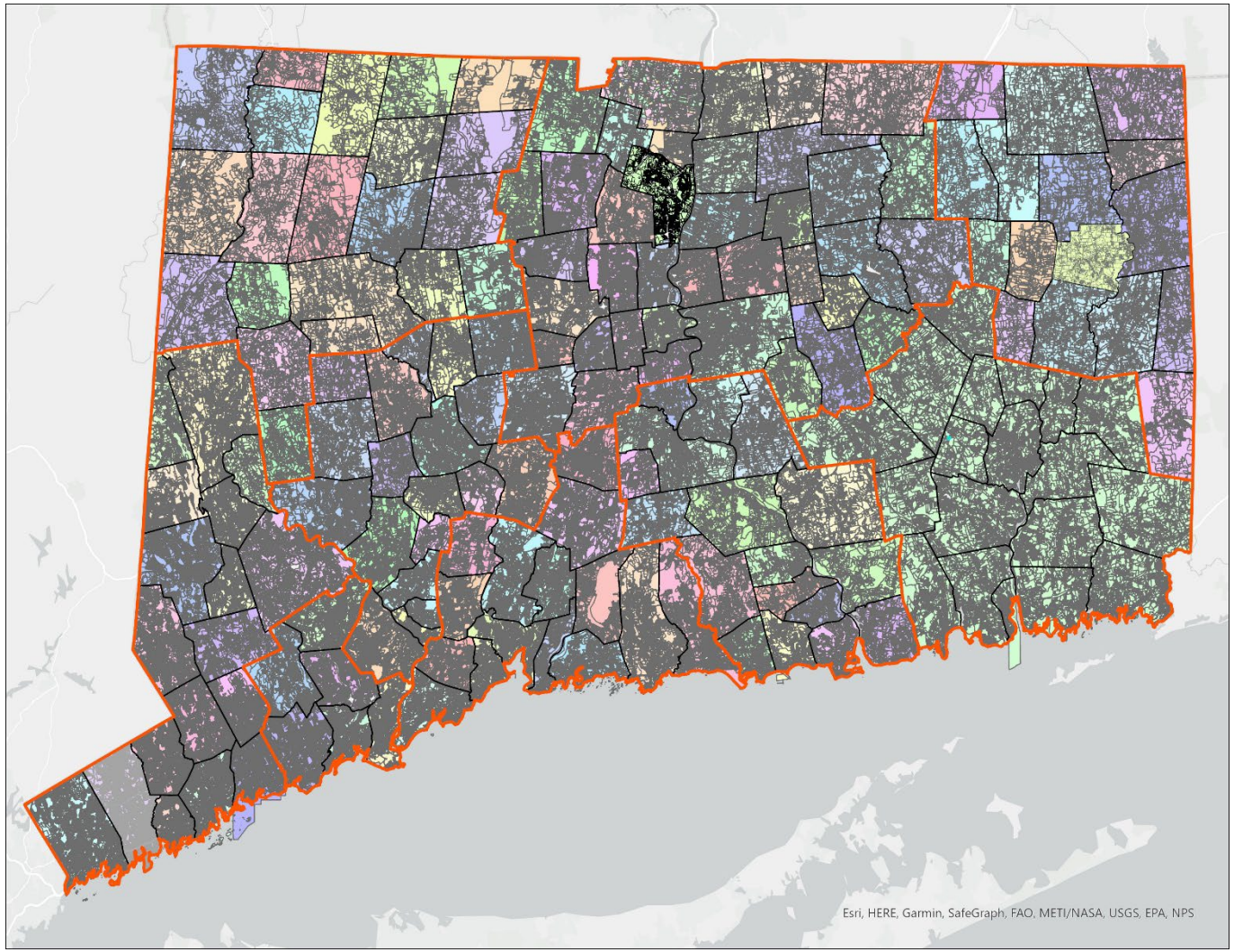
Using Municipal Tax Assessment Data to Target Building Decarbonization Programs

Technical Session 3 – 2022 Comprehensive Energy Strategy

September 23, 2022

Data Background & Context

- Data collected from a variety of sources
  - A large portion was provided by People's Action for Clean Energy (PACE) from a purchase made with the Warren Real Estate Group
  - Data was supplemented where available from municipal parcel and CAMA datasets published by the CT Office of Policy & Management under Public Act 18-175: AN ACT CONCERNING EXECUTIVE BRANCH AGENCY DATA MANAGEMENT AND PROCESSES, THE TRANSMITTAL OF TOWN PROPERTY ASSESSMENT INFORMATION AND THE SUSPENSION OF CERTAIN REGULATORY REQUIREMENTS
- Data cleaning & normalization is an ongoing project



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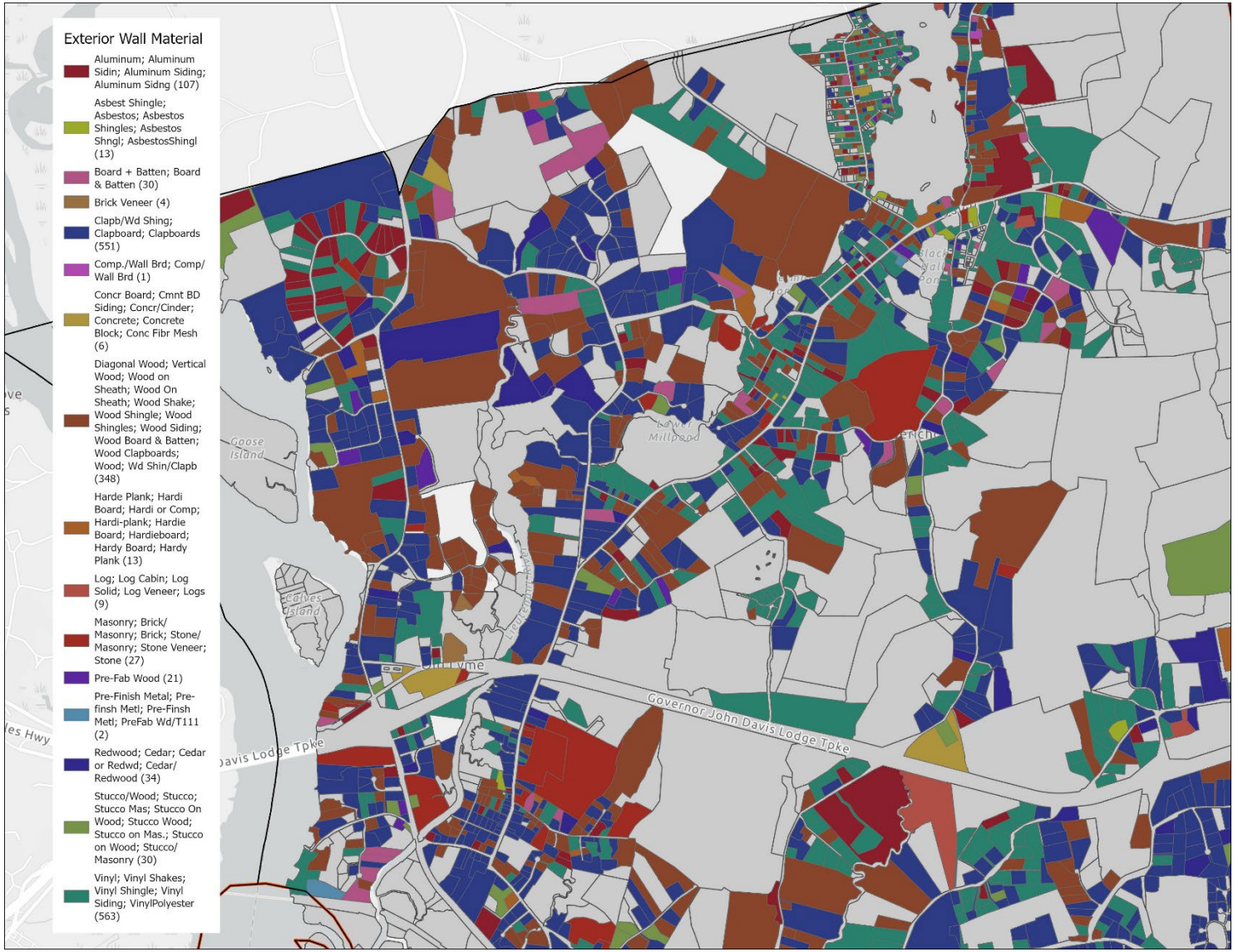
Results & Potential Implementation

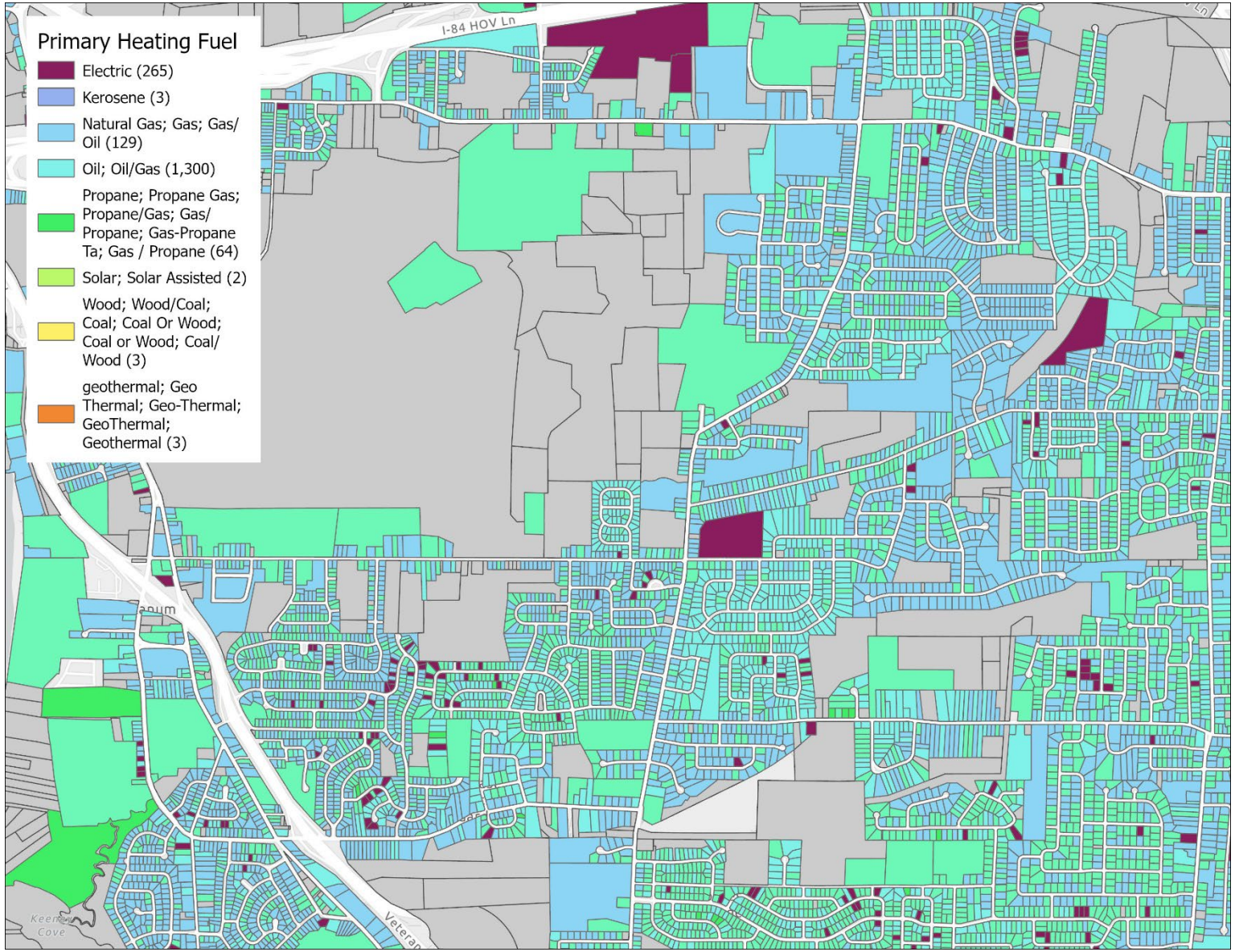
Building Envelope Analysis

- Detailed information is available in many municipalities on framing, exterior wall materials, building types, roof shape, basements and garages, and much more.
- This is found both as categorical information as well as graded quality of these components in many cases
  - There is a potential to identify ideal candidates for home energy improvement projects with this data



Old Lyme, CT

Heating Fuels & System Types

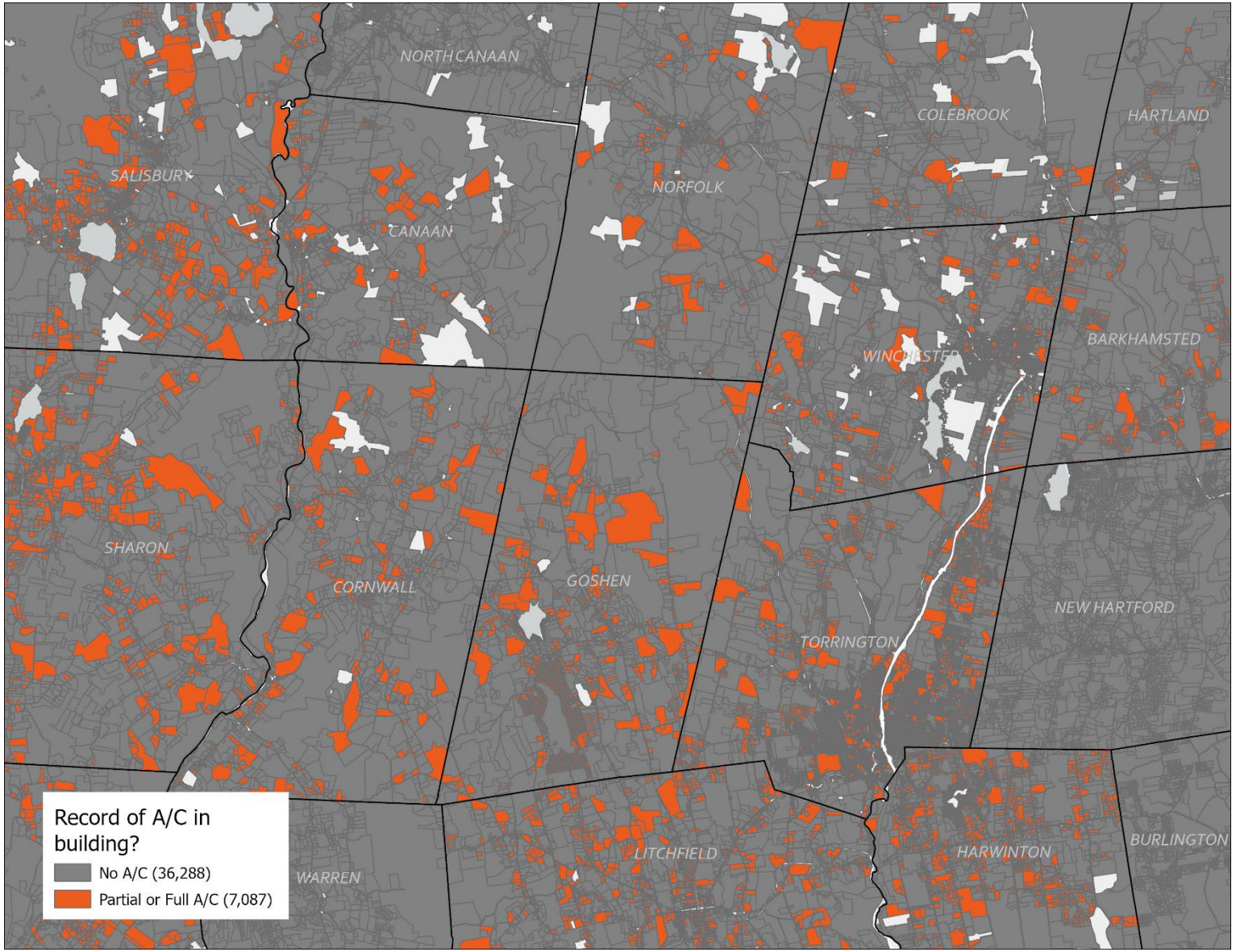


East Hartford, CT

- A very consistent data point collected by all municipalities with public CAMA data is information on the heating and cooling systems present in each building, as well as the fuels they use
- This could be used to target incentive programs or other outreach strategies

Extreme Heat: Who has AC?

Many municipalities also collect data on the presence of central air conditioning, and in some cases, the presence of window units as well. As Connecticut prepares for longer and more intense heatwaves in summer months, this data could be used to plan for locations of emergency cooling shelters, or help build grid demand models.



Presence of A/C in the Northwest Hills COG

Additional Data (In progress)

There is a vast amount of data in this dataset that is still being processed and normalized. Some of it includes:

- Building styles and uses (from the Vision Government Solutions database)
- Parcel location, ownership, mailing addresses
- Assessed and/or appraised values of land and improvements
- Last two sale dates, prices, and sale ID info
- Building size, lot size, and finished areas
- Year built, and date of last major renovation

Intended Use

The Green Bank is looking forward to implementing this data in our work in a variety of ways:

- Targeted outreach and engagement, especially in disadvantaged communities
- Continuing to build partnerships with other organizations such as PACE
- Create overlays and find investment overlaps with funding priorities in the Inflation Reduction Act and Infrastructure Investment and Jobs Act
- Inform new work in environmental infrastructure
- Track decarbonization progress longitudinally with annual grand list data updates

Further collaboration and data sharing with other state agencies will help place this data in context and enrich the insights possible with this dataset

- Improved data quality and standardization of municipal parcel information will help all of us!
- Contact us if interested in collaborating or using this data when the final dataset is available

Thank you!

Questions & Answers

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CT DEEP, Bureau of Energy & Technology Policy

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Sept. 23, 2022

Heat Roadmap Europe

Jeff Howard, Senior Environmental Analyst

Heat Roadmap Europe

HEAT ROADMAP EUROPE IS A SERIES OF STUDIES SINCE 2012 THAT PRODUCED MORE THAN 50 REPORTS AND DATASETS

HRE4 DEVELOPED STRATEGIES AND GUIDELINES FOR 14 EU MEMBER STATES THAT ACCOUNT FOR 80% OF HEATING AND COOLING DEMAND.

HRE4 SCENARIOS SHOW CO2 EMISSIONS CAN BE REDUCED BY 86% - MORE THAN THE CURRENT TARGET

"By collecting the waste heat from both industry and electricity production and using smart district heating grids, it is possible to save all of the natural gas currently used for heating buildings in Europe."

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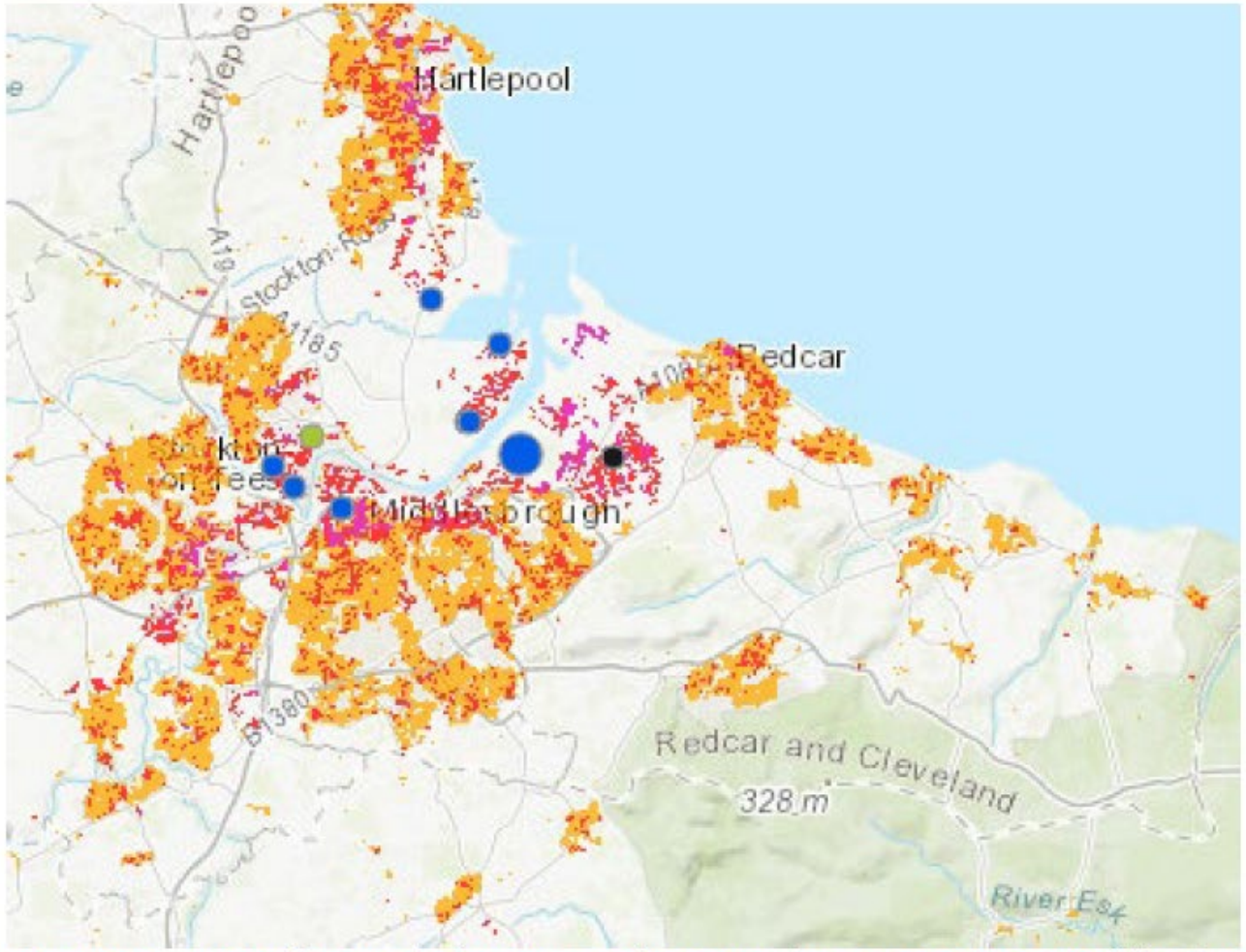
County scale – UK



Simple mapping of heat demand density and excess heat activities

Figure 2. Heat demand density and excess heat activities Middlesbrough.

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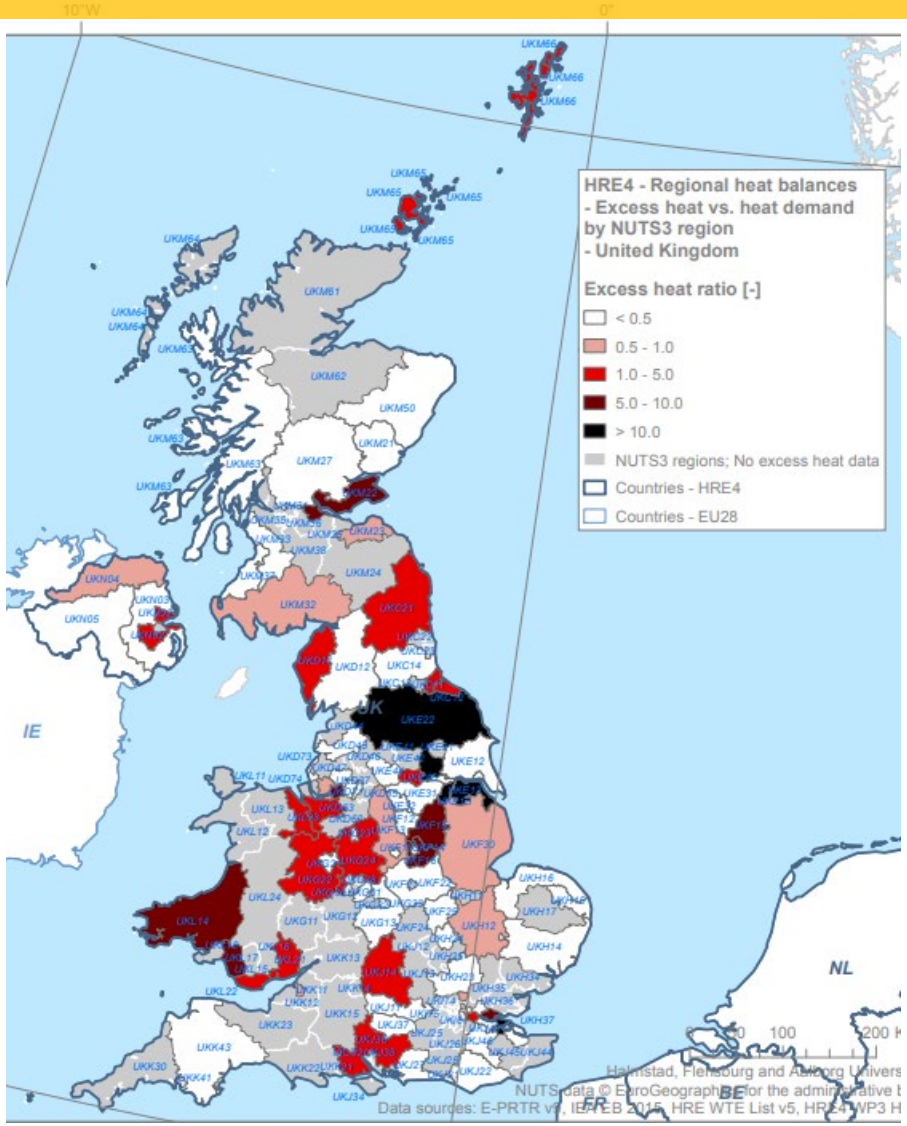
National scale – UK



Regional heat balances –
Excess heat vs. heat demand

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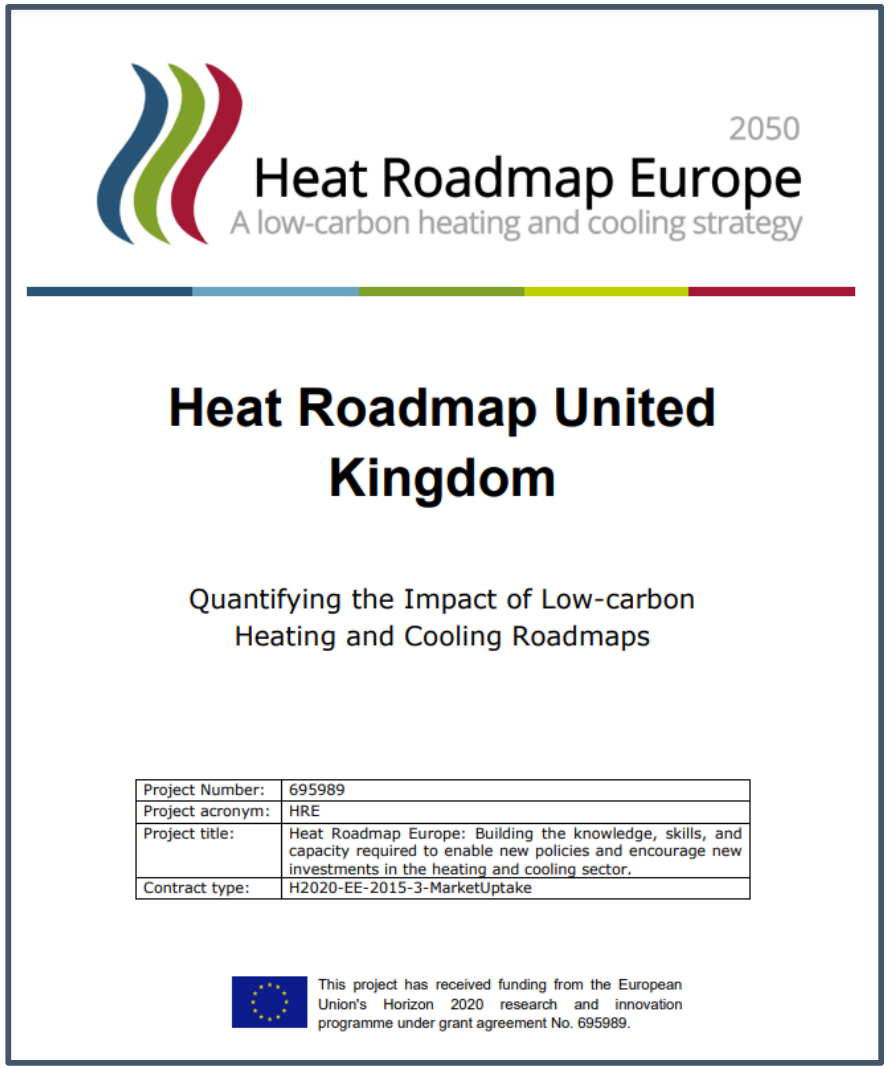
National scale – UK



1. **The heating and cooling sector can be fully decarbonised based on technologies and approaches which already exist, are market-ready and have successfully been implemented in Europe.**
2. **Energy efficiency on both the demand and the supply side are necessary to cost-effectively reach the decarbonisation goals.**
3. **More support is needed for implementation and higher energy saving targets for deeper renovation of the existing building stock and investments in industry.**
4. **In the vast majority of urban areas, district energy is technically and economically more viable than other network and individual based solutions, and can be 100% decarbonised through the use of renewables, large heat pumps, excess heat, and cogeneration.**
5. **In areas with limited district heating and cooling feasibility, individual supplies should be from heat pumps that can contribute to the integration of variable renewables.**

Country roadmap reports

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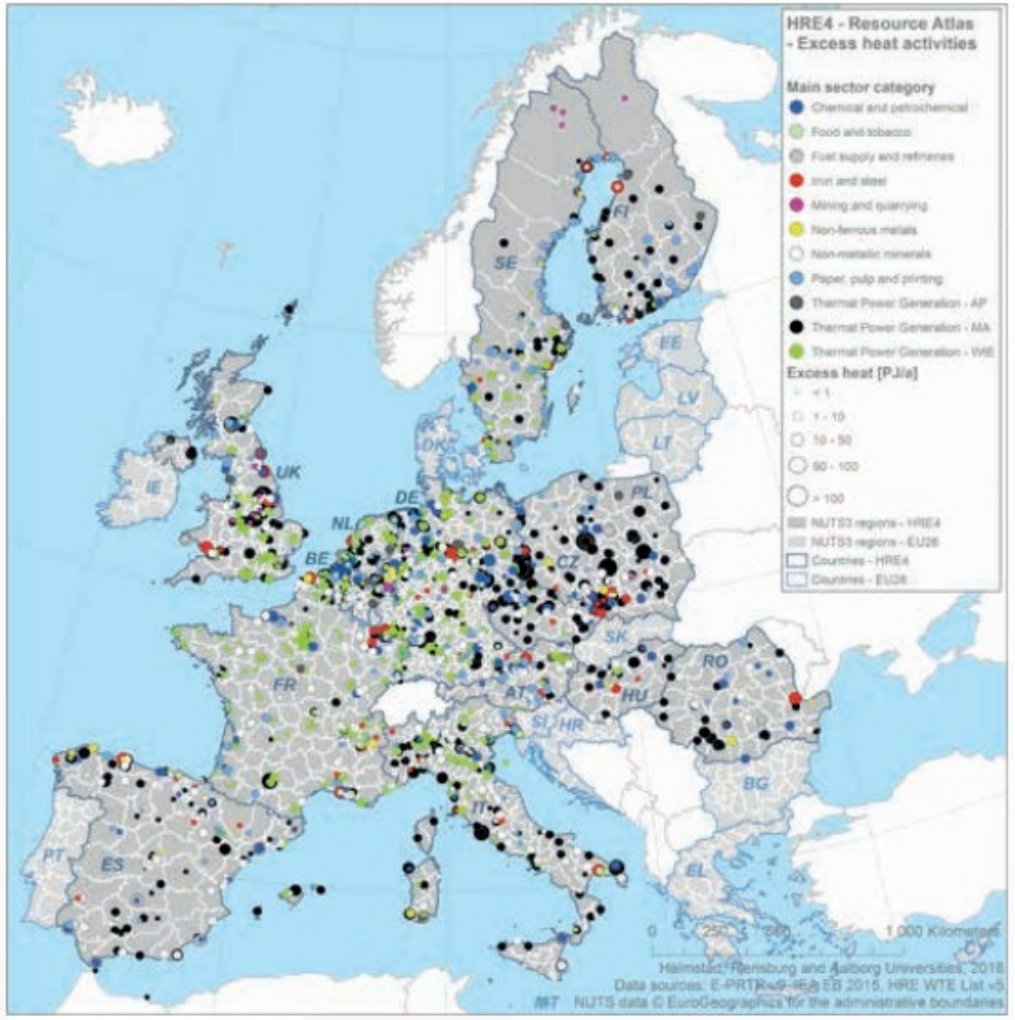
Continental scale



There is a

MASSIVE UNTAPPED POTENTIAL

of excess heat from industrial and commercial activities, which

COULD MEET MOST OF EUROPE'S BUILDINGS HEAT DEMAND

and bring immense efficiency gains

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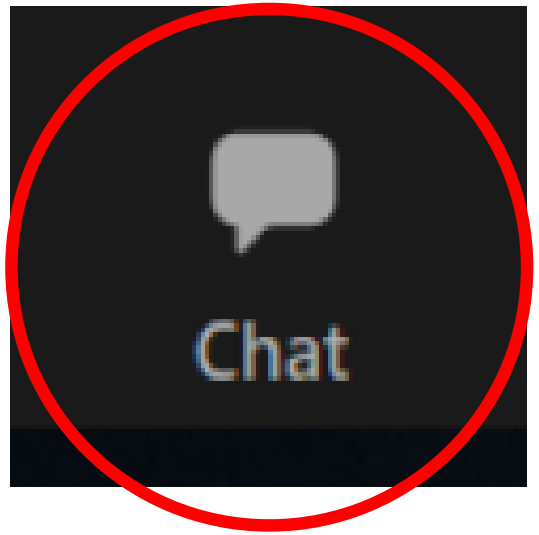
Questions



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Building Codes

Melissa Kops – CT Green Building Council

Andrea Krim – Northeast Energy Efficiency Partnerships

(speaker order may vary)

Click on agenda section heading to jump to corresponding slides

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Building Code Considerations

September 23, 2022

Melissa Kops AIA, LEED AP BD+C, LFA
Board Advisor
CT Green Building Council

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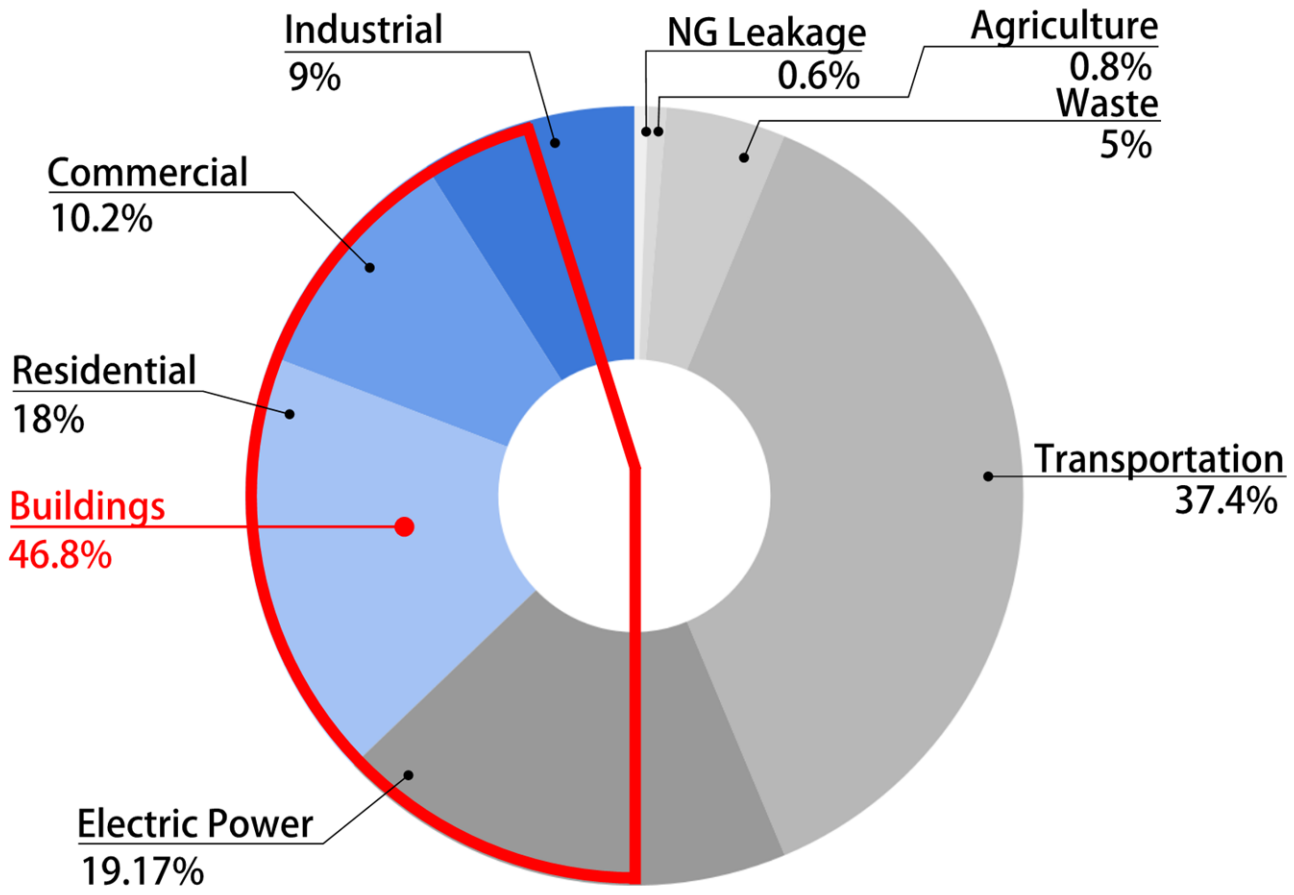
The Building Sector is the largest contributor to climate change in Connecticut

The Building Sector should be evaluated as a whole, including its electrical consumption.

Electrical consumption includes demand directly related to the performance of a building such as lighting, air-conditioning, heating, ventilation, appliances, etc.

- Prioritize the decarbonization of buildings in State climate policy.



Estimated greenhouse gas emissions in Connecticut from buildings

Graphic by the Connecticut Green Building Council

Sources: 2018 Connecticut Greenhouse Gas Inventory, DEEP Office of Climate Change, Technology and Research, 2019, Energy Consumption by Sector, Energy Information Administration

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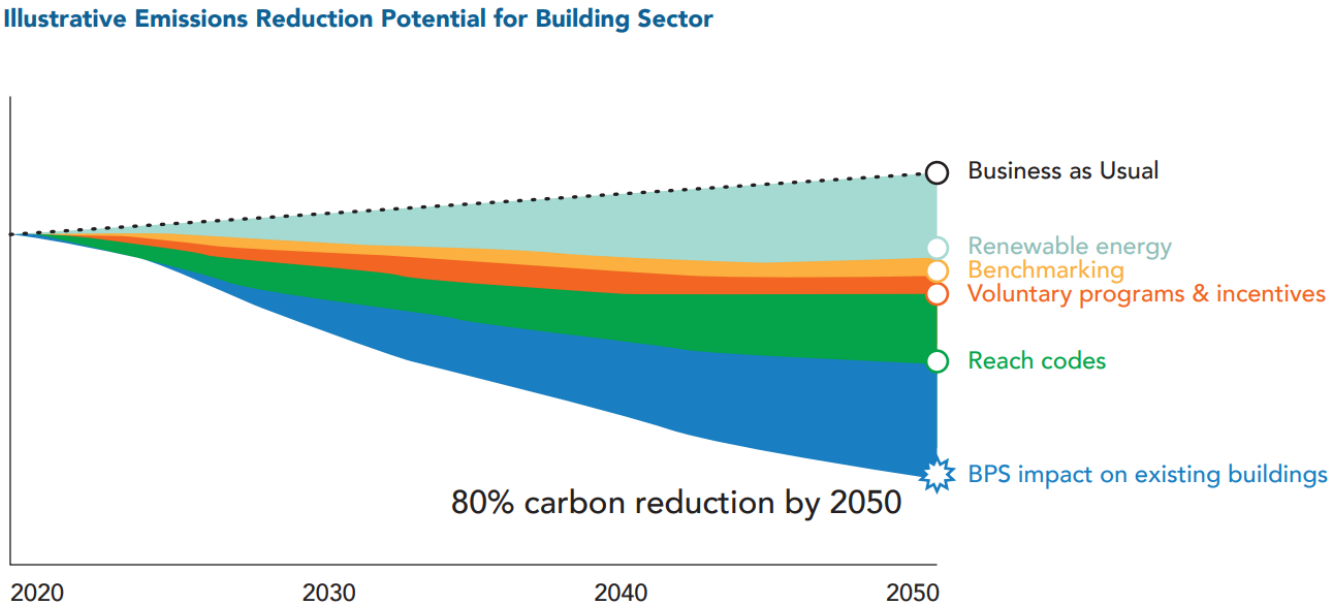
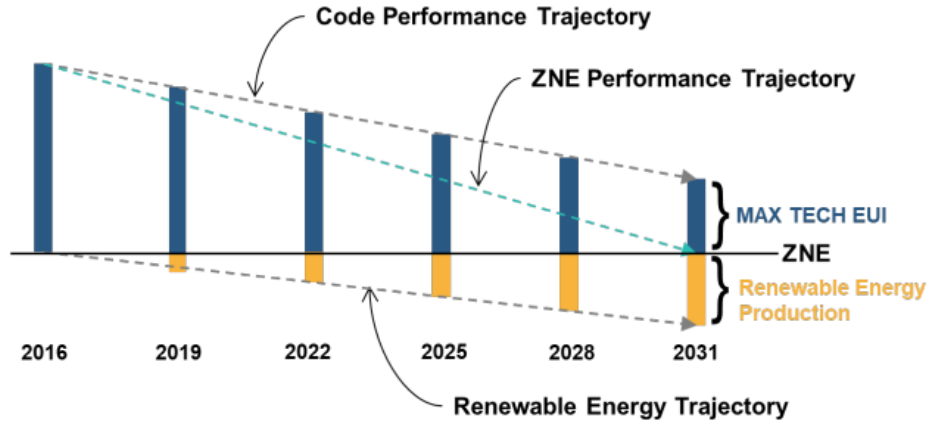
Create a Building Policy Framework

Voluntary Programs are only a small part of the solution. They incentive early adopters to show what is possible. Building codes and policy are required to motivate slow adopters to utilize new best practices.

- Quickly establish a timeline for building policy to give the slow-moving building industry time to prepare.



Source: 2021, [Building Performance Standards Framework](), Prepared for the American Cities Climate Challenge



Source: 2020, [Energy Code Roadmaps for Getting to Zero Outcomes](), New Buildings Institute

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Zero Energy Building Policy

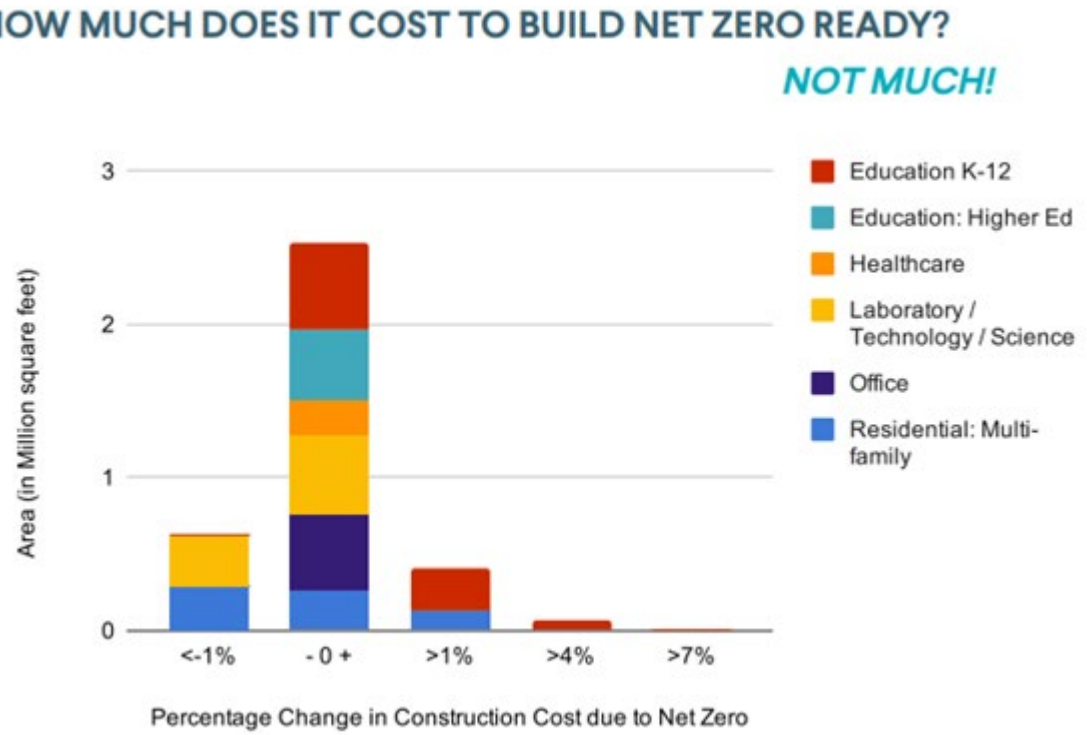
Newly constructed buildings will have long-lasting impacts. Stop digging the building emissions hole and build for zero emissions now.

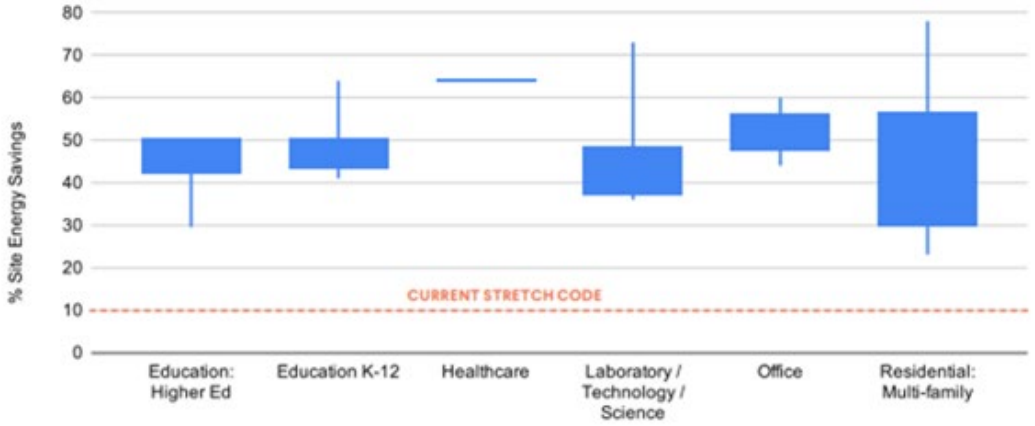
- Update the CT High Performance Building Standards to be net-zero-ready and fossil-fuel free.
- Allow municipalities to adopt a net zero ready stretch code including requiring building electrification.

Image Source: 2019, Zero Energy Buildings in Massachusetts: Saving Money from the Start, Prepared by Built Environment Plus (formerly USGBC MA)

The report revealed the following five key findings:

1. *ZE buildings are being built in Massachusetts today with virtually no upfront costs.*
2. *Return on investment for ZE in Existing and New Office Buildings can begin in as little as one year for ZE ready buildings.*
3. *Of the six building types studied, all can be Zero Energy Ready (ZER) for upfront costs of 0-7 percent, and all types break even in eight years or less when there are no additional upfront costs.*
4. *Existing office buildings retrofitted to zero energy, with renewables, can produce a return on their investment in as little as five to six years in comparison to a code compliant renovation.*
5. *Building energy demand can be reduced 44 – 54 percent across all building types with technology that's readily available today.*





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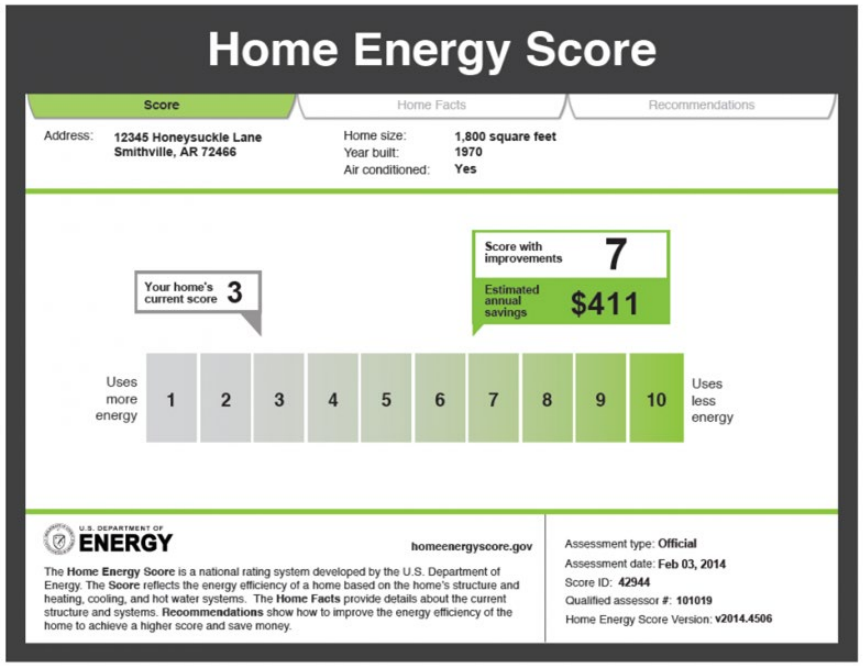
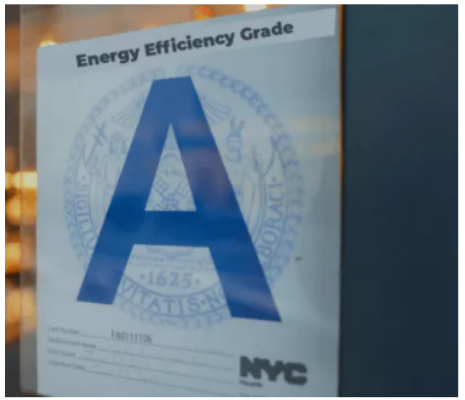
Energy Benchmarking and Building Performance Standards

Existing Buildings need to be retrofit to reduce their operational emissions and reduce demand on the grid.

- Require that existing commercial buildings report their energy usage.
- Require energy transparency for home sales and rentals.
- Enable municipalities to require energy labeling.
- Set a timeline for required energy performance targets for existing commercial buildings.





The ENERGY STAR rating that a buildings earns using the United States Environmental Protection Agency, helps compare the building's energy performance to similar buildings in similar climates.
NYC Buildings (on the Covered Buildings List) required to comply shall receive scores according to the following:
A= If the score is equal to or greater than 85
B= If the score is equal to or greater than 70 but less than 84
C= If the score is equal to or greater than 55 but less than 69
D= If the score is equal to or greater than 1 but less than 54
F= If the owner of such building has not complied, and the owner has had an opportunity to be heard with respect to such non-compliance.
Within 30 days after the owner obtains his/her Energy Efficiency Grade, such owner must post the grade and the Energy Efficiency score upon the location near each public entrance to such buildings. They must do this in a form and manner established by the department.
Get in touch with us to learn more about Local Law 33 & save thousands in violations!

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Connecticut Energy Labeling Legislative History

2021: S.B. 822 Home Energy Affordability (Governor's Bill)

Residential energy labels or electric usage data for home sales and rentals

- Voted out of committee with only requirements for rentals
- Was not brought to the floor for a vote.

2022: H.B. No. 5041 An Act Concerning Home Energy Affordability for Home Renters

- Voted out of committee
- Passed the House
- Was not brought to the floor for a vote in the Senate

2022: S.B. No. 14 An Act Concerning Home Energy Affordability for Home Buyers

- Had a public hearing
- Was not brought to a vote in committee

Energy Transparency: Using Energy Labels to make smarter decisions

October 21, 11am - 12:30pm
virtual webinar

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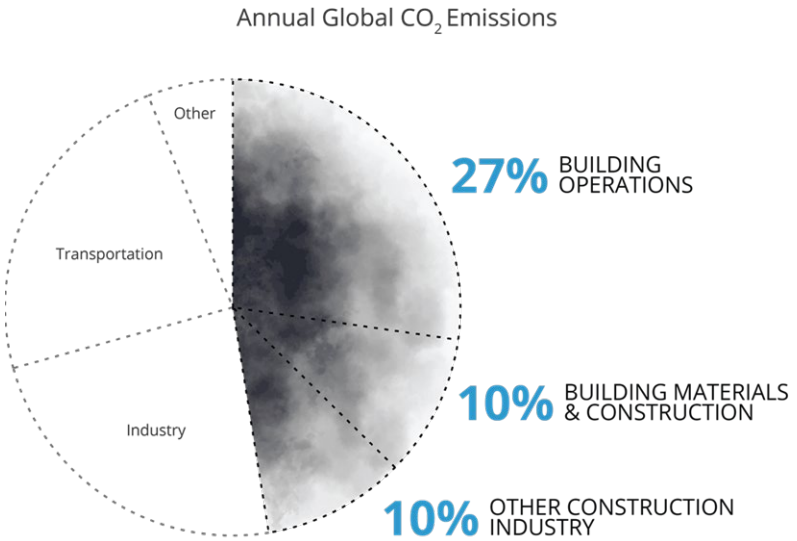
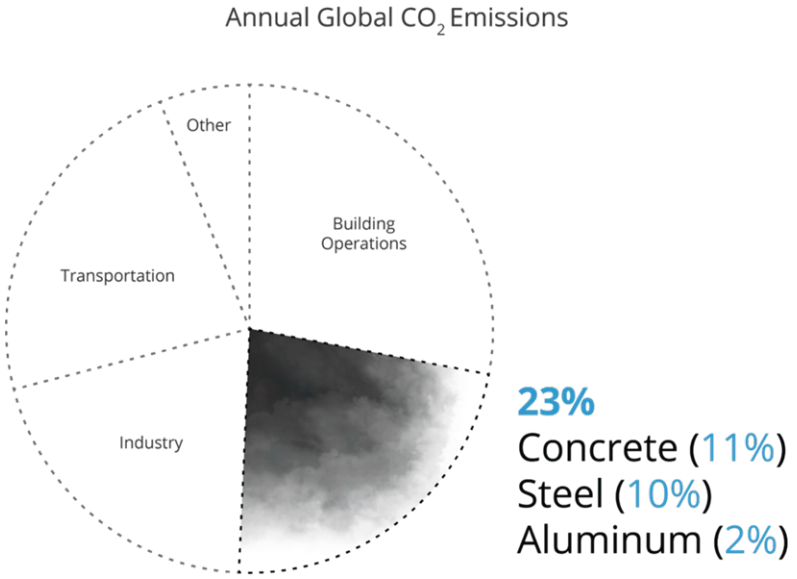
Don't Forget Embodied Carbon

Embodied Carbon contributes an outsized impact to building sector carbon emissions and has to be addressed to meet our climate goals.

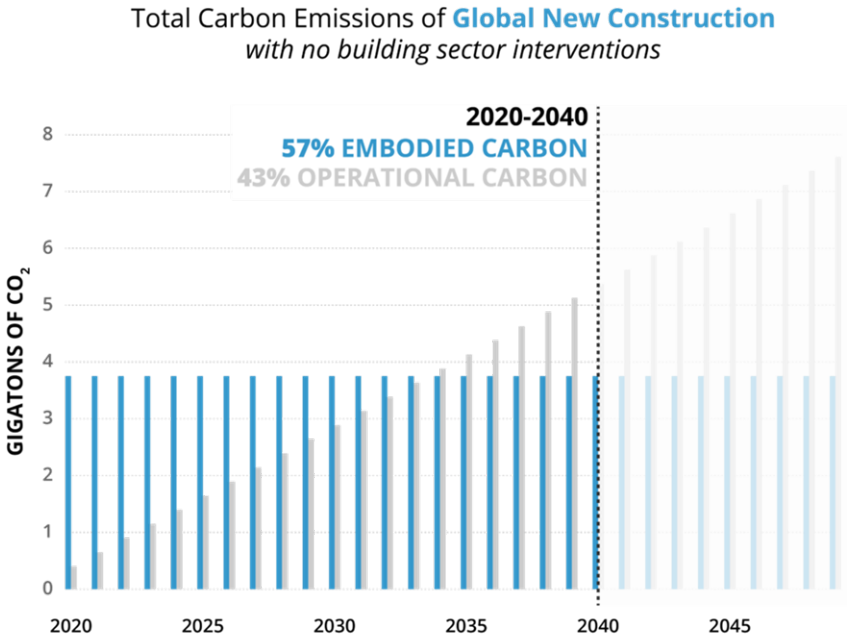
- Require embodied carbon transparency for state procurement in the form of EPDs and Life Cycle Assessments.
- Add embodied carbon requirements into a statewide stretch code.
- Set a timeline for embodied carbon reduction targets in new construction.



Data Sources: Global ABC Global Status Report 2021, EIA



Data Sources: Global ABC Global Status Report 2018, EIA



Data Sources: UN Environment Global Status Report 2017; EIA International Energy Outlook 2017

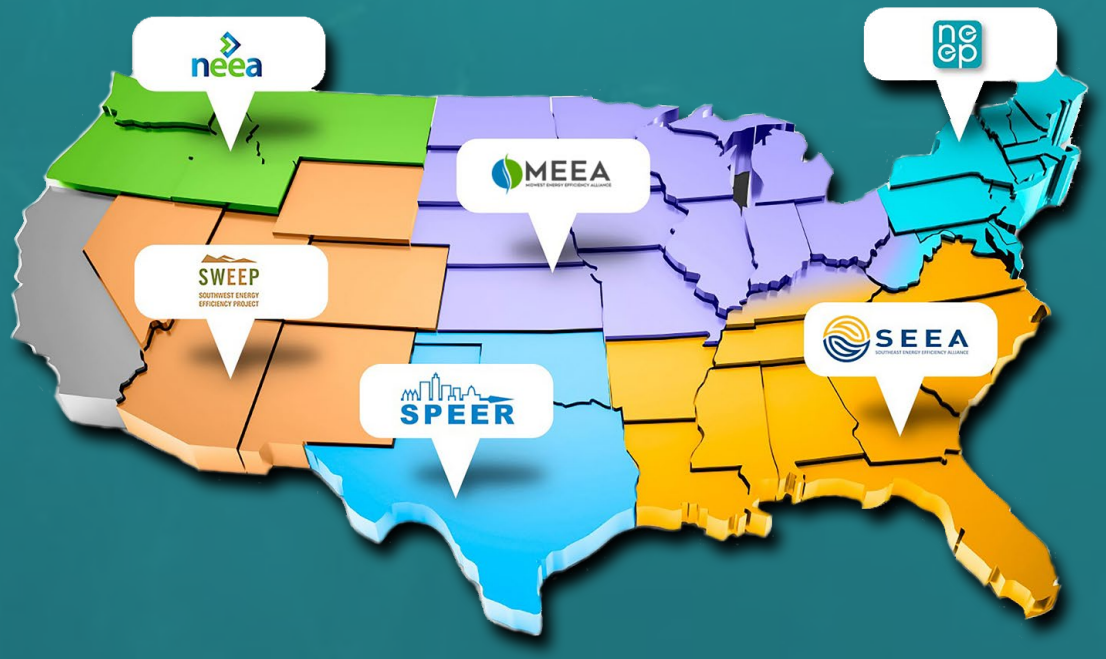
Northeast Energy Efficiency Partnerships

Building Energy Codes Support Strategies

Andrea Krim, Building Policy Manager

About NEEP

A Regional Energy Efficiency Organization



One of six REEOs funded in-part by U.S. DOE to support state and local efficiency policies and programs.

Northeast Energy Efficiency Partnerships

"Assist the Northeast and Mid-Atlantic region to reduce building sector energy consumption by at least 3% per year and carbon emissions by at least 40% by 2030 (relative to 2001)"

Mission

We seek to accelerate regional collaboration to promote advanced energy efficiency and related solutions in homes, buildings, industry, and communities.

Vision

We envision the region's homes, buildings, and communities transformed into efficient, affordable, low-carbon, resilient places to live, work, and play.

Approach

Drive market transformation regionally by fostering collaboration and innovation, developing tools, and disseminating knowledge

Building Energy Code in the U.S.

- U.S. doesn't have standardized approach to building codes
- No federal issued standards for energy efficiency
- Codes developed by trade organizations
  - International Code Council (ICC)
  - ASHRAE
- State/Local government determines which code to adopt and enforce
  - They can amend to weaken or strengthen
  - Patchwork of efficiency
  - Inconsistent enforcement
  - Many muni seek to go beyond base code
    - Stretch codes, Zero Codes.
    - Zoning Regs –or- Ordinances to increase EE, require all electric buildings

Building Energy Codes

2015

ME → 2021*

CT → 2021

NH → 2018

DC → 2021

WV

2018

MA → 2021*

NY → 2024*

MD → 2021

VT → 2021*

DE → 2021

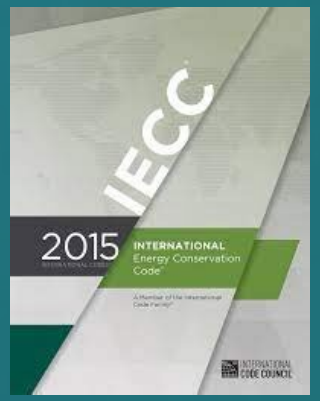
RI → 2021*

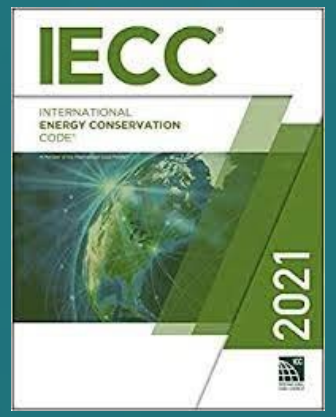
PA → 2021

2021

NJ

*Updating stretch codes





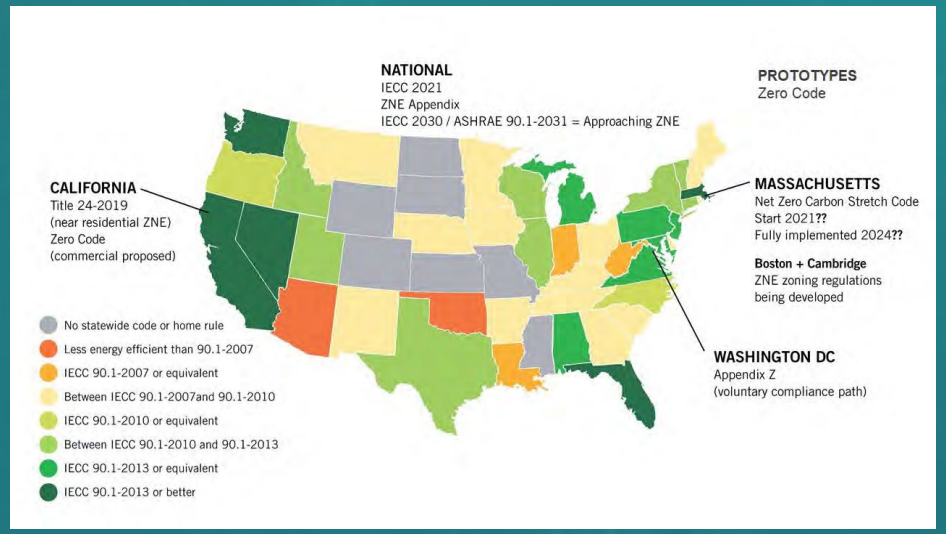
Status of Codes in Connecticut

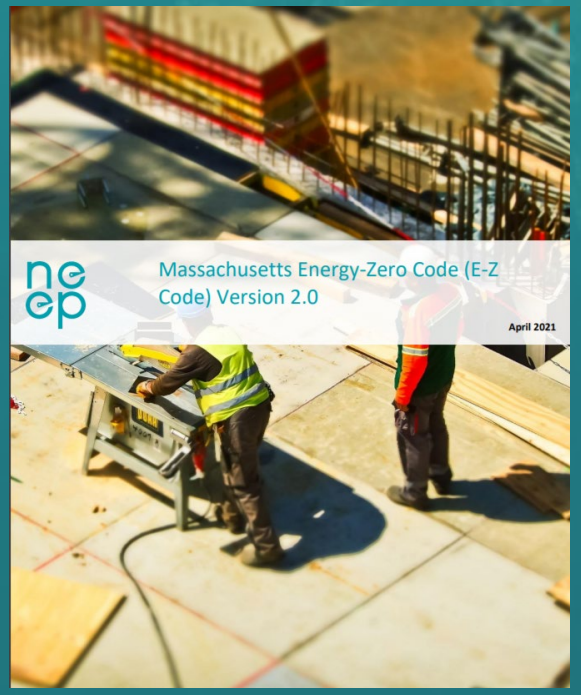
- Connecticut is expected to adopt an unamended 2021 IECC in October 2022.
  - The Connecticut Code and Standards Committee review and approves all state building and fire codes, including the building energy code.
- House Bill 6572-Legislation that would have allowed municipalities to adopt a stretch code for new or renovated buildings larger than 40,000sq
  - Arguments against the bill included affordability & upfront costs

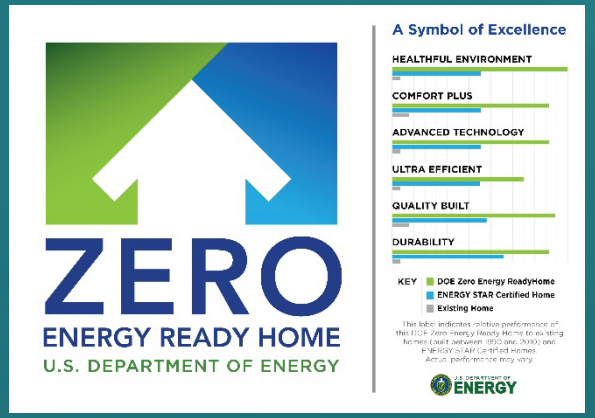
Codes Strategies for Connecticut

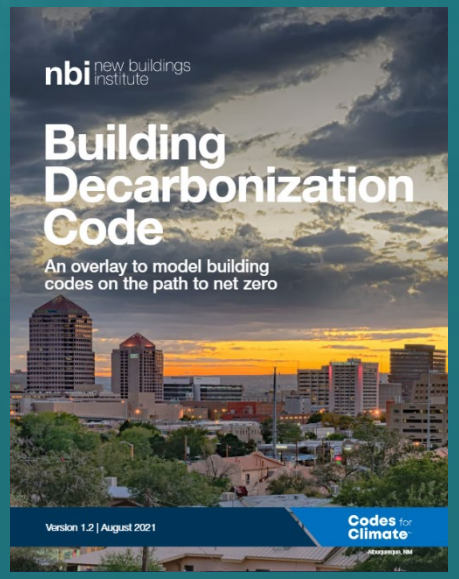
- Adopting model codes unamended as they are published
- Stretch Codes
- Benchmarking
- Building Performance Standards
- Zero Energy Codes

Stretch Codes take Many Paths



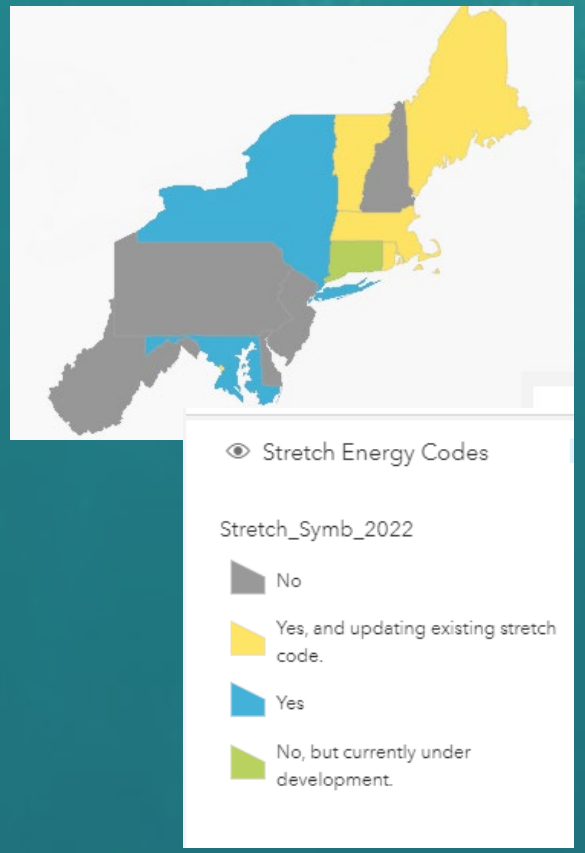




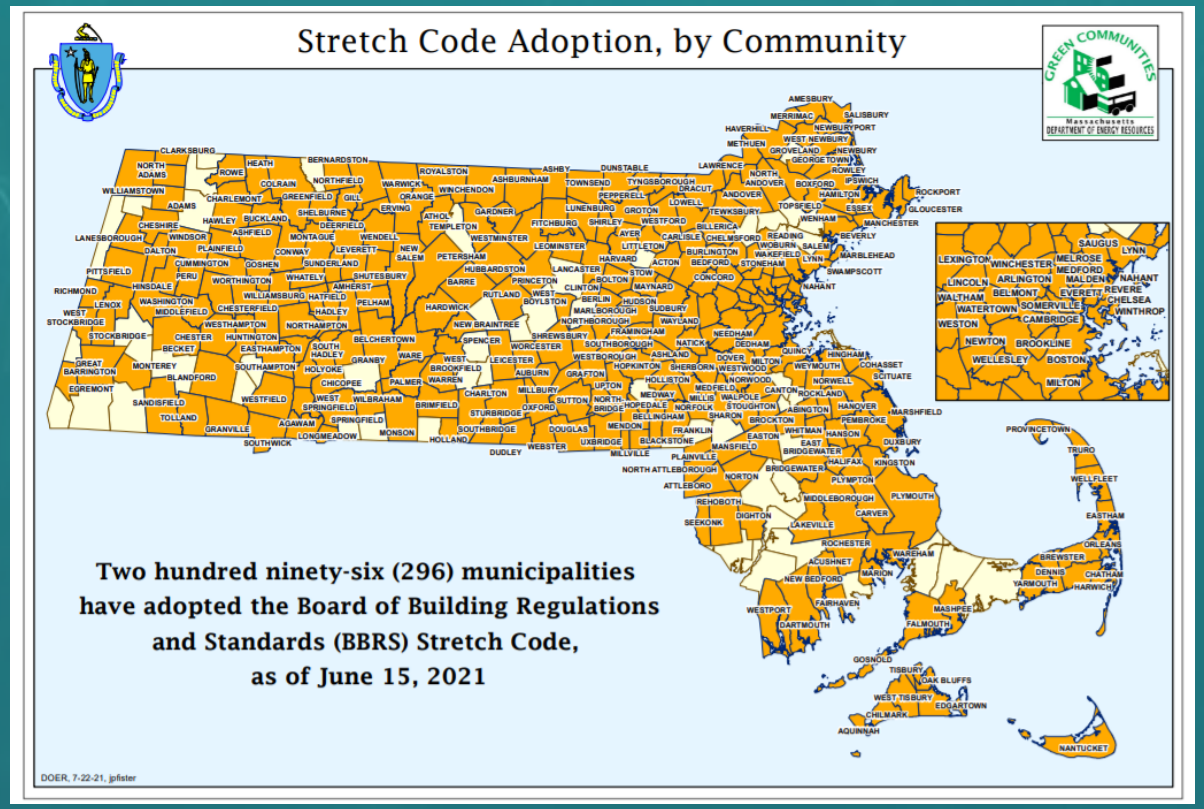


Stretch Codes: NEEP Region

State	Residential	Commercial	Details
MA	HERS/ERI	Percent Better	Stretch, Muni Opt In
NY	IECC	IECC/ASHRAE	Updating; Zero Energy base 2026
DC		Appendix Z (zero energy)	Electrification measures in base code 2021, Zero Energy base 2026
VT	Point Based		EV Charging, Solar Ready, Air Sealing, Points, HERS; ZE base 2030
RI	DOE ZERH	IGCC	Updating - Zero Code Option
ME	IECC ZE Appendix	IECC ZE Appendix	
MD		IGCC	Statewide Strech Zero/Electric Code



Massachusetts



Base 2021 IECC w/ electrification, Stretch code, 2022 Muni Opt-In Zero Code

Mass Energy Zero Code (EZ-Code)

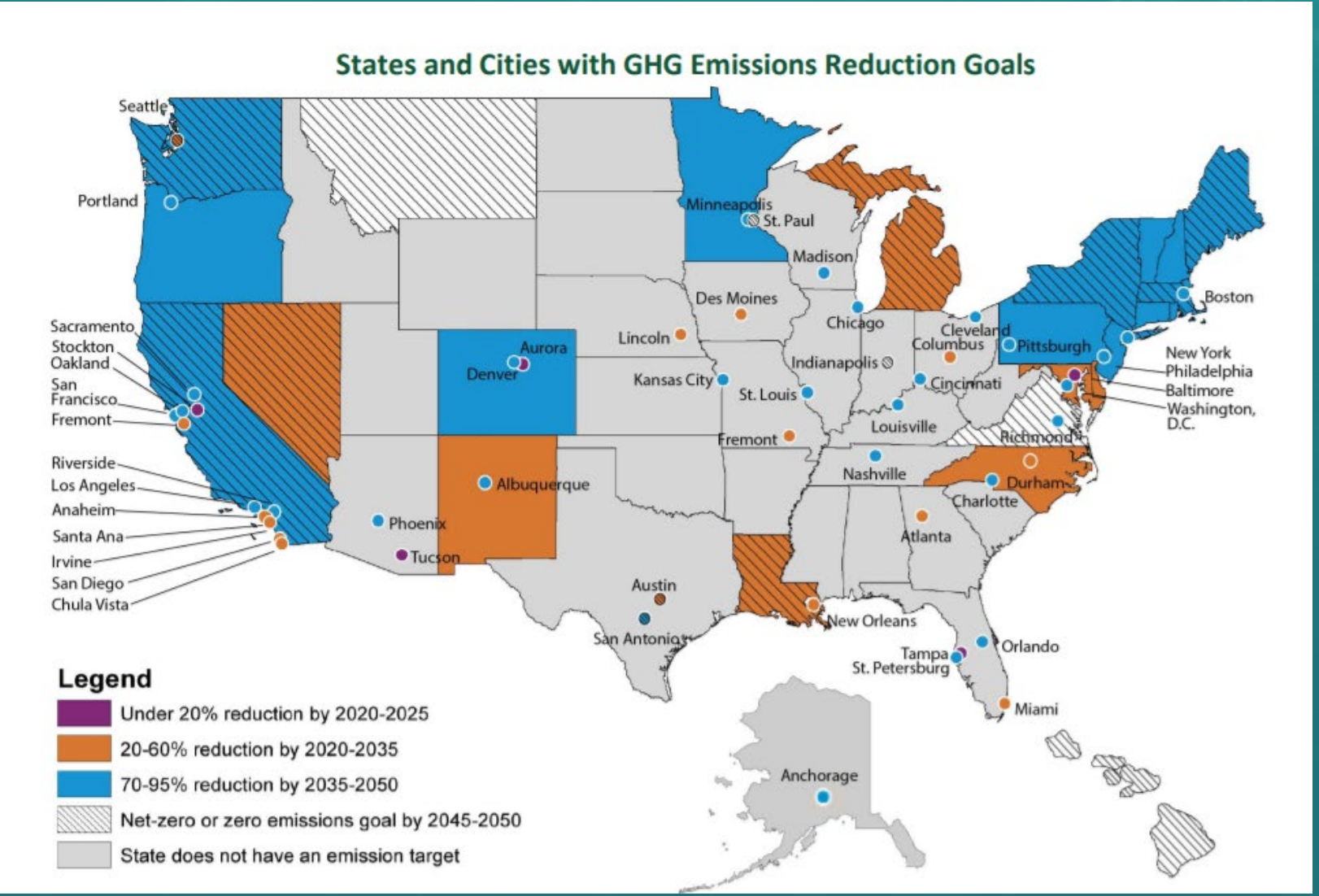
Energy Efficiency
Prescriptive Path
-OR-
Performance Path w/ Prescriptive Backstop

Electrification
No Combustion (w/exceptions)
EV requirements
Demand Response requirements

Renewable Energy
Achieve Net Zero
Renewables demonstrating Additionality
No Weighting Factors
On-site Solar requirements

Benchmarking Existing Buildings

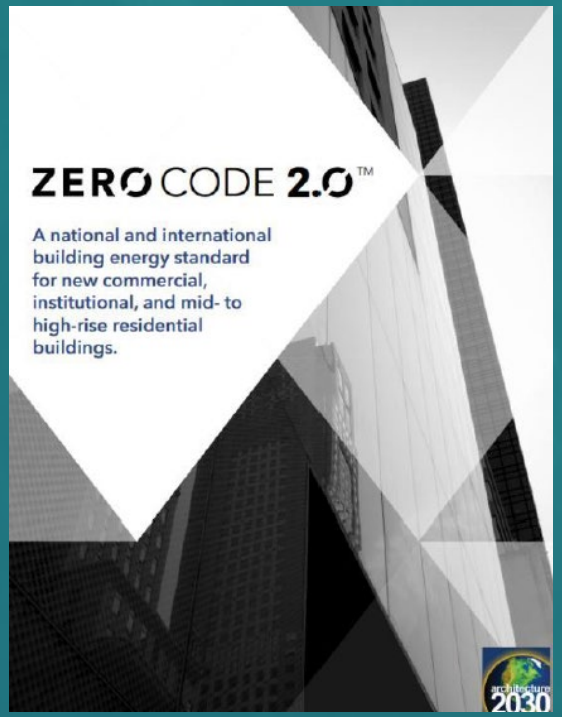
Building Performance Standards (BPS)

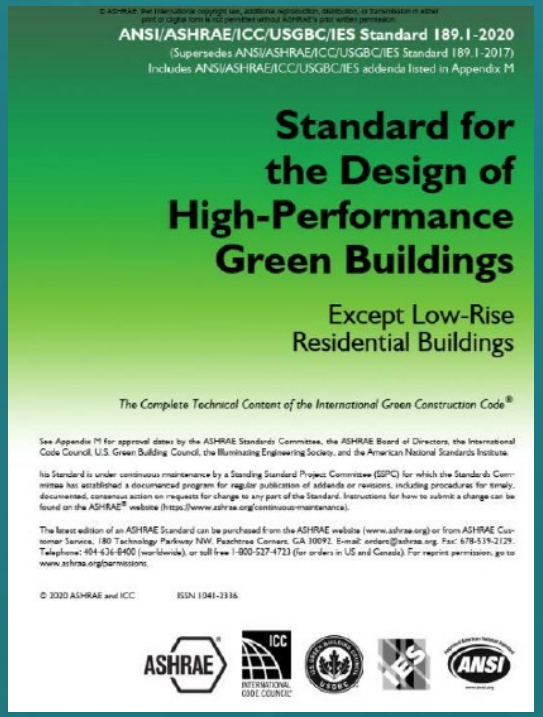


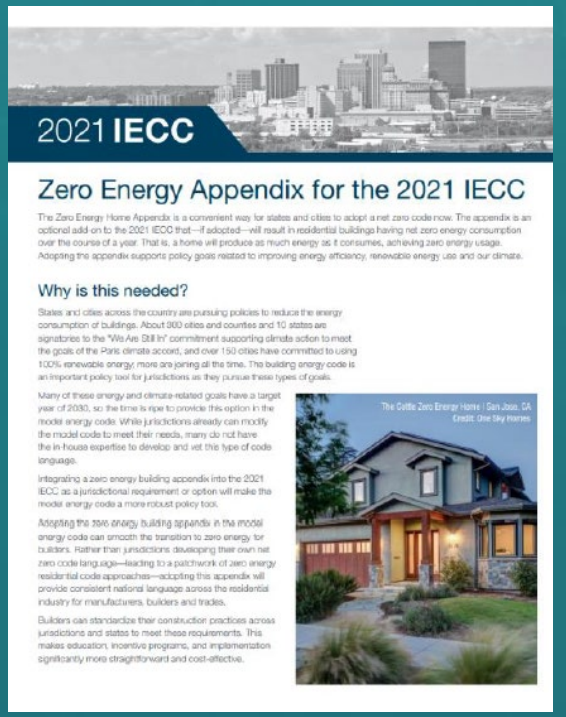
Building Performance Standards Northeast

- Boston – BERDO 2.0
  - 50% by 2030 100 % by 2050
- NYC Act 97
  - 40% by 2030 2005 baseline
- DC Omnibus Act of 2018
  - GHG and EE 50% by 2032
- Baltimore, Philadelphia, Pittsburgh

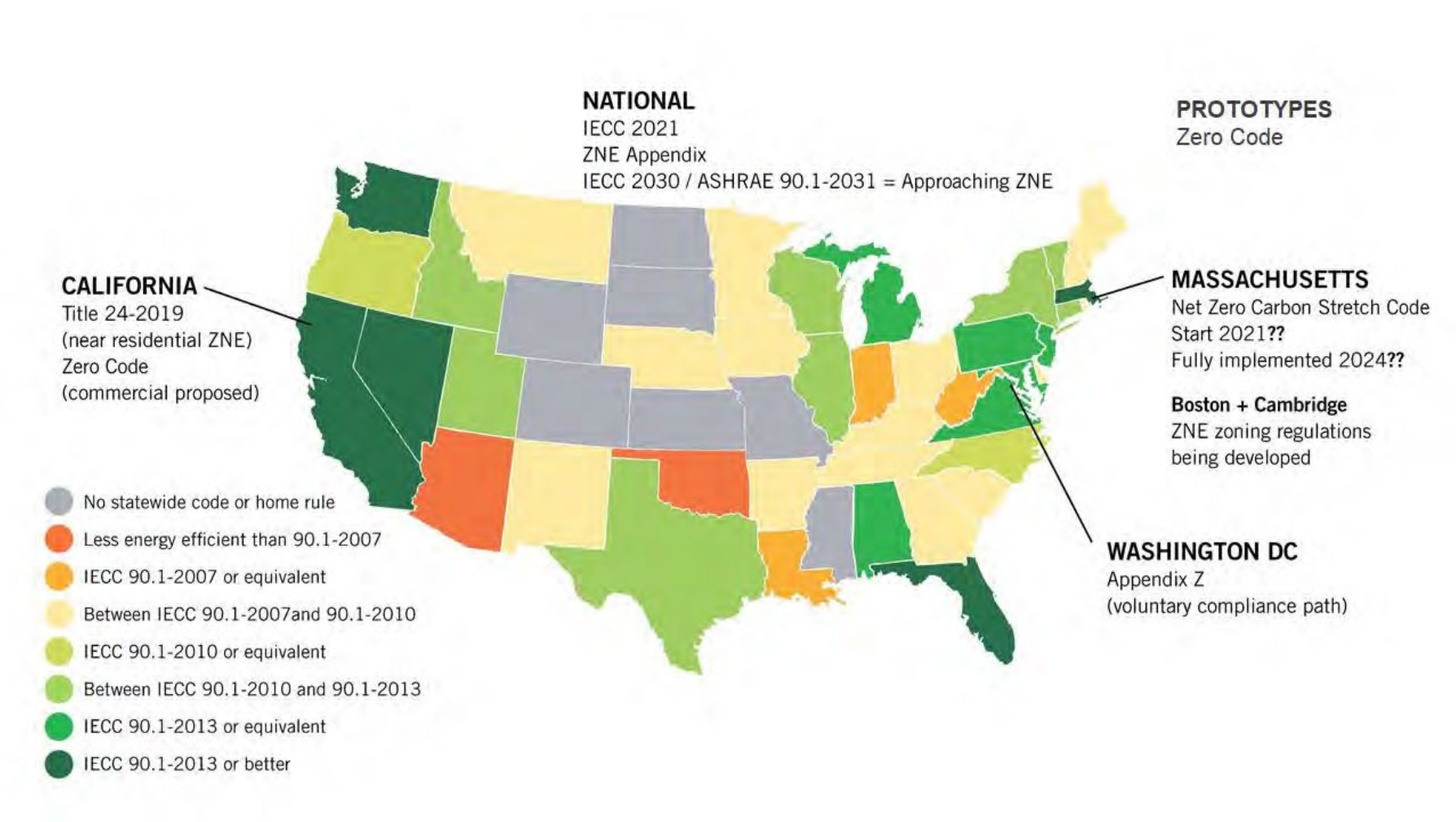
Renewables in Code



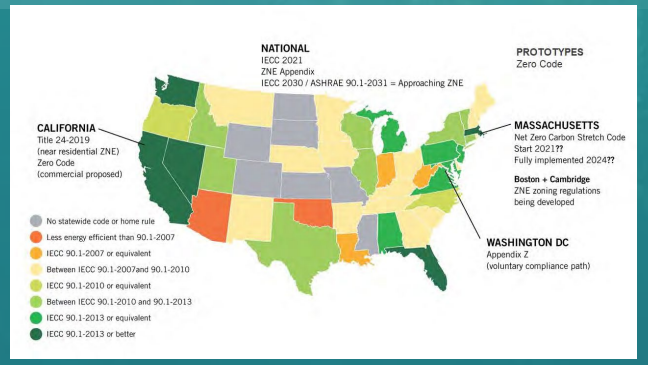




Zero Energy Codes



Zero Energy Codes



- **NEEP Region**
  - Washington DC – Appendix Z
  - MA Muni Opt-in ZE Stretch 2022
  - On path to zero base code **VT, NY, MA** by 2030

- **California**
  - Residential Solar requirement 2020
  - 2022 Code Heat pumps, Electric Ready, Battery Storage, Increased PV, Ventilation Requirements
  - Commercial and Multifamily Solar requirements 2023
  - All buildings net zero

Codes Policies

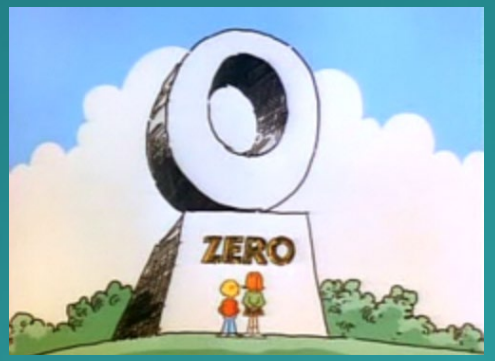
- For code to be effective the latest must be adopted and enforced.
- Codes to support ZE buildings must include latest efficient technology.
- Codes not be fossil fuel agnostic and move toward maximum electrification (w/exceptions).
- Codes should connect buildings to the grid and scale buildings to communities.
- Code address equity, to ensure zero energy buildings for all populations.
- Incorporate a formalized anticipatory and precautionary focus into regulatory process.
- Zero Energy Buildings are possible and affordable, today!

NEEP Resources

Codes / Standards Trackers, Toolkits, Papers

- Building Energy Codes & Standards
  - https://neep.org/efficient-resilient-buildings-and-communities/energy-codes

- Efficient, Resilient Communities
  - https://neep.org/efficient-resilient-buildings-and-communities/high-performance-communities

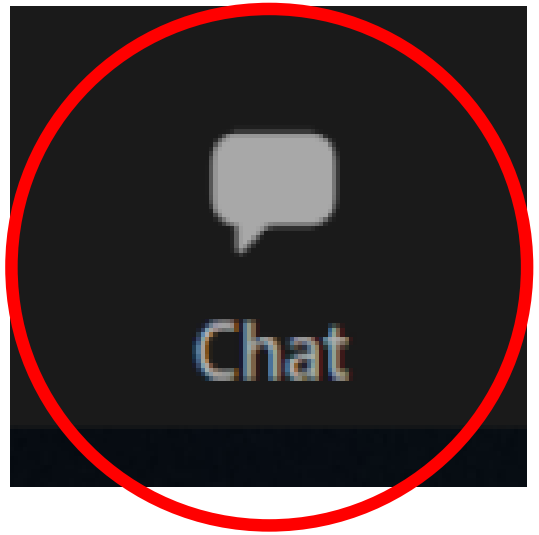


Thank you.

For more information, contact:

akrim@neep.org

Questions



At the conclusion of each panel DEEP will hold a brief question and answer period.

If you have a question for a presenter, please drop it into the chat to **Jeff Howard**. DEEP will pose as many questions as time allows to the speakers. Clarifying questions will be prioritized. Leading questions will not be accepted.

District Heating & Cooling

Peter Millman & Audrey Schulman – People's Action for Clean Energy & Home Energy Efficiency Team

Eric Bosworth – Eversource

Jodi Guthrie – SHARC Energy

(speaker order may vary)

Click on agenda section heading to jump to corresponding slides

BUREAU OF ENERGY AND TECHNOLOGY POLICY

People's Action for Clean Energy (PACE) & Home Energy Efficiency Team (HEET)

Networked Geothermal for CT

A way to accelerate the decarbonization of building heating by using efficient, emission-free, shared thermal loops, combined with ground source heat pumps.

heet

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Beyond Gas CT

- Conservation Law Foundation
- Save the Sound
- Sierra Club
- Acadia Center
- People’s Action for Clean Energy
- Connecticut Citizen Action Group
- Eastern CT Green Action

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One idea, many names

- GeoMicroDdistricts
- District thermal networks
- Thermal energy networks
- Networked or community geothermal
- District heating and cooling
- Shared thermal loops
- And more…

heet

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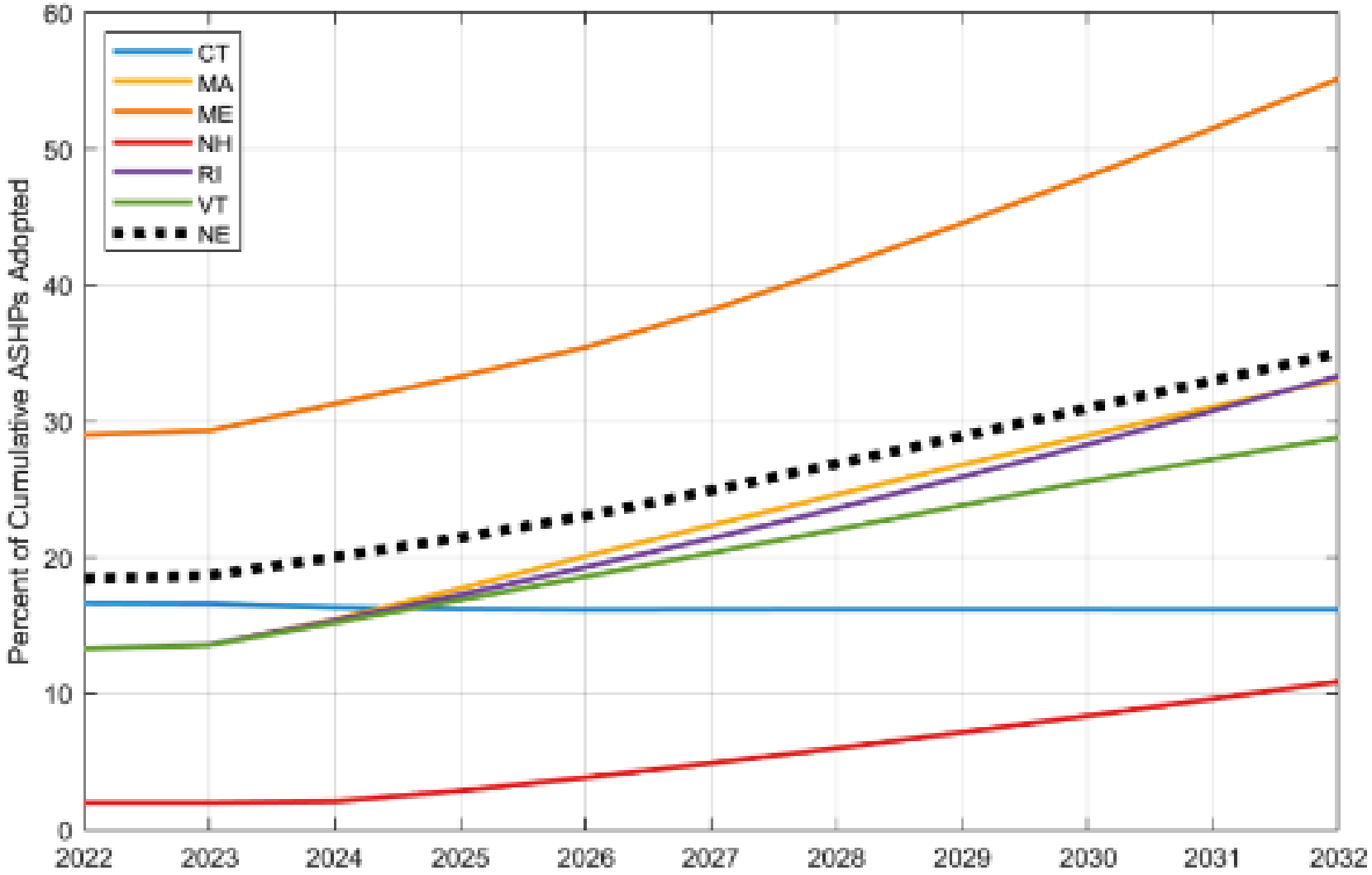
According to DEEP's webpage on Building Decarbonization:

"Fossil fuel combustion in residential and commercial buildings accounts for more than a quarter of Connecticut's economy-wide greenhouse gas emissions."

heet

PACE
People's Action for Clean Energy

Final 2022 Heating Electrification Forecast



Community Activist

Utility Executive

Steelworkers Union Leader

MIT academic

Networked Leadership

State Regulator

Geothermal Expert

Governor's Office

"Gas is the Bridge Fuel" originator

Research

GEO
MICRO
DISTRICT

Feasibility Study

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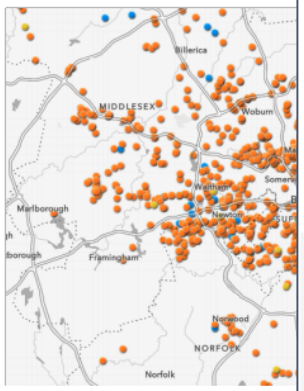
Significant Environmental Impact (SEI)
Natural Gas Leaks

Shared Action Plan Year 1 (2019/2020)

Utilities Enacting the Lea

April 27th 202



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HEET 2219-1551

LEARNING FROM THE GRO

GeoMicroDistrict Pilot: Installation, Evaluation ar

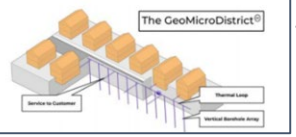
Audrey Schulman, Business Manager
Zeyneb Magavi, Principal Investigator

HEET is an award-winning Massachusetts nonprofit that c
concept and that aims to achieve two goals over the thre

1. **Evaluate the pilot GeoMicroDistrict capacity** a) meet a
demands for an approximately 100,000 sf dense, mixed-
minimize energy use and costs through optimization and
borehole thermal energy storage c) positively interact wi
resilience and reduce overall cost.

2. **Establish a standard method of GeoMicroDistrict rese**
policy makers and utilities of significant engineering and
impacts of GeoMicroDistricts. By driving down costs and
business case for utilities to install networked geothermal
transformation.

GeoMicroDistricts use bidirectional borehole thermal energy storage (BTES) as the prime source of thermal energy for buildings. A subsurface ambient temperature water loop, maintained at 40-80°F across seasons, delivers that temperature through service lines to buildings. The use of an ambient-loop



ENVIRONMENTAL Science & Technology

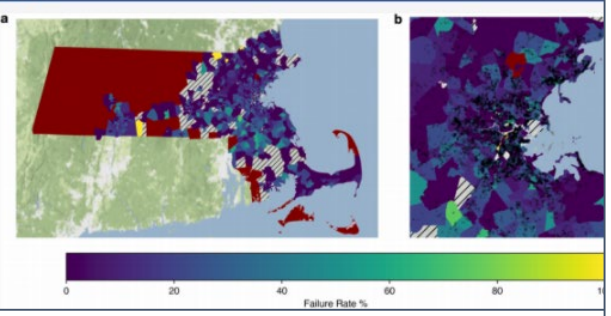
pubs.acs.org/est

Repair Failures Call for New P
Distribution Systems

Morgan R. Edwards,* Amanda Giang, Gregg
Robert Ackley, and Audrey Schulman

Cite This: https://doi.org/10.1021/acs.est.0c07531

ACCESS | Metrics & More | Article Recommendations | Supporting Inf



ELSEVIER

Energy Policy

Volume 162, March 2022, 112778

An environmental justice analysis of distribution-level natural gas leaks in Massachusetts, USA

Marcos Luna [a], Dominic Nicholas [b]

Show more

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https://doi.org/10.1016/j.enpol.2022.1

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ENVIRONMENTAL Science & Technology

pubs.acs.org/est

Article

Home is Where the Pipeline Ends: Characterization of Volatile Organic Compounds Present in Natural Gas at the Point of the Residential End User

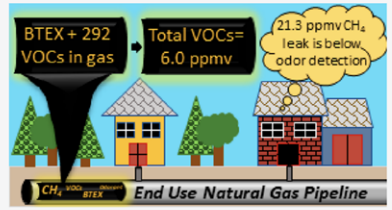
Drew R. Michanowicz,*[,▽] Archana Dayalu,[▽] Curtis L. Nordgaard, Jonathan J. Buonocore, Molly W. Fairchild, Robert Ackley, Jessica E. Schiff, Abbie Liu, Nathan G. Phillips, Audrey Schulman, Zeyneb Magavi, and John D. Spengler

Cite This: https://doi.org/10.1021/acs.est.1c08298

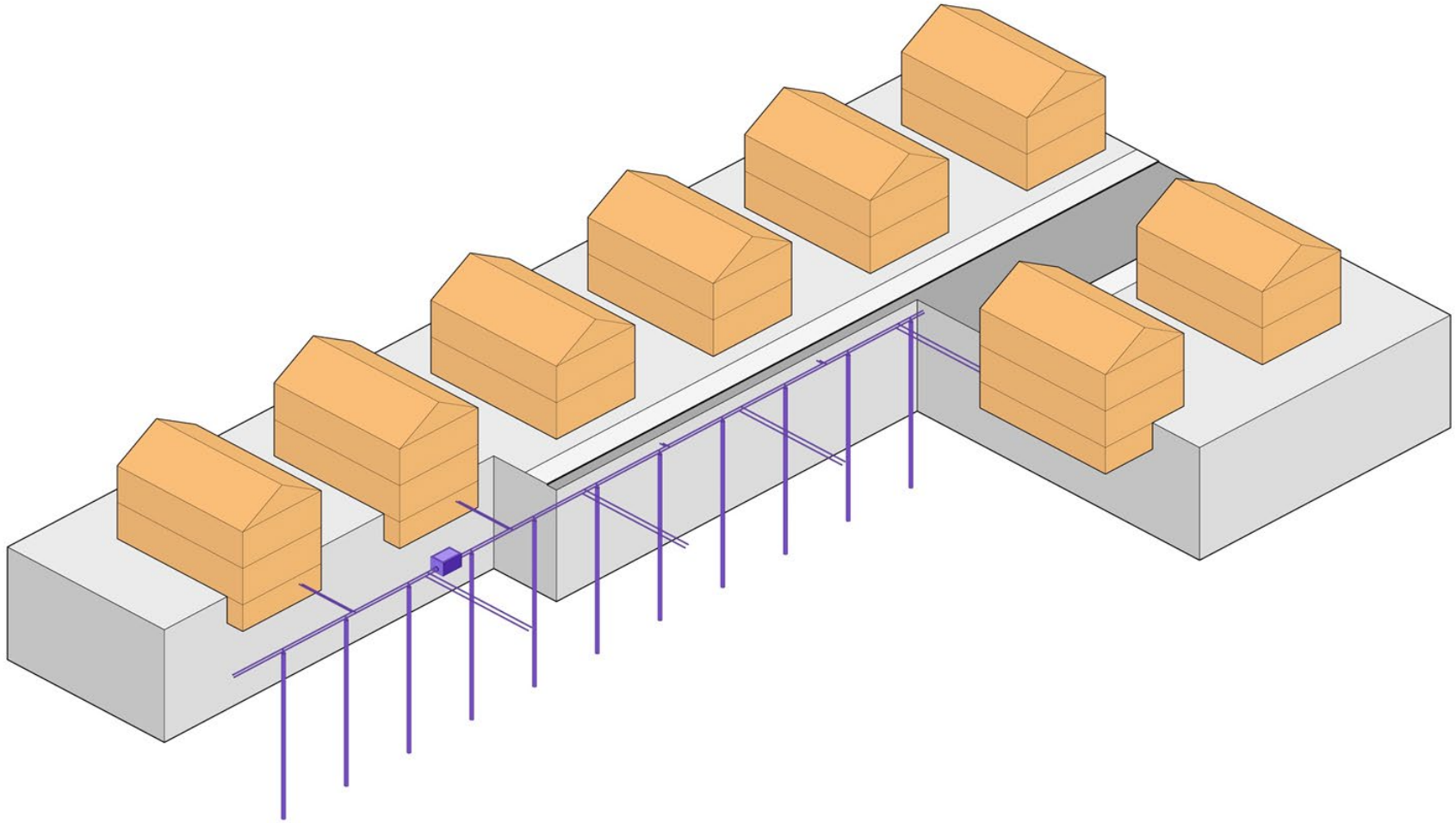
Read Online

ACCESS | Metrics & More | Article Recommendations | Supporting Information

ABSTRACT: The presence of volatile organic compounds (VOCs) in unprocessed natural gas (NG) is well documented; however, the degree to which VOCs are present in NG at the point of end use is largely uncharacterized. We collected 234 whole-NG samples across 69 unique residential locations across the Greater Boston metropolitan area, Massachusetts. NG samples were measured for methane (CH_4), ethane (C_2H_6), and nonmethane VOC (NMVOC) content (including tentatively identified compounds) using commercially available USEPA analytical methods. Results revealed 296 unique NMVOC constituents in end-use NG, of which 21 (or approximately 7%) were designated as hazardous air pollutants. Benzene (bootstrapped mean = 164 ppbv; SD = 16; 95% CI: 134−196) was detected in 95% of samples along with hexane (98% detection), toluene (94%), heptane (94%), and cyclohexane (89%), contributing to a mean total

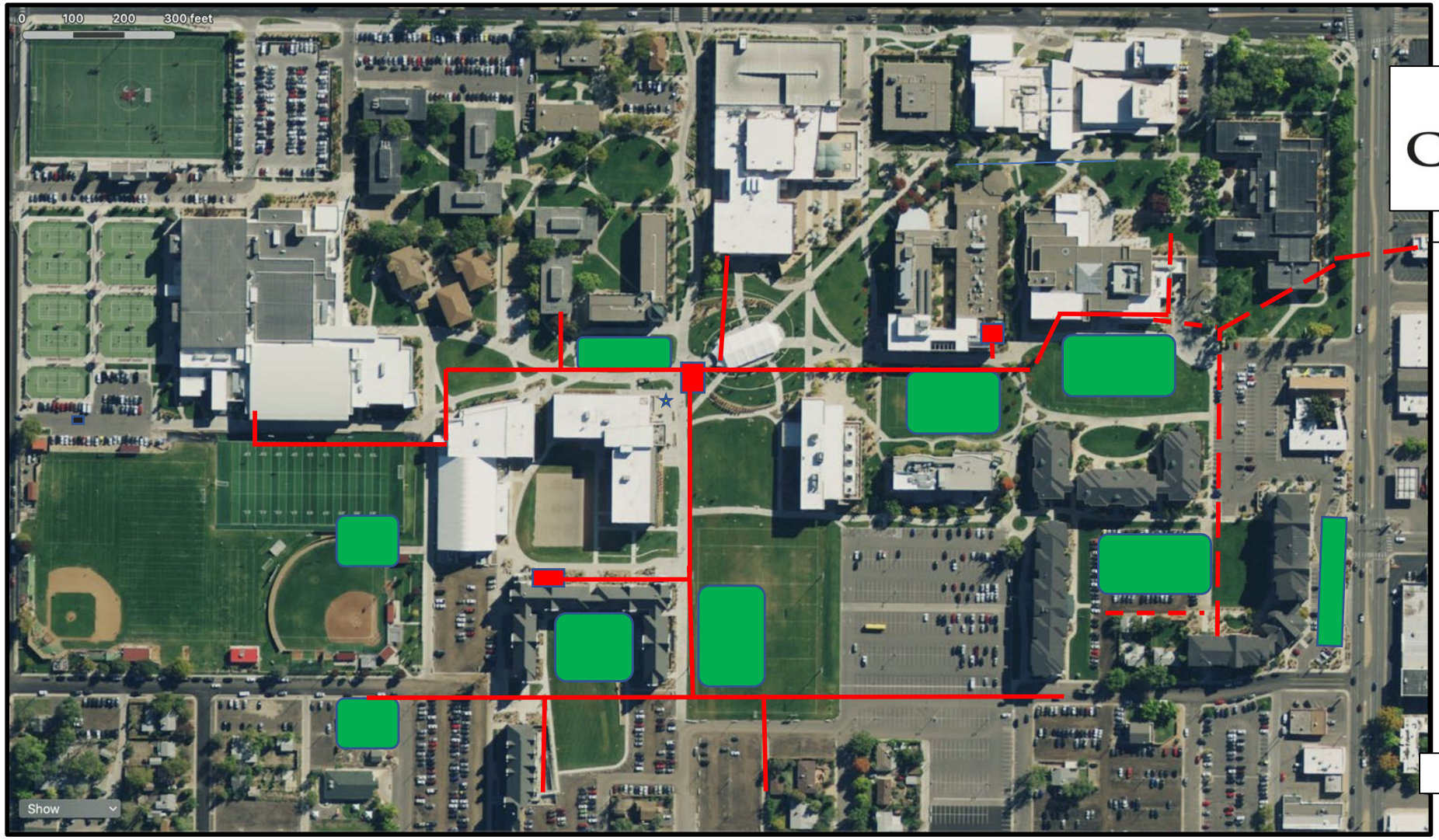


HEET's GeoNet (AKA GeoGrid, GeoMicroDistrict, etc.)



BUROHAPPOLD ENGINEERING heet

Case Study



COLORADO MESA UNIVERSITY

Borefields (121,000 ft)

Vaults & Mechanical Rooms

Shared loop:

18” Pipes

12” & 10” Pipes

Courtesy of The GreyEdge Group©

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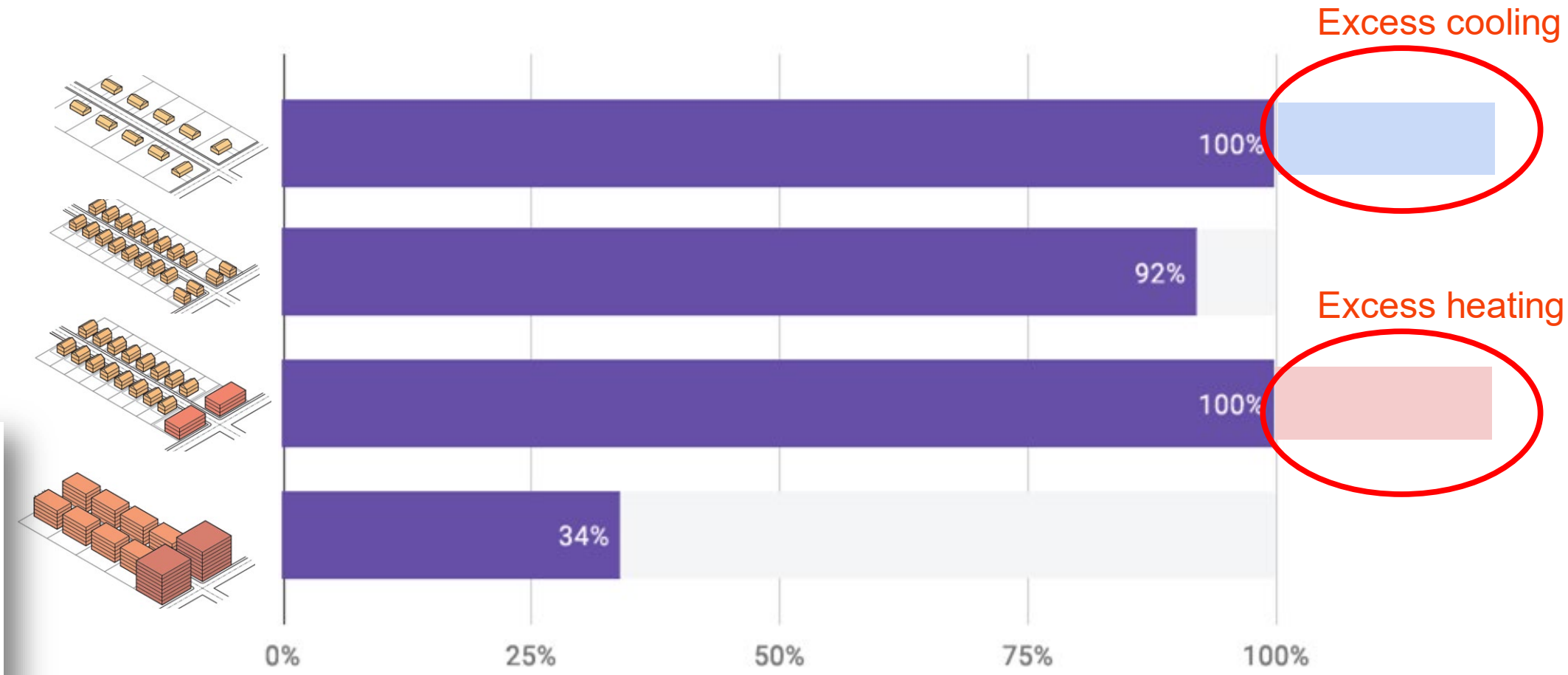
Technical Feasibility (by street segment)

Ability to meet energy demand through ‘shallow’ boreholes in the street only



GEO MICRO DISTRICT

Feasibility Study

heet BUROHAPPOLD ENGINEERING

GeoMicroDistrict Feasibility Study, Buro Happold Engineering, 2019

BUROHAPPOLD ENGINEERING heet

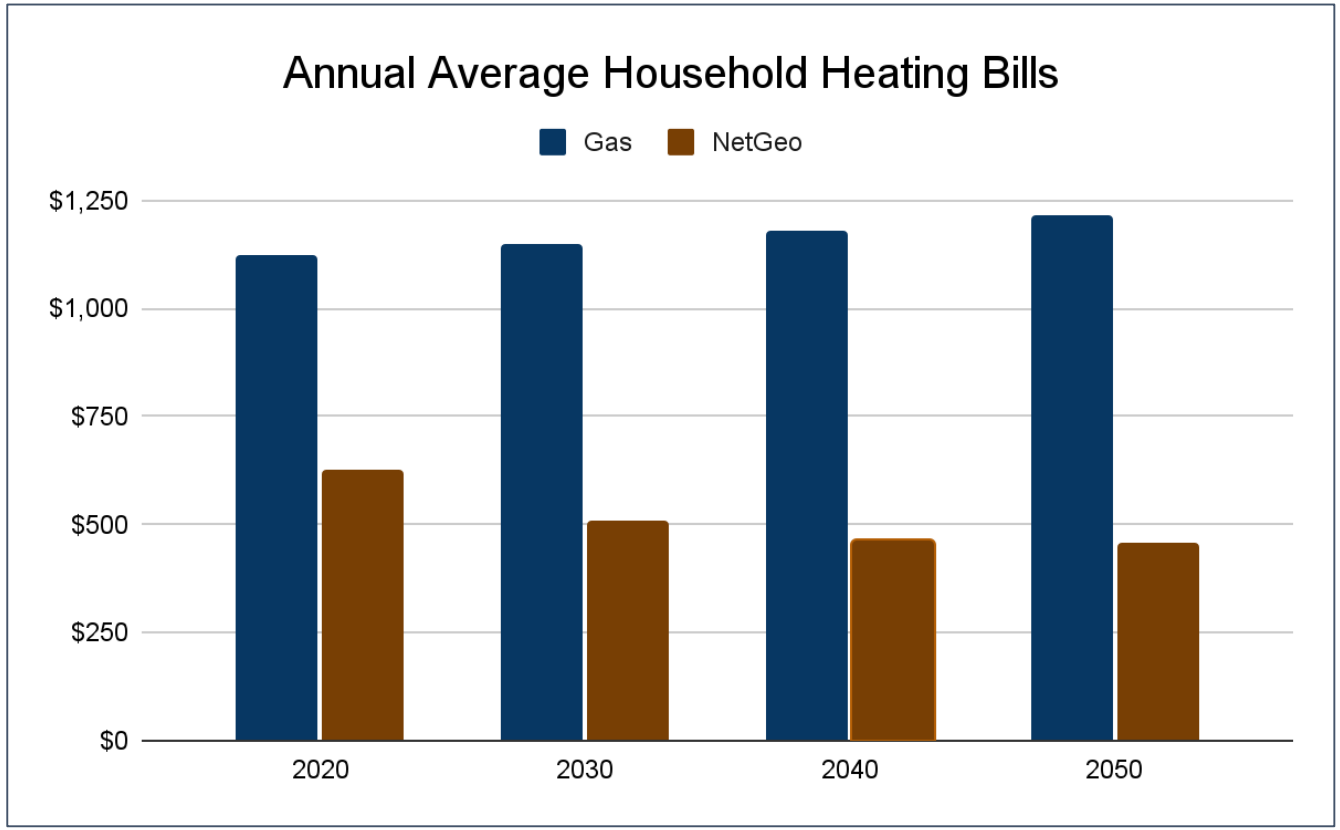
Benefits

- Safer
- Provides cooling

Benefits

- Safer
- Provides cooling
- Energy bill savings

MA Energy Bill Projection
(Applied Economics Clinic Brief)



Inflection Point; When Heating with Gas Costs More; Applied Economic Clinic Jan 2021

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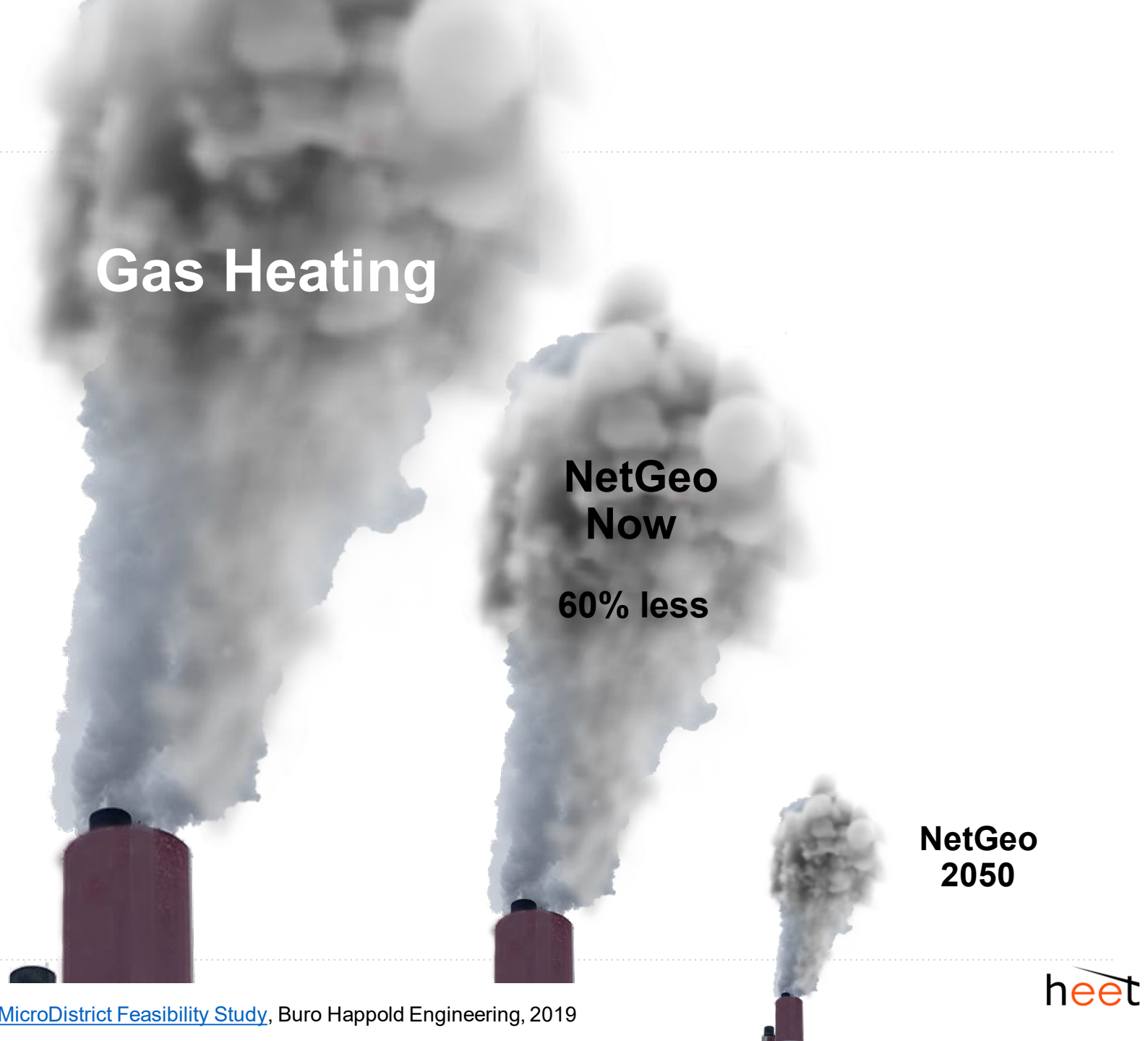
Benefits

- Safer
- Provides cooling
- Energy bill savings
- Cuts emissions



GeoMicroDistrict Feasibility Study, Buro Happold Engineering, 2019

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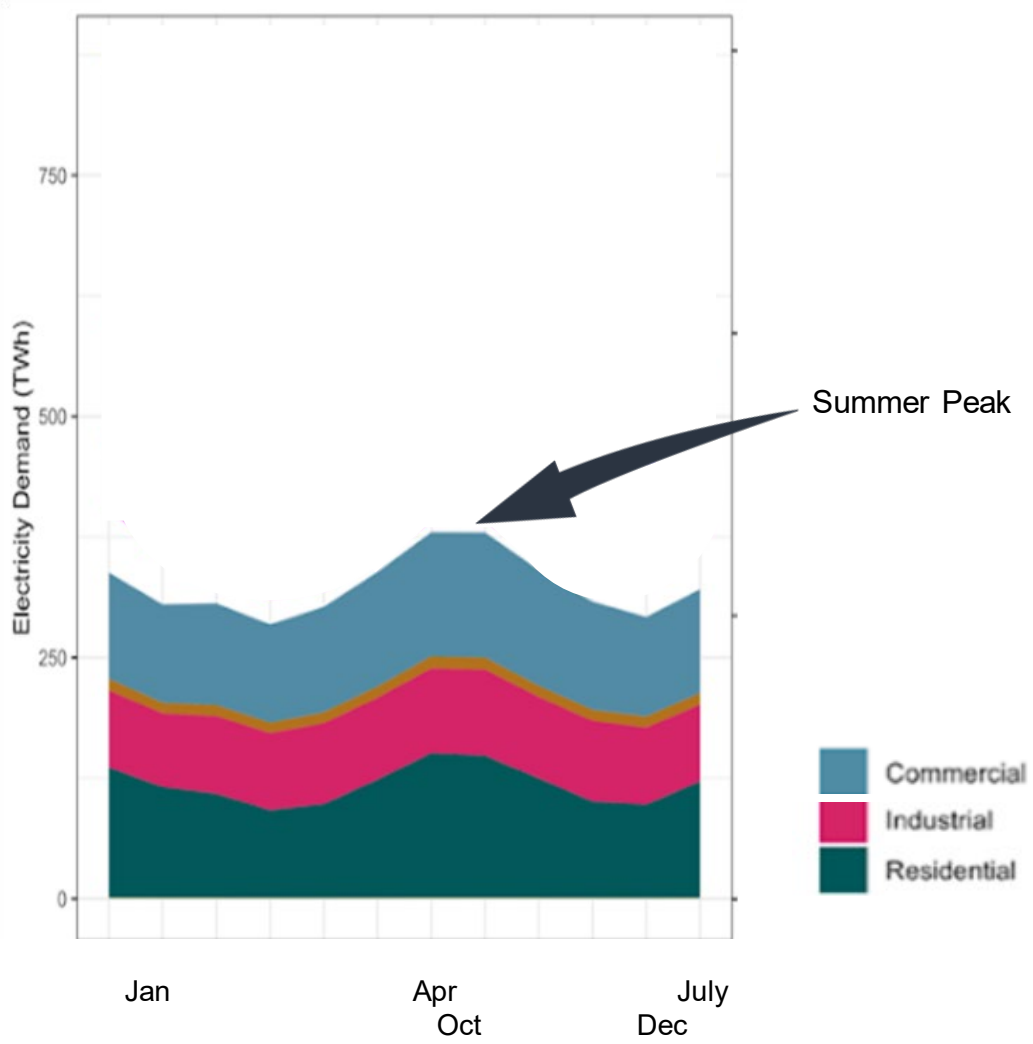
Benefits

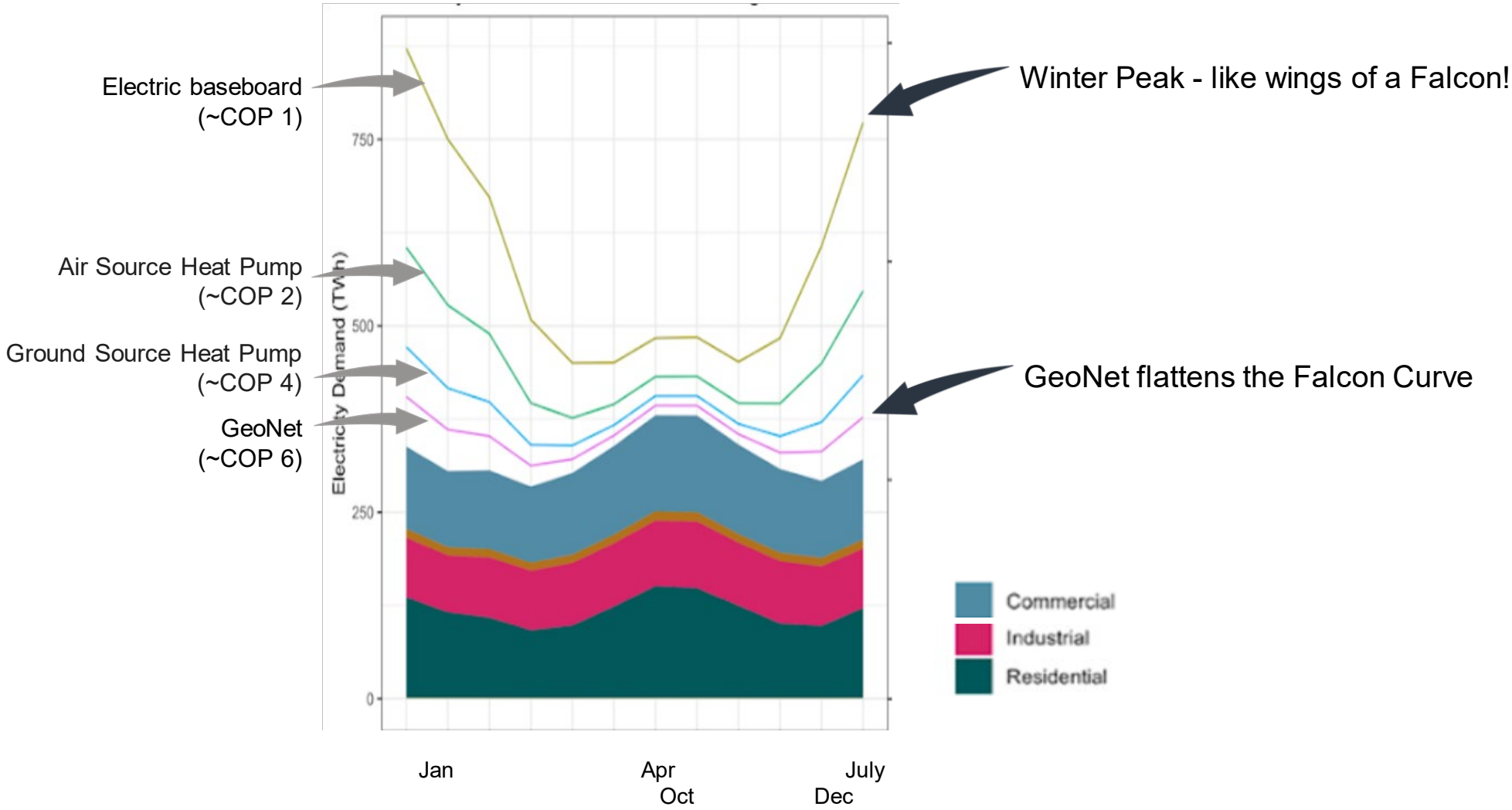
- Safer
- Provides cooling
- Energy bill savings
- Cuts emissions
- Retraining easy

Current US Seasonal Electric Peaks



Buonocore, J., Salimifard, P., Magavi, Z., Allen, J., "The Falcon Curve: Implications of Seasonal Building Energy Use and Seasonal Energy Storage for Healthy Decarbonization" DOI: 10.21203/rs.3.rs-1054606/v1

Future US Electric Peaks (as we electrify heating)



Buonocore, J., Salimifard, P., Magavi, Z., Allen, J., "The Falcon Curve: Implications of Seasonal Building Energy Use and Seasonal Energy Storage for Healthy Decarbonization" DOI: 10.21203/rs.3.rs-1054606/v1

MA Eversource Installation

Framingham, MA

- @ 100 units, including low income, govt and municipal buildings

Monthly customer costs/ heat pump

- Residential: $9/month, Low income: $7, Commercial/Industrial: $21

Schedule

- Construction - late 2022

MA National Grid Installations

4 sites total

- 20 to 40 customers per site

Monthly customer costs/ heat pump

- Homes $60/month, low income homes $45

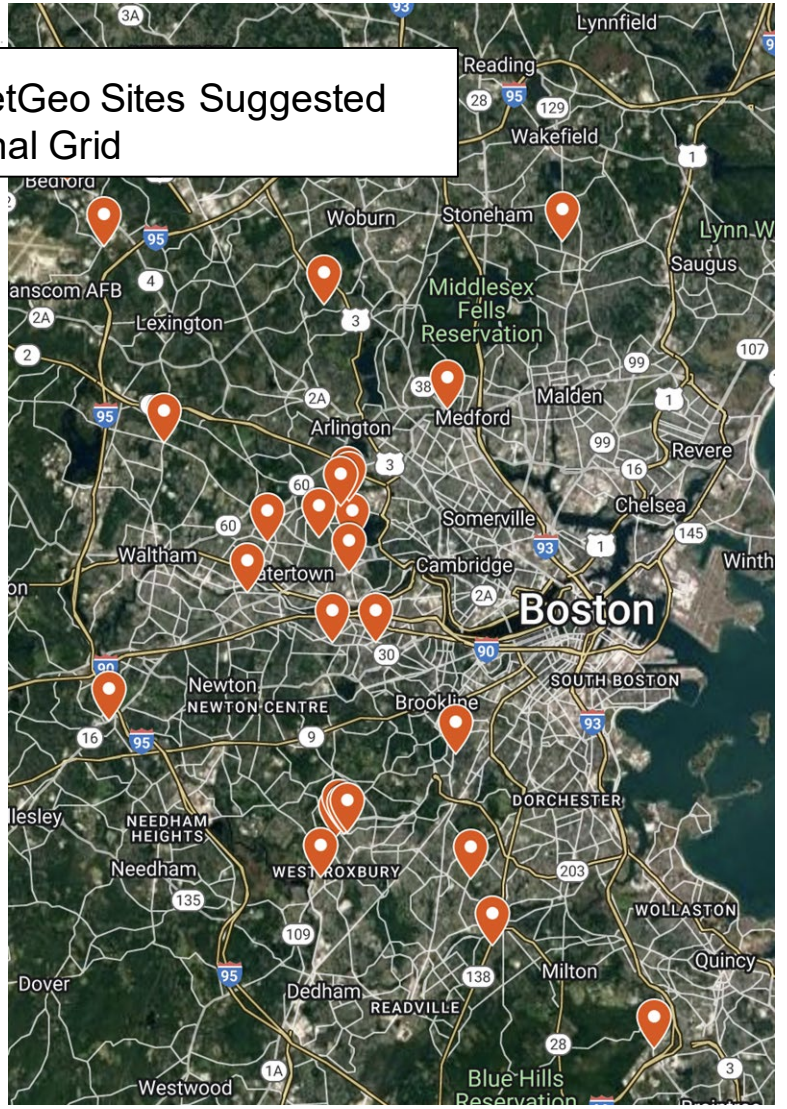
Site selection (at least 1 of following)

- Leakprone gas infrastructure or gas constraints
- Low income customers
- Mixed energy use

Schedule

- Site selection - 2023

Some NetGeo Sites Suggested by National Grid

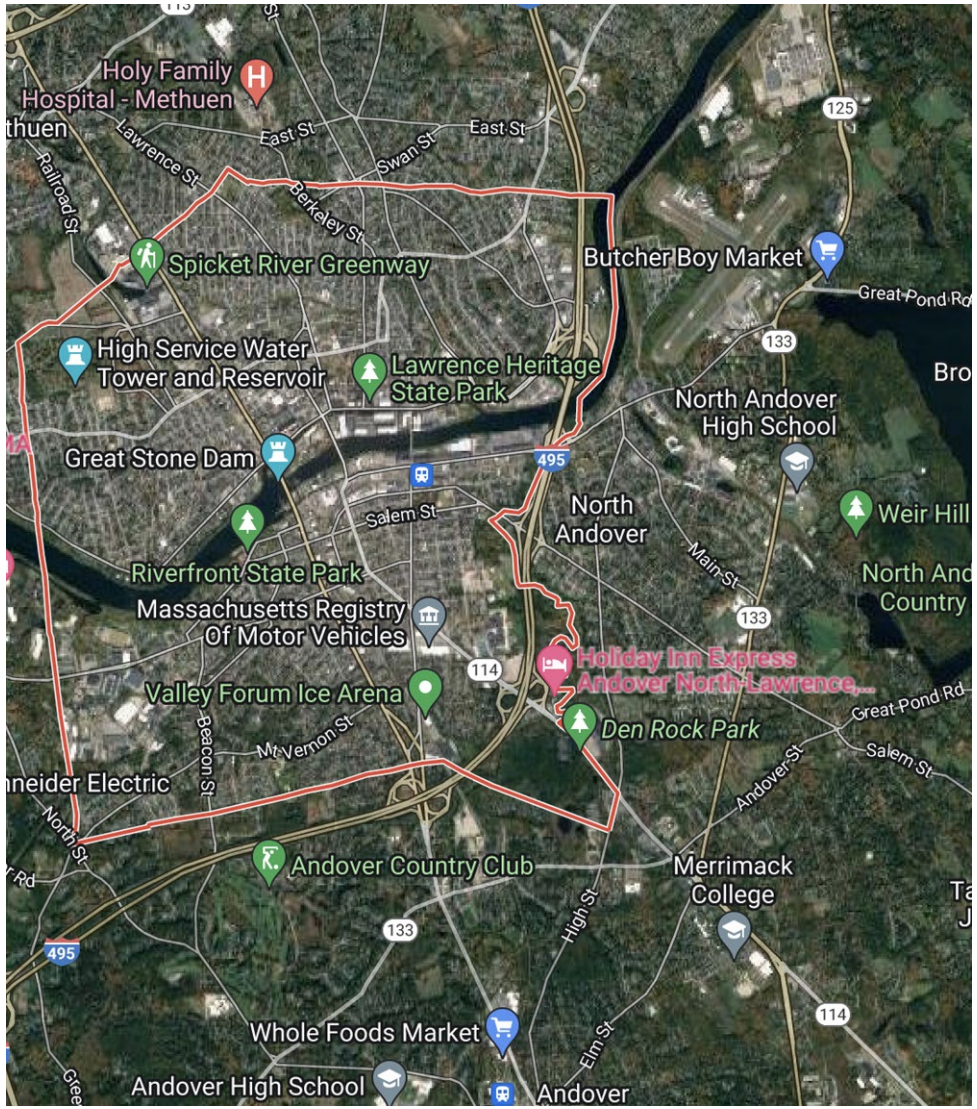


Merrimack Valley Installation

- Somewhere in North Andover, Lawrence
- Doesn't have to be gas utility
- RFP for site soon?

Massachusetts Legislation H5060

- Can replace gas infrastructure
- Data transparency & reporting on demonstration installations
- May create roadmap to transition when enough data



	Feasibility Studies	Approved Installation(s)	Legislation
DC	Yes	Yes ($5 million)	
Maryland			Geothermal Heating & Cooling Systems (H.1007)
Oregon	Yes		
Minnesota	Yes		Natural Gas Innovation Act (216B.2427)
New York	38 studies	2	Utility Thermal Energy Network & Jobs Act (S.9422)
Philadelphia	Yes ($500k)		City approval
Vermont	Yes		
Federal			Being proposed (stay tuned)

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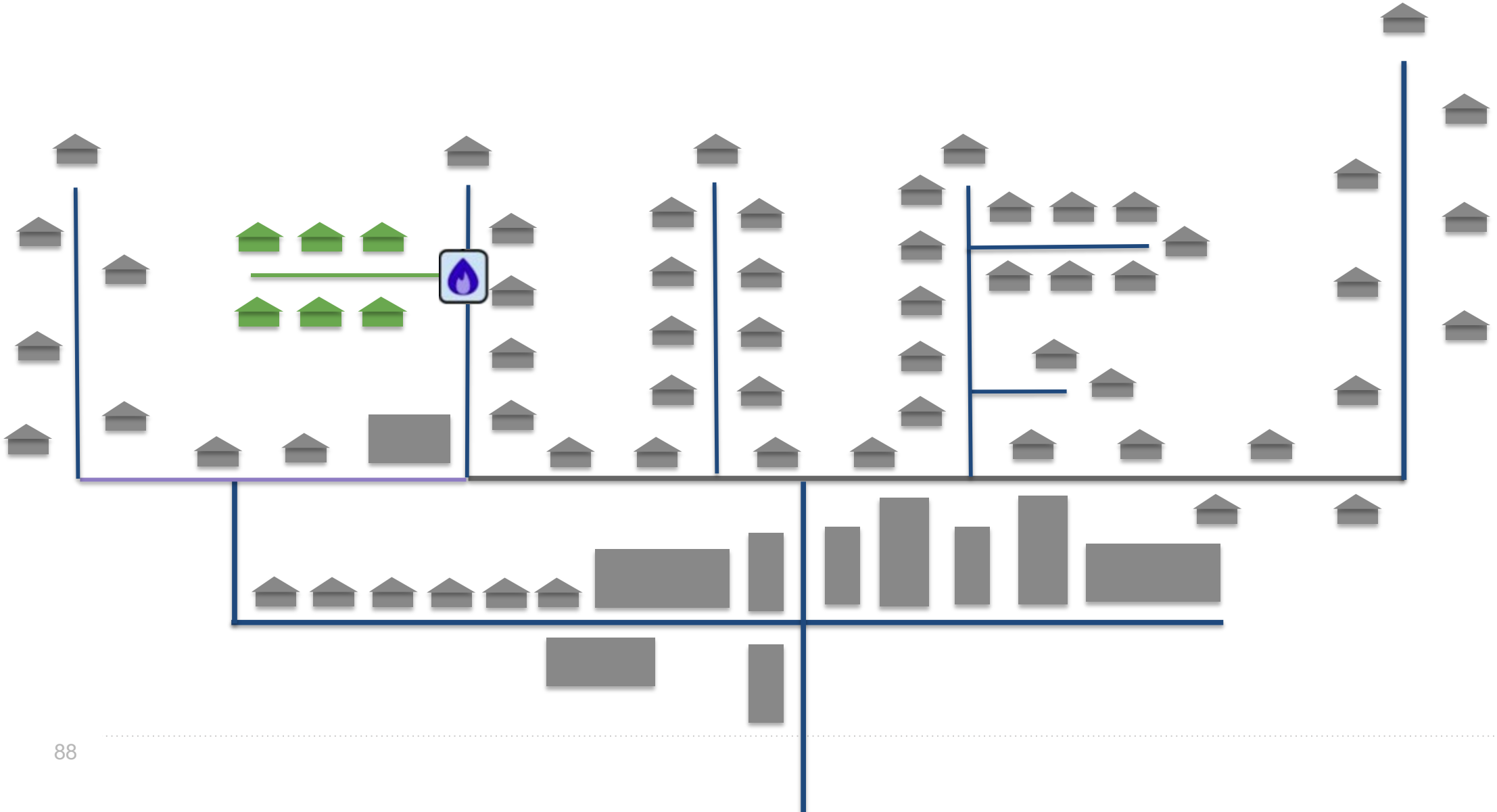
Phase 1: Initial Demonstration



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Phase 2: Iterate & Scale

heet

Phase 3: Geo/Gas Hybrid

heet

Reimagining our Energy Infrastructure:

ASHP / GSHP

RNG / Hydrogen

heet

What should CT do? Develop pilot projects in our state.

- We encourage DEEP to endorse Networked Geothermal in the Comprehensive Energy Strategy
- Pathway 1: PURA opens a docket or includes pilots in Innovative Energy Solutions program
- Pathway 2: The General Assembly passes legislation
- Pathway 3: PURA, the General Assembly, and DEEP collaborate

heet

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References and Resources:

- Six GeoMicroDistrict demos approved for Massachusetts!
- Department of Public Utilities Approves National Grid Geothermal Demonstration Project
- Geothermal Pilot Project in Framingham
- Eversource Geothermal Demonstration Project (starting on P. 128)
- Understanding Network Geothermal Technology (from Eversource)
- Petition of Boston Gas Company d/b/a National Grid for Approval of a Geothermal District Energy Demonstration Program.
- Governor Hochul signs bill promoting utility-operated thermal energy networks in New York State
- Presentation on the Utility Thermal Energy Network and Jobs Act: A RenewableTransition [New York] See 6:10-32:50 for the presentation by Jay Egg
- ISO-NE Final 2021 Heating Electrification Forecast (See page 7)

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Questions?

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Eversource

Eversource Geothermal Pilot Project

Clean Heat – The Potential of Networked Geothermal

www.eversource.com/geothermal

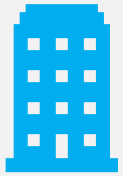
Eric Bosworth- Senior Program Manager
eric.bosworth@eversource.com

Geothermal Project Approval

EVERSOURCE

Program Structure

The demonstration project initially sought to test the viability of geothermal networks in three different scenarios. Ultimately the mixed use scenario was approved by the DPU



MULTI-FAMILY

# of HVAC Units: 30
Tons Per Unit: 2
Overall Tons: 60
Well Capacity: 75 Tons
Estimated Budget: $2.2M

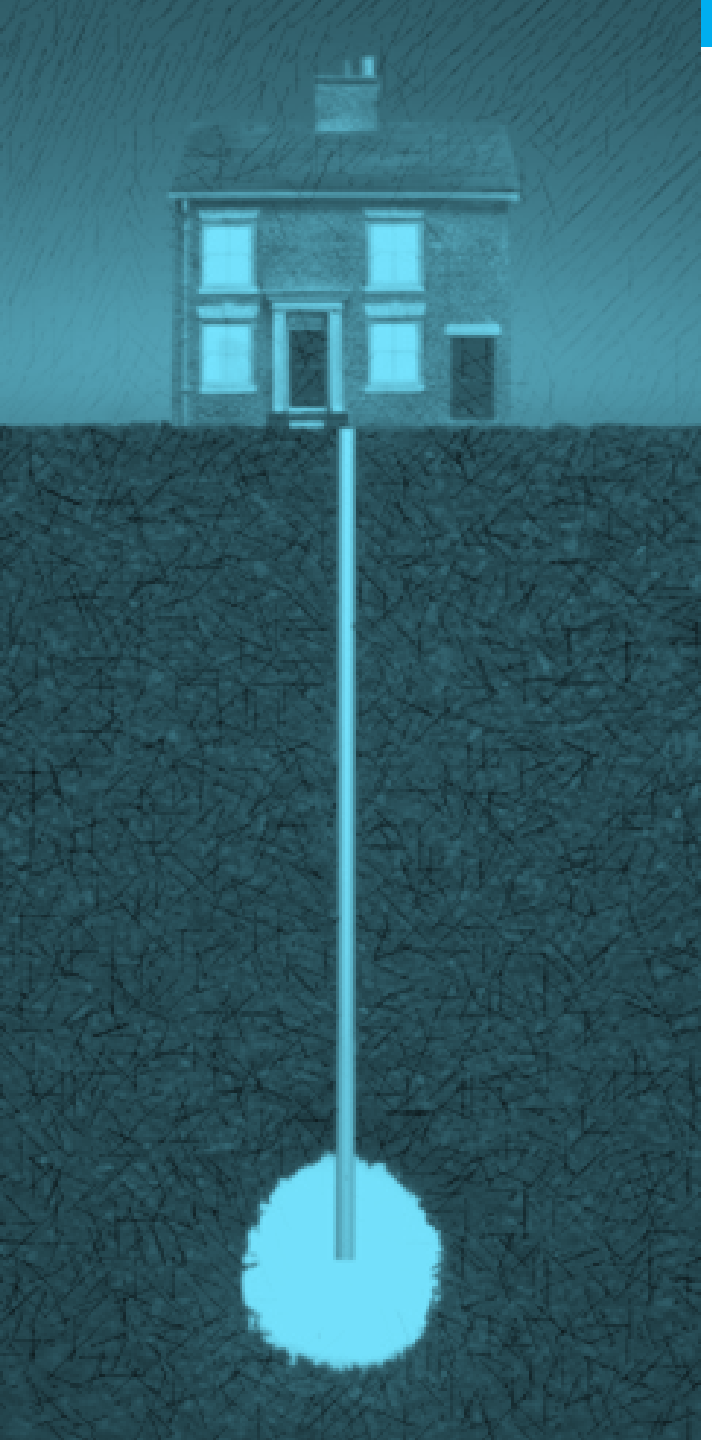
MIXED USE/DENSE URBAN

# of HVAC Units: 100
Tons Per Unit: 3
Overall Tons: 300
Well Capacity: 375 Tons
Estimated Budget: $10.2M

RESIDENTIAL NEIGHBORHOOD

# of HVAC Units: 10
Tons Per Unit: 3
Overall Tons:30
Well Capacity: 37.5 Tons
Estimated Budget: $1.2M

Budget estimates are inclusive of: Construction costs, staff costs, O&M, energy, water/glycol, performance monitoring



Big Picture Questions

EVERSOURCE

- Is it feasible to provide geothermal wells/loops and GSHPs as an **alternative/complement to delivered fossil fuels and gas service**?
- What is the **appropriate financial and business model**?
- What is **required to maintain a GSHP** system of wells?
- What are the **efficiencies that can be gained from shared loop system?**

Customer Outreach

EVERSOURCE

- Entire area was canvassed for customer willingness to participate
- Overwhelmingly positive response from customers that we were able to speak to
- Customer outreach done in coordination with the City of Framingham
- Sales and Technical representatives worked together to address customer questions

Project Timeline

End of 2021	Eversource will select the pilot site
Spring of 2022	Construction is scheduled to begin Timing of construction and installation activities will be site-specific.
Three years	The pilot program duration

Community Meeting

Once a pilot area is selected, Eversource will host a community meeting with residents and building owners. We want you to understand the project and will respond to your concerns or questions. Eversource will reach out to customers with meeting details after the pilot area is selected.

Post-Pilot Project

After the pilot project, Eversource or the customer may decide to stop using geothermal energy. Eversource will design and install the geothermal network system to minimize the cost and disturbance that come with stopping the program. The customer may choose to return to the original heating system (at no cost), shift to either an all-electric air source heat pump system (50% of the cost will be covered by Eversource), or continue with geothermal via an individual ground source heat pump. If the customer continues with their own geothermal, they will be responsible for the cost of installing a private vertical ground loop on the property.

EVERSOURCE

GEOTHERMAL PILOT PROGRAM

As the largest utility provider in New England, Eversource is committed to using energy sources and technologies that reduce/eliminate emissions, are low maintenance, cost-effective, and reliable, while also being environmentally sustainable well into the future. Eversource is investing in one such promising technology: a geothermal network pilot.

The pilot program eligibility and community selection process criteria are described in the frequently asked questions (FAQs) and on the Eversource pilot program website.

Scan this QR code with your smart phone camera for a direct link to the pilot program website.

www.eversource.com/content/ema-c/business/save-money-energy/explore-alternatives/geothermal-pilot-program

We're building a green community.

Join us!

Be a part of this innovative, community-minded, environmentally friendly pilot project that is happening in your neighborhood. As the largest utility provider in New England, Eversource has the responsibility to provide energy using the best methods possible for customers and the environment.

Eversource is working with the Massachusetts Department of Public Utilities to build a **geothermal** project that is the first of its kind in New England using networked geothermal technology. You'll be a part of a group sharing geothermal wells in your community.

Learn more about this three-year pilot that uses geothermal technology, which works by transferring heat to and from underground wells into your home using heat pumps. A geothermal system, on average, is up to 400% efficient and is the most environmentally friendly way to **heat and cool** your home.

Benefits to Those Who Participate in the Program

No direct cost to you:

- Geothermal heating and cooling equipment installed in your home that will provide both heating and central air conditioning ($30,000 value)
- New ductwork installed, if needed, in your home ($15,000 value)
- Energy-efficiency measures such as insulation and air sealing for your home (up to a $4,000 value in addition to existing Mass Save® incentives)
- Energy savings up to 40% on heating your home
- Full restoration of the affected areas of your lawn, if needed, after geothermal line from the street is installed
- System looks like a conventional heating system and is installed where your existing system is located
- System is quiet and long-lasting

Reduce your carbon emissions.

Because geothermal heat pumps don't require combustion of fossil fuels or fuel storage, installing geothermal is the single biggest way a homeowner can reduce their carbon (CO_2) emissions. According to the U.S. Environmental Protection Agency (EPA), geothermal heat pumps are the most energy efficient, environmentally clean, and cost-effective systems for heating and cooling buildings.

Comfort now, value later.

With this system, you'll have consistent heating and cooling, regardless of the season. A geothermal system is very energy-efficient because it uses the earth's stable temperature. According to the EPA, for every unit of electricity used in operating the system, the geothermal heat pump can deliver as much as four times the energy. That's 400% efficient! Geothermal heat pumps can achieve this efficiency because they don't create heat — they just transfer it, making it the most energy efficient home heating and cooling system on Earth.

And energy efficiency measures implemented with this program may increase the value of your home.

Can't wait to hear more?

Contact Marisol Burgos at **860-665-6255**. Call today!

EVERSOURCE

Primary Loop Layout Design

- Current primary layout option
- Single pipe design displayed (two pipe option available)
- Planned ~300 ton system
- ~30 Residential Homes, 5 Commercial Buildings, 10 Apartment Buildings
- Main borefield with smaller satellite fields
- Design is dependent on customer willingness to participate
- Alternate route has been established as a backup option

Project Timeline

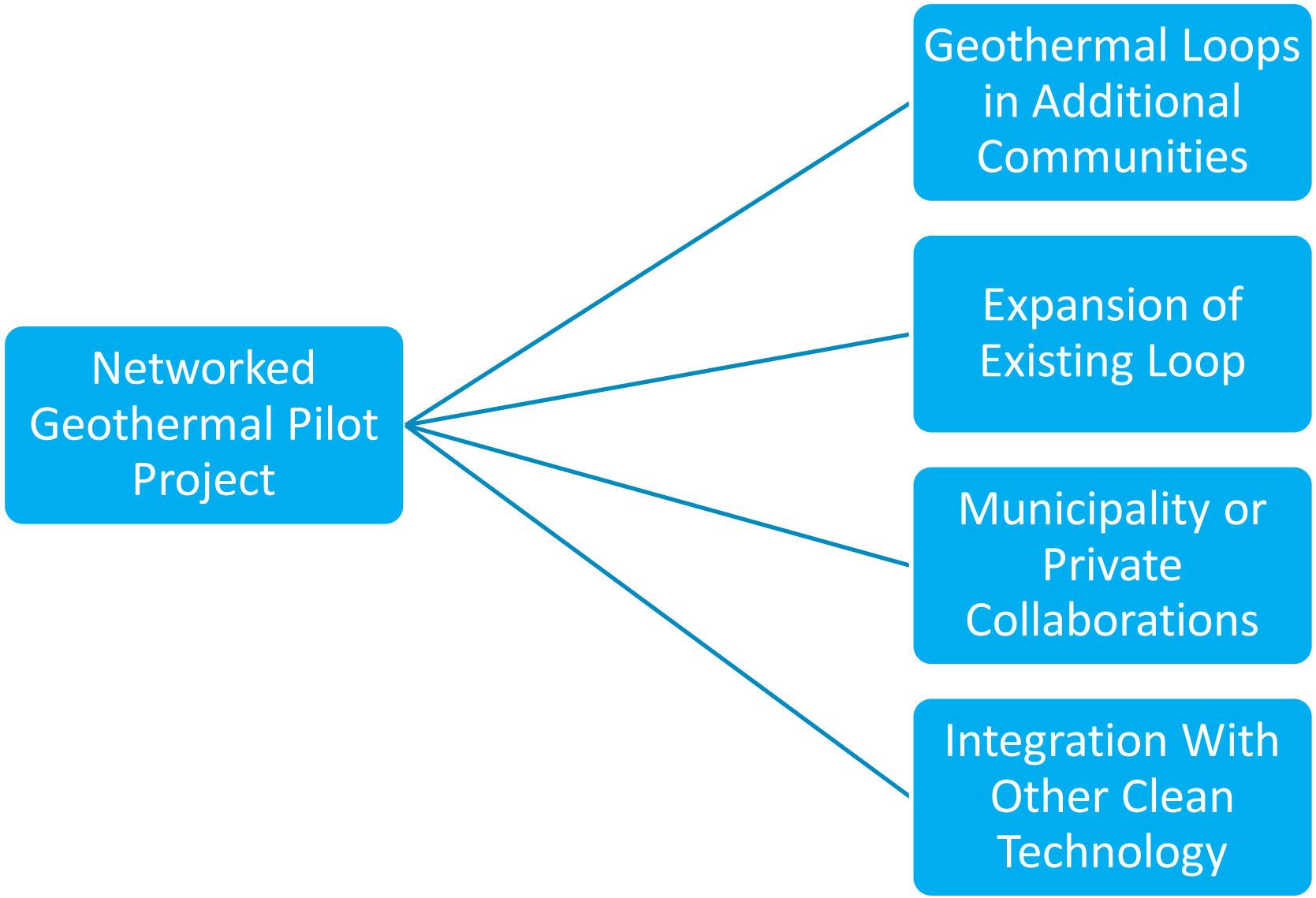
End of 2021 — **Eversource selected the pilot site**

Mid-to-late 2022 — **Construction is scheduled to begin**

Timing of construction and installation activities
Will be site-specific. (Approximately one year.)

Mid-to-late 2025 — **Total pilot program duration (two heating and cooling seasons)**

Future Opportunities

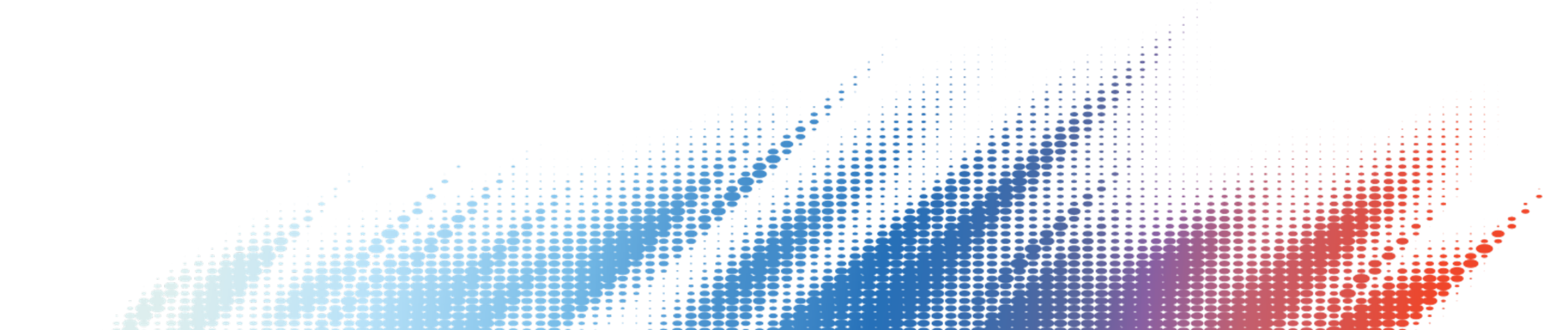


QUESTIONS

SHARC Energy

SHARC ENERGY

Wastewater Energy Transfer



Why Wastewater?

- Consistent, localized energy source
- Reduces energy & peak load on electrical grid
- Reduces fresh water use
- Measurable impact & ROI
- Solution to clean energy Inequity
- Accelerates Public/Private partnerships
- Available energy, today
- Reduces Carbon Emissions

Wastewater = Climate Action Acceleration

- ✓ Proven model with ROI & real impact and reasonable timeline
  - ✓ False Creek expanding to 10MW, financially proven <10 years

- ✓ Harness the untapped power of wastewater to create local energy & water security for future
  - ✓ WET creates public/private partnership
  - ✓ Denver National Western energy + community

- ✓ Significant water & energy savings
  - ✓ DC Water, saving >600k gallons/year (water for 3,200+ people/year)

Action items for Cities

- Feasibility study
- Expedite Public/Private partnership contracts
- Inventory City thermal resources
  - Lift stations WET ready
  - Map out sewer lines
- Building codes incorporate WET
- Promote & educate WET awareness
- Enable workforce shift from Coal/Oil/Natural Gas to clean energy jobs

PIRANHA

All-in-one heat pump

- **Apartments**
- **Commercial**
- **Mixed-Use Residential**

SHARC

High-volume energy transfer & filtration

- **District Energy**
- **Industrial**
- **Large Commercial**

What we sell, to whom

PIRANHA SERIES

SHARC SERIES

Residential Building

- Multi-unit housing, 50–-500 units
- Student Housing
- Senior Living
- Community Housing

Commercial

- Hospitals
- Micro-Breweries
- Hospitality
- Commercial Laundry & Wash
- Mixed-use, 500+ units

Industrial

- Commercial Food Production
- District Energy
- Pulp and Paper
- Textiles

SHARC ENERGY

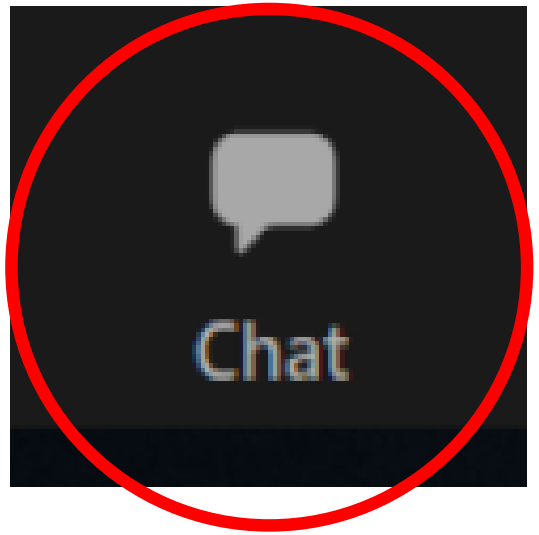
How do we get started?

We will introduce you to experts who are doing it today!

Jodi Guthrie
Global Director of Sales
jodi.Guthrie@sharcenergy.com
360-612-1337

Scan for Contact Info

Questions



At the conclusion of each panel DEEP will hold a brief question and answer period.

If you have a question for a presenter, please drop it into the chat to **Jeff Howard**. DEEP will pose as many questions as time allows to the speakers. Clarifying questions will be prioritized. Leading questions will not be accepted.

Measure Delivery

Cornelia Wu – Northeast Energy Efficiency Partnerships

Mark Scully & Bernie Pelletier – People's Action for Clean Energy

Peter Millman & Rob Harmon – People's Action for Clean Energy & MEETS Accelerator Coalition

Susan Mlodozeniec – MA Clean Energy Center

(speaker order may vary)

Click on agenda section heading to jump to corresponding slides

BUREAU OF ENERGY AND TECHNOLOGY POLICY

Northeast Energy Efficiency Partnerships

Total Energy Pathways: Workforce

Connecticut DEEP CES Technical Meeting 3 - Building Decarbonization - Support Strategies

September 23, 2022

Total Energy Pathways: Workforce

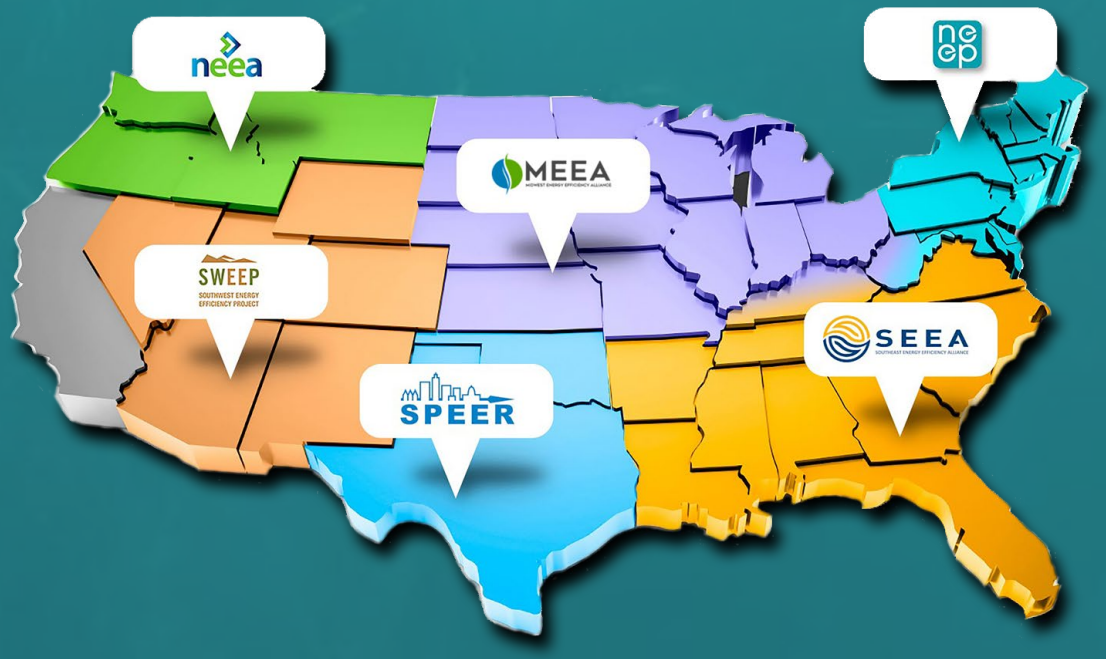
Empowering and Diversifying the Design & Construction **Workforce**

Cornelia Wu

Building Policy Manager

About NEEP

A Regional Energy Efficiency Organization



One of six REEOs funded in-part by U.S. DOE
to support state and local efficiency policies and programs.

Northeast Energy Efficiency Partnerships

"Assist the Northeast and Mid-Atlantic region to reduce building sector energy consumption by at least 3% per year and carbon emissions by at least 40% by 2030 (relative to 2001)"

Mission

We seek to accelerate regional collaboration to promote advanced energy efficiency and related solutions in homes, buildings, industry, and communities.

Vision

We envision the region's homes, buildings, and communities transformed into efficient, affordable, low-carbon, resilient places to live, work, and play.

Approach

Drive market transformation regionally by fostering collaboration and innovation, developing tools, and disseminating knowledge

WHY was Total Energy Pathways created?

We know that buildings account for 40% of total GHG in US

- 27% of this pie (11% global GHG) comes from building operations (heating, cooling, lighting, etc.)
  - The TEP project addresses building operations
  - It does not address GHG emissions from construction, embodied carbon, etc.

Why is this project about retrofits?

- In 2040, two-thirds of the global building stock will be buildings that already exist today

Why does this project focus on residential construction?

- Residential energy use accounts for 20% of total GHG emissions in the US
  - This is half the GHG of all buildings in the US

WHAT is Total Energy Pathways?

Total Energy Pathways is based on a pilot project in Vermont called Zero Energy Now (ZEN)

- ZEN offers a bundled approach, offering to homeowners under one umbrella:
  - Energy efficiency
  - Renewable energy
  - Strategic electrification

- In most cases, energy savings covered the monthly loan payments

- Lack of a trained workforce identified as a major challenge

WHAT is Total Energy Pathways?

Total Energy Pathways launched at NEEP, informed by ZEN

- SCALE up as a regional model
  - Whole home energy retrofit program
- Build and support market capabilities and workforce development
  - provide comprehensive zero energy/carbon home energy retrofits
- Help states achieve
  - building energy efficiency and decarbonization goals
- Help individuals
  - dramatically reduce energy bills, their carbon footprint, and create a more comfortable home, all at an affordable cost

WHY Total Energy Pathways: Workforce?

Addresses workforce challenges encountered in ZEN

- One of the major **barriers** to implementing whole-home, deep energy retrofits is access to a workforce with the right skills

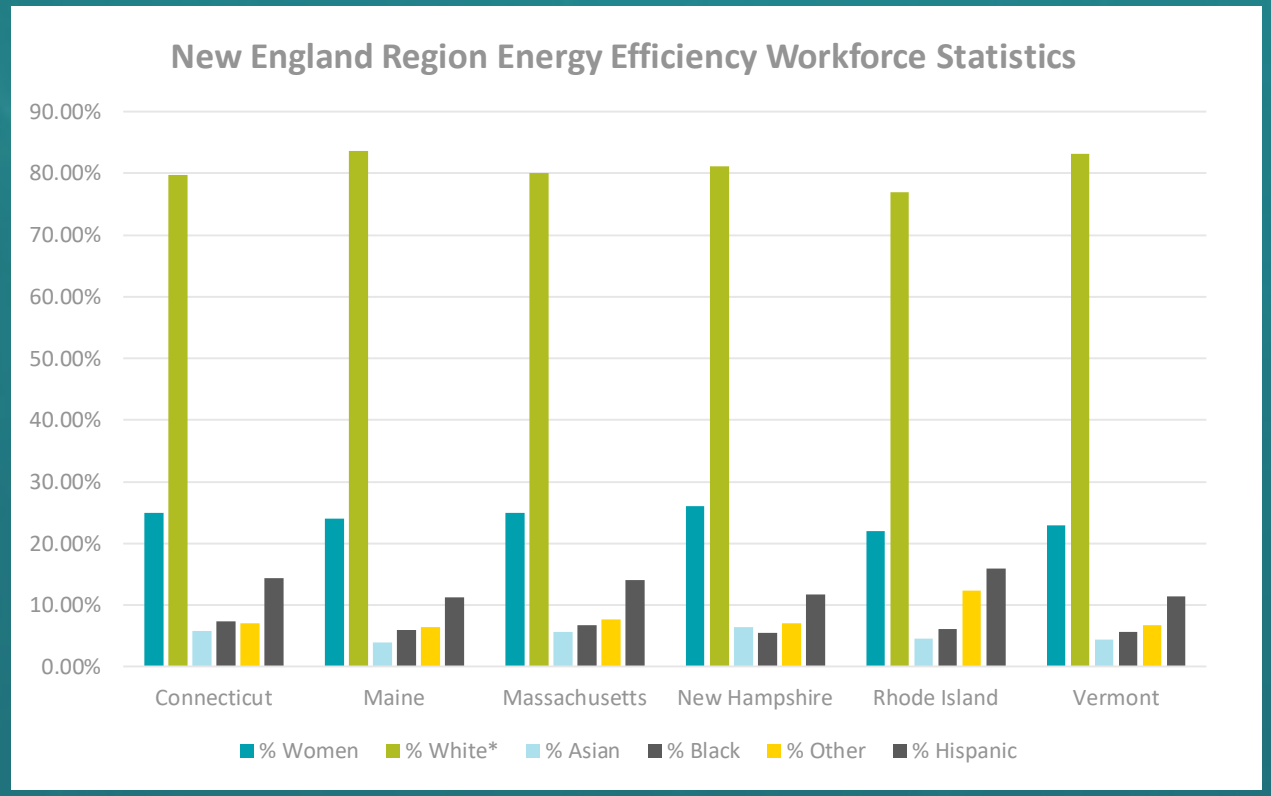
- In order to **scale up** the TEP program, we need to:
  - Diversify: focus on **women and BIPOC**
  - Educate: whole-home retrofit approaches

Energy Efficiency Jobs Baseline

Connecticut	33,573
Delaware	10,660
Maine	8,034
Maryland	65,412
Massachusetts	76,900
New Hampshire	10,838
New Jersey	32,880
New York	120,961
Pennsylvania	65,397
Rhode Island	10,627
Vermont	10,069
Washington, DC	11,214
West Virginia	6,309
TOTAL	462,874

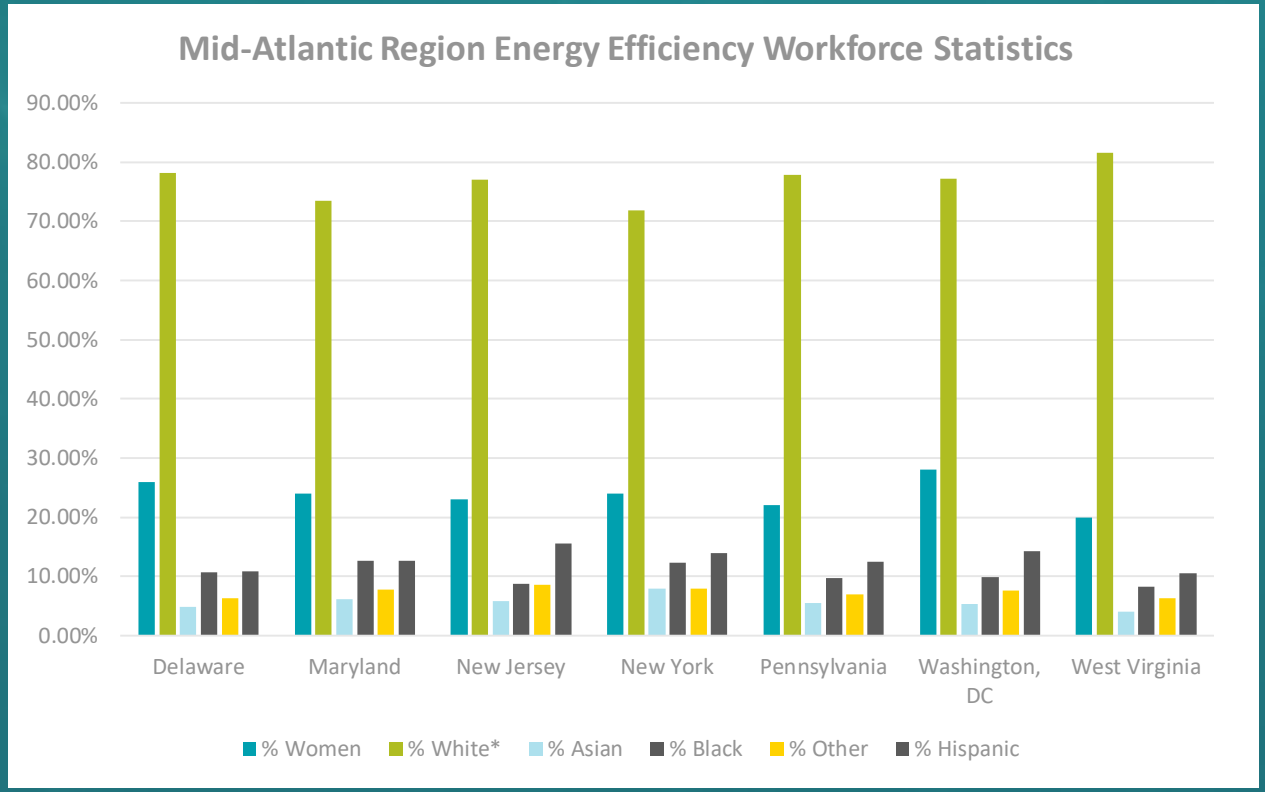
Source: E4 The Future Jobs Report, based on the national 2021 U.S. Energy and Employment Report (USEER)

Energy Efficiency Jobs – New England



Source: E4 The Future Jobs Report, based on the national 2021 U.S. Energy and Employment Report (USEER)

Energy Efficiency Jobs – Mid-Atlantic



Source: E4 The Future Jobs Report, based on the national 2021 U.S. Energy and Employment Report (USEER)

WHAT is Total Energy Pathways: Workforce?

Addresses workforce challenges encountered in ZEN

- Funding
  - US Department of Energy
- Project Partners
  - Energy Futures Group, VT
  - Building Performance Institute
  - Building Performance Association
- Project Advisory Committee
  - Connecticut DEEP, Efficiency Vermont, NYSERDA, Mass CEC … and more

Total Energy Pathways: Workforce

Why do we need home energy General Contractors?

- A GC can offer a “one-stop shop” experience to a homeowner interested in a whole-home energy retrofit.
  - Due to an existing labor shortage, there is a need for more workers.
  - In particular, there is a need for home energy GC’s.
- This is where TEP Workforce comes in
  - Adding workers to the home energy space, including home energy GCs, will provide opportunities to those individuals who had not previously considered these fields

Total Energy Pathways: Workforce

Online Resource Center

https://neep.org/tep/total-energy-pathways-workforce-development

Resources (both existing and new)

- Provides flexibility for varied educational needs and time commitments
- On-demand trainings such as class, webinar, downloadable training tools
- On-the job learning programs (paid internships)
- Re-training programs

Training Modules

- Eight training modules
- Added one per quarter beginning January 1, 2023

Total Energy Pathways: Workforce

Building Performance Institute TEP Certificate

- Offering a BPI TEP certificate will train new individuals, such as students, as well as existing contractors who want to further develop competencies.
  - Certificate based on a knowledge and skills assessment developed by subject matter experts
  - Identified 8 domains of knowledge correlating to the 8 training modules that will be created for the Online Resource Center
  - Contractor achieves a nationally recognized certificate, through a test
  - Certificate Program will launch December 2023

Total Energy Pathways: Workforce

Knowledge and Skills Assessment

- Designing a Building Decarbonization Project
- Project Financial Analysis
- Communication to Clients
- Energy Modeling, Load Calculations and Measure Analysis
- Building Science and Whole-building Concepts
- Project Carbon Impacts
- Electrification/Decarbonization Technologies
- Understanding the Post-Retrofit Process

Expected Outcomes

Period 1: Stakeholder Engagement & Project Development

1. Launch the Online Resource Center to the public
2. Complete the development of the TEP Certificate program and prepare it for piloting
3. Complete the project Communication and Dissemination Plan

Period 2: Certificate Exams & Scaling Up

1. 1000 individuals participate in class, webinar, and/or download a training tool
2. 50 contractors receive the TEP certificate
3. Training Tools and BPI TEP certificate parthway are available post project

Thank You!

NEEP Total Energy Pathways: Workforce
https://neep.org/tep/total-energy-pathways-workforce-development

Questions?

Cornelia Wu
cwu@neep.org

People’s Action for Clean Energy

Driving Climate Action at the Municipal Level: The PACE Energy Model

September 23, 2022
CT Comprehensive Energy Strategy Technical Session 3

The power of local action

- Local knowledge of residents, businesses, geography, history, etc.
- Tangible projects, experienced personally
- Local Ownership
- Familiarity & accountability of residents, businesses and local government
- Passion and local pride
- Competitive spirit

Branford, CT

Towns and cities are an immense and largely untapped, renewable energy source. Maybe the largest we have.

The PACE Energy Model

- Has been described as a "techno-economic model," comprising
  - Energy sources and uses
  - Greenhouse gas (GHG) emissions
  - Energy economics
- Is based on granular, publicly available data, including
  - Individual buildings and vehicles from town Grand Lists
  - Aggregate energy usage from EDCs (i.e., electricity and gas)
  - Individual residential solar installations from CT Green Bank
- Has been run for over thirty CT towns, and can now be run for every town—and for the state overall
- Through granular data, unleashes the power of GIS mapping data
- Is a work in progress since 2016, with expert assistance from Synapse Energy Economics

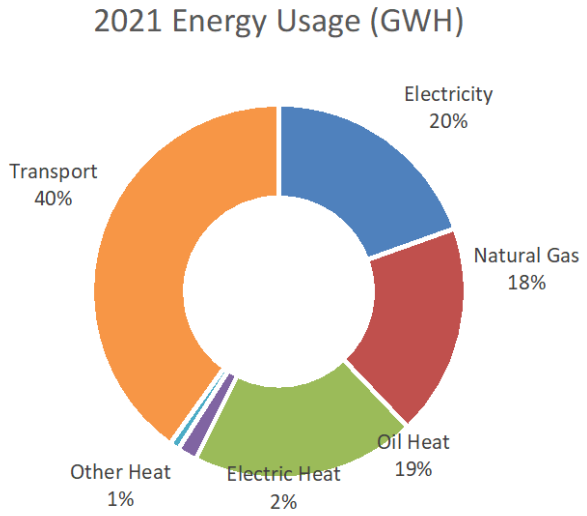
The purpose of the PACE Energy Model is to inform and drive local climate action

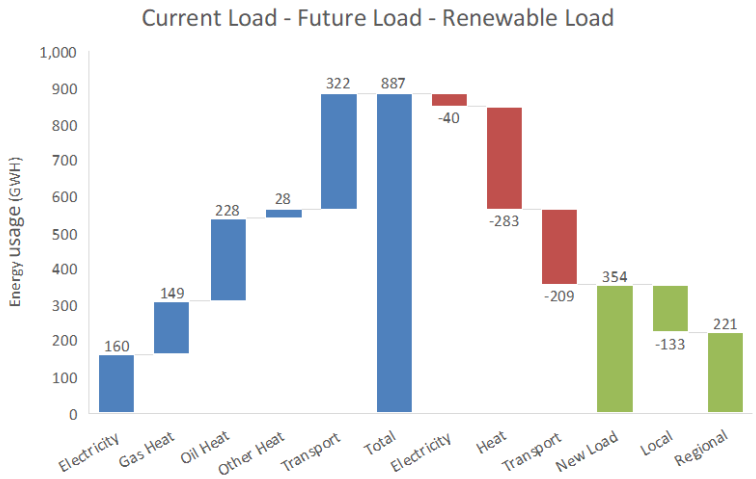
Built to help towns—and the state — answer a range of energy-related questions. These include:

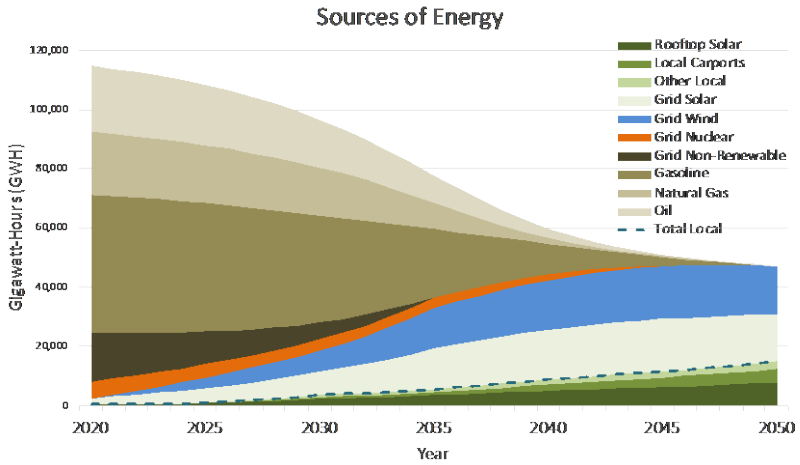
- How much energy do we use today?
- How much do we spend today on energy?
- How much will we use and spend in a 100% renewable world?
- How do we get there? Where should we target investments in efficiency, electrification, renewables, etc.

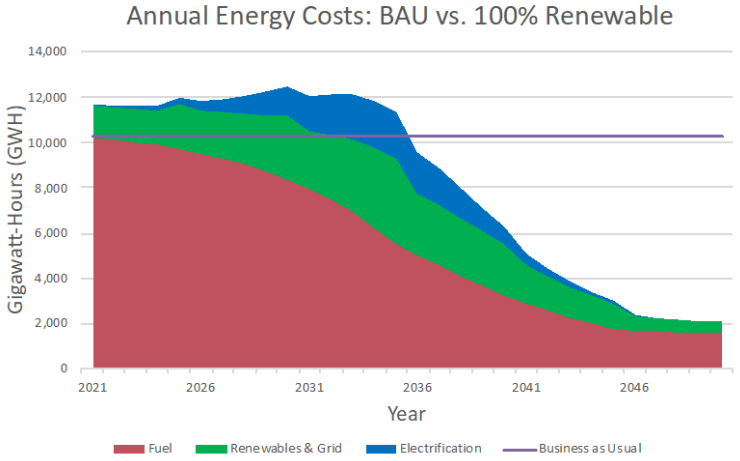
The PACE Energy Model is designed to help towns—and the state—envision in local, tangible ways their part in the transition to a clean energy economy.

Illustrative Model Outputs

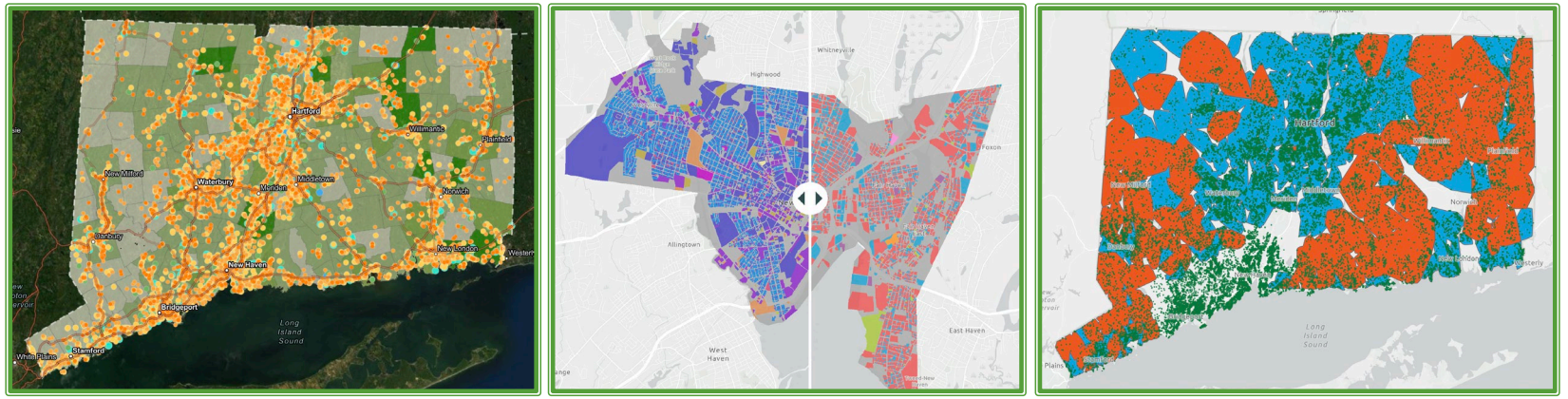








Granular geo-coded data unleashes the power of GIS mapping tools



- Location data for individual buildings, vehicles and solar installations enables GIS-based visualization and targeting of clean energy initiatives
- Model data can be overlaid with a vast library of GIS map layers, including:
  - Socio-economic
  - Geographic
  - Electric grid
  - Climate
  - Town parcel data
  - Existing programs (e.g., RSIP)

Recommendations

- Ensure Connecticut has the data needed to set realistic climate targets and monitor progress
  - Develop and enforce standards for local building data
  - Ensure timely and accurate delivery of vehicle data
  - Enhance aggregate town electricity and gas usage
  - Improve data on all solar and storage interconnections
  - Gather data on delivered fuels (e.g., heating oil, propane)
- Explore uses of the model to advance state initiatives

Accurate and timely data on energy, buildings, vehicles, renewables and storage will enable towns and the state to plan and track progress against climate goals.

MEETS Accelerator Coalition

MEETS for CT

MEETS= Metered Energy Efficiency Transaction Structure

A fundamentally different approach to
energy efficiency for commercial buildings

MEETS™
ACCELERATOR COALITION

PACE
People's Action for Clean Energy

Problem: Deep Energy Efficiency is not Currently Scalable

- Split incentives destroy building owner economics
  - Building owners with tenants are asked to invest
  - Tenants receive the savings
- Only improvements with short term paybacks and/or those that are incentivized using ratepayer funds are undertaken

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People's Action for Clean Energy

Solution: Treat Energy Efficiency like generation

- Meter the energy saved (post energy retrofit) over long periods of time
- Buy and sell the saved energy like generation
- Think of ‘Energy Efficiency’ as ‘Efficiency Energy’

MEETS™
ACCELERATOR COALITION

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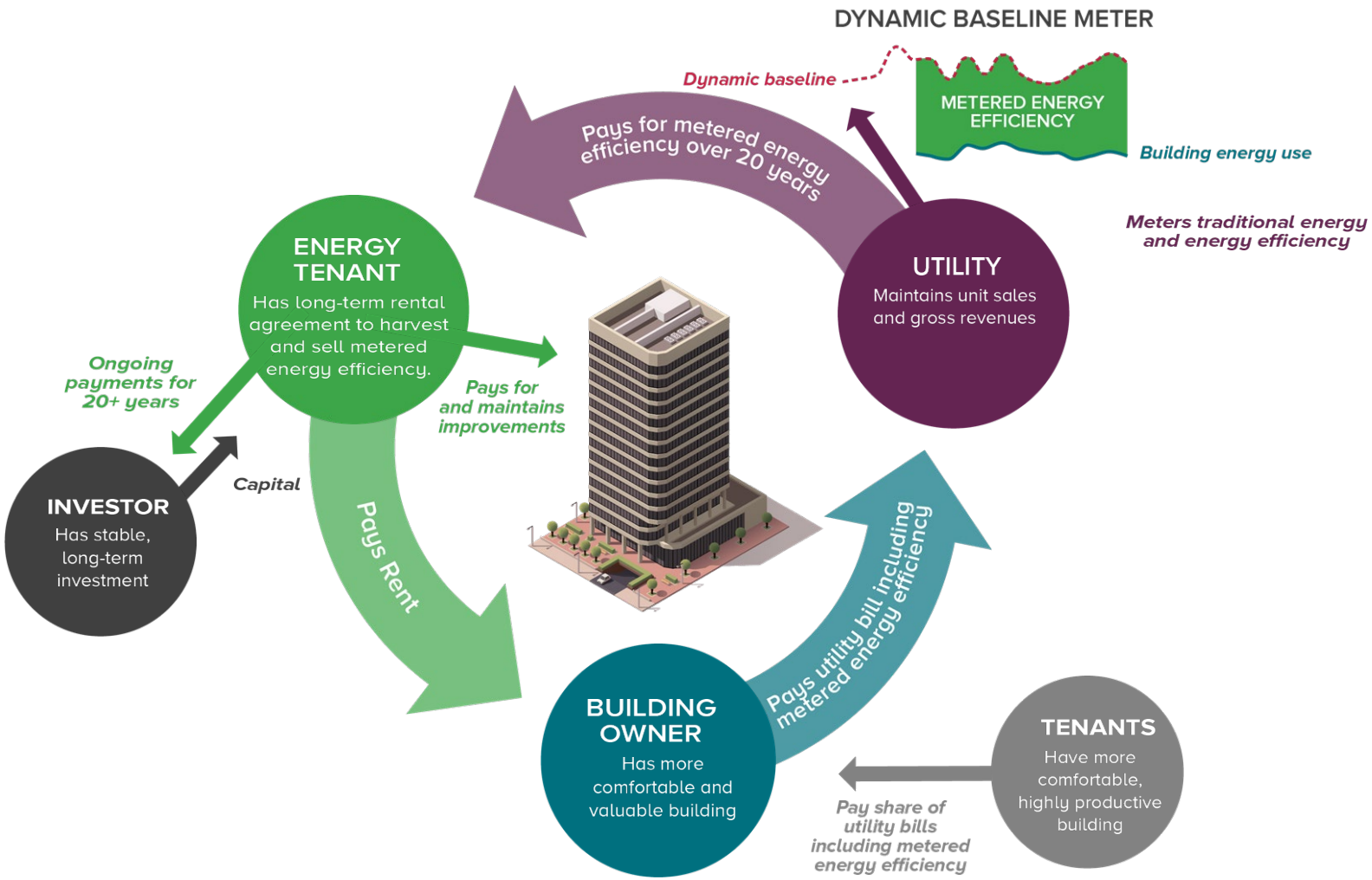
People's Action for Clean Energy

How does MEETS work and who participates?



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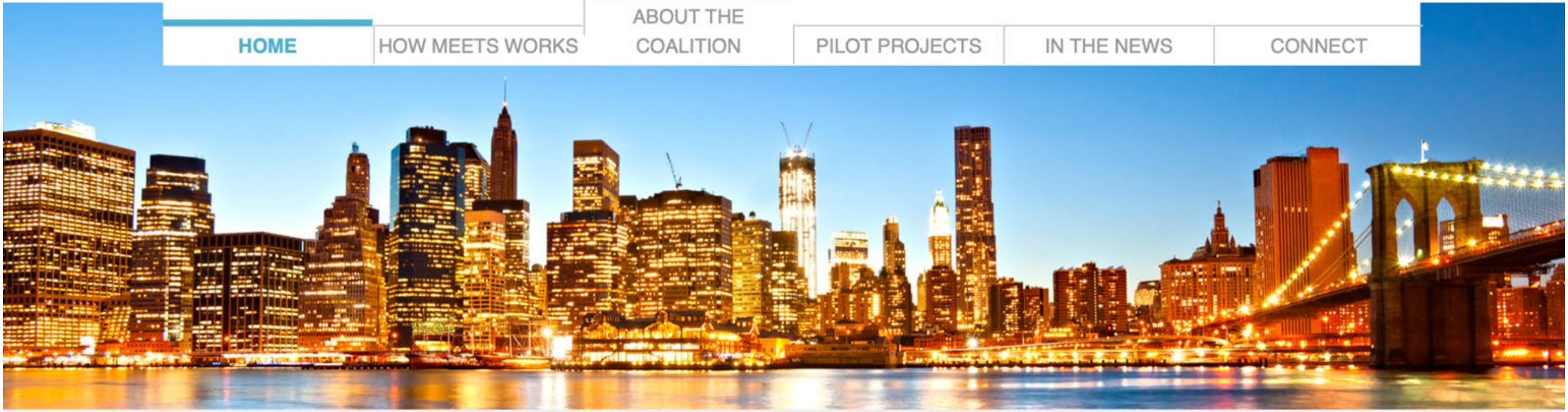


NEWS: Seattle City Light Rolls Out Second MEETS Expansion. Seeks 10 Buildings for Deep EE

SCL Announces Enhanced Procurement Rules for MEETS Projects

MEETS™

THE METERED ENERGY EFFICIENCY TRANSACTION STRUCTURE

MEETS™ is a fundamentally different approach to energy efficiency.

It aligns the interests of all stakeholders as it harvests energy from the commercial building sector.

The **MEETS Accelerator Coalition** provides the tools and community to bring deep energy retrofits to scale.

MEETS vs. Alternatives

There are many differences between MEETS and other approaches, including:

- Contracts are long term
- Pay for performance. Nothing is deemed.
- Utility (not the building owner) is the purchaser of the efficiency resource (counterparty)
- Utility places Efficiency (as energy) on the retail energy bill
- EnergyTenant (developer) is a tenant paying rent, and is hence, an asset, not a liability for the building owner
- Independent, 3rd party metering (M&V)

MEETS™
ACCELERATOR COALITION

PACE
People's Action for Clean Energy

MEETS Efficiency Energy Metering

MEETS is premised on the idea that each building will be metered individually for efficiency gains over long periods of time.

That requires the ability to maintain EE meter calibration as buildings undergo multiple non-routine events over time. Some of those events will overlap.

This metering is now commercially available.

MEETS™ ACCELERATOR COALITION

PACE People's Action for Clean Energy

MEETS Efficiency Energy Metering

To reduce risk to all parties, EE metering should:

- Be utility meter-based
- Be weather dependent/weather normalized
- Generate a physical model of the building prior to, during, and post retrofit
- Provide a breakdown of energy end uses within each building (i.e., virtual sub-metering)
- Enable calibration of each physical building model and energy baseline(s) over time as conditions change
- Be capable of metering efficiency for all fuels used in a building, including electricity, gas, steam, and oil. The result should be separate Efficiency Energy bills for each fuel.
- Be capable of generating accurate results using either interval or monthly data

MEETS™ ACCELERATOR COALITION

PACE People's Action for Clean Energy

Benefits of MEETS (1 of 5)

Utilities:

- Can meet goals with fewer (or no) ratepayer dollars
- Can drive harder to achieve improvements (beyond lighting)
- Pay only for delivered (metered) units
- Location-specific and reliable
- Maintain unit sales and gross revenues
- Possible earnings opportunity

MEETS™ ACCELERATOR COALITION

PACE People's Action for Clean Energy

Benefits of MEETS (2 of 5)

Buildings:

- Can address split incentive issues
- Avoids balance sheet liabilities
- Significant capital infusion into building
- Increases net operating income and net asset value

MEETS™ ACCELERATOR COALITION

PACE People's Action for Clean Energy

Benefits of MEETS (3 of 5)

Investors:

- Expands capital available to the retrofit market
- Stable, long-term, investments with utility as counterparty
- Scale through aggregation

MEETS™ ACCELERATOR COALITION

PACE People's Action for Clean Energy

Benefits of MEETS (4 of 5)

Efficiency Companies:

- Long-term contracts
- Creditworthy counterparties
- Significant increase in work

MEETS™ ACCELERATOR COALITION

PACE People's Action for Clean Energy

Benefits of MEETS (5 of 5)

State/Society:

- Significantly more EE at depth
  - Energy price stability (no fuel price changes)
  - Carbon reduction
  - Broader and deeper set of improvements
- Significant capital deployment
- Jobs
- No utility incentives
- No tax dollars
- Leave utility incentive dollars for other purposes.

MEETS™
ACCELERATOR COALITION

PACE
People's Action for Clean Energy

MEETS Pilot Programs

- Seattle City Light
  - Began at the start of the pandemic
  - Six buildings approved
    - 2 new multifamily (~40% better than code)
    - 4 large commercial office (~30-40% improvement)
      - 1 underway. $8M capital infusion.

- NYSERDA and National Grid
  - Developing pilot for upstate NY

MEETS™ ACCELERATOR COALITION

PACE People's Action for Clean Energy

MEETS and the Comprehensive Energy Strategy

We encourage DEEP to advocate for a MEETS pilot in the CES and PURA or the legislature to develop such a program.

MEETS™
ACCELERATOR COALITION

PACE
People's Action for Clean Energy

Questions?

MEETS™
ACCELERATOR COALITION

PACE
People's Action for Clean Energy

MA Clean Energy Center

CLEAN ENERGY LIVES HERE

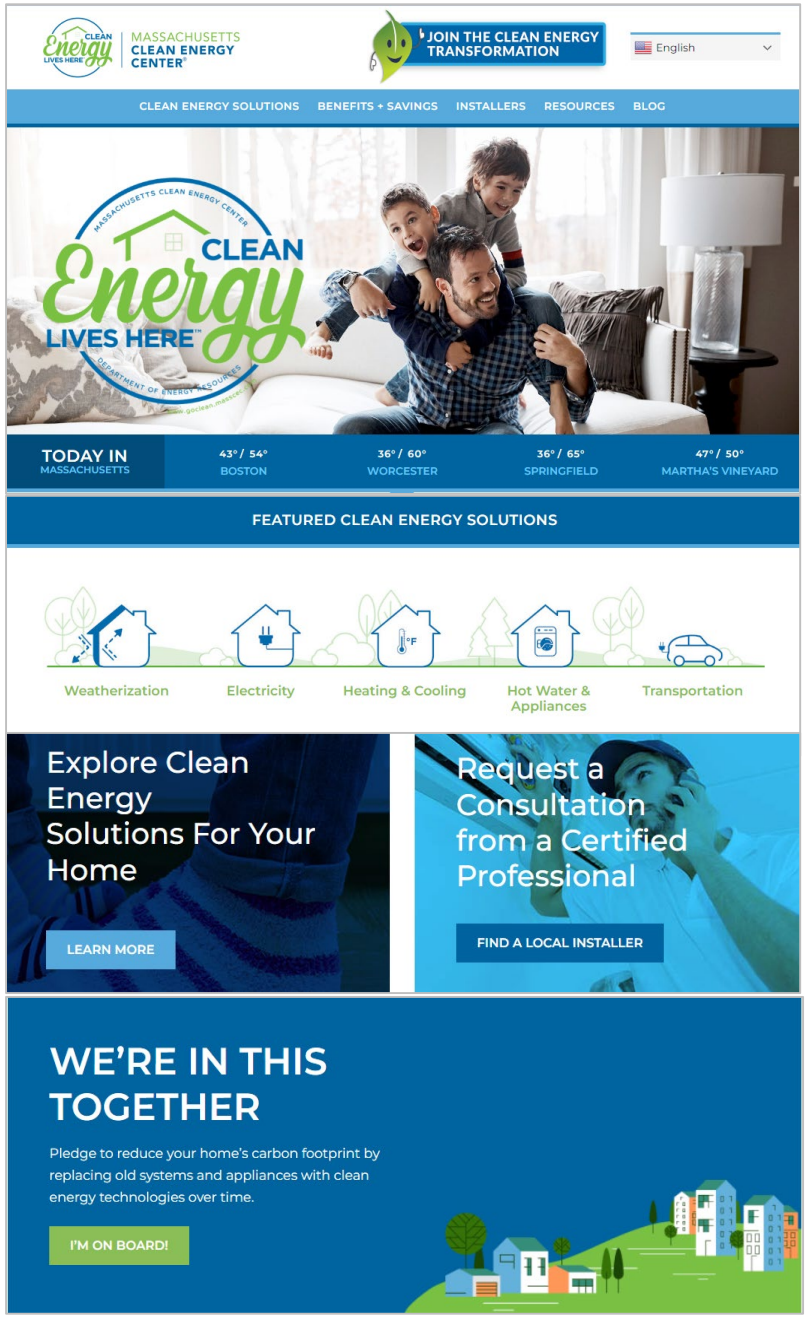
GOCLEAN.MASSCEC.COM

Susan Mlodozeniec
Marketing Director
MassCEC

Sept. 21, 2022

OUR MISSION

The Massachusetts Clean Energy Center's (MassCEC) mission is to accelerate the clean energy and climate solution innovation that is critical to meeting the Commonwealth's climate goals, advancing Massachusetts' position as an international climate leader while growing the state's clean energy economy.



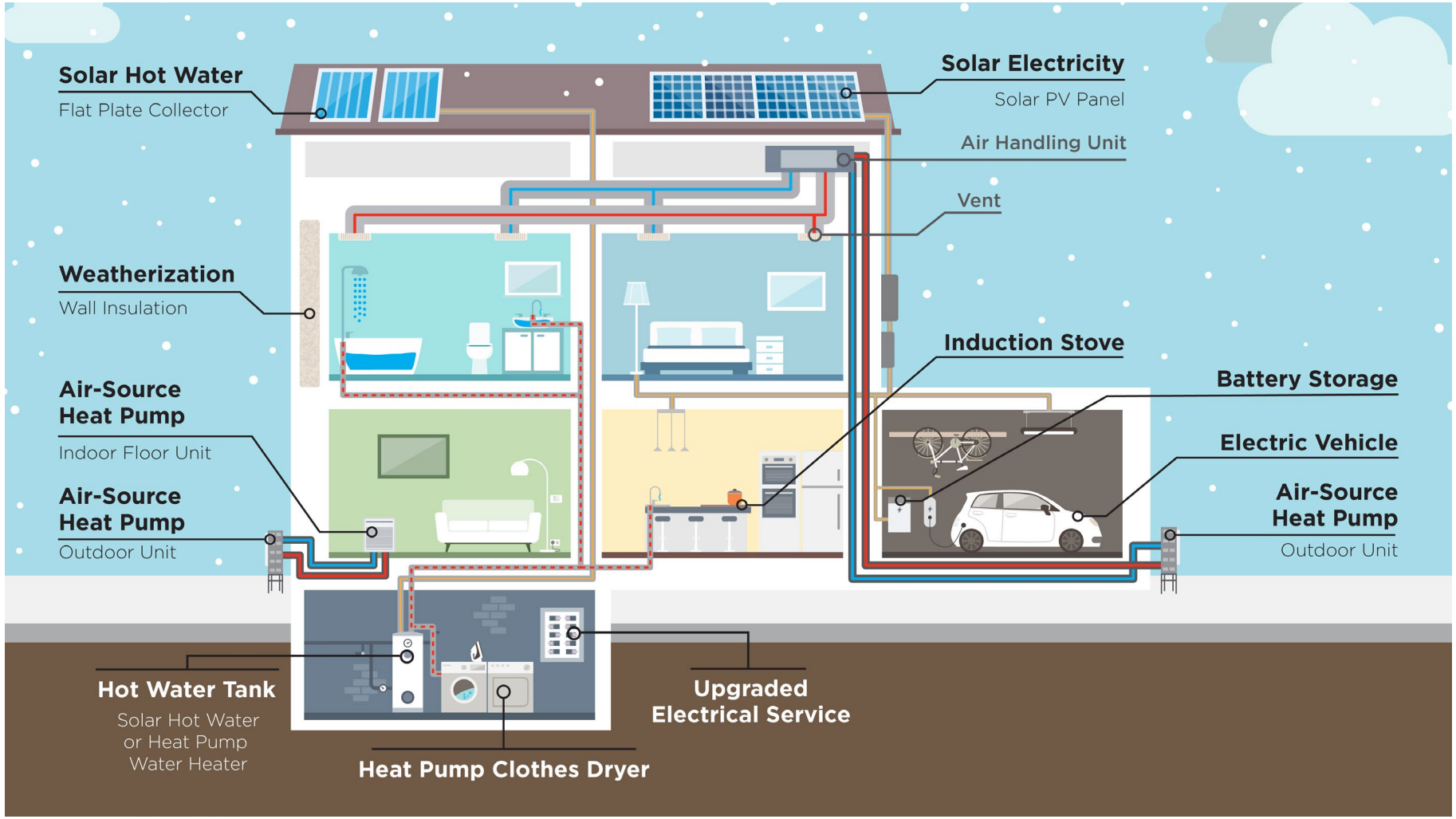
Clean Energy Lives Here is a public awareness campaign that educates and informs MA residents about decarbonized alternatives to common household systems and appliances

GOALS

1. **Engage consumers** on opportunities for home electrification, efficiency, and renewables
2. **Provide resources** to inform consumer evaluation and decision-making
3. Support residents in **developing a long-term plan** for transitioning home energy systems prior to failure
4. **Connect residents with installers**

JOIN THE CLEAN ENERGY TRANSFORMATION

THE CLEAN ENERGY HOME



COMPREHENSIVE HOME DECARBONIZATION

Weatherization

Electricity Supply

- Electric panel upgrade
- Community Solar
- Renewable Electricity
- Solar PV
- Home Battery

Heating/Cooling

- Air-Source Heat Pumps (ASHP)
- Ground-Source Heat Pumps (GSHP)
- Automated Wood Heat (AWH)

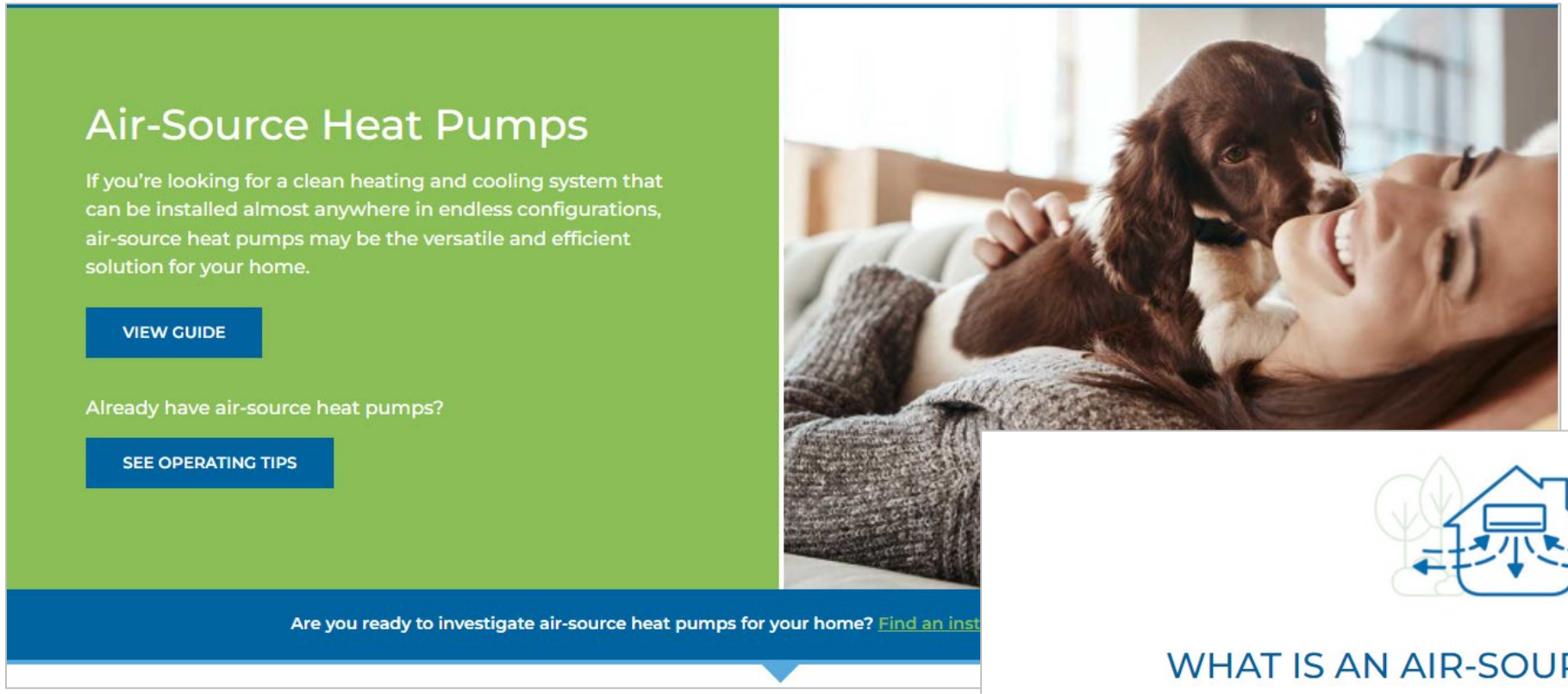
Hot Water

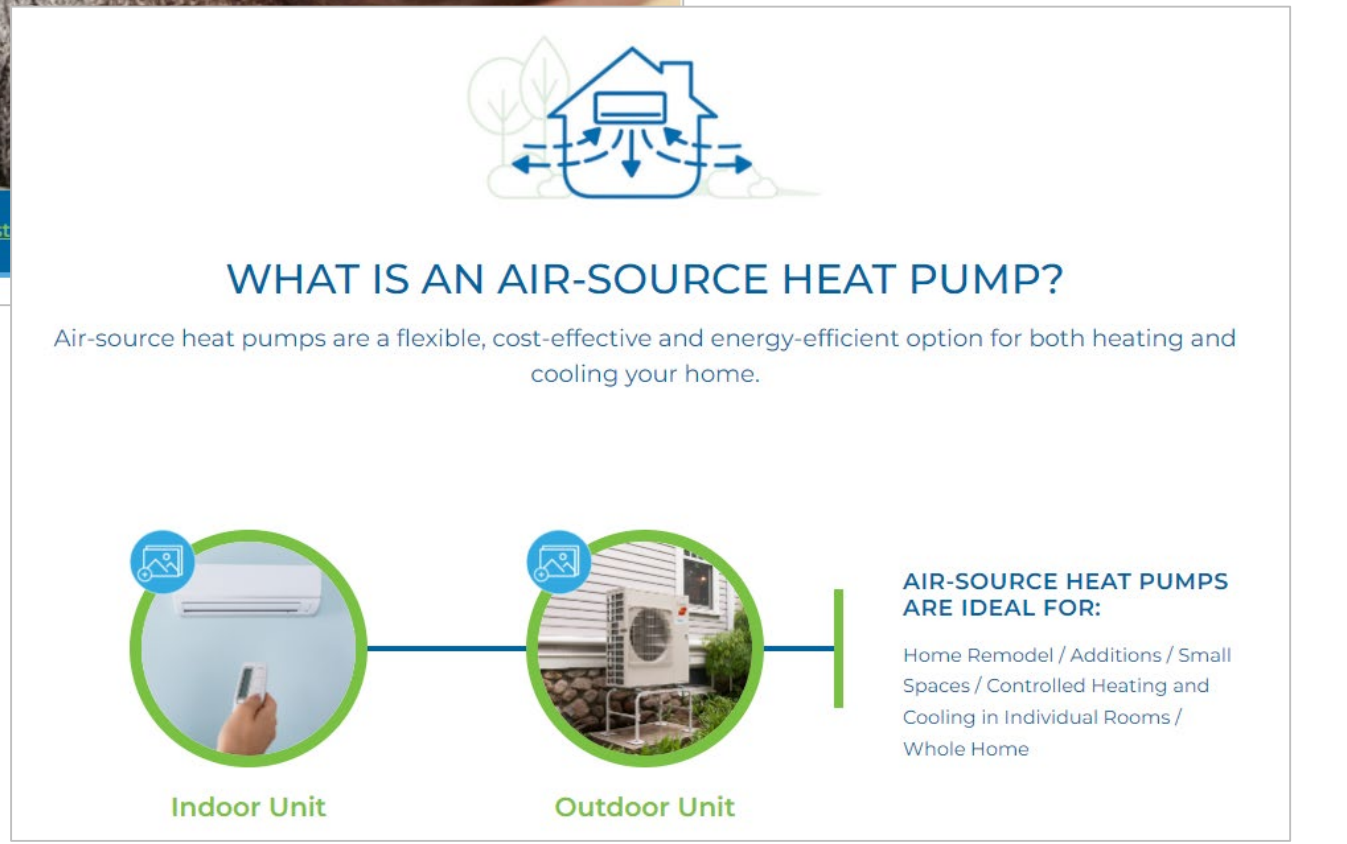
- Solar Hot Water (SHW)
- Heat Pump Water Heater (HPWH)

Appliances

- Induction Stovetop
- Heat Pump Clothes Dryer

Electric Vehicle





Introduce Air-Source Heat Pumps and offer guides

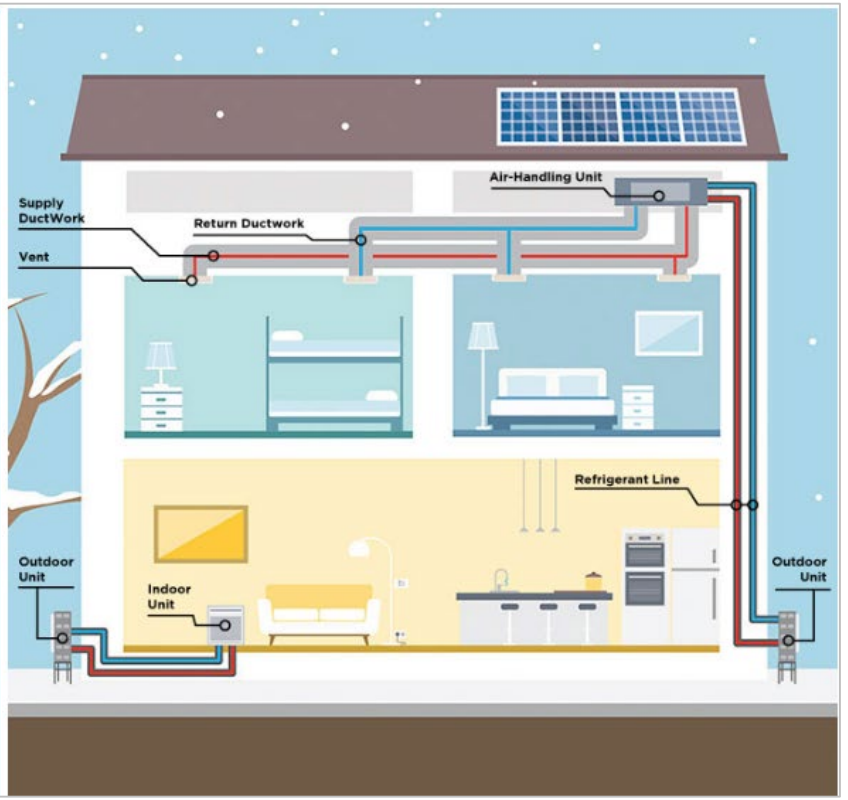
THE TECHNOLOGY

How It Works

- Think of an air conditioner that can run in reverse. This cold climate heat pump uses electricity to power a compressor and transfer heat using the refrigeration cycle.
- In the summer, it operates like an air conditioner to provide cooling, using the refrigerant to transfer heat out of your home.
- In the winter, a heat pump operates in reverse, providing heating by extracting heat from the outdoor air.

ting ductwork to

ss options are also
individual room,

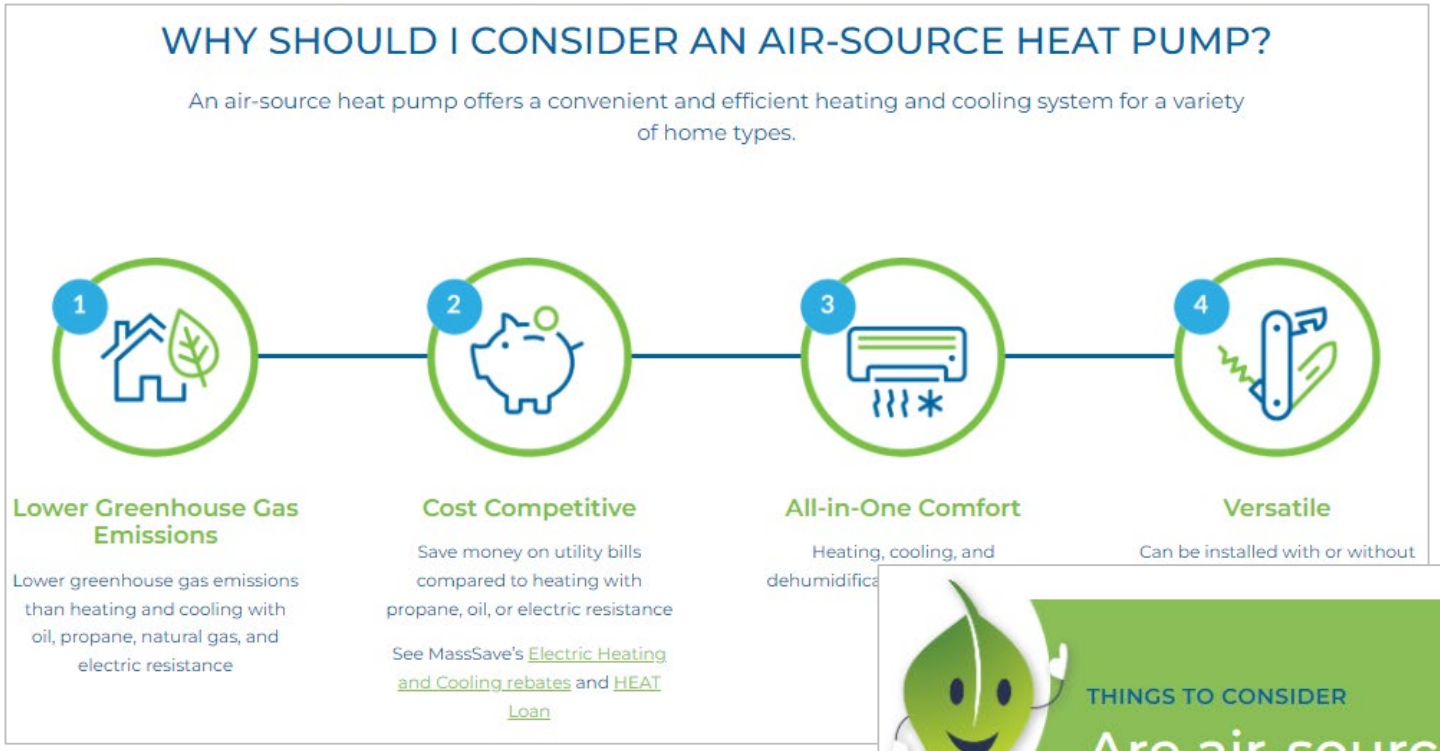


VIDEO

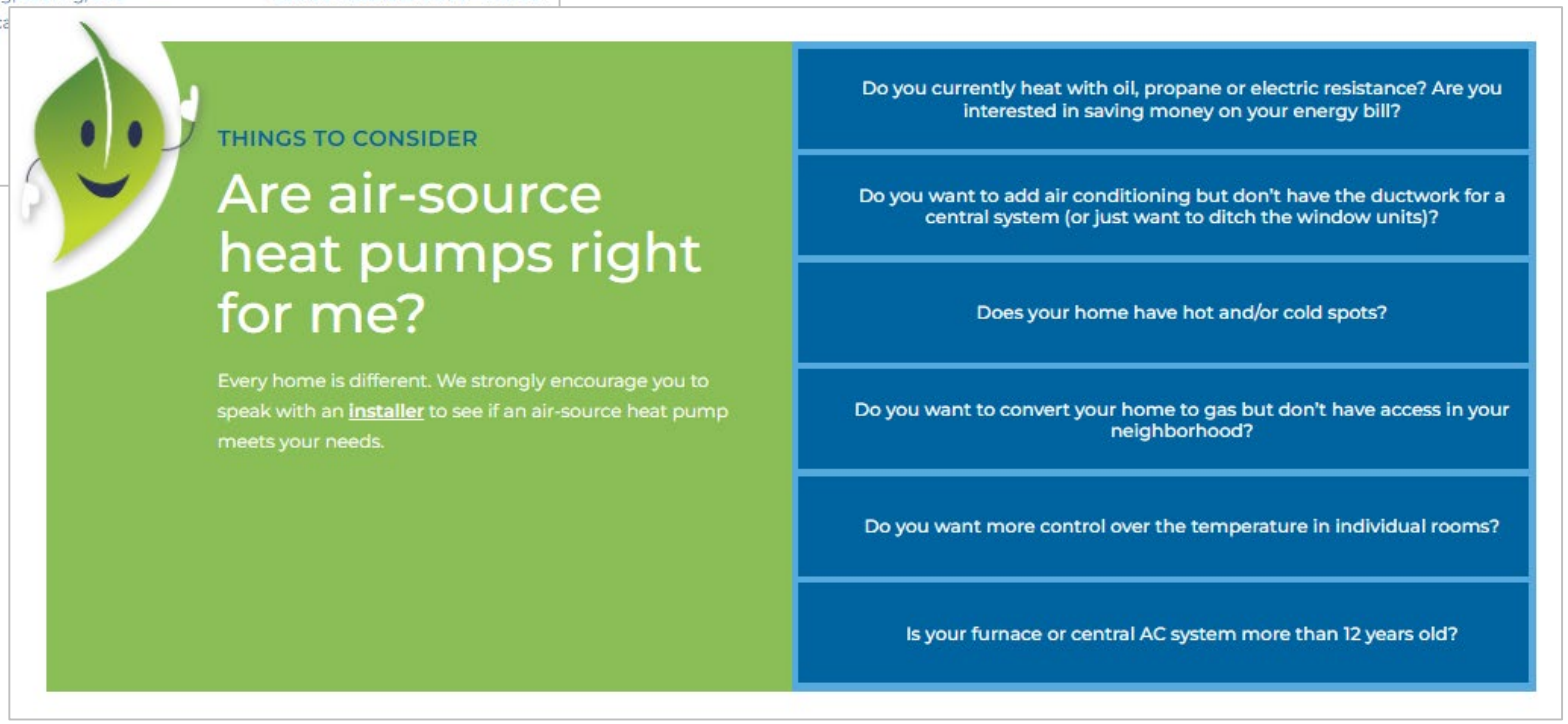
How a Heat Pump Works

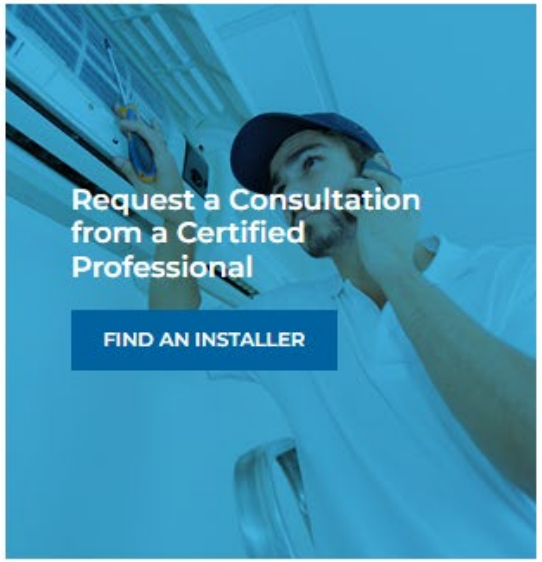
This Old House | 8 min. 36 sec.

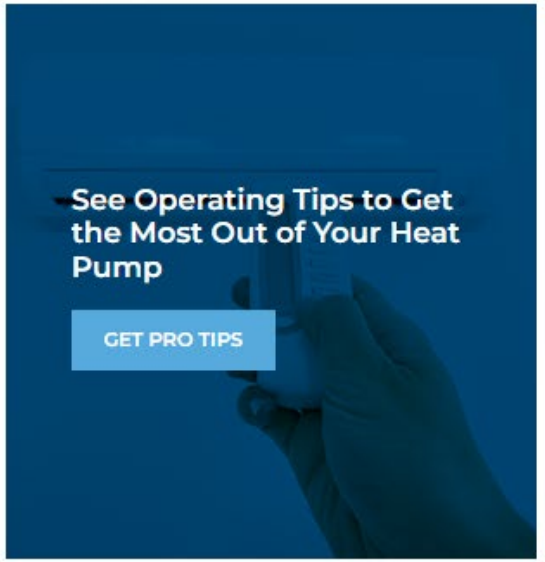
Explain how it works



Promote benefits and answer questions

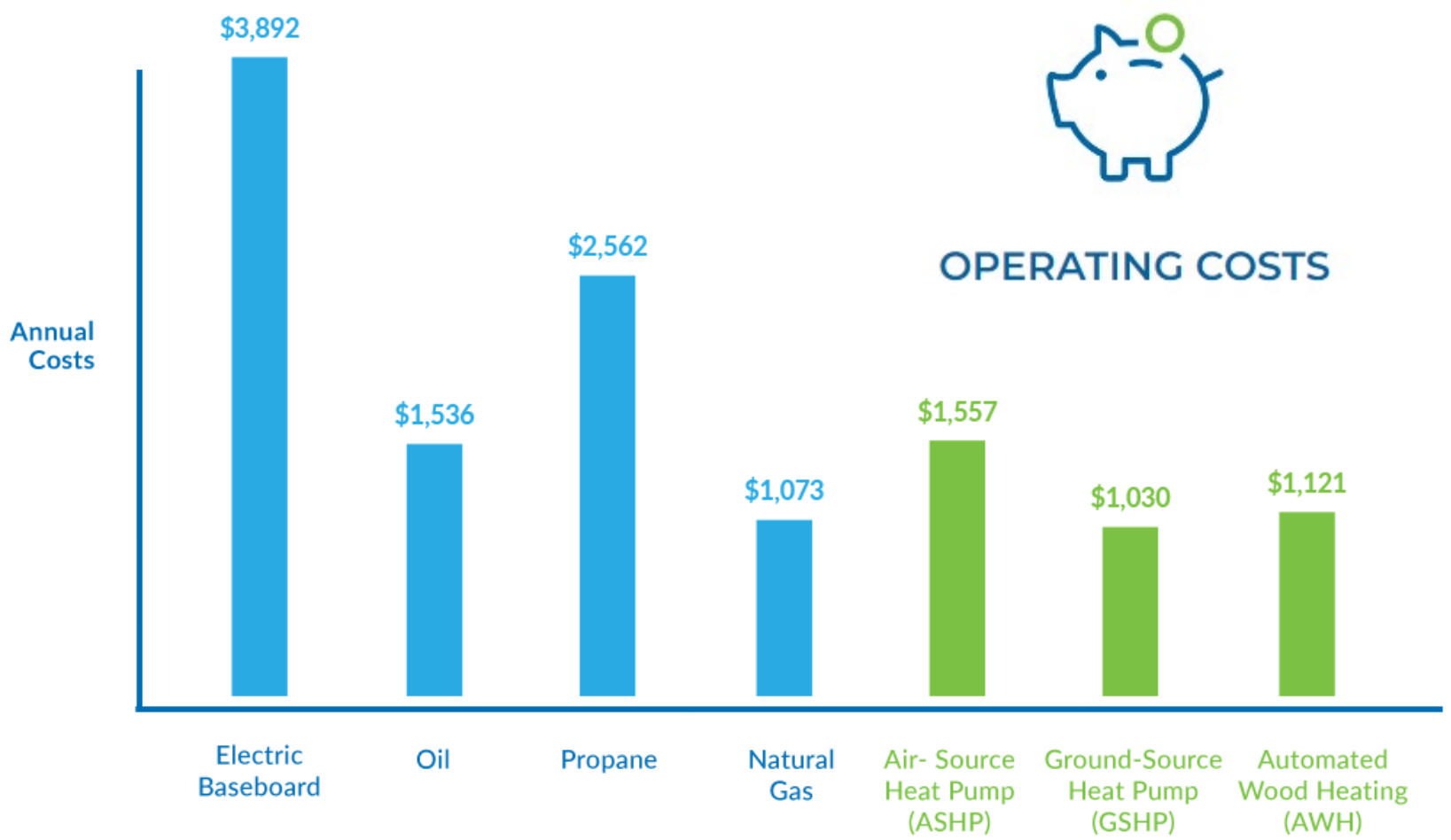




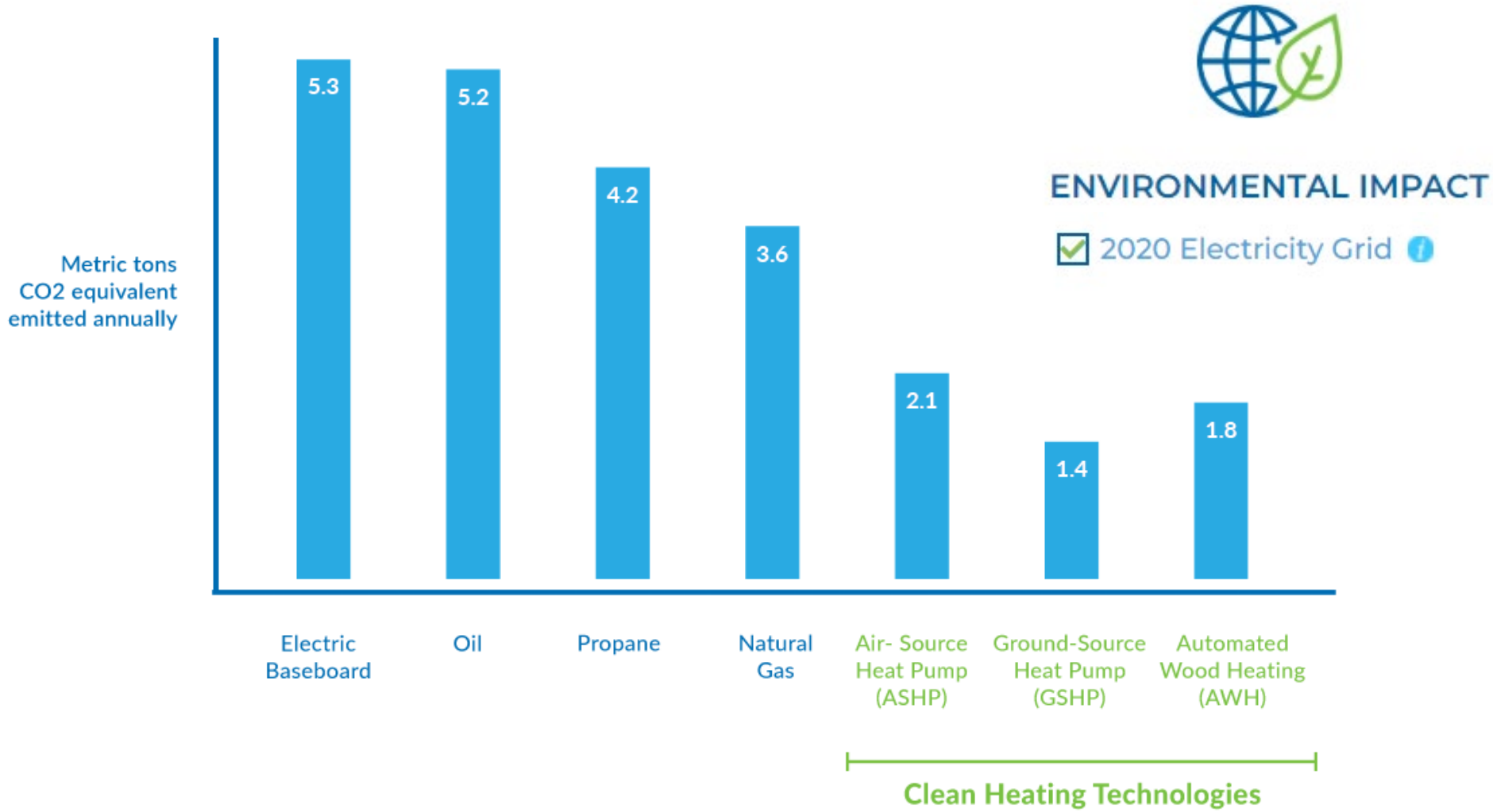


Offer guides (again), Installer contact info, and pledge

CONSUMERS SEE COST COMPARISON



CONSUMERS SEE GHG EMISSIONS COMPARISON



SUMMARY OF INCENTIVES BY TECHNOLOGY FROM ALL SOURCES

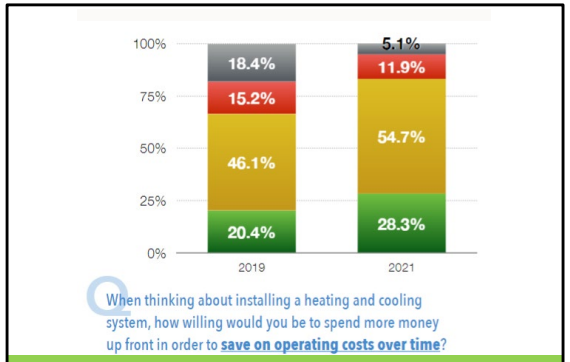
- Mass Save*
- DOER*
- Federal Tax Credits
- MA State Tax Credits*
- Financing*
- ENERGYSTAR
- MOR-EV*

* For MA residents

FEDERAL, STATE, AND MASS SAVE INCENTIVES AVAILABLE IN 2022 BY CLEAN ENERGY SOLUTION

	Mass Save	Mass Department of Energy Resources (DOER)	Federal Tax Credits	Mass State Tax Credits	Financing Options	Other
Air-Source Heat Pumps	Electric Heating and Cooling Rebates	Alternative Energy Certificates (AECs)			Mass Save HEAT Loan	
Automated Wood Heat		Alternative Energy Certificates (AECs)	26% for systems installed through 2022 and 22% for systems installed through 2023; consult IRS website		Mass Save HEAT Loan	
Battery Storage	Connected Solutions	SMART Battery Adder Clean Peak Energy Standard				
Electric Vehicle	Eversource's EV Home Charger Demand Response		Federal Tax Credits for New All-Electric and Plug-in Hybrid Vehicles			MOR-EV Municipal EV Programs
Ground-Source Heat Pumps	Electric Heating and Cooling Rebates	Alternative Energy Certificates (AECs)	30% for systems installed 2022 – 2032	6.25% Massachusetts Sales Tax Exemption	Mass Save HEAT Loan	
Heat Pump Clothes Dryers	ENERGY STAR® Clothes Dryer Rebates					
Heat Pump Water Heater	Electric Heat Pump Water Heater Rebates				Mass Save HEAT Loan	ENERGY STAR® Equipment Tax Credit
Induction Cooking	Induction Cooking Rebates					
Solar Electricity		Solar Massachusetts Renewable Target (SMART)	30% for systems installed 2022 – 2032	15% of the system cost as a state tax credit, up to $1,000		Municipal Light Plant Solar Rebate Program (for MLPs that do not participate in SMART)
Solar Hot Water		Alternative Energy Certificates (AECs)	30% for systems installed 2022 – 2032	15% of the system cost as a state tax credit, up to $1,000	Mass Save HEAT Loan	

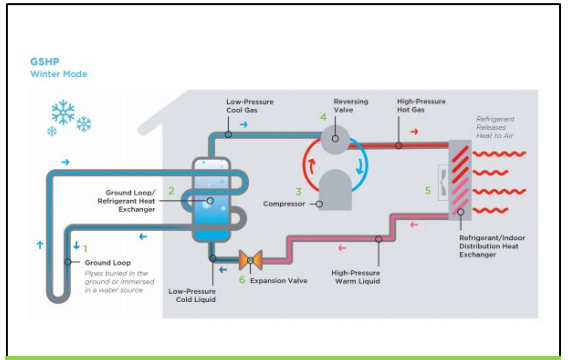
CLEAN ENERGY LIVES HERE CAMPAIGN ELEMENTS



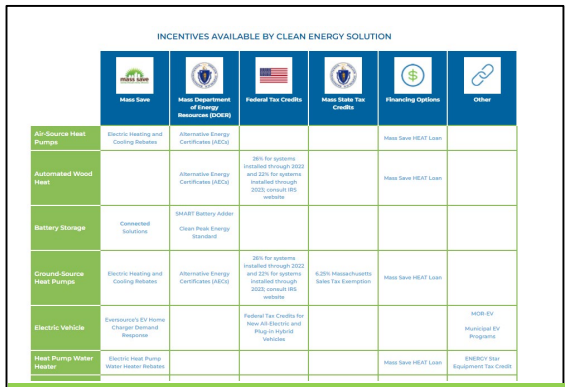
Market Research/Surveys

Goclean.masscec.com

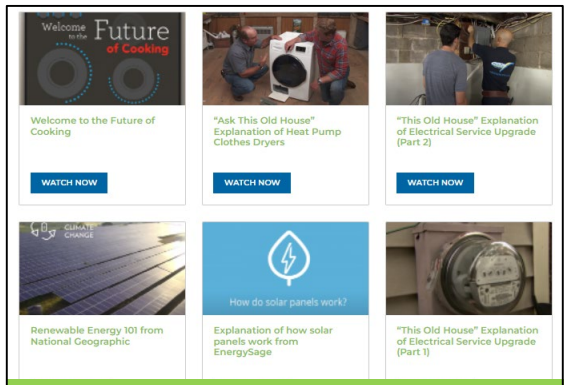
Guides



How It Works



Incentives Chart



Videos

Advertising

Email & Pledge

ADVERTISING YEAR 1 (MAY 2020 – FEB. 2021)

Search Ads

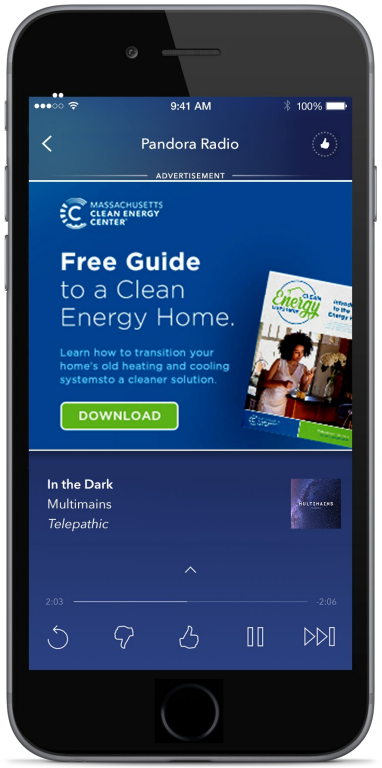
Ad · goclean.masscec.com/heating/cooling

Clean Heating & Cooling - Clean Energy Lives Here

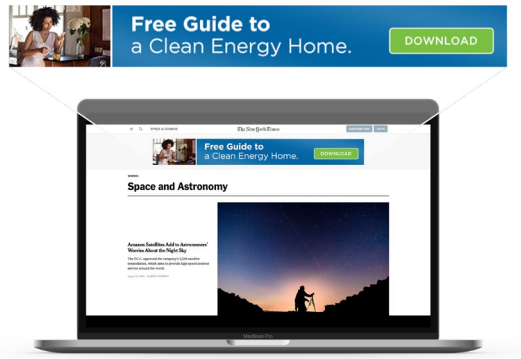
Visit MassCEC To Learn About the Renewable **Heating**, Hot Water, & Cooling Programs Offered.
Visit MassCEC to Learn How You Can Reduce Your Carbon Footprint & Save on Energy Bills.
Switch to **Clean** Energy. Renewable Energy Solution. Save Money.
Find A Local Installer · Clean Energy Solutions · Get A Guide · Take the Pledge

Street Furniture/Billboards

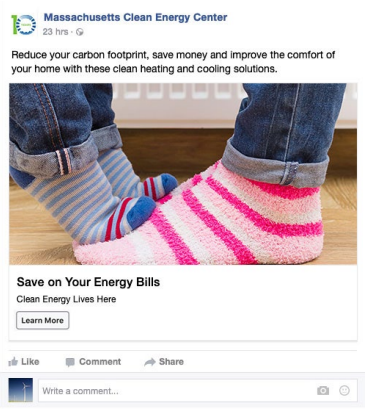
Pandora Radio



Digital Display Ads



Facebook/Instagram Ads



ADVERTISING YEAR 2 (JUL. 2021 – MAR. 2022)

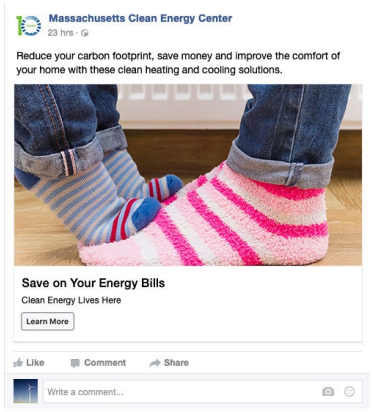
Search Ads

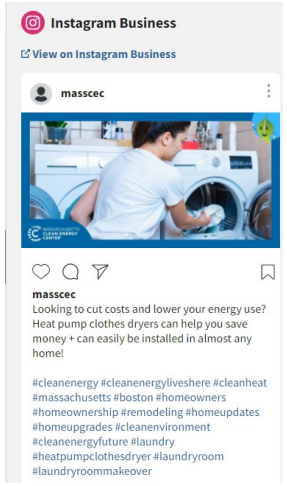
Ad · goclean.masscec.com/heating/cooling

Clean Heating & Cooling - Clean Energy Lives Here

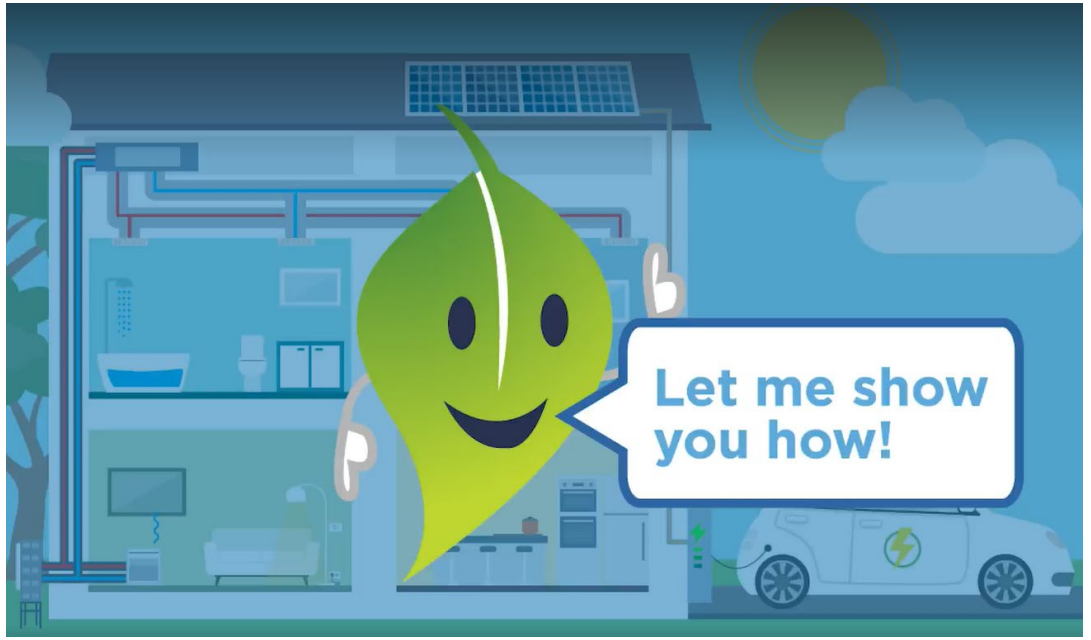
Visit MassCEC To Learn About the Renewable **Heating**, Hot Water, & Cooling Programs Offered.
Visit MassCEC to Learn How You Can Reduce Your Carbon Footprint & Save on Energy Bills.
Switch to **Clean** Energy. Renewable Energy Solution. Save Money.
Find A Local Installer · Clean Energy Solutions · Get A Guide · Take the Pledge

Facebook/Instagram Ads





YouTube Ad



Advertising continued until Mar. 31, 2022

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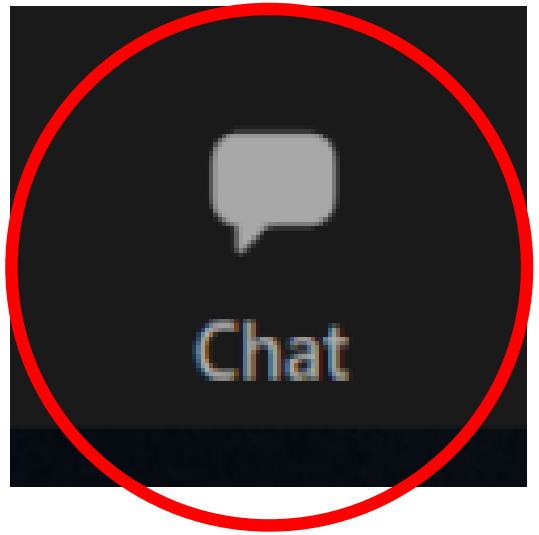
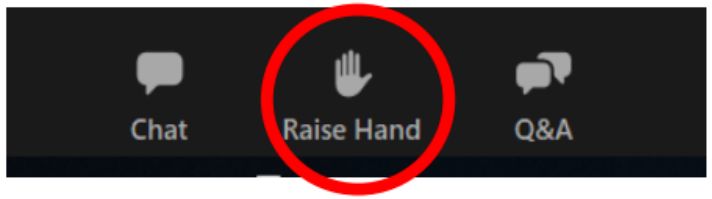
Questions

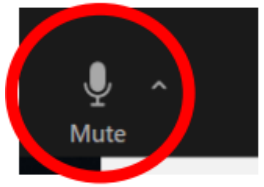


At the conclusion of each panel DEEP will hold a brief question and answer period.

If you have a question for a presenter, please drop it into the chat to **Jeff Howard**. DEEP will pose as many questions as time allows to the speakers. Clarifying questions will be prioritized. Leading questions will not be accepted.

Public Comments





Lower left of the screen

If you would like to make a comment during the public comment periods:

- Please use the “Raise Hand” feature if you would like to speak
- After any interested elected officials have provided their comments, you will be invited to provide your comment in the order the hands were raised
- Please unmute yourself, state your name and affiliation
- Given time limitations, please limit your comment to 2 minutes.
- After your comments, please remember to click the “Mute” button

General Public Comment

BUREAU OF ENERGY AND
TECHNOLOGY POLICY

WRAP UP

Thanks for joining our technical session today!

Written comments related to this session, or the general Comprehensive Energy Strategy can be submitted to:

1. web page – or –
2. Via email to

All information on upcoming Comprehensive Energy Strategy technical sessions and written comment opportunities can be found on the

This slide deck and a recording of this session will be posted on the CES webpage

Written Comments related to this technical session are due
Friday, October 7, 2022, at 5:00 p.m. ET

BUREAU OF ENERGY AND TECHNOLOGY POLICY

Thank you for joining!

Questions? DEEP.EnergyBureau@ct.gov

BUREAU OF ENERGY AND
TECHNOLOGY POLICY