# The missing link: Transforming deep retrofits into financial assets

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**Abstract**

*Deep retrofits — those saving 50 per cent or more energy and achieving superior sustainability performance — are valuable yet largely untapped financial assets. This paper describes how to calculate all the value created by deep retrofits, radically changing the value proposition of deep retrofits, enabling such investments to take their proper role as a central driver of company performance. Many corporations have steadily improved the energy and sustainability performance of their buildings, primarily to minimise operating costs and keep pace with changing codes and standards. Many also have been searching for financially viable approaches to expand sustainability efforts to meet growing customer, employee and investor demand, but have struggled to link deeper energy/sustainability retrofits to attractive financial performance. This paper presents the 'missing link': how to calculate and present the value created by deep retrofits of corporate real estate. The deep retrofit value model for corporations consists of nine 'value elements' organised around a traditional business valuation framework that starts with an evaluation of retrofit property costs and risks, and then details how a deep retrofit affects business costs, revenues and risks. If implemented broadly, corporations will enhance their competitive position and financial performance while helping to transform global energy use to create a clean, prosperous and secure future.*

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## INTRODUCTION

High levels of energy efficiency and sustainability are technically and economically possible as documented by the Rocky Mountain Institute (RMI) in *Reinventing Fire*;[1] however, unless corporate retrofit decision making moves beyond its current paradigm of evaluating retrofit investments based on simple payback from the energy cost-savings to recognising the true value created by deep retrofits, investment will remain limited, corporate profitability will suffer, and society's ability to realise a critical energy transformation will be damaged. Many also have been searching for financially viable approaches to expand sustainability efforts to meet growing customer, employee and investor demand, but have struggled to link deeper retrofits to attractive financial performance. Two-thirds of CEOs do not believe business is doing enough to address global sustainability challenges.[2] This paper presents the 'missing link': how to calculate and present the value created by deep retrofits of corporate properties. When used as part of a retrofit capital request, this approach changes the value proposition of deep retrofits enabling them to take their proper role as a central driver of company performance.

## WHAT IS DEEP RETROFIT VALUE AND WHY DOES IT MATTER?

Deep retrofits can be defined as projects that achieve superior energy cost-savings compared to those of a conventional simple retrofit — sometimes more than a 50 per cent reduction — while also achieving superior levels of sustainability. Deep retrofits take a whole-systems approach to the building, seeking to minimise overall energy consumption and maximise value. Perhaps the most famous commercial building deep retrofit was of the Empire State Building, which reduced energy costs and carbon emissions by about 40 per cent and played a key role in the owner's plan to reposition the building as a class A office space. Since the retrofit, the building has attracted tenants such as Skanska USA and Li & Fung who desire a healthy and productive workplace that also satisfies company sustainability commitments.[3] Deep retrofit value can be broadly defined as the net present value (NPV) of all of the costs and benefits of a deep energy and sustainability investment. This distinction is important because, while deep retrofits generate substantial energy cost-savings, they also create substantial *value beyond energy cost-savings* typically ignored in most retrofit decisions. This term became part of the industry sustainability vocabulary with the publication of *Value Beyond Cost Savings*.[4] For corporations, deep retrofit value is derived from benefits including:

- improved employee health, productivity and satisfaction;
- superior sustainability leadership and reputation;
- access to tax, finance and entitlement subsidies;
- improved risk management; and
- reductions in many non-energy operating costs.

A growing body of evidence suggests that these values beyond energy cost-savings are real, although how they are calculated and presented changes at the property level depending on whether the corporation owns or leases the building. The focus of this paper is on corporate owner-occupants.

Integrating deep retrofit value into property retrofit decisions matters because most retrofit investments today are based on meeting an approximate 3.5-year simple payback requirement based on energy cost-savings alone (based on a global survey of investors and occupants; trends were consistent globally and across small and large organisations).[5] Accordingly, many corporations may be under-investing in energy efficiency and sustainability, hurting their profits and competitive position. Surveys of corporate executives demonstrate broad recognition of factors that drive sustainability investment as shown in Table 1 (based on a survey of 272 respondents from Greenbiz's Intelligence Panel, consisting of executives and thought leaders in the area of corporate environmental strategy and performance).[6] As confirmation of the importance of valuing building sustainability, a 2012 survey of 370 of the leadership of the Urban Land Institute found that *lack of demonstrated value* was the leading impediment to greater adoption of building sustainability and proving up value at the property level would be the most important intervention (based on a survey of 370 leaders of the Urban Land Institute, 60.4 of whom were owners, principals or senior executives in the real estate industry).[7]

## APPLYING DEEP RETROFIT VALUE ANALYSIS

The primary purpose of deep retrofit value analyses is to enable preparation of a well-reasoned and supported analysis of the value beyond energy cost-savings to be presented as part of a retrofit capital request to decision makers. The following stakeholders can benefit from this approach:

- corporate real estate (CRE) executives and their facilities management (FM) staff preparing retrofit capital requests;
- internal corporate finance departments and others with capital budgeting due diligence responsibilities;
- architects, engineers, consultants and other service providers analysing and documenting support for energy efficiency recommendations;
- company sustainability and energy managers developing portfolio and property level retrofit sustainability strategies and capital budgeting plans;
- valuation professionals, appraisers and accountants trying to understand the business value implications of a company's retrofit-related energy efficiency and sustainability investment.

The basic deep retrofit value framework presented in this paper has been designed for retrofits of commercial office properties, but can be applied, with adjustment, to many property types as well as new construction, commercial interiors, equipment replacements

**Table 1: Factors driving sustainability investment in the next 12 months**

| *Factor* | *Percentage citing factor (%)* |
|---|---|
| Energy costs | 93 |
| Changes in consumer demand | 87 |
| Brand risks | 87 |
| Increased stakeholder expectations | 86 |
| Competitive threats | 81 |
| New revenue opportunities | 80 |
| Potential legislation/regulation | 73 |
| Investor engagement | 65 |
| Improving position in external ranking | 64 |
| Access to raw materials | 56 |
| Carbon costs | 46 |
| Fines or penalties for non-compliance | 41 |

and other types of sustainability investments. Forthcoming work from the authors will address deep retrofit value for investors.

## CALCULATING AND PRESENTING DEEP RETROFIT VALUE

RMI's deep retrofit value model for owner occupants consists of nine 'value elements' organised around a traditional business valuation framework that starts with an evaluation of retrofit property costs and risks, and then details how a deep retrofit affects business costs, revenues and risks. The rationale and support for each of these nine value elements are described below and listed in Table 2; they are then applied to a 300,000 square foot (27,870 sq m) office building deep retrofit in the final section of this paper. The summary provided in this paper focuses on presenting the structure of the analysis and demonstrating its real-world application to a property retrofit decision. More detail and focus on the specific retrofit measures/features that generate value for each value element are presented in RMI's practice guide.[8]

### Retrofit development costs

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 per cent or more with greater cost volatility.[9] Kok *et al*. state that the gross one-off cost of a retrofit of all major energy-using systems in a typical 500,000 square foot office building is US$10–20 per square foot.[10] Other case studies of recent deep retrofits of office buildings reveal an energy efficiency cost premium ranging from US$3 up to US$31 per square foot.[11] Development costs also can be substantially offset by 'avoided costs' and subsidies and incentives. Deep retrofits allow elimination of ongoing 'business as usual' costs due to capital upgrades, equipment replacement, accommodation of changing employee needs, or other reasons. Retrofit subsidies can reduce costs directly through tax credits, grants and rebates, enhanced entitlement benefits, and reduced loan interest costs. Additionally, larger energy users can go directly to utilities and negotiate outside of formal programmes.

### Non-energy property operating costs[12]

Deep retrofits can reduce non-energy property operating costs including maintenance, water, insurance and churn. In some cases, a deep retrofit also can increase space utilisation through equipment downsizing.[13] In some cases, operating cost-savings may take some time to materialise as FM and occupants become familiar with new systems and procedures.

**Table 2: Deep retrofit value categories and elements**

| *Value category* | *Value element* |
|---|---|
| *Property costs & risks* | 1. Retrofit development costs |
| | 2. Non-energy operating costs |
| | 3. Retrofit risk mitigation |
| *Enterprise costs* | 4. Health costs |
| | 5. Employee costs |
| | 6. Promotions & marketing costs |
| *Enterprise revenues* | 7. Customer access & sales |
| | 8. Property derived revenues |
| *Enterprise risks* | 9. Enterprise risk mitigation |

### *Maintenance*

Based on studies of 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 per cent). According to a 2010 Aberdeen Group study that identified the strategies employed to reduce maintenance costs, adopting a data and performance management strategy can cut 14 per cent or more from maintenance costs.[14] A study conducted for the US General Services Administration (GSA) found that, for 12 green GSA buildings, the maintenance costs on average were 13 per cent less than the baseline.[15]

### *Water*

Restrooms, kitchens, irrigation systems and cooling towers are the major water users in commercial properties.[16] Each offers significant opportunities 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 at minimum 40 per cent of total consumption in the US commercial and institutional sectors.[17]

### *Insurance*

Liberty Mutual Insurance, Fireman's Fund Insurance Co. and others offer discounts of 5 per cent or more on property and casualty insurance for properties that are green.[18]

### *Churn rate costs*

Churn rate is defined as the frequency with which building occupants are moved. Median annual churn rates in corporations are around 45 per cent (ie 45 per cent of the people are moved annually), with average move costs per person at around US$400.[19] Studies have shown that flexible workspaces and under-floor air dramatically reduce churn cost. Five studies demonstrate an average of 80 per cent reduction in churn costs due to under-floor air.[20]

### *Space utilisation and occupancy cost-savings*

Deep retrofits can downsize and consolidate mechanical equipment to free up more space for use or sublease. In some cases, rooms can be made smaller or completely eliminated as part of a deep retrofit.

## Retrofit risk mitigation[21]

Deep retrofits are 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 are compounded by additional risks of deep energy and sustainability retrofits potentially including new products and systems, system interoperability problems, new specialised service providers, new contracts and design processes, and complex financing requirements. Fortunately, deep retrofit development and operating cost risk can be mitigated through traditional insurance and related risk management techniques, specialised green due diligence and execution of RMI's tested deep retrofit best practices.[22] All retrofit capital requests should fully present project risks and strategies employed to mitigate risk.

## Health costs

Sustainable building retrofits and related operational improvements can improve the health of occupants. Retrofits and operating practices that 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 and space planning each have been documented to improve health.[23] 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.

### *Lowering health costs*

Improved occupant health can reduce the incidence and length of illness for building occupants. One estimate of the magnitude of building related health cost effects cited by the Carnegie Mellon University Center for Public Building Performance & Diagnostics indicates treatment for illnesses and health conditions influenced by the indoor environment is costing employers approximately US$745 per employee annually, representing approximately 15 per cent of all health expenditures.[24]

### *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.[25] A growing body of evidence supports the relationship between healthier indoor environments and 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.[26]
- A study of 31 green buildings from the City of Seattle found that absenteeism was reduced by 40 per cent.[27]
- A study sponsored in part by Cushman & Wakefield reported 30 per cent fewer sick days among one company's employees after each office moved to Leadership in Energy and Environmental Design (LEED) certified office buildings.[28]

### *Reducing presenteeism*

Employees often come to work when sick, or work from home when sick, reducing their overall effectiveness. The US Department of Labor estimates that Americans work seven days while sick per year. For those days, the Institute for Health and Productivity Studies estimates a decrease in productivity of 12–20 per cent.[29]

### *Reducing litigation risk/cost*

Developing or retrofitting a building to improve the key factors that impact health and wellbeing can reduce litigation risk and cost. As has been seen with second-hand smoke, asbestos, selected toxins, mould and other building issues, building retrofit and operations practices that were once common can become highly litigious.

### *Reducing future regulatory risk and cost*

Those factors that create litigation risk often create regulatory risk and cost. Federal, state and municipal regulations often arise in response to known health risks in the building or operation of buildings. New research findings on ventilation rates and carbon dioxide exposure are examples of new areas of potential regulatory exposure.

## Employee costs

Deep retrofits can significantly reduce employee costs through recruitment and retention cost-savings and increased worker productivity.

### *Recruitment and retention cost-savings*

Recruiting and retaining employees is costly for many businesses. This is particularly true for businesses requiring top tier or specialised talent. Keeping existing staff also requires a costly set of company actions including keeping up the firm's reputation and maintaining benefits and the work environment at high levels. Retrofits enhance recruitment and retention by improving employee satisfaction with their employer by creating an attractive and healthy office environment, improving property-level energy/sustainability ratings, and improving enterprise-level green reputation or ranking. Some examples of evidence for the importance of sustainable buildings to occupants are summarised below.

- In a survey of 1,065 tenants in 156 buildings managed by CBRE, 34 per cent of office

tenants agreed that green office space is important to recruiting, while 14 per cent disagreed, and 52 per cent were neutral.[30]
- 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 1–5, with 5 being the highest. Daylight and view in the office ranked second at 4.19.[31]
- Seventy-nine per cent of employees surveyed were willing to forego income to work for a firm with a credible sustainability strategy; 80 per cent of employees surveyed said they felt greater motivation and loyalty towards their company due to its sustainability initiatives.[32]

Improved workspaces create value by reducing employee costs for recruitment and retention, including costs for the search, hire, and training of 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[33] (studies show a range between 70 per cent and 200 per cent[34]).

### *Employee compensation costs (worker productivity)*

Deep retrofits enhance worker productivity by improving workspaces, thereby enhancing employee satisfaction with their workplace and creating the physical environment for more productive work. A select few of the studies that explore the connection between deep retrofit outcomes and worker performance are summarised below.

- Professor Wyon found that the performance impact of indoor air quality can go as high as 6 per cent to 9 per cent — meaning that improved indoor air quality can provide meaningful improvements to worker productivity.[35]
- Five daylighting studies cited by Carnegie Mellon in a summary analysis of daylighting studies showed average productivity gains of 5.5 per cent.[36]
- Lawrence Berkeley National Laboratory's 'Indoor Air Quality Scientific Findings Resource Bank' website opines that work performance may be improved from a few per cent to possibly as much as 10 per cent by providing superior indoor environmental quality.[37]

Retrofit-related productivity improvements can improve the quantity of work produced, reducing employee cost per unit of output and thereby potentially reducing the number of employees required, or enabling employees to produce more.

### Promotions and marketing costs

Deep retrofits enhance company promotions and marketing primarily through their contribution to a company's sustainable reputation and leadership. Retrofit-related promotions and marketing costs create value directly by reducing enterprise costs, which in turn increases earnings. Sustainability leadership and reputation comprise one of the many factors that contribute to a company's brand and marketing story. For example, over 200 large international companies belong to the World Council for Sustainable Development and over half have signed their 'Manifesto for Energy Efficiency'. Hundreds of other organisations and businesses also have signed the United Nations' 'Principles for Responsible Investment' committing to energy efficiency in their property portfolios. In some cases, deep retrofits are concrete proof that a company is 'walking the talk', providing publicity and a tangible example of its sustainable reputation and leadership. In other cases, deep retrofits contribute to the growing sustainability compliance requirements of many businesses and governments, becoming a minimum standard in order to be able to market a company's product.

### Customer access and sales

Deep retrofits enhance customer access and sales by positively contributing to a company's sustainability reputation and improving the engagement and innovation of employees. New regulations by governments and businesses are making sustainability a minimum requirement for the sale of many products and services. For example, US Executive Order 13514 requires 95 per cent of new contracts with the US General Services Administration (over US$20bn in annual expenses[38]) to be green.[39] The Department of Defense, Department of State and other federal agencies are also pursuing aggressive energy goals and numerous states and local governments currently demand sustainability through procurement policies and practices.[40]

Customer sustainability requirements in the private sector are also a growing trend. By the end of 2017, Wal-Mart will buy 70 per cent of the goods it sells in US stores from suppliers who use its Sustainability Index, which evaluates and discloses the sustainability of products.[41] Intel Corporation began setting expectations in 2011 for its top tier 1 suppliers to begin reporting greenhouse gas emissions, water and waste conservation metrics with the highest standards for their top 75 suppliers.[42] These trends are likely to grow based on a 2012 survey in which 83 per cent of corporate respondents stated they were either working directly with their suppliers or were discussing with them how to measure sustainability impacts.[43]

### Property-derived revenues

Deep retrofits enhance property-derived revenues primarily by increasing revenues from sub-leasing and property sales.

#### *Sub-leasing*

Deep retrofits can increase enterprise revenues by increasing the demand for subleased space, which translates into higher revenues through faster absorption, increased occupancy rates and potentially enhanced rent and/or lease terms. 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*.[44]

#### *Property sales*

Many owner-occupants sell buildings they own as part of normal business operations. 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.

### Enterprise risk mitigation

For many reasons as discussed above, deep retrofits help to mitigate enterprise earnings risk by reducing potential health and employee and marketing costs, and ensuring access to customers. Regulatory and legal risks are also significantly reduced. To better understand how deep retrofits help to mitigate business risks it is instructive to evaluate recent global business risk surveys conducted by Ernst & Young (E&Y) and Aon. Climate change or environmental risks did not make the top ten issues of concern to businesses globally in either the Aon or E&Y surveys; however, staff retention risk was ranked fifth in both surveys. The risk of brand or reputational damage ranked fourth in the Aon survey and was ranked 15th in the E&Y survey. Aon's respondents ranked regulation and compliance risk second, while E&Y's respondents ranked it seventh. Deep retrofits can help to mitigate all of these top-ranked business risks. A survey of 766 CEOs from around the world in 2010 found that 93 viewed sustainability as a critical driver of their company's future success, and up to 81 per cent responded that sustainability was an important factor in strategy and operations.[45]

## PREPARING THE DEEP RETROFIT VALUE REPORT

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 the occupant and retrofit assumptions are hypothetical for illustrative purposes. This deep retrofit value summary report typically would be supported by additional analyses and spreadsheets for each of the nine value elements determined appropriate for the retrofit situation.

## Engineering Co. deep retrofit project assumptions

### *Building description*

The building is a 20-storey, 300,000-square-foot (27,870 sq m) office building in Southern California. The building, built in the mid-1980s, is a conventional (non-green) office building, owned and occupied by a large engineering firm (Engineering Co.).

### *Company (occupant) description*

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

### *Energy efficiency and sustainability improvements*

The owner is considering a substantial renovation of the property, while also seeking energy savings of 50 per cent or more and a superior sustainability rating of at least LEED Gold. The owner wants to be a sustainability leader for its employees, customers and other stakeholders. To reach these goals, the proposed retrofit will include installation of window films, increasing the use of daylight in interior spaces, upgrading the heating, ventilation and air-conditioning (HVAC) systems (to increase the use of natural ventilation and heat recovery), replacing existing light fixtures with a redesigned LED lighting scheme and incorporating many other sustainable features necessary to achieve a LEED Gold rating. As outlined in Table 3, the retrofit is projected to cost US$7,500,000 and save 50 per cent of pre-retrofit energy costs, or US$570,000 per year.

## Finance assumptions

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

## Engineering Co.'s deep retrofit value report summary

Based on an analysis of the energy cost-savings of the proposed deep energy retrofit, the NPV was a negative US$2.25m, with a 7.6 per cent simple ROI and a 13-year simple

**Table 3: Pre-improvement building operating expenses**

| *Expense* | | *Annual cost (US$)* |
|---|---|---|
| *Janitorial* | | 200,000 |
| *Window cleaning* | | 50,000 |
| *Repairs & maintenance* | | 500,000 |
| *Utilities* | Electricity | 600,000 |
| | Natural gas | 40,000 |
| | Chilled water | 500,000 |
| | Water & sewerage | 20,000 |
| *Security* | | 200,000 |
| *Real estate taxes* | | 2,200,000 |
| *Insurance* | | 180,000 |

payback, which appeared not to be financially viable given company return hurdle rates and risk tolerance; however, as summarised in Table 4 and the analysis below, when the complete value of the deep retrofit to Engineering Co. is calculated, and both positive and negative risks are assessed, the NPV of the project is in the range US$3.36m–16.83m with a simple rate of return of 24–55 per cent — well in excess of Engineering Co.'s hurdle rate. Additionally, as shown in the detailed assessment and presentation of risk (this is a reference to a more detailed risk analysis document (not presented here), which would typically accompany a summary deep retrofit report), risks were reasonably mitigated through execution of many recommended deep retrofit process best practices and judicious use of traditional risk management practices (although these are not always fully presented).

## Retrofit development costs

The deep retrofit avoided pre-planned costs to replace and repair a variety of systems in the building. This reduced capital cost resulted in an NPV improvement of US$431,000 for the project. The owner captured Federal 179D tax credits (energy efficiency tax deductions) of US$0.30–1.80 per square foot. 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 US$400,000 of the retrofit development costs.

**Table 4: Summary deep retrofit value report for Engineering Co.**

| *Value element* | *Findings* | *Supporting analysis* |
|---|---|---|
| 1. *Retrofit development costs* | US$831,000 development cost offset | Tax credits, grants and avoided costs |
| 2. *Non-energy operating costs* | US$105,400 reduction in annual operating costs | Improved space utilisation, insurance discount and 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 and service providers that are mitigated well, putting outcomes within normal considered business risk parameters |
| 4. *Health cost-savings* | US$275,000 reduction in annual health costs | Reduction in absenteeism |
| 5. *Employee cost-savings* | US$137,500–1,787,500 in annual employee cost-savings | Recruiting/retention cost-savings; worker productivity (salary) cost-savings |
| 6. *Promotion & marketing costs* | US$0–450,000 cost-savings per year | Brand promotion cost reduction, reduced customer acquisition and closing costs |
| 7. *Customer access & sales* | Increased annual sales of US$0–1,125,000, or earnings of US$0–112,500 annually | Reduced sales due to limits on access to customers |
| 8. *Property derived revenues* | Increased net present value (NPV) of property of US$1,385,000 | Assumed 4 per cent sales price increase and sale in year seven |
| 9. *Enterprise risk mitigation* | Increased company NPV of US$867,500 | Assumed slight increase in earnings multiple from 3 to 3.1 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 |

### Non-energy operating costs

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

#### *Water costs*

There was no need to address water costs as water use was outside the scope of the proposed retrofit.

#### *Churn costs*

No churn cost-savings were assumed.

#### *Space utilisation and occupancy cost-savings*

Due to reduced space requirements of smaller HVAC and other systems as a result of deep energy efficiency savings, an estimated 1,500-square-foot increase in useable space represents a cost-saving of US$60,000 per year based on an assumed space cost of US$40.00 per square foot.

#### *Property and casualty insurance costs*

A 5 per cent discount on property and casualty insurance was available from select reputable carriers, resulting in an annual cost-saving of US$9,000 (US$180,000 × 0.05). Equally important to cost-savings in 'green' insurance policies are the terms that allow replacement to green standards.

#### *Maintenance costs*

Historically, the owner had spent US$1.67 per square foot on basic operations and maintenance (O&M), excluding major capital expenditures. With the proposed deep energy retrofit reducing total energy demand, many systems became simpler. Although other improvements were expected to generate O&M savings, the owner preferred to only include labour and material cost-savings from switching to LED lighting due to the uncertainty of other savings cost estimates given existing data.

LEDs would not need to be replaced in the lifetime of the analysis (ten years), but fluorescent bulbs would need to be replaced approximately every five years. The building has 2,800 light fixtures, and these fluorescent bulbs cost approximately US$15 per replacement. Each fluorescent bulb needs to be replaced every five years, and electricians cost US$100 per hour and can replace a bulb in half an hour. Therefore, the annual spend on routine lighting replacements is:

2,800/5 years = 560 replacements per year * (US$15 + US$100 * 0.5) = US$36,400.

While the US$15 bulb saving might be categorised as avoided cost, it has been included here in the assessment of maintenance cost-savings.

### Retrofit risk mitigation

Risk of execution and performance as designed for the project has been well mitigated by traditional risk mitigation techniques and project best practices implemented during the launch and design phase, and forthcoming (planned and budgeted) actions to be undertaken in the finance, construction and operations phases of the project. The 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. Additionally, the proposed retrofit project employed standard traditional risk mitigation techniques including insurance covering loss of business income and 'all-risk' causes of loss in construction and performance bonds. Information on product warranties was not initially analysed in the cost-based analysis, but a review suggested product and equipment warranties appeared to be in place and appropriate for the improvements.

[Authors' note: In addition to the overview of deep retrofit risk mitigation provided here, a more detailed risk analysis document is recommended that analyses business interruption risk, operations and maintenance plans, energy modelling risk and uncertainty, product warranties and other specific areas of potential risk.]

## Health costs

Health cost-savings due to reduced absenteeism resulting from the proposed retrofit will save the owner US$275,000 per year. 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. Based on discussions with human resources (HR), however, the potential future benefits in terms of reduced health costs as well as the other benefits were acknowledged, but it was felt that absenteeism was the most tangible current benefit.

### *Absenteeism*

With a 2.5 per cent rate of absenteeism due to sick days (meaning that 2.5 per cent of employees are off sick on an average day), the owner decided to target improvements to the ventilation systems, to ensure better thermal comfort and provide fresh air. In addition to energy savings from a new HVAC system, the owner conservatively hypothesised a 10 per cent reduction in the rate of sick days from the newly improved retrofitted office. This results in potential cost-savings due to fewer sick days as follows:

*Salary costs*: US$110,000,000 * 0.025 * 0.10 = US$275,000

## Employee cost-savings

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

### *Worker recruitment/retention cost-savings*

To test the assumption regarding the importance of sustainability to Engineering Co.'s employees, people in Engineering Co.'s recruitment and HR departments and the sustainability director were interviewed. Based on these interviews and evidence they provided from internal company employee surveys, it was determined that Engineering Co.'s employees and potential employees preferred employers who visibly and actively work to improve the environment. Analysis of competitor firms also indicated they were offering high levels of sustainability in their workspaces.

The head of HR estimated that approximately 1.25 per cent of staff time was spent on recruiting and training new employees, and that those costs could be lowered by reducing staff turnover. Using an estimate that average turnover might improve from 150 weeks to 165 weeks (ie a 10 per cent improvement), the lowered costs to replace those staff would be:

Recruitment costs: US$1,375,000 per year * 0.1 = US$137,500

### *Productivity cost-savings*

Productivity gains of up to 25 per cent have been found in some studies, but Lawrence Berkeley Laboratory in its summary analysis of many of the studies concluded: 'Work performance may be improved from a few per cent to possibly as much as 10 per cent by providing superior indoor environmental quality'. The proposed retrofit incorporated a majority of the measures that have been shown to generate superior productivity based on studies to date. Because of the uncertainty of productivity estimates, it is important to provide a range with a low end of zero. This enables retrofit capital decision makers to have the opportunity to draw their own conclusions. Assuming average annual salary costs of US$110,000,000 and a productivity increase of 0–1.5 per cent, potential salary cost-savings would be in the range US$0–1,650,000. Even if employees are not laid off, the productivity increase would increase work output in which case the dollar savings estimate is a proxy for increased value from the work of the employee.

### Promotion and marketing costs

As Engineering Co. is intimately involved in building and design, its headquarters building is an important symbol of its commitment to high-performance buildings. Additionally, the proposed deep retrofit contributed positively to the company and its property's sustainability ratings as measured in numerous external ratings and rankings. The marketing department had suggested that Engineering Co.'s clients, including government and business clients, were becoming increasingly concerned about sustainability, and a growing number of them were in the process of developing procurement guidelines which included vendor sustainability/energy performance in their decision making. Based on further discussions with the marketing department, Engineering Co.'s marketing budget was set at 10 per cent of its revenue; therefore, with revenue of US$225,000,000, marketing costs would be approximately US$22,500,000. The promotion and marketing cost-savings stemming from the building's contribution to the company's reputation and leadership, as well as the reduced time and costs to acquire and close clients, were estimated at 0–2 per cent of marketing costs per year, or US$0–450,000 per year.

### Customer access and sales

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

The marketing department had indicated that many of the firm's clients had become very concerned about the sustainability performance of their vendors, particularly the 25 per cent of the firm's business that came from Fortune 1000 corporations. A recent survey indicates that 83 per cent of corporations are beginning to talk with their suppliers about measuring sustainability.[46] Additionally, given Engineering Co.'s 15 per cent of revenues from federal government contracts, it was particularly concerning when Executive Order 13514 was issued requiring 95 per cent of new contracts with the GSA to meet sustainability requirements. In light of the evidence about customer concerns, and the growing importance of sustainability-related services to the engineering industry, seeking a high level of sustainability performance from the company's buildings appeared prudent. While specific evidence of sales improvements, or more likely potential loss of customer access and sales, for a company like Engineering Co. has not yet been verified, a range of potential sales impacts of 0–0.5 per cent per annum would be reasonable to apply for consideration given Engineering Co.'s customer base.

### Property-derived revenues

The proposed deep retrofit will increase the NPV of Engineering Co.'s building by approximately 4 per cent, or US$2,700,000, assuming a sales price of US$67,500,000 (US$225 per square foot). Since Engineering Co. has no current plans to sell the building, but could as business conditions change, a sale in seven years was assumed, and the premium was discounted to the NPV assuming a 7 per cent discount rate resulting in an NPV increase of US$1,385,000. The assumption of a 4 per cent increase in sales price is supported by evidence from over half a dozen research studies, which, on average, demonstrate sales price increases of over 10 per cent for LEED and/or Energy Star certified buildings. Additionally, the capitalised value of energy cost-savings alone (which directly increase the net operating income) exceeds a 4 per cent sales price increase.

### Enterprise risk mitigation

The proposed deep retrofit will positively contribute to reducing the business risks of Engineering Co. as a result of contributing to its sustainable reputation and leadership, and the improved health, productivity and satisfaction of its employees. While it is not precise science to estimate the value implications of reducing risk at Engineering Co., reduced risk would increase Engineering Co.'s current earnings multiple by around 3 per cent, from 3 to 3.1, which would result in a company value increase of US$2,250,000 (earnings of US$22,500,000 based on Engineering Co.'s profit margin of 10 per cent and sales of US$225,000,000). Assuming a sale of the company in ten years and discounting it back at 7 per cent would result in an NPV increase of US$867,500. Assumptions about how the deep retrofit would reduce company risks were supported by discussions with selected senior leadership and the company's risk manager, as well as HR professionals. Key business risks for Engineering Co. that are positively influenced by the deep retrofit include:

- competition and pricing pressure;
- reputational/brand risks;
- talent shortages and staff retention;
- increased stakeholder demands; and
- regulatory and compliance risks.

## CONCLUSION

Many companies want to be more sustainable in order to meet growing demand from customers, employees, investors and other stakeholders, and yet they do not always have a way to financially justify the approaches required to meet that goal. This paper provides a framework for linking one approach — deep retrofits — to financial value and illustrates how dramatically the economics of a deep retrofit can improve when all value is analysed. 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'. Like any potential profit opportunity, however, companies must invest and take risks to access 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 achieve superior profitability and help create a clean, prosperous and secure energy future for all.

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