# Hot Water and Hot Air Forums

Hot Water Forum, March 4–5 | Hot Air Forum, March 5–6

## Monday, March 3

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| **12:00 – 5:00 pm** | **UA 290 Tour and Heat Pump Water Heater Equipment Demonstration** |

Optional event off-site at United Association (UA) Local 290 training facility in Tualatin, OR.
*Available to add to your registration for $25; limited to 56 participants.*

## Tuesday, March 4 – Hot Water Forum

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| **7:00 am – 7:00 pm** | **Registration** |
| **7:30 – 8:20 am** | **Breakfast** |
| **8:20 – 8:50 am** | **Welcome and Introductions** |
| **9:00 – 10:30 am** | **Concurrent Sessions** |

### 1A. How to Get the Heat for Heat Pump Water Heaters

Many buildings are not designed, modified, and utilized for optimum service with air-source heat pump water heaters (HPWH). This session addresses how to assure optimum performance in the face of installation faults, especially inadequate air supplies for heat exchange, and handling cold discharge air.

Moderator: **Harvey Sachs**, ACEEE

*Ensuring HPWH Efficiency in Less-than-Ideal Spaces*
**Sam Larson**, Larson Energy Research

*Air-Source HPWH: Where Does the Warm Intake Air Come From? Where Does the Cold Exhaust Air Go?*
**Gary Klein**, Gary Klein Associates

*Central Horizontal Drain Water Heat Recovery in 80 Buildings and Growing: Design and Measured Performance*
**Gerald Van Decker**, RenewABILITY Energy Inc.

### 1B. Commercial Food Service

Heat pump water heaters are a proven technology in residential applications but have only been applied in limited cases in commercial food service. This creates a challenge for operators and designers who are unfamiliar with HPWH design principals, specification, and performance as well as Environment Health (EH) professionals who hold the responsibility for approving HPWHs. This session shares the latest lab and field research info HPWH performance as well as practical design advice and current HPWH policy.

Moderator: **Richard Young**, Frontier Energy

*Starting System Design, Sizing, and Policy Research to Decarbonize Water Heating in Commercial Kitchens*
**Amin Delagah**, TRC Companies

*Foodservice Water Heater Decarbonization: Field Data Research*
**Maya Gantley**, 2050 Partners

*Evaluating Unitary Heat Pump Water Heaters: Laboratory Insights for Diverse Foodservice Applications*
**Mehdi Zeyghami**, PG&E

## 1C. Demand Flexibility

Join us for an engaging panel discussion on the importance of demand flexibility in commercial heat pump water heaters, highlighting their benefits for consumers and their role in promoting grid stability. Experts from leading organizations will share insights into the latest advancements in grid-integrated systems, including load-shifting optimization and cost-minimization strategies, highlighting how these technologies can be leveraged to improve energy management and operational efficiency.

Moderator: **Vidhisha Moopnar**, New Buildings Institute

*Pure MAGIC - Made in America Grid Integrated Commercial Heat Pump Water Heaters*
**Tim O'Neill**, Ecotope, Inc.

*Standardization, Optimization, and Quantification of Load Shift in Commercial HPWH Systems*
**Scott Spielman**, Ecotope, Inc.

*Central Heat Pump Water Heater Load Shift Testing at Multifamily Buildings*
**M M Valmiki**, ASK Energy

*Demonstrating Simple Price-Responsive Controls for Central HPWHs to Minimize Cost Under Time-Varying Electricity Prices*
**Brian Woo-Shem**, LBNL

## 1D. Showers: Cleaning Away the Waste of Water and Energy

A fifth, and in some cases much more, of household and lodging hot water use is for showers. And much of that water, and thus the energy to heat it, is wasted. The presentations in this session look into different ways to reduce the water and energy waste of showers. One looks at how timing of showers and type of water heaters affect both peak and total energy demand for showers. Another presents a new technology to address the wasting of water before it warms up at the shower. The final presentation presents data about and possible ways to prevent excessively long showers in hotels.

Moderator: **Jim Lutz**, Hot Water Research

*Trade-offs Between Quantity and Timing of Shower Energy Consumption in Households*
**Rebecca Hall**, University of Queensland

*Water Conservation at the Shower*
**Anthony Cortez**, AwyvA

*Beyond the Faucet: Impact of Excessive Hot Water Use in Commercial Properties*
**Priya Thomas**, Shower Stream

**10:30 – 11:00 am Networking Break**

**11:00 – 12:30 pm Concurrent Sessions**

## 2A. Affordable Multifamily I: Solving the Challenges of Heat Pump Water Heaters

The electrification of hot water with heat pumps in multifamily and affordable housing faces challenging economics and technical constraints but is nevertheless essential for low-income and energy-burdened communities. This session will explore potential solutions to current challenges. Panelists will discuss an innovative pilot program in New York City that addressed technical and cost hurdles of commercial HPWHs with displacement strategies, analyze key takeaways from affordable housing organizations that have successfully installed and operated them, and provide updates on NEEA's Hot Water Innovation prize that seeks to develop new equipment options for in-unit HPWH replacements for multifamily buildings.

Moderator: **Joseph Wachunas**, New Buildings Institute

*Scalable Affordable Financeable Electrification: Displacement DHW in NYC*
**Nicole Ceci**, Steven Winter Associates

*Enhancing Affordable Housing Through Efficient Hot Water Solutions*
**Vidhisha Moopnar**, New Buildings Institute

*What the 2029 Water Heater Standards Mean and the Next Big Splash for Utility Efficiency Programs*
**Suzanne Foster Porter**, Kannah Consulting

## 2B. Simulating Hot Water for Better Programs, Designs and Tests

Water heater lab and field testing yield valuable data but are costly, with field testing posing challenges in managing consistent variables. This session will examine how simulations can evaluate water heater performance across multiple variables.

Moderator: **Debra Brunk**, 2050 Partners

*National Simulation Analysis of 120V Heat Pump Water Heaters*
**Jeff Maguire**, NREL

*Right-Sizing Heat Pump Water Heaters Using Simulation-Based Approach*
**Robbie Svidron**, Intellihot Inc

*How Well Does Laboratory Performance of Heat Pump Water Heaters Represent Field Performance?*
**Jim McMahon**, Better Climate Research and Policy Analysis

## 2C. Designing Distribution Systems

When it comes to hot water systems, we often forget one of the most critical components to making the whole system work: the supply and return of hot water, also known as the hot water recirculation system. The proper design and installation of these systems is vital to making any hot water system efficient, let alone work. In this session, we will explore a number of the strategies to control, update, and optimize hot water recirculation systems to promote sustainability while maintaining safety.

Moderator: **Christoph Lohr**, IAPMO

*Single Zone Hot Water Recirculation Systems: Control Strategies and Water Heater Performance*
**Gary Klein**, Gary Klein and Associates, Inc.

*Remix! - Updating Outdated Hot Water Distribution Systems with Digital Master Mixing Valves*
**Daniel Hacking**, TRC Companies

*Product Ratio Method - Optimizing Flow for Domestic Hot Water Circulation Systems*
**John Lansing**, PAE Consulting Engineers

## 2D. Basics of Commercial Heat Pump Water Heaters

Everything you need to know about central heat pump water systems (CHPWHs), in multifamily settings in one session. Leave with an understanding of all the available tools and support for ensuring reliable and efficient systems.

Moderator: **Keshmira McVey**, Bonneville Power Administration

*CHPWHs Ready for Prime Time: Presenting the Available Body of Tools to Support Market Transformation*
**Jonathan Heller**, Ecotope, Inc.

*Commercial Heat Pump Water Heater Market Research: Programs, Training, and Product Landscape*
**Helen Townsend**, D&R International

*HPWH: Cost Barrier Breakthroughs*
**Paul Campbell**, ICF International

## 12:30 – 1:30 pm Networking Lunch

## 1:30 – 3:00 pm Concurrent Sessions

### 3A. Water Heater Up-Front Costs

Heat pump water heaters are a silver bullet technology, but installation costs remain stubbornly high and the economics of transitioning from fossil gas to electricity can be challenging. This panel will discuss regional and national HPWH up-front and operating cost drivers and will present the key barriers along with success stories key solutions to driving down those costs.

Moderator: **Alexi Miller**, New Buildings Institute

*HPWH: Cost Barrier Breakthroughs*
**Paul Campbell**, ICF International
**Nathaniel Jutras**, ENERGY STAR

*Electrifying Fossil Fuel Customers…Strategies to Improve the Economics of Heat Pump Adoption*
**Sydney Roberts**, Southeast Energy Efficiency Alliance

### 3B. Market Transformation – Driving the Residential Water Heater Market to DOE's New Energy Efficiency Standard

DOE projects that its 2024 standards update for residential water heaters will cause 35 million electric resistance water heaters to be replaced with electric heat pump water heaters by the early 2040s. Achieving this transition, and realizing the associated savings, will require market building activities to complement the new regulations. In this session we will review the challenge of transforming residential water heating, look at HPWH promotions that are already in the field, and brainstorm new promotions for the future.

Moderator: **Chris Granda**, Energy Solutions

*Driving the Tide: Realizing the Potential of DOE's Landmark Residential Water Heater Standard*
**Chris Granda**, Energy Solutions

*Using Wholesale Distribution Partnerships as a Catalyst to Accelerate Transformation of the Heat Pump Water Heater Market*
**Emily Rosenbloom**, Northwest Energy Efficiency Alliance

*Making Water Heaters Fun - Costumes, Road Trips and National Holidays*
**Joseph Wachunas**, New Buildings Institute

## 3C. Commercial Recirculation Monitoring Studies

This session will focus on best practices and lab and field research on distribution systems with recirculation loops and discussion on key components such as demand pump controls, mixing and balancing valves. Field testing results from pre and post HP retrofit projects will be shared with focus on troubleshooting to uncover systemic distribution system issues and show the impact of extensive pipe heat losses and methods to mitigate it.

Moderator: **Amin Delagah**, TRC Companies

*On-Demand Hot Water Recirculation Systems and Best Practices*
**Alex Boetzel**, Earth Advantage

*Optimizing Central Heat Pump Water Heating Performance: The Essential Role of Pre- and Post-Retrofit Monitoring in Multifamily Buildings*
**Ashley Davis**, Association for Energy Affordability, Inc.
*Are Automatic Balancing Valves Effective in Improving Recirculation System Balancing and Reducing Recirculation Heat Loss?*
**David Chapman**, ZYD Energy

## 3D. Commercial Design

Size Matters: Explore sizing HPWH in multifamily buildings for optimal comfort and efficiency.

Moderator: **Keshmira McVey**, Bonneville Power Administration

*Water Heater Right-Sizing: Comparing Retrospective Demand Sizing Using Building Hot Water Data and ASHRAE Sizing Methods*
**Debra Brunk**, 2050 Partners

*Introduction to the New ASHRAE Guideline: Central Heat Pump Service Water Heating Systems in Multifamily Buildings*
**Carmen Cejudo**, PNNL

## 3:00 – 3:30 pm Networking Break

## 3:30 – 5:00 pm Concurrent Sessions

### 4A. 120 V Heat Pump Water Heaters

This session will address issues important to 120 V HPWHs, including experiences in the field with 120 V products, and tools relevant to pushing the delivery capacity of next-generation systems. Field data gathered on commercially available products in the field will be presented, with the Midwest, South, and West all represented. Since delivery capacity is an important question relevant to customer satisfaction, draw profiles that can be useful for development and laboratory evaluation of prototype systems are presented. In addition, the theoretical and practical limits of water delivery capacity are presented, to inform future research and development.

Moderator: **Noah Gabriel**, New Buildings Institute

*Plugging In for Hot Water in Cold Climates: 120V Heat Pump Water Heaters in the Midwest*
**Dani Ball**, Slipstream

*Hot Water Delivery of Plug-In 120-Volt Heat Pump Water Heaters in New Orleans*
**Tyler Pilet**, Pacific Northwest National Laboratory

*Field Data Driven Draw Profiles to Support HPWH Development*
**Melanie Moses-DeBusk**, Oak Ridge National Lab
*How Much Water Can a Water Heater Heat, If a Water Heater Heats with 12 Amps at 120 Volts?*
**William Doktycz**, Oak Ridge National Lab

### 4B. Residential Program Design: Bridging the Gap from Supply Chain to End Use

Discover the key drivers behind the successful adoption of heat pump water heaters across the supply chain, from distributors to homeowners. This session will explore innovative programs, strategies, and partnerships that have accelerated deployment while uncovering lessons learned from real-world implementation. Gain actionable insights to overcome challenges and build on proven success for advancing energy-efficient water heating solutions.

Moderator: **Emily Rosenbloom**, Northwest Energy Efficiency Alliance

*Lessons Learned and Best Practices for Collaborating with Distributors for Heat Pump Water Heater Market Adoption*
**Josh Butzbaugh**, Pacific Northwest National Laboratory

*Empowering Access and Affordability with Homeowner DIY HPWH Installations*
**Meghan Harwood**, VEIC

*Time to Level Up: Bringing Water Heater Installers Onboard with HPWHs*
**Troy Zdzieblowski**, Evergreen Energy Partners

## 4C. Commercial Field Demonstrations: Data Dispatch from California

This session will focus on design, operation, and optimization of high-performance HPWHs, recirculation systems, and controls. Emerging code-readiness research projects will address 1) real-world operation of light commercial hybrid HP/ER heaters, issues encountered and retrofit optimization strategies to deal with poor ventilation, low system COP, and water runouts, 2) CO2 HP operation in return to primary configuration at various recirculation return temperatures, and 3) energy savings and operation of advanced pumps with integrated and standalone pump controls. Lastly, results will be shared from a HPWH field demonstration with a full DHW system control solution for small centralized HPWH applications.

Moderator: **Amin Delagah**, TRC Companies

*Code Readiness Project Overview and Results from Integrated hybrid HPWH and Recirculation Pump Controls Retrofit Projects in Non-Residential Buildings*
**Jeff Staller**, 2050 Partners

*Results from CO2 Split HPWH in Return to Primary Configuration and Recirculation Pump Controls Retrofit Projects in Multifamily Buildings*
**Andrew Brooks**, AEA

*Field Demonstration of High-Performance Design and Control Solutions for Small Central Heat Pump Water Heater Systems*
**Yanda Zhang**, ZYD Energy

## 4D. Commercial Measurement & Verification

Come learn from specific field deployed multifamily HPWH installations. The speakers will cover 1) operational data visualization, 2) proper commissioning, and 3) new construction applications.

Moderator: **Tony Koch**, Bonneville Power Administration

*Empowering Meaningful Measurement & Verification with EcoDash: A Standardized Tool for Commercial HPWH M&V*
**Madison Johnson**, Ecotope

*Measuring the Bumpy Road to a Properly Commissioned Multi-SanCO2 Array in New Markets*
**Charlie Simek**, New Ecology

*Utility Funding for Large Heat Pump Water Heater Systems in Multifamily New Construction – Lessons Learned*
**Phoebe Warren**, Seattle City Light

## 5:30 – 7:00 pm Reception

# Wednesday, March 5 – Hot Water and Hot Air Forum

**7:30 am – 7:00 pm** **Registration**

**8:00 – 9:00 am** **Breakfast**

**9:00 – 10:30 am** **Welcome, Introductions, and Plenary Panel**

**2025: Uncertainty on Federal Policy but State and Air Quality Management District Efforts Will Shine**

Panelists will discuss potential changes in federal policy under the Trump administration and new Congress and growing efforts in California, the Northeast, and several other leading states. Topics covered will include equipment emissions standards, utility programs and regulations addressing the energy transition, federal grants and tax credits, clean heat standards, electric rate reforms and the New England Heat Pump Accelerator.

Moderator: **Karen Myers**, Vice President, Government Affairs; Rheem

Panelists:

- **Panama Bartholomy**, Executive Director; Building Decarbonization Coalition
- **Maggie Molina**, Executive Director; Northeast Energy Efficiency Partnership
- **Steven Nadel**, Executive Director; American Council for an Energy-Efficient Economy

**10:30 – 11:00 am** **Networking Break**

**11:00 – 12:30 pm** **Concurrent Sessions**

**5A. Financing**

Increasing energy efficiency performance and electrifying/decarbonizing buildings always involves one thing: financial support. This panel will discuss a variety of funding sources, innovative financing strategies, and customer preferences for electrifying hot air and hot water systems in buildings across commercial and residential (multifamily and single-family) buildings.

Moderator: **Daniel Farrell**, American Council for an Energy-Efficient Economy

*Financing Preferences Among Residents in Low-Income and Disadvantaged Communities*
**JahAsia Jacobs**, Rewiring America

*Tackling the Electrification Cost Gap Through Municipal Funding & Financing*
**Paul Picciano**, E3

**5B. TBD**

**5C. Appliance Emission Standards**

Moderator: **George Chapman**, Energy Solutions

*TBD*

## 5D. Hot Water and Hydronic Heat Combination Units

This session includes presentations on multifunctional heat pumps (combi heat pumps) capable of delivering space cooling, space heating, domestic water heating, and energy storage. It will also examine dual-fuel heat pumps that integrate electricity and natural gas. The session will delve into new technologies, market trends, and findings from initial field investigations.

Moderator: **Bo Shen**, Oak Ridge National Laboratory

*Combi Systems for North America*
**Amir Refaat, P.Eng., MBA**, Systemair

*Assessment and Development of a Multi-Functional Heat Pump Featuring Wall-Embedded Thermal Storage*
**Yifeng Hu, PHD**, Oak Ridge National Laboratory

*Triple Threat: Characterization of a Residential Tri-Mode Heat Pump for Multiple Climates*
**Pradeep Vitta**, GTI Energy

*Is Dual Fuel Heating the Key to Residential HVAC Decarbonization? Early Findings from a Dual-Fuel Combi-System Pilot*
**Meg Waltner**, PE, Energy 350

## 12:30 – 1:30 pm Networking Lunch

## 1:30 – 3:00 pm Concurrent Sessions

## 6A. Building Up the Workforce to Support Heat Pump Adoption

This session focuses on strategies for strengthening the skilled workforce as it relates to the latest high-performance HVAC equipment, addressing contractor resistance, and improving quality installations through on-the-job training and key concept knowledge areas. The discussion will also cover the new DOE Energy Skilled Recognition program, with Google as our strategic partner, as a means to enhance contractor visibility and business growth.

Moderator: **Neil Grigsby**, Northwest Energy Efficiency Alliance

*Addressing Contractor Resistance to Heat Pump Technology*
**Kieren McCord**, Pacific Northwest National Laboratory

*Enabling Higher Heat Pump/Heat Pump Water Heater Adoption with On-the-Job Training*
**Fredericka Brown**, Pacific Northwest National Laboratory

*Energy Skilled – Skill Standards to Guide Quality Heat Pump/Heat Pump Water Heater Deployment*
**Eduardo Rodriguez-Feo Bermudez**, Pacific Northwest National Laboratory

*DOE Energy Skilled Recognition: A Path to Greater Contractor Visibility and Business Growth*
**Jesse Willett**, Pacific Northwest National Laboratory

## 6B. Rates and Incentives

The affordability of heat pump retrofits can be impacted by electric heating rates, building codes, and installation incentives. This session will highlight the current state of heat pump bill impacts and prevalence of heat pump tariffs, and examine alternative rate designs, performance-based codes, and tax incentives as mechanisms to reduce costs.

Moderator: **Jon Koliner**, Slipsteam Inc.

*Rate Design for Electrification and Energy Affordability*
**Vivan Malkani**, E3

*Electric Rate Reform: The Prevalence and Bill Impacts of Heat Pump Tariffs Across the US*
**Ryan Shea**, RMI

*Speeding Up Clean Heating: Global Insights on Policies and Pathways to Electrification*
**Cory Luker**, Resource Innovations

## 6C. Energy from Wastewater and the Sun

Paths less commonly taken include photovoltaics for water heating in cold climates or green CHP for both hot water and power; improving any water heating system's efficiency with solar thermal; solar pool heating technologies today; and central horizontal drain water heat recovery in larger buildings.

Moderator: **Harvey Sachs**, American Council for an Energy-Efficient Economy

*Get Over the Hump: Utilizing Solar Thermal Technology to Dramatically Improve the Efficiency of Any Water Heating System*
**Adam Chrisman**, SunEarth Inc.

*Solar Pool Heating Technologies*
**Jill Murphy**, Magen Eco-Energy US

*Green CHP - Hot Water AND Power from the Sun*
**Terry Bickham**, Green CHP

*PV Water Heating: Analyzing Affordability of Low-Carbon Water Heating Tech for Cold Climates*
**Isabelle Kosteniuk**, Natural Resources Canada

## 6D. Thermal Energy Storage

Integration of thermal energy storage systems with building heating and cooling systems can reduce peak thermal loads and improve energy efficiency. This session showcases different integration strategies and solutions.

Moderator: Ramy H. Mohammed, GTI Energy

*Strategies for Combining Air Source Heat Pumps and Thermal Energy Storage in Cold Climates*
**Samantha Hill**, Center for Energy and Environment

*Thermal Energy Storage: Market Barriers and Opportunities for Adoption in Buildings*
**Liz Traynor**, American Council for an Energy-Efficient Economy

*Novel Modular Residential Cold-Climate Heat Pump for Space Conditioning and Water Heating*
**Juan Catano**, NREL

**3:00 – 3:30 pm** **Networking Break**

**3:30 – 5:00 pm** **Concurrent Sessions**

## 7A. Affordable Multifamily II

Income-qualified multifamily buildings represent a largely untapped market for energy savings and present a particularly challenging landscape of split incentives that make capital expenses complicated to justify without a more holistic understanding of the potential for savings and improved comfort. In this session, we will hear about current efforts aimed at this market segment and discuss unique challenges faced when engaging them, with a focus on comprehensive strategies that address these market realities.

Moderator: **Ryan Hamilton**, Consortium for Energy Efficiency

*Electrifying Evanston – Lessons from the Green Homes Pilot Program*
**Bill Lyons**, Elevate

*Decarbonizing Public Housing: Sustainable Futures for Low-Income Multifamily Communities*
**Joel Wool**, Boston Housing Authority

*Why Multifamily Housing Is an Equity Pitch*
**Kristen Cheriegate**, ICAST

## 7B. Designing the Future: Innovative Utility Programs for Decarbonization

This session plans to explore the steps that utility programs are taking as their focus shifts to decarbonization and what these innovative programs look like today.

Moderator: **Kim Rose**, C+C

*Updating TRMs to Align with Decarbonization Goals*
**Deepti Dutt**, Northeast Energy Efficiency Partnerships

*Innovative Residential Electrification Programs*
**Nupur Hiremath**, Silicon Valley Clean Energy

## 7C. Performance Metrics

How can utilities continue to pay incentives on heat pumps when the savings are so difficult to measure accurately? Presenters will share some of the latest research on new metrics for measuring and differentiating heat pump performance and efficiency.

Moderator: **Suzi Asmus**, Northwest Energy Efficiency Alliance

*The Case for COPpeak*
**Jeff Stewart**, Trane Technologies

*Low-Load Efficient Heat Pumps – Lab and Field Data Analysis*
**JJ Sawicki**, TRC Companies

*Exploring Representativeness of Heat Pump Performance Ratings*
**Dave Lis**, Northeast Energy Efficiency Partnerships

### 7D. Gas Heat Pumps

Heat pumps aren't all electric—some are powered by fuels such as natural gas and hydrogen. This session covers these systems that can be more efficient than condensing combustion technology, including field studies of commercially available gas heat pump products, laboratory evaluation of pre-commercial systems, hydrogen-readiness of fuel-fired heat pumps, and sizing approaches tailored toward the unique characteristics of gas-fired heat pumps.

Moderator: **Kyle Gluesenkamp**, Oak Ridge National Laboratory

*GAHP Field Results in DHW Systems*
**Cristalle Mauleon**, Lincus Inc.

*Heat Pump Performance in California: Hydrogen-Natural Gas Blend Fired Water Heating Applications*
**Madeline Talebi**, ICF

*Comparing Current DHW Sizing Methods with Reality*
**Alyza Khan**, Lincus Inc.

*Laboratory Evaluation of Thermally-Driven Adsorption Heat Pump for Domestic Hot Water*
**Ramy Mohammed**, GTI Energy

*Commercial Gas Heat Pump Integrated with Boiler and Chiller Plants*
**Arjun Thirumaran**, GTI Energy

**5:30 – 7:00 pm Reception**

## Thursday, March 6 – Hot Air Forum

**7:00 am – 4:00 pm Registration**

**8:00 – 8:50 am Breakfast**

**9:00 – 10:30 am Concurrent Sessions**

### 8A. Affordability: Lessons from Clean TECH California

Moderator: **Peter Grant**, Lawrence Berkeley National Laboratory

*What can 8,000+ heat pump installs tell you about customer satisfaction, customer bills, and grid impacts?: Insights from participant surveys, meter-based energy impacts, and machine learning analysis of TECH Clean California Heat Pump Data.*

Presenters:
**Teddy Kisch**, Energy Solutions
**Jen Loomis**, Opinion Dynamics
**Adam Scheer**, Recurve
**Dylan Sarkisian**, Energy Solutions

## 8B. Heat Pumps and HVAC Business Structure

Moderator: **Paul Campbell**, ICF

*Evolving Business Models: The Opportunity to Equitably Support Development of Residential Electrification Service Provider Businesses that Specify and Install Heat Pumps*
**Zak Paine**, Slipstream

*Collateral Damage: Trends that Heat Pump Policies and Programs May Be Driving Up Heat Pump Costs Due to Attracting Anti-Competitive and Monopolistic Behavior*
**Matthew Horwitz**, Southern California Edison

*Leveraging Federal and Local Green Business Programs to Recommend Pollution Prevention Technologies*
**Max Ciarlone**, Cook County (IL) Department of Environment and Sustainability

## 8C. Installation Tools

The success of market-transforming HVAC technologies will depend on contractors being empowered to install them effectively. Come learn about the latest tools available for installers to find and manage jobs, select equipment, and validate performance.

Moderator: **Sam Larson**, Larson Energy Research

*Responsibly Scaling ASHPs in Cold Climates: Upskilling HVAC Contractors to Guess Less and Measure More*
**Zak Paine**, Slipstream

*Digitizing Contractor Workflows: What Works, Why It Matters, and How to Build the Future Software Stack*
**Jason Trager**, Plentiful.ai

*Tools for Your Heat Pump Quality Installation Toolbox*
**Christian Valoria**, Pacific Northwest National Laboratory

## 8D. Decarbonization Using Dual-Fuel Technologies

This session will examine the potential of dual-fuel space conditioning and water heating systems in building decarbonization. Presenters will discuss findings from modeling studies and field demonstrations that investigated energy and emission savings of various configurations of dual-fuel equipment. Presenters will also share insights and best practices from demonstrating residential ground source heat pump systems in the field.

Moderator: **Ramanathan Dharmarajan**, GTI Energy

*Navigating the Dual-Fuel Landscape: Insights and Strategies for Market Adoption*
**Aaron Winer**, Northwest Energy Efficiency Alliance

*The New Dual Fuel: Exploring Ground Source Heat Pumps with Gas Backup to Decarbonize Residential Heating*
**Kristen Dong**, Illume Advising

*Dual Fuel and All-Electric Heat Pumps: Ratings are only Half the Story, It Turns Out Installation Matters*
**Matt Haffner**, Illume Advising

## 10:30 – 11:00 am Networking Break

## 11:00 – 12:30 pm Concurrent Sessions

### 9A. Low-Income New Construction and Retrofits in Multifamily and Manufactured Homes

Low-income communities are among those most vulnerable to unexpected energy bills while being the most cost-constrained for expenditures on energy-efficient retrofits and new construction. This session explores case studies in energy-efficient manufactured and multifamily housing, pilot projects for grid-interactive multifamily retrofits, and research on the economic and social barriers to heat pump retrofits in manufactured housing.

Moderator: **Dr. Tyler Pilet**, Pacific Northwest National Laboratory

*Leave No Home Behind: Enhancing Access to Decarbonized Heating in Manufactured Homes*
**Hannah MacDonald**, Dunsky Energy + Climate Advisors

*Grid-Connected Multifamily Building Retrofit Program*
**Hardik Shah**, GTI Energy

*High-Efficiency Manufactured Homes Pilot in Georgia*
**Don Shirey**, EPRI

*Affordable Multifamily Electrification Retrofits in the Midwest: Monitoring and Verification Results*
**Justin Sharer**, Slipstream

### 9B. Refrigerants

Due to the phaseout of the high-GWP refrigerants, this session presents the latest research on new A2L refrigerants with lower GWP for both new installations and retrofit HVAC&R designs.

Moderator: **Ramy H. Mohammed**, GTI Energy

*Central Space Heating: Performance of VRF and AWHP Systems and Alignment with A2L Requirements*
**John Arent**, NORESCO

*Experimental Evaluation of Ultra-Low GWP R290 Residential Heat Pump Across Multiple Operating Conditions*
**Sarath Kannan**, GTI Energy

*Technology Update on Next Generation Refrigerants for Air Conditioning and Heat Pumping Applications*
**Samuel F. Yana Motta**, Oak Ridge National Laboratory

## 9C. Impact of Controls on Dual Fuel Heat Pump Performance

Maximizing the carbon reduction potential of dual-fuel heat pumps relative to an evolving electric grid depends on the optimization of their control strategies. Presenters will highlight the impact of different control schemes for dual-fuel heat pumps on cost and carbon to a homeowner. The session will also examine the cost-effectiveness of fully electrifying peak space heating needs in cold climates versus adopting dual-fuel systems in gas-connected homes.

Moderator: **Ramanathan Dharmarajan**, GTI Energy

*Optimizing Hybrid Heat Pump Swapover Temperature for Cost and Carbon Savings*
**Ethan Goldman**, Resilient Edge

*Benefits of Grid-Responsive Dual Fuel Heat Pump in 2025, 2035, and 2050 Grids*
**Zhenning Li**, Oak Ridge National Laboratory

*Hybrid Heat Pumps: Optimizing Backup Fuels for Decarbonization*
**Micah Sweeney**, EPRI

*Hybrid Heat Pumps Avoid Extreme Marginal Abatement Costs of Electrifying Peak Heating Loads in Cold Regions*
**Sean Smillie**, E3

## 9D. Advancing Heat Pump RTUs: Potential and Real Impacts

Rooftop units (RTUs) are the most common commercial HVAC equipment, yet heat pump RTUs are uncommon. Hear about efforts to deploy heat pump RTUs more broadly through a national campaign, a cold-climate heat pump RTU specification, state market transformation, and pairing RTUs with energy recovery.

Moderator: **Ben Schoenbauer**, Center for Energy and Environment

*Heat Pump RTUs – Accelerating Awareness, Availability, and Adoption (Part 2 Challenge)*
**Michael Deru**, National Renewable Energy Laboratory

*Heat Pump RTUs – Accelerating Awareness, Availability, and Adoption (Part 1 Campaign)*
**Jim Young**, Guidehouse

*Next Gen Rooftop Units: Modeling Performance and Influencing the Market*
**Leah Guenter**, Center for Energy and Environment

*Advancing RTU Performance with Heat Pumps and Energy Recovery*
**Daniel Raherimanjato**, Center for Energy and Environment

## 12:30 – 1:30 pm Networking Lunch

## 1:30 – 3:00 pm Concurrent Sessions

### 10A. Assessing Workforce Needs

Growing a workforce with the skills to perform building decarbonization jobs is necessary for improving the energy efficiency and resiliency of our building stock. This session will provide insights into what actions and market approaches have been successful in supporting the development of a clean energy workforce.

Moderator: **Rohini Srivastava**, American Council for an Energy-Efficient Economy

*Taking the Guesswork Out of Workforce Investment*
**Erin Kempster**, Opinion Dynamics

*Achieving Electrification and Decarbonization Goals Through the Contractor Network*
**Steven Jaslowich**, National Grid

*Ensuring Excellence in Ground Source Heat Pump Installations: Quality Assurance is a Pillar of Success*
**Carina Paton**, VoltaMetrics

### 10B. Utility Programs: incentives, TRMs, and Automation

Moderator: **Allegra Steenson**, Pacific Northwest National Laboratory

*Electrification: Carrot and Stick*
**Andrew Wiegand**, Michaels Energy

*How Heat Pumps Fit in Utility Programs and TRMs*
**Samuel Rosenberg**, Pacific Northwest National Laboratory

*Partnering with Utilities for Energy Efficiency and Building Optimization*
**David Burchfield**, Burch Energy Services

### 10C. Rooftops, PTACs, Window Units and More

Developing efficient and high-performing heat pumps in a variety of form factors will be key to decarbonizing commercial buildings. Presenters will summarize efforts to bring more efficient rooftop units to the market and how better cold-climate or dual-fuel models can provided the needed warmth in the harshest climates.

Moderator: **Jason Jones**, Northwest Energy Efficiency Alliance

*Building Demand for Heat Pump Rooftop Units*
**Bjorn Jensen**, Consortium for Energy Efficiency

*Dual Fuel RTUs for Drop-In Decarbonization*
**Jason LaFleur**, GTI Energy

*Assessment and Evaluation of Heat Pumps Designed for Use in Cold Climate Multifamily and Hospitality Buildings*
**Ben Schoenbauer**, Center for Energy and Environment

## 10D. Heat Pump Commissioning and Controls for Cold Climates

This session explores innovative strategies to enhance the performance, efficiency, and grid integration of heat pumps for building decarbonization. Topics include optimizing dual fuel heating systems with predictive controls, addressing cold-weather performance limitations to reduce grid strain, and advancing connected commissioning solutions for streamlined installation and operation.

Moderator: **Subhrajit Chakraborty**, UC Davis

*Connected Commissioning Heat Pumps – 4 Birds, 1 Stone*
**Christopher Dymond**, Northwest Energy Efficiency Alliance

*Decarbonization of Heat Pump Dual Fuel Systems Using Advanced Control: Field Demonstration in a Small Commercial Building*
**Jingjuan Dove Feng**, TRC Companies

*Bad Heat Pump System Setback Recovery – An Electrification Barrier*
**Ben Larson**, Larson Energy Research

## 3:00 – 3:30 pm Networking Break

## 3:30 – 5:00 pm Concurrent Sessions

## 11A. Space Heating Up-front and Operational Costs

This session focuses on the costs associated with heat pumps and electrification. Presenters will share data behind heat pump upgrade costs, solutions to address cost barriers, and program designs to address affordability.

Moderator: **Justin Margolies**, Slipstream Inc.

*The Answer is Finally Here: How Much Does a Heat Pump Upgrade Versus a Gas Like-for-Like Replacement Actually Cost?*
**Malena Hernandez**, Opinion Dynamics

*U.S. Heat Pump Affordability: Top Strategies to Address Upfront and Operating Costs*
**Russell Unger**, RMI

*How to Design a Beneficial Electrification Program that is an Affordability Program*
**Ryan Kristoff**, ICAST

## 11B. Bringing Advanced, Efficient Space Conditioning to New Markets

Window heat pumps are an emerging packaged air source heat pump implementation promising portability, simplicity, and rapid deployment to market segments that can be difficult to serve, such as multifamily buildings and rented single family homes. These products can perform as efficiently as a conventional mini-split system, yet be installed without any tools or training, and new cold climate models are expanding the potential reach of the market rapidly. Hear CalMTA's Elaine Miller discuss the developments in delivering these products to the California Market, as well as VEIC's Jake Marin experiences bringing renters through the "DIY" process of installing a window heat pump in Vermont. Leading window heat pump manufacturer Gradient's Sam Lamos will also be on hand to discuss their market strategy, major partnerships, and other research currently being conducted on window heat pumps.

Moderator: **Matt Booth**, Washington State University

*Window Heat Pump Deployment Strategies and Results*
**Samantha Lamos**, Gradient Comfort

*Window Heat Pumps for Renters - A DIY Electrification Solution for an Underserved Population?*
**Jake Marin**, VEIC

*Transforming the Market for Room Heat Pumps: How Strategic Partnerships Can Accelerate Technology Adoption and Accessibility*
**Elaine Miller**, CalMTA/Resource Innovations

## 11C. Cold Climate Heat Pumps and Peak Impact

The session presents field and modeled data from investigation of both VRF and residential split system cold climate heat pumps. The results provide insight into challenges and potential solutions for addressing peak power consumption during periods of very cold weather.

Moderator: **Christopher Dymond**, Northwest Energy Efficiency Alliance

*The Challenge of Decarbonizing Peak Heat*
**Sean Smillie**, E3

*Annual Energy Savings and Peak Power Reduction Simulated for Cold Climate Heat Pumps*
**Bo Shen**, Oak Ridge National Laboratory

*Cold-Climate VRF: Is VRF an Electrification Option in the Future?*
**Kevin Frost**, Slipstream

## 11D. Field Study Data

Fact vs. Fiction: What is really happening with ASHP performance in cold climate conditions? Join us in this session to hear results from several field studies on real-world heat pump performance in cold climates.

Moderator: **Suzi Asmus**, Northwest Energy Efficiency Alliance

*Lab and Field Test of a Minisplit HP in Alaska*
**Jeff Munk**, National Renewable Energy Laboratory

*Characterizing Real-World Performance of Air Source Heat Pumps: Insights from Seven Midwest Studies*
**Dani Ball**, Slipstream

*Key Findings and Next Steps for the Residential Cold Climate Heat Pump Technology Challenge*
**Vrushali Mendon**, Pacific Northwest National Laboratory

***Thank you for attending!***