

GSA's Demonstration Research Project at Fort Carson

A Discussion Paper for the GSA Green Building Advisory Committee

Background

The Energy Independence and Security Act of 2007 calls for GSA to conduct an annual demonstration project on the green features of Federal buildings, including monitoring and data collection to study their impact on energy use and operational costs. The goal is to ensure that the Federal government learns from its experiences in green building and applies those lessons to current and future programs.

GSA is conducting this year's project at Fort Carson, Colorado in partnership with the US Army, US Department of Energy and two National Labs, building on Ft. Carson's commitment to achieve net zero energy, water and waste by 2020, and taking advantage of its large portfolio of LEED-certified buildings. This project will include technical research led by the National Renewable Energy Lab (NREL) and behavioral research led by the Pacific Northwest National Lab (PNNL).

The research is assessing performance of building systems and occupant interaction with those systems. The intent is to identify the best combined strategies, on both the building and portfolio levels, to achieve net zero performance at optimal lifecycle cost. The project is centered on the following research questions:

Technical (NREL):

1. What is the optimal thermal envelope system by space type from a lifecycle cost perspective?
 - a. **Objectives:** Evaluate air barrier performance, envelope assembly thermal performance and thermal comfort at LEED-certified buildings covering 5 space types (office/storage, maintenance, dining, barracks).
 - b. **Methods:** Conduct life cycle cost optimization modeling for key envelope components, infrared imaging and assessment of tested performance vs. envelope type.
2. How well are daylighting systems performing by space type?
 - a. **Objectives:** Evaluate daylighting strategies and operational opportunities to reduce lighting energy use at the 5 space types mentioned above.
 - b. **Methods:** Install daylighting and occupancy sensors; review switching and control zones, fenestration systems, passive switching strategies and occupant training programs. Develop lifecycle cost models to evaluate savings and recommend optimal control, view and daylighting systems.

3. What efficiency solution sets are available at the optimal energy lifecycle cost for common retrofits?
 - a. **Objectives:** Evaluate a LEED office building retrofit conducted on base and assess costs and benefits to apply to future renovations. Assess life-cycle cost effective strategies to achieve up to 30% better than ASHRAE 90.1-2010.
 - b. **Methods:** Analyze costs and benefits of energy strategies employed at the initial retrofit and of additional potential strategies, and use lifecycle optimization tools to identify efficiency packages that maximize integrated solutions while minimizing first costs.

Behavioral (PNNL):

1. How do occupants of green buildings perceive their work environment and interact with their building's design and operations features? What do occupants believe is their responsibility in the effective & efficient operation and functioning of these buildings?
 - a. **Objectives:** Determine the extent to which Ft. Carson green buildings support occupant work performance, comfort, and well-being and the extent to which occupants work with or against HPGB design and operation features.
 - b. **Methods:** Perform occupant satisfaction surveys of selected buildings as a baseline measure prior to any behavioral intervention. Conduct group interviews, surveys and observations to document the extent of occupant engagement with building design and operation features.
2. What occupant behaviors have the greatest potential to reduce energy use in buildings? Which approaches/interventions produce and maintain energy saving behaviors? What approaches are more acceptable to and effective with different Ft Carson employee groups (military, civilians, contractors)?
 - a. **Objectives:** Identify behaviors with the greatest impacts on energy use and test interventions to determine optimal ways to modify such behaviors for maximum long-term energy reduction.
 - b. **Methods:** Conduct surveys, interviews, limited submetering and observations before and after interventions; compare baseline and post-intervention data. Potential interventions may include training, coaching and participant developed competitions.

Discussion Questions:

1. Do you see any critical omissions or shortfalls in the proposed research in evaluating performance of a green building campus/installation?
2. What revisions or additions to these research questions or approach would strengthen the potential impact of the research and its benefits (e.g., in lessons learned, effective practices, or new ideas) for other military installations?
3. Is the research sufficiently focused to achieve meaningful results?
4. What advice would you provide on pursuing this research, based on your knowledge and experience – e.g., pitfalls to avoid, interesting questions on which to focus?
5. In what forms would the results of this project be most beneficially provided to the Federal audience (and other audiences)?