WaterSense®

Specification Review Webinar for Utilities and Promotional Partners

Stephanie Tanner, EPA WaterSense
Robert Pickering, ERG
Kim Wagoner, ERG
Joanna Kind, ERG

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Housekeeping

- All attendees are muted to minimize background noise
- Please type questions into the Questions box in the GoToWebinar control panel. We will have a dedicated time for Q&A at the end of each section and at the end of the presentation as time allows
- This PowerPoint presentation and a meeting summary will be posted on the public website
- Submit written comments to: watersense-products@erg.com
- This meeting is meant to be an open discussion
- All questions, comments, and concerns are welcome!

Meeting Objective

- Present information EPA has collected as part of its specification review
- Summarize issues and considerations EPA must address if it decides to revise the scope, water efficiency criteria, and/or performance criteria of a specification
- Review public comments received to date on the *Notice of Specification Review*
- Solicit additional feedback and information from utilities and promotional partners
- EPA does not intend to make a determination as to whether to move forward with a specification revision during this meeting

Agenda

- Lavatory Faucet Specification Considerations
- Showerhead Specification Considerations
- Tank-Type Toilets Specification Considerations
- Flushing Urinals Specification Considerations
- Weather-Based Irrigation Controllers
- General Considerations
- Next Steps

Specification Review Process

Thru Mar 2019

Internal Research
- Update product information, analyze WaterSense product database, conduct industry research
- Issue *Notice of Specification Review* and hold first stakeholder meeting

Mar-Jun 2019

Stakeholder Engagement
- Hold meetings with individual partners, standards committees, industry experts, and utilities
- Review comments, conduct additional analysis based on in house data
- Hold product type meetings with stakeholders to review information collected to date

← We are here

Jun-Aug 2019

Analysis
- Compile additional comments received and post to website
- Review and analyze information collected
- Continue engagement with standard committees and industry as necessary

Aug-Dec 2019

Develop Recommendations and Announce to Stakeholders by 31 December 2019
- Develop recommendations and review with EPA Management
- By December, present recommendations, post material to website, host public meetings

Part 1

Lavatory Faucets Specification Considerations

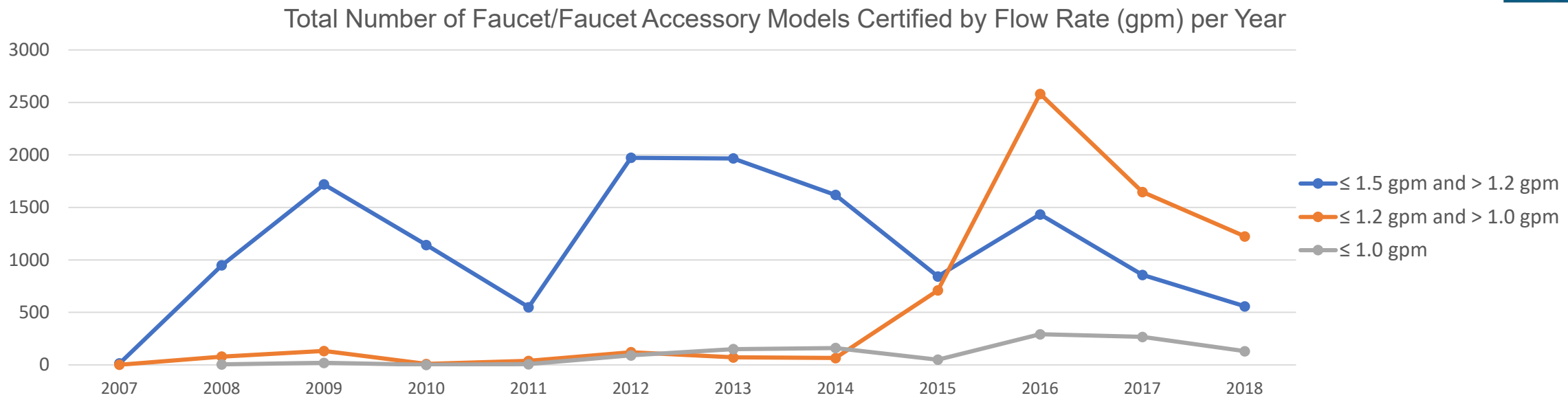
Specification for High-Efficiency Lavatory Faucets

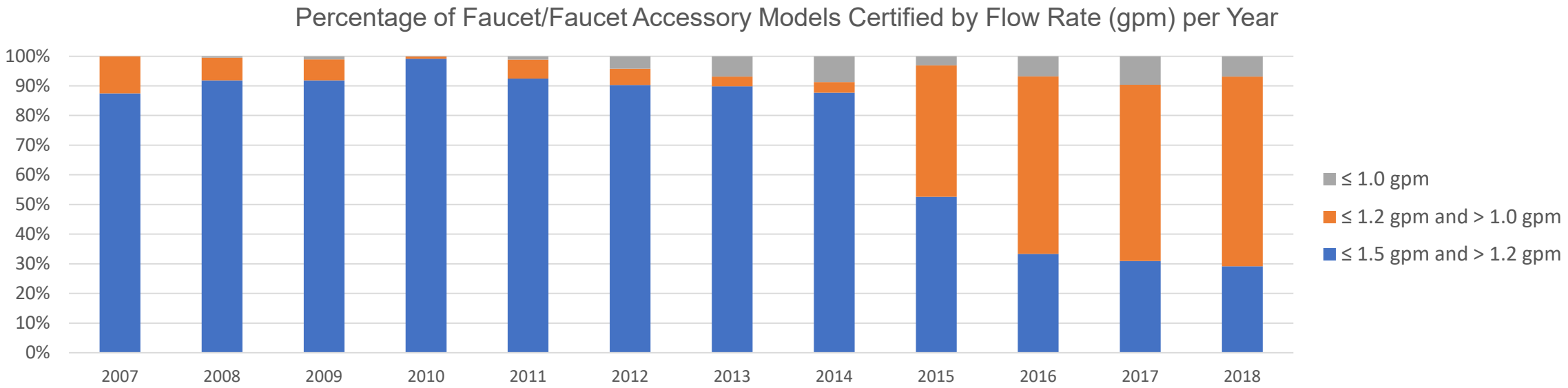
WaterSense High-Efficiency Lavatory Faucet Specification

- Released October 1, 2007
- Approximately 300 manufacturer partners
- Scope includes lavatory faucets, faucet accessories (e.g., aerators, laminar flow control devices), and bar sinks

Maximum Flow Rate	≤ 1.5 gpm and > 1.2 gpm	≤ 1.2 gpm and > 1.0 gpm	≤ 1.0 gpm	Total
Number of Models	9,534	5,847	1,164	16,545
Percentage of Total	57.6%	35.5%	7.0%	-

Certification Trends





Specification for High-Efficiency Lavatory Faucets

Water Efficiency Requirements

- The **maximum flow rate** shall be ≤ 1.5 gallons per minute (gpm) at a flowing pressure of 60 pounds per square inch (psi)

Performance Requirements

- Lavatory faucets and accessories shall **conform to applicable ASME requirements**
- The **minimum flow rate** shall be ≥ 0.8 gpm at a flowing pressure of 20 psi
- The product and/or product packaging shall be **marked** with the maximum flow rate

Criteria Considerations

Water Efficiency Considerations

Reduce the maximum flow rate criteria below 1.5 gpm

- Four states and multiple municipalities have established maximum faucet flow rates of 1.5 gpm, consistent with the WaterSense water efficiency criteria
- As of 2016, California requires lavatory faucets to flow at 1.2 gpm or less
- 42% of WaterSense labeled lavatory faucets and faucet accessories have a maximum flow rate at or below 1.2 gpm

Performance Considerations

Change the minimum flow rate criteria

- If EPA were to lower its maximum flow rate requirements, the current minimum flow rate could become harder to achieve
  - Many faucets with flow rates between 1.2 and 1.0 gpm are currently capable of meeting WaterSense's minimum criteria

Preliminary Water Savings Potential

- Lowering the flow rate maximum to:
  - 1.2 gpm would represent an additional 20 percent increase in efficiency over the current WaterSense specification and 45 percent increase over the national standard
  - 1.0 gpm would represent an additional 33 percent increase in efficiency over the current WaterSense specification and 55 percent increase over the national standard

Gallons Per Minute (gpm)	Potential Annual Savings Beyond 1.5 gpm for New Lavatory Faucets (billion gallons)	Potential Annual Savings Beyond 1.2 gpm for Existing Lavatory Faucets (billion gallons)	Total Savings Assuming 10% Market Share (billion gallons)
1.2 gpm*	0.3	26.1	2.6
1.0 gpm	0.5	45.8	4.6

*Excludes savings from California

Outstanding Questions on Efficiency and Performance

- Are there existing studies on the water efficiency and/or performance of lavatory faucets of which WaterSense should be aware?
- If WaterSense lowers the maximum flow rate criteria, should it also modify the minimum flow rate criteria?
- Is there anything else about water efficiency or performance that WaterSense should consider during its review process?

Questions and Discussion

Poll Question

Question: Based on what has been presented, does WaterSense have enough information to determine whether to revise its specification for lavatory faucets?

- Yes
- No

Poll Question

Question: In your opinion, should EPA revise the water efficiency criteria of the *WaterSense Specification for Lavatory Faucets*?

- Yes
- No
- Need more information

Scope Considerations

Current Specification Scope

- Applies to lavatory faucets and accessories in private use
- Explicitly excludes metering faucets, lavatory faucets in public use, and kitchen faucets

Opportunities for Scope Expansion

- Residential kitchen faucets
- Metering faucets

Residential Kitchen Faucet Background

- The current federal standard is 2.2 gpm at 60 psi
- Excluded from the current scope because they have different uses, such as effectively rinsing dishes and filling pots and containers
- WaterSense is considering residential kitchen faucets due to changes in the market, availability of products, and newly emerging state regulations
- Residential kitchen faucets are different than commercial kitchen faucets, which are intended for more specialized uses in commercial kitchens

Water Efficiency Considerations

Establish maximum flow rate

- California and Vermont mandate a maximum flow rate of 1.8 gpm or less, but allow a temporary override up to 2.2 gpm
- Georgia requires a maximum flow rate of 2.0 gpm or less
- The California Modernized Appliance Efficiency Database System (MAEDBS) lists over 19,000 compliant kitchen faucets and 1,400 kitchen faucet aerators flowing between 1.5 gpm and 1.8 gpm

Gallons Per Minute (gpm)	Potential Annual Savings for New Residential Kitchen Faucets (billion gallons)	Potential Annual Savings for Existing Residential Kitchen Faucets (billion gallons)	Total Savings Assuming 10% Market Share (billion gallons)
1.8 gpm*	0.9	86.9	8.8
1.75 gpm	1.0	99.5	10.1
1.5 gpm	1.6	160.0	16.2

*Excludes savings from California and Vermont

Performance Considerations

Temporary override

- Intended to counter performance concerns, allowing for faster filling times and improved user satisfaction

Minimum flow rate

- A minimum flow rate may be necessary to ensure adequate performance

Multiple modes

- Many residential kitchen faucets allow the user to switch between spray and stream modes
- WaterSense would likely only hold one mode subject to all performance requirements, but all modes would be required to meet the maximum flow rate criteria

Questions and Discussion

Metering Faucets Background

- ASME A112.18.1/CSA B125.1 definition:
  - A self-closing faucet that discharges water for a predetermined amount of time (i.e., cycle) or discharges a predetermined quantity of water before shutting off
- Metering faucets were excluded from the current scope because they have differing use patterns and user expectations compared to residential lavatory faucets
- Consideration of metering faucets is driven by
  - No maximum flow rate, only maximum volume per cycle
  - Cycle length is not defined, therefore water use can vary significantly
  - Reports that WaterSense aerators are being used on metering faucets to claim they are labeled

Applicable Requirements

Federal Requirement (EPAct)
Maximum water usage rate: 0.25 gallons per cycle (gpc)

California Title 20
Maximum water usage rate: 0.25 gpc

CalGreen
Maximum water usage rate: 0.20 gpc

American Disabilities Act (ADA)
Minimum cycle length: 10 seconds

Water Efficiency Considerations

Consider lowering the metering faucet maximum water usage below 0.25 gpc

- EPA could reduce maximum gallons per cycle to 0.15 gpc or 0.2 gpc to better align with water use from non-metering lavatory faucet flow rate
- For an average handwashing time of 7 seconds, a non-metering public lavatory faucet with a flow rate of 0.5 gpm would use 0.06 gallons whereas a metering faucet could use 3 to 4 times that

Water Efficiency Considerations

WaterSense could also consider establishing a maximum cycle time

- Currently there is no set standard that specifies the cycle length of a metering faucet

Code or Standard	Cycle Length	Corresponding Gallons per Minute	Volume Used with 0.5 gpm Aerator
ASME A112.18.1/CSA B125.1	5 seconds (required for testing of adjustable faucets)	3.0 gpm	0.04 gallons
2010 ADA Standard	10 seconds	1.5 gpm	0.08 gallons
LEED v2009	12 seconds	1.25 gpm	0.10 gallons

- A Michigan State University study found that actual handwashing time averages approximately 7 seconds.

Performance Considerations

- The national testing methodology and performance standards for metering faucets are established by the ASME A112.18.1/CSA B125.1 standard
- The standard includes life cycle testing, defined as 150,000 cycles
- The ASME/CSA standard does not establish a minimum flow rate, cycle length, or other performance requirements that could be pertinent to user satisfaction

Public Comments Received to Date

Plumbing Manufacturers International (PMI)

- Recommends that no changes be made to the lavatory faucets specification
- Referenced two EPA funded studies looking into the impact of water conservation on public health
- Refenced the CUWA white paper regarding declining flows

Metropolitan North Georgia Water District

- Suggested revising the specification with a maximum flow rate of 1.0 gpm and a minimum flow rate of 0.5 gpm
- Suggested creating specification criteria for kitchen faucets, requiring a maximum flow rate of 1.5 gpm or less
- Conducted retail market research and found significant majority of both lavatory and kitchen faucets had flow rates below current WaterSense and national levels

Outstanding Questions on Scope

- Are there faucet types EPA should consider for inclusion in its WaterSense specification (other than residential kitchen and metering faucets)?
- Are there existing studies on the water efficiency and/or performance of residential kitchen faucets or metering faucets of which WaterSense should be aware?
- If EPA develops a specification, should minimum flow rates be established for residential kitchen faucets and/or metering faucets to ensure user satisfaction?
- Could a label for metering faucets set other public lavatory faucet types at a disadvantage in the marketplace?

Questions and Discussion

Poll Question

Question: Which product categories should WaterSense expand the scope of its faucet specification to include?

- Both residential kitchen faucets and metering faucets
- Only residential kitchen faucets
- Only metering faucets
- Neither, leave the specification scope as is

Poll Question

Question: Would you consider rebating or incentivizing high-efficiency kitchen faucets?

- Yes
- No
- Already have rebate program for metering faucets
- Need more information

Poll Question

Question: Would you consider rebating or incentivizing high-efficiency metering faucets?

- Yes
- No
- Already have rebate program for kitchen faucets
- Need more information

Part 2

Showerhead Specification Considerations

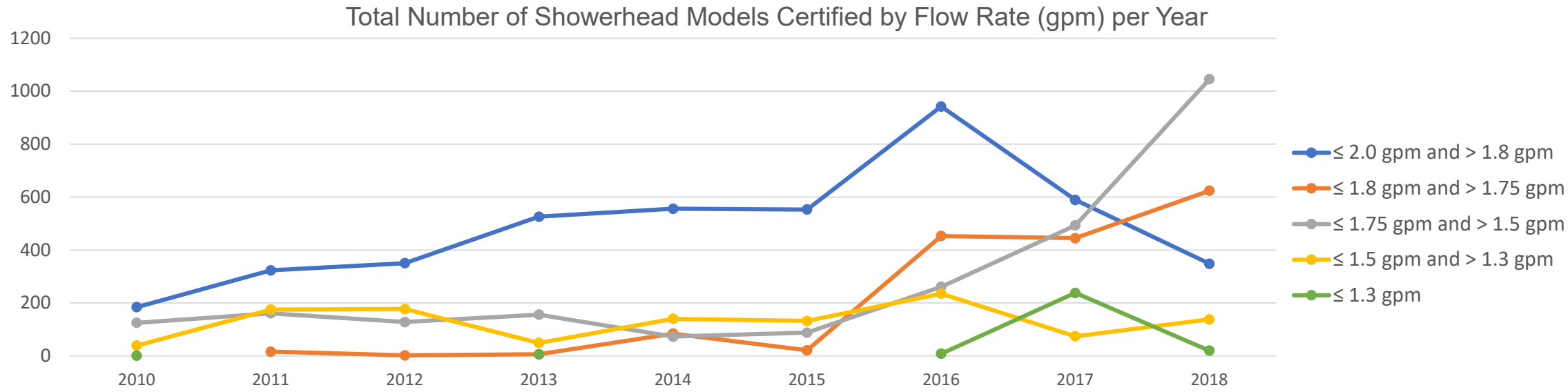
Specification for Showerheads

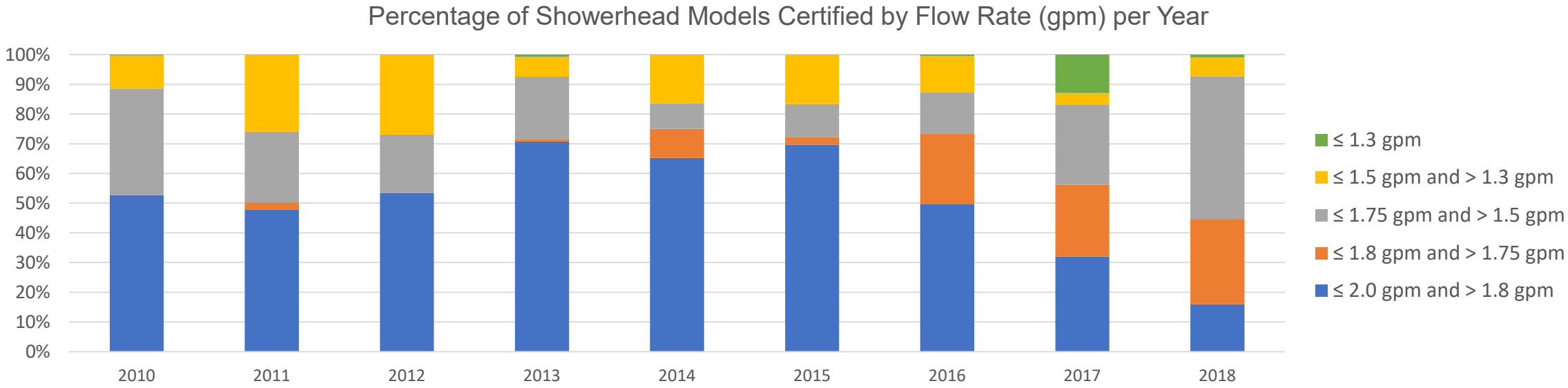
WaterSense Specification for Showerheads

- Released March 4, 2010
- Revised July 26, 2018 (Version 1.1)
- 178 manufacturer partners
- Number and percentage of WaterSense labeled showerheads by flow rate:

Maximum Flow Rate (gpm)	≤ 2.0 and > 1.8	≤ 1.8 and > 1.75	≤ 1.75 and > 1.5	≤ 1.5 and > 1.3	≤ 1.3	Total
Number of Models	3,471	1,383	2,216	977	269	8,316
Percentage of Total	41.7%	16.6%	26.6%	11.8%	3.2%	-

Certification Trends





Specification for Showerheads

Water Efficiency Requirements

- The **maximum flow rate** shall be ≤ 2.0 gpm

Performance Requirements

- Showerheads shall **conform to requirements in the applicable ASME standard**.
- The **minimum flow rate** tested at a flowing pressure of 20 psi must not be < 60 percent of the maximum flow rate
- The **minimum flow rate** tested at a flowing pressure of 45 psi and 80 psi must not be < 75 percent of the maximum flow rate
- The **minimum spray force** shall not be < 2.0 ounces of force at flowing pressure of 20 psi
- The **spray coverage** of the showerhead shall meet criteria included in the applicable ASME standard
- Showerheads and associated packaging shall be **marked** according to ASME A112.18.1/CSA B125.1, including the maximum flow rate marking

Scope Considerations

Current Specification Scope

- Includes showerheads, rain showers, and handheld showerheads
- Excludes body sprays

Opportunities for Scope Expansion

- EPA has not identified any new product types that would fall under the overarching showerheads product category that it is considering including the specification scope

Criteria Considerations

Water Efficiency Considerations

Reduce the maximum flow rate criteria below 2.0 gpm

- Three states and multiple municipalities require a maximum flow rate of 2.0 gpm or less
- As of 2018, California established a maximum showerhead flow rate of 1.8 gpm
- 58 percent of WaterSense labeled showerheads achieve a maximum flow rate of 1.8 gpm or less

Performance Considerations

- EPA has no data to suggest that users are dissatisfied with the current performance of labeled showerhead
- Some research has been done to indicate the current force balance test method does not accurately represent a showerhead's actual spray force
- EPA could alternatively measure spray force using a force gauge, which is similar to testing for pre-rinse spray valves and some international test methods for showerheads

Preliminary Water Savings Potential

- Lowering the flow rate maximum to:
  - 1.8 gpm would represent an additional 10 percent increase in efficiency over the current WaterSense specification and 28 percent increase over the national standard
  - 1.75 gpm would represent an additional 13 percent increase in efficiency over the current WaterSense specification and 30 percent increase over the national standard

Gallons Per Minute (gpm)	Potential Annual Savings Beyond 2.0 gpm for New Showerheads (billion gallons)	Potential Annual Savings Beyond 2.0 gpm for Existing Showerheads (billion gallons)	Total Savings Assuming 10% Market Share (billion gallons)
1.8 gpm*	0.9	91.1	9.2
1.75 gpm	1.2	117.0	11.8
1.5 gpm	2.4	246.2	24.9

*Excludes savings from California

Health and Safety Considerations

- During the initial specification development, WaterSense considered whether reducing the flow rate would increase the risk of thermal shock or scalding
- Industry has since worked to harmonize the automatic-compensating mixing valve and the showerhead standards to address incompatibilities of these components and to ensure products are marked and packaged consistently to educate the purchasers/specifiers on these risks

Public Comments Received to Date

Plumbing Manufacturers International (PMI)

- Recommends that no changes be made to the showerheads specification
- Referenced two EPA funded studies looking into the impact of water conservation on public health
- Refenced the CUWA white paper regarding declining flows

Metropolitan North Georgia Water District

- Conducted retail market research to investigate current availability of 1.8 gpm showerheads
  - 77% of available showerheads were WaterSense labeled
  - 40% of all showerheads had flow rates at or below 1.8 gpm
  - 55% of WaterSense labeled showerheads had flow rates at or below 1.8 gpm
- Suggested revising the specification to require a flow rate of 1.8 gpm

Denver Water

- Suggested adopting 1.8 gpm maximum flow rate, based on California shifting the market for these products

Public Comments Received to Date

Contra Costa Water District

- Reduced flow rates
  - Suggested further study is warranted to understand the relationship between scalding/thermal shock and flow rate of showerheads. Theoretically risk increases at lower flow rates, however not a lot of real world evidence has been provided to show evidence of these hazards actually occurring
  - Any changes to the WaterSense specification should consider existing homes that have older style valves and lack mixing valves altogether
  - CEC concluded that thermal shock/scald can occur due to several factors, and chose to move forward with a 1.8 gpm standard
- Trickle flow adapters
  - Questioned whether “trickle flow adapters” pose risk of scalding or thermal shock
  - Suggested that no research into this subject area has been completed
  - Has not heard of any reported issues related to scald or thermal shock stemming from trickle flow adapter giveaways

Outstanding Questions

Questions?

- Are there other product types EPA should consider for inclusion in the showerheads specification?
- Are there existing studies on the water efficiency and/or performance of high-efficiency showerheads of which WaterSense should be aware?
- Could decreasing the maximum flow rate for showerheads result in additional concerns related to thermal shock or scalding?
- Is there anything else about water efficiency or performance that WaterSense should consider during its review process?

Questions and Discussion

Poll Question

Question: Based on what has been presented, does WaterSense have enough information to determine whether to revise its specification for showerheads?

- Yes
- No

Poll Question

Question: In your opinion, should EPA revise the water efficiency criteria of the *WaterSense Specification for Showerheads*?

- Yes
- No
- Need more information

Poll Question

Question: Have you heard any complaints regarding the performance of WaterSense labeled showerheads?

- Yes
- No

Part 3

Tank-Type Toilets Specification Considerations

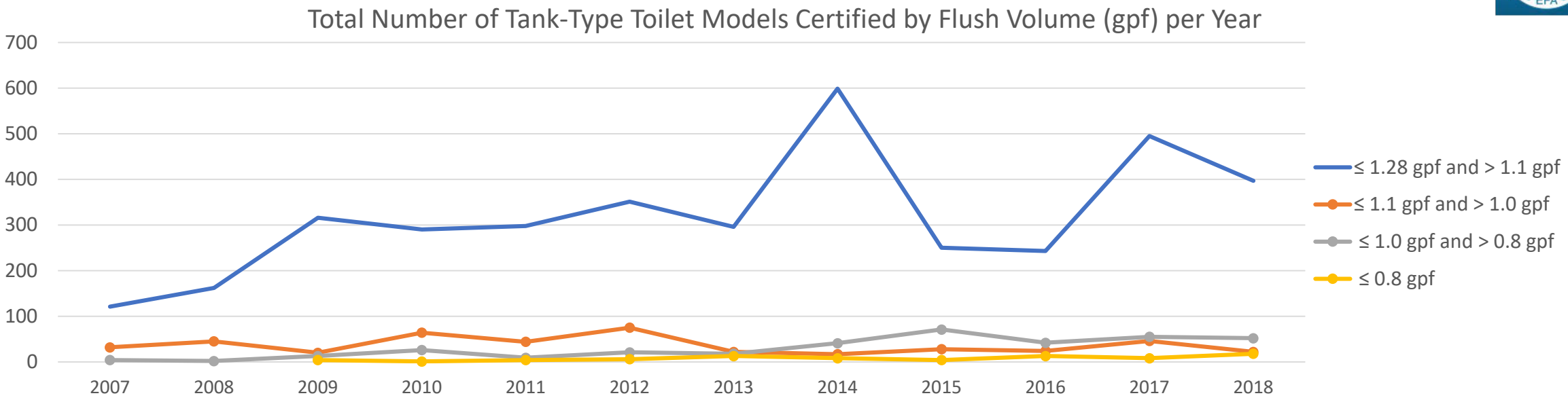
Specification for Tank-Type Toilets

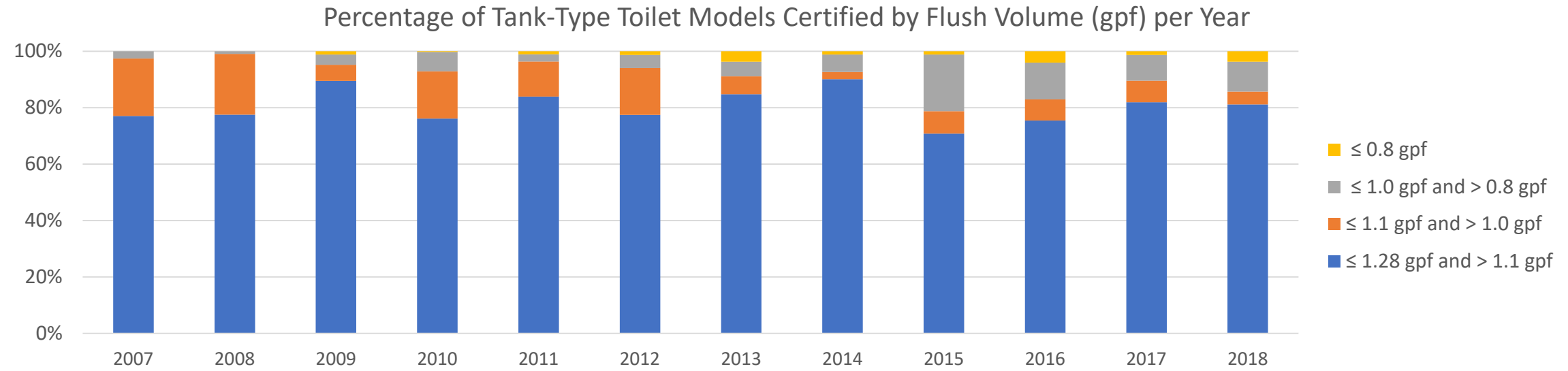
WaterSense Specification for Tank-Type Toilets

- Released January 24, 2007
- Last revised June 2, 2014 (Version 1.2)
- More than 140 manufacturer partners
- Number and percentage of WaterSense labeled tank-type toilets by flush volume:

Effective Flush Volume	≤ 1.28 gpf and > 1.1 gpf	≤ 1.1 gpf and > 1.0 gpf	≤ 1.0 gpf and > 0.8 gpf	≤ 0.8 gpf	Total
Single-Flush Models	1,887	36	166	58	2,147
Percentage of Single-Flush	87.9%	1.7%	7.7%	2.7%	-
Dual-Flush Models	703	391	107	11	1,212
Percentage of Dual-Flush	58.0%	32.3%	8.8%	0.9%	-
Total Models	2,590	427	273	69	3,359
Percentage of Total	77.1%	12.7%	8.1%	2.1%	-

Certification Trends





Specification for Tank-Type Toilets

Water Efficiency Requirements

- The **effective flush volume** shall not exceed 1.28 gallons (4.8 liters)
- Effective flush volume for dual-flush toilets calculated by averaging two reduced flushes and one full flush

Performance and Other Requirements

- Toilets shall pass **flush performance** criteria based on the waste extraction test protocol in the applicable ASME standard (i.e., flush toilet paper and 350 grams of miso paste)
- Toilets shall conform to **other applicable requirements** in ASME A112.19.2/CSA B45.1 and ASME A112.19.14 *Six-Liter Water Closets Equipped with a Dual Flushing Device* (for dual flush)
- Products shall be **marked** with the flush volume according to ASME A112.19.2/CSA B45.1

Preliminary Water Savings Potential

- Lowering the flush volume maximum to:
  - 1.1 gpf would represent an additional 14 percent increase in efficiency over the current WaterSense specification and 33 percent increase over the national standard
  - 1.0 gpf would represent an additional 22 percent increase in efficiency over the current WaterSense specification and 38 percent increase over the national standard

Gallons Per Flush (gpf)	Potential Annual Savings Beyond 1.28 gpf for New Tank-Type Toilets (billion gallons)	Potential Annual Savings Beyond 1.28 gpf for Existing Tank-Type Toilets (billion gallons)	Total Savings Assuming 10% Market Share (billion gallons)
1.1 gpf	0.9	71.9	7.3
1.0 gpf	1.4	111.8	11.3
0.8 gpf	2.5	191.7	19.4

Water Efficiency Considerations

Reduce the maximum effective flush volume criteria below 1.28 gpf

- Five states and multiple municipalities have adopted regulations mandating that tank-type toilets have a maximum effective flush volume 1.28 gpf or less, consistent with the WaterSense water efficiency criteria

Set maximum flush volume at 1.28 gpf for dual-flush toilets

- Current specification requires maximum *effective* flush volume of 1.28 gpf, calculated using average of two reduced flushes and one full flush
- *WaterSense Specification for Flushometer-Valve Water Closets* requires full-flush mode of a dual-flush toilet to meet the maximum flush volume criteria
- Requirements for dual-flush toilets are included in ASME A112.19.14 *Six-Liter Water Closets Equipped With a Dual Flushing Device*
- The WaterSense specification does not provide any water savings when compared to this national standard

Dual-Flush Considerations

- Many utilities have expressed that they want to eliminate dual-flush toilet eligibility or require full-flush mode to meet maximum flush volume requirements
  - This would assure water savings regardless of user behavior
- The 1.28 full flush maximum is supported by ASHRAE 189.1-2017, MaP PREMIUM, and the city of Vancouver, Canada
- However, either directly or through reference to WaterSense, California, Colorado, Georgia, and Texas codify a 2:1 effective flush volume calculation
- Number and percentage of WaterSense labeled dual-flush tank-type toilets by full-flush volume:

Full-Flush Volume	≤ 1.6 gpf and > 1.28 gpf	≤ 1.28 gpf	Total
Dual-Flush Models	1,001	211	1,212
Percentage of Total	82.6%	17.4%	-

- 2,147 single-flush WaterSense labeled toilet models would not be impacted

Existing Dual-Flush Studies

Report	Authors	Toilet Type	Reduced : Full Ratio
Seattle Home Water Conservation Study (2000)	Peter Mayer et al. (Aquacraft, Inc.)	Tank-Type	0.77 : 1
Canada Mortgage and Housing Corporation Dual-flush Toilet Project (2002)	Veritec Consulting	Tank-Type	1.6 : 1 (single-family) 1.1 : 1 (office male) 2.7 : 1 (office female) 1.7 : 1 (office overall) 1.3 : 1 (coffee shop)
Residential Ultra-Low-Flush Toilet Replacement Program (2003)	Paula Mohadjer, Jordan Valley Water Conservancy District	Tank-Type	1.48 : 1
Residential Indoor Water Conservation Study: Evaluation of High Efficiency Indoor Plumbing Fixture Retrofits in Single-Family Homes in the East Bay Municipal Utility District Service Area (2003)	Peter Mayer et al. (Aquacraft, Inc.)	Tank-Type	0.48 : 1

Existing Dual-Flush Studies

Report	Authors	Toilet Type	Reduced : Full Ratio
Flush: Examining the Efficacy of Water Conservation in Dual Flush Toilets (2010)	Masaye Harrison	Flushometer-Valve	1.6 : 1
Behavioral Economics and the Design of a Dual-Flush Toilet (2012)	Jade Arocha and Laura McCann	Flushometer-Valve (women's restroom only)	0.35 : 1 (before signage) 0.63 : 1 (after signage)

Questions and Discussion

Performance Considerations

Increase quantity of waste media and/or toilet paper that must be removed from toilet during waste extraction testing

- Current specification requires toilets to clear 350 grams of cased or uncased media and 4 balls of crumpled, single-ply toilet paper in four of five tests
- Toilets that can extract greater quantities are widely available
- Poor performance or need for “double flushing” can result in water waste

Include new test criteria to better assess bowl cleansability

- Cleansability becomes more of a concern at lower flush volumes or at higher waste extraction levels
- Current specification requires adherence to ASME A112.19.2/CSA B45.1, which includes a surface wash test meant to ensure toilets provide adequate surface wash
- No standardized or industry accepted tests exist beyond what is included in ASME A112.19.2/CSA B45.1
- Current performance test may not adequately address performance element

Public Comments Received to Date

City of Vancouver, Canada

- As of January 1, 2019, Vancouver requires all new toilets to have a maximum of 1.28 gpf
- Reported an absence of evidence supporting assumption behind effective flush calculation. EPA should consider setting the maximum flush volume at 1.28 gpf for all toilet types

Giese Construction and Renovation

- Suggested that EPA require silicone seals, gaskets, and bushings to make toilets leak free for the life of the product—rubber seals and bushings leak or drip after about 10 years

Metropolitan North Georgia Water District

- Consider better performance in terms of waste clearance
- Consider a flush volume of 1.1 gpf or less
- Provided EPA satisfactorily analyzes and address any potential adverse impacts on solids transport, water age, and corrosion in sewer collection systems

Public Comments Received to Date

Culver Van Der Jagt

- EPA should consider a specification for toilet-top sinks, devices in which used handwashing water fills the toilet tank
- Technology has been successful in Japan and in correctional facilities

Plumbing Manufacturers International (PMI)

- Recommends that no changes be made to the tank-type toilets specification

Denver Water

- Suggested moving to lower gallons per flush as many markets have shifted to 1.28 gpf
- Consider reviewing criteria such as MaP scores and dual-flush eligibility
- Dual flush models may not save as much as stated due to user confusion
- Brought up issues associated with lower water use (i.e. drain line carry issues, pathogens such as Legionella).

Public Comments Received to Date

Contra Costa Water District

- Suggested looking into and trying to address the possibility of aftermarket replacement parts (e.g., flappers) resulting in increased flush volume
- If additional flush volume reductions result in an increased cost to the average consumer not offset by the water bill savings, it may not be the right time to revise the specification.
- If performance and cost of ultra-efficient toilets is comparable and there are enough in production, it should be evaluated. However, if this leads to eliminating 1.28 gpf from the market then the potential externalities should be carefully evaluated
- Performance should be set above the current limits as there are plenty of quality products that achieve much higher performance than others. WaterSense should set the high performance and high efficiency products apart from the rest
- Recommended looking at the PERC drainline carry studies for further information on flush volume impacts on drainline carry. Suggested supplemental water sources from residential fixtures may offset drainline carry issues

Outstanding Questions

- Are there additional studies on the water efficiency and/or performance of tank-type toilets of which WaterSense should be aware?
- Are there recent studies on user behavior related to dual-flush toilets of which WaterSense should be aware?
- Is there anything else about water efficiency or performance that WaterSense should consider during its review process?

Questions and Discussion

Poll Question

Question: Based on what has been presented, does WaterSense have enough information to determine whether to revise its specification for tank-type toilets?

- Yes
- No

Poll Question

Question: In your opinion, should EPA revise the water efficiency criteria of the *WaterSense Specification for Tank-Type Toilets*?

- Yes
- No
- Need more information

Poll Question

Question: In your opinion, should WaterSense eliminate the effective flush calculation for dual-flush toilets?

- Yes
- No
- Need more information

Poll Question

Question: In your opinion, should EPA revise the performance criteria of the *WaterSense Specification for Tank-Type Toilets*?

- Yes
- No
- Need more information

Part 4

Flushing Urinal Specification Considerations

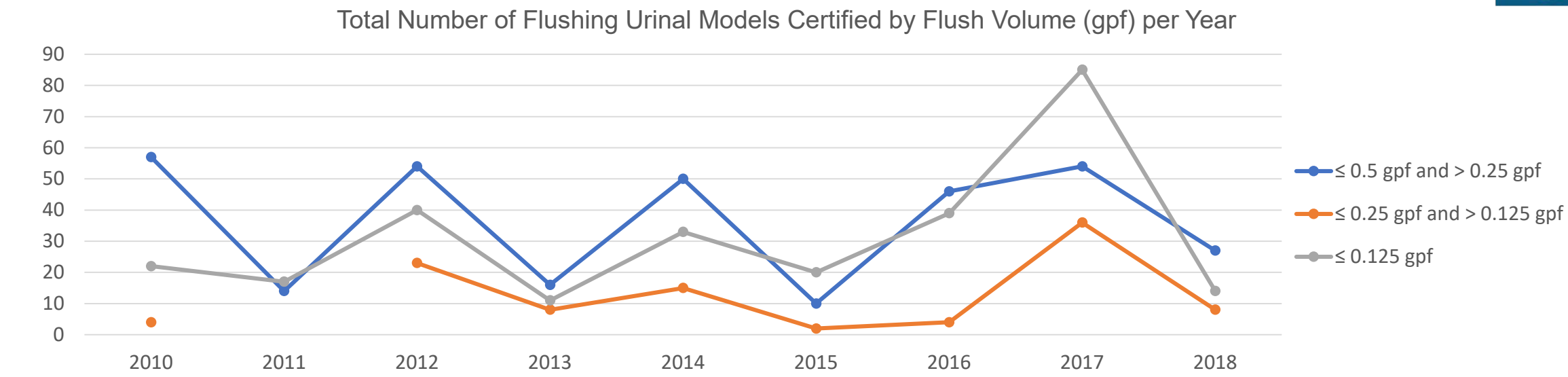
Specification for Flushing Urinals

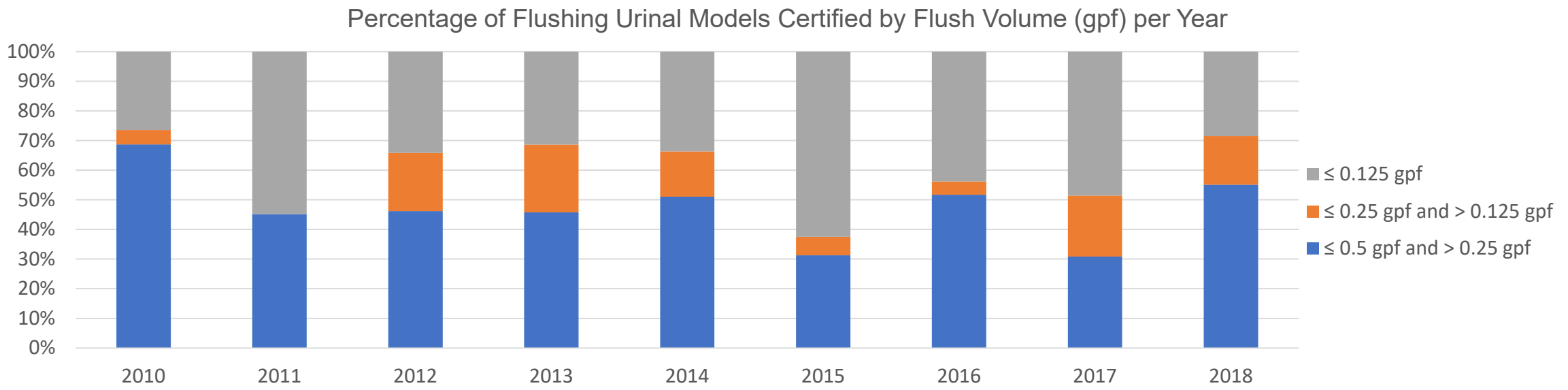
WaterSense Specification for Flushing Urinals

- Released October 8, 2009
- 25 manufacturer partners
- Number and percentage of WaterSense labeled flushing urinals by flush volume:

Flush Volume	≤ 0.5 gpf and > 0.25 gpf	≤ 0.25 gpf and > 0.125 gpf	≤ 0.125 gpf	Total
Number of Fixture Models	81	13	55	149
Percentage	54.3%	8.7%	36.9%	-
Number of Flush Valve Models	177	35	128	340
Percentage	52.1%	10.3%	37.6%	-
Number of Systems	54	46	102	202
Percentage	26.7%	22.8%	50.5%	-

Certification Trends





Specification for Flushing Urinals

Water Efficiency Requirements

- The **average maximum flush volume** must not exceed 0.5 gpf (1.9 Lpf)

Performance Requirements

- Fixture must **conform to the applicable ANSI standards,** when tested with a flushing device with the same rated flush volume
- Pressurized flushing devices must **conform to ASSE Standard 1037**
- The flushing device must not contain a **flush volume adjustment** that allows the flush volume to vary more than ± 0.1 gpf and may not be packaged, marked, or provided with instructions directing a user to an alternative flush volume setting
- The urinal fixture and flushing device product/packaging must be **marked with the rated flush volume**

Scope Considerations

Current Specification Scope

- Includes flushing urinals, including:
  - Urinal fixtures that use water to convey waste
  - Flushing devices (valves and tanks)

Scope does not include:

- Non-water urinals
- Non-water urinals with drain-cleansing action (hybrid urinals)

Non-Water and Hybrid Urinals

Background

- Not currently included in the *WaterSense Specification for Flushing Urinals*
- Covered under ASME A112.19.19 *Vitreous China Nonwater Urinals*
- MaP Testing maintains a list of 60 different non-water and hybrid urinal models from 15 different manufacturers
- WaterSense previously issued guidance on the inclusion on non-water using urinals in incentive programs, stating that these products are inherently water-efficient

Preliminary Water Savings Potential

- Lowering the flush volume maximum to:
  - 0.25 gpf would represent an additional 50 percent increase in efficiency over the current WaterSense specification and 75 percent increase over the national standard
  - 0.125 gpf would represent an additional 75 percent increase in efficiency over the current WaterSense specification and 88 percent increase over the national standard

Gallons Per Flush (gpf)	Potential Annual Savings Beyond 0.5 gpf for New Urinals (billion gallons)*	Potential Annual Savings Beyond 0.5 gpf for Existing Urinals (billion gallons)*	Total Savings Assuming 10% Market Share (billion gallons)*
0.25 gpf	0.2	17.2	1.7
0.125 gpf	0.3	25.7	2.6

*Excludes savings from California

Criteria Considerations

Water Efficiency Considerations

Reduce the maximum flush volume criteria below 0.5 gpf

- At least five states and multiple municipalities have adopted regulations mandating urinals have a flush volume of ≤ 0.5 gpf, consistent with the WaterSense water efficiency criteria
- As of 2016, the California requires wall-mounted urinals to flush at 0.125 gpf or less

Performance Considerations

- EPA does not have any indication of performance issues associated with current specification
- If EPA were to reduce the maximum flush volume below its current level, or incorporate non-water urinals into the scope, ~~they~~ would need to revisit concerns raised about drainlines and struvite or calcite build-up

Public Comments Received to Date

Plumbing Manufacturers International (PMI)

- Recommends that no changes be made to the urinals specification
- Referenced two EPA funded studies looking into the impact of water efficiency on public health
- Refenced the CUWA white paper regarding declining flows

Metropolitan North Georgia Water District

- Suggested revising the specification to require a flush volume of 0.125 gpf or less
- Provided EPA satisfactorily analyzes and address any potential adverse impacts on premise plumbing systems (i.e., struvite build-up, increased water age)

Denver Water

- Consider criteria for non-water urinals as a separate specification

Outstanding Questions

- Are there existing studies on the water efficiency and/or performance of flushing urinals at various flush volumes or non-water urinals of which WaterSense should be aware?

- Is there anything else about water efficiency or performance that WaterSense should consider during its review process?

Questions and Discussion

Poll Question

Question: Based on what has been presented, does WaterSense have enough information to determine whether to revise its specification for flushing urinals?

- Yes
- No

Poll Question

Question: In your opinion, should EPA revise the water efficiency criteria of the *WaterSense Specification for Flushing Urinals*?

- Yes
- No
- Need more information

Poll Question

Question: If you operate a rebate or direct installation program for urinals, what product types are included? (select all that apply)

- WaterSense labeled flushing urinals at 0.5 gpf
- WaterSense labeled flushing urinals at 0.125 gpf
- Non-water urinals
- Hybrid urinals
- We don’t operate a rebate/incentive program for urinals

Poll Question

Question: If WaterSense expands the scope of the urinals specification, which product categories should WaterSense expand the scope to include?

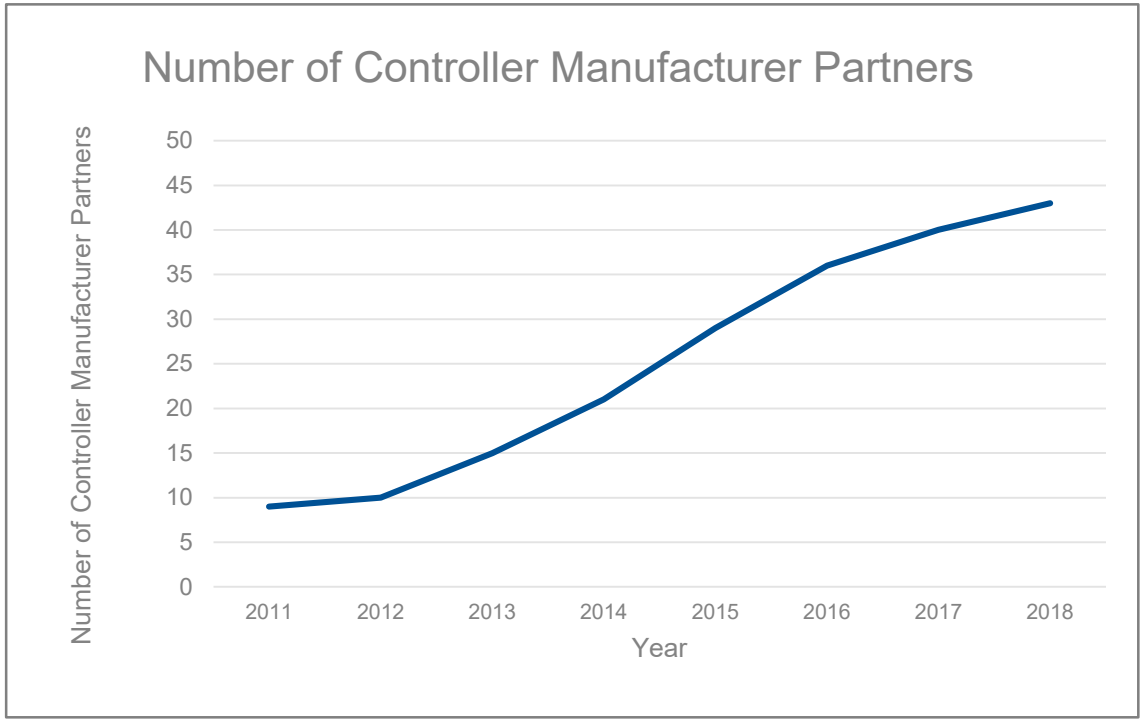
- Both non-water urinals and urinals with drain cleansing action
- Only non-water urinals
- Only urinals with drain cleansing action
- Neither, leave the specification scope as is
- Need more information

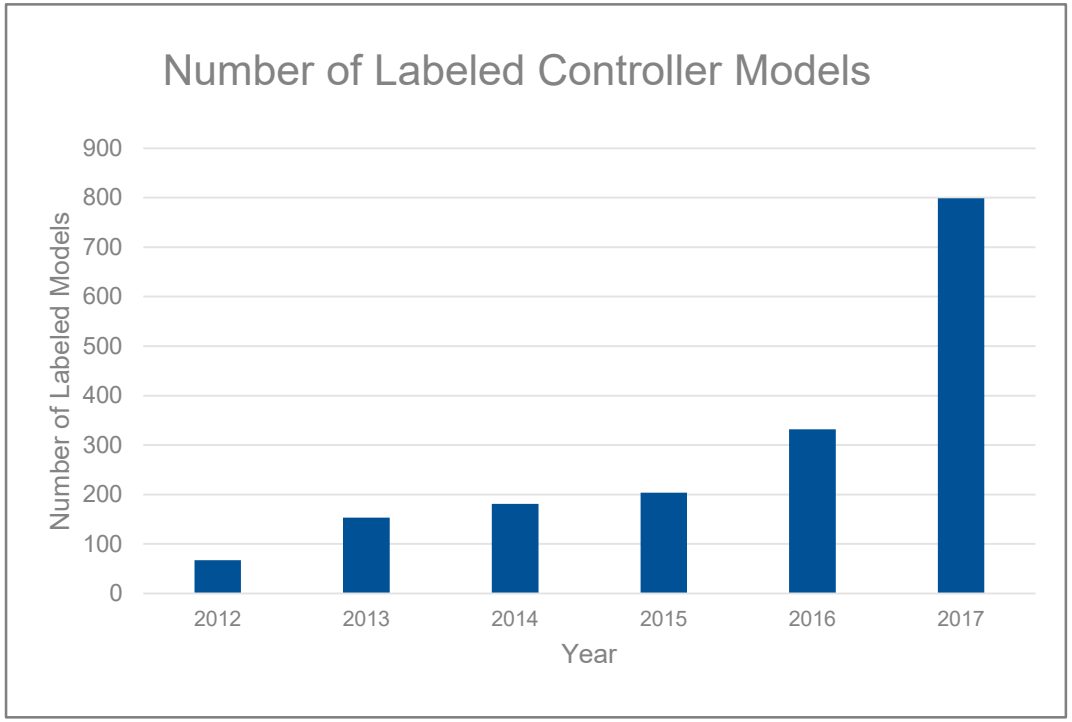
Part 5

Weather-Based Irrigation Controller Specification Considerations

Specification for Weather-Based Irrigation Controllers

- Released November 2011
- More than 30 manufacturer partners
- Approximately 800 labeled models





Scope

Current Specification Scope

- Applies to stand-alone controllers, add-on devices, and plug-in devices that use current weather data as a basis for scheduling irrigation
- Applies to controllers that create or modify irrigation schedules based on evapotranspiration (ET) principles by:
  - Storing historical crop evapotranspiration (ETc) data characteristics of the site and modifying these data with an onsite sensor;
  - Using onsite weather sensors as a basis for calculating real time ETc;
  - Using a central weather station as a basis for ETc calculations and transmitting the data to individual users from remote sites; or
  - Using onsite weather sensors.
- Excludes soil moisture sensors
- Includes residential and commercial application

Performance Test Method and Criteria

Current Test Method

- Eighth draft of the Smart Water Application Technologies™ (SWAT) test protocol for climatologically-based controllers with four modifications:
  - Minimum runtimes
  - Missing data from the reference weather station
  - Rainfall requirement
  - Order of operations

Performance Criteria

- **Irrigation adequacy** shall be ≥ 80 percent for each zone
- **Irrigation excess** shall be ≤ 10 percent for each zone
- The **average of the irrigation excess scores** calculated across the six zones shall be ≤ 5 percent

Performance Test Method and Criteria Considerations

2016 Audit

- Purpose was to review the LCBs to determine if they were correctly carrying out the program. In reviewing results, EPA identified potential weaknesses in current test method
  - Irrigation Required–Not all controllers irrigated in each zone during the test period
  - Unrealistic Irrigation Events Depth and Frequency–Some controllers were programmed with several small irrigation events resulting in schedules that are unrealistic in the field

Possible Resolutions

- Irrigation Required–Require that irrigation adequacy fall below 80 percent for a number of zones
- Unrealistic Irrigation Events Depth and Frequency
  - Place additional requirements on irrigation events, such as a longer minimum runtime, maximum cycle soak events/day, and maximum soak time
  - Alternatively, place a minimum irrigation amount (0.1 inch) on irrigation events
  - Implement watering restriction during testing

Performance Test Method and Criteria Considerations

ASABE X627 Weather-based Landscape Irrigation Control Systems

- Began in 2014–WaterSense is on the committee
- Initially developed to standardize the WaterSense test method, but includes several additional changes:
  - Hourly moisture balance–removes the order of operations question
  - Increased rainfall and ET_o requirements, resulting in a more rigorous test
  - Virtual zone attributes revised–such as root zone depth, crop coefficients
- It has not yet been published for public comment, but WaterSense encouraged manufacturer partner participation
- Several controllers were tested using this method in summer 2018, anticipate testing will continue this growing season
- WaterSense is currently assessing the test method and the potential impacts on test scores
- WaterSense will consider adopting the test method when final standard is published

Stakeholder Feedback on Performance Test Methods and Criteria

WaterSense reached out to several manufacturers and utilities in the past few months:

- Generally, both manufacturers and utilities are not in support of revising the test method
  - Manufacturers noted that the current test method is working for their products and there is no evidence of customer dissatisfaction with product performance
  - Utilities do not think the market is saturated enough with weather-based controllers to warrant an increase in performance

Are we missing any additional feedback or data?

- Issues with LCBs and testing?
- Does the test work for all weather-based products on the market?

Supplemental Capability Requirements

Current Supplemental Capability Requirements

- Preservation of programs when power source is lost
- Allow for independent, zone-specific programming and program storage
- Indication of operation in non-weather-based mode
- Capable of interfacing with a rainfall device
- Capable of accommodating water restrictions
- Includes a percent adjust (water budget) feature
- Reverts to proxy of historical weather data or percent adjust if weather data are lost
- Allows for manual operation for troubleshooting with automatic return to smart mode

Stakeholder Feedback

- WaterSense should not add regionally-specific feature requests from utilities

Questions and Discussion

Packaging and Product Documentation Requirements Considerations

Current Packaging and Product Documentation Requirements

- The product shall include the same components or attributes that it was tested with
- Must include an instruction manual that lists the settings and specific parts used during the performance test and the maximum number of stations for the product
- Must not be packaged nor marked to encourage operation of the controller in standard mode
- The add-on/plug-in device is not required to be packaged with the base controller(s) that it was tested with to meet the requirements of this specification

Considerations for Specification Revision

- In July 2018, WaterSense issued technical clarifications related to several inquiries from consumers and utility partners expressing confusion, published a compatibility list, and held a webinar last fall for manufacturers to help resolve the confusion
- Are there additional ways EPA could consider revising the packaging and labeling requirements and/or definitions?

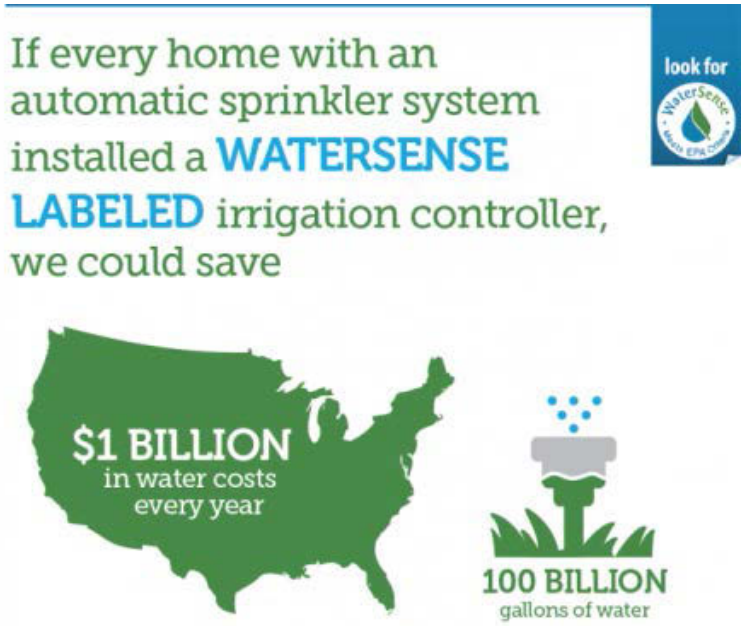
Definitions

- **Add-on Device**: A product that modifies an existing system equipped with a standard clock timer controller to use current weather data as a basis for controlling the irrigation schedule. For purposes of this specification, add-on devices are defined as those that are designed to work with any brand of base controller and may connect through a variety of ways.
- **Base Controller**: The standard clock timer controller to which the add-on or plug-in device is attached for full operation.
- **Plug-in Device**: A product that modifies an existing system equipped with a standard clock timer controller to use current weather data as a basis for controlling the irrigation schedule. For purposes of this specification, plug-in devices are defined as those that are designed to work specifically with one brand of controller and may connect with the base controller through a variety of ways.
- **Stand-Alone Controller**: A product for which weather-based control is an integrated capability. This includes a single controlling device (i.e., the irrigation controller) and all of the sensors and/or weather service(s) that provide the weather data.

Water Savings

Current Water Savings Estimate

- 15 percent estimated savings for outdoor water use
  - Studies indicated a range of overall savings from 6 to 30 percent
  - Individual site savings can vary beyond these overall numbers, depending on the watering habits prior to installing the WBIC
  - In a 2009 comprehensive study, *Evaluation of California Weather-Based "Smart" Irrigation Controller Programs*, first year savings were shown to be approximately six percent



Water Savings Estimate Considerations

- No stakeholder feedback received to date
- WaterSense is currently reviewing more recent studies
- Please submit any additional savings studies or data

Manufacturer Feedback

- We did not receive any public comments from manufacturers during the official specification review public comment period
- In individual calls, the general feedback was positive regarding the current specification
- Manufacturers cautioned against increasing performance thresholds, test method difficulty, or requiring additional specific features that would increase the price of the product
    - Several manufacturers noted that an increase in price for features that likely will not be used by the average end-user could depress market uptake
- Multiple manufacturers commented on the desire to keep products simple and straightforward to use, noting that the more steps there are in the setup process, the less likely an end user is to execute programming properly
- One manufacturer encouraged WaterSense to continue testing for the “end result” using performance testing, rather than a prescriptive list of features or specific method of scheduling

Utility Feedback

- One utility provided public comment on WBICs, expressing concern about users being able to opt in or out of weather-based control, suggesting a revised specification could address this concern
- The utilities we talked with were happy with the current specification and did not express a desire for a revised test method that incorporated scheduling based on predicted rainfall
- Several utilities expressed concern in using resources to revise the specification for possibly only incremental savings; instead they recommended:
  - Using funding to promote “good” products (those that are currently labeled) with a goal of increasing market share of weather-based controllers vs. clock timers
  - Using funding to educate end users on properly programming existing labeled products to the best of their ability, maximizing savings of the products currently on the market
- In general, utilities cautioned against raising the bar until there is more significant market penetration of weather-based controllers in the marketplace

Utility Feedback

- Utilities generally acknowledged that water savings are correlated to previous water use, with higher savings realized for high water users
  - Utilities in the eastern and southeastern United States acknowledged deficit irrigation occurs nationwide, but noted that in their regions, overwatering is much more prevalent and are not concerned with WBICs increasing water use
  - Utilities in drier regions acknowledged deficit irrigation and the potential for increased water use when a WBIC is installed, but said they are pleased with the savings they are seeing from their rebate programs
- Utilities are rebating WBICs across the country
  - According to annual reporting of WaterSense partners, 34 utilities are rebating to these products, with very few tailoring the rebate to their specific needs
- No utilities we talked with reported any performance issues with labeled products

Request for Additional Feedback

- Does the scope accommodate all relevant products on the market?
- Are there any other issues related to the current test method that we are not aware of?
- Are the supplemental capability requirements still relevant? Are there any new capabilities that should be included?
- Do the current packaging and labeling requirements, and associated definitions of product types work for both manufacturers and utilities? If not, please provide suggestions.
- Are there additional, more recent water savings studies WaterSense should reference?

Questions and Discussion

Poll Question

Question: Based on what has been presented, does WaterSense have enough information to determine whether to revise its specification for weather-based irrigation controllers?

- Yes
- No

Poll Question

Question: In your opinion, which pieces of the *WaterSense Specification for Weather-Based Irrigation Controllers* should EPA revise?

- Test method and performance thresholds
- Supplemental capability requirements
- Packaging and labeling requirements and/or definitions
- No changes needed
- Need more information

Part 6

General Water Efficiency Considerations

General Considerations

In its public comments, PMI referenced three reports for EPA's consideration

California Urban Water Agencies (CUWA), "Adapting to Change: Utility Systems and Declining Flows", November 2017

- Study aimed at understanding the impacts of declining flows resulting from substantial reductions in indoor water use and how utilities are adapting to these circumstances
- 50% of the utilities experienced impact on water/wastewater infrastructure
- Strategies do not suggest abandoning conservation, but recommend:
  - Taking a holistic approach to policy to account for lower flows in planning and allow more flexibility for utilities
  - Separating/distinguishing between short term (emergency response for demand reductions during drought) and long term (water use efficiency for sustained demand management) initiatives, as short term initiatives may not be suitable for long term implementation
  - Not solely relying on water use efficiency to manage future water demands

General Considerations

Water Conservation and Water Quality: Understanding the Impacts of New Technologies and New Operational Strategies

- Funded under EPA grant funded
- Study being conducted by Drexel University, Penn State, and UC Boulder
- Objective: The project will combine literature information with novel experimental results to develop and validate predictive models of the risk of failing to meet water quality goals for premise plumbing. The models will be encoded in a web-based decision support tool usable by facilities managers and utility personnel to identify high risk conditions for premise plumbing water quality and potential remedial actions
- Hypothesis: Decreases in water consumption result in lower flows of water through water system pipes that were designed to manage higher flows, which may negatively impact water quality
- Project funded through September 2019

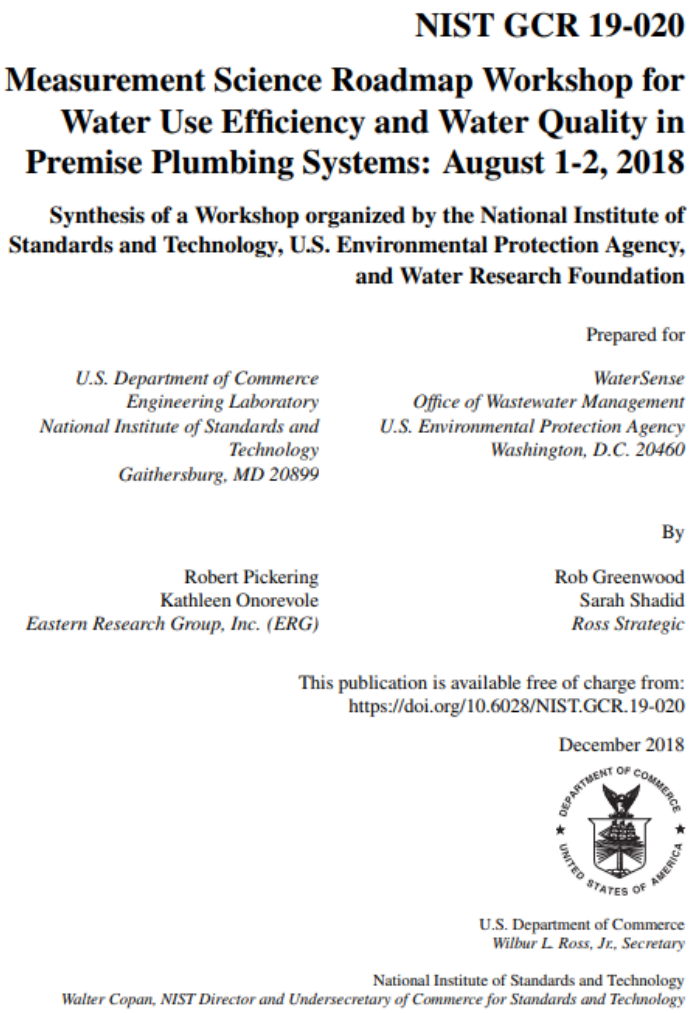
General Considerations

Right Sizing Tomorrow's Water Systems for Efficiency, Sustainability, and Public Health

- Funded under EPA grant funded
- Study being conducted by Purdue, Michigan State, San Jose State, and Tulane
- Objective: The project goal is to better understand and predict water quality and health risks posed by declining water usage and low flows
- One case study of a newly plumbed residential green building which did find:
  - An increased organic carbon, bacteria, and heavy metal levels
  - Different fixture use patterns resulted in disparate water quality within a single-family home
  - The greatest drinking water quality changes were detected at the least frequently used fixture
- Project funded through March 2021

Premise Plumbing Research

- WaterSense collaborated with NIST and the Water Research Foundation (WRF) to organize a workshop in August 2018 focused on research needs to inform premise plumbing design, installation, and maintenance.
- Workshop synthesis report released in December 2018 - https://nvlpubs.nist.gov/nistpubs/gcr/2019/NIST.GCR.19-020.pdf



NIST GCR 19-020

Measurement Science Roadmap Workshop for Water Use Efficiency and Water Quality in Premise Plumbing Systems: August 1-2, 2018

Synthesis of a Workshop organized by the National Institute of Standards and Technology, U.S. Environmental Protection Agency, and Water Research Foundation

Prepared for

U.S. Department of Commerce
Engineering Laboratory
National Institute of Standards and Technology
Gaithersburg, MD 20899

WaterSense
Office of Wastewater Management
U.S. Environmental Protection Agency
Washington, D.C. 20460

By

Robert Pickering
Kathleen Onorevole
Eastern Research Group, Inc. (ERG)

Rob Greenwood
Sarah Shadid
Ross Strategic

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December 2018

U.S. Department of Commerce
Wilbur L. Ross, Jr., Secretary

National Institute of Standards and Technology
Walter Copan, NIST Director and Undersecretary of Commerce for Standards and Technology

Questions and Discussion

Poll Question

Question: Do you have concerns about the impacts of water efficiency on drinking water quality and distribution, wastewater conveyance, or wastewater treatment?

- Yes, I'm very concerned
- Yes, I have some minor concerns
- No, I'm not concerned
- Need more information

Part 7

Next Steps

Previous Industry Webinars

WaterSense held more detailed industry meetings on specific product categories to discuss information reviewed as a result of the *Notice of Specification Review*

- **Webinar for Plumbing Fittings Manufacturers**: April 24, 2019
- **Webinar for Plumbing Fixtures Manufacturers**: May 9, 2019
- **Webinar for Weather-based Irrigation Controllers Manufacturers:** May 16, 2019

Presentation slides, meeting summaries and recordings can be found at: www.epa.gov/watersense/product-specification-review#webinars

Next Steps

- Pertinent information and comments and still be submitted to watersense-products@erg.com
- WaterSense will summarize information collected and issue a decision on whether it intends to move forward with a specification revision for each product category by **the end of 2019**
- If a specification revision is needed, WaterSense will:
  - Identify existing data gaps, concerns, and next steps (as applicable) related to development of a draft specification
  - Provide opportunity for public comments prior to and following the development of the draft specification
  - Hold additional stakeholder meetings, as appropriate, before issuing a final specification

Questions and Discussion

Contact Us

General E-mail: watersense@epa.gov

Comment Submission E-mail: watersense-products@erg.com

Website: www.epa.gov/watersense

Helpline: (866) WTR-SENS (987-7367)

Supplemental Slides

Lavatory Faucet Studies

The EPA examined the following resources to evaluate the water savings potential of a lower faucet flow rate:

Water Research Foundation (WRF) Residential End Uses of Water (REU) Study (2016)*

- Average household faucet use in 2016 was 26.3 gallons per household per day (gphd), down just 1.5 percent from 1999
- 95% of the faucet events had flow rates of 1.39 gpm or less, most with flow rates less than 0.48 gpm

Aquacraft East Bay Municipal District (2000) and Seattle (2003) studies (as cited in current specification supporting statement)*

- Estimated average 0.6 gallons per capita per day (gcpd) savings associated with lowering lavatory faucet flow rate from 2.2 to 1.5 gpm

Aquacraft Tampa Study (2004) (as cited in current specification supporting statement)*

- Evaluated savings from reducing the flow rate to 1.0 gpm for lavatory faucet aerators and 1.5 gpm for kitchen faucets
- Found a savings of 3.2 gcpd, though the savings contribution was not be differentiated between kitchen and lavatory faucets

CEC Staff Analysis (2014)

- Estimated that lowering the flow rate to 1.2 gpm would save 2.5 billion gallons of water in the first year of implementation in California
- Differentiates kitchen and lavatory faucet use based on theoretical assumptions

**Did not differentiate between kitchen and lavatory faucet use*

Kitchen Faucet Studies

WaterSense is not aware of any studies that have solely examined the use and savings specifically from kitchen faucets. The EPA examined the following resources to evaluate the water savings potential of a lower faucet flow rate:

Water Research Foundation (WRF) Residential End Uses of Water (REU) Study (2016)*

- Did not identify significantly different water use from faucets in the intervening years
- 95 percent of faucets had average flow rate events of 1.39 gpm or less, a majority of which were 0.48 gpm or less

CEC Staff Analysis (2014)

- Estimated that lowering the flow rate to 1.8 gpm would save 3.3 billion gallons of water in the first year of implementation in California
- Estimates that 72 percent of faucet use occurred in kitchens amounting to 41.6 occurrences per day based on the frequency of toilet and showerhead use to distinguish lavatory from kitchen faucet events

Tampa Study (2004) (as cited in current specification supporting statement)*

- Evaluated savings from kitchen faucets with a flow rate of 1.5 gpm and lavatory faucets with a flow rate of 1.0 gpm, but did not differentiate use or savings between the two
- The gallons per capita per day water use reduction from that study was more significant than the EMBUD and Seattle retrofit studies that did not evaluate a change in kitchen faucet flow rate (3.2 gpcd compared to 0.6 gcpd weighted average)

**Did not differentiate between kitchen and lavatory faucet use*

Metering Faucet Studies

Existing Savings Studies and Data

- Thames Water Research and Technology (Thames Water) in England (2000)
  - Collectively, 240 faucets in five identical towers were evaluated, equipped with three types of faucet controls:
    - infrared sensor control (48 in total)
    - push-top metered control (96 in total)
    - conventional swivel top manual control (96 in total)
  - Infrared sensor automatic controlled and push-top manually controlled metering faucets both on average expressed an almost 100 percent increase in water consumption than traditional manually controlled faucets
  - Retrofitting the push top faucets to flow for 7 seconds rather than 15 seconds after activation resulted in a significant reduction in water usage

Showerhead Studies

The EPA examined the following resources to evaluate the water savings potential of a lower showerhead flow rate:

Water Research Foundation (WRF) Residential End Uses of Water (REU) Study (2016)

- Average household faucet use in 2016 was 28.1 gallons per household per day (gphd), down 8.7 percent from 1999
- 82% of shower events flowed at 2.5 gpm or less
- Average shower length of 7.8 minutes

Aquacraft Tampa Study (2004)

- Evaluated savings from reducing the flow rate to 1.75 gpm for showerheads
- Found a savings of 9.8 gphd, or 28% from pre-retrofit

CEC Staff Analysis (2015)

- Estimated that lowering the flow rate to 1.8 gpm would save 1.4 billion gallons of water in the first year of implementation in California

MaP Testing Shower-Based Water Savings (2017)

- Shower length increased by only 2 seconds per 0.2 gpm flow rate reduction
- A 1.44 gallon reduction in shower volume was achieved per 0.2 gpm flow rate reduction
- They concluded that people do not compensate for lower flow rates by increasing the duration of their showers

**Did not differentiate between kitchen and lavatory faucet use*

Tank-Type Toilet Studies

The EPA examined the following resources to evaluate the water savings potential of a lower maximum flush volume:

Water Research Foundation (WRF) Residential End Uses of Water (REU) Study (2016)

- Average household toilet use in 2016 was 33.1 gallons per household per day (gphd), down 27 percent from 1999
- Average household flush volume reduced from 3.65 gpf to 2.6 gpf
- Occupants continue to flush an average of 5 times per day
- EPAct and WaterSense are working to shift the market