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The Economics of Sustainability in Commercial Real Estate

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THE ECONOMICS OF SUSTAINABILITY IN COMMERCIAL REAL ESTATE

FOREWORD

Commercial real estate retrofit projects that include energy efficiency are increasing at a rapid rate. An indicator of this is the growth of the LEED for Existing Buildings: Operations & Maintenance (LEED EBOM) Green Building Rating System. In 2009, for the first time since the US Green Building Council began rating buildings, the amount of space certified by the LEED EBOM rating system outpaced the amount of space certified by the LEED for New Construction (LEED NC) rating system.

Real estate firms are pursuing energy efficiency retrofits to directly lower their operating expenses and mitigate the risk associated with rising energy costs. In an uncertain economic setting, real estate managers are increasingly focused on managing the risks associated with their portfolios and turning toward operational efficiencies to drive down costs and increase net operating income.

Conversations with large industry participants indicate that real estate managers, despite the downturn in the US economy, are continuing to pursue retrofit projects. For example, members of Sustainability Roundtable, Inc.'s Sustainable Corporate Real Estate Roundtable have successfully deployed solutions that have optimized electricity consumption across a large portfolio to decrease their electricity costs by 5 percent.

As industry surveys are reporting on a regular basis, firms are moving their real estate portfolios toward greater sustainability with a primary focus on energy efficiency upgrades. Many decision makers are pursuing energy efficiency projects in their existing portfolios for additional reasons related to energy efficiency, including keeping assets competitive and attracting the highest quality tenants who are seeking more efficient, greener space.

Firms that have made the commitment to more sustainable real estate understand that this benefits corporate real estate fundamentally in the same manner it benefits business in general. That is to say: More sustainable real estate operations align a real estate organization's social and commercial responsibility to drive innovation and short-term and long-term value creation.

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‘Expand knowledge of the built environment, in a changing world, through scholarships, education and research’

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The authors would also like to thank each of the property managers, investment managers and real estate owners that participated in the interviews for this white paper. A clear industry perspective on sustainability in real estate is critical to promoting energy efficiency and improving the quality of the built environment.

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1 EXECUTIVE SUMMARY

Numerous studies have shown that retrofitting an office building with energy efficiency improvements can significantly reduce operating costs, yet many existing office buildings have not been retrofitted. The objective of this white paper is to explain the incentives and motivations of various parties throughout the real estate management chain so that real estate managers can better understand why investments in energy efficiency are not more prevalent. The white paper focuses specifically on existing office buildings.

Within the white paper the authors explore the question of why many existing buildings have not been retrofitted, despite operational savings, from both a qualitative and quantitative perspective. The qualitative study consisted of interviews with key players in the real estate management chain, including property managers, asset managers, portfolio managers and institutional owners. The quantitative study consisted of the development of a financial model to compare competing alternative capital investments. The competing investments consisted of a cosmetic improvement, which was modeled to either increase rent or decrease leasing costs, and an energy efficiency improvement, which was modeled to decrease utility costs. Several permutations were tested to gauge the sensitivity of returns for each case. Both the qualitative and quantitative studies were designed to understand how industry participants allocated capital to energy efficiency improvements.

The white paper concludes that financial considerations are the primary drivers behind real estate investment decisions. Secondary factors that drive investments in energy efficiency improvements include: fostering a positive public image, winning new business and focusing on environmental responsibility. Recommendations to increase investment in energy efficiency are also provided within the white paper. Increased investment in energy efficiency will result if managers recognize that energy efficiency projects can decrease the volatility of returns, and that these returns are maximized by making the investment in energy efficiency prior to significant lease rollover.

The goal of this white paper is to help real estate managers better understand the motivations behind management decisions and provide recommendations to make the case for energy efficiency improvements. Questions answered within the paper include:

- How does an energy efficiency improvement get implemented?
- Who is the driver behind that decision?
- What financial metrics are used to determine if an investment makes economic sense?
- How does a real estate manager choose one investment type over another?

2 INTRODUCTION

Energy efficiency in buildings is clearly a pressing issue. Globally, buildings are responsible for about one-third of the world's energy use. Not only do buildings use more energy than any other industry, but their share of energy use is expected to grow ever-more intense. Numerous studies have proven that simple acts such as commissioning a building or installing more efficient light bulbs not only save resources but also pay for themselves in a relatively short time period. However, many office buildings in the United States have not even implemented simple retrofits, let alone more complex and expensive retrofits.

The objective of this white paper is to explore the incentives and motivations of various parties throughout the real estate management value chain to understand why investments in energy efficiency are not more prevalent. The focus is specifically on existing office buildings owned by real estate investors, rather than owner-users or government entities. Thus, the paper has been written primarily for the commercial real estate industry, such as property managers, asset managers, investment managers and real estate owners. The goal of this white paper is to overcome the barriers to implementation of efficiency retrofits in existing commercial buildings by increasing collaboration between all building stakeholders, including property managers, investment managers, portfolio managers and owners. To realize a significant reduction of energy use, energy efficiency retrofits need to permeate all levels of the real estate value chain and not be restricted to government, corporate users and tenants. To advance this cooperation, a comparative methodology is developed to assess and promote performance improvement upgrades to existing buildings as a profitable investment to improve cash flow and increase asset value.

2.1 Commercial Real Estate Management Value Chain

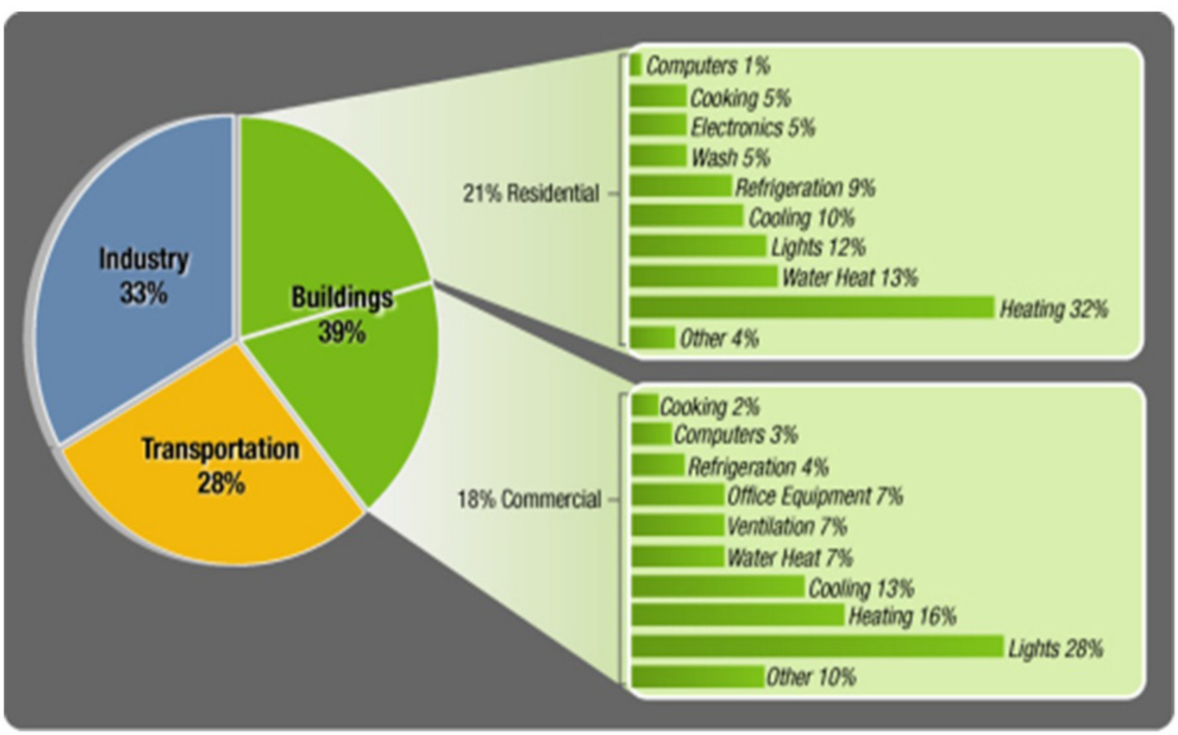
The commercial real estate industry is a highly fragmented industry. Incentives and motivations in the decision-making process are not always aligned. The real estate value chain includes a diverse set of entities, such as designers, engineers, contractors, owners, financiers and property managers, among others. There are a number of unique value chains throughout a building's life cycle including the design phase, operation phase and disposition phase. Through any phase, the value chain may be horizontal or vertically integrated within a single company or across multiple companies.

In the operation phase the value chain might be analyzed based on ownership structure: owner-user buildings and owner-investor buildings. The owner-user building is typically owned, occupied and managed by a single entity. In the owner-investor value chain, the owner leases the building to a tenant and the value chain may include tenant, property manager, asset or portfolio manager, and owner. In this value chain the ownership may be singular or may be a group of investors. In a vertically integrated real estate organization, these business lines may be structured as separate businesses within a holding company or structured as independent departments with different vice presidents. Different managers may compete for limited investment capital; for example, a leasing manager, asset manager and facility manager may need to demonstrate the return on investment for building improvements compared to a competitive return with other capital investment opportunities.

2.2 Energy Efficiency Retrofits and Property Performance

The energy efficiency of a building is limited by how the building is designed, engineered, constructed, operated and maintained. Achieving greater energy efficiency in an existing building depends on several factors, including the building envelope, system types and efficiency, energy end use, such as plug loads, and building operation and maintenance practices. The efficiency of the building envelope impacts the energy load for the building, including the required energy used to heat, cool and ventilate. Simple strategies to reduce heating and cooling loads include appropriate insulation, optimizing window glazing area, minimizing the infiltration of outside air, and using an opaque roofing material. Additionally, the envelope impacts the lighting load for the building, depending upon how much natural daylight penetrates through windows into the interior spaces. Common design features include the enhancement of natural daylight into a building through the use of skylights, light shelves, tubular daylighting and other means of daylight harvesting. Mechanical systems impact building energy efficiency based on the age of the equipment, repair and maintenance program, and whether systems are operated as designed and have been commissioned. Inefficient mechanical systems expend more energy than necessary to heat or cool the building. Plug loads also impact building efficiency. Plug loads include computers, copiers and appliances. Energy inefficient equipment and "vampire power," or energy drawn by a piece of equipment while sitting idle, both can have a significant impact on overall building energy efficiency.

The efficient use of energy impacts the operating cost of a building. The average cost of energy for a typical commercial building may depend on several factors, including the geography, climate, building type and location. Energy costs are also one of the most controllable expenses unlike other major line items, such as taxes and insurance. The energy expenditure for all buildings is $1.09 per sq. ft. ($11.73 per square meter) (US dollars) and $1.40 per sq. ft. ($15.07 per square meter) (US dollars) for office buildings (CEBECS 2003). Figure 1 shows the average end use of energy for both commercial and residential buildings. Energy prices have significantly increased over the past several years, underscoring the importance of energy efficient operations. Since 2000, average commercial energy prices have increased approximately 25 percent (Ciochetti & McGowan 2009).



(US DOE 2008)

Figure 1: Total energy consumption by real estate sector

3 METHODOLOGY

3.1 Retrofitting Process for an Existing Commercial Building

Energy efficiency projects may yield substantial operational savings to a building owner. Understanding end-use energy consumption is a critical step in realizing value from an efficiency retrofit project. Examples of end-use measurement tools and methods include sub-meters, data loggers, monthly utility tracking sheets and annual energy audits. Many efficiency retrofit opportunities are overlooked because of inadequate end-user information. A 2007 worldwide study found that only two-thirds of companies tracked energy data and approximately 60 percent tracked the cost of energy, although the numbers varied by the national origin of the company (WBCSD 2007).

3.1.1 Building Commissioning

Another critical factor in an energy efficiency upgrade is commissioning or recommissioning of an existing building. Commissioning or recommissioning a building is generally performed by an independent third party to verify that building systems operate as they were designed. Recommendations from a commissioning agent may be simple, like adjusting the belt tension on the fan of an air-handling unit, to complex and costly, like replacing an underperforming chiller. The Lawrence Berkeley Laboratory (LBL) estimates the median cost of commissioning existing buildings to be $0.27 per sq. ft. ($2.90 per square meter) (US dollars) of floor space and the average annual energy savings to be about 15 percent with a 0.7-year simple payback period (Leonardo Academy 2008). Despite the cost saving potential, anecdotal evidence suggests frequent building commissioning is not widely performed throughout the commercial real estate industry.

3.1.2 Efficiency Improvement Projects

There is a wide range of solutions available to increase the efficiency of a commercial building. One way to look at these solutions is to categorize projects by expected initial cost. Categories might include no-cost improvements, low-cost improvements and significant cost improvements (Dirksen & McGowan 2008) (Table 1).

Table 1: Sample energy efficiency improvement projects

No-cost improvements	Seal window and door frames
	Change filters regularly
	Replace washers and cartridges in leaking faucets
	Replace light bulbs
	Review current building operating procedures
Low-cost improvements	Equipment tune-ups
	Review sequence of operations
	Calibrate controls
	Perform minor equipment upgrades
	Install occupancy sensors
Significant cost improvements	Window replacement
	Faucet and toilet replacement
	Photovoltaic installation
	Equipment replacement

Many of the no-cost and low-cost improvements may provide significant reductions to building energy consumption. According to a recent report based on several case studies, energy consumption for heating, ventilating and air conditioning (HVAC) can be reduced by 20 percent by detecting mechanical faults and ensuring systems operate correctly (NSTC 2008). Many cost savings related to HVAC can be made by changing operation procedures, which do not require retrofits.

Lighting is a low-cost improvement with significant energy reduction potential. A lighting retrofit may include replacing lamps, ballasts or the entire luminaire (both the lamp and ballast). For example, simply replacing 40W T12 lamps and magnetic ballasts with 32W T8 lamps with standard electronic ballasts could save 87W and $39 (US dollars) per fixture per year (Conley 2010). A second example would be replacing a wall-mounted light switch with an occupancy sensor, where appropriate, can reduce energy consumption up to 25 percent (Roberts 2009). It should be noted that any solution should be evaluated not only on cost but holistically. For example, providing a tenant control over ventilation may reduce cooling loads and also improve occupant comfort.

3.2 The Perspective on Sustainability Within the Real Estate Industry

Real estate managers share decision-making responsibility with a number of participants, including property managers, asset managers, portfolio managers and institutional owners. In some cases, these decision makers may be vertically integrated in a single firm or they may be a third-party service provider. A recent study conducted by the MIT Center for Real Estate provides insight into how many managers are making the business case for sustainability to decision makers.

Companies were selected primarily based on the amount of market share in their respective business. Firms with a significant share of their assets in office properties were targeted and a total of 19 firms located in 13 different cities

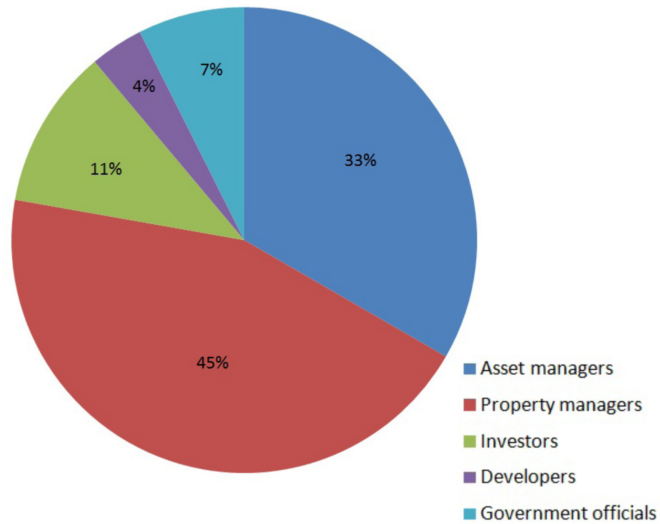


Figure 2: Professional roles of interview participants

participated. Overall, 27 individuals participated, including nine asset managers, 12 property managers, three investors, one developer and two government officials.

The level of decision-making responsibility among interview participants varied widely. Participants ranged from a property manager to a chief operating officer responsible for the management of multibillion dollars of real estate. The perspective of each participant was not always in alignment. However, each individual offered valuable insight into the decision-making process.

3.2.1 Property Management Companies

According to a report by the National Real Estate Investor, the top 25 largest property management companies collectively manage approximately 8.3 billion square feet (7.7 x 10^8 square meters) of floor space[1] (National Real Estate Investor 2008). Of the top 25 companies, six participated in the interview (Table 2). These six companies collectively manage approximately 4.8 billion square feet (4.4 x 10^8 square meters) of commercial property. Interview participant job responsibilities ranged from individual property managers to senior managing director.

[1] *Total property under management includes all commercial product types as well as multifamily residential.*

Table 2: Participant property management companies by size

Rank	Property management company	Square feet under management	Square meters under management
1	CB Richard Ellis Group	1,900,000,000	176,510,000
2	Jones Lang LaSalle	1,200,000,000	111,480,000
3	Colliers International	868,000,000	80,637,200
5	Cushman Wakefield	500,000,000	46,450,000
7	Grubb & Ellis	265,600,000	24,674,240
20	Transwestern	124,000,000	11,519,600

(National Real Estate Investor 2008)

3.2.2 Asset Management Companies

Interviews were conducted at six of the top 25 investment management companies (Pensions & Investments 2006). Asset managers who have management responsibility for the performance of real property were selected for the interviews. The level of job responsibility of interview participants ranged from asset manager to the chief operating officer (COO) of North America. Table 3 summarizes the companies interviewed.

3.3 Interview Questions

Interview questions were developed to explore the decision-making process for capital allocation for energy efficiency retrofits and to determine the incentives and motivations behind a decision to invest in energy efficiency improvements and how these incentives may shape the outcome. The relationship among decision makers was also analyzed. The questions were designed to discover any perceived or real barriers in making the decision to invest in energy efficiency improvements.

Table 3: Participant asset management companies by size

Rank	Real estate investment managers	Total assets under management (US dollars)
5	Principal Real Estate	$32,511,000,000
6	UBS Global Real Estate	$29,396,000,000
7	JP Morgan Asset Management	$29,068,000,000
11	INVESCO Real Estate	$17,347,000,000
25	AEW Capital	$4,855,000,000
26	Colony Realty Partners	$4,406,000,000

(Pensions & Investments 2006)

3.2.3 Commercial Real Estate Owners

The ownership role in commercial real estate includes both passive investment management and active investment management. Accordingly, a number of the largest real estate owners often are included on the list of the largest investment management companies and property management companies. Six large owners with some level of vertical integration in either asset management, property management or both participated in the interviews.

3.4 Building an Economic Model to Analyze Capital Improvements

Any real estate manager tasked with operating a building is focused on maximizing the net operating income (NOI) of that building. Real estate managers focus on both sides of the equation by increasing net operating income through increases to gross rental revenues or decreases to operating expenses. There is a trend within the real estate industry for managers to focus on gross rental revenue as a means to increase NOI. However, decreases to the operating expenses of a building may also create significant value. Building a financial model (a proforma) whereby real estate managers can evaluate competing investment alternatives will assist the manager in making more informed decisions. The objective of using a financial model is to apply return metrics that various real estate managers use to analyze an investment, and to then compare the order of magnitude of the various returns.

One of the biggest factors affecting investment in energy efficiency upgrades is the initial capital required to implement an upgrade. As previously discussed, real estate managers may have conflicting goals for investment capital. For example, a portfolio manager may be motivated to keep the volatility of his portfolio to a minimum, which results in keeping major capital outlays to a minimum. Meanwhile, a property manager is motivated to increase operational efficiency, which may involve significant capital improvements.

Below is a stepwise process on how to build a financial model of competing investment returns. The following illustration is based on a fictitious suburban office building and uses industry averages as inputs. A hypothetical capital investment of $200,000 (US dollars) for the building is used. This investment can either be in the form of a cosmetic upgrade (e.g., remodeling a lobby) or an energy efficient upgrade (e.g., retrofitting all of the light fixtures). Comparing the amount of the initial investment with the change in cash flow and capital appreciation will reveal the order of magnitude of returns provided by each investment.

3.4.1 Return Metrics

Simple payback period, change to net operating income, internal rate of return and net present value are commonly used return metrics. A description of these terms is found in the Glossary at the end of the paper. The financial model will incorporate many of these metrics to reach the broadest audience of real estate professionals, including property managers, asset managers and property owners.

3.4.2 Key Assumptions

The following key assumptions were used to build the financial model:

- **Fictitious building:** The facts and figures used in the model are rough estimates for an average suburban office building located in the United States and are based on industry averages such as those found in the Institute of Real Estate Management (IREM) Income/Expense Analysis: Office Buildings (IREM 2008).

- **No financing:** It is assumed that the up-front cost for the capital investment will be paid by the property owner out of a cash reserve.

- **Employee productivity:** In predicting the effects of various investments, it is assumed that none of the investment alternatives will affect employee productivity either positively or negatively. Measuring productivity or changes to productivity is beyond the scope of this study.

- **Lease type:** The leases in the financial model are assumed to be a modified gross lease with a base year stop. This means that the tenant agrees to pay all operating expenses above a specified annual level known as the “stop.” For example, if a tenant’s lease specifies gross rent of $20.00 per sq. ft. ($215 per square meter) (US dollars) with a $5.00 per sq. ft. ($54 per square meter) (US dollars) base year stop, the landlord is agreeing to pay for the first $5.00 per sq. ft. ($54 per square meter) (US dollars) worth of operating expenses, which may include water, electricity, solid waste, property insurance, real estate taxes, property management fees and other general property operating expenses. If the expenses were to rise to $5.50 per sq. ft. ($59 per square meter) (US dollars) in the second year, the landlord would pay the first $5.00 per sq. ft. (US dollars) and the tenant would pay the extra $0.50 per sq. ft. ($5.40 per square meter) (US dollars).

- **Expense reductions:** If the operating expenses in any one year decrease below the base year stop, depending on the lease structure the landlord may keep all or some of the savings. Using the example above, if the expenses decrease to $4.50 per sq. ft. ($48 per square meter) (US dollars), the landlord only pays $4.50 per sq. ft. ($48 per square meter) (US dollars) and the tenant does not share in the $0.50 per sq. ft. ($5.40 per square meter) (US dollars) savings. The tenant is still responsible for paying the entire $20.00 per sq. ft. ($215 per square meter) (US dollars) gross rent.

- **Base year reset:** It is assumed that when a tenant renews their lease, their base year stop resets to the current year's actual operating expenses. Additionally, when a new tenant signs a new lease, their base year stop is also set at the current year's actual expenses. These two actions simplify the model so that whenever a lease is expired, the base year stop for that space will always reset to the current year's expenses.

- **Lease expiration:** For simplification, the model assumes five tenants of equal size. Lease expirations are as follows: two tenants' leases expire in Year 2 of the analysis, three more tenants' leases expire in Year 3, and one tenant's lease expires in Year 5. The tenant with the lease expiration in Year 5 is assumed to have signed a 3-year lease in Year 2. The tenant expiration is staggered to show the effect of investment in the property with varying rollover percentages.

- **Lease term:** Four leases are assumed to be 5-year leases and one lease is assumed to be a 3-year lease for the reason stated above.

- **Revenue and expenses:** The financial model assumes a suburban office building using national averages for revenues and expenses published by the Institute of Real Estate Management (IREM). Table 4 shows a summary of the averages for all US suburban office buildings in 2006.

Table 4: Average US suburban office building revenue and expenses

Suburban office building (2006)	Total $/sq ft (US dollars)	Percentage change 2005-2006	Percentage of total operating costs
Gross rents	$19.43	2.50%	
Utilities	$1.96	5.40%	23.60%
Janitorial/maintenance	$2.11	2.90%	25.40%
Admin/benefits	$1.08	-3.60%	13.00%
Insurance services	$1.04	-1.90%	12.50%
Net operating costs	$6.02	2.90%	
R.E./other taxes	$1.90	4.40%	22.90%
Total operating costs	$8.30	3.50%	
Occupancy levels	95.00%	0.00%	
Operating ratio	0.43		
US median management fee	3.24%		

(IREM 2008)

The financial model evaluates a building of 100,000 sq. ft. (9,000 square meters) with tenants of equal size of 20,000 sq. ft. (1,900 square meters), for simplicity. A program such as Argus, or other financial modeling software, is helpful when building a financial model with tenants of varying size and lease expirations. Assumptions about rent and expenses are based on industry averages provided in the IREM Median Income and Expense report between 2004 and 2006. The assumptions about escalation percentages to operating expenses and rent growth, tenant retention and absorption are arbitrary and use common commercial real estate underwriting practices. Finally, the sales cap rate is assumed to be 9 percent. Table 5 summarizes these assumptions.

Table 5: Financial model input assumptions

Input assumptions	
Gross rentable office area	100,000 sq ft (9,290 m²)
Average tenant size	20,000 sq ft (1,858 m²)
Average suburban office rent	$19.43 (US dollars)
Average sub op expense	$8.30 (US dollars)
Op expense growth	3.50%
Rent growth	2.50%
Reversion cap rate	9.00%
Tenant renewal probability	75.00%
Absorption	6 months

- **Cap rate:** A cap rate of 9 percent was arbitrarily chosen. Given the current market conditions at the time of this paper, there is almost no investment sales activity to establish a market cap rate assumption. The cap rate remains fixed for all scenario analysis.

- **Tenant renewal probability:** The tenant renewal probability refers to the likelihood an existing tenant would renew a lease in the building at lease expiration. The selection of a 75 percent probability is common to commercial real estate financial underwriting.

- **Absorption:** The absorption period is the number of months an office suite may sit vacant from the time an existing tenant lease expires and a new tenant lease starts. It represents the lost revenue to the landlord and is often referred to as “downtime” throughout the commercial real estate industry. Assuming a normal real estate market cycle, six months absorption is common to commercial real estate financial underwriting.

Table 6 uses the above assumptions to yield the Year 1 cash flow.

Table 6: Proforma Year 1 cash flow (US dollars)

	Year 1
Gross rental revenues	$1,943,000
Less vacancy & absorption	$0
Plus expense reimbursements	$29,050
Effective gross income	$1,972,050
Total operating expenses	-$859,050
Net operating income	$1,113,000

3.5 Comparison of Capital Investment

The proforma is used to analyze the impact of a capital investment to the net operating income and capital appreciation of the building. Two types of capital investments are analyzed: a cosmetic improvement and an energy efficiency improvement. For comparison, either improvement project is assumed to cost $200,000 (US dollars). Any impact to the financial model is realized in the year following the improvement project.

Cosmetic improvement: The cosmetic improvement is assumed to raise the aesthetic quality of the building and could include projects like a lobby upgrade, bathroom renovation, landscaping, or a mixture of these and various other projects. The purpose of the improvement is to increase the gross income generated by the building. In practice many of these improvements are made to either raise the building to a market standard or prevent the building from market obsolescence. The decision may also be made to reposition a building within a market. Gross income could increase as a result of the following three scenarios:

1. **Increased average rent:** The cosmetic improvement raises the quality of the building and increases the achievable rents for the building.

2. **Increased renewal probability:** The improvement increases the probability that an existing tenant will renew a lease upon expiration.

3. **Decreased absorption period:** The improvement is expected to enhance the aesthetic quality of the building thereby making it more attractive to a prospective new tenant. The effect is a decrease in absorption time.

A sensitivity analysis was run with three scenarios to model changes in average rent, tenant renewal probability and absorption. The model assumes that both renewal probability and absorption behave in tandem: If lease renewal probability of an existing tenant increases, the same attributes of the building may also decrease the absorption time for a new tenant to sign a lease.

Energy efficiency improvement: There are many possible energy efficiency projects including, but not limited to, building commissioning, lighting retrofits and HVAC retrofits. The financial model assumes the landlord spends $200,000 (US dollars) in energy efficiency retrofits to decrease the energy consumption of the building. For simplicity, the building is assumed to consume only electricity as the primary source of energy (e.g., no natural gas, district steam, etc.).

Electricity consumption for the building used in the financial model illustration is assumed to be 15.70 kWh, based on the average consumption for a suburban office building published by the US Energy Information Administration in the 2003 Commercial Building Energy Consumption Survey. Further, the model assumes the average commercial price of electricity to be $0.106/kWh (US dollars) according to statistics provided by the Department of Energy (2008). Table 7 summarizes the electricity cost and consumption assumptions.

Table 7: Electricity assumptions

Electricity consumption	15.70 kWh
Electricity price	$0.106/kWh (US dollars)
Electricity price annual growth	2.55%

Using an assumption of an electricity use decrease of 38 percent, the adjusted annual energy consumption for the building after the retrofit is 9.73 kWh. At the stated electricity cost of $0.106/kWh (US dollars), the electricity bill for the building before the retrofit is approximately $166,000 ($1.66 per sq. ft. or $18 per square meter) (US dollars) and after the retrofit is $103,000 ($1.03 per sq. ft. or $11 per square meter) (US dollars). The savings of the energy retrofit is approximately $0.63 per sq. ft. ($6.80 per square meter) per year (US dollars). Assuming a 3-year payback period, the total cost of the project for the subject building would be approximately $1.90 per sq. ft. ($20 per square meter) (US dollars).

The following scenarios demonstrate the ways in which an investment in energy efficiency projects could reduce a building's operating expenses:

1. **Electricity consumption decrease:** The energy efficiency improvement is expected to decrease electricity consumption below the 15.70 kWh in the proforma. The energy reduction is realized in the cash flow in the year following the improvement (e.g., if the improvement is made in Year 0 the decrease is in Year 1).

2. **Rebates:** Utility companies, in addition to many local, state and federal government agencies, offer rebates to reduce electricity consumption. These rebates typically cover a portion of the up-front retrofit cost. In this model, rebates of $0.60 per sq. ft. ($6.45 per square meter), $1.20 per sq. ft. ($12.92 per square meter) and $1.80 per sq. ft. ($19.40 per square meter) (US dollars) are analyzed according to recommendations from industry participants.

A sensitivity analysis was run on the energy efficiency improvement using three different permutations because the performance of the energy efficiency improvement does not always align with the original design specification. The sensitivity analysis tests an energy efficiency improvement at various performance levels. The baseline energy reduction used in the analysis is 30 percent, a slight adjustment downward from the assumed 38 percent initially noted.

4 QUALITATIVE AND QUANTITATIVE ANYLYSIS

The question of energy efficiency retrofits within this paper is approached from two different angles. First, a qualitative study was conducted whereby numerous players in the real estate value chain were interviewed in order to examine current perceptions of potential energy efficiency projects. Second, a quantitative approach was developed that was designed to provide a framework for discussing changes to various return metrics as the result of capital investments. This section of the paper examines the results of both the qualitative study and the quantitative model. The increased perspective on real estate owners' motivations and a quantitative energy efficiency improvements framework equip real estate managers to make a business case for investment in energy efficiency improvements.

4.1 Qualitative Analysis: Industry Perspective on Real Estate Sustainability

4.1.1 Drivers of Energy Efficiency Improvements

There are many trends regarding energy efficiency retrofits throughout the commercial real estate industry. Understanding the principle drivers and motivations of industry peers will help real estate managers make the business case to stakeholders both internal and external to the company. Analyzing recent interviews, salient trends in managerial thinking became apparent. Table 8 summarizes current thought leadership on making the case for efficiency improvements. From the interviews, it was concluded that sustainability improvements are driven by the most visible players in the real estate industry, primarily corporate tenants and institutional real estate investors. Tenants, landlords and geography also impacted energy efficiency decisions.

Table 8: Summary of key drivers and motivations

Interview Results Summary		
Category	**Key points**	
Drivers of energy efficiency projects	**Visibility**	Large tenants and large owners with high public visibility are most interested in sustainability.
		Larger companies are more likely to have the available capital to invest in energy efficiency projects.
	Geography	Attitudes vary depending on location. Coastal cities report much more focus on energy efficiency than central cities.
Motivations behind energy efficiency projects	**Economics**	Projects must show a positive financial return or they will not be implemented.
	Market advantage	Property managers can use their expertise in energy efficiency to win new clients in both property management and sustainability consulting.
	Shifting class standard	Class A buildings are almost expected to have efficient lighting and automatic faucets. These improvements are partially motivated by economics and partially by cosmetics.
		Efficiency improvements indicate to potential purchasers and tenants that a building is well managed.
Corporate policies	**Benchmarking**	Over half of companies have a sustainability policy. Most are benchmarking using ENERGY STAR.
	Compensation	Most companies do not tie compensation to energy efficiency. Property managers are expected to focus on efficiencies as part of their job.
Government policies	**Lack of awareness**	Few companies are preparing their buildings to be in compliance with government energy efficiency regulations.
Value of energy efficiency	**Payback period**	After implementing no-cost strategies, managers evaluate expenditures based on a payback period of 2-3 years.
		Government, owner-occupiers and owners with longer hold periods will accept slightly longer payback periods.
	Effect of lease structure	Owner is much more likely to make investments if the leases are gross or modified gross and the landlord can capture much of the savings from energy efficiency.
		Many leases allow the landlord to amortize the cost of improvements back to tenants. This helps increase the landlord's return on investment.
	Rebates	Many states and municipalities provide rebates to help pay for energy efficiency improvements.
Capital allocation decision	**Priorities**	Top priority is always safety and required code issues.
		Second is tenant retention, which usually consists of front-of-the-house cosmetic improvements rather than back-of-the-house energy efficiency.
Real estate cycle	**Decreased investment**	When the market is in decline, there is less capital in general to spend on energy efficiency projects. Companies are preserving what capital they have available.
Industry structure	**Fund structure**	Opportunistic funds are focused on minimizing capital investment and selling quickly. They have shorter hold periods and a higher cost of capital.
		Core funds are more willing to invest capital due to their longer hold period and lower cost of capital.
	Reporting period	Fund managers report returns on monthly or quarterly basis. They are motivated to keep large investments and return volatility low.
	Lack of education/belief	Managers either have not seen studies showing that energy efficiency makes economic sense or are not convinced by these studies. Time will tell if the technologies pay off.

Tenants: High-profile tenants, such as large corporations or Fortune 500 companies, are more likely to request sustainability features in a building that they are considering to lease. One reason for this is that annual reports published by public corporations are often scoured by industry analysts and shareholders. The reports often include a section on corporate responsibility, including a commitment to sustainable business practices. Some companies herald the selection of sustainable real estate as a visible commitment to their constituents. These tenants are more likely to partner with a real estate manager on achieving greater sustainability in a property.

Landlords: For the real estate manager of primarily leased space an understanding of landlord commitment is important. Large institutional real estate owners are likewise very visible companies to the investment community. Many investment managers reported a growing number of investors – albeit small in number – are enquiring about corporate sustainability policy, including investment and management of sustainable buildings. To facilitate raising capital from these investors, fund managers may have an incentive to promote sustainability.

Aside from being a marketing tool for large, high-profile companies, these same companies are more likely to have capital available to invest in energy efficiency. It is more likely that smaller investors do not have excess capital available to invest, while some larger, well-capitalized firms are able to continue making investments as long as they create value to the investor.

Geography: Geography plays a significant role in the awareness of sustainable real estate management practices and a manager's willingness to invest in sustainability improvements. Interview participants in cities known to be environmentally progressive were near unanimous in stating that improving energy efficiency in existing buildings was a major driver in their real estate markets. These participants stated that tenants, investors and potential purchasers alike are asking about the energy performance of a building. Some tenants in mainly coastal markets are inserting clauses into request for proposals (RFPs) that address the property's sustainability program. In contrast, participants managing assets in less environmentally conscious markets stated that information on the environmental impact for a building was not a frequent request by existing or new tenants.

4.1.2 Motivators Behind Energy Efficiency

Financial consideration, marketing advantage, market differentiator, indicator of management and paradigm shift are the key motivators identified behind energy efficiency.

Financial consideration: Financial consideration was the primary factor affecting capital allocation to sustainability improvements. As expected with any investment, interview responses indicated that if it makes sense from an economic perspective and capital is available, then managers will allocate money to the investment. Likewise, some real estate managers reported that tenants are willing to spend money on their own space if the improvements pay for themselves during the term of their lease. Similarly, property owners are willing to invest in energy efficiency if they are able to recover these initial costs and make a suitable return on investment. Other factors influencing the financial decision include average hold period, cost of capital and expected return on investment.

Marketing advantage: There are several nonfinancial motivations toward sustainability retrofits. More than one property manager stated that increasing their knowledge of energy efficiency was a strategic move to win business. One compelling example consisted of a property manager buying a half-page advertisement in the local newspaper touting the energy expense reductions he had created for property owners. Further, some management firms not only use their knowledge to win property management contracts, but also to win consulting contracts. Most institutional owners do not have the specialized staff in place to implement complicated projects, including the certification process for LEED for Existing Buildings: Operations & Maintenance (EBOM). Other property management firms considered the efficient management of a building merely as a service to their clients – something a good manager should be doing anyway.

Market differentiator: Energy efficiency improvements are not only considered as a way to decrease operating expenses, but also as a way to differentiate one building from others. Multiple managers stated that energy efficient features are part of a new shifting class standard for Class A buildings. For example, a restroom that does not have automatic toilets, faucets and paper towel dispensers may appear outdated compared to a similar building with these features. Likewise, energy-conscious tenants on a property tour look for an updated ceiling grid with efficient lighting compared to older, outdated lighting. Understood in this context, energy efficient features become tangible, visible qualities of a building.

Indicator of management: An efficient building may also be a market signal to tenants and prospective buyers of competent asset management. This was a recurring theme as managers involved in acquiring properties expressed that they may be more cautious purchasing a property lacking energy efficient retrofits. Not only was this a signal that there may be significant capital costs to upgrade the building after the acquisition, but may indicate the previous owner likely either did not have enough capital to properly maintain the property or was simply inexperienced.

Paradigm shift: Several managers shared stories of tangential benefits to making energy efficiency improvements. In one example a property manager changed out inefficient fans in the HVAC distribution for more efficient fans. The newer fans were quieter and tenants were pleased with the decrease in noise level. Another property manager switched the janitorial service to a daytime cleaning schedule. Not only did this save energy because it was no longer necessary to light the building at night, but tenants were able to request specific cleaning assignments and monitor quality. One astute manager commented that energy efficiency retrofits of mechanical equipment before the end of the expected useful life may very well avert a crisis before a system fails. This is contrary to much of the current ownership mentality: "if it ain't broke, don't fix it."

4.1.3 Corporate Policy Regarding Sustainability

Recent corporate marketing campaigns tout sustainability initiatives. Such campaigns include oil companies highlighting their investments in renewable energy or automobile manufacturers calling themselves the green car company. As part of the interview process, the authors aimed to discover how much of this sustainability mindset permeated into commercial real estate. Questions included specifics of a company's corporate policy and how the company ensured the policy was followed.

More than half of the companies interviewed claimed to have an official corporate sustainability policy that ranged from energy consumption reductions in buildings to recycling programs or printing on both sides of a sheet of paper. The most common stated policy is to benchmark managed buildings with ENERGY STAR Portfolio Manager. Upon obtaining an ENERGY STAR score, many companies will perform a LEED gap analysis to determine the feasibility of upgrades that could lead to the LEED EBOM certification. However, several managers cautioned that chasing LEED EBOM certification may be a detractor to the real estate industry from making significant energy-specific improvements. The reasoning was that firms were spending money on LEED consultants that otherwise could have been spent on efficiency upgrades.

Despite the laudable efforts of a sustainability program, execution and implementation are not without challenge. One real estate manager stated that often a corporate initiative distributed by senior management went straight to the bottom of the proverbial inbox. Other managers considered energy efficiency and sustainability his or her personal responsibility to educate both owners and tenants. Only one company interviewed ties a small portion of an employee's annual bonus to sustainability. When others companies were asked why there is no compensation tied directly to a property manager's energy efficiency performance, the majority of respondents simply stated that it is a property manager's job to keep operating expenses low.

4.1.4 Government Policy Regarding Sustainability Improvements

Interview participants were also asked about the increasing number of federal, state and local government regulations on energy efficiency requirements in buildings. Less than half of all respondents stated they are current on these regulations. Of those that are aware, they are paying close attention to government policies regarding energy efficiency. They are well aware that the government has specific requirements regarding energy use reduction, but they are also realistic about just how much effect these regulations can have. For this reason, the responses indicated that government regulations are a tertiary consideration behind economics and corporate policy.

4.1.5 Valuing Energy Efficiency Improvements

Nearly every asset and portfolio manager stated that if a capital improvement was accretive to asset value, they would make the investment. Most interviewees described a number of operational changes that require no cost and thus did not require an investment return metric. As previously discussed, shifting the janitorial staff to clean during the day rather than late at night can save energy. Alternatively, if tenants do not like daytime cleaning, another solution is to have the janitorial staff work as a team and move through one floor at a time, preventing the whole building being lit during night cleaning hours. Another no-cost efficiency improvement is to decrease the hours when the heating or cooling operates on weekends. One manager noted a drastic decrease in energy costs after reducing the number of hours the building was heated or cooled to just Saturday morning rather than a full day on Saturday – proudly noting that “not one tenant” issued a complaint about the change.

The financial metric used to analyze potential energy efficiency improvements that interviewees were unanimous in citing was payback period. The vast majority of participants cited a payback period hurdle of 2-3 years maximum. If an energy efficiency project takes more than 2-3 years to pay back, it will likely not be implemented.

The exception is a Real Estate Investment Trust (REIT), which invests solely in core assets and has a hold period of 7-10 years. One REIT stated that they could consider payback periods of up to 4-5 years.

Besides making a return on capital invested, there were various other reasons for a manager to invest in energy efficiency. In fact, through an upgrade to building management systems one interviewee set up a central control room that allowed one person to monitor an entire building portfolio. Though overhead reductions are not typically included when analyzing energy efficiency investments, they make for an interesting ancillary benefit to the property owner.

Lease structure: The structure of the lease between tenants and landlords also has a large effect on whether or not an investment in energy efficiency was made. Not only do leases dictate who benefits from a reduction in energy costs, but they also dictate who pays the initial cost. The leases in place were considered a major factor in whether or not a landlord is willing to make investments in energy efficiency. In the case of a gross lease, the landlord is more likely to make the investment because the landlord may capture energy savings. In a triple net (NNN) lease, the landlord is very unlikely to make an energy efficient improvement because he/she would be paying for the improvement while the tenant realized any savings.

Most interviewees stated that the leases in their office buildings are modified gross leases with an expense stop. As a result, managers analyze tenant rollover in the property to evaluate when to make investments in energy efficiency. If there is significant upcoming rollover, the landlord may take the opportunity to reduce energy expenses thereby reducing the expense stop for any new leases or lease renewals. A lower expense for the building flows through to a higher net operating income and greater capitalization of the income at property disposition. This concept will be explored in greater detail in the discussion about the proforma below.

Many leases also allow the landlord to amortize the cost of capital improvements to the tenant, provided that the capital improvements have a direct positive impact to the tenant through the reduction of operating expenses. This lease clause may apply to energy efficiency improvements if the tenant’s energy costs decrease as a result of the improvement. While the interviewees were split on whether to amortize the cost of the improvement over the life of the lease or the payback period of the improvement, they all confirmed that getting the tenant to share in the cost of any improvements helped make the decision to invest in energy efficiency easier. The following is sample language that explains how a landlord can amortize the cost of improvements to a tenant:

> *Amortization of the cost of capital investment items which are installed primarily to reduce operating expenses for the benefit of all of the project's tenants or which may be required by any governmental authority. All such costs, including interest costs, shall be amortized over the reasonable life of the capital investment items, with the reasonable life and amortization schedule being determined by the landlord according to generally accepted accounting principles, but in no event to extend beyond the reasonable useful life of the building.*

Managers are encouraged to check with their legal staff on the interpretation of this clause.

Rebates: In recent years, local utility companies and municipalities have been offering rebates to building owners to make energy efficiency improvements to their properties. The presence of rebates was frequently cited as a major financial consideration when deciding whether or not to make investments in energy efficiency. One national manager stated that he would make investments in renewable energy (mostly photovoltaic), but that these investments were being made only in states that provided rebates. Along similar lines, a director at a property management firm illustrated this point with a lighting retrofit project that cost $1.80 per sq. ft. ($19.38 per square meter) (US dollars) but was more than paid for by $2.00 per sq. ft. ($21.52 per square meter) (US dollars) in rebates.

4.1.6 Capital Allocation Decision-Making Process

A significant focus of the interviews was to analyze how property managers, asset managers and owners select among competing capital improvement projects. The unanimous top priority was any life safety issue or code compliance. Cosmetic improvements that were thought to increase building occupancy were the next priority, followed by investments in energy efficiency. Similarly, respondents prioritized capital expenditure, in part, on the timing of the disposition. If an owner felt that he/she would either recoup the cost or be forced to reduce the sales price at disposition, he/she was more willing to spend money on energy efficiency, such as a new, efficient boiler.

The structure of the investment vehicle, whether it was a single asset account, pooled fund or REIT, was also a factor in energy efficiency decisions. The managers of opportunity funds stated that since their cost of capital was so high, the time value of money has an impact on the decision. A simple present value calculation shows that spending a dollar tomorrow is preferable to spending a dollar today. As a result, short-term fund managers indicated they might try to push any major capital investments into the future. One manager of a value-added fund explained this concept quite succinctly: "If my hurdle rate is 20 percent [per year], I'm not going to spend $500,000 [US dollars] to upgrade the building unless somebody will pay me $600,000 [US dollars] for that upgrade when I sell the building next year."

Other factors influencing capital allocation were asset quality and market position. If an asset was seen to be of a lesser image in the market, capital was allocated to improving the aesthetic appeal of the building, or front-of-the-house improvements. Sustainability improvements, with the exception of a few regional markets, are by and large back-of-the-house expenditures, which often take a second position in capital planning. Further, several property managers stated that many buildings lack the structural or mechanical attributes to realize significant value from efficiency improvements. Many owners simply do not have the capital to make the necessary improvements to these buildings. For one property manager, 80 percent of his buildings had energy efficiency improvements of some kind, while the remaining 20 percent of owners had no available capital.

4.1.7 Industry Structure

The financial structure of a real estate investment has a pronounced effect on capital expenditure in energy efficiency improvements. Many of the interviewees own or manage real estate in a real estate investment fund. One industry veteran whose company manages multiple billions of dollars worth of assets stated that over half of his real estate funds are value-added funds. It is this proliferation of value-added funds that may be acting as a barrier to investment in energy efficiency retrofits.

With a hold period of just 3-5 years, there is often little incentive for value-added funds to make improvements to a building's energy efficiency. One reason is the investors may not realize a return on investment prior to disposition of the asset. Another reason is the investment is focused on high-risk, high-return capital appreciation, as opposed to lower, stable cash flow yields. Additionally, due to the high cost of capital for such funds, any capital allocated to a project needs to immediately show a strong return on investment as indicated by several asset managers. With such high return hurdles to cross, many fund managers are not willing to make investments in technologies where the return is considered to be unproven. Further, real estate funds, whether core or opportunistic, generally report earnings to investors either on a monthly or quarterly basis. A senior-level manager at a property management firm summed it accordingly: "The commitment to sustainability [for the investment community] needs to be stronger than the commitment to quarterly earnings." A fund manager is evaluated on the performance of a collective set of assets. For this reason, a manager is very risk averse, preferring to keep the volatility of returns to a minimum. As such, a manager has a natural tendency to avoid capital expenditures that show up as a large negative number on a fund's profit and loss statement.

Another way in which the real estate industry structure may inhibit energy efficiency improvements is the differing goals among management players. Accountable to owners and investors, portfolio managers are generally making decisions that will both increase returns and smooth volatility. The consensus among real estate managers is that a stand-alone capital improvement project cannot decrease the overall fund performance. Asset managers, on the other hand, stated that their objective is to maximize the value of various real assets at a specific point in time so that each will fetch the highest price at disposition. In a strong real estate investment market, significant value is created through capital appreciation at sale, which inevitably leads to a high churn rate of buildings being sold. As one asset manager stated, "The real estate industry lacks proper long-term planning." Meanwhile, property managers are focused on maximizing revenue and decreasing costs in just one asset. Each one of these objectives leads to slightly differing goals in the real estate management business.

A recurrent theme among interviewees was the real estate industry lacks proper education on the issue of energy efficiency, which further inhibits a wide-scale adoption of energy efficiency retrofits. Most respondents stated that it would be very difficult to make a capital investment, such as an energy efficient chiller, and realize the full value of that investment at disposition. Purchasers and appraisers alike underwrite the historical utility bills of the property and thus improperly discount the future performance of a retrofit. An energy efficiency investment therefore needs to show a decrease in energy consumption of a significant magnitude. At the same time, that decrease in energy use needs to be sustained for a number of years before the value will be capitalized into the value of the building. Knowing how the industry underwrites acquisitions, many owners are hesitant to invest in efficient technologies if they cannot recoup that investment in a reasonable time frame. Several managers committed to sustainability described the education process as incremental: investing in increasing capital-intensive efficiency projects as performance of lower-cost improvements in their buildings is proven.

4.2 Quantitative Analysis: Findings From the Economic Model

The primary purpose of creating a financial model was to show how various capital investments affect the financial returns at a property. While the measurements in the model are not intended to provide precise returns, the model is useful for determining an appropriate order of magnitude of returns. Within each investment scenario, multiple permutations were run. The following tables summarize the various permutations that were tested and the sensitivities within each scenario.

Table 9: Base case scenario

Base building assumptions		Base electricity assumptions	
Average suburban office rent (2006)	$19.43 (US dollars)	Electricity consumption	15.70 kWh
Average sub op expense (2006)	$8.30 (US dollars)	Electricity price (per kWh)	$0.106/kWh (US dollars)
Op expense growth ('05-'06)	3.50%	Electricity price annual growth	2.55%
Rent growth ('05-'06)	2.50%	Electricity expense per building square foot	$1.66 (US dollars)
Tenant renewal probability	75.00%	Electricity % operating expenses	20.05%
Absorption	6 months		

Base case scenario: No investment is made in either a cosmetic upgrade or energy efficiency upgrade (Table 9).

Investment scenario 1 ("rent increase"): An investment of $200,000 (US dollars) is made in cosmetic upgrades to the building, such as the lobby, restrooms, etc. The building improvement is expected to position or reposition the building to receive a higher rent than the base case rent of $19.43 per sq. ft. ($209 per square meter) (US dollars). All other variables stay fixed. Table 10 summarizes the specific rent increase permutations that were tested within scenario 1.

Table 10: Permutations for rent increase scenario

Scenario 1	Percentage rent increase	$/sq ft increase (US dollars)
Permutation 1	0.83%	$0.25
Permutation 2	1.67%	$0.50
Permutation 3	2.50%	$0.75

Investment scenario 2 ("lease-up improved"): Similar to investment scenario 1, an investment of $200,000 (US dollars) is made in cosmetic upgrades to the lobby. However, in scenario 2, the improvement is expected to both increase tenant retention and decrease the absorption time for any vacant space. No other variables are changed. Renewal probability will increase from the base case of 75 percent and at the same time absorption period will decrease from the base case of 6 months. Table 11 summarizes the three permutations within scenario 2.

Table 11: Permutations for lease-up improved scenario

Scenario 2	Renewal probability	Absorption period (months)
Permutation 1	80.00%	5
Permutation 2	85.00%	4
Permutation 3	90.00%	3

Investment scenario 3 ("energy decrease"): In investment scenario 3, rather than investing in cosmetic upgrades to the lobby, an investment of $200,000 (US dollars) is made in energy efficiency upgrades to the building, such as a lighting retrofit, upgrade of an HVAC system, etc. No other variables are changed. Energy consumption will decrease from the base case of 15.70 kWh which will result in energy cost reduction from the base case of $1.66 per sq. ft. ($17 per square meter) (US dollars). Table 12 summarizes the three permutations within scenario 3.

Table 12: Permutations for energy decrease scenario

Scenario 3	Electricity expense decrease	First year decrease op expense per sq ft (US dollars)
Permutation 1	25.00%	$0.44
Permutation 2	30.00%	$0.53
Permutation 3	35.00%	$0.61

4.2.1 Simple Payback Period Analysis

The majority of the interview respondents stated payback period is the most important metric when analyzing an investment in a building. Figure 3 shows the simple payback periods for each permutation within each investment scenario.

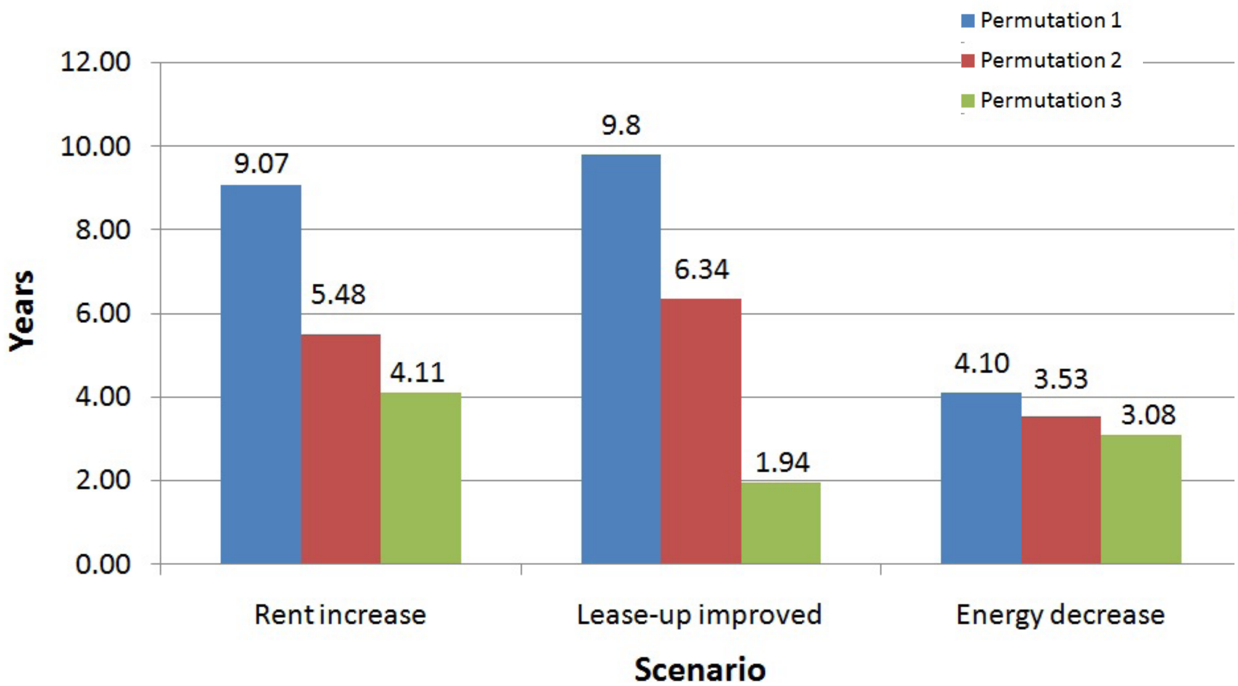


Figure 3: Project-level payback period comparison

Figure 3 illustrates how investment in a cosmetic upgrade can be less predictable than investment in an energy efficiency upgrade. The rent increase scenario (scenario 1) is very sensitive to whether rent increases $0.25, $0.50 or $0.75 per sq. ft. (US dollars) with payback periods ranging from 4.11 years to 9.07 years. Similarly, the lease-up improved scenario (scenario 2) is also very sensitive to each permutation with the potential for the quickest payback at 1.94 years, but also the longest payback at 9.8 years. Contrasting with the other two scenarios, the energy decrease scenario (scenario 3) results are clustered very close together with little difference between the various permutations. This analysis suggests that though investing in energy efficiency improvements may not provide the quickest possible payback, it may be a better investment for managers interested in keeping volatility of returns to a minimum.

4.2.2 Project-Level Internal Rate of Return Analysis

Each investment scenario and permutation was also evaluated on merit of internal rate of return (IRR) over a 10-year time horizon. Figure 4 shows a comparison of the IRR for each investment scenario and permutations within the scenario. The IRR is calculated based on the initial cost of the improvement project and uses the incremental increase to the net operating income as the stream of cash flows. This is a project-level IRR and does not take into account reversion value, which will be analyzed later in this section.

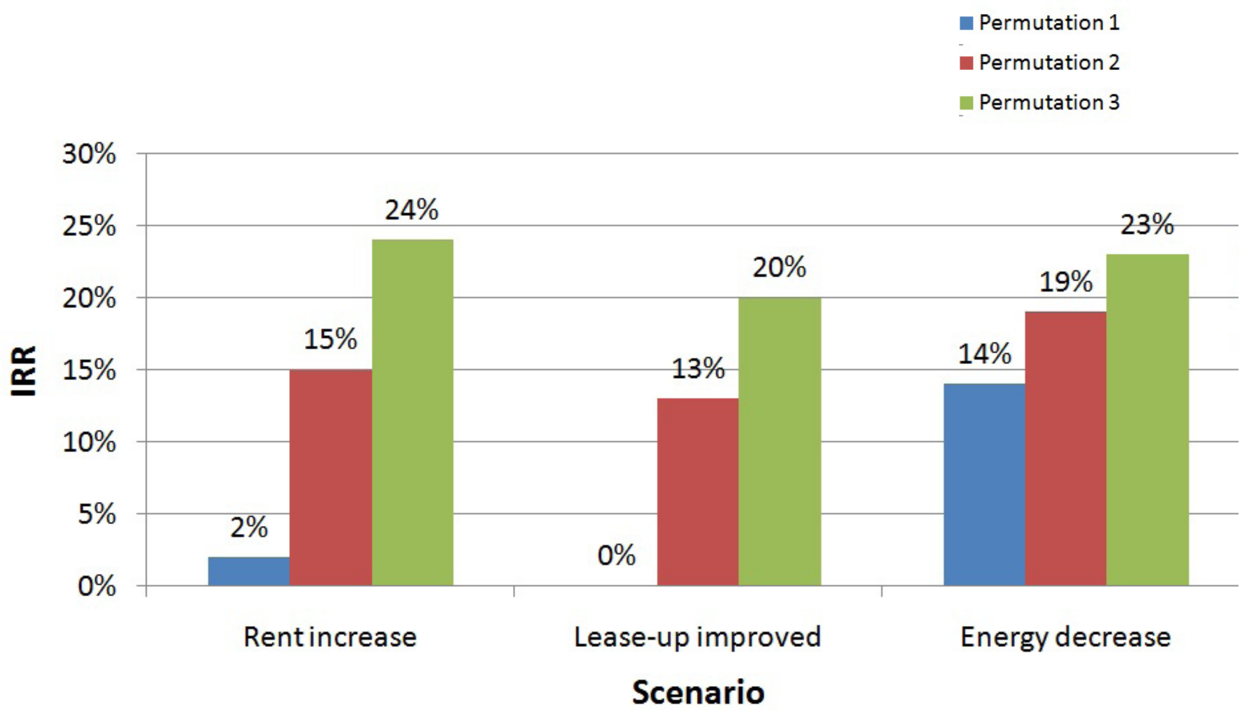


Figure 4: Project-level 10-year IRR comparison (no reversion)

Figure 4 displays how both the rent increase scenario and lease-up improved scenario have a negligible return in permutation 1, while the energy decrease scenario returns a 14 percent IRR. In the energy decrease scenario the decrease to operating expense is realized in the cash flow of the year following the improvement. This results in a higher net operating income realized earlier in the 10-year time horizon, which increases the overall IRR. In contrast, the rent increase does not impact the cash flow until there is significant rollover and lease rates are reset to the higher rents. The lease-up improved scenario is highly sensitive to the rollover in the building thus impacting the cash flow.

4.2.3 Project-Level Net Present Value Analysis

The third metric to evaluate the financial impact of each investment scenario is a net present value (NPV) analysis. The NPV assumes a discount rate of 7.5%, which assumes a 10-year Treasury (3.49% yield) plus a risk premium (400 basis points). Figure 5 shows the project-level NPV of each investment scenario based on a 10-year cash flow. The NPV is calculated using the initial cost of the project, the discount rate and incremental increase to net operating income as the cash flow stream and does not take into account reversion.

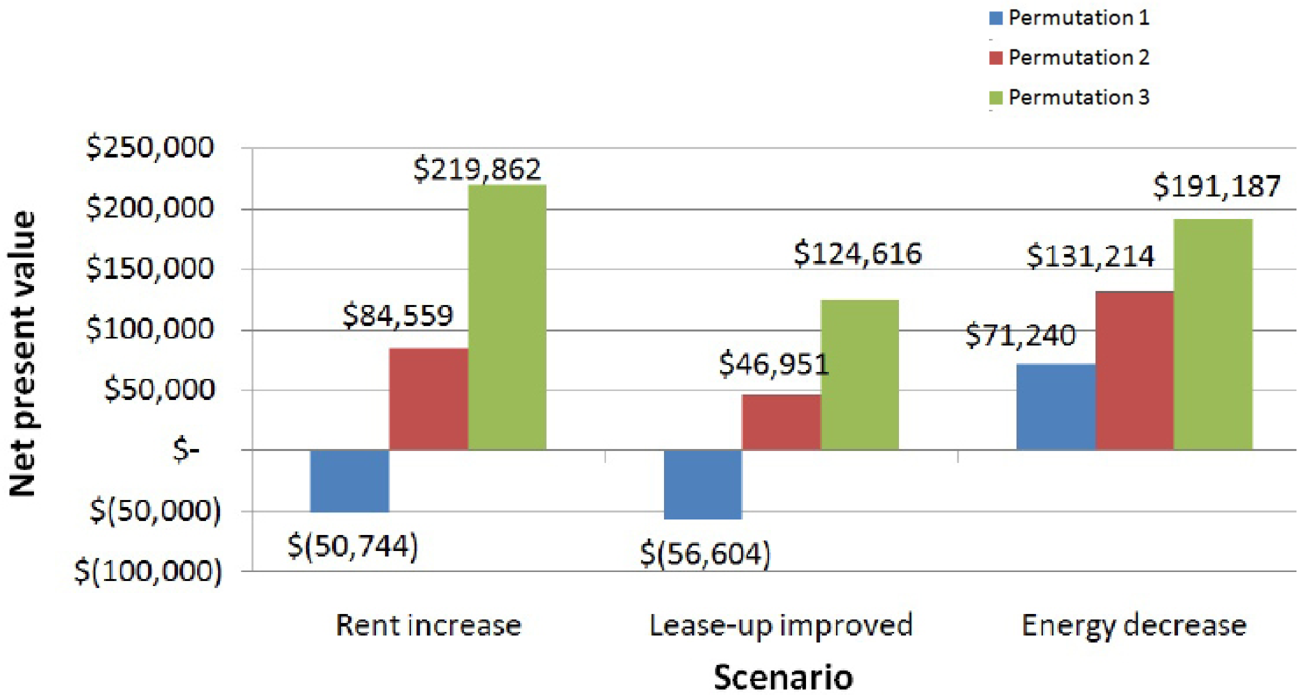


Figure 5: Project-level 10-year NPV comparison (no reversion)

Figure 5 shows that the rent increase scenario nets the highest positive NPV to the project and the lease-up improved scenario nets the lowest positive NPV. The energy decrease scenario is the only scenario to return a positive NPV in permutation 1. Likewise, the energy decrease scenario is shown to be the lowest in return volatility, measured by the difference between the lowest and highest outcomes.

4.2.4 Annual Net Operating Income Analysis
The following analysis compares all three investment scenarios against each other. For simplicity, only the middle permutations (permutation 2) are used. The middle permutations were selected as they are most likely to occur for each scenario.

Each investment scenario is analyzed based on how much the net operating income (NOI) increases each year. Figure 6 shows the annual NOI increase for each type of improvement as lines with the units on the left Y axis. The graph also shows the percentage of tenant lease rollover each year, shown as bars with the units on the right Y axis.

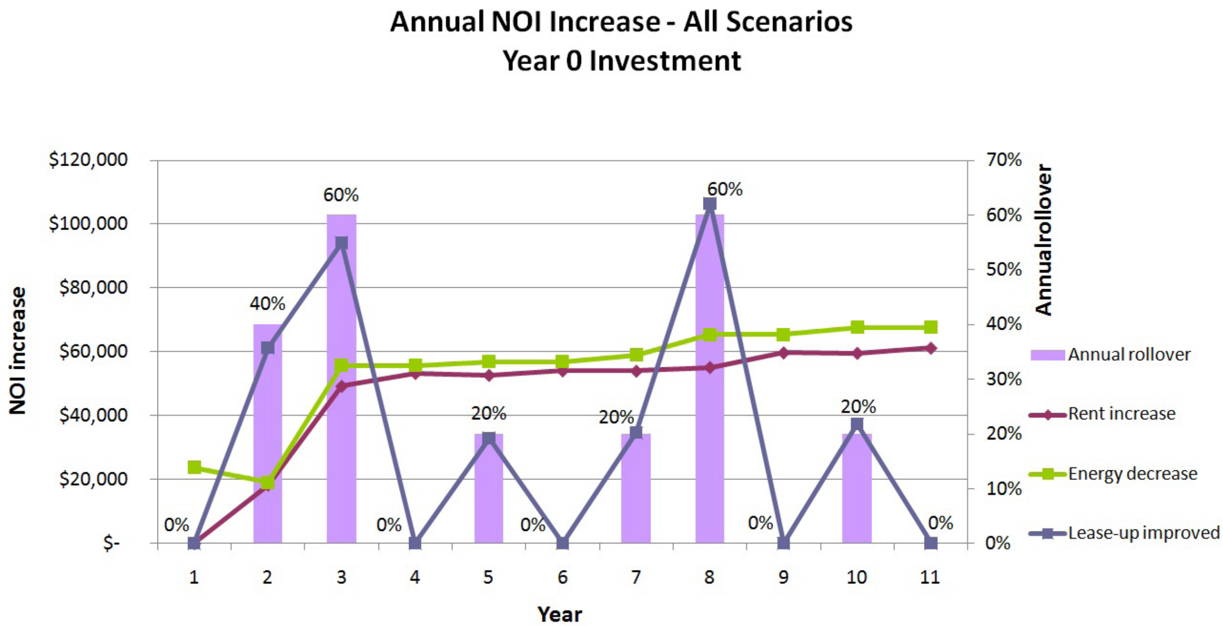


Figure 6: Annual NOI increase vs. rollover percentage

Figure 6 clearly shows that whenever a tenant lease rolls over, the annual NOI for the lease-up improved scenario increases drastically. During years when there is no tenant rollover, however, NOI does not increase at all. In contrast, the NOI for both the rent increase and energy decrease scenarios increases as tenant leases roll over, then gradually grows over time. This comparison shows that an investment decision for a cosmetic upgrade to increase tenant retention exhibits volatile returns. If the intent of the investment is to raise rents or decrease expenses, however, these returns are less volatile and more predictable.

4.2.5 Reversion Value Analysis

The NOI analysis was extended to calculate the financial impact on asset value. This was done by applying a capitalization rate to the NOI during each year of the analysis. As can be seen in Figure 7, the base case, rent increase and energy decrease scenarios are all quite volatile because the reversion value dips whenever significant lease-up costs are incurred. However, the lease-up improved scenario actually decreases the volatility of reversion value because it decreases the severity of lease-up costs. Managers should recognize that while changes to NOI are more volatile under the lease-up improved scenario, decreasing lease-up costs can actually smooth the volatility of total returns. Figure 7 shows the asset value at each year by investment scenario.

Figure 7: Reversion value comparison (Year 0 investment)

4.2.6 The Effect of Tenant Rollover on Investment Returns

The financial model also tested for sensitivity to lease rollover on the rent increase scenario and energy decrease scenario. The lease-up improved scenario was not tested because returns in this scenario are driven solely by tenant rollover. The impact of lease rollover was tested by varying the timing of the investment against lease rollover of 60 percent, 40 percent and 20 percent.

Energy efficiency improvements: Many interview respondents stated that tenant lease rollover was a deciding factor in considering an energy efficiency improvement. The energy efficiency improvement lowers the overall operating expense of a building, increasing the NOI. By reducing operating expenses just prior to a rollover, any new lease that is signed will have a lower expense stop. Therefore, with a lower operating expense and a lower expense stop to reimburse expense escalations, the landlord would benefit from savings created by the energy efficiency improvement. To test this assertion, the model was run with the energy efficiency improvement being completed in one of three years: Year 1, Year 2 or Year 4. The rollover schedule was kept fixed in all of these tests to see when the landlord would benefit most from making this investment. The increase to NOI was used as the financial metric to measure the results. Figure 8 plots the changes to NOI in each test against the rollover schedule.

- When the investment is made in Year 1, 40 percent of tenants roll over within one year and the remaining 60 percent roll over the next year. In this case, the NOI increases very rapidly and remains at this high level throughout the analysis life.

- When the investment is made in Year 2, 60 percent of tenants roll over within one year, but the remaining 40 percent do not roll over until Year 7. In this case, it takes much longer for the NOI to climb to the maximum when the investment is made in Year 1.

- When the investment is made in Year 4, only 20 percent of tenants roll over within one year and the remaining tenants are not fully rolled over until Year 8. In this case, NOI is clearly lower than either of the other two scenarios for a much greater time.

This analysis confirms the assertions being made by most real estate managers. In order to fully realize the value of an energy efficiency improvement, it is most beneficial to have tenants rolling over sooner, rather than later, after the improvement is made.

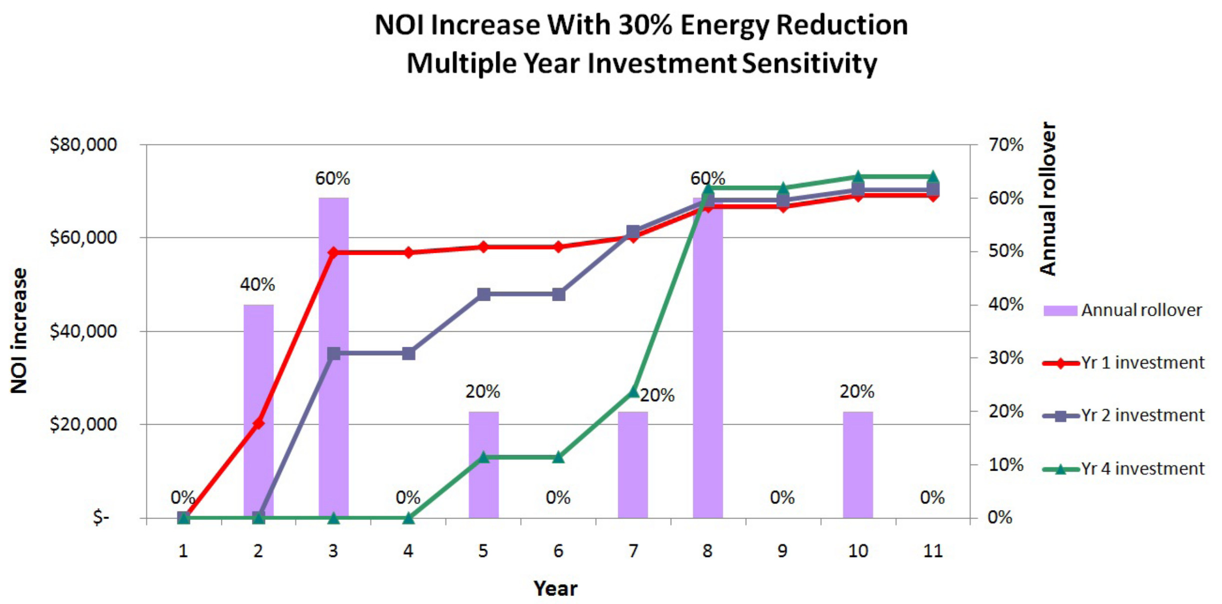


Figure 8: Sensitivity of energy efficiency improvement to lease rollover

Cosmetic improvements: The impact of rollover was also analyzed for the rent increase scenario. Similar to the rollover analysis on an energy efficiency improvement, the timing of the cosmetic improvement was varied depending on the rollover schedule of the building. The increase to the NOI exhibits similar characteristics to the decrease in energy with respect to rollover sensitivity: the increase to NOI is proportionately related to rollover in the building (Figure 9).

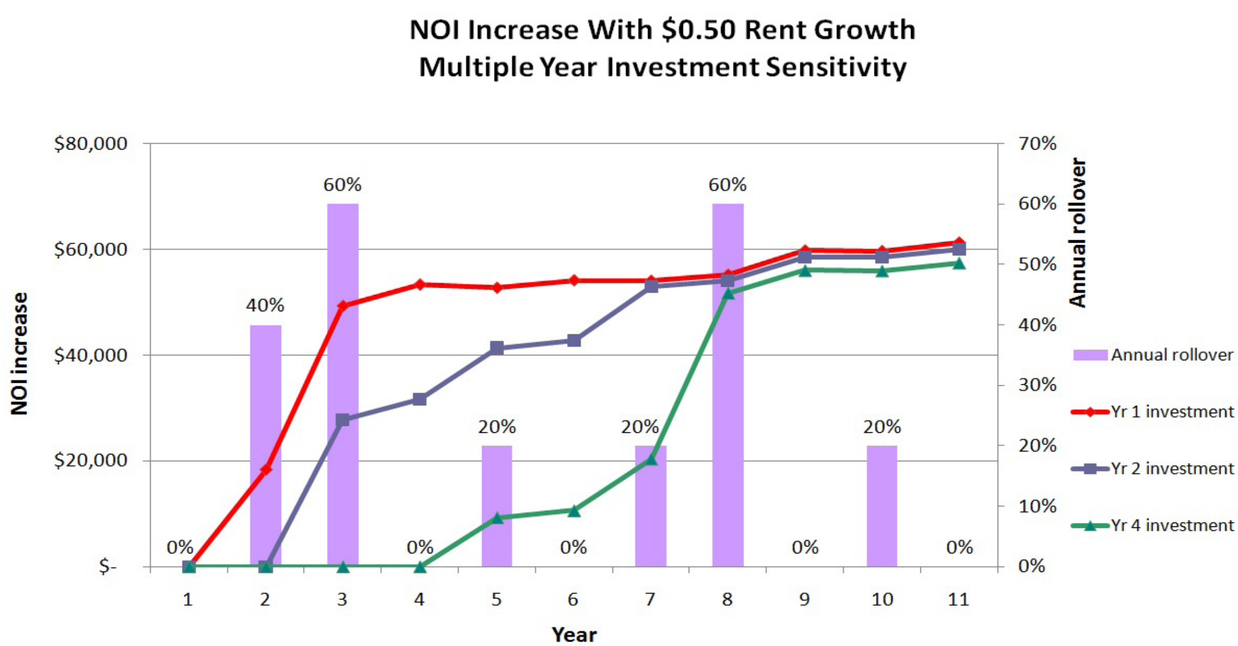


Figure 9: Sensitivity of rent increase to lease rollover

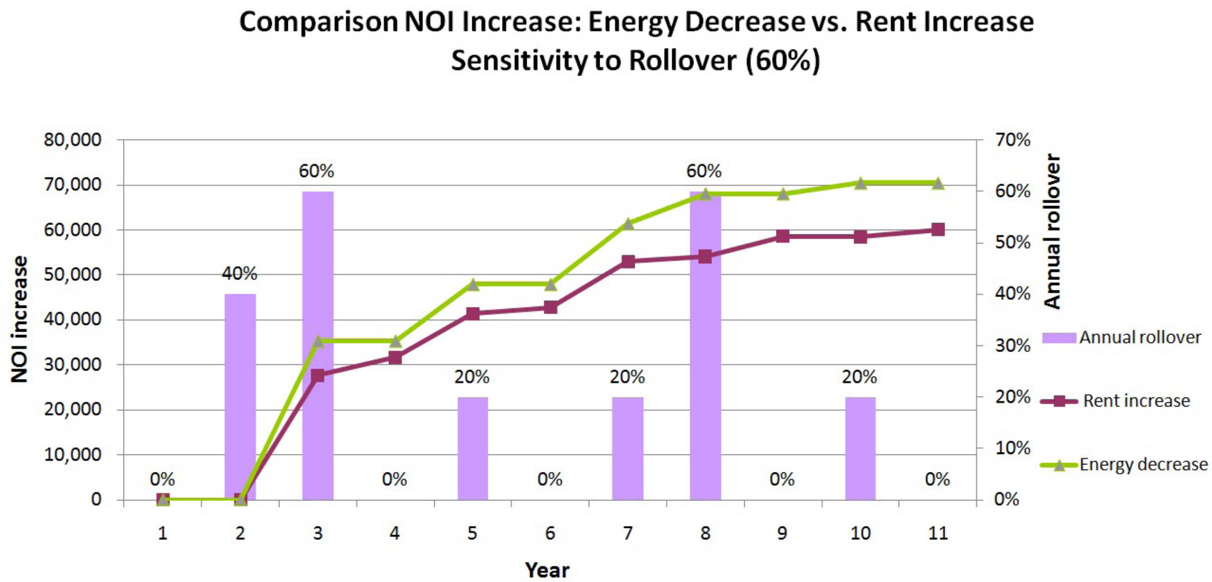


Figure 10: Comparison of NOI increase: energy decrease vs. rent increase scenario

To compare the order of magnitude for each scenario on increase to NOI, each was analyzed with a 60 percent tenant rollover. Figure 10 shows a comparison of the energy decrease scenario and the rent increase scenario. The return volatility is similar; however, the energy decrease scenario shows a greater increase to NOI earlier in the cash flow and persists throughout each year.

4.2.7 Energy Efficiency Rebates

Utility companies and various government entities routinely provide rebates to property owners who perform energy efficiency improvements. Though rebates may not always be available as funding sources, many interviewees stated that they play a role in deciding whether or not to invest in energy efficiency. Guided by recommendations from various interviewees, rebates of $0.60 per sq. ft. ($6.46 per square meter), $1.20 per sq. ft. ($12.92 per square meter) and $1.80 per sq. ft. ($19.38 per square meter) (US dollars) were analyzed to determine their effect on simple payback period with a $2.00 per sq. ft. ($21.53 per square meter) (US dollars) investment. Starting from a base case assumption where the energy efficiency improvement reduces energy consumption by 30 percent, rebates in Year 1 of the analysis had the following effect on simple payback period as shown in Table 13.

Table 13: Energy efficiency rebates payback period analysis

Rebate amount (US dollars)	Payback period (years)
$0	3.53
$0.60	2.53
$1.20	1.48
$1.80	0.86

Rebates clearly have a large impact on the payback period of an investment. While utility companies and government entities may not continue to offer rebates in perpetuity as energy efficient improvements become more prevalent in the industry, one can clearly see why they are currently such a driving force behind the investment decision.

4.2.8 Combined Case

An investment in a building does not have to be categorized as either a cosmetic improvement or an energy efficiency improvement. If a lobby is retrofitted, it will likely receive updated, more efficient light fixtures. Similarly, a lighting retrofit not only saves energy but may enhance the aesthetic quality of the building. To analyze this effect, the two types of investments might be combined with the assumption being that an integrated design approach will achieve results above and beyond those achievable if each investment was completed on its own. A cosmetic upgrade is presumed to already incorporate some energy efficient features. However, since construction will already be taking place, the incremental cost to improve energy efficiency to an even greater degree is relatively small in comparison to completing an energy efficiency improvement alone.

In the combined case scenario for the subject building, a $200,000 (US dollars) cosmetic improvement is assumed. An additional investment of $100,000 (US dollars) to upgrade the improvements to be more energy efficient is added to the cost, an approximate cost increase of 50 percent. Assuming that much of the energy efficiency improvement cost may already be part of the cosmetic improvement, an additional 50 percent cost is a conservative estimate. The combined case is assumed to have both a positive effect on rents by an increase of $0.50 per sq. ft. ($5.38 per square meter) (US dollars) and lower operating costs by a decrease in energy consumption of 30 percent.

In the combined case the return would be expected to be greater than if each project had been undertaken separately. Spending the additional $100,000 (US dollars) on the cosmetic improvement yields approximately the same return as if each project was completed independently. In this scenario, spending $300,000 (US dollars) today provides a similar return to spending $400,000 (US dollars) in two separate projects. Figure 11 shows the incremental effect of the combined case in comparison to each individual case investment scenario.

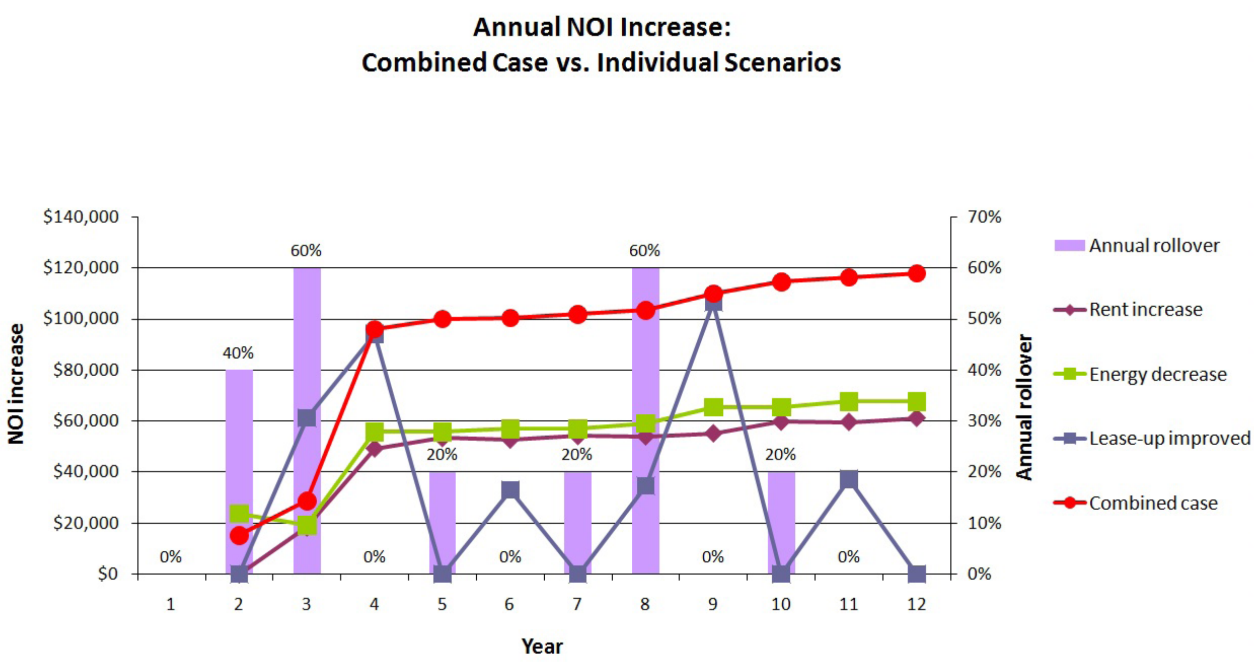


Figure 11: Comparison of NOI combined case vs. individual scenarios

4.2.9 Summary of Results

The quantitative model included three potential scenarios for investing $200,000 (US dollars) in a fictitious building:

1) Invest $200,000 (US dollars) in a cosmetic improvement, which results in a rent increase

2) Invest $200,000 (US dollars) in a cosmetic improvement, which results in increased tenant renewal probability and decreased absorption time

3) Invest $200,000 (US dollars) in an energy efficiency project, which reduces operating expenses

Each scenario had three separate permutations to test the sensitivity. All three scenarios showed that any capital investment has a high sensitivity to tenant rollover. In general, the value of the investment is not captured until a new lease is signed, so a manager would be wise to make any investments prior to signing new leases. The lease-up scenario was particularly volatile compared to the other scenarios as value creation is high when a lease rolls over and zero at all other times. Keeping the prior point about rollover in mind, if a building is already near full occupancy, the landlord may be wise to not invest until a tenant rollover gets close. Finally, the returns of both cosmetic scenarios vary widely in magnitude and timing of the return.

In contrast, the investment in energy efficiency, while not having the highest return in all scenarios, is benefited by low volatility and a narrow range of returns. In a time of general uncertainty in the real estate markets, the predictability afforded by energy efficiency investments may be well-suited for many real estate managers.

Analyzing the issue of energy efficiency from both a qualitative and a quantitative perspective allowed the authors to discover the industry practice and attitude toward energy efficiency improvements and then confirm if these views were warranted using a financial model. A recurring theme among decision makers was that getting tenants into the building would always be a top priority. This will likely always remain the case because without tenants, it does not matter how efficient a building is. However, most portfolio managers stated that they are concerned with showing a steady return and keeping return volatility to a minimum. Accordingly, an energy efficiency improvement that is accretive to NOI each year should be considered alongside more volatile investment strategies, such as trying to increase tenant retention, which is only accretive to NOI when a lease rolls over.

One counter-intuitive result was regarding the timing and volatility of returns in each scenario. The estimated payback periods for both cosmetic improvement scenarios (rent increase and lease-up improvement) exhibited great variation between each permutation. In contrast, while the energy efficiency scenario did not exhibit payback periods as low as some of the other scenarios, the payback period was less volatile overall. Similarly, the spread of NOI possibilities varied widely between permutations in the cosmetic investment scenarios. Meanwhile, the spread of possible NOI increases resulting from energy efficiency improvements was much less volatile.

Interview participants also said they were more likely to make investments in energy efficiency just prior to leases rolling over. The financial model demonstrates why this is such a large factor and shows the drastic effect that rollover has on NOI increases resulting from both cosmetic and energy efficiency improvements. In sum, the dual-focused approach of interviews coupled with a financial model was able to confirm much of the industry sentiment while also bringing forward several issues that may have been overlooked by the real estate industry overall.

4.3 Recommendations

The purpose of the research presented within this paper was to discover whether there is a misalignment of incentives and motivations throughout the real estate management value chain that prevent investment in energy efficiency retrofits to existing buildings. The following conclusions call attention to inefficiency and offer recommendations for correction.

4.3.1 Increase Transparency

One of the most frequently cited reasons from interview participants for investing in energy efficiency was to better the corporate image. Many firms use real estate to showcase corporate commitment to sustainability to their shareholders, clients and partners. LEED EBOM certification is taking hold for multitenant office buildings, but critics point to the lack of emphasis on energy use and the prescriptive nature of the point system. Both LEED EBOM and ENERGY STAR Portfolio Manager are voluntary programs. Currently, when tenants and purchasers are evaluating a building, it is difficult for them to know how much energy the building actually uses and therefore its overall energy efficiency. Beginning in 2010, California and Washington, DC, will require property owners to disclose a building's ENERGY STAR rating prior to any major transaction.

These disclosure laws will likely advance investments in energy efficiency as current owners strive to get their ENERGY STAR rating higher prior to a transaction. Further, as shown through the financial model, investments in energy efficiency will not only make a building with low energy consumption attractive to buyers, but will also provide a positive financial return. With energy disclosure, tenants and buyers will become informed in making decisions about the operational performance of a building, which may result in a higher valuation for energy efficient buildings. Owners and landlords may find investments in energy efficiency projects to be more liquid as the improved building performance becomes visible and desirable to the market.

4.3.2 Education and Proof of Concept Is Required

A recurring perception from the interviewees regarding energy efficiency retrofits is that many improvements require the use of new technologies that are not yet proven. The case can also be made that the technologies are actually well-proven; rather it is the certainty of returns from those technologies that is unproven. Regardless of whether the technologies are unproven or the financial returns from the technologies are unproven, hesitation from real estate managers exists. In a period where investment capital is scarce, projects that are more visible, such as aesthetic improvements to a property, are selected over energy efficiency projects.

As energy efficiency improvements are further proven to reduce expenses and create a positive return on investment, adoption of these improvements can be expected to become more mainstream. As the quantitative analysis has shown, energy efficiency projects have the added benefit of decreasing the volatility of returns. Knowledge of these benefits, both decreased volatility and decreased expenses, needs to spread throughout the industry, specifically to lenders and appraisers so that they make funding available for these projects. A clearing house of data, perhaps in the form of a third-party research firm, would help in the dissemination of information between parties. With greater proof of energy savings and increased lender willingness for energy efficiency projects, these improvements will become more frequent.

4.3.3 Proper Valuation of Energy Efficiency Improvements Is Needed

Proper valuation of energy efficiency improvements is lacking in the real estate investment market. Interviewees were split roughly equal between those who believe energy efficiency retrofits are a capital expense and those who recognize that these retrofits can be a profitable investment. As such, an often cited reason for making investments in energy efficiency improvement projects is to decrease operating expenses thereby increasing the NOI to a building. A related reason for energy efficiency investment is that buildings with improvements are viewed to have potentially increased NOI in the future; therefore, a lower sales cap rate should be considered when capitalizing NOI to a purchase price. However, buyers and sellers should not count on realizing both of these effects at the same time.

Value is created through energy efficient investments in buildings because either:

- Expenses decrease for a sufficient time to increase NOI. A market cap rate would be used in converting this increased NOI to a purchase price, or
- The energy efficiency investments have not had enough time to prove that they permanently increase NOI. In this case, a slightly lower than market cap rate would be applied based on the potential that NOI will increase in the near future.

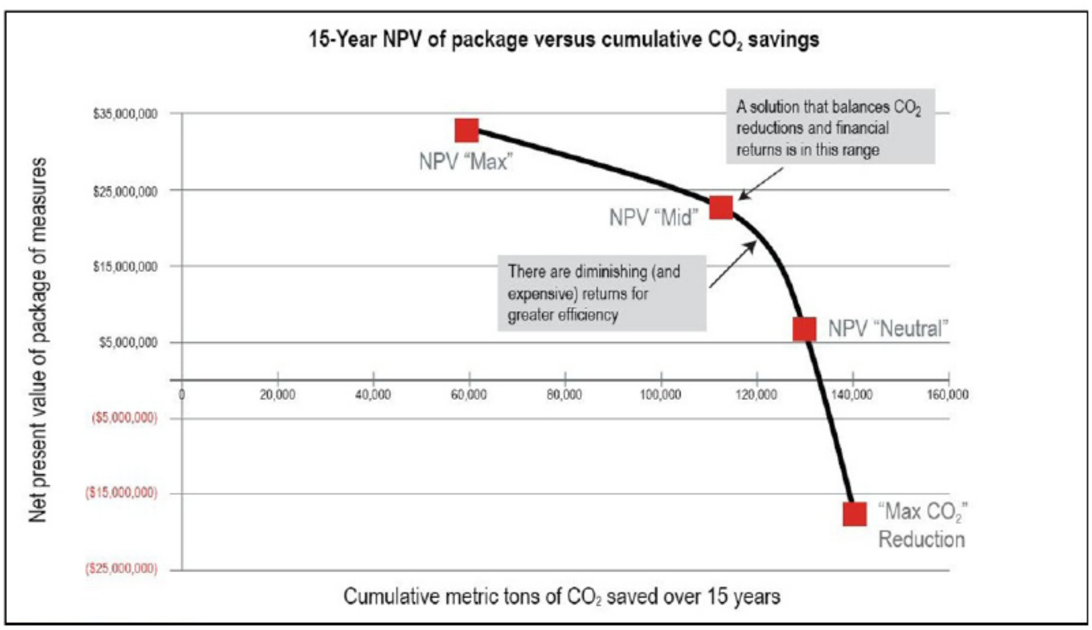
To use an increased NOI and a lower cap rate at the same time when valuing a building would be like trying to capture the value of an energy efficiency investment twice. Recognizing the relationship between cap rates and NOI will help buyers, sellers, lenders, appraisers and others place an appropriate value on energy efficient investments without "double counting" any potential increase in value.

5 CASE STUDY: EMPIRE STATE BUILDING

A striking example of a high-profile multitenant office building energy efficiency improvement comes from arguably the most famous office building in the world – the Empire State Building. Announced on April 6, 2009, the Empire State Building is anticipated to reduce energy use and greenhouse gas emissions by up to 38 percent. While the retrofit is expected to cost approximately $20 million (US dollars), annual energy savings are estimated at $4.4 million (US dollars) (Jones Lang LaSalle 2009). The goal of the project may go beyond lowering operating costs and reducing the emissions from this building. The project team has also capitalized on the landmark status of the building in order to become a model for building owners throughout the world. As stated in the project charter:

"The retrofit of the Empire State Building into a Class A pre-war trophy building will transform the global real estate industry by transparently demonstrating how to create a competitive advantage for building owners and tenants through profitably greening existing buildings." (Jones Lang LaSalle 2009)

The project team, consisting of Jones Lang LaSalle, Clinton Climate Initiative, Rocky Mountain Institute, Johnson Controls and Empire State Building Operations, is aiming to achieve a LEED Gold certification and an ENERGY STAR rating of 90. However, the team did not have an open-ended budget. As a for-profit corporation, the Empire State Building Company had to ensure



(JLL Project Plan, 2009)

Figure 12: Empire State Building: NPV vs. carbon reduction

that the upgrades provided the maximum benefit at the most reasonable cost. To this end, the team analyzed over 60 potential projects and eventually settled on eight feasible projects to implement. The project team performed energy modeling to achieve energy savings of up to 45 percent. However, the marginal cost of increasing savings from 38 percent to 45 percent proved to be prohibitively expensive under current market conditions. Wanting to be a sustainable and profitable example for other building owners, the project team strived for a balance of cost versus carbon reduction. Figure 12 (page 32) shows a curve representing total net present value of the retrofits compared to the carbon reduction. The project team decided to settle at the point along the curve labeled NPV "Mid" which proved to be an appropriate balance between investment and carbon reduction.

To reduce energy use by 38 percent, the Empire State Building project team implemented a holistic design approach. First, the project team reduced the cooling loads in the building. This allowed the chiller plant to not be oversized, also called right-sizing. The team settled on the following eight projects out of the 60-plus projects considered for the retrofit (JLL 2008) (Table 14).

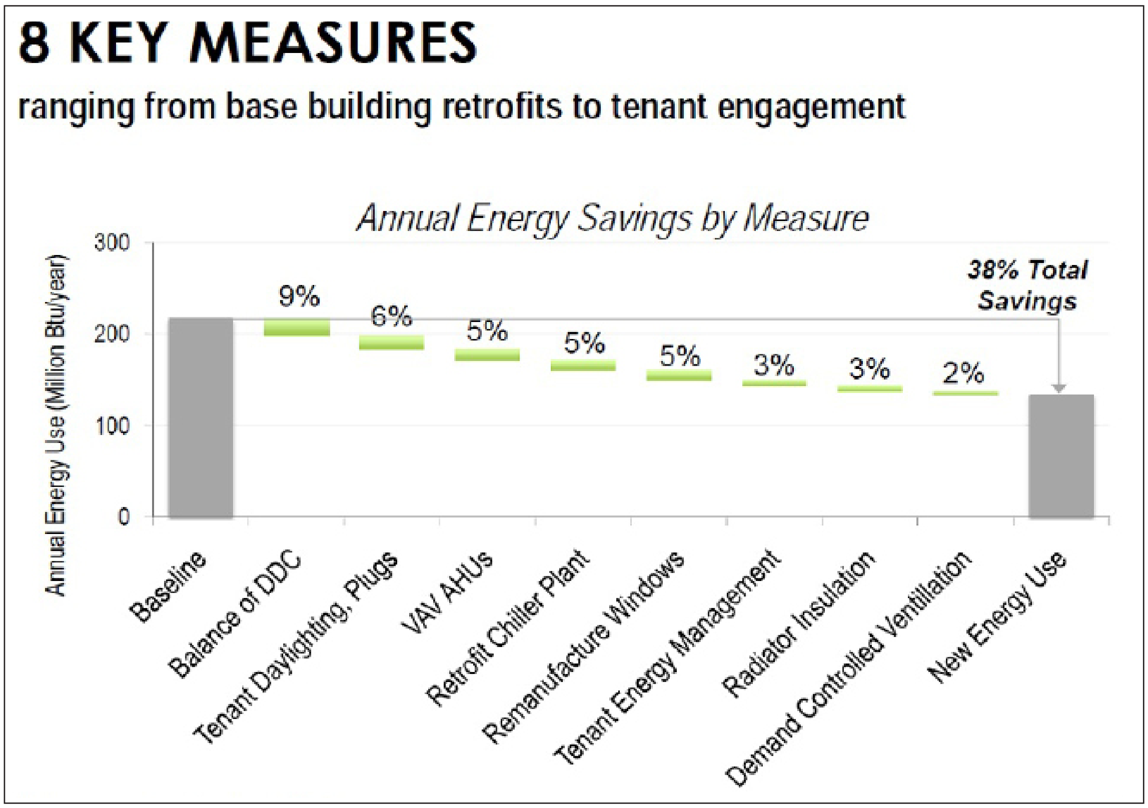
Table 14: Empire State Building retrofit projects

Direct digital controls (DDC)	Direct digital controls allow remote, Web-based control of a building's systems to ensure that temperatures and energy use remain in the optimum range.
Tenant daylighting, lighting and plug loads	This measure involves reducing lighting power density in tenant spaces; using ambient, direct/indirect and task lighting; installing dimmable ballasts and photosensors for perimeter spaces; and providing occupants with a plug load occupancy sensor for their personal workstation.
Variable air volume air-handling units	Variable air volume air-handling units will replace the existing constant volume units.
Upgraded window glazing	Approximately 6,500 existing double-hung insulated glass windows will be replaced with suspended coated film and gas-filled windows.
Tenant energy management	Independent metering will be provided to many of the tenants. Tenants will have access to online energy and benchmarking information as well as sustainability tips and updates.
Radiative barrier	More than 6,000 insulated reflective barriers will be installed behind radiator units located at the perimeter of the building. In addition, the radiators will be cleaned and the thermostats will be repositioned to the front side of the radiator.
Tenant demand-control ventilation	Carbon dioxide sensors will be installed to control the volume of outside air cooled. One return air carbon dioxide sensor will be installed per air handling unit.
Retrofit of the chiller plant	The chiller plant retrofit will include the retrofit of four industrial electric chillers in addition to upgrades to controls, variable speed drives and primary loop bypasses. Due to the approach of reducing heating and cooling loads first, the project team was able to avoid replacing the chiller and could instead simply retrofit the existing chiller.

(esbsustainability.com 2010)

The eight energy efficiency projects listed above individually each play a part in reducing energy consumption in the building. It is through the integration of these projects into a building system that significant energy reduction is achieved. Figure 13 shows the energy reduction of each project as a component of the integrated design.

As stated above, part of the impetus behind the Empire State Building retrofit is to provide example projects for other building owners to follow. Not only are managers able to do the environmentally responsible thing through these retrofits, but also strive to prove that being environmentally responsible can be profitable. With a firm background of commercial real estate and high performance building knowledge, this white paper will help property managers make the case to owners that energy efficiency retrofits can increase NOI, thus increasing the owner's bottom line.



(Johnson Controls, 2009)

Figure 13: Eight key measures to retrofit the Empire State Building

6 APPENDICIES

6.1 Appendix A: References

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6.2 Appendix B: Glossary

Core fund: A core fund is generally considered to be a lower-risk, lower-return investment that seeks stabilized assets in established markets or locations.

Internal rate of return: The internal rate of return (IRR) is the discount rate established by an organization as the threshold for which an investment is considered economically viable. It is calculated using the value of future cash flows in an investment where the net present value is greater than or equal to zero. It can also be thought of as the annual compounded rate of return one can expect on an initial investment.

Net present value: The net present value (NPV) of an investment is the sum of all future cash flows from an investment discounted back to the time of the initial investment. The discount rate should be equal to the rate of return that could be achieved in an alternate investment with similar risk characteristics.

Net operating income (NOI) increase: The reason for making a capital investment in a building is to increase the net operating income created by that building. By analyzing the up-front investment in comparison to the annual increase in NOI, decision makers can decide if the investment will meet their return criteria. Further, dividing the increased NOI by a capitalization rate determines how much an investment adds to the total value of a property.

Pooled funds: Pooled funds are aggregated funds from many individual investors for the purpose of the investment. There is a wide range of pooled funds available, generally characterized by the risk-return structure of the fund. Two common pooled funds are value-added funds and core funds.

Real estate value-added fund: A real estate value-added fund, also called an opportunistic fund, is the real estate equivalent of the private equity and alternative investment class that seek high returns and often focus on development or turnaround properties (Hahn, Geltner & Gerardo-Lietz 2005).

Simple payback period: The simple payback period of an investment is the amount of time that the returns from the investment take to pay back the initial cost of the investment. A basic example would be a $100 (US dollars) investment that pays $25 (US dollars) per year. In this case, the simple payback period is 4 years, and the discounted payback period would be slightly less, since the value of future cash flows is discounted using a market discount rate.

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