

# **Energy Smart Schools – Applied Research, Field Testing, and Technology Integration**

## **Technical Progress Report - Annual**

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### **ABSTRACT**

This multi-state collaborative project will coordinate federal, state, and private sector resources and high-priority school-related energy research under a comprehensive initiative that includes tasks that increase adoption of advanced energy efficiency high-performance technologies in both renovation of existing schools and building new ones; educate and inform school administrators, architects, engineers, and manufacturers nationwide as to the energy, economic, and environmental benefits of energy efficiency technologies; and improve the learning environment for the nation's students through use of better temperature controls, improvements in air quality, and increased daylighting in schools.

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## **Executive Summary**

Several of the contractors have made significant progress this year. Most of the tasks are in the final stages of completion. An extension for this project was requested and granted from the DOE.

A ribbon-cutting ceremony was held for the Canton City Schools micro-turbine project in June. Additionally, construction and delivery of several of the performance enhanced relocatable classrooms (PERC) was completed this year.

Several audits were performed at schools around the country to find underlying trends and then conduct retrofits in problem schools and classrooms. Statistics thus far have proved similar findings in dissatisfaction with temperature and indoor air quality.

By the time the next Annual Technical Progress Report is submitted, we plan to have finished all of the work. The next year should be filled with full completion of all tasks and dissemination of information to interested parties on the success of the project in an effort to get others to duplicate the high performance and energy smart schools initiatives.

## **Experimental**

Available in individual task summaries below.

# Results and Discussion

## **Integrated School Building Technologies:** **California Energy Commission**

Construction is 99% complete on the Oakland Unified School District Cesar Chavez Education Complex. The district expects to have construction complete by the second week in December. Students will be moved into the new school during the Christmas holiday break and will begin the new year in the school. Plans are being made now for the grand opening event which will take place on Thursday January 29, 2004. Pacific Gas and Electric (PGE), Collaborative for High Performance Schools (CHPS) and the Oakland Unified School District are all working together on this grand opening event. The district is working on all final reports due so that the Commission can release the remaining grant funding to the district.

Tahoe Truckee Middle School has 95% of the masonry walls on this project complete. The roof is on the classroom wing and the library administration wing. The metal roof decking is in place in mechanical and storage areas. The site retaining wall is about 90% complete. All roofing will be complete by November 15, 2003. Construction should be complete by August 8, 2004. School will be open in the fall for 04/05 school year. Commissioning agent will do measurement and verification to prove that the design exceeds title 24 by 20%. The construction contractor has a waste diversion plan in place and the goal is to divert 50% of all construction waste. Final funding for this project has been released by the Office of Public School Construction. The project will use recycled materials in carpets, walk off mats, ceramic tile, ceiling tile, acoustic panels and toilet partitions. This project is also using materials that have been tested to insure that there is no off gassing of any VOC's. These materials include carpet, wall and ceiling insulation, acoustic panels, ceiling tiles and custom casework. The draft CHPS scorecard for this project is 30 + points. All of these points have been closely monitored and verified.

The Commission plans to continue to provide support to Tahoe Truckee School District to insure that construction stays on track and construction compromises do not negatively impact the CHPS design principles. A site visit to the Truckee school is scheduled for Friday November 7, 2003. Visits will be conducted and ongoing meetings with commissioning agent will take place to insure original design intent. Close contact is continuing with the Commissioning agent at the Oakland School site. The Commission is also working closely with CHPS and PGE to coordinate the grand opening of the Oakland site.

## **Installation and Evaluation of Microturbines:** **Ohio Office of Energy Efficiency**

In Canton, on June 5, 2003, the Canton City Schools had a ribbon-cutting ceremony for the microturbine project. A news release follows:

The Canton City Schools, in conjunction with the Ohio Department of Development Office of Energy Efficiency, FirstEnergy Solutions, and area businesses, will begin a two-year commercial demonstration of two natural-gas-fueled, micro-turbine generators that will produce electricity, heating, and cooling for the C. T. Branin Natatorium. The unique system, which has a

combined capacity of 56 kilowatts, will use exhaust to heat the swimming pool and to drive an ammonia based absorption chiller to provide air conditioning in the building's offices.

FirstEnergy Solutions, a subsidiary of Akron, Ohio-based FirstEnergy Corp., designed the integrated system and will collect performance data for designing future applications.

The Canton project is part of a \$7-million joint federal and state Energy Smart Schools initiative funded in part by the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy; the National Association of State Energy Officials; and four other state energy offices and state research institutions, from California, Florida, New York, and Wisconsin, all of which are implementing energy-efficiency schools initiatives.

Other project participants include Norman Eckinger General Contractors; Hilscher-Clark electrical contractors; Standard Plumbing and Heating; and Roth Brothers, Inc.

Project is continuing in the data gathering stage as the units are operating. There also has been some issue with the backflow pressure valves that is currently being addressed. There has been some discussion with Canton about incorporating the project and the data gathering into science, math, physics and technology classes.

### **Portable Classroom Characterization and Research:** **Florida Solar Energy Center**

#### *Establish Baseline:*

The NC PERC was delivered some HVAC commissioning conducted September 23 by the HVAC distributor. Also the lights and controls were commissioned by Kurt Creamer of the North Carolina Solar Center. Instrumentation is scheduled to begin October 20. The FL PERC was delivered to Shingle Creek Elementary School in Orlando, FL on September 3, 2003. South East Modular finished the punch list items that needed to be site installed, such items as floor, ceiling and wall finish and marriage line sealing. A representative from South East Modular also commissioned the lights and operations and all are functioning properly. Staff from FSEC instrumented the building and data is being recorded. The website should be functioning with live data and information by early November. The NY PERC is still located in Cornwall, NY but is not scheduled to have occupants this school year. FSEC would like to monitor it for another year if the district relocates the classroom to the high school, which is being discussed.

#### *Improved Design and Systems Engineering:*

Both the NC and FL PERC's have had minor on site resolutions performed with regards to lighting, hvac controls and operations. This is primarily because there is a third party that mates the two halves of the units together, which included wiring. Perhaps an atypical wiring scheme is not communicated effectively to this third party. In both sites, representatives from the modular manufacturer and hvac distributor have commissioned and "trouble shooted" on site to resolve these issues in less than a half a day.

#### *Improved Procurement Activities:*

Web site design is complete for describing the PERC project and data analysis as collected for the NY PERC. A classroom purchasing guide based largely on the prototype design, energy use and economic and financial analysis is available. The website will be updated as information becomes available for NC PERC and FL PERC.

NY PERC Comparison

<http://fsec.ucf.edu/bldg/active/bdac/education/perc/index.htm>

### **Technology Integration**

## **NEW YORK STATE ENERGY RESEARCH AND DEVELOPMENT AUTHORITY**

NYSERDA completed all Beta testing of the online training and formally launched 13 out of 25 courses under the following URL: <http://www.hpschooldesigntraining.com>. The DOE Peer Review team reviewed the marketing plan and discussed plans for NYSERDA to work closely with DOE promotions of regional High Performance Schools Design 101 training. NYSERDA met with the New York State Education Department - Office of Professions, Executive Director of Architecture Licensing to introduce website and generate interest in online training for NYS licensed architects that are not members of AIA. The courses were submitted to AIA-CES in Oklahoma under NYSERDA Provider Code to obtain approval for continuing education credit. A flyer was produced describing the Online Training and distributed at AIA National Conference. Next steps include development of the remaining 12 courses and launch by January 31, 2004.

### **Applied Engineering and Design Assistance**

## **New York Energy Research and Development Authority**

NYSERDA developed a plan for format and content for the Technical Assistance Workshop planned for April 2004. The two-day format for State Energy Officials will include one day of training outlining how to develop a successful Technical Assistance Program and a second day of training outlining specific steps for technical assistance providers to promote and assist with the implementation of High Performance K-12 schools.

## **FLORIDA LARGE SCALE STUDY AND DIAGNOSTIC TESTING OF SCHOOLS AND CLASSROOMS**

*Large Scale Survey:* The large scale survey to determine the levels of occupant satisfaction or dissatisfaction with the IAQ, thermal, lighting and acoustical conditions in schools and classrooms is largely complete. The questionnaire was available as a mail-out and as web-based form that was filled out and submitted to a web server. State energy offices and education departments across the country were solicited to participate in the survey and telephone interviews were conducted to fill in gaps and obtain additional detail.

*Operating conditions.* A total of 8 audits have been performed— 3 in the Northwest, 1 in the Midwest, 1 in the Northeast and 3 in the South. The Northeast audit report is still pending.

*Analysis.* Statistical analysis work has been begun and will be continued during the next several months.

*Retrofits.* In the Northwest, the “after” monitoring phase of the Washington state school has been completed and a retrofit report for the project will be sent to FSEC shortly. Work also continues on the second Northwest retrofit at one of the audited Oregon schools. Unit ventilator maintenance throughout the school has been completed, and the cafeteria and auditorium ventilation control work is now being

rebid as a result of changes FSEC requested during the July conference call. Work is scheduled to be completed by October 31<sup>st</sup>, and post monitoring is planned for November.

A small-scale retrofit involving a 4-classroom dehumidifier at a Florida school has previously been completed, and the second Florida retrofit involving soffit air sealing is now also being completed. The recommended soffit sealing at the second school has previously been completed and post-monitoring will be completed by early October. An outside air test is also still scheduled for this school. An AC unit change out in one of the classrooms at the school may still be undertaken, and this classroom is presently being monitored for a pre/post comparison.

Follow up. A resurvey of the Florida school with the 4-classroom dehumidifier retrofit is planned, and other followup surveys will be planned after post monitoring periods this fall.

Website Presentation: <http://www.naseo.org/projects/schools/netl/florida.pdf>

## Conclusion

Projects within each task area have begun to show results. In March, NETL representatives and NASEO met with all Task Project Managers to discuss the progress of each project. Presentations from this meeting can be viewed on the NASEO website: <http://www.naseo.org/projects/schools/netl/default.htm>.

Each project met several unforeseen obstacles this year, the most of which occurred in California with construction details. The microturbines in Ohio encountered backflow pressure valve issues, and Florida Solar Energy Center experienced timing conflicts with manufacturers. Most of the issues have been remedied. An extension has been granted by the DOE to ensure full completion of all of the tasks by October 2004.

## References

There are no references to this report.

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