



California Energy Commission

DOCKETED

14-AAER-01

TN 73368

JUL 12 2014

July 11, 2014

Mr. Harinder Singh,
California Energy Commission,
Dockets Office, MS-4,
Re: Docket No. 14-AAER-1,
1516 Ninth Street,
Sacramento, CA 95814-5512

Subject: Additional Comments - Toilets and Urinals – CEC Docket No. 14-AAER-1, Appliance Efficiency Pre-Rulemaking

Dear Mr. Singh and Commission staff,

Again, we thank you for the opportunity to participate in this pre-rulemaking process. This comment letter is intended to only address issues related to plumbing products, specifically toilets and urinals. Included herein are: (1) responses to the docketed CASE initiative “tier proposals” and comments dated June 6, 2014 dealing with toilet fixtures, (2) suggested superior and fully supported ‘paths forward’ approaches to achieving reduced urban water and energy consumption, and (3) a general discussion of current and short-term future research related to plumbing system functionality.

(1) RESPONSE TO CASE PROPOSALS contained within:

“Faucets, Toilets, & Urinals, CASE Initiative for PY 2014: Title 20 Standards Development, Comments regarding draft regulations, Docket 14-AER-1, Water Appliances”, dated June 6, 2014 (docketed June 6, 2014)

Waste extraction

The June 6 CASE proposal noted above offers nothing different from the original CASE Addendum 1 proposal of February 20, 2014 (docketed February 21, 2014). As reported in our letter of June 5, 2014 (docketed June 6, 2014), the recommended increase in the minimum MaP score to 600 grams from the current 350 grams used in the ANSI standard is based upon flawed assumptions, is unjustified, and will not yield water nor energy savings. Please refer to our docketed comment letter for a full explanation of background reasons for these conclusions.

Maximum flush volume

The June 6 CASE proposal newly recommends a decrease in maximum toilet flush volume to 1.06 gallons (4.0 liters) per flush (gpf), presumably based upon development by our organization in 2012 of the MaP PREMIUM category of residential toilet fixtures. One must note that it was ONLY on January 1, 2014, that the maximum toilet flush volume in California was lowered from 1.6 gpf to 1.28 gpf in accordance

with AB715¹. The MaP PREMIUM category offers an alternative to consumers for homes without drainline issues; toilets classified as PREMIUM are absolutely NOT recommended for non-residential applications nor for older homes with degraded drainline systems. Although the CASE proposal suggests a 1.06 gpf maximum threshold be applicable only to tank-type toilets, perhaps assuming that tank-type toilets are exclusively found in residential installations, a large number² of tank-type toilets are in fact installed in non-residential-type applications.

In summary, without further investigation and tracking of ‘real world’ installations of 1.28 and 1.06 gpf toilets in various applications (particularly commercial), we recommend the rejection of this proposal.

(2) PATHS FORWARD

Most of us are well aware of the current drought situation in California. The CASE proposals are presumably designed to address the drought and achieve water and energy use reductions. However, the development of new standards and other initiatives should: (1) provide one or more paths to achieving savings in a timely manner (concerning California’s current drought situation, most immediately) and (2) be based upon science founded upon independent research. We suggest that the existing CASE proposals do neither.

New water-using product standards (such as those proposed through the CASE proposals) and legislative mandates are long-term impact paths to possible water use reduction. This is clearly illustrated by AB715, supported by numerous stakeholders when signed into law in 2007 and now in full effect in 2014, seven years later.

However, more immediate water use reductions are needed in California. In the past 20 years, water utilities have shown over and over that carefully executed demand management programs can yield immediate water use reductions, particularly in times of major drought. Recognizing the experience and ability of California water utilities to execute user-focused conservation programs, we recommend the following paths forward:

Legacy toilet replacement program

Although many toilet replacement programs have been successfully implemented in California in the past 25 years, there still remains a remnant of water-wasting ‘legacy’ models, i.e., those toilet models with flush volumes of 3.5, 5.0, and 7.0 gallons per flush (gpf). According to the 2005 Potential Best Management Practices study by the California Urban Water Conservation Council³, there were about 8.7

¹ It must be noted that what is reported in Section 6.2 of the CASE team’s original proposal of July 29, 2013 (docketed July 29, 2013) regarding the percentages and dates prior to 2014, relates ONLY to what must be available in the manufacturer’s product line (catalog, website or other marketing promotions for California), NOT WHAT IS SOLD OR INSTALLED. As a result, the ONLY important date for implementation of a reduced maximum flush volume of 1.28 gpf in California is January 1, 2014, when the percentage is finally set at 100 percent.

² We estimate that approximately 30 percent of all toilets installed in non-residential applications are of the tank-type design.

³ California Urban Water Conservation Council, 2005. “*Potential Best Management Practices (PBMP) Report: High Efficiency Plumbing Fixtures – Toilets and Urinals*”, Prepared by Koeller and Company.

million of these older non-efficient toilets still installed in California residences in 2005⁴. Assuming that figure has been halved by 2013 through normal replacement and water utility conservation programs, it means that about 4.3 million legacy toilets still exist in residential dwellings today (many of which are likely installed in low income dwellings, particularly apartments).

The proposed 'Legacy toilet replacement program' initiative would replace remaining non-efficient toilets in the state with High-Efficiency Toilets (HETs) compliant with AB715. To the extent funding is made available for such an aggressive program, this is where significant indoor water savings (and related energy savings) can be achieved in the short-term without relying upon changes to codes or standards.

Attachment A provides a rough analysis of the potential short-term savings using CASE report and other data. The predicted annual water savings from replacing the 4.3 million Legacy toilets amounts to approximately four times the CASE proposal's estimated savings from toilets. And, with a well-executed program, these savings would occur in a much shorter time span.

California water conservation 'Summit'

The California Department of Water Resources, the California Water Board, the California Public Utilities Commission, and the California Energy Commission are all currently seeking and evaluating short-term and long-term strategies to reduce California water (and/or energy) consumption.

Demand management programs by California water utilities have historically represented a viable 'source' of 'new water'. We recommend the four state agencies named above commission a 'summit' on water conservation and demand management that brings together the working experience and resources available at those agencies to develop an immediate action plan commencing in 2014 and specifically designed to address drought conditions. We further recommend the summit include key water utility staff representatives and consultants with direct applicable experience in this area. It is especially important for the demand management experience that exists outside of the four named agencies also be brought to bear to immediately address California's current drought situation. Action plans can and should be initiated within the proposed 'summit'.

(3) RESEARCH AND SCIENCE

Since the 1980s, and in response to periodic water supply shortages, manufacturers have developed new product designs and technologies that deliver improved product efficiencies. The development and mandating of new efficiency standards for these products (e.g., through AB715, CalGreen, WaterSense, ASME/CSA, and 'green' mandates) has occurred through various consensus processes with excellent stakeholder involvement. However, much of that process occurred without sufficient regard for building plumbing (supply and wastewater) 'systems'. Only recently, the consequences of repeatedly reducing water use at the system endpoints (toilets, urinals, showers, faucets, appliances) is becoming evident. Longer hot water delivery times, thermal shock and scalding dangers, and the presence of harmful resident pathogens in slow moving or stagnant supply systems are just some of the unintended consequences we can attribute (in whole or in part) to reduced flows in plumbing systems. Attachment B illustrates the dramatic reductions in water consumption that have occurred since the 1980s.

⁴ The estimate of 8.7 million non-efficient residential toilets is consistent with the statement in the CASE report, "Toilets & Urinals Water Efficiency, CASE Initiative for PY 2013: Title 20 Standards Development, Analysis of Standards Proposal for Toilets & Urinals Water Efficiency", dated July 29, 2013 (docketed July 29, 2013), page 22, which states "The study found that about 67 percent of the installed toilets met the existing federal efficiency standard, having rated flush volumes of 1.6 or less." The remainder of 33 percent (of 24.6 million total) amounts to 8.1 million non-efficient residential toilets.

In view of the above, we recommend the CEC (and others) support important plumbing and water efficiency research initiatives before implementing any Title 20 plumbing standards beyond those suggested in the draft CEC staff report. At a minimum, support is recommended for the following:

- a. Plumbing Efficiency Research Coalition (PERC), Phase 2 Study to Investigate Drainline Transport in Buildings, www.plumbingefficiencyresearchcoalition.org (Phase 1 completed; Phase 2 to begin in 2014 - awaiting funding)
- b. Pipe Sizing Task Force, Revise 'Hunter's Curves' (design guidelines) to reflect the lower fixture and appliance flows as shown in Attachment B. An example of current work may be found here: www.map-testing.com/assets/files/hunters_drain_pipe_calculations-by_dan_cole-iapmo_official-spring_2014.pdf (Work underway)
- c. High-efficiency urinal field study – 0.125 gpf flushing urinals. Survey facilities managers as to installation and operating experiences and assess feedback related to the replacement of non-efficient urinals with 1-pint urinals as a result of 2010 Los Angeles City ordinance.

Other research initiatives are needed to assure user health and safety. Specifically, there is an emerging issue with respect to residence time for water in plumbing systems. Reduced demand and higher efficiencies in building plumbing products (see Attachment B) are now resulting in longer residence times for water within the building supply piping. This, in turn, can lead to the storage of water for such a long period of time within the supply pipes that the disinfection residual is no longer present to protect public health. Thus, Legionella and pathogen growth may be occurring, and cases of user illness and death are already being documented by the Center for Disease Control and other research institutions⁵. Definitive remedies for this problem have yet to be determined. We therefore recommend the health and safety effects of reduced flows in building potable water supply lines be carefully and immediately investigated. Decisions with respect to new end-use fixture standards must consider the overall impact to the plumbing system and to the users.

We continue to support the CEC draft staff report's recommendations relating to this pre-rulemaking process for plumbing products. Thank you for considering these comments. We are available to answer questions regarding the above information.

Regards,



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⁵ http://www.map-testing.com/assets/files/pathogens_in_plumbing_systems-presentations.pdf (3.7mb)

REPLACING NON-EFFICIENT LEGACY TOILETS IN CALIFORNIA

Target: replace 4.3 million existing Legacy toilets flushing at 3.5, 5.0 gpf and above.

- 4.3 million toilets serve an estimated 6.65 million people¹.
- That population flushes 4.76 times per day² = 31.7 million flushes per day
- Assumed average savings per flush = 2.4 gallons (3.5 & 5.0 reduced to 1.28)
- Overall savings = 2.4 x 31.7 million flushes = 76 million gallons per day = 233 Acre-Feet (AF) per day
- 365 days x 233 AF/day = 85,100 Acre-Feet per Year (AFY) = 27,700 Mgal/yr
- 25-year life of the fixtures³: 25 x 85,100 AFY = 2,130,000 Acre-feet saved over the life of the 4.3 million replacement toilets.

It should be noted that, on an annual basis, water savings (and energy savings) from this program are 4 times the savings forecasted in the CASE proposal.

Historically, four program types have been used in the past 20 years to achieving toilet replacements in the residential sector: rebates, voucher redemptions, free distribution, and direct installation. Each program type possesses distinct advantages and characteristics; these are summarized in the table on the following page, the most expensive approach being direct installation wherein the customer benefits from a fully installed free toilet. Recent direct install programs in Southern California have cost the water utilities about \$220 per fully installed toilet. The other three program types are less expensive because the responsibility for toilet installation rests with the customer/homeowner.

Estimated program costs per AF of water savings are summarized in this table for each of the four types.

Program types and water savings

	<i>Rebate</i>	<i>Voucher</i>	<i>Distribution</i>	<i>Direct Installation</i>
Replace toilets	4.3 million legacy toilets			
Implementation cost per replaced toilet	\$120	\$140	\$165	\$220
Total program cost for 4.3 mil replacements (\$mil)	\$516	\$602	\$710	\$946
Total water savings	2.130 million AF			
Program cost per AF saved	\$242	\$283	\$333	\$444

A combination of program types is required to effectively reach all demographics in the state. We estimate the development and implementation of such programs could begin in 2014 and, with aggressive marketing and outreach, could achieve 70 percent replacement within four years.

¹ "Toilets & Urinals Water Efficiency, CASE Initiative for PY 2013: Title 20 Standards Development, Analysis of Standards Proposal for Toilets & Urinals Water Efficiency", dated July 29, 2013 (docketed July 29, 2013), Table 5.3: 37.3 million population – 24.1 million residential toilets; equals 1.55 persons per residential toilet.

² ...Ibid, Table 5.3: Flushes per person per day: 4.76; It should be noted, however, that the generally reported national average is 5.1 flushes per person per day.

³ ...ibid, page 21: "...product lifetime of 25 years..."

Characteristics of Typical U.S. Water Utility Toilet Replacement Program Types

	Rebate Program	Voucher Program	Distribution Program	Direct Installation Program
Program cost to sponsoring water authority (cost per unit)	Lowest cost of all types = Rebate amount plus approximately \$15-25 for rebate processing by outside firm.	Slightly higher cost than rebate due to retailer recruiting and involvement = Voucher amount plus approximately \$20-40 for establishing relationships and processing vouchers.	Free to customer; will cost water authority \$120 to \$170 for a high-volume program using commodity HETs.	Most expensive program type; cost will depend upon type of fixture installed for the customer; current range is \$200 to \$240 per installed toilet.
Selection of toilet fixtures	By the customer (selection may be restricted by the water authority to an "approved toilet list")	By the customer (selection may be restricted by the water authority to an "approved toilet list")	By the water authority and the implementation contractor; customer choice (if any) is limited to a few models on hand.	By the water authority and the installation contractor; customer choice (if any) is limited to a few models on hand.
Purchase of toilet fixtures	By the customer	By the customer	By the program implementation contractor	By the installation contractor (plumbing contractor)
Toilet fixture installation	By the customer	By the customer	By the customer	By the installation contractor
Used toilet disposition	None provided for in the program; toilet may end up being re-used.	None provided for in the program; toilet may end up being re-used.	Dismantling, destruction, and recycling by the implementation contractor.	By the installation contractor or the water authority.
Retailer involvement in program	Retailer sells toilet to customer.	Retailer sells toilet to customer and accepts a water authority voucher as cash for full or partial payment.	No involvement	No involvement, except to the degree that installation contractor acquires fixtures at retail.
Program implementation and administration	By the water authority or, in the case of a large program, by a rebate processing contractor.	By the water authority or, in the case of a large program, by a marketing contractor and a voucher processing contractor.	Primarily by the implementation contractor, with oversight by the water authority.	Primarily by the installation contractor, with oversight by the water authority.
Installation verification	Required; a statistically valid sample of rebated installations should be physically inspected.	Required; a statistically valid sample of vouchered installations should be physically inspected.	Required; a statistically valid sample of installations should be physically inspected.	Not required; installations performed by program personnel.
Special facilities requirements	None	None	Warehouse; distribution center; used toilet receiving and dismantling yard.	Possibly a warehouse
Popularity of program type	Most popular of all program types.	Very seldom used, due to need to develop strong, continuing relationships with plumbing retailers in the area and process voucher reimbursement claims from those retailers.	Second most popular program type, because of the volume of toilet replacements that can be achieved in a very short time period.	Also seldom used, because of the inherent program costs and contingent liabilities.

Attachment B

**TABLE 2-A. WATER CONSUMPTION BY WATER-
USING PLUMBING PRODUCTS AND APPLIANCES –
1980 TO 2012**

Water-using Fixture or Appliance	1980s Water Use	1990 Requirement	EPAct 1992 Requirement	2009 Baseline Plumbing Code	2012 'Green Code' Requirement	% Reduction in avg water use since 1980s
Residential Bathroom Lavatory Faucet	3.5+ gpm	2.5 gpm	2.2 gpm	2.2 gpm	1.5 gpm	57%
Showerhead	3.5+ gpm	3.5 gpm	2.5 gpm	2.5 gpm	2.0 gpm	43%
Toilet – Residential	5.0+ gpf	3.5 gpf	1.6 gpf	1.6 gpf	1.28 gpf	74%
Toilet - Commercial	5.0+ gpf	3.5 gpf	1.6 gpf	1.6 gpf	1.6 gpf ¹	68%
Urinal	1.5 to 3.0+ gpf	1.5 to 3.0 gpf	1.0 gpf	1.0 gpf	0.5 gpf	67%
Commercial Lavatory Faucet	3.5+ gpm	2.5 gpm	2.2 gpm	0.5 gpm	0.5 gpm	86%
Food Service Pre-rinse Spray Valve	5.0+ gpm	No requirement	1.6 gpm (EPAct 2005)	No requirement	1.3 gpm	74%
Residential Clothes Washer	51 gallons/load	No requirement	26 gallons/load (2012 standard)	No requirement	16 gallons/load	67%
Residential Dishwasher	14 gallons/ cycle	No requirement	6.5 gallons/cycle (2012 standard)	No requirement	5.0 gallons/cycle (ASHRAE S191P)	64%

gpm: gallons per minute

gpf: gallons per flush