

# ENERGY-EFFICIENCY ECONOMICS:

## What You Need to Know

Using sophisticated financial modeling  
to make the most-informed decisions  
when upgrading multi-tenant office buildings

In 2001, the U.S. Environmental Protection Agency conducted a review of all of the office buildings that had used its online Energy Star benchmarking system ([www.energystar.gov](http://www.energystar.gov)). A startling statistic came to light: The lowest-scoring buildings used four times as much energy as the highest-scoring ones. Granted, the buildings with the highest scores were extremely energy-efficient. Still, the gulf between them and the lowest-scoring buildings makes one wonder about the magnitude of energy wasted in this country.

The benchmarked buildings included both income-producing and owner-occupied properties. One might expect income-producing properties to take energy efficiency more seriously than their owner-occupied counterparts because lower energy costs imply higher net operating income (NOI), the mother's milk of real-estate investors. However, too many income properties continue to have very inefficient building systems for a variety of reasons: "lowest-first-cost" decision-making, dysfunctional owner/tenant dynamics, and popular myths that lead owners and managers to ignore or reject worthwhile energy upgrades.

If you were to ask a roomful of income-property owners and managers if improved energy efficiency could make their buildings more profitable, competitive, and valuable, most, if not all, probably

would say yes. Pose the same question to a roomful of engineers, vendors, and consultants, and most probably also would say yes. However, only those who understood leasing and real estate finance would be able to support their yes with compelling mathematics.

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To make the most-informed decisions when selecting energy projects to approve, it is vital to

know how a property's leases might allocate energy savings between the owner and the tenants (see the sidebar "Understanding the Basic Types of Leases"), how much the tenants would be obligated to contribute toward the cost of an expense-reducing capital project, how the owner's share of savings could boost NOI, and how a higher NOI could support an increase in appraised value. Clearly, replacing myth with math goes a long way toward better decision-making regarding energy throughout the life cycle of a typical income property.

This article offers new time- and cost-effective best practices for analyzing the merits of proposed energy-efficiency upgrades to multi-tenant, income-producing office properties (see the sidebar "Huge Potential in Office Sector"). Keep in mind that, as with most analytical approaches, the "devil is in the details." The ultimate value of this analysis depends on many factors, such as the reliability of projected costs and savings and the volatility of utility prices. Moreover, unless energy-

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# Understanding the Basic Types of Leases

There are three major subsets of leases in the U.S. office sector. Given the proper approach, energy efficiency can be pursued profitably with all three. They are:

- Net leases, which require the tenant to pay for everything.
- Gross leases, which require the landlord to pay for everything.
- Fixed-base leases, which require the landlord to pay a certain amount of operating expenses (defined by a “base year” or “expense stop”) and the tenant(s) to pay the rest.

Figure 1 suggests how the impact of an energy-saving upgrade would be felt by a particular tenant and the owner in a fixed-base lease. In this example, an energy upgrade that produces electricity savings of 40 cents per square foot benefits both parties. The tenant saves the 10 cents in utility costs that were above the expense stop in Year 1. The landlord realizes the remaining 30 cents in savings as a reduction in the amount of

### Before-tax cash flow

- potential gross income
- vacancy and bad-debt allowance
- + miscellaneous income
- = effective gross income
- operating expenses (owner's share)
- = **net operating income**
- debt service
- = before-tax cash flow from operations

In this example, an energy-saving upgrade that produces 40 cents per square foot in savings, with 30 cents going to the owner, might support \$3 per square foot in higher asset value.

### Income approach to appraisal

$$\frac{\text{net operating income}}{\text{capitalization rate}} = \text{asset value}$$

$$\frac{30 \text{ cents per sq ft per year}}{10\%} = \$3 \text{ per sq ft}$$

FIGURE 2. The owner's view of lower operating expenses.

utility expense he is obligated to pay in Year 2. The owner's share of savings boosts the property's net operating income (NOI), which helps support a higher property appraisal.

There are two keys to determining the true value of a proposed energy-efficiency improvement in a commercial office building:

- (1) knowing how each lease divides the costs and savings between owner and tenant(s) and
- (2) knowing how the owner's share of savings affects both current and future returns.

Figure 2 shows an income statement from a typical leased office building and demonstrates how the owner's share of decreased operating expenses can improve NOI, which can improve the property's appraised value. Realize that the owner does not always capture all of the energy savings and that this NOI/asset-value relationship only applies to the portion of savings that makes it to the owner's pocket.

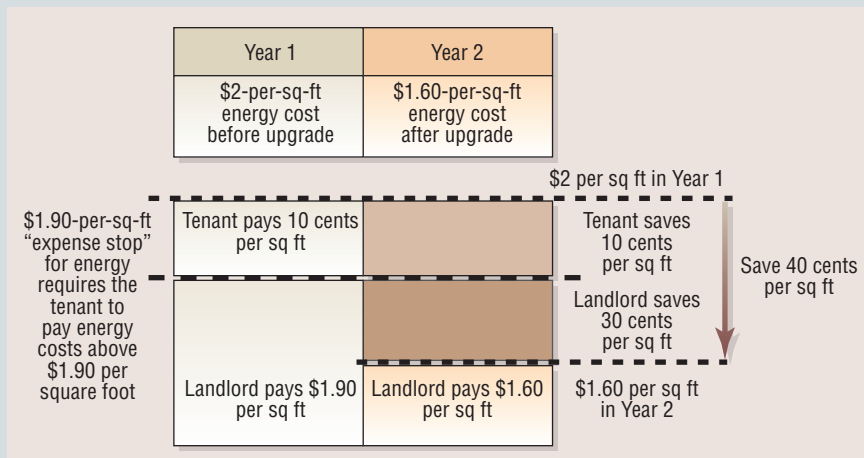


FIGURE 1. The allocation of savings in a fixed-base lease.

saving equipment is properly installed, intelligently operated, periodically recommissioned, and otherwise well-maintained, any predicted savings may prove elusive. In multi-tenant buildings, other devilish details, such as disturbances associated with installations, can be important as well. Fortunately, knowing about each of these issues is the first step in addressing them. Each year, countless energy-saving projects are successfully implemented in income properties because the right questions were

asked and answered at the right time.

### WHO PAYS? WHO BENEFITS?

Before you can quantify the value of improved energy efficiency in a leased property, you need to evaluate carefully who will pay for the improvement and who will benefit from it (see the sidebar “Calculating the Owner's Share of Savings”). Only then can you take the next step: determining how those savings might drive improved profitability, competitiveness, and value.

Take the example of an income-producing office building. If the operating expenses are lowered, the owner, the tenant(s), or both will realize the savings, depending on the expense-sharing provisions of the leases and certain other factors. The portion of the savings that goes to the owner will increase NOI, which, in turn, could improve the appraised value of the building when it is refinanced or sold. Meanwhile, the improved comfort and convenience that often accompany

energy-efficiency upgrades may help with tenant retention and attraction. The portion of the savings captured by the tenant will lower occupancy cost, which will improve the tenant's ability to pay rent. The combination of energy savings and the improved look/feel of the space may make the tenant more interested in renewing the lease.

The moral of the story: It does little good for engineers to focus on kilowatts, kilowatt-hours, simple payback period (SPP), and other commonly used metrics to describe and evaluate projects if they forget to consider other vital issues, such as who would pay for the upgrade, who would benefit, and the downstream effects of the projected energy savings.

#### WINNING STRATEGIES NEED WINNING MECHANISMS

According to Jim Collins, internationally known management expert, even the best strategies will fail without well-conceived mechanisms for executing them. If you are serious about saving as much energy as possible:

- Have you adopted best practices for finding, evaluating, and approving expense-reducing capital projects for your properties?

- Do you apply these best practices on a systematic, portfolio-wide basis so that you know you are focusing your limited time and capital on the most promising upgrade opportunities at all times?

- Are you on the lookout for rebates and other incentives so you can be sure you are not missing "free money" (see the sidebar "The Money Is Out There") that could help you improve your properties?

- In the case of income-producing properties, does every proposed expense-reducing capital project include a financial analysis of who would pay for the improvement, who would get the savings, and how that allocation of costs/savings might influence the owner's total return?

- If you are an engineer, a vendor, a contractor, or a consultant advising a client on opportunities to improve

## Huge Potential in Office Sector

One could find opportunities to apply state-of-the-art, readily available energy-saving technologies in all but the most efficient commercial buildings. Income-producing office buildings are particularly ripe for new energy-efficiency best practices for several reasons:

- Non-owner-occupied office buildings comprise a large portion of U.S. commercial and industrial floor space. The Commercial Building Energy Consumption Survey estimates this sector at almost 2.3 billion sq ft. It is an important market for engineers to consider when targeting buildings for energy improvements.

- Owners of multi-tenant office space often have an easier time implementing building-wide energy-efficiency improvements than do owners of other types of income property. For example, a building-wide lighting retrofit often is more straightforward in an office tower, where the look and feel of each tenant's space is similar, than it is in a retail mall, where lighting can be a vital part of merchandising, or an industrial park, where lighting levels may vary widely and lighting quality may or may not be vital to the industrial processes conducted in each space.

- Because the dynamics of leasing office space frequently cause owners and tenants to stalemate on the topic of energy efficiency, it is not unusual to find tenant spaces that are decades behind their owner-occupied counterparts when it comes to the energy efficiency of lighting and other basic building systems.

It is important to note that office buildings tend to use formulas (as opposed to the separate metering approach popular in retail and industrial settings) to allocate expenses. The expense-sharing clauses that define these formulas can be quite diverse. The typical large multi-tenant office building's rent roll contains a variety of expense-sharing provisions that dictate how the savings produced by a proposed upgrade would be allocated to the owner and tenants. It would be imprudent to recommend any proposed upgrade to an income-property owner/manager without thoroughly understanding this allocation.

energy efficiency, do your analyses go beyond SPP and consider the impact of the estimated energy savings on your client's business?

These are just some of the questions that need to be answered with a yes if you want your winning strategies to have a positive impact on the bottom line. Applying energy-saving strategies to properties and projects becomes more practical if you keep a few key lessons in mind:

**Expense-reducing capital projects must be positioned properly to compete for two precious commodities: time and money.**

There is only so much "management bandwidth" to select and pursue initiatives. Similarly, there is only so much capital to fund even the best projects. Staff cutbacks and the current economy have only tightened these two constraints.

Whether you work with owner-occupied or income-producing property, can you honestly say that energy-saving proj-

ects compete effectively for the owner's time and money? Might there be ways to raise the perceived importance of energy projects so that they receive the attention they deserve?

Does your organization need to grow its income properties' NOI and asset value? Could low-risk, high-return expense-reducing capital improvements to your existing portfolio provide "internal growth" that would offset the present lack of opportunities for "external growth" (i.e., building or buying additional properties)?

If you are a vendor or service provider, do you understand your prospect's business well enough to position your offerings as being more compelling than whatever else may be distracting the decision-makers?

**Finding the opportunities that most deserve a share of that finite time and capital requires a systematic, portfolio-wide**

## Calculating the Owner's Share of Savings

There are four principal approaches to calculating the owner's share of projected savings from a proposed energy-efficiency upgrade to a multi-tenant office building:

### QUIKSCOPE

Available at no cost to firms that join the U.S. Environmental Protection Agency's Energy Star program for commercial real estate, easy-to-use QuikScope software performs a scoping-level analysis of how a given office building's leases might allocate the costs and benefits of an energy upgrade to the owner and tenants. Because it uses weighted averages and other simplifying assumptions, QuikScope does not produce an investment-grade analysis. However, it can be very useful in suggesting which upgrades are worth considering.

### DISCOUNTED-CASH-FLOW-VALUATION SOFTWARE

Discounted-cash-flow-valuation software projects the cash flows and appraised value of a given income property over time. Unfortunately, discounted-cash-flow valuation is not ideal for modeling energy upgrades, energy savings, or capital-expense-cost recoveries on a tenant-by-tenant or month-by-month basis. Multiple runs of such software could simulate the net operating income of a property before and after an upgrade; however, extensive side calculations would need to be performed in a spreadsheet program to sew these pre- and post-upgrade runs together and determine the project's merits from the building owner's perspective.

### CUSTOM SPREADSHEETS

Both QuikScope and discounted-cash-flow models of a proposed upgrade usually require the development of a multitude of custom spreadsheets to allocate costs, savings, and cost recoveries for each tenant and period. These cobbled-together modeling exercises take time and can be unwieldy, especially if decision-makers require sensitivity analysis (i.e., the analysis of multiple scenarios) before approving capital for projects.

### NOI BUILDER

NOI Builder is a proprietary software tool used to produce an investment-grade analysis of any capital project that proposes to lower any operating expense. An NOI Builder study shows where every upgrade dollar is invested, the source and destination of every dollar of return, and the present value and internal rate of

	"Short" simple payback		"Long" simple payback	
	Short SPP	NOI Builder	Long SPP	NOI Builder
Square feet	100,000	100,000	100,000	100,000
Project cost	\$95,325	\$95,325	\$95,325	\$95,325
Year 1 utility savings	\$54,680	\$54,680	\$24,620	\$24,620
Lease type	N/A	Base year	N/A	Base year
Simple payback	1.74 years	N/A	3.87 years	2.4 years
Investment IRR	54.65%	-6.85%	17.45%	34.43%
IRR with appraisal	N/A	12.98%	N/A	46.09%

**FIGURE 3. The dangers of using simple payback period. Which project would you want to approve?**

return (IRR) of the project itself. The analysis shows where it makes sense to invest in improving the energy efficiency of common areas and tenant spaces (both mid-lease and between leases) and helps calculate and justify capital-expenditure recoveries. Because the calculations are automated, sensitivity analysis is easy, and decision-makers get fast, well-documented answers to a variety of what-if questions that otherwise could stall project approval. Once a building's leases are entered into NOI Builder, the model can be updated easily to accommodate leasing changes or additional proposed upgrades.

Consider the two capital projects in Figure 3. The first is a project that the vendor represents as meeting the owner's less-than-two-year simple-payback criterion. A sophisticated analysis of this proposed upgrade—one that considers the expense-sharing provisions of the existing leases—reveals that although the owner would pay the entire cost of the upgrade, the tenants would capture practically all of the resulting energy savings. In this case, a seemingly short simple-payback-period (SPP) project is discovered to be a terrible investment for the owner, yielding a negative-6.85-percent return.

The other project in Figure 3 is a seemingly long SPP project. Normally, an upgrade with a simple payback of almost four years would be of little interest to an income-property CFO. However, upon close examination, this project is a winner. Once the expense-sharing and capital-cost-recovery provisions of the building's leases are taken into account, it is discovered that the SPP from the owner's perspective would be only 2.4 years, and the owner's IRR would be more than 46 percent.

As these examples demonstrate, owner occupants may get away with using SPP, but when it comes to leased buildings, decision-making must be based on something more sophisticated than simply dividing project cost by annual energy savings.

**approach.** This implies that (1) all decision-making criteria are clearly listed and prioritized; (2) the building portfolio is systematically screened for these criteria in the order of least to most expensive to study; (3) the decision-making chain is well-defined, and each stakeholder in that chain understands not only his own goals, objectives, and responsibilities, but those of the stakeholders directly above and below him; (4) all of the costs and benefits are analyzed; and (5) the cost/benefit analysis is communicated in a language that all stakeholders can understand.

When it comes to devising a strategy for pursuing energy savings, have all of the decision-makers agreed on which criteria make projects the most compelling?

If you are working with a large, geographically dispersed building portfolio, has a top-level screening of all buildings

## The Money Is Out There

Each year, more than \$1 billion in rebates and other incentives is available to help you make your properties more energy-efficient. These subsidies come from utilities, federal and state agencies, non-profit organizations, and other sources, many of which have problems giving away the money.

To capture some of this "free money," consider projects that are not typical retrofits, such as tenant fit-outs, lobby remodeling, and other new construction. In some cases, you can collect a subsidy if some aspect of the construction relates to energy and/or water efficiency. Certain rebates can be applied for retroactively, so you may be eligible based on projects already completed.

There are several ways to obtain information on available incentives. One is to call utilities, state energy offices, and other relevant sources. Another is the Internet. A third is a commercially available database. For more information on the database, contact the author at [mjewell@realwinwin.com](mailto:mjewell@realwinwin.com).

been performed so that the top projects worth pursuing can be ranked?

Is there a well-defined decision chain from the person with the authority to approve the project down to the frontline person charged with finding/evaluating the opportunities?

Are the downstream benefits of improved energy efficiency fully understood by the individuals preparing the proposals? Do these individuals know how to quantify the positive impact reduced operating expenses have on NOI and appraised value? What about the

positive effect lower operating expenses can have on tenant retention and attraction? Do they realize that lower operating expenses may allow the owner to set lower expense stops for leases signed after the upgrade is completed?

Do you find your engineers trying to convince senior management to fund energy upgrades with elaborate analyses calibrated in kilowatt-hours, therms, or other decidedly non-financial language? If you are an income-property owner, wouldn't it be great if your energy-service company took the time to translate projected energy savings into benefits that you consider when making other capital decisions?

**If you get the right answers by asking the wrong questions, you are just lucky.** So many building owners, property managers, and vendors/contractors are guilty of placing too much emphasis on SPP. This mistake is particularly egregious in the case of income properties.

If you own/manage a multi-tenant office building, which do you think is more important to know: the SPP of a project or who would get the savings—the owner or the tenant(s)? Would it surprise you to learn that, depending on the leases in place, a four-year SPP project may be a more profitable investment than a two-year SPP project when viewed from the owner's perspective (Figure 3)?

How do you feel about your project being judged solely on the merits of its SPP, with financial benefits realized after the SPP ignored?

**In the absence of math, decisions often are governed by myths.** Do not let fiction fill the vacuum left by a lack of facts. Blindly accepted myths and inappropriately applied "rules of thumb" play a major role in the continued waste of energy in this country. When selecting projects to fund, you need to know the facts. Who pays? Who benefits? You need access to tools that deliver actionable information automatically. If your financial analysis requires an impractical level of time and effort, it will not get done, especially if you need to see multiple scenarios before approving a project. If

## Winning Strategies, Winning Mechanisms

Even the best strategy will fail if it does not have a well-conceived mechanism to ensure its implementation. One could suggest many combinations of winning strategies and mechanisms in the context of applying energy efficiency to portfolios of buildings. Following are three such combinations.

### STRATEGY: KNOW YOUR PROPERTIES

- Have your properties ranked according to Energy Star benchmarking score (visit [www.energystar.gov](http://www.energystar.gov)), utility rates, energy intensity, anticipated holding period, and availability of capital for improvement.
- Know which upgrade technologies and operating best practices have been implemented at each of your properties.
- Know which leases allow the owner to capture savings and/or exercise cost recovery for capital expenses (cap ex) that reduce operating expenses.

### MECHANISM: MAKE THE PROPERTY MATRIX A BEST PRACTICE

- Screen each property, and use the resulting matrix to help ensure that highest-and-best-use-of-capital opportunities are pursued first.

### STRATEGY: CLAIM THE "FREE MONEY" YOU DESERVE

- Capture all of the rebates and other incentives you are entitled to when doing cap ex.
- Pursue rebates for tenant fit-out, remodeling, and other new construction, not just for energy/water retrofit projects. Also, screen your recent cap ex for retroactive rebates.
- Make sure the paperwork and other requirements are handled properly so you can collect your rebate dollars.

### MECHANISM: MAKE REBATE SCREENING A BEST PRACTICE

- Any energy-, gas-, or water-related cap-ex proposal must have a rebate report attached to it. Outsource the rebate administration to an organization that does these filings on a full-time basis, and make sure the entity that handles the filings automatically double-checks (and applies) for any additional rebates that are relevant to your project.

### STRATEGY: FIND AND FUND THE BEST UPGRADES

- Fund a capital project if it exceeds a predetermined required rate of return, whether there are rebates to help pay for the upgrade or not.
- Insist that decision-making go beyond simple payback period and consider the leases, appraised value, and other relevant factors in the approval process.
- Given finite access to capital, fund projects that represent the highest rate of return first.

### MECHANISM: MAKE OWNER/TENANT COST/BENEFIT ANALYSIS A BEST PRACTICE

- Any capital expenditure that is proposed to reduce operating expenses must have a cost/benefit analysis showing the owner's share of projected savings and the owner's return on investment attached to it.

your people lack the time or skills to perform and present these calculations, you should consider outsourcing the financial analysis to someone who has automated the number-crunching.

In the case of a multi-tenant building,

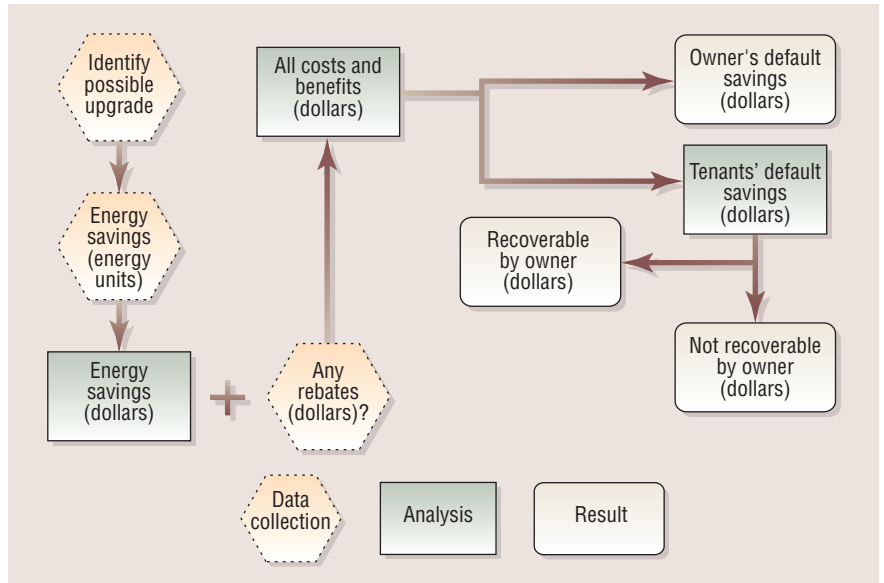
are the people who approve/reject capital expenses the same people who signed the existing leases? If not, have they at least read the leases lately? How much of the energy cost is paid by the owner? How much of the projected upgrade's savings

would inure to the landlord on a tenant-by-tenant, month-by-month basis? Can the owner assess tenants for capital improvements that reduce operating expenses for tenants?

If you are an engineer recommending an energy-saving capital project for a multi-tenant building, have you detailed the costs/savings of the project on a tenant-by-tenant and common-area basis? Do you know how much of the projected savings will inure to the owner and how much capital cost could be assigned to the tenants according to the terms of the existing leases? Do you have a best practice of including a leasing analysis in every proposal you present to multi-tenant building owners/managers?

See the sidebar “Winning Strategies, Winning Mechanisms” for three sets of strategies and mechanisms you might want to consider adopting.

Figure 4 combines the topics discussed



**FIGURE 4. Best practice for analyzing upgrades to income property.**

in this article and depicts the latest best practice for evaluating improvements to income properties.

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