Short Form Work Paper WPSDGEREHC1063

**Revision 0**

**San Diego Gas & Electric**

**Energy Efficiency Engineering**

**High Efficiency Furnaces 92 AFUE (1.08 HIR), 95 AFUE (1.05 HIR), 96 AFUE (1.04 HIR), 97 AFUE (1.03 HIR), and 98 AFUE (1.02)**

**- Residential**

**December 26, 2017**

## Short Form Workpaper for High Efficiency Furnaces 92 AFUE (1.08 HIR), 95 AFUE (1.05 HIR), 96 AFUE (1.04 HIR), 97 AFUE (1.03 HIR), and 98 AFUE (1.02) - Residential

## Introduction

This short form workpaper documents the ex-ante load impact and cost-effectiveness values used for High Efficiency Residential Central Natural Gas Furnaces. Impacts are found from DEER and the costs were adopted from SCG’s workpaper “WPSCGREHC130115A-Rev04\_Res\_HE Furnaces” with the exception of:

1. SDGE refrains from converting the unit of measure to ($/Furnace). SDGE measure cost will remain in ($/kBtuh).

## Document Revision History

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| --- | --- | --- | --- |
| **Rev** | **Date** | **Author** | **Summary of Changes** |
| 0 | 12/27/2017 | Joshua Williams/ SDG&E | * Adopted SoCal Gas workpaper “WPSCGREHC130115A-Rev04\_Res\_HE Furnaces” with all its assumptions and values. * The only exception is SDGE refrains from converting the unit of measure to ($/Furnace). SDGE measure cost will remain in ($/kBtuh). * The 2017 Database for Energy Efficient Resources (DEER2017) v2.4.7 [3] data include: gas energy savings, equipment useful life, and net-to-gross for this measure. |

| **Section** | **Value** |
| --- | --- |
| **Summary & Purpose** | This short form workpaper documents the ex-ante load impact and cost-effectiveness values used for High Efficiency Residential Central Natural Gas Furnaces. Impacts are found from DEER and the costs were adopted from SCG’s workpaper “WPSCGREHC130115A-Rev04\_Res\_HE Furnaces”.  Residential Furnace – Energy Star Central Gas (AFUE = 81% & 90% - 98%) Legacy Implementation updates effective 1/1/2017.   |  |  |  |  |  | | --- | --- | --- | --- | --- | | Measure Characteristic | | | | | | Implement ID | Deer Measure ID | Building Type | Delivery Type | Version-Source | | 462510 | Res-GasFurnace-AFUE92 | Res | PreRebDown |  | | DEER2017 - D17 v2 | |  | | 462513 | Res-GasFurnace-AFUE95 | Res | PreRebDown |  | | DEER2017 - D17 v2 | |  | | 462514 & 462819 | Res-GasFurnace-AFUE96 | Res | PreRebDown & PreRebUp |  | | DEER2017 - D17 v2 | |  | | 462515 & 462765 | Res-GasFurnace-AFUE97 | Res | PreRebDown & PreRebUp |  | | DEER2017 - D17 v2 | |  | |
| **1.1 Measure & Baseline Data** | |  |  |  |  |  | | --- | --- | --- | --- | --- | | Measure Characteristic | | | | | | Implement ID | Deer Measure ID | Building Type | DEER Baseline | MeasureAppType | | Measure 1 - 462510 | Res-GasFurnace-AFUE92 | Res | Code / Standard |  | | ROB | |  | | Measure 2 -462513 | Res-GasFurnace-AFUE95 | Res | Code / Standard |  | | ROB | |  | | Measure 3 -462514 & 462819 | Res-GasFurnace-AFUE96 | Res | Code / Standard |  | | ROB | |  | | Measure 4 -462515 & 462765 | Res-GasFurnace-AFUE97 | Res | Code / Standard |  | | ROB | |  | |
| **1.2 Technical Description** | Per cited per WPSCGREHC130115A-Rev04\_Res\_HE Furnaces workpaper |
| Code for All Measures | * + 1. ***Title 20:*** This measure falls under the current Title 20 of the California Energy Regulations, section 1605.1 e, Gas and Oil Space Heaters and Electric Residential Boilers. As of November 19th, 2015, the minimum AFUE for Mobile Home gas furnaces is 80% for all furnaces of any input rating, according to Table E-6, *Standards for Commercial Gas/Oil-Fired Central Furnaces*. This table also shows for all other building types, the minimum AFUE is 80% for non-weatherized gas furnaces and 81% for weatherized gas furnaces. It also states on table E-5, furnaces with a rated input of more than 225,000 BTU/hr shall have an AFUE of 80%.     2. ***Title 24:*** Title 24 of the California Energy Regulations references California’s Title 20 Appliance Efficiency Standards for the minimum efficiency of furnaces installed in California.     3. ***Federal Standards:*** This measure falls under Federal DOE (10 CFR Part 430) [5] Energy Regulations. Under this regulation, compliance with the standards in the direct final rule will be required on May 1, 2013 for non-weatherized furnaces and on January 1, 2015 for weatherized furnaces and central air conditioners and heat pumps. Because most residential type furnaces are installed inside the house, it’s considered as non-weatherized for which the minimum AFUE is 80%.        1. On January 14, 2013, the US DOE proposed to settle a lawsuit brought by the American Public Gas Association that seeks to roll back gas furnace efficiency standards. If accepted by the court, the Federal minimum efficiency standards will revert to a minimum AFUE of 75 for mobile homes and a minimum AFUE of 78 for all other residential furnaces. [6]     4. **California Energy Commission Appliance Efficiency Database:** Market distribution and availability are provided in Attachment C. For more details, please refer to California Energy Commission Appliance Efficiency Database. |
| Requirements | * + 1. Qualifying Efficiency        1. A central gas furnace with an AFUE equal to or greater than 92% and less than 95% for residential single family, multifamily and mobile homes.        2. A central gas furnace with an AFUE equal to or greater than 95% and less than 96% for residential single family, multifamily and mobile homes.        3. A central gas furnace with an AFUE equal to or greater than 96% and less than 97% for residential single family, multifamily and mobile homes.        4. A central gas furnace with an AFUE equal to or greater than 97% for residential single family, multifamily and mobile homes.     2. Program Restrictions and Guidelines        1. This measure is applied to a residential single family, multifamily and mobile homes located in SDG&E’s service territory. To qualify the applicant must have natural gas distributed to the installation address for the gas furnace rebate. The central natural gas furnace must have an Annual Fuel Utilization Efficiency (AFUE) rating of ≥ 92% and < 95%, ≥ 95% and < 96%, ≥ 96% and < 97%, and ≥ 97% for incentives. |
| **1.3 Installation Type and Delivery Mechanisms** |  |
| Installation Type | |  |  |  | | --- | --- | --- | | Code | Description | Comment | | ROB | Replace on Burnout | Measure applied when existing equipment fails or maintenance requires replacement | | NC | New Construction | Measure applied during construction design phase as an alternative to a code-compliant standard design | |
| Delivery Mechanisms | * Downstream Rebate – Deemed Rebate * Direct Install * Upstream |
| **1.4.1 DEER Data** |  |
| Net-to-Gross Ratio | All-Default<=2yrs  All other EEMs with no evaluated NTGR: new technology in program for 2 or fewer years |
| GSIA | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | GSIA | Description | Sector | BldgType | ProgDelivID | GSIAValue | | Def-GSIA | Default GSIA | Any | Any | Any | 1 | |
| Effective and Remaining Useful Life | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Building type | Bldg Vintage | Climate Zone | EUL (yrs) | RUL (yrs) | DEER Version | | ALL | AV | ALL | 20 | 0 | DEER2017 | |
| **Section 2. Calculation Methodology** |  |
| Energy Savings/Peak Demand Reduction – All Measures | * + 1. Annual Gas Energy Savings        1. This measure is located in the DEER 2017 database; gas impact savings were extracted from the READI tool and are used for these measures.        2. The 2017 Database for Energy Efficient Resources (DEER2017) v2.4.7 [3] data include: gas energy savings for these measures (Res-GasFurnace-AFUE92, Res-GasFurnace-AFUE95, Res-GasFurnace-AFUE96, and Res-GasFurnace-AFUE97). Gas impact savings for these measures were pulled directly from the DEER READI tool for each climate zone and IOU that serves gas customers within California. The breakout by IOU was made because DEER shows different savings values by IOU in the same climate zone; see “Measure Summary table and Savings Calculations” spreadsheet for the range of savings.        3. Annual therm savings for this measure has been calculated in therms per kBTUh. |
| **Section 3. Load Shapes** | N/A |
| **Section 4. Costs** | All cost adopted and cited from “*WPSCGREHC130115A-Rev04\_Res\_HE Furnaces workpaper* ” . |
| **Section 4.1 Modeled Costs** |  |
|  | The Base Case Cost, and Measure Costs are located in the table below:  Base Case and Measure Case cost analysis ($/kBTUh)   |  |  | | --- | --- | | (All Measures) Base case cost ($/kBTUh) | | | 80% | $12.00 | | Measure Cost ($/kBTUh) | | | (Measure 1) 92% | $14.06 | | (Measure 2) 95% | $18.91 | | (Measure 3) 96% | $23.88 | | (Measure 4) 97% | $30.51 | | (All Measures) Labor Cost ($/kBtuh) | | |  | $5.84 |   *All costs are noted as $ / kBTUh* |