



Combined Space and Water Heating

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Tim Kingston, R&D Manager | GTI
tkingston@gti.energy | 847.768.0936

Combined Space and Water Heating

Baseline

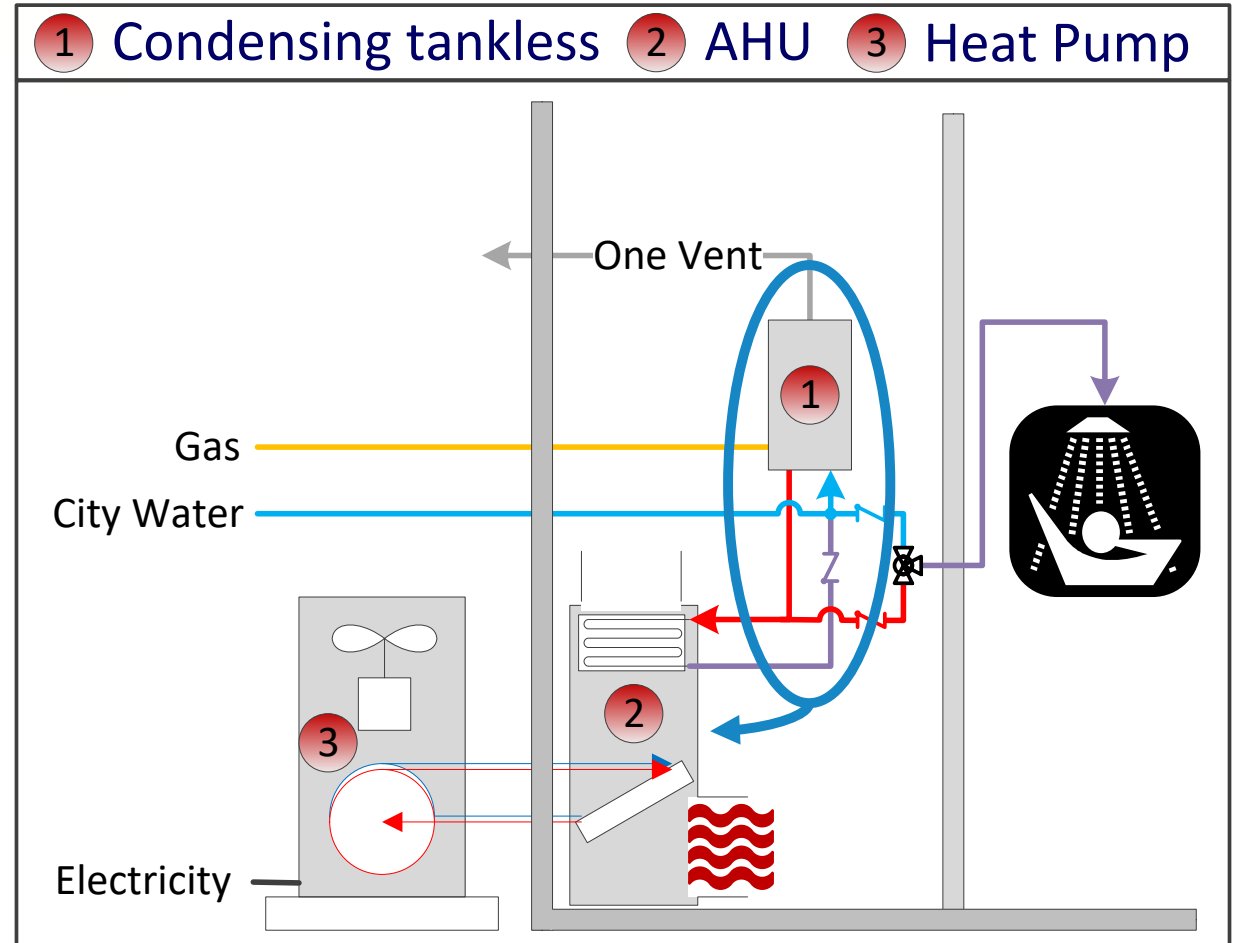


Advanced



Combined Space and Water Heating

- > **One thermal engine**
 - Tank or tankless
 - Open or closed loop
- > **Outdoor unit integration**
 - Condenser for AC
 - Heat pump for AC/heat
- > **Air Handler Unit (AHU)**
 - Replaces furnace
 - Hydronic coil
 - Refrigerant coil



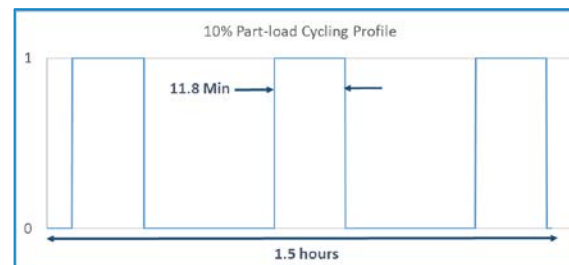
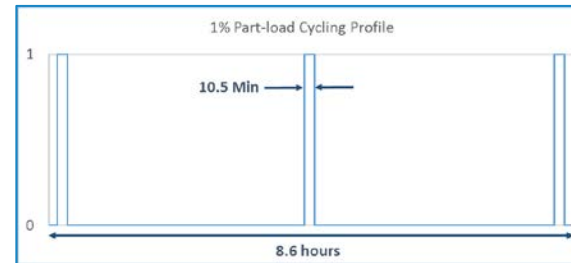
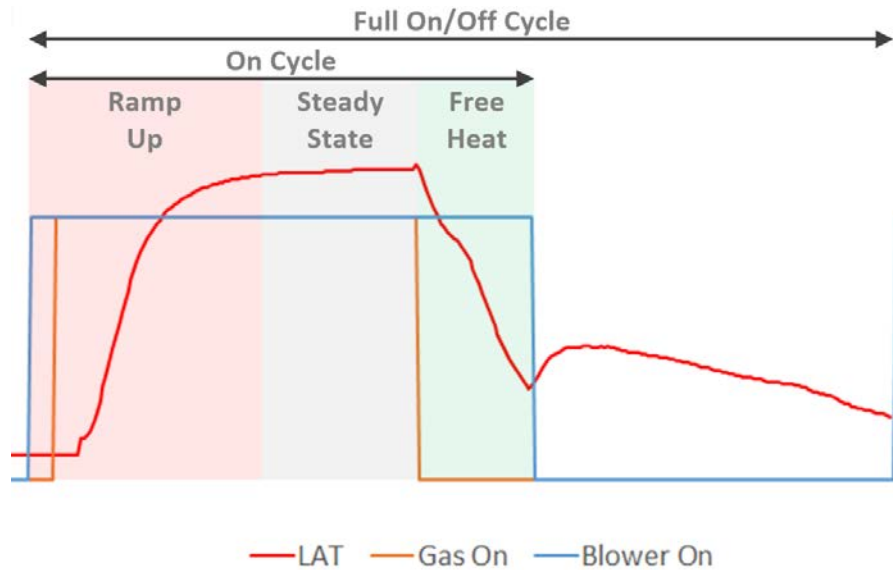
Virtual Test Home – Performance Characterization



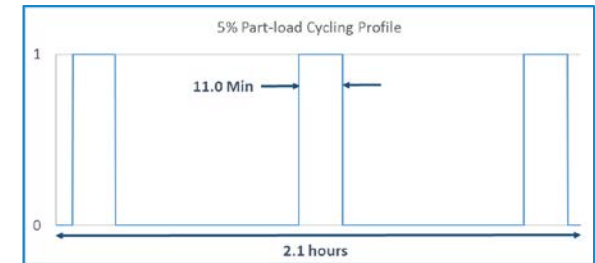
- Simulated use evaluations
- Controlled repeatable environment
- Side-by-side homes in the lab
- Multi-point characterizations



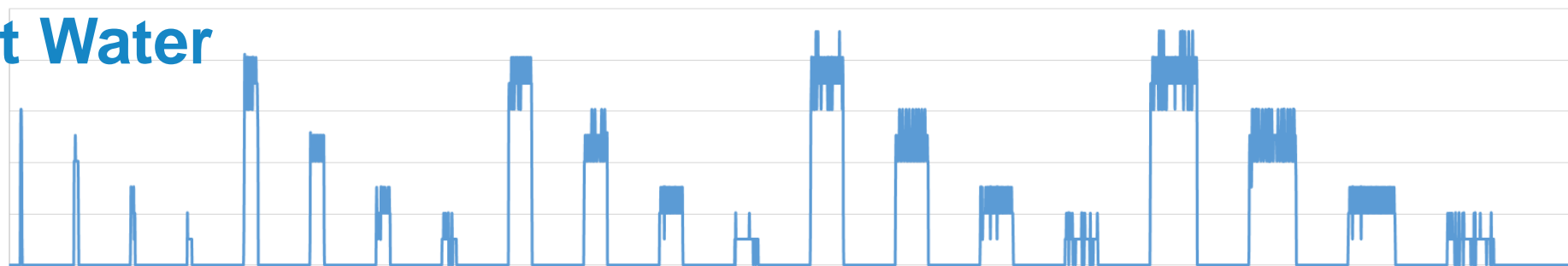
Simulated Use – Part-load Performances



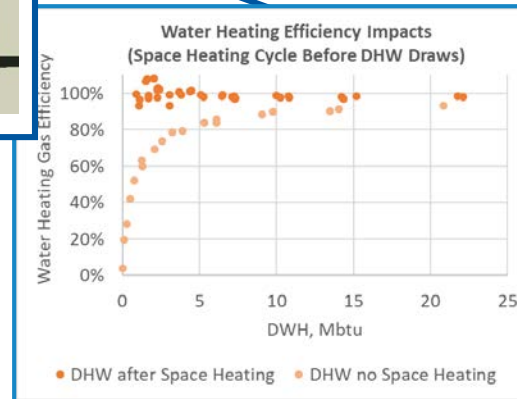
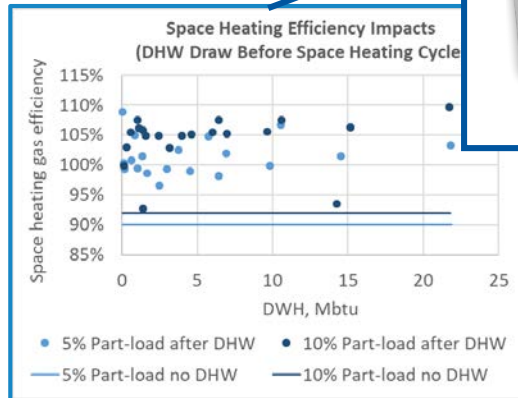
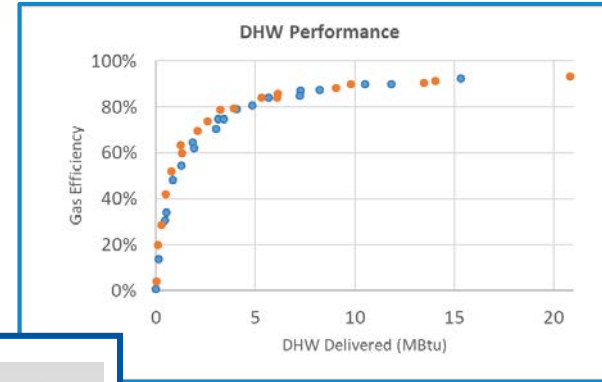
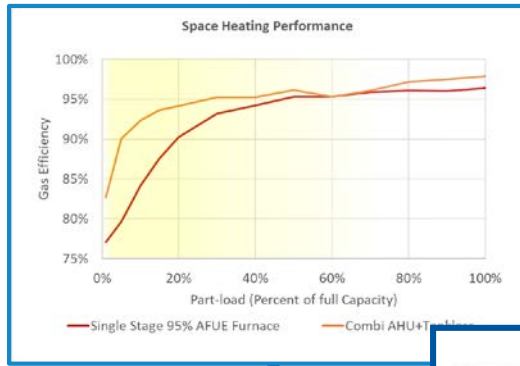
Space Heating



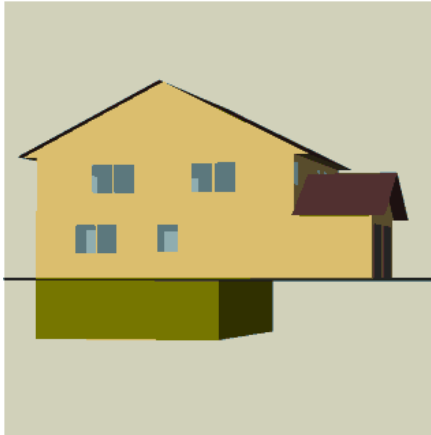
Hot Water



Energy, Environmental Impact, Cost - Quantification



Equipment Performance Characterizations



1,600 sq-ft

Reference Model

2009 IECC building code



Furnace
95%
AFUE



Heat Pump
17 SEER
10 HSPF

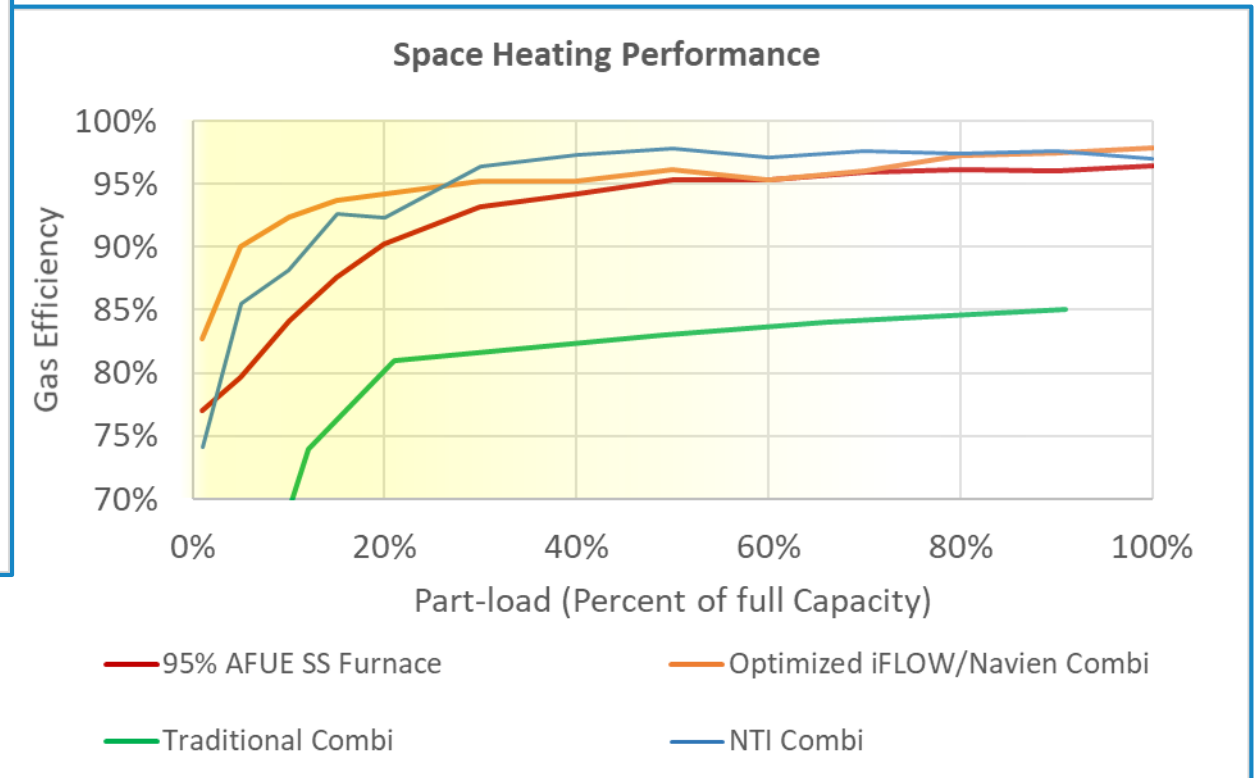
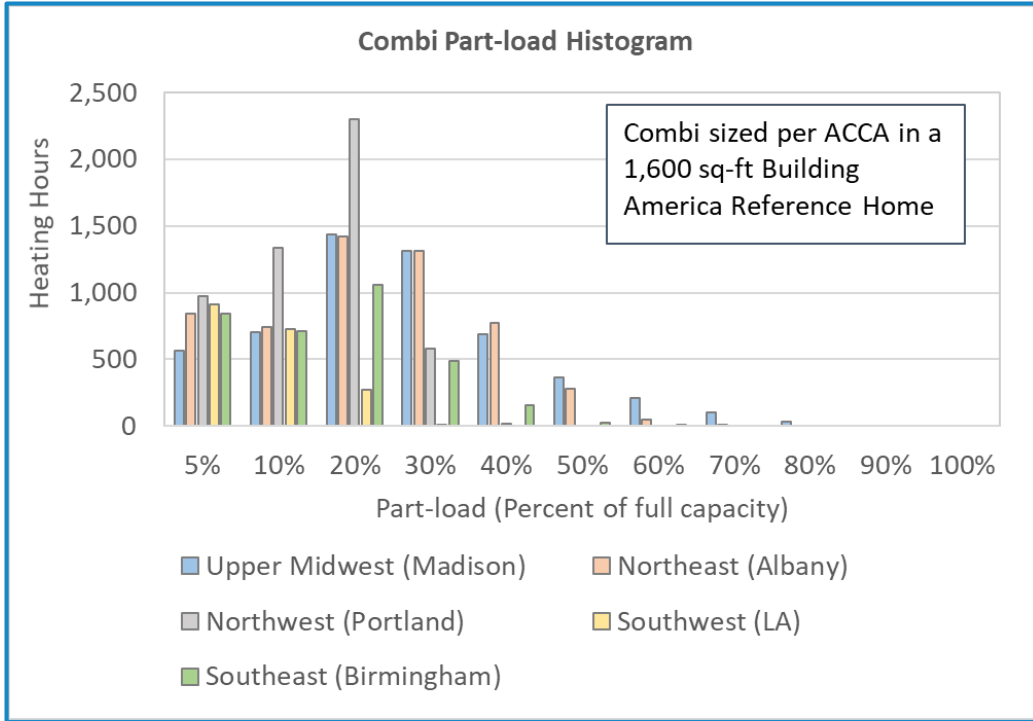


Combi
97% AFUE
(NTI)

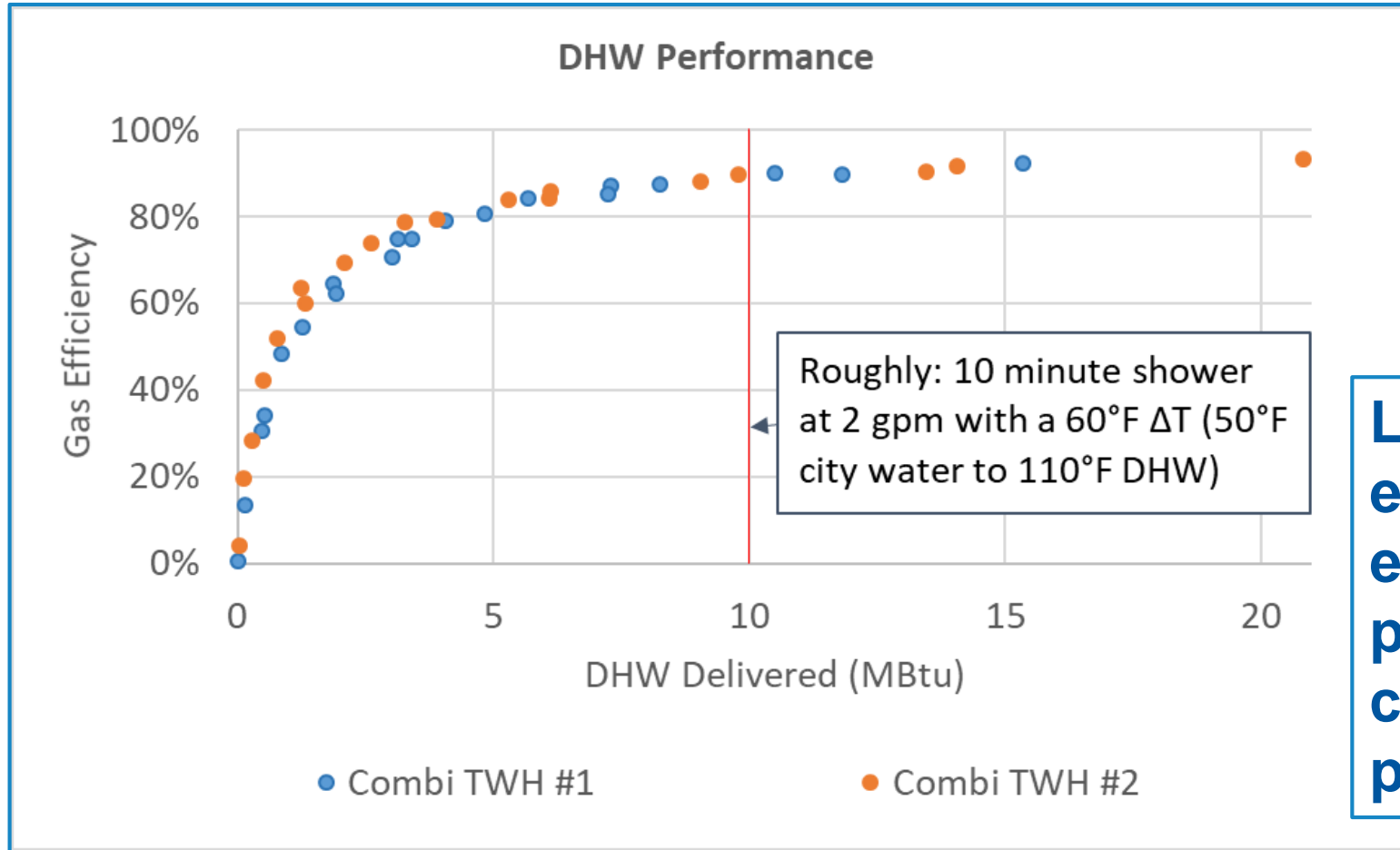


Combi
97% AFUE
(Navien/iFLOW)

Combi Space Heating Performance

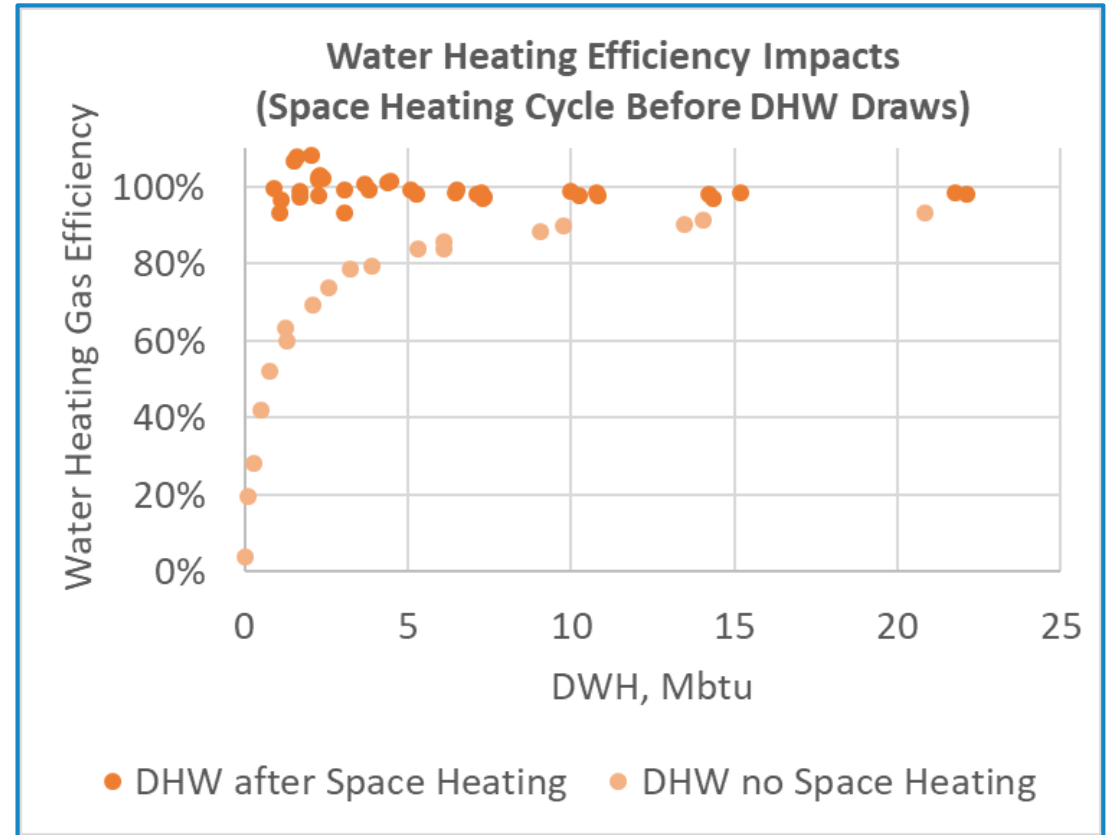
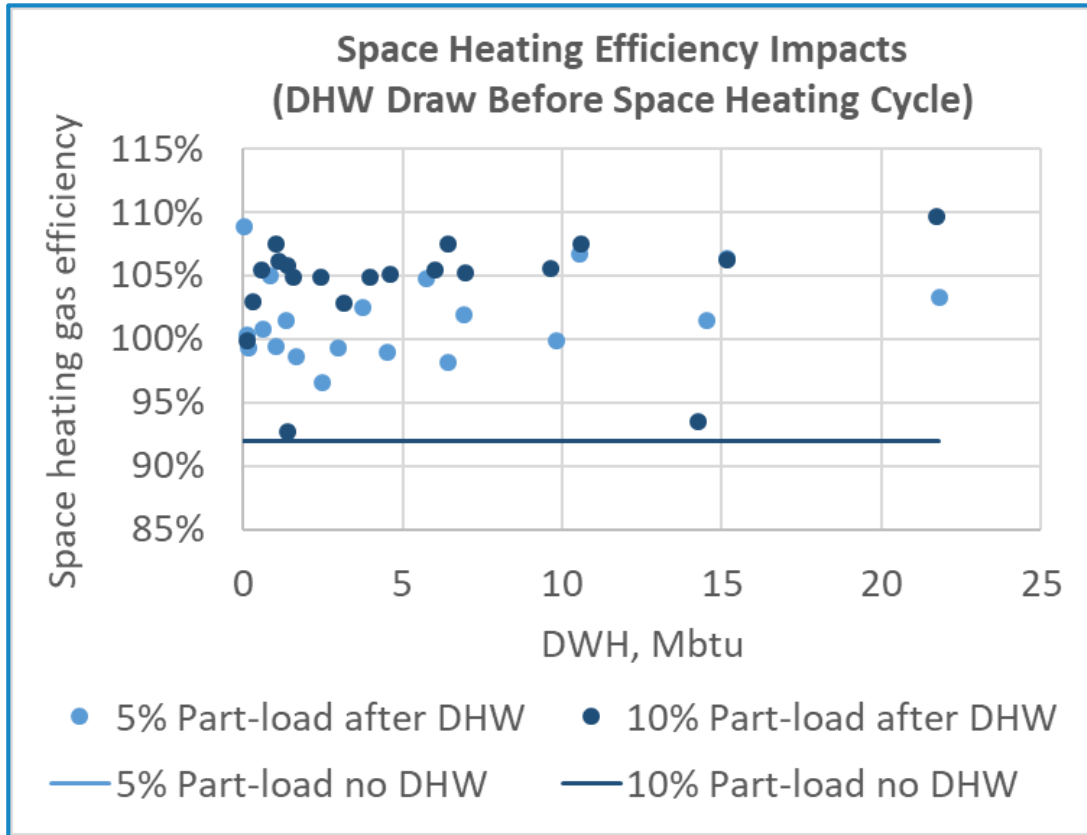


Combi Water Heating Performance

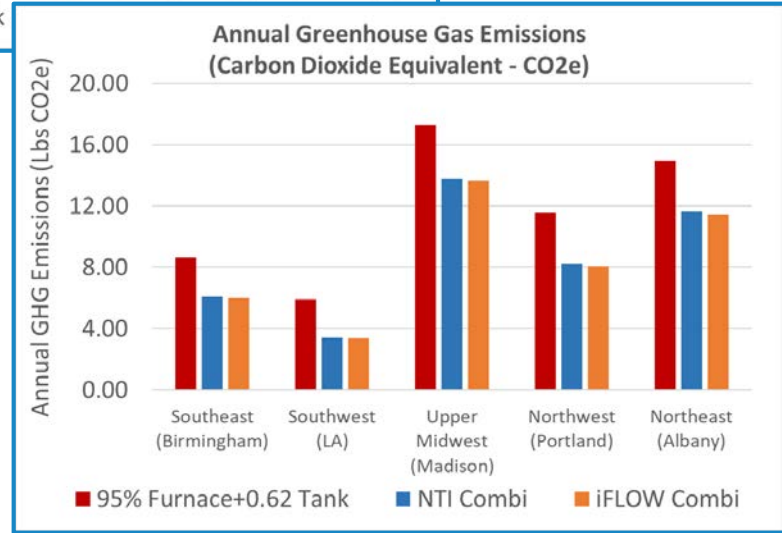
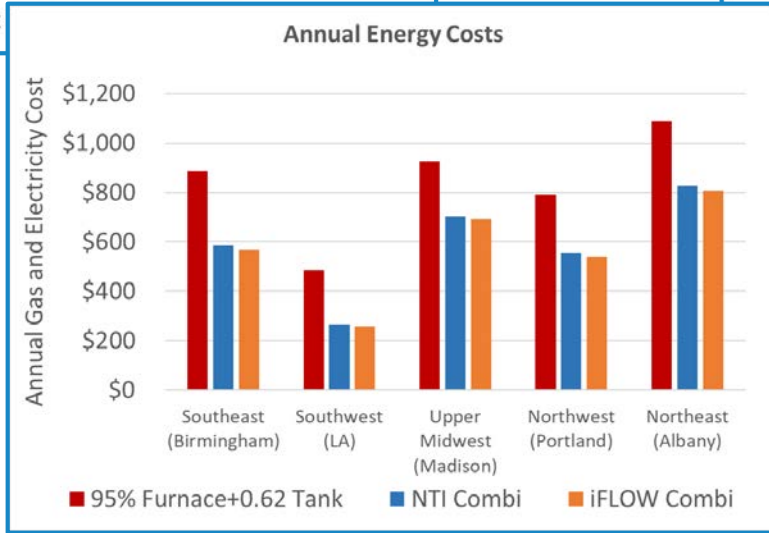
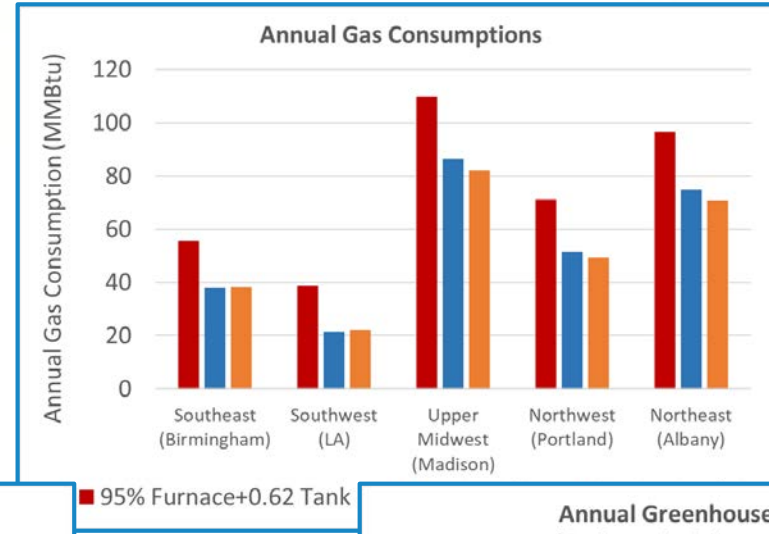
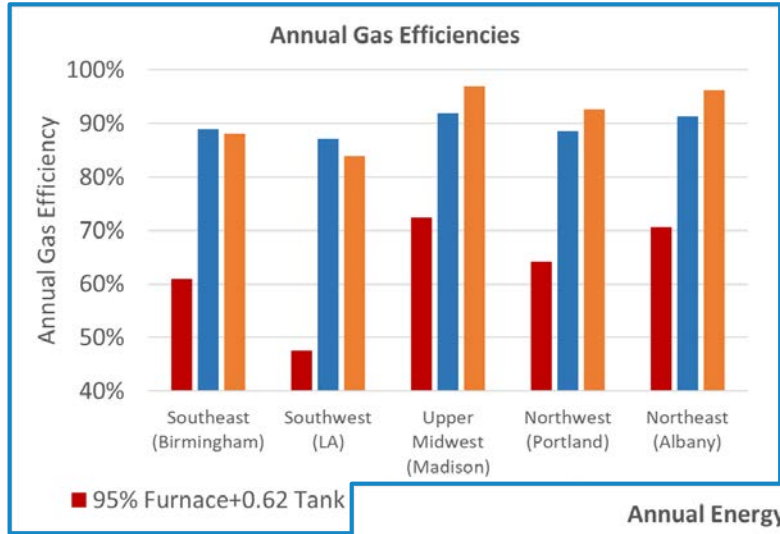


Like space heating efficiency, water heating efficiency depends on part-loads and can be characterized and predicted.

Combi Contiguous/Coincidental Performance



Combi Energy, Environmental, and Cost Impacts



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