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| State of California | | |
| M e m o r a n d u m | |  |
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| Date: | October 22, 2020 | |
| To: | Gary Barsley, Southern California Edison (SCE); Henry Liu, Pacific Gas and Electric (PG&E); Chan Paek, Southern California Gas (SCG); Ed Reynoso, San Diego Gas and Electric (SDG&E); John Zwick (SDG&E); Nancy Goddard, PacifiCorp; Ayad Al-Shaikh | |
| CC: |  | |
| From: | Peter Biermayer - Utilities Engineer, Energy Efficiency Planning and Forecasting Section, Energy Efficiency Branch, Energy Division, CPUC | |
| Subject: | DEER WaterHeater Calculator v4.2.xlsm | |

Recent concerns regarding the water heater calculator received by the CPUC and the DEER support team include:

• Some TechIDs encompass a wide range of input capacities (e.g., large tankless water heaters, gt200kBtuh) that may not best be represented by a single unit-energy savings (UES), normalized by input capacity.

• The hot-water load profiles (represented by DEER building type names) contained in the calculator are not adjusted based on water heater size. They remain fixed as a total whole-building, hot-water load profile.

• Multi-family home “MFm” hot-water profile represents a single in-dwelling unit rather than a central hot-water profile of a multi-family complex. None of the DEER building types represent “commercial” water heaters serving central multi-family water heating systems in an effective manner.

The DEER support team recognizes that recent additions to the water heater calculator versions 4.0 and higher have made more apparent the pre-existing limitations inherent to the calculator framework as listed:

• The calculator applies hot-water load profiles to all MeasureIDs thus leading to instances that would not typically happen in practice (e.g., small storage water heater installed at a university dormitory).

• The cross-technology comparisons and sizing methods (estimating the number of units required to meet building load) are applied to whole-building, hot-water loads, but savings are being normalized to the measure-case input capacity (NormUnit=”kBtu/h”). This method can lead to significant differences in the number of units for the standard- and measure-case water heaters. The exception to this methodology involves residential water heaters which, instead, compares single water heaters (NormUnit = “Each”).

• Large commercial water heater TechIDs (gt200kBtuh), while following a consistent approach (using the “AHRI binning workbook”) for estimating the average input capacity, include capacities that exceed those anticipated for programs.

• Hot-water load profiles—derived from DEER eQUEST building prototypes—can be used to determine whole-building savings rather effectively, but tend to be less accurate than those determined using a “per unit” hot-water load profile.

While the CPUC and consultants cannot at this time make significant improvements or updates to the calculator, **the CPUC will allow PAs to develop new TechIDs and MeasureIDs that tailor the input capacity range of certain categories using calculator version 4.2 for program years 2021-2022. This development will allow PAs to develop TechIDs that better represent water heaters that are more commonly expected to be offered through their programs.**

As has been discussed via emails, a training can be offered to those who require guidance for adding TechIDs and MeasureIDs using the DEER WaterHeater Calculator v4.2.xlsm. A poll will be issued to help those interested select from a list of available dates and times.

As indicated in Resolution E-5082, all DEER measures that will be reanalyzed using updated weather data; the water heater calculator will also be updated at the same time. Improvements to the water heater calculator that are being considered include:

• Use hot-water profiles that better simulate the energy savings for single water heater replacements rather than whole-building replacements(as is the case in current calculator). The improved hot-water profiles will better represent specific occupancy types and schedules intended to be served by individual water heaters in the DEER building types.

• The sizing method for cross-technology (e.g., tankless versus storage) comparisons will be better managed when combined with the preceding improvement.

• Incorporate heat pump water heater (HPWH) performance enhancements (e.g., part-load and non-standard-condition performance, variable tank temperature, etc.).

• Future water heater calculator improvements will consider developing a hot-water profile to represent multi-family complexes with centralized water heating systems.