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Figuring it out

by Alison Ryan
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A post-occupancy study of Northwest LEED-rated buildings turned up some actual numbers on comparative energy and water savings in green buildings - but it also highlighted challenges in studying performance.

Daily Journal of Commerce Photo

The report, a Cascadia Region Green Building Council project, compiled information on 11 buildings in Seattle and Portland that have been occupied for more than a year and have earned certification through the U.S. Green Building Council's Leadership in Energy and Environmental Design rating system.

"Post-occupancy studies really don't get done in a lot of cases, whether the building is green or not," said Gina Franzosa, Oregon State director of the Cascadia Region Green Building Council. "We were hoping to prove a couple different things. Even though your intentions may be really good, once the rubber hits the road, you might not be getting what you really set out to achieve."

The study is really a way, Franzosa said, to figure out where buildings are meeting desired efficiency, where they're not meeting desired efficiency, and where ways of determining efficiency are or aren't hitting the mark.

Findings indicate that most participating buildings experienced real energy savings in relation to original modeling; most also saved in indoor water usage.

The average 25-year dollar-savings for buildings in the study - compared to the regional median - was $2 per square foot, but savings estimates varied widely depending on calculation method used. Monetary savings for water use were minimal per square foot.

Evaluations compared actual energy- and water-use information, compiled directly from utility bills, with two forms of modeled use: the LEED baseline cases for a similar building's water and energy use, and the modeled usage in the initial building design.

The baseline approximates a similarly designed building constructed just to meet code requirements and is modeled by pulling the energy-efficiency features out of the as-designed model. The design-modeled use reflected the energy-efficiency features included in the initial building design.

Portland participants

Seven of the 11 buildings studied are in Portland, including:

• The Balfour Guthrie Building, a three-story, 18,000-square-foot, LEED-silver-rated office building.

• The Hillsdale Library, a one-story, 12,300-square-foot, LEED-gold-rated library building.

• The Jean Vollum Natural Capital Center, or Ecotrust Building, a three-story, 70,000-square-foot, LEED-gold-rated retail and office building.

• Viridian Place, a three-story, 15,000-square-foot, LEED-certified office and retail building.

• Portland State University's Broadway Building, a 10-story, 198,000-square-foot, LEED-silver-rated apartment, classroom, office and retail building.

• PSU's Epler Hall, a six-story, 64,000-square foot, LEED-silver-rated apartment, office and classroom building.

• The Henry, a 12-story, 220,000-square-foot, LEED-gold-rated condominium and retail building.

Seattle buildings examined included the King Street Center, Seattle Public Library and Traugott Terrace. The 11th building was an unidentified office building.

Energy use

Six of the buildings - Balfour Guthrie, Seattle Library, Hillsdale Library, the Henry, Epler Hall and the Broadway - used less energy than suggested by their design models.

Although building size and type varied widely, eight of the 11 had energy-use intensities within the range of 44 to 55 kilo British thermal units, or kBtu, per square foot. No building's actual performance was within 20 percent of its design model. All buildings used less than the to-code baseline, with an average saving of nearly 40 percent below baseline.

Water use

Water design projections were available for seven of the buildings - Viridian Place, Balfour Guthrie, Seattle Library, the Henry, Epler Hall, Traugott Terrace and the Broadway - and all seven used at least slightly more water than projected by their design models. Four of seven saved more than 8 percent of the to-code baseline.

Both PSU buildings in the study performed well on energy use, said Dresden Skees-Gregory, PSU sustainability coordinator. And though the buildings aren't doing as well on water use, she said, their performance is still impressive.

"It's important to note they're still doing better than standard buildings," Skees-Gregory said of Epler Hall and the Broadway Building. "And I think that was true of almost every building in the study."

Data gaps

Study results are largely put forth as part of an early-stage, general-

information-gathering process. Green building science and information is still in the early stages, and Franzosa of the Cascadia council said the study is a launching pad for further research.

"It's really an evolving area," said Jerry Yudelson, an associate principal at Interface Engineering who has studied green building data. "These kinds of post-occupancy evaluations are really critical to fine-tuning. They are really essential to making sure that people know that efficient systems make a difference."

According to the study, deeper review hinges on information that could be captured during construction and design - initial metering figures, initial expected building performance and changes made to energy features during construction and value engineering. The study also indicated that lack of data in areas such as water usage patterns, typical residential and commercial building energy and water use also has an impact on what can be learned.

Skees-Gregory said PSU is beginning to reassess how it's collecting data and what data are being collecting. Especially nice, she said, would be comparing the energy savings with the cost of installing above-standard systems, so that the university could see a clear return on investment.

Most important, Yudelson said, is that if a team doesn't actively commission a building or put in measurement verification systems, it won't know why the building's not performing. Verification systems make for an optional LEED point, and Yudelson said that of the first 100 projects certified under LEED, approximately a third obtained the verification point.

"It definitely costs more than putting in a bike rack," he said. "But it's a worthwhile thing, and I think engineers are figuring out that they can do that in the $10,000 to $20,000 range on a typical project."