



COST EFFECTIVE WATER HEATING SOLUTIONS

Alliance for Residential Building Innovation

Marc Hoeschele, Davis Energy Group

Context

Why Important? Current mainstream atmospheric gas storage and electric storage water heaters make it difficult to reach 50% savings goals.

❑ Opportunities

- ❖ Water heating budget is significant
- ❖ Efficient technology options exist

❑ Problem

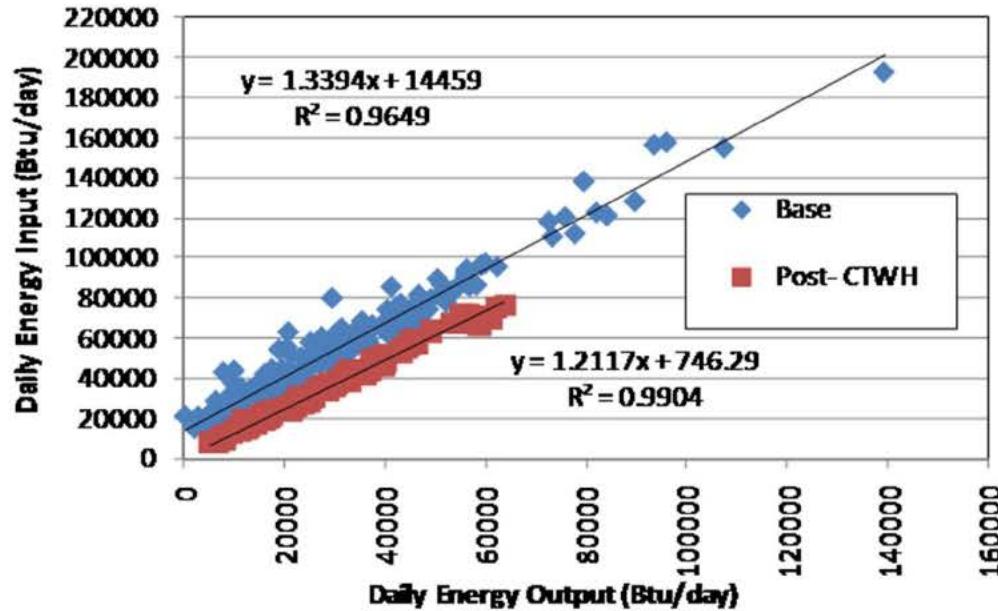
- ❖ Limited cost-effective product selections for retrofits (especially gas)
- ❖ Plumbing industry business-as-usual approach
- ❖ Lack of homeowner knowledge— they just want hot water
- ❖ Emergency replacements



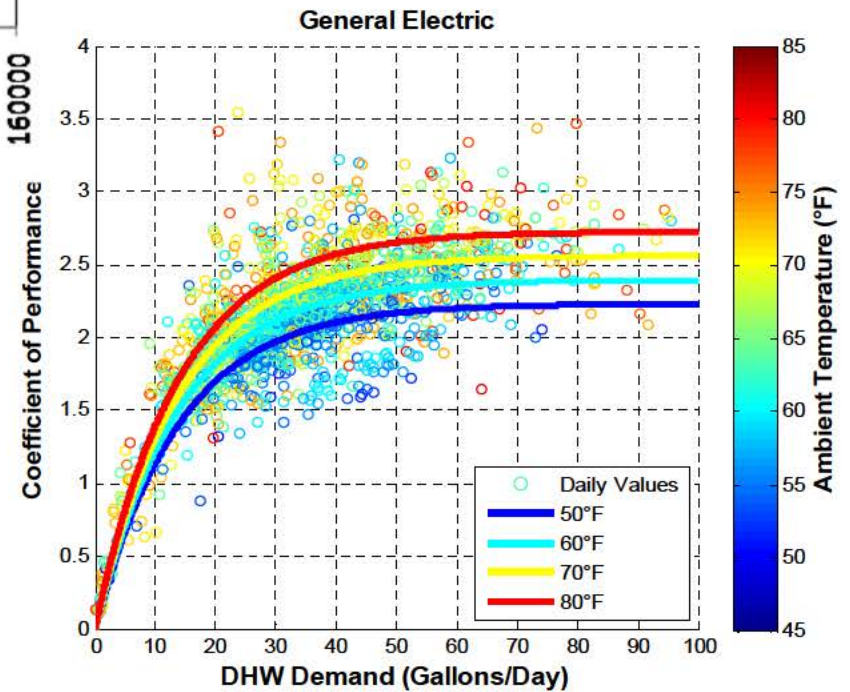
Technical Approach

- ❑ Develop an easy-to-use guideline to allow for application-specific water heater selection
 - ❖ Based on monitored field performance (CEC PIER California study and CARB New England HPWH data)
 - ❖ Assess performance based on product type, hot water use variations, utility costs, climate
- ❑ Issues
 - ❖ How to implement--- how to reach the markets
 - ❖ Technologies are always changing/improving
 - ❖ Recommendations based on cost-effectiveness tend to avoid best available technologies

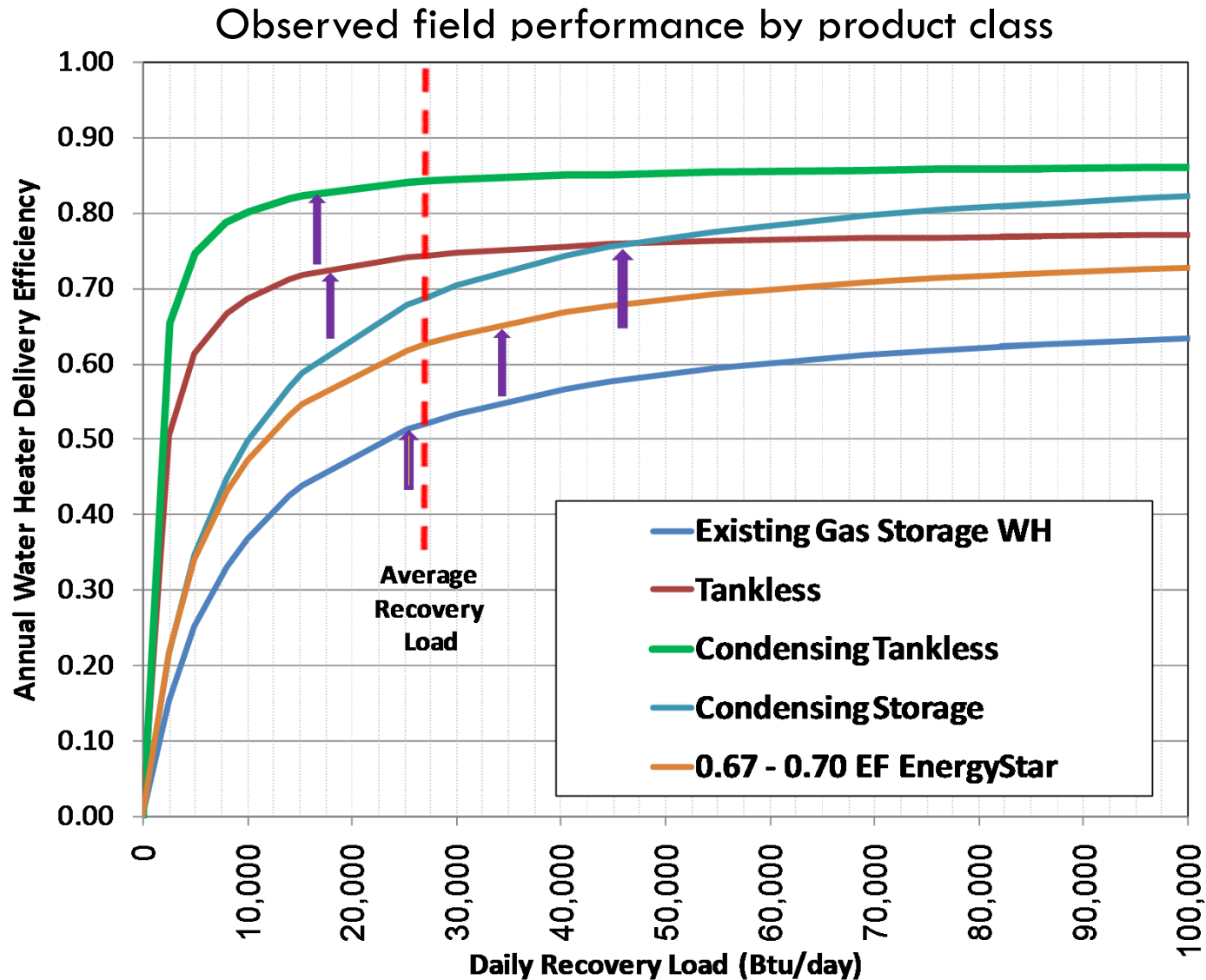
Field Monitored Efficiency



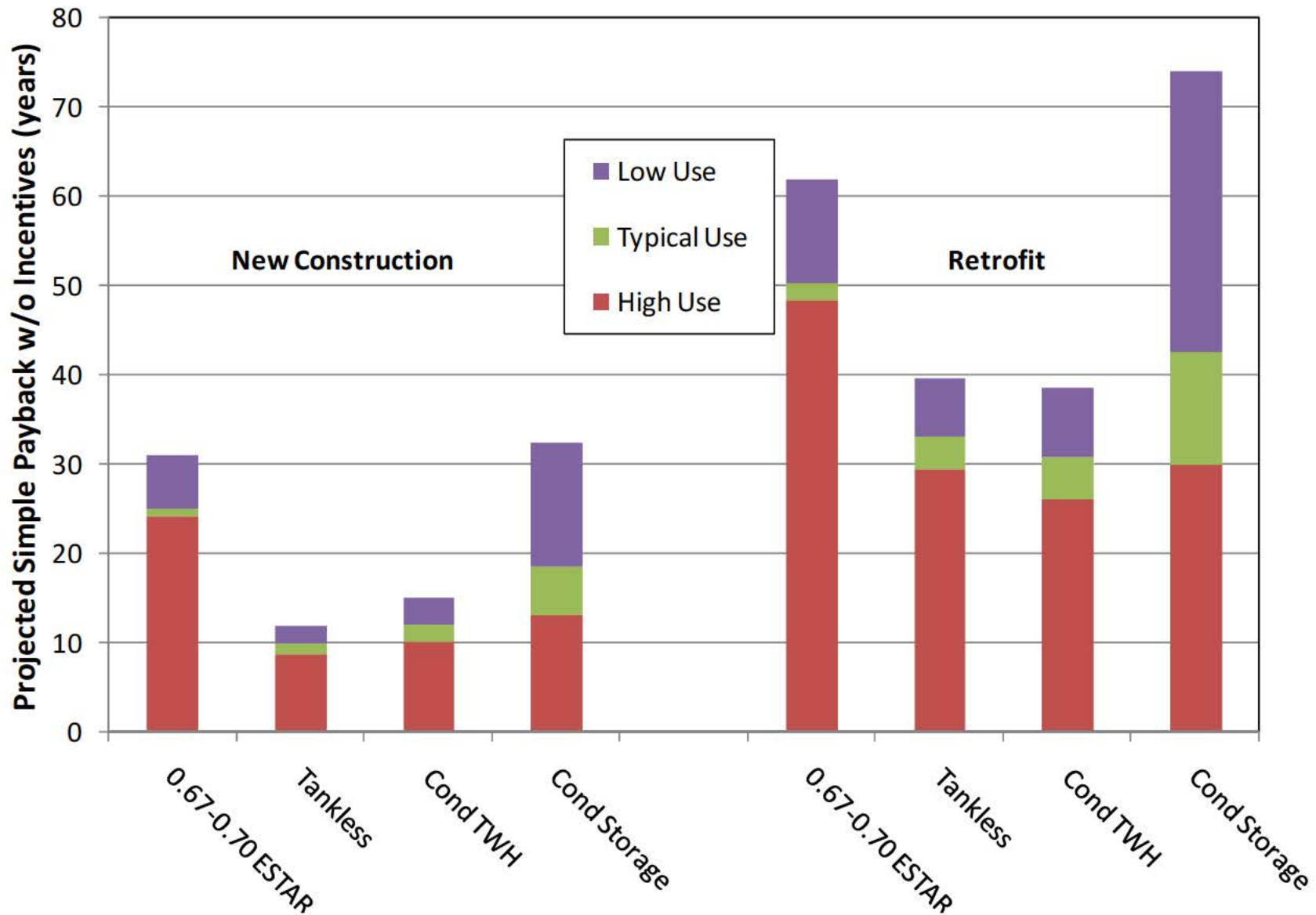
HPWH Data
(courtesy of CARB)



Gas Water Heater Efficiency Comparison



Projected Gas Water Heater Economics



Recommended Guidance

The 80% solution for **Gas** and **Electric** WH's

	Low Loads (<20 kBtu/day load)	Moderate Loads (+/-30 kBtu/day load)	High Loads (>40 kBtu/day load)
New Construction			
Adequate Water Quality	TWH	TWH	TWH/CSTO
Poor Water Quality	0.62 EF GAS/TWH(1)	TWH(1)/CSTO	TWH(1)/CSTO
> 5000 HDD	0.92 ELECTRIC	0.92 ELECTRIC	0.92 ELECTRIC
< 5000 HDD	HPWH(2)	HPWH(3)	HPWH
Retrofit			
Gas	Standard 0.62 EF WH unless high natural gas costs (>~\$1.50/therm), in which case recommendations consistent with new construction		
Electric	Consistent with new construction recommendations		

Notes:

- (1)- If water quality can be addressed and unit will be maintained
- (2)- If electric rates high (>\$.15/kWh)
- (3)- If electric rates above average (>\$.10/kWh)



Value

- ❑ **Practitioners** (Plumbing and home performance contractors)
 - ❖ Provides informed guidance that they currently lack
 - ❖ Allows them to better up-sell
- ❑ **End users**
 - ❖ Provides quantification of cost-effectiveness
 - ❖ Reduces confusion in the water heater selection process
 - ❖ Facilitates decision making prior to WH emergency
- ❑ **Manufacturers & Suppliers**
 - ❖ Provides guidance on what products should be marketed in particular area
 - ❖ Stimulates development of lower cost, higher performance products

Market Readiness

- ❑ Can be implemented as recommended practice through several vehicles:
 - ❖ Trade publications (Reeves Journal, Home Energy, Builder, etc.)
 - ❖ Building America website
 - ❖ Local utility training programs

Pros and Cons

□ Pros

- ❖ Reduces homeowner utility costs
- ❖ Informs plumber/homeowner of relative cost-effectiveness of various options, allowing for better decision making
- ❖ Improves knowledge base and practices of contractors and suppliers

□ Cons

- ❖ Service infrastructure may not be fully in place
- ❖ Inertia of current practice difficult to overcome
- ❖ May not always send the energy efficiency signal



References

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- ❑ Hoeschele, M., D. Springer. 2008. “Field and Laboratory Testing of Gas Tankless Water Heater Performance”. ASHRAE Transactions, vol. 114, pt. 2.
- ❑ Pigg, S., D. Cautley, and A. Mendyk, 2010. “Energy Use by Residential Gas Water Heaters- A Technical Field Study in 10 Wisconsin Homes”. Energy Center of Wisconsin. Report Number 254-1.
- ❑ Schoenbauer, B., M. Hewett, and D. Bohac, 2011. “Actual Savings and Performance of Natural Gas Tankless Water Heaters”. ASHRAE Transactions, vol. 117, pt.1, 657-672.
- ❑ Shapiro, C., S. Puttagunta, and D. Owens. 2012. “Measure Guideline: Heat Pump Water Heaters in New and Existing Homes”. Building America report completed by CARB.

