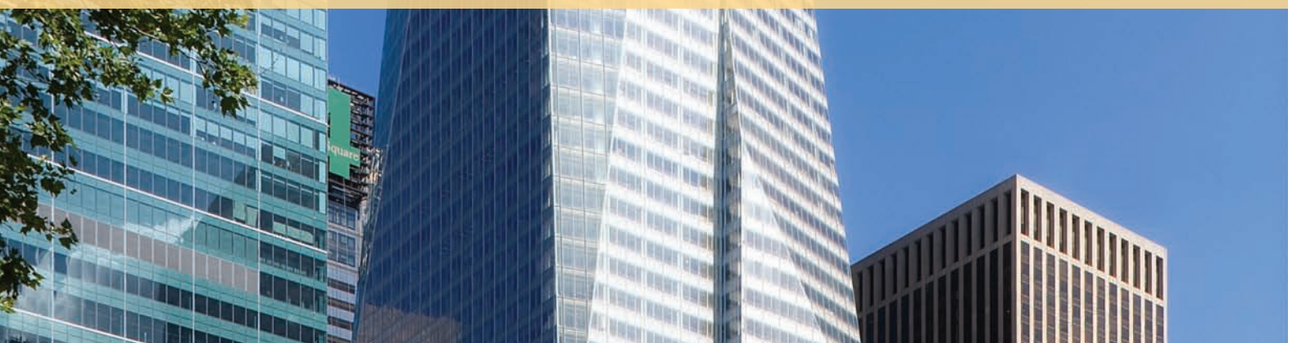
Documenting Performance

Does it Need to Be So Hard?

The "Editor's Commentary" in the Fall 2008 issue of High Performing Buildings (HPB) distilled some of the "Lessons Learned" over the first year of publishing HPB. The commentary stated "getting energy performance data should be easy… but what we've learned in our first year is that energy consumption can be a complex issue, and the data that are available need some analysis."



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In the Winter 2008 issue of HPB, we wrote an article entitled "The Proof is Performance," where we reviewed the measured energy consumption of one of the first well-known green buildings in the United States—the Condé Nast Building at 4 Times Square in New York City. In that guest commentary, we reviewed some of the challenges in measuring and reporting building energy performance, but given the experience of the first year of HPB we felt compelled to weigh in with some additional thoughts on the topic of energy consumption reporting for buildings.

Conceptually, the statement "getting energy performance data should be easy" is true. Virtually every building has electric, gas and other fuel revenue meters coming into the building, and summing whole building energy use for a year should not be rocket science. Why is it so hard for HPB (and other building trade publications) to get this information for the buildings being profiled?

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Calculating any building's energy use intensity (high performance or not) is a fairly simple task: Sum all energy use, and divide by the floor area to obtain the building's energy use intensity (EUI, usually expressed in Btu/ft^2/yr). This can be used to easily compare to what EUI was projected at the time of design. Nearly all of the buildings highlighted in HPB (and most other green building trade magazines) have had energy models developed during design that can provide the design estimate of expected EUI.

Too often the model doesn't necessarily simulate how the building actually will be operated or account for all of the equipment loads within the building. Modeling seems to be improving, but at present, there is no real incentive to accurately model the building as it will actually operate (and perhaps there's a penalty for such accuracy if one is trying to stretch to get that next LEED® energy performance credit).

The New Buildings Institute recently did a well-researched study on the energy performance of LEED buildings,[1] the most authoritative review to date. When the data were first released, some important caveats to the findings were discussed. Most importantly, they were able to obtain actual energy data for only 121 buildings out of 585 requested, and it's unclear whether that sample is representative. Unfortunately, these caveats, along with the fact that a large portion of

Opposite: The Bank of America Tower at One Bryant Park is designed to be one of the most sustainable office buildings in the world.

the buildings are using significantly more energy than predicted, are usually lost in most discussion by green promoters.

More recently, relatively serious questions have been raised about energy performance in green buildings. For a good summary, see the article "Lies, Damn Lies, and... (Another Look at LEED Energy Efficiency)" on BuildingGreen.com.[2] Experts will debate for years the validity of the arguments raised, but serious questions remain about how "high performance" buildings are performing when they're actually operating.

If it is so easy to collect energy bills, calculate an EUI, and report it relative to expected performance, why is it so hard to get measured energy performance for buildings highlighted in this magazine?

While in many buildings it is easy, it can be more of a challenge for others. In multitenant buildings, often there are multiple meters, and it is not always simple to access the energy use history for all of those meters; presenting partial data can be misleading. Many buildings are part of a campus (e.g., university buildings and hospitals) and might not have the energy use of all buildings metered. These problems should be easily solved with some inexpensive additional metering, which should be part of any high performance design.

A bigger issue is that case studies of high performance buildings are often prepared by the design teams. However, they rarely have any ongoing role at the building once it is occupied and starts consuming energy. In some cases, the relationship between the design team and the owner/occupants becomes complicated, and neither side wants to help the other look good (or bad) by sharing data.

This highlights the critical role of building operating staff in making sure that a *designed* high performance building actually does perform. In too many cases, the design team doesn't really understand the needs of, and pressures on, building operations staff. Therefore, the well-intentioned design can't be operated to that intention.

We've heard several engineers complain that the buildings they designed weren't working as well as they should because "the operations staff won't run the building the way we intended." Designers need more feedback from operators to move toward more true low energy buildings.

Bridging the gap from design to operations is critical. It doesn't matter how elegant or sophisticated the design might be. When the building has been occupied, *the operator will always win in the end!* This is not to place all responsibility on designers. There is a great need for more (and ongoing) training of building operational staff. However, it's irresponsible for designers to not adequately consider how the building will (*or even can*) be run.

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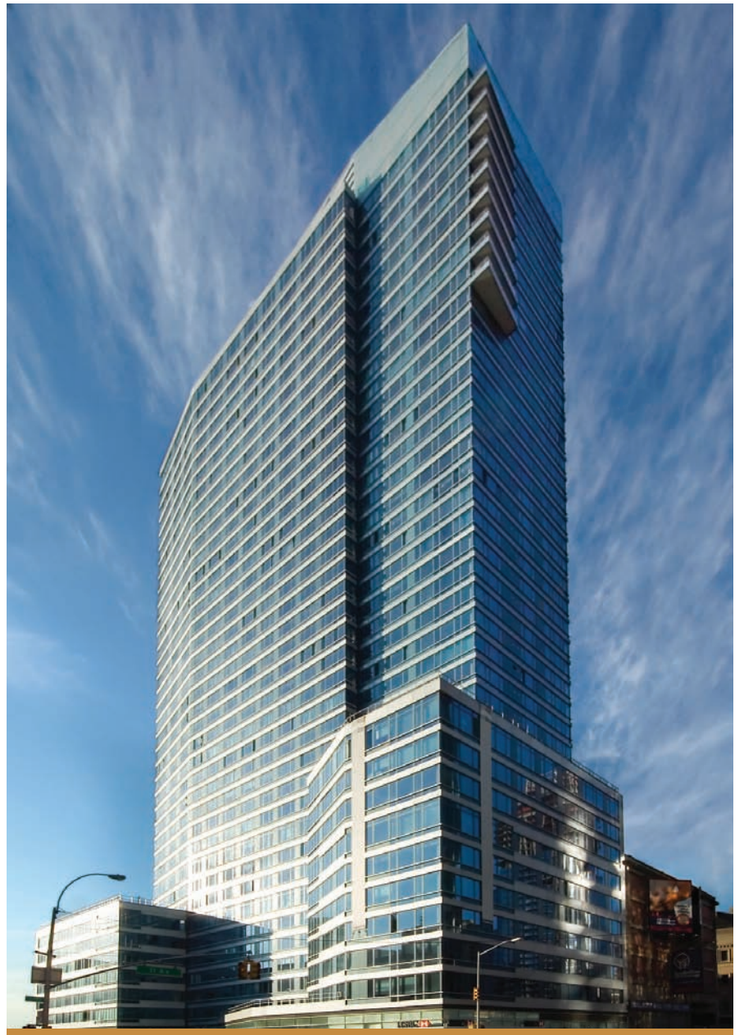
We have encouraged other owner firms to publish case studies with measured energy performance in HPB. We've both been frustrated that the firms aren't willing to do so because the numbers don't look good. Unfortunately, this is partially due to setting unrealistic expectations. Some of the projected (and well-publicized) estimates of energy use are significantly lower than what seems realistic.

Recently, we've even heard of a couple of projects where owners pay for two sets of energy models: one to get the most LEED credits, and another with more realistic assumptions about operating conditions for budgeting their real expected energy costs. If this sort of "gaming" grows, our current modeling and reward system is setting perverse incentives. We've set expectations and incentives for energy modelers to predict idealized performance, regardless of what will really happen in the building when it's built and occupied.

The lack of real, measured performance data on green buildings causes owners and their designers to operate in somewhat of a vacuum, often pursuing technologies and techniques that are not worthwhile.



The Helena is one of the first LEED Gold high-rise residential buildings in New York City.

So what's the path forward? Given the growing pressure to reduce carbon footprints, there is much more emphasis on understanding both energy performance targets, and then whether they're being met. The Architecture 2030 program[3] has highlighted current median EUIs for various building types, and the targets for various years toward their zero carbon building targets. When different parties look at the EUI targets, they can see how their simulations fit with that, and also the targets give more "benchmarks" for

what represents lower energy buildings. This gives a better measure to track ongoing performance than simply "we're 35% below code."

One challenge is that most "high performing buildings" demonstrate improved energy performance beyond a code or LEED threshold under ASHRAE/IESNA Standard 90.1's "Energy Cost Budget" methodology. This compliance option of the energy standard uses cost-based comparison as a proxy due to real challenges in determining valid conversion and loss factors for different energy sources, primarily electricity, which has a variety of generation sources and environmental impacts depending on location. A better metric than cost for energy performance is "source energy," which accounts for any generation, transmission and distribution losses for all fuels. However, obtaining consistent and valid "site to source" conversion factors can be a challenge.

There will also be much more transparency about the performance of all buildings with moves toward mandatory energy performance benchmarking, already a policy in California for all commercial buildings, the District of Columbia for buildings more than 100,000 square feet and expected in other jurisdictions including New York City before long.

ASHRAE's planned building energy label initiative[4] will take things to the next step. Two building energy performance indicators are planned: a design, or "asset" rating, which will be based on the simulated energy performance of a building; and an "operational" rating that rates the building performance as operated, based on the energy actually consumed in the building. If the building is optimally operated as designed/expected, the asset and operational ratings should be relatively close; if not, that might indicate opportunities for improvement. While the ASHRAE label program won't be available for a while, building owners (and designers) can get an operational rating for most building types using the EPA ENERGY STAR® Portfolio Manager rating tool.

Too much anecdotal information suggests that a fairly large number of high-profile green buildings are using much more energy than their widely published projections. We desperately need more data on actual performance, with random samples, and comparisons of new green buildings to plain vanilla, standard construction buildings serving the same uses as those green buildings.

Energy performance is only one attribute of a high performance building, but is often touted as providing significant cost savings to offset any increased costs of the buildings. Other valuable qualities of green buildings may result in higher energy use, but provide significant environmental benefits. (While it can be done efficiently, moving and conditioning increased ventilation air will always have some cost.) What's needed is more transparency about how buildings (whether high performance or not) really work.

Managing expectations about green building energy performance is critical to help with this transparency. Buildings have more electronic equipment than 10 or 20 years ago, and these all consume energy — think about how many chargers or power supplies are plugged in by your desk and every other desk in your building. Most of these weren't there five to 10 years ago. All of this equipment consumes energy, and it can really add up. While we'd all like to get to zero energy or 50% below code buildings in the near future, that may be a real challenge for many buildings. Matching projections with reality is critical.

We challenge designers (including fellow members of ASHRAE) and owners to be completely transparent with presenting energy use in their buildings. The Durst Organization, which has led in designing and building high performing buildings since the mid-1990s, has already reported on actual performance of the Condé Nast Building at 4 Times Square. We commit to sharing measured performance data on two new LEED buildings in New York City developed by the The Durst Organization.

We plan to summarize the actual performance of The Helena, a LEED-NC Gold residential high rise, in the Summer 2009 issue of HPB. We also plan to present operating data for the Bank of America Tower at One Bryant Park within two years after the commencement of revenue operation of the facility's cogeneration plant (publication date approximately summer 2011). The building is nearing construction completion and is expected to receive a LEED Platinum rating.

We strongly encourage HPB to include with every case study a simple table of key performance metrics: total metered energy and water per floor area, and any other critical performance characteristics that are relevant for a real understanding about how a building performs. If a building has been occupied for more than two years and cannot provide measured energy and water data, valid reasons should be included in the case study as to why, and plans for future measurement of performance explained.

This is the only way we can truly say we're making progress toward *higher* performing buildings.

References

1. Turner, C., and M. Frankel. 2008. "Energy Performance of LEED for New Construction Buildings." Vancouver, Wash.: New Buildings Institute.
2. Malin, N. 2008. "Lies, Damn Lies, and... (Another Look at LEED Energy Efficiency)." Posted Sept. 2, 2008, on BuildingGreen.com, http://tinyurl.com/5m4bpr.
3. Architecture 2030. www.architecture2030.org.
4. http://tinyurl.com/5qgmbr ●

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