Work Paper SCE13WP004

**Revision 2**

**Southern California Edison Company**

**Faucet Aerator and Low Flow Showerhead**

# At-a-Glance Summary

|  |  |
| --- | --- |
| ****Solution and 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 |
| **Gross Measure Cost ($/unit):** | Refer to Excel Calculation Attachment |
| **Measure Incremental Cost ($/unit):** | Refer to Excel Calculation Attachment |
| **Effective Useful Life:** | 10 years (EUL ID: WtrHt-WH-Aertr, WtrHt-WH-Shrhd) |
| **Measure Application Type:** | Retrofit (RET) |
| **Net-to-Gross Ratio:** | Aerator, SFM: 0.59 (NTG ID: Res-sSF-mDHWaerator)  Aerator, MFM: 0.65 (NTG ID: Res-sMF-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 document does not contain a data set in conformance with the 4/1/14 CPUC Ex Ante Database Specification; SCE will provide that data set separately.** |

# Document Revision History

|  |  |  |  |
| --- | --- | --- | --- |
| Revision # | Revision Date | Author (Affiliation) | Summary of Changes |
| 0 | 06/19/2012 | Alfredo Gutierrez (SCE) | - Original workpaper for 2013 PC |
| 1 | 12/12/13 | Ryan Cho (SCE) | In accordance with the Energy Division’s disposition, the following revisions are incorporated to this workpaper.   * Revised all Unit Energy Savings (UES) values. * Updated the Installation Rates to 0.67 (Faucet Aerator) and 0.74 (Showerheads) |
| 2 | 9/9/14 | Jason Wang (SCE) | Added 7% adjustment factor based on 7% market share of electric water heaters in SCE territory. |

# 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

Table 1: Measures and Codes

|  |  |  |
| --- | --- | --- |
| Solution Code | Measure Code | Measure Name |
| WH-62220 | N/A | Faucet Aerator replacing No Faucet Aerator |
| WH-79994 | N/A | 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 1.5 gallons per minute (gpm).

There are 2 types of low flow showerheads:

* Aerating showerheads introduce water into the flow, which produces an even, misty spray while maintaining sufficient water pressure.
* Laminar flow showerheads split the 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 1.7 gpm.

## 1.3 Application Types and Delivery Mechanisms

See Appendices A and B for definitions of application types and delivery mechanisms.

The delivery mechanisms for these measures are:

* Financial Support - Direct Install
* Financial Support – Giveaway
* Partnership – Giveaway

The program type/install type is Retrofit – First Baseline Only (REF).

## 1.4 Measure and Base Case Cost Effectiveness Data

### 1.4.1 DEER Measure and Base Case Analysis

Both measures were in DEER 2005 but do not remain in DEER 2014. Savings in this work paper are based on an Energy Division disposition.

Table : DEER Measure Description

|  |  |  |
| --- | --- | --- |
| DEER Measure ID | DEER Measure Description | DEER Base Description |
| D03-934 | Faucet Aerators. | No Faucet Aerators. |
| D03-937 | Low Flow Showerhead. Flow rate of 2.0 gpm. | Standard showerhead. Flow rate of 2.5 gpm. |

Table 3: DEER Difference Summary

|  |  |
| --- | --- |
| DEER Difference Summary Table | |
| Referenced versions of DEER and READI | DEER 2014, READI v2.1.0 |
| Summary of deviation from DEER | DEER contained similar measures which have since been removed. |
| DEER measures scaled? | No |
| DEER eQUEST prototypes used? | No |
| DEER operating hours used? | No |

**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.

Table 4: Net-to-Gross Ratio

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| NTGR ID | Description | Sector | BldgType | ProgDelivID | NTG |
| Res-sSF-mDHWaerator | Faucet aerators | Res | SFm | DirInstall | 0.59 |
| Res-sMF-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.

**Installation Rate**

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

Table 5: Installation Rate

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

**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.

**Technology Fields**

The Technology Fields were obtained from the Ex Ante Database Specification. The relevant Use Category, Use Sub-category, Technology Group, and Technology Type values for the measures in this work paper are in the table below.

Table 6: Technology Fields

|  |  |
| --- | --- |
| Classification | Value |
| Measure Case UseCategory | Service and Domestic Hot Water |
| Measure Case UseSubCats | Hot Water Point of Use |
| Measure Case TechGroups | Plumbing Fixture |
| Measure Case TechTypes | Faucet Aerator, Showerhead |
| Base Case TechGroups | Plumbing Fixture |
| Base Case TechTypes | Faucet Aerator, Showerhead |

**Effective and Remaining Useful Life**

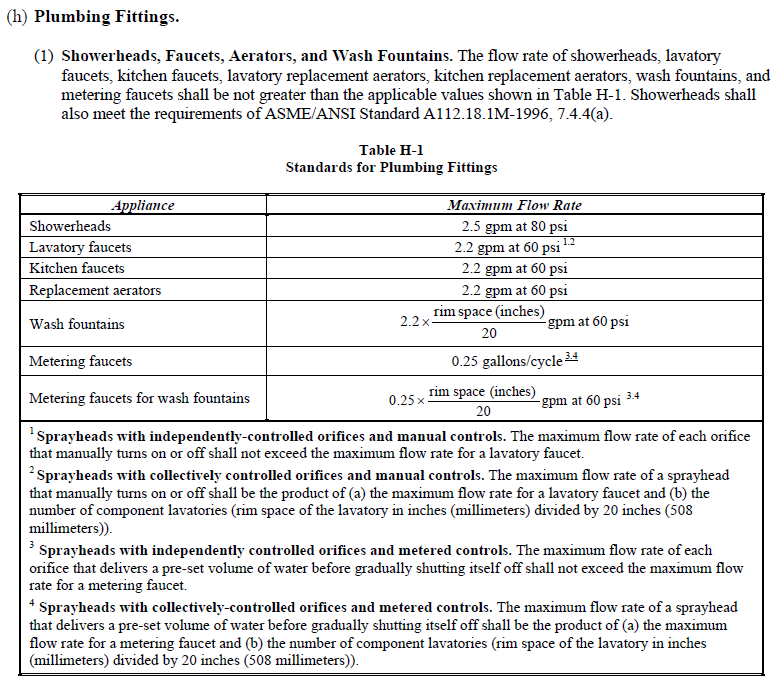
The EUL and RUL values were obtained using the DEER READI tool. DEER defines the RUL as 1/3 of the EUL value. The RUL value is only applicable to the first baseline period for an RET measure with an applicable code baseline. The relevant EUL and RUL values for the measures in this work paper are in the table below.

Table 7: EUL and RUL

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| EUL ID | Description | Sector | UseCategory | EUL (Years) | RUL (Years) |
| WtrHt-WH-Aertr | Faucet Aerators | Any | SHW | 10 | 3.3 |
| WtrHt-WH-Shrhd | Low-Flow Showerhead | Res | SHW | 10 | 3.3 |

### 1.4.2 Codes and Standards Analysis

**Title 20 2014 [422]:** Section 1605.1, Table H-1 provides requirements for aerators and showerheads. The measure cases in this work paper have lower flow rates (1.5 gpm for aerators and 1.7 gpm for showerheads) than code requirements.



**Title 24 2013 [355]**: The Residential Compliance Manual, Section 5.9.1 §110.3(c)7 references the requirements set in Title 20.

Table 8: Code Summary

|  |  |  |
| --- | --- | --- |
| Code | Applicable Code Reference | Effective Dates |
| Title 20 (2014) | Section 1605.1, Table H-1 Standards for Plumbing Fittings | July 1, 2014 |
| Title 24 (2013) | 2013 Residential Compliance manual, Section 5.9.1 §110.3(c)7 – Certification of Showerheads and Faucets | July 1, 2014 |

### 1.4.3 Non-DEER Study Review

No studies were reviewed for this work paper.

# Section 2: Calculation Methodology

The 2/22/13 Energy Division Workpaper Disposition for Water Fixtures 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.

The measures in this workpaper do not have requirements for measure case flow rate, so the most conservative ED-provided savings are used. The most conservative measures were:

* Showerhead 1.7 gpm ( “ShowerHd-Gas-1.7,” “ShowerHd-Elec-1.7”)
* Faucet Aerator 1.5 gpm (“FaucetAer-Gas-1.5-Lav,” “FaucetAer-Elec-1.5-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**

Due to the program delivery, it is unknown whether the customer uses electric water heating. Therefore the savings are 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].



Table 9 shows example savings for Faucet Aerators in Single Family Homes. See Attachment 1 for a full list of savings.

Table 9: Faucet Aerators Savings for Single Family

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ED Disposition Savings | | | | Adjusted Savings | | |
|
| **CZ** | **kWh** | **kW** | **Therms** | **kWh** | **kW** | **Therms** |
| 6 | 22.05 | 0.00222 | 0.958 | 1.54 | 0.00016 | 0.067 |
| 8 | 20.90 | 0.00210 | 0.908 | 1.46 | 0.00015 | 0.064 |
| 9 | 21.30 | 0.00214 | 0.925 | 1.49 | 0.00015 | 0.065 |
| 10 | 21.07 | 0.00212 | 0.915 | 1.48 | 0.00015 | 0.064 |
| 13 | 21.13 | 0.00212 | 0.918 | 1.48 | 0.00015 | 0.064 |
| 14 | 22.34 | 0.00224 | 0.970 | 1.56 | 0.00016 | 0.068 |
| 15 | 17.73 | 0.00178 | 0.770 | 1.24 | 0.00012 | 0.054 |
| 16 | 25.05 | 0.00252 | 1.088 | 1.75 | 0.00018 | 0.076 |

# 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.

Table 10: Building Types and Load Shapes

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

# Section 4: Base Case & Measure Costs

## 4.1 Base Case Cost

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

Table : 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 | DEER 2005: D03-934 | $7.12 | $5.58 |
| Low Flow Showerhead replacing Standard Showerhead | N/A | $0.00 | $0.00 | 2010-12 Ex Ante Measure Cost Study [475] | $18.50 | $15.67 |

## 4.2 Measure Case Cost

See Section 4.1.

## 4.3 Gross and Incremental Measure Cost

### 4.3.1 Gross Measure Cost (GMC)

For REF, the Gross Measure Cost is the full measure cost. Since a code case does not exist, the Incremental Measure Cost is not applicable.

Table 12: Gross and Incremental Measure Costs

|  |  |  |
| --- | --- | --- |
| Measure | 1st Baseline Cost  (Gross Measure Cost) | 2nd Baseline Cost (Incremental Measure Cost) |
| Faucet Aerator replacing No Faucet Aerator | $12.70 | N/A |
| Low Flow Showerhead replacing Standard Showerhead | $34.17 | N/A |

### 4.3.2 Incremental Measure Cost (IMC)

See Section 4.3.1.

# Attachments

1. 

1. ****

1. ****

# References



[355]

[422]

[428]

[475]

# Appendix A: Application Types

This table compares the application types in SCE’s systems with those in DEER.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| SCE Application (Program) Type | DEER Application Type | Savings | | Cost | | Life | |
| **1st Baseline (BL)** | **2nd BL** | **1st BL** | **2nd BL** | **1st BL** | **2nd BL** |
| New Construction (NEW) | New Construction (Nc) | Above Code or Standard | N/A | Incremental Cost | N/A | EUL | 0 |
| Replace on Burnout (ROB) | Replace on Burnout (Rob), Normal Replacement (NR) | Above Code or Standard | N/A | Incremental Cost | N/A | EUL | 0 |
| Retrofit (RET) | Early Replacement (ER) | Above Customer Existing | Above Code or Standard | Full Cost | Incremental Cost | RUL | EUL-RUL |
| Retrofit – First Baseline Only (REF) | Early Replacement RUL (ErRul) | Above Customer Existing | N/A | Full Cost | N/A | EUL | 0 |
| Retrofit Add-on (REA) | N/A | Above Customer Existing | N/A | Full Cost | N/A | EUL | 0 |

# Appendix B: Delivery Mechanisms

A delivery mechanism is a delivery method paired with an incentive method. SCE’s delivery methods include:

* Appliance Turn-in and Recycling
* Audit/Information
* Commissioning
* Financial Support
* Innovative Design
* Midstream Programs
* Partnership
* Upstream Programs

The following table describes the incentive methods.

|  |  |
| --- | --- |
| Incentive Method | Description |
| Direct Install | The utility program performs an assessment of the customer’s facility, provides recommendations, and implements energy efficiency measures for free. |
| Down-Stream Incentive - Deemed | The customer installs qualifying energy efficient equipment and submits an incentive application to the utility program. Upon application approval, the utility program pays an incentive to the customer. |
| Exchange - Replacement | The utility program holds events where customers can trade functional equipment for similar but more energy efficient equipment, free of charge. |
| Giveaway | The utility program provides customers with energy efficient equipment for free. |
| Mid-Stream Incentive | The utility program offers buydowns and incentives to third parties (typically retailers, distributors, and contractors), who then stock, promote, lower prices on, and/or sell energy efficient equipment. Contractors install energy efficiency equipment, sometimes using specified quality procedures, at the customer’s property. |
| On-bill Finance - loan | Customers can finance energy efficiency projects at 0% interest and repay the loan through their monthly utility bill. |
| Testing Services / Other | The utility program performs free testing services or assessments of the customer’s facility and provides information and recommendations for potential energy efficiency measures. |
| Up-Stream Buy Down, Up-Stream Incentive | The utility program offers buydowns and incentives to vendors (typically manufacturers and distributors), who then manufacture, stock, promote, lower prices on, and/or sell energy efficient equipment. There is some overlap between the mid-stream and up-stream approaches. |