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## The Cost of GREEN

Does a sustainable facility  
really cost more?

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# The Cost of GREEN Buildings

Is the cost gap closing?

By Janelle Penny

**D**oes a green building cost less to create and maintain than a conventional building? The General Services Administration (GSA) says yes.

An in-depth study of 22 green federal buildings across the U.S. showed that on average, the representative buildings chosen from GSA's portfolio regularly outperformed national averages of building performance data. These buildings use less energy and water and cost less to maintain, as well as emit less carbon dioxide and have more satisfied occupants than conventionally designed buildings.

But is this true for private sector facilities? The gap between the costs of green vs. non-green has certainly narrowed considerably, but has that gap closed yet? Building professionals weigh in on creating, remodeling, and maintaining green facilities.

## Green Building Performance

The study, *Green Building Performance: A Post Occupancy Evaluation of 22 GSA Buildings*, compares each building's energy use intensity, energy cost, carbon dioxide emissions, maintenance costs, water use, and occupant satisfaction against widely accepted industry and GSA baselines. Sixteen of the buildings were LEED-NC certified or registered, with the remaining six meeting the requirements of other sustainable building programs, including ENERGY STAR and the California Title 24 Energy Standard.

Three of the five LEED Gold buildings performed better

than industry baselines, but the other two – a Department of Homeland Security (DHS) facility in Omaha, NE, and the Census Bureau office complex in Suitland, MD – earned unexpectedly low scores in some areas.

The DHS building bested the industry baseline scores in all categories except water use, which not only exceeded the national average but was also much higher than when the building was previously assessed. This raised suspicion about leaks, unexpected use, and other concerns, but the GSA ultimately

realized the spike was due to a shift in occupancy as the 10,000 square feet of space left vacant when the building opened was filled, according to Eleni Reed, chief greening officer for GSA's Public Buildings Service.

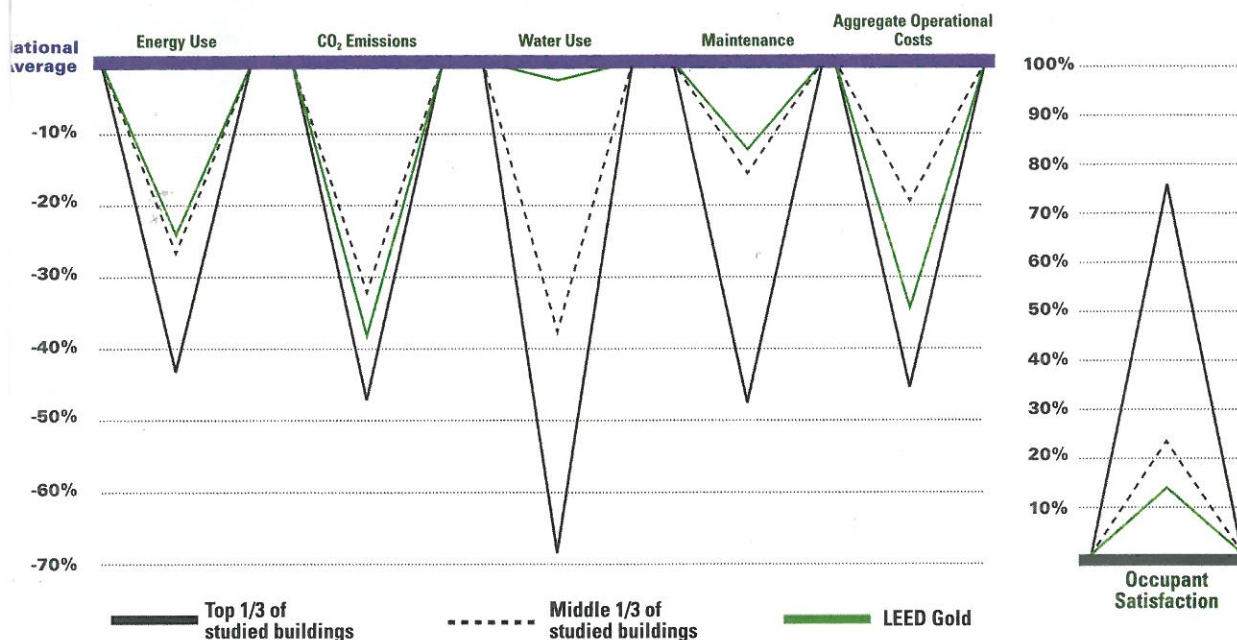
The Suitland facility earned low scores in three of the eight categories, but further investigation revealed that its size and densely populated spaces contributed to its scores relative to the industry average. Building occupants were intensely focused on the 2010 Census when the building study was conducted, Reed notes, adding that buildings of this size are uncommon and are likely not represented in the industry averages that the study compared with GSA's 22-building sample. The unexpected results underscore the status of cost-comparable green building as a moving target and the importance about indexing occupants and building use to put findings into context.



The Green Building, the first LEED Platinum office building in Louisville, KY, boasts a 40-foot lobby ceiling. All public spaces are continually measured for natural light, with automatic controls and artificial lighting ready to step in when the light level is too high or low.

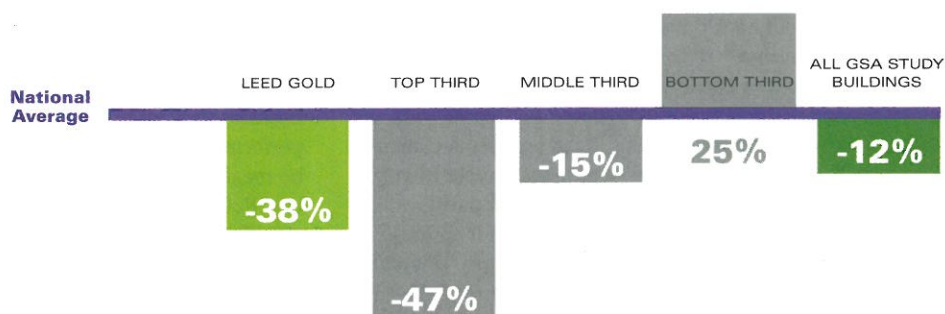


## GSA Buildings Compared to the National Average



The top third of GSA's 22-building sample performed best in all six categories studied, beating even the five federal facilities that were certified LEED Gold (above). Their portfolio still generally exhibited superior performance (right), though the bottom third of GSA's sample buildings lagged behind the national average by a 25% margin.

## Performance of Study Buildings Compared to National Average



"In general, buildings incorporating sustainable design practices perform better than industry average buildings," Reed says. "Upfront investment in sustainability measures needs to be matched by sustainable operations and maintenance practices. Building owners need to compare the performance of their buildings to internally established baselines."

### The Road to Cost Parity

As the marketplace gradually adopts green technologies, costs for today's new innovations will drop just like yesterday's newest, costliest innovations, says Douglas Pierson, partner of an architectural firm, (fer) studios, and lead architect on The Green Building, the first LEED Platinum commercial building in Louisville, KY. This will eventually drive down the costs of greening buildings, which in turn can have a considerable effect on O&M costs when the greening process includes high-efficiency equipment and other

improvements that lower consumption of energy, water, and other resources.

However, those O&M practices must also be sustainable or they could negate some of the savings from your energy-efficient equipment and building improvements. Most of the buildings in the GSA study showed savings in aggregate maintenance costs. However, the ones ranking in the bottom third of the 22-building sample showed unusually high aggregate maintenance costs, about 25% above the national average for U.S. commercial buildings.

"O&M costs are lowest when sustainability is integral to every aspect of a building," the study notes. "Building and systems efficiency alone isn't enough. Upfront investments in sustainable measures need to be matched by sustainable O&M practices."

Pierson, whose firm approaches all buildings with sustainable design regardless of whether the owner is seeking green certification, says those upfront investments in green materials and technologies aren't quite on an even playing

*continued*





field with the older non-green versions, but the costs are quickly evening out.

"Building green has moved closer to the center in that there are a lot more options out there for green resources and materials," Pierson explains. "For example, paints are almost all low-VOC right now, whereas when we were doing the Green Building in 2006, it was a different story."

The cost of retrofitting some green upgrades into existing buildings can sometimes seem high simply because the new, more sustainable materials or equipment weren't originally designed into the building. This can affect product choice and the scope of work. Implementing a skylight, for example, requires a hole in an existing roof, so a building owner adding a skylight or roof monitor may be more favorable toward a small installation over an inadequately lit room rather than a large one taking up most of the roof.

"You are going to pay a premium on some things because you're going back and retrofitting the facility," explains Ben Lilly, senior vice president and director of embassy programs for H&A Architects and Engineers, a planning, architecture, engineering, and interior design firm that counts federal building projects at around 85% of its business. "Look at lifecycle costs and buyback time. For example, with photovoltaics, you might look at tying it back into the grid so you can push power back onto the grid and see what utility rates you get from that."

Smaller, less invasive changes, however, are much easier to implement and the green materials involved may come with little to no premium, Pierson explains. Read product documentation carefully to choose the greenest product for your money.

"With coatings and services approaching cost parity, there are more options, but you have to be careful about recordkeeping and where the materials come from," Pierson says. "Manufacturers have started to keep more records about where the source material comes from and where it's harvested and manufactured. In concrete systems, it's become more common to use recycled content in the concrete, such as fly ash and slag. Those are approaching parity as well, but we're not quite there yet."

## Building Profile #1

**Census Bureau Headquarters – Suitland, MD**

**Built:** 2006

**Cost:** \$307 million

**Square Feet:** 2,340,988

**Occupants:** 5,360

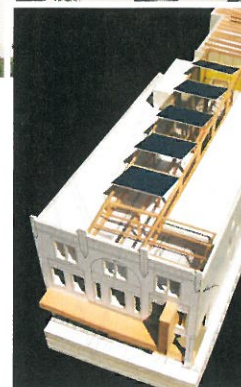
**LEED Certification:** Gold

**ENERGY STAR Score:** 91

**Performance:** Did not meet national average on water use, utility costs, or aggregate operational costs due to densely populated spaces, but exceeded national average in all other areas with scores similar to other LEED Gold buildings in the sample.

INFORMATION COURTESY OF GSA AND SKANSKA USA

The Green Building is a 110-year-old masonry structure that once housed a dry goods store. Much has changed since its extensive renovation began. The building incorporates old growth lumber where possible (top left), and any new wood is FSC-certified and harvested locally. The new space (top right) is now home to a street-facing cafe, art gallery, event spaces, an indoor-outdoor courtyard with a vertical garden, and office space.



## Set Priorities to Cross the Cost Gap

Some technologies, however, are a different story. Take a look at how building systems affect each other to find the best area to invest in. Instead of only considering first cost, find choices that pay off in the long term whenever possible, advises Todd Jersey, architect, owner, and principal in charge of design for Todd Jersey Architecture.

"You could put in electric baseboard flooring, which is very low-cost and efficient, but if you're smart about it and say 'We have this many dollars, so let's spend it on insulation,' you don't need the heat," Jersey explains. "You can call that settling – I call it smart design. It's about the maximum performance per dollar spent."

Existing buildings can also reap considerable benefits from retro-commissioning, in which a third-party commissioning team inspects your facility to look for poorly performing equipment, control system set points that must be recalibrated, and other energy hogs. The process can cost \$20,000-\$40,000, explains Rob McAtee, H&A's vice president and mechanical engineering department head. However, the reduced energy bills and higher building performance will cut back considerably on wasted energy, even if you don't take any additional action to green the facility. (For more on retro-commissioning, see page 18.)

"If the building's more than a few years old, it's likely out of calibration, wasn't set up right to begin with, or has

*continued*



PHOTO COURTESY OF GSA

The Census Bureau initially appeared to earn an inferior score relative to the industry baseline, but GSA officials quickly discovered that densely populated spaces were to blame.



things that are broken," McAtee says. "You could get a low-level analysis done just to look for problems. It's not free, but the benefits are huge because you can save hundreds of dollars per square foot. An existing building would benefit almost universally."

### The Future of the Green Premium

A review of green material costs over the last few years makes it clear that prices are likely to continue to drop, especially for maturing technologies like photovoltaics, because products that have already proved their potential in many buildings put consumers' minds at ease and allow demand to grow. It's worth keeping an eye on the costs of equipment and materials you hope to implement when they become affordable.

In the meantime, sustainable O&M practices and sensible, yet budget-friendly retrofits can produce a big impact on your company's green credibility, as well as its bottom line.

"Insulation is always low-hanging fruit, as is anything related to the envelope," McAtee advises. "There are better window coatings that can block heat from solar radiation but still give you a lot of good light. If there's one place to start, it's your envelope."

Reduce the replacement of building materials and other items that aren't past their prime yet, especially when renovating or remodeling the building, Pierson adds.

"One of the greenest things you can do is reuse. That has the lowest carbon footprint," Pierson explains. "Decide what's important in the building and figure out a way to save it. Then you'll have a good sense of what will be reused and what will be new construction, which produces a clean budget and cost structure to go with it."

The costs of greening buildings ultimately rely on changing attitudes among architects, builders, and owners, Pierson adds. "It will take the obsolescence of sustainable design as a different kind of building system," he explains. "As soon as that becomes standard – and we're approaching that – then we'll see the cost fall into place."

Where do you stand? Share your green building experiences with us – and possibly your peers – by emailing [janelle.penny@buildings.com](mailto:janelle.penny@buildings.com). We may report your experiences in a future issue. ■

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## Building Profile #2

EPA Region 8 Headquarters – Denver, CO

**Built:** 2006

**Cost:** \$90 million

**Square Feet:** 301,292

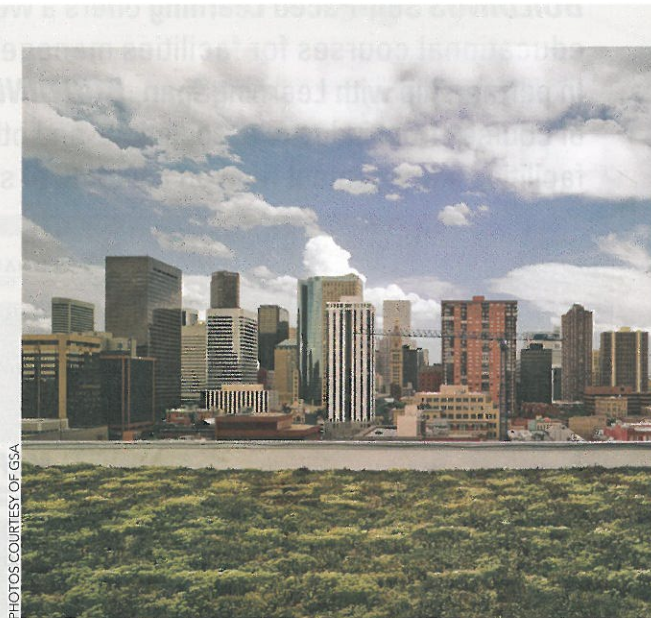
**Occupants:** 922

**LEED Certification:** Gold

**ENERGY STAR Score:** 94

**Performance:** Bested the national average in all categories surveyed, with scores generally comparable to the other LEED Gold buildings in the sample.

INFORMATION COURTESY OF GSA AND WHOLE BUILDING DESIGN GUIDE



PHOTOS COURTESY OF GSA

This regional EPA headquarters features a green roof with a view of the Denver skyline (above), solar panels that reduce the building's need for grid power (below), and a nine-story atrium that diffuses daylight (left).

