

Black text is USGBC's answer to my article which mentions LEED buildings using more energy than comparable buildings, Red text is rebuttal by me. (Henry Gifford)
Article is "BuildingRatingSystems," posted on HenryGifford.com

U.S. GREEN BUILDING COUNCIL

Dear Chapter Leaders:

The recent New Buildings Institute study demonstrating the quantifiable energy savings of LEED buildings is the subject of an opinion piece written by Henry Gifford and published on his Web site.

The year-long NBI Study, entitled *Energy Performance of LEED for New Construction Buildings*, was funded in part by a grant from EPA and was peer reviewed by EPA, PNNL, and the Berkeley Center for the Built Environment, among others, prior to publication. The NBI study demonstrates that LEED buildings are more energy efficient than conventional buildings of the same type, and points to the importance of ongoing monitoring and improvement in actual energy performance in order to realize the full potential of energy model-based designs.

USGBC welcomes thoughtful critiques, but remains committed to decisions based on facts, not opinions. Gifford's assertions are based on serious misrepresentations of the data and on analytical biases that both USGBC and NBI have raised with the author for correction prior to publication. These factual corrections were not included in the document published on Gifford's Web site.

Given the urgency of improving the energy efficiency of our built environment, accuracy matters. USGBC has therefore included the factual corrections we shared with Mr. Gifford below. **Some of the "corrections" below were shared with me, but none of them are facts.**

In summary, they are as follows:

1. LEED buildings do have a lower EUI than CBECS and Mr. Gifford's claim is not correct based on the data. **LEED buildings only look better when comparing new buildings to old, and when comparing the median of one dataset to the mean of**

another dataset. The mean EUI (Energy Use Index) of the LEED buildings is 105, which is 15% higher than 91, the mean EUI for the whole CBECS database the study compared the LEED buildings to (which includes buildings built before 1920), and is 29% higher than the mean EUI of 81.6 for CBECS buildings built between 2000 and 2003, which is the most fair comparison, as all the LEED buildings were built or renovated in 2000 or later.

2. He combines highly differentiated building types together and attempts to compare them CBECS, which will, and does, result in faulty analysis. **This is the same comparison the study's claim of a 25% to 30% energy saving is based on.**

3. His claim that the buildings self-selected suggests a bias that simply wasn't present, ignoring the transparent and good faith effort to do as comprehensive a post-occupancy study as possible based on data that was available. **There has been much discussion of why approximately one fourth of the buildings were dropped from the study, but no discussion of why a much larger number of buildings (about half the buildings certified by LEED up to that point) were dropped after a single letter went unanswered.**

4. His own analysis uses highly selective data and does not adhere to appropriate research methodology for variable data. **I used the same data the study used, and compared the mean of one dataset to the mean of another dataset, which is an appropriate methodology.**

5. His fundamental misunderstanding of how LEED for New Construction rewards energy efficiency and renewable energy and how LEED for Existing Buildings incentivizes increasing levels of energy efficiency colors the conclusions he drew. **LEED for new construction does not reward, or even measure energy efficiency. It rewards predictions.**

Significant details of each of these points are outlined below, and we encourage you to refer others to these more detailed explanations should they have additional questions. **I encourage you to refer people to read my article, "BuildingRatingSystems," which is available on my website at HenryGifford.com.**

- According to the NBI study, LEED buildings have a lower EUI than CBECS in every category of buildings except laboratory buildings. A careful review of the raw study data reveals that any type of building in the LEED data (excluding laboratory buildings) has an average EUI well below the CBECS

average EUI for that type of building. As an example: office buildings, which make up the most common building type in LEED, have an average EUI of approximately 62 kBtu/SF for LEED buildings, compared to 93 kBtu/SF in CBECS. That result can only be obtained after eliminating the worst performing 20 of the 121 buildings in the LEED dataset, comparing new LEED buildings to old CBECS buildings, and comparing the median LEED value to the mean CBECS value. Claiming that LEED EUIs are higher is not correct. The mean EUI of the LEED buildings (105) is 29% higher than the mean EUI (81.6) for new CBECS buildings. Mr. Gifford, using the combined LEED building EUI mean (105 kBtu/SF), mixes such a wide variety of building types, and contains a much higher percentage of very high energy type buildings than the CBECS data set he is choosing to compare it against. The high energy "type" buildings removed from the LEED dataset were not separated by building type. They were simply the 20 buildings with the highest energy use. No buildings were removed from the CBECS dataset.

- Specificity in analysis of this type is extremely important because you have to compare apples to apples in order to draw clear results. Mixing apples with sardines, from an analytical perspective, is in error and therefore produces erroneous and misleading results. NBI was comparing apples to sardines when they compared the median EUI of new buildings to the mean EUI of old buildings. Mr. Gifford's discussion vacillates back and forth between new commercial buildings versus existing commercial buildings, and further includes unrelated commentary about residential buildings. The NBI study compared new commercial buildings to old. I made a more fair comparison by comparing new (and a few completely renovated) to new. Gifford combines highly differentiated buildings types together and then attempts to compare them with CBECS data, which therefore does not produce accurate analytical results. This is the exact comparison the study's claims of 25% to 30% average energy savings for LEED buildings is based on.
- Claiming the sample is 'self-selecting' is an inaccurate depiction of the data and the analysis. For this sample, it is true that how the group of buildings that did not report utility data are performing in absolute terms or relative to the group of buildings that did report utility data is unknown. This "self-

selection” to the extent it is even an issue in this analysis, is typically a possibility in the analysis of surveys having non-respondents. No effort was undertaken by USGBC or NBI to specifically seek out the better performing buildings. To the contrary, USGBC and NBI went to great lengths to obtain participation from each and every eligible project, and both NBI and USGBC would have preferred to have 100% project participation. **Sending one letter and ignoring people who didn’t answer is hardly “great lengths”.** That some projects were not able to report utility data and did not meet the basic requirements for inclusion in the analysis is, unfortunately, not all that uncommon in the operations of buildings at the present time. However, due to general increasing awareness regarding the energy performance of buildings and efforts from USGBC with tools such as LEED for Existing Buildings, Operations & Maintenance and from U.S. EPA’s EnergyStar program, more and more building owners are regularly tracking the energy use of their buildings. The data, subsequent analysis by NBI, and subsequent peer review of the analysis represents a tremendous, good faith effort to assess the post occupancy performance of buildings earning LEED certification and to make comparisons to the commercial stock of buildings. **Not reporting the average (mean) energy use, comparing median to mean, eliminating the highest energy use buildings from most analysis, and making comparisons to poorer performing, older buildings hardly “represents a tremendous, good faith effort.”**

- The analysis Gifford presents is highly selective: It is based on the average (arithmetic mean) of the CBECS EUI and the LEED data set rather than on the full data. **No data is missing. I compared the mean EUI of all the 2000-2003 CBECS buildings to the mean EUI of all the LEED buildings. The mean EUI of the 395 CBECS buildings built between 2000 and 2003 is 81.6, the mean EUI of all 121 LEED buildings reporting is 105.** Utilization of an average figure instead of the rigorous and extensive raw data is an oversimplification that produces erroneous results. **The average (mean) is what the CBECS data reports, and it was good enough for the NBI study to use as a comparison in their study.** The median is a common statistical indicator of the average that is particularly appropriate for highly variable data sets. In statistical terminology, it provides more robust results than the mean, and is less distorted by extreme results. **The CBECS dataset**

includes higher high values than the LEED dataset, and lower low values than the LEED dataset, but the US Energy Information Administration still reported mean values in their CBECS report. The median was used for all LEED building averages in the study for this reason. There can be justification for using a median to analyze a dataset, or for comparing the median of one dataset to the median of another dataset, but there is no justification for comparing the median of one dataset to the mean of another dataset, which produces a meaningless and misleading comparison.

- Gifford's assertions fundamentally misunderstand the way LEED for New Construction rewards energy efficiency and renewable energy. For example, Mr. Gifford indicts the use of solar panels, stating that "money spent on solar panels can't also be spent elsewhere." Rather, the LEED credit structure values (through the award of LEED points) efficiency and reductions of energy use the same irrespective of the source of the savings (1 kWh reduction gained through efficiency is equal to 1 kWh reduction gained through a PV system). EA credit #2 offers points for renewable energy only. The LEED point structure incentivizes building owners and project teams to use their capital investment wisely by investing in energy efficiency first as it is almost universally accepted that efficiency is the best first use of money. Project teams may choose to invest in on-site renewable systems instead of efficiency but LEED does not incentivize project teams to act in this manner. LEED for new buildings does not reward energy efficiency or energy production, or even require either one to be measured. It only requires predictions of energy saving.
- Gifford's assertions also mischaracterize the manner in which LEED for Existing Buildings/Operations and Maintenance incentivizes increasing levels of energy efficiency. Energy efficiency represents the single greatest opportunity for earning credits within the LEED for Existing Buildings/Operations and Maintenance rating system.

USGBC has released the raw data set (keeping the building owner and address confidential) from the NBI study to numerous researchers who are in various stages of analysis towards the publication of peer reviewed papers intended to guide the development of LEED specifically and to inform the green building community at large. The analysis conducted by these independent researchers has validated the

work conducted by NBI and peer reviewed papers presenting these confirming analyses will available in the near future.

Further rigorous, peer-reviewed technical analysis of the data and of LEED building performance overall will offer further clarification as well as substantive guidance on how LEED can continue to be improved.

USGBC remains dedicated to research and scientific inquiry, measurement and verification of results, rigorous analysis, and peer review. **The USGBC can hardly be described as dedicated to verification of results or rigorous analysis, as they still defend a study that never even mentions the mean EUI of the LEED rated buildings.** In 2008, the Council invested \$2 million in matching funds for third-party research on building performance, occupant health and well-being, green schools, and other critical topics. We look forward to learning how to improve our own work from the serious technical and scientific inquiries of both the academic and practicing communities, and from the experiences and inspiration of dedicated individuals.

NBI has also issued a response; please see the attached NBI response and “frequently asked questions” document.

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