DOCKETED

Docket Number:	15-WATER-03
Project Title:	Water Energy Appliance Rebate Program
TN #:	204756
Document Title:	Gary Klein Comments: Treating Hot Water as a System
Description:	N/A
Filer:	System
Organization:	Gary Klein
Submitter Role:	Public
Submission Date:	5/28/2015 12:39:42 PM
Docketed Date:	5/28/2015

Comment Received From: Gary Klein
Submitted On: 5/28/2015
Docket Number: 15-WATER-03

Treating Hot Water as a System

I appreciate the opportunity to provide comments to the Energy Commission regarding measures to address the drought.

The most valuable water to conserve is hot water, at the top of the tallest building, located at the highest elevation in the worst pressure zone in each community. To get the biggest energy and greenhouse gas bang for the investment in water use efficiency, work down and then out.

Indoor water has somewhere between 2 and 25 kWh per 1,000 gallons of embedded energy depending on where the community is located within California. The average for indoor cold water is about 5 kWh/1,000 gallons and includes both water supply and waste water treatment. The average for outdoor cold water is about 2.5 kWh/1,000 gallons and only includes the water supply ration of the embedded energy. Traditional gas and electric storage water heating uses roughly 250 kWh per 1,000 gallons, or 50 times as much energy the average indoor cold water. The ratio changes depending on the embedded energy in water and which water heating technology is being used. One way to proportion the rebates is relative to the amount of embedded energy that can be saved.

There are two technologies that should be considered for inclusion in any incentive program: on-demand circulation pumps and thermostatic shower valves. They can be considered separately, but they provide the largest total benefits when combined.

This proposal is supported by the graph on the Energy Commission's drought website that shows the breakout of indoor water use. Hot water is used in all categories except for toilets. The shower comprises approximately 20% of all indoor water use in CA. As such, it is the single largest water-centric consumer of energy and producer of green house gas emissions in the home.

Generations of building much larger homes (56% increase in median size since 1973) necessitating longer and higher volume plumbing runs coupled with lower flow fixtures is producing significant water and energy waste. On average 20% or more of the energy associated with hot water is now being lost to distribution inefficiency and the wasteful behaviors it generates.

As a result of long wait times for hot water to arrive, generations of California bathers have developed a habit of turning on their showers and then leaving to do something else such as brushing teeth, using the washroom or making the bed while waiting for hot water to arrive. When bathers return to begin showering the water is hot, but significant portions of energy-laden water were wasted before they did so. This wasted water is called warm-up waste.

Warm-up waste is composed of two distinct portions; structural waste and behavioral waste. Structural waste is the previously heated water that has cooled in the pipes and now must be purged before hot water arrives. Behavioral waste is the hot water that inadvertently runs down the drain after the structural waste has been purged, but before bathers begin showering.

Recent research from Lawrence Berkley National Lab (LBNL) indicates that, on average, California bathers spend approximately 70 seconds away from the shower waiting for hot water to arrive (warm-up waste), yet the structural waste is actually purged in about 30 seconds. Approximately 60% (40 seconds) of the total warm-up waste is actually behavioral waste.

The LBNL research further indicates that fast hot water delivery, like that which is achieved with on-demand recirculation pumps, does not stimulate the behavior change necessary to meaningfully reduce warm-up waste. Rather, it merely increases the ratio of behavioral waste to structural waste within a relatively consistent warm-up waste volume.

It now appears as if generations of California bathers have become so conditioned to waiting for hot water that the behavior of leaving and doing something else while waiting has become impervious to change.

The LBNL research underscores the necessity of treating hot water was a system and recognizing that not doing can result in a failure to achieve water, energy and green house gas emissions savings projections.
As it pertains to the shower, the ability to effectively address both the structural waste and behavioral waste components of warm-up waste is easily achieved by combining two proven and commercially available technologies: on-demand recirculation pumps and thermostatic shut-off valves (TSV). On-demand pumps minimize the structural waste; TSVs minimize the behavioral waste.

TSVs work by detecting when near bathing temperature water arrives at the point of use and then automatically lowering the waterâ€™s flow to a trickle until the bather is ready to enter the shower. As such, TSVs should be used in conjunction with on demand pumps to ensure the pumpâ€™s assumed savings. TSVs also help teach bathers how quickly their hot water arrives. There are TSVs for shower heads and for tub/spout valves. Both types should be included in a program. They can be installed in retrofit and in new construction and are applicable to single and multi-family residential installations. They can also be used in other occupancies such as hotel/motel, dormitory and health care.

On-demand circulation pumps are by far the most energy efficient method of priming hot water supply pipes with hot water. They are also the technology that practically eliminates the transfer of warm water into the cold water line when the pumps are installed under a sink in what are typically retrofit applications. One pump can have many activation locations and depending on the configuration of the plumbing can serve more than just the kitchen or bathroom where they are installed. On-demand pumps can be installed in retrofit and in new construction. They are applicable in virtually all occupancies where hot water is needed or desired and the wait times are long.

While the emphasis of rebate programs is likely to be on existing buildings, I would recommend including a rebate for new construction that teaches builders and plumbers how to improve hot water system efficiency. We can use this crisis to start building new buildings correctly.