Public Abstract
Sustainable Design, Operation and Evaluation of Buildings in University Programs for Commercial Building Management

Participants:	Georgia Institute of Technology University of South Carolina-Beaufort North Carolina A&T State University
Project Schedule:	January 1, 2004 – December 31, 2006
Project Budget:	$374,674.00 ($161,806 from NASEO, $88,868 GT cost share & $124,000 in-kind services and software donations)

Objective: Sustainable design practices for commercial and government buildings are gaining acceptance among building owners and architects and engineers employed for design of these buildings. With growing interest in LEED certification and California Title 24, operation and maintenance of green buildings to realize the cost benefits of sustainable design is finally being recognized and accepted by facility owners and managers. With current economic motivations, building managers must be aware of design as well as as-built performance, and new technologies and controls for incorporation into new and existing buildings require a new knowledge base and new management tools to achieve optimal asset performance and to convince senior management to invest in these new technologies to achieve life-cycle savings for their buildings. The participating universities have established programs to educate future and current managers of commercial facilities, such as large office buildings, retail spaces, hotels and resorts, and multi-building campuses. However, these programs lack a focus on a new building management paradigm that incorporates sustainable design standards and technologies. The proposed project will support development of new university courses; continuing education courses; building operations research; and student internships aimed at imparting an in-depth understanding of the benefits of sustainable building design and how to achieve them. These courses will teach design standards and their life cycle cost implications; provide knowledge on new building technologies; utilize software for building simulations and modeling; and demonstrate how optimal building performance impacts business success and how to interpret that to financial officials.

Methodology: The participating universities will identify new courses and establish course objectives within their respective degree programs, sharing their resources and expertise. Special projects and internships will be incorporated in the courses to offer practical experiences to augment classroom lectures/discussions, utilizing existing relationships with private (e.g., resorts on Hilton Head Island) and public sector (e.g., U.S. General Services Administration) partners. Course proposals will be submitted to school/college curriculum committees for approval; initial offerings scheduled; and courses taught. The participants will jointly evaluate the effectiveness of courses, and identify strengths and weaknesses in texts, course materials, software, special projects, internships, etc. In Years 2-3, the participants will develop and offer continuing education offerings for building and facility managers, and present research findings to industry conferences nationwide.

Benefits: Increase the number of building managers capable of realizing the promise of sustainable buildings and optimizing building operations. Accelerate the diffusion of sustainable building technologies by attracting qualified management students to careers in sustainable building/facility management, and providing industry expertise to existing partners, conference attendees and continuing education professionals.

Contact:
Professor Kathy O. Roper (P.I.)
Georgia Institute of Technology, Building Construction Program
kathy.roper@arch.gatech.edu

Public Abstract
Foundations: Energy-Saving and Mold-Free Systems (FEAMOS Project)

The objective of this project is to develop, demonstrate and assist in the acceptance by builders of a few highly energy effective foundation systems for the thermal upgrade (retrofitting) on the interior of basements. The best of the existing technology and specific elements of new technology will be examined in parallel with a view to ensuring good indoor environment and elimination of potential for moisture condensation and mold growth.

The project will last three years. The team members are New York State Energy Research and Development Authority (NYSERDA), New Jersey Institute of Technology (NJIT), Syracuse University (SU), Steven Winter Associates, Demilec Inc., Fortifiber Inc., Icynene Inc., and Owens Corning Corporation.

The benefits of the project, in addition to the energy savings include large additional living space with significantly improved indoor environment as well as an extended durability of the building envelope (the latter being a key element in the sustainability of the built environment). This project will improve the best in the current building practice and develop new material technology.

Involvement of leading American material manufacturers ensures that this project is market-oriented from the first day. Furthermore, development of a new technology of insulated moisture buffer is planned for this project. It will provide protection from moisture condensation and prevent moisture damage and may also contribute to the reduction of peak energy loads. This approach may be further developed for many other applications in thermal upgrade of existing buildings and renovation of historically significant building facades.

Research methodology is based on the functional analysis of the system. While the scientific basis of basement performance is well documented and although we know why vapor barriers on interior are not working, alternative solutions have not been analyzed with a sufficient scrutiny and verified on the cost-benefit basis. Two parallel research streams are carried out in this project. One involves improvement of existing solutions, while the other involves the development of a new technology. The first stage of the project involves laboratory research that will allow the manufactures to perform modifications or improvements to the existing products and obtain the necessary evaluation/acceptance reports. The second stage includes a full-scale testing in a coupled indoor/outdoor environmental simulator facility and advanced computer modeling. Finally, field monitoring and technology demonstrations performed in the third stage of the project will provide the basis for the design guide and technology transfer to the builder's community.

Contact:
Robert M. Carver
NYSERDA
rmc@nyserda.org

Public Abstract
Controlled Low-Energy Heating and Cooling of Residential Housing

The Wyoming Business Council (administers the Wyoming State Energy Program), University of Wyoming, New York State Energy Research and Development Authority, Utah Energy Office, and University of Utah propose a $1.2M (NASEO funding plus cost-share commitments), 2-year research project to integrate transpired solar roof/wall panels and ground source cooling/heating systems designed to provide low-energy heating and cooling for residential housing. This proposal addresses the Building Technologies Program Area of State Technologies Advancement Collaborative (STAC) Solicitation, 03-STAC-1, "Energy Efficiency Research, Development, Demonstration, and Deployment Projects." The Wyoming Business Council in Cheyenne, WY will be the Prime contractor in this effort. The WBC will subcontract with the University of Wyoming and the Idaho National Engineering and Environmental Laboratory (INEEL) to accomplish the work proposed. University of Utah involvement will be via a linked STAC proposal entitled "Controlled Low-Energy Heating and Cooling of Residential Housing – Solar Roofing Panel Design and Testing." Industrial participants include Solar Unlimited Inc. (Cedar City, UT) and Conserval Systems (Buffalo, NY).

In 2002 and 2003, team members tested prototype samples of transpired solar wall panels (TSP) on a warehouse in Idaho Falls, ID, on a residence in Cedar City, UT, and on a manufactured home in eastern Wyoming with favorable results. The team is also monitoring a ground source cooling loop installed on the residence in Cedar City, UT. Investigations to date indicate that automated controls are necessary for efficient integration of these devices with whole house heating, ventilation, and air conditioning (HVAC) systems. These products will be adapted and tested on two Habitat-for-Humanity homes in Cedar City, UT, an existing test structure in Arlington, WY, an off-grid new residence in Cedar City, and an insulated concrete form (ICF) home under construction in Laramie, WY. Data from a TSP on a public housing project in New York state will also be available. A control system, using off-the-shelf hardware with modifications, will be developed and programmed to integrate the heating and cooling provided by the transpired panels and cooling from ground source systems with conventional HVAC systems in the homes. Team members will monitor the energy benefits provided by both retrofit and new construction installations using web-based data acquisition software. Research results, installation methods, and deployment lessons learned will be communicated to appropriate parties via workshops held in several geographic locations in the US.

Benefits of this project include the demonstration of innovative integration of low-cost sustainable design systems into conventional residential HVAC (new construction and retrofits), development of performance data for several different test installations, and dissemination of research, deployment, and performance results. These systems will provide significant energy savings, displace fossil fuel use, and provide automated ventilation required by the International Building Code.

Contact:
Chris P. Pantelides
University of Utah, Department of Civil & Environmental Engineering
chris@civil.utah.edu

Public Abstract
Commercial Building System Optimization in North Carolina and Virginia

Sponsoring Organizations: The North Carolina State Energy Office (NCSEO) leads a team comprised of the Virginia Division of Energy (VDoE), the Global Environment & Technology Foundation (GETF) and The Cadmus Group, Inc. (Cadmus).
Objectives: (1) Demonstrate a viable Commercial Building System Optimization program that combines a number of innovative resources synergistically to maximize demand reduction performance, energy efficiency, disaster responsiveness, and the occupant productivity characteristics of two existing commercial office buildings. (2) Implement and design an existing building retrofit with innovative technologies (e.g. new generation lighting), distributed energy generation with waste heat utilization, and pilot a new automated utility metering system in a commercial building. (3) Use a web-based activity log for project communications and data capture. (4) Promote the innovative technologies and develop Case Studies detailing process and results.
Benefits: The project is estimated to reduce energy consumption in commercial office buildings by 30 to 50%, significantly reduce emissions; pilot an automated utility metering system for the first time in a commercial building; document the importance of design charrettes for existing building enhancements; provide valuable information on retrofitting distributed generation in an existing building; and provide a model and roadmap (through Case Studies) for replication.
Methodology: A five-step methodology is proposed. **Step 1 – Audits** includes a comprehensive building audit, examining the HVAC system and controls, lighting, potential architectural changes, potential office equipment changes, and water systems. **Step 2 - Energy Efficiency** includes work to benchmark the energy performance of the building, using utility bill information and the ENERGY STAR rating system, Portfolio Manager. **Step 3 – Charrette**: A charrette is an intensive, highly integrative, multidisciplinary roundtable workshop that brings together stakeholders and experts at the very outset of a design or problem-solving process. This charrette is the critical component of the project and will involve the building owner and managers, architects, engineers, experts in energy efficiency and distributed generation, controls, lighting, water, landscaping, air quality and materials. Results of Steps 1 and 2 will feed into the charrette process and help to identify a set of measures to improve energy efficiency and demand side reduction. As a part of the charrette team's analysis, an automated building system diagnostics tool, (piloted in a commercial building for the first time) will use intelligent systems and the Internet for automated utility metering, data logging, analysis and collection (by Virginia Commonwealth University). **Step 4 – Financing**: Innovative mechanisms will be explored with the building owner to help identify options to finance the implementation of the measures. **Step 5 – Information Dissemination** includes an innovative web-based log of activities, major findings, and decisions. This innovative communications tool will allow team members to be updated in real-time on all critical developments and will provide a rich text of information to use in documenting the process and results of the project and preparation of the Case Studies.
Timeframe: One and one-half years from project inception (receipt of signed grant).
Budget: The total cost of the project is $ 334,403.31 with a match of $ 184,000.

Contact:
Larry Shirley, Director
State of North Carolina, State Energy Office
Larry.shirley@ncmail.net

Public Abstract
Sustainable Design, Operation and Evaluation of Buildings in University Programs for Commercial Building Management

Participants: University of South Carolina-Beaufort, Georgia Institute of Technology, North Carolina A&T State University
Project Schedule: January 1, 2004 – December 31, 2006
Project Budget: $148,920 ($66,750 from NASEO, $82,170 USCB cost share)
Objective: Sustainable design practices for commercial and government buildings are gaining acceptance among building owners and architects and engineers employed for design. With interest growing in buildings that meet standards such as LEED and California Title 24, operating and maintaining green buildings to realize the benefits of sustainable design is now a priority for facility owners. In this dynamic business environment, building managers must be cognizant of both design intents and as-built performance, and new technologies and controls incorporated into new or renovated buildings require a new knowledge base and new management tools to achieve optimal asset performance.

Analogous to the advent of new computer technologies in the 1970s and 80s, successful management of sustainable buildings presents a new paradigm for facility owners and operators. Universities developed and taught courses related to new technologies, and computer hardware and software vendors recognized the role of higher education in successful technology deployment, and donated or discounted their products to universities and their students in order to speed technology diffusion. Similarly, colleges and universities should be in the forefront of educating new managers for positions that rely more on current knowledge of new building technologies than on experience with managing prior generation buildings.

The participating universities have established programs that educate future and current managers of commercial facilities, such as large office buildings, hotels and resorts, and multi-building campuses. However, these programs lack a focus on the new building management paradigm that incorporates new design standards and technologies. The proposed project will support development of new university courses, undergraduate and graduate; continuing education courses; building operations research; and student internships aimed at imparting an in-depth understanding of the benefits of sustainable building design and how to achieve them. These courses will teach design standards and their life cycle cost implications; provide an introduction to building technologies; utilize software for building simulations and modeling; and demonstrate how optimal building performance impacts business success.
Methodology: The participating universities will develop and deliver new courses in sustainable facility management within their respective degree programs, sharing their resources and expertise. Special projects and internships will be incorporated in the courses to offer practical experiences to augment classroom lectures/discussions, utilizing existing relationships with private (e.g., resorts on Hilton Head Island) and public sector (e.g., U.S. General Services Administration, military bases) partners. The participants will jointly evaluate the effective ness of courses, and identify strengths and weaknesses in texts, course materials, software, special projects, internships, etc. In Years 2-3, the participants will develop and offer continuing education offerings for practicing building managers.
Benefits: Increase the number of building managers capable of realizing the promise of sustainable buildings and optimizing their operation. Accelerate the diffusion of sustainable building technologies by attracting qualified management students to careers in sustainable building/facility management. Develop educational models for sustainable facility management.

Contact: Alan Warren, University of South Carolina, dwarren@gwm.sc.edu

Public Abstract
DC Water and Sewer Authority Central Operating Facility HVAC Renovation Project at the Blue Plains Waste Water Treatment Plant

The District of Columbia Energy Office (DCEO), and Maryland Energy Administration are proposing this project at the District of Columbia's Water and Sewer Authority (WASA) totaling 3.0 million. The Maryland Energy Administration lends support in the dissemination of the case study and application in other commercial structures. The DCWASA HVAC Renovation Project at the Central Operating Facility at Blue Plains Waste Water Treatment Plant addresses improved energy efficiency, demand reduction performance, occupant productivity from previous structure usage, and additional funding will allow the expansion of the indoor air quality/health safety benefit for operating staff.

The District of Columbia's Energy Office submits this proposal for $600,000 under the NASEO State Technologies Advancement Collaborative (STAC solicitation), Building Technologies: Commercial Building Systems Optimization to support the non-federal cost share match of $3.0 million dollar renovation project at the WASA headquarters facility, the Central Operating Facility located at the Blue Plains Waster Water Treatment Plant. DC WASA was created in 1996 by District of Columbia Government and the US Government and is a semiautonomous regional entity, providing retail and wastewater services to DC residential and commercial customers, wholesale wastewater treatment services to a portion of Maryland's Montgomery and Prince George's counties, and Virginia's Fairfax, Loudoun counties and the town of Vienna, Virginia.

Contact:
Charles J. Clinton, Director
DC Energy Office
chuck.clinton@dc.gov

Public Abstract
Launching of the High Plains Appropriate Technology Resource Center

The University of Kansas (KU) seeks funding to establish the High Plains' regional center for appropriate technology. Recently, students at KU have coalesced to form an ambitious task force to begin the foundations of a significant research and educational facility. This group, called AT+home, combines students from the School of Architecture, the School of Engineering and the Environmental Studies Program in hopes to provide a well-rounded team from which to develop holistic, innovative technologies addressing the needs of regional residential structures and their environment.

Lawrence, Kansas is the chosen site of this regional demonstration project because of it's proximity to a major urban area (Kansas City); the synergies of a grass roots energy organization, major university, and community government that are supportive of the project; and it's bi-state location (serving Missouri and Kansas).

The student-initiated AT+home project aims to critically inspect a conventional, High Plains home to determine its use of building materials, electricity, natural gas, food, and water and its production of wastes. With an understanding of what is necessary and appropriate to provide comfort to homeowners, students and experienced faculty will investigate ways to achieve this standard as the starting place for all considered technology research. The technology research will focus on providing applicable, responsible, affordable solutions. Through a collaborative process, AT+home intends to research, test, document and demonstrate technologies that increase efficiency and sustainability of residential homes while maintaining comfort for the inhabitants.

The overall purpose of the project is to promote interdisciplinary faculty research, design and implementation of holistic, appropriate technologies, while allowing students hands-on experience and community education on regionally specific appropriate technologies. The types of projects AT+home will implement include, but are not limited to, efficient HVAC systems, applying passive solar techniques, photovoltaic panel collectors, wind generated power, an urban and organic garden, composting waste system, etc. Currently, the AT+home Student Organization has prepared an in depth package that defines the project, its goals, organization, timeline, and roles of the included schools. They have contacted the department heads of each involved school and received their support, and applied for official university recognition as a viable student organization.

AT+home is prepared for the next step having established the project as a joint endeavor of the University of Kansas and the Metropolitan Energy Center (MEC), and creating a student based University organization. AT+home is prepared to begin the observation and communication with other appropriate technology centers to gain insight and exposure of successful organizations and projects. In the spring of 2004, interested students/faculty are to be involved into the project through workshops and classes. In such workshops and classes the comprehensive, conceptual plan and initial research plans will be completed. By fall of 2004, AT+home will begin efforts in community outreach. Through workshops, tours and discussions AT+home's research and demonstrations will be relayed to public for their benefit in more appropriate, applicable technologies.

Contact:
Rebecca Bruce
University of Kansas
rjbruce@ku.edu

Public Abstract
Sustainable Design, Operation and Evaluation of Buildings in University Programs for Commercial Building Management

Participants: University of South Carolina-Beaufort, Georgia Institute of Technology, North Carolina A&T State University
Project Schedule: January 1, 2004 – December 31, 2006
Project Budget: $173,233 ($77,954 from NASEO, $95,279 participant cost share)

Objective: Sustainable design practices for commercial and government buildings are gaining acceptance among building owners and architects and engineers employed for design. With interest growing in buildings that meet standards such as LEED and California Title 24, operating and maintaining green buildings to realize the benefits of sustainable design is now a priority for facility owners. Building managers must be cognizant of both design intents and as-built performance, and new technologies and controls incorporated into new or renovated buildings require a new knowledge base and new management tools to achieve optimal asset performance.

This process of technology infusion requires successful management of sustainable buildings presents a new paradigm for facility owners and operators. The University's role has been to develop and teach courses related to new technologies, to demonstrate new hardware and software and to prepare the next generation of design and facility management professionals to incorporate best practices into an emerging field. They should be in the forefront of educating new managers for positions that rely more on current knowledge of new building technologies than on experience with managing prior generation buildings.

The participating universities have established programs that educate future and current designers and managers of commercial facilities, such as university laboratories, large office buildings, hotels and resorts, and multi-building campuses. However, these programs lack a focus on the new building management paradigm that incorporates new design standards and technologies. The proposed project will support development of new university courses, undergraduate and graduate; continuing education courses; building operations research; and student internships aimed at imparting an in-depth understanding of the benefits of sustainable building design and how to achieve them. These courses will teach design standards and their life cycle cost implications; provide an introduction to building technologies; utilize software for building simulations and modeling; and demonstrate how optimal building performance impacts business success.

Methodology: The participating universities will develop and deliver new courses in sustainable facility management within their respective degree programs, sharing their resources and expertise. Special projects and internships will be incorporated in the courses to offer practical experiences to augment classroom lectures/discussions, utilizing existing relationships with private (e.g., small commercial developers) and public sector (e.g., 21st Century Lab Program of Lawrence Berkeley Lab, military bases) partners. The participants will jointly evaluate the effectiveness of courses, and identify strengths and weaknesses in texts, course materials, software, special projects, internships, etc. In Years 2-3, the participants will develop and offer continuing education offerings for practicing building managers.

Benefits: Increase the number of building managers capable of realizing the promise of sustainable buildings and optimizing their operation. Accelerate the diffusion of sustainable building technologies by attracting qualified management students to careers in sustainable building/facility management. Develop educational models for sustainable facility management.

Contact:
Robert Powell
North Carolina Agricultural and Technical State University
rpowell@ncat.edu

Public Abstract
Controlled Low-Energy Heating and Cooling of Residential Housing

The Wyoming Business Council (administers the Wyoming State Energy Program), University of Wyoming, New York State Energy Research and Development Authority, Utah Energy Office, and University of Utah propose a $1.2M (NASEO funding plus cost-share commitments), 2-year research project to integrate transpired solar roof/wall panels and ground source cooling/heating systems designed to provide low-energy heating and cooling for residential housing. This proposal addresses the Building Technologies Program Area of State Technologies Advancement Collaborative (STAC) Solicitation, 03-STAC-1, "Energy Efficiency Research, Development, Demonstration, and Deployment Projects." The Wyoming Business Council in Cheyenne, WY will be the Prime contractor in this effort. The WBC will subcontract with the University of Wyoming and the Idaho National Engineering and Environmental Laboratory (INEEL) to accomplish the work proposed. University of Utah involvement will be via a linked STAC proposal entitled "Controlled Low-Energy Heating and Cooling of Residential Housing – Solar Roofing Panel Design and Testing." Industrial participants include Solar Unlimited Inc. (Cedar City, UT) and Conserval Systems (Buffalo, NY).

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Contact:
John Nunley, Manager, State Energy Program
Wyoming Business Council
jnunle@state.wy.us