Building Efficiency Toolkit

ULI San Francisco District Council
Sustainability Committee

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Urban Land Institute
San Francisco
Serving the Greater Bay Area

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About the Urban Land Institute
The mission of the Urban Land Institute is to provide leadership in the responsible use of land and in creating and sustaining thriving communities worldwide.

Established in 1936, the Institute today has more than 30,000 members worldwide, representing the entire spectrum of the land use and development disciplines. ULI relies heavily on the experience of its members. It is through member involvement and information resources that ULI has been able to set standards of excellence in develop¬ment practice. The Institute has long been recognized as one of the world's most respected and widely quoted sources of objective information on urban planning, growth, and development.

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Executive Summary

Increasing tenant demand and emerging government regulations are compelling owners of existing commercial buildings to invest in green improvements. A growing body of evidence indicates that green building investments increase net operating income and create value. Existing buildings face greater challenges compared to new construction when making green investments, including:

- higher marginal costs to rehabilitate older mechanical and building systems,
- tenant disruption as a result of major retrofit projects, and
- limited ability to pass through retrofit costs to tenants due to existing lease structures.

This Toolkit, developed by the Sustainability Committee of the San Francisco District Council of the Urban Land Institute, identifies and attempts to "demystify" these and other challenges that owners of existing buildings may face when implementing a green retrofit project.

The Value of Green Improvements

The driving force behind building owners making capital investments is the need to retain or enhance value by remaining competitive in the market. A green retrofit is one of a menu of "value-add" repositioning options that a property owner can consider. The market rewards for green upgrades, in particular, are compelling.

Numerous independent reports document that efficient buildings achieve higher occupancy and rents, lower operating costs, and increased value. For example, McGraw-Hill Construction reports that efficiency improvements increase building value by an average of 7.5 percent, reduce operating costs by an average of 8 to 9 percent, and improve return-on-investment an average of 6.6 percent. Cassidy Turley also reported in August 2010 that LEED-certified buildings in the San Francisco Bay Area have significantly lower vacancy rates and higher rents compared to the overall commercial building stock.

There is also a nationwide trend towards government regulations that require new buildings to meet energy-efficiency standards, and existing buildings to comply with energy benchmarking and disclosure. Driven by the fact that commercial buildings are one of the biggest contributors to environmental pollution in the United States, accounting for 40 percent of total energy use, 72 percent of electricity consumption, 39 percent of the carbon dioxide emissions, and 13 percent of total water consumption (as reported by the U.S. Environmental Protection Agency), those regulations are designed to reduce energy use and carbon dioxide emissions both for new and existing buildings. New buildings set a new standard in the market, one that attracts tenants seeking a lower carbon footprint. The disclosure and benchmarking regulations put competitive pressure on existing buildings because the relative efficiency and operations of existing commercial buildings can now become transparent as part of a leasing or purchasing decision. That combination of requirements for new and existing buildings has made energy efficiency a key driver of an existing building's competitive strength in the market.

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In the Bay Area, the cities of San Francisco and Oakland will publicly disclose commercial building efficiency in a phased schedule based on completion of energy ratings and compilation of data. The San Francisco Buildings Energy Performance Ordinance has a phased schedule with energy use of all buildings greater than 10,000 square feet publicly disclosed beginning April 1, 2014.

Increasingly, it is becoming clear that upgrading commercial buildings to current standards for energy efficiency and sustainability is no longer simply an option, it is a competitive necessity. Building owners should develop a strategy for implementing efficiency improvements to remain competitive, decrease risk of obsolescence, and enhance asset value.

Investment Strategy

Deciding which improvements to include in a green retrofit is similar to scoping any other asset-repositioning investment: the cost of the investment must provide sufficient return to attract the needed capital. Conducting an evaluation of green retrofit can be complicated, confusing, and time-consuming, given the difficulty in accurately projecting energy savings and the uncertainty of recouping the investment in improvements that may only indirectly relate to energy savings.

The approach described in this Toolkit advocates that building owners not limit the scope of investigation, but rather, take a holistic approach that considers both energy-related and environmental performance improvements. If assets are evaluated holistically, energy-efficiency measures will help offset the cost of a deeper, green retrofit to achieve even greater value for the owner and for the community.

A complete building audit begins with an independent, third-party consultant who evaluates a range of potential green improvements. With an existing property, it is important to start with an understanding of the building's current operating status and establish a "baseline," or benchmark. Most energy auditors follow American Society of Heating, Refrigeration and Air-Conditioning Engineers' *ASHRAE Handbook* guidelines, which provide a range of implementation levels. It is important that the audit complies with recognized energy standards to ensure consistency in results and to enable benchmarking to other buildings.

It is critical to bring in an independent, certified third-party auditor for a number of reasons:

- to validate eligibility for utility program incentives;
- to earn a certification or recognized rating from an industry standards body; and,
- to gather ideas from experts, especially regarding newer technologies in the market.

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The audit report is a roadmap for implementation. A good audit report will include the expected costs to implement various energy-efficiency measures, will identify available incentives, and will estimate the expected payback for the investment, including simple payback, internal rate of return, and/or net present value.

Owners should feel free to work with their preferred contractors to implement the green retrofit; in other words, use proven vendors and resources that are familiar with the asset. Third-party validation should be incorporated where appropriate, and will be required if certification of the building, through LEED or other means, is being pursued.

Measurement and verification should be included in the cost/benefit analysis of the retrofit and should be automated, where feasible. Advances in technology will ultimately allow for "constant building commissioning" as part of normal operationsto ensure ongoing optimal performance. Subsequent to the retrofit, a building owner should routinely verify that the project is achieving projections by assessing utility bills, tenant comfort, projected cash flows, and asset value.

Financing Sources

As part of the initial conceptualization of a green investment, building owners should conduct a risk/reward evaluation to understand how costs, risks, and rewards will be distributed among the owner, tenants, and financing entities. This process will influence the scope of improvements, communication with tenants, and the final selection of financing sources.

The risk/reward profile has three dimensions:

1. Distribution of retrofit costs and savings between owner and tenant – owners should analyze existing leases to determine the distribution of capital costs and benefits of a retrofit between owner and tenants (if a "split incentive" exists - in other words, if the burden of costs goes to the owner and the tenant receives the benefits - the owner may want to consider converting to an "energy aligned lease" structure);
2. Risk of achieving savings – owners should understand how the retrofit costs will be repaid from energy savings in the event the energy savings do not meet projections; and
3. Compatibility of financing sources – owners should ensure that new financing for retrofit projects doesn't create encumbrances that conflict with existing financing.

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Seven categories of financing sources are available to building owners:

1. Equity investment by building owners: Many large building owners with sufficient cash flow or liquidity will fund green improvements with equity, based on estimates of higher rents, lower occupancy costs, and increased long-term asset value.
2. Conventional loan financing: Conventional loan financing with specified loan-to-value underwriting criteria can be the least expensive, least restrictive debt source for green improvements in cases where the improvements directly increase net operating income (NOI) and correspondingly, the value of the property.
3. Utility rebates: In California, investor-owned utilities have extensive and robust rebate programs that are constantly evolving and improving.
4. Grants, tax deductions and special loans: Both the state and federal governments offer many options in this category, which are constantly changing. Current examples include the federal 179D tax deduction, Community Development Financial Institution funding, small business loans, and Fannie Mae Green Refinance Plus.
5. Property Assessed Clean Energy (PACE) loans: Many jurisdictions offer municipally financed, long-term financing that is repaid from annual tax assessments secured by a tax lien.
6. On-bill financing and on-bill repayment: Funding for on-bill repayment, offered by California investor-owned utilities, has been fully subscribed and the California Public Utilities Commission is currently considering options to source capital from third-party lenders. For these programs, loan repayment is included in the utility bill.
7. Energy Service Companies (ESCOs): Energy service companies fund the improvements, which are repaid through the utility bill. This form of financing has historically been offered to governmental and institutional properties and to-date, has had limited application in the commercial real estate market.

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Exhibit 1

Summary of Financing Sources

Summary of Financing Sources			
Program	**Description**	**Pros**	**Cons**
Owner equity	Owner invests additional equity based on expectation of higher rents and value.	Most flexible financing source.	Capital is at risk. Owners must have sufficient cash flow and/or liquidity.
Conventional lenders	Loan is based on increased NOI or value resulting from estimated energy savings of retrofits.	Lowest-cost/longest-term amortization of efficiency improvements.	Limited by lender underwriting criteria, i.e., must show increased NOI and value.
Rebates	Rebates provide refunds for efficiency investments and are typically available through utility companies.	Subsidizes the cost of retrofits; can taylor to specific improvements; no property lien.	Limited in application.
179D tax deduction	Federal initiative, tax deduction for energy-efficiency retrofits in commercial buildings constructed prior to 2005.	Tax deduction of up to $1.80 per square foot for lighting, HVAC and building envelope improvements.	Secured by lien. May result in a larger capital gains tax upon sale. Issue of priority.
Community Development Financial Institution (CDFI)	U.S. State Department of Treasury awards credits and funds to financial institutions in economically distressed areas.	Assists lenders in establishing favorable financial products and services, including for efficiency improvements.	Geared toward lenders. Energy efficiency may be a small component of the program.
Federal small business loan programs (SBA)	SBA 7A and 504 loan programs are applicable to energy-efficiency projects.	Assists small businesses in funding energy efficiency projects. Preference is given to LEED-certified projects.	Geared toward small businesses. Process-intensive.
Fannie Mae Green Refinance Plus	Flexible underwriting to allow borrowers to refinance properties while making energy- and water-efficient improvements.	Funding for energy-efficiency improvements in affordable multifamily housing.	Limited to affordable multifamily projects. Creates encumbrances. Process intensive.
Property Assessed Clean Energy (PACE)	Energy efficiency-related projects are funded through the issuance of bonds.	Allows efficiency investments to be re-paid over time.	Secured by lien. Issue of priority.
On-bill financing (OBF) and on-bill repayment (OBR)	Upfront capital is secured by payments through validated savings projections paid through utility bill. Third-party lenders will soon to be involved in OBR.	Provides financing for small projects. Up to five years of interest-only payments. Runs with property. Secured by ability to turn off utilities for repayment.	OBF funding is fully subscribed. Need to check on terms with regard to sale or re-leasing of property.
Energy service companies (ESCOs)	ESCOs finance retrofit projects. Energy savings is guaranteed.	No property lien. Addresses split-incentive concerns. Runs with property. Cost and performance risk is assumed by ESCO.	Limited availability for commercial buildings to qdate.

Note: HVAC = heating, ventilating and air conditioning; IRS = Internal Revenue Service; LEED = Leadership in Energy Environmental Design; NOI = net operating income; SBA = small business association.

Introduction

Introduction

This purpose of this Toolkit is to help owners and managers of existing buildings understand where to start, where to look, and which issues to consider when developing the scope and obtaining financing for a green investment, including simple operational efficiencies. The Toolkit focuses on existing buildings because in today's market, it is relatively straightforward to incorporate and finance green improvements into new buildings for several reasons: First, green features can be more easily integrated into new buildings during the initial design process. Second, green elements are a relatively small portion of overall development costs and can therefore be incorporated into conventional project financing. Third, since all tenants are new to the building, leases can be structured to facilitate the pass-through of green investment costs and associated savings from the owner to the tenants.

In contrast, existing buildings face much greater challenges when a green retrofit project is undertaken. First, the marginal cost to rehabilitate older mechanical and building systems is generally higher. Second, major retrofit projects, such as replacing chillers and boilers, may disrupt tenants' business operations. Third, existing leases may not allow the owner to pass through retrofit costs to the tenants, who benefit from the savings. This Toolkit identifies and attempts to "demystify" a variety of challenges that existing buildings owners may face, in order to facilitate the successful implementation of a green retrofit project.

The April 2012 *Institutional Real Estate Letter* (Appendix B) points out that owners of existing buildings can easily achieve ongoing operational savings of $0.10 to $0.25 per square foot annually, which can result in a 2 to 3 percent increase in asset value. But green investment in existing commercial buildings is not simply about achieving energy-efficiency savings and lowering operational costs. It is also about recognizing that regulatory and market trends compel owners of existing buildings to invest in green improvements.

For example, current regulations require new buildings to be efficient and existing buildings to be transparent in their energy use. From a market standpoint, energy efficiency and other green improvements in recent years have become as important for remaining competitive as traditional upgrades, such as renovating lobbies and restrooms. Owners of existing commercial buildings should recognize that if green investments are not undertaken, these buildings will likely become obsolete. Green investment is about enhancing property value through lower operational costs and increased net operating income, retaining tenants, mitigating obsolescence, and managing risk.

This Toolkit was developed by the Sustainability Committee of the San Francisco District Council of the Urban Land Institute. In the process of developing the Toolkit, the Committee interviewed numerous, knowledgeable participants in the development, banking, appraisal, public sector and academic arenas, and conducted extensive additional research. The perspective offered in this document is that of practitioners in the commercial real estate industry, not of design or energy experts. Our hope is that what we have learned may facilitate

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other non-experts to engage proactively and productively in upgrading the efficiency of existing buildings. Given the rapid pace of change and innovation in green improvements, the Toolkit is as much a research guide for sources of information as it is a "how to" manual. We anticipate that the Toolkit will be updated periodically as new technologies, processes, products, and financing sources become available.

Our foundation premise that regulatory and market forces compel owners of existing commercial buildings to engage in efficiency upgrades or risk building obsolescence was reinforced numerous times in our interviews. As one interviewee put it:

> *Sustainability is a "competitive necessity". It's about being relevant to customers (tenants, buyers), which attracts debt and equity.* (Josh Callahan, Wilson Meany)

Or, as another interviewee noted:

> *In urban environments, the ability to construct new buildings diminishes each year. As an alternative, a significant opportunity exists to utilize new technologies to convert or retrofit existing buildings into "green jewel boxes". The value-add perception of efficiency improvements will continue to improve as energy usage data becomes more available, transparent, and correctly analyzed and interpreted.* (Gary Holtzer, Hines Development)

The emphasis on existing, older buildings was also something that our interviewees reinforced. Here is a comment typical of what we heard:

> *For large owner/investors, the primary motivations for investing in efficiency improvements are to mitigate risk and enhance asset values. However, the marginal dollars required to fund efficiency improvements do not factor into large owners'/investors' overall asset-financing strategies because they generally have access to alternative sources of capital and liquidity. A directory of financing sources may be more useful for smaller owners/investors of Class B buildings.* (Gary Holtzer, Hines Development)

As compelling as the market forces are, green retrofits are still a challenge for most owners of existing buildings. A June 2013 survey of over 3,000 respondents worldwide by Johnson Control's Institute for Building Efficiency found that capital availability "remains the most significant challenge" to implementing building efficiency in the United States, Europe, and Australia. But this was not the only challenge that respondents noted. The certainty of actually achieving the projected savings and relevant financial criteria for evaluating the worth of the investment were also cited. Exhibit 2 summarizes the Institute for BUilding Efficiency's results.

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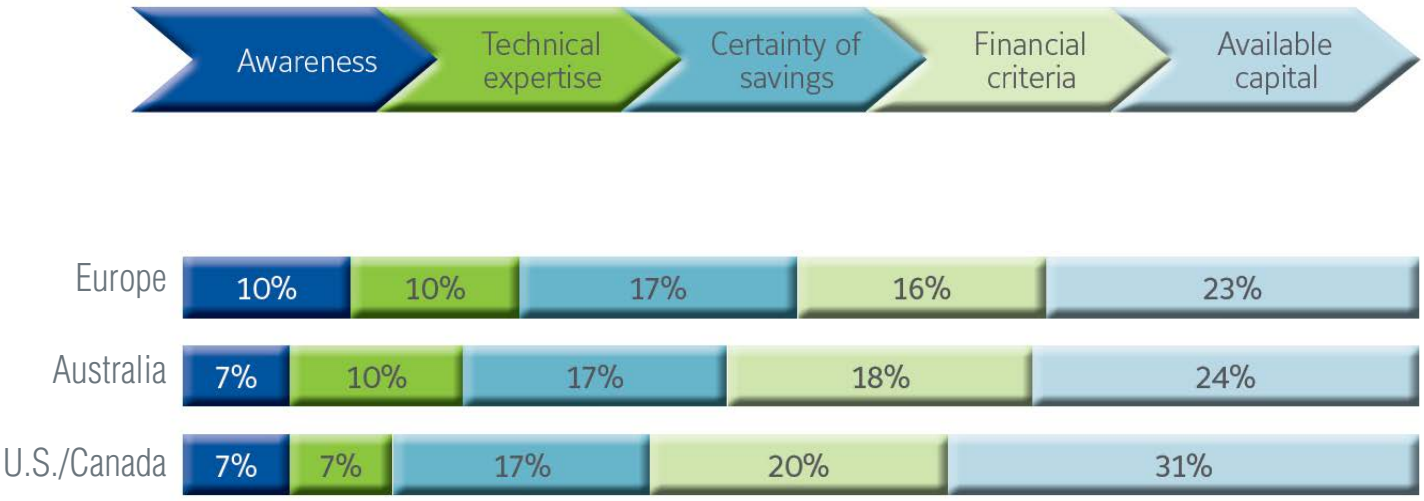
Exhibit 2

Challenges to Implementing Building Efficiency



Source: Institute for Building Efficiency.

Introduction

The Toolkit is divided into three sections which illuminate key, strategic challenges facing existing building owners when considering a green retrofit. None of the issues exist independently of the others, and all require an understanding of the objectives and incentives of stakeholders in order to engage them effectively. The Toolkit sections are as follows:

I. The Value of Green Improvements: Section 1 discusses the market and regulatory forces that compel owners of existing buildings to make green investments. It documents research that validates the higher rents, occupancy and value of efficient buildings and discusses how emerging energy-use disclosure requirements are affecting the market. It presents a persuasive case that upgrading is a necessity to preserve and enhance market value, reduce risk, and remain competitive in the market.

II. The Investment Strategy: Section 2 describes how to scope improvements for a green retrofit, ranging from simple operational savings to more extensive capital investments. It suggests a holistic approach that goes beyond just energy-related improvements to include environmental performance improvements. Section II notes some of the challenges of variability in audit results and suggests ways to become an informed buyer of energy audit services. Finally, it describes a five-step approach to exploring, ranking, selecting, and implementing green improvements.

III. Financing Sources: Section 3 describes how to assess risk/reward factors that will affect the project scope and the choice of financing source(s). The section then identifies a range of potential financing sources, recognizing that financing for green improvements is an evolving field and that new sources are constantly emerging. Web links that contain additional information about each financing source are included in Appendix A.

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The appendices contain several resources that supplement the Toolkit:

- Appendix A: Links to Additional Resources
- Appendix B: "Don't Waste Your Energy," by Hugh Morgan and Walt Homan, *Institutional Real Estate Letter*, April 2012
- Appendix C: Cassidy Turley " Real Green Index," August 2010
- Appendix D: San Francisco's Existing Commercial Buildings Energy Performance Ordinance
- Appendix E: LaSalle Investment Management "Green Guide"
- Appendix F: Department of Energy Report on "Variation in Energy Audits: A Case Study of Navy Yard Building 101"
- Appendix G: "Why Retro-commission Your Building?" by William J. Stangeland, McGuire Engineers Inc. | HPAC Engineering, March 2013
- Appendix H: Green Tenant Toolkit from the Business Council on Climate Change

I. The Value of Green Improvements

The Value of Green Improvements

The driving force behind building owners' making capital investments is the need to retain or enhance value by remaining competitive in the market. With an increasing supply of new buildings in the market, owners of existing buildings who do not invest risk losing tenants and seeing their assets slide into obsolescence. A green retrofit is only one of a menu of "value-add" repositioning options that a property owner can consider. But the market rewards for green upgrades are compelling. Furthermore, new regulations that require disclosure of buildings' energy use will allow tenants and buyers to take into account the cost of energy use when shopping for space.

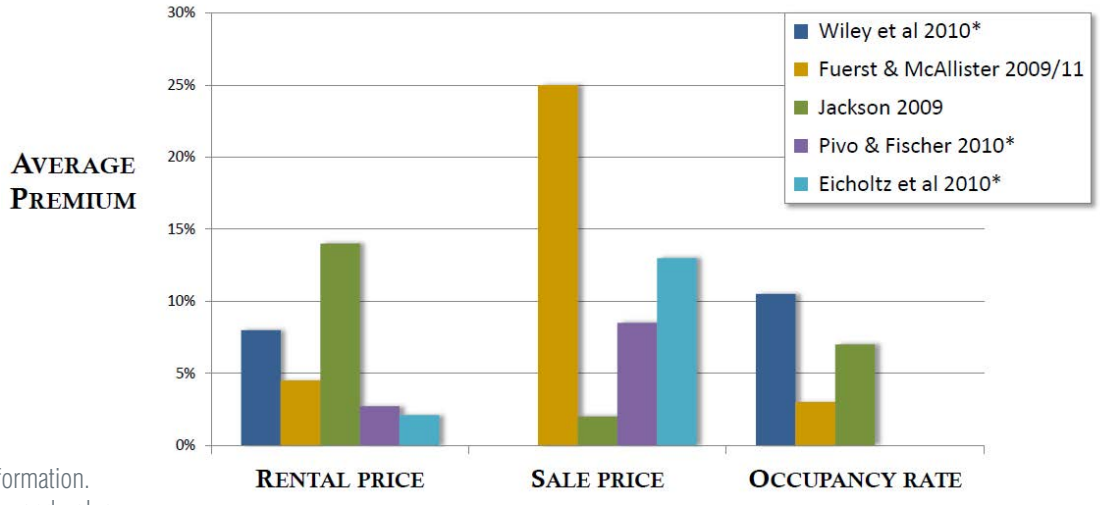
Enhanced Value

Numerous independent reports document that the market rewards efficient buildings with higher occupancy and rents, lower operating costs, and increased value. For example, McGraw Hill Construction reports that efficiency improvements increase building value by an average of 7.5 percent, reduce operating costs by an average of 8 to 9 percent, and improve return on investment an average of 6.6 percent.

Another study by the Institute on Market Transformation, a Washington, D.C.-based nonprofit organization that promotes energy efficiency, green building, and environmental protection, validates those conclusions. The Institute summarized the results of five outside studies that measured the effect of an Energy Star score on (a) rental rates, (b) sale price, and (c) occupancy rates. (Energy Star is an international standard for energy-efficient consumer products created in 1992 by the Environmental Protection Agency [EPA] and the Department of Energy). Although the five studies vary in absolute conclusions, all point to positive increases in property performance and value, as illustrated in Exhibit 3.

Exhibit 3

Effect of Energy Star Score on Rents, Value, and Occupancy



Note: More information on the studies cited and the graphing of their results is availble from David Leipziger at david@imt.org.

Source: Institute for Market Transformation. http://www.imt,org/policy/efficiency-and-value

The Value of Green Improvements

Fireman's Fund Insurance, the first property and casualty insurance company to offer green insurance for commercial buildings in the United States, also documented the economic advantages of green investments in a 2009 article titled "The Benefits of Green Building and Retrofits":

- Higher rents and occupancy rates. The CoStar Group found that occupancy rates in LEED-certified buildings (Leadership in Energy Efficient Design - certified buildings) average 92 percent, compared to 87 percent in traditional buildings.
- Lower operating costs. The EPA reported that green buildings can reduce waste output by up to 90 percent and use 30 percent less energy, resulting in a 5 percent increase in net operating income.
- Attraction and retention of quality tenants, including government users. Improved indoor air quality results in lower absenteeism and, possibly, higher productivity.
- Lower insurance risk. Green buildings experience fewer losses and are therefore a better insurance risk, resulting in lower insurance premiums.

Cassidy Turley also reported in August 2010 that LEED-certified buildings in the San Francisco Bay Area have significantly lower vacancy rates and higher rents when compared to the overall commercial building stock. (The complete study is attached as Appendix C).

The market clearly offers higher rents, occupancy rates, and value for efficient buildings. This in itself is a compelling motivation for building owners to explore efficiency investments. There is also a nationwide trend towards government regulation that requires new buildings to meet energy-efficiency standards, and existing buildings to comply with energy benchmarking and disclosure. Those regulations allow the cost of energy to become part of tenants' evaluation of occupancy costs, which may significantly affect the competitive position of nonefficient, existing buildings.

Regulation

What is driving the regulation of commercial buildings? The EPA reports that commercial buildings are one of the biggest contributors to environmental pollution in the United States, accounting for 40 percent of total energy use, 72 percent of electricity consumption, 39 percent of carbon dioxide emissions, and 13 percent of total water consumption. In an attempt to lessen those effects, regulations are generally designed and implemented to reduce energy use and carbon dioxide emissions in two ways:

1. While still a relatively small portion of the overall market, new commercial buildings must meet high energy efficiency standards. In California, those standards are contained in Title 24 of the state law. For many jurisdictions, meeting the higher standards of LEED may also be required.

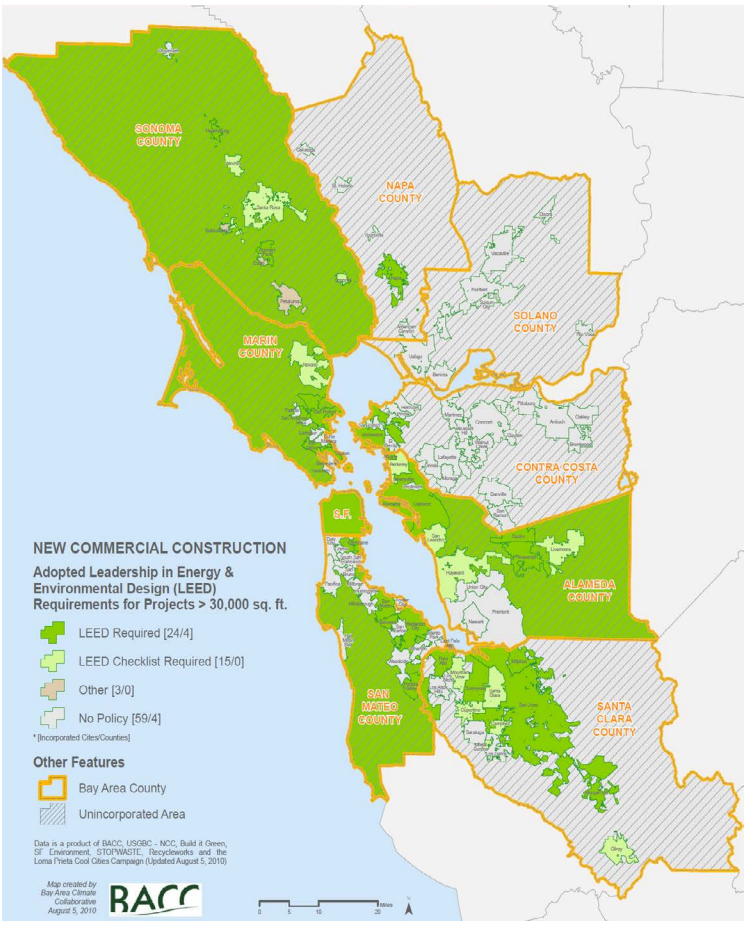
The Value of Green Improvements

2. For existing buildings, which still comprise about 95 percent of the market, state and local regulations now require the disclosure of energy-efficiency data to tenants and, upon sale, to prospective buyers. In some jurisdictions this data will soon become available to the general public.

Exhibit 4 shows the jurisdictions in the San Francisco Bay Area that either require compliance with LEED standards or require a LEED checklist review for construction of new commercial buildings greater than 30,000 square feet. Of the 109 jurisdictions shown, 46 require compliance or checklist review and 63 have no requirements. However, the 46 jurisdictions requiring either compliance or review comprise 80 percent of the Bay Area's population.

Exhibit 4

San Francisco Bay Area Jurisdictions
LEED Standards Adopted or Energy Checklist Required



Source: Bay Area Climate Collaborative.

The Value of Green Improvements

As noted, new construction that meets increased efficiency standards is a relatively small part of the total supply of commercial buildings. The Cassidy Turley study referred to earlier reports that LEED-certified buildings in the San Francisco Bay Area make up only 5percent of the total inventory of 490 million square feet of commercial office space. However, as the number of buildings that meet LEED standards increases, they will begin to effectively compete against nonefficient buildings.

Disclosure regulations present older buildings with even more market pressure to improve efficiency. Those regulations require commercial building owners to disclose energy-efficiency ratings based on Energy Star or other current industry standards. In California, effective January 1, 2014, state law requires disclosure of a commercial building's energy-efficiency rating to any new tenant or buyer.

In the Bay Area, the cities of San Francisco and Oakland will be publicly disclosing commercial building efficiency in a phased schedule based on completion of energy ratings and compilation of the data. The San Francisco Existing Commercial Buildings Energy Performance Ordinance (a summary of which is attached as Appendix D), has a phased public schedule with energy use of all buildings greater than 10,000 square feet publicly disclosed beginning April 1, 2014. Those disclosure and benchmarking requirements allow prospective tenants, occupants, and owners to evaluate the relative efficiency and operations of existing commercial buildings as part of a leasing or purchasing decision. Disclosure will make it even more difficult for existing buildings to compete with the newer, more energy-efficient product.

Energy disclosure and benchmarking regulations do not exist in all markets, but they are becoming increasingly prevalent, especially in major metropolitan areas. Exhibit 5 shows, as of February 2013, the states and local jurisdictions that have adopted energy efficiency disclosures or benchmarking requirements for commercial, public, or residential buildings. As these regulations take effect, their effect on the market will increase.

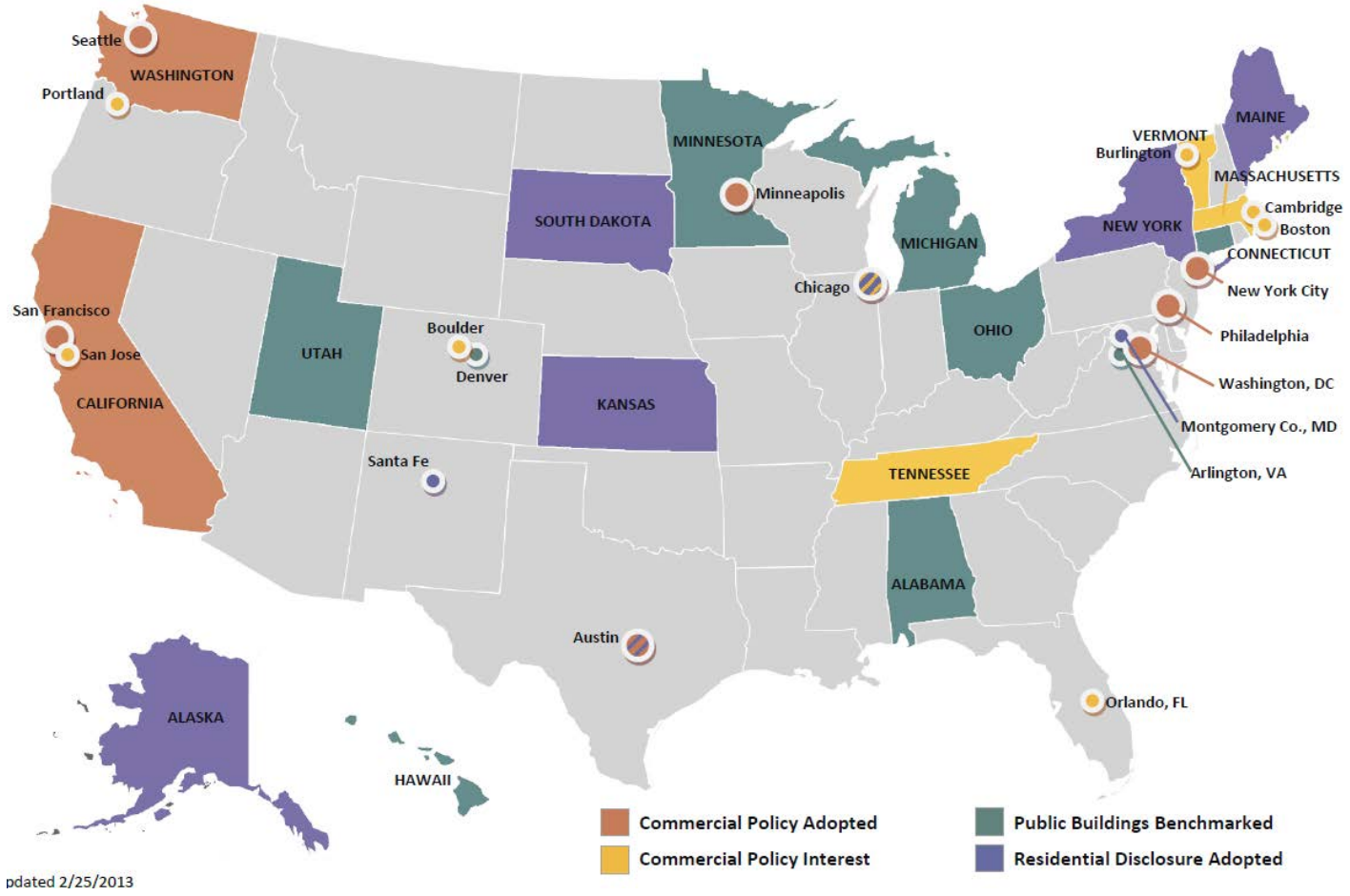
Many building owners have not waited for regulations requiring energy-efficiency disclosure. They have decided that the best competitive retrofit strategy is to pursue a rating that captures market benefits through a certification or accreditation, such as Energy Star or one of the various LEED ratings. Each rating level will have a different marginal cost and value; therefore, owners need to evaluate and select a level that provides the most cost-effective means for increasing efficiency.

Increasingly, it is becoming clear that upgrading commercial buildings to current standards for energy efficiency and sustainability is no longer simply an option, it is a competitive necessity. Building owners should develop a strategy for implementing efficiency improvements in order to remain competitive, to decrease risk of obsolescence, and enhance asset value. The evaluation of risk/reward conditions and selection of a financing source is discussed in

The Value of Green Improvements

Exhibit 5

Adoption of Building Energy-Efficiency Disclosure or Benchmarking Requirements as of February 2013



Source: Institute for Market Transformation.

II. Investment Strategy

Investment Strategy

Deciding which improvements to include in a green retrofit is similar to scoping any other asset-repositioning investment: the cost of the investment must provide sufficient return to attract the needed capital. But conducting an evaluation of green retrofit can be complicated, confusing, and time-consuming, given the difficulty in accurately projecting energy savings and the uncertainty of recouping the investment in improvements that may only be indirectly related to energy savings.

The approach described in this section advocates that building owners *not* limit the scope of investigation, but rather, take a holistic approach that considers both energy-related and environmental performance improvements. Next, the section describes some of the consistency and standards issues associated with the audit process and suggests ways to more effectively manage those issues. And finally, the section outlines a five-step process to systematically analyze options and facilitate decision making regarding which improvements to include in a green retrofit project.

A Holistic Approach

With existing properties, there can be a tendency to "work around the edges" or to work on one system at a time. This approach often creates redundant construction work over time with truncated returns, higher total costs, and incompatibility of components. So as with new construction, owners of existing buildings should consider a full range of options before choosing the most cost-effective subset of components for implementation. The final strategy should meet criteria for increasing property value, capturing current technology, and retaining the flexibility to consider other components for implementation in the future.

Historically, the benefits of green improvement projects have centered on energy savings. Energy-related improvements range from (a) simple, no-cost operational measures; (b) low-cost modifications, including changes in occupant behavior; (c) extensive capital investments (with and without utility incentives); and (d) alternative energy purchase or on-site generation. The net present value or payback period is calculated for each measure based on the magnitude and value of energy savings.

Increasingly, investors are realizing that benefits go beyond simply more efficient operations. This is particularly evident in the Bay Area where desirable, high-rent tenants demand green buildings that are not just energy efficient but healthy places to work. Therefore, a green improvement program should address both opportunities for energy-related savings resulting from greater building efficiency and the environmental performance of the building, such as improved tenant health and productivity, carbon credits, and enhanced pedestrianand transit linkages.

Investment Strategy

1. Energy-related improvements include items such as energy efficient lighting, building control systems upgrades, and higher efficiency heating, cooling, and ventilation systems. Implementation of these improvements will likely result in immediate, quantifiable reductions in utility bills and corresponding lower operating expenses to the tenant or higher net operating income to the owner. Frequently, utility companies will offer rebates, grants, and other financing tools for many types of efficiency or demand-side energy management improvements. The energy savings, in many cases, fund amortization of the capital investment either through an increase in revenue to the building owner or through on-bill financing and repayment programs.
2. Environmental performance improvements will achieve broader objectives that address the building's impact on the environment, and its connection to the surrounding community fabric. Examples include (a) use of sustainably-harvested wood, (b) recycling of construction materials, (c) use of paints and materials that contain low amounts of volatile organic compounds, (d) installation of water-conserving fixtures, (e) use of environmentally-friendly cleaning products, and (f) reduction in the building's carbon footprint through access to mass transit and ride sharing. An increasing number of tenants in the Bay Area have come to expect such performance measures and will avoid buildings that lack them. Financing for those types of improvements will likely be based on a validated increase in asset value, which allows higher loan amounts based on loan-to-value underwriting criteria.

LaSalle Investment Management's "Green Guide" for sustainable building management, outlines a variety of sustainable operational best practices, including energy efficiency, water conservation, and tenant improvements and renovation. For each category, several low-cost options as well as more significant investment opportunities are presented. For example, energyefficiency measures include low-cost items such as calibrating controls and sealing air leaks; higher-cost options include installing lighting motion sensors and replacing chillers. Tenant improvement options focus on improving indoor air quality through the use of low-toxicity paints and building materials. Please refer to Appendix E for the complete guide.

The process of formulating a green investment strategy involves a broad range of options. An owner that starts the process holistically can then narrow the choices to those best suited to the particular property and its circumstances.

Building Audit Consistency and Standards

Before starting an audit, building owners should become familiar with the uncertainties associated with the process and then consider how to address the uncertainties. This issue is of great concern among those active in building efficiency, with a call for more consistent industry standards and terminology.

Investment Strategy

It is important that the audit complies with recognized energy standards in order to ensure consistency in results and benchmarking to other buildings. Most energy auditors follow American Society of Heating Refrigeration and Air-Conditioning Engineers' *ASHRAE Handbook* guidelines, which provide a range of implementation levels. Appendix A includes a link to many different building codes and standards that serve as industry standards for consistency in audits. Refer, in particular, to AHRAE's publication P*rocedures for Commercial Building Energy Audits, Second Edition.*

Research on this issue continues from a variety of sources. For instance, the Environmental Defense Fund has facilitated a consortium of stakeholders, including the Department of Energy, in a project called the Investor Confidence Project. The goal of this project is to"enabl[e] a market for investment quality energy efficiency projects by reducing transaction cost and engineering overhead, while increasing the reliability and consistency of savings." The Investor Confidence Project is described at http://www.eeperformance.org/. It is a good source for building owners who want to become familiar with the elements of an energy audit and understand best practices for procedures and documentation.

Appendix F contains a report that describes one of the primary concerns building owners face when conducting energy audits, namely, variation in audit results. The report, "Variation in Energy Audits: A Case Study of Navy Yard Building 101", from the Department of Energy, describes an energy audit conducted in 2013 for a building at the Philadelphia Navy Yard. The report outlines three levels of building audits:

Level I: A simple walk-through inspection by an "experienced observer" leading to verbal recommendations. Level I determines a rough estimate of efficiency improvements or helps identify capital projects.

Level II: An analysis of the detailed energy use of a building, attributed to the various building subsystems, followed by a financial analysis of best return on investment for building or system upgrades. Level II offers specific recommendations and investment costs and is the most commonly utilized audit. The auditor should deliver Level II findings within four weeks of commencing an assessment. It is imperative for the building owner to review these initial findings with the auditor and determine specifically which measures have the greatest likelihood of implementation.

Level III: A deeper investigation, including a whole-building computer simulation of the retrofits identified in the Level II audit that require significant capital investment. Level III is a detailed analysis of capital-intensive modifications. The most feasible measures identified in Level II should be studied further during Level III from an engineering, operational, and financial perspective. The final audit report may take another one to two months to complete.

Investment Strategy

The Department of Energy case study contained in Appendix F presents the variation in results from three different auditors and makes recommendations for improving industry standards in terminology, analysis, and documentation. This case study and the variation in results that it highlights is a cautionary tale for owners to select competent, reliable auditors, but to also ensure that audit results meet recognized industry standards, are carefully scrutinized, and understood before implementation occurs.

A Five-Step Approach to the Complete Building Audit

The building audit is the first step in identifying opportunities to conserve energy and increase environmental performance. Subsequent steps address analysis of options, financing, and verification. The five steps for undertaking a green improvement project that will produce reliable results are as follows, and are discussed in more detail below:

1. Research and evaluate the full range of options.
2. Assess and rank the options.
3. Establish the final scope, budget, and financing plan.
4. Implement the project.
5. Validate and certify.

Step 1: Research and evaluate the full range of options.

Summary: Perform an integrated assessment of the facility, which should include an investment-grade energy audit conducted by an independent, third-party auditor. Ensure that the information for each option includes cost, compatibility of various measures with one another, and expected impact on operating cost and asset value. Include in the research and evaluation how each component contributes to qualifying for certifications and accreditation that will increase marketability and enhance property value; for example, the audit should include an assessment of the requirements to achieve the desired level of certification, for example, in the case of LEED, Certified, Silver, Gold, or Platinum.

With an existing property, it is important to start with an understanding of the building's current operating status and establish a "baseline," or benchmark. In addition to establishing a reference point for improvements and incentive payments, a baseline also provides the retrofit design team with a perspective from which to consider alternative retrofit options. For example, almost any energy audit should produce an Energy Star score for the building. Maintained by the EPA, this benchmark will rank the building on a 100-point scale compared to other similar buildings across the nation. Many jurisdictions are requiring disclosure of Energy Star scores.

Investment Strategy

An experienced auditor will compile and review a considerable amount of information before ever stepping on site, including building uses, hours of operation, utility bills, and electrical and mechanical drawings, as available. Providing the auditor with access to this information in advance will speed up the audit process. Supplying that information requires the time and expertise of in-house building management staff, which should be actively involved throughout the process. Although in-house staff can conduct much of the assessment work, it is critical to bring in an independent, certified third-party auditor for a number of reasons:

- To validate eligibility for utility program incentives;
- To earn a certification or recognized rating from an industry standards body; and
- To gather ideas from experts, especially regarding newer technologies in the market.

Ultimately, the energy audit report will be organized into no-cost, low-cost, and capital-intensive measures. It will align the building systems with available utility rebates and other potential financing sources. All recommendations will meet the latest codes, notably, Title 24 standards in California. (Please refer to Appendix A for additional information regarding building codes.) A good audit report will include the expected costs to implement various energy-efficiency measures, available incentives, and expected payback for the investment, including simple payback, internal rate of return, or net present value.

Exhibit 6 illustrates a sample energy audit report that offers a sense of the information that results from the audit, ranging from no-cost measures, such as checking the thermostat, to more expensive measures, such as reflective window film or rooftop solar systems. As Exhibit 6 shows, each measure results in electricity or gas savings that are reported in units of energy and in dollars. Then the audit shows the simple payback period, in years, of the cost of each measure. Finally, the audit shows the payback period for each measure, net of potential utility incentive payments.

Investment Strategy

LEED Certification: The U.S. Green Building Council sponsors Leadership in Energy and Environmental Design, a program that provides third-party certification of green construction and retrofits. The LEED certification process promotes an integrated approach to identifying and implementing green investments, and it includes environmental performance elements in addition to energy-related improvements. Building projects satisfy prerequisites and earn points to achieve different levels of certification. To be considered for LEED certification, a building must earn an Energy Star score above 70; in other words, it must perform in the top 30 percent of similar buildings nationwide with regard to effective energy management.

A LEED readiness assessment can run in parallel with the energy audit and may even include many of the same players. If pursuing LEED certification, it is highly recommended that a LEED-accredited professional is included on the team. The process is similar to the energy audit; however, the review is more comprehensive.

Although not all LEED components result in directly quantifiable savings, all as whole, LEED- certified buildings generate indirect benefits including lower vacancy rates, higher tenant retention, better building management, a higher quality asset, and greater liquidity in marketplace, which translates into lower operating costs, increased cash flow, and increased asset value. For example, it may be argued that in the current San Francisco office market, in order for a building to be categorized as “Class A”, it must have obtained LEED certification.

It would be ideal to offset the costs of LEED measures that provide indirect benefits against the costs of a more comprehensive retrofit. For example, when repainting or resurfacing as a result of an energy retrofit, materials containing low amounts of volitle organic compounds, could be utilized and thereby earn LEED credits. There are many other examples.

Please refer to Appendix A for additional information regarding the U.S. Green Building Council and LEED certification.

Steps 2 and 3: Assess and rank the options, establish the final scope, budget, and financing plan.

Summary: Put all of the investment options on the table and develop a comprehensive roadmap for the property. Evaluate feasibility, risk, and expected payback period for each option. Identify mutually exclusive choices, and rank each option based on its marginal cost and its contribution to long-term value enhancement. Expect to find proven investments that will contribute directly to reducing operating costs, and, either immediately or in the future, increase net operating income and property value. Choose the highest ranked options and establish a total budget and a reasonable development and financing plan.

Investment Strategy

Exhibit 6

Sample Energy Audit Report

Type	Description	Annual Energy and Cost Savings				Payback		Payback with Incentive			
		Peak Savings (kW)	Electricity Savings (kWh)	Gas Savings (therms)	Annual Savings	Total Cost	Simple Payback (years)	Potential Utility Incentive	Net Cost	IRR	Simple Payback (years)
NC	Check the Thermostats on Heat Pumps	-	124,406	-	$14,276	$0	n/a	-	-	n/a	n/a
LC	Install High Capacity Air Filters	18.6	26,650	-	$2,943	$2,500	0.8	-	$2,500	45%	0.8
LC	Reset Condenser Water Temperature	25.8	17,149	-	$1,968	$3,610	1.7	($1,374)	$2,236	93%	1.0
CI	Variable Speed Condenser Water Pumping	-	315,631	-	$36,219	$77,056	2.3	($24,600)	$52,456	66%	1.8
CI	T-12 to T-8 Lighting and Occupancy Controls	74.2	198,502	-	$22,778	$137,165	6.4	($19,896)	$117,269	11%	5.3
CI	Fluorescent Lighting Installation	2.6	22,267	-	$2,555	$15,423	5.3	($3,000)	$12,423	21%	4.6
CI	Reflective Window Film	98.3	543,441	-	$62,360	$165,336	2.8	($59,985)	$105,351	68%	1.4
CI	Install Premium Efficiency Inverter Duty Motors on Air Handler Fan and Condenser Water Pump Motors	10.7	105,283	27,273	$42,222	$22,168	0.6	($785)	$21,383	211%	0.3
	Subtotals	**230.2**	**1,353,329**	**27,273**	**$185,321**	**$423,258**	**2.3**	**($109,640)**	**$313,618**	**59%**	**1.7**
DR	Reduce Lighting	170.6	7,805	-	$3,264	$12,360	3.4	-	$12,360	26%	3.5
DR	Reduce Ventilation	53.4	4,696	-	$2,345	$1,500	0.6	-	$1,500	145%	0.6
	Subtotals	**224.0**	**12,501**	-	**$5,609**	**$13,860**	**2.5**	-	**$13,860**	**38%**	**2.2**
SG	Solar PV System on Rooftop	167.3	322,652	-	$63,500	$1,985,000	27.0	($745,000)	$1,240,000	6%	15.8
	Totals	**621.5**	**1,688,482**	**27,273**	**$254,430**	**$2,422,118**	**2.4**	**($854,640)**	**$1,567,478**	**57%**	**1.8**

Note: CI = Capital Investment; LC = Low Cost; DR = Demand Response; n/a = Not Applicable; IRR = Internal Rate of Return; NC = No Cost; kW = kilowatt; PV = photovoltaic; kWh = kilowatt-hour; SG Self-Generation

Source: Hypothetical payback analysis derived by report authors from actual building audit reports.

Investment Strategy

Owners, property managers, and consultants must eventually come together and decide which measures make the most sense for the property. The audit report will become a road map for implementation. A good rule of thumb when evaluating energy-related investments, for example, is to consider each alternative in the following order of priority:

1. Does the project reduce energy load, demand for scarce or costly resources, or both?
2. Can the same work be done more efficiently or with less maintenance?
3. Can benefit be achieved from changing the order of operations or by greater granularity of controls?
4. Is it reasonable to add renewable energy generation on site or use more attractive alternate fuel sources?

Specific projects will vary greatly by age of the asset, use, and building systems. That being said, paybacks and incentives should be well understood by the stakeholders after completion of the audit process. Owners themselves and real estate market experts can lend their expertise to the projection of expected occupancy and rental rates as a result of the retrofit.

Owners should consider many factors, including implementation risks, market uncertainties, and achievable timetables for the property. But if there is one thing to expect from this process, the energy audit will likely to uncover a handful of proven, efficiency-related projects with rates of return that outpace many other investment opportunities in the market.

As with any property upgrade, owners should decide if and how much to finance and how much of their own funds to invest. Given the savings associated with energy-related investments, there are vehicles in the market today available to finance energy-related retrofits, which will be discussed in more detail in Section 3. If owners evaluate the asset holistically, energy-efficiency measures will help offset the cost of a deeper, green retrofit to achieve even greater value for the owner and for the community.

Retro-Commissioning: Part of the energy audit will identify no-cost and low-cost measures, which taken together are often referred to as “retro-commissioning” (RCx). RCx is the equivalent of a building “tune-up.” It is not expensive, intrusive, or “high-tech.” RCx measures do not take long to implement; existing building management staff and vendors can be used. Generally, payback periods associated with RCx elements are relatively short. According to the California Energy Commission, retro-commissioning can reduce existing building energy consumption by 7 to 15 percent with a simple payback period of one year or less. Now that the benefits of retro-commissioning have been clearly documented in hundreds of cases, it is recognized by the Department of Energy as a top priority for existing buildings across the nation.

Investment Strategy

The following are popular retro-commissioning measures:

- Turning off equipment when not in use;
- Calibrating sensors and instrumentation;
- Optimizing the operations of building systems;
- Eliminating simultaneous heating and cooling;
- Repairing or optimizing economizer operation;
- Lowing condenser water temperature; and
- Resetting static pressure set points.

The California Commissioning Collaborative is an excellence resource for RCx service providers. In addition, in 2007, the EPA funded an extensive *Retrocommissioning Guide for Building Owners.* Certified professionals can also be found through the Building Commissioning Association. Please refer to Appendices A and G for additional information.

Steps 4 and 5: Implement the project, validate and certify

Summary: Manage the construction of the project to ensure minimal disruption to tenants. Renegotiate leases if necessary in order to assure repayment of financing. Use trustworthy vendors with a track record of performance. In some cases (e.g., with energy service companies), the construction will be conducted by the company that is providing the financing. Verify that the project is achieving projections by assessing utility bills, tenant comfort, future cash flows, and asset value. Monitor repayment of financing and ensure that the desired certifications and accreditations have been secured.

Owners should feel free to work with their preferred contractors to implement the green retrofit, using proven vendors and resources that are familiar with the asset is usually recommended. All work in California should conform to the efficiency standards set forth in Title 24. In some cases, an objective third party may be necessary for certification, and some rebates may have utility company-driven deadlines. But, generally, work can proceed on a timeline that is suitable for the property and its owner.

Existing property owners can expect to give increasing attention to measurement and verification, an important, growing field. Measurement and verification should be included in the cost/benefit analysis of the retrofit and should be automated, where feasible. Advances in technology will ultimately allow for "constant building commissioning" as part of normal operations to ensure ongoing optimal performance. Those tools do not eliminate the need for human intervention, but rather, should inform existing property management teams regarding upcoming maintenance needs, or simply provide information when the building is not performing as expected.

III. Financing Options

Financing Options

As part of the initial conceptualization of a green investment, building owners should conduct a risk/reward evaluation to understand how costs, risks, and rewards will be distributed among the owner, tenants, and financing entities. That process will influence the scope of improvements, communication with tenants, and the final selection of financing sources. The building owner will face an array of financing options, many of which are evolving and many of which are offered through local or state channels. This section outlines the issues to examine in the risk/reward evaluation and provides an overview of financing options that currently exist in the marketplace.

Risk/Reward Evaluation

Each property and financing source will have a different risk/reward profile. Understanding the profile is an important prerequisite for selecting the scope of improvements and the financing source(s). The risk/reward profile is comprised of three dimensions:

1. Distribution of Costs and Savings: Existing leases govern the pass-through of costs and distribution of savings. Some tenants may be unwilling to assume liability for the costs of efficiency improvements if there is the potential that the realized savings will be insufficient to cover repayment. Therefore, the owner should analyze existing leases, and then discuss with tenants how the distribution of costs and savings for a retrofit will be distributed.

2. Risk of Achieving Savings: Energy savings may provide the primary source of repayment of financing. Conventional lender financing will require an investment-grade audit; other financing sources may shift the risk of achieving the savings to a third-party financing source. In either case, financing should be structured to ensure that potential shortfalls in achieving the projected savings or changes to building occupancy or use will not result in unfunded repayment obligations for the owner.

3. Compatibility of Financing Sources: Some financing sources may be incompatible with existing financing, or with other financing sources for the retrofit. Therefore, the owner should ensure that contemplated improvements are compatible with the anticipated financing sources, and that any new financing will fit into the existing and future capital stack for the building as a whole.

Here is more detail on each of these dimensions:

1. Distribution of Costs and Savings: A significant number of existing commercial buildings have leases that create a so-called split incentive, making conventional financing of building efficiency improvements difficult. That situation occurs when the lease places the liability for capital improvements on the owner, but the savings from reduced energy costs accrue primarily to the tenants. (Note that the building owner will still realize energy savings attributable to the building's common areas and will also likely benefit from increased asset value, based on the ability to charge higher rents when leases expire.)

Financing Options

When the split-incentive situation exists, the owner will see no increase in net revenues during the terms of existing leases from which to repay a loan that funds the improvements, nor will the owner be able to receive a higher appraised value because net operating income (NOI), the basis of valuation for commercial buildings, will not increase. The inability to receive higher net revenues and higher valuation means that financing sources that rely on conventional lender underwriting criteria will be unable to fund a loan for the improvements. While this does not rule out an owner funding the investment from equity or other sources, such as rebates, on-bill repayment, or energy service company (ESCO) financing, it does limit financing options.

Exhibit 7, identifies categories of commercial leases where the split incentive exists.

Exhibit 7

Commercial Lease Types with the Split Incentive

Lease Type	Who Pays Expenses	Who Pays Capital Costs	Split Incentive?
Gross Lease	Owner	Owner	
Modified Gross Lease	Owner and Tenant	Owner	X
Triple Net Lease	Tenant	Tenant	
Multi-tenant Office Net Lease	Tenant	Owner	X

Source: Plan NYC "The Energy Aligned Clause, Solving the Split Incentive Problem."

The split-incentive issue may be addresses in several ways:

First, commercial property owners can engage with tenants to review split-incentive conflicts and explore lease modifications, such as the creation of an "energy-aligned lease." In an energy-aligned lease (also known as a "green" lease), the cost of efficiency

Financing Options

improvements are passed through to tenants based on their pro rata share of projected energy savings. Once the improvements are paid for, the tenant continues to realize the energy savings resulting from the retrofit. Appendix A provides links to sources of information about energy aligned leases. Appendix H, the Green Tenant Toolkit by the San Francisco Business Council on Climate Change, outlines communication, leasing and partnering strategies with tenants to achieve an equitable distribution of costs and benefits for green improvements.

Second, building owners can pursue financing sources for efficiency improvements, such as rebates and grants. That approach may significantly limit the cost of improvements eligible for funding.

Third, owners may pursue on-bill finance (OBF) or on-bill repayment (OBR) provided through a utility company, third-party capital source, or an ESCO. With those financing methods, the utility bill paid by the tenant is the means for repaying the upfront cost of the improvements. This is described in further detail below.

A building owner could also wait until existing leases expire and then offer leases to new tenants that have energy aligned clauses, but such an approach may cause unreasonable delay, create barriers to re-leasing, and make the building less competitive in attracting new tenants.

2. Risk of Achieving Savings: The repayment of financing for many efficiency-improvement projects is based on utility bill savings from an existing behavior profile of tenants and occupants. Consequently, the building audit that projects utility bill savings must be reliable enough to meet the underwriting criteria of the financing source. If it is not, there will be some other mechanism for allocating the risk of achieving the savings. For conventional financing, the owner may need to assume that risk. Alternatively, the risk of achieving savings may be assumed by another entity (the utility, a third-party financing source, or an ESCO) that bills directly for utilities and assumes the risk that the savings will be sufficient to repay the investment.

   In all of these cases, the owner needs to ensure that the inability to achieve the projected savings will not result in an unanticipated liability. Ideally, rental rates will increase over time with completion of the improvements, thus substantially mitigating the risk that savings will be insufficient. However, if the financing is repaid from utility bills and if energy use declines as a result of tenant or occupant changes (for instance, modified hours of operation or amount of computer and server use), the amount available for repayment may decrease. The building owner/manager should carefully assess the terms of repayment from any financing source to understand clearly how the liabilities for repayment from energy savings are satisfied if the energy savings do not meet projections.

Financing Options

3. Compatibility of Financing Sources: Some efficiency financing sources may create encumbrances that conflict with other financing on the property, such as conventional loans. In conventional financing, loans are securitized by a lien on the property, allowing foreclosure in the event of nonpayment. First-lien lenders may object to additional liens from second-lien mortgages or potential tax liens associated with energy-efficiency improvements.

   That type of conflict may arise with the Property Assessed Clean Energy (PACE) financing program that is offered in many states and municipalities. PACE offers loans that are repaid with annual assessments levied on the property tax bill. Nonpayment of the annual assessment results in a tax lien on the property, which is a lien that is senior to a conventional mortgage.

   Lenders with mortgages on commercial properties have objected to PACE financing, based on the potential for the creation of tax liens for nonpayment of the annual assessment. The result is that before PACE financing can be used on commercial properties, existing debt holders *must consent* in writing to the additional tax burden represented by PACE. As a result, PACE has only been used on a limited basis for building efficiency improvement projects to date; however, as lenders become more familiar with the program, acceptance appears to be growing.

   Another type of conflict may arise with financing of efficiency-improvement projects where repayment is incorporated into the property's utility bill. In this case, the loan is secured by a contract that provides the ability to turn off utility service in the event of nonpayment. If the property is sold or the property is re-leased, the remaining loan balance can either stay with the property or be repaid in full. Compatibility issues with this form of financing may arise if there is no source for repaying the remaining loan obligation or if the new tenant refuses to assume the utility bill with repayment. Therefore, when using this method of financing, the property owner should ensure that the repayment obligation will not limit flexibility in the event of a sale or re-leasing of the space.

Evaluating these risk/reward issues up front enables realistic scoping of improvements and selection of suitable financing sources consistent with the preferences of the building owner, tenants, and existing lenders.

Financing Options

The number and type of funding programs for existing building-efficiency retrofits are constantly expanding and changing. There are an increasing number of rebates, grants, tax credits and deductions, and special loan programs at the federal, state, and local levels. Many conventional lenders are offering energy-retrofit loans to serve what appears to be an increasing demand for that type of product. Furthermore, many building owners are

Financing Options

implementing energy-aligned leases to mitigate the split-incentive problem discussed earlier. Utility companies are expanding rebates, on-bill financing and repayment programs based on validated energy savings, and they are using third-party lenders as sources of capital. And an increasing number of ESCOs, which previously focused on providing energy-efficiency financing to the municipal and institutional markets, are beginning to offer their services to private, commercial building owners.

Outlined below are seven categories of financing sources available to building owners:

1. Equity investment by building owners: Many large-building owners interested in long-term value appreciation have already decided that the value-add play for existing buildings requires green retrofits. Consequently, those owners have simply increased their equity investment in the buildings with the confidence that the return on investment will be adequate to satisfy shareholders or outside investors.
2. Conventional lender financing: Lenders are required to meet loan-to-value underwriting criteria, which may be difficult if the improvements do not directly increase the NOI and, correspondingly, the value of the property. However, if those limitations do not exist, conventional loan financing can be the least expensive, least restrictive debt source for the improvements.
3. Utility rebates: In California, Investor-owned utilities (IOUs) have extensive and robust rebate programs that are constantly evolving and improving. Be sure and investigate what is available.
4. Grants, tax deductions and special loans: Both the state and federal government offer many options in this category, which are constantly changing. Be sure and investigate what is available.
5. PACE loans: Many jurisdictions offer municipally financed, long-term financing that is repaid from an annual tax assessment secured by a tax lien in the event of nonpayment. This type of financing is still evolving.
6. On-bill financing and on-bill repayment: Loan repayment is included in the utility bill. Funding for these programs, offered by California IOUs, has been fully subscribed and the California Public Utilities Commission (CPUC) is currently considering options to source capital from third-party lenders.
7. Energy service companies: ESCOs fund the improvements, which are repaid through the utility bill. This form of financing has historically been offered to government and institutional properties and to date, has had very limited application in the commercial real estate market.

Financing Options

Here is more detail on each option:

1. Equity investment by building owners: After reviewing all other financing options, building owners may conclude that the most straightforward means of capturing long-term value is to fund the improvements with additional equity. This option has the fewest restrictions and conflicts and is justified by the long-term appreciation of the property. However, it may not be an option available to buildings with limited liquidity or cash flow.

2. Conventional loans: Bank lending has the potential to provide the lowest-cost, longest-term debt financing of energy savings in situations where the split-incentive problem does not exist or has been resolved. When energy savings result in higher net operating income and correspondingly higher property values, lenders are able to meet loan-to-value or debt coverage ratio underwriting criteria. That capability allows property owners to either refinance or obtain a second mortgage at low interest rates to fund green improvements. As building owners begin to understand that significance, many are moving to energy-aligned leases, which enable conventional financing to occur.

   With an expanding market for sustainable products and services that create identity among major clients, many banks are reconsidering underwriting criteria that previously prevented the underwriting of green improvements that do not directly and immediately increase NOI and property value. Some professionals in the appraisal industry have also recently begun to focus on that issue and as a result, are formulating new appraisal standards. As these trends evolve, banks may be more active in providing low-cost, long-term, conventional debt financing of green improvements.

3. Utility rebates: Rebate and financing programs are available through each of California's Investor-owned utilities, including PG&E, Southern California Edison, and San Diego Gas & Electric. What is generally available from the IOUs is described at the CPUC's website at http://eega.cpuc.ca.gov. The important details of each IOU's program are described at the website of the utility company that provides service to the buildings under consideration for efficiency retrofits. Review of the IOU programs can provide property owners with a general starting point for obtaining information regarding inspections, scope of improvements, and rebate program options. However, more property-specific information should be obtained by the contractor conducting the energy audit, because identifying suitable rebate programs can sometimes be complicated, and various programs may overlap.

4. Grants, tax deductions, and special loans: Early in the process of considering a green retrofit, property owners should review the latest options for grants, deductions, and special loans by visiting the Database of State Incentives for Renewables & Efficiency (DSIRE) at http://www.dsireusa.org. DSIRE is a well-maintained resource that organizes incentive programs by federal government, state government, and utility companies.

Financing Options

- *Federal tax deduction:* Section 179D of the Internal Revenue Code provides federal tax deductions worth up to $1.80 per square foot to building owners who have upgraded lighting, heating, ventilating, and air conditioning (HVAC); or the building envelope. The deduction is available for energy-efficient properties constructed or retrofitted since December 31, 2005. The 179D deduction provides a one-time accelerated depreciation for commercial, multifamily, and public agency-owned facilities. To qualify for a Section 179D tax deduction, the Internal Revenue Service requires an independent, third-party energy tax study. Therefore, to evaluate 179D incentives, property owners should seek professional accounting advice and they will need to obtain a qualified energy audit. For additional information, please refer to Appendix A.

  Grocery stores pursuing energy-efficiency measures should consider this program for lighting and refrigeration. This may also apply to specialty retail like a chain of convenience stores with high refrigeration demand.

  Note that a Section 179D deduction will result in lowering the "basis" of the property, (the original value utilized when calculating capital gains upon sale). Because the basis is reduced, the profit upon sale will increase, resulting in a larger capital gains tax.

- *Community Development Financial Institutions (CDFI) Fund:* The CDFI program utilizes federal resources to provide grants and technical assistance to lenders in economically distressed communities so that they can provide favorable lending products for healthy, sustainable community development. For additional information, including a description of CDFI's activities and a searchable database of financial institutions that have receiving funding, please refer to Appendix A.

- *Federal small business loan programs:* The Small Business Administration's SBA 7A loans and SBA 504 loans are increasingly being utilized for energy efficiency-related projects. Preference is now provided to small businesses that are pursuing Leadership in Energy and Environmental Design (LEED) certification, for example. Small businesses that need to expand or renovate an existing space should explore those loans as possible financing sources. For additional information, please refer to Appendix A.

  Note that the SBA programs require a significant amount of paperwork; therefore, property owners and contractors should be prepared to spend considerable time with the local development corporation estimating the scope and savings for planned improvements.

Financing Options

- *Fannie Mae - Green Refinance Plus:* This is a federal finance program designed to improve energy and water efficiency, enhance financial and environmental sustainability, and extend the useful life of affordable multifamily projects. The finance program offers flexible underwriting to allow borrowers to refinance rent-restricted properties while realizing additional funds to make energy- and water-efficient improvements. Please refer to Appendix A for additional information.

  Note that Green Refinance Plus involves a considerable amount of paperwork and has the potential for creating property encumbrances that can potentially conflict with other project loans.

5. PACE: As described earlier, a PACE loan finances energy-efficiency upgrades or renewable-energy installations through loans that are repaid by additional annual tax assessments on the property. Frequently, though not always, the loans are funded through municipal bonds. Repayment of the loan is secured by the ability to place a tax lien on the property if the annual assessments are not paid. Because of the security, the hope is that these types of loans will eventually provide low cost financing for green retrofits to both residential and commercial buildings.

   PACE programs are certainly ubiquitous. Exhibit 8 shows the extent of PACE programs nationwide, with programs authorized in 29 states and operating in hundreds of jurisdictions. Many programs are multijurisdictional and are administered by outside organizations such as Renewable Funding or Ygrene Energy Funding. In California, San Francisco, Oakland, and Sonoma County are among over 100 jurisdictions offering PACE financing for building efficiency, including a commercially focused PACE program, managed by Renewable Funding, called California First. Links to these programs are included in Appendix A.

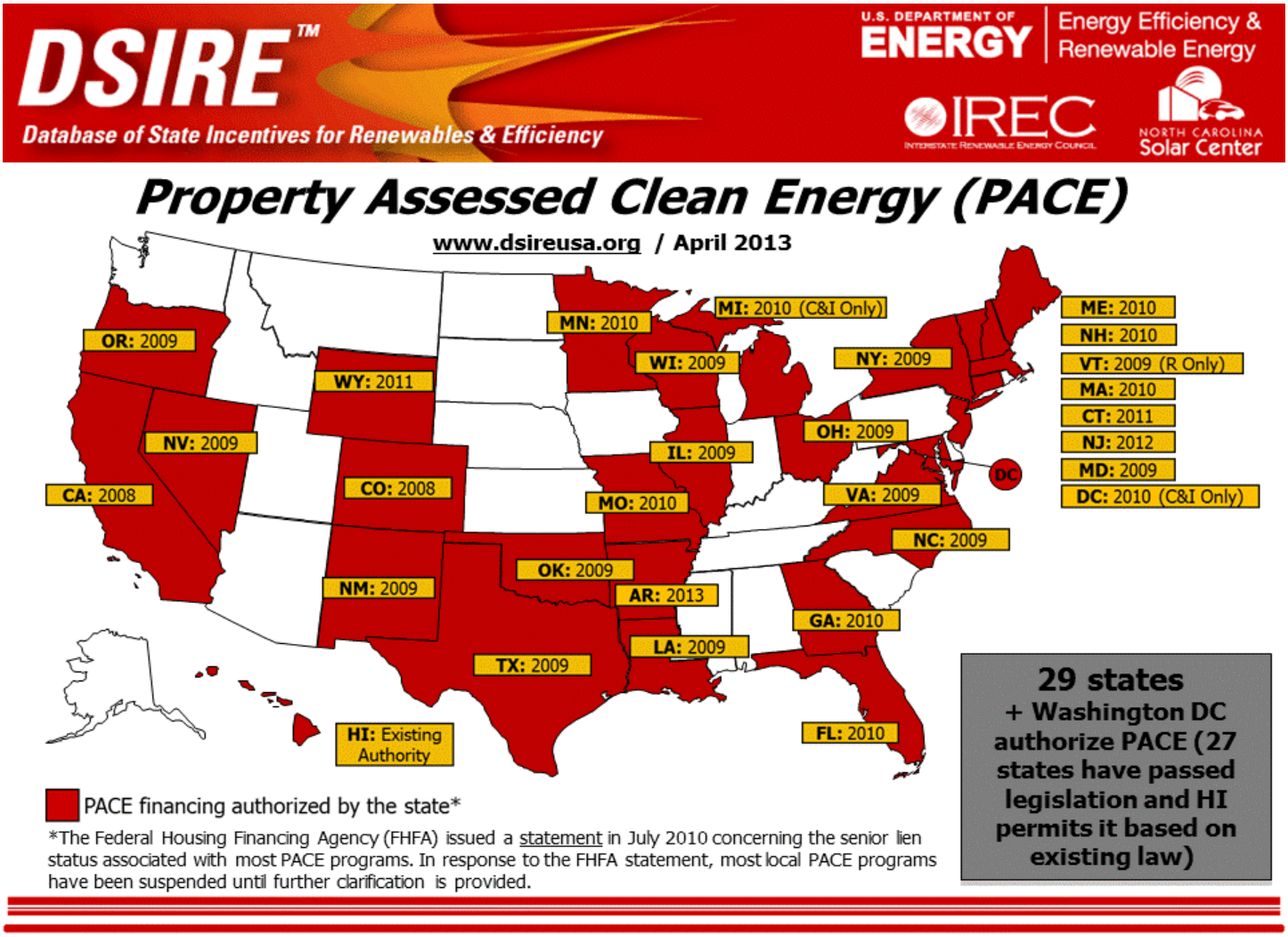
   As described above, commercial lenders are concerned about the possibility of tax liens from PACE financings, but have not taken a position of absolute opposition. PACENow, an advocate for PACE financing programs, released its Lender Support Study in December 2012, which surveyed mortgage lenders regarding their attitudes on PACE financings. The survey gauged awareness and understanding of PACE among 25 different primary lenders. The principal results of the study are summarized as follows:

   - Lenders generally expressed no blanket opposition to PACE. The right to consent to projects is of paramount importance, but they appear open to approving projects that benefit customers and improve the value of collateral. Lender partnership and education at project initiation are key to improving probability of lender consent.
   - Lenders support energy-efficiency and renewable energy projects in concept, but have little firsthand experience financing them and are wary of underwriting the resulting projected savings and benefits. Education based on standard industry data and results from comparable projects is necessary to increase ease of approvals.

Financing Options

Exhibit 8

PACE Funding Programs



Source: DSIRE, http://www.dsireusa.org/userfiles/image/summarymaps/pacefinancingmap.gif

Financing Options

In other words, to use PACE for a property with an existing loan requires working closely with the existing lender to insure understanding and approval.

PACENow reports that, as of February 2013, 16 active commercial PACE programs were accepting applications to finance building-efficiency projects. Most of them have been active for less than a year, and some were just completing their first projects. Both San Francisco and Sacramento have recently completed significant retrofit financings using PACE. San Francisco financed a $1.4 million retrofit of an office building leased by Prologis from the Port of San Francisco. In July, 2013, Sacramento's PACE program announced financing for a $3.2 million energy-efficiency upgrade for Metzler Real Estate at the Metro Center Corporate Park, as well as closing a total of $4.2 million of PACE financing over the prior 90 days.

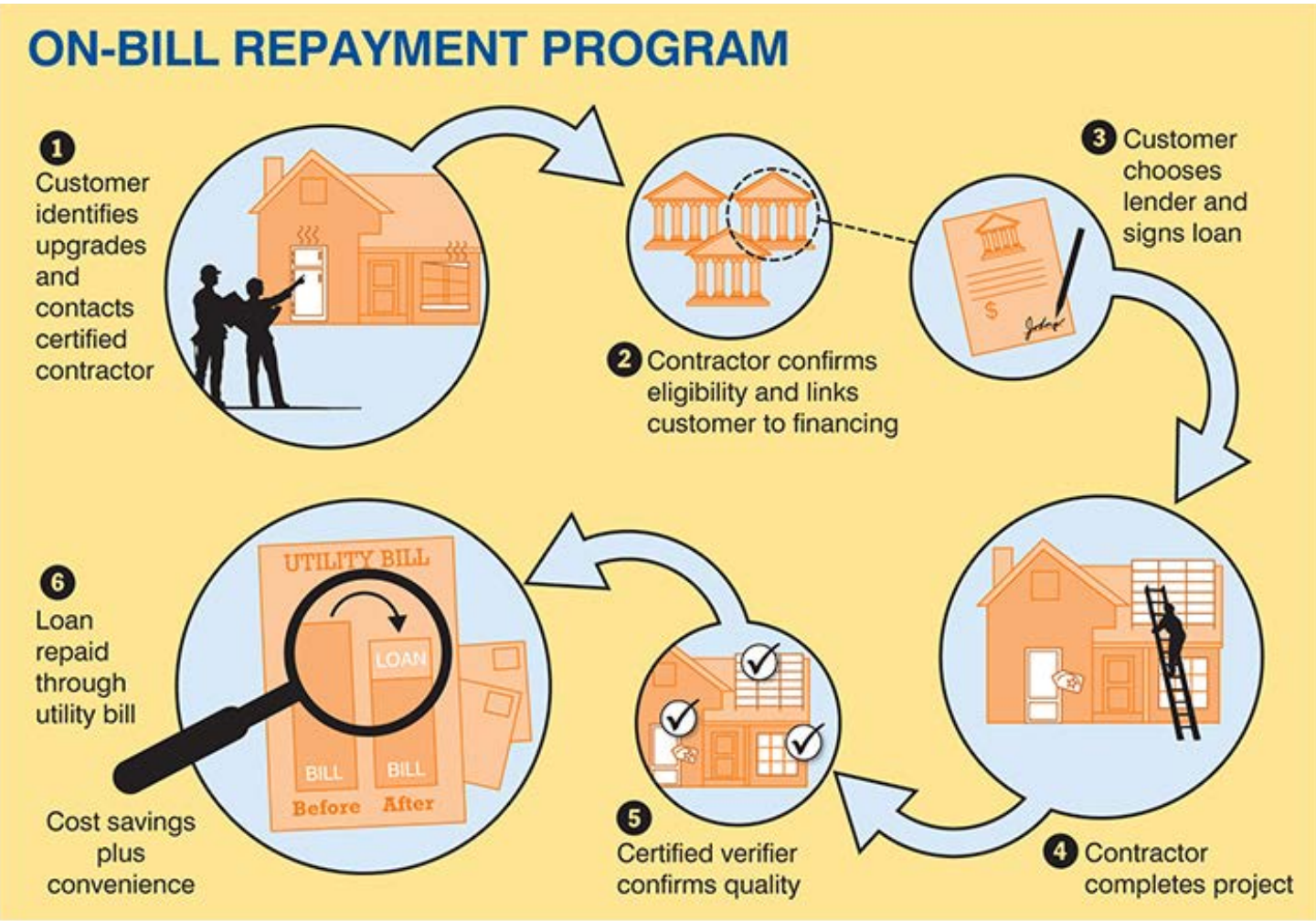
As experience with PACE increases, it will likely become an increasingly attractive financing source. Building owners considering an efficiency improvement project should check with lenders and with a PACE program manager on how best to proceed.

6. On-bill financing and on-bill repayment: The three major investor-owned utilities in California offer an on-bill financing (OBF) program, though most have exhausted the allocation of funding from ratepayer funds. Until now, utility companies in California have used ratepayer funds to advance the cost of efficiency improvements, with repayment through the OBF program. Under this program, a building owner repays the cost of efficiency improvements through the utility bill, which incorporates amortized loan payments that are offset by utility savings achieved as a result of the efficiency improvements. To date, PG&E has funded $200 million of projects using ratepayer funds repaid with OBF.

   However, IOUs have concerns about using ratepayer funds in this way. Therefore, efforts are underway to use private, third-party funds for efficiency projects. This new program, which will work similarly to OBF, is called on-bill repayment (OBR). Exhibit 9 illustrates the on-bill repayment process.

Financing Options

Exhibit 9
How On-Bill Repayment (OBR) Financing Works



Source: Environmental Dense Fund.

Financing Options

OBF and OBR have several advantages over other financing sources. First, they do not place a lien on the property which could conflict with other liens. Second, OBF and OBR can provide financing for smaller projects, with costs ranging from $10,000 to $100,000. Third, financing is tied to the property and is therefore not affected by changes in building ownership or occupancy.

That being said, OBF and OBR have limitations. Typically, the amortization period for repayment is short; therefore, the types of improvements financed must generate high marginal savings, and may not include longer-term, more expensive components that could also enhance property value.

The newer, on-bill OBR programs may have a longer amortization period and, thereby, increase the scope of improvements that can be financed. In exchange for providing financing, private lenders participate in validated future energy savings. The availability of capital may be expanded beyond the limitations that are inherent in OBF, the ratepayer-funded program. For example, Union Bank has participated as a third-party lender for energy-efficiency projects where repayment is secured with OBR through the utility company or an ESCO contract.

Please refer to Appendix A for links to additional information regarding OBF and OBR in California.

7. Energy Service Companies: ESCOs are businesses that develop, install, and arrange financing for projects designed to improve the energy efficiency and lower the maintenance costs of facilities. ESCOs generally act as project developers for a wide range of tasks and assume the technical and performance risk associated with the project. Typically, they offer the following services:

    - Develop, design, and arrange financing for energy efficiency projects;
    - Install and maintain the energy-efficient equipment involved;
    - Measure, monitor, and verify the project's energy savings; and
    - Assume the risk that the project will save the amount of energy guaranteed.

    Those services are bundled into the project's cost and are repaid through the energy savings generated.

    ESCOs employ a wide array of cost-effective measures to achieve energy savings, which often include the following: high efficiency lighting, high-efficiency heating and air conditioning, efficient motors and variable speed drives, and centralized energy management systems.

Financing Options

Typically, the comprehensive energy-efficiency retrofits inherent in ESCO projects require a large initial capital investment and offer a relatively long payback period. The customer's debt payments are tied to the energy savings offered under the project so that the customer pays for the capital improvement with the savings that result from the difference between pre-installation and post-installation energy use and other costs.

ESCOs are increasingly expanding from the municipal and institutional market, where they have been active for many years, to the private building-efficiency market. For building owners with split-incentive issues or limited capital resources, ESCOs may provide a viable financing option for energy-efficiency retrofits.

Several ESCOs are pursuing innovative methods to fund energy-efficiency retrofits that require minimal or no upfront capital, avoid encumbering properties with liens, remove any split-incentive concerns, and remain with the property (as opposed to the building owner) during the payback period. Appendix A contains links to additional information.

A building owner/manager should contact larger ESCOs that have been active in the municipal and institutional market but have not yet announced programs for existing building efficiency improvements. A comprehensive list of these companies is available on the website of the National Association of Energy Service Companies, at http://www.naesco.org/.

Exhibit 10 summarizes the financing options discussed in this section.

Summary of Financing Sources

Financing Options

Exhibit 10

Summary of Financing Sources

Summary of Financing Sources			
Program	**Description**	**Pros**	**Cons**
Owner equity	Owner invests additional equity based on expectation of higher rents and value.	Most flexible financing source.	Capital is at risk. Owners must have sufficient cash flow and/or liquidity.
Conventional lenders	Loan is based on increased NOI or value resulting from estimated energy savings of retrofits.	Lowest-cost/longest-term amortization of efficiency improvements.	Limited by lender underwriting criteria, i.e., must show increased NOI and value.
Rebates	Rebates provide refunds for efficiency investments and are typically available through utility companies.	Subsidizes the cost of retrofits; can taylor to specific improvements; no property lien.	Limited in application.
179D tax deduction	Federal initiative, tax deduction for energy-efficiency retrofits in commercial buildings constructed prior to 2005.	Tax deduction of up to $1.80 per square foot for lighting, HVAC and building envelope improvements.	Secured by lien. May result in a larger capital gains tax upon sale. Issue of priority.
Community Development Financial Institution (CDFI)	U.S. State Department of Treasury awards credits and funds to financial institutions in economically distressed areas.	Assists lenders in establishing favorable financial products and services, including for efficiency improvements.	Geared toward lenders. Energy efficiency may be a small component of the program.
Federal small business loan programs (SBA)	SBA 7A and 504 loan programs are applicable to energy-efficiency projects.	Assists small businesses in funding energy efficiency projects. Preference is given to LEED-certified projects.	Geared toward small businesses. Process-intensive.
Fannie Mae Green Refinance Plus	Flexible underwriting to allow borrowers to refinance properties while making energy- and water-efficient improvements.	Funding for energy-efficiency improvements in affordable multifamily housing.	Limited to affordable multifamily projects. Creates encumbrances. Process intensive.
Property Assessed Clean Energy (PACE)	Energy efficiency-related projects are funded through the issuance of bonds.	Allows efficiency investments to be re-paid over time.	Secured by lien. Issue of priority.
On-bill financing (OBF) and on-bill repayment (OBR)	Upfront capital is secured by payments through validated savings projections paid through utility bill. Third-party lenders will soon to be involved in OBR.	Provides financing for small projects. Up to five years of interest-only payments. Runs with property. Secured by ability to turn off utilities for repayment.	OBF funding is fully subscribed. Need to check on terms with regard to sale or re-leasing of property.
Energy service companies (ESCOs)	ESCOs finance retrofit projects. Energy savings is guaranteed.	No property lien. Addresses split-incentive concerns. Runs with property. Cost and performance risk is assumed by ESCO.	Limited availability for commercial buildings to qdate.

Note: HVAC = heating, ventilating and air conditioning; IRS = Internal Revenue Service; LEED = Leadership in Energy Environmental Design; NOI = net operating income; SBA = small business association.

Appendix A
Links to Additional Resources

Appendix A
Links to Additional Resources

BUILDING CODES & GREEN STANDARDS

Department of Energy (DOE)
- http://www.energycodes.gov/sites/default/files/becu/BECU_Codes_101.pdf

American Society of Heating Refrigeration and Air-Conditioning Engineer

ASHRAE Standards and Guidelines
- http://www.ashrae.org/standards-research--technology/standards--guidelines
  - Standard 62.1-2010
  - Standard 62.2-2010
  - Standard 90.1-2010
  - Standard 90.2-2007
  - Standard 189.1-2011

Procedures for Commercial Building Energy Audits, Second Edition
- http://www.ashrae.org/resources--publications/bookstore/procedures-for-commercial-building-energy-audits

State of California

Title 24
- http://www.energy.ca.gov/title24/
- http://www.energy.ca.gov/title24/2013standards/index.html

AB 758 Energy Efficiency Program for Existing Buildings
- http://www.energy.ca.gov/ab758/

AB 1103 Commercial Building Energy Use Disclosure Program
- http://www.energy.ca.gov/ab1103/

San Francisco Existing commercial Buildings Energy Performance Ordinance Overview
- http://www.sfenvironment.org/sites/default/files/fliers/files/sfe_gb_ecb_ordinance_overview_2.pdf

Environment Protection Agency

Indoor Air Quality
- http://www.epa.gov/iaq/largebldgs/pdf_files/iaq.pdf

Water Sense
- http://www.epa.gov/watersense/pubs/businesses.html

Appendix A Links to Additional Resources

Compilation of Green Certified Products & Services, including appliances, building finishes, cafeteria products, cleaning products, construction materials, office electronics, paper products, and more (provided by the General Services Administrations)

- http://sftool.gov/GreenProcurement?title=Green%20Products%20Compilation

ACCREDITATIONS & CERTIFICATIONS

Energy Star Overview: What is Energy Star and how does it work?

- http://www.energystar.gov/index.cfm?c=business.bus_bldgs
- http://www.energystar.gov/ia/business/evaluate_performance/pm_lp_guide.pdf

Energy Star Portfolio Manager: An updated program to make "benchmarking painless and more productive"

- http://www.energystar.gov/PortfolioManager

LEED Building Certification and Professional Accreditation (U.S. Green Building Council)

- http://www.usgbc.org/leed/why-leed
- http://new.usgbc.org/leed/rating-systems/existing-buildings
- http://www.usgbc.org/credentials

ASHRAE Building Energy Assessment Professional (Engineer's Certification)

- https://www.ashrae.org/education--certification/certification/building-energy-assessment-professional-certification

Build It Green Accreditation (residential, Bay Area): A diverse and rich source of information about seminars, contractors and accreditation

- http://www.builditgreen.org/

NARs Green Designation (National Association of Realtors)

- http://www.greenresourcecouncil.org/

RETRO-COMMISSIONING

California Commissioning Collaborative

- http://www.cacx.org

Environmental Protection Agency, *A Retro-commissioning Guide for Building Owners*

- http://www.peci.org/sites/default/files/epaguide_0.pdf

Appendix A Links to Additional Resources

Certified professionals may be located through the Building Commissioners Association

- http://www.bcxa.org

SPLIT-INCENTIVE AND ENERGY ALIGNED LEASES

PlanNYC – Green Buildings & Energy Efficiency:

- http://www.nyc.gov/html/gbee/html/initiatives/clause.shtml

Better Bricks, Northwest Energy Efficiency Alliance, "Engaging Tenants and Brokers in Your Sustainability Initiatives" by Allison Drucker

- http://www.betterbricks.com/commercial-real-estate/reading/engaging-tenants-and-brokers-your-sustainability-initiatives

General Services Administration, Green Lease Policies and Procedures,

- http://www.gsa.gov/portal/content/103656

"The Green Lease", by James Kidston, *Parsus LLP News*, March 12, 2010:

- http://parsuslaw.wordpress.com/2010/03/12/the-green-lease/

"How to Green Your Landlord,"by Jennifer Kaplan, *Ecopreneurist* (blog), June 5, 2009

- http://ecopreneurist.com/2009/06/05/how-to-green-your-landlord/

The Natural Resources Defense Council's Center for Market Innovation guide on energy-efficiency leases

- http://www.nrdc.org/greenbusiness/cmi/energy-efficiency-leases.asp

Coalition for Better Buildings, resources on energy-aligned leasing

- http://www.c4bb.org/issues/energy-aligned-leasing/

FINANCING SOURCES

As a first step, property owners should review the latest options for rebates, grants, deductions, and special loans by visiting the Database of State Incentives for Renewables & Efficiency (DSIRE)

- http://www.dsireusa.org

What is generally available from investor-owned utilities (IOUs) is described at the California Public Utilities Commission

- http://eega.cpuc.ca.gov

Appendix A Links to Additional Resources

Information on the details of IOU-provided financing is available at each of the utility web sites.

Federal 179D Tax Deductions

Internal Revenue Service, Modification of Notice 2008-40; Deduction for Energy Efficient Commercial Buildings

- http://www.irs.gov/irb/2012-17_IRB/ar08.html

Sustainable Energy Associates, 179D Tax Deductions

- http://www.sustainableenergyassc.com/

Community Development Financial Institution Fund

A description of CDFI's activities

- http://www.cdfifund.gov/what_we_do/programs_id.asp?programid=7

Searchable database of financial institutions that received funding, which can be sorted by state, year, and program

- http://www.cdfifund.gov/awardees/db/index.asp

Small Business Association, SBA 7A loans and SBA 504 loans

- http://www.sba.gov/content/sba-loans

Fannie Mae, Green Initiative

- https://www.fanniemae.com/multifamily/green-initiative

Property Assessed Clean Energy (PACE) program overview

- https://renewfund.com/overview

CaliforniaFirst commercial PACE funding program description

- https://californiafirst.org/overview

San Francisco commercial building PACE program information

- https://commercial-pace.energyupgradeca.org/county/san_francisco/overview

Appendix A Links to Additional Resources

On-Bill Repayment Program

- http://www.cleanenergyfinancecenter.org/2012/07/on-bill-repayment-shows-great-promise-but-significant-challenges-remain/
- http://blogs.edf.org/californiadream/2012/11/12/on-bill-repayment-approved-by-california-public-utilities-commission/
- http://www.pge.com/en/mybusiness/save/rebates/onbill/index.page
- https://www.sce.com/wps/portal/home/business/tools/on-bill-financing/!ut/p/b1/hc5BC4IwHAXwTxR7bjLtOMW2_yiXGaW7hlcIlbVD9Plb4Emo3u3B78FjnjXMj92rv3X-Pfhq7-6d7eYlSrQzVIFebDSjjpHd2L9JEBNAGgC9R-Lc_M78gGclAcpU7Z5HaeAn0leE-geyq2Los4Yj6DtUZhrAvgWAmQqFDWSgIAzuDHydJMw5U9hgY9rdQb-EAmrg!!/dl4/d5/L2dBISEvZ0FBIS9nQSEh/?from=onbill
- http://www.sdge.com/bill-financing

ESCOs

- http://www.scienergy.com – Managed Utility Services Agreement (MUSA)
- http://www.metrusenergy.com – Energy Services Agreement (ESA) and also, Energy Retrofit Lease
- http://energyperformancecontracting.org/ - Check with the current controls vendor and services providers at the property, regarding options they may offer (Johnson Controls, etc.) to pay for performance contracting.

ADDITIONAL REFERENCES

National Association of Realators, Field Guide to Green Property Management

- http://www.realtor.org/field-guides/field-guide-to-green-property-management

"Low-cost Fixes Can Yield Big Savings," *National Real Estate Investor*, October 2008. Property owners and managers can ease into a green operations program by taking low-cost measures to conserve energy before committing to a complete green building renovation.

- http://nreionline.com/brokernews/greenbuildingnews/low-cost-fixes-yield-savings

Appendix B
Don't Waste Your Energy

PORTFOLIO MANAGEMENT

by Hugh Morgan and Walt Homan

Don't Waste Your Energy

How Investors Should Think About Reducing Energy Consumption in Their Multi-Tenant Office Assets

Buildings consume a large amount of energy, and until recently, real estate energy bills were viewed as an uncontrollable expense. New software and technology are changing this. Investors now realize that energy expenses can be reduced through any of five paths: capital investment (retrofits), utility incentives, open-market procurement, occupant behavior change and operational improvement.

The last path — operating more efficiently — is the easiest and most cost effective way of capturing savings as it does not necessitate major capital investments. It does require both senior management commitment and behavior change at the operating level and is most effective with multi-tenant office properties where managers have the greatest influence over energy spending. Ongoing savings can amount to $0.10 to $0.25 per square foot annually, often incrementally over several years. These savings can result in a 2 percent to 3 percent increase in asset value and can be measured accurately.

Commercial real estate accounts for a large share of our economy's energy consumption, nearly 20 percent according to estimates from the U.S. Department of Energy. Historically, the commercial real estate community had little visibility into energy expenses because its only data source for this expense was the building utility bill. Utility bills are limited as a data source because:

- The property manager receives the utility bill 15 to 45 days after a given consumption period, long after consumption events have occurred.
- Utility bill data is not granular, and so a user cannot associate specific day-to-day activities with figures on the bill.
- Utility tariffs (charges) can be complicated with varying rates and demand charges that are difficult to understand. Third-party energy contracts complicate this even further because the operator generally has multiple bills for energy each month.

Executive Summary

- **Energy consumption accounts for a major proportion of a building's running costs.**
- **Considerable savings in energy costs can be achieved through a targeted approach.**
- **Reductions in running costs have significant implications for a property's asset value.**

Additionally, managers tend to focus on bills the owner has to pay, so in the case of retail, industrial and multifamily properties, where the tenant is billed directly by the utility for its energy use, they tend not to focus on energy as an expense. With multi-tenant office properties, where the tenants are either directly or indirectly (through base rent) billed for energy use, energy is often a property's second largest controllable expense, and is something that the manager should not only be actively monitoring, but also actively managing.

Many multi-tenant office managers continue to do their best to understand their buildings' energy consumption by using utility bill information. As noted above, this information is not timely, is not granular and can be difficult to decipher. Additionally, this data can only be rolled up to the portfolio level with a large amount of manual effort.

Even if this process were simplified, aggregated utility bill data would tell the investor little about how the portfolio is performing relative to how well it could be doing (i.e., it lacks clear benchmarks) and would not take into account factors such as weather and occupancy, which greatly affect how buildings perform. A property manager might proudly announce that your 1.0 million-square-foot midtown Manhattan office building spent 20 percent less on energy this winter compared with the previous years; you then find out that it was one of the mildest winters on record in New York City and recall the building was running a vacancy rate significantly higher than normal, and that the electric rates were actually lower than the previous year. Exciting news from the manager, but not all that helpful and completely misleading about the real state of energy use by the asset.

GREATEST INVESTOR IMPACT

Institutional investors want to see their investments increase in value, which, operationally, means increasing ongoing cash flow. Any investment in more efficient operations must generate a return equal to or greater than the investors return targets (cost of capital). Additionally, an operator must balance potential savings with tenant satisfaction so as to maintain operating cash flow. There is not much point shutting

down half the lighting in an office building if this upsets the tenants and half of them opt not to renew their leases.

Energy consumption and spending can be most actively reduced by investors in multi-tenant office properties where the owner is responsible for the energy bill. Energy savings do have some importance to the investor in other property types (such as retail, industrial, multifamily) as owners coach tenants to "do the right thing," but this is more about brand and reputation and less about hard dollar savings.

WHERE TO FOCUS

Reduction in energy consumption and spending in multi-tenant office properties can be achieved in any of five paths (see table below).

An institutional investor should pursue each of these paths in appropriate measure. We will focus here on Operational Improvement as the lowest cost and highest ROI energy saving path for a multi-tenant office investor to pursue, the one with the most "low-hanging fruit."

To improve building operations, the owner first has to have accurate, real-time data about a portfolio's energy consumption. Without this, it is a bit like driving a car on a long trip without access to its dashboard: experienced drivers will have some sense of how fast they are going, how much fuel they have used and how efficiently the vehicle is operating, but only in a very general sense.

Historically, getting real-time energy consumption and spending information out of a building was difficult, time consuming and expensive. Even if an investor was able to access the information, rolling this data up at a portfolio level was extremely difficult: buildings use different (often proprietary) management systems and sit in different utility service areas, so making an "apples to apples" comparison was time consuming and sometimes next to impossible. And, even if the investor was able to gather consumption data in one place, it was difficult to make any sense of it — the proverbial case of too much data, too little insight.

Fortunately, with advances in technology, it is now economically viable to:

- Gather real-time property consumption data
- Apply accurate and complete expense data to each property in a portfolio
- Roll performance data up at the portfolio level, across utility service areas and markets
- Give the investment team, the managers and the engineers actionable insights with respect to their assets' energy consumption

The final factor noted above is critical: The operating team must have access to information that they can make sense of and take

Paths for Reducing Energy Consumption and Spending

Energy-Saving Path	Example	Capital Requirement	Landlord Control	Measurable ROI	Challenge
Capital Investment	Lighting retrofit	↑	↑	↔	• Must be dedicated capital • Longer payback periods • True ROI may be difficult to quantify
Utility Incentives	Demand response	↓	↔	↔	• Typically designed for industrial users • Must not break contractual tenant relationships for comfort
Open-Market Procurement	Energy purchase agreement	↓	↔	↑	• High risk: owner can win or lose big • Need market expertise • Contract performance may be difficult to measure
Occupant Behavior	Tenant awareness program	↓	↓	↓	• Affecting change in behavior requires significant marketing spending • ROI is more difficult to measure than others
Operational Improvement	Modifying chiller operation to avoid peak demand	↓	↑	↑	• Change of operating culture/ behavior takes time • Some operators may be more open to change than others

Key: Positive; Negative; Neutral
Source: MACH Energy

action on. This means applying sophisticated analytics to the mass of real-time data collected that identify normalized patterns, trends and exceptions, both at the building and at the portfolio level.

Now, actionable insights alone are not enough for a team to reduce a building's energy expenses. Operating teams are busy; they often have multiple and sometimes conflicting priorities. To overcome this, the investor must signal its commitment to reducing energy spending as a programmatic focus. This is the trigger event in a three-stage process, typically with the investor identifying a clear goal for the operating team to pursue (for example, "let's shoot to reduce our energy spending by 5 percent this year").

Then, the property manager needs to empower his or her team to begin to make changes in how it operates the asset, using feedback provided by the real-time analytics to measure the effects of different operating strategies and changes. Every asset is different, and its operators know it better than anyone. Operators need to be given the freedom to manage an asset as they think best, to experiment. The proof of a successful energy reduction program will be in the real-time analysis that all three parties — the investor, the property manager and the building engineer — can understand and review.

The investor is likely to only need to review data from the portfolio occasionally — perhaps on a quarterly basis — and can use it to manage by exception, drilling down only where it looks as though specific assets may be operating well above their energy spending potential. The property manager may look at the data once or twice a month, but the engineer will look at the analytics once or twice a day, adjusting his activities to optimize building performance.

Additionally, some investors give their operating teams modest incentives to reduce spending while keeping tenants comfortable, running friendly competitions between properties with small cash bonuses for success. These incentives can be a powerful motivator.

Investors that pursue improved building operations in their multi-tenant office assets can see their energy spending drop $0.10 to $0.25 per square foot, often several years in a row. These incremental savings can result in a 2 percent to 3 percent increase in asset value: assume $0.25 per square foot in measured annual savings capped at 5 percent, which equals $5.00 per square foot in added value. On a property worth $250 per square foot, this equates to an increase of 2 percent in value. In addition, recent academic studies — including "Doing Well by Doing Good? Green Office Buildings" by Piet Eichholtz, Nils Kok and John Quigley — also have suggested valuation increases accrue in energy-efficient buildings. ❖

Hugh Morgan is the principal of **hughmorgan Consulting,** and **Walt Homan** is CEO of **MACH Energy.**

Appendix C
Cassidy Turley Green Index, August 2010

Cassidy Turley BT Commercial

Real Green Index

Bay Area
Mid-Year 2010

Offices in Burlingame, Capitola, Monterey, Napa, Oakland, Palo Alto, Pleasanton, Redwood City, Sacramento, Salinas, San Francisco, San Jose, San Rafael, Santa Clara, Santa Rosa, Walnut Creek

Broker Lic #00825241

www.ctbt.com

Cassidy Turley BT Commercial

Bay Area

Real Green Index | Mid-Year 2010

Summary

Cassidy Turley BT Commercial's Real Green Index report tracks and measures key statistics related to LEED (Leadership in Energy and Environmental Design) Certified office and R&D buildings and spaces throughout the Bay Area. According to the U.S. Green Building Council (USGBC), LEED is an internationally recognized certification system that measures how well a building or community performs across all the metrics that matter most: energy savings, water efficiency, CO2 emissions reduction, improved indoor environmental quality, and stewardship of resources and sensitivity to their impacts. LEED Certifications are awarded by the USGBC based on a point system, with 21-26 points granting a LEED Certified status, 27-31 points awarding a LEED Silver status, 32-41 points earning a LEED Gold certification and 42-57 points granting a LEED Platinum status. For this report we focus on certifications granted for entire buildings (LEED EB), new construction (LEED NC) and commonly for specific interiors within a space (LEED CI).

One recent study completed by the New Buildings Institute indicated that new buildings certified under the USGBC's LEED system, on average, outperform non-LEED buildings by 25-30% in terms of energy use. The study also demonstrated a strong correlation between LEED certification level and energy savings, with Gold and Platinum-certified buildings outperforming non-LEED buildings by nearly 50 percent. In addition to improvements in energy savings, LEED-certified buildings traditionally have lower vacancy rates and sell for higher prices than their non-LEED competitors. **Currently, across the Bay Area, LEED-certified space has a vacancy rate 130 basis points below the overall market vacancy rate of 18.4%.**

As a result of the increased cost savings and performance of LEED-certified space, the Bay Area has seen a flood of new certifications being awarded over the past several years. The first LEED-certified office / R&D project in the Bay Area made the list in 2002 with a 50,460-square-foot building located at 2121 Sand Hill Road in Menlo Park. Since then, the Bay Area has certified 23.8 million square feet of new office / R&D buildings or spaces. The greatest flood of LEED-certified space arrived in 2009 with 12.2 million square feet. San Francisco currently dominates the Bay Area in LEED-certified space with over 14 million square feet; however other markets, most notably in the Silicon Valley, are following suit, with more and more space certified each year.

In the Bay Area, a majority of the LEED-certified projects occurred at the gold standard with 61% of LEED-certified projects awarded in the 32-41 point range. Silver was the next highest awarded at 22% followed by standard certification (12%) and platinum (5%).

LEED Certified Projects YTD-2010 (Through June 30, 2010)

	Project / Building Name	Address	City	LEED SF
1	Metropolitan Life Building	425 Market St	San Francisco	996,760
2	303 2nd	303 2nd St	San Francisco	731,792
3	45 Fremont	45 Fremont St	San Francisco	588,764
4	201 Mission	201 Mission St	San Francisco	482,876
5	University Circle	1900 University Ave	Palo Alto	451,000
6	199 Fremont	199 Fremont St	San Francisco	435,289
7	100 Van Ness	100 Van Ness Ave	San Francisco	372,047
8	150 Spear	150 Spear St	San Francisco	256,827
9	Station Landing	3055 Oak Rd	Walnut Creek	255,000
10	Emery Bay Center	6425 Christie Ave	Emeryville	251,087

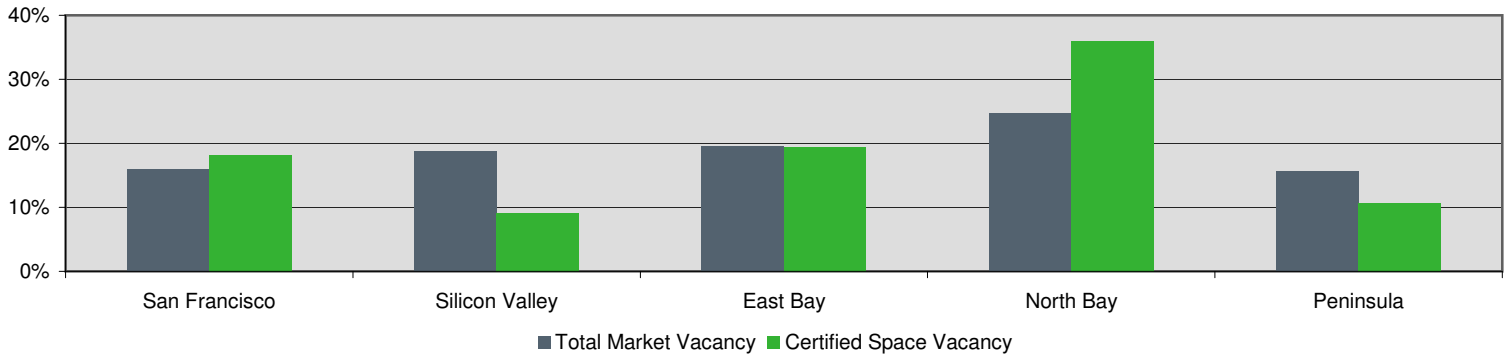
Real Green Index | Bay Area

Mid-Year 2010

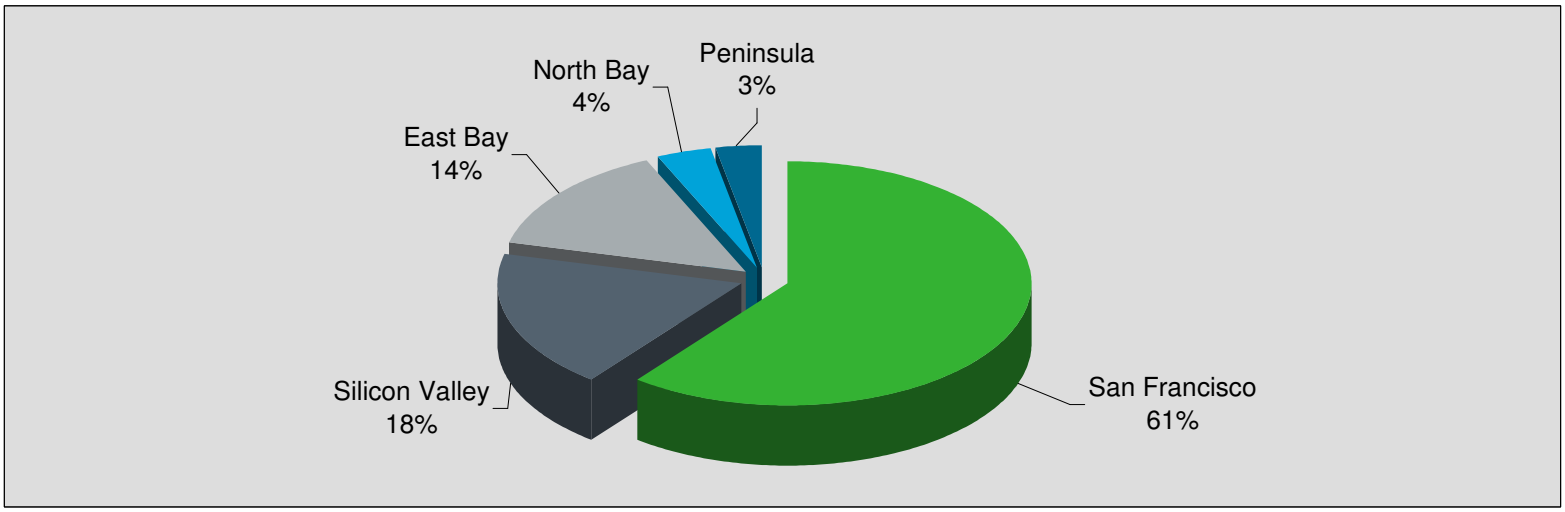
Market Summary

Market	Total Market SF (Office/R&D)	Total Market Vacancy	LEED Certified RSF	% of Market LEED Certified	Certified Space Vacancy RSF	Certified Space Vacancy
San Francisco	84,013,837	16.0%	14,481,702	17.2%	2,625,474	18.1%
Silicon Valley	230,463,451	18.8%	4,320,263	1.9%	394,126	9.1%
East Bay	105,726,395	19.6%	3,458,953	3.3%	670,087	19.4%
North Bay	20,438,633	24.6%	891,133	4.4%	320,238	35.9%
Peninsula	50,161,143	15.6%	708,715	1.4%	75,586	10.7%
Totals	**490,803,459**	**18.4%**	**23,860,766**	**4.9%**	**4,085,511**	**17.1%**

Market Vacancy vs. LEED Vacancy



Market Share of LEED Certified Space



Cassidy Turley BT Commercial

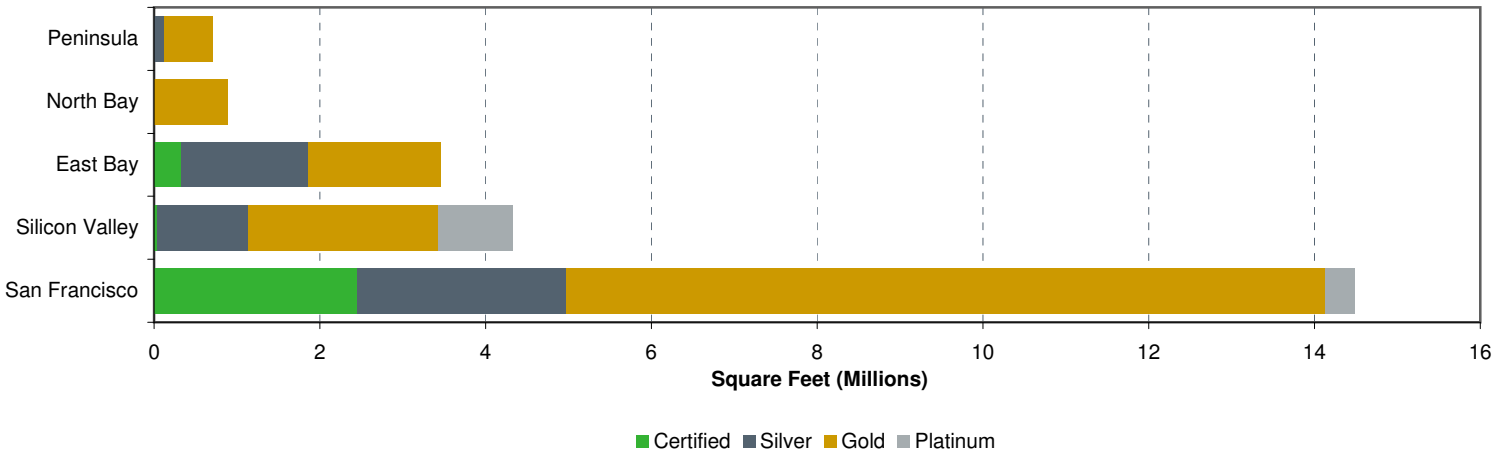
Real Green Index | Bay Area

Mid-Year 2010

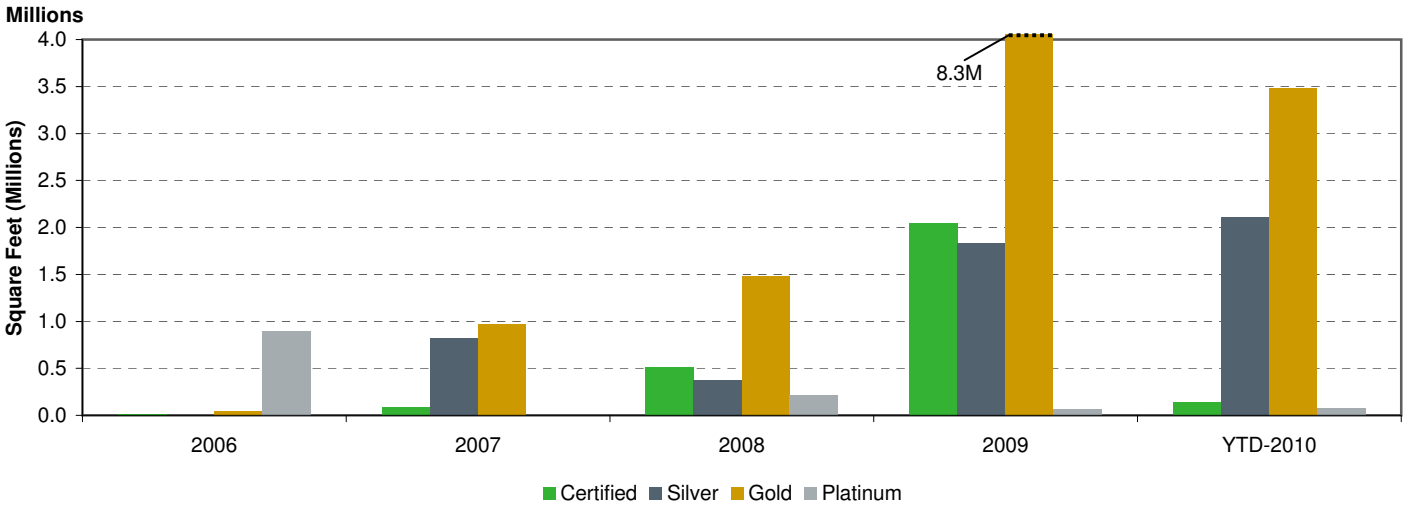
Certification Level Breakdown

Market	Certified	Silver	Gold	Platinum	Totals
San Francisco	2,449,891	2,514,585	9,167,714	349,512	14,481,702
Silicon Valley	37,000	1,098,770	2,289,493	895,000	4,320,263
East Bay	327,157	1,535,948	1,595,848	0	3,458,953
North Bay	0	0	891,133	0	891,133
Peninsula	0	130,000	578,609	0	708,609
Totals	**2,814,048**	**5,279,303**	**14,522,797**	**1,244,512**	**23,860,660**

Market Volume by Certification Level



Annual Certification Volume



Cassidy Turley BT Commercial

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Cassidy Turley BT Commercial's San Francisco Office is the **first & only** commercial brokerage firm in the Bay Area to Achieve LEED Commercial Interiors certification.

It was selected as a Green Building America Award-winning project.

LEED certification of Commercial Interiors was based on a number of green design and construction features that positively impact the project itself and the broader community.

For Cassidy Turley BT Commercial's space, these features include:

- Extensive use of natural materials such as bamboo for custom millwork, walls and furnishings
- Use of natural cork and quartz flooring
- Exceeding 20% recycled content in materials
- Exceeding 60% reused furnishing
- Creating full height glazed offices and expansive open floorplans for views and daylighting
- Utilizing high reflective ceilings materials for maximizing light
- Installing high efficient energy and water fixtures and equipment





Cassidy Turley BT Commercial

Appendix D
San Francisco's Existing Commercial Buildings Energy Performance Ordinance

SF Environment

Existing Commercial Buildings Energy Performance Ordinance: Overview

Energy is the single largest controllable operating cost in commercial facilities, but you can't manage energy costs if you don't know where to begin. The Existing Commercial Buildings Energy Performance Ordinance will help decision-makers for commercial buildings have the information to control utility costs, improve energy efficiency, and benefit the bottom line. Adopted in 2011, the ordinance is being phased-in over three years. For existing nonresidential buildings with at least10,000 square feet of conditioned (heated or cooled) space, the ordinance requires:

- **An Actionable Plan:** An energy efficiency audit once every 5 years identifying specific cost-effective measures that would save energy.
- **A Benchmark:** Annually summarize the energy used by the entire building. This enables tracking trends and understanding how your building is performing compared to similar buildings.
- **Transparency:** Annually share an overview of energy benchmarking results with tenants and the City. San Francisco Department of Environment is required to make this information available to the public.

The Ordinance was informed by the recommendations of the Mayor's Task Force on Existing Commercial Buildings, which suggested policies, actions, and partnerships to meet local and state goals for greater energy efficiency. By reducing energy costs, this effort will improve competitiveness of commercial stock, support the economy, reduce greenhouse gas emissions, and help electricity reliability.

It is the building owner's decision how to benefit from opportunities identified in the energy efficiency audit. Commercial properties in San Francisco are eligible for rebates (www.sfenergywatch.org), federal tax benefits, and special financing that enhances both the bottom line and cash flow. Implementing specific cost-effective recommendations from credible experts helps cut operating costs, reduce exposure to utility rate increases, and improve asset value.

This document explains both the benchmark, and the audit - two separate requirements. Some buildings will be exempt from an energy audit, but benchmarking is required for all occupied nonresidential buildings of 10,000 square feet or larger that have been in operation for at least two years.

The information in this briefing can also be found at: www.sfenvironment.org/ecb.

Benchmarking

Each whole non-residential building larger than 10,000 square feet must be benchmarked using Energy Star Portfolio Manager (www.energystar.gov/benchmark). Portfolio Manager is an online tool provided at no cost to the user by the U.S. Environmental Protection Agency.

Building owners or their representatives must annually electronically report key benchmarking results to the Department of Environment and to tenants. This report is an "Annual Energy Benchmark Summary", and is based on data from the prior calendar year. For example, a 2013 report will be based on energy used from January to December 2012.

An Annual Energy Benchmark Summary includes:

- Contact information and gross square footage
- Energy Use Intensity (how much energy the building used per square foot for the year)
- 1-100 Performance Rating provided by Portfolio Manager, where applicable
- Greenhouse gas emissions from energy usage
- Assessor's Parcel Number (APN or block/lot)

The Annual Energy Benchmark Summary does not include commodity energy use (kWh or therms) for the whole building, nor for any meters.Benchmarking with Portfolio Manager will also be required under

California Public Resources Code 25402.10 (also known as AB 1103.) Where the San Francisco Existing Commercial Buildings Energy Performance ordinance requires annual benchmarking and public disclosure of limited statistics summarizing overall performance, the complimentary state law will require private disclosure of all energy usage information between parties to the sale, lease, or refinance of the entire building. For additional information: www.energy.ca.gov/ab1103/

For the first year that an Annual Energy Benchmark Summary report is required from buildings larger than a given size, the Department of Environment must keep the report confidential. In subsequent years, the Department of Environment is required to make the Annual Energy Benchmark Summary public.

Exemptions to Benchmarking Requirements

An Annual Energy Benchmark Summary is not required for:

- **New Buildings:** (The Certificate of Occupancy from the Department of Building Inspection is dated less than two years prior to the Annual Energy Benchmark Summary due date.)
- **Unoccupied Buildings:** (The building had less than one full-time equivalent occupant for the previous calendar year.)

In all other cases, the Annual Energy Benchmark Summary is required. To obtain an exemption to benchmarking requirements, please write to: benchmark@sfenvironment.org. In the message, include:

- Contact information for the owner, and the owner's agent if applicable.
- Assessor Parcel Number (block and lot)
- Gross square footage of the building(s)
- Reason for exemption:
    - Date and Permit Number for Certificate of Occupancy, or a copy.
    - Statement that the building was unoccupied for the 12 months of the prior calendar year.

Benchmarking Timeline

Annual Energy Benchmark Summary reports are due April 1 every year, with one exception: In 2011, the reports were due October 1.

The Annual Energy Benchmark Summary is based upon the energy performance data for the prior calendar year. For example, a report due in 2013 will be based upon measured energy use January through December 2012.

Due Date	Benchmarking	Status of Public Disclosure
October 1, 2011	Buildings larger than 50,000 square feet must benchmark	None
April 1, 2012	Buildings larger than 25,000 square feet must benchmark	Public disclosure begins for buildings greater than 50,000 square feet (only)
April 1, 2013	Buildings larger than 10,000 square feet must benchmark	Public disclosure for buildings greater than 25,000 square feet
April 1, 2014 and beyond	Buildings larger than 10,000 square feet must benchmark	Public disclosure applies to all affected buildings

How to Submit an Annual Energy Benchmark Summary

Reports must be sent to SF Dept of Environment electronically using the Portfolio Manager tool. Clicking the appropriate links listed in this section will lead your internet browser to a Portfolio Manager login page. By accessing your account through the appropriate link, the Annual Energy Benchmark Summary reporting template provided by the City will be added to your Portfolio Manager account. The reporting template will securely send only the data required to meet the ordinance (and no more). The report is sent once – only when you click "Release Data." If you need to correct an error, you may do so and then click "Release Data" again.

To add an AEBS to your Portfolio Manager account, click the link in the table below that corresponds to the year the report is due:

Benchmark Due	Link to Report
2013	www.tinyurl.com/2013aebs
2012	www.tinyurl.com/2012aebs
2011	www.tinyurl.com/2011aebs

Instructions will pop up when you open the report template. However, it's usually easier to work with instructions in a separate file. The instructions and the links above can be found at: www.sfenvironment.org/ecb.

For the first year that an Annual Energy Benchmark Summary report is required from a building, the Department of Environment must keep the report contents confidential and only publicly post which buildings have complied. In subsequent years, the Department of Environment is required to make the Annual Energy Benchmark Summary public.

When reporting, it is critical to use Portfolio Manager's "Unique Building Identifier" field to identify the building by Assessor Parcel Number (block and lot). To look up a parcel: http://propertymap.sfplanning.org

The Department of Environment will accept an Annual Energy Benchmark Summary for the entire building from any party with the necessary information about the entire building, including the owner's representative or a whole-building tenant.

Training and Technical Assistance

SF Environment offers presentations and webinars on meeting, and benefitting from, the new requirements. To sign up for a free webinar, go to www.sfenvironment.org/ecb. To request a presentation for your organization: benchmark@sfenvironment.org.

In-Person Step-by-Step Workshops

Pacific Gas & Electric Company provides free classes on benchmarking, and how to use your benchmark results to save energy and money. Classes are available online, at and the Pacific Energy Center at 851 Howard Street and locations throughout Northern California: www.pge.com/energyclasses

The PG&E course is divided into two sessions. In the morning session, "Benchmarking Energy Use in Commercial Buildings," you will be provided with a computer and walk step-by-step with your own data through the process of benchmarking your building. This includes instructions on using Portfolio Manager, setting up PG&E's Automated Benchmarking Services (ABS) to automatically update energy use data, and preparing an Annual Energy Benchmark Summary. Participants receive free follow-up technical support. The optional afternoon session puts your results into practice, asking: "You've Benchmarked Your Building: What's Next?"

Visit www.pge.com/energyclasses for more info.

Additional Free Training

US EPA's ENERGY STAR program provides webinars and on how to benchmark with Portfolio Manager. (Note: These videos and webinars are provided for a national audience. They do not cover local ordinances or PG&E's Automated Benchmark Service.) www.energystar.gov/benchmark

Energy Efficiency Audits

Benchmarking provides perspective about how a building performs relative to its peers. To identify specific opportunities for savings, weigh costs against benefits, and prioritize investments, an energy audit is necessary. The owner of each non-residential building larger than 10,000 square feet must obtain a comprehensive energy efficiency audit of the entire building from a qualified energy auditor at least once every five years. The auditor must submit a detailed report to the building's decision makers, and the point is to provide a reliable catalog of opportunities to save energy and save money.

The complexity of an energy audit and the potential for savings vary with the size, intricacy, and use of a building. The Ordinance requires audits to meet or exceed the American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE) **Procedures for Commercial Building Audits**, with larger facilities required to receive a more rigorous evaluation than smaller facilities. The audit requirements are:

Building Size	Minimum Level of Effort
50,000 square feet and larger	ASHRAE Level II – An "intermediate" survey and energy analysis
10,000 to 49,999 square feet	ASHRAE Level I – A basic energy analysis

For a summary of what each level of effort entails, ASHRAE has provided the Department of Environment with an excerpt from the **Procedures for Commercial Building Audits**, which can be downloaded from: www.sfenvironment.org/ecb

The full **Procedures for Commercial Energy Audits** are available directly from ASHRAE: www.ashrae.org

Large facilities and buildings with complex systems are encouraged to consider retrocommissioning as an alternative way to meet the audit requirement. Retrocommissioning is the systematic, detailed examination of all systems and operations in a building to ensure they are operating as designed, and to identify opportunities for operational and capital improvements. The California Commissioning Collaborative provides an excellent guide to selecting a retrocommissioning provider: http://www.cacx.org

Audit Timeline

All building owners must have at least 12 months between the notice that an audit is required, and the date when the Confirmation of Energy Audit is due. Notification of audit requirements is sent to the party listed by the Office of the Assessor Recorder as the contact for property tax, and the owner is responsible for filing a Confirmation of Energy Audit on or before the due date assigned to the parcel.

Important: The due dates for benchmarking are not related to the due dates for an energy efficiency audit.

Due Date	Audit	Public Disclosure
~~November 15, 2012~~ **Extended to March 15, 2013**	Confirmation of Audit due for initial group of buildings, approximately 1/3 of stock.	Cost-effective energy efficiency opportunities in individual buildings are confidential. Confirmation of compliance (or exemption) will be published.
April 1, 2013	Confirmation of Audit due for second group of buildings, approximately 2/3 of stock.	
April 1, 2014	Confirmation of Audit due for final group of buildings.	
2017 and beyond	Confirmation of Energy Audit due for 20% of stock every year	

Energy audits completed since 2008 may be used to fulfill the audit requirement, provided that the audit is an evaluation of the whole building meeting the applicable ASHRAE Level of Effort, or retrocommissioning. If only portions or specific systems in the building have been evaluated, or if the energy efficiency evaluation was conducted prior to 2008, a current and comprehensive audit is required.

Audit due dates for individual buildings have been established on a rolling deadline determined by the Dept of Environment. Spreading audits over three years will help the engineering community be able to meet demand.

Qualifications for Energy Auditors:

The Energy Efficiency Auditor responsible for the Energy Efficiency Audit Report must possess one of the following qualifications:

	Certification or License	AND	Minimum Experience
(1)	Licensed Engineer (PE) **OR** PhD in mechanical engineering*	**AND**	• At least 2 years experience performing energy efficiency audits or commissioning of existing buildings; **OR** • Any certification listed in #2 below.
(2)	• ASHRAE Building Energy Assessment Professional (BEAP); • Association of Energy Engineers Certified Building Commissioning Professional (CBCP);* • Association of Energy Engineers Certified Energy Manager (CEM); • Association of Energy Engineers Existing Building Commissioning Professional (EBCP); **OR** • Northwest Energy Education Institute Energy Management Certification	**AND**	• At least 2 years experience performing energy efficiency audits or commissioning of existing buildings
(3)	• BOC International Building Operator Certification Level II; **OR** • International Union of Operating Engineers Certified Energy Specialist	**AND**	• At least 10 years experience as a building operating engineer; **OR** • At least 5 years experience as a chief operating engineer
(4)	Equivalent professional qualifications to manage, maintain, or evaluate building systems, as well as specialized training in energy efficiency audits and maintenance of building systems, as determined by the Director of the Department of Environment		

* Credentials noted with an asterisk (*) have been approved by the Director as substantially equivalent to the credentials cited in the ordinance.

How to File a Confirmation of Energy Audit

To confirm the energy audit was completed and the building owner has complied, the auditor must submit a brief summary called a 'Confirmation of Energy Audit' to the Department of Environment. It is the building owner's decision whether to implement retrofits, and to take advantage of financing and incentives that may be available by implementing the opportunities identified in the energy efficiency audit.

The Confirmation of Energy Audit is a brief online summary of the findings in the Energy Audit Report. It includes:

- Contact information
- Auditor, their qualifications, and when the audit was completed
- A list of all cost-effective energy efficiency measures identified. For reporting purposes, "cost-effective" means energy efficiency measures that are estimated by the auditor to either:
    - Have a simple payback of 3 years or less,
    - Have a beneficial net present value,
    - As an integrated package, offer an overall simple payback of approximately 3 years, OR
    - As an integrated package, offer positive net present value.

Accessing the Confirmation of Energy Audit tool:

A Confirmation of Energy Audit may only be filed by the auditor responsible. To register:

1. Create a free account with Zoho Creator [https://www.zoho.com/creator/lp/signup.html]. Be sure to use the email address you will use for submitting the Confirmation of Energy Audit.
2. Email benchmark@sfenvironment.org requesting access to the CEA. Include:
    - Full name AND
    - Email address associated with your Zoho Creator account.
3. Upon receipt of your request, SFE staff will authorize the auditor to use the Confirmation of Energy Audit tool and email you an invitation to use the tool.

Exemptions to Audit Requirements

An Energy Efficiency Audit is not required if the building is new or is recognized by a third party as high performing:

- **High Performance Buildings:** The building has received the ENERGY STAR in 3 of the past 5 years, or LEED for Existing Buildings certification in the past 5 years.
- **New Construction:** The building was constructed (i.e. received a final Certificate of Occupancy) in the past 5 years.

Buildings that meet these criteria are exempt from an audit until the next audit cycle, and will remain exempt if they maintain current recognition for high performance.

Buildings are also exempt from the audit requirement for as long as any of the following conditions apply:

- **Unoccupied Buildings:** (The building had less than one full-time equivalent occupant for the previous calendar year.)
- **Financial Distress:** Examples of qualifying financial distress include:
  - Properties qualified for sale at public auction by the Treasurer and Tax Collector due to arrears of property taxes that resulted in the property's qualification for sale at public auction, or acquisition by a public agency within two years prior to the due date of an energy efficiency audit report
  - A court appointed receiver is in control of the asset due to financial distress
  - Buildings owned by a financial institution through default by the borrower
  - Buildings acquired by a deed in lieu of foreclosure
  - Buildings where the senior mortgage is subject to a notice of default.

In all other cases, the Confirmation of Energy Audit is required.

Enforcement

The priority of the Department of Environment is education; we will work with property owners, managers, operators, and tenants to improve energy management. As such, enforcement will emphasize outreach and education, and we will collaborate with the commercial sector to draw attention to facilities and teams who are demonstrating leadership in energy management.

If necessary, the ordinance directs the Department of Environment to take the following steps:

1. **Warning –** A written notice of violation.
2. **Public Notice –** 30 days or more after a deadline, the Department of Environment will indicate via a public website that a building is not in compliance with local law.
3. **Fine –** Fines can be levied 45 days after the written notice. Buildings of 25,000 square feet and larger can be subject to fines of $100 per day, up to a maximum of $2,500 per violation. Buildings smaller than 25,000 square feet can be subject to fines of $50 per day, up to a maximum of $1,500 per violation.

For More Information

Web: www.sfenvironment.org/ecb
Call: (415) 992-6373
Email: benchmark@sfenvironment.org

Appendix E
LaSalle Investment Management "Green Guide"

LaSalle's greenguide

10 steps toward sustainable building management

LaSalle Investment Management®

Real estate experience. Investment expertise.

Our commitment to sustainability

As a leading global real estate investment manager, LaSalle Investment Management recognizes the opportunity it has to reduce the environmental impact of the real estate holdings it manages on behalf of its clients. Buildings are responsible for a significant share of CO_2 emissions, electricity usage, water usage, and solid waste. We know that small changes in the operations of our managed properties can have a materially positive impact on the environment. We also recognize that taking financially responsible steps to improve sustainable operational practices at our managed properties not only represents good and responsible corporate citizenship, but is compatible with serving our clients well through additional value-creation in their real estate holdings.

LaSalle is committed to the following Global Sustainability Goals:

Reduce the environmental impact of our business

Reduce the environmental impact of our Clients' Real Estate holdings

Meet or exceed local environmental regulations

Drive thought leadership and innovation on sustainable property investments

Collaborate with clients, tenants, property managers, and other service providers to provide sustainable management of properties

LaSalle's Green Guide is a global version of regional toolkits that we have prepared for our portfolio and asset managers around the world to share with our external property management teams. As a result, the information or practices contained in this document may not be appropriate or feasible in every location. We are sharing it with the real estate community because we believe the practices detailed are important not just in delivering investment performance, but more importantly, in reducing the impact of real estate on the environment. This guide details a variety of low or no-cost sustainable operational best practices which can help reduce energy and water consumption, increase recycling efforts, and effectively reduce the overall carbon footprint of real estate assets. Along with the environmental benefits, we anticipate that a further benefit of these efforts will be reduced operating expenses, and more competitive properties in their respective markets.

LaSalle's GreenGuide is being shared to provoke creative thinking from asset and property managers about our managed assets. While it is not a guide for specific project implementation, it is a directive for careful evaluation of options that could improve environmental stewardship through operational practices. In all of LaSalle's investment decisions, the financial return implications of operational decisions are our first priority and fully evaluated as part of the decision-making process. This guide is not intended to be all-inclusive. Rather, its purpose is to serve as a jumping-off point for getting started on increasing sustainable property operations, and decreasing overall energy consumption and impact on the environment. This guide is intended to be sufficiently high-level to be applicable across all property types, yet specific enough to be actionable. As such, some suggested actions will be applicable to some properties, but not to others, while other suggested practices will apply to all property types. Asset and property managers familiar with individual assets should be able to discern the practices, and operational principles, most relevant to sustainable operations of each property.

LaSalle believes that as tenants increasingly value sustainable property operations in order to lessen impact on the environment, asset and property managers implementing these best practices will reduce the overall impact of real estate on the environment and create a more satisfied tenant base while improving property financial performance.

10 STEPS

We have focused on 10 best practice areas for reducing the environmental impact of our property operations. Each practice provides general best practice guidelines which can be adapted, as appropriate and relevant, to the property-specific needs of each asset. We recognize that lease structures, the size of an asset, required contractual practices, and other items may impact the applicability of some of these best practices.

1. Energy Efficiency
2. Waste Recycling
3. Sustainable Purchasing
4. Green Cleaning
5. Water Conservation
6. Exterior Site Management
7. Preventive Maintenance
8. Tenant Improvements / Renovation
9. Transportation
10. Staff Education

1. Energy Efficiency

Energy efficient operations can result in large short-term and long-term cost savings. Through an analysis of your building's HVAC/electrical systems and current operational practices (also called "retro-commissioning"), you can identify low-cost repairs and operational changes that result in quick energy savings paybacks. Depending on the level of experience of the building engineering staff, some or all of the analysis and repairs can be completed by the building engineering staff. At times, however, the assistance of a well-qualified outside consultant may be required.

As a second step, completing a more detailed energy efficiency audit will identify larger capital improvement projects that can offer even greater potential for energy savings. In some cases incentive programs are available to assist with the analysis, engineering and equipment-replacement costs associated with a retro-commissioning process, or a detailed capital improvement upgrade project. In addition to identifying savings opportunities, these analyses may identify comfort and operational efficiency issues.

Goals

- Reduce energy and utility expenditures
- Maximize equipment life
- Improve occupant comfort and satisfaction
- Reduce carbon emissions

Low-Cost / Easy Implementation Options

Lighting check. Walk the floor. Simply checking to make sure lights are turned off as scheduled – whether manual or automatic – is a no-cost item which may save significant energy. Check, and if necessary, adjust time clock controls for lighting. Communicate the requirement for out of hour cleaners and maintenance to turn off lights when areas are not being used. Remind tenants of the energy saving power of turning off the lights.

HVAC start times. Reduce HVAC hours of operation: reduce start-up and shut-down times for HVAC systems (as lease terms allow). Reduce weekend hours of operation: many tenants may encourage reductions to save energy consumption (as lease terms allow).

Calibrate controls and occupancy sensors. Uncalibrated thermostats, equipment control sensors and occupancy sensors can lead to higher energy usage, accelerated equipment wear and tear, and uncomfortable tenants. A regular calibration and maintenance schedule will allow equipment to run as designed and maximize efficiency. Trend-monitoring with your energy management control system (EMS), or regular checks with stand-alone data loggers can verify that systems are operating efficiently.

Check damper and control valve functionality. Over time, duct systems and hydronic control valves can become sticky, leaky, and out of calibration. These seemingly minor problems can grow into large-scale system inefficiencies that result in high energy use when left unattended. Periodically checking, adjusting and repairing these systems will maximize system performance. An inspection of control system scheduling times may surprise you. In many cases schedules programmed into control systems don't accurately reflect actual facility operating schedules -- either because tenant requirements have changed, or because onetime special event changes were never adjusted back to normal schedules. A simple cross-check of all equipment schedules with actual occupant needs, and a few adjustments, may immediately yield significant savings in annual energy costs. A system should be put into place to make this inspection on a recurring basis, either monthly or quarterly.

Analyze and adjust equipment sequencing. Central plant equipment (boilers, chillers, cooling towers, pumps, hot/cold deck dampers, etc) all work together based on a sequence of operations designated by the original design strategy. Over time, changes in building usage and load profile may require these sequences to be adjusted to maximize efficiency, and minimize conflicting operational patterns. A detailed analysis of these sequences by an experienced analyst may identify numerous opportunities for optimization.

Check steam traps and radiator valves. In many older buildings, heating systems have broken steam trap valves on radiators. Broken steam trap valves result in the loss of large amounts of valuable heat to condensation or to wastewater systems. Systematically checking and repairing each trap improves energy efficiency and occupant comfort.

Seal envelope penetrations to reduce air infiltration. Simple air leaks around all external envelope penetrations (windows, doors, conduits, piping, etc) cause your HVAC system to work harder to heat and cool your space. Detecting these leaks and sealing them with the appropriate material will not only yield energy savings, but will reduce drafts and corresponding comfort complaints. Consider adding a regular resealing program into your preventive maintenance program for all envelope penetrations. Suggested frequency: every 5-10 years.

Initiate power management software on office computer equipment. Most modern desktop computer equipment (CPUs and monitors) can be programmed to power down or "sleep" after a certain period of inactivity. Activating this software and programming it to an individual user's profile can not only save plug load energy, but also reduce the amount of cooling energy required to remove computer waste heat. Encourage tenants to power down computers and printers overnight. A monitor left on overnight uses enough energy to laser-print 800 pages. A photocopier left on overnight wastes enough electricity to make 5,300 copies.

Audit utility bills. Perform a review of monthly utility bills to look for anomalies. Watch for electrical, gas, or water consumption which is unusually high, or has recently increased, which may indicate a problem worth investigating. An unknown leaking water line, or lights left on continually, can have a significant impact on monthly utility consumption. If the tenant is responsible for equipment maintenance, consider sharing ideas with the tenant, and ensure tenant compliance with the maintenance obligations under the lease.

Higher-Cost Energy Retrofit Options

The following is a list of higher-cost energy efficiency options requiring retrofitting work. Asset and property managers should collaborate to evaluate the feasibility of implementing these improvements. Options include the following:

Lighting system retrofits. Perform an internal lamp audit. Incandescent down-lights could be replaced with fluorescent bulbs. Poor lighting design and inefficient fixtures waste energy and increase loads on cooling systems. Advances in ballast, lamp, luminaires, and control technology make it possible to obtain higher quality lighting with significant reductions in energy usage. Some of our properties still contain T-12 lighting fixtures that can readily be converted to T-8, or the newer T-5 fixtures. Garages and emergency stairwells may contain Metal Halide or Sodium Vapor fixtures (frequently burning on a 24 x 7 basis) which could be converted to T-8 fluorescent fixtures. In many cases a lighting retrofit project can pay for itself with the generated energy savings in less than one year. Utility rebate programs where available can accelerate this payback.

Lighting occupancy sensors. Lighting Motion Sensors automatically turn lights off after a pre-set time when there is no activity in a space. Motion sensor upgrades often have a payback of less than two years.

Chiller replacement. Chillers that are close to the end of their life cycle (20-25 years), or are using ozone-depleting refrigerants, may be good candidates for replacement. New chillers have much higher efficiency coefficients and operate better at partial loads, yielding substantial energy savings. Additionally, replacing a chiller can reduce long-term maintenance costs associated with adding refrigerant.

Control system upgrades. Buildings with electro-mechanical or all-pneumatic control systems may be prime candidates for upgrades to direct digital controls (DDC). The installation of a DDC master controller that interfaces with older pneumatic systems is the first step in maximizing HVAC performance and monitoring/ trending capabilities. If the capital expenditure budget allows, the DDC system can be further optimized by replacing valve and damper actuators with DDC components and installing digital space and equipment-monitoring points. Where building codes allow, CO2 sensors in the parking garages can shut down energy-consuming mechanical ventilation systems when not needed at times of low levels of activity.

Motor replacement and variable frequency drives (VFD's). Many older motors greater than 5 horsepower will yield substantial energy savings when replaced with new motor technologies. A qualified engineering consultant can determine whether this type of upgrade project is a cost-effective opportunity for your facility. Variable frequency drives (VFD's) that control motor speed based on partial demands are effective energy-saving devices that may not have been available when the building was originally designed. The payback is typically less than two years. If the tenant is responsible for equipment maintenance, consider sharing ideas with the tenant, and ensure tenant compliance with the maintenance obligations under the lease.

Energy rebate and tax incentive programs. In many countries, states and municipalities incentive programs are available for energy reduction investment which can be very attractive financially. Research what is available in each property's location. Any capital expenditure recommendations should incorporate the effect of incentive programs.

2. Waste Recycling

Recycling takes a product or material at the end of its useful life and turns it into a usable raw material to make another product. By taking products out of the landfill waste stream, your building can save money on its waste disposal fees, and make a positive environmental impact.

Goals

- Minimize waste sent to landfills
- Reduce fees associated with waste disposal
- Identify additional opportunities for collection of recyclable materials currently in the landfill waste stream

Program Components

The establishment of a recycling program is a two-step process. First, the baseline quantities of waste vs. recycling must be determined; and second, a comprehensive recycling program to minimize landfill waste and track program improvements must be implemented. If the property team and the asset manager determine that a recycling program should be evaluated, the full scope of work should be developed and priced.

Determine your baseline. Perform a waste audit in order to identify waste collection practices and potentially recyclable materials in your facility's landfill waste stream. Your waste vendor may be able to provide this service for you. Perform an internal time-and-motion study to determine the best placement for recycle bins based on your facility's occupant behavior. Identify the frequency of waste and recycling pick-ups.

Develop a comprehensive recycling plan. Create a plan to address all aspects of the facility's waste stream and continually reduce the amount of solid waste going to the landfill.

Low-Cost / Easy Implementation Options

Start with the basics. A high-quality recycling program must first ensure that basic recyclable materials are being diverted from the landfill waste stream. A Waste Recycling Program should include the following elements: paper, glass, aluminum, metals, plastics, batteries, fluorescent light bulbs. In office environments, the number one material found in waste receptacles is paper. Coordinate with the tenants to ensure collection boxes for office paper are located at each desk and in every copy room. Working with your tenants and your waste management contractor, consider whether collection boxes for cans and plastic bottles should be placed at individual desks and/or in lunch and break rooms.

Work with your local waste/recycling contractor. Talk with your waste management contractor about the best way to achieve high landfill diversion rates for your recycling program. Some contractors prefer recyclables separated into different collection containers. Others prefer them co-mingled (all recyclables together). Work with your waste management contractor to determine the preferred process to remove recyclables off-site. When hiring a waste/recycling vendor, ensure that they have recycling programs that facilitate cooperation with tenants.

Consider designating a recycling coordinator. Consider assigning to a single person– the recycling coordinator – the task of creating and maintaining a robust recycling program. Consider forming a "Green Team," or property recycling committee comprised of tenant personnel to help champion this effort.

Check with your local municipalities. Many jurisdictions now offer tax rebates, and other incentive programs for implementing recycling programs. The tax incentives for recycling can be significant.

Higher-Cost Implementation Strategies

A more comprehensive recycling program could include creating a system to collect and recycle food scraps, electronics, batteries, fluorescent lamps, and toxic wastes such as unused paints. Think outside the box and explore all options. Tenants and adjacent property owners may be good sources of information and ideas for areas where collaboration can occur.

3. Sustainable Purchasing

Some management companies offer a supplies purchasing program. If there is such a program, green products should be requested. Sustainable procurement and purchasing is a strategy used to ensure products and services used at the property have minimal impacts on the environment. Sustainable purchasing is commonly referred to as Environmentally Preferable Purchasing (EPP). EPP programs look at all aspects of purchasing -- such as human health, packaging, embodied energy, price, recycled content and waste. There are natural synergies between many of the components of a good Sustainable Operations Program. Therefore, some of the items in an effective EPP Program will also be present in your recycling and low-emitting paints, finishes and furnishings programs.

Goals

- Save energy and water
- Select products containing fewer toxic components
- Generate less waste by purchasing goods with reduced packaging and high recycled content
- Save money through lower disposal costs
- Purchase goods, such as electronics, from manufacturers that will accept them back for recycling ("take-back programs").

Guidelines for Developing an EPP Program

Understand what your management company offers to its clients, and assess the ability of your asset to participate in the program. If your management company has such a program, consider developing an EPP Policy for your asset to allow it to participate in the program.

A high-performing EPP policy. This policy will include: Collect baseline data to determine current purchasing practices; Establish criteria for each type of product purchased; Develop a green product database; Meetings with company vendors to learn about alternative product choices; Revisit purchasing data after three months to determine if improvements were made

Ideas for Sustainable Purchasing Targets

Salvaged materials. The most commonly available salvaged and refurbished materials are office furniture, especially chairs and desks, wood cabinetry, metal filing cases, refurbished fax machines and copiers, refurbished toner cartridges

Recycled materials. Consider products that contain at least 30% recycled content, such as office and copier paper, folders and boxes, building materials such as insulation, carpet tile, dry wall and ceiling tiles.

Low-toxicity purchases. Low-mercury fluorescent lamps (below 100 picograms per lumen hour) products containing low levels of Volatile Organic Compounds (VOC), including cleaning products that meet standards such as those for US-based Green Seal: www.greenseal.org (see Green Cleaning section for more details), adhesives, paints, and sealants (see Paints and Finishes section).

Take-Back Program

Talk to vendors about product take-back programs. Share what you learn with tenants if appropriate. Some companies already offer to take back and recycle products such as photocopiers when they've reached the end of their useful lives. This transfers responsibility for recycling from the customer to the company and keeps waste out of landfills.

4. Green Cleaning

Green Cleaning practices use products and processes that reduce or eliminate any negative impact from cleaning on human health and the environment. When bidding cleaning contracts, the property team should ask the potential vendors to explain in detail their supply purchasing programs, employee training programs, and cleaning methodologies. Request a bid which contemplates the strategies outlined below. If the tenant is responsible for cleaning their space consider sharing "green' practices with the tenant. Conventional cleaning products often contain chemicals called Volatile Organic Compounds (VOCs). Implementing green cleaning practices is one simple and low-cost way to reduce VOCs and potentially improve indoor air quality.

Goals

- Improve indoor air quality
- Encourage custodial staff to think and act in a more environmentally-friendly manner
- Improve marketability of buildings to prospective tenants

Low-Cost / Easy Implementation Options

Green cleaning products. Encourage the hiring of vendors who make use of cleaning products that contain low levels of VOCs. Where the property manager buys supplies for use by on-site personnel, please follow the purchasing recommendations contained in this guideline.Green cleaning products typically do not carry any cost premium. They have become essentially cost-neutral due to both increased competition in the green cleaning chemicals market, and to their own efficiency. A smaller quantity of concentrated green cleaner when mixed with water will clean as effectively as a larger quantity of conventional cleaner.

Use green cleaning specific equipment. In most cases green cleaning chemicals are meant to be used with a dilution system provided by the specific chemical supplier. The system mixes a prescribed amount of water with the chemical concentrate to guarantee low-VOC levels. Micro mops and dusting cloths use one quarter less chemical than conventional wet mops, and can be washed and reused. Encourage vendors to use mops (or purchase them if for use by on-site staff) with an ergonomic design to reduce custodial worker fatigue and injuries.

Modify cleaning hours. Consider modifying cleaning hours for common areas to daytime or morning cleaning to enable less cleaning to be done after-hours with lights on. Consider having cleaners turn lights off as they complete a floor during after-hours cleaning. Over the course of a year the energy savings can be considerable.

Use recycled paper products. Disposable paper products, including paper towels, toilet seat covers, and toilet paper, should contain at least 60% recycled content and should be chlorine free. Purchase trashcan / bin liners that contain at least 10% post-consumer recycled content.

Provide walk-off mats. Both inside and outside of all high traffic areas, use walk-off mats to trap dirt and contaminants before they are tracked through the building. Using mats will reduce the amount and intensity of cleaning required in your building. Vacuum mats at least once per day.

Higher-Cost Implementation Options

Consider the benefits of requiring cleaning vendors to use HEPA (highly efficient particulate air filter) vacuums. These will improve the collection and retention of soils and dust, and help improve the indoor air quality.

Training. Because so many buildings use outside cleaning service contractors, it's advantageous to ensure proper training on green cleaning protocols and the chemical dilution system. When bidding a cleaning contract, the property team should ensure the RFP requires that the cleaning service contractors servicing your facility provide training in green cleaning standards, such as the following:

- The benefits of the green cleaning program
- Recommended cleaning procedures and frequencies
- Proper maintenance of waterless urinals (if applicable)
- How to use each cleaning apparatus (vacuums, chemical mixing equipment, etc)
- Ergonomic use of machinery to maximize productivity and reduce operator fatigue, discomfort or injury
- Safety for proper lifting
- Effective recycling: what to recycle, locations of recycling bins, and waste diversion goals
- Purchasing of recycled paper products

5. Water Conservation

We should aim to use water more efficiently without negatively impacting building occupants. This will reduce utility expenditures associated with potable water purchases and wastewater disposal charges.

Goals

- Use water more efficiently without negatively impacting building occupants
- Cut utility expenditures associated with potable water purchases and wastewater disposal charges

Low-Cost/Easy Implementation Options

Conduct a water audit. Check with local water utility to determine if they will perform a free water audit for your building to establish a "baseline" for your building.

Inventory water fixtures. Inventory all fixtures in the building, including taps (kitchen/bath/utility), urinals, toilets and showers. Gather specifications for each fixture and determine if it meets appropriate standards and best practice. Evaluate your fixture inventory to see if it would be cost-effective to retrofit older plumbing valves and/or fixtures with newer models that use less water.

Retrofit existing plumbing valves. Assess viability of retrofitting flush valve kits with lower flow rebuild kits, or dual flush options to increase water efficiency.

Install flow restrictors on taps. Consider installing flow restrictors on taps as a lesser-cost alternative to more costly low-flow lavatory tap replacements.

Improve landscape irrigation practices. When irrigation is necessary, irrigate in the early morning to prevent evaporation. Consider replacing water-intensive ornamental plants with drought tolerant, native or adaptive plantings.

Take advantage of rebates. Check with your local city / county / water district to determine if any rebates are offered for water fixture retrofits.

Higher-Cost Implementation Options

Low or no-flow toilets and urinals. Waterless urinals, low flow urinals, and dual flush (or low-flow) toilets. High efficiency or low-flow lavatory taps, kitchen sink taps, shower heads, and cleaning sink taps. If waterless urinals are installed, ensure that the custodial staff is properly trained on fixture maintenance.

Meter water usage. If they don't currently exist, evaluate installing water meters on the building's main potable water line and on irrigation and chilled water make-up systems.

Use non-potable water for non-potable uses. Evaluate the feasibility of investing in greywater or blackwater filtration systems for use in irrigation and toilet flushing.

Irrigation controls. Current generation automated irrigation controls can detect current evapotranspiration levels so that the system waters only when necessary for plant health. Irrigation controls are a key strategy to prevent over-watering, and reduce water consumption expenditures.

Drip and microsprayer irrigation system. A drip irrigation and microsprayer system directs water to the plants requiring irrigation, and substantially reduces water lost to evaporation.

Conductivity meter and automated controls for the cooling tower. By better controlling the concentration of dissolved solids in the cooling tower water system, water efficiencies required for blow-down can be maximized.

6. Exterior Site Management

Proper management of building exteriors and grounds is key to achieving a more sustainable facility overall. Exterior site management practices should have the lowest possible environmental impact in order to preserve the integrity of the local ecosystem, while working to integrate the building into the surrounding landscape.

Goals

- Reduce use of potable water for landscaping irrigation
- Work with the property manager to reduce environmental toxicity caused by the use of paints, sealants and cleaners on the exterior of the building and on-site property.
- Minimize pesticide and herbicide use and explore options with more natural methods.

Low-Cost/Easy Implementation Options

Irrigation. Adjust watering schedules on automated sprinkler systems to water early in the morning, or instruct landscaping staff to only irrigate in early mornings. Limit irrigation to the amount required for each plant type. Evaluate the most effective irrigation options for new planting areas (i.e., drip or micro-sprayer irrigation systems).

Plantings. When updating landscaping, choose xerophytic plants that are able to survive with little water, native plants, or plants that are highly adaptive to the area. Native and adaptive plants will require less maintenance than ornamentals. Choose trees that provide shade and require little water once established.

Landscape management. Consider composting green waste produced on-site if local law allows, and if the composted materials can be used as mulch on landscape beds to prevent weed growth and provide nutrients to the soil.

Implement a PM system for the irrigation system. Implement a Preventive Maintenance System for the Irrigation System, which would include items such as: logging the irrigation water meter readings to detect leaks, monitoring the hours of operation to minimize the use of water, periodically inspecting the landscape to look for wet areas that may indicate an underground leak, and ensuring that all sprinkler heads target the landscaping (and are not watering the sides of buildings or other impermeable surfaces).

Higher-Cost Implementation Options

Integrated pest management*. Instead of using harmful pesticides and herbicides, consider Integrated Pest Management (IPM) techniques that prioritize source control and low-toxicity mitigation measures to reduce pest infiltration. IPM is an effective and environmentally-sensitive approach to managing pests and minimizing pest damage. Require detail on these options when issuing an RFP for pest control services.

Lower emitting landscaping equipment. Encourage landscape vendors to use electric power tools if available. Schedule maintenance activities so that power tool operation is minimized during employee work hours.

Automated irrigation systems. Purchase systems controlled by a weather station. Landscaping is irrigated only when the weather station notifies the system that evapo-transpiration rates exceed precipitation. Automated, adjustable irrigation will reduce water consumption and produce healthier plants. Investigate system installation to enable grey-water re-use for irrigation where cost-effective.

** Integrated Pest Management - an integrated approach of crop management to solve ecological problems when applied in agriculture.*

7. Preventive Maintenance

Encouraging staff to collaborate and develop performance goals for their buildings over the long term can result in continuing improvements. Preventive maintenance is a schedule of planned maintenance actions aimed at equipment optimization, as well as the prevention of breakdowns and failures. A good preventive maintenance program is designed to preserve and enhance equipment reliability by tuning, repairing and replacing worn components before they actually fail. Maximizing the useful service life of all building systems reduces the amount of total resources required to operate your building, as well as ensures efficient operation and minimized utility consumption.

Goals

- Prevent system breakdowns and failure
- Maximize lifespan of equipment and the building
- Reduce tenant complaints about comfort
- Increase safety and security
- Improve indoor environmental quality

Preventive Maintenance Program Components

The depth of maintenance programs varies in accordance with property type, budget, and team resources. Many of the low-cost strategies suggested here would normally be included in the annual operating budget. Be prepared to detail the scope, cost, and savings to be produced by the PM program.

Low-Cost/Easy Implementation Options

Create a detailed PM plan. Having a PM plan in place allows for regularly scheduled maintenance on mechanical equipment and minimizes the amount of system down time. A PM plan -- including a detailed work order system -- allows staff to become familiar with equipment, controls, and establishes a regular inspection and maintenance protocol.

Checks to be included in the PM plan. Fire safety system and extinguishers, HVAC coil cleanliness, Plumbing valves and fixtures, Belts and bearings, Windows and screens, Motor rotations and lubrication, Damper function, System calibration, Building envelope, Condensate pan cleanliness, Any additional PM measures as may be required on a property-specific, and equipment-specific basis

Building basics. It is expected that all property management staff tasked with equipment maintenance will be trained in the basics of all building MEP (Mechanical/Electrical/Plumbing) systems and operations -- boilers (including the blow-down process), motors, heat pumps, chillers, cooling towers, fans, dampers, VAV and CV systems, control systems, etc., -- as well as the safe operation, employee safety regulations, and emergency procedures associated with those systems.

Fundamentals of commissioning. Commissioning ensures that all building systems are installed correctly and performing according to the design intent. Optimizing energy use through commissioning can produce significant energy savings (frequently 5-15%), and will reduce operating costs.

Benchmark for "good practice" indoor air quality. A variety of local and national guidelines are available for cleanliness, comfort, and control of pollutants. There are also standards available for the control of HVAC pressure flows, proper cleaning of equipment, capture and exhaust point sources (copier rooms, custodial closets, etc). Be aware of exterior and interior pollutant sources that may be property-specific.

Ventilation guidelines. Find the ventilation guidelines for your country. It is important to recognize that the ability to comply with any standard will be HVAC system-dependent. A standard's goal is to provide building occupants with adequate outside air and ventilation rates.

Proper drying guidelines. After any water leaks, follow proper drying guidelines immediately to prevent biological growth. Have emergency contact numbers for drying services pending significant leaks.

Refrigerant management. Keep a log of all maintenance performed on refrigeration equipment containing more than 50 lbs / 22.7 kg of refrigerant. Track the amount of refrigerant added, and determine the estimated annual leakage rate. If the annual leakage rate exceeds 3% of the total refrigerant charge, identify and repair all leaks and/or consider replacement, depending on age.

Outside air. Calculate fresh air intake to assure proper minimum per applicable local standards. Mke sure that the outside air intake is not located near pollutant sources such as automobile/truck fumes, kitchen and toilet exhaust, and cooling towers, etc. Where possible, utilize appropriate size filters on exterior air intakes and on return air grilles.

Smoking. Where feasible, the building rules should not allow smoking inside the building. All exterior designated smoking areas should be located at least 20 feet / 6 metres from all building entrances and air intakes.

8. Improvements / Renovations

Indoor air quality can be improved below existing compliant levels by using green products during building improvement and renovation projects. The materials can include low-toxicity adhesives, sealants, caulk, mastics, paints, clear finishes, insulation, flooring, systems furniture and seating.

Goals

- Improve Indoor Air Quality
- Reduce environmental impact from the use of toxic materials
- Reduce natural resource depletion through re-use of recyclable materials (carpet, metals, etc.)

Low-Cost/Easy Implementation Options

In those situations where the Landlord controls the build-out and product selection, consider using the following guidelines when selecting adhesives, sealants, insulation, paints and primers. If the tenant is in control of product selection, educate the tenant about these options where possible.

Local sourcing. As a guiding principle, selection of local materials and products will save on transportation costs and energy consumption, and should be considered where economics and practical considerations allow.

Adhesives and sealants. Low-toxicity adhesives are available for installing all building materials, including ceramic tile, linoleum, vinyl flooring, carpet base, wall coverings and countertops. Use adhesives that meet the Volatile Organic Compound (VOC) limits as set by local regulations or international standards for carpet, seam sealer, tile, flooring, cove base, countertop, framing, and panel adhesives. Consider low-toxicity, water-based siliconized acrylic caulk (painter's caulk) for interior moisture and air sealing. Consider low-toxicity mastic for sealing HVAC ductwork. Use low-VOC water-proofing sealants for any applications within the building's vapor barrier system

Insulation. Blanket insulation with no added urea-formaldehyde should be selected when possible.

Paints and primers. Specify paints and primers that meet the local emission and chemical component requirements and standards:

Recycle demolished materials. Diversion of construction materials. Once building rules and regulations are in place, and contractors apprised (and where local law and custom allow), recycling of demolished materials can be done with little additional effort at minimal or no additional cost. Typical recycled materials would include ceiling tiles, carpet, dry wall, and metal studs. In addition to demolished materials, all general construction debris should be included in the recycling program.

Limiting impact of construction on occupied areas. Adequate method statements should be put in place prior to commencing work in occupied buildings to minimize the impact of noise, vibration, dust and other disturbances within the building.

Higher-Cost Implementation Options

Systems furniture and seating. Low-toxicity systems furniture and seating options are available. Avoid vinyl and virgin polyester textiles. Consider reuse of existing furniture where feasible and appropriate.

Carpets and carpet padding. Specify carpet that complies with local carpet standards, or choose natural fibers such as wool and jute.

Non-carpet flooring. Where reasonable, specify low-VOC or rapidly renewable alternatives to vinyl composition flooring, including Linoleum. Made from natural materials including ground cork, limestone, pigment and linseed oil, it does not release any petroleum-based harmful or irritating chemicals. Hardwood flooring with Forest Steward Council (FSC)-certified wood. Engineered flooring systems with no added urea-formaldehyde in their glue or resins, Flooring systems composed of rapidly renewable resources. As an example, bamboo is durable and rapidly renewable. (It grows quickly and has short harvest cycles.)

Built-in cabinets and shelving. Where possible, specify cabinets made from composite wood products that contain no added urea-formaldehyde for built-in cabinets and shelving. Specify wheatboard, formaldehyde-free MDF (Medium Density Fiberboard) or plywood for cabinets, storage systems and shelving.

9. Transportation

Transportation accounts for a significant portion of total energy consumption. Various transit options, including bus, light rail, heavy rail, subway, car pooling, shuttles, telecommuting, walking or biking are available to reduce single-occupancy trips.

Goals

- Provide information to tenants that will help them access available services to help reduce greenhouse gas emissions and air pollution associated with work-related travel and employee commuting.

Transportation Program Ideas

The property team should research transportation programs available in your community, and provide information to tenants on the programs. Check with business improvement district leadership for programs available to building owners in the area (i.e., clean air campaigns, shuttle services, etc.). Provide information to tenants on car pool, car-share, and van pool services provided by the community. Install secured bicycle parking to encourage biking to work.

Encourage alternatives. Consider providing preferred parking spaces to tenants who drive Partial Zero Emissions Vehicles (PZEV), or Zero Emissions Vehicles (ZEV), or alternatively-fueled cars such as hybrids, bio-diesel and ethanol. Educate tenants on the alternative transportation programs offered by the local transportation authority.

10. Staff Education

Operating a building at its optimal performance requires property management teams that are well-trained -- not only in operations and maintenance -- but in energy efficiency and sustainable practices. A comprehensive operations strategy that provides continuing education to staff will reward a facility with better performance, proactive (rather than reactive) maintenance, and is likely to provide for better tenant comfort and retention rates. When selecting property management companies, inquire about the property manager's staff education policy and practice with respect to sustainable property operations.

Goals

- Hire property management companies with a commitment to providing on-site and/or off-site training for building maintenance staff to ensure ongoing education in best practices and the latest technology.
- Target training in focused areas to include energy efficiency, preventive maintenance, water efficiency, indoor air quality, and commissioning

Recommended Educational Topics

Utility fundamentals and building data analysis. Property engineers and management teams should understand the different building fuel types and common units of energy measurement (BTU, therm, kW, kWh, gallon) in order to accurately read utility bills. Understand demand versus consumption. Staff should learn the basics of energy accounting, as this will help them assess next steps required to develop energy conservation projects. Staff should be able to analyze building energy usage trends in terms of base loads and seasonal load changes from different HVAC system components. Understanding trends helps identify system problems and enables targeted development of energy conservation projects. Staff should understand your utility billing rate. Talk to your utility provider to determine if there is a better rate for your usage pattern.

HVAC and control systems. Develop a better understanding of building system components, sequence of operations, analysis/ troubleshooting capability, and proactive maintenance strategies.

Lighting. Lighting is the "low-hanging fruit" in any commercial building's attempt at maximizing energy efficiency. Lighting upgrade projects are relatively quick and easy and yield high returns on investment. Ensure your staff becomes educated on the cost-benefits of lighting upgrade projects, and that they research any local incentives (tax, rebates, etc.) which may lessen economic investment. Staff should understand that lighting alone can account for 20-40% of commercial building energy costs. Installed lighting should have good color rendering, and utilize energy saving technologies such as occupancy sensors, photo sensors and timers that save energy.

Energy codes. Staff should be familiar with the national and local energy codes that apply.

Tenant education. Inform and educate your tenants about recycling, energy reduction, and other sustainable practices you are implementing in their building. Not only are they likely to appreciate efforts to lessen the environmental impact of the building operations, but are also much more likely to give their "buy-in" to ensure the mutual success of these programs.

Recommendations

Share best practices with other property locations and team members. Share your successes! Attend lectures on other local green operations/buildings in the area. Take tours of similar buildings implementing sustainable practices.

What should you do now? BE PROACTIVE.

Sustainability practices are constantly evolving. Share best practices!

Get started with your team evaluating the applicability of these *10 Steps Toward Sustainabile Building Management* in your organization.

Develop a sustainability action plan with payback analysis. Identify items for near and longer term objectives, investigate costs and paybacks, and assign responsibility for action items.

Create an action plan for implementation of best practices and track your progress.

Coach your marketing teams to promote the green and energy efficient features of your properties. If your property has sustainable operations, take initiative to promote these green distinctions to existing and prospective tenants.

Reach out to a local sustainability consultant to implement a program. Leading property management firms such as Jones Lang LaSalle have expert teams to guide sustainability improvement programs and certifications.

www.lasalle.com/sustainability

Appendix F
Dept. of Energy Report on "Variation in Energy Audits"

Report

Variation in Energy Audits: A Case Study of Navy Yard Building 101

Introduction

EEB Hub researchers used Building 101 to examine the variability in energy audits among three service providers, and explore the effect that this variability has on building owners who are considering energy efficient retrofits. The data available from the highly instrumented Building 101 was used to assess audit accuracy and develop suggestions for increasing standardization of the auditing practices and data analysis.

Building 101 at The Navy Yard

Building 101 in The Navy Yard is the temporary headquarters of the U.S. Department of Energy's Energy Efficient Building Hub (EEB Hub). The building is currently owned by the Philadelphia Industrial Development Corporation (PIDC) and managed by Cushman and Wakefield.
Built in 1911, Building 101 was originally a Marine barracks at the The Navy Yard in Philadelphia. All of the building's mechanical systems were updated in 1998. The building is currently used as an office building with multiple tenants, including the EEB Hub, PIDC, and various commercial tenants including Northrop Grumman, Synterra, and Oxicool.

Building 101 covers 61,700 square feet over four floors (basement through third floors). The building is in the shape of a "T" with three wings, and is comprised of offices, a lunchroom, mechanical spaces, and miscellaneous support spaces, as well as a lobby/atrium located in the center of the building. Tenant space is located in all four floors, including the basement. Mechanical equipment lies in the basement mechanical rooms and the attic, which is also used for storage. Building 101 is occupied throughout the year, with typical office hours for office spaces.

Building 101's Energy Efficiency Opportunity

The Building 101 instrumentation project is determining a baseline for energy use in the building. Ultimately, the building will be used as a test bed in which the effectiveness of a new building system can be measured against this baseline. The ability to establish the precise impact of a discrete building system will be an excellent resource for the regional market.

As one of the nation's most highly instrumented buildings, Building 101 streams over 1,500 data points every 60 seconds. This data reflects the energy, comfort, and indoor air quality (IAQ) baseline, which will be used to calibrate and verify detailed simulation models of the building systems, as well as to quantify the impact of any improvements.

Using this instrumentation data, EEB Hub researchers tested the efficacy of energy audits, one of the first steps in a building retrofit. They contracted three energy auditing firms with distinct audit practices to survey the building and report on energy use and costs, as well as to make recommendations for upgrades and renovations.

The Energy Audit Process

Energy auditing is a systematic process for analyzing a building's existing energy usage and identifying opportunities to conserve energy and achieve energy cost savings. It is common practice to perform an energy audit when planning either a major energy efficiency renovation or adapting the use of a building. Three levels of energy audits are generally recognized by auditors, with level I and level II audits being most commonly used.

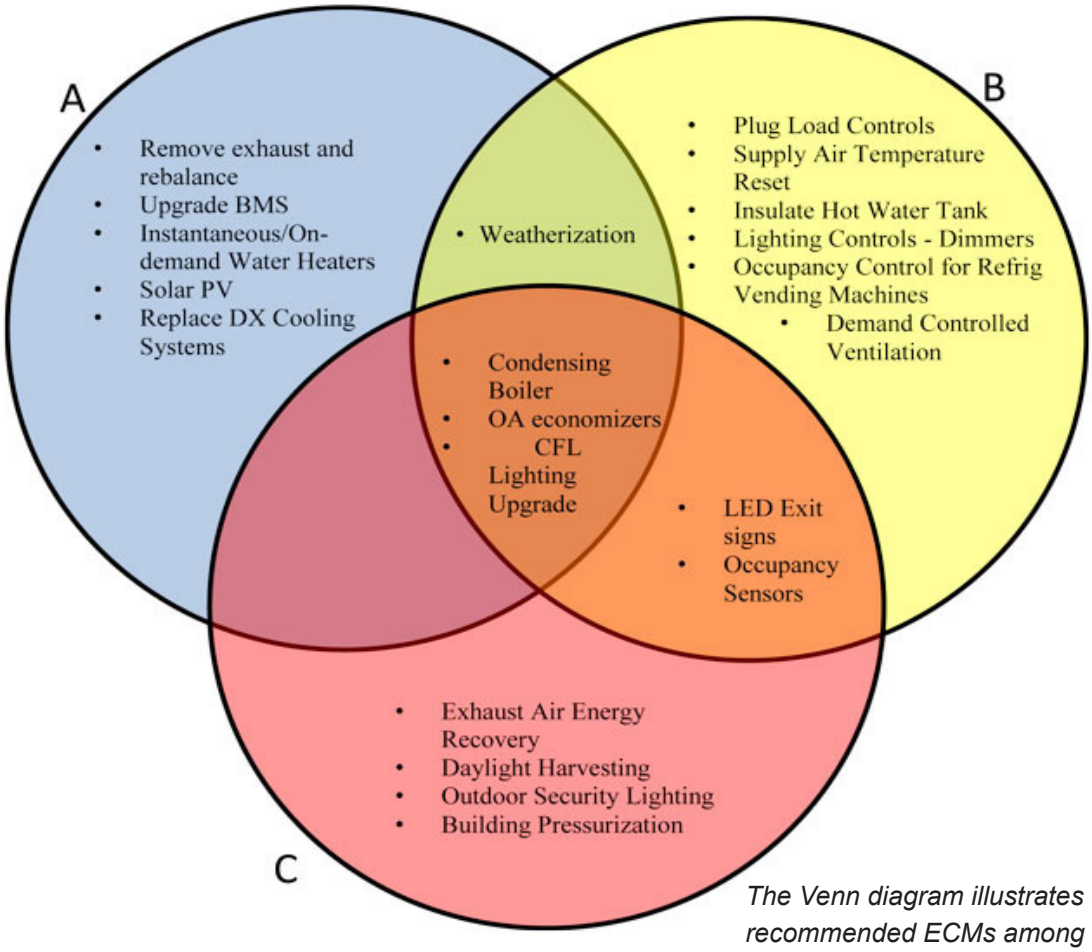
- **Level I:** A simple walk-through inspection by an "experienced observer" leading to verbal recommendations
- **Level II:** An analysis of the detailed energy use of a building, attributed to the various building subsystems, followed by a financial analysis of best return on investment for building or system upgrades
- **Level III:** A deeper investigation, focused on a whole-building computer simulation, of the retrofits identified in the Level II audit that require significant capital investment.

Level I is used to determine a rough estimate of efficiency improvements and/or to help identify capital projects. Level II offers specific recommendations and investment costs and is the most commonly utilized audit, while level III is a detailed analysis of capital intensive modifications.

These definitions leave some room for interpretation. Each individual engineer might draw the line between Level I and Level II services differently, and the client often influences an auditor's priorities, making the levels somewhat subjective.

EEB Hub researchers expected the results of the three firms to be fairly consistent. Conversely, each Energy Audit firm presented very different findings and recommendations.

Building 101 Energy Audit Results



The Venn diagram illustrates the various recommended ECMs among auditing firms.
Source: *EEB Hub*

Company A: Overview of Findings and Recommendations

Company A's engineering staff visited the site in October 2011. The audit team inspected Building 101's office areas, common areas, mechanical equipment rooms, and building envelope. Sampling rates of equipment and spaces were determined in the field. The audit team inspected all of the air handling units (100% sample rate) including supply fan motors, dampers, coils, and valves, with the testing methodology focusing on equipment relevant to specific energy conservation measures (ECMs).

Company A identified ten ECMs, including: disconnect exhaust fan, envelope-door weatherization, lighting upgrades, building management system, airside economizer, tankless water heaters, solar panels, condensing boiler, replace DX cooling systems, and increased attic insulation.

Company A contended that, if all of these ECMs are implemented, they would provide a total annual electric and gas cost savings of $60,200 (38% savings).

Company B: Overview of Findings and Recommendations

Company B surveyed the facility, including the lighting systems, windows, insulation levels, domestic hot water systems, HVAC systems, and controls. This company also performed a detailed utilities analysis. Company B then developed a calibrated energy simulation computer model and performed various "what-if" scenarios in order to develop their recommendations. Company B's approach was meant to be quick, but accurate, using the structured energy auditing software kW-Field.

Company B recommended six ECMs: airside controls optimization, building pressurization, exhaust air energy recovery, replacing boiler with staged condensing boilers, lighting controls and retrofits, occupancy sensors, emergency lighting fixture schedules, daylight harvesting, T12 to T8 lighting fixture retrofit in restrooms, and retrofit outdoor security lighting.

Company B's analysis indicated that approximately $22,495, or 14.5% of the present utility costs, could be saved by implementing these ECMs.

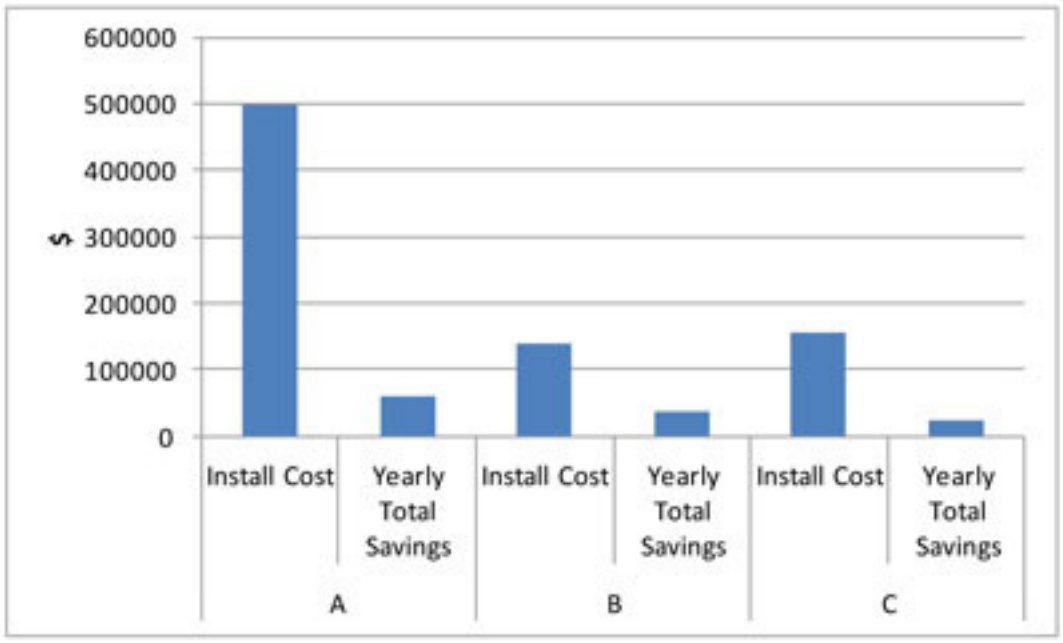
Company C: Overview of Findings and Recommendations

Company C analyzed Building 101 and proposed fourteen ECMs, eight of which involved lighting and lighting control upgrades. Other ECMs proposed include: re-commission of building envelope; installing plug load controls; mixed and supply air temperature reset; replacing the conventional natural gas boiler with a new condensing gas boiler; economizers on rooftop units; and hot water tank insulation.

Company C's analysis suggested that these ECMS could be expected to reduce facility electricity consumption by about 16% and natural gas consumption by about 61%, resulting in $34,000 or 24% reduction in annual utility expenditures.

Audit Variability

The graph below summarizes the annual savings, implementation costs, and simple payback periods for all three Energy Audit results:



A comparison of the three Building 101 audits.
Source: *EEB Hub*

The arrays of Energy Conservation Measures (ECMs) varied significantly among Energy Audits, both in ECM technologies recommended and their prioritization with respect to energy savings impact. Only a few of the same ECMs appear on all three auditor lists and none of those are prioritized in the same way. In addition, the differing naming conventions and categorization of ECMs among firms make precise comparisons difficult.

For example, all three energy audits identify lighting and lighting controls as an ECM. However, Company C identifies eight distinct Lighting ECMs, each with its own implementation costs and payback periods. The total implementation cost is about $8,000, with an average payback period of 4.8 years. Company A, on the contrary, groups all Lighting ECMs into one overarching Lighting Upgrade ECM, with an implementation cost of about $81,000 and a payback of about 4 years. Finally, Company B identifies five distinct Lighting ECMs, with a total implementation cost of about

$43,000 and an average payback period of 6.7 years. This variability in recommended measures demonstrates that even within a similar ECM category, different auditing firms may produce disparate proposals and estimates.

Of note, Company C and Company A did offer similar predictions regarding Building 101's carbon footprint reduction as a result of the proposed retrofits: 199 tons and 205 tons, respectively. Company B did not calculate a carbon footprint reduction estimate based on the firm's proposed retrofits, which is, in itself, another point of variation among energy auditing processes.

Recommended installation costs and overall yearly savings differed among auditors as well. Company C offered the lowest installation cost of $138,130 and annual savings of just under $40,000. Company A proposed the most expensive initial investment at $497,690, but offered annual savings of approximately $60,000 and with a payback time only 4.6 years longer than company C suggested.

Company A was the only company to identify the benefits and necessity of upgrading Building 101's Building Monitoring System (BMS) to a BACnet control system (i.e. a system that complies with the BACnet protocol, a standardized set of rules governing the communication of data about building automation and control networks) and included extensive detail on the building's current BMS. This point explains the much higher expense of Company's A installation recommendations. In fact, the BMS did have to be replaced before the completion of this case, proving the benefit of upgrading to a new BMS unit as opposed to investing in optimizing the existing controls.

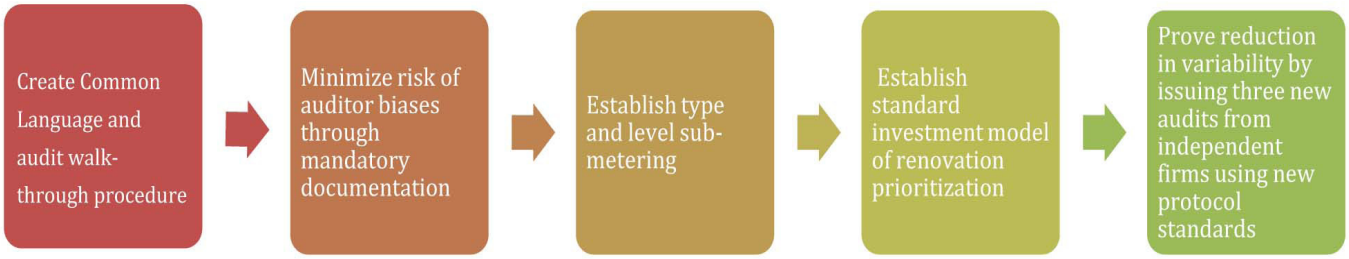
The data gathered by the energy audit firms on quantifiable energy usage and costs, as well as sustainability measures such as carbon footprint, showed much less variability than the firms' estimates of the costs and payback periods of the proposed ECMs. Thus, much of the variability between firms arises from the estimates of equipment costs and the labor to install that equipment, analogous to three different automobile mechanics diagnosing a similar problem with a car but quoting widely different repair costs based on parts and labor estimates.

Recommendations for Energy Audit Standardization

Standardizing the assessment of a building's energy use will give building owners and institutions more confidence in the value of energy audits and the building retrofit projects that rely on them. In

addition, greater standardization of energy audits could incentivize utility companies to offer energy audits in efficiency incentive programs and would leverage energy disclosure ordinances by providing a standardized first step for owners to improve building energy performance.

To address the problem of variability among auditing practices, the EEB Hub is developing a protocol-based Energy Auditing Process with a set of measurement and modeling tools that will lead to standardization of the Level II auditing process. An introduction to this process is listed below.



A summary of the steps for standardizing energy audits.
Source: *EEB Hub*

The conversation on standardization begins with building a common language. Even the term “energy audit” is commonly misused. Some companies that sell energy products exploit the term “energy audit,” using it to refer to what is actually a sales proposal that recommends products they sell. This practice leads to loss of credibility in the energy audit business. The EEB Hub hopes to eliminate this kind of misapplication by building consensus around the definition of industry terms and around types of documentation expected to accompany any energy audit.

The next step in limiting variability among energy audits is to provide all auditors with a detailed, sequential walk-through protocol. In the case of Building 101, a well-designed walk-through protocol would have aided Company C in identifying that more was needed than simply optimizing the BAS controls and it would have encouraged Company B to provide a carbon footprint reduction estimate. By laying out a logical path through the audit process and calling for in-depth considerations of payback periods, the EEB Hub will promote consistency among ECM recommendations by auditors.

The EEB Hub provides a neutral space to foster collaboration among audit providers in gathering and

analyzing data, as well as in marketing and promoting auditing services. Given the robust data that GPIC and the EEB Hub have already gathered on instrumentation, control upgrades, and the energy audit process, Building 101 can serve as an ideal test bed or control subject for energy audit firms to refine their techniques and study what ECMs are most useful in any baseline energy audit.

Appendix G
Why Retro-Commission Your Building?

Why Retro-commission Your Building?

By William J. Stangeland,
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March 4, 2013

With energy costs on the rise and the future of oil, natural gas, and other fossil fuels unknown, saving energy is top of mind for many building owners and managers. The ticket to increased energy efficiency—as well as reduced occupant complaints and lower operating costs—is retro-commissioning.

This article will discuss what retro-commissioning is, why it is important, what buildings need it, and what its benefits are. Additionally, the article will discuss ways in which retro-commissioning is implemented and touch on pertinent code changes.

What Is Retro-commissioning?

Retro-commissioning is a systematic and documented process for identifying no- and low-cost improvements that can boost the efficiency and performance of an existing building. Through investigation, analysis, and optimization of building performance through operations-and-maintenance- (O&M-) improvement measures, retro-commissioning seeks to improve how building equipment and systems function together.

The retro-commissioning process for existing buildings essentially is the same as the commissioning process for new ones, involving inspection and testing of HVAC, plumbing, electrical, lighting, and life-safety systems, as well as the building envelope. The process also includes checking for complete documentation and ensuring building operators are sufficiently trained to sustain building performance. Participants in the retro-commissioning process include the building's O&M staff; the building-automation-system (BAS) contractor; the testing, adjusting, and balancing contractor; various service personnel; and the commissioning authority.

Retro-commissioning uncovers problems stemming from design or construction. Additionally, it identifies the types of issues that develop throughout a building's life.

Why Is Retro-commissioning Needed?

As buildings age and their use changes, system efficiency degrades and operational requirements change. With retro-commissioning, building systems are optimized through O&M upgrades, "tune-up" activities, and diagnostic testing. The process is performed on all building systems, including HVAC, plumbing, electrical, lighting, and life safety, as well as the building envelope.

Reasons to retro-commission a building include:

- Reduce operating costs.
- Identify and resolve building-system control and maintenance issues.
- Minimize operational risks.

- Increase asset value.
- Improve comfort and indoor-air quality (IAQ).
- Reduce liability.
- Improve tenant satisfaction and retention.
- Identify O&M-staff training needs.
- Update O&M manuals and procedures to reflect current building use.
- Extend equipment life.
- Obtain LEED (Leadership in Energy and Environmental Design) for Existing Buildings or ENERGY STAR certification.
- Qualify for local rebates or incentives.

Buildings as new as 2 to 3 years old, in which excessive energy use often goes unnoticed, can benefit from retro-commissioning.

Retro-commissioning efforts should target:

- The building envelope. For instance, if a building has openings to the outside, they may not be sealed tightly, which means the HVAC system works much harder to heat, cool, and pressurize the building, resulting in energy waste.
- Energy-management systems that were not installed or programmed correctly or that may have degraded over time.
- Operational controls that are out of calibration or not sequencing properly.
- Equipment that is running more than needed or inefficiently.
- Time clocks or schedules that were set up improperly.

Phases of Retro-commissioning

The retro-commissioning process consists of five distinct phases:

1. Planning. The planning phase includes meeting with the building owner, documenting the owner's facility requirements, and performing a site walk-through. A contract with a services provider is prepared, negotiated, and finalized before any additional steps are taken.

2. Investigation. After the retro-commissioning team is assembled and the kick-off meeting is held, a site investigation is conducted, facility documentation is reviewed, diagnostic monitoring begins, and functional tests and simple repairs are performed. This aids in determining how systems are supposed to operate and enables the team to prioritize operating deficiencies.

3. Implementation. During the implementation phase, the highest-priority deficiencies are corrected, and proper operation is verified.

4. Turnover. A smooth transition provides the tools and knowledge necessary for the building's O&M staff to sustain savings and operational improvements.

5. Persistence. This last phase ensures continuous system-performance improvement through persistent strategies.

How Retro-commissioning Is Implemented

A typical way to start retro-commissioning services is to perform an energy audit of the building and/or to document the building's ENERGY STAR rating. Then:

- Develop a building-operation plan, defining the present-day requirements of the building and its systems and identifying any operational problems affecting occupant comfort and any additional low-cost/no-cost items that can be implemented.
- Prepare a plan for testing all building systems to confirm correct operation and/or define required remedial work.
- Implement and document the tasks in the above plan.
- Repair and/or upgrade all systems and components found to be deficient.
- Retest all building components after changes are made to ensure optimal operation.

Code Changes

Codes are being changed to require commissioning and retrocommissioning. For instance, the 2012 International Energy Conservation Code requires system commissioning in buildings in which mechanical-equipment capacity is equal to or greater than 480,000 Btuh of cooling and 600,000 Btuh of heating.

Case Studies

Retro-commissioning projects on which McGuire Engineers has worked include a major museum in Chicago and a large community school in Wisconsin.

At the museum, more than 1 million square feet of space is cooled, heated, and humidified to tight tolerances year-round. With this comes high energy use. The chilled-water system was studied to determine if there were any opportunities to save energy. Multiple cost-saving measures, some of which were implemented immediately, were identified.

The community school was experiencing issues with building pressurization, heating and air distribution, central-air-handler operation, the location and application of HVAC controls, and its BAS. Through modifications of air-handling units, the hot-water-piping system, and sequence of operations and the integration of temperature/carbon-dioxide sensors in classrooms, the school was able to decrease system-wide energy use and achieve improved occupant comfort.

Conclusion

Most buildings are not performing to their potential. Thus, it is important to consider retro-commissioning, as the majority of existing buildings have not undergone any type of commissioning or quality-assurance testing. With building conditions (age, size, construction type, systems, etc.) varying so widely, energy savings can range from 11 cents per square foot to 72 cents per square foot.

William J. Stangeland has more than 30 years of experience in HVAC- and plumbing-system design. As president of McGuire Engineers Inc.*, he is responsible for controlling the overall quality of the firm's business, fostering client satisfaction, and mentoring and developing the firm's staff. He has been a leader in the firm's sustainability efforts.*

Appendix H
Green Tenant Toolkit from the Business Council on Climate Change

Appendix H
Green Tenant Toolkit from the Business Council on Climate Change

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welcome

Welcome to the Green Tenant Toolkit! These tools will assist tenants and landlords in reaching their sustainability goals within commercial buildings. The objective is to enable and enhance partnerships with owners or managers, occupiers, and their agents to minimize operating costs, save water, manage energy, and reduce carbon emissions by identifying split incentives and offering best practice solutions.

This toolkit is designed for use by tenants, occupiers, and owners of all classes and sizes of commercial buildings, and may be used at all points within the life cycle of the lease. The toolkit, which is based upon the recommendation of the Mayor's Task Force on Existing Commercial Buildings (City and County of San Francisco, December 2009), was developed by a diverse group of real estate and environmental professionals representing brokers, property management, large tenant groups, attorneys, electrical utilities, and design and construction experts - convened by **the Business Council on Climate Change** and **SF Environment.** The toolkit was designed for San Francisco buildings, but may be adapted for use in any location.

about the toolkit

This tool was created by a 26-person working group convened by the Business Council on Climate Change and SF Environment. Learn more about this group here >>

disclaimer

The Green Tenant Toolkit was developed through the collaboration of the Business Council on Climate Change together with representatives from the private and public sector as a service to the community. Use of the information contained in the Green Tenant Toolkit is voluntary and should be undertaken after an independent review of the applicable facts and circumstances of each particular project...Click here for the full disclaimer >>

How to use the tool

The tool is divided into 3 sections:

>> **Green Lease:** a guide to integrating sustainability throughout the life-cycle of your commercial lease.

>> **Stakeholder Engagement:** tips, tricks, and perspectives for tenants and building management to engage in win-win environmental solutions.

>> **Check-lists:** a "Green Sheet" that summarizes key sustainability metrics for any property.

Click through the menu in the left-hand column to see each section.

Check out Greenbiz.com's article on the Green Tenant Toolkit here >>

Your Feedback is Valued

Please fill out our feedback form to help improve the user experience! >>

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stakeholder engagement

click on any of the above boxes to learn more

who is the owner?

- Ownership Group
- Investment Partners
- Property Management
- Facilities Management

what is the owner's business objectives?

- Maximize the asset value
- Efficient tenant retention/acquisition programs
- Ability to increase rents
- Strive for 100% occupancy

how can the owner impact the building's performance?

- Through control of the physical and operational aspects of building
- Setting policies and guidelines
- Capital investment decisions
- Set goals for the building
- Implement tenant engagement programs

what motivates the owner to sustainability?

- Increase asset value and decrease operating cost Increase tenant retention/maximize occupancy
- Public image / leadership in the market
- Attract investors
- Compliance

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stakeholder engagement

who is the tenant?

- Business Owner/Manager
- Board
- Department heads
- Regional management team
- Investor shareholders

what is the tenant's business objectives?

- Employee retention/attraction
- Provide healthy, productive work environment for employees
- Optimize rent/minimize operating costs
- Fulfill strategic goals
- Ultimately increase value of the enterprise

how can the tenant impact the building's performance?

- Invest in capital upgrades within their tenant spaces
- Set company sustainability policies & guidelines
- Employee education and engagement
- Influence owner/landlord decisions

what motivates the tenant to sustainability?

- Adhere to social norms and peer influence
- Personal image - "Do the right thing"
- Incentives (financial or other)
- Care for the environment
- Desire to work in a healthy and socially conscious environment

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stakeholder engagement

who is the occupant?

- Employees of tenant companies
- On-site employees and/or third-party management of building owner

what is the occupant's business objectives?

- Work in a healthy, comfortable environment
- Feel good about their company and its environmental goals Participate in incentive programs and help company's bottom line

how can the occupant impact the building's performance?

- Behavior changes related to energy and resource reduction Participate in company sustainability initiatives
- Practice sustainable waste management and utilize sustainable transportation

what motivates the occupant to sustainability?

- Adhere to social norms and peer influence
- Personal image - "Do the right thing"
- Incentives (financial or other)
- Care for the environment
- Desire to work in a healthy environment

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the green sheet
tenant collaboration

metrics

- tenant collaboration
- waste and water management
- transportation
- energy
- indoor air quality
- certifications
- other considerations

U

1 green lease

- Do ownership and management offer or support green leases?
- click here for more information about a green lease

U

2 green team

- Is there a Green Team that consists of management and operations, as well as tenants, with the mission of improving efficiency, reducing waste and continuing to improve sustainability?
- click here for more information about forming a green team.

P

3 sf green business certification

- Have one or more tenants achieved San Francisco's Green Business Certification? Since the requirements of this honor often require the cooperation of building owners, presence of a San Francisco Certified Green Business is an indicator of potential for cooperation.

download the **Green Sheet** pdf

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the green sheet
waste & water management

metrics

- tenant collaboration
- waste and water management
- transportation
- energy
- indoor air quality
- certifications
- other considerations

U

1 san francisco commercial water conservation ordinance

- Are the building's fixtures compliant with local code?
- see the ordinance *here*

U

2 water submetering

- Is tenant's water use metered collectively or individually? Describe.
- LEED Credit EBO&M WE 1&2

U

3 waste diversion

- What is the overall waste diversion rate for the building: What percentage of waste is recycled or composted?
- Do all common areas have recycling and compost bins?
- Are recycling and compost convenient for all occupants?

F

4 materials

- What portion of the materials used to construct the building are post-consumer recycled content?

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P Public Information U User Submitted Information F Future Information

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the green sheet transportation metrics

1 walkscore

- Walkscore is a number between 1-100 that measures the walkability of any address. Being close to stores, services, parks, and schools encourages this ultimate zero emissions transportation option: *www.walkscore.com*

2 transitscore

- Transitscore measure how well a location is served by public transportation.
- See all nearby bus, metro, and train routes near your building: www.transitscore.com

3 bicycle infrastructure

- Does the site provide secure bike parking and showers for bike commuters?
- Metric: LEED BD&C credit SS 4.2?
- Help plan bike trips to your building: http://www.sfbike.org/mapper/

4 electric vehicle infrastructure

- The building provides electric vehicle charging stations
- Click here for the Department of Energy's map of alternate fuel vehicle stations

5 carpool

- At least 5% of parking spaces are reserved for carpool
- Metric: LEED BD&C credit SS 4.4

6 car share

- Is car-share available within 4 blocks?

7 alternative transportation use

- Percent reduction in conventional commuting trips
- Metric: LEED EBO&M credit SS 4

- tenant collaboration
- waste and water management
- transportation
- energy
- indoor air quality
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the green sheet energy metrics

- tenant collaboration
- waste and water management
- transportation
- energy
- indoor air quality
- certifications
- other considerations

1 ENERGY STAR®

- Buildings that are energy efficient enough to earn a rating of 75 or higher (on a 1-100 scale) compared to similar buildings can earn the ENERGY STAR

2 on-site energy generation

- Does the building use solar panels or other devices to generate energy on site?

3 electricity sub-metering

- Are tenants' electricity uses metered collectively or individually? Describe

4 energy supply / emissions

- What fraction of energy is supplied by renewable sources (beyond the local grid baseline)?

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the green sheet
indoor air quality

metrics

2 green cleaning

- Do the building's cleaning policies and procedures meet LEED EBO&M IEQ3?

High performance cleaning program
Custodial effectiveness assessment
Sustainable product purchasing
Indoor pollutant control
Integrated pest management

3 hvac systems

- Are economizers in good operating order and in use?
- What fraction of air supplied to tenants is drawn from outside?

- tenant collaboration
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P Public Information
U User Submitted Information
F Future Information

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the green sheet certifications

1 ENERGY STAR®

- Buildings that are energy efficient enough to earn a rating of 75 or higher (on a scale of 1-100) can earn the ENERGY STAR®

2 LEED®

- US Green Building Council's 'Leadership in Energy and Environmental Design' rating system.

3 sf green business certification

- San Francisco Certified Green Businesses meet high environmental standards, and are recognized by the City for their achievements.

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metrics

- tenant collaboration
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the green sheet
other considerations

U 1 cool roof / green roof

- Does the building have a cool roof or vegetated roof?
- Metric: LEED BD&C credit SS 7.2

U 2 public space

- Does the building supply public plazas or similar significant outdoor spaces for public benefit?

F 3 landscape

- Use of previous paving, native or climate adapted plants, water efficient irrigation, and management of hardscapes to minimize storm water runoff

metrics

- tenant collaboration
- waste and water management
- transportation
- energy
- indoor air quality
- certifications
- other considerations

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