



# 2020 HOT WATER FORUM VIRTUAL

JULY 21, 22, 28, 29



(Presentation times below are EDT)

## ***Preliminary Program (subject to change)***

TUESDAY, JULY 21

### **12:00 – 1:30 pm (EDT) [Welcome and Plenary Panel](#)**

Welcome and Introductions: **Chris Perry**, American Council for an Energy-Efficient Economy

Welcome from Sponsors: **Karen B. Meyers**, Vice President, Government Affairs  
Rheem Manufacturing Company

**Joshua C. Greene**, Vice President, Government and Industry Affairs  
A.O. Smith Corporation

### **[Plenary Panel: Making Efficient Water Systems Accessible to All](#)**

Moderator: **Megan Geuss**, Appliance Standards Awareness Project

Panelists: **Matt Cox**, Greenlink Group  
**Charles E. "Chip" Greene**, Greene & Associates, Inc.  
**Alice Rosenberg**, Consortium for Energy Efficiency

### **1:30 – 1:45 pm (EDT) Break**

### **1:45 – 2:45 pm (EDT) Concurrent Sessions**

#### **[\(SS1\) Lessons Learned from Innovative Water Heater Programs](#)**

Utilities are increasingly recognizing the importance of program elements beyond specifications and downstream rebates that contribute to success. Midstream models, contractor training efforts, supply chain engagement, awareness building, and other strategies are helping efficiency programs drive market transformation for the uptake of efficient and connected water heaters. This session will take an in depth look at how these approaches are adopted in local service territories, what insights can be gleaned from these evolving components, and how newer programs can leverage these opportunities to maximize their impacts.

Moderator: **Kim Katz**, Consortium for Energy Efficiency

Panelists: **Jesus Pernia**, Eversource  
**Jennifer Sylvester**, National Grid  
**Francois Lebrasseur**, A.O. Smith Corporation

## (SS2) Designing and Decarbonizing Multifamily Hot Water Systems

This session will cover three topics as they relate to multifamily occupancies. What are the incentives and regulations surrounding efforts to decarbonize water heating? How can hot water systems be right-sized based on modern materials and water-efficient flow rates? What have we learned from measured data that can help improve our models of energy and water use?

Moderator: **Gary Klein**, Gary Klein and Associates

Carrots and Sticks Driving Central System Decarbonization

Presenters: [Nicole Ceci](#), Steven Winter Associates  
[Shawn Oram](#), Ecotope, Inc.

Right Sizing Multifamily Systems and Gallons/Day Use

Presenter: [Pete Skinner](#), E2G Solar, LLC

Field Data vs. Models: Multifamily Hot Water Consumption

Presenter: [Emily Higbee](#), Redwood Energy

**2:45 – 3:05 pm (EDT) Chat Rooms – Information shared in Sessions 1 and 2**

**3:05 – 3:15 pm (EDT) Break**

**3:15 – 4:15 pm (EDT) Concurrent Sessions**

## (SS3) Electric HPWHs: Next Generation Refrigerants and Load Shifting

From alternate refrigerants to increasing use of heat pump water heaters as grid resources, heat pump water heater applications are growing and so is their adoption. In this session, we will take a deeper dive into new developments in heat pump water heaters. The first two presenters cover the latest research in next generation refrigerants and reducing refrigerant charge in heat pump water heaters to maximize safety. In the final session, we will turn our attention to load shifting strategies for CTA-2045 enabled water heaters.

Moderator: **Jessica Peters**, Energy Solutions

An Overview of Alternate Refrigerants for HPWH Applications

Presenter: [Kashif Nawaz](#), Oak Ridge National Laboratory

Refrigerant Charge Reduction for Heat Pump Water Heaters

Presenter: [Bo Shen](#), Oak Ridge National Laboratory

Non-Targeted vs. Targeted Load Shifting Using Heat Pump Water Heaters

Presenters: [Cheryn Metzger](#), Pacific Northwest National Laboratory  
[Ebony Mayhorn](#), Pacific Northwest National Laboratory

## (SS4) Healthy Hot Water Distribution Systems

Properly designing, operating, and maintaining hot water distribution systems is necessary for reducing health risks to occupants like Legionella infections. This is particularly true in the midst of the COVID-19 pandemic, as many buildings have remained unoccupied for months and could potentially have bacteria build up from stagnant water. This session will provide an overview of healthy hot water systems and discuss safety considerations and lessons for buildings in response to the current pandemic.

Moderator: **Hannah Bastian**, American Council for an Energy-Efficient Economy

Legionella and Plumbing Design: Report from the National Academies of Sciences

Presenter: [Amy Pruden](#), Virginia Tech

Flushing to Control Legionella: Limitations and Knowledge Gaps

Presenter: [William Rhoads](#), Virginia Tech

Designing Legionella Out of Building Plumbing

Presenter: [Tim Keane](#), Legionella Risk Management, Inc.

**4:15 – 4:35 pm (EDT) Chat Rooms – Information shared in Sessions 3 and 4**

WEDNESDAY, JULY 22

**12:30 – 1:30 pm (EDT) Concurrent Sessions**

**(SS5) Water Heating Demand Response Opportunities in Gas and Electric**

Grid Interactive water heaters have the potential to dramatically impact the grid in a positive way providing a flexible load with energy storage capacity. The ability to balance load and store energy will become increasingly important as more renewable generations get added to the grid. The panel will provide some insight into real world deployments highlighting the benefits and challenges ahead as we move from pilots to large scale roll outs of GIWHs.

Moderator: **Matt Carlson**, Aquanta

Water Heaters as a Peak Pricing Tool

Presenters: [Jessica Atwater](#), CLEAResult  
[Rebecca Brisson](#), Portland General Electric

Aggregating Grid-Interactive Water Heaters as a 2.5MW Virtual Power Plant

Presenter: [Olin Lagon](#), Shifted Energy

ConEdison Gas Water Heater Demand Side Management Pilot

Presenter: **Kenn Latal**, ICF

**(SS6) Modeling the Performance of Water Heaters**

Simulation models are powerful tools capable of both estimating HPWH energy use and informing HPWH design. This session will provide attendees with a look into recent advances in modeling by detailing how the models work and what they can tell us about water heaters. The first talk shows new techniques for modeling combi systems, the emerging product class of tankless water heaters serving both water and space heating loads, including one-half inch gas line-capable products. The next presentation covers updates to the EnergyPlus stratified tank model to significantly speed up calculation time and assesses the effectiveness of different condenser wrap patterns around tanks. The final presentation presents experimental evaluations of the performance of heat pump water heaters under a variety of temperature and humidity conditions.

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

Reduced Order Models of Tankless Water Heaters and Combis

Presenter: [Alex Fridlyand](#), GTI

Improving Performance of the Stratified Tank Water Heater Model in EnergyPlus

Presenter: [Noel Merket](#), National Renewable Energy Laboratory

Experimental Evaluation of UEF at Various Ambient Conditions: Variation of UEF with Temperature and Relative Humidity

Presenter: [Kashif Nawaz](#), Oak Ridge National laboratory

**1:30 – 1:50 pm (EDT) Chat Rooms – Information shared in Sessions 5 and 6**

**1:50 – 2:00 pm (EDT) Break**

**2:00 – 3:00 pm (EDT) Concurrent Sessions**

**(SS7) Hot Water Technologies Helping Us Get Closer to Zero Energy**

With the increased interest in getting to zero energy (and zero carbon) buildings, it is important to explore creative solutions for producing and distributing hot water. This session explores some of the cutting-edge technologies and applications being used to achieve ambitious energy performance goals. The moderator will provide a brief overview of promising technologies and then our presenters will provide details of specific technologies and projects. Presentations will cover 1) a system using waste heat from a building's chilled water system to provide domestic hot water and 2) a unique combination of solar photovoltaic (PV) and solar thermal water heating.

Moderator: **Jennifer Amann**, American Council for an Energy-Efficient Economy

New Technologies to Produce Domestic Hot Water

Presenter: **Richard Furman**, New Energy Technologies, LLC

Small Home Energy System Analysis Comparing Conventional HVAC/DHW vs. SunDrum® System

Presenter: **Michael Intrieri**, SunDrum® Solar

**(SS8) New Technologies and Research in Residential Gas Water Heating**

Looking beyond the standard gas-fired storage water heater, with low efficiency operation and a negative impact on the building envelope, the presenters will discuss new research findings, demonstration results, and innovative products in residential gas water heating. Speakers will discuss a) a recent study to establish a technically-sound greenhouse gas emission rate for tankless gas water heaters, focusing on methane emissions, b) the potential for combined space and water heating systems through product design, system controls, and installation best practices, and c) the demonstration and deployment of residential gas heat pump water heaters.

Moderator: **Paul Glanville**, GTI

Methane Emissions from Tankless Water Heaters

Presenter: **Erin Bonetti**, GTI

Improvements in Combi System Controls and Efficiency

Presenter: **Stephen Bagshaw**, iFlow

Moving Past 100% Efficient: Results from a California Demonstration of Residential Gas Heat Pumps

Presenter: **Merry Sweeney**, GTI

**3:00 – 3:20 pm (EDT) Chat Rooms – Information shared in Sessions 7 and 8**

**3:20 – 3:30 pm (EDT) Break**

**3:30 – 4:30 pm (EDT) Shameless Commerce Happy Hour**

TUESDAY, JULY 28

**12:30 – 1:30 pm (EDT) Concurrent Sessions**

**(SS9) Market Transformers: Codes and Standards Deliver More Savings than Meets the Eye**

Energy codes and appliance standards represent significant cost-effective savings opportunities at both the state and national level and have the potential to significantly reduce energy use and CO<sub>2</sub> emissions. These approaches lock in the savings made possible by advancing technologies and maturing markets, supported by efficiency programs and energy advocates. Presenters will cover the efforts to advance codes and standards activities at the state, national, and international levels. A close look at recent California building codes and appliance standards efforts will lead into a discussion of U.S. and Canadian strategies and opportunities, leading to an investigation of their applicability in other top emitting countries of the world.

Moderator: **Chris Granda**, Energy Solutions

How Can the U.S. Water Efficiency Standards Inform Worldwide CO<sub>2</sub> Reduction?

Presenter: **Matt Malinowski**, CLASP

Two for One: How States Can Start Meeting Energy and Water Goals with Hot Water Efficiency Standards

Presenter: **Megan Geuss**, Appliance Standards Awareness Project

Supersized Savings: California Unlocks Huge Hot Water Savings through Codes and Standards

Presenter: **Amin Delagah**, Pacific Gas & Electric

**(SS10) Important Considerations for Energy-Efficient Multifamily Hot Water Systems**

This session will cover three key topics for optimizing multifamily hot water system designs. How can architectural decisions be used to improve the performance of the hot water system and increase customer satisfaction? What are some ways to improve the efficiency of central hot water distribution systems? What are the factors that need to be considered when trying to optimize heating capacity and storage volume for large heat pump water heating systems?

Moderator: **Larry Weingarten**, Consultant

What Can You Do Before Sending Out the Bid to the Plumber in Multifamily New Construction?

Presenter: **Gary Klein**, Gary Klein and Associates

Distribution Done Right: Efficient Hot Water Distribution Design for Multifamily Buildings

Presenter: **Dylan Martello**, Steven Winter Associates

Balance of Heating Capacity and Storage Volume in Central Heat Pump Water Heating Systems

Presenter: **Yanda Zhang**, ZYD Energy, Inc.

**1:30 – 1:50 pm (EDT) Chat Rooms – Information shared in Sessions SS9 and SS10**

**1:50 – 2:00 pm (EDT) Break**

**(SS11) Making Heat Pump Water Heaters the Right Fit for California**

As HPWH technologies are utilized to begin the ‘electrification’ and ‘decarbonization’ of the California water heating market, we can learn from those who are actively engaged with HPWH product development, product deployment and product application within the state. Whether in new construction or retrofit applications, California has the opportunity to transition its water heater market to an electric, high-efficiency, manageable system that can integrate increasing amounts of clean, renewable energy while seamlessly providing for the hot water needs of consumers and businesses.

Moderator: **Panama Bartholomy**, Building Decarbonization Coalition

Decarbonizing Building Hot Water Loads with Heat Pump Retrofits in Large Multifamily Properties

Presenter: **Amy Nagengast**, Bright Power

Retrofit-Ready Heat Pump Water Heaters: Progress Update After One Year

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

Heat Pump Water Heater Load Shifting Incentives in California

Presenter: **Pierre Delforge**, Natural Resources Defense Council

**(SS12) How Do Humans Use Hot Water**

To create an energy efficient hot water system, we must first understand how humans use hot water. Our first presentation will explore behavioral findings of handwashing experiment using “autonomous” faucets. We’ll then switch gears and focus on hot water usage profiles that can be used by hot water researchers and designers for evaluating innovative water heating technologies and related hot water studies.

Moderator: **Chris Perry**, American Council for an Energy-Efficient Economy

Smart Faucets and Behavioral Design

Presenter: **Erin MacDonald**, Stanford University

California’s Title 24 Draw Profiles are Now Available

Presenter: **Peter Grant**, Beyond Efficiency

Identifying Field-Representative Draw Profiles

Presenters: **Travis Ashley**, Pacific Northwest National Laboratory

**Walter Hunt**, Pacific Northwest National Laboratory

# WEDNESDAY, JULY 29

**12:30 – 1:30 pm (EDT) Concurrent Sessions**

## **(SS13) New Commercial Hot Water Program Opportunities: Pumps and Commercial Kitchens**

Commercial and industrial incentive programs have historically been focused on high-touch custom program approaches that are resource intensive and often limited by low volume and uptake. However, this paradigm is changing as new opportunities and approaches are created for hot-water-related end uses. This session focuses on new market developments and shares new insights, successes, and lessons learned from implementing new program approaches for commercial pumps and food service equipment. Pumps, as the often-overlooked work horses of hydronic heating systems and recirculation systems in residential and commercial buildings, rarely receive much thought or attention. However, there has been a great deal of recent activity in the pump industry, including new regulations that will increase pump efficiency that took effect in January 2020 and new deemed midstream utility programs for pumps that are delivering dramatic energy and water savings to programs and consumers. Commercial foodservice represents another significant hot water savings opportunity but poses challenges as foodservice customers reflect a diverse set of market actors. This session will highlight a uniquely successful program approach, point of sale rebates, that promote a wide variety of commercial foodservice equipment and delivers significant hot water savings while meeting the demands of this challenging market.

Moderator: **Sarah Widder**, Cadeo Group

What's New in Pumps?

Presenter: [Sarah Widder](#), Cadeo Group

Pump Up the Volume

Presenter: [Shonte Davidson](#), Eversource

Market Momentum: Point of Sale Programs Drive Foodservice Savings

Presenters: [Jessica Abrera](#), AVANGRID  
[Danielle Poulin](#), Eversource

## **(SS14) Thermal Heat Pump Innovations: Commercial and "Combi" Applications**

Thermal heat pump (THP) technologies represent the opportunity to cut energy use and carbon emissions by up to 50%, compared to traditional gas water heaters or combination systems. Multiple products for commercial water heating and whole house "combi" system applications are under development; come to this session to learn the latest information about performance and lessons learned from field installations. Additionally, speakers will reflect on the design and control of "combi" and "hybrid" installations, with THP equipment serving multiple loads (HVAC + hot water) and/or optimized to operate in conjunction with conventional water heaters and boilers.

Moderator: **Aaron Winer**, Northwest Energy Efficiency Alliance

Residential Gas-fired Heat Pump Combi Systems: System Design and Demonstration Results

Presenter: **Chris Keinath**, Stone Mountain Technologies, Inc.

Results and Key Findings from FortisBC's Gas Absorption Heat Pump Pilot

Presenters: [Rav Deol](#), FortisBC **Jim Kobialko**, Fortis BC

Innovative Applications of THPs in Multifamily Buildings and Restaurants

Presenter: **Paul Glanville**, GTI

**1:30 – 1:50 pm (EDT) Chat Rooms – Information shared in Sessions 13 and 14**

**1:50 – 2:00 pm (EDT) Break**

## 2:00 – 3:00 pm (EDT) Concurrent Sessions

### [\(SS15\) Grid-Interactive Efficient Water Heaters](#)

This session will cover the use of heat pump water heaters to provide a variety of services to the electric grid. In addition to providing an overview of techniques and forecasts of their potential for load shifting, methods for controlling individual and fleets of heat pump water heaters to best accommodate demand response will be presented. Results will be presented from laboratory testing, field trials, and simulation programs.

Moderator: **James Phillips**, Guidehouse

Exploring the Functionality and Value of Electric Storage Water Heaters as Flexible Resources

Presenter: [Doug Lindsey](#), Electric Power Research Institute

Custom Controls for Improved Demand Response from heat Pump Water Heaters

Presenter: [Bethany Sparr](#), National Renewable Energy Laboratory

Connected HPWHs: Method to Forecast Energy Use and Extrapolate Load Shifting Potential

Presenter: [Joshua Butzbaugh](#), Pacific Northwest National Laboratory

### [\(SS16\) Modeling and Plumbing System Design](#)

The presenters will cover four topics including: Just what is the pressure drop in modern pipe and fittings, and why does it matter to plumbing design; Why is it so important to right-size water distribution systems based on current and expected flow rates?; What percentage of the hot water events aren't actually hot from the perspective of the user and what does this mean for system design?; and, What can we learn from architectural decisions that affect the location of the wet rooms and the water heater(s)?

Moderator: **Gary Klein**, Gary Klein and Associates

Pressure Drop in Modern Pipe and Pipe Fittings

Presenter: [Emily Higbee](#), Redwood Energy

Right Sizing Water Distribution Systems to Meet Today's and the Future's Fixture Demand

Presenter: [Rich Houle](#), Reliance Worldwide Corporation

How Hot is Hot Enough? Quantifying Unmet Loads in Simulation

Presenter: [Jeff Maguire](#), National Renewable Energy Laboratory

How Low Can We Go? How Close Can We Get? 2020 Update

Presenter: [Yanda Zhang](#), ZYD Energy

## 3:00 – 3:20 pm (EDT) Chat Rooms – Information shared in Sessions SS15 and SS16