Work Paper SCE17WP004

**Revision 0**

**Southern California Edison**

**Faucet Aerator and Low Flow Showerhead**

# At-a-Glance Summary

|  |  |
| --- | --- |
| **Measure Codes** | WH-62220, WH-79994 |
| **Measure Description** | Faucet Aerator, Low Flow Showerhead |
| **Base Case Description** | No Faucet Aerator, Standard Showerhead |
| **Units** | Per unit |
| **Energy Savings** | Refer to Excel Calculation Attachment 1 |
| **Full Measure Cost ($/unit)** | Refer to Excel Calculation Attachment 1 |
| **Incremental Measure Cost ($/unit)** | Refer to Excel Calculation Attachment 1 |
| **Effective Useful Life** | 3.33 years (EUL ID: WtrHt-WH-Aertr, WtrHt-WH-Shrhd) - updated in accordance with Draft Resolution E-4807 [510] |
| **Measure Installation Type** | Retrofit Add-on (REA) |
| **Net-to-Gross Ratio** | Aerator, SFM: 0.59 (NTG ID: Res- mDHWaerator)  Aerator, MFM: 0.65 (NTG ID: Res- mDHWaerator)  Low Flow Showerhead, SFM: 0.7 (NTG ID: Res-sAll-mDHWshwr)  Low Flow Showerhead, SFM: 0.55 (NTG ID: Res-Default>2) |
| **Important Comments** | This work paper has a complementary Ex Ante Database data set that will be provided in a separate submission to the California Public Utilities Commission (CPUC). |

# Revision History

|  |  |  |  |
| --- | --- | --- | --- |
| **Rev** | **Date** | **Author** | **Summary of Changes** |
| 0 | 11/23/2016 | Arvind Subramanya/TRC; Andres Fergadiotti/SCE | - This work paper is an update of SCE13WP004.3  - New calculation template update for 2017 program year  - Work paper is updated with 2016 Title-24 Residential code requirement and 2016 Title-20 Code language.  - Faucet aerator measure revised to reflect 1.0 GPM faucet aerator to be compliant with 2016 Title 20 Code.  - Faucet Aerator material cost has been updated to reflect latest cost from Grainger.com source and labor cost updated to reflect RSMeans 2016 labor rates.  - All (16) California Climate Zones have been added to the calculation template.  - EUL updated in accordance with Draft Resolution E-4807 [510] |

# Commission Staff and Cal TF Comments

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Rev** | **Party** | **Submittal Date** | **Comment Date** | **Comments** | **WP Developer Response** |
|  |  |  |  |  |  |
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Cal TF website: <http://www.caltf.org/>

# Section 1. General Measure & Baseline Data

## 1.1 Measure Description & Background

The measures are:

* Faucet aerator replacing No Faucet Aerator
* Low Flow Showerhead replacing Standard Showerhead

**Base, Standard, and Measure Cases**

|  |  |
| --- | --- |
| **Case** | **Description of Typical Scenario** |
| Measure | Faucet Aerator; Low Flow Showerhead |
| Existing Condition | No Faucet Aerator; Standard Showerhead |
| Code/Standard | N/A |
| Industry Standard Practice | N/A |

Measures and Codes

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Measure Codes** | | | | **Measure Name** |
| SCG | SDG&E | SCE | PG&E |
|  |  | WH-62220 |  | Faucet Aerator replacing No Faucet Aerator |
|  |  | WH-79994 |  | Low Flow Showerhead replacing Standard Showerhead |

**Implementation Requirements**

Eligible building types are:

* Residential Single Family
* Residential Multi-family
* Residential Mobile Home - Double-Wide

All SCE climate zones are eligible. For direct install measures, the contractor must verify that the product is installed correctly.

## 1.2 Technical Description

A faucet aerator is a device that screws onto an existing faucet head in order to reduce water flow. It splits the flow of water into multiple streams and adds air. This reduces flow while maintaining sufficient water pressure. This work paper assumes an aerator measure case flow of 1.0 gallons per minute (gpm).

There are 2 types of low flow showerheads:

* Aerating showerheads introduce air into the flow, which produces an even, misty spray while maintaining sufficient water pressure.
* Laminar flow showerheads split the flow of water into multiple parallel streams; no air is added. They produce less steam than aerating showerheads.

This work paper assumes a showerhead measure case flow of 1.5 gpm.

## 1.3 Installation Types and Delivery Mechanisms

The delivery mechanisms for these measures are:

* Financial Support - Direct Install

The program type/install type is Retrofit Add on - REA

**Installation Type Descriptions**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Installation Type** | **Savings** | | **Life** | |
| 1st Baseline (BL) | 2nd BL | 1st BL | 2nd BL |
| Retrofit Add-on (REA) | Above Customer Existing | N/A | EUL | N/A |

A delivery mechanism is a delivery method paired with an incentive method. Delivery mechanisms are used by programs to obtain program participation and energy savings.

**Delivery Method Descriptions**

|  |  |
| --- | --- |
| **Delivery Method** | **Description** |
| Financial Support | The program motivates customers, through financial incentives such as rebates or low interest loans, to implement energy efficient measures or projects. |
| Partnership | The program implements projects through a partnership between the utility and an institutional, government, or community-based organization. |

**Incentive Method Descriptions**

|  |  |
| --- | --- |
| **Incentive Method** | **Description** |
| Direct Install | The program implements energy efficiency measures for qualifying customers, at no cost to the customer. |

## 1.4 Measure Parameters

### 1.4.1 DEER Data

Both measures were in DEER 2005 but do not remain in DEER 2016. Therefore, savings in this work paper are based on an Energy Division disposition.

DEER Difference Summary

|  |  |
| --- | --- |
| **DEER Item** | **Used for Workpaper?** |
| Modified DEER methodology | No |
| Scaled DEER measure | No |
| DEER Base Case | No |
| DEER Measure Case | No |
| DEER Building Types | No |
| DEER Operating Hours | No |
| DEER eQUEST Prototypes | No |
| DEER Version | DEER 2017, READI v2.4.7 |
| Reason for Deviation from DEER | DEER contained similar measures which have since been removed. |
| DEER Measure IDs Used | N/A |

**Net-to-Gross Ratio**

The NTG values were obtained using the DEER READI tool. The relevant NTG values for the measures in this work paper are in the table below.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **NTGR ID** | **Description** | **Sector** | **BldgType** | **Measure Delivery** | **NTGR** |
| Res- mDHWaerator | Faucet aerators | Res | Any | DirInstall | 0.59 |
| Res- mDHWaerator | Faucet aerators | Res | MFm | DirInstall | 0.65 |
| Res-sAll-mDHWshwr | Low flow showerheads | Res | Any | DirInstall | 0.7 |
| Res-Default>2 | All other EEM with no evaluated NTGR; existing EEM with same delivery mechanism for more than 2 years | Res | Any | All | 0.55 |

Note: Direct install measures that are not hard-to-reach will use the default NTG value.

**Spillage Rate**

Spillage rates are not tracked in work papers; they are tracked in an external document which will be supplied to the Commission Staff.

**Installation Rate**

The IR values were obtained using the DEER READI v2.4.7 tool. The relevant IR values for the measures in this work paper are in the table below.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **GSIA ID** | **Description** | **Sector** | **BldgType** | **ProgDelivID** | **GSIAValue** |
| Res-LowF-FA-All | Residential low-flow Faucet Aerator; Annual Installation Rate | Res | Any | NonUpStrm | 0.67 |
| Res-LowF-SH-All | Residential low-flow Showerhead; Annual Installation Rate | Res | Any | NonUpStrm | 0.74 |

**Effective and Remaining Useful Life**

The EUL and RUL values were obtained using the DEER READI v2.4.7 tool. DEER defines the RUL as 1/3 of the EUL value. The RUL value is only applicable to the first baseline period for an RET measure with an applicable code baseline. The relevant EUL and RUL values for the measures in this work paper, with some of these updated in accordance with Draft Resolution E-4807 [510], are in the table below.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **EUL ID** | **Description** | **Sector** | **UseCategory** | **EUL (Years)** | **RUL (Years)** |
| WtrHt-WH-Aertr | Faucet Aerators | Any | SHW | 3.33 | - |
| WtrHt-WH-Shrhd | Low-Flow Showerhead | Res | SHW | 3.33 | - |

Note that EUL for Low-Flow Showerhead was not updated within the Draft Resolution E-4807 [510] for the REA application type; hence, its EUL is assumed to be equal to its RUL of 3.33 and consistent with that revised per resolution for Faucet Aerators (e.g., 3.33 years).

### 1.4.2 Codes and Standards Analysis

**Title 20 2016 [508]:** Section 1605.1, Table H-3 provides requirements for aerators and Table H-5 provides requirements for showerheads. The measure cases in this work paper have lower flow rates (1.7 gpm for showerheads and 1.0 gpm for aerators) when compared to 2016 Title-20 standards.





**Title 24 2016 [496]**: Section 110.1 references the requirements set in Title 20.

Code Summary

|  |  |  |
| --- | --- | --- |
| **Code** | **Reference** | **Effective Dates** |
| Title 20 (2016) | Section 1605.1, Table H-3 and H-5 Standards for Plumbing Fittings | January 1, 2017 |
| Title 24 (2016) | Section 110.1 Mandatory Requirements for Appliances | January 1, 2017 |

## 1.5 EM&V, Market Potential, and Other Studies – Base Case and Measure Case Information

**1.5.1 Non-DEER Study Review**

No studies were reviewed for this work paper.

## 1.6 Data Quality and Future Data Needs

N/A

# Section 2. Calculation Methodology

The 2/22/13 Energy Division Workpaper Disposition for Water Fixtures (Attachment 2) provided “basis” savings values for:

* Showerheads 1.5 gpm, 1.6 gpm, and 1.7 gpm
  + The average base case flow is 2.25 gpm, according to SCG and SDG&E study data.
* Faucet Aerators 0.5 gpm, 1 gpm, and 1.5 gpm
  + The average base case flow is 1.91 gpm, according to SCG and SDG&E study data.

These basis values were multiplied by climate zone-specific multipliers to determine final savings. The Single Family, Multi Family, and Mobile Home building types were included.

Based on code requirements, the most conservative ED-provided savings are used within the calculations (Attachment 3). The most conservative measures were selected as follows:

* Showerhead 1.5 gpm ( “ShowerHd-Gas-1.5,” “ShowerHd-Elec-1.5”)\*\*
* Faucet Aerator 1.0 gpm (“FaucetAer-Gas-1.0-Lav,” “FaucetAer-Elec-1.0-Lav”)

\*\*Note that although the written ED disposition shows the correct savings values for Showerheads 1.5 and 1.7 gpm (Tables 2 and 3 in the disposition), the calculation spreadsheet “20132014DHWFixturesMeasures.xlsx” has reversed the two sets of values. Additionally, it appears that showerhead savings are higher for multifamily and manufactured homes than for single family. The reason for this is unclear.

**Market Share**

Note that since this workpaper only addresses Direct Install program delivery, measure impacts documented in Disposition were not adjusted to account for market share for cases where there is uncertainty as far as the installed technology. Further, on all projects, Direct Install installations include verification of installed equipment.

For non-direct install program delivery (which is currently not supported by SCE), it is unknown whether the customer uses electric water heating. Therefore the savings would have to be multiplied by an adjustment factor of 7%, which is the market share of electric water heaters in SCE territory, from the 2009 Residential Appliance Saturation Study [428].



Values from the embedded calculation spreadsheet in CPUC’s Water Fixture Disposition, dated February 22, 2013 (Attachment 2) were used in calculations (Attachment 1).

Sample measure impacts adopted from Disposition for Faucet Aerators and Low Flow Showerheads for SFM are summarized below. See Attachment 1 and 2 for a full list of savings for all affected measures and building types.

**ED Disposition Savings – SFM**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Faucet Aerators**  **(1.0 GPM)** | | | | **Electric Low Flow Showerhead (1.5 GPM)** | | |
| **CZ** | **kWh** | **kW** | **Therms** | **kWh** | **kW** | **Therms** |
| 1 | 37.25 | 0.00374 | 1.617 | 132.36 | 0.01330 | 5.98482 |
| 2 | 37.07 | 0.00372 | 1.610 | 131.73 | 0.01323 | 5.95619 |
| 3 | 36.26 | 0.00364 | 1.575 | 128.88 | 0.01295 | 5.82733 |
| 4 | 35.02 | 0.00352 | 1.521 | 124.44 | 0.01250 | 5.62688 |
| 5 | 36.00 | 0.00362 | 1.563 | 127.93 | 0.01285 | 5.78437 |
| 6 | 34.13 | 0.00343 | 1.482 | 121.28 | 0.01218 | 5.48370 |
| 7 | 33.32 | 0.00335 | 1.447 | 118.43 | 0.01190 | 5.35484 |
| 8 | 32.34 | 0.00325 | 1.405 | 114.94 | 0.01155 | 5.19735 |
| 9 | 32.97 | 0.00331 | 1.432 | 117.16 | 0.01177 | 5.29757 |
| 10 | 32.61 | 0.00328 | 1.416 | 115.89 | 0.01164 | 5.24030 |
| 11 | 33.86 | 0.00340 | 1.470 | 120.33 | 0.01209 | 5.44075 |
| 12 | 34.93 | 0.00351 | 1.517 | 124.13 | 0.01247 | 5.61256 |
| 13 | 32.70 | 0.00329 | 1.420 | 116.21 | 0.01167 | 5.25462 |
| 14 | 34.57 | 0.00347 | 1.501 | 122.86 | 0.01234 | 5.55529 |
| 15 | 27.44 | 0.00276 | 1.192 | 97.53 | 0.00980 | 4.40987 |
| 16 | 38.76 | 0.00389 | 1.683 | 137.74 | 0.01384 | 6.22822 |

# Section 3. Load Shapes

The ideal load shape for net benefits estimates would represent the difference between the base case and measure case. The closest load shapes that are applicable to the measures in this work paper are listed in the table below.

Building Types and Load Shapes

|  |  |  |
| --- | --- | --- |
| **Building Type** | **Load Shape** | **E3 Alternate Building Type** |
| Residential Mobile Home - Double-Wide | HeatPump\_WtrHt-RC | Residential |
| Residential Multi-family | HeatPump\_WtrHt-RC | Residential |
| Residential Single Family | HeatPump\_WtrHt-RC | Residential |

# Section 4. Costs

## 4.1 Base Case Cost

The base case cost is $0 because the base case is the customer’s existing equipment.

**Base and Measure Case Costs**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Measure** | **Base Case Cost Source** | **Base Case Equipment Cost** | **Base Case Labor Cost** | **Measure Case Cost Source** | **Measure Case Equipment Cost** | **Measure Case Labor Cost** |
| Faucet Aerator replacing No Faucet Aerator | N/A | $0.00 | $0.00 | Grainger.com | $7.28 | $7.73 |
| Low Flow Showerhead replacing Standard Showerhead | N/A | $0.00 | $0.00 | 2010-12 WO017 Ex Ante Measure Cost Study [475] | $18.50 | $15.67 |

The measure cost for the faucet aerator has been calculated as an average of (3) cost quotes from 2016 online retailer, grainger.com [Attachment 4]. Low flow showerheads have not changed significantly from the cost sources used in this work paper, therefore, the costs have not been updated.

For the faucet aerator measure, the labor rate was not available in the CPUC’s supported WO17 cost evaluation; however, it was estimated using DEER 2008 assumptions with installation time for the faucet aerator = 7.2 mins (0.12\*60). This time is multiplied by the average national plumber labor rate based on 2016 RSMeans ($64.40). For the low flow showerhead measure, the labor rate is based on WO17.

## 4.2 Measure Case Cost

See Section 4.1.

## 4.3 Full and Incremental Measure Cost

**Full and Incremental Measure Cost Equations**

|  |  |  |  |
| --- | --- | --- | --- |
| **Installation Type** | **Incremental Measure Cost** | **Full Measure Cost** | |
| **1st Baseline** | **2nd Baseline** |
| REA | MEC + MLC | MEC + MLC | N/A |

MEC = Measure Equipment Cost; MLC = Measure Labor Cost

BEC = Base Case Equipment Cost; BLC = Base Case Labor Cost

**Full and Incremental Costs**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Measure** | **Installation Type** | **Incremental Measure Cost** | **Full Measure Cost** | |
| **1st Baseline** | **2nd Baseline** |
| WH-62220 | REA | $15.01 | $15.01 | N/A |
| WH-79994 | REA | $34.17 | $34.17 | N/A |

# Attachments

1. SCE17WP004.0 A1-Calculation Template.xlsm
2. SCE17WP004.0 A2-Energy Division Workpaper Disposition for Water Fixtures.docx
3. SCE17WP004.0 A3-Cost Documentation.xlsx

# References



[428]

[475]

[496]

[508]