LEED and Energy Efficiency: Do Owners Game the System?

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Abstract By meeting a set of predetermined requisites and guidelines in the construction or retrofitting process, building owners are able to obtain a Leadership in Energy and Environmental Design (LEED) certification. Given that owners of LEED-certified buildings are often rewarded with financial incentives such as tax breaks and zoning allowances, it has been suggested that applicants for LEED certification take advantage of scoring credits that are easier to obtain, but that may not serve in the interests of the environment. In this paper, we evaluate the frequency with which building owners in California seeking LEED certification after the year 2009 applied the most energy-reducing measures to their buildings. The findings indicate that LEED applicants do not seem to display a selective bias against the LEED rating system score credits deemed as particularly energy-friendly.

The Leadership in Energy and Environmental Design (LEED) program was created in 1998 by the U.S. Green Building Council. Its self-proclaimed goal is to “provide building owners and operators with a framework for identifying and implementing practical and measurable green building design, construction, operations and maintenance solutions” (USGBC, 2012). To date, LEED-certified buildings can be found in 135 countries. The program is voluntary, and standards are verified and approved by third parties.

Four levels of LEED certification exist: Certified, Silver, Gold, and Platinum. Certification level is dependent on the total amount of points achieved, with a 110-point LEED rating system scale assessing commercial buildings and neighborhoods (a minimum of 40 points is required). Residential homes are assessed on a 136-point scale, with a minimum of 45 points required to obtain certification.

In many ways LEED has been successful, heightening awareness of the design and life-cycle assessment of buildings. Buildings that are LEED-certified typically have lower operating costs, less waste to send to landfills, greater savings in water and energy use, lower greenhouse gas emissions, and greater health benefits for inhabitants (Quirk, 2012). To date, over 12,400 buildings can be found in the LEED Certified Project directory, and this excludes certified residential homes (USGBC, 2012). A study of 121 LEED-certified buildings showed that the median energy use intensity (EUI) of these buildings lay 24% beneath the national average for similar buildings (Turner and Frankel, 2008). Energy reductions are a particularly important component of the LEED program. According to the U.S.
Department of Energy (DOE), more than 40% of human energy consumption takes place in buildings (USDOE, 2012). Unless electricity usage is connected to a metering system, it may be difficult for many inhabitants to analyze their energy consumption and consequently to seek out ways to reduce it. LEED seeks to make such action more accessible by dedicating the largest proportion of its total credits to the reduction of energy within buildings. From integrating metering systems to increasing renewable energy sources, LEED applicants are able to take a variety of measures to ensure more sustainable, energy-efficient buildings.

The modern renown of the LEED certification as well as some of its benefits may be involved in altering its original intent of environmental impact reductions. Specifically, certain news articles cast doubt on the fact that individuals applying for LEED certification may not be trying to reduce an impact on the environment, but rather are looking for an easy way to save money (Frank, 2012). A vibrant example is “How to Cheat* at LEED for Homes,” a report offering guidance on the easiest ways to collect points towards LEED certification (Seville, 2011). This process of “gaming the system” may have far-reaching implications. A LEED certification qualifies building owners for tax rebates, zoning allowances, and other incentives in hundreds of cities. This may make the certification of LEED buildings a question of economizing, not of reducing environmental impact. If building owners intentionally add a point to their LEED certification rating system scores by installing a bike rack, looking at the potential to game or manipulate the LEED system by going after the lowest cost points, even when they do not use a bike, LEED’s purpose of achieving sustainability may become obsolete. This is especially true as other city and state building codes require more effective energy-reducing measures, which may become obsolete.

Determining whether such perks motivate LEED certification is complicated for newly constructed buildings. This is because in contrast to LEED, which is a voluntary form of green building regulation, many cities and states now have mandated building codes that force new buildings to adhere to minimum standards of energy consumption and sustainability. For instance, the state of California has established CalGreen, the first mandatory statewide green building code in the United States. Created in 2011, CalGreen shares many mandates with the recommendations on the LEED rating system (CBSC, 2012). Furthermore, cities within the state have their own ordinances to promote environmental sustainability, an example being the San Francisco Green Building Ordinance, which requires that newly constructed residential and commercial buildings adhere to elements of green building. These and other recent forms of building regulation have narrowed the gap between newly constructed and LEED-certified buildings; therefore, newly constructed buildings may be less helpful in evaluating whether factors unrelated to environmental benefits may prompt the LEED certification process.

The LEED for Existing Buildings: Operations & Maintenance (LEED EB O&M) Rating System has criteria for buildings that are not meant to undergo major renovations. The standards are based on the operating performance of the building, independent of its initial design. The fact that the stock of the existing office space in the U.S. greatly outnumbers the new office stock added each year allows
LEED-EB O&M to have the greatest influence on the green office market (Blumberg, 2012). An assessment of each building is made by determining whether the building has fulfilled all prerequisites required for LEED certification, as well as a minimum amount of points, contained within six distinct categories: sustainable sites, water efficiency, energy and atmosphere, materials and resources, indoor environmental quality, and innovation in operations. The type of LEED status achieved is based on the final number of points: Certified: 34–42 points, Silver: 43–50 points, Gold: 51–67 points, and Platinum: 68–92 points. Over the course of initial LEED certification, all prerequisites and credits must be enacted for a minimum of three months (except for Energy & Atmosphere Prerequisite 2 and Credit 1, which have durations of one year).

Buildings that are certified through LEED EB O&M have been constructed before certification. This means that their energy needs have also been previously defined, most often without the guidance of green building regulations. For the purpose of this investigation, LEED EB O&M certified buildings are used because their prior existence provided two relevant assumptions for measurement: (1) It can be assumed that LEED EB O&M certified buildings have relatively few energy efficiency measures in place, as these were not required by building codes at the point of their construction. (2) If energy efficiency measures are not in place, it would be expensive for building owners to upgrade to such measures. This may provide an incentive for them to resort to cheaper, less energy-reducing credits to gather the required number of points for LEED certification. Analyzing LEED EB O&M certified buildings was therefore seen as the best way to evaluate whether LEED certification recipients may have been less motivated by LEED’s most important contribution, energy efficiency, than by the opportunity to save money through financial incentives.

**Methodology**

Our aim in this study was to utilize project information from LEED EB O&M certified projects to assess the frequency of measures deemed to be most helpful in reducing building energy consumption. By assessing LEED EB O&M rating system scale scores for projects in California, this analysis sought to answer the following questions: What is the frequency with which the most energy-reducing measures found in the LEED EB O&M rating system scale were applied to certified projects in the state of California? Statistically, how does the frequency of the identified energy-reducing credits change as LEED certification level (Certified, Silver, Gold, or Platinum) changed for these certified projects?

A list of LEED EB O&M certified projects in California was obtained from the LEED Certified Projects Directory. Data gathering and analysis underwent the following steps:

1. Data on LEED EB O&M projects within California were isolated and categorized by certification level from the LEED Certified Projects Directory.
2. Among the identified LEED EB O&M projects, those containing a PDF attachment with the project’s exact rating system scale scores in each category were extracted and imported as an .xlsx format file into Microsoft Excel. Of the 229 identified LEED EB O&M projects evaluated in 2009 or later, 91 featured these attachments.

3. We input data into Excel to record the presence or absence of each identified energy-reducing credit, as well as the LEED certification level of the project. In the Appendix, we explain how these energy-reducing credits were identified.

4. Graphs were created comparing energy-reducing credits and the percent of projects in each LEED certification level that applied them. These were used to analyze the frequency of energy-reducing credits for each category, as well as the relationship between LEED certification level and the observed frequency of energy-reducing credits.

**Results**

No clear absence of any of the nine identified energy-reducing credits could be found among the surveyed LEED-certified projects. Though certain credits were less frequently enacted than others, there was no credit that was avoided by every project. In comparison to the other credits, Existing Building Commissioning (both Implementation and Ongoing Commissioning) had extremely low rates of adoption across all certification levels except Platinum, which is illustrated by Exhibit 1.

In addition to Existing Building Commissioning, the use of on-site or off-site renewable energy had extremely low adoption rates. Not one of the surveyed buildings at the LEED Certified level adopted an energy metering system, the only credit for which one entire certification level failed to obtain an identified credit, as seen in Exhibit 2.

However, it must be noted that the available data were constrained by the fact that only 91 construction projects were available for data collection. Moreover, projects were unevenly distributed among certification levels, with 8 LEED Certified, 29 Silver, 49 Gold, and 5 Platinum level buildings. This implies that confidence in results should be lower for the certification levels that are represented in lower numbers.

Despite this concern, a general trend could be observed that as certification increased to the next higher level, the percentage of buildings at that level had consistently higher rates of adoption of nearly every credit surveyed. Exhibit 3 conveys this well by summarizing rates of adoption of energy standards, identified by the percentage below average energy consumption, for the Optimize Energy Performance Credit.

Identified energy-reducing credits that seemed least affected by certification level were Sustainable Purchasing, Durable Goods: Electric, at which Gold-certified
**Exhibit 1** | Rates of LEED EB O&M Certified Buildings with Existing Building Commissioning Credit

![Bar Chart](chart1.png)

**Exhibit 2** | Rates of LEED EB O&M Certified Buildings with Energy Metering System Credit versus Metering Accomplished

![Bar Chart](chart2.png)
buildings yielded the lowest percent adoption rate. Certified and Silver buildings were even at approximately 35% adoption. In fact, this credit was the only one that did not follow the trend of higher rates of adoption at higher certification levels (Exhibit 4).

**Discussion**

Most of the results indicate that the number of and the identified energy-reducing credits were not unpreferentially treated in the buildings’ LEED certification processes. With the exception of LEED Certified buildings and System Level Metering, all energy-reducing credits were represented among the certification levels. This suggests that applicants for LEED EB O&M certification were not affected simply by financial incentives, but that energy reduction is still a significant reason for LEED certification (Graebert and Fischer, 2011). The general trend that as certification level increased, adoption of the energy-reducing credits increased, makes intuitive sense. Higher levels of certification require more credits, and many of these credits are found in the promotion of energy efficiency.

**Economic Feasibility of Enacting LEED Credits**

A tentative explanation of the trend seen in LEED certification level and adoption of energy-reducing credits relates to the economic feasibility of enacting credits: adopting LEED certification standards requires money, and the availability of money limited the possible number of credits enacted, as well as the eventual
Exhibit 4 | Rates of LEED EB O&M Certified Buildings with Sustainable Purchasing, Durable Goods: Electric Credit

The U.S. EPA examined five different cost-effectiveness tests used by different states as primary or secondary consideration: (1) participant cost test (PCT); (2) program administrator cost test (PACT); (3) ratepayer impact measure test (RIM); (4) total resource cost test (TRC); and (5) societal cost test (SCT). These tests, which are commonly used across the country by different states, are used to evaluate the cost effectiveness of energy efficiency (EPA, 2008). In California, the marginal costs are low for some of the mandatory energy efficiency measures yet elsewhere the costs of attaining more energy-efficient items might be different.

Furthermore, it could be that the chosen credits were actually not expensive for owners to apply in their buildings. The cost of applying energy-reducing credits in LEED EB O&M certified buildings was not assessed, due to the lack of detailed information and the potential variability of such a cost, depending on building type. This analysis focuses on energy reduction because it is one of the most important parts of the LEED program; it spans at least three of its six categories and is a less specific enforcement goal (compared to water use or waste disposal, for instance). Costs for energy-reducing credits may not have been high for building owners, incentivizing them to apply precisely these credits.

Owners Understand Long-Term Benefits of Energy Efficiency

Given the expectation that financial incentives would motivate building owners to forgo the most drastic energy-reducing measures, one possibility that could explain the negation of this hypothesis as shown by the observed trend is related to the owners’ understanding of the long-term benefits. Owners were focused on long-term benefits, thus comprehending that any reduction in energy would pay off in
the long run. Reductions in energy consumption precede reductions in energy bills, and when considering the life-cycle of a building, it is clear that better energy measures will save money in the long run. Therefore, energy-reducing credits may have presented owners the same financial incentives as tax breaks.

**Trends Not Readily Captured by the Data**

It is important to remain skeptical of the results given the relatively small sample size, especially for Certified (8) and Platinum (5) buildings. Unfortunately there were no further projects available for data collection in the state of California, and it may be beneficial in the future to consider a larger region for data analysis (i.e., the entire U.S.). In this case, however, the effect of differing state-wide building codes must also be taken into account. To make the results of this experiment more applicable to LEED-certified buildings, it would also be helpful to combine them with data from other LEED certification systems, such as LEED for New Construction.

Understanding the dependence of energy efficiency measures could provide more insight into owners’ adoption of energy-reducing credits. Many energy efficiency measures are dependent on one another. For example, owners could invest in a more efficient HVAC system; however, they would need to improve the insulation and windows to realize the full benefit of the new system. The data available do not allow for separation of these investment decisions.

**Deviation from the Observed Trend**

One deviation from the general trend of certification level and credit adoption lay in Sustainable Purchasing, Durable Goods: Electric. The purchasing of energy-efficient electrical appliances saw significantly higher rates in Certified and Silver buildings than in Gold buildings. Whether this is an anomaly due to lack of sufficient data is questionable, but it could indicate that this is an area where economic feasibility was not as much of a factor as personal preference. Although not necessarily related to the preexisting hypothesis of achieving financial gain through LEED certification, it may serve as another avenue for future exploration.

**Conclusion and Recommendations**

The trend we observe shows that as LEED certification level increases, the number of energy-reducing credits adopted increases. The results indicate that building owners do not display selection bias against energy-reduction measures when pursuing LEED certification. These findings could indicate that owners pursue energy-reducing measures due to their financial feasibility; both the understanding of the long-term benefits and that the cost of implementing these measures may not be as high as first thought. Further exploration into a larger data set may reveal trends not readily apparent in our data. This data set could include a larger region (e.g., the entire U.S.) or buildings certified as either LEED Existing Buildings or LEED New Construction. Further work will allow for a better understanding of
building owners’ motivation to adopt energy reduction measures and whether or not they have bias toward “easy” credits to achieve financial incentives associated with LEED certification.

Appendix

Identification of Effective Energy-reducing Credits Chosen for Evaluation

As our aim was to determine the extent to which energy reduction measures are applied for LEED certification, the credits responsible for such reductions needed to be identified. No exclusive study assessing the criteria and their individual impacts on energy reduction could be found, and such a study would likely be difficult to provide due to the high interconnectedness of the criteria. However, using the USGBC’s own explanation of the intentions of each criterion (USGBC, 2008), as well as an independent assessment by Scheuer and Keoleian (2002), a consistent profile could be established of the credits most prone to reduce energy use.

An additional factor was that applicants for certification should be able to recognize that the credit dealt with energy reductions. For this reason, three of the six categories (Water Efficiency, Indoor Environmental Quality, and Innovation in Operations) were excluded from the identification of credits.

Nine credits were ultimately identified from the three remaining categories (variations of the same credit are displayed in parentheses):

**Sustainable Sites**

1. **Alternative Commuting Transportation, Reduction** (10%, 25%, 50%, 75%)—intent on reducing pollution, land development, and automobile use for commuting. Can be achieved by facilitating mass transit, bicycles, carpools, or alternative/electric vehicles. Reduces energy use outside of building.

**Energy & Atmosphere**

2. **Optimize Energy Performance,** (In increments of 2%, from 17% to 45% above national average)—according to ENERGY STAR Performance Ratings, reduce total energy use of the building, based on a benchmark of comparable buildings. Twelve months of energy data is required.

3. **Existing Building Commissioning, Implementation**—implement improvements and projects to ensure that the building’s major energy-using systems are repaired, operated, and maintained effectively for optimal energy performance. Includes the implementation of low-cost operational improvements, staff training on energy efficiency, updating
the building plan, and retrofitting the building. Identified as significant in maintaining long-term building energy efficiency.

4. **Existing Building Commissioning, Ongoing Commissioning**—continuing to monitor and apply changes in building maintenance and repair to ensure optimal energy efficiency. Must include a building equipment list, performance measurement frequency, and steps to respond if energy efficiency is not at an optimal level. Identified as significant in maintaining long-term building energy efficiency.

5. **Performance Measurement, System Level Metering** (40%, 80%)—develop a breakdown of energy use and employ a system-level metering of at least 40% of the total expected annual energy consumption of the building. This provides information on how energy is consumed in the building, enabling the building to make energy consumption changes based on the available data.

6. **Renewable Energy** (On-site 3%/Off-site 25%, On-site 6%/Off-site 50%, On-site 9%/Off-site 75%, On-site 12%/Off-site 100%)—recognize and implement more environmentally-friendly sources of energy, either on–or offsite. Solar, geothermal, wind, biomass, and biogas technologies are all applicable. Offsite energy sources are defined by the Center for Resource Solutions Green-e Energy program’s products certifications requirements (Center for Resource Solutions, 2012).

7. **Emissions Reduction Reporting**—identify, track, and record emissions reductions delivered by energy efficiency, renewable energy, and other building emissions reduction measures, using a third-party voluntary reporting or certification program (i.e., EPA, ENERGY STAR). This makes data trends available that can help with energy reduction.

**Materials & Resources**

8. **Sustainable Purchasing, Ongoing Consumables**: (40% of purchases, 80% of purchases)—purchases that are regularly made for use in operations & maintenance of buildings are based on an environmentally preferable purchasing (EPP) policy. It should evaluate the items purchased for the building, identify more environmentally-friendly alternatives, and establish a policy to purchase these alternatives if economically feasible. This credit focuses on goods that are to be replaced, and it includes paper, toner cartridges, binders, batteries, desk accessories, etc. Such products consume less energy than their counterparts.

9. **Sustainable Purchasing, Durable Goods: Electric**—purchase of electrical appliances that are certified to fulfill energy-efficient standards, such as ENERGY STAR requirements. Includes refrigerators, ovens, microwaves, and vacuums. Directly reduces the use of energy in the building.

Some credits were not chosen simply because they are not reflective of the LEED certification process as a whole; for example, LEED O&M includes credits dealing
with solid waste management, while LEED for New Construction does not. So-called regional priority credits, which are credits that have specific importance in specific geographical areas, were likewise not taken into account in this investigation due to their lack of universality. Prerequisites were not considered simply because they are required measures of the certification process; thus, adherence to prerequisites reveals nothing about the independent decisions of the site owner.

References


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