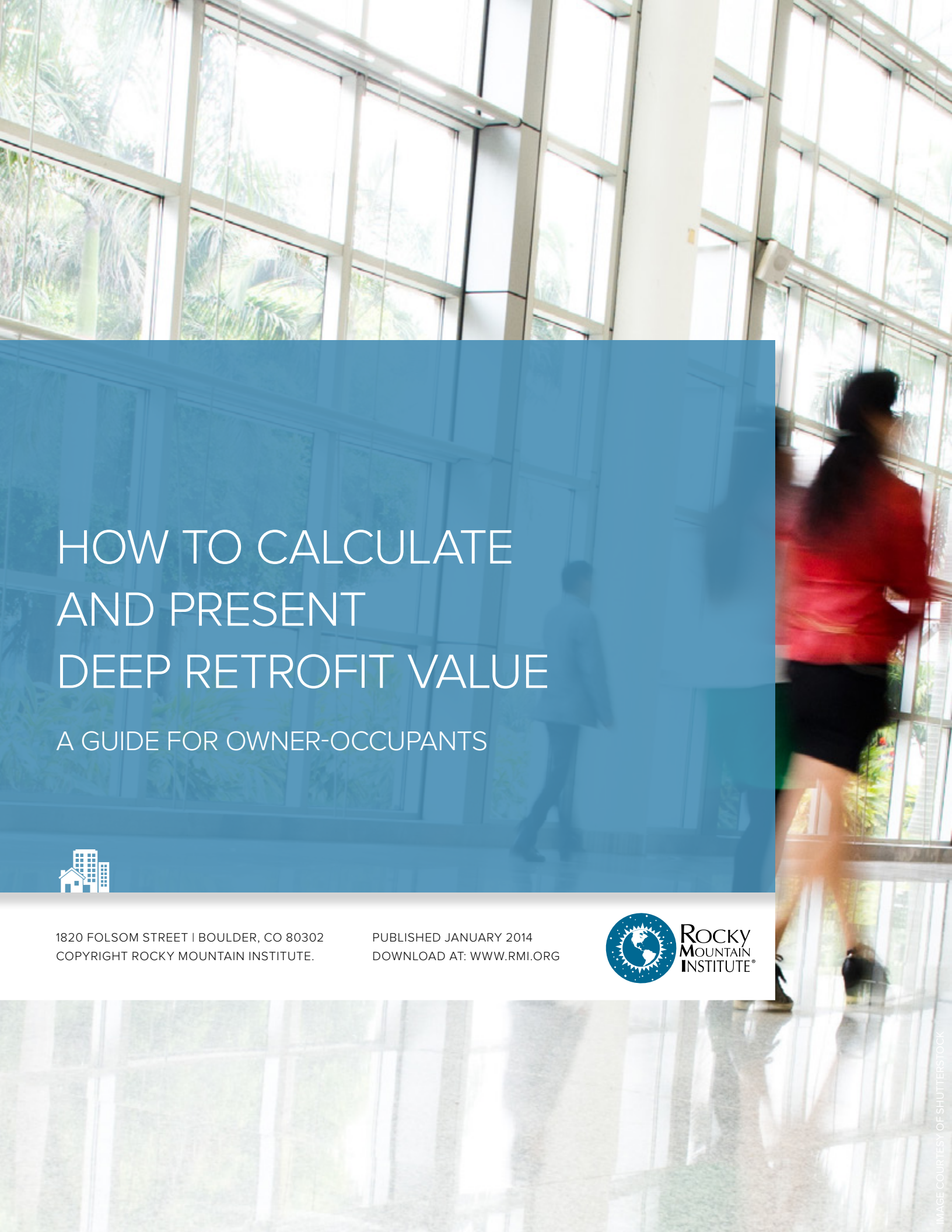

HOW TO CALCULATE AND PRESENT DEEP RETROFIT VALUE

A GUIDE FOR OWNER-OCCUPANTS

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HOW TO CALCULATE AND PRESENT
DEEP RETROFIT VALUE

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

Deep energy retrofits offer businesses myriad tangible, meaningful benefits beyond energy cost savings alone. But learning how to account for, articulate, and capture those benefits is the key.

This might come as a surprise to some, but energy efficiency is about more than energy, and deep energy retrofits, which achieve superior energy savings over conventional retrofits and can reduce a building's energy consumption by 50 percent or more, offer bottom-line benefits for business beyond energy cost savings alone. They generate substantial additional value that is typically ignored: improved employee health, productivity, and satisfaction; bolstered leadership credentials and reputation; access to tax, finance, and entitlement subsidies; improved risk management; reductions in non-energy operating costs; and higher occupancies, tenant retention, rents, and sales prices.

Accounting for, articulating, and capturing that present-but-overlooked additional value can drive far greater investments in building energy efficiency while generating returns that directly benefit a business's balance sheet. Such non-energy benefits of deep retrofits are not "soft" and intangible but in fact real opportunities for significant, quantifiable business value. Rocky Mountain Institute's ***How to Calculate and Present Deep Retrofit Value for Owner-Occupants*** (Deep Retrofit Value practice guide) shows how to tap into that value.

The guide helps professionals move forward with and achieve their goals to build business value through highly efficient buildings. It also helps professionals better demonstrate the impact of deep energy retrofits to peers inside and outside their organization.

IS DEEP RETROFIT VALUE FOR YOU?

The guide's basic value framework focuses on owner-occupants but can be applied, with adjustment, to residential spaces and other property types as well as new construction, tenant improvements, equipment replacements, and other types of sustainability investments. The guide is useful to anyone interested in better understanding how deep retrofits create value, but is primarily designed for:

- **corporate real estate executives and their facility management staff** preparing retrofit capital requests;
- **internal corporate finance departments** and others with capital budgeting due diligence responsibilities;
- **architects, engineers, consultants, and other service providers** analyzing and documenting support for energy-efficiency recommendations;
- **company sustainability and energy managers** developing retrofit sustainability strategies and capital budgeting plans;
- **investors and lenders** interested in understanding occupant demand, the most important retrofit value driver for investors; and
- **valuation professionals, appraisers, and accountants** trying to understand the business value implications of an enterprise's retrofit-related energy efficiency and sustainability investment.

RMI'S RETROFIT VALUE MODEL

Deep Retrofit Value is based on the four pieces of RMI's Retrofit Value Model (see figure). That model shows, at a high level, the evaluation process business leaders should make of deep retrofit investments.

For example, consider the installation of an updated air ventilation system (a design & execution practice). This system uses less energy, improves air circulation, and creates better indoor air quality (direct retrofit outcomes). Because air circulation is improved, employees are more comfortable; because air quality is better, employees get sick less often (indirect retrofit outcomes). The ventilation system provides benefits with direct implications for an organization's bottom line: greater comfort and fewer sick days creates a context whereby employees are more engaged and productive—meaning more work is accomplished and more innovations are fostered—as well as reduces the costs associated with absenteeism and the recruitment of new employees to replace those that leave the organization (property/enterprise performance). And that improvement in property/enterprise performance has quantifiable value that can be directly tied back to the deep energy retrofit (retrofit value).

THE NINE ELEMENTS OF DEEP RETROFIT VALUE

The non-energy cost aspects of Deep Retrofit Value fall into nine discrete value elements. They serve as a menu of the potential types of value a retrofit can create:

1. **Retrofit Development Costs:** These costs are critical because they represent the initial capital investment against which future cost savings and other benefits are measured. Many retrofit projects have little cost premium if timed correctly with other capital improvement projects and if the project follows Deep Retrofit Value best practices.
2. **Non-Energy Property Operating Costs:** Deep retrofits can reduce these costs (e.g., maintenance, water, insurance, and occupant churn rate) and can add more occupied space in a building through equipment downsizing and better occupant use of space.
3. **Retrofit Risk Mitigation:** Deep retrofits are often subject to the standard and relatively high real estate risks of a "to-be-built" project where development costs and future operating cost savings are forecast to determine return on investment. These risks can be compounded by additional risks like new products and systems, new specialized service providers, new contracts and design processes, complex financing requirements, and potential savings underperformance from building energy simulation models. Following Deep Retrofit Value best practices and fully presenting the risks enables risk mitigation.

4. **Health Costs:** There is substantial evidence that intelligently retrofitted and operated buildings improve the health of building occupants and users, directly reducing health costs, for example through moisture and pollutant control, improved ventilation and access to outside air, access to the natural environment and daylighting, and temperature control.
5. **Employee Costs:** There is strong evidence that deep retrofits can reduce employee costs by lowering recruiting, retention, and employee compensation costs.
6. **Promotions and Marketing Costs:** The substantial expenses associated with promotions and marketing—typically in the range of 10 percent of revenues—often do not include all the time spent by non-marketing staff in promotions and marketing activities. Deep retrofits can provide the content many companies are looking for in order to shape their branding story, offsetting money that would otherwise be spent developing other approaches to sustainability branding.
7. **Customer Access and Sales:** Deep retrofits contribute to improved customer access and sales because customers of all types—consumers, businesses, and governments—are beginning to require demonstrated sustainability performance and leadership as part of their decision to purchase. Deep retrofits also increase sales potential since more healthy, productive, and satisfied workers are more engaged and innovative.
8. **Property-Derived Revenues:** Deep energy retrofits can provide additional company revenues from the enhanced demand for deep retrofit properties from potential tenants in the event a company must lease some of its space or from potential buyers of the property in the event a company must sell. Other revenues can come from purchase agreements, energy services agreements, renewable energy certificates, and government or utility tax credits, rebates, or other subsidies.
9. **Enterprise Risk Management/Mitigation:** Deep retrofits can significantly contribute to mitigating some of the more pressing business risks facing companies today, primarily by contributing to an enterprise's performance as measured by sustainability reputation and leadership; individual occupant health, productivity, and satisfaction; and space flexibility.

To assess a deep retrofit project, a professional must evaluate the outcomes of a deep energy retrofit on a given value element and then address how the outcomes create business value. But professionals need not evaluate and present each of the nine value elements. It may make most sense to select the most promising value elements for initial analysis and then proceed to the others, if possible, for a more complete analysis.

HOW TO CALCULATE AND PRESENT
DEEP RETROFIT VALUE

GETTING STARTED

INTRODUCTION

Deep energy retrofits are projects that achieve superior energy savings over conventional retrofits, often reducing a building's energy consumption by 50 percent or more compared to before the retrofit while achieving superior sustainability. Such deep retrofits generate substantial reductions in energy consumption and energy costs, but they also create significant additional value typically ignored in most retrofit decisions. Deep retrofits can yield improved employee health, productivity, and satisfaction; sustainability leadership and reputation; access to tax, finance, and entitlement subsidies; improved risk management; reductions in non-energy operating costs; and higher occupancies, tenant retention, rents, and sales prices.

Yet despite this well documented value beyond energy cost savings, such additional value is seldom brought under one umbrella and accurately assessed for inclusion in retrofit value analysis and related investment decision making. That is where **Rocky Mountain Institute's Deep Retrofit Value Project** plays an important role, defining value models and practical methods for calculating and presenting value for both owner-occupants and investors.

Buildings play a critical role in people's lives as places to live, work, shop, and be entertained. How we heat, cool, light, manage, and use buildings has a dramatic impact on global resource use—including energy—as well as on people's health and happiness. Better assessment and presentation of deep retrofit value can drive greater investment in and adoption of deep retrofits, for the benefit of all.

This practice guide details how to calculate and present the value of a property-specific deep retrofit for owner-occupants,* who own a substantial portion of commercial real estate and are the leading tenants for investor space. (A separate practice guide under development offers a parallel process for investors.) It breaks down the non-energy cost aspects of deep retrofit value into nine discrete value elements, and then offers a sample report showing how to synthesize and present such an analysis.

* Owner-occupants of commercial buildings can directly apply this guide. Landlords, corporate tenants, and other users of varied buildings including nonprofits, governments, and occupants with other legal structures can apply this guide with adjustments to individual situations.

WHEN AND HOW TO USE THIS GUIDE

The primary purpose of this guide is to enable preparation of a well-reasoned and supported analysis of deep retrofit value—especially the often-overlooked value beyond energy cost savings—to be presented as part of a retrofit capital request to decision makers.

WHEN TO USE THIS GUIDE

This guide is useful to anyone interested in better understanding how deep retrofits create value, but is primarily designed for:

- Corporate real estate executives and their facility management staff preparing retrofit capital requests;
- Internal corporate finance departments and others with capital budgeting due diligence responsibilities;
- Architects, engineers, consultants, and other service providers analyzing and documenting support for energy efficiency recommendations;
- Company sustainability and energy managers developing retrofit sustainability strategies and capital budgeting plans;
- Investors and lenders interested in understanding occupant demand, the most important retrofit value driver for investors; and
- Valuation professionals, appraisers, and accountants trying to understand the business value implications of an enterprise's retrofit-related energy efficiency and sustainability investment.

The basic value framework presented in this guide can be applied, with adjustment, to residential spaces and many other property types as well as new construction, tenant improvements, equipment replacements, and other types of sustainability investments. The focus of this report is on whole-building deep retrofits.

HOW TO USE THIS GUIDE

The nine value elements described in this guide provide a comprehensive framework to capture all value beyond energy cost savings resulting from execution of a deep retrofit. However, consistent with other industry valuation practice guides or standards, the recommended methodologies for calculating and presenting retrofit value need to be adjusted to reflect the specific retrofit situation. The type and level of retrofit, type of property, owner-occupant circumstances (including access to internal company/organization data), geographic location, market context, and purpose of the valuation analysis will all affect how retrofit value is calculated and presented.

The nine value elements serve as a menu of the potential types of value that a retrofit can create. It is not necessary to evaluate and present all nine value elements, only those applicable to a particular retrofit project or portfolio strategy. Selected elements can be evaluated reasonably efficiently and made compelling to decision makers and other important stakeholders.

To most effectively calculate and present deep retrofit value, it is important to integrate value considerations into initial charrettes, design meetings, and occupant discussions, both to make sure retrofit goals and designs reflect initial assessments of what will create the most value, but also to gain occupant buy-in and gain access to various types of employee, sales, and other data that is required to do the best job of calculating and presenting retrofit value.

We recommend that deep retrofit value analysis be provided as a supplement to traditional energy-cost-based analysis in a form similar to that presented in our "Sample Deep Retrofit Value Report" (**page 76**). As shown in that example, presenting deep retrofit value requires a mix of quantitative estimates of value creation and qualitative textual support for key assumptions and risk analysis.

EVOLUTION OF THIS PRACTICE GUIDE

This practice guide endeavors to provide a comprehensive framework to capture all of a specific deep retrofit project's value beyond the traditional focus on energy cost savings. We focus on private benefits to occupants, and acknowledge that many important public benefits from deep retrofits, including reduced carbon and other pollutant emissions, improved national security, and public health benefits, are not fully analyzed or monetized. We only include the value generated by creation of public benefits to the extent they can be captured by the building owner-occupant.

While the deep retrofit model endeavors to provide a comprehensive and organized set of value benefits, it was not possible to provide a comprehensive presentation of the full variety of methods to calculate value for each value element. This is the result of the complexity presented by different property types, retrofit investment options, and owner-occupant situations, as well as the general considerations in presenting a guide, versus a single property analysis case study. However, the guide does provide the structured analytic process and foundational evidence linking retrofits to value that should facilitate analysis for a specific retrofit investment and serve as a foundation for establishing portfolio level property sustainability policies.

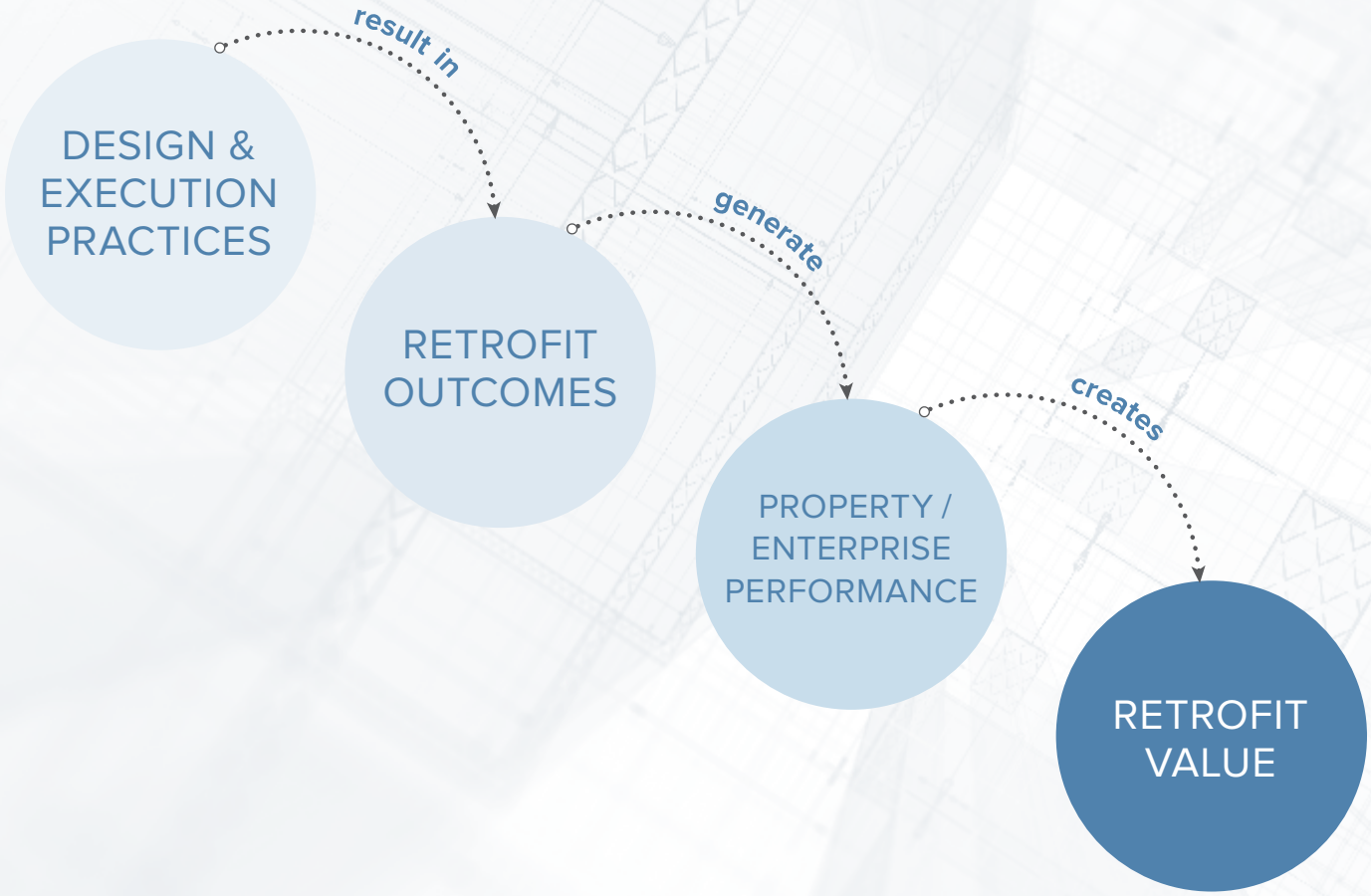
This practice guide is an evolving document that will improve over time as we test it further in the market on a variety of projects and refine our thinking as new research emerges. Of course, most of the improvements in methods and practice will occur as others in the market adapt the methodology for their purposes. We welcome and encourage comments and suggested refinements and improvements.

HOW TO BEGIN

Retrofit value methodology (Figure 1) should start with an analysis of the energy efficiency and sustainability measures of the planned retrofit and the property outcomes (thermal comfort, better lighting, etc.) that will be achieved. From there it is possible to assess building performance (cost savings, health and productivity, and sustainable reputation and leadership) and finally calculate value impacts.

FIGURE 1

RMI RETROFIT VALUE MODEL



THE NINE VALUE ELEMENTS

The calculation and presentation of deep retrofit value follows a structured process consistent with traditional business valuation practice. We start with an evaluation of retrofit development and operating costs, and then detail how a deep retrofit affects enterprise costs, revenues, and risks across the nine value categories:*

Property Costs and Risks

1. Retrofit Development Costs
2. Non-Energy Property Operating Costs
3. Retrofit Risk Mitigation

Enterprise Costs

4. Health Costs
5. Employee Costs
6. Promotions and Marketing Costs

Enterprise Revenues

7. Customer Access and Sales
8. Property-Derived Revenues

Enterprise Risks

9. Enterprise Risk Management/Mitigation

We structure our analysis of the nine value elements by first addressing the foundation of how a deep retrofit creates value for that specific element. This is done by analyzing the outcomes from the deep retrofit related to the value element, and then by addressing how the outcomes create value for the project. Once this foundation is understood, calculation and presentation follow. The seven principles for successful presentations detailed in **Appendix A** are relevant to all value elements, yet each section also includes presentation strategies specific to that value element.

PERFORM AN INITIAL ANALYSIS

It may seem daunting to address each of the nine value elements, and often decision-makers within an organization only care about a subset of values. However, as we previously noted, it is not necessary to evaluate and present each one. We recommend selecting the most promising value elements for initial analysis, then moving to the others if possible for a more complete analysis. The table below provides our recommendations for three common property types.

TABLE 1

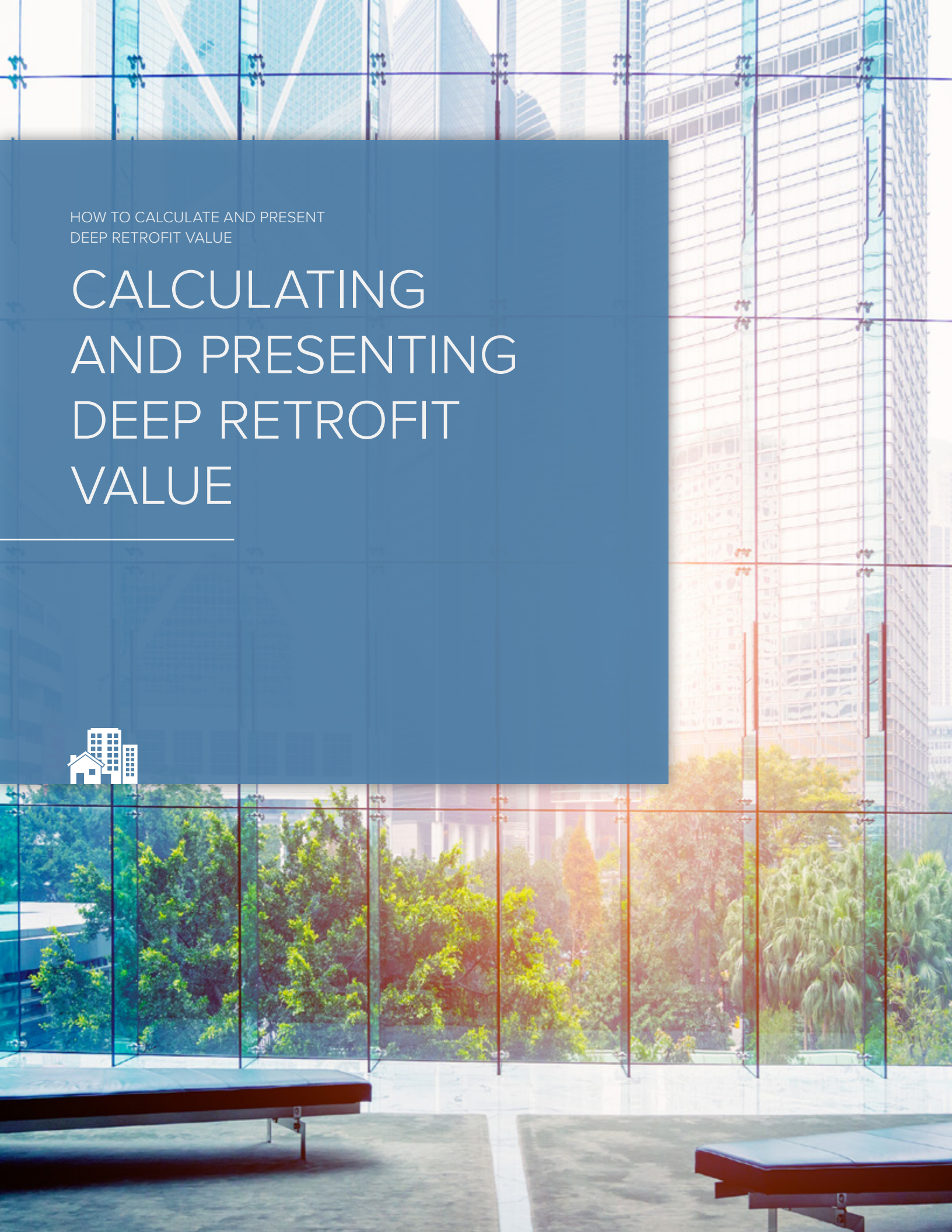
THREE COMMON PROPERTY TYPES

PROPERTY TYPE	HIGHEST PRIORITY VALUE ELEMENTS	
Corporate Office	#1 Retrofit Development Costs #3 Retrofit Risk Mitigation #4 Health Costs	#5 Employee Costs #7 Customer Access and Sales #9 Enterprise Risk Management/Mitigation
Small Business Retail	#1 Retrofit Development Costs #3 Retrofit Risk Mitigation	#6 Promotions and Marketing Costs #7 Customer Access and Sales
Healthcare	#1 Retrofit Development Costs #3 Retrofit Risk Mitigation Costs	#5 Employee Costs

* Enterprise refers to the owner-occupant or occupant of the property. We use the term “enterprise” because the occupant could be a government, nonprofit, corporation, or non-corporate entity. We will sometimes use the term “company” or “business” in the place of enterprise, but in most cases the point would still have relevance to government or nonprofit organizations.

HOW TO CALCULATE AND PRESENT
DEEP RETROFIT VALUE

CALCULATING AND PRESENTING DEEP RETROFIT VALUE



CALCULATING AND PRESENTING
DEEP RETROFIT VALUE

RETROFIT DEVELOPMENT COSTS

1

1. RETROFIT DEVELOPMENT COSTS*

Retrofit development costs are critical to calculating and presenting retrofit value because they represent the initial capital investment against which future cost savings and other benefits are measured. All or a large portion of development costs are paid up front, which gives them even more weight given the time value of money.†

Retrofit development costs are complicated to calculate and present accurately, and are often misunderstood and misrepresented due to the general difficulties of cost forecasting, made more difficult when new products, systems, and contracts are used. Further complicating the analysis is that it is often difficult to properly allocate the energy/sustainability retrofit costs, as they are generally an incremental portion of the total retrofit development budget. A successful retrofit capital request will clearly note how costs are defined and calculated, and carefully explain any benchmarks used for cost comparisons. Equally important is a thorough presentation of how retrofit development risks will be managed and mitigated, which is the focus of value element three (**page 27**).

Many of the most prominent studies looking at green premium costs are based on new construction, and do not well represent existing buildings. Evidence from new building developments, and the experience and claims of major contractors, suggest retrofit cost premiums for high levels of sustainability may be 10 percent or more (compared with the cost of a major renovation) with greater cost volatility.‡

But as RMI has proven, many retrofit projects have little cost premium if timed correctly with other capital improvement projects and if the project follows best practices (see **Appendix B**).

While a complete presentation of how to calculate retrofit development costs is beyond the scope of this practice guide, we define retrofit development costs, discuss special presentation issues, and identify offsetting development cost subsidies and incentives.

The total retrofit development cost budget for all of the planned upgrades is called the gross retrofit cost. The gross cost of deep retrofits will vary greatly based on a wide range of factors, including building type, project team experience, project location, site conditions, the varying ways energy use reductions are achieved, and the significant underlying variances in building age, construction type, and other variables. An article in the *Journal of Sustainable Real Estate* stated that the gross cost of a retrofit of all major energy-using systems in a typical 500,000-square-foot office building is $10–$20 per square foot.[1] Case studies of recent deep retrofits of office buildings revealed an energy-efficiency cost premium of $3–$31 per square foot.[2]

* Many insights in this section are derived from talks with Peter Morris at Davis Langdon and review of his article "What Does Green Really Cost?" *PREA Quarterly,* Summer 2007.

† When valuing a stream of cash flows using discounted cash flow analysis, cash inflows and outflows are discounted to present value reflecting the opportunity cost of money. Accordingly, early year cash flows are not as heavily discounted as later years, giving them more weight on an absolute basis.

‡ Development cost evidence is available on the Green Building Finance Consortium website research library at www.GreenBuildingFC.com.

OFFSETTING RETROFIT DEVELOPMENT COSTS

A very large percentage of the gross deep retrofit cost can be offset by the ongoing "business-as-usual" costs of the building. Buildings require major and minor improvements over time, whether for major capital upgrades, equipment replacement, accommodating changing employee needs, or other reasons. Deep retrofits take the place of or accelerate many of these costly (but standard) building interventions. The difference between the *gross deep retrofit cost* and the total *business-as-usual cost* is the deep retrofit net cost, or "premium."

However, the most direct offset for a deep retrofit cost premium are subsidies and incentives provided by federal, state, and local governments and utilities.[3] Subsidies and incentives fall into four broad categories: 1) tax credits and incentives; 2) grants, rebates, and other financial subsidies; 3) entitlement-related benefits; and 4) subsidized lending. A good initial resource for determining eligibility for subsidies and incentives is the Database of State Incentives for Renewables and Efficiency (DSIRE) and the local utility.*

In addition to generally available subsidies and incentives, larger energy users can go directly to utilities and negotiate outside of formal programs.

Tax Credits and Incentives

There are a plethora of credits and incentives at every level of government. Capturing the full value of tax credits and subsidies can often involve tax planning. Additionally, sometimes an equipment vendor or counter party is actually taking the incentive from the retrofit and it is important to fully understand the underlying economics of the deal to effectively negotiate terms.

Grants, Rebates, and Other Financial Subsidies

State and local governments often offer grants, rebates, and financial incentives. Utilities likewise have numerous grant, rebate, and technical assistance programs for energy efficiency, renewables, and water projects. Programs range from incentives for specific features or energy efficiency measures to paying for performance or retro-commissioning incentives that add savings to the initial outlay.

Entitlement-Related Benefits

Many local governments around the country offer entitlement-related benefits, which include expedited planning and permitting, site density bonuses, and fee waivers or reductions.

Subsidized Lending

In the place of traditional debt from banks, life insurance companies, or commercial mortgage-backed securities conduit lenders, the sustainable/energy retrofit debt markets have evolved around utility, local, state, or federal subsidies and sponsorship. These government and utilities-related energy efficiency financing programs offer various credit enhancements such as loan loss reserves, loan guarantees, and interest-rate buy downs, and by direct lending using revolving loan funds. In all cases, the amount of debt financing is limited by the requirement that annual energy cost savings cover the debt service cost of the energy loan.

Property Assessed Clean Energy (PACE) loans are emerging as a potentially effective source of capital for borrowers of diverse credit strength. These loans are particularly attractive because they are secured by a property tax lien, they are not due upon sale, assessments typically qualify as a "pass through" to tenants, and they offer low interest rates.

* See value element three for a full discussion of retrofit risk and mitigation, which is an important part of a development costs presentation.

On-bill financing and repayment programs are growing in scale and scope. With utility on-bill financing programs, the utility provides the financing, whereas with on-bill repayment programs states or other sources provide the funds. In both cases, payment of debt is made through the utility bill. These programs have broad application across property and credit types, and in the case of programs structured as tariffs—as opposed to customer loans—the debt obligation stays with the meter, which is an important benefit.

Federal incentives are primarily focused on tax credits and deductions, but a number of programs under the Small Business Administration (SBA) and various programs through the Department of Housing and Urban Development (HUD) are also available.

Applicability, Level of Benefit, Terms, Timing, and Complexity

Determining the applicability, level of benefit, terms, and timing of subsidies and incentives can be complex. The number and types of programs and variability of sponsoring governments and organizations creates some challenges. The documentation, timing, and related requirements to receive benefits can be cumbersome. However, with widely available and significant benefits (10–30 percent cost reduction), it is worth the effort to consider and obtain those that can be accessed cost effectively.

EXAMPLES

SUBSIDIES AND INCENTIVES FOR OFFSETTING DEEP RETROFIT COSTS

TAX CREDITS & INCENTIVES

- Federal IRC 48 provides a 30-percent tax credit for qualifying renewable energy projects.
- Georgia provides an income tax credit for lighting retrofits and other energy-efficiency projects.
- Oregon offers business energy tax credits for investments in sustainable buildings or renewable energy.
- Indiana and Washington offer tax credits or rate reductions for green industry businesses.
- Some local governments, such as Cincinnati and Baltimore, offer property tax abatements or credits.

GRANTS, REBATES, AND OTHER FINANCIAL SUBSIDIES

- A Pennsylvania program offers up to $2 million grants for high-performance building programs.
- Numerous California utilities offer incentives up to $500,000 when building efficiency exceeds a threshold, with an additional $50,000 for enhanced commissioning, certification, and monitoring.
- Seattle City Light's Energy Smart Services program offers incentives up to 70 percent of the cost of installing energy-efficient systems in buildings or industrial facilities.
- The Energy Trust of Oregon offers many financial incentive programs and the City of Portland provides $500,000 in grants through its Green Investment Fund program.

ENTITLEMENT-RELATED BENEFITS

- Anchorage refunds permitting fees for LEED projects.
- Seattle, Chicago, San Diego, San Antonio, and Santa Barbara County offer expedited permitting or permit assistance.
- San Diego, Anchorage, Gainesville, Sarasota, and San Antonio offer fee waivers or reductions.
- Arlington County, Santa Clara County, Austin, and the City of Seattle provide density bonuses for downtown projects that achieve a LEED Silver rating.*

SUBSIDIZED LENDING

- An April 2012 study by Resources for the Future identified 226 government and utilities-related energy efficiency financing programs on the books in 2011, over 150 of which covered commercial properties.
- Approximately 30 states have passed legislation authorizing PACE loans and many localities—including San Francisco, Washington, D.C., Los Angeles, Cleveland, Miami, New Orleans, and Madison—have programs underway.
- Utilities with on-bill financing and repayment programs include Pacific Gas & Electric, Sacramento Municipal Utility District, San Diego Gas & Electric, Sempra Energy, and others in California; Alliant Energy, United Illuminating, and National Grid.
- Federal incentives include the SBA 504 program, which provides credit enhancements and is typically executed by local community development financial institutions, and the SBA 7A program, which provides up to a 75 percent guarantee.

* Offered to developments that include a certain number of affordable housing units.

RETROFIT DEVELOPMENT COSTS

CALCULATING RETROFIT DEVELOPMENT COSTS

There are at least two methods to properly determine the deep retrofit cost premium: 1) evaluating the added costs of individual green features, and 2) a whole-building approach.

Individual Green Features

What is the price difference of a code-compliant standard chiller versus a top-efficiency chiller? How much does it cost to install under-floor air rather than continuing with the existing air system? In some cases it is possible to calculate a negative cost, such as on the Empire State Building's deep retrofit, where the chiller cost was negative $17 million due to other aspects of the deep energy retrofit that reduced cooling load.[4] The main challenge with this approach is that it assumes business-as-usual costs can be accurately priced, which for many projects is not practical.

Because a deep retrofit may result in a plan to upgrade the entire building over several years, a business-as-usual capital budget commensurate in detail and length is required to indicate all offset or avoided costs. However, detailed and long-term business-as-usual budgets or anticipated costs often do not exist. For many buildings, capital planning happens one year in advance or not at all.

Whole-Building Approach

A "whole-building" approach is used in situations where detailed business-as-usual planning data is not available. Some property managers have five- and ten-year capital plans or facility condition assessment reports that roughly estimate longer-term building upgrade needs. Or they may have a list of buildings due for a franchise-specific upgrade—as is often the case in grocery stores and other retail properties. These and other higher-level plans and reports provide a general idea of the business-as-usual improvements and a cost per square foot, which can then be subtracted from the gross cost with the assumption that all of the original business-as-usual renovation objectives will be met by the deep retrofit.

PRESENTING RETROFIT DEVELOPMENT COSTS

The key to presenting retrofit development costs is providing enough information to convince the decision maker that everything that potentially impacts the project costs has been included and an appropriate cost contingency has been built into the budget. It is also important to distinguish costs among capital, operations, and tenant improvement (TI) budgets. Bucketing costs appropriately helps to properly assess what really needs to be funded or financed.

Development costs are always subject to significant risk due to weather, labor issues, material costs, execution uncertainties, and other issues. Significant cost contingencies and other risk mitigation strategies are used to deal with this standard level of risk. The gross cost of a deep retrofit is also subject to risks of pioneering products, technologies, systems, design, and contracts as well as potential inexperience in service providers and contractors. In addition, there can be large uncertainty around the "business-as-usual" and "premium" costs. Accordingly, the most successful presentations of retrofit development cost will document how complexities are handled and special risks mitigated.

CALCULATING AND PRESENTING
DEEP RETROFIT VALUE

NON-ENERGY PROPERTY OPERATING COSTS

2

2. NON-ENERGY PROPERTY OPERATING COSTS*

Non-energy operating costs can be critical components of building profitability and company value. Deep retrofits can reduce these costs, which include maintenance, water, insurance, and occupant churn rate.† In some cases, a deep retrofit can also add more occupied space in a building through equipment downsizing,‡ and more commonly increase occupant density to either add more occupants to the building or sublease the extra space—in both cases reducing the net property operating cost per employee-occupant.

Non-energy operating cost savings create value directly for the property owner by increasing net operating income, which is capitalized to create property value. Similarly, if an enterprise's earnings are increased because energy/building costs are reduced, company value is increased (the value of a company is typically expressed as a multiple of its earnings).

MAINTENANCE

We define maintenance to include:

- routine maintenance (including grounds and janitorial)
- deferred maintenance (non-capital) projects
- processing work orders

Based on our experience and studies on the correlation between green buildings and maintenance costs, green buildings generally cost less to maintain than the average building (in the range of 5–10 percent).§ While some common sense hypotheses like reduced time to change light bulbs, maintain landscaping, and vacuum carpets may explain the maintenance cost reductions found in many highly efficient buildings, little research has been done to precisely identify all the relevant factors.

One increasingly important area in building management is the use of technology to reduce energy and operating costs, often referred to as applying analytics to "big data." Performance information can now be collected on every light bulb, fan, plug, and other device or system within a building on an almost continuous basis. For example, Darrell Smith, Director of Facilities and Energy for the Microsoft Campus, said recently that they collect "500 billion data points from the campus every day."[5] Software programs analyze vast volumes of that data to detect whether HVAC equipment is simultaneously heating and cooling due to a failed sensor or other problem, adjust system operations to match space occupancy, help maintain optimal set-points for systems and equipment, and increase the visibility of and focus on energy waste.

* RMI's RetroFit Depot presents significant detail on the design, execution, and calculation of retrofit energy cost savings. "Value Beyond Cost Savings: How to Underwrite Sustainable Properties" presents additional detail on underwriting energy/carbon reduction investment in Expanded Chapter VI, pages 24 to 55. For more detailed descriptions of many of the studies mentioned here, see Expanded Chapter IV.

† While building specific carbon taxes/offsets are a reality in some parts of the world, and may become more geographically prevalent in the future, they are not included in our analysis.

‡ For example, the Deutsche Bank Tower Renovation: http://designalmic.com/the-new-deutsche-bank-towers-in-frankfurt-mario-bellini-architects-gmp-architekten/

§ Recent willingness by insurance companies to reduce premiums for green buildings does appear to support the contention that commissioning and sustainable design improve human health, reduce "sick building syndrome" claims, and may also reduce damage claims from both human and natural hazards. Nalewaik, A., & Venters, V. (2009), "Cost Benefits of Building Green," *Cost Engineering,* 51(2), 28-34.

While most of the cost savings from big data analytics come from energy savings, two other benefits include fault detection and diagnosis and alarm management.[6] Fault detection and diagnosis software can automatically identify and prioritize problems for building engineers. Maintenance staff can go straight to the problem, and bring the right repair tools and parts the first time. Continuous equipment maintenance can avoid waste and improve resource allocation. Similarly, alarm management can prioritize and structure the numerous notifications generated by building systems, focusing attention on the most critical things, thereby lowering costs and improving employee/tenant satisfaction. Given the substantial amount of attention that this area is receiving, and the many claims of cost savings, it is important to recognize important value benefits, but also be diligent in not double counting benefits in deep retrofit value presentations.

EXAMPLES

REDUCED MAINTENANCE COSTS

- A 2008 Leonardo Academy study found that properties certified with LEED for Existing Buildings (LEED-EB) had a median maintenance and repair (not including janitorial) cost of $1.17 per square foot compared to the regional average of $1.52 per square foot.[7] After accounting for slightly higher janitorial costs ($1.24 vs. $1.14 per square foot), the overall cost of maintenance was $0.25 per square foot cheaper, or a 9 percent annual maintenance cost savings.
- According to a 2010 Aberdeen Group study, adopting a data and performance management strategy can cut 14 percent or more of maintenance costs, allowing for visibility and routine tracking of key performance metrics such as operating costs, budget, and energy consumption; and increased collaboration between departmental stakeholders.[8]
- A study conducted for the U.S General Services Administration (GSA) found that 12 green GSA buildings had maintenance costs on average 13 percent less than the baseline.[9]

WATER

There is an increasing recognition of the water, energy, and operation and maintenance savings that can be realized through the implementation of water-saving initiatives.[10] Water costs have not historically been a large part of a property's budget, but with growing concerns about water availability and cost, efficient use of water resources is perhaps more a future risk mitigation issue than it is a current cost issue.

This concern reflects the fact that new and existing water resources are becoming increasingly scarce in a number of regions throughout the country. At the same time, per capita water consumption is increasing annually, water and sewer rates have increased dramatically over the last decade (100–400 percent), and new water supply options are too costly or altogether unavailable—often resulting in stringent water use requirements in new construction applications.

Restrooms, kitchens, irrigation, and cooling towers are the major water users in commercial properties.[11] Each offer significant opportunity to reduce water consumption, ranging from low- or no-cost fixes to major system redesign. Deep retrofits will uncover all of the reduction opportunities, with a potential to save 40 percent or more of total water consumption in the U.S commercial and institutional sectors.[12]

EXAMPLES

WATER SAVINGS INITIATIVES

- The most efficient toilets and faucets available today use two to three times less water than what is currently installed in most existing buildings.
- Some technologies enable the capture of used (grey) water for reuse in toilets and irrigation.
- The U.S. Environmental Protection Agency's WaterSense program[13] and the Alliance for Water Efficiency[14] provide information and case studies on the opportunity for water cost savings, which vary dramatically due to cost differentials between geographic regions and widely varying reliance on water between different types of properties.

INSURANCE

More and more insurance companies are recognizing the benefits of green buildings and rewarding property owners with lower premiums and improved protection against loss. Specific energy-efficiency measures like commissioning, efficient windows, and daylighting can help reduce disruption and loss from natural events and other building liabilities that are currently covered by various insurance products (Table 2).

TABLE 2

ENERGY-EFFICIENT TECHNOLOGIES AND THE PREVENTION OF LOSSES

EEM	Fire & Wind Damage	Ice & Water Damage	Power Failures	Professional Liability	Health & Safety (Lighting)	Health & Safety (Indoor)
Building Commissioning	X	X		X	X	X
Daylighting			X		X	X
Demand-Controlled Ventilation	X		X			X
Efficient Duct Systems	X	X		X		X
Efficient Windows	X	X				
Energy Audits & Diagnosis				X	X	X
Extra Interior Gypsum Board	X					
Heat-Recovery Ventilation		X				X
Insulated Water Pipes		X				

EXAMPLES

INSURANCE BENEFITS

- Today, Liberty Mutual Insurance, Fireman's Fund, and others offer pricing discounts to qualifying green commercial properties.[15]
- In the event of major loss or damage, several providers now provide products that cover the added expense of sustainability upgrades and certification.
- For the Chubb Group of Insurance Companies, expanded coverage for sustainability upgrades does not require a higher premium. Instead, the coverage is based on a higher property asset value, effectively producing a lower premium cost relative to coverage.
- The Hanover Insurance Company gave a 10 percent discount on homeowner property insurance premiums to homeowners with solar and energy-efficient homes in six states circa 1980 with the justification that the heating systems had fewer running hours, resulting in a reduced fire hazard.[16]
- The Lawrence Berkeley National Laboratory website highlights other ways insurance companies are going green.[17]

CHURN RATE

Churn rate is the frequency with which building occupants are moved, either internally or externally, including those who move but stay within a company, and those who leave a company and are replaced. Median annual churn rates in corporations are around 45 percent (i.e., 45 percent of the people are moved annually), with median move costs per person at around $400.[18] For a company with 10,000 employees, the median annual cost would therefore be $1.8 million.

Deep retrofits can affect churn rate costs in two ways:

- Deep retrofits may result in a decline in churn rates because of increased occupant comfort and satisfaction.
- Deep retrofits often incorporate systems, such as underfloor air and moveable partitions, or flexible, open design layouts, which reduce the costs of accommodating churn.

While it seems reasonable that occupant comfort and satisfaction would reduce churn because a lack of satisfaction and comfort is a driver of staff requests for a change in workplaces, limited research exists to establish these connections. See the Health Costs and Employee Costs sections of this report for more information on analyzing retrofit-related occupant comfort and satisfaction.

EXAMPLES

CHURN RATE COST REDUCTIONS

- Five studies demonstrate an average 80 percent reduction in churn costs due to underfloor air.[19]
- The GSA Adaptable Workplace Lab showed that using easily reconfigured furniture could save 90 percent of reconfiguration costs and reduce reconfiguration time from days to hours.
- The Pennsylvania Department of Environmental Protection reduced average churn costs from $2,500 to $250 per workstation by using more flexible building and furniture systems in its high-performance green buildings.[20]

SPACE OPTIMIZATION

Deep retrofits can downsize and consolidate mechanical equipment to free up space for use or sublease. In some cases, mechanical, server, and other support spaces can be completely eliminated. This has been a major driver of value for deep retrofits in high-cost markets like New York City.

Today, shared workspaces offer even greater opportunity. Many companies with traditional offices find meeting and collaboration space in high demand, while offices are vacant a majority of the time. Meanwhile, today's employees seek a more mobile and varied workspace, and wireless communication technologies enable improved collaboration, room reservations, and paging.

Organizations on average allocate 190 usable square feet per person and, through hoteling (sharing workspaces), telework, and other initiatives, can go as low as 80 square feet per person.[21] These changes are happening in both the pubic and private sectors.

EXAMPLES

SPACE OPTIMIZATION

- The deep retrofit of the Deutsche Bank Twin Towers reduced mechanical equipment enough to free up an entire floor in one building, which was converted to audio-visual meeting rooms.
- The U.S. Patent and Trademark Office eliminated three floors of office space and saved $1.5 million per year in rent by incorporating telework and office sharing into its new building program.
- Cisco Systems realized significant cost savings after utilizing shared workspaces (Table 3, next page)

TABLE 3

SHARED WORKSPACE COST SAVINGS FROM CISCO SYSTEMS[22]

COST CATEGORY	SAVINGS
REAL ESTATE RENT More people in same space	37%
CONSTRUCTION Building smaller space	42%
WORKPLACE SERVICES Reduce utilities & maintenance costs; nearly eliminating the costs of moves, adds, and changes for workspaces through the use of flexible furniture settings	37%
FURNITURE Purchase less (and less expensive) furniture than used in the cubicles	50%
IT CAPITAL SPEND Spending less on switches and cables	40%
CABLING Reducing the number of wired IP cables required per workspace	60%
EQUIPMENT ROOM SPACE Racking fewer switches because of wireless infrastructure	50%

NON-ENERGY PROPERTY COSTS

CALCULATING VALUE FROM NON-ENERGY PROPERTY COST REDUCTIONS

1. Document the company's non-energy property expenditures.
2. Evaluate potential non-energy property operating cost savings from the deep retrofit.
3. Develop sensitivity analysis around potential cost savings.

PRESENTING NON-ENERGY PROPERTY COST SAVINGS

In addition to the general guidance on presenting retrofit value (see **Appendix A**), there are a number of special considerations for presenting non-energy property cost savings to decision makers:

- Have property managers review the non-energy property cost and savings estimates and provide their comments.
- Present actual brochures and/or quotes from local insurance company branches that verify the cost savings in premiums associated with a green building.
- Carefully evaluate cost savings estimates from different vendors or service providers and make proper disclosures about sources of key information if potential bias is possible.

CALCULATING AND PRESENTING
DEEP RETROFIT VALUE

RETROFIT RISK MITIGATION

3

3. RETROFIT RISK MITIGATION*

Risk is one of the most important factors in any deep energy retrofit capital decision.† Deep retrofits are often subject to the standard and relatively high real estate risks of a "to-be-built" project where development costs and future operating cost savings that determine return on investment (ROI) are forecast. These normally high risks can be compounded by additional risks including new products and systems, system interoperability problems, new specialized service providers, new contracts and design processes, complex financing requirements, and potential energy savings underperformance from building energy simulation models.

Traditionally, a developer or investor seeking capital for a project must anticipate the property risks and related concerns of capital decision makers and identify, mitigate, or otherwise address those concerns in the capital request (regardless of whether it is equity, debt, new construction, acquisition capital, or capital for a retrofit).

Failing to address these risks can result in poor capital allocation decisions. For example, a 25 percent simple ROI where risks are not fully addressed can be a much worse investment than a 10 percent return when property risks are properly taken into account. Investments where risks are not fully identified, managed, and/or mitigated can result in a retrofit that significantly underperforms its forecasts, creates legal and insurance problems, frustrates employees/tenants and facility managers, reduces space flexibility/adaptability, and faces current and future regulatory problems.

Yet, capital requests in the energy efficiency/sustainability retrofit industry have not focused on risk analysis. Perhaps as a result, retrofit investors have limited investment to that which can be paid back through energy savings in approximately 3.5 years on average,[23] indicating a simple return requirement of over 28 percent. This onerous requirement limits investment and suggests investors perceive significant risk even in simple energy retrofits.

WHY RISK MATTERS

Risk is not a soft, indirect, or non-financial consideration, but one of the most important value elements in a deep energy retrofit investment. For example, an annual $1,000 retrofit cash flow benefit valued assuming a 10 percent return requirement would be worth $10,000. The same $1,000 cash flow valued using a 5 percent return requirement (due to perceived lower risks) would be worth $20,000, a 100 percent value increase.‡

Thus, even if your retrofit valuation analysis does nothing else but clearly identify risks and discuss how they were managed and/or mitigated, you will have successfully applied important value concepts far better than current best practice. If your risk assessment can reduce the required return rate by even a few percentage points, dramatic value increases and deeper retrofits will be possible. Equally important, risk-averse senior decision makers will become more likely to approve deep investment if uncertainty about

* Detailed lists and analyses of factors decreasing development costs and risks (pages 140 to 145) and factors increasing development costs and risks (pages 160 to 171) can be found in Appendix V-C of GBFC Sustainable Property Cost-Benefit Checklist in Expanded Chapter V of "Value Beyond Cost Savings: How to Underwrite Sustainable Properties."

† Risk is referenced in multiple columns in the retrofit value models.

‡ This example assumes simple direct capitalization of the cash flow stream for illustrative purposes.

outcomes is reduced. In other words, just by making the effort to define risk, overall risk is reduced. This happens through reduction of unknowns (clearly defining the issues) and setting of category risk ranges (for sensitivity testing).

Retrofit-related risks can be mitigated in three primary ways;

1. Traditional insurance and related risk-management mechanisms
2. Specialized green building due diligence
3. Execution of RMI life-cycle retrofit best practices

TRADITIONAL RISK MANAGEMENT TOOLS

Many of the risks of deep energy retrofits can be mitigated through normal insurance and surety practices. In some cases, appropriate insurance and surety products can be found from traditional sources that slightly modify some practices to address the special considerations of deep retrofits. In other cases, new companies may offer more specialized products. As with all insurance and surety products, it is important to carefully consider the cost and benefits of any purchase given a specific project's size, risk profile, and other factors.

Deep retrofit projects use many of the same types of traditional risk management tools, some modified to reflect the sustainable nature of the project, and some not. A listing of some of the key risks and applicable risk management tools are presented in the risk mitigation matrix in Table 4 prepared by Energi Insurance Services, Inc., a leading provider of risk management and insurance solutions for the energy industry.

TABLE 4

RISK MITIGATION FOR ENERGY EFFICIENCY

NOTABLE EXPOSURES	RISK FINANCING TOOLS
TANGIBLE PROPERTY / FIXED ASSETS	
"All Risk" Causes of Loss/Construction, including: > Theft, Vandalism & Fire > Materials in Transit, including Loading & Unloading > Materials Stored Off Premise	**Builder's Risk or "All Risk" Property Policy**
Loss or Delay of Business Income (relevant if income generating assets are affected)	**Property Policy**
"All Risk" Causes of Loss, including: Fire, Windstorm, Vandalism, Lightning, Earthquake	
Sudden and Accidental Equipment Breakdown	**Machinery & Equipment Breakdown**
Business Income / Equipment Breakdown	
Flooding / Selected Locations	**Flood Insurance**
LIABILITY/THIRD PARTY - INJURY TO WORKERS AND BODILY INJURY AND PROPERTY	
Site & Operations BI & PD Injuries to Others	**Commercial General & Excess / Umbrella Liability**
Vehicle Related BI & PD Injuries to Others	**Automobile & Excess / Umbrella Liability**
Injuries to Employees	**Workers' Compensation**
PERFORMANCE	
Contractor Insolvency	**Bid & Performance Bonds**
Inability to Complete Construction	
Failure to Deliver Material	**Supply Bond**
Defect in Means & Methods of Construction	**Contractors Errors & Omissions***
Negligent Supervision of Subcontractors	
Non-Payment due to Credit Risks such as Default, Insolvency or Bankruptcy	**Trade Credit Insurance / Contract Frustration**
Equipment Design / Manufacturing Defect	**Product Warranty**
Equipment Output Deficiency	**Performance Warranty**
Shortfall in Projected Energy Savings	**Energy Saving Warranty**

Source: From the Energi Risk Mitigation Reference Guide for new energy Financing, 2012, courtesy of Energi.

* The risk financing tools suggested (property and casualty insurance, surety bonds, warranties and hedging) may not be available in all cases.

SPECIALIZED GREEN BUILDING DUE DILIGENCE

A good summary of the kinds of new risk issues specific to green buildings can be found in a 2009 report completed by Marsh, the world's leading insurance broker and risk advisor.[24] Marsh conducted a series of four forums with construction industry executives to identify the top risk categories associated with green building projects. The results included:

- **Financial risks:** The additional costs of green buildings may affect completing projects on time and on budget, but must be weighed against the cost of not going green.
- **Standard of care/legal:** Mandates regarding LEED certification bring an increased risk of legal liability for green building design and construction professionals.
- **Performance:** Project owners/developers increasingly require additional contract provisions and warranties regarding the energy efficiency of green buildings, causing additional exposure to liability for breach of contract or warranty.
- **Consultants/subconsultants and subcontractors:** Lack of green construction experience by these parties can lead to problems obtaining LEED certification, delays, improper material specifications, and inflated bids.
- **Regulatory:** New building codes and mandates associated with green construction can mean an increased liability to everyone involved in the building process.

EXAMPLES

DUE DILIGENCE

A recent article by Peter Britell, author of Green Buildings: Law, Contract and Regulation, 2012, in the *New York Law Journal* indicated several practical categories of due diligence keyed to the goals of the buyer, tenant, or lender:[25]

- Review of LEED or other green rating applications for projects in development or completed projects
- Review of compliance with government green building zoning codes for new and completed projects
- Review of major tenant compliance with green lease requirements
- Review of landlord compliance with major tenant green lease requirements
- Review of compliance with green rules in mortgages and other funding documents
- Review of tax credit, property tax, zoning, green tax-exempt bond and other incentive rules and compliance/qualification for new or completed projects
- Review of energy benchmarking, such as the Energy Star rating and/or compliance with energy-use reporting and retrocommissioning laws

RMI RETROFIT LIFE-CYCLE BEST PRACTICES EXECUTION

Best practices in the design and execution of a deep retrofit can significantly reduce the risk of property underperformance, yet often retrofit capital requests do a poor job of identifying potential risks and explaining how they have been mitigated or managed.

Deep retrofit processes do cost more upfront, including completing a deep retrofit value report, but given the value potential and upside of excellent execution, strong consideration should be given to appropriate levels of initial spending to get projects right. It might be hard to justify when just considering cost savings, but potential value creation can be significant.

RMI's deep retrofit value models fully incorporate the identification and analysis of retrofit risks using a structured process starting with the launch of the project, all the way through the design, financing, construction, and operation of the building. This process is detailed in **Appendix B: Deep Retrofits and Risk Mitigation—27 Best Practices.** This is a critical aspect of risk mitigation and should be included in any deep retrofit project.

RETROFIT RISK MITIGATION

CALCULATING THE VALUE OF RETROFIT-RELATED PROPERTY RISK MITIGATION

The key to calculating the value of risk mitigation is to prepare a deep retrofit project risk analysis presentation (RAP) that fully identifies all the special risks related to the deep energy/sustainability retrofit.* The presentation of the value of property-related risk mitigation might involve some value calculations, but the majority of the presentation will be in the form of a structured analytic discussion. The calculation of the value to the enterprise due to increased value of the property at the time of sale, if sale is expected, is calculated in value element eight, property-derived revenues.

PRESENTING RETROFIT RISK MITIGATION VALUE EVIDENCE

The specific approach to presenting the findings will depend on the type of retrofit investment and other factors. Presentation of the retrofit risk mitigation findings related to development costs are typically best presented when discussing development costs, just as those related to operating costs are properly presented when discussing operating costs. Risks are also an important part of the presentation of property-derived revenues and enterprise risks in value elements eight and nine, respectively. Finally, the summary of risks presented in the **Sample Deep Retrofit Value Report** section may be the most important application of risk finding.

* A guide to identifying all the risks, both positive and negative, of development and operating costs can be found in the Expanded Chapter V of *Value Beyond Cost Savings, How to Underwrite Sustainable Properties*, by Scott Muldavin (2010).

CALCULATING AND PRESENTING
DEEP RETROFIT VALUE

HEALTH COSTS

4

4. HEALTH COSTS

There is substantial evidence that intelligently retrofitted and operated buildings improve the health of building occupants and users directly reducing health costs. Retrofits and operating practices can control moisture and pollutant sources, improve ventilation and access to outside air, promote access to the natural environment and lighting, address temperature control, and apply ergonomic furniture, all improving health.[26]

Studies show that healthier buildings can lower incidence and severity of asthma symptoms, respiratory illness, depression, anxiety, and even chronic pulmonary disease and cancer. There is also a growing level of study and recognition of the relationship between public health concerns like obesity and how buildings and communities are designed. Communities like New York City have taken a lead, developing "Active Design Guidelines" for buildings and neighborhoods, detailing the important link to improved health. A summary of the conclusions of the substantial body of knowledge about the relationship between deep retrofit building outcomes and health is summarized in Table 5 below.[27]

TABLE 5

BUILDING ATTRIBUTES AND PHYSICAL HEALTH

	HEALTH EFFECTS					
INDOOR ENVIRONMENTAL RISK FACTOR	Asthma/Allergy	Building-related Symptoms	Respiratory Infections	Chronic Pulmonary Disease	Other: Reproductive, Cataracts	Cancer
Low Ventilation Rate		X	X			
Air-Conditioning & Humidification Systems		X				
Microbiological Agents & Dampness, etc.	X	X	X	X		
Combustion Products	X	X			X	
Chemicals Emitted from Building or Contents (VOCs,SVOCs)	Z	X				
Temperature (High) & Relative Humidity (High or Low)		X				
Ionizing Radiation (Radon)						C
Env. Tobacco Smoke	X	X		X	X	C

X = Evidence Sufficient for Association Z = Evidence Suggestive of Association C = Causal Relationship

Source: Adapted from M.J. Mendell, "Indoor Environments and Health: What Do We Know?" Presentation, Lawrence Berkeley National Laboratory, March 3, 2004. Building related symptoms include a variety of symptoms including what are often classified as sick building syndrome.

Such building-related health benefits create value for the occupant by lowering health costs, reducing absenteeism and presenteeism, and reducing litigation and future regulatory risk/cost.

Perhaps even more important, improved mental and physical health contributes to occupant productivity and satisfaction, which creates value through employee cost reductions (see **value element five**).[28]

EXAMPLES

RETROFIT RELATED HEALTH EFFECTS

- Throughout the normal range of ventilation rates encountered in buildings, increased ventilation rates are, on average, associated with fewer adverse health effects and with superior work and school performance.[29]
- In offices, a 35 percent decrease in short-term absence was associated with a doubling of ventilation rates from 25 to 50 cubic feet per minute (cfm) per person.[30]
- Many studies have found that occupants of office buildings with above-average ventilation rates (up to 40 cfm per person) have 10 to 80 percent fewer sick building symptoms at work.[31]
- Substantially higher rates of respiratory illness (e.g., 50–370 percent) in high-density buildings (barracks, jails, nursing homes, and health care facilities) have been associated with very low ventilation rates.[32]
- Building dampness and mold in homes were associated with a 30–50 percent increase in a variety of respiratory and asthma-related health outcomes.[33]
- If workers are faced with nowhere to relieve stress in the office, premature onset of psychiatric, stress-induced, and anxiety-related illnesses, as well as cardiovascular diseases, can surface.[34]
- Studies show that our ability to directly access nature can alleviate feelings of stress, thus bolstering the case for biophilia—the need to connect with nature—in the workplace.[35]
- A comparative examination of an old office space characterized by poor lighting and air quality versus a healthy, brightly daylit office showed greater activation of hormonal stress in the former and significantly less headaches in the latter.[36]

LOWERING EMPLOYER HEALTH COSTS

Improved occupant health can reduce the incidence and length of illness for building occupants, enhancing the health profile of companies, enabling more favorable contracts, and/or directly reducing expenses with health insurance and medical providers. The value of potential savings will vary based on the ability of occupants to get credit for better claims experience and to clearly articulate rationale for improved health.

Lowered health costs also create direct and immediate value for employees (captured under value element five, employee costs).

REDUCING ABSENTEEISM

The fundamental value proposition from reducing absenteeism is based on the fact that companies, on average, spend 112 times the amount of money on people as on energy costs in the workplace.[37] Accordingly, building-related investments that reduce planned employee absenteeism are highly valuable. Value from reduced absenteeism will vary based primarily on employee salaries and the amount of reduction in absenteeism, but a growing body of evidence shows that healthier indoor environments reduce absenteeism by 15–40 percent.

EXAMPLES

REDUCED ABSENTEEISM

- A Canadian study revealed that approximately one-third of employees' sick leave can be attributed to symptoms caused by poor indoor air quality.[38]
- A study sponsored in part by commercial real estate giant Cushman & Wakefield reported 30 percent fewer sick days among one company's employees, and discovered a 10 percent increase in net revenue per employee in another company after each office moved to LEED-certified office buildings.[39]
- A 2007 study by an Australian law firm found sick days reduced by 39 percent overall, to 0.28 days per month, after moving to a highly-rated green building.[40]
- A survey of 534 tenants in 154 office buildings in 2009 found that tenants in LEED or Energy Star buildings reported an average of 2.88 less sick days per year resulting in an average impact of $1,228 per worker or $4.91 dollars per square foot.*
- A 2000 study by Clements and Croome found that buildings with advanced management (building intelligence) had decreased rates of illness and absenteeism.
- A survey of three case studies by Rocky Mountain Institute suggested that better lighting and HVAC systems could reduce absenteeism 15–25 percent.[41]
- A study of 31 green buildings from the City of Seattle found absenteeism reduced by 40 percent.[42]

* Assumes average of 250 square feet per worker and actual average salary of tenants of $106, 644. "Green Buildings and Productivity," Miller, Pogue, Gough, & Davis, Journal of Sustainable Real Estate, No. 1-2009.

REDUCING PRESENTEEISM

Employees often come to work when sick, or work from home when sick, reducing their overall effectiveness. The U.S. Department of Labor estimates that Americans work seven days per year while sick. For those days, the Institute for Health and Productivity Studies estimates a 12–20 percent decrease in productivity.[43]

REDUCING LITIGATION RISK/COST

Developing or retrofitting a building to improve the key factors that impact health and well-being can reduce litigation risk and cost. Reduced litigation costs can increase company earnings and value directly. Reduced litigation risk enhances value as part of the overall risk analysis that the market applies in determining a company's value.

As with secondhand smoke, asbestos, select toxins, mold, and other issues, building retrofit and operations practices that were once common can become highly litigious. Employers and building owners bear the risk of negative reactions by employees or tenants due to real or perceived exposure to unhealthy buildings. Many tenants and individuals apply elements of the "precautionary principle" when making space occupancy decisions.*

For an owner-occupant, litigation risk comes from customers, vendors, or employees that come in contact with a building. In addition to the critical building health issues identified above, there are a host of new building and health-related issues arising as a result of the increase in building-related health research and knowledge. New and planned studies of carbon dioxide concentrations, volatile and semi-volatile organic compounds, and ventilation rates, as well as biophilia and daylighting, offer evidence that may change the health expectation, and legal environment, of buildings in the near future.†

REDUCING FUTURE REGULATORY RISK AND COST

The factors that create litigation risk often create regulatory risk and cost. Federal, state, and municipal regulations often arise in response to known or potential health risks in the building or operation of buildings.

* The precautionary principle is a moral and political principle which states that if an action or policy might cause severe or irreversible harm to the public or to the environment, in the absence of a scientific consensus that harm would not ensue, the burden of proof falls on those who would advocate taking the action [Raffensperger C. & J. Tickner (eds.), *Protecting Public Health and the Environment: Implementing The Precautionary Principle, Island Press*, Washington, DC, 1999]. In some legal systems, as in the law of the European Union, the precautionary principle is also a general and compulsory principle of law [Recuerda, Miguel A., "Risk and Reason in the European Union Law," European Food and Feed Law Review, 5, 2006]. (Wikipedia, August 2009)

† Background on carbon dioxide and ventilation rates based on December 2012 conversation with Mark Mendell, Staff Scientist & Epidemiologist, Lawrence Berkeley National Laboratory.

IMPROVED OCCUPANT HEALTH

CALCULATING VALUE FROM IMPROVED OCCUPANT HEALTH

In preparing value evidence, both in gathering the data and performing calculations, it is important to understand that the analyst will need to make appropriate adjustments in the methods discussed below to reflect the specific property type, owner-occupant type, geographic region, and investment decision under consideration.

Follow these general steps to make the estimates as real as possible:

1. Articulate how the specific energy efficiency or sustainability measures in the retrofit project generate positive occupant health outcomes—i.e., how improved air quality, thermal comfort, ventilation rates, etc. improve health.
2. Show how the positive health outcomes from the project create value in one of the ways described, and generate an estimated range of potential cost savings based on research and analysis.
3. Obtain estimates of the average health costs for the employees to be in the retrofitted space.
4. Obtain estimates of the number of employees that will be in the retrofitted space. With changing conceptions of the workplace, organizations may be putting more workers in their spaces using hoteling programs, telecommuting policies, or open office layouts.
5. Calculate a range of cost savings per employee or per square foot—with appropriate sensitivity analysis around the key assumptions that affect the estimates.

Development of these estimates, and requisite data requirements, is part of RMI's continuing Deep Retrofit Value Project and we welcome comments and expect enhancements as this very important topic continues to gain traction.

Lower Employer Health Costs

Annual health care costs per employee averaged $5,026 as of September 2012.* Average workers' compensation costs vary widely by state and industry classification but are typically in the range of $500 per employee or more. Given the limited research and data that supports enterprise-level health cost savings estimates, it is important to provide a range of potential cost savings and be as transparent as possible about data uncertainty.

Absenteeism†

The formula to calculate health cost savings from building-related reduced absenteeism is relatively straightforward.

1. Estimate the number of days of reduced absenteeism due to an efficient workplace (see variety of estimates above).
2. Multiply it by an average total compensation per employee to get a rough calculation of dollars saved.
3. Additional value can be calculated through more refined analysis that factors in annual overtime related to absenteeism, practices relative to replacing absent workers, and further breakout and detail of the salaries of employees and replacement workers.

* U.S. National Compensation Survey, Bureau of Labor Statistics, September 2012. Average total compensation of $30.80 per hour worked; health insurance on average 8.5% of total; assumed 1,920 hours worked. This figure does not include employer costs for workers' compensation insurance that can vary significantly by state and industry.

† Given the direct link between positive health outcomes and improved absenteeism, we include absenteeism and presenteeism under health cost savings, instead of under worker performance.

IMPROVED OCCUPANT HEALTH

CALCULATING VALUE FROM IMPROVED OCCUPANT HEALTH (CONT.)

Presenteeism

To calculate presenteeism, start with the average salary of employees. Assuming seven days of working while sick per employee, and a 12–20 percent reduction in productivity, the average cost of presenteeism is roughly 0.34 to 0.56 percent of total salaries.* If better data on sickness and presenteeism is available for the organization, it should be applied to this estimate. Using an estimate (similar to the one for absenteeism) of the reduced days of sickness due to an improved workplace, that total cost can be reduced up to 50 percent.

Reduced Litigation Risk/Cost

Quantifying the value of reduced litigation risk/cost can be done directly by estimating the avoided litigation costs/potential costs from building-related health problems that could arise based on industry estimates or company specific estimates/experience.†

Alternatively, the cost of insurance or alternative risk mitigation techniques serves as a good proxy for the potential cost or damages. Presentation of this information is particularly critical as a clearly articulated case for the additional risk or cost can be an important part of why a senior decision maker might authorize additional retrofit dollars, particularly if the marginal cost of additional expenditures to obtain the health cost benefits is presented.

The whole issue of risk is often best addressed on an overall retrofit basis, given the many types of risk that arise—however, feedback from the industry suggests that provision of numerical estimates and ranges without some discussion of risk is not recommended.

Reduced Future Regulatory Risk

Calculate in a similar manner to that of litigation risk above.

4

* [Total presenteeism cost] = [% reduction in productivity] * [% of salary spent working from home] = [12–20%] * [7/#of workdays in a year=7/250=2.8%] = 0.34–0.56%

† Discussion with company risk managers or in house legal counsel can help in generating this information.

IMPROVED OCCUPANT HEALTH

PRESENTING HEALTH-RELATED VALUE EVIDENCE TO DECISION MAKERS

- Building-related health cost savings estimates should be presented using ranges and sensitivity analysis. It is okay to present ranges of potential cost savings for each of the five components of health-related value, as well as for the total.
- When presenting ranges and sensitivity analysis, it is critical to discuss the nature of the risk and uncertainty that led to the chosen ranges.
- Like with all calculations and arguments supporting the recommendations, make the estimates as specific as possible to the project, retrofit measures, and occupants.
- Given that most health and productivity studies isolate the effects of a specific outcome like temperature control, it is important not to double count, and to consider the implications of the quality of the scientific studies and the ability to control for factors independently in the analysis.
- The specific property type, size, age, location, and description need to be considered when applying findings from key scientific studies. Are the indoor air quality, lighting, temperature control, and other outcomes projected for a building similar to the outcomes on which the health and productivity studies were based?

Real estate investors are used to dealing with uncertainty. Accordingly, even if it is not scientifically possible to provide a specific quantitative estimate of health or productivity benefits that would result from a particular investment in sustainable property, a thoughtful and independent analysis of the potential benefits to occupants, and how potential occupants for the specific building would react to such information, is particularly important. Occupant surveys have shown that due to the precautionary principle, even a potential for improved health or productivity by occupants will be more than sufficient to justify any additional cost to create the potential benefits.

CALCULATING AND PRESENTING
DEEP RETROFIT VALUE

EMPLOYEE COSTS

5

5. EMPLOYEE COSTS

Organizations routinely make large investment decisions on behalf of their employees—upgrading personal technology, common spaces, benefits packages, or training—and often require limited proof of the expected returns. Despite this common practice, the substantial employee cost saving benefits of investments in deep energy efficiency/sustainability retrofits are often not considered, or are held to a higher standard of quantification. However, there is strong evidence that deep retrofits can reduce employee costs by lowering recruiting, retention, and employee compensation costs.

RECRUITING AND RETENTION COST SAVINGS

Recruiting and retaining employees is costly for many businesses. This is particularly true for businesses requiring top-tier or specialized talent. Hiring new staff requires significant staff time to recruit, interview, and then train the new employees. One rule of thumb for businesses is that the full cost of replacing an employee is one and a half times their annual salary (detailed studies show a range between 70 and 200 percent).*[44]

While the 70 to 200 percent range seems high, it is more plausible considering what is involved. The cost of an outside recruiter would typically range from 20 to 40 percent of first year salary. Alternatively, the staff time to conduct the search needs to be considered. Add to this the employer costs to retain and manage the recruiter, conduct interviews, train the new employee, and accept lower first-year productivity.

Retaining existing staff also requires a costly set of company actions such as keeping up the firm's reputation and maintaining benefits and the work environment at high levels. Most businesses take action through compensation, benefits, and other efforts to create a compelling work environment and company brand/culture. Retrofits can reduce these costs by improving employee satisfaction with their company/job by creating attractive and healthy office environments, improving property-level energy/sustainability ratings, and improving enterprise-level green reputation or ranking.

The evidence cited in the Health Costs section above, as well as the related absenteeism research, provides the foundation for the healthy office. Particular retrofit outcomes like daylighting, high levels of ventilation, air quality, improved temperature control, and views of nature are also important.

The top five criteria for occupant function in an office that, if unaddressed, can lead to dissatisfaction are:[45]

- a need for variety (light levels, temperature, etc.);
- the ability to act on the workplace environment, and notice effects;
- meaningful stimuli to avoid stagnation;
- having one's own territory to indicate safety and identity; and
- a view to the outside world.[46]

Another significant element of indoor environmental quality is noise. The detrimental health effects of excessively loud noise are well documented and have posed a longstanding occupational safety concern. Lower-decibel noise is also a very common problem in office environments, with researchers reporting that over 50 percent of office workers were disturbed by noise, and that office noise can have deleterious effects not only

* The standard definition of cost per hire (CPH) from the Society of Human Resource Management is the sum of external and internal costs divided by the total number of hires. http://www.shrm.org/hrstandards/publishedstandards/documents/11-0096%20hr%20standards%20booklet_web_revised.pdf

on physical health (generally through stress-related effects) but also on both work product and work-related psychosocial factors such as communication, frustration tolerance, group cohesiveness, and job performance.[47, 48, 49, 50]

For companies that are in highly competitive employee sectors, a deep retrofit and the resulting positive work environment and satisfaction can supplement other efforts to attract top talent, as well as improve retention of key staff. Studies documenting cost savings from this connection are limited, but as studies do show that retention correlates to employee engagement and buy-in, and employees routinely list environmental performance as a desired characteristic,* it is reasonable to assume some value is created for the company.

EMPLOYEE COMPENSATION COSTS (WORKER PRODUCTIVITY)

Approximately 90 percent of the cost of running most building-housed businesses is employee costs. Deep energy/sustainability retrofits have been shown to enhance employee satisfaction, improving the productivity of workers—and more productive workers can drive sales and revenue growth. Deep energy retrofits enhance employee satisfaction by offering better thermal comfort, indoor air quality, and visual acuity (the ability to clearly see the task at hand), and by providing access to nature and/or daylight (such as a window overlooking trees).

These improvements reduce absenteeism and improve the quantity of work produced, reducing employee cost per unit of output—potentially reducing the number of employees required, or enabling employees to produce more. Reductions in the number of employees, or the salary per unit of output, can reduce employee costs directly. Reductions in employee costs increase company earnings, which increase value directly when value is calculated by multiplying earnings by a price-earnings multiplier (higher quality of work resulting from deep retrofits primarily improves sales and revenues, so is accounted for in value element seven, customer access and sales).

Some common retrofit energy efficiency measures (EEMs) that generate these property outcomes include adding insulation or improving the building's envelope, providing natural ventilation, adding daylight collectors or additional glazing, making windows operable, integrating views and access to nature/outdoors, and a variety of operating practices that can improve the indoor environmental quality as summarized in Table 6 on the next page.

* Employees planning to leave an organization were 25% less satisfied with their physical workplace than those who planned to stay—Knoll & DYG, Inc., "The Second Bottom Line: Competing for Talent Using Innovative Workplace Design."

TABLE 6

OCCUPANT PERFORMANCE: PRODUCTIVITY STUDIES

STUDY TOPIC	NUMBER OF STUDIES
Gains from Indoor Environmental Quality (IEQ)	22
Gains from Temperatue Control	14
Gains from Lighting	18
Gains from Privacy and Interaction	13
Gains from Ergonomics	11
Gains from Access to Natural Environment	22
Gains from Whole Building	23
TOTAL	123

Source: Value Beyond Energy Cost Savings, How to Underwrite Sustainable Properties, Scott Muldavin, Green Building Finance Consortium, 2010.

As shown in Table 6, the bulk of studies around productivity gains comes from improvements to indoor environmental quality (IEQ), lighting, and access to the natural environment, as well as whole-building efficiency improvements.* Terrapin Bright Green's important paper on the economics of biophillia also provides important background on how intelligently executed retrofits can help drive worker productivity.[51] It states:

"The concept of biophilia implies that humans hold a biological need for connection with nature on physical, mental, and social levels, and that this connection affects our personal well-being, productivity, and societal relationships."

* Please refer to the RetroFit Depot (http://www.rmi.org/retrofit_depot) for additional information and case studies, as well as "Value Beyond Cost Savings: How to Underwrite Sustainable Properties," by Scott Muldavin. The Green Building Finance Consortium's Research Library serves as another valuable resource.

EXAMPLES

RECRUITING AND RETENTION COST SAVINGS THROUGH EMPLOYEE SATISFACTION

- In a survey of 1,065 tenants in 156 buildings managed by the real estate services firm CBRE, 34 percent of office tenants agreed that green office space is important to recruiting, while 14 percent disagreed. Additionally, 62 percent of office tenants agreed that green office space created a positive public image for firm's owners and stakeholders, while only 5 percent disagreed. As might be expected, larger tenants had a higher opinion of the importance of sustainability, but even tenants with 1 to 5 employees on average rated the importance of green space at 3.53 on a scale of 1 to 5, with 5 being the highest rating.[52]
- Based on a survey of tenants seeking office space, a healthy indoor environment was cited as the most important factor with a total score of 4.51 on a scale of 1 to 5, with 5 being the highest. Daylight and view in the office ranked second at 4.19, and lighting controls, fixtures, and practices to conserve energy ranked fifth and sixth from 3.74 to 3.77. Nearly 95 percent of building managers surveyed reported higher tenant satisfaction immediately after green upgrades.[53]
- When specifically examining the factors motivating investments to increase building performance, building owners and managers cited occupant health and well being as most important (83.3 percent), improved indoor air quality/environmental quality second (82.7 percent), and lowering operating costs third (77.3 percent).[54]
- Occupants in 22 retrofitted GSA buildings reported 27 percent higher occupant satisfaction than the national average for U.S. commercial buildings and the top third of the buildings scored 76 percent higher than the national average.[55]
- 79 percent of employees surveyed were willing to forego income to work for a firm with a credible sustainability strategy; while 80 percent said they felt greater motivation and loyalty toward their company due to its sustainability initiatives.[56]
- In a ranking of the importance of key green building features to building managers, healthy indoor air quality was cited 97 percent, comfortable indoor air temperatures 96 percent, daylight and views 86 percent, and energy conservation 73 percent, indicating the importance of occupant satisfaction to productivity-related building outcomes.[57]

EXAMPLES OF EMPLOYEE PRODUCTIVITY GAINS

- In a survey of over 2,000 tenants who moved into 154 LEED or ENERGY STAR buildings, 55 percent of the 534 responses received agreed or strongly agreed that employees were more productive, while 45 percent suggested no change.[58]
- Professor David Wyon found a 20 to 70 percent linear relationship between dissatisfaction regarding indoor air quality (IAQ) and worker performance. The magnitude of the performance impact of IAQ varies and can go as high as 6 to 9 percent—meaning that improved IAQ can provide meaningful improvements to worker productivity.[59] According to Wyon, "It has now been shown beyond reasonable doubt that poor indoor air quality in buildings can decrease performance in addition to causing visitors to express dissatisfaction."[60]
- Adrian Leaman of the Usable Buildings Trust in England assessed the potential impact buildings have on worker performance ranging from a positive 12.5 percent (improved performance) to a negative 17 percent (hampered performance), for an overall 30 percent change in worker performance between the best and worst buildings.[61]
- Thirteen studies suggest individual productivity gains from HVAC improvements, and 14 studies link temperature control to performance gains of 0.2–7 percent.[62]
- Work performance may be improved from a few percent to possibly as much as 10 percent by providing superior indoor environmental quality (IEQ).[63]
- Better perceived indoor air quality is correlated with improvements in office work tasks, with approximately a 1 percent increase in task performance per each 10 percent decrease in the percentage of occupants dissatisfied with indoor air quality.[64]
- A majority of studies indicate that performance (speed and accuracy) of office work tasks is usually highest when the air temperature maximizes comfort.[65]
- Performance (speed and accuracy) of typical office tasks improves with increased ventilation rate, with an approximate 0.8 percent increase in performance for each 10 cfm per person increase in ventilation rate (for initial ventilation rates between 14 and 30 cfm per person).[66]
- A large-scale survey of office worker exposure to light during the winter in Sweden shows that mood and vitality were enhanced in healthy people with higher levels of exposure to bright daylight.[67]
- One study shows that a half-hour exposure to bright daylight by sitting adjacent to windows reduced afternoon sleepiness in healthy adult subjects. Daylight levels ranged from about 1000 lux to over 4000 lux, depending on sky conditions. The study also found that daylight was almost as effective as a short nap in reducing normal post lunchtime drowsiness and increasing alertness.[68]

(continued on next page)

EXAMPLES OF EMPLOYEE PRODUCTIVITY GAINS (CONT.)

- A study that used a controlled setting with a 3-hour exposure of bright electric light (3000 lux) found significant reductions in anxiety among healthy adult subjects following the light exposure on three consecutive days. The researchers suggest that the effect may be mediated by serotonin.[69]
- Across 17 studies from 1934–1997, experts agreed that good daylighting "improves tests scores, reduces off-task behavior, and plays a significant role in the achievement of students."[70]
- Five daylighting studies cited by Carnegie Mellon showed average productivity gains of 5.5 percent.[71]
- A Walmart study in which only half of the store was daylit found that the sales per square foot were significantly higher for departments located in the daylit sections of stores—regardless of which half was daylit. In addition, sales in daylit departments of this new store were markedly higher than sales in the same department in other non-daylit stores.[72]
- In environments with many stimuli and patterns, the patterns that are most likely to hold our attention and induce a relaxed response are fractal patterns commonly found in nature.[73]
- On average, patients whose hospital windows overlooked a scene of nature were released after 7.96 days, compared with the 8.71 days it took for patients whose views were of the hospital's exterior walls to recover sufficiently to be released—a decrease of 8.5 percent.[74]
- A study found a decreased length of stay for patients in sunny, daylit hospital rooms, when compared with those in dull rooms with artificial lighting.[75]

EMPLOYEE COSTS

CALCULATING VALUE FROM REDUCED EMPLOYEE COSTS

Recruiting and Retention

Any estimates of potential value from better recruiting and retention and the resulting forecasted cost savings should begin with a conversation with human resources. They can help clarify whom the organization wants to hire.

Calculating the value of improved worker recruiting and retention due to a deep retrofit requires extrapolation, as the number of relevant studies is limited.

1. Use either an estimate of 1.5 times the average salary as a recruiting cost, or more conservatively (or less specifically) use 2011 U.S. average survey data from the Society of Human Resource Management showing average recruiting costs of $3,196 per employee.*
2. Multiply this number by the average number of staff leaving the organization over each year (14 percent is a common data point, depending on the company) for a baseline.
3. Use reasonable assertions of 10 percent reduction in staff turnover to calculate an estimate of potential cost savings.†

Worker Productivity

To calculate retrofit value from worker productivity, follow these steps:

1. Analyze the subject property and make a preliminary assessment of how strong the relationship is between the specific energy efficiency/sustainability measures and outcomes planned, and worker productivity.
2. Collect and analyze the most relevant studies that provide evidence of the relationship between deep retrofits and worker productivity benefits for the project.
3. Work with human resources to develop a profile of the types of workers that will be in the building to be retrofitted. One part of this analysis is to calculate the average compensation (including all non-health benefits) for employees in the subject building (this will likely have to be done on a confidential basis by human resources or by using averages for companies in the industry if human resources determines the data to be confidential or lacks the resources to do it).
4. Evaluate the employee profiles and relevant productivity studies and document a range of the potential productivity increase possible from the retrofit. The reasoning and analysis, including qualitative input from managers working day to day with employees, should be clearly articulated with appropriate citations to studies.

There are a number of additional ways to adjust/reflect on this range of employee cost savings resulting from the building retrofit. While it is not realistic to assume that workers can, or will, be let go as a result of projected productivity increases, there is enough employee turnover and contract worker employment in many organizations to enable companies to relatively quickly reduce employee costs as a result of increased productivity. It might also be reasonable to assume that the full employee cost savings does not start in year one, but ramps up over a few years.

An alternative way to think about the cost savings estimate is to interpret it as a proxy calculation for the value of increased output (more products, sales, and revenues) that would result from workers producing more and being happier in their work environment.

* This number is recruiting cost (sourcing, recruiting, and staffing activities), and includes in the sample size many more temporary or lower wage positions (requiring less time to hire and onboard). Depending on the composition of the workforce assessed, these numbers can vary widely.

† Turnover averaged 14% for the years 2009 to 2011 based on research from the Society of Human Resource Management. Executive Brief, Tracking Trends in Employee Turnover, Society of Human Resource Management, 2012.

EMPLOYEE COSTS

PRESENTING VALUE EVIDENCE TO DECISION MAKERS

Besides following the seven principles presented in **Appendix A**, it is also important to present results of conversations with human resources and other internal company people consulted in arriving at conclusions. Then discuss how better, greener buildings will improve the working environment as well as the company's leadership and reputation in the industry.

Next, clearly delineate the connections between employees sought, what attracts them, and how the business can leverage building retrofits to attract them. Finally, provide a range (or sensitivity analysis) in recruiting and retention cost savings, again vetted by human resources. This range can be conservative, depending on available evidence, using low estimates of recruiting cost per employee and relative importance of the high-performing building to the company's reputation and employee satisfaction.

Since worker productivity creates company value from potential employee cost reductions and/or higher sales and revenues, it is important to acknowledge to retrofit decision makers that the calculation of the financial benefits (value) can be accounted for in either or both places, and explain where value benefits were accounted for and that they were not double counted.

It is also important to acknowledge that the value calculations are not a precise science, but based on the best scientific research on the relationship between retrofits and worker productivity applied directly to the subject project using real numbers from the company's human resources department.* Larger companies may be able to conduct internal surveys and analysis of like kind buildings with varying levels of sustainability to develop statistical relationships appropriate for their companies.

As presented in the calculation section, given the range of uncertainties in calculating employee cost savings as a result of worker productivity, it is best to present conclusions using sensitivity analysis. We recommend using relatively conservative ranges for the sensitivity analysis with full explanation of range selection and opinions on its reasonableness. Full disclosure is the recommended approach when discussing how these numbers may vary.

5

* Alternatively, if actual salary data for people that will be in the building is not available either due to confidentiality concerns or uncertain plans as to who will be in the retrofit space, conservative estimates of salaries from similar business sectors or other parts of the company can be used.

CALCULATING AND PRESENTING
DEEP RETROFIT VALUE

PROMOTIONS AND MARKETING COSTS

6

6. PROMOTIONS AND MARKETING COSTS*

Companies typically spend in the range of 10 percent of revenue on promotions and marketing, employing scores of different approaches to reach and influence customers. This substantial expense often does not even include all the time spent by non-marketing staff in promotions and marketing activities.†

A company's reputation and brand are critical to its profitability. More and more companies are challenged to create content that establishes and maintains positive sustainable branding. As a result of their significant contribution to a company's sustainability reputation and leadership, deep retrofits can provide the content many companies are looking for in order to shape their branding story, offsetting money that would otherwise be spent developing other approaches to sustainability branding.

Sustainable reputation and leadership can directly reduce employee costs, improve access to customers, and reduce enterprise risks for occupants. For investors, deep retrofits contribute to the reputation and leadership of tenants, and lead to increased rents, tenant retention, and occupancy, as well as improved brand recognition and access to capital for the investor company.

As more companies focus on developing a sustainable reputation, the issue of greenwashing —promoting green image while not fulfilling image through actions—has become more prominent. Deep retrofits can help a company strike an important balance between substance and promotion. Many companies today are in the high promotion, low substance quadrant where deep retrofits can add particular value. Deep retrofits are verifiably sustainable and their promotion carries little risk of greenwashing accusations, which can negate the value of the marketing completely and even incur substantial additional marketing and promotions costs.

Deep retrofits can also reduce promotion costs by reducing the cost of distributing content. Retrofits create concrete examples of sustainable actions that provide fodder for Internet marketing promoted through press releases and other articles. Because of the ongoing performance verification and tracking that occurs after retrofit construction, deep retrofits can provide content for at least a few years.

Deep retrofits can also contribute to the growing sustainability compliance requirements of many businesses and governments, becoming a minimum standard to be able to market a company's product.‡

Because promotions and marketing costs are such a large part of most company operating budgets, small contributions to cost reductions can add significant value. Depending on the industry, marketing budgets can range from as low as 1 percent of sales to over 30 percent. New companies may spend as much as 50 percent of sales for introductory marketing programs in the first year.

* Improved sustainability leadership and reputation, and related enhancement to promotions and marketing, also contribute value through improved product sales and pricing, which is detailed in the enterprise revenues section of this chapter. This section only addresses potential promotions and marketing cost reductions.

† Promotions and marketing expenses often account for staff time from marketing departments or other departments with specific marketing roles, but staff time from other departments that is spent in promotions and marketing activities is often not included. This investment by non-marketing staff can be substantial, especially in professional services and finance, and insurance and real estate sectors where many non-marketing staff carry a heavy marketing and promotions role.

‡ Such a minimum standard is a critical component of the "social license to operate" of many companies. This concept is addressed more fully in the enterprise/value risk section below.

EXAMPLES

SUSTAINABILITY REPORTING MECHANISMS

COMPANY LEVEL

- Specific company sustainability programs, policies, and plans/guidelines
- International Standards Organization (ISO) 14001 Environmental Management Standard
- International Standards Organizations (ISO) 50001—Energy Management Systems
- ASTM Sustainability Standards (various)
- Global Reporting Initiative (GRI) Sustainability Reporting Initiative
- Dow Jones Sustainability Index (DJSI)
- RobecoSam Corporate Sustainability Index (Basis of DJSI)
- Global Real Estate Sustainability Benchmark (GRESB)
- CDP Reporting
- ULI/Greenprint Carbon and Energy Performance Index
- IPD Environmental Code
- B-Corporation Certification
- MCSI Global Environmental Indices

FUND PERFORMANCE

- The Global Real Estate Sustainability Benchmark (GRESB)

PROPERTY LEVEL

- Company specific measurement and reporting systems
- Energy Star—U.S. Department of Energy
- ULI Greenprint Center for Building Performance
- Department of Energy Asset Rating Index (under development and review)
- BOMA 360
- EU Energy Performance in Buildings Initiative
- NABERS-Australia
- International Green Construction Code, International Code Council
- Enterprise Green Communities Certification
- LEED, BREEAM, GreenStar, CASBEE, Green Globes, and other international green building rating systems
- ASTM Standard E 2797 Building Energy Performance Assessment (BEPA)

EXAMPLES

SOURCES OF SUSTAINABILITY COMMITMENTS

- Company corporate social responsibility reports
- Commitments in company sustainability policies and plans
- United Nations Finance Initiative Principles for Responsible Property Investment
- CERES Principles: Coalition for Environmentally Responsible Economies (CERES) ten-point code of environmental conduct
- United Nations "Sustainable Energy for All"
- World Business Council for Sustainable Development's "Commitments for the Future We Want"
- Building Owners and Managers Association (BOMA) 7-Point Challenge

EXTERNAL SUSTAINABILITY EVALUATION SOURCES

- Local energy/sustainability disclosure laws have emerged in a number of communities including New York City, Philadelphia, and Seattle.
- Municipal building codes and state product codes continue to require increasing levels of energy efficiency and sustainability.
- At the federal level, the Securities and Exchange Commission advises voluntary disclosure requirements as they apply to risks related to climate change.*
- Private investment analysts, such as Bloomberg's Environmental, Social, and Governance (ESG) databases and MCSI's Global Sustainability Indices,** have been evaluating companies for their sustainability efforts and the potential implications of climate change readiness in their products and operations.[76]

* Accordingly, if your company is exposed to risks to its costs, customer access, or subject to other risks due to its exposure to sustainability-related risks the SEC advises disclosure.

** Bloomberg's ESG databases, currently used by over 7,000 investors, tracked over 10,000 publicly traded companies in 2013, up more than three-fold since 2008.

PROMOTIONS AND MARKETING COSTS

CALCULATING VALUE FROM RETROFIT-RELATED PROMOTIONS AND MARKETING COST REDUCTIONS

1. **Document company marketing and promotions expenditures.**
2. **Assess how the retrofit will influence the company's sustainability reputation and leadership.**
3. **Assess the importance of sustainability reputation and leadership to customers.**
4. **Evaluate potential marketing and promotion cost savings from the deep retrofit.**

1) Document Company Marketing and Promotions Expenditures

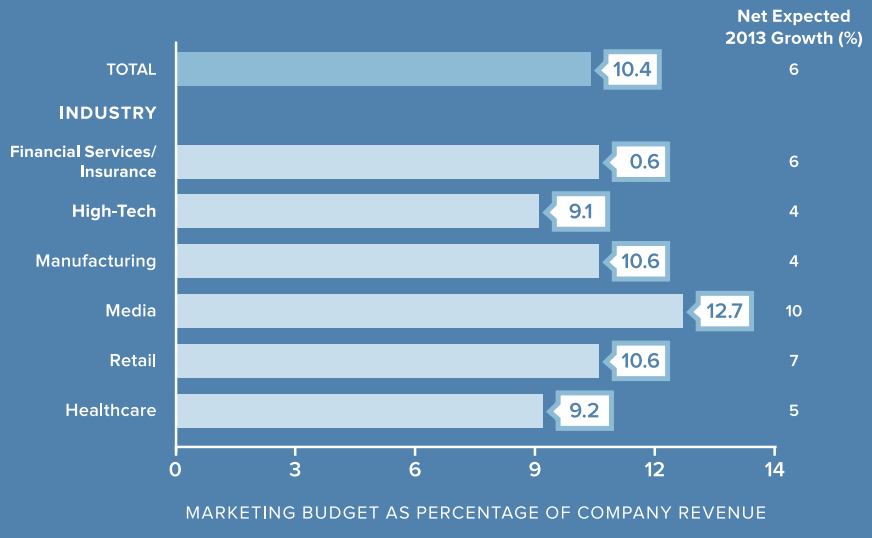
Documenting marketing and promotions expenses can be difficult as company expenses can be spread throughout corporate and business unit overhead budgets as well as operating units. In addition to cost centers that address marketing and promotion activities, a significant amount of staff time in operating units is spent on promotions, marketing, and related client/customer acquisition activities.

There is rarely a perfect answer for total company marketing and promotion costs, and it is not important to the value calculation that the number be perfect. What is important is to document how the number was derived and have some assurance that company decision makers will think the number is reasonable.

For most companies, the marketing budget will be a very significant part of operating expenses. For example, average total marketing budgets and expected growth in 2013 for several industries are shown in Figure 2 below. If possible it would be ideal to understand the portion of total marketing and promotions spent on enhancing sustainability reputation and brand, as this is the portion that a deep retrofit would affect.

FIGURE 2

MARKETING BUDGETS FOR DIFFERENT INDUSTRIES



Note: Data was gathered from responses to the following questions: What percentage of your organization's revenue is allocated to your total marketing expense budget for fiscal 2012? Compared with fiscal 2012, by how much do you expect your organization's total marketing expense budget to decrease, stay the same or increase in fiscal 2013?

Source: Gartner: Key Findings From U.S. Digital Marketing Spending Survey

PROMOTIONS AND MARKETING COSTS

CALCULATING VALUE FROM RETROFIT-RELATED PROMOTIONS AND MARKETING COST REDUCTIONS (CONT.)

2) **Assess how the retrofit will influence the company's sustainable reputation and leadership**
Unfortunately, while the contribution of non-energy cost factors to company sustainable reputation and leadership has been understood and documented for some time, methodologies for translating the contribution of deep retrofits to business/shareholder value are still in the development stage.*
To measure the contribution of a deep retrofit to sustainable reputation and leadership we recommend following four steps:

   a. **Identify the organization's public commitments to sustainability (see examples on next page)**
   There are many sustainability commitments that organizations make at the property and company levels. While these pledges are a starting point, they do not represent a measure of sustainability performance, only their public commitment.

   b. **Document how the company chooses to measure and report sustainability leadership**
   Measurement/reporting mechanisms can be either internal or external, but are typically voluntary. These mechanisms can be found at the company, fund, and property levels.

   At the company level one emerging trend is "integrated sustainability reporting,"† as illustrated by the recent founding of the Sustainability Accounting Standards Board (SASB) and the Carbon Accounting Standards Board (CASB). In addition to the SASB and CASB, the International Integrated Reporting Council has published a "Pilot Programme 2012 Yearbook" reporting the results of pilots from over 80 companies,[77] and many companies throughout the business world are making progress on integrating sustainability throughout their companies, an important step contributing to financial integration.

   Sustainability at the fund level is important as well. Often institutional investors are more interested in fund performance than an investment manager's performance since they technically invest in the fund, not the investment manager.

   At the property level, measurement and reporting systems are often included directly in many of the company-level measurement and reporting systems.

   c. **Identify external sustainability rating/ evaluation sources**
   Beyond voluntary ratings and evaluations, there are a growing number of external non-voluntary sustainability measurement and reporting systems that are having an increasing impact on how companies think about sustainability. These systems include many governmental regulations/ requirements at the local, state, and federal levels.

   d. **Evaluate the role of property sustainability in the context of a company's sustainability measurements, reports, and ratings**
   Buildings are a physical manifestation of a company. A company that espouses a sustainability ethic or culture but fails to "walk the talk" with its buildings will have a very concrete representation of its lack of commitment available for its employees, investors, customers, and shareholders to see. This risk stands to increase as building rating systems emerge, and competitors follow through on concrete and verifiable objectives.

* Don Reed's "Stalking the Elusive Business Case for Corporate Sustainability" (World Resources Institute, 2001) does a particularly good job of identifying the corporate sustainability/value connection over ten years ago. Recent work by Herve Kieffel of PWC ("Sustainability Valuation: An Oxymoron?" April 2012) provides more updated insights. These are just a few of the many articles on this topic.

† Integrated sustainability reporting involves the integration of sustainability and financial reporting.

PROMOTIONS AND MARKETING COSTS

CALCULATING VALUE FROM RETROFIT-RELATED PROMOTIONS AND MARKETING COST REDUCTIONS (CONT.)

3. **Assess the importance of sustainability reputation and leadership to customers**

   Evaluate the importance of sustainability reputation and leadership to customers by looking at three types of customers each with unique sustainability demands; 1) individual customers, 2) business customers, and 3) government customers.

   While the best source of information on sustainability positioning among a company's peers may be from internal marketing, another reliable understanding can come from internal surveys and direct customer-facing resources from sales and marketing. These resources are most likely to hear, first hand, the market's expectations for valuing a company's sustainability leadership and thus provide useful information to inform a retrofit decision maker.

   There will be wide variability in the importance of sustainability among different types of companies and their customers. For example, companies with complex public relations challenges—such as mining, oil, big box retail, etc.—might highly value sustainability reputation and leadership in order to offset negative public relations stemming from their other activities. Companies working in health fields—such as medical and pharmaceutical—might also highly value sustainability reputation and leadership.

   There are a growing number of external sources documenting how individuals, businesses, and governments are beginning to make sustainability reputation and leadership a critical determinant or minimum standard for purchase. Sources of information include customer surveys, business and government procurement policies, and growing documentation of public commitments by companies and organizations to be more sustainable. More sophisticated ways to understand the importance customers place on sustainability include demographic and geographic analyses.

4. **Evaluate potential marketing and promotion cost savings from the deep retrofit**

   It is necessary to assess the importance of a deep retrofit relative to other marketing and promotion activities by identifying the specific content creation and promotions cost avoided through performing a deep retrofit. For example, retrofit-related sustainability leadership is more likely to affect general promotions and brand management, rather than reduce the direct costs of customer acquisition.

   However do not be too quick to write off cost segments. Positive sustainability leadership and reputation are becoming a minimum standard for many business and government customers, as well as for consumers. This development will not necessarily reduce costs, but may help increase the speed and ease of sales, which could indirectly affect costs. *(continued on next page)*

PROMOTIONS AND MARKETING COSTS

CALCULATING VALUE FROM RETROFIT-RELATED PROMOTIONS AND MARKETING COST REDUCTIONS (CONT.)

4. Evaluate potential marketing and promotion cost savings from the deep retrofit (cont.)

It is also important to think through the relative importance of deep retrofits as part of a company's overall sustainability marketing and promotions. For example, a deep retrofit could be instrumental for product and service companies in the building industry. Highly efficient buildings are a highly visible and tangible representation of a company's commitment to excellence in buildings.

The important part of this analysis is to be able to separate the cost saving benefits due to promotions and marketing advantages from the revenue benefits, which will be separately covered in value element seven, customer access and sales.

To conclude the analysis, a potential range of cost savings for promotions and marketing must be estimated. It is likely that the percent savings will be low, but given the significant costs for promotions and marketing it might still be significant.

PRESENTING PROMOTIONS AND MARKETING-RELATED VALUE EVIDENCE TO DECISION MAKERS

Just because it is hard to calculate the value contribution of reduced marketing and promotions cost does not mean it should not be addressed. For example, only one-third of chief marketing officers (CMOs) surveyed report their companies are able to demonstrate quantitatively the impact of their marketing spending. Another 36 percent respond they have a good sense of the qualitative impact, but not the quantitative impact.[78]

In addition to the general guidance on presenting retrofit value (**Appendix A**), there are a number of special considerations for presenting promotions and marketing cost savings to decision makers:

- Use concrete examples of promotions and marketing costs that could be avoided due to improved sustainability reputation and leadership.
- Carefully explain the relative contribution of a single building deep retrofit to a company's overall sustainability reputation and leadership.
- If the primary value benefits relate to improvements in promotions and marketing (to gain market share) or meeting minimum customer standards, and not cost savings, do not force the issue with unsupportable assumptions. Instead, focus on capturing those value benefits in the Customer Access and Sales section.

CALCULATING AND PRESENTING
DEEP RETROFIT VALUE

CUSTOMER ACCESS AND SALES

7

7. CUSTOMER ACCESS AND SALES

There is growing evidence that deep retrofits directly contribute to improved customer access and sales. Customers of all types—direct consumers, businesses, and governments—are beginning to require demonstrated sustainability performance and leadership as part of their decision to purchase. Buildings are an important component of most companies' production processes, so executing deep retrofits can help company products achieve higher sustainability ratings. The contribution of deep retrofits to a company's sustainability reputation and leadership is discussed in detail under value element six, promotions and marketing costs. Finally, there is growing evidence that more healthy, productive, and satisfied workers have been shown to be more engaged and innovative, increasing sales potential.

ENABLING ACCESS TO NEW AND EXISTING MARKETS

Sustainability is changing the dynamic of direct customer, business-to-business, and business-to-government sales. Company executives now shape sustainability initiatives to help meet the perceived direct-consumer demand for sustainable products. In addition, major private and public sector organizations prefer and sometimes mandate sustainable products for their supply chains. Walmart and other retailers have pushed their consumer goods manufacturers to provide detailed information not just on their products, but their overall operations. Many of these suppliers have turned to their own suppliers with similarly detailed information requests.

Individual consumers are also becoming more accustomed to exerting their sustainability preferences in their purchasing. If companies are looking to boost the sustainability of their product and grow sales in order to adapt to this change in demand, deep retrofits can provide an effective component of their product strategy. Within retail properties, sustainability has been directly linked to individual shopper satisfaction. Daylighting in retail stores, a standard deep retrofit measure, is widely acknowledged to increase sales by creating a more enjoyable shopping environment.[79] Retrofitted buildings also contribute directly to product sustainability because buildings are important factors of production, are components of an environmental footprint, and contribute to overall company sustainability ratings.

INCREASING SALES

Better working environments can encourage more engaged, innovative, and satisfied workers, who will build better products and sell more effectively. If companies are looking to boost employee engagement, deep retrofits can provide an effective tool, as a strong correlation exists between sustainability performance and employee engagement.

EXAMPLES

INCREASED ACCESS TO MARKETS

- A 2011 McKinsey survey of 1,946 executives showed that companies are moving beyond reputation management and finding ways to use sustainability to drive growth. While only 28 percent of companies are leveraging sustainability to reach new markets or customers, those companies are the likeliest to say they have competitive advantage—suggesting that company sustainability provides competitive advantage for new market access.[80]
- According to a 2012 MIT/BCG report, 41 percent of nearly 3,000 executives cite customer preference for sustainable products and services as a factor leading to changes in the business model.[81]
- Ernst & Young and *GreenBiz's* 2011 report found that 87 percent and 80 percent of 272 leaders in corporate environmental sustainability cite changes in customer demand and new revenue opportunities, respectively, as key considerations in pursuing sustainability initiatives.
- In a 2012 survey, 83 percent of respondents said they are either working directly with their suppliers or are discussing with them how to measure sustainability impacts.[82]
- A survey released in 2013 by Boston-based public relations firm Cone Communications, found 71 percent of Americans now consider the environment when making purchasing decisions, up from 66 percent in 2008. Nearly 70 percent said it is okay for a company not to be "environmentally perfect" as long as it is honest about it. Similarly, 78 percent said they would boycott if they discovered the company had made a false environmental claim.[83]
- A 2012 Nielsen survey that polled more than 28,000 on-line respondents from 56 countries found that 66 percent of consumers prefer to buy products and services from companies that have implemented programs to give back to society, 62 percent prefer to work for these companies, 59 percent prefer to invest in these companies, and 46 percent are willing to pay more to buy from these companies.[84]
- A survey by the Carbon Trust found half of multinational companies already state they would choose suppliers based on their carbon performance in the future. Forty-two percent of those not currently addressing supply chain issues expect to in the next 12 months. Of the 40 percent of firms already working on supply chain emissions, two-thirds are willing to pay a 10 percent premium for low carbon products or services.[85]
- U.S. Executive Order 13514 requires 95 percent of new contracts with the U.S. General Services Administration (over $20 billion in annual expenses[86]) to be green.[87]
- By the end of 2017, Walmart will buy 70 percent of the goods it sells in U.S. stores from suppliers who use its Sustainability Index, which evaluates and discloses the sustainability of products.[88]
- Intel Corporation began setting expectations in 2011 for their Top Tier 1 suppliers to begin reporting of greenhouse gas emissions, water, and waste conservation metrics with the highest standards for their top 75 suppliers.[89]
- The Department of Defense, The Department of State, and other federal agencies are pursuing aggressive sustainability polices.
- Numerous states and local governments currently demand sustainability through procurement policies and practices.[90]

INCREASED WORKER PERFORMANCE AND SALES

- Hewitt & Associates looked at 230 workplaces with more than 100,000 employees and found that the more a company actively pursues worthy environmental and social efforts, the more engaged its employees are.[91]
- The Society for Human Resources Management found that morale was 55 percent higher in companies that have strong sustainability programs than in companies that have poor ones.[92]
- One study found that companies with engaged employees boosted operating income by 19 percent compared to companies with the lowest percentage of engaged employees, which saw operating income fall 33 percent.[93]
- A 2011 study found that companies with engaged employees have three times the operating margin.[94]
- A Gallup study found companies with an average of 9.3 engaged employees for every actively disengaged employee experienced 147 percent higher earnings per share compared with their competition.[95]
- A 2012 study of 494 facilities of PNC Bank, a large U.S. financial firm, found a positive correlation between sustainable properties (i.e. LEED certified) and revenues when controlling for external factors including location and income levels. Compared to non-LEED certified facilities, LEED certified facilities annually opened up 458 more consumer deposit accounts and had $3,032,000 more in consumer deposit balance per facility per year. LEED certified facilities also opened up 25.5 more consumer loan accounts and had $994,900 more in loan balance per facility per year. The researchers posited that the difference stemmed from employees feeling more engaged with the company mission while working in a green building and as a result providing better customer service that increases customer satisfaction and improves sales.[96]

CUSTOMER ACCESS AND SALES

CALCULATING VALUE FROM CUSTOMER ACCESS AND SALES

Developing support for a retrofit capital request with regard to customer access and sales requires the following steps:

1. Assess if the proposed retrofit generates the property outcomes and related retrofit performance (sustainable reputation and leadership and improved employee engagement and innovation) important to customer access and sales (see **page 55** for guidance).
2. Determine the importance of product and/or company sustainability to individual, business and government customers.
3. Evaluate the role of property sustainability in the context of customer demand/requirements for sustainability.
4. Gather sales data for the relevant parts of the business impacted by the deep retrofit.
5. Develop a range of estimates of the potential impact on company sales taking into consideration the relative role of the deep retrofit project in company sustainability, potential minimum requirements of customer segments, and other factors.

PRESENTING RETROFIT-RELATED CUSTOMER ACCESS AND SALES VALUE TO DECISION MAKERS

While all seven principles of presenting retrofit value (see **Appendix A**) are relevant for presenting value from customer access and sales, it is possible that the quantitative information in this section will not be supported or documented well enough to rely upon in the presentation. Even if no quantification of value is attempted (based on some percentage of sales), it is likely that there will be compelling evidence to textually present regarding current and future expected trends in individual, business, and government customers. This presentation will be quite compelling to senior decision makers concerned about continuing access to customers.

CALCULATING AND PRESENTING
DEEP RETROFIT VALUE

PROPERTY-DERVIED REVENUES

8

8. PROPERTY-DERIVED REVENUES

Deep retrofits can provide additional company revenues from the enhanced demand for deep retrofit properties from potential tenants in the event a company must lease some of its space or from potential buyers of the property in the event a company must sell. Additional "other" revenues can be generated from power purchase agreements, energy services agreements, renewable energy certificates, and government/utility tax credits, rebates, or other subsidies.

Numerous statistical studies have been published during the last five years that establish the basis for deep retrofit rent, occupancy, and sales price premiums in larger office buildings (see Table 7).

TABLE 7

EVIDENCE OF SUSTAINABLE OFFICE VALUE

STUDY	Rental Premium	Occupancy Premium	Sale Price Premium
Eicholtz, Kok & Quigley Dec 2010	ES: 2.1% LEED: 5.8%	N/A	ES: 13% LEED: 11.1%
Wiley et al. 2010	ES: 7–9% LEED: 15–17%	ES: 10–11% LEED: 16–18%	N/A
Fuerst and McAllister Mar 2011	ES: 4% LEED: 5%	N/A	ES: 26% LEED: 25%
Eicholtz, Kok, et al. April 2011	ES/LEED: 3%	N/A	ES/LEED: 13%
Newell, Kok, et al.; Australian Study Sep 2011	Green Star: 5% NABERS: N/A	N/A	Green Star: 12% NABERS: 2–9%
Miller, Morris & Kok; Retrofit Study Fall 2011	LEED EB: 7%	N/A	N/A
Pogue et. al.; Do Green Bldgs. Make $ & Sense 3.0 Fall 2011	LEED: 4.11%	3.14%	N/A
Bernstein, Russo, McGraw Hill/Siemens 2012	13%	16%	10%

While there is still significant debate in the industry about the accuracy/reliability of the numerical results of the studies, they all establish a positive relationship between sustainability/energy efficiency and value enhancement. Increased subleasing, property sales, and other revenues directly translate to value by increasing enterprise revenues, which in turn increases earnings, which are translated into value by a price earning multiple that reflects the risks the market sees in the earnings.

In addition to the direct value from increased revenues, the improved ability to sublease and sell a property provides valuable flexibility to an occupant. In RMI's deep retrofit model, we factor this valuable benefit in when discussing the risk mitigating benefits of deep retrofits in value element three, retrofit risk mitigation.

SUBLEASING

Many owner-occupants sublease significant amount of space in buildings they own. Deep retrofits can increase enterprise revenues by increasing the demand for sublease space, which translates into higher revenues through faster absorption of the space, increased occupancy rates, and potentially enhanced rent and/or lease terms. Deep retrofits increase the demand for space largely as a result of enhanced sustainable reputation and leadership and more healthy, productive, and satisfied employees.

A full discussion of how deep retrofits influence space user demand and related rents, occupancies, and sales prices can be found in the expanded chapters of *Value Beyond Cost Savings*.*

PROPERTY SALES

Many owner-occupants eventually sell buildings they own. Deep retrofits can increase enterprise revenues by increasing the sales price of buildings sold and/or increasing the speed at which a building is sold. Both the amount and speed of sale is driven by higher demand by potential tenants, which contributes to higher demand by potential buyers.

In addition to increased tenant demand, many potential buyers are beginning to place a higher priority on energy efficiency and sustainability, making deep retrofits a "premium" commodity. This growing investor demand is particularly strong for larger corporate buyers, but many buyers will pay extra for a completed deep retrofit that enables them to move in directly without any of the risks of completing the retrofit, including potential tenant/employee disruption.

OTHER REVENUES

Sustainable properties can generate specialized revenue streams from power purchase agreements, renewable energy certificates, and a wide variety of government and utility tax credits, rebates, and other subsidies.

* See Expanded Chapter VI, section titled "Underwriting Space User Demand" on pages 55 to 72 and Expanded Chapter V, section titled "Process for Determining Model Inputs", pages 73 to 76. Additional detail on market evidence can be found in Expanded Chapter V, section titled "Presentation of Market Performance Evidence", pages 127 to 151 and in GBFC research library code 15.

EXAMPLES

DEEP RETROFITS AND OTHER REVENUE SOURCES

A power purchase agreement (PPA) is a legal contract between an electricity generator (building owner) and a host site owner or lessor. The host site owner or lessor purchases energy or capacity (power or ancillary services) from the building owner, which can generate additional revenues. The rationale for PPAs goes beyond revenue, which can be modest in many cases depending on the energy generation potential, risks undertaken, and ability to sell back excess energy to utilities. Renewable energy investment can improve the ability to achieve valuable sustainable certifications, reduce carbon use, and accordingly help space users meet government, stakeholder, and internal sustainable compliance goals.

Renewable energy certificates (RECs), also known as green tags, renewable energy credits, or tradable renewable certificates (TRCs), are tradable environmental commodities in the United States which represent proof that one megawatt-hour (MWh) of electricity was renewable (generated from an eligible renewable energy resource). RECs have been more widely used with specialized renewable energy sources like wind farms, but have growing applicability to buildings. Revenues likely will be limited relative to total revenues or revenue enhancement from increased occupant demand.

Government and utility tax credits, grants, rebates and other subsidies are widely available for specific deep retrofit properties. The specifics are tightly tied to the location of the property. In most cases, these revenues are front loaded and will be applied as a development cost mitigator in value element one, retrofit development costs. It is important to include these valuable benefits in a valuation calculation and presentation to a retrofit capital provider, but equally important to not double count them.

Demand response programs help protect the electrical grid during times of peak energy demand, and many utilities now offer load management programs where the utility pays customers to reduce energy consumption during peak energy periods. These programs have primarily been used by larger customers, but smaller customers are being targeted in the future as technology improves in buildings of all sizes. However, participating in a traditional demand response program can require a significant amount of time working with the utility and managing consumption during peak periods. In addition, detailed plans need to be developed and implemented to avoid business disruptions and occupant discomfort.

PROPERTY-DERIVED REVENUES

CALCULATING VALUE FROM PROPERTY-DERIVED REVENUES

The specific magnitude of value enhancement will be property specific, based on subleasing, sales, and other revenue strategies and practices as well as location dependent grants, rebates, and other subsidies.

Subleasing

1. Assess the level of subleasing in the subject building and known subleasing plans/strategies in the building for the future. This assessment should also include an assessment of the existing subleases and rollover dates. The value related to unanticipated subleasing would be covered in the risk-mitigation section under property operating risks in value element three.
2. Estimate the importance of deep retrofit space to potential tenants for the specific building and market (see subleasing discussion above).
3. Estimate the influence of the deep retrofit on the key value variables—tenant retention, speed of absorption, occupancy, rents, and lease terms.
4. With these estimates it is a relatively simple mathematical exercise to calculate the potential deep retrofit subleasing revenue benefit. The total amount of revenues from the subleased space, assuming no deep retrofit, can be subtracted from the total revenues from the sublease, assuming a deep retrofit, to get an estimate. Be sure to use a consistent discount rate to bring estimates to present value.

This analysis may sound difficult, but is consistent in difficulty and approach to the traditional process of analyzing market demand and determining value inputs in typical acquisition due diligence and valuation work. A full discussion describing how to do this can be found in chapter V of Value Beyond Cost Savings, and is the subject of the second report in RMI's Deep Retrofit Value Project, How to Calculate and Present Deep Retrofit Value for Investors.

Property Sales

1. Assess whether a property sale is planned and use that estimated date of sale in the calculation. If no sale is planned, choose an assumed sale date in the future (use 10 years unless there is evidence to the contrary) and run the calculation from that date.
2. Assess the potential increase in sales price and reduced time to sell for the subject property. This can be based on a limited assessment of most likely buyers and their interest in deep retrofits as well as other market derived evidence of sales price premiums from sustainability.*
3. The final calculation is a relatively simple assessment of sales price premium (additional revenues upon sale at the date of sale) and bringing the revenues to present value with the use of a discount rate.

Other Revenues

Calculation of these revenues is based primarily on an investigation of the "other revenue" strategies/practices being implemented and a sound accounting of revenue implications, with particular attention paid to when the revenues would be generated and proper discounting of future revenue streams.

* Detail on market evidence for sales price premiums for sustainable/energy efficient buildings can be found in Expanded Chapter V, section titled "Presentation of Market Performance Evidence," pages 127 to 151 and in GBFC research library code 15.

PROPERTY-DERIVED REVENUES

PRESENTING PROPERTY-DERIVED VALUE EVIDENCE TO DECISION MAKERS

The general guidelines for presentation all apply in presenting property derived revenues and value evidence. It is particularly important to clearly present the assumptions underlying the sublease and property sales analysis and the rationale for the estimated premiums for a deep retrofit.

It is also important to use ranges for potential premiums due to a deep retrofit to reflect the fact that it is unlikely that this space user and buyer analysis can be carried out with the level of diligence and analysis typical in the acquisition of a new building or full property valuation analysis. Round all numbers and estimates and do not presume or present a level of precision on inputs or outputs that defies common sense.

CALCULATING AND PRESENTING
DEEP RETROFIT VALUE

ENTERPRISE RISK MANAGEMENT / MITIGATION

9

9. ENTERPRISE RISK MANAGEMENT/MITIGATION

*Deep retrofits can significantly contribute to mitigating some of the most pressing business risks facing companies today, primarily by contributing to the enterprise's performance as measured by sustainability reputation and leadership; individual occupant health, productivity, and satisfaction; and space flexibility. The historic focus on energy cost savings alone leaves out valuable contributions of deep retrofits, and focuses on a low-priority issue for occupiers.**

In this section we deal primarily with short- to medium-term risk issues faced by the organization. Longer-term risk issues from changes in climate and degradation of environmental resources can have very significant costs to many companies, varying by geography and company type. Work is underway to better internalize these longer-term risks at the company level, and should be factored into this analysis as appropriate.

It is important to understand that while the value benefits of this section are also closely tied to how a deep retrofit influences a company's sustainable reputation and leadership, it is not double counting in that the value of sustainable reputation and leadership independently affects various of the nine value elements.

DEEP RETROFITS AND KEY BUSINESS RISKS

To better understand how deep retrofits mitigate business risks, it is instructive to evaluate the key risks businesses are facing. Recent global business risk surveys by Ernst & Young and Aon identified key business risks (see Table 8, next page).

Climate change or environmental risks did not make the top ten issues of concern to businesses globally. The relative ranking of energy efficiency/climate in these surveys is consistent with a survey done in 2008 prior to the long economic downturn that found energy efficiency ranked 10th of those issues key to occupiers of offices:

KNIGHT FRANK SURVEY OF FACTORS DRIVING LEASE DECISIONS[97]

1. Rental cost
2. Retention of key staff
3. Lease flexibility
4. Space efficiency
5. Higher quality environment
6. Occupational flexibility
7. Proximity to public transit
8. Proximity to clients/competitors
9. Higher building profile
10. Energy efficiency

The above rankings of the issues concerning business leaders provide some explanation of why occupants of buildings have been slow over the last 15–20 years to invest in energy efficiency, and even today limit investment in deep energy/sustainability retrofits to that which can be justified by energy cost savings alone. However, even a brief assessment of the top ten lists in Table 8 provide ample evidence of the potential risk mitigation value deep retrofits can provide beyond energy cost savings.

* Energy efficiency ranked last of the top ten key issues to occupiers in a survey of corporate real estate directors of 100 top companies with over 40,000 employees. Retention of key staff, lease flexibility, and higher quality office environment were all ranked in the top five issues in the survey. Central London Occupier Survey, Knight Frank, September 2008.

TABLE 8

KEY BUSINESS RISKS

BUSINESS RISK ISSUE	Ernst & Young Ranking[98]	Aon Ranking[99]
Pricing Pressure / Competition	1	3
Cost Cutting and Profit Pressure	2	3
Market Risks	3	6
Macroeconomic Risk / Slowdown	4	1
Damage to Reputation/Brand	Not Ranked	4
Talent Shortages / Staff Retention	5	5
Expansion of Government Role	6	Not Ranked
Regulation and Compliance	7	2
Business Interruption	Not Ranked	7
Sovereign Debt Crisis / Austerity	8	Not Ranked
Emerging Technologies	9	Not Ranked
Commodity Price Risk	Not Ranked	8
Cash Flow / Liquidity Risk	Not Ranked	9
Political Shocks / Risks	10	10

EXAMPLES

ENTERPRISE RISK MITIGATION

- Business leaders themselves, who reported taking the following sustainability-related actions in 2012, reinforce the clear link of how deep energy retrofits can mitigate enterprise risk:
  - 63 percent reduced energy use in operations
  - 51 percent managed corporate reputation for sustainability
  - 46 percent responded to regulatory constraints or opportunities
  - 26 percent improved employee retention and/or motivation
  - 22 percent mitigated operational risk related to climate change
- A survey of 3,000 corporate executives from 113 countries by MIT and the Boston Consulting Group found that once sustainability is on the management agenda, it stays there. Seventy percent of companies have placed sustainability on their permanent management agendas, and almost none say they plan to reduce their commitments.[100]
- A 2010 survey of 766 CEOs from around the world found that 93 percent view sustainability as a critical driver of their company's future success, and up to 81 percent responded that sustainability is an important factor in strategy and operations.[101]
- Companies with a positive ESG (environmental, social, and governance) reputation were shielded from a decline in stock price around the time of the dramatic protests that disrupted the 1999 World Trade Organization (WTO) ministerial meetings in Seattle—even if those companies operated in industries more broadly regarded as environmentally damaging and labor-abusing.[102]
- Ernst & Young published the results of a corporate real estate survey focused specifically on projects that reinforce sustainability initiatives, including how deep retrofits can contribute to earnings growth and risk mitigation.[103] While 93 percent of respondents cited energy costs as a driver of sustainability initiatives, over 80 percent of respondents cited other key factors including changes in consumer demand, brand risks, increased shareholder expectations, competitive threats, and new revenue opportunities.
- A McKinsey 2012 Business of Sustainability study shows how businesses are using sustainability to create value.[104] In this study, they separated the 3,203 survey responses into two groups; 10 percent that they called "sustainability leaders" and the remaining 90 percent that they called "all other respondents." Most businesses were involved in many activities that would benefit from deep retrofits (see Table 9, next page).
- In a 2013 survey of over 600 corporate real estate executives that identified the key areas of increasing demand being placed on them, 54 percent cited driving the sustainability agenda, and 65 percent cited transforming the quality of the workplace (see Table 10, next page).

TABLE 9

ACTION FROM LEADERS AND OTHERS ON SUSTAINABILITY

VALUE-CREATION LEVER	LEADERS Taking Action	ALL OTHERS Taking Action
Managing corp. reputation for sustainability	77%	49%
Reducing energy use	76%	61%
Reducing emissions	73%	40%
Responding to regulatory constraints or opportunities	64%	44%
Mitigating operational risk related to climate change	44%	19%
Improving employee retention or m otivation	44%	19%

TABLE 10

KEY DEMANDS BEING PLACED ON CORPORATE RE EXECUTIVES

Enhancing the productivity of the real estate portfolio	68%
Transforming the quality of the workplace	65%
Presenting scenarios and solutions to the business	65%
Bringing more flexibility to the portfolio	56%
Enabling remote or mobile working	55%
Driving the sustainability agenda	54%
Aligning CRE with business drivers and functional areas	53%
Delivering a platform for growth in select markets	46%
Attracting and retaining talent	46%

ANALYZING ENTERPRISE RISK

There are numerous ways to think about the value of a business enterprise. Regardless of the method, it is impossible to determine a company's value, or properly assess any financial analysis of a deep retrofit investment, without an assessment of risk. This risk is determined through an examination of the key value drivers such as company products, markets, reputation, leadership, strategy, organizational structure, debt and equity structure, capital reserves, balance sheets, and ability to maintain and/or enhance its competitiveness.

The analysis of enterprise risk in a deep retrofit capital funding presentation can provide an extra layer of valuable benefits for decision makers to consider. Higher levels of energy and sustainability performance from a deep retrofit can reduce current and future regulatory risk, lower health and other employee costs, maximize space flexibility, and promote the brand and reputation of the company, improving customer access and mitigating financial shocks to the company. These additional risk benefits can be quite valuable, and ignoring or not properly presenting them could lead corporate leaders to underinvest in property energy efficiency/sustainability, lowering company value and threatening future profitability.

The issue of energy price risk, while ranked relatively low in the surveys above can be an important issue for some companies and can be measured. Energy prices in the past ten years have gone through some rapid price swings. If less energy is used and energy flexibility is enhanced, the risk from these price swings can be significantly moderated. While not the most important issue to many executives, it is a critical issue to society overall, and provides some downside event risk management benefits that can be valuable.

ESG Performance and Value

Strong environmental, social, and governance (ESG) performance, including a strong sustainability reputation and brand enhanced by deep retrofits, is gaining more attention with shareholders/investors. Over 1,100 financial services firms (including asset owners, investment managers, and professional service partners) have signed the United Nations Principles for Responsible Property Investment[105]—jointly managing over $32 trillion in assets.[106] These signatories agree to incorporate ESG issues into their investment and operational decision making, among other things.

According to research by Deloitte & Touché, a positive ESG reputation adds an extra layer of protection in the event of risks/shocks to the company.[107] ESG disclosure is valuable because it helps a company demonstrate that it is managing its risks and has a track record of paying attention to ESG performance.

While statistical studies have focused on the effect of ESG performance on public company stock prices, the link of deep retrofits, and related more positive ESG performance, is much better established in evaluating how improved sustainability reputation and leadership affects employee costs (recruiting and retention), promotions and marketing costs, customer access and sales, subleasing and property sales revenues, and enterprise risk specifically. The details of this research are presented earlier in this practice guide.

CALCULATING THE VALUE OF RETROFIT-RELATED RISK MITIGATION

Enterprise risk differs from property-related development and operating risks addressed in value element three, and is best calculated and presented separately. Whereas the retrofit development risk mitigation section applies a more traditional underwriting approach to assessing the potential success of a deep retrofit project, the enterprise risk section focuses on an assessment of the potential benefits of the proposed deep retrofit to the company.

The presentation of the value of enterprise risk mitigation might involve some value calculations, but the majority of the presentation will be in the form of a structured analytic discussion. Specific calculations of the enterprise cost and revenue implications of many of the risk issues will be addressed in the earlier value elements. Accordingly, the process for calculating/assessing how a deep retrofit can create value from risk mitigation will broadly follow the following steps:

1. Assess key business risks: The key business risks and company priorities identified above can serve as a starting hypothesis of what is important, but the reality for a specific company might be quite different. The Aon Global Risk Management Survey provides significant detail on the importance of different risk issues by industry segment that can also provide a good starting point.
2. Evaluate the proposed deep retrofit: Evaluate how the retrofit will result in proposed property outcomes, how the property outcomes generate performance, and finally how performance creates value for each value element (numbers 4, 5, 6, 7, and 8) in this report. It is important to be as specific as possible in articulating how the retrofit will generate a positive sustainable reputation as described in value element six.
3. Assess and document the importance of the deep retrofit to performance outcomes: The relative importance of the deep retrofit will be determined by a number of factors including the size and importance of the building to the company, the number of customers, employees, and other stakeholders that interact with the building in real time or through company marketing, and the importance of the real estate/building industry to the company's brand and product/service offerings. Buildings, as tangible hard assets, often have oversized impacts on sustainability brand and reputation.

PRESENTING THE VALUE EVIDENCE TO RETROFIT DECISION MAKERS

In addition to the seven principles of deep retrofit value presentations in Appendix A, it is particularly important to not overstate the importance of the deep retrofit to the company's overall reputation or make other questionable assumptions that would undermine the analysis. It is also appropriate to acknowledge the difficulty of attributing too much of the company's sustainability reputation to a single property, while also making the case for the much more significant value of a portfolio-wide policy of deep retrofits, reinforcing the long-term nature of real estate asset decisions.

A key component of presenting risk analysis, either at a property or company level, is to emphasize the negative consequences (downside risk) of failing to act. In many cases, high levels of energy efficiency/sustainability performance are becoming minimum standards for meeting shareholder, employee, customer, regulator, and other stakeholder criteria. Calculating the positive value of minimum standards can be tricky, but presenting the cost/risk of not meeting minimum standards of important stakeholders is both easy and quite compelling.

SAMPLE DEEP RETROFIT VALUE REPORT

INTRODUCTION

This section presents a sample summary of a deep retrofit value report to provide an illustration of how the calculations and analyses completed for each of the nine value elements come together in a document to support deep retrofit investment decisions.

The sample report presented below is based on an actual property, although many of the occupant- and property-level assumptions are hypothetical for illustrative purposes. This deep retrofit value summary report would typically be supported with additional analysis and spreadsheets for each of the nine value elements.

The format of a deep retrofit value report can vary, depending on the specific retrofit situation. In some cases, the report might be in a PowerPoint format and in others a more formal due diligence or narrative valuation report. In other cases, a brief two-page memo explaining a rationale for replacement of key equipment or software might be appropriate. In all cases, such reports should follow the seven principles of deep retrofit presentations, including knowing the audience, specificity, and comprehensive risk assessment.

For most situations, a deep retrofit value report will be structured around the nine value elements and will typically supplement an analysis of return, payback, or net present value based on energy and other cost factors. The final presentation to decision makers must combine all analyses while avoiding double counting. In many situations it is appropriate to only present a subset of the nine value elements.

Engineering Co.
Deep Retrofit Value

SAMPLE REPORT

Engineering Co. Deep Retrofit Project Assumptions

Building Description

The 20-story, 300,000-square-foot office building in Southern California is a conventional (non-green) office building built in the mid-1980s, and is owned and occupied by a large engineering firm (Engineering Co.).

Company (Occupant) Description

Engineering Co. has 1,500 employees, annual revenues of $225 million, and salary costs of $110 million. The firm pays $8,000 per employee in health costs, while the employee pays $10,000.

Pre-Improvement Building Operating Expenses Include:

Janitorial	$200,000
Window Cleaning	$50,000
Repairs and Maintenance	$500,000
Utilities	
Electricity	$600,000
Gas	$40,000
Chilled Water	$500,000
Water and Sewer	$20,000
Security	$200,000
Real Estate Taxes	$2,200,000
Insurance	$180,000

Energy Efficiency/Sustainability Improvements

The owner is considering a substantial renovation of the property, while also seeking energy savings of 50 percent or more and a superior sustainability rating of at least LEED Gold. The owner wants to be a sustainability leader for its employees, customers, investors, and other stakeholders. The property should significantly reduce energy and water use, but also increase daylighting, improve ventilation, use sustainable materials, and employ sustainable operating practices.

To reach these goals, the proposed retrofit will include installing window films, increasing the use of daylight in interior spaces, upgrading the HVAC systems (to increase the use of natural ventilation and heat recovery), replacing existing light fixtures with a redesigned LED lighting scheme, and incorporating other sustainable features necessary to achieve a LEED Gold rating. The retrofit is projected to cost $7,500,000, and save 50 percent of pre-retrofit energy costs, or $570,000 per year.

Finance Assumptions

While PACE and new utility on-bill financing mechanisms were considered, given timing considerations and other factors, Engineering Co. chose to fund the retrofit from company equity and use local and federal government subsidies.

Preliminary Cost-Based Financial Analysis

Preliminary financial analysis based on the incremental cost estimates to achieve Energy Co.'s sustainability and energy goals suggest a 13-year simple payback and simple ROI of 7.6 percent, well below the company's equity hurdle rate for investment. A full assessment of the potential accuracy of forecasts or other design, execution, or operational risks inherent in the proposed deep retrofit project was not presented.

Accordingly, Engineering Co. asked its consultants to do additional analysis and come back with a supplemental deep retrofit value report that calculates and presents all the value elements of the deep retrofit and more clearly identifies the project risks.

Engineering Co's Deep Retrofit Value Report Summary

Based on the initial cost-based assessment of the proposed deep energy retrofit, the net present value (NPV) of the proposed retrofit was a negative $2.25 million and appeared not to be financially viable given company return hurdle rates and risk tolerance.

However, as summarized in the table and analysis below, when the complete value of the deep retrofit to Engineering Co. is calculated, and both positive and negative risks to Engineering Co. are assessed, the net present value of the project ranges from $3.36 million to $16.83 million with a simple rate of return of 24 to 55 percent, well in excess of Engineering Co.'s hurdle rate.

As discussed below, the wide range is a result of substantial employee cost savings due to recruiting and retention and productivity benefits.

Additionally, as shown in our detailed assessment and presentation of risk,* the proposed deep retrofit did a reasonable job of risk mitigation through execution of many recommended deep retrofit process best practices and judicious use of traditional risk management practices.

A summary of the conclusions for each value element is shown in Sample Report Table 1 and discussed in more detail below.

* This is a reference to a more detailed risk analysis document (not presented here) that would typically accompany a Summary Deep Retrofit Report.

Sample Report Table 1

Deep Retrofit Value Report Summary: Engineering Co.

	Value Element	Leaders Taking Action	Supporting Analysis
1	Retrofit Development Costs	$831,000 development cost offset	Tax credits, grants, and avoided costs
2	Non-Energy Operating Costs	$105,400 reduction in annual operating costs	Improved space utilization, insurance discount, reduced maintenance costs
3	Retrofit Risk Mitigation	Best practice risk mitigation practices implemented well	Deep retrofits subject to construction-related risk as well as new products, systems, service providers which are mitigated well, putting outcomes within normal business risk parameters considered
4	Health Cost Savings	$275,000 reduction in annual health costs	Reduction in absenteeism
5	Employee Cost Savings	$137,500 to $1,787,500 in annual employee cost savings	Recruiting/retention cost savings; worker productivity (salary) cost savings
6	Promotions and Marketing Costs	$0 to $ 450,000 cost savings per year	Brand promotion cost reduction, reduced customer acquisition and closing costs
7	Customer Access and Sales	Increased annual sales of $0 to $1,125,000, or earnings of $0 to $112,500 annually	Conservative estimate based on potential limitations on customer access—which must be factored into enterprise risk analysis
8	Property Derived Revenues	Increased net present value of property $1,385,000	Assumed 4% sales price increase and sale in year 7
9	Enterprise Risk Mitigation	Increased company NPV of $867,500	Assumes slight increase in earnings multiple due to significant contribution to reducing key company business risks including competitive and stakeholder pressures, brand management, talent recruiting and retention, and future regulatory risk

Property Costs and Risks

1. Retrofit Development Costs

While retrofit development costs generally were outside of the scope of the initial deep retrofit value report, a review of the calculation of the "deep retrofit premium"—the incremental cost of the energy efficiency and sustainability improvements—uncovered a number of value elements that were not considered in the retrofit development cost estimate, resulting in an $831,000 offset to upfront development and future capital costs:

- The deep retrofit resulted in significant mitigation of future costs (avoided costs) to replace and repair a variety of systems in the building scheduled for replacement. This avoided capital cost resulted in an NPV improvement of $431,000 for the project.
- The incremental development cost estimate failed to fully deduct the value of tax credits and subsidies employed by Engineering Co., such as Federal 179D tax credits that offer energy efficiency tax deductions of $0.30 to $1.80 per square foot as well as state business tax credits. In addition, the local government and utilities both offered small grants as incentives for deep energy efficiency retrofits. Added together, these development cost subsidies offset $400,000 of the retrofit development costs.

Property Costs and Risks (cont.)

2. Non-Energy Operating Costs

Our analysis of non-energy operating costs identified an additional annual operating cost savings of $105,400 as discussed below.

Water Costs

There was no need to address water costs as the initial cost-based project analysis addressed water cost savings well.

Churn Costs

Cost savings from reduced churn costs (cost associated with internal moves) are possible due to the resulting space use plan, but since an underfloor ventilation system was not part of the plan, and some of the space usage strategies may be considered non-sustainability-related changes, no churn cost savings were assumed.

Space Utilization Cost Savings

Due to reduced space requirements of smaller HVAC and other systems as a result of deep energy efficiency savings, we estimate a rental cost saving of $60,000 per year.

Space Utilization Cost Savings

A 1,500-square-foot increase in useable space represents a rental cost saving of $60,000 per year based on an assumed rent of $40.00 per square foot.

Property and Casualty Insurance Costs

A 5 percent discount on property and casualty insurance was available from select reputable carriers, resulting in an annual cost savings of $9,000. Equally important to the cost savings in the "green" insurance policies are the terms that allow replacement to green standards.

Insurance Cost Savings

$180,000 x .05 = $9,000 annual savings

Maintenance Costs

Historically, the owner spends $1.67 per square foot on basic operations and maintenance (O&M), excluding major capital expenditures. With the proposed deep energy retrofit that reduces total energy demand, many systems become simpler. In particular, lighting improvements will replace T12 fluorescent lighting fixtures with LEDs that reduce the number of times bulbs need replacing. Although other improvements are expected to generate O&M savings, the client prefers to only include labor and material cost savings from switching to LEDs due to the uncertainty of other savings cost estimates given existing data.

LEDs: LEDs won't need to be replaced in the lifetime of the analysis (10 years), but fluorescents will need to be replaced approximately every five years. The building has 2,800 light fixtures, and these fluorescents cost approximately $15 per replacement. Each fluorescent needs to be replaced every five years, and electricians cost $100 per hour and can replace a bulb in .5 hours. While the $15 dollar bulb savings might be categorized as avoided cost, we include it here in our assessment of maintenance cost savings.

Lighting Replacement Cost Savings

2,800 bulbs / 5 years = 560 replacements per year
x ($15 + $100 x .5) = $36,400 annual savings

We have presented only one category of estimated maintenance cost savings. Often, a range applying sensitivity analysis is required to account for likely variability. For example, there may be no or limited cost savings, at least in year one, as the new LED systems might require non-standard commissioning, and other systems likely require some learning on the part of maintenance staff. However, other savings, due to smaller, simpler, and newer HVAC systems might accrue.

Property Costs and Risks (cont.)

3. Retrofit Risk Mitigation

Risk of execution and performance as designed for the project has been well mitigated by traditional risk mitigation techniques and risk mitigating process best practices implemented during the launch and design phase, and contemplated (planned and budgeted) actions to be undertaken in the finance, construction, and operations phase of the project.

The initial cost-based deep retrofit analysis was prepared employing many best practice retrofit processes, including a modified integrated design process, a reasonable stakeholder engagement and goal setting process, a sound and experienced team, lawyers experienced with deep retrofit projects and related contracts, intelligent timing and sizing of system replacements, and funding for commissioning and retro-commissioning, but it failed to present these steps in a structured fashion to provide retrofit capital decision makers proper context for understanding the financial projections provided.

Additionally, the proposed retrofit project employed standard traditional risk mitigation techniques including insurance covering loss of business income, “all risk” causes of loss in construction, and performance bonds. Information on product warranties was not analyzed, but our review suggests product and equipment warranties appear to be in place.

In the attached Deep Retrofit Process Best Practices Analysis we provide our assessment of what was covered well in the initial proposal but not documented, and provide additional analysis of business interruption risk, operations and maintenance plans, energy modeling risk and uncertainty, product warranties, and select other areas of potential risk that need additional documentation and assessment.

Enterprise Costs

4. Health Costs

Health cost savings of $275,000 per year are projected for the proposed retrofit as discussed below.

The improvements planned are expected to generate substantial positive health outcomes to employees.* Targeted ventilation improvements, increased daylighting and access to outside views, use of healthy materials in the construction and operation of the property, and other measures planned, have been shown to produce positive mental and physical health outcomes in employees. These positive outcomes can reduce health cost premiums for employees as well as Engineering Co., decrease absenteeism and presenteeism, and reduce potential legal and regulatory exposure as research on building impacts improves and laws and regulations change.

Based on discussions with human resources, they acknowledge the potential future benefits to reduced health costs as well as the other benefits, but felt that absenteeism was the most tangible current benefit. Accordingly, we focus our financial assessment on absenteeism and account for potential risk reduction in other areas of health in our assessment of enterprise risk—value element nine.

Absenteeism

With a 2.5 percent rate of absenteeism due to sick days (meaning that 2.5 percent of employees are out sick on an average day), the owner decides to target improvements to the ventilation systems, to better ensure thermal comfort and provide fresh air. In addition to energy savings from a new HVAC system, the owner conservatively hypothesizes a 10 percent reduction in the rate of sick days from the newly improved retrofitted office. This results in an annual salary cost savings of $275,000.

Salary Cost Savings

$110,000,000 x .025 x .10 = $275,000

in potential cost savings due to fewer sick days.

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* Based on existing research about how retrofits like those planned affect employee health (see attached detail on this research).

Enterprise Costs (cont.)

5. Employee Cost Savings

Employee cost savings from deep energy retrofits are derived from reductions in employee recruiting and retention costs and increased worker productivity. Together, the potential cost savings for Engineering Co. are substantial, ranging from $137,500 to $1,787,500 as summarized below.

Worker Recruiting/Retention Cost Savings

There is substantial and growing evidence in the market that employees care about the sustainability reputation of their companies and work environments. This is particularly true for younger employees, employees in professions with a strong relationship to sustainability, and employees, like engineers, who are in high demand.

To further support our assessment of the importance of sustainability to Engineering Co.'s employees, we interviewed people in Engineering Co.'s recruiting and human resources departments and the sustainability director. Based on these interviews and evidence they provided us from internal company employee surveys, we conclude that Engineering Co.'s employees and potential employees prefer employers who visibly and actively work to improve the environment.

The head of HR estimates that approximately 1.25 percent of staff time is spent on recruiting and training new employees, and that those costs can be lowered by reducing staff turnover. Ascertaining exactly to what degree employees leave an organization due to their office environment can be difficult.* Using an estimate that average turnover might increase from 150 weeks to 165 weeks (a 10 percent improvement), the lowered costs to replace those staff would be $137,500 annually.

Employee Cost Savings

$1.375 million per year x .1 = $137,500 annual savings

Productivity Cost Savings

Most productivity cost savings studies isolate productivity gains from specific measures like improved HVAC systems, daylighting, and temperature control. Improved ventilation, thermal comfort, and improved cognition (from daylighting and better lighting) are retrofit outcomes that are significant contributors to productivity.

The proposed retrofit incorporates a majority of the measures that have been shown to generate superior productivity based on studies to date. Accordingly, given this analysis and the uncertainty of productivity estimates, we have calculated potential cost savings assuming a productivity increase of 0 to 1.5 percent, providing retrofit capital decision makers the opportunity to draw their own conclusions about this very valuable outcome of deep retrofits.

Productivity Cost Savings

Assuming average annual salary costs of $110,000,000 and a productivity increase of 0 to 1.5 percent, potential salary cost savings would range from 0 to $1,650,000.

* Surveys, including those provided by the Center for the Built Environment (http://www.cbe.berkeley.edu/) can help in this task.

Enterprise Costs (cont.)

6. Promotions and Marketing Costs

Estimating potential marketing and promotion cost savings from deep retrofits is not a precise science, but based on our assessment discussed below we estimate cost savings of $0 to $450,000 per year, for the next five years.

The proposed deep retrofit represents tangible physical evidence of Engineering Co.'s sustainability commitment, visible to clients when they visit and/or see the property in company promotional materials. As Engineering Co. is intimately involved in building and design, its headquarters building is an important symbol of its commitment to high performance building. Additionally, the high level of energy efficiency and sustainability contributes positively to the company and property's sustainability ratings that are measured in numerous external ratings and rankings of the company.

The marketing department suggests that Engineering Co.'s clients, including government and business clients, are increasingly concerned about sustainability, and a growing number of them are in the process of developing procurement guidelines that include vendor sustainability/energy performance in their decision making.

Based on further discussions with the marketing department, we learned that Engineering Co.'s marketing budget is 10 percent of their revenue.* With revenue of $225,000,000, marketing costs are approximately $22,500,000. We estimate that promotions and marketing cost savings stemming from the building's contribution to the company's reputation and leadership, as well as reduced time and cost to acquire and close clients, at between 0 and 2 percent of marketing costs per year, or from $0 to $450,000 per year. Considering many clients could be inaccessible if Engineering Co. does not keep up its sustainability reputation this estimate may be conservative.

* Close to the average for the industry of 10.4% of revenue.

Enterprise Revenues

7. Customer Access and Sales

Increased revenues as a result of the proposed deep retrofit could provide 0 to $1,125,000 dollars per year. This is based on an assumption of a 0 to 0.5 percent increase in sales (or alternatively avoided loss of sales) and increased annual earnings of $0 to $112,500 based on Engineering Co.'s 10 percent profit margin. Assuming a standard industry earnings (EBITDA) multiple of approximately 3 for engineering firms, this would equate to a value increase of $337,500. Support for our analysis is summarized below.

The marketing department indicates that many of the firm's clients have become concerned about sustainability issues.* Given Engineering Co.'s 15 percent of revenues from federal government contracts it was particularly concerning when Executive Order 13514 was issued requiring 95 percent of new contracts with the GSA to meet sustainability requirements. In light of these factors, and the growing importance of sustainability-related services to the company, we have assumed an annual increase in sales of 0 to 0.5 percent.

An additional potential boost to sales that is more difficult to measure at this time is the affect of more healthy, productive, satisfied, and engaged employees on product and sales innovation, work quality, and other intangibles that a motivated workforce bring to the company. While human resources have just begun initiating internal employee surveys to measure some of these issues with employees, initial indications are that a high performance deep retrofit will positively affect employee contribution to sales. We have not calculated any additional sales as a result of these deep retrofit benefits, but suggest continued monitoring of employees to aid future retrofit capital decisions.

8. Property-Derived Revenues

The proposed deep retrofit will increase the net present value of Engineering Co.'s building by approximately 4 percent, or $2,700,000 assuming a sales price of $67,500,000 ($225 per square foot). Since Engineering Co. has no current plans to sell the building, but could as business conditions change, we have assumed a sale in 7 years, and discounted the premium to present value assuming a 7 percent discount rate resulting in a net present value increase of $1,385,000.

Our assumption of a 4 percent increase in sales price is supported by evidence from over half a dozen research studies that on average demonstrate sales price increases of over 10 percent for LEED and/or Energy Star certified buildings. Additionally, the capitalized value of energy cost savings alone (which directly increase the net operating income) exceeds a 4 percent sales price increase.

Other potential sources of deep retrofit-related revenue from Engineering Co.'s ownership of their building would be revenue from power purchase agreements or increased revenue and occupancy in sublet space. Since Engineering Co. does not currently lease any space or have a power purchase agreement, no additional revenues are assumed.

* A recent survey indicated 83% of corporations are beginning to talk with their suppliers about measuring sustainability.

Enterprise Risks

9. Enterprise Risk Mitigation

The proposed deep retrofit will positively contribute to reducing the business risks of Engineering Co. as a result of its contribution to its sustainable reputation and leadership and improved health, productivity, and satisfaction of its employees.

While it is not precise science to estimate the value implications of reduced risk on Engineering Co.'s value, we assume that reduced risk will increase Engineering Co.'s current earnings multiple around 3 percent, from 3 to 3.1, which would result in a company value increase of $2,250,000 (earnings of $22,500,000 based on Engineering Co.'s profit margin of 10 percent and sales of $225,000,000). Assuming a sale of the company in 10 years and discounting it back at 7 percent would result in an NPV increase of $867,500.

Assumptions about how the deep retrofit would reduce company risks were supported by our discussions with select senior leadership and the company's risk manager, as well as human resources. Key business risks for Engineering Co. that are positively influenced by the deep retrofit include 1) competition and pricing pressure, 2) reputational/brand risks, 3) talent shortages and staff retention, 4) increased stakeholder demands, and 5) regulatory and compliance risks.

Summary

The project, assessed on energy cost savings alone, offers a simple payback of 13 years and a negative $2.25 million in NPV. With the low-end of the potential values beyond energy cost savings, the expected benefit is $3.36 million, and with the maximum potential value increases the project is worth $16.83 million. Most of the largest (and most variable) benefits are due to improved employee health and productivity. Without a full consideration of the project, the client would likely have ignored a highly profitable retrofit, and continued operating an inefficient and undesirable building.

HOW TO CALCULATE AND PRESENT
DEEP RETROFIT VALUE

CONCLUSION

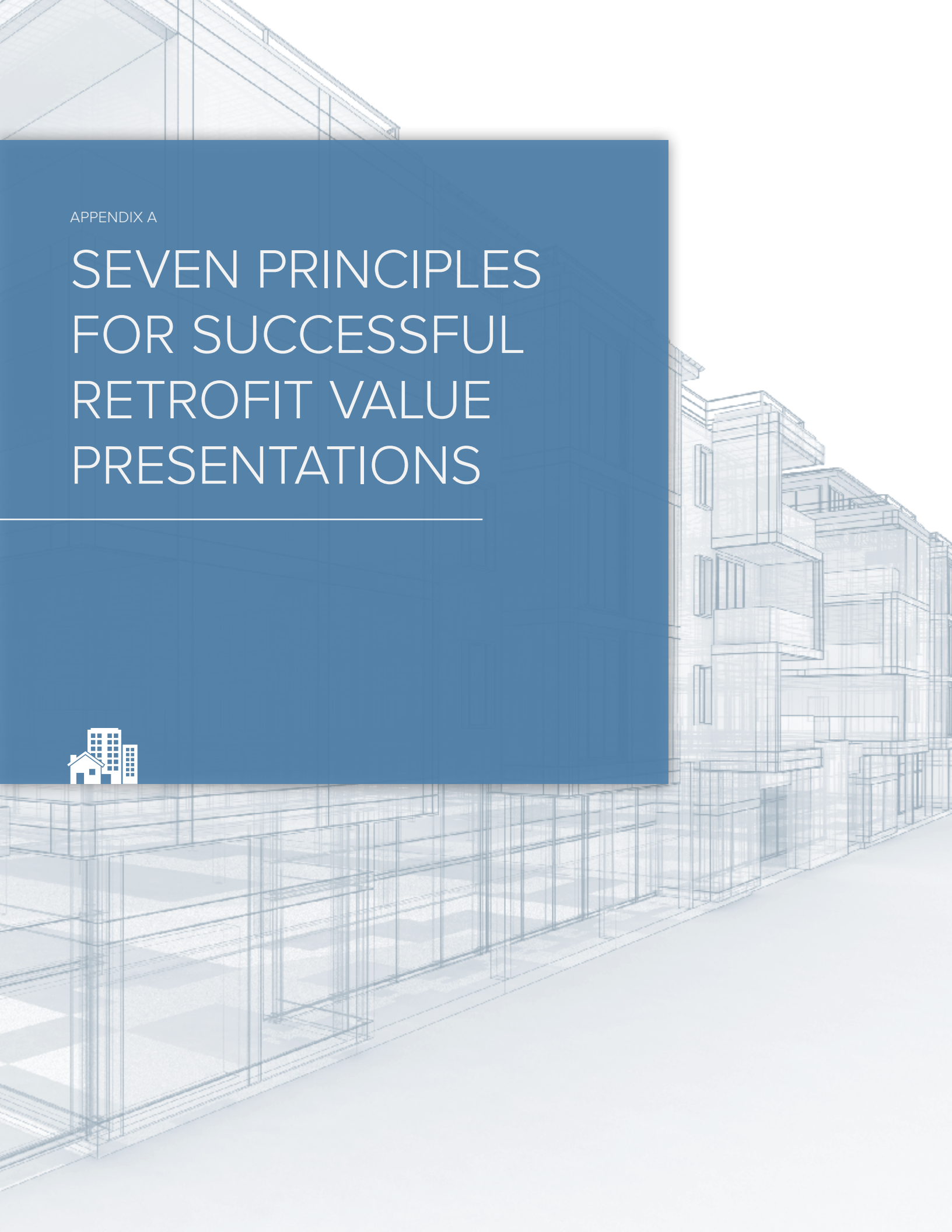
CONCLUSION

Deep retrofits generate substantial value for owner-occupants, well beyond the energy cost savings. When all the benefits of deep retrofits are included in the calculation of value, deep retrofits can compete directly for company equity delivering rates of return, at reasonable risk, well in excess of most company's "hurdle rates."

Owner-occupants control over half of commercial real estate, and lease a substantial portion of investor-owned properties. This huge reservoir of real estate represents a gold mine of potential profitability that can deliver real bottom-line results while preserving and enhancing a company's long-term competitive position. As with any potential profit opportunity, a company must invest and take risks to mine potential profits. In this regard, the cost involved in deep retrofit investment, including the cost of calculating deep retrofit value, is a small price to pay to potentially access a gold mine, and create a clean, prosperous, and secure energy future for all.

APPENDIX A

SEVEN PRINCIPLES FOR SUCCESSFUL RETROFIT VALUE PRESENTATIONS



SEVEN PRINCIPLES FOR SUCCESSFUL RETROFIT VALUE PRESENTATIONS

All retrofit value presentations are not created equal. The format, length, and emphasis will vary based on the type of capital investment (equipment or system replacement, minor retrofit, major retrofit, etc.) and the specific energy efficiency and sustainability measures recommended.

However, regardless of the type of retrofit investment, presentations will be more successful if they follow seven basic principles:

1. Perform Consistently Rigorous Analysis
2. Know Your Audience
3. Offer Deep Retrofit Value Report as a Supplement
4. Focus on Bottom Line Value and Risk Conclusions
5. Be Property and Company Specific
6. Avoid Double Counting
7. Present Risk Context

These presentation principles are important to understand before starting to research and calculate deep retrofit value. It can be difficult to follow these principles unless they are specifically factored into a research and analysis plan.

1.

PERFORM CONSISTENTLY RIGOROUS ANALYSIS

Retrofit value presentations should follow a structured and logical process consistent with what capital providers are familiar with reviewing prior to allocating capital. Given the high level of subjectivity in interpreting and applying data in real estate valuation and financial analysis, the appraisal and finance industries have relied upon standards, guidelines, structure, and transparency to guide their work. Retrofit value presentations need to follow a similar approach.

2.

KNOW YOUR AUDIENCE

Knowing your audience up front and what action you want them to take after the presentation is one key to success. Multiple audiences (stakeholders) may mean more than one presentation or an approach appropriate for senior decision makers that also provides necessary detail for others. Since retrofits are real estate decisions, it is important to understand the type of analytical models, data, and presentation formats that are currently used for similar investments by property owners and occupants.

3.

OFFER DEEP RETROFIT VALUE REPORT AS A SUPPLEMENT

While different approaches can be successful, RMI's deep retrofit value (DRV) methodology focuses on value beyond energy cost savings (VBECS) and is designed to supplement traditional energy modeling, cost analysis, and life-cycle cost analysis (LCCA). While it may be possible to consider additional value benefits and provide more sophisticated sensitivity analysis within traditional simple ROI, LCCA, or cost-benefit analysis, we think a separate analysis and presentation more easily incorporates into current practices.

While a supplemental DRV report is appropriate for many situations, there are other ways to integrate the information into retrofit decision making that honor existing decision-making approaches. The key is to ensure all relevant value considerations are incorporated while avoiding double counting.

For example, many corporations employ total occupancy cost (TOC) analyses that include all costs incident to the planning, design, execution, and operation of an asset, and are beginning to apply this methodology to sustainability/retrofit decisions. In that case, some of the cost items—like the non-energy operating cost items addressed in the RMI model—would not have to be included, but some of the enterprise cost savings, risk, and other value elements may still need to be added to the TOC analysis.

4.

FOCUS ON BOTTOM LINE FINANCIAL AND RISK CONCLUSIONS

Solving a problem requires a structured approach, including asking questions, collecting data, conducting analyses, accessing findings and conclusions, and presenting recommendations. In most cases, successful presentations are not presented in the same order or way solutions were calculated. This is particularly important for DRV presentations. The decision maker is most interested in the bottom-line value and related risk analyses. These financial, value and risk conclusions should be clearly presented up front, along with key assumptions that drive the conclusions, with appropriate research and analytics provided as support. RMI's Deep Retrofit Value Model is based on this principle of capital provider value focus.

5.

BE PROPERTY AND COMPANY SPECIFIC

The successful presentation of retrofit value requires specificity. This principle is why we created separate RMI deep retrofit value models for owner-occupants and for investors. The importance of specificity also includes the evidence of value.

While much value evidence is based on studies, surveys, and analyses of owner-occupants, buildings, or portfolios of buildings, a successful value presentation must adjust and apply the evidence for the specific property and occupant. For example, there is substantial research supporting how deep retrofits (or specific components like HVAC, daylighting, etc.) influence worker productivity or health. The conclusions of these studies are derived from studies of certain types of individuals, companies, property types, and deep retrofit measures. To apply the findings from these studies to a particular deep retrofit situation, it is reasonable and appropriate to conduct a qualitative assessment of the applicability of the studies, making adjustments to research results, or averages of research results, to reflect the specific circumstances of the proposed deep retrofit project.

While it may seem subjective to adjust the results of statistically derived studies and research, this qualitative assessment of quantitative data, and appropriate documentation of analysis, is at the heart of all valuation and due diligence analysis. Even more important, value benefits derived from detailed company- and property-specific analysis carry significant weight and cannot be easily dismissed by retrofit investment decision makers.

6.

AVOID DOUBLE COUNTING

Earning and retaining the trust of retrofit capital decision makers is critical to a successful capital request. Unfortunately, it is easy to double count benefits from retrofit projects, and equally easy to fail in a retrofit capital request as a result of such mistakes.

Double or fuzzy counting happens when combining the savings estimates from research on single systems such as lighting, HVAC, data analytics, daylighting, etc. It does not mean such data should not be used, as long as it is fully disclosed and integrated results properly interpreted. Citing or otherwise misusing research studies that are potentially misleading or poorly done can doom a project if a member of the investment committee asks a tough question or knows the research.

RMI's Deep Retrofit Value Model endeavors to clearly separate benefits and avoid double counting. For example, we specifically include the cost savings from reduced absenteeism as part of health cost reductions, rather than under employee cost reductions. However, the productivity benefits of improved mental and physical health are calculated and presented under employee costs. While decisions about where to account for benefits/costs might differ, the important point is to only count benefits or costs once.

7.

PRESENT RISK CONTEXT

No investment decision should ignore risk. However, many retrofit decisions employing traditional LCCA or simple ROI analyses do not explicitly consider risk (or revenue impacts), but decision makers implicitly factor risk into decisions when they either turn down projects or scale them back through "value" engineering.[108]

Retrofit decisions face significant risks from new products, materials, systems, service providers, contracts, and performance uncertainty. Fortunately, retrofit risk can be managed, and in many cases mitigated, by best practices in retrofit execution and operation (see **APPENDIX B**). Retrofit projects can also generate substantial positive risk outcomes. Unfortunately, if risks are not intelligently and comprehensively addressed, capital providers make decisions assuming the maximum level of risk and uncertainty.

APPENDIX B

DEEP RETROFITS & RISK MITIGATION – 27 BEST PRACTICES

DEEP RETROFITS AND RISK MITIGATION—27 BEST PRACTICES

LAUNCH

1. **Energy Retrofit Triggers:** Identify the situations in a building's life cycle that can trigger a deep retrofit analysis, and design a strategic plan accordingly.
2. **Stakeholder Engagement:** Engage multiple stakeholders (beyond the building owner and service providers) to identify opportunities with broad perspectives.
3. **Team Selection:** Select initial team members with energy retrofit expertise, who can find the full potential value of a retrofit and ensure execution cost should not be the only factor.
4. **Goal-Setting Charrette:** Determine maximum potential energy performance of the entire building while identifying constraints to shape the project's total potential efficiency savings.
5. **Performance Benchmarks**: Benchmark the energy and occupant performance of the building to better design the project, set performance targets, and compare proposed approaches. This "before upgrade" view is key to having a reference point to accurately prove improvement.
6. **Contracts, Insurance, and Legal:** Write contracts that align the team around a shared project vision, properly designating responsibilities and compensating performance. Ensure that legal and insurance strategies are fully sensitive to the special considerations of deep retrofits.
7. **Evaluate Cost of Doing Nothing:** Assess how delaying improvements to your building could raise costs through increased utility bills, erode occupant satisfaction, and exacerbate operational and enterprise risks.

DESIGN

8. **Integrative Design:** Emphasize integrative design principles to establish team dynamics and working relationships and reveal potential energy savings.
9. **Reduce Loads and Improve Shell, Then Accurately Size Equipment:** Reduce capital expenditures and minimize future operating costs by first reducing loads, and then installing efficient, optimally sized systems.
10. **Occupant and Manager Engagement:** Incorporate the occupants and the building manager in the design process, and solicit their input on the design and operation of the retrofitted building.
11. **Technical Potential Analysis:** Analyze the technical potential of the building—the energy/resource use that would result from implementing all of the most cutting-edge efficiency measures possible, without regard to financial or other restraints.
12. **Design Options Assessment:** Analyze using energy modeling, life-cycle cost analysis, and preliminary deep retrofit value analysis to find which combination of energy-efficiency measures provides the greatest value to the building's owner and occupants.

13. **Cost Estimation:** Estimate the gross and net costs of the retrofit.[109] This is critical to determining its financial viability, and is most insightful when compared against a baseline and assessed using bundles of energy efficiency measures. Identifying factors that can undermine energy retrofits (short-term lower utility rates, contractor or equipment underperformance, warm weather, unexpected vacancies, operations staff changes, etc.) provides a complete picture of the potential cost.
14. **Regulation and Code Compliance:** Be aware of potential regulation and code problems stemming from an energy retrofit, and work with local and state officials to mitigate these risks.
15. **Project Phasing:** Intelligently phase project over multiple stages and years, depending on efficiency and expected life of existing improvements, leasing situations, and consideration of future technology/economic conditions that might make currently infeasible measures possible.

FINANCE

16. **Finance Options Assessment:** Consider the full array of financial options available as early in the execution process as possible. Compare alternatives considering all terms and conditions including interest rates, financing amount, closing costs and timing, escrow and hold-back requirements, recourse, etc.
17. **Utilization of Subsidies:** Take advantage of all government and utility tax, financial, and entitlement-related subsidies in a cost-effective manner.
18. **Underwriting/Due Diligence Support:** Underwriters/due diligence analysts for loans and equity investments are busy and unlikely to have access to the knowledge and data necessary to properly assess the risks and value of a deep retrofit investment. Therefore, secure well-supported and argued support for deep retrofit value. This may involve third-party reporting plus expert review similar to what is used in other complex risk situations (appraisal, Phase 1 Environmental Site Assessment, Property Condition Assessment engineering report) or new types of insurance (Energy Savings Warranty).
19. **Deep Retrofit Value Report:** Future best practice for all deep retrofit loans and equity investments will require rigorous well-supported assessment of retrofit value and risk.
20. **Business Interruption Strategy:** Carefully consider and plan the construction phase to avoid disruption to tenants and/or employees.

CONSTRUCT

21. **Contractor/Service Provider Selection:** Select contractors (ideally early in design) and other service providers with requisite experience in deep energy/sustainability retrofits.
22. **Construction Management:** Utilize specialized construction management strategies to intelligently execute deep retrofit construction and sustainability certification.

OPERATE

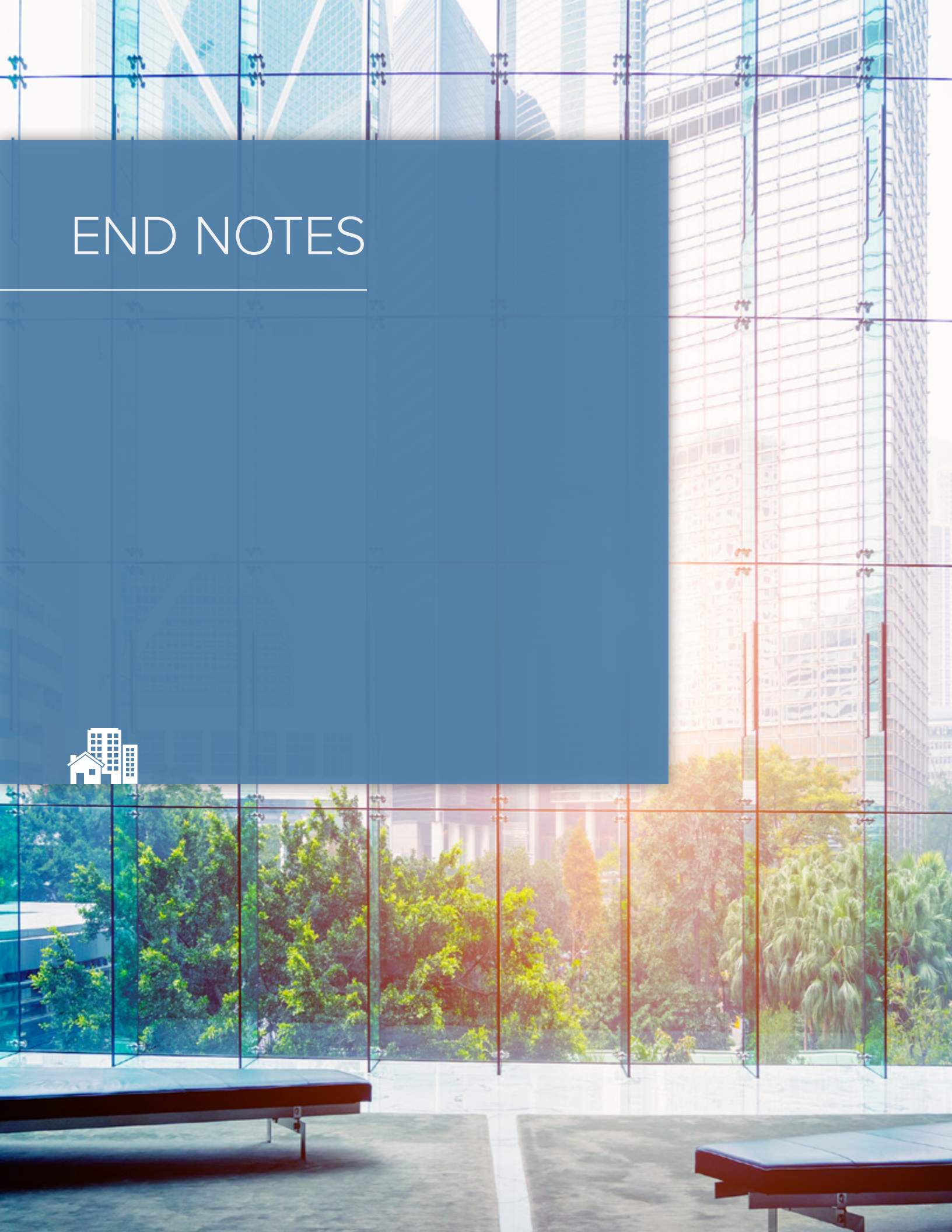
23. **Operations and Maintenance Plan:** Involve maintenance personnel and facilities operators in any building upgrades from the beginning, so they can help form the energy reduction goals, understand them, and be more engaged to help achieve them.
24. **Commissioning:** Implement commissioning during the design process, the construction of the retrofit, and on an ongoing basis to ensure systems and equipment were installed and are operating according to design.
25. **Green Leasing:** Establish a green lease with tenants to enable the sharing of costs and benefits of an energy efficiency project.[110] If properly managed, this can increase total energy savings.[111] While primarily an investor issue, many owner-occupied buildings have significant amount of sublease space.
26. **Measurement and Verification:** Carefully think through measurement and verification (M&V) systems in advance and intelligently present them to ensure the proper quantification and ability to verify project energy savings.*
27. **Stakeholder Communications:** Fully inform stakeholders of any potential changes to their spaces during and after design and construction, and educate them about their new energy efficient building.

LEARN MORE

More information about these processes can be found on the RMI website: **www.rmi.org/retrofit_depot**

* Often in order to pay contracts tied to energy performance.

END NOTES



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