



# Hot Water Forum

## *Water Heating, Distribution, and Use Efficiency*

Hilton Portland & Executive Tower • Portland, OR • February 21-23, 2016

### CONFERENCE PROGRAM

#### Sunday, February 21

3:00 pm – 7:00 pm	REGISTRATION OPEN	<i>Plaza Foyer</i>
5:00 pm – 7:00 pm	HOSPITALITY	<i>Plaza Foyer</i>

#### Monday, February 22

7:30 am – 7:30 pm	REGISTRATION OPEN	<i>Plaza Foyer</i>
8:00 am – 9:00 am	CONTINENTAL BREAKFAST	<i>Pavilion East</i>
9:00 am – 10:30 am	WELCOME, INTRODUCTIONS, AND PLENARY SESSION	<i>Pavilion West</i>

Welcome and Introductions: **Rachel Cluett**, American Council for an Energy-Efficient Economy

#### **Plenary Session: *Updates since the 2015 Federal Water Heater Standards Took Effect***

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

Speaker(s): **Ashley Armstrong**, US Department of Energy  
**Frank Stanonik**, Air-Conditioning, Heating, & Refrigeration Institute  
**George Chapman**, Consortium for Energy Efficiency  
**Robert Mader**, Contractor Magazine

**Description:** The 2015 Water Heater Minimum Efficiency Standards took effect in April 2015 beginning mandatory adoption of higher efficiency levels for water heaters larger than 55 gallons. Simultaneously, the US Department of Energy is adopting a new test procedure that extends coverage, divides water heaters into four capacity-based categories, and uses different but more realistic tests for each class. Our speakers represent perspectives from manufacturers, contractors, utilities, and regulators involved in this work and will present updates from their respective areas.

**This session will cover:**

- The collision of two regulatory changes – the new test method and new minimum efficiency standards
- What the new standards require
- Details on cross-walk for rating water heaters under the new test method
- News from equipment manufacturers on the effect of standard and test procedure changes on business
- How these changes are affecting utilities and energy efficiency programs
- What's happening in the field – news from contractors

**10:30 am – 11:00 am****NETWORKING BREAK***Plaza Foyer***11:00 am – 12:30 pm****BREAKOUT SESSIONS***Session 1A**Broadway I***Grid-Enabled, Grid-Responsive, and Grid-Interactive Electric Thermal Storage (ETS) Water Heating (GIWH): How We Got Here and Where We're Going!**Moderator: **Steven Koep**, Vaughn Thermal Corporation, Co-Chair – PLMA GIWH Interest Group

Utility Industry Policy Update: How We Got Here!

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

Efficiency Standards, Environmental Performance, and Water Heating Technology

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

Grid-Interactive Loads: Pursuing Market Acceptance through Codes and Standards

Speaker: **Paul Steffes**, Steffes Corporation

From Legacy Systems to GIWH and Community Storage!

Speaker: **Steven Koep**, Vaughn Thermal Corporation, Co-Chair – PLMA GIWH Interest Group

**Description:** Grid-Interactive Water Heating (GIWH) is poised to move from lab tests and pilot projects to market introduction for electric utilities across the country. Simultaneously, increasing amounts of variable renewable energy are being integrated on to the grid, ancillary service markets are developing, and water heating efficiency standards are evolving. 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 grid-responsive to grid-interactive water heating.

*Session 1B**Broadway II***CO<sub>2</sub> Heat Pump Water Heating Advancement in the US Market**Moderator: **Omar Abdelaziz**, Oak Ridge National LaboratoryCO<sub>2</sub> for Larger Commercial ApplicationsSpeaker: **Troy Davis**, Mayekawa

Eco Cute for the US Market

Speaker: **John Miles**, Sanden

**Affordable ENERGY STAR® CO<sub>2</sub> HPWH for the US Market**

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

**CO<sub>2</sub> Heat Pump Water Heater Field Tests: What We Know and What We Wish We Knew**

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

**Description:** Heat pump water heaters using CO<sub>2</sub> have shown extremely high COPs and high service temperatures. Can they be successful on a large scale in US markets? Speakers from industry, utility, and research laboratories will cover CO<sub>2</sub> HPWH for large commercial applications, split water-heating systems, development of a low cost CO<sub>2</sub> HPWH for the US market that could meet ENERGY STAR® criteria, and results from field-testing of CO<sub>2</sub> HPWHs.

Session 1CBroadway III**Heat Pump Water Heater Marketing: How to Influence the Planners and the Procrastinators**

Moderator: **Becca Yates**, Northwest Energy Efficiency Alliance

Discussion Panelists: **Becca Yates**, Northwest Energy Efficiency Alliance  
**Steve Ryan**, US Environmental Protection Agency

**Description:** The water heater market is a double-edged sword. Some consumers plan ahead and replace their water heater proactively while others wait until their water heater breaks, and they have to act quickly to get a replacement. The consumer mindset, needs, and demographic profiles are markedly different in these two scenarios and programs need to tailor their marketing strategies accordingly to influence both types of consumers. The Northwest Energy Efficiency Alliance and ENERGY STAR® will discuss the experience and research that has informed their unique approaches and results in transforming the market.

Session 1DBroadway IV**What Is the Future for Solar Thermal Water Heating?**

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

**Solar Thermal vs. Photovoltaic Water Heating**

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

**Residential Solar Water Heating Trends and Financial Incentives in Oregon**

Speaker: **Rob Del Mar**, Oregon Department of Energy

**Solar Thermal in a Changing Utility Landscape: Lessons from Florida**

Speaker: **Jeff Curry**, Lakeland Electric

**Understanding and Improving Solar Thermal Water Heating Effectiveness for California Households**

Speaker: **Loren Lutzenhiser**, Portland State University

**Field Results from a New Solar Thermal System**

Speaker: **Larry Weingarten**

**Description:** This session will cover various developments in solar thermal water heating and explore the costs and benefits of relying on solar thermal vs. photovoltaics.

**12:30 pm – 1:30 pm****LUNCH***Pavilion East*

**1:30 pm – 3:00 pm****BREAKOUT SESSIONS***Session 2A**Broadway I***Grid Interactive Water Heating (GIWH) Research**Moderator: **Keith Dennis**, National Rural Electric Cooperative Association

System Level Value of GIWH

Speaker: **Mark Dyson**, Rocky Mountain Institute

GIWH for the Multi-family Residential Sector

Speaker: **Jim Lazar**, Regulatory Assistance Project

Demonstrating GIWH as Part of an Enhanced Load Control Strategy

Speakers: **Ken Glaser**, Connexus Energy**Eric LeBow**, Power Over Time

**Description:** This session includes a number of research efforts that explore the value of grid interactive water heating (GIWH) to utilities, customers, and businesses. The first presentation will detail Rocky Mountain Institute's recent analysis of the total value creation potential of GIWH for utilities, customers, and third-party entrepreneurs yielded a current estimate of \$3.7 billion/year across the US with many stakeholders able to capture some of that value as either cost savings or new revenue. The presentation will outline this market sizing analysis and highlight the paths to market for innovative utilities and third parties to capture the value. The second presentation will draw from a forthcoming Regulatory Assistance Project report to explore how the 45 million electric water heaters in the US can enable approximately 100,000 megawatts of additional variable renewable energy to be easily integrated into the US electric grid. The presentation will focus on the multi-family sector, where deployment is easier due to concentration of customers, access issues, communications network availability, and lack of applicability from other water heating technologies. The last presentation will cover results Connexus Energy's deployment of a number of retrofitted grid-interactive water heater controls, installed to evaluate the potential for GIWH to function as the foundation of an enhanced load control strategy that will include electric vehicles and residential battery systems.

*Session 2B**Broadway II***Field Testing of Integrated Space Conditioning and Water Heating Systems**Moderator: **Paul Glanville**, Gas Technology Institute

Integrated Forced-Air System: Field Research on Combis with Condensing Gas Water Heaters and Electric Heat Pumps

Speaker: **Tim Kingston**, Gas Technology Institute

Findings from Three Field Studies of Rheem's H2AC Condenser Waste Heat Recover System at Full Service Restaurants

Speaker: **Hillary Vadnal**, Gas Technology Institute

Development of the Mitsubishi Dual Purpose (Space Conditioning and Heating Water) Heat Pump

Speaker: **Paul Doppel**, Mitsubishi

**Description:** Integrating space conditioning and water heating systems stands to offer a cost-effective alternative to traditional and standalone equipment. Experts have conducted field tests of these integrated approaches under various application scenarios. In this session, they will present their latest findings and expected impacts.

*Session 2C**Broadway III***Heat Pump Water Heaters and the Northwest Market: Where Have We Been and Where Are We Going?**

Moderator: **Aaron Winer**, CLEAResult

Energy Efficiency Program Perspective

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

Manufacturer Perspective

Speaker: **Francois Lebrasseur**, General Electric

Utility Perspective

Speaker: **Kevin Peterson**, Puget Sound Electric

**Description:** The Northwest Energy Efficiency Alliance has worked for the past five years to transform the water heater market, encouraging consumers to adopt heat pump water-heater technology while achieving large energy savings in Oregon, Washington, Idaho, and Montana. The market has come a long way and The Northwest Energy Efficiency Alliance has learned some important lessons that will inform future strategies and success. This session will share perspectives from multiple layers of the water heater market to understand the unique barriers and successes each stakeholder has experienced. Based on understanding nuances of the market, we will piece together a cohesive approach for future success.

*Session 2D**Broadway IV***Modeling What We Know about Hot Water Use**

Moderator: **Jim Lutz**

HOTHOUSE: Hot Water Provision in Homes - Consumption, Storage, and Lifestyle

Speaker: **Richard Buswell**, Loughborough University

Modeling Hot Water Use in Single Family Buildings

Speaker: **Sean Armstrong**, Redwood Energy

Revising Hot Water Calculations in Title 24 in California

Speaker: **Bruce Wilcox**

**Description:** How domestic hot water is dealt with in building energy simulation models is still a work in progress. This session will begin with a critical review of the current state of the art along with some preliminary findings from field research in the United Kingdom. Next will be a discussion of two efforts in California. One will be about using the Residential End Uses of Water databases to discover the per person, per fixture use of domestic hot and cold water to more accurately model higher density multi-family housing. The other is about ongoing efforts to revise water heating energy use calculations in California's building energy efficiency code.

**3:00 pm – 3:30 pm**

**NETWORKING BREAK**

*Plaza Foyer*

**3:30 pm – 5:00 pm****BREAKOUT SESSIONS***Session 3A**Broadway I***Grid Interactive Water Heating Market Development: New Business Models for Scaling the GIWH Market**Moderator: **Mark Dyson**, Rocky Mountain Institute

Scaling a GIWH Rental Business Model

Speaker: **Dan Flohr**, Sequentric

Standardizing GIWH and Rolling Out at Scale

Speaker: **Conrad Eustis**, Portland General Electric

Water Heater Leasing: The New/Old Business Model for GIWH

Speaker: **Steven Koep**, Vaughn Thermal Corporation

**Description:** This session focuses on examining new business models to capture the value generated by the proliferation of GIWH technologies. Hear from companies and utilities that are working to develop the potential for getting GIWH deployed into consumers' homes and explore their business case for doing so.

*Session 3B**Broadway II***Gas-Fired Heat Pump Water Heaters**Moderator: **Kyle Gluesenkamp**, Oak Ridge National Laboratory

Commercial Heat Pump Water Heaters

Speakers: **Mike Garrabrant**, Stone Mountain Technologies, Inc.  
**Patrick Geoghegan**, Oak Ridge National Laboratory

Membrane Based Heat Pump Water Heaters

Speakers: **Devesh Chugh** and **Saeed Moghaddam**, University of Florida

Issues Related to Development of a Residential Adsorption Heat Pump Water Heater

Speaker: **Moonis Ally**, Oak Ridge National Laboratory

Field Evaluation of Pre-Commercial Residential Gas Heat Pump Water Heaters

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

**Description:** This session will provide new laboratory and field research data on measuring the performance of advanced gas water heaters.

*Session 3C**Broadway III***Pipe Sizing**Moderator: **Jim Lutz**How Small Can We Go: Pressure Drop versus Flow Rate for  $\frac{3}{8}$  and  $\frac{1}{2}$  inch Nominal TubingSpeaker: **Gary Klein**, Gary Klein and Associates

Peak Design Flow Rates in Commercial Potable Hot Water Systems

Speaker: **Carl Hiller**, Applied Energy Technology

Peak Water Demand Study: Development of Metrics and Method for Estimating Design Flows in Buildings

Speaker: **Toritseju Omaghomi**, University of Cincinnati

**Description:** Pipe sizing techniques rely on knowledge of peak demand and pressure drops. Current codes and practices are based on research that is many decades old. At this panel, we will hear about recent research that is updating our knowledge of peak demands in single-family homes and hotels. Also presented are initial findings of pressure drop across modern PEX plumbing fittings.

*Session 3D*

*Broadway IV*

## Large Central Domestic Hot Water (DHW) Applications

Moderator: **Nehemiah Stone**, Stone Energy Associates

Controlling and Monitoring Heat Pump Hot Water Systems Utilized in Large Central Applications (primarily in Hawaii)

Speakers: **Robert Cooley** and **Dennis Ennslinger**, EDC Technologies, Inc.

Smart Ways to Control Hot Water Distribution in New and Existing Multifamily/Commercial Buildings; including a Case Study from Southern California Gas Company's *On Demand* Efficiency Program

Speaker: **Larry Acker**, ACT, Inc. D'MAND Systems

**Description:** As the science and practice of providing hot water through a central distribution system advances in response to a host of influences, new technologies and even new pairings of technologies are appearing. Drivers for new solutions include tenant satisfaction, owners' economics, energy efficiency, water savings, and other environmental concerns. This session will provide data and insights on some of the best of those advances, from two of the leading firms in the field.

**5:15 pm – 6:15 pm**

**LIGHTNING SESSION**

*Pavilion West*

## 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 packed 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**

*Plaza Foyer*

**7:30 pm**

**EVENING INFORMAL SESSIONS**

*Broadway I & II*

## Saving Water through Behavior Changing Technologies

Moderator: **Todd Levin**, Argonne National Laboratory

**Description:** The United States is experiencing a number of key trends that have increased the imperative to develop and implement comprehensive water conservation efforts. Such conservation can be achieved through both technical change (e.g., low-flow showerheads) and behavioral change (e.g. shorter showers). With this in mind, the US Department of Energy Building Technologies Office commissioned Argonne National Laboratory to conduct a scoping study of the market landscape for behavior-changing technologies in the water sector. We will discuss the findings and lessons learned that were developed through background research, stakeholder outreach, and stakeholder participation in a 2-day workshop hosted by Argonne in April 2015. These findings include: 1) technology characteristics that are favorable for motivating behavioral change; 2) barriers that have and prevented the development and market adoption of technologies with these characteristics in the water sector, and; 3) concrete research and development pathways that could be undertaken to overcome these barriers, increase the penetration of technologies that influence water consumption behavior, and ultimately reduce domestic water consumption.

## A Market Transformation Initiative: Heat Pump Water Heaters as Grid-Scale Thermal Batteries

Moderator: **Dennis Stiles**, Pacific Northwest National Laboratory

**Description:** The US Department of Energy is considering launching a market transformation program that would challenge utilities and market actors to encourage widespread adoption of grid-interactive HPWH, and thus realize benefits including grid stability, economy, and reduced carbon emissions – without affecting consumer utility. Because the HWF uniquely brings together manufacturers and market channels, utilities, the research community, and government staff, we are offering an informal session at the event. DOE will briefly outline its “straw man”, to elicit response, support and critiques of all aspects – especially focused on better ways to achieve the objectives. All are invited.

### Tuesday, February 23

**7:30 am – 5:00 pm** **REGISTRATION OPEN** *Plaza Foyer*

**8:00 am – 9:00 am** **CONTINENTAL BREAKFAST** *Pavilion East*

**9:00 am – 10:30 am** **BREAKOUT SESSIONS**

*Session 4A*

*Broadway I*

#### From Grid Responsive to Grid Interactive: An Evolving Perspective

Moderator: **Steven Koep**, Vaughn Thermal Corp.

Discussion Panelists: **Keith Dennis**, Natural Rural Electric Cooperative Association  
**Steve Rosenstock**, Edison Electric Institute  
**Paul Steffes**, Steffes Corporation  
**Eric LeBow**, Power Over Time  
**Dan Flohr**, Sequentric  
**Joe Childs**, Eaton  
**Steven Koep**, Vaughn Thermal Corporation

**Description:** As we move toward the Internet of things, it’s important to recognize the trend from pre-programmed stand-alone timers and one-way radio-control devices (on-off/**grid-responsive**) to high-speed, two-way communication (element modulation/**grid-interactive**) and the variety of ancillary services (frequency control, etc.) that are enabled. From communication protocols to grid-interactive functionality, the panel participants will share their perspectives on the evolving market opportunity.

*Session 4B*

*Broadway II*

#### Heating Water with Integrated Heat Pumps

Moderator: **Van Baxter**, Oak Ridge National Laboratory

Modeling and Analysis of Integrated Heat Pump Systems

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

Air-Source Integrated Heat Pump Test Results

Speakers: **Jeff Munk**, **Moonis Ally** and **Van Baxter**, Oak Ridge National Laboratory



**Ground-Source Integrated Heat Pumps: Field Test Results**

Speakers: **Shawn Hern**, ClimateMaster, Inc.  
**Van Baxter**, Oak Ridge National Laboratory

**Water Heating via Gas Engine Driven Heat Pumps**

Speakers: **Isaac Mahderekal**, IntelliChoice  
**Ayyoub Momen** and **Ed Vineyard**, Oak Ridge National Laboratory

**Description:** This session will include research on highly efficient combined space and water heating systems that rely on air source, ground source, and gas engine driven heat pumps.

*Session 4C**Broadway III***Midstream and Upstream Utility Programs**

Moderator: **Jennifer Parsons**, The United Illuminating Company

**Survey of Heat Pump Water Heater Programs**

Speaker: **George Chapman**, Consortium for Energy Efficiency

**Efforts to Shift from Traditional Rebate Programs to Upstream Approaches**

Speaker: **Marshall Johnson**, Energy Trust of Oregon

**Upstream Hot Water Program at the Connecticut Utilities**

Speaker: **Jennifer Parsons**, The United Illuminating Company

**Description:** Moving the rebate process from a downstream (i.e. mail-in) consumer submission to an upstream submission at the distributor level, has proven to be an effective means of capturing larger volumes of high efficiency equipment sales, while also creating a market shift from conventional, code equipment to high efficiency equipment. This session will highlight some of the successes programs have experienced by reaching beyond the customer to the distribution chain.

*Session 4D**Broadway IV***Changes to Codes and Standards**

Discussion Panelists: **Jim Lutz**  
**Gary Klein**, Gary Klein and Associates

**Description:** What impact will changes to the US Department of Energy and ASHRAE test procedures have across other codes and standards? This change will likely impact solar rating (SRCC), home ratings (RESNET, ENERGY STAR®), utility programs, and others.

**10:30 am – 11:00 am****NETWORKING BREAK***Plaza Foyer***11:00 am – 12:30 pm****BREAKOUT SESSIONS***Session 5A**Broadway I***Grid-Responsive Water Heaters**

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

**Field Test Results of Grid-Responsive HPWH**

Speaker: **Roderick Jackson**, Oak Ridge National Lab

## Development of Grid-Enabled Units

Speakers: **Samuel DuPlessis** and **Venkat Venkatakrishnan**, General Electric

## Grid-Connected Electric Resistive and

## HPWHs

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

## EERE Tech to Market: Grid Responsive HPWHs

Speaker: **Dennis Stiles**, Pacific Northwest National Laboratory

**Description:** The session is intended to present information on grid-enabled heat pump water heaters (HPWHs) regarding their development, field-testing, and marketing. The goal is that this information will help significantly increase the number of grid-enabled HPWHs in the market through a better understanding of this new technology.

Session 5BBroadway II

Due to a scheduling conflict, session 5B has been moved to 3:30-5:00pm Tuesday, February 23 in Room *Broadway IV*.

Session 5CBroadway III**Heat Pump Water Heaters and the Northern Climate Specification Update**

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

Discussion Panelists: **Geoff Wickes**, Northwest Energy Efficiency Alliance

**Ben Larson**, Ecotope

**Christian Douglass**, Ptarmigan Research

**Description:** Northwest Energy Efficiency Alliance's Northern Climate Specification (NCS) was first release in 2009 to provide guidance to manufacturers interested in developing products that not only meet ENERGY STAR® criteria but also are able to provide high levels of consumer satisfaction and energy performance in cooler, northern climates. Since the NCS was released, manufacturers have stepped up to the challenge and there are currently 55 products on the NCS Qualified Products List. The NCS is in the process of being updated with a variety of new features including:

- Additional tiers for improved efficiency levels
- Clarify test procedure so manufacturers can better design products
- Open testing to other certified labs
- Clarify definitions of terms (unconditioned, semi-conditioned and conditioned space)
- Define performance challenge process
- Warranty requirement clarification

Session 5DBroadway IV**Distribution in Large Buildings**Moderator: **Ben Schoenbauer**, Minnesota Center for Energy and Environment

Demand Control Recirculation in Commercial and Hotel Properties

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

Controls for Circulation Systems in Large Buildings

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

Energy Research on Improving the Balancing and Mixing of Domestic Hot Water

Speaker: **Gabriel Ayala**, Enovative Group

**Description:** This session will explore solutions to distribution losses and waste in both energy and water in large buildings.

**12:30 pm – 1:30 pm****LUNCH***Pavilion East***1:30 pm – 3:00 pm****BREAKOUT SESSIONS**Session 6ABroadway I**US Department of Energy's Working Group on Adopting a Standard Communications Port for Water Heaters**Moderator: **Brian Spak**, Portland General ElectricDiscussion Panelists: **Robin Roy**, Natural Resources Defense Council**Bill Hosken**, AO Smith**Chris Granda**, Appliance Standards Awareness Project

**Description:** On September 14, 2015, Senators Cantwell and Wyden sent a letter to Energy Secretary Moniz requesting that DOE "establish a working group to establish and promote the widespread adoption of a standard communications 'port' for selected appliances, particularly electric water heaters." The establishment of a common port on all electric water heaters would be a low incremental cost to water heater manufacturers while dramatically lowering the cost of water heater demand response programs. At the same time, such a port would increase the customer experience for those enrolled in water heater demand response programs, thus enabling their robust adoption around the country. DOE is currently considering the adoption of a working group to i) recommend a specific open communications port on grid-enabled water heaters; ii) develop a path forward to widespread adoption; and iii) identify potential pilot projects. The panel will discuss this pending working group and share insights on the benefits and challenges of establishing a standard port for all grid enabled water heaters.

Session 6BBroadway II**Distribution in Residential Buildings**Moderator: **Gary Klein**, Gary Klein and Associates, Inc.

Single Family Compact Domestic Hot Water Distribution Design

Speaker: **Farhad Farahmand**, TRC Solutions

Drain Water Heat Recovery Research

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

Hot Water Research Facility at PG&amp;E

Speaker: **Eddie Huestis**, Pacific Gas & Electric Applied Technology Services

**Structural Waste versus Behavioral Waste**

Speaker: **Troy Sherman**, Evolve Technologies, LLC

**Description:** How long do you want to wait for hot water to arrive after you turn on the tap? Even if the structural waste is small, will people change their behavior to take this into account? We will discuss what it means to have a “compact” plumbing design in dwellings that have one water heater whether single or multi-family or to multi-family units with one branch off a central circulation. We will also discuss the importance of simultaneously addressing structural and behavioral waste.

*Session 6C**Broadway III***What’s Cooking? Using a Targeted Approach to Selling ENERGY STAR® Certified Commercial Water Heaters**

Moderator: **Mark Michalski**, Cadmus

Discussion Panelists: **Casey Hollabaugh**, Hollabaugh & Associates  
**Jeff Woodard**, Hollabaugh & Associates

**Description:** Everyone in our industry knows that ENERGY STAR® certified commercial water heaters offer substantial energy savings to a variety of commercial customers. What we do not know we can learn from our panelists in how they are engaging commercial customers through their program sales and marketing channels to upsell them on certified units. Learn their strategies, what works and what does not, as we strive to identify pathways to increasing commercial water heater efficiency, one kitchen at a time.

*Session 6D**Broadway IV***Innovating Storage Water Heaters**

Moderator: **Dave Kalensky**, Gas Technology Institute

A Utility Case for Continued Innovation in Storage Water Heating

Speaker: **Holly Meyer**, Northwest Natural

NAECA III Generation Water Heaters and Their Performance Measurement

Speaker: **Troy Trant**, Rheem Manufacturing

Emerging Technology: Unplugged Smart Flue Damper

Speakers: **Cory Weiss**, Field Controls Inc. and **Dave Kalensky**, Gas Technology Institute

**Description:** Since their re-introduction into the North American market in 2003 tankless water heaters have drawn great interest, however, the storage waters have and will continue to be the predominant product of choice in gas water heating. This session will look at the utility and market drivers that push innovation for this product class, one manufacturer’s view of 2016 product innovations in gas and electric storage water heater to meet NEACA III, and an emerging gas storage water heating technology.

**3:00 pm – 3:30 pm**

**NETWORKING BREAK**

*Plaza Foyer*

**3:30 pm – 5:00 pm**

**BREAKOUT SESSIONS**

*Session 7A**Broadway I***Plumbing Pathogens**

Moderator: **Jim Lutz**

Pathogens in Hot Water Systems: Where Are They, How Do They Get There, and How Do We Get Rid of Them?

Speaker: **Carl Hiller**, Applied Energy Technology

Challenges Associated with Pathogen Control Considerate of the Water-Energy News

Speaker: **William Rhoads**, Virginia Tech

**Description:** Increasingly important pathogens are living in our drinking water. This session will present research on elevated water age and poor water quality in green buildings. What is in ASHRAE's newly released standard 188-2015 *Legionellosis: Risk Management for Building Water Systems*? What are they doing with Guideline 12 - *Minimizing the Risk of Legionellosis Associated with Building Water Systems*? Are other probiotic approaches to pathogen control in plumbing systems possible?

*Session 7B*

*Broadway II*

### **Field and Lab Monitoring in Commercial Kitchens**

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

Results from 18 Field Monitoring Projects on Rack and Flight Conveyor Dishwashers

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

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

Speaker: **Don Fisher**, Fisher Consultants

Recent Testing and Added Features of the 2<sup>nd</sup> Generation Hot Water System Testing Laboratory at PG&E

Speaker: **Eddie Huestis**, Pacific Gas & Electric Applied Technology Services

**Description:** Fisher-Nickel Inc. has recently taken on two extensive projects that seek to modernize hot water system design and operation. The first speaker will summarize the results from eighteen monitoring projects on rack and flight conveyor dishwashers. These machines are the most water and energy intensive appliances in commercial kitchens using two to three times their anticipated hot water use. Observations relating to the maintenance and operation of existing machines and commissioning of new machines will be provided. 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 system's energy and water use, delivery performance and overall system efficiency. Updates on the design, installation and monitoring of the replacement system will be covered. The third speaker will present on the recent testing completed and added features of the 2<sup>nd</sup>-generation hot water system laboratory at Pacific Gas & Electric.

*Session 7C*

*Broadway III*

### **Application of the CTA 2045 Standard for Grid Interactive Water Heaters**

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

Discussion Panelists: **Conrad Eustis**, Portland General Electric

**Josh Keeling**, Portland General Electric

**Chris Kotting**, USNAP Alliance

**Description:** Utilities and service providers are deploying a variety of communication standards and technologies today. Smart Grid information may reach the home through diverse means (e.g. AMI system, cellular, FM radio, Internet, paging, power-line carrier, etc), each being optimal under different circumstances. Within the home, these signals may be received directly by individual end devices, or may pass through an energy management system or gateway. It becomes very challenging for manufacturers to offer products supporting so many different protocols and standards. The term USNAP is an acronym for Universal Smart Network Access Port, a simple, cost effective, solution that enables any HAN (Home Area Network) or DR (Demand Response) standard, present and

future, to communicate with utility systems, energy gateways or other devices within the home. By providing industry with a protocol independent modular communication interface (MCI), it is possible for manufacturers to produce intelligent and energy aware consumer products that are able to interact with each other as well as the Smart Grid.

Conrad Eustis will provide context, history, structure and rationale on why CTA 2045 is the best option for grid interactive appliances to meet the increasing need for demand response in the residential market. Josh Keeling will provide analytical results of the current pilot to date highlighting the potential savings and lessons learned. Chris Kotting will provide an overview of USNAP and the rationale and plans for adopting CTA 2045 for grid interactive appliances (specifically water heaters) for manufacturers, utilities and end users.

*Session 7D*

*Broadway IV*

**(Formerly session 5B) Showers: Recycling or Capturing Waste Heat - Which is the More Efficient Option?**

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

Discussion Panelists: **Kaity Tang** and **James Domanski**, CLEARResult  
**Rick Caruso**, Swing Green  
**David Epstein**, Orbital Systems

**Description:** This session will present information on recycling showers, drain water heat recovery, and gray water source water heating. There are at least three companies trying to bring recycling showers to the US market. We will discuss their approaches to the technology and the potential challenges they face with codes and standards. The presentation on drain water heat recovery will present field data from one house that is currently being monitored. A different strategy is to collect all grey water at one location and use a heat pump to extract the energy and use it to heat the water in a storage tank. Field data on two systems will be presented. Discussion will revolve around the system impacts of installing each one or all of these devices.



## **Acknowledgments**

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Karen Meyers, Vice President of Government Affairs, Rheem Manufacturing  
Amy Bryan, Director of Residential Marketing, Jackson EMC

## Thank You Funders and Allies!

### GOLD



### SILVER



### BRONZE

