**Workpaper WPSDGENRWH1205**

**Revision 0**

**San Diego Gas & Electric**

**Energy Efficiency Engineering**

**Storage Tank Water Heaters**

Revision History

|  |  |  |  |
| --- | --- | --- | --- |
| Revision No. | Date | **Description** | **Author** |
| 0 | June 15, 2012 | Adopted WPSCGNRW120026A\_Rev5\_StorageWH\_NonResr-May22.docx, updated May 18, 2012. | Kelvin Valenzuela |
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Measure Summary Table

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Measure Name | CZ | Measure Electric End Use Shape (Load Shape) | EUL or RUL | NTG | Unit Definition | Program Type (NEW, ROB, RET) | Incremental Measure Cost ($/unit) | Gas  Savings (therms/ unit) | Gross Unit Annual Electricity Savings (kWh/unit) | User Entered kW Savings per unit (kW/unit) | % Eligible for TOU AC  Adjustment | Gross  Realization Rate (GRR) |
| Small Storage Water Heater ≤75 MBtu/hr | SDGE | N/A | 15 | 0.60 | MBtuh | NEW, ROB | $7.22 | 0.96 | N/A | N/A | N/A | 1.00 |
| Large Storage Water Heater >75 MBtu/hr, Tier 1 | SDGE | N/A | 15 | 0.60 | MBtuh | NEW, ROB | $1.23 | 0.63 | N/A | N/A | N/A | 1.00 |
| Large Storage Water Heater >75 MBtu/hr, Tier 2 | SDGE | N/A | 15 | 0.70 | MBtuh | NEW, ROB | $13.13 | 1.93 | N/A | N/A | N/A | 1.00 |

# Table of Contents

[Revision History i](#_Toc321313035)

[Measure Summary Table ii](#_Toc321313036)

[List of Figures iv](#_Toc321313037)

[List of Tables iv](#_Toc321313038)

[SECTION 1 - General Measure & Baseline Data 1](#_Toc321313039)

[1.01 Measure & Delivery Description 1](#_Toc321313040)

[1.02 DEER Differences Analysis 2](#_Toc321313041)

[1.03 Code Analysis 3](#_Toc321313042)

[1.04 Measure Effective Useful Life 3](#_Toc321313043)

[1.05 Net-to-Gross Ratios for Different Program Strategies 3](#_Toc321313044)

[1.06 Gross Realization Rate 3](#_Toc321313045)

[1.07 Time-of-Use Adjustment Factor 3](#_Toc321313046)

[SECTION 2 - Energy Savings & Demand Reduction Calculations 3](#_Toc321313047)

[2.01 Load Shapes 3](#_Toc321313048)

[2.02 Energy Savings 3](#_Toc321313049)

[SECTION 3 - Base Case & Measure Costs 11](#_Toc321313050)

[3.01 Base Case Cost 11](#_Toc321313051)

[3.02 Gross Measure Cost 11](#_Toc321313052)

[3.03 Incremental Measure Cost 11](#_Toc321313053)

[Attachments 13](#_Toc321313054)

[References 14](#_Toc321313055)

List of Figures

[Figure 1 - Energy Factor for 30-gallon Small Storage Water Heaters in the CEC Appliance Efficiency Database 6](#_Toc321313056)

[Figure 2 - Energy Factor for 40-gallon Small Storage Water Heaters in the CEC Appliance Efficiency Database 6](#_Toc321313057)

[Figure 3 - Energy Factor for 50-gallon Small Storage Water Heaters in the CEC Appliance Efficiency Database 7](#_Toc321313058)

[Figure 4 - Energy Factor for 60-gallon Small Storage Water Heaters in the CEC Appliance Efficiency Database 7](#_Toc321313059)

[Figure 5 - Energy Factor for 75-gallon Small Storage Water Heaters in the CEC Appliance Efficiency Database 8](#_Toc321313060)

[Figure 6 - Thermal Efficiency for Non-condensing Large Storage Water Heaters in the CEC Appliance Efficiency Database 8](#_Toc321313061)

[Figure 7 - Thermal Efficiency for Condensing Large Storage Water Heaters in the CEC Appliance Efficiency Database 9](#_Toc321313062)

List of Tables

[Table 1 - Baseline and Minimum Qualifying Measure Energy Factors for Small Storage Water Heaters 2](#_Toc321313063)

[Table 2 - Base and Measure Storage Water Heater Efficiencies in DEER 2011 4](#_Toc321313064)

[Table 3 - Storage Water Heater Efficiency Ranges from California Energy Commission Appliance Efficiency Database 4](#_Toc321313065)

[Table 4 - California Title 20 and 24 Gas Appliance Standards,2 4](#_Toc321313066)

[Table 5 - Baseline and Qualifying Measure Efficiencies for Storage Water Heaters 5](#_Toc321313067)

[Table 6 - Calculation of Annual Energy Savings by Equipment Type 10](#_Toc321313068)

[Table 7 - Annual Energy Savings by Equipment Type 10](#_Toc321313069)

[Table 8 - Gross and Incremental Measure Cost by Equipment Type 12](#_Toc321313070)

1. General Measure & Baseline Data

Measure & Delivery Description

Measure description

These measures apply to energy efficient storage water heaters used in commercial or industrial applications to produce hot water. Relative to standard models, energy efficient units typically have features such as larger heat exchange surfaces and/or additional tank insulation.

Tankless water heaters with a storage tank and control set that are factory mounted on the same skid and that follow the capacity rules listed in the California Titles 20 and 24 standards also qualify as a storage tank water heater[[1]](#endnote-1),[[2]](#endnote-2). Title 20 states, “Storage water heater means a water heater that heats and stores water within the appliance at a thermostatically controlled temperature for delivery on demand and that has an rated input less than 4,000 Btu/hr per gallon of stored water”.

The combined tankless/storage/control system must be a catalog item available to all buyers in order to be qualified as a storage water heater.

The 2006 Storage Water Heater Workpaper includes a more detailed technology description in its Appendix A[[3]](#endnote-3).

Market Applicability

* + - 1. These measures are applicable to any storage hot water applications, with the exception of process end-use.
      2. Applicable commercial building/business types include (but are not limited to) offices, restaurants, retail stores, schools, colleges, hotels, motels, and recreational facilities.

Terms & Conditions

* + - 1. This measure is not limited to specific NAICS codes.
      2. The rebate applies to gas-for-gas equipment replacements on burnout or to new installations in existing buildings.
      3. The rebate does not apply to new construction (NC).
      4. Storage water heaters used for space heating applications do not qualify.
      5. Water heaters used for pools or spas do not qualify.
      6. The manufacturer’s name and equipment model number must be provided.
      7. If necessary, customer must provide proof of unit efficiency (e.g., manufacturer’s equipment specification sheet).

Delivery Method

* + - 1. The preferred delivery method is a downstream prescriptive rebate offered to the gas customer purchasing the new boiler.
      2. However, a midstream point-of-sale rebate or an upstream manufacturer rebate strategy may also be implemented.

Qualifying Efficiency

* + - 1. Test methods for measuring water heater efficiencies are referenced in the California Titles 20 and 24 standards,3.

Minimum qualifying energy factor (EF) for small (≤75 MBtu/hr) storage water heaters:

0.73 – (0.0019\*V), where Volume (V) is the rated storage volume in gallons.

Equivalent to EF that is 0.06 above the California Titles 20 and 24 effective January 20, 2004.

Table 1 lists the baseline measure and qualifying measure energy factors for small storage water heaters with selected storage tank rated volumes.

Minimum qualifying thermal efficiency (TE) for large (> 75 MBtu/hr) storage water heaters:

83% for Tier 1 storage water heaters (non-condensing)

90% for Tier 2 storage water heaters (condensing)

Tier 2 large storage water heaters are condensing and often require flue modifications to handle the condensate. These modifications increase installation costs and may be eligible for a higher rebate amount.

1. Baseline and Minimum Qualifying Measure Energy Factors for Small Storage Water Heaters

|  |  |  |
| --- | --- | --- |
| **Storage Tank Rated Volume (V) (gallons)** | **Baseline Energy Factor**  **= 0.67-(0.0019\*V)** | **Measure Energy Factor = 0.73-(0.0019\*V)** |
| 30 | 61% | 67% |
| 40 | 59% | 65% |
| 50 | 58% | 64% |
| 60 | 56% | 62% |
| 75 | 53% | 59% |

DEER Differences Analysis

DEER 2011

* + - 1. This document utilizes DEER 2011[[4]](#endnote-4) data to accommodate the need to develop the deemed Energy Efficiency Measures. Table 2 lists the baseline and measure efficiencies for storage water heaters in the DEER 2011 data.

Measure Efficiency

The minimum qualifying measure efficiencies are similar to the “2011 Database for Energy-Efficient Resources (DEER) for Use in the California IOU 2013-14 Energy Efficiency Planning”, with some exceptions. The following measure efficiencies are adopted after consideration of the high-efficiency storage water heaters listed in the California Energy Commission Energy Efficiency Appliance Database[[5]](#endnote-5):

* + - * 1. Small (≤75 MBtu/hr) storage water heater – the Titles 20 and 24 standard equation for small (<75 MBtu/hr) storage water heaters is adapted to an energy factor equal to { 0.73 – (0.0019\*V) } in this workpaper, where Volume (V) is the rated storage volume. The DEER 2011 Database provides data for three tiers of energy factor in each storage tank rated volume (30, 40, 50, 60, and 75 gallons), as shown in Table 1 above. For many combinations of DEER qualifying efficiency value and tank volume, there are no storage water heaters that qualify. So the four DEER values were reduced to a single EF equation that is analogous to the Titles 20 and 24 equation and that provides an EF that is always 0.06 higher than Titles 20 and 24 for any tank volume.
        2. Large (>75 MBtuh) Tier 1 storage water heater – the DEER 2011 value of 83% TE is used in this workpaper.
        3. Large Tier 2 storage water heater – the DEER 2011 value of 90% TE is used in this workpaper.

Baseline Efficiency

The minimum baseline efficiencies match the “2011 Database for Energy-Efficient Resources (DEER) for use in the California IOU 2013-14 Energy Efficiency Planning”4, which are consistent with the California Titles 20 and 24 standards,.

Small (≤75 MBtu/hr) storage water heater – the DEER 2011 equation for the baseline energy factor of { 0.67 – (0.0019\*V) } is used in this workpaper, where Volume (V) is the rated storage volume in gallons.

Large storage water heater – the DEER 2011 value of 80% TE is used in this workpaper.

Incremental Measure Cost

Since the efficiencies used here are different from those uses for the DEER 2011 database, the incremental measure costs were adjusted as well. Data were collected through a survey of vendors that sell storage water heaters in California for each of the categories of storage water heater type, rated input, and efficiency used in this workpaper.

1. Base and Measure Storage Water Heater Efficiencies in DEER 2011

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Equipment Type** | **Rated Input (MBtu/hr)** | **Efficiency Units** | **DEER  Baseline  Efficiency** | **DEER  Measure  Efficiency** |
| Small, Tier 1 | ≤ 75 | EF | 0.67-(0.0019\*V) | 0.62 |
| Small, Tier 2 (30, 40, 50 gal.) | ≤ 75 | EF | 0.67-(0.0019\*V) | 0.65 |
| Small, Tier 2 (60, 75 gal.) | ≤ 75 | EF | 0.67-(0.0019\*V) | 0.66 |
| Small, Tier 3 | ≤ 75 | EF | 0.67-(0.0019\*V) | 0.70 |
| Large, Tier 1 (non-condensing) | > 75 | TE | 80% | 83% |
| Large, Tier 2 (condensing) | > 75 | TE | 80% | 90% |

V is the rated volume in gallons.

Code Analysis

The minimum baseline efficiencies are consistent with the California Titles 20 and 24 standards,2. The minimum qualifying measure efficiencies exceed the California Titles 20 and 24 standards,2.

Measure Effective Useful Life

* + 1. The effective useful life (EUL) for storage water heaters of 15 years is taken from DEER 2011 update[[6]](#endnote-6).

Net-to-Gross Ratios for Different Program Strategies

* + 1. The DEER 2011 documents recommend a net-to-gross ratio (NTGR) of 0.60 for all downstream service hot water boilers, which includes the equipment covered under this program[[7]](#endnote-7).
    2. The DEER 2011 documents recommend a net-to-gross ratio (NTGR) of 0.70 for new commercial technologies, which would include Tier 2 condensing storage water heaters.

Gross Realization Rate

Gross realization rate of 1.00 is applied to the measures in this document.

Time-of-Use Adjustment Factor

N/A

1. Energy Savings & Demand Reduction Calculations

Load Shapes

N/A

Energy Savings

Annual Gas Energy Savings.

* + - 1. The annual gas energy savings are based on DEER 20114, with changes to the measure efficiency values based on the CEC Appliance Database. Table 2 lists the baseline and measure efficiencies for storage water heaters in the “2011 DEER for Use in the California IOU 2013-14 Energy Efficiency Planning”4.
         1. No small 75-gallon storage water heaters listed in the CEC Appliance Database met the Tier 1, Tier 2, or Tier 3 qualifying efficiencies.
         2. Very few 60-gallon storage water heaters in the CEC Appliance Database met the Tier 2 and none met the Tier 3 qualifying efficiencies.
         3. Very few 30, 40, or 50-gallon storage water heaters in the CEC Appliance Database met the Tier 3 qualifying efficiency.
         4. The large Tier 1 storage water heater minimum thermal efficiency (TE) is 83%as seen in DEER data.
         5. The large Tier 2 storage water heater minimum thermal efficiency (TE) is 90% as seen in DEER data.

1. Base and Measure Storage Water Heater Efficiencies in DEER 2011

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Equipment Type** | **Rated Input (MBtu/hr)** | **Efficiency Units** | **DEER  Baseline  Efficiency** | **DEER  Measure  Efficiency** |
| Small, Tier 1 | ≤ 75 | EF | 0.67-(0.0019\*V) | 0.62 |
| Small, Tier 2 (30, 40, 50 gal.) | ≤ 75 | EF | 0.67-(0.0019\*V) | 0.65 |
| Small, Tier 2 (60, 75 gal.) | ≤ 75 | EF | 0.67-(0.0019\*V) | 0.66 |
| Small, Tier 3 | ≤ 75 | EF | 0.67-(0.0019\*V) | 0.70 |
| Large, Tier 1 (non-condensing) | > 75 | TE | 80% | 83% |
| Large, Tier 2 (condensing) | > 75 | TE | 80% | 90% |

V is the rated volume in gallons.

Storage Water Heater Efficiencies in CEC Database.

* + - 1. Table 3 shows the range of storage water heater efficiencies found in the CEC Appliance Database5. No small storage water heaters with 75-gallon tank volume were found that met the DEER 2011 qualifying efficiency standard.

1. Storage Water Heater Efficiency Ranges from California Energy Commission Appliance Efficiency Database5

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Equipment Type** | **Rated Input (MBtu/hr)** | **Efficiency Units** | **Minimum Efficiency** | **Maximum Efficiency** |
| Small | 30 – 199 | EF | 0.48 | 0.90 |
| Large, Tier 1 (non-condensing) | 75 – 2,400 | TE | 80.0% | 83.8% |
| Large, Tier 2 (condensing) | 76 – 399 | TE | 86.9% | 99.0% |

Standard Efficiencies.

* + - 1. Table 4 lists the California Titles 20 and 24 standards for water heaters having a rated input in MBtu/hr which is less than 4 times the rated volume in gallons (that is, the rated input to volume ratio is less than 4,000 Btu/gal). Also, the efficiencies of the storage water heaters found in the CEC Appliance Database all meet these standards.

1. California Title 20 and 24 Gas Appliance Standards1,

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Equipment Type** | **Rated Input (MBtu/hr)** | **Rated Volume (gal)** | **Efficiency Units** | **Minimum Efficiency** | **Maximum Standby Loss (Btu/hr)** |
| Small federally-regulated | ≤ 75 | Unspecified | EF | 0.67-(0.0019\*V) |  |
| Small non-federal regulated | ≤ 75 | < 20 | EF | 0.62-(0.0019\*V) |  |
| Small non-federal regulated | ≤ 75 | > 100 | EF | 0.62-(0.0019\*V) |  |
| Large | ≤ 155 | Unspecified | TE | 80% | Q/800 + 110√V |
| Large | > 155 | Unspecified | TE | 80% | Q/800 + 110√V |

V is the rated volume in gallons; Q is the rated input is Btu/hr

Baseline and Measure Efficiencies.

* + - 1. Table 5 lists the efficiency units and efficiency values recommended for storage water heaters. The minimum baseline efficiencies and efficiency units match the California Titles 20 and 24 standards,2. The qualifying measure efficiencies have the following changes compared to the DEER 20114:

The small storage water heater minimum energy factor (EF) has been changed from a fixed value of 0.62 to a calculated value of 0.73-(0.0019\*V), where Volume (V) is the rated storage volume in gallons. This formula is analogous to the formula used in the California Titles 20 and 24 standards effective January 20, 2004,2, and it provides an energy factor that is uniformly 0.06 higher than the California standard. This approach makes the energy savings more uniform across storage tank rated volumes and greatly increases the availability of qualifying equipment in across the full range of storage tank rated volumes from 30 to 75 gallons.

Figure 1 shows that there are 27 30-gallon small storage water heaters with energy factor exceeding the calculated value of 0.673 (the standard is 0.613).

Figure 2 shows that there are 94 40-gallon small storage water heaters with energy factor exceeding the calculated value of 0.654 (the standard is 0.594).

Figure 3 shows that there are 132 50-gallon small storage water heaters with energy factor exceeding the calculated value of 0.635 (the standard is 0.575).

Figure 4 shows that there are 29 60-gallon small storage water heaters with energy factor exceeding the calculated value of 0.616 (the standard is 0.556).

Figure 5 shows that there are 23 75-gallon small storage water heaters with energy factor exceeding the calculated value of 0.588 (the standard is 0.528).

The large Tier 1 storage water heater minimum thermal efficiency (TE) is 83%; and the Tier 2 storage water heater minimum thermal efficiency is 90%, as seen in DEER data.

Figure 6 shows that there are 132 large non-condensing storage water heater models with thermal efficiency at or above 83%.

Figure 7 shows that there are 106 large condensing storage water heater models with thermal efficiency at or above 90%.

1. Baseline and Qualifying Measure Efficiencies for Storage Water Heaters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Equipment Type** | **Rated Input (MBtu/hr)** | **Efficiency Units** | **Base Efficiency** | **Qualifying Efficiency** |
| Small (30-75 gallon) | ≤ 75 | EF | 0.67-(0.0019\*V) | 0.73-(0.0019\*V) |
| Large, Tier 1 (non-condensing) | > 75 | TE | 80% | 83% |
| Large, Tier 2 (condensing) | > 75 | TE | 80% | 90% |

V is the rated volume in gallons



1. Energy Factor for 30-gallon Small Storage Water Heaters in the CEC Appliance Efficiency Database



1. Energy Factor for 40-gallon Small Storage Water Heaters in the CEC Appliance Efficiency Database



1. Energy Factor for 50-gallon Small Storage Water Heaters in the CEC Appliance Efficiency Database



1. Energy Factor for 60-gallon Small Storage Water Heaters in the CEC Appliance Efficiency Database



1. Energy Factor for 75-gallon Small Storage Water Heaters in the CEC Appliance Efficiency Database



1. Thermal Efficiency for Non-condensing Large Storage Water Heaters in the CEC Appliance Efficiency Database



1. Thermal Efficiency for Condensing Large Storage Water Heaters in the CEC Appliance Efficiency Database

Energy Savings Calculation

For calculating energy savings, the following assumptions are used:

The energy savings calculated for DEER 20114 are correct except for the small storage water heater measure efficiency values.

The average efficiency for the baseline products is California Title 20 code standards.

The average efficiency for the qualifying products is the measure efficiency.

With these assumptions, the energy saved by a high-efficiency measure storage water heater can be calculated as follows:

*∆Q3-4 = ∆Q1-2 x (1/E3-1/E4) / (1/E1-1/E2) Eqn-1*

where

*∆Q* – Energy Saved (therms/yr). Savings which results from installing the high-efficiency measure equipment.

*E* – Efficiency (%). Efficiency of equipment in appropriate efficiency units (energy factor, thermal efficiency, etc.).

*Subscript 1* = DEER 2011 baseline (reference) equipment

*Subscript 2* = DEER 2011 measure (new high-efficiency) equipment

*Subscript 3* = Adjusted baseline equipment value

*Subscript 4* = Adjusted measure equipment value

The energy savings calculated for DEER 20114 are averaged across 20 building types to produce a single value for the entire SoCalGas service territory for each equipment type. The energy savings data and calculations are included in an Excel file embedded as Attachment A.

Only existing building vintages are used for the calculations.

Table 6 lists the base efficiencies, measure efficiencies, and calculated values for the three measure efficiencies used in the DEER calculations for each of the five small storage tank rated volumes (30, 40, 50, 60, and 75 gallons).

Table 6 also lists the adjusted base efficiencies, measure efficiencies, and calculated values corresponding to the measure efficiencies used in the DEER calculations for each of the five small storage tank rated volumes (30, 40, 50, 60, and 75 gallons).

Table 7 compares the annual energy savings from the DEER 2011 calculations and the adjusted values used here. For large storage water heaters, the DEER 2011 calculation values are averaged across the 20 building types to determine the adjusted values used here.

1. Calculation of Annual Energy Savings by Equipment Type

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **DEER 2011** | | | **Adjusted Values** | | |
| **Rated Volume (gal)** | **Base  Efficiency** | **Measure Efficiency** | **Annual Energy Savings (therms/yr/MBtuh)** | **Base  Efficiency** | **Measure  Efficiency** | **Annual Energy Savings (therms/yr/MBtuh)** |
| 30 | 0.613 | 0.62 | 0.271 | 0.613 | 0.673 | 2.143 |
| 30 | 0.613 | 0.65 | 1.175 | 0.613 | 0.673 | 1.840 |
| 30 | 0.613 | 0.70 | 1.536 | 0.613 | 0.673 | 1.102 |
| 40 | 0.594 | 0.62 | 0.400 | 0.594 | 0.654 | 0.875 |
| 40 | 0.594 | 0.67 | 1.402 | 0.594 | 0.654 | 1.134 |
| 40 | 0.594 | 0.70 | 1.556 | 0.594 | 0.654 | 0.943 |
| 50 | 0.575 | 0.62 | 0.462 | 0.575 | 0.635 | 0.601 |
| 50 | 0.575 | 0.67 | 1.359 | 0.575 | 0.635 | 0.906 |
| 50 | 0.575 | 0.70 | 1.482 | 0.575 | 0.635 | 0.784 |
| 60 | 0.556 | 0.62 | 0.295 | 0.556 | 0.616 | 0.279 |
| 60 | 0.556 | 0.66 | 1.417 | 0.556 | 0.616 | 0.876 |
| 60 | 0.556 | 0.70 | 1.553 | 0.556 | 0.616 | 0.735 |
| 75 | 0.5275 | 0.62 | 1.158 | 0.5275 | 0.5875 | 0.792 |
| 75 | 0.5275 | 0.66 | 1.469 | 0.5275 | 0.5875 | 0.747 |
| 75 | 0.5275 | 0.70 | 1.576 | 0.5275 | 0.5875 | 0.653 |

1. Annual Energy Savings by Equipment Type

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | **Annual Energy Savings (therms/yr/MBtuh)** | |
| **Equipment Type** | **Rated Input (MBtu/hr)** | **DEER 2011** | **Adjusted Values** |
| Small (30-75 gallon) | ≤ 75 | 1.14 | **0.96** |
| Large, Tier 1 (non-condensing) | > 75 | 0.63 | **0.63** |
| Large, Tier 2 (condensing) | > 75 | 1.93 | **1.93** |

1. Base Case & Measure Costs

Base Case Cost

* + 1. When the customer is replacing equipment on burnout (ROB) or buying new equipment (NEW), the customer must buy a new storage water heater to continue operating, so the base case cost is that of a baseline (standard) storage water heater.
    2. The base case costs are shown in Table 8 below.

The upper section of the table lists the 2008 DEER cost data taken from the “2011 Database for Energy-Efficient Resources (DEER) for Use in the California IOU 2013-14 Energy Efficiency Planning”4. DEER reported the cost per storage water heater, not the cost per MBtu/hr. The base case equipment efficiency values used for the DEER cost data analysis match the base case equipment efficiency ranges reported for DEER above and those used in this workpaper.

The middle and lower sections of the table list the results of a survey of equipment vendors that sell storage water heaters in California. The middle section provides the cost per storage water heater, for comparison to the DEER data. The lower section provides the cost per MBtu/hr. The vendor calls produced data for most of the categories of boiler type, rated input, and efficiency used in this workpaper. The base measure costs shown in Table 8 represent an arithmetic average of the equipment cost per MBtu/hr in each category. The cost data and calculations are included in an Excel file embedded as Attachment B.

Gross Measure Cost

* + 1. The gross measure costs include the cost of the equipment, excluding installation and start-up costs. For the purposes of determining incremental measure costs, the installation and start-up costs are assumed to be the same for the base case and measure equipment.

The gross measure costs are shown in Table 8 below.

The 2008 DEER cost data (taken from the “2011 Database for Energy-Efficient Resources (DEER) for Use in the California IOU 2013-14 Energy Efficiency Planning”4) are reported as the cost per storage water heater, not the cost per MBtu/hr. Because the input rates are not provided in DEER cost data, cost/MBtuh cannot be calculated, and thus these DEER data are not used for determining the incremental measure cost.

Table 8 lists the results of a survey of equipment vendors that sell storage water heaters in California. It also includes some cost data from SCG rebate applications for storage water heater measures. The table provides the cost per MBtu/hr. The gross measure costs shown in Table 8 represent an arithmetic average of the equipment cost per MBtu/hr in each category. The cost data and calculations are included in an Excel file embedded as Attachment B. For comparison, the 2008 DEER cost data are also included in Attachment B.

Incremental Measure Cost

* + 1. The incremental measure cost (IMC) is the difference between the cost of the average baseline unit and the average high efficiency measure.
    2. The incremental measure costs are shown in Table 8 below.

1. Gross and Incremental Measure Cost by Equipment Type

|  |  |  |  |
| --- | --- | --- | --- |
| **Equipment Type** | **Small** | **Large Tier 1** | **Large Tier 2** |
| **Rated Input (MBtu/hr) 🡪** | **≤ 75** | **> 75** | **> 75** |
| **2012 Vendor Survey Data per MBtuh** |  |  |  |
| Average Base Cost ($/MBtuh) | $12.52 | $14.18 | $14.18 |
| Average Gross Measure Cost ($/MBtuh) | $19.74 | $15.40 | $27.30 |
| Average Incremental Measure Cost ($/MBtuh) | **$7.22** | **$1.23** | **$13.13** |

Attachments

*Attachment A – Storage Water Heater Energy Savings Calculations*



*Attachment B – Storage Water Heater Vendor Cost Data*



References

1. *California Code of Regulations, Title 20. Public Utilities and Energy, Division 2. State Energy Resources Conservation and Development Commission*, California Energy Commission, CEC-140-2008-001-REV1, August 2008 (Accessed Mar. 12, 2012 at <http://www.energy.ca.gov/regs/title20/index.html>). [↑](#endnote-ref-1)
2. *2008 Building Energy Efficiency Standards, Nonresidential Compliance Manual*, Title 24, California Energy Commission, CEC-400-2008-017-CMF-Rev1, December 2008, Revised August 2009, Revised March 2010, Revised July 2010 (Accessed Mar. 12, 2012 at <http://www.energy.ca.gov/title24/>). [↑](#endnote-ref-2)
3. *Storage Tank Water Heaters Workpaper*, Revision D, EEA Report No. B-REP-05-599-16D, November 20, 2008.   
     [↑](#endnote-ref-3)
4. *DEER Database for Energy-Efficient Resources*, Version 2011 4.00, For Use in the California IOU 2013-14 Energy Efficiency Planning (Accessed Mar. 7, 2012 at <http://www.deeresources.com/>). [↑](#endnote-ref-4)
5. *California Energy Commission Appliance Efficiency Database* (Accessed March 7, 2012 at <http://www.appliances.energy.ca.gov/AdvancedSearch.aspx>). [↑](#endnote-ref-5)
6. *Technology and Measure Cost Data/Effective and Remaining Useful Life (EUL/RUL) Values*, <http://www.deeresources.com/index>. “EUL\_Summary\_10-1-08.xls”

    [↑](#endnote-ref-6)
7. *DEER 2011 Net-To-Gross Ratios*, “DEER2011-NTG\_IncludingCarryoversFromDEER2008\_2011-12-07.xls”,

    [↑](#endnote-ref-7)