

Participant Notes Compiled from Closing Discussion Session

Summary

Question 1 – What types of HW systems do you expect to see in 20 years?

In twenty years, water heating systems should look nothing like they do today. They should be highly energy- and water-efficient and fueled by renewable energy with the possibility of small-scale co-generation. They will have optimized distribution systems, reducing losses through methods such as installing low volume, high velocity plumbing. Waste heat will be recovered, and grey water recycling systems will be commonplace. They will have improved maintainability, easy to refurbish or recycle, and may be modular in design. They should also be affordable. Smart metering will be used, with sub-metering for multi-family residences and control options for the consumer.

Question 2 – Steps that need to be taken to make our vision a reality:

In order for water heating systems of the future to become a reality, there is a need for targeted education efforts (of consumers and industry), and increased R&D. Standards should be created/improved, and they should include whole-system metrics. Builders and installers should be trained or certified, and new construction should be “high-efficiency-ready”. There should be better oversight on compliance and inspections to make sure building codes are being met – including at the governmental level. High efficiency systems need to prove themselves to be reliable. There also needs to be better marketing, and better coordination between water and energy industries. Renewable energy sources should be promoted through measures such as subsidies, carbon offsets, cap and trade, or removing subsidies for water and fossil fuel energy. Finally, a reduction of costs is necessary for consumer buy-in. This could include creative financing, incentives such as tax credits, or the option of leasing a water heater.

Question 3 – How should codes and labels be updated?

Labeling in general should be more consumer-friendly, and different “green” and product-specific labeling schemes should be consolidated/universalized so that there is one metric that is used; there should never be two competing labels on one product. However, standards should be adjusted regionally, where appropriate, and there should be third-party testing behind labeling standards. Ratings should begin to target whole systems including equipment, distribution, and controls. In addition, increased coordination between plumbing and energy codes is critical, and codes should not vary by jurisdiction.

Transcript of all feedback

Question 1 – What types of HW systems do you expect to see in 20 years?

- Self-generating systems
- Multiple uses (i.e. space heating & DHW)
- Utilizing waste energy
- Optimized distribution designs (i.e. new materials)
- Reduced distribution losses, distributed heating appliances
- More integration (does space heating)
- Cores for services (1 or 2)
- Drain heat recovery
- Distribution systems designed
- 100% solar
- Integrated systems/applications (space, hw)
- Efficient: energy & water
- Optimized design
- Mass-produced renewably-powered
 - o Including geothermal
- Life-cycle cost lowest:
 - o Environmental costs
 - o Embodied energy
- Modular design:
 - o Expandable as families grow
 - o Increased efficiency as new technology comes out
- Maintainability
- Refurbishability (designed for)
- Durable for long life
- User feedback features
 - o Diagnostics
 - o Use
- Compatible with smart meter systems
- Water re-use
- Drain water heat recovery
- Eliminate central heating to move to point-of-use
- Heating:
 - o In storage: solar thermal & wind or PV, plus auxiliary for backup
 - Then, smaller heater to bring pre-heated water up to temperature for use
 - o Different heating for specific area as appropriate
 - o Micro co-generation for water heating and electricity
- Delivery:
 - o Shorter runs – designed in architecture
 - o Integrated design for whole house
 - o Low volume, high velocity
- Consumer knows how much water they are using
 - o Smart meter
 - o Full to empty tank capacity
- Reclaiming grey water
- Use per capita
- Proper sizing
- High performance water heat, E.F. > 3.0
- Status symbol

- Water quality, scaling problems
- Maintenance, self-diagnostic
- Fuel cells
- Efficient, using renewables
- Reliable, long lasting & low maintenance
- Simple to install & maintain
- Low cost: 1st cost & operation
- Recyclable and/or reusable
- Integrated into building envelope
- Real-time metering (smart metering) for leak detection or excessive use
- Sub-metering for multi-family
- Intelligent energy management for TOU
- Grey water recovery & heat recovery
- Solar and compressor based
- Micro co-gen, co-gen, or Fuel Cell
- Integrated with other functions depending on climate and site needs
- Limits to consumption
- Responsiveness to site, community, and household
- Integrated with other functions – (Full heat recovery to combine a variety of household needs – (heat recovery from refrigerator, AC, dehumidification, cooking, mechanical ventilation)
- Combined with space heating and other functions to justify higher investment and greater efficiency
- Centralized Options – Either distributed or community-based (centralized use co-housing or community centers where water is produced by renewable sources – very efficient heat recovery and efficient end use)
- User needs to have responsibility – they need to pay for it
- Systems that provide feedback at heater or at end of use
- What is hot water was integrated at point of use – (information display at point of use
- Coin operated faucets and showers
- Central plumbing core (from factory – Tie in heat recovery functions – Manufactured mass produced –
- Load control (off peak) and smart meter integral part of system
- Nuclear – at point of use?
- Move toward all condensing combustion appliances in Canada – Better to have one really efficient system
- Nuclear – cold fusion [a mini-reactor in every back yard!]
- Distributed hot water generation
- Solar – for all options, solar should be the primary source
- Solar thermal for pre-heating, with PV powered electric water heater
- Grey-water heat recovery
- Other heat recovery sources (e.g., dryer, dishwasher, plasma TV) close to uses with storage near the point of use (with very little electric POU heaters)
- Combination refrigerator/water heater [discussed how to harvest “waste” heat from virtually all potential sources within the dwelling, particularly in the summer when internal gains have no other intrinsic value]
- Combined hydronic [make the WH serve the heating function too]
- Building integrated PV and thermal systems [instead of PV or solar thermal on the roof, make it part of the roof, and wall, and awnings, and ...]
- Fuel cells
- Don't just rely on people becoming smarter

- Smarter systems to figure out minimum energy options
- Smarter people with more intelligent life styles
- Nothing like we have now.
- Gary's design in every house.
- Highly efficient, both energy and water.
- Affordable, high performance – what, when, temperature.
- House as a system applied to hot water distribution system.
- Every use point within a minimum distance of the source.
- Real time feedback – energy, price, volume. Control options for the consumer.
- Monitoring of flow

Question 2 – Steps that need to be taken to make Q1 a reality:

- Education (EVERYBODY)
- Codes & Standards
- Economic Evaluation
- Understanding better energy flows & losses
- Metrics of whole system = system E.F.
- Better understanding of behavior
- Intelligent fixtures
- Engineered distribution systems
- Draw limiter
- R&D
 - o Lower cost evacuated tubes
 - o Lower cost sensible storage
- Cost reduction & reliability
- Committed infrastructure with integrated development from up & down the distribution chain
- Creative financing schemes to help average consumers embrace advanced technologies
- Validation through demonstration with good energy performance results
- R&D
- Consciousness-raising: educate the public and industry
- Coordination: between water & energy groups, as well as labels
- Standards & codes
- Eliminate federal pre-emption
- Efficiency programs
- New construction: High efficiency-ready
 - o Floor drains, electric
 - o Venting locations, etc.
- Cost-effective retrofit solutions
- Pay the true cost of water & energy
- Training of PHLL(?)
- Certifying installers
- Manufacturer incentives
- X-prize for water heating (golden carrot)
- Long term plan & schedule for upgrades
- Negotiated agreements with advocates and manufacturers
- Marketing
- Less deceptive practices: truth in advertising
- Promote connection with green

- Meter water (especially in Sacramento)
- Community-based social marketing
- Shower budget systems (coin-op?)
- Compliance/inspection
- Distribution plumbing systems
 - o Develop simulation tools
 - o ACCA manual for plumbing
- Let the market work: eliminate all subsidies for energy source (put \$ into education instead)
- Facilitate communication with builders to ensure they are building/designing homes that the “new” system works in
- Emerging technology – technical training
- Integrated design
- All energy for hot water from renewables
- Cohesive R&D and data collection (internal)
- Least cost using evolving gas & electric infrastructure
- C/E (with carbon offsets and/or controls)
- Support from utility, industry, regulators
- Fossil fuel limits versus renewable limits?
- Minimal line losses (plumbing)
- Continuing efficiency gains in making and delivery
- Continuing commoditization
- New tech commodity market share
- Reduce parasitics
- Design process optimized efficiency
- Building code requires piping design & approval
- Inspection confirms design conformance
- Computer modeling tool to optimize piping design
- Drain water heat recovery codified
- Pilot programs to validate designs and technologies
- More collaboration with efficiency programs
- No tax penalties for EE Improvements due to increased property value
- Lease or rental options –with maintenance incorporated (at one point in Canada 70% of water heaters were leased)
- Source of financing to eliminate first cost barrier
- No installation or maintenance cost – (example - flat \$17.00 month – Eco Cute in Japan)
- Issue of utility private sector competition - regulatory barrier to leasing
- Whole house Retrofit Package systems for housing by vintages – integrate DHW with space heating and/or other heat recovery (redo hot water distribution if needed)
- Solar Hot water is \$5,000 - not going to see it at that cost
- Plumbing is not a cost issue it is a practice issue – Need to change the codes – there are two things – CA has a mandatory requirement – influenced by the federal standard – when we specify in code we cannot exceed the federal standard. Here is a standard option you can pass- but we will give you trade=off options – If you specify a higher EF we will give you credit – Creative ways to get around regulatory barriers – Drive peoples behavior – High efficiency is barely used – Need to make it a known practice
- Indicators of performance for feedback (based on actual HERS rating – (better hot water system will give you better rating))
- Berkeley – Residential Energy Compliance – at point of sale –
- When you buy you have a sticker – Houses need stickers? Modeled as well as utility bill.

- What is the need for consumer education regarding how to use these systems??? Who is in charge or are people being more conscious?
- Users guide to mechanical systems and house operation is important
- Energy audits used to do this – provide information to occupants
- Intelligent meters – Dash boards – Exterior review to spot problems, leaks, controls not working properly
- Benchmarking to see how they compare to neighbors to others in community or service area.
- More integrated design - mechanical engineer talking to architect to avoid missed opportunities.
- Stimulate deployment and field testing – early adopters – Reduce risk by indemnifying manufacturers and early adopters
- Lots of research dollars [including LOTS of research on behavior related issues, like draw schedules]
- Change codes
- Get the economics right – make solar on an economic par with other options
- Make the solutions simple enough that consumers can understand how to operate them
- Craft effective marketing messages [e.g., what will people lose by not adopting, rather than what will they gain by adopting – more effective]
- Real time feedback by appliance [what did it cost me this month to run the dryer the way I did?]
- Utility rates that reward/punish people for their choices
- Coin-operated equipment [direct, present link between use and cost – but it must be time dependent valued]
- Government officials with enough guts to enforce meaningful codes / standards.
- Elimination of atmospheric water heaters
- Review of every plumbing design for efficiency, performance.
- Minimum standard, gold standard, reward for going over and above.
- Method to characterize the thermal and water efficiency of the system.
- Commissioning, with some quantifiable system performance (No more than 3 cups of water wasted, minimum delivered)
- Consumer education

Question 3 – How should codes and labels be updated?

- Update efficiency test procedures and standards
- Mandate better consumer-friendly labels/certification
- More restrictive codes & standards on distribute
 - o Shower tower ban
 - o Underslab uninsulated piping ban
- Green promotion that includes hot water
- Roll hot water into IECC/energy codes
- Communication between plumbing & energy codes
- Pull up codes
 - o Energy Star/CEE pull up first
- Roll HW into Energy Star homes standards & home performance with Energy Star
- Testing and verification (residential commissioning) in houses after installation
- Total system (equipment, distribution, controls) efficiency rating, instead of just equipment
- Make EF more realistic
- Single efficiency rating across fuels and systems

- \$/year
- Energy budget per person (cap & trade)
- Educate “life cycle” payback instead of at purchase cost only
- Home owner rents hot water heater from utility as you would rent your wireless router from your internet service provider – and pays for hot water separate than cold water, separate from grey water
- System evaluation matrices should be able to allow new technologies to be evaluated too
- CODES:
 - Determine the type of system design that makes sense for different applications and areas or “zones” or “regions”
 - Performance-based codes
 - Hot water within 2 seconds @ sinks/showers
 - Field verification
 - Method to rate the whole installed system instead of just the individual components
- LABELS:
 - Universal labels instead of 20 different labels with different requirements; even having the same requirements in several different programs can be confusing for consumers and manufacturers
 - Label requirements for regions
- Energy Star-leading code
- LEED program, green buildings
- Pool covers
- Plumbing ready for dual
- Grey water
- Easier-to-understand code
- Awareness of intelligent systems
- Rebates
- Taxes
- Unified green programs
- More harmonization of standards internationally
- Enforcement of labels, third party testing
- Ways to compare equipment and homes
- Remove/challenge federal pre-emption
- New mechanism to encourage quality installations
- Commissioning and recommissioning
- LEED for homes not aggressive enough (regarding energy efficiency)
- LEED for Homes requires Energy Star as minimum – needs to be better
- Faucets redesign – Different mixing valve – reduce cold water waste – (Center is cold, right is cold, left is hot) (Need to avoid wasted draw)
- Hot start for showers
- Need measured data to verify field performance of technology and systems rather than assumed performance from laboratory – Need to understand the specific performance in specific applications HPWH – Dehumidification?? Cooling? Load impacts?? (What are the behavior impacts?? – What about system interaction?? What about non-energy benefits??
- Penalties for using too much water –
- HP Water Heaters - \$2500 installed cost – is this the best investment???
- Move toward all condensing combustion appliances in Canada – Better to have one really efficient system -

- Combustion safety issues- lots of conventional DHW backdraft or spill or not spill resistant
- Conflicting requirements / regulations - in different jurisdictions – Patchwork - move toward greater consistency (of good regulations)
- Interesting issues - location - inside vs outside the building enclosure - HP water heater work better in hot garage – but will remove more humidity and cool if inside conditioned space. Should codes respond to local climate, regional issues??
- Better indicators of performance
- Different levels for energy star – encourage better performance and competition between manufacturers
- There should not be two competing labels for one product.
- Unified set of requirements that are thoughtfully put together for water, energy, etc.
- Beware of centralized planning – allow for local control. Different regions have different issues.
- Depoliticize program, stakeholder driven not mandate driven.
- Labels need to be consistent, codes need to be rationally based.
- Improved code enforcement, inspector training and funding priority.