|  |
| --- |
| APPLIANCE & PLUG LOADs  CLOTHES washer, Residential  SWAP004-01 |

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Measure Name

Clothes Washer, Residential

Statewide Measure ID

SWAP004-01

Technology Summary

This measure pertains to ENERGY STAR-certified residential clothes washers. A significant amount of the energy used for clothes washing is used for heating the water, thus machines that use less water are typically more energy efficient. Horizontal-axis (front loading) clothes washers tumble clothes through a smaller pool of water than conventional vertical-axis (top loading) models, saving up to 50% of energy consumed in the washing process. High-efficiency machines also have more efficient motors that spin clothes two to three times faster than the conventional machines. Thus, more water is removed from the clothes, which reduces the energy required to dry them.

The following terms are useful to understand the ENERGY STAR clothes washer measure:

* The **capacity** is the entire volume measured in cubic feet which a dry-clothes load could occupy within the clothes container during washer operation.
* The **energy consumption per cycle** is equal to the sum of the washing machine electrical energy consumption, the hot water heater energy consumption, and the dryer energy consumption.
* The **integrated** **modified energy factor (IMEF)** and **modified energy factor (MEF)** indicate how many cubic feet of laundry can be washed and dried with one (1) kWh of electricity. The higher the number, the greater the efficiency. The efficiency requirements for residential clothes washer models are based upon IMEF.
* The **integrated** **water factor (IWF)** is the number of gallons needed for each cubic foot of capacity. A lower number indicates lower water consumption and therefore represents more efficient use of the water.

Measure Case Description

This measure is defined as a clothes washer that meets the minimum criteria of ENERGY STAR Version 8.0 or the ENERGY STAR Most Efficient 2018.[[1]](#footnote-1) The following table provides the minimum integrated modified energy factor (IMEF) / modified energy factor (MEF) and the maximum integrated water factor (IWF) for the measure offerings defined for this measure. Savings were calculated for each applicable building type and for each investor-owned utility service area for each measure offering.

Measure Case Specification

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Tier** | **Measure Offering** | **Applicable Building Types** | **Min. Integrated Modified Energy Factor (IMEF)** | **Min. Modified Energy Factor (MEF J2)** | **Max. Integrated Water Factor (IWF)** |
| ENERGY STAR Residential | Top-Loading  > 2.5 cubic feet | Single family  Mobile home Multifamily (in unit)  Multifamily (common) | 2.06 | n/a | 4.3 |
| Front-Loading  > 2.5 cubic feet | 2.76 | n/a | 3.2 |
| ENERGY STAR Most Efficient Residential | Top-Loading  > 2.5 cubic feet | Single family  Mobile home Multifamily (in unit)  Multifamily (common) | 2.92 | n/a | 3.2 |
| Front-Loading  > 2.5 cubic feet |

Base Case Description

The base case technology for this measure is a top-loading or front-loading residential clothes washer that meets the federal and Title 20 California Appliance Efficiency Regulations (see Code Requirements).

Code Requirements

Applicable state and federal codes and standards for clothes washers are denoted and further explained below.

Applicable State and Federal Codes and Standards

|  |  |  |
| --- | --- | --- |
| **Code** | **Applicable Code Reference** | **Effective Date** |
| CA Appliance Efficiency Regulations – Title 20 (2017) | Section 1605.1, Table P-2: Standards for Residential Clothes Washers | March 7, 2015 |
| Federal Standards | Code of Federal Regulations, 10 CFR 430.32(g)(3) | March 7, 2015 |
| Code of Federal Regulations, 10 CFR 431.156 | January 1, 2018 |
| CA Building Energy Efficiency Standards – Title 24 | None. | n/a |

**California Appliance Efficiency Regulations (Title 20).** The 2017 California Appliance Efficiency Regulations (Title 20)[[2]](#footnote-2) requires that all residential clothes washers manufactured on or after the effective dates meet the minimum efficiency requirements for the integrated modified energy factor (IMEF) and the integrated water factor (IWF). Title 20 minimum standards for residential clothes washers follow U.S. Department of Energy (DOE) federal minimum efficiency requirements.

**DOE Federal Standards.** Clothes washers fall under federal DOE Energy Regulations.[[3]](#footnote-3) , shown in the following tables. Note that federal standards match the requirements cited in Title 20.

Federal and State Minimum Efficiency Requirements for ENERGY STAR Clothes Washers – Residential

|  |  |  |  |
| --- | --- | --- | --- |
| **Residential Clothes Washers** | **Clothes Container Compartment Capacity (ft3)** | **Min. Integrated Modified Energy Factor (IMEF)** | **Max. Integrated Water Factor (IWF)** |
| Compact Top-Loading Clothes Washers | < 1.6 ft3 | 1.15 | 12.0 |
| Standard Top-Loading Clothes Washers | ≥ 1.6 ft3 | 1.57 | 6.5 |
| Compact Front-Loading Clothes Washers | < 1.6 ft3 | 1.13 | 8.3 |
| Standard Front-loading Clothes Washers | ≥ 1.6 ft3 | 1.84 | 4.7 |

Normalizing Unit

Each

Program Requirements

Measure Implementation Eligibility

All combinations of measure application type, delivery type, and sector that are established for this measure are specified below. Measure application type is a categorization based on the circumstances and timing of the measure installation; each measure application type is distinguished by its baseline determination, cost basis, eligibility, and documentation requirements.  Delivery type is the broad categorization of the delivery channel through which the market intervention strategy (financial incentives or other services) is targeted. This table also designates the broad market sector(s) that are applicable for this measure.

*Note that some of the implementation combinations below may not be allowed for some measure offerings by all program administrators.*

Implementation Eligibility

|  |  |  |
| --- | --- | --- |
| **Measure Application Type** | **Delivery Type** | **Sector** |
| New construction | UpDeemed | Res |
| New construction | DnDeemed | Res |
| New construction | DnDeemDI | Res |
| Normal replacement | UpDeemed | Res |
| Normal replacement | DnDeemed | Res |
| Normal replacement | DnDeemDI | Res |

Eligible Products

This measure is defined as a clothes washer that meets minimum criteria of ENERGY STAR Version 8.0 or the ENERGY STAR Most Efficient 2018.[[4]](#footnote-4) Eligible product information for each measure offering is described below.

Energy Efficiency Requirements for Clothes Washers

| **Measure Offering** | **Requirements** |
| --- | --- |
| ENERGY STAR Residential Clothes Washer > 2.5 cubic feet | * Must be an ENERGY STAR-qualified top-loading or front-loading model. * The clothes container volume must be > 2.5 and ≤ 6.0 cubic feet. * Top-loading models must have an Integrated Modified Energy Factor (IMEF) ≥ 2.06 and an Integrated Water Factor (IWF) ≤ 4.3. * Front-loading models must have IMEF ≥ 2.76 and an IWF ≤ 3.2. * Qualified machines that satisfy the ENERGY STAR Connected criteria are allowed an IMEF 5% lower than the minimum qualifying standard. |
| ENERGY STAR Most Efficient Clothes Washer | * Must be an ENERGY STAR Most Efficient model that is a top-loading or front-loading residential model. * The clothes container volume must be ≥ 1.6 and ≤ 6.0 cubic feet. * Models > 2.5 cubic feet must have an IMEF ≥ 2.92 and an IWF ≤ 3.2. |

Eligible Building Types

Eligible building types include residential single family and double-wide mobile homes, and in-unit multifamily residences; as well as multifamily common area laundry.

Eligible Climate Zones

The measure is applicable in all California climate zones.

Program Exclusions

The following products are not eligible for the ENERGY STAR Most Efficient Clothes Washer (> 2.5 cubic feet):

* Configurations other than a front-loading or top-loading design.
* Clothes washer with capacity ≤ 2.5 cubic feet.
* Combination washer-dryers and residential clothes washers with a heated drying functionality.
* Compact washers ≤ 1.6 cubic feet.
* Commercial clothes washers

Data Collection Requirements

Data collection requirements are to be determined.

Use Category

Appliance and plug loads (AppPlug)

Electric Savings (kWh)

The methodology to derive unit energy savings (UES) of an ENERGY STAR clothes washer is dependent upon the product tier/measure offering. The UES of residential clothes washers were drawn from the Database of Energy Efficient Resources (DEER) were calculated as a function of the energy requirements of the washing machine itself, and the energy requirements of the water heater and clothes dryer.

| **Tier** | **Measure Offering** | **Statewide Measure Offering ID** | **Energy Impact Measure ID** | **DEER Version** |
| --- | --- | --- | --- | --- |
| ENERGY STAR – Residential | Top-Loading | SWAP004G (Dwelling)  SWAP004H (Common) | RB-Appl-EffCW-med-Tier1-Top | DEER 2020 |
| Front-Loading > 2.5 ft3 | SWAP004A (Dwelling)  SWAP004B (Common) | RB-Appl-EffCW-med-Tier2-Front | DEER 2020 |
| ENERGY STAR Most Efficient (ESME) – Residential | Top-Loading > 2.5 ft3 | SWAP004I (Dwelling)  SWAP004J (Common) | Scaled from: RB-Appl-EffCW-med-Tier3-Front | DEER 2020 |
| Front-Loading > 2.5 ft3 | SWAP004C (Dwelling)  SWAP004D (Common) | RB-Appl-EffCW-med-Tier3-Front | DEER 2020 |

Residential Clothes Washers – DEER-Based Unit Energy Savings

The measure offerings for which the values were drawn directly from DEER 2020 are specified below. The DEER Measure IDs in this table are only applicable to residential clothes washers installed in single-family, domestic mobile home, and in-unit multifamily residences.

Clothes Washer DEER Measure IDs

| **Tier** | **Measure Offering** | **DEER Measure ID** | **Min. Integrated Modified Energy Factor (IMEF)** | **Max. Integrated Water Factor (IWF)** |
| --- | --- | --- | --- | --- |
| ENERGY STAR – Residential | ENERGY STAR Top-Loading | RB-Appl-EffCW-med-Tier1-Top | 2.06 | 4.3 |
| ENERGY STAR Front-Loading > 2.5 ft3 | RB-Appl-EffCW-med-Tier2-Front | 2.76 | 3.2 |
| ENERGY STAR Most Efficient (ESME) – Residential | Top-Loading > 2.5 ft3 | Scaled from RB-Appl-EffCW-med-Tier3-Front | 2.92 | 3.2 |
| Front-Loading > 2.5 ft3 | RB-Appl-EffCW-med-Tier3-Front |

The UES of an ENERGY STAR Most Efficient top-loading clothes washer (2.92 IMEF) is scaled from the top-loading “Tier 3” measure in DEER (2.76 IMEF).

The UES of a residential ENERGY STAR clothes washer installed in multifamily common area are based upon the DEER savings values corresponding to the DEER Measure IDs in the previous table. However, the savings are scaled proportionally to reflect the increase in wash cycles per year in a multifamily common area compared to residential use. The scaling factors shown below are derived from the number of wash cycles per year specified in the U.S. Department of Energy (DOE) Technical Support Documents (TSDs) for residential clothes washers.

Scaling Factors for Unit Energy Savings of Residential Clothes Washer

| **Building Type** | **Wash Cycles per Year** | **Scaling Factor** | **Source for Cycles per Year** |
| --- | --- | --- | --- |
| Single Family | 295 | - | U.S. Department of Energy (DOE). 2012*. Technical Support Document: Energy Efficiency Program for Consumer Products and Commercial and Industrial Equipment: Residential Clothes Washers.* Prepared by Navigant Consulting, Inc. and Ernest Orlando Lawrence Berkeley National Laboratory. Chapter 7, page 7-6. |
| Multifamily | 1,095 | 3.71 | U.S. Department of Energy (DOE). 2014. *Technical Support Document: Energy Efficiency Program for Consumer Products and Commercial and Industrial Equipment: Commercial Clothes Washers.* Prepared by Navigant Consulting, Inc. and Lawrence Berkeley National Laboratory. Chapter 7, page 7-6. |

**Saturation of Electric Water Heating and Electric Dryers.** The energy use estimates from the DOE TSD assume the use of an electric water heater and an electric dryer. Thus, the calculated UEC must account for the saturation of electric hot water heating and electric dryers in California.

In 2009, the California Energy Commission administered the Residential Appliance Saturation Study (RASS)[[5]](#footnote-5) across the service territories of the large investor-owned utilities (IOUs). The survey requested households to provide information on appliances, equipment, and general consumption patterns. Data collection was completed in early 2010.

The 2009 RASS data was analyzed to estimate the residential electric and gas water heater and dryer saturations for residential homes in California. Note that this analysis used the residential saturations from RASS for commercial washers installed in multifamily common areas washers because no other comparable source was available for those applications.

Residential Dryer and Water Heater Saturations, by Utility Service Area and Fuel Type

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **IOU Service Area** | **Gas Dryer w/ Gas Water Heating** | **Gas Dryer w/ Elec Water Heating** | **Electric Dryer w/ Gas Water Heating** | **Electric Dryer w/ Electric Water Heating** |
| PG&E | 40.2% | 0.2% | 57.9% | 1.6% |
| SCE | 71.7% | 0.4% | 21.3% | 6.6% |
| SDG&E | 66.4% | 0.9% | 31.3% | 1.4% |
| SCG | 78.0% | 0.4% | 20.8% | 0.7% |

**Interactive Effects Multiplier.** The interactive effects multipliers were drawn from DEER. Because interactive effects factors specific to clothes washers were not available, the HVAC interactive effects factors for screw-in lamps were applied to the clothes washer measure savings. The interactive effects factors were selected for “IOU territory” (weighted by climate zone) and the “Existing” building vintage. The factors for the utilities were used for the appropriate service territory. The “small office” building type was used for the multifamily common area measures.

Peak Electric Demand Reduction (kW)

Residential Clothes Washers – DEER-based Peak Demand Reduction

As with electric energy savings, the peak demand reduction of residential ENERGY STAR clothes washers was drawn directly from the Database of Energy Efficient Resources (DEER). The measure offerings for which the values were drawn directly from DEER are specified below. The DEER Measure IDs in this table are only applicable to residential clothes washers installed in single-family, domestic mobile home, and in-unit multifamily residences.

Clothes Washer DEER Measure IDs

| **Tier** | **Measure Offering** | **DEER Measure ID** | **Min. Integrated Modified Energy Factor (IMEF)** | **Max. Integrated Water Factor (IWF)** |
| --- | --- | --- | --- | --- |
| ENERGY STAR – Residential | ENERGY STAR Top-Loading | RB-Appl-EffCW-med-Tier1-Top | 2.06 | 4.3 |
| ENERGY STAR Front-Loading > 2.5 ft3 | RB-Appl-EffCW-med-Tier2-Front | 2.76 | 3.2 |
| ENERGY STAR Most Efficient (ESME) – Residential | Top-Loading > 2.5 ft3 | Scaled from RB-Appl-EffCW-med-Tier3-Front | 2.92 | 3.2 |
| Front-Loading > 2.5 ft3 | RB-Appl-EffCW-med-Tier3-Front |

**Coincident Demand Factor.** The coincident demand factor (CDF) was drawn from the U.S. DOE Office of Energy Efficiency and Renewable Energy Building Analysis Spreadsheets developed as companion resources for the House Simulation Protocols. The Building America Existing Homes spreadsheet provides the set of standard operating conditions—including hourly and monthly profiles for occupancy, lighting, appliances, and miscellaneous electric loads developed by Building America to objectively compare energy use before and after a retrofit.

Peak Demand Reduction Inputs

|  |  |  |
| --- | --- | --- |
| **End Use** | **CDF** | **Source** |
| Multifamily Common Area | 0.067 | U.S. Department of Energy (DOE), Office of Energy Efficiency and Renewable Energy. 2010. Building America Analysis Spreadsheets. “B10 Analysis - Existing Homes 2011.01.26.xlsm.” See “Pre-Retrofit Normalized Hourly Profiles (Common Areas)” on the “Hourly Profiles” tab. Last modified December 17, 2010. |

**Interactive Effects.** The interactive effects multipliers were pulled from the Database for Energy Efficient Resources (DEER) 2016. Because interactive effects specific to clothes washers were not available, the HVAC interactive effects factors for compact fluorescent lamps were applied to the clothes washer measure savings. The interactive effect factors were selected for “IOU territory” (weighted by climate zone) and the “Existing” building vintage. The factors for the utilities were used for the appropriate service territory. The “small office” building type was used for the multifamily common area measures.

Gas Savings (Therms)

The natural gas unit energy savings (UES) of an efficient clothes washer is based solely on the energy savings associated with reduced gas hot water heater and gas dryer energy consumption that will result from the installation of a high-efficiency clothes washer. The approaches to estimate the gas UES for residential clothes washers are summarized below.

Residential Clothes Washers – DEER-Based Unit Energy Savings

As with electric energy savings, the gas UES of residential ENERGY STAR clothes washers was drawn directly from the Database of Energy Efficient Resources (DEER). The measure offerings for which the values were drawn directly from DEER 2018 are specified below. The DEER Measure IDs in this table are only applicable to residential clothes washers installed in single-family, domestic mobile home, and in-unit multifamily residences.

Clothes Washer DEER Measure IDs

| **Tier** | **Measure Offering** | **DEER Measure ID** | **Min. Integrated Modified Energy Factor (IMEF)** | **Max. Integrated Water Factor (IWF)** |
| --- | --- | --- | --- | --- |
| ENERGY STAR – Residential | ENERGY STAR Top-Loading | RB-Appl-EffCW-med-Tier1-Top | 2.06 | 4.3 |
| ENERGY STAR Front-Loading > 2.5 ft3 | RB-Appl-EffCW-med-Tier2-Front | 2.76 | 3.2 |
| ENERGY STAR Most Efficient (ESME) – Residential | Top-Loading > 2.5 ft3 | Scaled from RB-Appl-EffCW-med-Tier3-Front | 2.92 | 3.2 |
| Front-Loading > 2.5 ft3 | RB-Appl-EffCW-med-Tier3-Front |

**Electric (kWh) to Gas (therm) Conversion.** The energy use estimates taken from the U.S. Department of Energy (DOE) Technical Support Documents (TSDs) assume the use of an electric dryer and electric hot water heater. Because the energy usage is expressed exclusively in kWh, the dryer and water heater energy use values were converted to therms for the domestic hot water and dryer combinations that include gas as a fuel source.

**Gas Correction Factors.** Gas energy savings estimates were developed for the following domestic hot water and dryer combinations: electric water heat / electric dryer, gas water heat / electric dryer and gas water heat / gas dryer. According to the 2009 RASS, 0% of California IOU customers have electric water heat / gas dryer combinations in their homes. RASS distributions are considered separately for PG&E, SCE, SCG, and SDG&E customers. Because gas dryers and gas water heaters have a lower energy factor than electric dryers and electric water heaters, correction factors must be applied to facilities with gas dryers and/or gas water heating.

The gas water heater (or gas dryer) correction factor is a ratio of the efficiency of an electric storage water heater (or electric dryer) to the efficiency of a gas storage water heater (or gas dryer).

Gas Correction Factors

|  |  |  |
| --- | --- | --- |
| **Factor** | **Value** | **Source** |
| Gas Dryer Correction Factor | 1.120 | U.S. Department of Energy (DOE). 2012. *Technical Support Document: Energy Efficiency Program for Consumer Products and Commercial and Industrial Equipment: Residential Clothes Washers.* Prepared by Navigant Consulting, Inc. and Ernest Orlando Lawrence Berkeley National Laboratory. |
| Efficiency of electric water heater | 1.000 |
| Efficiency of gas water heater | 0.750 |
| Gas Water Heater Correction Factor | 1.333 |

**Interactive Effects.** The interactive effects multipliers were pulled from DEER 2016. Because interactive effects factors specific to clothes washers were not available, the gas HVAC interactive effects factors for compact fluorescent lamps were applied to the clothes washer measure savings. The interactive effect factors were selected for “IOU territory” (weighted by climate zone) and the “Existing” building vintage. The factors for the utilities were used for the appropriate service territory. The “small office” building type was used for the multifamily common area measures.

See the Electric Savings for an explanation of the remaining parameters in the calculation.

Life Cycle

Effective useful life (EUL) is an estimate of the median number of years that a measure installed through a program is still in place and operable. Remaining useful life (RUL) is an estimate of the median number of years that a technology or piece of equipment replaced or altered by an energy efficiency program would have remained in service and operational had the program intervention not caused the replacement or alteration.

The EUL specified for high-efficiency clothes washers are presented below. Insofar as the clothes washer measure is not add-on equipment, the RUL is not applicable.

Effective Useful Life and Remaining Useful Life

| **Parameter** | **ENERGY STAR Residential Top- and Front Loading, > 2.5 ft3** | **ENERGY STAR Most Efficient Clothes Washer, > 2.5 ft3** | **Source** |
| --- | --- | --- | --- |
| EUL (yrs) | 11.0 | 11.0 | California Public Utilities Commission (CPUC). 2014. “DEER2014-EUL-table-update\_2014-02-05.xlsx.” |
| RUL (yrs) | n/a | n/a | - |

Base Case Material Cost ($/unit)

Residential Clothes Washers

The base case material cost for equipment *delivered via direct install* is equal to $0.

The estimation of the base case material cost for *all other delivery types* was estimated with regression analysis of model data obtained by Energy Solutions, under contract with PG&E in November 2016, to determine the incremental measure cost (IMC) of a high efficiency residential clothes washer. A web scraping tool collected data on cost and other product attributes of clothes washers from five major retailers; washer models were matched to the ENERGY STAR qualified product list (QPL),[[6]](#footnote-6) the California Energy Commission (CEC) Modernized Appliance Efficiency Database System (MAEDBS),[[7]](#footnote-7) and the U.S. Department of Energy (DOE) Compliance Certification Database – all accessed in 2016.[[8]](#footnote-8) Using a multiple regression analysis, the study team identified the incremental cost of the measure features that improve efficiency (represented by the IMEF value).

Measure Case Material Cost ($/unit)

Residential Clothes Washers

The estimation of the material cost for *all delivery types* was estimated with regression analysis of model data obtained by Energy Solutions, under contract with PG&E in November 2016, to determine the incremental measure cost (IMC) of a high efficiency residential clothes washer. A web scraping tool collected data on cost and other product attributes of clothes washers from five major retailers; washer models were matched to the ENERGY STAR qualified product list (QPL),[[9]](#footnote-9) the California Energy Commission (CEC) Modernized Appliance Efficiency Database System (MAEDBS),[[10]](#footnote-10) and the U.S. Department of Energy (DOE) Compliance Certification Database – all accessed in 2016.[[11]](#footnote-11) Using a multiple regression analysis, the study team identified the incremental cost of the measure features that improve efficiency (represented by the IMEF value).

Note that at the time of this analysis (November 2016), the ENERGY STAR specification was different from the current ENERGY STAR specification (2018). However, the minimum IMEF requirements remained consistent. The mapping from the prior and current ENERGY STAR specifications is as follows:

**Front-Loaders:**

IMEF ≥ 2.76: 2016 ENERGY STAR Most Efficient = 2018 ENERGY STAR

IMEF ≥ 2.72: 2016 CEE Tier 3 = 2018 ENERGY STAR Most Efficient

**Top-Loaders:**

IMEF ≥ 2.06: 2016 ENERGY STAR = 2018 ENERGY STAR

IMEF ≥ 2.76: 2016 CEE Tier 3 = 2018 ENERGY STAR Most Efficient

For consistency, this measure will refer to the 2018 ENERGY STAR specifications.

The IMC was derived using the multiple regression analysis shown using data from five major retailer websites:

The resulting regression coefficient for IMEF is 0.49. The IMC is calculated as:

*Costbase = Base case cost ($)*

*= Difference between the average IMEF of ENERGY STAR only models and the average IMEF of non-ENERGY STAR models.*

Due to different market characteristics between front-loading and top-loading clothes washers, a separate IMC analysis was conducted for each type.

Base Case Labor Cost ($/unit)

The base case labor cost for equipment *delivered via direct install* is equal to $0.

For *all other delivery types*, it is assumed the participant would have purchased a standard efficiency clothes washer absent the program. As such, the labor cost is assumed to be the same for both base case and measure case scenarios and the incremental labor cost is equal to $0.

Measure Case Labor Cost ($/unit)

For *all other delivery types*, it is assumed the participant would have purchased a standard efficiency clothes washer absent the program. As such, the labor cost is assumed to be the same for both base case and measure case scenarios and the incremental labor cost is equal to $0.

Net-to-Gross (NTG)

The net to gross (NTG) ratio represents the portion of gross impacts that are determined to be directly attributed to a specific program intervention. The NTG established for residential clothes washers is applicable for all units with a modified energy factor (MEF) that exceeds the ENERGY STAR qualification by 10

Net-to-Gross Ratios

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **ENERGY STAR Residential Top- and Front Loading  > 2.5 cubic feet** | **ENERGY STAR Most Efficient Clothes Washer,  > 2.5 cubic feet** | **Source** |
| NTG – residential units with MEF ≥ 10% above ENERGY STAR | 0.31 | 0.31 | Itron, Inc. 2011. *DEER Database 2011 Update Documentation.* Prepared for the California Public Utilities Commission. Page 14-5 Table 14-3. |

Gross Savings Installation Adjustment (GSIA)

The gross savings installation adjustment (GSIA) rate represents the ratio of the number of verified installations of the measure to the number of claimed installations reported by the utility. This factor varies by end use, sector, technology, application, and delivery method. This GSIA rate is the current “default” rate specified for measures for which an alternative GSIA has not been estimated and approved.

Gross Savings Installation Adjustment Rates

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **ENERGY STAR Residential Top- and Front Loading,  >2.5 cubic feet** | **ENERGY STAR Most Efficient Clothes Washer, >2.5 cubic feet** | **Source** |
| GSIA | 1.0 | 1.0 | California Public Utilities Commission (CPUC), Energy Division. 2013. *Energy Efficiency Policy Manual Version 5*. Page 31. |

Non-Energy Impacts

The non-energy impacts associated with a high-efficiency clothes washer is the reduction in water use. The water savings for this measure were derived only for the residential models that meet the ENERGY STAR Most Efficient specification. This includes ENERGY STAR Most Efficient models installed in single family and in-unit multifamily residences, as well as residential clothes washers installed in multifamily common areas.

The water savings for the residential ENERGY STAR Most Efficient clothes washers were calculated with the Water Energy Nexus Calculator (WEN Calculator version 1.05), a calculator designed to calculate the embedded energy in water and the avoided capacity cost associated with water savings.[[12]](#footnote-12) The “Environmental Benefits” module within the WEN Calculator calculates reduced water use from secondary data of existing environmental benefits models.

DEER Differences Analysis

This section provides a summary of inputs and methods that are adopted from the Database of Energy Efficient Resources (DEER), and the rationale for inputs and methods that are not DEER-based.

DEER Difference Summary

|  |  |
| --- | --- |
| **DEER Item** | **Comment** |
| Modified DEER methodology | Yes |
| Scaled DEER measure | Yes |
| DEER Base Case | Yes |
| DEER Measure Case | Yes |
| DEER Building Types | Yes |
| DEER Operating Hours | Yes |
| DEER eQUEST Prototypes | No |
| DEER Version | DEER 2016 READi v2.3.0 |
| DEER Measure IDs Used | RB-Appl-EffCW-med-Tier1-Top  RB-Appl-EffCW-med-Tier2-Top  RB-Appl-EffCW-med-Tier1-Front  RB-Appl-EffCW-med-Tier2-Front  RB-Appl-EffCW-med-Tier3-Front |
| NTG | Source: DEER 2011.  The value of 0.31 is associated with NTG ID: *Res-sAll-mCW* |
| GSIA | Source: DEER. The value of 1.0 is associated with GSIA ID: *Def-GSIA*  The value of 1.0 is associated with GSIA ID: *Res-CW-PGE* |
| EUL/RUL | Source: DEER. The value of 11 years is associated with EUL IDs: *ComLau-EffCW and Appl-Eff-CW* |

Revision History

Measure Characterization Revision History

|  |  |  |  |
| --- | --- | --- | --- |
| **Revision Number** | **Date** | **Primary Author, Title, Organization** | **Revision Summary and Rationale for Revision**  **Effective Date and Approved By** |
| 01 | 02/28/2018 | Jennifer Holmes  Cal TF Staff | Draft of consolidated text for this statewide measure is based upon:  PGECOAPP127, Revision 4 (December 18, 2017)  PGECOAPP127, Revision 3 (January 13, 2017)  Consensus reached among Cal TF members. |
| 12/31/2018 | Jennifer Holmes  Cal TF Staff | Revisions for submittal of Version 01 |
| 07/02/2019 | Ayad Al-Shaikh, Cal TF Staff | Update DEER Table. |

1. ENERGY STAR. 2018. "ENERGY STAR® Program Requirements Product Specification for Clothes Washers - Eligibility Criteria Version 8.0." Effective February 5, 2018.

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3. Code of Federal Regulations at 10 CFR 430.32 (g)(3).

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4. ENERGY STAR. 2018. "ENERGY STAR® Program Requirements Product Specification for Clothes Washers - Eligibility Criteria Version 8.0." Effective February 5, 2018. Page 3.

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6. <https://www.energystar.gov/productfinder/product/certified-clothes-washers/results> [↑](#footnote-ref-6)
7. <https://cacertappliances.energy.ca.gov/Pages/ApplianceSearch.aspx> [↑](#footnote-ref-7)
8. <https://www.regulations.doe.gov/certification-data/CCMS-79223002113.html#q=Product_Group_s%3A%22Clothes%20Washers%20-%20Residential%22> [↑](#footnote-ref-8)
9. <https://www.energystar.gov/productfinder/product/certified-clothes-washers/results> [↑](#footnote-ref-9)
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