

Integrated HVAC Control Methods for Supplemental High Efficiency Mini-Split Heat Pumps in Existing Homes

University of Central Florida / Florida Solar Energy Center

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Integrated HVAC Control Methods for Supplemental Mini-Split Heat Pumps

Team



A Research Institute of the University of Central Florida 



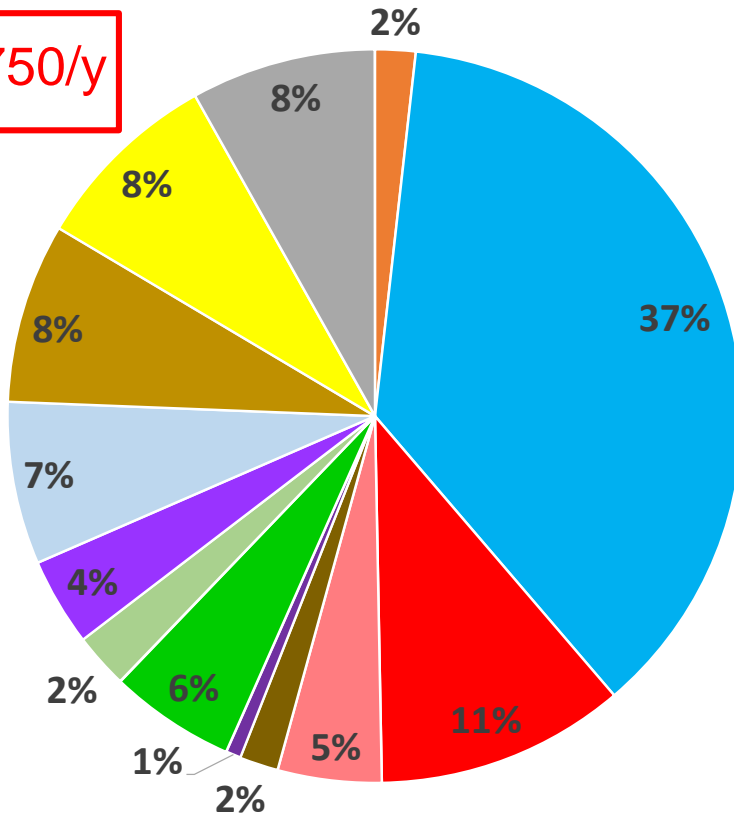
- Eric Martin, Karen Fenaughty, and Danny Parker.
- Involved in several prior studies investigating performance of variable capacity space conditioning systems.
- Data and participants from one such prior study leveraged for the current project.
- Cost sharing partner, providing mini-split heat pumps and in-kind support.
- Cost sharing partner, providing fan cyclers and in-kind support.

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The Problem (The Need/Challenge)

Heating = 39%, \$750/y
Cooling = 37%

- DHW
- Dryer
- Range
- Dishwasher
- Refrigerator
- 2nd Refrigerator
- Main TV
- Pool Pump
- Spares
- Lighting
- Plugs & Fans



- Low-cost space conditioning upgrade solution needed for homes with existing functioning, low efficiency central system.
- Opportunity to save energy and manage reduced loads as homes are progressively retrofit without short cycling or loss of humidity control or comfort.

2013 measured annual end use loads, 56 home sample, central Florida. Avg. home total = 44.1 kWh/d; 16,080 kWh/y; \$1,930/y

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The Solution – Supplemental MSHP

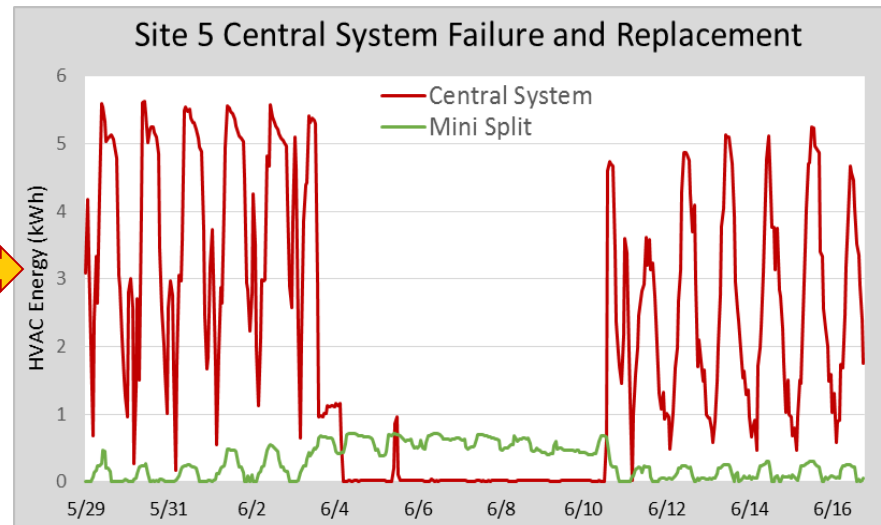
- High efficiency, centrally located mini-split heat pump provides space conditioning energy savings by displacing runtime of an existing, lower efficiency central split system.
- Investigate enhanced savings and comfort with periodic central system fan cycling.
- Investigate enhanced savings, comfort, and ease of use with an integrated controller (2-stage thermostat).
- Conduct simulations to evaluate economics of choices for central system replacement at end-of-life. Vary system size, type, efficiency, etc.



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Advantage, Differentiation, and Impact

- Findings from previous 10 home study:
 - Cooling: 33% energy savings (2,007 kWh/y; ~\$240/y), 16% peak reduction.
 - Heating: 59% energy savings (390 kWh/y; ~\$50/y), 56% peak reduction.
 - Electric resistance = 68% energy savings; heat pump = 19%
 - MSHP keeps conditions tolerable in the event of central system failure. →
- Current project enables completion of guidance for design, installation, and system control to promote supplemental MSHP as a mainstream retrofit measure.



Thank You

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