Building Thermal Decarbonization
Support Strategies

Technical Session 3
CT 2022 Comprehensive Energy Strategy

September 23, 2022
Logistics & Housekeeping

- This session is being recorded
- Please include your name and affiliation (if any) in your Zoom icon
- Please turn off your audio and video except when speaking
- 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.
<table>
<thead>
<tr>
<th>Agenda Section</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>1:00-1:15 pm</td>
</tr>
<tr>
<td>Public Comment</td>
<td>1:15-1:30 pm</td>
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<tr>
<td>Geographic Data</td>
<td>1:30-1:50 pm</td>
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<tr>
<td>Q&amp;A</td>
<td>1:50-2:00 pm</td>
</tr>
<tr>
<td>Building Codes</td>
<td>2:00-2:30 pm</td>
</tr>
<tr>
<td>Q&amp;A</td>
<td>2:30-2:40 pm</td>
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<tr>
<td>District Heating &amp; Cooling</td>
<td>2:40-3:20 pm</td>
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<tr>
<td>Q&amp;A</td>
<td>3:20-3:35 pm</td>
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<tr>
<td>Measure Delivery</td>
<td>3:35-4:20 pm</td>
</tr>
<tr>
<td>Q&amp;A</td>
<td>4:20-4:35 pm</td>
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<tr>
<td>Public Comment</td>
<td>4:35-4:50 pm</td>
</tr>
<tr>
<td>Wrap Up</td>
<td>4:50-4:55 pm</td>
</tr>
</tbody>
</table>
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:
**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

<table>
<thead>
<tr>
<th>Technical Session</th>
<th>Meeting Date(s)</th>
<th>Deadline for Written Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Sept. 23, 2022 1 p.m. - 5 p.m. ET</td>
<td>Oct. 7, 2022, at 5:00 p.m. ET</td>
</tr>
<tr>
<td>4</td>
<td>Oct. 6, 2022 9 a.m. - 5 p.m. ET</td>
<td>Oct. 21, 2022, at 5:00 p.m. ET</td>
</tr>
</tbody>
</table>
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.
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
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
5. Electric Demand Response
6. Alternative Fuels
7. Natural Gas Planning & Policies
8. Carbon Pricing & Low-Carbon Incentives
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
Questions and Comments

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
Geographic Data

Caleb Smith – CT Green Bank

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

(speaker order may vary)
CT Green Bank
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
Results & Potential Implementation
• 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
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.
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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Vice President of Operations
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CT DEEP, Bureau of Energy & Technology Policy
Heat Roadmap Europe

Jeff Howard, Senior Environmental Analyst
“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.”
Simple mapping of heat demand density and excess heat activities

Figure 2. Heat demand density and excess heat activities Middlesbrough.
National scale – UK

Regional heat balances – Excess heat vs. heat demand
Heat Roadmap United Kingdom

Quantifying the Impact of Low-carbon Heating and Cooling Roadmaps

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
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.
Questions

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Building Codes

Melissa Kops – CT Green Building Council

Andrea Krim – Northeast Energy Efficiency Partnerships

(speaker order may vary)
Building Code Considerations

September 23, 2022

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

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.


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.
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.
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
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.
Northeast Energy Efficiency Partnerships
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
<table>
<thead>
<tr>
<th>Year</th>
<th>States</th>
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<tbody>
<tr>
<td>2015</td>
<td>ME → 2021*, CT → 2021, NH → 2018, DC → 2021, WV</td>
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<tr>
<td>2021</td>
<td>NJ</td>
</tr>
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</table>

*Updating stretch codes
• 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

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

• Efficient, Resilient Communities
Thank you.

For more information, contact:

akrim@neep.org
Questions

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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)
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.
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
One idea, many names

- GeoMicroDistricts
- District thermal networks
- Thermal energy networks
- Networked or community geothermal
- District heating and cooling
- Shared thermal loops
- And more...
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.”
Networked Leadership

State Regulator

Geothermal Expert

Governor’s Office

“Gas is the Bridge Fuel” originator

Community Activist

Utility Executive

Steelworkers Union Leader

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

Marcus Luna, R., D., Dominic Nicholas, R.

Show more

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


Energ Policy
Volume 162, March 2022, 112778

Energy Policy
Volume 162, March 2022, 112778

Online version: 10.1016/j.enpol.2022.112778

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ARCTIC

- 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 84 separate residential locations across the Greater Boston metropolitan area, Massachusetts. NG samples were measured for methanes (C1), ethane (C2), and trimethane (C3) VOCs (NMOCs) content (including tentatively identified components) using commercially available UIC-D analysis methods. Results revealed 234 unique NMOCs, with concentrations in 41 and 18,500 ng/m3, respectively. The 10 most abundant VOCs (including benzene, toluene, ethylbenzene, xylene, trimethylbenzene, and ethylcyclohexane) were detected in 98% of samples, along with toluene (98%), benzene (94%), ethylbenzene (94%), and cyclohexane (99%), contributing to a mean total VOC level of 6.50 ppm.
HEET's GeoNet  (AKA GeoGrid, GeoMicroDistrict, etc.)
Case Study

Borefields
(121,000 ft)

Vaults &
Mechanical Rooms

Shared loop:
18” Pipes
12” & 10” Pipes

Courtesy of The GreyEdge Group©
Technical Feasibility (by street segment)

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

- Safer
- Provides cooling
Benefits

➢ Safer
➢ Provides cooling
➢ Energy bill savings

MA Energy Bill Projection
(Appplied Economics Clinic Brief)

Annual Average Household Heating Bills

- Gas
- NetGeo

<table>
<thead>
<tr>
<th>Year</th>
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<tr>
<td>2050</td>
<td>$500</td>
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</tbody>
</table>

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

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

GeoMicroDistrict Feasibility Study, Buro Happold Engineering, 2019
Benefits

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

Gas Pipes

Water Pipes
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)

Winter Peak - like wings of a Falcon!

GeoNet flattens the Falcon Curve

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](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)
- Leak prone gas infrastructure or gas constraints
- Low income customers
- Mixed energy use

Schedule
- Site selection - 2023

Some NetGeo Sites Suggested by National Grid

NetGeo Sites in MA

[Map of NetGeo sites in Massachusetts]
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
<table>
<thead>
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<th>Area</th>
<th>Feasibility Studies</th>
<th>Approved Installation(s)</th>
<th>Legislation</th>
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<tr>
<td>DC</td>
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<td>Yes ($5 million)</td>
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<tr>
<td>Maryland</td>
<td></td>
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<td>Geothermal Heating &amp; Cooling Systems (H.1007)</td>
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<tr>
<td>Oregon</td>
<td>Yes</td>
<td></td>
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<tr>
<td>Minnesota</td>
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<td>Natural Gas Innovation Act (216B.2427)</td>
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<td>New York</td>
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<td>2</td>
<td>Utility Thermal Energy Network &amp; Jobs Act (S.9422)</td>
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<tr>
<td>Philadelphia</td>
<td>Yes ($500k)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Federal</td>
<td></td>
<td></td>
<td>Being proposed (stay tuned)</td>
</tr>
</tbody>
</table>
Phase 1: Initial Demonstration
Phase 2: Iterate & Scale
Phase 3: Geo/Gas Hybrid
Reimagining our Energy Infrastructure:

ASHP / GSHP

RNG / Hydrogen
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
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
- ISO-NE Final 2021 Heating Electrification Forecast (See page 7)
Questions?
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

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

- 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

• 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
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

Networked Geothermal Pilot Project

- Geothermal Loops in Additional Communities
- Expansion of Existing Loop
- Municipality or Private Collaborations
- Integration With Other Clean Technology
QUESTIONS
Wastewater Energy Transfer
Why Wastewater?

- Consistent, localized energy source
- Reduces fresh water use
- Solution to clean energy inequity
- Available energy, today
- Reduces energy & peak load on electrical grid
- Measurable impact & ROI
- Accelerates Public/Private partnerships
- 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
High-volume energy transfer & filtration
- District Energy
- Industrial
- Large Commercial

All-in-one heat pump
- Apartments
- Commercial
- Mixed-Use Residential
What we sell, to whom

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
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
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
Northeast Energy Efficiency Partnerships
Total Energy Pathways: Workforce

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

September 23, 2022
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.
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
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

<table>
<thead>
<tr>
<th>State</th>
<th>Jobs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connecticut</td>
<td>33,573</td>
</tr>
<tr>
<td>Delaware</td>
<td>10,660</td>
</tr>
<tr>
<td>Maine</td>
<td>8,034</td>
</tr>
<tr>
<td>Maryland</td>
<td>65,412</td>
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<tr>
<td>Massachusetts</td>
<td>76,900</td>
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<tr>
<td>New Hampshire</td>
<td>10,838</td>
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<tr>
<td>New Jersey</td>
<td>32,880</td>
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<tr>
<td>New York</td>
<td>120,961</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>65,397</td>
</tr>
<tr>
<td>Rhode Island</td>
<td>10,627</td>
</tr>
<tr>
<td>Vermont</td>
<td>10,069</td>
</tr>
<tr>
<td>Washington, DC</td>
<td>11,214</td>
</tr>
<tr>
<td>West Virginia</td>
<td>6,309</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>462,874</strong></td>
</tr>
</tbody>
</table>

Energy Efficiency Jobs – New England

Energy Efficiency Jobs – Mid-Atlantic

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
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 pathway 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

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

Branford, CT
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

2021 Energy Usage (GWH)

- Electricity: 20%
- Natural Gas: 18%
- Other Heat: 1%
- Electric Heat: 2%
- Transport: 40%

Current Load - Future Load - Renewable Load

- Energy usage (GWH)

- Sources of Energy

- Annual Energy Costs: BAU vs. 100% Renewable
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
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
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’
How does MEETS work and who participates?
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 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 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
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
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
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
Benefits of MEETS (4 of 5)

Efficiency Companies:

- Long-term contracts
- Creditworthy counterparties
- Significant increase in work
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 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 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.
Questions?
MA Clean Energy Center
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
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
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.

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

**OPERATING COSTS**

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>Annual Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric Baseboard</td>
<td>$3,892</td>
</tr>
<tr>
<td>Oil</td>
<td>$1,536</td>
</tr>
<tr>
<td>Propane</td>
<td>$2,562</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>$1,073</td>
</tr>
<tr>
<td>Air-Source Heat Pump (ASHP)</td>
<td>$1,557</td>
</tr>
<tr>
<td>Ground-Source Heat Pump (GSHP)</td>
<td>$1,030</td>
</tr>
<tr>
<td>Automated Wood Heating (AWH)</td>
<td>$1,121</td>
</tr>
</tbody>
</table>
CONSUMERS SEE GHG EMISSIONS COMPARISON

Metric tons CO2 equivalent emitted annually

Electric Baseboard: 5.3
Oil: 5.2
Propane: 4.2
Natural Gas: 3.6
Air-Source Heat Pump (ASHP): 2.1
Ground-Source Heat Pump (GSHP): 1.4
Automated Wood Heating (AWH): 1.8

Clean Heating Technologies
# 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
CLEN 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.
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.
Find A Local Installer · Clean Energy Solutions · Get A Guide · Take the Pledge

Facebook/Instagram Ads

Let me show you how!

YouTube Ad

Advertising continued until Mar. 31, 2022
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.
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
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. BETP’s Energy Filings 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 CES webpage

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
Thank you for joining!

Questions? DEEP.EnergyBureau@ct.gov