



Commercial Water Heaters Put to the Test

Next phase for the PG&E Water Heater Lab

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PG&E Water Heater Lab

- Created as part of emerging technologies in support of PG&E rebate program to validate energy savings of energy efficient water heaters
- First phase of residential testing was completed in 2008:
 - “Laboratory Testing of Residential Gas Water Heaters”
- Residential lab capable of sequencing up to six WHs with identical draw profiles and consistent inlet water and air temperatures
- Designed following DOE (10CFR430 SprtB AppE) and ASHRAE (Std 118.2) test methods

Now we are ready for Phase 2:
Commercial Water Heaters

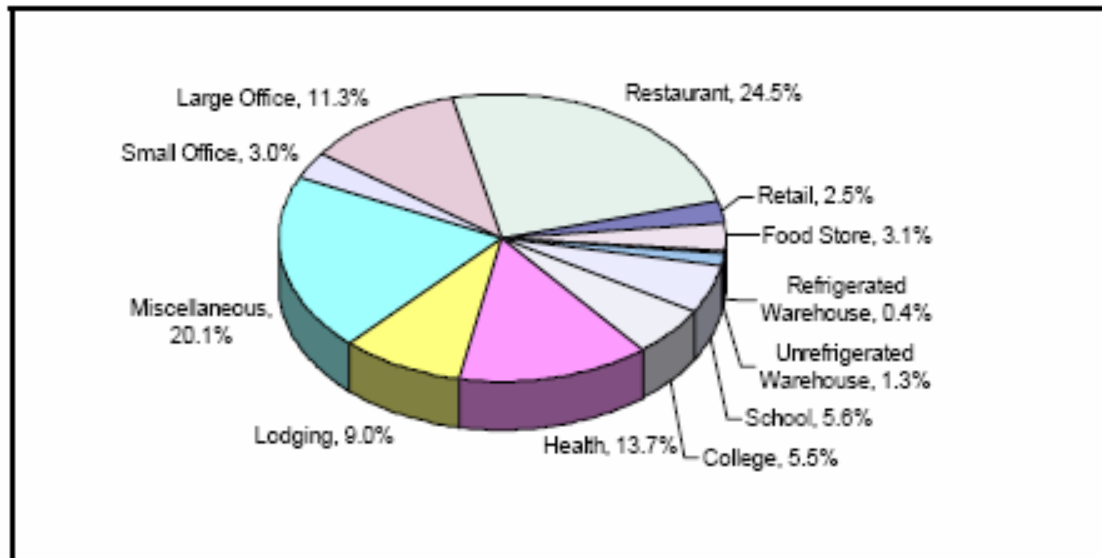




Commercial Water Heater Lab Testing

- Lab will be expanded to conduct testing of commercial water heaters
- Initial phase of commercial testing will focus on water heating in the food service industry
 - High hot water usage and reduced life of water heaters
 - Huge savings and market penetration opportunities
- California Commercial End Use Survey (CEUS):

Commercial Gas Usage by Building Type



23% of Restaurant Gas Usage is for Water Heating



Commercial Water Heater Lab Testing

- FNI-FSTC will conduct field monitoring of a restaurant to gather a high resolution 24-hour “real world” hot water use profile to be used in testing
 - Monitored at 5 second intervals for a more accurate profile: max gpm, duration of draws
 - Record the source of each hot water draw to characterize operation
- Investigate the thermal efficiency of high-efficiency and standard-efficiency tankless and tank-type commercial water heaters
 - Compare thermal efficiency results using ANSI Z21.10.3 test method to efficiency results of 24-hour “real world” hot water use profile



Commercial Water Heater Lab Testing

- Evaluate the energy savings of retro-commissioning water heating systems
 - Supplement retro-commissioning field study conducted by FNI-FSTC: insulation, flue damper, timer on recirculation loop
 - Further investigation into optimizing distribution including time clocks, aquastat, on-demand recirculation, and point-of-use electric water heaters
- Determine the effects of preheat on the efficiency of water heaters
 - Particularly, the potential to degrade the efficiency of a condensing water heater by simulating solar or waste heat recovery systems
 - Monitor flue temperatures to ensure material is capable of withstanding the heat; is PVC acceptable?
- Monitor the performance of commercial water heaters (with a focus on tankless) in meeting the demands of commercial kitchen appliances and equipment
- Additional testing: heat trace on recirculation loop, pH of condensate



Features of Commercial WH Lab

- Test single or two-unit systems
- Recirculation loop
- Modulating flow control valve that follows water use profile (max 40 gpm)
- Warm inlet temperatures to simulate pre-heat
- Capable of integrating appliances that use hot water



Integrating appliances



Water tempering



PG&E Boilers and Water Heating Catalog

June 2009

HOT WATER HEATING

LARGE DOMESTIC HOT WATER BOILER

Available to commercial end-use customers. Only boilers > 75,000 Btuh qualify. Must meet a minimum thermal efficiency of 84%. Include a manufacturer's specification sheet documenting these characteristics. Boiler must not be used for space conditioning. Boiler must not be used for industrial (process) end-use.

Product Code	Rebate/Unit Measure
H105 Large Domestic Hot Water Boiler	\$1.50/MBtuh

INSTANTANEOUS HOT WATER HEATER

Available to commercial end-use customers only. Water heaters must meet efficiency requirements based on size, as shown below. Only instantaneous water heaters (as defined by the California Energy Commission Title 20 & 24 standards) used for non-process hot water applications qualify. The manufacturer name and equipment model number must be provided. Customers must provide proof of the tankless nature of the water heater (e.g., manufacturer equipment specification sheets).

Input Rating	Required Efficiency
≤ 200 MBtuh	Energy Factor ≥ 0.63
> 200 MBtuh	Thermal Efficiency ≥ 82%

All required efficiencies exceed Title 20 & 24 standards, as prescribed above.

Product Code	Rebate/Unit Measure
H9 Instantaneous Hot Water Heater > 75 MBtuh - ≤ 200 MBtuh	\$2.00/MBtuh
H10 Instantaneous Hot Water Heater > 200 MBtuh	\$2.00/MBtuh
H14 Instantaneous Hot Water Heater ≤ 75 MBtuh	\$2.00/MBtuh

HOT WATER HEATING continued

STORAGE WATER HEATER

Water heaters must meet efficiency requirements based on size, as shown below. If the size and efficiency are not shown on the invoice, you must include a manufacturer's specification sheet documenting these characteristics.

Input Rating	Required Efficiency
≤ 75,000 Btuh	Energy Factor ≥ 0.62
> 75,000 Btuh	Thermal Efficiency ≥ 82%

All required efficiencies exceed Title 20 & 24 standards, as prescribed above.

Product Code	Rebate/Unit Measure
H6 Storage Water Heater	\$2.00/MBtuh

INSULATION

PIPE INSULATION

1" or 2" of fiberglass, foam, or calcium silicate insulation must be added to existing nonresidential bare pipe systems which transfer fluid directly from gas-fired equipment. Minimum qualifying pipe diameter is 1". Insulation thickness, liquid or steam temperature will determine the rebate amount. Additional required information will be the manufacturer's name, insulation material type, and the material k-value rating.

Product Code	Rebate/Unit Measure
H106 1" Pipe Insulation; Hot Water 120 - 200° F	\$2.00/Linear Foot
H107 2" Pipe Insulation; Hot Water 120 - 200° F	\$3.00/Linear Foot
H108 1" Pipe Insulation; Low Pressure (< 15 psig) steam 200 - 250° F	\$3.00/Linear Foot
H109 2" Pipe Insulation; Low Pressure (< 15 psig) steam 200 - 250° F	\$4.00/Linear Foot



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