**Short Form Work Paper WPSDGENRWH1205A**

**Revision 0**

**San Diego Gas & Electric**

**Energy Efficiency Engineering**

**Storage Tank Water Heaters for Commercial and Industrial Applications 55 gallons and under (<75kBtu/h)**

**July 18, 2019**

# Storage Tank Water Heaters for Commercial and Industrial Applications Short Form WP

## Introduction

This short form workpaper documents the Ex-ante data by referencing the SCG (WPSCGNRWH120206A-Rev11) workpaper measure for Non-Residential Storage Water Heaters, by adopting measure definitions, cost and impacts. SDG&E created new Technology Cost IDs which are documented in Table 1 below. The cost values for storage tank water heaters rated below 75kBtuh are adopted from SCG workpaper.

Table 1: Measure IDs with adopted SCG Cost and SDG&E new UEF Technology Cost IDs

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| SDGE Imp. ID | Msr ID | Msr Cost ID / Value | Std Cost ID / Value | IMC  (Units = Cap-kBTUh) |
| 465438  465444  465450  465456  465462  465468 | WPSDGENRWH1205A-Rev00-Msr001 | SDG\_Stor\_UEF-Gas-030gal-0p64UEF | SDG\_Stor\_UEF-Gas-030gal-UEF\_BASE | $2.86/unit |
| 465440  465446  465452  465458  465464  465470 | WPSDGENRWH1205A-Rev00-Msr002 | SDG\_Stor\_UEF-Gas-040gal-0p64UEF | SDG\_Stor\_UEF-Gas-040gal-UEF\_BASE | $4.78/unit |
| 465442  465448  465454  465460  465466  465472 | WPSDGENRWH1205A-Rev00-Msr003 | SDG\_Stor\_UEF-Gas-050gal-0p64UEF | SDG\_Stor\_UEF-Gas-050gal-UEF\_BASE | $2.67/unit |
| 465439  465445  465451  465457  465463  465469 | WPSDGENRWH1205A-Rev00-Msr004 | SDG\_Stor\_UEF-Gas-030gal-0p68UEF | SDG\_Stor\_UEF-Gas-030gal-UEF\_BASE | $4.36/unit |
| 465441  465447  465453  465459  465465  465471 | WPSDGENRWH1205A-Rev00-Msr005 | SDG\_Stor\_UEF-Gas-040gal-0p68UEF | SDG\_Stor\_UEF-Gas-040gal-UEF\_BASE | $7.81/unit |
| SDGE Imp. ID | Msr ID | Msr Cost ID / Value | Std Cost ID / Value | IMC  (Units = Cap-kBTUh) |
| 465443  465449  465455  465461  465467  465473 | WPSDGENRWH1205A-Rev00-Msr006 | SDG\_Stor\_UEF-Gas-050gal-0p68UEF | SDG\_Stor\_UEF-Gas-050gal-UEF\_BASE | $6.11/unit |

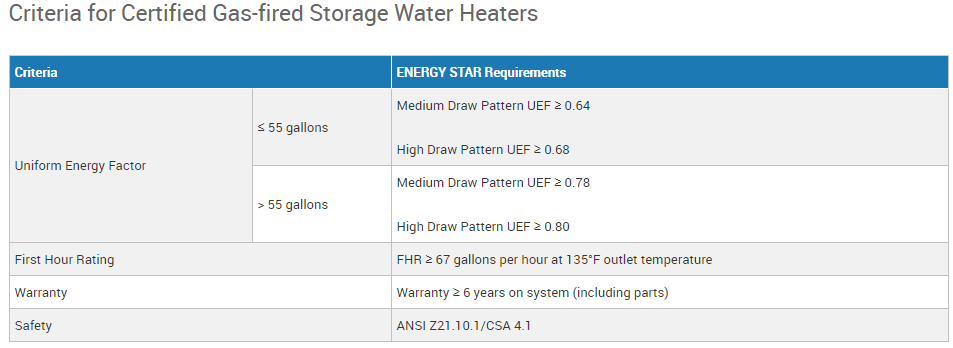
**Document Revision History**

|  |  |  |  |
| --- | --- | --- | --- |
| **Rev** | **Date** | **Author** | **Summary of Changes** |
| 0 | 06/15/2012 | Kelvin Valenzuela / SDG&E | Adopted WPSCGNRW120026A\_Rev5\_StorageWH\_NonResr-May22.docx, updated May 18, 2012. Source Description set to “WPSDGENRWH1205-0” |
| 0 | 12/17/2018 | Eduardo Reynoso / SDG&E | 1. Proposed abridge short form workpaper for EAR team review.  2. Changed SDG&E workpaper ID from WPSDGENRWH1205-Rev0 to WPSDGENRWH1205A-Rev0 and restarted revision history. The Source Description = “WPSDGENRWH1205A-0”.  3. Adopted SCG workpaper (WPSCGNRWH120206A-Rev11) measure definitions, savings impacts, and technology cost, in support of the storage water heaters rated <75kBtuh  4. New 1/1/2019 start dates to address Water Heating Disposition issued on 3/1/2018 due to EF to UEF Federal Code changes.  5. Generated new measures to account for UEF rating change and adoption of Medium and High Draw storage tank water heaters.  6. Created new 1/1/2019 start dates to address Resolutions E-4952/4818 new Measure Application Types.  7. Updated Energy Savings Impacts ex-ante database records per CPUC staff disposition dated 2/6/2019, for using the latest version of the Water Heating calculator workbook “workbook DEER-WaterHeater-Calculatorv3.2\_rev25Sep2018.xlsm”. |

Eligibility Requirements

* Must be meet Energy Star Certified Criteria for Certified Gas-fired Storage Water Heaters below and listed on Energy Star website.

(<https://www.energystar.gov/productfinder/advanced> )



* All storage water heating units must meet or exceed the Unified Energy Factor (UEF) values described in the following measure summary table to participate in the EE program.

**Measure Summary Table**

|  |  |  |
| --- | --- | --- |
| ***Measure ID*** | ***Measure Description*** | ***Baseline Description*** |
| WPSDGENRWH1205A-Rev00-Msr001 | 30 Gallon Medium Draw water heater with a rating of ≥0.64 UEF; Savings Converted into Cap-kBTUh | Medium Draw 30 Gallon Gas Storage Water heater with a rating ≥ 0.60 UEF |
| WPSDGENRWH1205A-Rev00-Msr002 | 40 Gallon Medium Draw water heater with a rating of ≥0.64 UEF; Savings Converted into Cap-kBTUh | Medium Draw 40 Gallon Gas Storage Water heater with a rating ≥ 0.58 UEF |
| WPSDGENRWH1205A-Rev00-Msr003 | 50 Gallon Medium Draw water heater with a rating of ≥0.64 UEF; Savings Converted into Cap-kBTUh | Medium Draw 50 Gallon Gas Storage Water heater with a rating ≥ 0.56 UEF |
| WPSDGENRWH1205A-Rev00-Msr004 | 30 Gallon High Draw water heater with a rating of ≥0.68 UEF; Savings Converted into Cap-kBTUh | High Draw 30 Gallon Gas Storage Water heater with a rating ≥ 0.65 UEF |
| WPSDGENRWH1205A-Rev00-Msr005 | 40 Gallon High Draw water heater with a rating of ≥0.68 UEF; Savings Converted into Cap-kBTUh | High Draw 40 Gallon Gas Storage Water heater with a rating ≥ 0.64 UEF |
| WPSDGENRWH1205A-Rev00-Msr006 | 50 Gallon High Draw water heater with a rating of ≥0.68 UEF; Savings Converted into Cap-kBTUh | High Draw 50 Gallon Gas Storage Water heater with a rating ≥ 0.63 UEF |

Implementation Requirements

* + - 1. The rebate applies to gas-for-gas equipment replacements on normal replacement (or burnout) to new installations.
      2. This measure is applicable to any commercial domestic (or “service”) hot water application.
      3. This Workpaper does not cover water heaters used for space conditioning, process end-use applications, pools, or spas.
      4. Applicable commercial building/business types include (but are not limited to) offices, restaurants, retail stores, schools, colleges, hotels, motels, and recreational facilities.
      5. This measure is not limited to specific NAICS codes.
      6. This measure includes replacing a storage water heater with a storage water heater.
      7. This workpaper has savings values for many commercial and industrial building types. Non-Residential building types and or locations (climate zones) that are not explicitly included within the ex-ante submission impact table shall use a best available Building type and Location designation.

Documentation Requirements

* + - 1. The manufacturer’s name and equipment model number must be provided.
      2. If necessary, customer must provide proof of unit efficiency (e.g., manufacturer’s equipment specification sheet).

Terms and Conditions

* + - 1. Only storage water heaters as defined by the California Energy Commission qualify, and they must:
         1. Be used primarily for domestic hot water
         2. Have an input rating of less than 75,000 kBTU/hour.
         3. Never be used for process end-use.

**Measure Summary**

**Table 1: Measure Summary Table**

| **Section** | **Value** |
| --- | --- |
| **Summary & Purpose** | This short form workpaper documents ex-ante load impacts cost-effectiveness values for storage water heaters for commercial and indusial applications. The cost values are adopted from SCG’s workpaper as described in the revision history above herein. All savings parameters and cost are per SCG workpaper (WPSCGNRWH120206A-Rev11). All measure definitions have been adopted from DEER/READI and savings impacts have been modified by SCG, unit = “Cap-kBTUh” versus “Each”. |
| **1.1 Measure & Baseline Data** | DEER measure definitions have been modified by the SCG workpaper as noted herein.     |  |  |  | | --- | --- | --- | | SDGE Imp. ID | Measure ID | Modified DEER Measures Description | | Refer to ex-ante table | WPSDGENRWH1205A-Rev00-Msr001 | 30 Gallon Medium Draw water heater with a rating of ≥0.64 UEF; Savings Converted into Cap-kBTUh | | Refer to ex-ante table | WPSDGENRWH1205A-Rev00-Msr002 | 40 Gallon Medium Draw water heater with a rating of ≥0.64 UEF; Savings Converted into Cap-kBTUh | | Refer to ex-ante table | WPSDGENRWH1205A-Rev00-Msr003 | 50 Gallon Medium Draw water heater with a rating of ≥0.64 UEF; Savings Converted into Cap-kBTUh | | Refer to ex-ante table | WPSDGENRWH1205A-Rev00-Msr004 | 30 Gallon High Draw water heater with a rating of ≥0.68 UEF; Savings Converted into Cap-kBTUh | | Refer to ex-ante table | WPSDGENRWH1205A-Rev00-Msr005 | 40 Gallon High Draw water heater with a rating of ≥0.68 UEF; Savings Converted into Cap-kBTUh | | Refer to ex-ante table | WPSDGENRWH1205A-Rev00-Msr006 | 50 Gallon High Draw water heater with a rating of ≥0.68 UEF; Savings Converted into Cap-kBTUh | |
| **1.2 Technical Description** | The measures within DEER and the DEER-WaterHeater-Calculator-v3.1 generated by both SCG and Commission Staff. DEER measures for all small storage water heaters were provided by the approved water heater calculator and given in a Per Unit savings basis. This workpaper uses some assumptions to convert savings into a per Cap-kBTUh savings basis.  DEER Difference Summary   |  |  | | --- | --- | | **DEER Item** | **Used for Workpaper?** | | 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 | N/A | | DEER Version | DEER 2019 | | Reason for Deviation from DEER | N/A | | DEER Measure IDs Used | |  | | --- | | NG-WtrHt-SmlStrg-Gas-Ite75kBtuh-30G-MD-0p64UEF | | NG-WtrHt-SmlStrg-Gas-Ite75kBtuh-40G-MD-0p64UEF | | NG-WtrHt-SmlStrg-Gas-Ite75kBtuh-50G-MD-0p64UEF | | NG-WtrHt-SmlStrg-Gas-Ite75kBtuh-30G-HI-0p68UEF | | NG-WtrHt-SmlStrg-Gas-Ite75kBtuh-40G-HI-0p68UEF | | NG-WtrHt-SmlStrg-Gas-Ite75kBtuh-50G-HI-0p68UEF | | |
| Measures | Per DEER/READI Measures IDs as noted herein above per Revision History |
| Code for All Measures | Title 20 and Title 24 as reflected and referenced in DEER      As of December 29, 2016, the Department of Energy developed a final ruling within the Federal Registerwhich has changed the way that all residential and some commercial water heating technology would be rated. All water heaters within the scope of the ruling will no longer be rated with the Energy Factor (EF), thermal efficiency, or standby loss but now be using the Uniform Energy Factor (UEF). The UEF is the DOE’s newly developed metric for communicating the energy efficiency of water heaters. UEF ratings are determined by assigning water heaters into one of four different categories of hot water usage and then evaluating their performance based on that usage[[1]](#endnote-1). These categories are based on draw pattern and differ by the labels *very small, low, medium,* and *high*. This allows water heaters to be compared more easily between different types (i.e. Storage and Tankless), so long as they are being compared within those same bins. The final ruling from the Federal Register dated on December 29, 2016 can be found in *Attachment B*. The attachment contains the following table that can be referenced when evaluating the UEF of units that coincide with the current code standards of Title 20 for water heaters.  **Table 3: Equations to Convert Current Title 20 Code to UEF**    The final ruling also contains tables that define what is meant by the draw patterns of very small, low, medium, and high.  Section 429.17 (B) Determine the applicable draw pattern as follows:  (1) For consumer gas-fired water heaters, consumer oil-fired water heaters, consumer electric water heaters, tabletop water heaters, grid enabled water heaters, residential-duty commercial gas water heaters, residential-duty commercial oil filed water heaters: Use the New FHR (First Hour Rating) to select the applicable draw pattern from the table in this paragraph:  **Table 4: Storage Water Heater Draw Patterns**    (2) For instantaneous gas-fired water heaters, instantaneous electric water heaters, and residential-duty commercial electric instantaneous water heaters: Use New Max GPM to select the applicable draw pattern from the table in this paragraph:  **Table 5: Instantaneous Water Heater Draw Patterns** |
| **1.3 Installation Type and Delivery Mechanisms** | **Delivery Method Descriptions**   |  |  | | --- | --- | | **Delivery Method** | **Description** | | Financial Support | The program motivates customers, through financial incentives such as rebates or low interest loans, to implement energy efficient measures or projects. | | New Construction | The program offers financial incentives and/or design assistance to customers involved with new building construction. This is intended is to motivate customer to exceed Title 24 building energy efficiency requirements (residential or nonresidential). |   **Incentive Method Descriptions**   |  |  | | --- | --- | | **Incentive Method** | **Description** | | Down-Stream Incentive | 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. Such an incentive may be deemed or customized. | | Mid-Stream Incentive | The program gives a financial incentive to a midstream market actor, such as a retailer or contractor, to encourage the promotion of efficient measures. The incentive may or may not be passed on to the end-use customer. | | Up-Stream Incentive | The program gives a financial incentive to an upstream market actor, such as a manufacturer or distributor, to encourage the manufacture, provision, or distribution of an efficient measure. The incentive may or may not be passed on to the end-use customer. | | Direct Install (DirInstall) | The program implements energy efficiency measures for qualifying customers, at no cost to the customer. | |
| Installation Type | **Installation Type Descriptions**   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **Installation Type** | **Savings** | | **Life** | | | 1st Baseline (BL) | 2nd BL | 1st BL | 2nd BL | | Replace on Burnout (ROB)  (expiry date = 12/31/2018)  Normal Replacement (NR)  (start date = 1/1/2019) | Above Code or Standard | N/A | EUL | N/A | | New Construction (NEW/NC) | Above Code or Standard | N/A | EUL | N/A | |
| Delivery Mechanisms |  |
| **1.4.1 DEER Data** |  |
| Net-to-Gross Ratio | Com – Default>2yrs  SDG&E is using the default as there is no other applicable NTGD |
| 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.   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **GSIA ID** | **Description** | **Sector** | **BldgType** | **ProgDelivID** | **GSIAValue** | | Def-GSIA | Default GSIA values | Any | Any | Any | 1 | |
| 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.   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **EUL ID** | **Description** | **Sector** | **UseCategory** | **EUL (Years)** | **RUL (Years)** | | WtrHt-Com | Commercial Water Heater | Com | SHW | 15 | 0 | |
| **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 SCG Modified DEER Measure IDs as noted herein above. |
| **Section 3. Load Shapes** | ElecImpProfile: SDGE:DEER:Com:Indoor\_Non-CFL\_Ltg  Gas: Annual |
| **Section 4. Costs** |  |
| Base Cost | |  |  |  |  | | --- | --- | --- | --- | | SDG&E Impl. ID | Base Cost ID | Base Cost Value | Units | | Ex-ante submission | SDG\_Stor\_UEF-Gas-030gal-UEF\_BASE | $ 31.66 | Cap-kBTUh | | Ex-ante submission | SDG\_Stor\_UEF-Gas-040gal-UEF\_BASE | $ 27.76 | Cap-kBTUh | | Ex-ante submission | SDG\_Stor\_UEF-Gas-050gal-UEF\_BASE | $ 29.39 | Cap-kBTUh | |
| Measure Cost | |  |  |  |  |  | | --- | --- | --- | --- | --- | | SDG&E Impl. ID | Measure Cost ID | Msr Cost Value | IMC | Units | | Ex-ante submission | SDG\_Stor\_UEF-Gas-030gal-0p64UEF | $ 34.52 | $ 2.86 | Cap-kBTUh | | Ex-ante submission | SDG\_Stor\_UEF-Gas-040gal-0p64UEF | $ 32.54 | $ 4.78 | Cap-kBTUh | | Ex-ante submission | SDG\_Stor\_UEF-Gas-050gal-0p64UEF | $ 32.06 | $ 2.67 | Cap-kBTUh | | Ex-ante submission | SDG\_Stor\_UEF-Gas-030gal-0p68UEF | $ 36.02 | $ 4.36 | Cap-kBTUh | | Ex-ante submission | SDG\_Stor\_UEF-Gas-040gal-0p68UEF | $ 35.57 | $ 7.81 | Cap-kBTUh | | Ex-ante submission | SDG\_Stor\_UEF-Gas-050gal-0p68UEF | $ 35.49 | $ 6.10 | Cap-kBTUh | | Note: For a complete list of incremental measure cost by implementation, refer to Introduction located on page 1-2, located herein by reference. | | | | | |

1. [↑](#endnote-ref-1)