

GREEN PROVING GROUND TEST BED TECHNOLOGIES

April 19, 2011

- GPG Test Bed projects were selected for enhanced M&V because they have the greatest potential, agency wide, to meet GSA's sustainability goals, based on technical evaluation by Pacific Northwest National Laboratoryⁱ and represent innovative or underutilizedⁱⁱ technologies aligned with priorities established by the Department of Energy's FEMPⁱⁱⁱ
- Final selection of projects is subject to availability of funding for measurement and verification

Category	Technology	Project Description
Building Envelope	High R Value Windows	Curtain wall system with high performance glass to drastically improve the energy performance and occupant comfort
HVAC	Wireless Mesh Sensor Network	Wireless Mesh Sensor network supports active monitoring of temperature in multiple locations, enabling continuous improvement in energy management of large enterprise data centers
HVAC	Magnetic Bearing Compressor	Magnetic bearing compressors are essentially frictionless and their speed is controlled by a variable frequency drive. Eliminating the friction in these compressors greatly increases their efficiency at part load conditions. These chillers have just recently been introduced to the commercial market.
HVAC	Variable Refrigerant Flow	Variable refrigerant flow system enables the use of many evaporators of differing capacities and configurations, providing individualized comfort control, simultaneous heating and cooling in different zones, and heat recovery from one zone to another.
HVAC	Variable-Speed Chiller Plant Control	Hartman LOOP technologies optimize all-variable speed plants by creating a network-based control 'operating system' that optimizes the plant as a system and affords energy cost reductions of 20% to 45%, and enables reductions in plant size of 20% or more with the same capacity and redundancy capabilities as larger conventional plants.
HVAC	Condensing Boilers	A condensing boiler extracts additional heat from the waste gases by condensing this water vapor to liquid water, thus recovering its latent heat. Condensing boiler can achieve up to 98% thermal efficiency compared to 70%-80% with conventional designs. Integrated project design, allowing for only boilers required by demand to be used at any given time. will yield additional energy savings.
Lighting	Low Ambient / Task Lighting	Low ambient / task lighting with integrated daylighting systems and occupant control (DALI systems with workstation specific fixtures) in 10 locations spread over 6 buildings will harvest daylight and respond to occupant preference and contemporary work patterns
Lighting	Integrated Daylighting Systems	Expanded digital lighting control with integrated daylighting harvesting and management promises significant energy savings in selected locations
Metering	Plug Load Reduction	Submetering equipment linking to a website will provide occupants access to a dashboard showing how their individual behavior contributes to overall building energy use.

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Policy	Net Metering	Even though the electric consumption of the building exceeds the output of the PV system overall, a substantial amount of electricity is sold back to the utility. Project will evaluate effectiveness of registering the building as a qualified facility with the Federal Energy Regulatory Commission (FERC) which will allow us to receive compensation rates up to the utility company's avoided cost of alternative generation
Power Generation	Photovoltaics	This project includes high efficiency solar panels that will generate 2 megawatts of renewable energy per year, and a "Solar Lab" where the performance of four different types of solar technology will be researched by GSA and the Department of Energy's Sandia National Laboratories to determine which solar panels work best in the Midwestern climate.
Water Heating	PV with Solar Water Heating	This "turnkey" project combines normal roof mounted photovoltaic panels with thermal heat extractor panels mounted beneath them, thereby collecting both electric and thermal energy from the same footprint, and potentially improving the efficiency of the PV modules.
HVAC	Commercial Ground-Source Heat Pump	Centralized water to water ground source heat pump systems have the potential to significantly reduce site and source energy usage, reduce green house gas emissions and save the water that would otherwise be used by the cooling tower. This project will evaluate this technology at up to three locations
HVAC	Chilled Beams	Use of active beams in the office spaces as the primary source of conditioning the space the building is better able to use the more efficient thermal transfer rate of water in the occupied space rather than using air as is often typical in office settings.
Building Envelope	Smart Windows	Compare electrochromic windows, which have varied tinting values between 2% sunlight allowance and 60% light allowance via electronic controls with an interstitial organic polymer "window filler" that darkens as surface temperature increases. These are the first Federal building installations of this technology.
Water	Non-Chemical Water Treatment	Non-chemical treatment systems have the potential to significantly reduce water consumption, reduce energy (although there are trade-offs that must be measured, since the systems consume energy, but may improve energy performance of the towers), and reduce chemical discharge into wastewater systems.

i PNNL Score is based on evaluation of project against seven equally weighted criteria: (1) Degree to which the technology or practice is innovative or underutilized (2) Potential to be widely deployed (3) Ability to provide practical data needed to measure results and/or outcomes (4) Ability to establish quality baselines in a timely manner (5) Probability of success commensurate with projected risk (6) Wide deployment likely to be life-cycle cost effective (7) Availability on the market

ii Innovative (I) / Underutilized(U): Innovative - commercially available from at least one vendor/manufacturer, less than five years in US market place, no GSA experience with technology/practice. Underutilized - established technologies / practices (five or more years in US market place), 3 or more vendors/ manufacturers, little or no GSA experience with technology

iii Technologies Department of Energy's Federal Energy Management Program (FEMP) has identified as the most promising for the Federal sector based on three factors: Energy Savings Potential for Federal Buildings (50%); Cost Effectiveness (30%); Probability of Success (20%).