Short Form Work Paper WPSDGEREWH0011

**Revision 4**

**San Diego Gas & Electric**

**Energy Efficiency Engineering**

**Clothes Washers for Residential Applications**

**December 12, 2017**

# SDG&E Clothes Washer Short Form Workpaper

## Introduction

This short form workpaper documents the ex-ante load impact and cost-effectiveness values used for clothes washers.

## Document Revision History

|  |  |  |  |
| --- | --- | --- | --- |
| **Rev** | **Date** | **Author** | **Summary of Changes** |
| 0 | 07/16/2012 | N/A | Modified DEER 2005 RunID RRes00AVC2T3D |
| 1.0 | 06/25/2014 | Martin Vu/RMS Energy Consulting, LLC | Combined SCG’s WPSCGREAP111222A clothes washer (2.0 MEF and 6.0 WF) and WPSCGREAP140221A clothes washer measure (3.2 MEF & 3.0 WF) and appropriately modified the workpaper to make it relevant to SDG&E’s program offering. |
| 2.0 | 05/27/2015 | Judelson Enriquez / RMS Energy Consulting, LLC | Adopted PG&E Workpaper PGECOAPP127 rev1 High Efficiency Clothes Washers, updated May 19, 2015, which incorporates the March 2015 federal code change for residential clothes washers. This includes the statewide measures: Energy Star, Energy Star Most Efficient, and CEE Tier 3 measures. |
| 2.1 | 08/06/2015 | Judelson Enriquez / RMS Energy Consulting, LLC | Updated measure offering to be consistent with statewide offering. Added EnergyStar and CEE Tier 1 clothes washer offering. |
| 3 | 9/23/16 | M. McNulty, P. Ford, K. Valenzuela SDG&E | Generated Short Form workpaper to include DEER/READI values for all except Cost. Parameters are applied as noted and Cost is subject to CPUC Staff review. |
| 4 | 12/12/17 | Keith Valenzuela / SDGE Contractor | Updated top load and front load impacts for 2017 DEER updates to apply to 2017 |

## Measure Summary

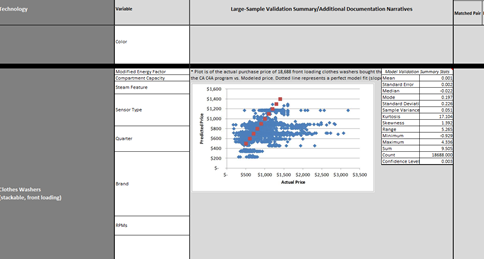
Table 1: Measure Summary Table

| **Section** | **Value** |
| --- | --- |
| **Summary & Purpose** | This short form workpaper documents ex-ante load impacts and cost-effectiveness values for residential clothes washers. Only Base Cost and Measure Cost parameters are being submitted with calculations and documentation for review. All other parameters are per DEER/READI and are used by SDG&E as noted in this Measure Summary Table (Table 1). |
| **1.1 Measure & Baseline Data** | Measure is an efficient clothes washer that meets minimum criteria for Star Most Efficient, which is equivalent to DEER Tier 2. The baseline is a Title 20 compliant top-loading or front-loading clothes washer. |
| **1.2 Technical Description** | ROB replacement of an existing top or front loading clothes washer with a DEER Tier 2 clothes washer, as defined in DEER, which exceeds Title 20 standards. Energy impacts and parameters, except for cost, are defined in DEER/READI and are as noted herein.  Note: Non-residential implementation ID’s are included in this workpaper. It is assumed the energy savings documented based on residential operating profile are conservative for non-residential measures. |
| Measures | Per DEER/READI with IDs as below |
| Implementation ID - 1 | 463755 - Clothes Washer - Top Loading - Energy Star Most Efficient  402049 - High Efficiency Clothes Washer, CEE Tier 2 Models (Non-Res) |
| Implementation ID - 2 | 463756 - Clothes Washer - Front Loading - Energy Star Most Efficient  402050 - High Efficiency Clothes Washer, CEE Tier 3 Models (Non-Res) |
| Implementation ID - 3 | 463755 - Clothes Washer - Top Loading - Energy Star Most Efficient  402049 - High Efficiency Clothes Washer, CEE Tier 2 Models (Non-Res) |
| Installation Type | * Replace On Burnout (ROB) |
| Delivery Mechanisms | * Downstream Rebate – Deemed |
| **1.4.1 DEER Data** |  |
| DEER Measure ID - 1 | RB-Appl-EffCW-med-Tier2-Top (DEER 2017) |
| DEER Measure ID - 2 | RB-Appl-EffCW-med-Tier2-Front (DEER 2017) |
| DEER Measure ID - 3 | RB-Appl-EffCW-med-Tier2-Top (DEER 2018) |
| Net-to-Gross Ratio | Res-sAll-mCW Clothes washer MEF 10% > Energy Star |
| Effective and Remaining Useful Life | Appl-EffCW (Linked to READI data) |
| **Section 2. Calculation Methodology** | Measures will be processed using DEER Measure/Impact ID by building type and Building Location. All will be processed and claimed using “Existing” vintage. |
| Energy Savings/Peak Demand Reduction – All Measures | All Energy Impacts per DEER Measure IDs noted above |
| **Section 3. Load Shapes** | DEER:Res\_ClothesDishWasher; Annual (Linked to READI data) |
| **Section 4. Costs** | WO 17 - See attached supporting documentation |
| **Section 4.1 Modeled Costs** | There are no CostIDs for these measures in READI. |
| Base Cost – Measure 1 | $467.54 Per calculations herein |
| Base Cost – Measure 2 | $672.40 Per calculations herein |
| Base Cost – Measure 3 | $467.54 Per calculations herein |
| Measure Cost – Measure 1 | $502.95 Per calculations herein |
| Measure Cost – Measure 2 | $698.49 Per calculations herein |
| Measure Cost – Measure 3 | $502.95 Per calculations herein |
| Incremental Cost – Measure 1 | $35.41 Per calculations herein |
| Incremental Cost – Measure 2 | $26.09 Per calculations herein |
| Incremental Cost – Measure 3 | $35.41 Per calculations herein |
| **Section 4.2 Proposed Costs** | There are no CostIDs for these measures in READI. |
| Base Cost – Measure 1 | $467.54 Per calculations herein |
| Base Cost – Measure 2 | $672.40 Per calculations herein |
| Base Cost – Measure 3 | $467.54 Per calculations herein |
| Measure Cost – Measure 1 | $517.54 Per calculations herein |
| Measure Cost – Measure 2 | $722.40 Per calculations herein |
| Measure Cost – Measure 3 | $517.54 Per calculations herein |
| Incremental Cost – Measure 1 | $50.00 Per calculations herein |
| Incremental Cost – Measure 2 | $50.00 Per calculations herein |
| Incremental Cost – Measure 3 | $50.00 Per calculations herein |

## Cost Calculation Documentation

The preliminary cost estimates above were derived using the regression equations from “2010-2012 WO017 Ex-Ante Measure Cost Study Final Report, May 27, 2014” (WO17). The values computed are derived in the attached Excel workbook. SDG&E believes that the WO17 approach yields inaccurate results that are downward biased. The chart below is from Volume I of WO17 Results. While the linear approach may have a decent R-squared (0.74) that approach is clearly not the optimal. The model should have been specified using some alternative functional form such as a non-linear function.

### Chart from WO17 Volume I, Row 58/column AC



Also, the MEF (Modified Energy Factor) variable is assumed to be a continuous variable. This is also a problem as the cost per additional MEF is implicitly assumed to be linear. SDG&E believes that the MEF variable could have been better specified as well.

Given the above, SDG&E used the WO17 model to estimate both base and higher efficiency costs. The IMC for Top Loading Energy Star Most Efficient is $35.41 and for Front Loading Most Efficient is $26.09 for a simple average of $30.75. SDG&E is currently offering a rebate of $50 and the program does not differentiate the loading type. For the reasons identified above, SDG&E believes that the linear model in WO17 over estimates the base equipment cost and underestimates the more efficient.

Given the above, SDG&E would like to stipulate to an IMC value of $50.

## Cost Calculation Workbook

