



ENERGY STAR

SUMMARY OF THE FINANCIAL BENEFITS OF ENERGY STAR® LABELED OFFICE BUILDINGS

California Energy Commission

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Summary of the Financial Benefits of ENERGY STAR® Labeled Office Buildings

A new study of commercial office buildings concludes there are substantial financial benefits associated with achieving the ENERGY STAR label for buildings.

The financial benefits of improved building energy efficiency and lowered energy costs are widely recognized. Many corporations and real estate firms have actively invested in energy efficiency, cutting energy costs while improving building performance and financial returns.

Nonetheless, the national economy as a whole and its building stock in particular remain inefficient and wasteful of energy. In 2001, total national energy expenditures were nearly \$700 billion.¹ Commercial buildings accounted for nearly one-fifth of the total energy used and one-third of end use electricity.² Commercial buildings incur \$132 billion per year in energy bills, and this cost is rising rapidly.³ Many commercial properties waste about one-third of the energy they consume, burdening their corporate owners with large and rising energy bills.

This paper summarizes the findings from a study on the financial benefits of energy efficiency in commercial buildings, prepared for the U.S. Environmental Protection Agency (EPA), entitled, *The Financial Benefits of ENERGY STAR® Labeled Office Buildings*. The study provides a detailed analysis of the benefits of using ENERGY STAR to achieve a high level of energy performance in commercial buildings.⁴ The benefits analyzed include significant direct financial savings from reduced energy use and persistent savings from improvements in energy performance, and improved building occupancy and greater building asset value. At a time of rising energy costs, the use of ENERGY STAR is increasingly recognized as a hallmark of fiscally sound building management and operation. ENERGY STAR is a smart building strategy from both a fiscal and risk reduction perspective.

What Are ENERGY STAR Labeled Buildings?

ENERGY STAR is a voluntary public-private partnership program. As one important program strategy, EPA supports ENERGY STAR in the commercial sector to help businesses and other organizations monitor, understand, and reduce building-wide energy use, as well as assess the financial impact of improved energy performance.

A key element of this approach is EPA's National Energy Performance Rating System for buildings, unveiled in 1999. EPA's online benchmarking system, Portfolio Manager (PM), allows building owners and managers to enter data about their buildings' energy consumption, hours of operation, number of occupants, location, and other building characteristics. The system compares each building's energy performance with the performance of similar buildings across the country—providing insights into how well each building is designed, maintained and operated. Each building receives an ENERGY STAR rating from 1 to 100 based on one year's energy consumption.

EPA awards the ENERGY STAR label to owners of buildings with ratings in the top 25 percent of energy efficiency performance ratings nationally. To receive the ENERGY STAR label, the owner of the building must have a professional engineer verify that it has earned a rating of 75 or higher based on 12 consecutive months of data. In addition, the building must conform to current industry standards for thermal comfort, air ventilation, control of indoor air pollutants, and illumination.

Buildings can be re-benchmarked periodically, which helps owners determine whether energy performance is improving, remaining the same, or deteriorating, and can also help owners verify the impact of building improvements and changes in management practices. EPA recognizes buildings rated 75 or higher in

The ENERGY STAR Label for Buildings



ENERGY STAR Buildings Program Elements	
Portfolio Manager (PM)—National Energy Performance Rating System	An online benchmarking tool used to measure a building's energy performance on a 100-point scale. This is the building's "rating."
National Benchmark	A rating of 75 or greater, which denotes superior energy performance.
ENERGY STAR Label	A certification mark to recognize superior energy performance for buildings with a rating of 75 or greater.

ENERGY STAR Buildings Program Statistics	
More than 26,000 buildings have used the rating system.	
More than 2,500 buildings have earned the ENERGY STAR Label.	
More than 40% of ENERGY STAR labeled buildings are office buildings.	

subsequent years with a new ENERGY STAR label. Through 2005, more than 2,500 buildings had earned the ENERGY STAR, including more than 1,000 office buildings.

Many building owners find that the ENERGY STAR rating process helps them identify opportunities to cost-effectively reduce waste and achieve significant energy savings. Some also attribute value to the recognition provided by the ENERGY STAR for buildings label. For example, Equity Office Properties has stated that "the ENERGY STAR label signals to its tenants and investors that it has capitalized on an

extraordinary opportunity to make its buildings environmentally and fiscally sound.”⁵

To help communicate the successful energy management practices used in ENERGY STAR labeled buildings, EPA encourages building owners to submit case studies about their building upgrades and the benefits realized, such as economic payback, peak demand reduction, and increased valuation. These case studies are available on the ENERGY STAR Web site at <www.energystar.gov>.

What Are the Financial Benefits of ENERGY STAR Labeled Office Buildings?

Approach

To determine the financial benefits associated with buildings that have earned the ENERGY STAR label, data were analyzed for office buildings that earned the ENERGY STAR label between 1999 and 2004. The data come from three sources:

- **Portfolio Manager data.** Supplied by EPA, these data cover 882 buildings that received the ENERGY STAR label through September 2004. The data consist of snapshots of each building at the time it was labeled. There were 283 buildings, labeled in multiple years, resulting in 540 additional observations. In all, 1,422 snapshots of building energy performance were analyzed.
- **ENERGY STAR Web site building profiles.** A total of 305 building profiles for ENERGY STAR labeled office buildings had been submitted to EPA for listing on the ENERGY STAR Web site as of October 2004. The profiles provide narratives of the buildings’ energy upgrade histories as well as insight into the financial benefits of these upgrades.

- **Interviews with ENERGY STAR partners.** Representatives of major ENERGY STAR commercial partners—including Arden Realty, Inc., Hines Interest Ltd., Transwestern Commercial Services, and USAA Real Estate Company—were interviewed about the benefits they attribute to ENERGY STAR, and to draw from the data that these companies have gathered on their buildings.

The performance data for ENERGY STAR labeled office buildings were compared to that of a national subset of buildings derived from the U.S. Department of Energy’s Commercial Buildings Energy Consumption Survey (CBECS). The “CBECS Subset” shown in the figures below represents “average” performance for the stock of buildings that is similar in age, size, etc. to buildings that have earned the ENERGY STAR label.

Key Findings

The analysis finds that ENERGY STAR labeled office buildings provide benefits in several key areas:

- **Direct energy savings.** ENERGY STAR labeled office buildings are one-third more energy efficient than average U.S. office buildings,⁶ and have annual energy bills that are, on average, at least \$0.50 per square foot lower per year, or 35 percent lower than the average building.
- **Persistence of energy performance and savings.** The energy performance of ENERGY STAR labeled office buildings improves over the first several years, and these savings persist. Buildings that earned the ENERGY STAR label in six consecutive years are 20 percent more energy efficient in the sixth year than in the first year labeled.⁷

- **Higher occupancy trend.** Managers of Real Estate Investment Trusts (REITs) with large ENERGY STAR portfolios confirm that both tenant comfort and occupancy are higher in their ENERGY STAR labeled buildings.
- **Increased asset value trend.** Reliably persistent energy performance makes it more likely that the higher net operating income from energy cost savings will be recognized through higher building valuation. Experienced managers of large portfolios of ENERGY STAR labeled buildings interviewed for the study confirm that ENERGY STAR helps increase building value.
- **Additional benefits.** In addition to the benefits examined in this study, energy-efficient buildings contribute to lower emissions, reduced exposure to volatile fuel prices, and savings in operations and maintenance costs.

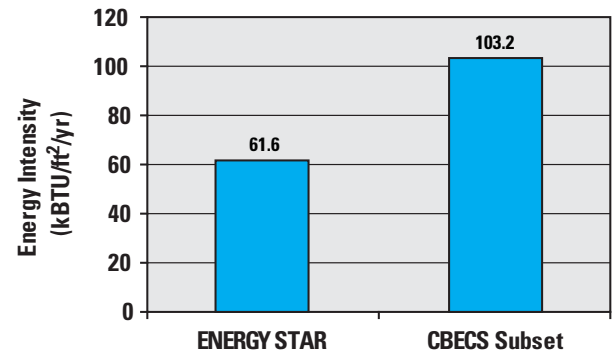
Each of these key findings is discussed in more detail below. In addition, analysis of the data provides some insight into the characteristics of the best-performing ENERGY STAR labeled buildings.

Direct Energy Savings

An important benefit from energy efficiency is direct energy savings, resulting in lower energy bills. ENERGY STAR labeled buildings, when compared to an analogous subset from the national stock, were found to use 40 percent less energy. As shown in Figure 1, energy intensity in ENERGY STAR labeled buildings was 61.6 kBTU per square foot per year (kBTU/ft²/yr), compared to 103.2 kBTU/ft²/yr in an average building—a difference of about 35.0 kBTU/ft²/yr, being conservative.

These energy savings are equivalent to about \$0.50 per square foot per year in lower energy costs. For a 100,000 ft² office building, this translates to an annual energy bill that is \$50,000 below that of an average building.

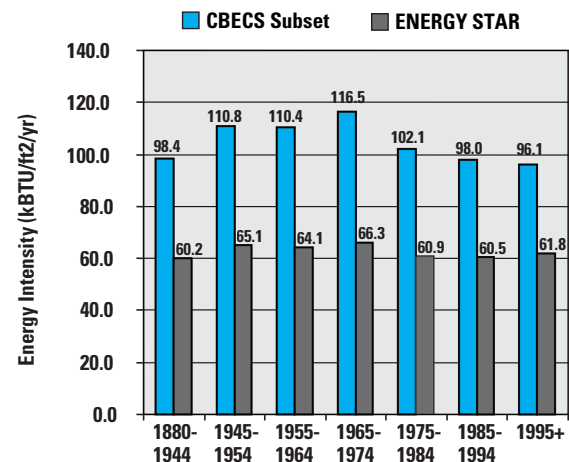
Figure 1: Energy Intensity in ENERGY STAR Labeled vs. CBECS Average Buildings



Source: Capital E Analysis of EPA data

Figure 2 shows the improvement in performance of ENERGY STAR labeled buildings relative to average buildings from CBECS by the construction year of the buildings, thus confirming that 35.0 kBTU/ft²/yr is a conservative estimate for the improved performance of ENERGY STAR labeled office buildings compared to average buildings.

Figure 2. Energy Intensity in ENERGY STAR Labeled vs. CBECS Average Buildings, by Year Built



Source: Capital E Analysis of EPA data

The energy savings potential from ENERGY STAR labeled buildings, and the value of the energy savings, will vary across the country, as shown in Table 1 below.

It is important to note that the ENERGY STAR designation recognizes energy efficiency performance, without regard to the steps taken to achieve higher performance. Thus, the lower energy costs associated with ENERGY STAR labeled buildings are not necessarily the result of specific investments in energy efficiency. For example, some buildings that received the ENERGY STAR label may have already been performing above the benchmark rating of 75 and required no additional investment. However, these buildings may have been designed originally to be superior energy performers.

Persistence of Energy Performance

Buildings that receive the ENERGY STAR label in multiple years consistently outperform comparable non-labeled buildings, and the performance margin increases over several years of re-labeling. As shown in

Figure 3, buildings that earned the ENERGY STAR label in six consecutive years used 20 percent less energy per square foot in the sixth year than in the first year of labeling, compared to average buildings.

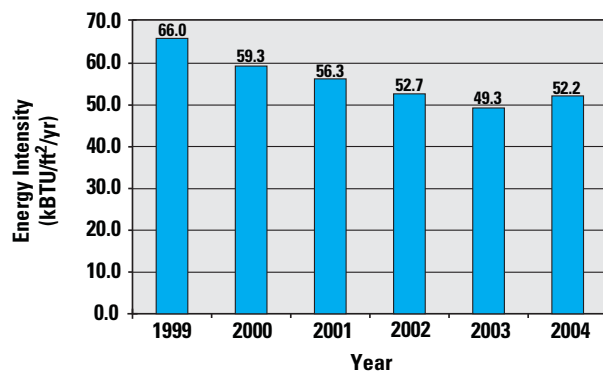
Although the sample size is small, this is an important finding because in the past, lack of persistence in energy savings was a disincentive to making energy efficiency upgrades. Previous analyses of the ENERGY STAR program have estimated benefits based on the energy performance calculated for one label year and, therefore, have not recognized the improvement in building performance over time.¹¹ As a consequence, some of the benefits of ENERGY STAR applied over multiple years are greater than previous estimates and should be recognized.

Table 1. Energy Performance Differentials and Cost Savings for ENERGY STAR Labeled Buildings by Region

Region	Energy Performance (kBtu/ft ² /yr)			Avg. Cost per kBtu (2003/2004) ⁹	Cost Differential Per Square Foot per Year
	ENERGY STAR ¹⁰	CBECS Subset	Differential		
United States	61.6	103.2	41.6	\$0.015	\$0.62
1- New England	65.2	106.7	41.5	\$0.018	\$0.75
2- Middle Atlantic	68.2	101.2	33.0	\$0.017	\$0.57
3- East North Central	55.9	111.5	55.6	\$0.014	\$0.76
4- West North Central	63.2	134.0	70.8	\$0.013	\$0.90
5- South Atlantic	64.0	103.2	39.2	\$0.014	\$0.55
6- East South Central	59.4	101.9	42.5	\$0.013	\$0.57
7- West South Central	61.4	89.0	27.6	\$0.014	\$0.38
8- Mountain	61.9	100.9	39.0	\$0.013	\$0.52
9- Pacific	60.9	94.2	33.3	\$0.018	\$0.60

Source: Capital E Analysis of EPA and EIA Data

Figure 3. Energy Performance vs. Label Year for Buildings Labeled in All Six Years(10 buildings)



Source: Capital E Analysis of EPA data

Higher Occupancy Trend

Changes in occupancy have a potentially large financial impact for building owners and managers. For example, a one percent increase in occupancy in a 100,000 ft² building renting at \$30 per square foot would be worth \$0.30 per square foot, or \$30,000 per year. To achieve such savings through energy efficiency in a building with annual energy costs of \$1.50/ft² would require as much as a 20 percent reduction in energy use.

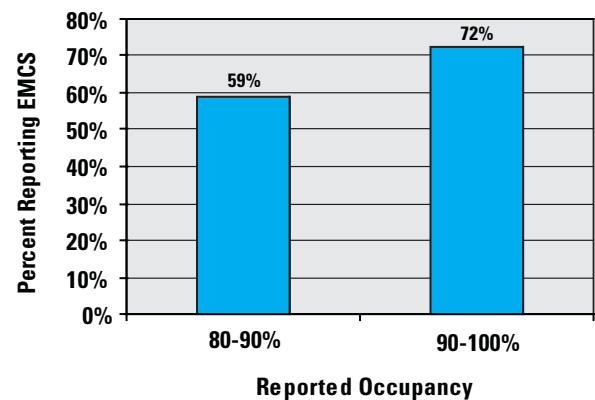
Several factors lead us to expect ENERGY STAR labeled buildings to be associated with higher levels of occupancy. First, these buildings are more likely to have energy-efficient lighting and ventilation systems, and advanced energy management and control systems (EMCS), compared to non-labeled buildings. These technologies have been demonstrated to improve occupant comfort and attitude toward occupied space.¹² Increased tenant satisfaction can lead to higher occupancy and greater profitability. As shown in Figure 4, ENERGY STAR labeled buildings with the highest occupancy also have higher reported use of EMCS.

Discussions with senior REIT managers with large portfolios of ENERGY STAR labeled buildings also confirm that labeling is positively correlated with higher occupancy.

Increased Asset Value Trend

Interviews with REIT managers explored the link between increased energy performance, specifically ENERGY STAR labeling, and asset value. According to Bob Accomando at Arden Realty Inc., the savvy marketplace is starting to recognize the added value of ENERGY STAR.¹⁵ Hines Interest Ltd. claims that its ENERGY STAR labeled buildings are more competitive, more valuable, and more profitable.¹⁶

Figure 4. Reported Occupancy and Relationship to Energy Management and Control Systems



Source: Capital E Analysis of EPA data

David Downey, Managing Director of Transwestern Commercial Services, states, “When we sell buildings that are ENERGY STAR, purchasers are more likely to recognize and pay the increased building value resulting from the decreased energy use and increased net operating income. This is true for both lenders and investors.”¹⁷

Factors that increase net operating income and asset value include:

- persistent lower energy and operating costs; and
- higher occupancy.

“Energy efficiency and ENERGY STAR help us to lower overall operating costs for our tenants. Furthermore, by being more efficient, we’re better able to control building temperatures and thus keep tenants more comfortable.”

—Brenna Walraven, Executive Director of National Property Management at USAA Realty Company.¹³

“ENERGY STAR helps attract tenants and increase occupancy. An ENERGY STAR label has psychological and marketing value, and it is becoming more important to tenants.”

—Gail Sturm, Senior Vice President of Transwestern Commercial Services¹⁴

Lower energy consumption yields higher net operating income (NOI). The persistence of energy performance in ENERGY STAR labeled buildings documented in this study helps ensure future energy savings and a higher NOI, which can contribute to increased asset value. If the market recognizes an increased NOI from persistent energy cost savings at a capitalization rate of 8.5, a \$0.50 per square foot annual reduction in energy costs would result in asset valuation increase of \$5.90 per square foot. Currently lower capitalization rates imply even larger increases in building value from persistent energy efficiency savings.

The ENERGY STAR Web site profiles provide insights about how ENERGY STAR has directly impacted valuation in some buildings. For example, following an energy efficiency upgrade the First National Bank Center in San Diego cut annual operating costs by more than \$0.50 per rentable square foot. The building operator reports that this upgrade increased the building's value by almost \$4 million.¹⁸

As Brenna Walraven of USAA Realty Company notes, “Increasingly, more sophisticated tenants understand and renew leases at higher rates with landlords that work to control expenses without sacrificing tenant comfort. Energy efficiency and our partnership with ENERGY STAR help execute on these mutually beneficial goals.”¹⁹

Additional Benefits

Analysis of data on ENERGY STAR labeled buildings identified several other benefits. These include:

- **Better operations and maintenance.** Better performing buildings—such as ENERGY STAR labeled buildings—tend to be more actively managed and feature better operations and maintenance procedures.
- **Peak load, demand charges, and tiered rate structure savings.** New utility pricing schemes that better reflect delivered (peak) electricity costs can be more easily mitigated with a properly configured EMCS. ENERGY STAR labeled buildings that feature EMCS can realize additional savings under such schemes.
- **Emissions reduction benefits.** The public health, property, and other benefits associated with reduced energy use are driving the expansion of cap-and-trade and other emissions trading programs. These programs are creating financial returns for building owners who cut energy use.
- **Hedge against price fluctuations.** Consuming less energy reduces exposure to volatile energy prices, a significant source of financial risk.

While the financial value of these additional benefits is not quantified, they nonetheless lend additional weight to the argument that achieving the ENERGY STAR label is a smart building management strategy both from a fiscal and a risk reduction perspective.

Case Study: Arden Realty

Arden Realty has been named ENERGY STAR Partner of the Year twice, and in 2003 was recognized with the ENERGY STAR Award for Sustained Excellence in Energy Management. This company has a strong history of re-labeling ENERGY STAR buildings: While only 8 percent of all ENERGY STAR labeled office buildings received the label four or more times, 56 percent of Arden's ENERGY STAR buildings have been re-labeled four or more times.

Arden Realty's First Vice President for Asset Management, Bob Accomando, reports that the first step towards better energy performance is to fine-tune the existing systems—increasing the life expectancy of equipment through preventative maintenance and increasing energy efficiency by roughly 8 to 10 percent. Mr. Accomando notes that energy efficiency has improved its property NOI and enhanced the value of Arden Realty's buildings.²⁰

Arden reports an average financial payback of 3.5 years from energy savings alone on energy efficiency retrofits performed on ENERGY STAR labeled buildings, even before the recent surge in energy prices.

The strong Arden Realty building values are reflected in the December 2005 sale of Arden Realty to GE Real Estate for \$3.2 billion.

For More Information

For more information about the benefits of ENERGY STAR, or to learn about how to join the ENERGY STAR partnership, please visit [<www.energystar.gov>](http://www.energystar.gov).

About the authors

Greg Kats is founding Principal of Capital E <www.cap-e.com>, a national clean technology deployment and strategy firm. He is the Principal Advisor in developing \$550 million of green affordable housing, involving Enterprise, JPMorgan Chase, Fannie Mae, the American Institute of Architects, and others. Mr. Kats served from 1996 to 2001 as the Director of Financing for the \$1.1 billion Office of Energy Efficiency and Renewable Energy at the U.S. Department of Energy. He is Chair of the Energy and Atmosphere Technical Advisory Group for LEED and serves on the LEED Steering Committee. Mr. Kats co-founded and chaired, from 1995 to 2001, the International Performance Measurement & Verification Protocol <www.ipmvp.org>.

Jeff Perlman is a consultant with Capital E and the president of Bright Power in New York City, where he helps design, install, and obtain financing for solar and energy efficiency projects for commercial and residential buildings.

Endnotes

¹ EIA Web site. <www.eia.doe.gov/emeu/aer/txt/ptb0105.html>. Most recent available data is \$694 billion in 2001. Accessed 10/21/05.

² EIA Web site. <www.eia.doe.gov/emeu/aer/diagram1.html> and <www.EPA.doe.gov/emeu/aer/pdf/pages/sec8_3.pdf>. Accessed 10/21/05.

³ 2005 Buildings Energy Data Book, U.S. Department of Energy, Energy Efficiency and Renewable Energy. August 2005. Available at: <<http://buildingsdatabook.eere.energy.gov>>.

⁴ Greg Kats and Jeff Perlman, "Financial Benefits of ENERGY STAR Labeled Office Buildings," U.S. EPA, February 2006. Available at <www.cap-e.com/publications>.

⁵ Energy Management & Investor Returns: The Real Estate Sector. 2002. Innovest Strategic Value Advisors, October. p. 17 Available at: <www.innovestgroup.com>.

⁶ The data set used for baseline "average" office buildings is a subset of the Department of Energy's Commercial Buildings Energy Consumption Survey (CBECS) Public Use Data from 1999. EPA selected these buildings for comparison because they are most similar to the ENERGY STAR labeled office buildings in size and use.

⁷ An important problem related to energy efficiency investments, especially before the mid-1990s, is that energy savings commonly did not persist. That is, energy efficiency gains eroded over time, reducing energy savings and making energy efficiency a less attractive investment. Thus, the persistence of performance in ENERGY STAR labeled buildings is an important finding.

⁸ Note that the incidence of EMCS decreases slightly, from 72 percent to 70 percent, when comparing buildings with ratings in the 90+ range to those in the 80-90 range.

⁹ Average cost per kBtu for electricity, natural gas and oil. See references for Table 2-3 in the report for sources of these data.

¹⁰ The average for ENERGY STAR labeled buildings is based upon the most recent year in which the building was rated and labeled.

¹¹ See, for example: Von Neida, Bill and Thomas W. Hicks. 2002. Building Performance Defined: The ENERGY STAR National Energy Performance Rating System. Association of Energy Services Professionals.

¹² Kats, Greg et al. 2003. The Costs and Financial Benefits of Green Buildings: A Report to California's Sustainable Building Task Force. October. (available at <www.cap-e.com/publications>). Also see: Sensharma et al. 1998. Relationships Between the Indoor Environment and Productivity: A Literature Review. Published in ASHRAE Transactions. Vol. 104. See: <www.dc.lbl.gov/IHP>.

¹³ Brenna S. Walraven, RPA, CPM, Executive Director, National Property Management, USAA Realty Company, personal communication with author, October 7, 2005.

¹⁴ Gail Sturm, Vice President, Transwestern Commercial Services, personal communication with author, February, 2005.

¹⁵ Bob Accomando, First V.P. Asset Management, Arden Realty, conversation with author, February 15, 2005.

¹⁶ Andrew Kitchens, Senior Manager, Engineering Services, Hines, email communication with author, December 23, 2004.

¹⁷ Transwestern Commercial Services manages more than 150 million ft² nationwide. Transwestern began rating its properties through ENERGY STAR in 2000, and received an ENERGY STAR Partner of the Year award in 2003. Out of 161 rated buildings, 45 have earned the ENERGY STAR label. (Conversation with David Downey, February 2005.)

¹⁸ ENERGY STAR Labeled Building Profile: First National Bank Center, San Diego, California. <www.energystar.gov/index.cfm?fuseaction=labeled_buildings.showProfile&profile_id=1357> Accessed October 8, 2004.

¹⁹ Brenna S. Walraven, RPA, CPM, Executive Director, National Property Management, USAA Realty Company, conversation with author, October 7, 2005.

²⁰ Bob Accomando, First V.P. Asset Management, Arden Realty, conversations with author, February and December 2005.

