

March 10-11, 2021

March 17-18, 2021

Program

(Presentation times below are EDT)

WEDNESDAY, MARCH 10

12:00 – 1:30 pm (EDT) Welcome and Plenary Panel

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

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

Plenary Panel: Efficient Hot Water Systems: Perspectives from Around the World

Moderator: **Matt Malinowski**, CLASP

World's Next Water Efficiency Standards: South Africa

Presenter: **Adrie Fourie**, Solid Green Consulting

World's Next Water Efficiency Standards: India

Presenter: **Mohit Verma**, Environmental Design Solutions

International ISO Standards for Rating Water Efficiency Products

Presenter: **Richard Lambert**, Standards Australia

1:30 – 1:45 pm (EDT) Break

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

(S1) All Boats Rise on Heat Pump Water Heaters: Leveraging Supply Chain Partners to Drive Market Alignment and Customer Demand

It has been historically challenging for a single entity to deliver HPWH market transformation. Collaborative initiatives at a regional level with a potential to scale nationally may offer an alternative path to success. ENERGY STAR®, in partnership with NEEA and their member utilities, product manufacturers, and national retailers, will be launching a unique and dynamic HPWH marketing campaign during 2Q across the Pacific Northwest. Leveraging ENERGY STAR'S national partnership network, this collective team plans to share learnings and help launch similar programs across the country. In this session, a cross functional partnership team will describe their contribution to program design and execution, the success metrics established, and the assets created to optimize the path to purchase. Attendees will learn how to form alliances to accelerate HPWH market adoption in their territories.

Moderator: **Nathaniel Jutras**, U.S. Environmental Protection Agency

Open Waters: ENERGY STAR and the Untapped Potential of Heat Pump Water Heaters

Presenter: **Nathaniel Jutras**, U.S. Environmental Protection Agency

Setting Sail: NEEA Launches Transformative Consumer Awareness Campaign to Grow the Heat Pump Water Heater Market

Presenter: **Kyle Stuart**, Northwest Energy Efficiency Alliance

More Hands-on Deck: ENERGY STAR Council Provides Platform for Manufacturers to Hop Onboard

Presenter: **Kevin Clark**, Rheem

(S2) Thinking of Hot Water as a System

Hot water systems are more than just a collection of components. These components interact with each other and affect the performance of the system. This session will explore three different aspects of hot water systems. The first presentation will be about a new method of passive freeze protection for flat plate thermosyphon solar thermal water heaters. The second will be about the interaction of WaterSense shower heads and the time it takes to clear out the structural waste at the start of a shower event. The third presentation will explore the implications of using 1-pipe systems to bring water to hand washing sinks on occupant health and safety, including Legionella risk.

Moderator: **Kanchan Swaroop**, Appliance Standards Awareness Project

A New Passive Freeze Protection Method for Thermosyphon Solar Water Heating

Presenter: **Robert Stayton**, Sagehill Enterprises

Reducing Hot Water Waste and Waits for WaterSense Shower Heads

Presenter: **Troy Sherman**, Evolve Technologies

Considering the Elimination of Hot Water for Handwashing Sinks

Presenter: **Brian Hageman**, Mazzetti

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

(S3) Large Scale System Design and Sizing

This session will present new tools to support the design and sizing for large capacity water heating systems. The first presenter will compare pipe sizing using the Water Demand Calculator to the standard methods in the International Plumbing Code and the Uniform Plumbing Code. The second presenter will introduce the Ecosizer, a tool that will help designers size the various commercial heat pump water heaters systems. The third presenter will discuss the addition of multifamily water heating systems to *NEEA's Advanced Water Heating Specification 8.0*. The final presenter will highlight programs that have evolved a midstream program design to address multiple water heating opportunities under a comprehensive program offering.

Moderator: **Bouba Diemé**, Consortium for Energy Efficiency

Reducing Hot Water Energy Use by Use of the Water Demand Calculator

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

The Ecosizer: A Central Heat Pump Water Heating Sizing Tool

Presenter: **Paul Kintner**, Ecotope

Adding Multifamily Water Heating Performance Specification to the Advanced Water Heating Specification 8.0

Presenters: **Geoff Wickes**, Northwest Energy Efficiency Alliance

Nicky Dunbar, Northwest Energy Efficiency Alliance

Ready to Leave the Nest: Programs Learn to Fly When They Move Beyond Water Heaters

Presenter: **George Chapman**, Energy Solutions

(S4) Next Generation Fuel-fired Technologies: From the Lab to the Market

The direct use of natural gas has long been heralded as a clean and efficient method for space and water heating. In our new era of climate awareness, the natural gas industry is looking to do even more and develop “quantum leap” technologies delivering unprecedented energy savings and carbon emissions reductions. First, we’ll hear the utility perspective, where representing more than one-third of gas residential customers across the US and Canada, eighteen utilities have formed the North American Gas Heat Pump Collaborative to jointly support accelerated and sustained adoption of gas heat pump technologies. Work is underway to characterize the market, engage with industry partners and develop strategies that will prime the market for accelerated adoption when new products arrive. Then we’ll hear two updates on advanced fuel-fired technologies, including recent results from development and demonstration of emerging fuel-fired heat pump water heaters for homes and businesses.

Moderator: **Paul Glanville**, GTI

Priming the Market to Accelerate Gas Water Heating Efficiency

Presenter: **Jim Jerozal**, Nicor Gas

Evaluating a Robur Gas-fired Heat Pump

Presenter: **Martin Thomas**, Natural Resources Canada

Experimental UEF Results of a Prototype Semi-open Sorption Membrane-based Water Heater

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

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

THURSDAY, MARCH 11

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

(S5) Hot Water Programs: Reaching All Corners of the Market

Utility programs can help consumers afford energy efficient hot water equipment. However, not all programs take in to account additional considerations in in low-income communities. This session will explore the topic of equity in the hot water sector from a few angles, including improving metrics to better account for underserved populations, improving diversity and equity in programs, and motivating the workforce to consider the issue of equity.

Moderator: **Elizabeth Freeman**, Nexant

MCE’s Low-Income Families and Tenants Pilot Program: Electrifying Affordable Housing

Presenter: **Megan Ching**, Association for Energy Affordability

Equity in Water Heating from a Workforce Perspective

Presenter: **Adam Parker**, Emerald Cities Collaborative

Achieving Diversity and Equity in the Programs

Presenters: **Shonte Davidson**, Eversource

Ruth Georges, Eversource

(S6) Advances in Heat Pump Water Heaters

The latest advances in HPWH are presented. The studies presented in this session cumulatively represent several years of experimental data. First is a field study in which HPWH controls were optimized considering simultaneous objectives of meeting hot water needs while reducing demand, energy, greenhouse gases, and cost. Next is a field study comparing the performance of an off-the-shelf HPWH unit charged with a conventional high global warming potential (GWP) refrigerant (R134a) to the same HPWH unit charged with a low-GWP refrigerant (R1234yf). Finally, the measurable performance impacts of the anti-siphon hole in common dip tubes are presented based on experimental laboratory data.

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

Residential Heat Pump Water Heater (HPWH) Sizing and Optimization

Presenter: **Greg Pfothenauer**, Franklin Energy

Alternative Refrigerants for Residential Heat Pump Water Heaters (HPWH) with R1234yf Field Evaluation

Presenters: **Kashif Nawaz**, Oak Ridge National Laboratory

Jeff Munk, Oak Ridge National Laboratory

The Impact of the Dip-tube Anti-siphon Hole on Tank Performance Metrics

Presenter: **Joseph Rendall**, 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

(S7) Love (of Water Heating) in the Time of COVID

The COVID crisis has impacted all aspect of our lives, and the water heating industry is no exception. However, as water heating represents an essential service and supports sanitation and customer health, the industry continued to meet customer needs every day, in the field, despite unprecedented challenges. Water heaters don't stop failing just because a pandemic has struck, and the industry didn't stop either. This session will highlight how the industry has responded and adapted in the face of the constantly evolving landscape.

Moderator: **George M. Chapman**, Energy Solutions

COVID Impacts from an Efficiency Program Perspective

Presenter: **Charlie Taylor**, Energy Solutions

COVID Impacts from a Manufacturer Perspective

Presenter: **Karen Meyers**, Rheem Manufacturing

COVID Impacts from a Distributor Perspective

Presenter: **Michael Kelly**, The Granite Group

(S8) Modeling and Optimizing Tanks, Heat Exchanges, and Controls

Tank type water heaters are the most common water heaters and are very promising for reducing peak demand because of their large energy storage capacity. Modeling of the tank, the heat exchanger, and controls are explored in this session. The first presentation introduces a physical model of buoyancy and flow phenomena within the tank itself, and the second presentation describes a heat exchanger technology and design tools for improving the efficiency heat pump water heater systems. The third presentation describes a method to minimize electricity cost during time-of-use electricity pricing using the latest model-free reinforcement learning techniques.

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

Water Heater Multi-Physics Simulation for Predictive Virtual UEF Testing

Presenters: **Divya Thiagarajan**, Gamma Technologies
Jonathan Harrison, Gamma Technologies

Optimization of Copper-tub Coils for Energy Efficiency and Charge Reduction in Heat Pump Water Heaters

Presenter: **Yoram Shabtay**, Heat Transfer Technologies and International Copper Association

Reinforcement Learning-Based Water Heater Control

Presenter: **Kadir Amasyali**, Oak Ridge National Laboratory

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 - Zoom Platform

WEDNESDAY, MARCH 17

12:30 – 1:30 pm (EDT) Plenary Session

Carrots and Sticks in Hot Water: The Heat Pump Water Heater Policy and Program Rodeo

Introductions and Moderator: **Amruta Khanolkar**, New Buildings Institute

Magnitude of the Opportunity and AWHI Overview

Presenter: **Smita Gupta**, New Buildings Institute

Best Policy and Regulatory Examples across the Country

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

Market Development – Best Incentive Program Examples across the County and Market Demand Building Effort through AWHI

Presenter: **Owen Howlett**, Sacramento Municipal Utility District

Small Commercial/Central Technology and Market Confidence Building Efforts through AWHI

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

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

(S9) ENERGY STAR® Water Heater Specification and Test Method for Connected Water Heaters

This session will cover ENERGY STAR's connected water heater specification and test method. Explore how grid-connected water heaters in Hawaii are part of a public private project improving energy efficiency and distributed energy resource benefits in a cost-effective manner. Presenters will also explain how adding storage technology can expand the load shifting benefits of grid-connected water heaters.

Moderator: **Bill Hosken**, A.O. Smith

ENERGY STAR: Water Heater Specification and Test Method for Connected Residential Water Heaters

Presenter: **Bethany Sparn**, National Renewable Energy Laboratory

Public Private Partnerships: Delivering Complementary Value with Energy Efficiency and Distributed Energy Resource Integration

Presenter: **Forest Frizzell**, Shifted Energy

State of the Art Storage: Expanding Connected Water Heater Load Shifting

Presenter: **Kashif Nawaz**, Oak Ridge National Laboratory

(S10) Legionella and Hot Water: Balancing Health and Sustainability

During this session, we will review how hot water temperatures can positively or negatively impact public health and safety. Topics covered include but are not limited to hot water temperatures and legionella, hot water design consideration, and hot water return system balancing concerns. The presentation will conclude with an update in regard to some of the latest codes, standards, and guidelines that the industry is producing and how they could affect domestic hot water systems.

Moderator: **Christoph Lohr**, International Association of Plumbing and Mechanical Officials

Hot Water and Legionella: Balancing Public Health and Sustainability

Presenter: **Christoph Lohr**, International Association of Plumbing and Mechanical Officials

Reducing Water Temperature Energy Savings

Presenters: **Maile Akina**, LiquiTech

Scott Wolber, LiquiTech

2:45 – 3:05 pm (EDT) Chat Rooms – Information shared in Sessions SS9 and SS10

3:05 – 3:15 pm (EDT) Break

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

(S11) Next-Gen Commercial Water Heating Products

This session will present three novel commercial water heating products that aim to maximize the production, efficiency, and cost-effectiveness of heated water with storage systems. The first presenter will provide an overview of a heat pump plus storage system and how it works. Next, a new CO₂-based heat pump water heater and storage system close to being launched in the US market will be presented. To finish, attendees will learn about a geothermal-enabled heat pump distributed DHW system, which can be readily retrofitted to any building complex using small thermal storage tanks and heat pumps wherever they are convenient.

Moderator: **Geoff Wickes**, Northwest Energy Efficiency Alliance

Central Heat Pump Water Heaters

Presenter: **Ryan Hamilton**, Nyle Water Heating Systems

Heat20: A Smart, Grid Connected CO₂ Heat Pump Solution for Commercial Buildings

Presenter: **Cain White**, Mitsubishi Electric Trane HVAC US

Pioneers in High-Efficient Electric Thermal Energy Recovery

Presenter: **Lynn Mueller**, SHARC Energy

(S12) Decarbonizing the Gas Grid: Opportunities and Challenges for Water Heating

Three experts will share innovations and challenges in decarbonizing the gas grid, through blending delivered fuels with zero-carbon hydrogen. Whether it provides seasonal storage of renewable electricity at a massive scale ("green" hydrogen) or eliminates carbon emissions associated with natural gas ("blue" hydrogen), fueling homes and businesses with hydrogen is viewed as a critical piece in the decarbonization puzzle. Speakers will provide an overview of the opportunities and challenges with operating fuel-fired water heaters using blended and pure hydrogen, drawing lessons from research and demonstrations in Europe, Asia, and North America, while providing perspectives from academia, utilities, and industry. The session will highlight results from recent laboratory tests on water heaters, discuss hydrogen-blending pilots in North America, and outline a decarbonization pathway for fuel-fired water heating, from UC Irvine, SoCalGas, and GTI.

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

Overview of Blended Hydrogen Impacts on Water Heating Equipment

Presenter: **Paul Glanville**, GTI

Hydrogen-fueled Impacts on Residential Equipment: Simulation and Testing Results

Presenter: **Yan Zhao**, University of California – Irvine

Opportunities and Challenges with Decarbonized Fuels: The Utility Perspective

Presenter: **Kevin Woo**, SoCalGas

4:15 – 4:35 pm (EDT) Chat Rooms – Information shared in Sessions 11 and 12

THURSDAY, MARCH 18

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

(S13) The Hot Water Battery: Emerging Heat Pump Water Heater Technologies and Grid Connectivity

This session will cover the ways that water heaters are being used as an energy storage mechanism to accommodate intermittent energy generation on the grid. A key part of these advances involves emerging heat pump water heater technologies. Communication standards and field results reporting on the use of heat pump water heaters for thermal storage and grid management will be discussed.

Moderator: **Bill Healy**, National Institute of Standards and Technology

Greening the Grid: Emerging HPWH Technologies

Presenter: **Amruta Khanolkar**, New Buildings Institute

Grid-Interactive Efficient Buildings: Water Heat as Storage

Presenter: **Tanya Barham**, Community Energy Labs

Cellular and AMI CTA-2045 on Water Heaters in the Field

Presenter: **Tristan de Frondeville**, SkyCentrics

Heat Pump Water Heater Load Shifting Strategies

Presenter: **Ebony Mayhorn**, Pacific Northwest National Laboratory

(S14) Modeling Domestic Hot Water Systems to Understand Energy Use

Water heating is a major energy use in buildings including multifamily housing, gyms, restaurants, and commercial laundries. As efficiency improvements are applied to the building shell, HVAC systems, lighting, and domestic hot water energy become larger components of the total energy use. Energy modeling simulation is applied with great effect to predict the performance of buildings in many aspects. However, the simulation of domestic hot water (DHW) systems is based on dated research of use patterns, fixture flow rates, and equipment efficiencies. This session covers the parts of the systems to be modeled, the current efforts at ASHRAE 90.1 to improve the energy standards for domestic hot water (DHW) systems, and an open-source tool for water utility distribution networks that are now being applied to premise plumbing systems.

Moderator: **Shawn Oram**, Ecotope

How to Think about Modeling Domestic Hot Water (DHW) Systems

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

ASHRAE 90.1 Gets into Hot Water

Presenter: **Carmen Cejudo**, Pacific Northwest National Laboratory

Using SIMDEUM (Simulation of Water Demand, and End-Use Model) for Domestic Hot Water System Modeling

Presenter: **Mirjam Blokker**, KWR Water Research Institute

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

(S15) The Electric Slide: How to Convert Homes to Heat Pumps without Missing a Beat

California has enacted strong greenhouse gas emission reduction goals and policies. Historical energy policies and market forces mean that roughly 90% of residential water heating in the state is gas-fired. Achieving those emission reduction goals will require electrification of gas-fired water heating in ~10 million existing buildings. This session will cover current discussions and plans for this electrification effort.

Moderator: **Jose Buendia**, Southern California Edison

How to Electrify Without Panel Upsizing

Presenter: **Tom Kabat**, Good Gridizen

Water Heating as a Service for Electrification and Efficiency

Presenter: **Chris Granda**, Energy Solutions

Update/Perspective on 120v Water Heaters

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

(S16) Multifamily Hot Water Distribution Systems

This session will cover recent and upcoming lab and field projects that measure multifamily hot water production and distribution systems' performance. The first two presentations will detail observations and overarching architectural, building code, project requirements, and engineering design conclusions drawn from measured data in several multifamily buildings. Then, attendees will get a preliminary look at an upcoming lab testing project of a real-world riser distribution system to physically prove various configurations in a controlled setting applicable to centralized systems, including testing of various balancing valves, mixing valves, check valves, recirculation controls that impact the performance of distribution systems. Please bring your ideas on what should be tested in distribution systems with multiple risers and plan to attend the Chat Room meeting immediately following the conference session.

Moderator: **Lois Arena**, Steven Winter Associates, Inc.

Hot Water & Thermal Load Measurements at NE Multifamily Buildings

Presenter: **Peter Skinner**, E2G Solar LLC

Recirculation Pump Controls and Crossover Issues for Existing Multifamily Buildings: Hidden Challenges and Solutions

Presenter: **Jack Aitchison**, Association for Energy Affordability

Lab Testing of CEC Three-story Prototype Multifamily Hot Water Recirculation System with Various Values and Pump Controls

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

Yanda Zhang, ZYD Energy, Inc.

3:00 – 3:20 pm (EDT) Chat Rooms – Information shared in Sessions 15 and 16