**Workpaper WPSCGREAP120531A**

**Revision 2**

**Southern California Gas Company**

**Customer Programs Department**

**Coldwater Default Clothes Washer**

Revision History

|  |  |  |  |
| --- | --- | --- | --- |
| Revision No. | Date | **Description** | **Author** |
| 0 | April 10, 2012 | Draft | Steve Hastie (Navigant Consulting) |
| 1 | June 19, 2012 | Release | Chan Paek, SCG |
| 2 | December 26, 2014 | Updating paper for program start | Julianna Colwell, SCG |
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Measure Summary Table A

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Measure ID | Measure  Description | Pre-Existing  Description | Code/Standard  Description | Sector | App Type(s) | Delivery Method(s) | EUL ID | NTG ID(s) | GSIA ID |
| ApgClw001 | Cold Water Default Clothes Washer | N/A | Top loading, standard (1.6 ft3 or > capacity) IMEF ≥1.29, IWF ≤ 8.4 | Res | ROB | Downstream Prescriptive | Appl-EffCW | ET-Default | Res-CW-SCG |

Measure Summary Table B

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Measure ID | Descriptors | | | | | Above Preexisting/  Customer-Average Savings | | | Above Code/  Standard Savings | | | Cost | | |
| Bldg Type | Bldg Vint | Bldg Loc | Bldg HVAC | Norm Unit | kWh/ unit | kW/unit | therm | kWh/ unit | kW/unit | therm | Code/ Standard ($/unit) | Measure ($/unit) | Incremental  Measure ($/unit) |
| ApgClw001 | SFm | ANY | 1 | N/A | Unit | N/A | N/A | N/A | N/A | N/A | 6.22 | $417.00 | $449.00 | $32.00 |
| ApgClw001 | SFm | ANY | 2 | N/A | Unit | N/A | N/A | N/A | N/A | N/A | 5.95 | $417.00 | $449.00 | $32.00 |
| ApgClw001 | SFm | ANY | 3 | N/A | Unit | N/A | N/A | N/A | N/A | N/A | 5.96 | $417.00 | $449.00 | $32.00 |
| ApgClw001 | SFm | ANY | 4 | N/A | Unit | N/A | N/A | N/A | N/A | N/A | 5.85 | $417.00 | $449.00 | $32.00 |
| ApgClw001 | SFm | ANY | 5 | N/A | Unit | N/A | N/A | N/A | N/A | N/A | 6.02 | $417.00 | $449.00 | $32.00 |

**Note: For the complete list of Measures, refer to the accompanying calculation spreadsheet Attachment A**

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1. General Measure & Baseline Data

Measure & Delivery Description

Measure Description

* + - 1. This Workpaper documents the impacts of a washing machine that facilitates washing laundry in cold water (“Coldwater Washer”). The measure assumes that, when a washer needs to be replaced, it is replaced with the Coldwater Washer rather than a standard non-Energy Star washer, resulting in energy savings of 0.019 therms per SCG laundry load, and 0.504 kWh per laundry load for SCG customers with electric water heaters. With an incremental cost of $32 per washer.
      2. Measure savings result from two factors:
         1. Overall changes in behavior of customer due to limiting and eliminating some warm/hot water options and replacing them with cold water only.
         2. The one wash option that allows for the use of hot water has lowered the set point from 124 degrees Fahrenheit to 95 degrees Fahrenheit.
      3. Figure 1 shows an example dial set up, where all wash cycles will use cold water, except for the “Heavy Duty” which would use the 95 degree Fahrenheit hot water.
      4. The washing machine is based on a standard non-Energy Star washer, except for the internal hot water temperature limiting mechanism and the incorporation of the cold water temperature setting into the cycle dial. The measure targets customers unwilling or unable to purchase the more expensive Energy Star washers (e.g., front-load washers).
      5. Washer in this measure is a top-loading standard size with a capacity at or greater than 1.6 ft3



1. Washer Cycle Dial

Code/Standard Description

* + - 1. The manufacturer has developed the Cold Water machine so that it meets the federal standards for clothes washers manufactured on or after March 7, 2015 and before January 1, 2018.
      2. The minimum requirements are that a top loading washer, standard size of greater than 1.6 ft3 Integrated Modified Energy Factor (IMEF) is 1.29 ft3/kWh/cycle and the Integrated Water Factor (IWF) is 8.4 gal/cycle/ft3. [[1]](#endnote-1)

Preexisting Description

* + - 1. N/A

Measure Descriptors

1. Measure Descriptors

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| MeasureID | Use-Category | UseSubCategory | Tech Group | Tech Type | PreTech Group | PreTech Type | StdTech Group | StdTech Type |
| ApgClw001 | **AppPlug** | **Laundry** | **Clean\_equip** | **ClothesWash** | **Clean\_equip** | **ClothesWash** | **Clean\_equip** | **ClothesWash** |

Delivery Type

* + - 1. Downstream prescriptive rebate offered to the gas customer purchasing a new washer.
      2. Midstream point-of-sale rebate offered in the retail locations.

1. Delivery Types

|  |  |
| --- | --- |
| Delivery Type | Description |
| *PreReb* | *Prescriptive Rebate* |

Measure Application Type

1. Measure Application Type

|  |  |  |
| --- | --- | --- |
| Code | Description | Comment |
| *ROB* | *Replace on Burnout* | *measure applied when existing equipment fails or maintenance requires replacement* |

Eligibility Requirements

* + - 1. Federal baseline for clothes washers manufactured on or after March 7, 2015 and before January 1, 2018. The top loading, standard size of greater than 1.6 ft3 Integrated Modified Energy Factor (IMEF) is 1.29 ft3/kWh/cycle and the Integrated Water Factor (IWF) is 8.4 gal/cycle/ft3. 1

Implementation Requirements

* + - 1. The rebate applies to gas-for-gas equipment replacements on burnout.
      2. The rebate does not apply to new construction (NC).
      3. Applicable single family residential.

1. Sector and Subsector(Building Type)

|  |  |  |  |
| --- | --- | --- | --- |
| Measure ID | Sector | Subsector | Subsector(Building Type) Description |
| ApgClw001 | *Res* | *SFm* | *Single Family* |

Documentation Requirements

* + - 1. Proof of purchase must be provided and can include all or any one of the following: the manufacturer’s name and equipment make and model number, retailer information, equipment cost, and invoice/receipt with payment in full.
      2. Must provide IMEF and IWF identification as well as the cubic feet of the model.
      3. The date purchased and the date installed.

Terms and Conditions

* + - 1. Single family residential cold water default washer cannot be used in commercial applications.
      2. No more than one unit can be rebated per household.
      3. General terms and conditions for SCG measures can be found at <http://www.socalgas.com/for-your-home/rebates/terms-conditions.shtml>

DEER Differences Analysis

This is a new technology, and DEER does not contain any information on this measure.

Code Analysis

1. Code Summary

|  |  |  |
| --- | --- | --- |
| Code | Applicable Code Reference | Effective Dates |
| Title 24 (2014) | N/A | N/A |
| Title 20 (2014) [[2]](#endnote-2) | Section 1605.1 (p) (1) Table P-2 | April 1, 2014 |
| Code of Federal Regulations [[3]](#endnote-3) | 10 CFR 430.32 (g)(3) | March 7, 2015 |

California Title 20 and CFR Title 10 both currently have the same minimum standards stated for Clothes Washers.

The minimum standards are effective starting on March 7th, 2015. Thus the cold water washer will be required to meet these standards. Table 6 defines the minimum values. 2018 will bring another code update that will force baseline washers to be even more efficient.

1. California and Federal Code

|  |  |  |
| --- | --- | --- |
| Product Class | Integrated Modified Energy Factor (ft3/kWh/cycle) | Integrated Water Factor (gal/cycle/ft3) |
|  | (Minimum Values) | (Maximum Values) |
| Top-loading, Compact (less than 1.6 ft3 capacity) | .86 | 14.4 |
| Top-loading, Standard (1.6 ft3 or greater capacity) | 1.29 | 8.4 |
| Top-loading, Compact (less than 1.6 ft3 capacity) | 1.13 | 8.3 |
| Top-loading, Standard (1.6 ft3 or greater capacity) | 1.84 | 4.7 |

Measure Effective Useful Life

1. Effective Useful Life

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| MeasureID | EUL ID | EUL Yrs | RUL Yrs | Description |
| ApgClw001 | Appl-EffCW | 11 [[4]](#endnote-4) | N/A | High Efficiency Clothes Washer |

EUL is determined to be 11 years based on similar technology defined in DEER 2014 Database.

DEER similar technology is deemed as an appropriate comparison because there are no critical changes, effecting its’ EUL, to washing machine technology with the cold water washer technology.

Net-to-Gross Ratios for Different Program Strategies

1. Net-to Gross Ratio

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| MeasureID | NTGR ID | NTGR\_therm | Description | Delivery Type |
| ApgClw001 | ET-Default | .85 [[5]](#endnote-5) | Emerging Technologies approved by ED through Workpaper review | Prescriptive |

* + 1. This project was started in the SCG Emerging Technologies group in 2009.

Time-of-Use Adjustment Factor

N/A

Gross Savings and INstallation Adjustment (GSIA)

1. GSIA Table

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| MeasureID | GSIA ID | GSIA Type | GSIA Value | Description |
| ApgClw001 | Res-CW-SCG | AnnInstRate | 1 | Residential Clothes washer; Annual Installation Rate |

Value was taken directly from DEER 2014 using READI v.2.1.0 and follows typical values associated with deemed measures.

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

In 2011 SCG commissioned a market study with Navigant Consulting to assess the customer acceptance, attitudes, existing operating procedures, and the performance of an originally GE branded cold water default clothes washer. Please see Attachment B.

* + - 1. This study concluded that there is a market for a top loading cold water default clothes washer.
      2. This market needs education about the use and effectiveness of cold water washing.
      3. The study found that once habits are modified there is a persistence rate of 90% among study participants.
      4. Savings from the washer were achieved in two ways:
         1. Behavioral change of participants to washing more in cold water due to the limiting choices the new washer offers
         2. Lowering of the temperature of the only hot water wash option from the standard outlet water temperature of the water heater (estimated to be 124°F) to 95°F.
    1. The study was conducted by monitoring the laundry activity of 90 participants in the Los Angeles area before and after they were given a cold water default washer.
       1. A baseline period of 6 weeks was established, with participants recording their cold, warm, and hot laundry loads in a diary. Monitoring equipment was installed on a sample of the washers to corroborate the diary findings for water usage and temperature.
       2. Then each participant was given a cold water washer, installed professionally. Participants were asked to continue their diary recording for another 6-8 weeks with the new machines.
       3. There were two follow up measurements – one at week 15 of the study and the other 3 months later.
    2. The results indicated that the cold water default washer did save energy and that participants felt positively about the technology.
       1. SCG territory customers would be expected to save about .0267 therms per load of laundry.
       2. Savings must be adjusted to account for the new 2015 Code of Federal Regulations 10 CFR 430.32 (g)(3); this is shown in section 2.02 of this document.

1. Energy Savings & Demand Reduction Calculations

Load Shapes

The E3 Calculator contains a fixed set of load shapes selections that are the combination of the hourly avoided costs and the load shape data that was available at the time of the tool’s creation. The Residential target sector is the applicable occupancy type for this measure. In the E3 Calculator, there are several Measure Electric End Use Shapes for wall insulation, depending on the fuel source and equipment type. The load shape that most closely fits this measure is Res\_ClothesDishWasher.

Energy Savings

This is considered a new technology and therefore has no savings values on record in DEER.

Savings were calculated using data recorded from the Navigant Cold Water Default Washer Field Study and Short-Term Persistence Report. They are compiled into the Excel sheet Whirlpool Washer Savings Calculator as Attachment C. Water Inlet temperature was determined for each climate zone using CPUC directed values in Attachment D.

The baseline value was determined by taking the manufacturer reported gallons per cycle of their baseline washers (same model as the cold water default washer but without the cold water default features) and calculating the energy used over a typical year to heat the water used. The amount of hot/warm water used per typical family was determined during the Navigant Cold Water Default Washer Field Study by recording the types (warm, hot, cold) and sizes of laundry done.

The average gallons per cycle for the new 2015 baseline washers was calculated by taking the gallons per wash cycle stated by the two largest U.S. washer manufacturers and performing a simple averaging of the numbers.

The energy usage for the new cold water washer was then calculated using the factors of load type (wash temperature and size) distribution and the lower water temperature set point.

* + - 1. There was a behavioral adjusted value for how many warm loads were switched to hot or cold loads, based on the field study.
      2. The second factor was the energy savings seen by lowering the set point of the hot wash. This significantly lowers the therms/load.

This translates into a savings relative to baseline of about 0.019 therms/load when using a gas water heater or 0.504 kWh/load with an electric water heater in SCG Territory. There are about 295 loads done each year by a typical single family residence (DOE test procedure 10 CFR 430, subpart B, appendix J2, section 4.4).

The IOU savings is the savings for each climate zone, weighted by the number of single-family homes in that climate zone. The weighted average was created by using the highlighted table in Attachment E, which shows the number of SCG single-family homes and corresponding energy savings in each climate zone. The SCG IOU weighted savings are 5.68 therms or 148.73 kWh, depending on the fuel type of the residence’s water heater.

There was a change of reported values from the original published Navigant report compared to final savings values in Attachment C due to taking into account federal washer standard changes slated to occur in March 2015 and changing from one manufacturer’s product to that of another. The cold water default washer manufacturer’s product, which is being designed to meet the new federal standards, will use significantly less water per load, which caused a similar significant reduction in savings for this measure relative to savings estimated from the field study.

1. Base Case & Measure Costs

Base Case Cost

The estimated average cost of a standard efficiency washer in this price range is $417.

* + 1. This was a direct weighted average of top loading washing machines in the $376-475 price range. National information on sales of top loading washers indicates that approximately 16% of top loading washers sell in the $376-425 range and 8% in the $426-475 range.

Gross Measure Cost

This product is estimated to retail for $449, assuming 10% discounting by retailers, when it will be brought to market and will be sold in typical retail appliances locations.

There are no other competitors currently producing this type of product.

Incremental Measure Cost

The incremental measure cost is the Gross Measure Cost of $449 minus the Base Case Cost of $417 to equal $32.

Attachments

*Attachment A – WorkPAD Measure Upload Template & Measure Summary Table*



*Attachment B –Navigant Cold Water Default Washer Field Study and Short-Term Persistence Report*

**

*Attachment C –Whirlpool Washer Savings Calculator*



*Attachment D–Comparison-of-Ground-Temperatures*



*Attachment E–Weighted Savings Values*



References

1. (Standards for Residential Clothes Washers, 2014), <http://www1.eere.energy.gov/buildings/appliance_standards/product.aspx/productid/39> [↑](#endnote-ref-1)
2. (California Code of Regulations Title 20, Division 2, 2014), <http://www.energy.ca.gov/title20/index.html> [↑](#endnote-ref-2)
3. (Code of Federal Regulation 2013, 2014), <http://www.gpo.gov/fdsys/browse/collectionCfr.action?selectedYearFrom=2013&go=Go> [↑](#endnote-ref-3)
4. (EUL Table Update, 2014), <http://deeresources.com/files/DEER2013codeUpdate/download/DEER2014-EUL-table-update_2014-02-05.xlsx> [↑](#endnote-ref-4)
5. (DEER2011 Update Net-To-Gross table, 2012), <http://deeresources.com/files/DEER2011/download/DEER2011_NTGR_2012-05-16.xls> [↑](#endnote-ref-5)