



Hot Water Forum

Water Heating, Distribution, and Use Efficiency

Hilton Portland & Executive Tower • Portland, OR • February 26 - 28, 2017

PROGRAM (*subject to change*)

Sunday, February 26

3:00 pm – 7:00 pm REGISTRATION OPEN

5:00 pm – 7:00 pm RECEPTION

Monday, February 27

7:30 am – 7:30 pm REGISTRATION OPEN

8:00 am – 9:00 am CONTINENTAL BREAKFAST

9:00 am – 10:30 am WELCOME, INTRODUCTIONS, AND PLENARY

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

Welcome from Co-hosts: **Joshua Green**, AO Smith
 Karen Meyers, Rheem

Welcome from Major Funders: **Amy Bryan**, Jackson EMC
 Jeff Pratt, Oglethorpe Power

Plenary Panel Discussion: *The Changing Face of Water Heater Efficiency Ratings*

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

Speaker(s): **Ashley Armstrong**, US Department of Energy
 Frank Stanonik, Air-Conditioning, Heating, and Refrigeration Institute
 George Chapman, Consortium for Energy Efficiency (*invited*)

10:30 am – 11:00 am NETWORKING BREAK

11:00 am – 12:30 pm**BREAKOUT SESSIONS**Session 1A

Grid-Enabled, Grid-Responsible, and Grid-Interactive Electric Thermal Storage (ETS) Water Heating – The Foundation of Community Storage!

Moderator: **Steven Koep**, Vaughn Thermal Corporation, Co-chair – PLMA Behind-the-Meter Storage (BTMS) Interest Group

Utility Industry Policy Update - How We Got Here and Where We're Going

Speaker: **Keith Dennis**, National Rural Electric Cooperative Association

Is There a 'Policy-Gap' for GIWH and Community Storage Technologies?

Speaker: **Robin Roy**, Natural Resources Defense Council

From Load Management to DR to Community Storage: The Great River Energy Journey

Speaker: **Gary Connett**, Great River Energy

Where is the SMART in Smart Grid Connected Water Heaters?

Speaker: **Bill Hosken**, AO Smith

Disrupt or Be Disrupted: GIWH, Community Storage and Beneficial Electrification!

Speaker: **Steven Koep**, Vaughn Thermal Corporation, Co-chair – PLMA Behind-the-Meter Storage (BTMS) Interest Group

Description: Electric water heating, as an integral part of the 'connected home' future, is an emerging reality for electric utilities across the country. Simultaneously, increasing amounts of variable renewable energy are being integrated to the grid. This changing landscape is leading to a variety of challenges and opportunities as stakeholders, ranging from policymakers, utilities, environmental advocates, and manufacturers, work to balance their interests while meeting the demands of consumers and the market. Join us for a discussion of how policies and technologies interact and continue to evolve as we move from 'Load Management' to 'Community Storage'.

Session 1B

CO₂ Heat Pump Water Heaters: Results from the Field

Moderator: **Charlie Stephens**, Northwest Energy Efficiency Alliance

Combined Space and Water Heating Using Split System CO₂ Refrigerant Heat Pump Water Heaters

Speaker: **Ken Eklund**, Washington State University

PNNL Lab Home Testing Results for CO₂ Combi System

Speaker: **Cheryn Metzger**, Pacific Northwest National Laboratory

Description: Come learn results from lab and field studies on CO₂ Heat Pump Water Heaters. We will cover research and lessons learned from split-system heat pump water heaters used for combined space and water heating in low-load homes. In addition, we will review lab home performance evaluation results of a new technology, a CO₂ split-system heat pump water heater, which has the potential to use less than half the water heating and space heating energy as typical electrical resistance appliances.

Session 1C

Interactive Systems: Wring Out the Waste

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

Tub Technologies: Auto-Diverting Tub Spouts

Speaker: **Troy Sherman**, Evolve Technologies (*invited*)

Conserving Hot Water through Tub Spout Diverter Labeling

Speakers: **Richa Sherman**, US Environmental Protection Agency (*invited*)
Tessa Roscoe, ERG (*invited*)

Pump Efficiency Rule Making

Speaker: **Stephen Putnam**, Grundfos North America (*invited*)

The Impact of Pressure Drop

Speaker: **Gary Klein**, Gary Klein and Associates

Description: This session provides an overview of a few important aspects of water distribution. Join us to learn about new technologies that save wasted bathtub water. We will also cover the impacts of the upcoming tub spout diverter-labeling program. Finally, we will uncover the true impact of pressure drop in a hot water distribution system.

Session 1D

Today's Landscape of Residential Efficiency Programs

Moderator: **Alice Rosenberg**, Consortium for Energy Efficiency

Summary of Residential Energy Efficiency Water Heater Programs in 2016 across the US and Canada

Speaker: **Alice Rosenberg**, Consortium for Energy Efficiency

ENERGY STAR® Overview: Specification Updates and Consumer Outreach Campaign Successes

Speaker: **Steve Ryan**, US Environmental Protection Agency

Description: This session will provide a high-level snapshot of residential water heating efficiency programs (including HPWHs, gas storage, gas tankless, EPACK, indirect, hybrid, solar). CEE staff will share findings from the 2016 Water Heating Program Summary, which provides data on trends such financial incentive structures, promotion strategies, installation considerations, and financing approaches. US EPA will then present updates and recent developments relative to the ENERGY STAR® water-heating program, including specification revision plans and outcomes from the 2016 consumer outreach campaign to promote efficient products across the country. Participant Q&A and discussion to follow.

12:30 pm – 1:30 pm

NETWORKING LUNCH

1:30 pm – 3:00 pm**BREAKOUT SESSIONS**Session 2A

GIWH Control Providers RoundtableModerator: **Keith Dennis**, National Rural Electric Cooperative Association

Discussion Panelists: **Robert Warden**, Comverge
Joe Childs, Eaton
Matt Carlson, Aquanta
Laurie Vaudreuil, Mosaic Power
Clint Caudie, Carina Technologies
Paul Steffes, Steffes Corporation
Dan Flohr, Sequentric Energy Systems
Brian Zimmerly, SolarCity

Description: As the foundation of Community Storage, Grid-Interactive Water Heating (GIWH) is emerging as the low-hanging fruit of energy storage technologies. Hear from control providers about the technologies and program models that they are bringing to the Community Storage market.

Session 2B

Gas Heat Pump Water Heating: Developments and DemonstrationsModerator: **Paul Glanville**, Gas Technology Institute

Transforming the Gas Water Heating Market

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

Residential Combi-Space/Water Heating Gas Absorption Heat Pump System: Field Evaluation and Lessons Learned

Speaker: **Michael Garrabrant**, Stone Mountain Technologies, Inc.

Residential Gas Absorption Heat Pump Water Heaters: Field Trials and Extended Life Testing of Packaged Prototypes

Speaker: **Paul Glanville**, Gas Technology Institute

Description: This session will cover emerging gas heat pump water heating technologies, with a focus on residential applications. Speakers will review market considerations, provide update lab and field research data, and share a roadmap to accelerated commercialization.

Session 2C

Demonstration of Hot Water Systems in Commercial Kitchens for the California Energy CommissionModerator: **Amin Delagah**, Fisher-Nickel, Inc.

Results from Monitoring the Existing Hot Water System at an Elementary School

Speaker: **Michael Slater**, Fisher-Nickel, Inc.

Results from an In-Depth Hot Water System Replacement Project in a Full-Service Restaurant

Speaker: **Don Fisher**, Fisher ConsultantsResults from 2nd Generation Hot Water System Testing Laboratory at Pacific Gas & Electric CompanySpeaker: **Eddie Huestis**, Pacific Gas & Electric Applied Technology Services

Description: Fisher-Nickel Inc. has recently taken on two extensive field projects that seek to modernize hot water system design and operation. The first speaker will summarize the results from monitoring an existing hot water

system in a K-6 school that included point-of-use monitoring in the dish room. The hot water delivery performance and overall system efficiency in the dish room will be discussed. The second speaker will discuss a study that monitored hot water use from generation to point of use in a full-service restaurant. Details will be provided on the original and replacement system's energy and water use, delivery performance and overall system efficiency. Details regarding the design and installation of the optimized system will be covered. The third speaker will present existing results from recent testing completed at the 2nd-generation Commercial Hot Water System Laboratory at PG&E. This lab measures incremental savings from various optimization practices by mimicking the operation of hot water systems in full service restaurants.

Session 2D

Unintended Consequences of Energy and Water Efficiency Standards

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

What Happened to All the Forecasted Large Tank HPWHs after the NAECA 3 Ruling? - How the Supply Chain Did Work Arounds to the Large HPWH tank Deployment

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

How Water and Energy Efficient Building Standards and Designs Can Impact Potable Water Quality

Speaker: **William Rhoads**, Virginia Polytechnic Institute and State University

The Impact on Utilities of Reducing Water Use in Homes

Speaker: **Gary Klein**, Gary Klein and Associates

Description: Because domestic hot water delivery is part of a system, changing one part of that system will impact the rest of that. Energy and efficiency standards so far have targeted only appliances and fixtures. This session looks at some of the unintended consequences of those standards on the rest of the system. Differential energy efficiency standards on electric water heaters based on storage volume appear to have caused unintended changes in the sales of large water heaters. Water conservation standards are driving down the water flow rates in on premise plumbing. This is likely to encourage the growth of pathogens in the plumbing and cause operational problems for the water and wastewater utilities.

3:00 pm – 3:30 pm

NETWORKING BREAK

3:30 pm – 5:00 pm

BREAKOUT SESSIONS

Session 3A

GIWH Research & Market Development in the Pacific Northwest

Moderator: **Steven Koep**, Vaughn Thermal Corporation, Co-chair – PLMA Behind-the-Meter Storage (BTMS) Interest Group

Developing 'Grid Friendly' Electric Water Heating: Efficient and Controllable

Speaker: **Jennifer McMaster**, Bonneville Power Administration

Standardizing GIWH and Rolling Out at Scale (design and implementation of a utility-backed CTA2045-enabled WH program)

Speaker: **Roch Naleway**, Portland General Electric

Water Heater Control Energy Effects at the System Level

Speakers: **Kenji Spielman**, Energy Trust of Oregon

Ken Dragoon, Flink Energy

Description: This session will examine research and market development activities in the Pacific Northwest that are focused on capturing the value generated by the proliferation of GIWH, Load Management and HPWH technologies. Hear from organizations and utilities that are working to develop the potential for getting 'connected water heaters' deployed into consumers' homes.

Session 3B

Frontiers in Heat Pump Water Heater Research

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

Conditioning Interactions with HPWHs: A Test in Side-by-Side Lab Homes

Speaker: **Cheryn Metzger**, Pacific Northwest National Laboratory

Results from a 23-Site Residential Field Study of Hybrid HPWHs in Central California

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

Presentation: TBD

Speaker: **Ben Larson**, Ecotope

Description: Our session will present the latest research in how heat pump water heaters interact with their environment and how they react to the draws placed on them. From studies in the lab, to studies in side-by-side lab homes, to real houses, we provide cutting-edge work on how water heaters respond to different demand conditions, how cold they make the house in which they are running, and just what they are doing in the field.

Session 3C

Solar Thermal Water Heaters

Moderator: **Larry Weingarten**

Solar Powered Water Heating Technology Research

Speaker: **Gerardo Diaz**, University of California, Merced

Ultra-High Efficiency, PV System Integration Non-Grid Tied, Hot Water Energy Storage

Speaker: **Carlos Colon**, University of Central Florida, The Florida Solar Energy Center

Assessment of Current and Potential Environmental Benefits of Residential Solar Water Heating in California

Speaker: **Loren Lutzenhiser**, California Energy Commission (*invited*)

Description: Solar thermal is dead! We have probably all heard this, but it is not true. Our speakers will bring you up to date on research that demonstrates direct solar thermal and PV powered thermal, are evolving to be competitive with other energy sources, even in the present, uncertain energy landscape.

Session 3D

Legionella & Water Safety

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

Effect of Flow Rate on Legionella Levels at the Tap

Speakers: **William Rhoads**, Virginia Polytechnic Institute and State University

Legionnaires' Disease in Flint, Michigan: Lessons Learned

Speaker: **William Rhoads**, Virginia Polytechnic Institute and State University

A Monochloramine Study on the Hot Water System in a Hospital

Speaker: **Janet Stout**, Special Pathogens Laboratory

Description: The bacteria Legionella, which can cause Legionnaire’s Disease, has become an increasingly alarming threat to human health in safety in hot water systems. Come learn about the effects of flow rate on breeding Legionella, lessons learned from the water crisis in Flint, and current research on a promising method to disinfect water systems.

5:15 pm – 6:15 pm

LIGHTNING SESSION

Shameless Commerce: Introducing New Products and Services

Description: In this session, we will deviate from our usual norms, and offer anyone a few minutes to present new products or services, as well as their advantages, features, availability, etc. This session will be filled with short 5-minute presentations. Come hear about a variety of new products and services, and continue discussions directly following this session during the reception.

5:30 pm – 7:30 pm

RECEPTION

Tuesday, February 28

7:30 am – 4:00 pm

REGISTRATION OPEN

8:00 am – 9:00 am

CONTINENTAL BREAKFAST

9:00 am – 10:30 am

BREAKOUT SESSIONS

Session 4A

Efficient Hot Water Control and Delivery

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

Introduction to Hot Water Controls and Distribution Losses

Speaker: **Gary Klein**, Gary Klein and Associates

Field Study of an Intelligent, Networked, Retrofittable Water Heater Controller

Speaker: **Ben Schoenbauer**, Center for Energy and the Environment

Developments in Recirc Controls in Dorms and Updates on CEC Crossover Research

Speaker: **Gabriel Ayala**, Enovative

Distribution Losses and Control Alternatives

Speaker: **Shawn Oram**, Ecotope

Description: The primary goal of hot water distribution systems is to deliver hot water quickly and efficiently, with minimizing waste. This session will review new hot water controls for both water heaters, as well as distribution systems, as well as non-control approaches that all aim to find solutions to the fundamental problem of quick, efficient, hot water delivery.

Session 4B

Understanding Electric Heat Pump Water Heater Energy Use across Climates and Draw Patterns

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

Simulated Heat Pump Water Heater Performance in All 50 US States

Speaker: **Pierre Delforge**, National Resources Defense Council

Towards a Universal Test Pattern: Lab Studies of Water Heater Control Responses to Various Draws

Speaker: **Ben Larson**, Ecotope

Description: Our sessions grapples with two important topics concerning understanding hybrid heat pump water heater energy use: how do we predict when the water heater switches between heating components, and how do we use this capability to simulate heat pump water heater performance in all climates across the U.S.? Both topics explore the water heater's nonlinear responses to variation in independent variables. The first reports on the results of subjecting heat pump water heaters to various draw patterns in the lab. The second is a modeling study of annual energy use across all 50 states.

Session 4C

Advances in Drain Water Heat Recovery Modeling and Technology

Moderator: **Peter Grant**, Davis Energy Group

Development of Title 24s New DWHR Savings Algorithm

Speakers: **Peter Grant**, Davis Energy Group

Eddie Huestis, Pacific Gas and Electric Company Applied Technology Services

Benefit/Cost Analysis of Residential DWHR for California's Title 24

Speaker: **Bo White**, NegaWatt Consulting

The Advantages of Horizontal DWHR

Speaker: **David Velan**, EcoDrain

Description: Vertical drain water heat recovery (DWHR) units are being added to California's Title 24 building code, while horizontal DWHR units are entering the market. Speakers will describe the laboratory testing, algorithm development, and benefit/cost calculations driving code changes as well as some of the benefits of horizontal units.

Session 4D

Unique Program Approaches in the Market

Moderator: **Alice Rosenberg**, Consortium for Energy Efficiency

Overview of NDPP Effort to Promote HPWHs Midstream

Speaker: **Howard Merson**, Vermont Energy Investment Corporation

Rural Energy for America Program (REAP)

Speaker: **John Holman**, United States Department of Agriculture, Rural Development, Oregon

Whole House Approach

Speaker: **Jerry Ryan**, New Jersey Natural Gas

What Co-ops are Doing

Speaker: **Keith Dennis**, National Rural Electric Cooperative Association

Description: This session will feature a panel of efficiency programs designed to address a particular market barrier. Each presentation will speak of a unique strategy that they are employing to overcome these challenges, and lessons

learned from experience to date. VEIC will talk about their joint work in conjunction with EPA to run a midstream incentive program to distributors – on a national scale – to promote HPWHs. The REAP program will highlight guaranteed loan financing and grant funding to agricultural producers and rural small businesses to purchase or install renewable energy systems or make energy efficiency improvements. Representatives from New Jersey will explain how they are able to promote water heaters to customers despite cost effectiveness challenges. NRECA will share updates from the Co-op perspective.

10:30 am – 11:00 am NETWORKING BREAK

11:00 am – 12:30 pm BREAKOUT SESSIONS

Session 5A

Grid-Responsive Water Heater Controls (HPWHs and ERWHs)

Moderator: **Sarah Widder**, Pacific Northwest National Laboratory

Developments in CEA 2045 and Grid-Responsible HPWH Controls

Speaker: **Teja Kuruganti**, Oak Ridge National Laboratory

TOU Water Heater Optimization

Speaker: **William Burke**, Virtual Peaker

CTA 2045 Smart Water Heater Field Pilot

Speaker: **Johnathan Weaver**, Jackson EMC

Description: This session will explore innovations in water-heater control algorithms that enable responsive control of both HPWHs and traditional electric resistance water heaters, including CEA 2045, PNNL's VOLTTRON platform, and new control logic approaches.

Session 5B

Gas Heat Pump Water Heating: Design of Advanced Sorption Systems

Moderator: **Ed Vineyard**, Oak Ridge National Laboratory

Theory of Semi-Open Sorption Gas-Fired Heat Pump Systems and Early Experimental Results

Speaker: **Kyle Gluesankamp**, Oak Ridge National Laboratory

Using the Open Source SorpSim for Simulation of Water Heating Applications

Speaker: **Zhiyao Yang**, Oak Ridge National Laboratory

Commercial Water Heating with Gas Absorption Heat Pumps: Development and Impact of Storage Tank Design

Speaker: **Mike Garrabrant**, Stone Mountain Technologies

Description: This session investigates advanced sorption water heating designs and modeling techniques for improving performance.

Session 5C

Multifamily Water Heating Great and Small: From Shower Flow Rates to Large Scale Central Heat Pumps

Moderator: **Ben Larson**, Ecotope

Field Measured Flow Rates of Showerheads

Speaker: **Mike Bailey**, Energy Trust of Oregon

Field Results from Distributed and Central Heat Pump DHWs in Four Apartment Complexes of Zero Net Energy Housing

Speaker: **Sean Armstrong**, Redwood Energy

Central Heat Pump Water Heating Systems: Interplay and Efficiency Implications of Heat Pumps and Circulation Loops

Speaker: **Jon Heller**, Ecotope

Description: This session will present the findings of the latest field research in efficient hot water systems for multifamily buildings. It spans the small (yet numerous) starting with field measurements of shower head flow rates, moves to units served by individual hybrid heat pumps, and finishes with design implications of large scale (10+ ton) central heat pump systems.

Session 5D

Market Madness: Coordinating Supply Chain Players on the HPWH Court

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

Rapid Adoption of Energy Efficient Products through Midstream Interventions

Speaker: **Howard Merson**, Vermont Energy Investment Corporation

Jump Starting the Installer Contractor Markets with Innovative Approaches

Speaker: **Jill Reynolds**, Northwest Energy Efficiency Alliance

Retail Markets: How to Get Utilities, OEM and Retails All on the Same Page

Speaker: **Jessica Atwater**, CLEAResult

Description: The Northwest Energy Efficiency Alliance (NEEA), Vermont Energy Investment Corporation (VEIC) and CLEAResult have worked for the past eight years to transform the electric water heater market, encouraging adoption of heat pump water heater (HPWH) technology while achieving large energy savings throughout the nation. Panelists from NEEA, VEIC and CLEAResult will take a coast-to-coast look on slam-dunk approaches to drive HPWH sales and savings.

12:30 pm – 1:30 pm

LUNCH

1:30 pm – 3:00 pm**BREAKOUT SESSIONS***Session 6A*

Behind the Scenes of Water Heater Numerical SimulationsModerator: **Ben Larson**, Ecotope

A Public-Domain, Hardware-based Modeling and Design Tool for Heat Pump Water Heaters

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

HPWHsim: Under the Hood of a Heat Pump Water Heater Performance and Energy Simulator

Speaker: **Michael Logsdon**, Ecotope

HPWH Modeling Improvements in EnergyPlus and BEopt

Speaker: **Jeff Maguire**, National Renewable Energy Lab

Description: How do you do that, exactly? Come and hear the nitty-gritty details of state-of-the-art simulations on heat pump water heaters. This session provides an in-depth look at how numerical simulations can be used to improve heat pump water heater design using physics-based modeling tools and performance map-based modeling tools, or predict their energy use and performance impact from a whole building integration perspective using EnergyPlus or BEopt.

Session 6B

Wide-Ranging Applications of CO₂ Heat Pump Water HeatersModerator: **Charlie Stephens**, Northwest Energy Efficiency AllianceApplications for CO₂ Heat Pump Water Heaters in Multifamily BuildingsSpeaker: **Jon Heller**, EcotopeExploratory Lab Testing of a Residential Scale Combined Space and Water Heating CO₂ Heat PumpSpeaker: **Ben Larson**, EcotopeEarly Field Installations of a 3-ton Combined Space and Water Heating CO₂ Heat PumpSpeaker: **Charlie Stephens**, Northwest Energy Efficiency Alliance

Description: In this session, we will cover lab and field study results of a variety of sizes of CO₂ heat pump water heaters in both residential and multifamily housing. Presentations will cover projects ranging from 2-3 ton capacity heat pumps intended for residential homes, to large 500+ multifamily units using CO₂ water-to-water heat pump equipment to recover heat from a grocery store refrigeration system.

Session 6C

Field Monitoring of Dish Rooms in Large Commercial Kitchens

Moderator: **Don Fisher**, Fisher Consultants

Results from Monitoring Three Best-in-Class Flight Conveyor Dishwashers with Heat Recovery

Speaker: **Michael Slater**, Fisher-Nickel, Inc.

Results from an In-Depth Boiler Room and Dish Room Monitoring Project in an Army Cafeteria

Speaker: **Amin Delagah**, Fisher-Nickel, Inc.

The Next Frontier for Savings: Pre-Rinse Operations in Large Dish Rooms

Speaker: **Amin Delagah**, Fisher-Nickel, Inc.

Cash for Kitchens: The Water-Energy Nexus in Your Favorite Eateries

Speaker: **Stan Mueller**, DNV GL Energy Services USA, Inc.

Description: Fisher-Nickel Inc. has recently completed three field projects in large commercial dish rooms. The first speaker will compare the results from monitoring water and energy use of three flight conveyor dishwashers with heat recovery systems, two which are operating in parallel in an in-flight catering operation and the 3rd in a commercial cafeteria. The results will compare the best-in-class technology with previous and existing generation standard heat-recovery technology. The second speaker will discuss the findings of a dish room replacement project in an army cafeteria, which features a change from a steam-fed dishwasher to one where water is heated mostly with onboard heaters. The results highlight the water and energy savings potential in the dish room as well as the energy savings potential in the boiler room. The third speaker will present findings from pre-rinse operations in five large dishrooms. The water and energy intensity of scrappers, troughs, industrial hoses with pre-rinse valves, dry-scrapping operations and various other practices will be contrasted. The overall goal is to demonstrate the best equipment and operating practices with the manual pre-rinse operations. The last speaker will review the results from a pilot water conservation audit and incentive program, Cash for Kitchens, in Los Angeles that yielded water and energy savings in Restaurants.

Session 6D

California and Beyond: Policy Pathways and Hot Water

Moderator: **Ed Vineyard**, Oak Ridge National Laboratory

Pathways to Decarbonize Residential Water Heating in California

Speaker: **Shuba Raghavan**, University of California, Berkeley

Opportunities and Hurdles in California: A Policy Framework to Decarbonize Thermal Loads in Buildings

Speakers: **Merrian Borgeson**, Natural Resources Defense Council
Pierre Delforge, Natural Resources Defense Council

The Role of Natural Gas for Water Heating

Speaker: **Sue Kristjansson**, SoCalGas

3:00 pm – 3:30 pm

NETWORKING BREAK

3:30 pm – 5:00 pm**BREAKOUT SESSIONS***Session 7A*

The Potential of HPWH's for Demand Response and Grid ServicesModerator: **Sarah Widder**, Pacific Northwest National Laboratory

Hierarchical Controller Design for Engaging Heat Pump Water Heaters to Provide Primary Frequency Regulation

Speaker: **Jacob Hansen**, Pacific Northwest National Laboratory

Grid-Connected Heat Pump Water Heaters: Climatic and Seasonal Effects of Optimal Energy Efficiency and Demand Response Potential

Speaker: **Hemang Nerlekar**, Navigant Consulting

HPWHs and Demand Response

Speaker: **George Gurlaskie**, Duke Energy

Description: This session will share new research demonstrating the potential for and feasibility of HPWHs providing demand response and grid services. Electric resistance water heaters have been long explored for providing this functionality, but more efficient HPWHs can also provide similar services while saving 50 to 60% on water heater energy use. These grid-responsive HPWHs have the potential to provide significant benefits to the grid and the consumer. This session will present recent research evaluating HPWHs providing grid services in the field, large scale modeling efforts evaluating HPWHs ability to serve as “virtual batteries,” and provide insight from utilities regarding considerations for implementation and programs development.

Session 7B

Cutting Edge Multifamily Research: New Data, Projects, and ProgramsModerator: **Chris Perry**, American Council for an Energy-Efficient Economy

DHW Electrification in Multifamily Buildings: On-the-Ground Perspective

Speakers: **Andy Brooks**, Association for Energy Affordability Inc.**Nick Dirr**, Association for Energy Affordability Inc.

How Much Water Do People Use: New Sources of Water Use Data

Speaker: **Nehemiah Stone**, Stone Energy

Electric Water Heating in Zero Energy Ready Multifamily Buildings

Speaker: **Jess Kincaid**, Bonneville Power Administration

Description: Efficient electric water heating is playing an increasingly important role in reducing the overall electric load of new multifamily buildings. The problem is, we have lacked sufficient data on hot water use and case studies on implementing efficient hot water projects...until now. Join us to learn about cutting-edge research in the field of multifamily water heating. You will learn about using new data that more accurately reflects multifamily hot water use, overcoming challenges experienced during a California DHW electrification project, and results from developing of a brand new Zero Energy Ready multifamily program.

Session 7C

New Standards for Hot Water

Moderator: **Danny Tam**, California Energy Commission

How Hot Water is Calculated in Title 24

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

How Hot Water Draw Patterns in Title 24 Calculations

Speaker: **Bruce Wilcox**, Consultant

Reporting on IAPMO Pipe Sizing Activities

Speaker: **Dan Cole**, International Association of Plumbing and Mechanical Officials

Description: The California Energy Commission is updating their Building Energy Efficiency Standards (Title 24) and the International Association of Plumbing and Mechanical Officials (IAPMO) has been researching the best way to size domestic water pipes. The first presentation will examine how hot water energy use is calculated in the building energy efficiency standards. The second presentation will explain recent changes to the hot water draw schedule and heat pump water heater simulations in those standards. The third presentation will report on the recent work of IAPMO's Pipe Sizing Task Force and implications for code changes.

Thank You Funders and Allies!

CO-HOSTS



GOLD



SILVER



BRONZE

