



## *ACEEE Hot Water Forum - 2008*

# Central Domestic Hot Water System Study

*Within SoCal Gas' and SDG&E's  
Multifamily Energy Efficiency Rebate Program*

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Nehemiah Stone

# Background

- DHW represents largest MF gas savings opportunity
- Previous studies showed 1/8 of expected savings
- This study gathered more info and devoted more time to verification of accuracy
- Site inspections, temperature readings, site personnel interviews, contractor interviews
- Customer-specific change model

# Current Study

- Billing analysis on fifty PY2007 participants installing controls on CDHW systems
  - Indicated average savings of about 1/4 of what was expected by program managers
  - Indicated several cases of **increased** energy use after controls were installed
  - Based on complete and verified data
  - Prompted Sempra to call this meeting to discuss implications and possible solutions

# Site Inspection Form

Hot Water Supply for Domestic Use \_\_\_\_\_ °F

Controller Type \_\_\_\_\_ Controller Setpoint \_\_\_\_\_ °F

Controller Make \_\_\_\_\_

Controller Model # \_\_\_\_\_

Boiler/Water Heater (Circle Type) Location \_\_\_\_\_

Manufacturer \_\_\_\_\_ Model # \_\_\_\_\_

Serial # \_\_\_\_\_ BTU/HR Input \_\_\_\_\_

No. of Stages \_\_\_\_\_ Dedicated Meter # \_\_\_\_\_

Temperature & Pressure Relief Valve

Storage Tank Temperature \_\_\_\_\_ °F

Expansion Tank

City Water Supply \_\_\_\_\_ °F

Boiler Outlet/Supply Temperature \_\_\_\_\_ °F

Tank Thermostat Setpoint \_\_\_\_\_ °F

Hot Water Supply Temperature \_\_\_\_\_ °F

Notes: \_\_\_\_\_

Storage Tank Size \_\_\_\_\_ Gallons

Hot Water Boiler Circulation Pump

Model # \_\_\_\_\_

Serial # \_\_\_\_\_

Notes: \_\_\_\_\_

Piping Insulation Condition (Circle One)

Good Fair Poor Missing

Hot Water Return Recirculation Pump

Model # \_\_\_\_\_

Serial # \_\_\_\_\_

Notes: \_\_\_\_\_

Hot Water Return from Domestic Water End Uses \_\_\_\_\_ °F

Site # \_\_\_\_\_ Contact \_\_\_\_\_ Hot Water to Boiler \_\_\_\_\_ °F

Contact Phone \_\_\_\_\_

Site Address \_\_\_\_\_ (Unit/Suite) \_\_\_\_\_ (City) \_\_\_\_\_

No. of Bldgs. \_\_\_\_\_ No. of Units \_\_\_\_\_

Acct # \_\_\_\_\_

Meter # \_\_\_\_\_

No. of Pools \_\_\_\_\_ No. of Spas \_\_\_\_\_ No. of BBQ's \_\_\_\_\_ No. of Laundry Rooms \_\_\_\_\_

# Major Findings - Savings

- Average realization rate of 25%
- Contractors' averages ranged from -20% to 41%
- Control manufacturers' avgs ranged from 0% to 41%
- Variation within one contractor's installations varied from -77% to 136%
- Out of 33 sites (116 systems), 13 sites had an increase in energy use
- 5 Sites had at least 90% of expected savings
- Systems with boilers had an average 32% realization rate; those with water heaters had -8% RR

# Major Findings - Conditions

- Most systems had faults that should have been corrected:
  - Cross over: 5-10% minimum
  - CWS plumbed straight into boiler: 15%
  - Burner out of adjustment (sooting, flame roll-out): 50%
  - Boiler short cycling: 10%
  - Tanks never drained/flushed: 2/3
- Some systems should never have been considered candidates for controls (e.g., NO storage tank, mixing valves with temp settings at cross-purposes)

# Major Findings - Conditions

- Most systems had faults that should have been corrected:
  - Bare (uninsulated) pipes: 80%
  - Broken/missing refractory bricks: 10%
  - Failed return water pumps: 10%
  - Boiler standardized sizing:
    - Under sizing: ~20%
    - Over sizing: ~15%
  - Leaks: 5% had visible leaks at the equipment
- Only 5% of the sites had a maintenance agreement

# Findings

- Most older systems had setpoints about 131°F
  - 137°F was assumed for work-papers
- Contractors state that ideal setpoint is between 110 °F and 120 °F
- Roughly 10% of site personnel had tenant complaints before controller installation
- Roughly 10% of site personnel had tenant complaints after controller installation
- 80% of site personnel do not know who to call
- Most just turn the heat up

# Major Conclusions

- CDHW Systems are too complex to allow addressing controls as a widget
- Systems fail, so installation cannot be the end of the story
- Best performance came from systems with continuous post-installation monitoring
- Savings would be significantly higher if systems were brought into normal operating condition before adding controls



End sheet

Thank you for your attention.