

(4) Closing the Gap: Getting Full Performance from Residential Central Air Conditioners

This two-year project includes the development of next-generation central air-conditioning performance ratings, development and demonstration of a central air conditioner for hot/humid climates, and HVAC contractor training.

Total project cost: \$1,534,716

Funding request: \$683,179

Project Lead: New York State Energy Research and Development Authority

Project Participants: Florida Solar Energy Center; Advanced Energy; Energy Center of Wisconsin, American Council for an Energy-Efficient Economy; CDH Energy; Wisconsin Energy Conservation Corporation, Lawrence Berkeley National Laboratory

Patents

None.

Publications/Presentations:

“Measured Impacts of Proper Air Conditioning Sizing in Four Florida Case Study Homes”, FSEC-CR-1641-06, Final Report, October 25, 2006. This was the UCF/FSEC deliverable for Task 3.2.

<http://www.fsec.ucf.edu/en/publications/pdf/FSEC-CR-1641-06.pdf>

“Closing the Gap: Getting Full Performance from Residential Central Air Conditioners, Task 4 - Develop New Climate-Sensitive Air Conditioner, Simulation Results and Cost Benefit Analysis”, FSEC-CR-1716-07, April 27, 2007. This was the joint UCF/FSEC and CDH Energy deliverable for Task 4.1. <http://www.fsec.ucf.edu/en/publications/pdf/FSEC-CR-1716-07.pdf>

Progress in Past Quarter and Current Status:

Task 1 Improve Central Air Conditioner Performance Ratings

Task 1.1 Review present standards and method of testing

Task 1.2 Field performance data review

Task 1.3 Develop population weighted temperature bin-hour distributions

Task 1.4 Preliminary proposed rating procedures

Task 1.5 Simulate benefits of alternative metrics for diverse climates

Task 1.6 Analysis and recommendations

Task 1 is being primarily completed by other project partners. During this reporting period UCF/FSEC assisted ACEEE and CDH Energy in addressing reviewer comments and revising the white paper related to Tasks 1.1 and 1.4.

Task 2 Robust Feature Set for Residential Air Conditioners

Task 2.1 Develop trial specification sets

Task 2.2 Draft specification

Task 2 is being primarily completed by other project partners. During this reporting period UCF/FSEC provided review comments to ACEEE and CDH Energy regarding the white paper being completed for this task.

Task 3 Field Performance Data and Innovation

Task 3.2 Benefits of proper sizing

The goal of Task 3.2 was to show the benefits of proper air conditioner sizing to contractors, customers and utilities. Field tests were conducted in 4 Florida case study homes by UCF/FSEC, with additional tests conducted at several homes in Wisconsin by ECW.

UCF/FSEC's portion of Task 3.2 was fully completed in October 2006, with the findings summarized in the report "Measured Impacts of Proper Air Conditioning Sizing in Four Florida Case Study Homes", FSEC-CR-1641-06, Final Report, October 25, 2006.

<http://www.fsec.ucf.edu/en/publications/pdf/FSEC-CR-1641-06.pdf>

This Task 3.2 report was reviewed and discussed in the May 2007 issue of Energy Design Update

(<http://www.aspenpubs.com/energy/lpext.dll?f=templates&fn=main-h.htm>).

Task 4 Develop New Climate-Sensitive Air Conditioner Designs

Task 4.1 System Configuration: identification, simulation and cost-benefit analysis

Task 4.2 Prototype System: design, construction, laboratory and field testing

Task 4.1 was completed during the previous reporting period. The final version of the white paper/report was finished on April 24, 2007. The report can be downloaded from:

http://securedb.fsec.ucf.edu/pub/pub_show_abstract?v_pub_id=4348 (abstract)

<http://www.fsec.ucf.edu/en/publications/pdf/FSEC-CR-1716-07.pdf> (full report)

Work on Task 4.2 continued during this reporting period. The prototype air handler with enhanced dehumidification performance was moved from the laboratory test facility to a field test site, UCF/FSEC's 1600 ft² Manufactured Housing Laboratory (<http://www.baihp.org/data/mhlab/index.htm>). Installation of the refrigeration plumbing, electrical connections, and data acquisition system for the prototype air conditioner was

completed in July 2007. Field testing and associated data acquisition began in late-July 2007 and will continue through October 2007.

A second aspect of Task 4.2 is developing and testing an improved supply air fan control. The strategy will vary the fan speed and air handler flow rate based on interior humidity levels. A field test site was previously identified, and portable data loggers continued to collect baseline indoor and outdoor air conditions (temperature and humidity). During this reporting period the supply air fan control algorithm was implemented on a test air handler in the laboratory, and the functionality of the implementation was verified. The control strategy will now be implemented at the field test site to examine the impacts on relative humidity control and energy efficiency performance.

Task 5 Information Dissemination and HVAC Contractor Training

UCF/FSEC's portion of the training aspect of this task was completed in December 2006. As other UCF/FSEC tasks are completed (e.g., Task 4), their results will be disseminated.

Plans for Next Quarter:

- The project ends October 31, 2007. The only remaining UCF/FSEC deliverable for this project is the white paper for Task 4.2.