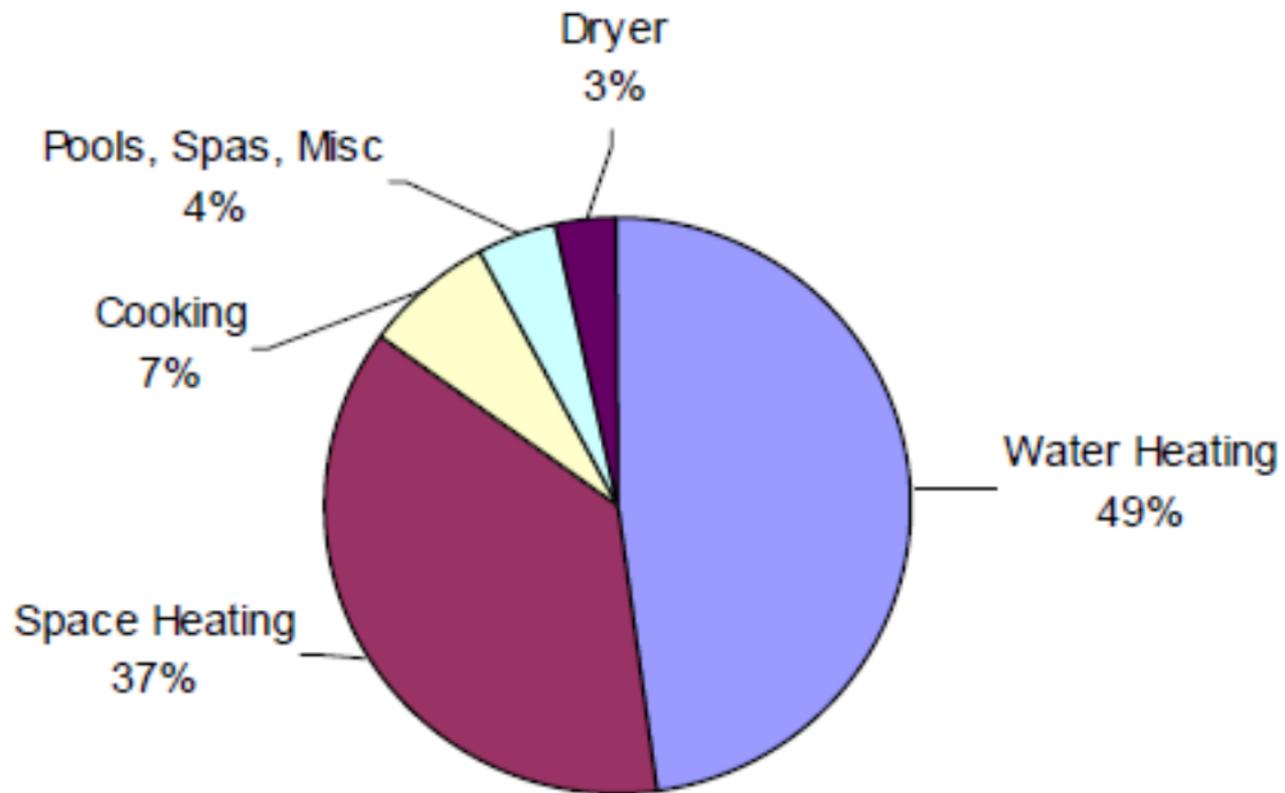


Hot Water in California: Single Family Perspective

CEC Water Heating Workshop
July 16, 2013

Marc Hoeschele, Davis Energy Group
Larry Brand, Gas Technology Institute

California Residential Gas Consumption

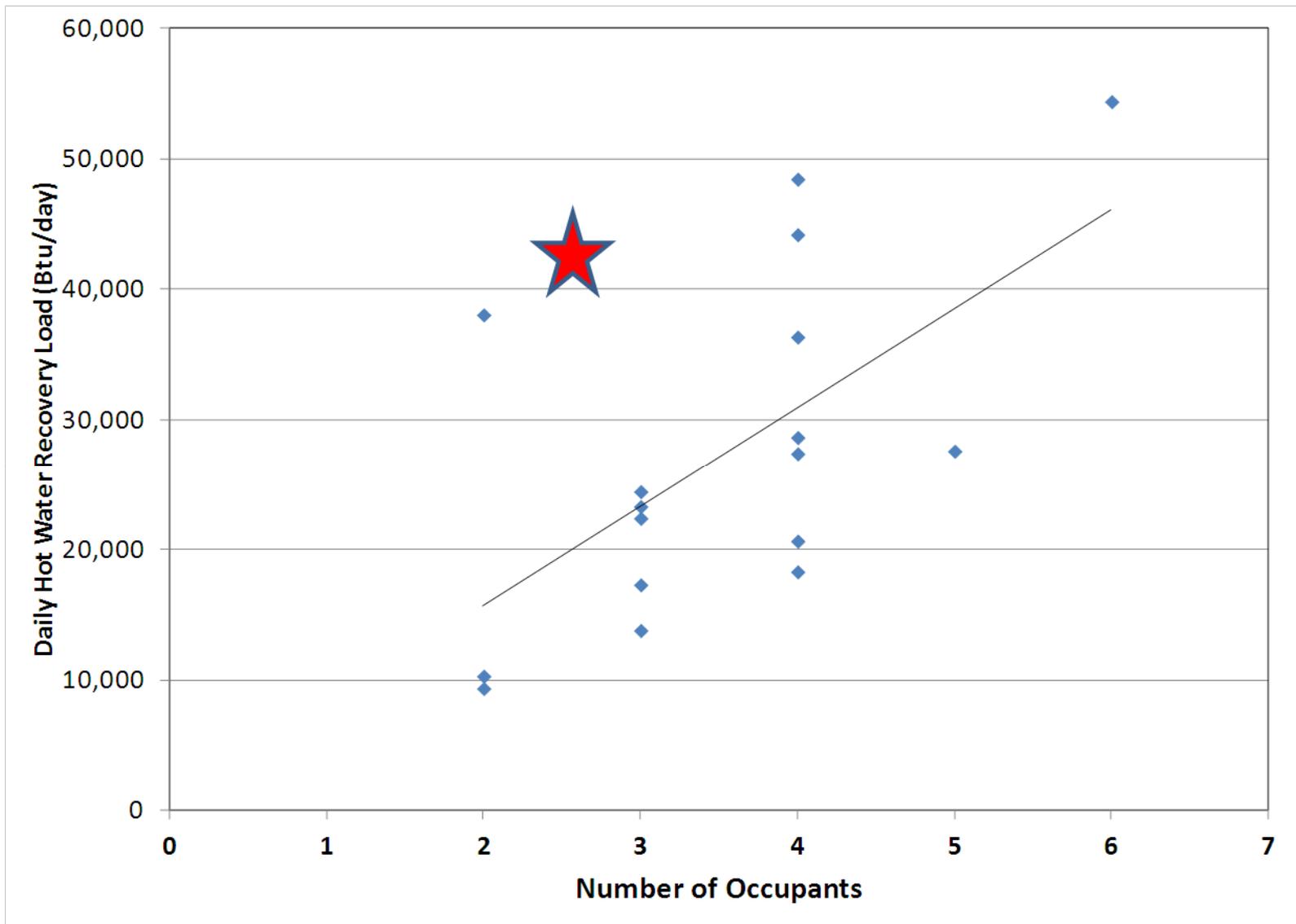


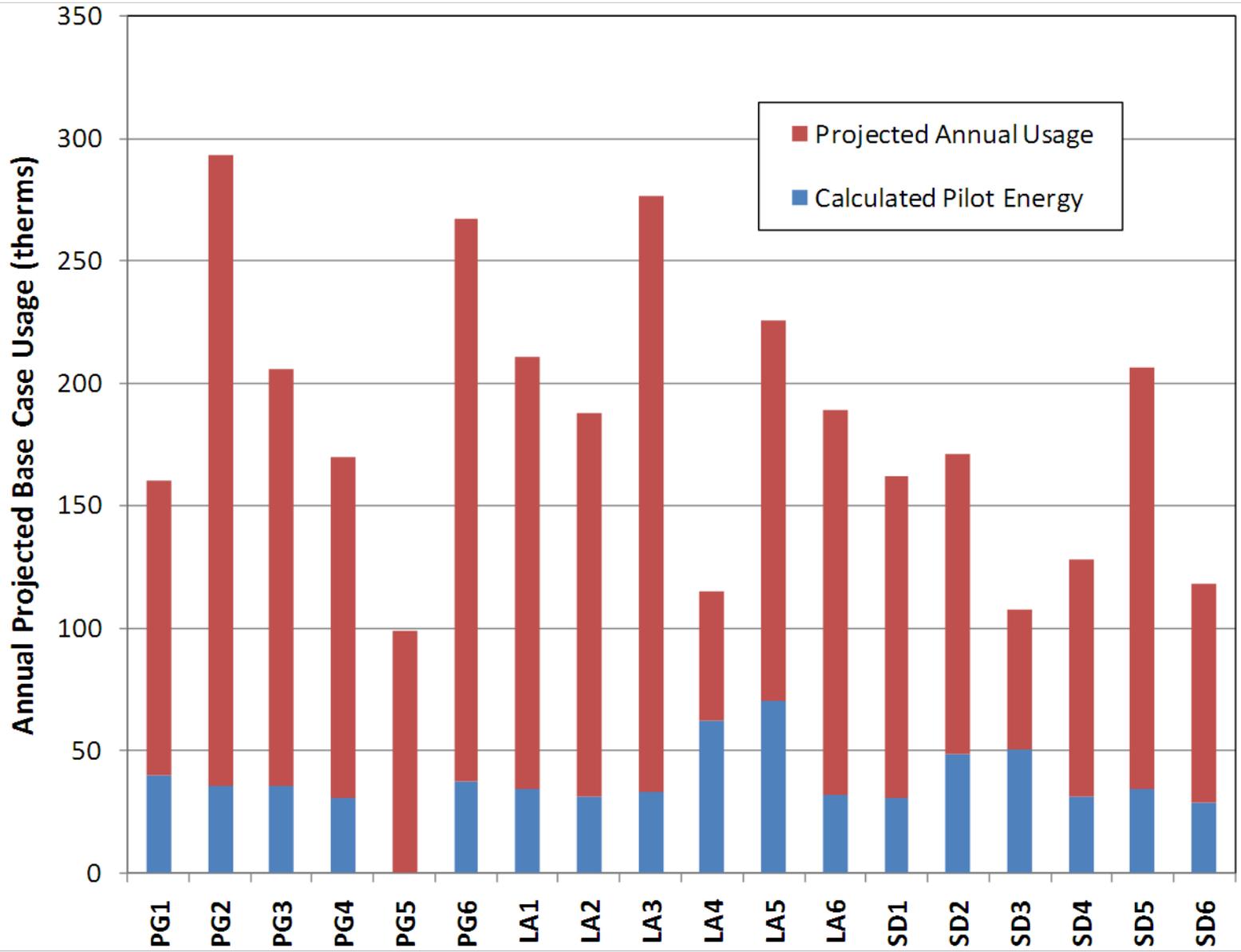
Source: 2010 California Residential Appliance Saturation Survey

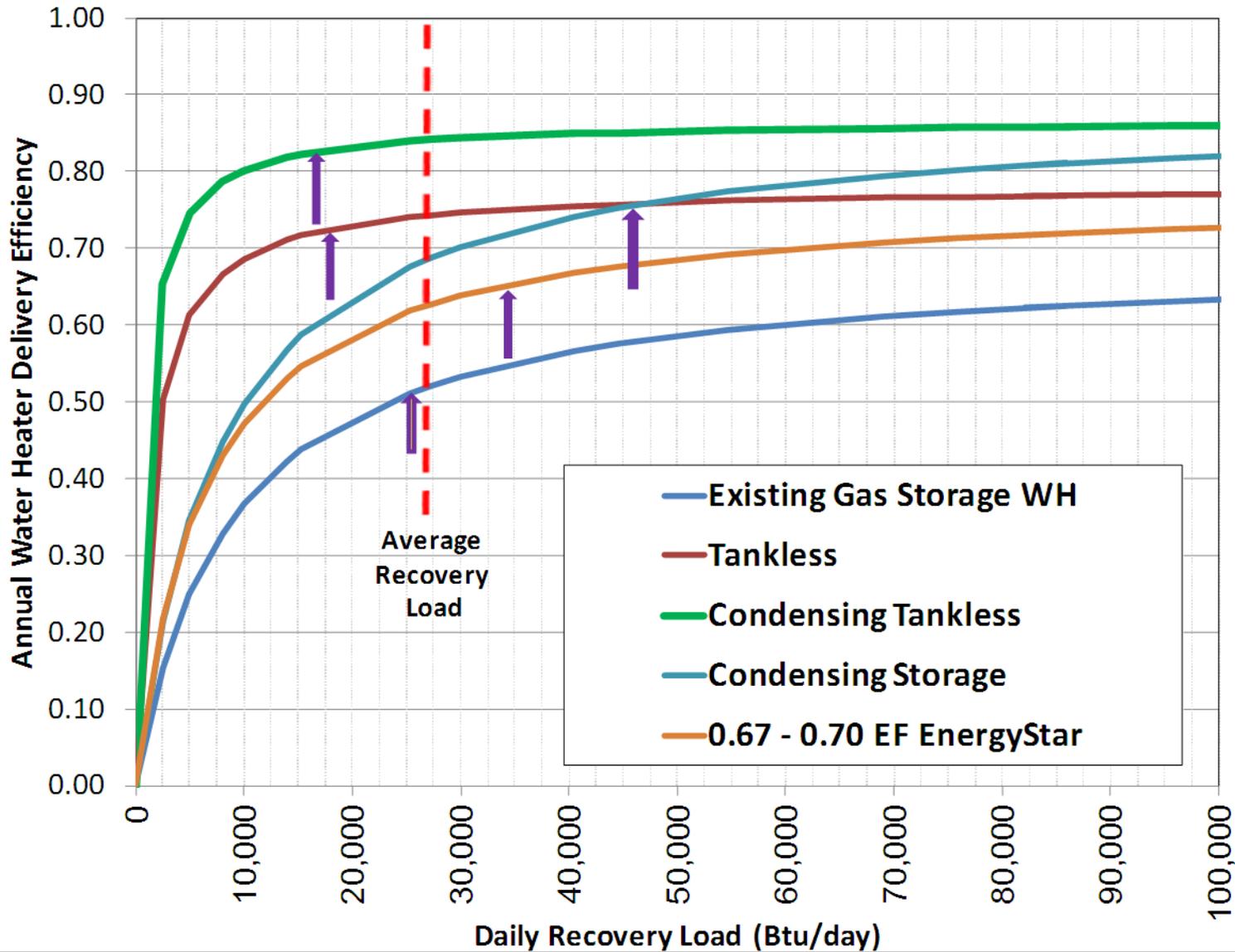
- CEC Energy Almanac (2009 data)
 - $460 \times 10^9 \text{ ft}^3$ Residential natural gas usage
- RASS
 - 193 therms DHW per CA household
 - 88% natural gas saturation (single family)
- 2010 US Census data
 - 12.4 million households, 69% single family
- Single family CA DHW use: $165 \times 10^9 \text{ ft}^3$ ($74 \times 10^9 \text{ ft}^3$ MF)
- Of the SF load, $\sim 34 \times 10^9 \text{ ft}^3$ is gas pilot energy

What's the Latest News....

- GTI PIER Residential Water Heating Program
- “Facilitating the Market Transformation to Higher Efficiency Gas-Fired Water Heating”
 - DEG completed field monitoring at 18 CA homes
 - Both pre- and post-retrofit detailed monitoring over a 14 month period
 - Evaluate advanced gas WH technologies
 - Entry level EnergyStar Storage WHs
 - Condensing and Hybrid Storage WHs
 - Condensing and Non-Condensing Tankless







	Average Rated Efficiency	Monitored Field Efficiency	Efficiency Correction	Adjusted Efficiency vs. Rated Efficiency
Base Storage	0.58 EF	0.504	0.06	97%
EnergyStar	0.675 EF	0.649	0.015	99%
TWH	0.82 EF	0.706	0.03	90%
Cond TWH	0.944 EF	0.774	0.02	84%
Cond Storage	0.916 TE	0.745	(0.01)	80%

The Combo Technology

- **Integrated Heating & Water Heating System**
- Powered by Tankless Technology (.94 EF)
- One Source for home heating, cooling and water heating

1. Tankless Water Heater

- The Rheem tankless water heater serves two purposes in the hydronic system: it provides continuous hot water for use throughout the home. When a call for heat is made, the tankless water heater also acts as the heat-source for air handler, providing both hot water and heating for the home simultaneously.

2. Hydronic Air Handler

- The hydronic air handler features a hydronic heating coil in place of either electric heating elements or gas-fired heat exchangers. When in heating mode, the hydro pump circulates hot water between the tankless water heater and the hydronic coil.

3. Cooling Coil

- In Cooling mode, the cooling coil operates the same as any other



GTI's Combo Systems Program

\$1.2 million invested, \$900k+ in active projects

- > Market analyses
- > Load profiling
- > Lab evaluations
- > System comparisons
- > System improvements
- > Field evaluations
- > EE pilot programs



Energy Savings Over Typical

Combo system: 94% vs. Typical: 78%, 0.59 EF

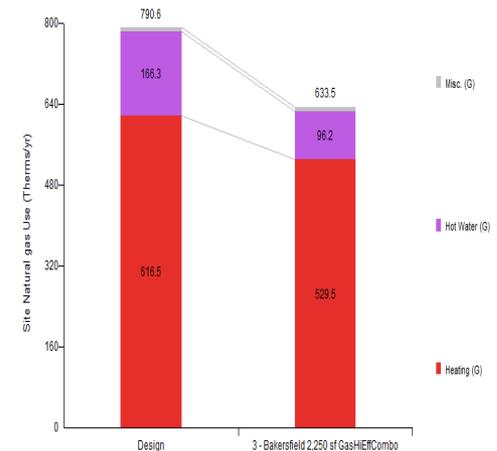
Lab tests indicate 84%-93% fuel efficiency, thus not achieving consistent condensing operation

> Estimated Annual Energy Savings

- Cold: up to 230 therms
- Moderate: up to 140 therms

> Estimated Annual Cost Savings

- Cold climates: up to \$230
- Hot climates: up to \$140



Gas Utility Pilot Program

- > 90 EF+ tankless water heater + hydronic air handler (from manufacturing partner)
- > Targeting at least 40 residences with mid-efficiency forced air furnaces
- > At least 5 fully instrumented residences with data acquisition systems (PARR supported)
- > Field performance, measured energy savings, cost analysis, customer reaction
- > Contractor technical/sales training, consumer messaging, rebate structuring

Overcoming Perceived Barriers

- > Manufacturer distribution channels identified perceived code barrier
- > Inspectors prohibiting combo systems?...
 - > Perception stemmed from past makeshift installs
 - > No means for water circulation, lack of proper labeling
- > New packaged combo systems address the previous issues
- > Lack of knowledge prevented adoption of new tech within the trade
- > Training and contractor education helped alleviate code misperception

Areas for Roadmap to Focus on:

- Equipment
 - Conventional equipment handled reasonably well
 - How to deal with HPWHs and other emerging products (e.g. drain heat recovery, 3 function HPs)?
 - Combined hydronic: identify optimized designs; compliance method needs work; ratings inadequate
- How do we get good plumbing design?
 - Do we have good enough information and models to model distribution systems well?
 - Develop “compact house design” that provides for both envelope UA, duct UA, & plumbing distribution credits?
- Improve understanding of load patterns & load seasonality