Session 7B

ACEEE 2018 Hot Water Forum

Optimal Approaches for Space Heating with Combi Systems

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Overview

Integration

An integrated systems approach requires optimization to attain highest system efficiencies.
HOW BEST TO GUIDE OPTIMIZATION

Characterization

 Appliance efficiency metrics used in Energy Efficiency Program forecasting, policy and decision-making limit potential savings.
ALTERNATIVE EFFICIENCY METRICS ARE WARRANTED

Simulation

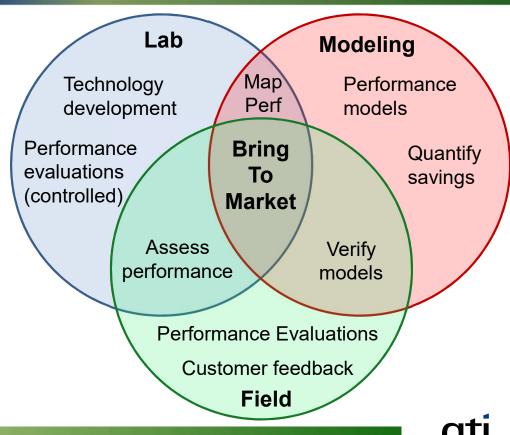
 Simple appliance curves in energy efficiency software does not adequately simulate performance.

ACCURATE PERFORMANCE CURVES ARE NEEDED

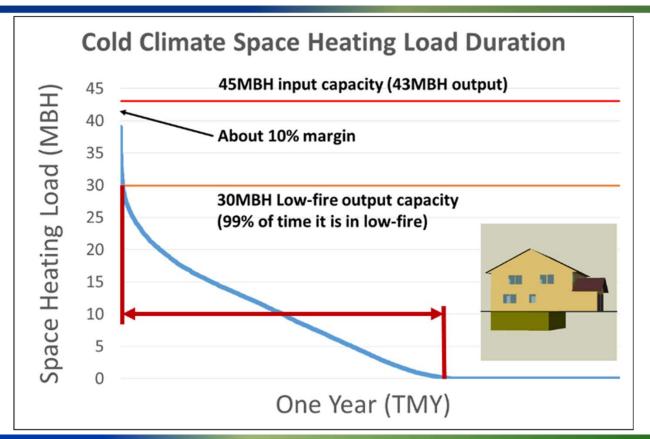
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An Holistic Approach to R&D

- > "Virtual Test Home" in the lab
 - Data sets for performance mapping
- > Modeling Software development
 - Advanced Energy Plus modules
- > Building Energy Analysis
 - Identify technology gaps
 - Quantified energy savings
- > Field Demonstration projects
 - Pilots, feedback, training

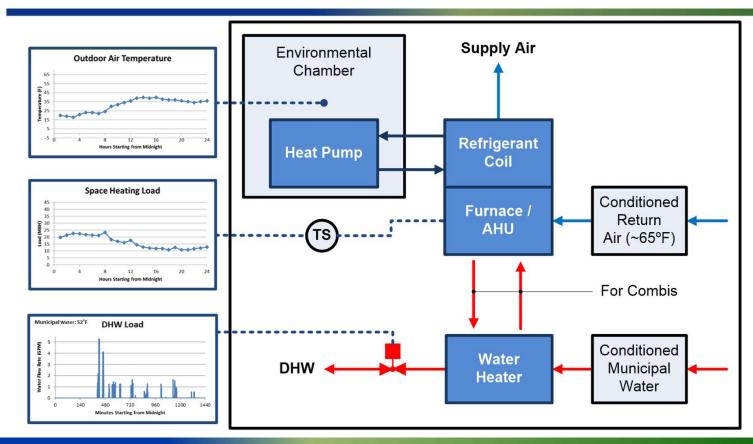


Critical to Characterizing Part-load Performance



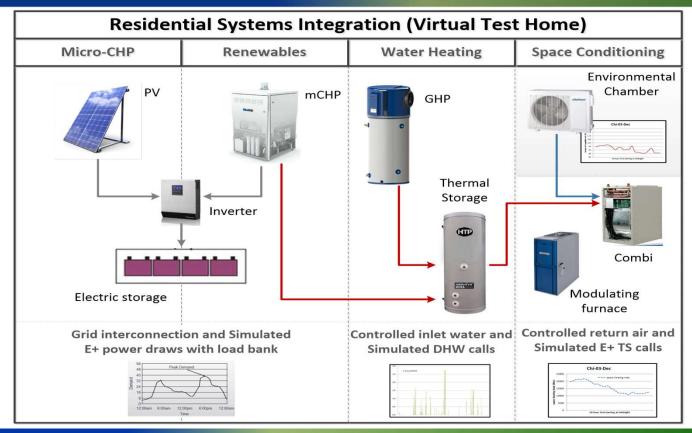


The Virtual Test Home (Phase 1)



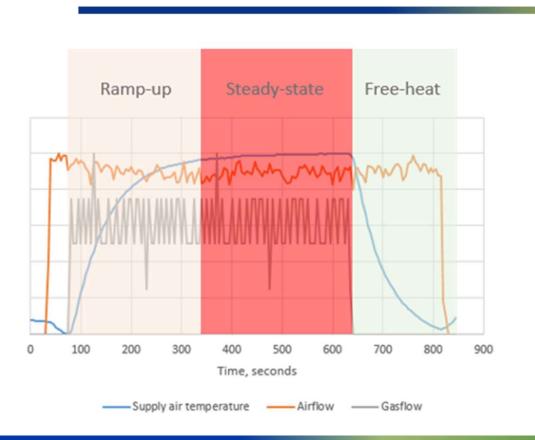
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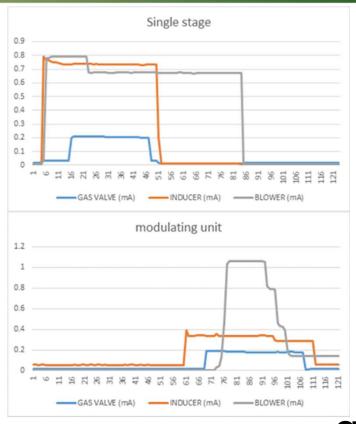
The Virtual Test Home (Phase 2)





Forced-air Heating Systems Characterization

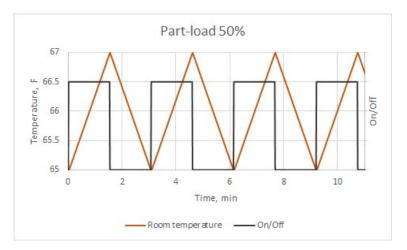


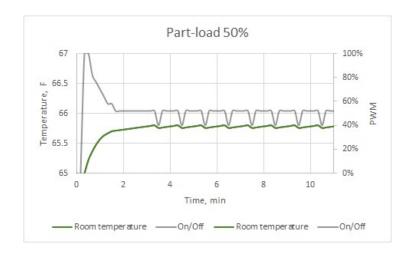


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Thermostat Cycling Simulation

- > Calculated heat delivered: Based on continually measured airflows and temperatures
- > Calculated conditioned space temperature: Based on required and delivered heat
- > Assumes 2°F conditioned space dead band

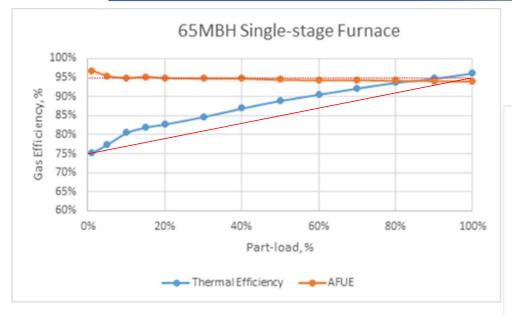


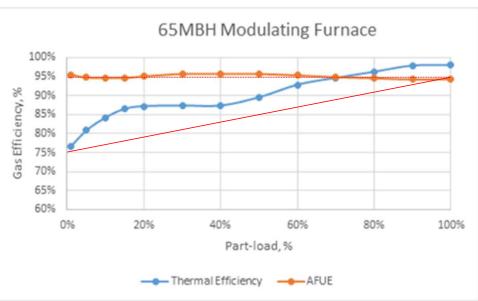


Part Loads: 1% - 5% - 10% - 20% - 30% - 40% - 50% - 60% - 70% - 80% - 90% - 100%

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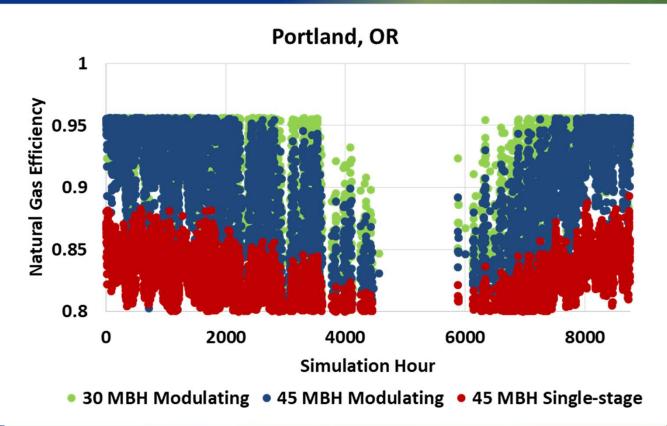
Example Heating Systems Characterizations





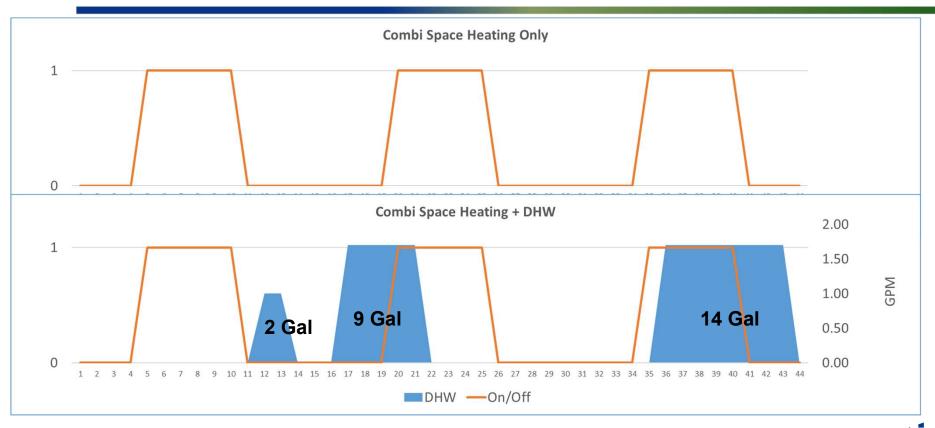
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Modeled Efficiency Results





Combi Systems Strategy



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Observations

- >Test can be done over a 24 hour period
- >High correlation between testing and real world
- >Performance curves for EnergyPlus

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Next Steps

>Testing

— (8) furnaces [1Q18 -2Q18]

- (3) combi-systems [3Q18 – 4Q18]

Confirm

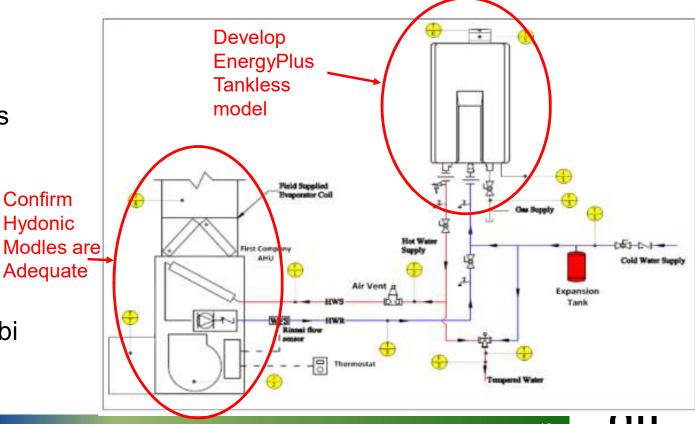
Hydonic

Adequate

>Model

 confirm hydronic heat exchanger models are adequate

 develop tankless water heater combi system (no storage)



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Thank You!

