



Testing Water Heaters with Different Draw Profiles

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PG&E Water Heater (WH) Testing Program

- Current Residential Rebate
 - \$30 gas EF \geq 0.62, tank \geq 30 gallons
 electric EF \geq 0.93, tank \geq 40 gallons
 tankless not included

www.pge.com/myhome/saveenergymoney/rebates/appliance/waterheater
- Want to be able to recommend the highest efficiency product for a particular end use pattern (best match)
- Is Energy Factor (EF) and Thermal Efficiency (TE) sufficient measures to create a new tiered rebate?
 - What are the impacts on EF from “real” usage profiles?
 - Most new, high-efficiency gas water heaters require electricity. Does EF hide the true operating cost from this higher cost energy?
 - Can we create a draw pattern dependent EF modifier?
- What are the potential energy/\$ savings from high EF systems?
- Should we include tankless?



PG&E Water Heater (WH) Testing Program

- Project Funded by PG&E Emerging Technologies Program
 - Statewide Program for all IOUs
 - Purpose:
 - **Detect** and **Qualify** new technologies to improve Energy Efficiency and Demand Response
 - Accelerate the market penetration of new and innovative products through:
 - Product evaluations
 - Pilot projects
 - Field studies
 - Findings turned into information guides or mass-market rebates
- WH program intended to gather information to support an expanded rebate offering
 - Tiered rebate based on EF/TE
 - Condensing vs. non-condensing



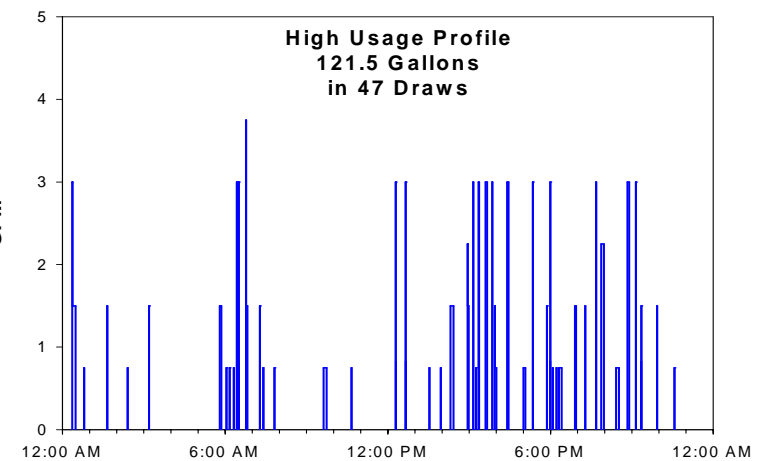
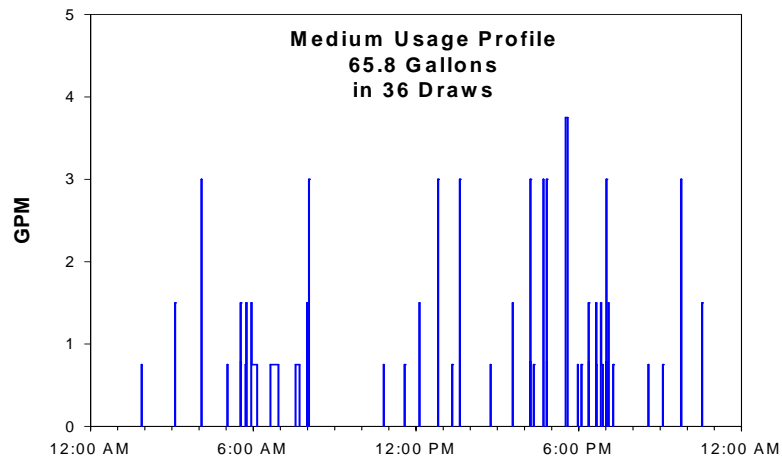
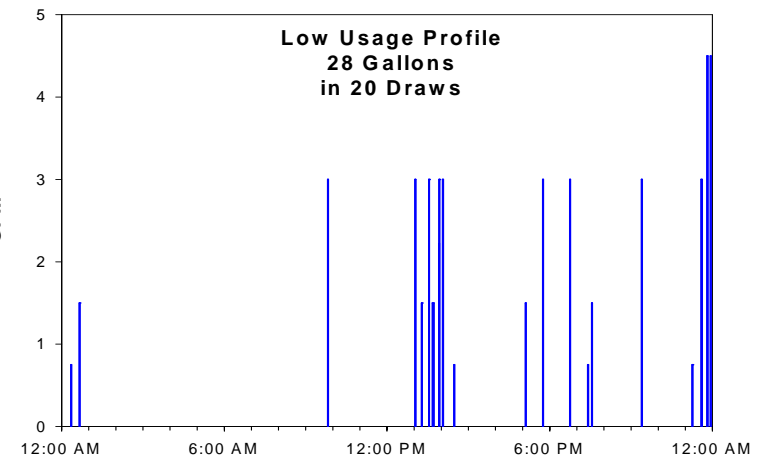
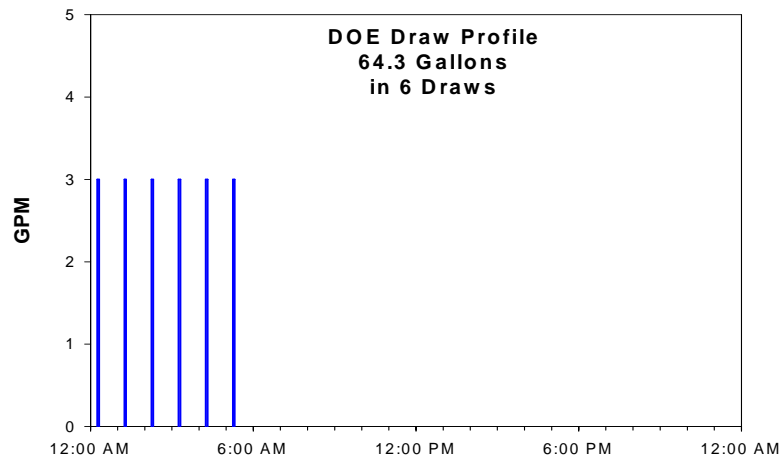
Water Heater Test Lab

- Created in 2007; testing began in December
- 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
- Round 1 – Residential gas WHs
- Round 2 – Commercial system with recirculation
- Round 3 – Effects of pre-heat systems (?)



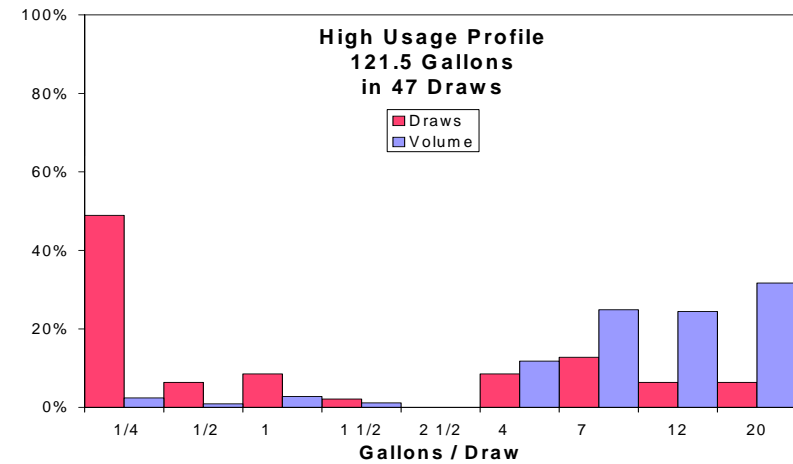
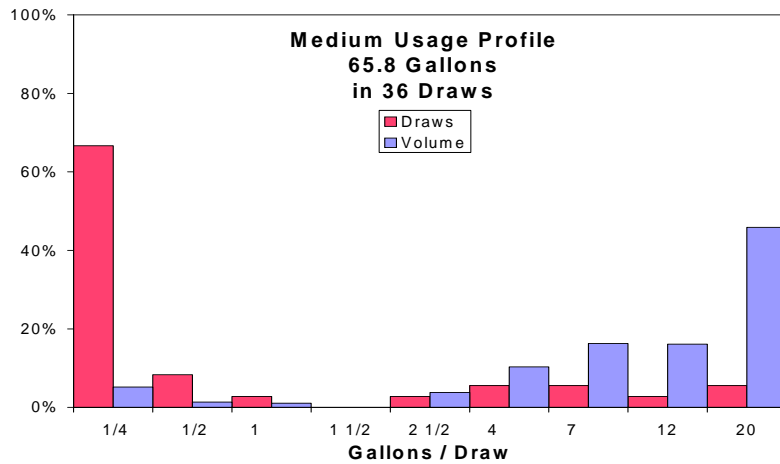
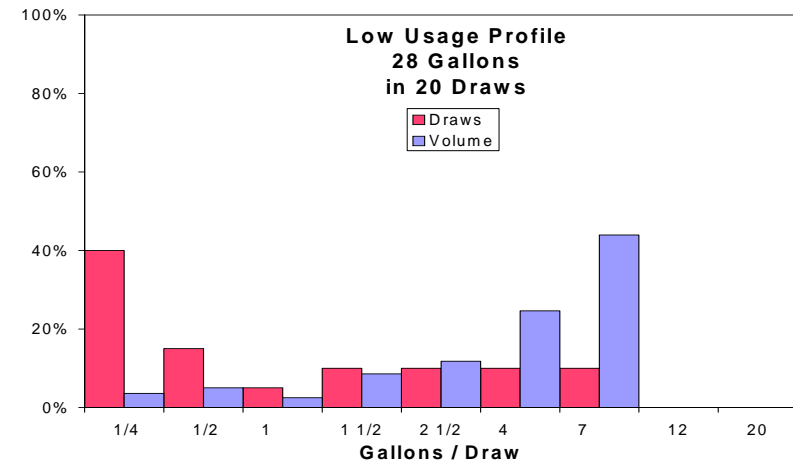
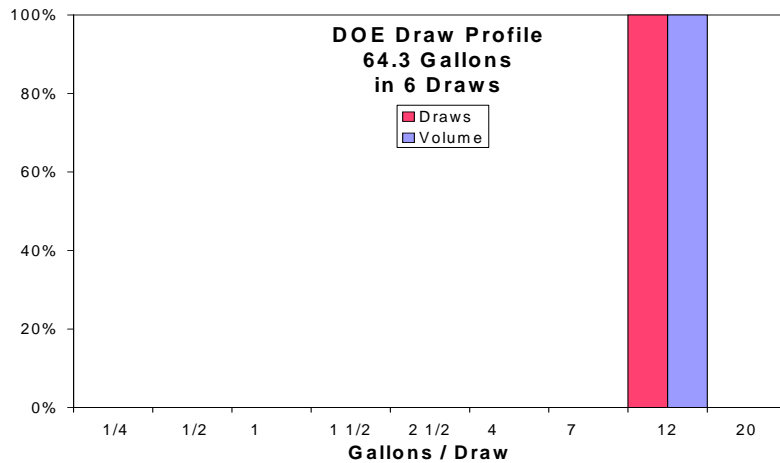


Sample Draw Profiles





Sample Draw Profiles (distribution)



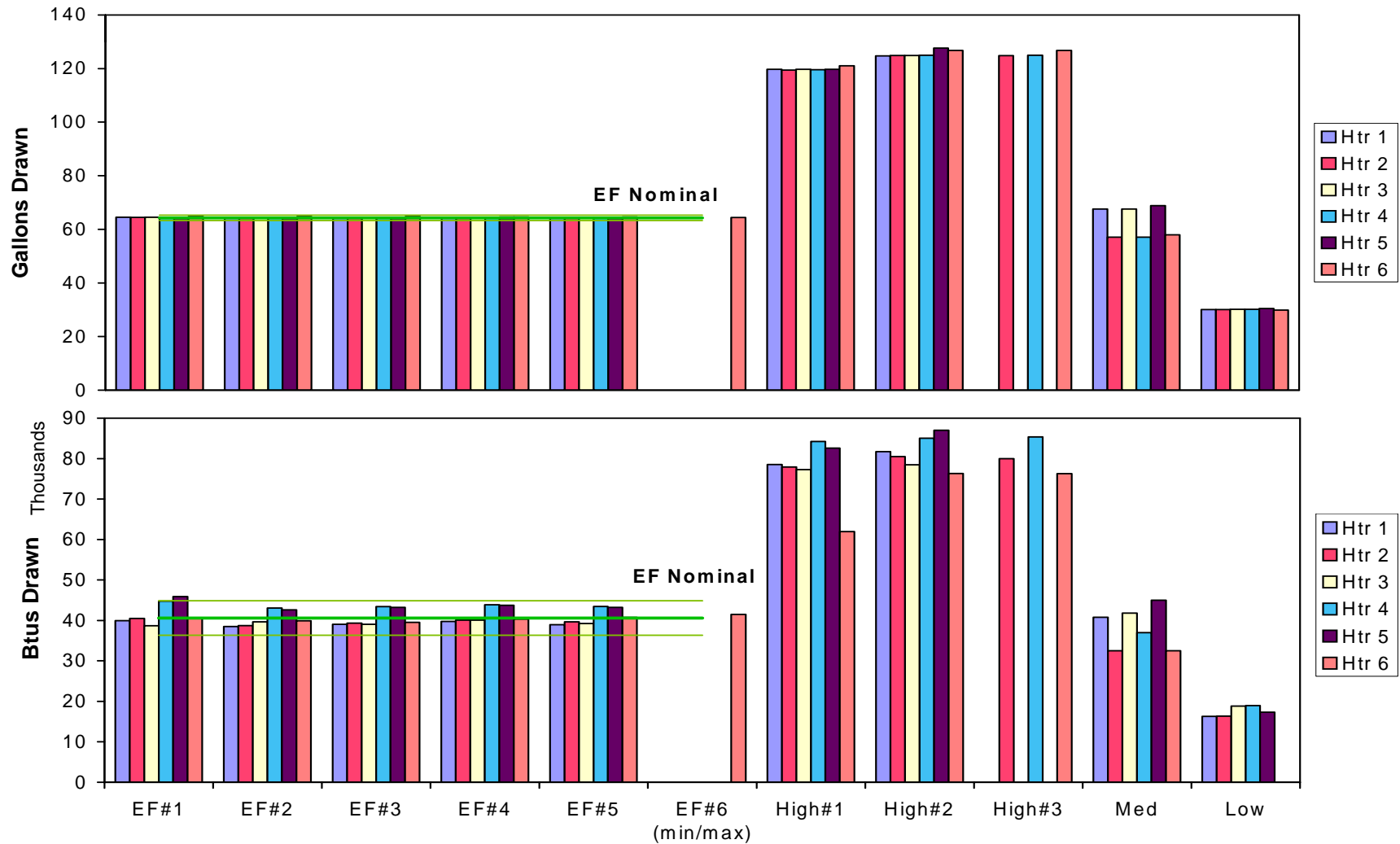


Concerns/Issues

- How well can we reproduce the heater ratings
- Accuracy of water heating energy measurement for short draws
 - Time constants of system and instruments
- Should we count the total water heated, or just that actually delivered to the faucet for use?
- Can/should we adjust the results for outlet and average tank temperatures (like in the DOE/ASHRAE test methods)?
 - Looking for relative differences between systems

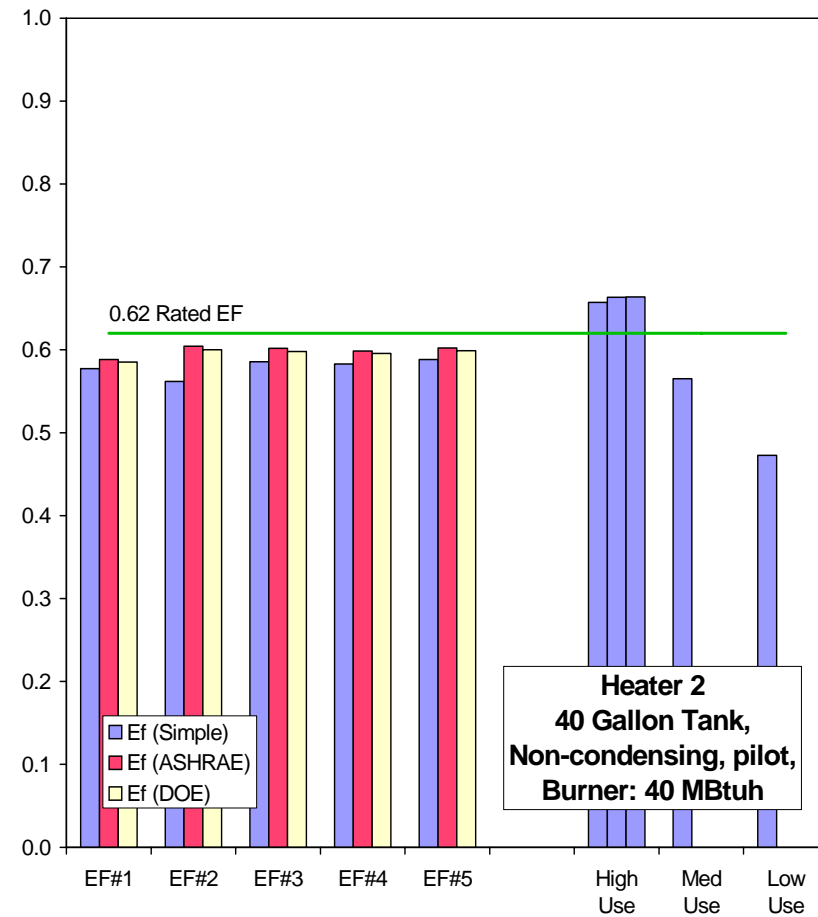
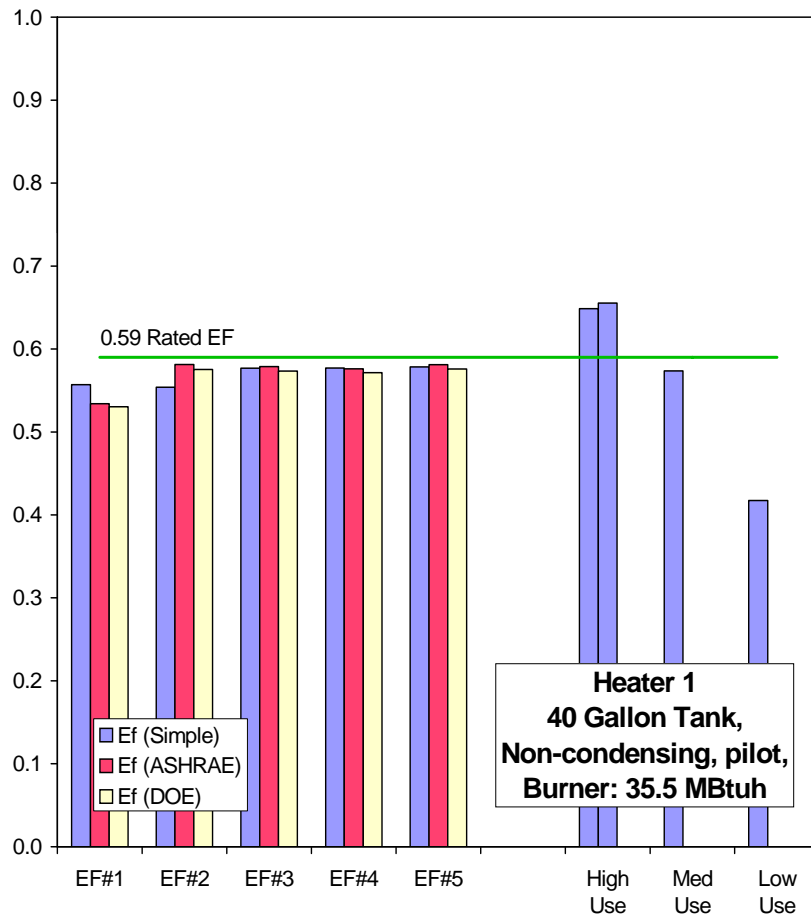


Actual Draw Amounts



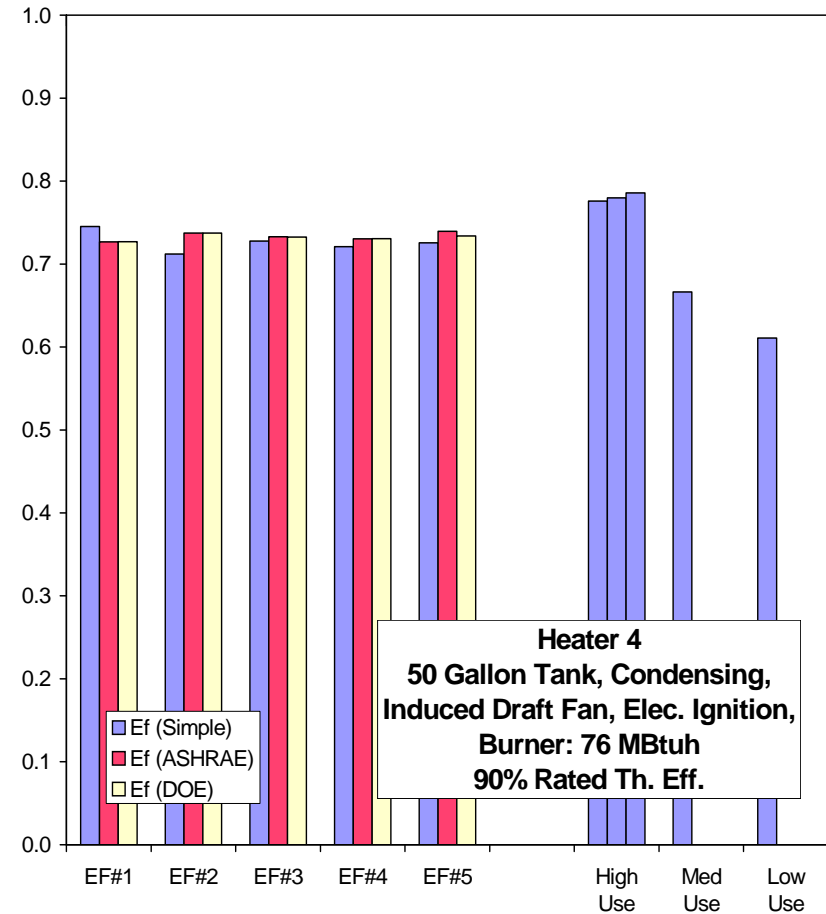
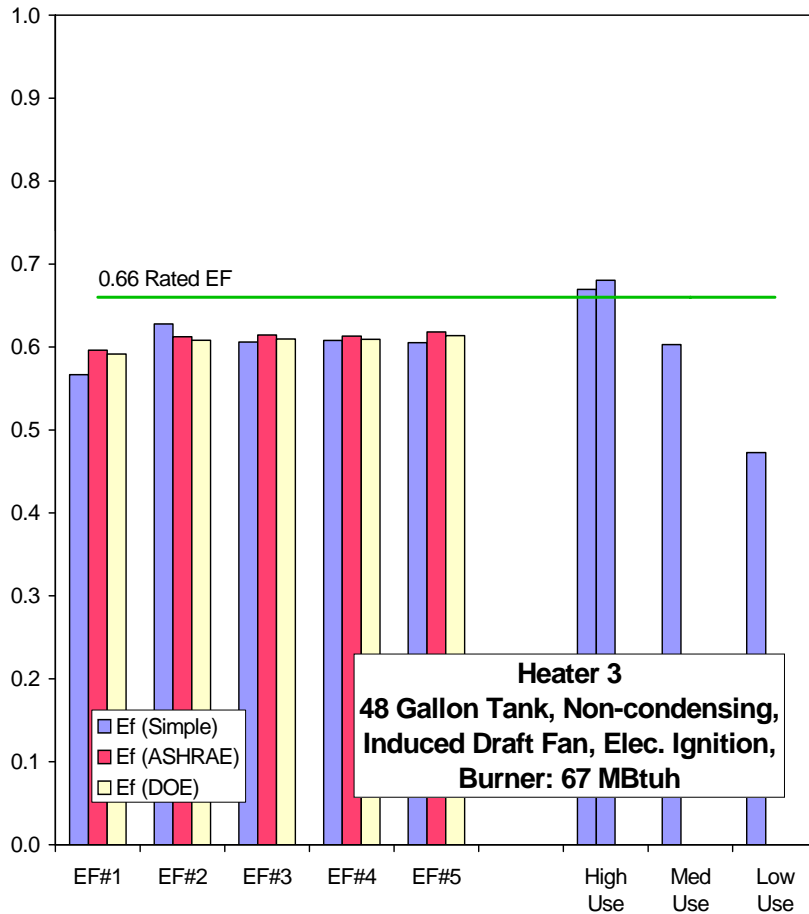


Energy Factors



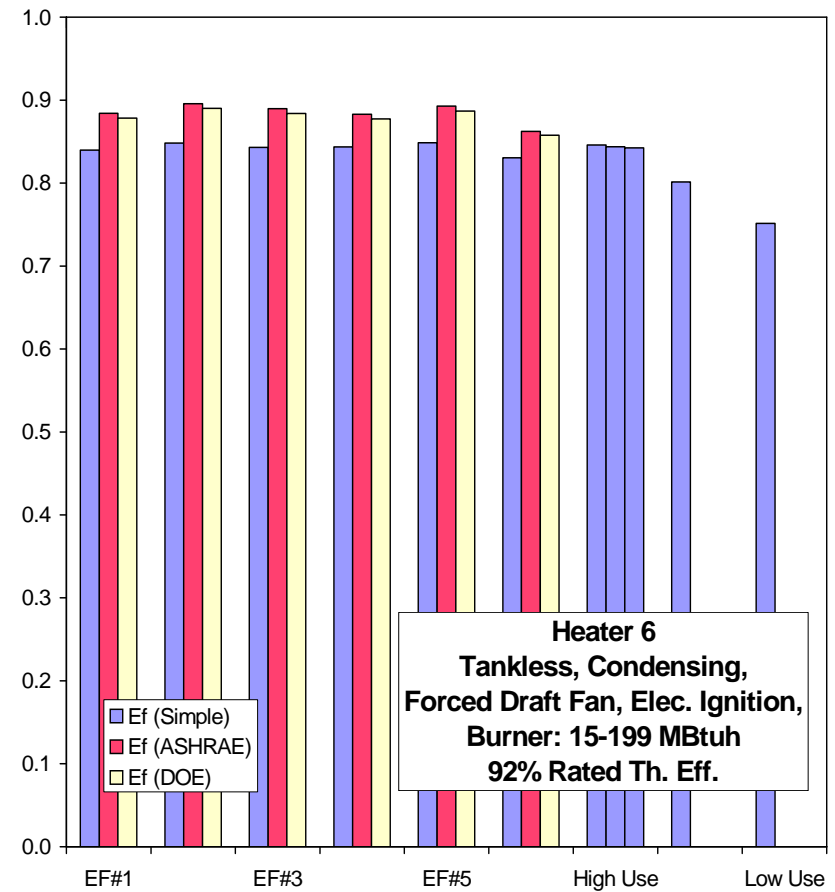
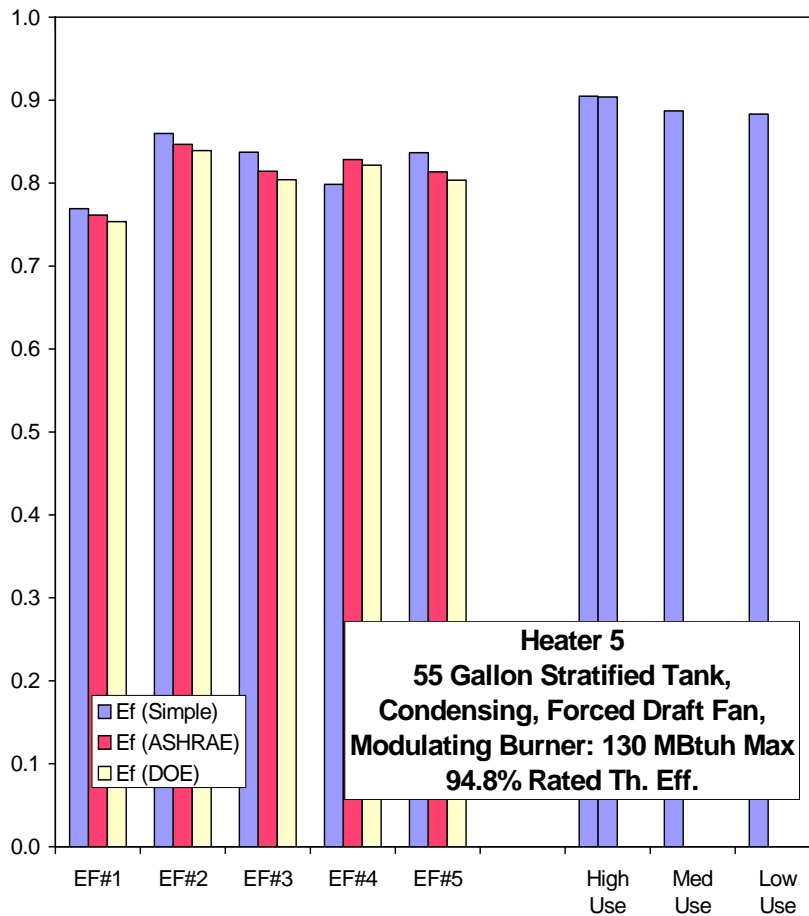


Energy Factors (continued)



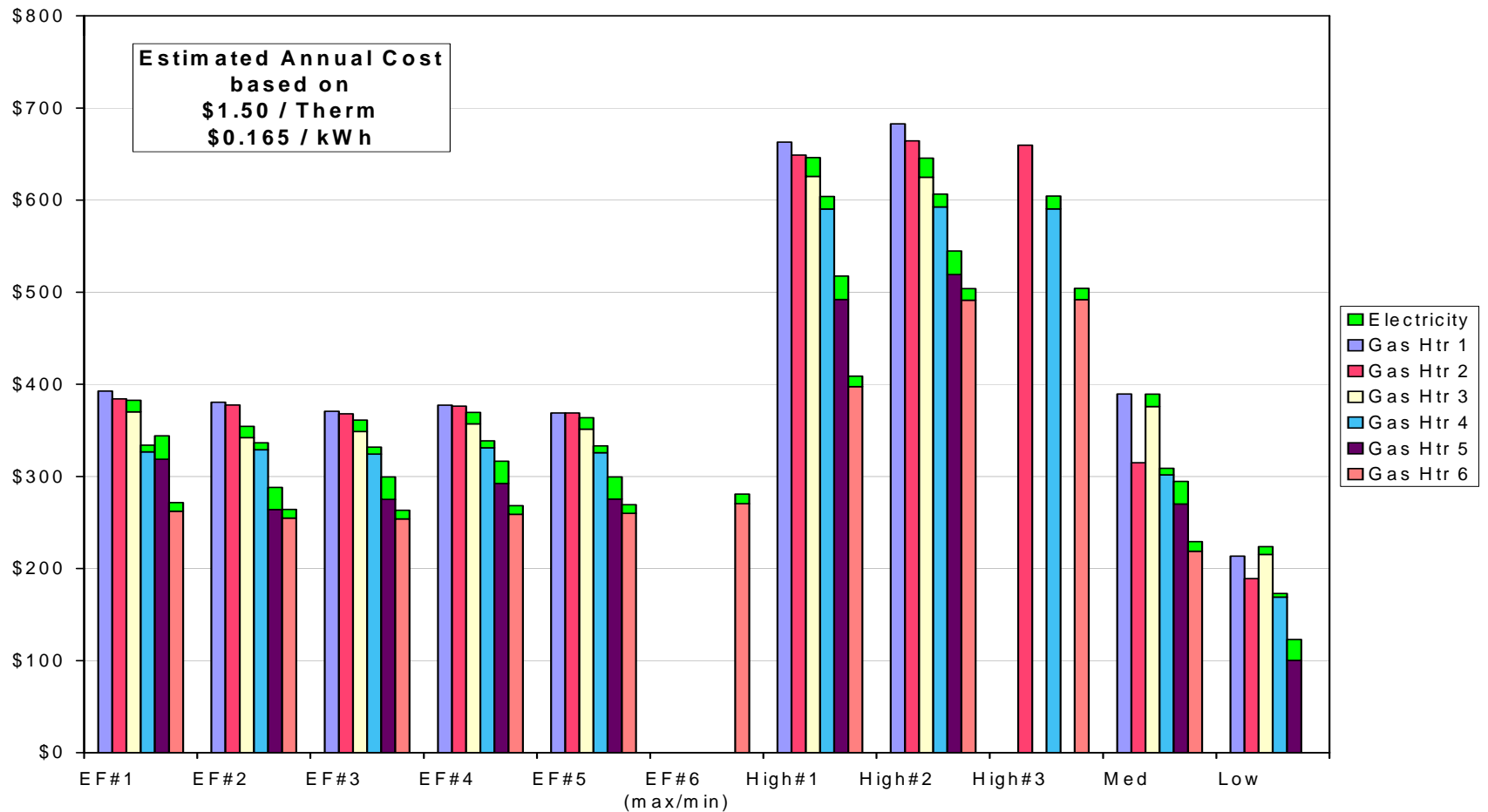


Energy Factors (continued)





Estimated Annual Cost





Observations/Conclusions

- Data is preliminary – still being gathered and processed
- Low EF tank-type heaters appear to have a greater reduction in EF with low usage (higher contribution of standby loss)

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