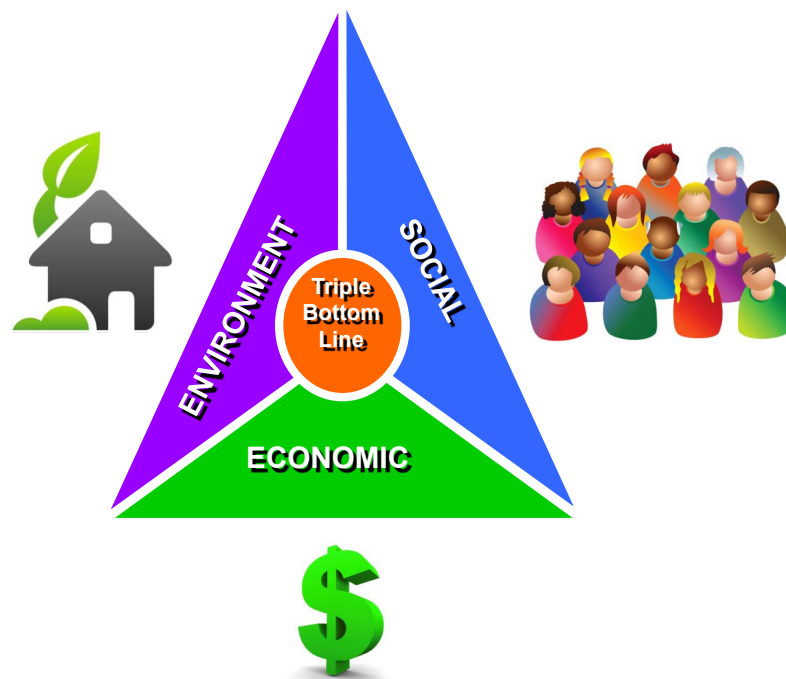




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Sustainability “How-To Guide” Series



GETTING STARTED

Christopher P. Hodges

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—Chris Hodges

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GETTING STARTED

FOREWARD

IFMA Sustainability Committee (ISC)

The IFMA Sustainability Committee (ISC) is charged with developing and implementing strategic and tactical sustainability initiatives. A current initiative involves working with the IFMA Foundation on the development of a series of How-To Guides that will help educate facility management professionals and others with similar interests in a wide variety of topics associated with sustainability and the built environment.

The general objectives of these “how-to” guides are as follows:

1. To provide data associated with a wide range of subjects related to sustainability, energy savings and the built environment
2. To provide practical information associated with how to implement the steps being recommended
3. To present a business case and return-on-investment (ROI) analysis, wherever possible, justifying each green initiative being discussed
4. To provide information on how to sell management on the implementation of the sustainability technology under discussion
5. To provide case studies of successful examples of implementing each green initiative
6. To provide references and additional resources (e.g., web sites, articles, glossary) where readers can go for additional information
7. To work with other associations for the purpose of sharing and promoting sustainability content

The guides are reviewed by an Editorial board, an Advisory board and, in most cases, by invited external reviewers. Once the guides are completed, they are distributed via the IFMA Foundation’s web site www.ifmafoundation.org free of charge.

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The Mission of the IFMA Foundation is to promote and support scholarships, educational and research opportunities for the advancement of facility management worldwide.

Established in 1990 as a non-profit, 501(c)(3) corporation, the IFMA Foundation is supported by the generosity of a community of individuals—IFMA Members, chapters, councils, corporate sponsors and private contributors—and is proud to be an instrument of information and opportunities for the profession and its representatives.

A separate entity from IFMA, the IFMA Foundation receives no funding from annual membership dues to carry out its mission. Supported by the generosity of the FM community, IFMA Foundation provides education, research and scholarships for the benefit of FM professionals and students. Foundation contributors share the belief that education and research improve the FM profession.



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

The Vision Statement of the IFMA Foundation

1 EXECUTIVE SUMMARY

Facility managers have been inundated over the past several years with information about green and high performance buildings. Most of the attention of the green movement in buildings has been on the design and construction of new facilities. However, the facility manager is faced with the challenge of ageing facilities that are much more costly and time consuming to make more energy efficient and sustainable. The purpose of this guide is to provide the facility manager with a roadmap for developing a sustainability program in existing buildings.

The Introduction in this guide lays out the tools available to the facility manager for making the built environment more sustainable. Building certification programs have prescribed a detailed and well documented approach to sustainability in the built environment. Although many facility managers engage in these programs, there are a multitude of facility managers with ageing facilities that do not have the time or resources to make the significant changes required by certification programs. However, there are thousands of every day actions and initiatives that can be implemented to reduce consumption, increase efficiency, and contribute to the bottom line. Using tools like the Triple Bottom Line, Sustainable Facility Management (SFM), Total Cost of Ownership, and the approaches outlined in this guide, facility managers can establish a sustainability program that is aligned with the goals and strategy of the organizations they serve.

The detailed findings in this Getting Started Guide include a step-by-step process for assessing your organization, finding your starting point, identifying initiatives, evaluating their value, and implementing, measuring and monitoring their effectiveness. Those steps include the "how-to" suggestions for:

- Taking your organization's temperature
- Creating alignment
- Establishing your starting point
- Creating and prioritizing sustainable initiatives
- Implementing, measuring and monitoring your plan

Getting Started also includes information on making the business case for a SFM program. This includes outlining a process for the program and finding the right approach for your organization that is aligned with available time and resources.

Finally, one of the most valuable sections of this guide includes case studies of three organizations that are on the path of Sustainable Facility Management. In looking at how it's done, we were able to solicit input from three organizations that are taking different paths, with different levels of available resources. They have shared their goals, approaches, results, and their lessons learned.

By developing an SFM program, any facility manager can positively contribute to their organization's bottom line, commitment to the environment, and to the health, safety and productivity of their constituents. Sustainability is a tremendous opportunity for the facility manager and can be implemented at any level of available resource. The path to SFM is never complete, but at least through the sharing of these experiences, those that have been doing the right things but have not yet developed their program can use this guide to organize and quantify their efforts and create value for their organizations.

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2 INTRODUCTION

Sustainability is defined as the ability to meet our needs without compromising the ability of future generations to meet theirs. Over the past several decades, we have increasingly measured governments, industries and businesses by their commitment to sustainability. Traditional financial measures of success are being supplemented with social and environmental standards. Now, these entities are being held accountable for their impact on people and the environment – the triple bottom line (TBL). The triple bottom line is the effect of everything we do on three critical facets of life and work in the modern age: the social, environmental, and economic impact of life on earth. The annual reports of the organizations we serve as facility managers are just as likely to contain statements about environmental impacts and corporate social responsibility (CSR) as they are to report bottom line financial results.

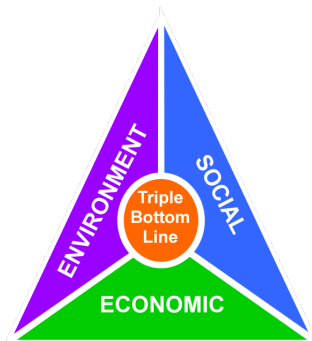


Figure 1: The Triple Bottom Line

Awareness of the impact of buildings on the environment and the productivity of those who occupy them has increased over the past few years. Recognition of the significant impact that buildings have on the environment has caused us to react by creating facility related sustainability programs. The initial focus of facility related sustainability programs has been on the design and construc

tion of new, high performance green buildings. In the United States of America alone, there are almost five million non-residential existing buildings. This is in stark contrast to the several hundred thousand that are built each year. How do we make our existing building inventory more sustainable?

Existing buildings remain the biggest challenge and the largest potential for energy reduction, conservation of resources, and improvement of workplace productivity worldwide. Recent and ongoing financial challenges in organizations around the world pose a significant challenge to making our existing building stock more sustainable. However, within every challenge lies an opportunity; an opportunity to re-examine our priorities and shift the focus to how we operate our facilities. Facility managers are in a unique position to face the challenge and make a positive difference to our organizations bottom line.

Facility Management is the profession that provides the long-term stewardship, but rarely gets the attention or the funding required to keep our workplace efficient and productive. Many facility managers have the skills, desire, and commitment to sustainable building practices, but often lack the resources and programmatic approach needed to make existing facilities more sustainable.

With long term stewardship and the life-cycle approach in mind, this guide was written to provide the practicing facility manager with basic knowledge about how to get started down the path of creating a sustainability program in existing facilities. It is intended to address the needs of facility managers as the building operator with inherently limited resources.

2.1 Sustainable Facility Management (SFM) and the Triple Bottom Line

Facility management is a profession that often struggles for recognition and competes for dollars. The demand for high performing and sustainable facilities over the last several years has increased, but the funding to make our existing facilities more sustainable does not seem to keep pace with the demand. As the economy struggles, the budget challenges faced by facility managers increase in complexity. Sustainability in existing buildings is often seen as an added burden to the struggle, but may offer an opportunity more so than an added burden.

Why is this an opportunity for facility managers? In the past several years, the impact of facilities on the environment has been documented, tabulated and published by researchers, government agencies, and energy administrations around the world. And the news is not good. Buildings account for a large proportion of our energy usage, materials and resources, and production of greenhouse gases. Climate change has dominated the headlines for the first few years of the 21st century, and it is becoming apparent that our consumption habits have a significant and negative effect on the environment. Whether you are an ardent environmentalist, or confirmed skeptic about climate change, the negative effect of our buildings on the environment and our resources is now well documented, and reduction of these negative effects is demanded.

The first step in determining the facility manager's role in the challenge of sustainable facilities is to examine our traditional role and observe how it is changing. The traditional definition of facility management is the convergence of people, place and process. The facility management profession resides in the convergence of those three important areas. Sustainable facility management (SFM) is a life-cycle approach to facility stewardship that integrates the people, place, and business of an organization with the economic, environmental, and social benefits of sustainability. This definition establishes the unique perspective of the facility-manager by integrating the traditional definition of facility management with the demand for more environmentally friendly and efficient facilities.

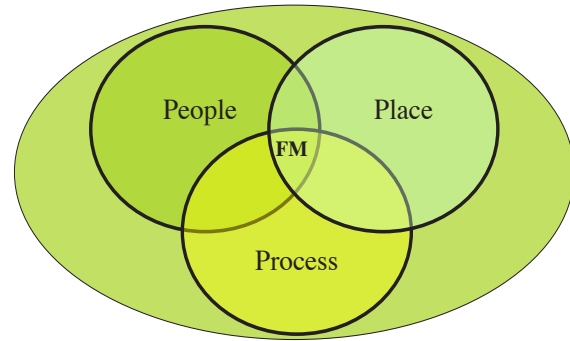


Figure 2: The Convergence of the Traditional Definition of Facility Management and Sustainable Facility Management

Since much of the world has adopted the triple bottom line as the measurement for sustainability, the facility manager would do well to translate the outcome of facility operations and management into the language of the triple bottom line. Traditionally, aside from worker health and safety issues, the facility manager was held primarily accountable for the financial impact of facilities. Now, the facility manager can incorporate the effect of facilities on the environment, the workforce, and society in general by minimizing environmental impact, maximizing the productivity of the workplace, and quantifying the impact of facilities in the broader terms the world has adopted. While not all organizations use the triple bottom line, it serves as a common language for facility managers to quantify and communicate the value of sound facility management practices to the organizations they serve.

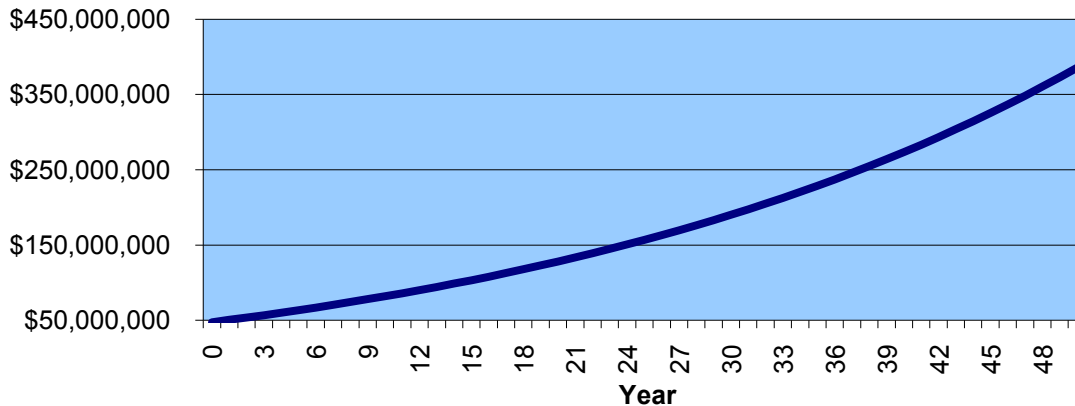
Given the move toward corporate social responsibility and other non-financial measures of organizational success, the facility manager can positively contribute to these non-financial organizational measures by implementing, measuring and monitoring environmental and productivity-enhancing improvements. This can be done while still making a positive impact on the financial bottom line. The creating alignment portion of this guide addresses how to create that alignment between the organization's commitment and the facility management function. An important tool for creating alignment between an organization's commitment and facility management is to evaluate sustainability initiatives in terms of Total Cost of Ownership.

2.2 Total Cost of Ownership

Total cost of ownership (TCO) includes the cost to design, build, operate and maintain, and dispose of a facility over its service life. While much emphasis is placed on the design and construction of facilities, most of our dollars are spent on

operating and maintaining our facilities over their life cycle. Total cost of ownership can easily be demonstrated by examining the cost of designing and building a facility and operating it over its service life, as shown in the example in Figure 3.

Total Cost of Ownership



Mid-Rise Corporate Headquarters: 400,000 gross square feet (36,000 square meters)

Design and Construction Cost: \$47,600,000 (RS Means 2009)

Capital Renewal: 1% of CRV (APPA 2004)

Annual O&M Budget: \$6.30/SF (~\$68/ square meter) (IFMA 2009)

Inflation: 3%

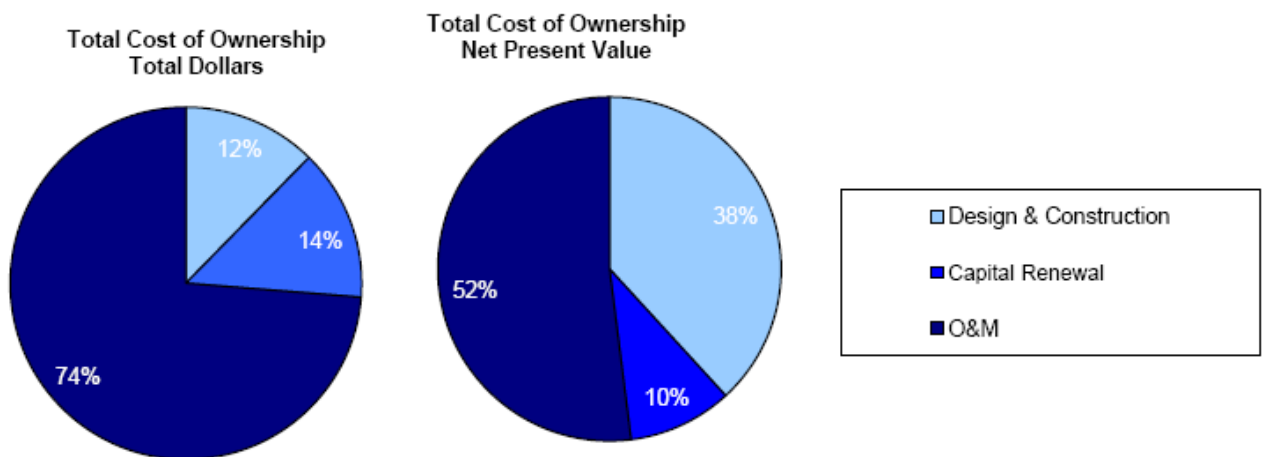


Figure 3: Total Cost of Ownership

In this example, we assumed a mid-rise office building of 400,000 gross square feet (36,000 square meters), built in the United States, with a design and construction cost of \$47.6 Million US dollars. Annual operations and maintenance (O&M) and capital renewal costs are then added to derive the life cycle cost. The estimate for capital renewal expenditure is one percent of the current replacement value (CRV) of the facility on an annual basis. The reason that capital renewal is considered separately from O&M costs is that the funding mechanisms for operating budgets and capital budgets are often separated when financing the facility management function. Note that in this example, disposal costs are not considered.

The total life cycle cost of a \$47.6 million building is just under \$400 million total US dollars expended over a 50-year life cycle (considering a 3 percent annual inflation rate and excluding disposal cost). The O&M cost is the largest component at over \$280 million US dollars (in total dollars). In terms of total dollars expended over the life of the facility, capital renewal is approximately equal to that of the original construction cost, whereas O&M costs are about six times that of design and construction. The costs in this model are also expressed in terms of net present value (NPV).

2.3 O&M and Capital Renewal Dollars

Many facility managers would argue that it is far easier to obtain funding for new construction than it is to fund ongoing operations and maintenance activities. However, as seen in Figure 3, design and construction accounts for a small portion of the total cost of ownership.

Why is it so hard to fight for O&M and capital renewal dollars? The answer to this question is complicated and varies across organizations and in various countries around the world. An almost universal and simplistic answer is that society values the new over the old. In other words, it may be our human nature to want to see our efforts and money spent creating and building something new, rather than maintaining what we have.

A universal job priority for a facility manager is to maintain the budget – the economic portion of the triple bottom line. This often becomes the top priority, overriding many other aspects of the profession and skewing the emphasis to the short-term in lieu of long term financial planning and management of our assets. This may also lead to an underestimation of the effect of the workplace

on what is probably the most important aspect of facility management stewardship – the social portion of the triple bottom line, or the people of our organization.

2.4 The Real Cost—People

As stewards of the work environment, facility managers have a significant amount of influence over the productivity of the workplace. In most organizations, the productivity of the workforce is paramount to the success of the organization, but the effect of the work environment on productivity is not well understood. In the past several years, the emphasis on productivity of our work environments has increased. However, most organizations still struggle with the link between the quality of the workplace, workplace expenditures, and the productive output of the people of the organization. If we were to add the people expenditure to our example above, our organizational 50-year cost of the \$47.6 million facility in our example could be billions of US dollars, many times the cost of designing, building, and operating the facility.

While we have yet to provide much insight into the link between facilities and the productivity of the workforce, corporate social responsibility has become the descriptor of each organization's recognition of their commitment to the people portion of the triple bottom line. Given our new-found or renewed commitment to people, why not start with our own workforce? Since CSR has risen to the front page of annual corporate reports and government agendas, there's no reason not to start with the workplace as the starting point in demonstrating our organizational commitment to people. By creating healthy productive work environments, we can contribute to all three legs of the triple bottom line.

2.5 Putting it all together

An organization's commitment to each leg of the triple bottom line is an important driver of sustainable efforts in the built environment. In making our existing buildings more sustainable, the first step is to recognize and measure our organization's commitment to people, the environment, and the financial bottom line. We believe this will enable the facility manager to implement a sustainable facility management program that is in alignment with the mission and strategy of the parent organization.

Whether an organization has a high level commitment to the environment and CSR, or the organization remains bottom-line driven, all facilities can be made more sustainable through SFM. In today's business environment, the focus on the bottom line and society's concern over the people and environment do not have to be mutually exclusive.



3 DETAILED FINDINGS

3.1 Taking your Organization's Temperature: Measuring the Commitment to the Triple Bottom Line (TBL)

Any member of an organization can accomplish an assigned task, but not without the commitment and resources allocated by the organization. Those resources include; labor hours, money, and commitment to the program. This holds true for facility managers and SFM. Without management buy-in and support, sustainability initiatives will be most difficult or impossible to achieve. That's why the first step in creating a sustainability program in existing buildings is to evaluate your organizational commitment to sustainable facilities.

The drivers for sustainability within our organizations can be as simple as operational cost reduction to full-fledged CSR programs that involve every aspect of the organization's mission and strategy. If cost reduction is a primary driver, energy and utility consumption, efficient use of

materials and resources, and providing a safe, comfortable work environment provide appropriate justification for a sustainable facility program. If CSR is the organizational driver, a SFM program can complement and enhance the CSR program

Regardless of the motivation of an organization to act more sustainably, the commitment level will have a significant bearing on the level of sustainable facility initiative a facility manager will be able to implement. The first step in an SFM program is to "take the temperature" of your organizational commitment to sustainability.

There are many ways to measure an organization's commitment to the three components of the TBL. Figure 4 provides an example. Organizational commitment to the TBL is the starting point for any SFM program. Organizational drivers will set the tone for the commitment of manpower, money and commitment to the SFM program.

Once the level of commitment is established, the facility manager has an understanding of which sustainability initiatives align with the organizational strategy. This will also establish which initiatives will be supported internally and which will have a high chance of success.

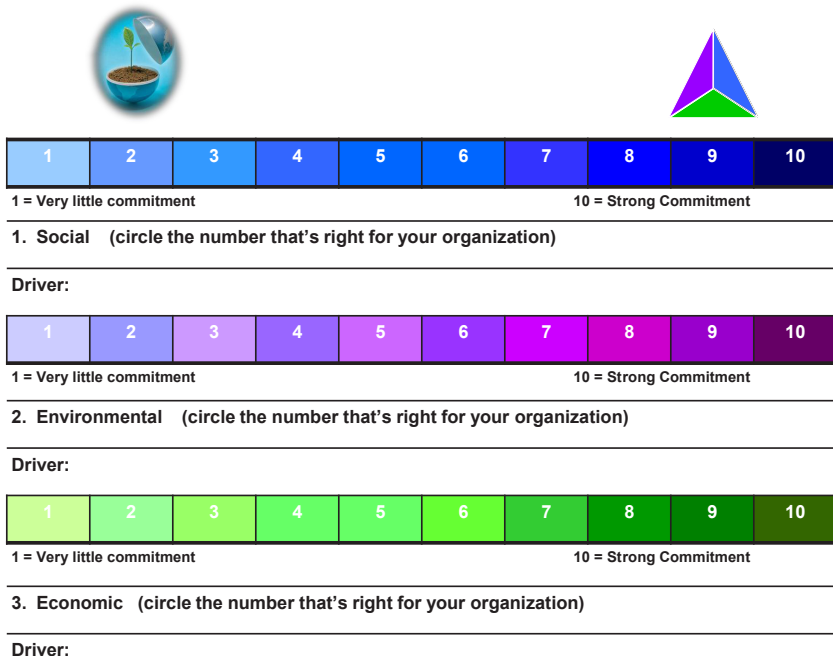


Figure 4: Taking your Organization's Temperature

3.2 Creating Alignment

The triple bottom line can be used as a continuous check and counterbalance in choosing which sustainability initiatives are right for the organization and the facility. Once the level of commitment is established and vetted against the triple bottom line, it can be used as a tool for continuous alignment with organizational strategy and goals.

In many cases, the facility manager's world is skewed toward the economic corner of the triple bottom line. This is a reality, especially in periods of troubled economic conditions. This is precisely the reason the facility manager should be in tune with the organization's strategy and economic constraints. The strategy serves as the long-term guide, and the economic constraints serve as the periodic reality check.

3.3 What's important?

In the context of getting started, it helps to simplify the process of making our existing buildings more sustainable by concentrating on the key areas that have served as the basis for most of the building certification programs in the world. Building certification programs have been developed around five key elements of sustainability and how they relate to facilities.

Energy: The most visible target for greening efforts is energy efficiency. There are many programs that measure energy consumption in buildings. However, they all rely on the determination of one basic metric – the energy intensity of the facility. The energy intensity is the amount of energy used by the building annually, and is expressed by the term, British Thermal Units per square foot per year, or kBtu/SF/year (the “k” designating the unit in thousands). (kilowatts per square meter per year). The kBtu is the common term that quantifies our use of electricity and natural gas, the two most common energy sources for buildings.

Water: In the United States of America, a typical 100,000 square foot (9,000 square meter) office building can use over three million gallons (11 million liters) of water per year. The primary water uses in a facility are domestic, process water, and water used for irrigation. By using low flow fixtures, low-flow toilets, and implementing water saving strategies, this facility saves over one million gallons (38 million liters) of water per year.

Materials and Resources: Controlling what's coming and going from your facility can be one of the most effective ways to decrease your environmental footprint and demonstrate your commitment to CSR. Purchasing programs that promote the use of environmentally friendly products are now commonplace. These programs target the waste stream produced by the facility and the purchasing of consumables, durable goods, and construction materials.

Indoor Environment: Since we spend most of our life indoors, and a fair portion of that time in the workplace, the indoor environmental quality can have an enormous impact on workplace productivity. There are several key contributors to indoor environmental quality: the introduction of outside air in a building's ventilation system, whether smoking is allowed in the building, chemical usage, and the use of green cleaning techniques.

Site (Location) issues: Although most managers of existing buildings would argue that they are long past the choice of the location of their building, there are several site features and organizational policies related to the workplace that have significant impact on energy, utility consumption, and productivity. Much of the energy and utility use related to the workplace comes not only from the building, but the amount of energy used getting to and from the building. Energy reduction strategies, such as telecommuting, use of public transportation, use of fuel and energy efficient vehicles, and alternative workplace strategies are all related to the location of the organization.

Given these five key areas, there are hundreds of initiatives that a facility manager can implement to create a SFM program. Now that we've addressed organizational strategy, alignment, and the five key things, we'll move on to establishing your starting point.

3.4 Establish THE Starting Point: The Sustainability Audit

Regardless of the size of your facility, or whether you lease or own, establishing your starting point involves evaluation and measurement of your current status. Utility consumption is usually the first target, but, material and resource use, waste production, indoor environmental quality, and site characteristics should all be included in estab-

lishing your starting point. Many organizations conduct a sustainability audit that addresses each of these five key elements. Building rating systems also serve as an excellent source of detailed checklists to conduct an audit.

The sustainability audit is the vehicle for recording important building characteristics such as utility use, waste stream, and other quantitative attributes. A sustainability audit also includes evaluation of policy, practices, and procedures that relate and contribute to sustainable facility management, and include interviews with appropriate stakeholders in an organization that have influence or are affected by material use, recycling, purchasing, or consumption of goods and services.

If the goal of an organization’s sustainability program is building certification, the sustainability audit may involve a two-step process; a prerequisite audit, and points audit. Since the USGBC’s Leadership in Energy and Environmental Design (LEED®) and other building rating systems have prerequisites; the prerequisite audit informs the organization if the prerequisites are met, or are within reasonable reach.

An important part of the sustainability audit is establishing which measurement and monitoring processes are in place in a facility. The monitoring and measurement portion of the sustainability audit includes measurement of utility consumption, waste, recycling, and building controls through metering and measurement. Figure 5 is a sample input form, representing a portion of a LEED® audit checklist. This form is used to document current facility conditions and practices relative to the LEED® points system, and track the building’s conformance to the rating system on a point-by-point basis. In this example, only the prerequisites are documented. A similar methodology can be used for all LEED® points.

Figure 6 is an excerpt from the output of a sustainability audit. The output is in the form of a list of recommended sustainability initiatives. This illustration deals with the energy and water use characteristics of the facility. A comprehensive audit would also include: materials and resources, site characteristics, and indoor environmental issues. Figure 6 represents a preliminary list of sustainability initiatives, recommendations, current status of each initiative, feasibility of the initiative, and the opinion of cost to implement the initiative.

Figure 5: A Sample Input Format for a Sustainability Audit

LEED Section	Prereq / Credit	LEED Topic	LEED Action	LEED Prerequisite Description	LEED Points	Points	Action Required	Action Due Date
Energy & Atmosphere/Total Points					23	0		
Energy & Atmosphere	P1	Existing Building Commissioning	Develop comprehensive building operation plan & commissioning plan	Verify Building is performing as intended - check that fundamental building system assemblies are performing as intended to meet current needs and sustainability requirements	Req	No	Est. cost, prepare plan, implement commissioning plan	10/1/2008
Energy & Atmosphere	P2	Minimum Energy Performance	Demonstrate ES rating of building	Minimum level of efficiency for the building and systems. Demonstrate that the building has achieved an ES rating of at least 60 utilizing the Portfolio Manager tool.	Req	No	Develop and implement plan for increase in ES rating	11/30/2008
Energy & Atmosphere	P3	Ozone Protection	Zero use of CFC refrigerants	Provide documentation that's base building HVAC systems do not use CFCs.	Req	No	Prepare Refrigerant documentation	10/1/2008
Indoor Environmental Quality/Total Points					22	0		
Indoor Environmental Quality	P1	Outside Air Introduction and Exhaust Systems	Minimum IAQ performance	Maintain existing building outside air (OA) ventilation distribution system, meet the EPA IAQ or SMACNA IAQ guidelines for HVAC system maintenance, and test and maintain the operation of all building exhaust systems.	Req	No	Prepare outside air study	9/7/2008
Indoor Environmental Quality	P2	Environmental Tobacco Smoke (ETS) Control	Prevent or minimize exposure to ETS	Prohibit smoking or provide isolated and negative pressured spaces for smoking or reduce air leaks between smoking and non-smoking rooms in residential buildings.	Req	No	Revise smoking policy to require all exterior smoking areas at least 25 feet away from exterior doors, operable windows, or outside air intakes	9/7/2008
Indoor Environmental Quality	P3	Asbestos Removal or Encapsulation	Reduce potential exposure of occupants to asbestos	Document that all potentially friable asbestos in the building interior and exterior and on the site have been removed or encapsulated.	Req	No	Provide survey information, abatement information, or asbestos management plan	8/24/2008

Figure 6: A Sample Output of a Sustainability Audit

Assessment Recommendations	Status	Feasibility Rating	Opinion of Cost
ENERGY MANAGEMENT			
Operations and Maintenance Improvements (Low Cost/ No Cost)			
Program 'optimized start' for self-contained air conditioning units using existing BMS	Potential	High	no external costs
Tighten 'programmed off' scheduling of self-contained air conditioning units using BMS	Potential	High	no external costs
Reduce static air pressure set points for self-contained air conditioning units	Potential	High	no external costs
Program a 'night setback' for the corridor temperature setpoints using BMS	Potential	High	no external costs
Program allowable space temperature range during occupied hours using BMS	Potential	High	no external costs
Program two restroom exhaust fans off at night using BMS	Potential	High	no external costs
Implement demand response program	Potential	High	no external costs
Replace elevator lamps with LED lighting	Potential	High	nominal cost
Change lighting schedule to manually shut off lights	Potential	High	no external costs
Purchase ENERGY STAR qualified equipment	Potential	High	NA
Purchase premium-efficiency electric motors when performing motor replacements	Potential	High	NA
Repair/adjust or replace faulty relative humidity sensors	Potential	High	NA
Develop IT energy management program for computers	Potential	High	no external costs
Energy Conservation Measures			
Install variable frequency drives on cooling tower fans	Potential	Low	\$ 50,000
Install variable frequency drive on condenser water pumps	Potential	Medium	\$ 25,000
Install automatic motion sensor lighting controls in meeting areas	Potential	Medium	\$ 10,000
Use of alternative energy			
Evaluate options for purchase of renewable energy	Potential	Medium	NA
WATER EFFICIENCY			
Cooling Tower Water Management			
Install a water meter on the cooling tower blowdown line	Potential	High	\$ 2,000
Irrigation Practices			
Install rain sensor controls for the landscaping irrigation system	Potential	High	\$ 5,000
Water Metering			
Pursue sewer credit on all wastewater through lawn irrigation meter	Potential	High	no external costs

The output of the sustainability audit can also include information about whether the recommended initiative will contribute to a point requirement in a building rating system, the contribution of the initiative to each of the components of the triple bottom line (environmental, social, economic), cost (as in this example), payback period, return on investment, or any other economic attribute that the organization values in its decision making process.

Building and building system age, as well as the general condition of the facility have a significant influence over where sustainability initiatives are concentrated. If a building system requires a significant capital investment over several years to meet life-cycle expectations, the cost and efficiency of the replacement system or component will dictate the pace and cost of the sustainability program. It is not uncommon to be faced with a lifecycle replacement of a building system that is out-of-sync with the sustainability program. In that case, the organization must consider if replacement for increased efficiency is warranted several years in advance of an end-of-lifecycle replacement.

The evaluation and prioritization of sustainability initiatives is the most challenging portion of a SFM program. This is the place where cost, return on investment, social value, and environmental effects are scrutinized and compared to the organization's strategy and goals. The next step in the SFM process is formulating an action plan for sustainability. The action plan is an organized and prioritized list of sustainability initiatives.

3.5 Creating and Prioritizing Sustainable Initiatives

Once the sustainability audit is completed, there will be key elements on which to concentrate: energy, water, materials and resources, indoor environment, and site. As in our example output from a sustainability audit (Figure 6), it is likely that any sustainability audit will uncover dozens, if not hundreds of potential areas for improvement.

The most successful implementers of a SFM program develop a prioritization system for sustainability initiatives. The prioritization system is where the organization integrates their approach with the triple bottom line. The initiatives associ-

ated with each of the strategic goals formulated in the sustainability strategy can be weighed against the three components of the triple bottom line, the social, environmental, and financial aspects of the initiative. The “weighting” of the value of each of these aspects will be determined by the organizations commitment to the environment, the community, and the need to generate financial returns, and is likely to be different for each organization.

Each of the initiatives considered can be weighed against the organization’s commitment to the three triple bottom line components. For example, an organization may not have the ability or desire to enhance their corporate image, and thus might concentrate on the environmental and financial aspects of sustainable facility management. Others might highly value the CSR aspects of their image and strive to keep all of the elements of the triple bottom line in balance.

In assessing the value of a sustainability initiative to an organization, the elements of the triple bottom line can be used to align with organizational priorities. For each initiative, the overall intent of the initiative can be weighed against the effect of the implementation on the potential environmental, economic, and social benefits of implementation.

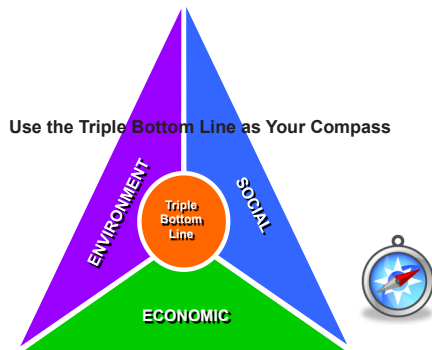


Figure: 7 Using the Triple Bottom Line (TBL) as Your Compass

Figure 8: Using the TBL to Assess Sustainability Initiatives

Initiative	Intent	Environmental Benefit	Economic Benefit	Social Benefit
Installing a Reflective Surfaced or “Cool” Roof	Reduce Heat Island Effect	+	+/-	+/-
Install Low-flow Water Fixtures	Decrease Water Use	+	+	+
Increase Outside Air Intake	Improve Indoor Air Quality	+	-	+

Figure 8 is a simple tool for assessing the viability of a sustainability initiative by measuring it against the triple bottom line. In this case, the economic benefit is the long-term net effect of the implementation of the initiative. The economic column of this chart could just as easily be further divided into the economic first cost of the initiative and the long-term economic benefit. The sophistication and application of this tool is up to the user.

In the case of these three examples, the positive (green) benefits are easy to see. Less evident are the plus/minus (yellow) indicators. These attributes of a sustainability initiative could go either way. The direction they take; either positive or negative, depends on geographic location, “marketing” ability of the organization to commit to social factors, and a number of other factors. The negative (red) indicator is relatively easy to see, in that it represents a net cost to the organization to implement.

Assessing sustainability initiatives in this manner is not always as straight forward as it may seem. There are often conflicting priorities when choosing the right sustainability initiative. For example, the sustainability initiative of increasing the amount of outside air in a building is intended to improve indoor environmental quality. It is likely that this will have a positive social benefit, considering that the building occupants will benefit from improved air quality. Regarding the economic effect, this would most likely have a net cost to the organization since the introduction of more outside air into a building would require more energy to heat and cool the outside air. The net effect on the environment is likely to be neutral (or potentially negative if you were to consider increased fuel use to heat and cool outside air). The level of granularity in using this type of assessment and prioritization system can be significant, and caution is needed to assure that the level of detail used in assessing priorities does not become so complex that all action stops.

The use of this type of assessment tool also requires careful consideration and close coordination with the goals and strategy of the organization. It requires that the organization pre-define their commitment to the environmental, social, and economic factors that are important to them. For example, what is meant by “social effects”? That could mean building occupants to one organization, and commitment to their community in another. Environmental effects can mean the effect on occupants, or the effect of an initiative on the

earth. Each organization should determine their priorities that closely align with their mission and strategy.

This type of tool is also effective in prioritizing long lists of sustainability initiatives in a building. It allows the user to choose the initiatives that have the most positive effect and align closely with the strategy and goals of the organization. What may be positive for one organization may be negative for another. What may be positive for a building belonging to one organization in one area may be quite different for the same type of facility in a different region or climate. Whether an initiative is viewed as a positive, negative or neutral in any of the three areas of the triple bottom line will vary across organizations. There will never be one right answer to the effect of these initiatives.

3.6 Implementing, Measuring, and Monitoring your Plan

Implementing: In project management, there are three key elements to any project; budget, schedule, and the ability to meet expectations. The same is true for a sustainability plan. Budget considerations include the time and money commitment of the organization. The level of available resources drives the schedule. The expectations of a sustainability plan are expressed in terms of the goal, and should be consistent with the budget and time allowed.

Budget is likely to be a strong driver of sustainability initiatives for most organizations. Sustainability initiatives will fall into the following major categories:

1. Low or no-cost initiatives that can fit into the operational budget and normal operating work procedures
2. Moderate-cost initiatives that require money and effort outside the normal budget or significant work hours of the facility management staff
3. High-cost initiatives that require capital expenditure and a significant amount of internal and external work hours to accomplish

Low and no-cost initiatives are generally accomplished over a period of months, fit within an operational budget, and take little to no extraordinary work hour efforts outside of the facility management staff. In the movement toward greener and high performance buildings over the past several years, these types of initiatives have been dubbed “low hanging fruit”. Although the term has

become commonplace, some have argued that our focus on only those initiatives that yield quick results and fast paybacks may in fact hinder further efforts and create barriers to a more balanced and long-term approach to making facilities more sustainable.

Examples of low or no-cost initiatives include; implementation of green cleaning procedures, recycling programs, lighting retrofits that do not require fixture modifications, implementation of sustainable purchasing programs, employee education programs, adjusting set points for building controls, and installation of low-flow aerators on lavatory and shower fixtures.

Most organizations can afford to implement low-cost sustainability initiatives. However, the amount of time required of the facility management staff may become an impediment to the SFM program if sufficient manpower commitment is not available. In other words, low-cost initiatives may require small amounts of operating dollars, but a moderate amount of labor hours that is not otherwise budgeted.

Moderate cost initiatives tend to be programmatic in nature and may require many months and potential capital dollars to implement. These efforts may also require several hundred hours of internal and external staff time.

Examples of moderate-cost initiatives include; lighting retrofits that require equipment upgrades (and involve local utility provider involvement), installing low-flow water fixtures, modifications to building control systems, building system upgrades at the component level, and enactment of policies, practices and procedures that require education and buy-in from constituents.

High-cost initiatives require capital expenditures and more than one year to implement. Labor requirements can be significant; usually in the form of detailed facility and building system condition assessments, and design and installation services that require a significant amount of outside help in the form of architects, engineers, designers, contractors, and project management personnel.

Examples of high-cost initiatives include: replacement of building control systems; building system upgrades at the system level, capital replacements with more efficient systems, development of policies, practices and procedures that require a significant amount of time, and internal or external effort; and the implementation of renewable energy technologies.

Since some moderate and all high-cost sustainability initiatives by definition require capital expenditure, the organizational level of commitment to capital renewal will drive the implementation to a high-level sustainability program. Regardless of your level of operational or capital funding, the sustainability initiative must fit within the financial and operating guidelines of the organization. Implementation of the SFM program will be much easier if the initial steps of alignment of the plan with the mission and strategy of the organization are followed. This ensures that the financial and organizational support for the program is in place before the plan is implemented.

An organization's financial policies will dictate how each initiative is vetted and return on investment is determined. Common methods for determining economic viability are net present value (NPV), payback period, and return on investment (ROI). The facility manager should have a good understanding of the language and methodology of finance within the organization, and be in a position to prepare a written justification for the initiative.

Measurement and Monitoring: Once a SFM plan is initiated and the schedule and budget are determined and in place, a continuous program of measurement and monitoring is required. The methodology for a measurement and monitoring program will be unique to each organization and should be in line with the organization's management processes.

The most successful implementers of sustainable facility management start with their organization's mission and strategy. The mission and strategy provide the guidelines for measurement of processes and continuous review and improvement of the facility management function. Measurement and monitoring of the success of the sustainability initiatives involves developing key performance indicators (KPIs). KPIs represent the most common metrics that can be easily tracked and have the most impact on the cost and efficiency of facility operations. The most common examples of sustainability KPIs are utility usage, water, waste stream metrics, green purchasing metrics, and indicators of indoor air quality such as carbon dioxide (CO₂), and the facility's carbon footprint. The search for the proper KPIs and development of a "dashboard" of operational indicators allows the facility manager to constantly measure and monitor the most important operational characteristics.

A good basis for developing KPIs is to use the areas that we have already outlined for the monitoring program: energy, water, materials and resources, indoor environment, and site characteristics. The measurement and monitoring program can be supplemented with other indicators such as; quality of sustainability policies, education programs, operational efficiencies, implementation of green operational practices, and other factors and goals that are unique to the organization. Once an organization has been through a strategic sustainability planning process, they are able to develop KPIs that are unique and most important to them. Once measurements are in place, the organization can benchmark performance against others.

Not every facility management organization will have a performance management system in place. However, regardless of the management tools available to the facility manager, there are some best practices and monitoring and measurement techniques that can be adopted in even the smallest of organizations. One such tool is the Balanced Scorecard (BSC). The BSC is a performance management system that looks at the organization from four perspectives; financial,

people, learning and growth, and internal process. The BSC can easily be adapted to SFM and allow an organization to measure and constantly evaluate their sustainability efforts. These measures can be used to check progress against specific goals, or to benchmark against the sustainability efforts of other organizations. Even if the BSC is not fully utilized by an organization, the system can be used to focus the SFM program on sustainability initiatives and achieving meaningful results.

Figure 9 is an example of a dashboard created to outline a SFM program, including the organizational goal, sustainability objective, and initiatives to support the objective, measurements, targets, and current status of the initiative. This example follows the Balanced Scorecard methodology and includes just one of the four BSC perspectives – internal process perspective. This method of listing objectives, measures, targets, and status could just as easily be simplified to a facility management dashboard for any component of a SFM program.

Figure 9: Balanced Scorecard for the Process Perspective

	Organizational Goals	Sustainability Objectives	Initiatives	Measures	Targets	Current Status
Internal Process	1. Increase Operational Efficiency	1. Become Carbon Neutral	1. Calculate Emissions Inventory 2. Purchase Energy Star Equipment 3. Purchase Offsets	Decrease in Carbon Emissions	15% Decrease	12%
		2. Decrease Water Consumption	1. Install waterless urinals 2. Install automatic flushers.	Decrease in Water Consumption	10% Decrease	0%
	2. Conserve Resources	3. Achieve Energy Star Certification	1. Lighting retrofit project. 2. Perform an energy audit. 3. Purchase energy star products.	Decrease in Energy Consumption	20% Decrease	22%
		4. Decrease Waste	1. Institute a double sided printing policy. 2. Provide recycling bins at every desk.	Decrease waste to landfill	10% Decrease	12%

Whether your organization uses a Balanced Scorecard, or is still struggling with developing the right dashboard for facility management, the success of the SFM program can be easily measured and monitored by using the right number and right quality of KPIs. There are many useful technology tools available to the facility manager for measuring and monitoring a SFM program. A detailed analysis of performance management systems for the FM function are well beyond the scope of this guide. However, we cannot underestimate the importance of a sound measurement and monitoring program for an effective SFM program.

3.7 Putting these steps into perspective

Motivation for developing a SFM program can come from many levels. Regardless of the driver that created the desire for the program, the facility manager is in a unique position to develop and manage the process. Thus far, this guide has outlined several steps for creating a SFM program. Those steps include:

- Taking your organization’s temperature
- Creating alignment
- Establishing your starting point
- Creating and prioritizing sustainable initiatives, and,
- Implementing, measuring and monitoring your plan

Each of these elements of a SFM plan is guided by the triple bottom line. The triple bottom line is the world’s adopted assessment tool for determining an organization’s commitment to sustainability. If used effectively in the SFM program, the triple bottom line can also serve as the compass by which alignment between organizational goals and facility management green practices are guided. A carefully thought-out SFM program aligns closely with the mission, vision, and strategy of an organization. The triple bottom line serves as the starting point, and remains present as the guiding compass throughout the process. Figure 10 shows the relationship between each of the five steps in developing an SFM plan, and the importance of the triple bottom line as a guide in each step of the process.

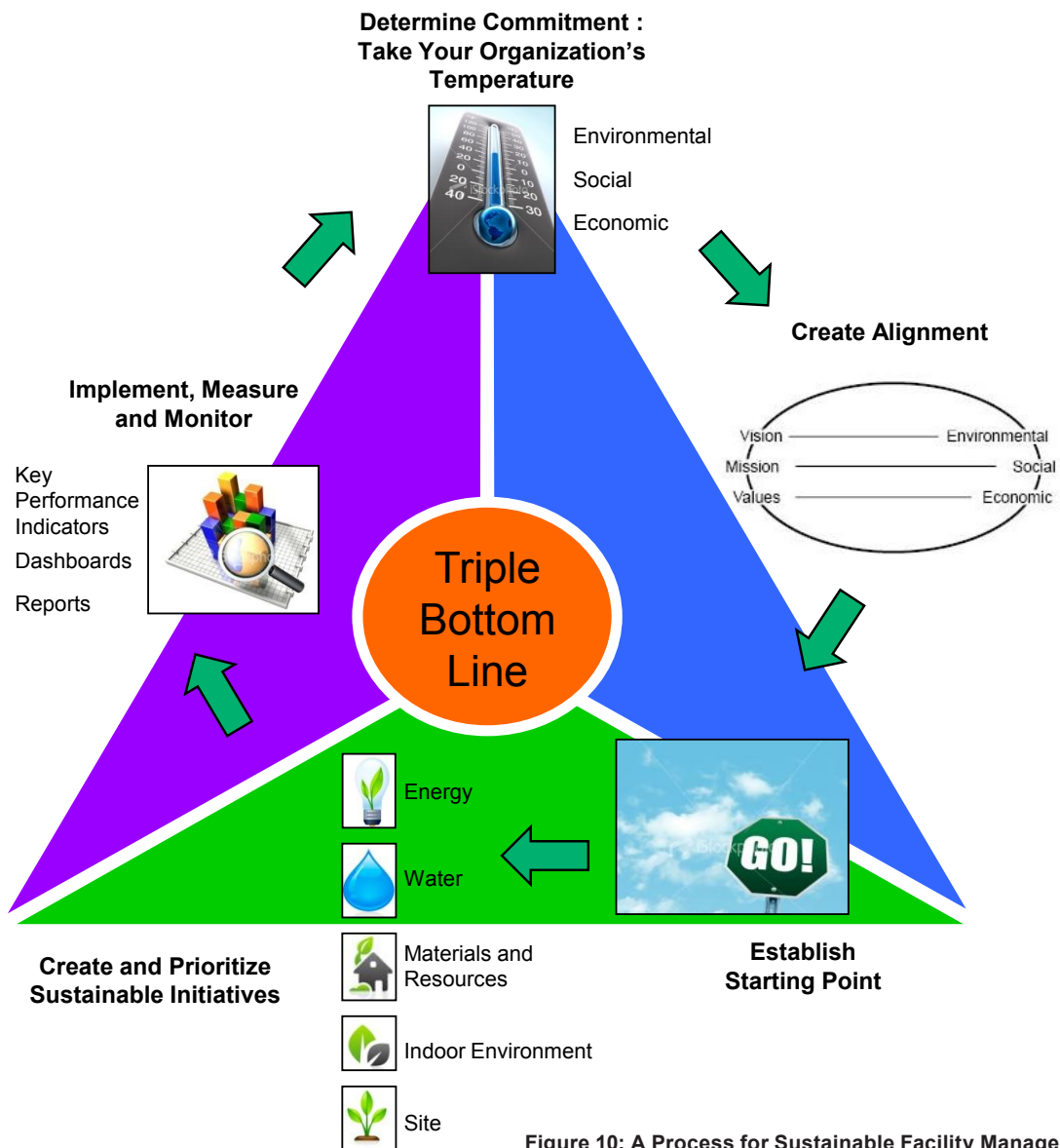


Figure 10: A Process for Sustainable Facility Management

The methodology that has been described here provides a framework and guideline for facility managers to get started, and to see where others may have taken their programs. Hopefully, this will provide at least some key pieces of information about the getting started process that may have been previously missing from the facility manager's toolkit.

There is no one right answer as to how to make an existing building sustainable, but there is no doubt that the facility manager should be the primary driver of this process. There is no one who knows better how to make the facility safer, more efficient, comfortable, and productive. Doing this takes time, effort, and monetary and human resources. If we are to balance the needs of our organizations with the needs of the workforce and the environment, we need to heed the triple bottom line of sustainability and balance all of these important components.



4 BUSINESS CASE

4.1 Funding for ongoing Operations

Funding for ongoing operations of buildings is a challenge for the facility management profession. Most facility managers would agree that it is much easier to obtain capital dollars for new construction within their organizations than it is to increase operating dollars. Most facility managers draw their funding from ongoing operational budgets and forward-looking capital budgets. In many cases, these two primary funding mechanisms are under the control of different departments within the organization. This leads to a fragmented approach to facility purchases. In the introduction to this guide, we outlined the complexity and potential difficulties in administering both an operating and capital budget. This dual funding mechanism can make the greening of existing buildings difficult.

There are a multitude of projects and initiatives that make existing facilities more sustainable. There are low cost and no-cost initiatives that can be funded through short-term operational budgets and improved practices. As we outlined in the detailed finding section of this guide, there are also moderate and high-cost initiatives that require capital investments and a significant amount of time to implement.

Compounding the funding issues is the lack of consistent and widely recognized benchmarks for what these budget and funding requirements should be to operate a well maintained, efficient facility. Benchmarking and indexing data for facility operations and capital investment levels is available through the International Facility Management Association (IFMA), the Association of Higher Education Facilities Officers (APPA), the Building Owners and Managers Association (BOMA), and others. Although there is no shortage of operations data and capital expenditure indexes, there is no singular approach for determining whether a facility manager's budget is within industry accepted ranges for operating and capital expenditures.

Among the many benchmarking tools and indexes available is IFMA's Facility Operating Current Replacement Value Index. The Index is a rough measure of the amount of money used to support ongoing operations compared to the value of the building. It is derived by dividing the total annual maintenance cost for a facility by the current replacement value (CRV) of the facility. IFMA's Research Report #32, Operations and Maintenance Benchmarks (IFMA 2009), reports that the average Facility Operating Current Replacement Value Index of the IFMA members' facilities included in the report is at 1.55 percent. This represents a slight decline from previous benchmark reports. The reported decline from previous studies underscores the dilemma faced by a majority of facility managers. The decrease in IFMA's Index provides an indication of what most facility managers already know; operation and maintenance budgets are declining. This represents a stark contrast with the need for greener, more efficient facilities. The need has never been stronger, but the funding required to achieve these goals is getting harder and harder to come by. This may force facility managers to concentrate on only the low and no-cost greening initiatives, discarding the longer term, more costly, and often more meaningful initiatives.

4.2 Evaluating your resources

The process for SFM involves several steps to making our facilities more sustainable, but they require buy-in, dedicated time from the facility management staff, and money. In order to make these processes less daunting and easier to follow, we will now look at several approaches that recognize differing levels of support and resources within an organization.

- Initial Approach: Small facilities, small FM workforce, limited outside involvement, limited budget
- Mid-level Approach: Several facilities, some dedicated FM workforce, some outside resources
- Room-by-room Approach: Several campuses, dedicated FM workforce, outside resources available

Each of these approaches will allow the facility manager to achieve some level of sustainable facilities. Each recognizes the limitations of available resources and matches the level of effort with the amount of funding, labor availability and organizational commitment.

Also, instead of adopting labor availability and cost as the primary driver of these approaches, as we have done here, a facility manager can utilize these approaches in a step process. In this case, the SFM program may start out with an initial approach and move on to higher level sustainability initiatives as internal support for the program builds.

An initial approach can be used by anyone, but is more suited to small or single facilities, leased facilities, and those with a limited or primarily outsourced facility management staff. There are inherent difficulties in the greening of leased facilities, not the least of which is the owner's attitude toward sustainable facilities. However, even in leased facilities, the facility manager is often in the position to positively influence the greening of existing buildings. Most building owners are aware of the market pressure and positive economic potential of providing economical, safe, and environmentally friendly facilities to their tenants. Facility managers in leased facilities are increasingly inquiring about the sustainable features of their facilities and are acting in partnership with owners to evaluate operational efficiency and institute green practices.

The initial approach is not limited to leased facilities either. It can be used by facility managers that have limited in-house staff and limited, primarily operational, budgets. The following are examples of no- or low-cost sustainability initiatives:

- Lighting (bulb) replacements
- Water-saving techniques such as low-flow aerators and landscaping irrigation
- Temperature set point control and efficient use of existing building controls
- Recycling programs
- Purchasing programs geared toward waste reduction, equipment efficiency, and consumables (Copiers, paper and other consumables)
- Taking advantage of positive site features such as parking, public transportation access, transportation subsidies and encouragements
- Employee education programs

The moderate approach usually involves an incremental increase in the amount of time and budget devoted to a SFM program. Although most of the facility improvements may still be operational in nature, a moderate approach will capture future capital budget items and seek efficiency improvements in future capital replacements. Instead of approaching only no-cost or operational cost improvements used in the initial approach, this approach will make greater use of operational and capital dollars by using payback period analysis and life-cycle cost assessment to determine the economic feasibility of sustainable initiatives. The following are examples of a moderate approach to sustainability initiatives:

- Lighting upgrades, occupancy sensors
- Water-saving techniques such as installation of low-flow fixtures, waterless urinals, and water-saving irrigation modifications
- Upgrading and improving building controls, installing variable frequency drives and other energy-saving equipment modifications
- Waste reduction programs
- Purchasing programs geared towards durable goods, alterations, and construction efficiency
- Indoor air quality improvements such as ventilation, air quality measurement and monitoring

The room-by-room approach involves a detailed assessment of the facilities characteristics in energy and water use, use and disposal of materials and resources, the indoor environment, and site attributes of the facility. Budget dollars involve all levels of initiatives: no-cost, operational dollar expenditures, and capital expenditures. This approach seeks to capture facility-related and operational related efficiency improvements. A thorough assessment of the facility attributes is made, along with an assessment of the work of the facility – whether it's an office, manufacturing facility, research and development, or other type of facility. All business processes are evaluated and analyzed against the triple bottom line and the company's bottom line. The following are examples of a room-by-room approach to sustainability initiatives:

- Interior redesigns to incorporate natural day lighting
- Site improvements such as landscaping, green areas, permeable pavements

- Upgrading and replacement of building systems with energy efficient systems
- Use of alternative energy sources and on-site power generation
- Operational equipment energy and waste reduction programs
- Food service, employee amenity and workplace efficiency monitoring and improvement

As these examples show, each level of commitment to SFM leads to a deeper and deeper look at the way facilities operate. What may start as an initial approach may soon develop into a thorough assessment of an organization's practices and ratcheting-up of the program once support, visibility, and available resources increase. There is no reason that the facility manager cannot start with the basic and increase the scale of the SFM program within a short period of time from startup. Functional SFM programs, even though they may still be in the initial stages, may also involve initiatives that are considered higher-level approaches.

4.3 Selling to senior management

Limited budgets, labor shortages, and lack of organizational support pose significant obstacles to making our existing facilities more efficient, productive, and environmentally friendly. The facility manager needs to recognize and respond appropriately to the level of organizational support and allocation of human resources.

Familiarity with the financial language of the organization, translation of sustainability into that language, and the ability to sell sustainability initiatives to senior level management are useful skills. Using the triple bottom line to show alignment of sustainable facility management with the strategy of the organization is an effective technique in demonstrating the value of the SFM program. Coordinating the SFM program with performance management tools of the organization such as the balanced scorecard also shows alignment and strengthens the connection with the overall strategy. Making the business case for facilities is part of everyday life for the facility manager.

In the case study portion of this guide, we have provided some examples of facility managers who have been successful in making the business case. Selling to senior management ultimately comes down to demonstrating the financial and non-financial benefits of sustainable facility management to our organizations. This involves showing the short and long term costs and value of SFM in clear, concise language that is consistent with the commitment of the organization to each of the legs of the triple bottom line.



5 CASE STUDIES: A LOOK AT HOW IT'S DONE

In preparing this guide, we have laid out a methodology for starting a SFM program. SFM programs can be as simple or detailed as required by the organization, its practices, policies, and procedures. The components of each level of program as outlined above can be moved around, supplemented, and manipulated to fit any budget, manpower requirement, or organizational mandate.

To further illustrate the development and implementation of SFM programs, we contacted several IFMA member organizations that had undergone SFM programs and asked them several questions:

- What were your motivations?
- What was the level of organizational commitment?
- Did you measure the level of commitment prior to starting the program?
- What resources were you able to devote to the program (time and money)?
- Were you able to meet your stated goals?
- What were some of the unique aspects of your program?

The following section highlights three separate organizations and their approach to SFM. With only one exception, the characterization of the efforts as initial, mid-level, and room-by-room- have not been stated. You can draw your own conclusions about which level of approach they used in developing their programs, or if they used this methodology at all. Each organization displayed a high level of commitment to a sustainability program, and each achieved success. Although this is not explicitly stated in each case, the triple bottom line approach to sustainability is inherent in the way they evaluated their existing operations and how they developed their programs.

It is interesting to note that building certification was the stated goal in only two of the three of our case studies, and that certification, at least in one of the cases, did not depend on taking a higher level approach to the sustainability process. The type, value and level of building certification programs in existing buildings are the subject of significant discussion, and are open to the interpretation of individual organizations. We have not attempted to qualify or quantify the value of building certification programs in this guide.

We sincerely hope that we have been able to capture the outstanding level of achievement of each of these organizations in this guide and congratulate them on helping make some of our existing building stock more economical, safer, and more productive places to carry out the business of their organizations.



BAE SYSTEMS

5.1 BAE Systems

5.1.1 Introduction

With over 400 facilities worldwide, and a top to bottom commitment to sustainability, BAE Systems needed an action plan for curtailing energy consumption and greening of their facilities. Through a beta test site in Greenlawn, New York (GNY), BAE Systems was able to launch an assessment program that involved a “room by room combat” audit approach. BAE Systems developed the room-by-room approach using a Utility Cost Takeout (UCT) strategy. UCT is a technique developed and used by BAE Systems to significantly decrease utility costs and lower operating expenses.

Primary Goal: To Decrease Utility Costs

5.1.2 Methodology

Room by Room Combat: In order to meet the goal of overall operating expense reduction, BAE used the UCT strategy to take a critical look at each and every portion of the facility – from office areas, to research and development, to production and test equipment. With a variety of space uses, BAE has significant opportunity for utility reduction.

A typical sustainability strategy would involve looking at the building infrastructure and facility service delivery, but may not include production equipment or tenant operations. At BAE, the facility management staff not only looks at traditional building infrastructure components, but the approach is extended to test and production equipment, and involves close coordination with operations personnel. The difference is that a complete audit of every room and local system is conducted and reviewed for short payback utility cost reduc-

tion opportunity (UCT). If the payback is less than one year, the correction is made. For example, if a specific piece of test equipment produces waste heat, the BAE Facility Management staff works with operations personnel to implement practical methods to harness the waste heat and contribute to building system heating requirements.

This approach differs from traditional conservation approaches in that the building is looked at holistically, including production and test equipment with environmental controls. Without a room-by-room approach, the integration of building systems with process would be missed – along with numerous opportunities for Utility Cost Takeout. This approach is an example of alignment between the facility management function, manufacturing operations, and the goals of the senior management of the organization.

Figure 11 is a sample excerpt from the documentation BAE Systems uses for the room-by-room approach. This particular portion of the spreadsheet BAE used is to document electrical usage from lighting fixtures in one small portion of their building. The spreadsheet tool is used to document winter and summer electrical usage for all lighting fixtures specific to each room or area evaluated. The electrical usage cost, cost to implement a re-lamping program, electrical savings from the re-lamping initiative, and payback period are all documented on the spreadsheet. The spreadsheet is extended to include all areas of the facility. This example is for just one portion of the program – electrical usage by lighting fixture. The room-by-room approach is used in all areas of the facility, and all equipment used in the facility, whether it is building system (facility) related, or production (operations) oriented.

Figure 11: Example documentation of the room-by-room approach

		ANNUAL SUMMARY SAVINGS BASED ON FULL YEAR (12 MONTHS) OF IMPLEMENTATION								SIMPLE PAYBACK			ACTUAL SAVINGS TO END OF CALENDAR YEAR SAVINGS BASED ON FISCAL WEEK	
		IMPLEMENTATION SAVINGS FROM		EXISTING TOTAL		MODIFIED TOTAL		SAVED TOTAL		INSTALL COST		PAYBACK YEARS	TOTAL IMPLEMENTED CALENDAR YEAR KWH	TOTAL IMPLEMENTED SAVINGS CALENDAR YEAR
ITEM	LOAD DESCRIPTION	KWH OR KWH + KW	DATE	KWH	COST	KWH	COST	KWH	COST	EACH	TOTAL			
LIGHTING														
	B-8 FAC Conf room	KWH & KW	1/1/07	2,446	\$367	1,223	\$183	1,223	\$183	\$22	\$88	0.5	1,223	\$183
	1of 2 B-8 Break room	KWH & KW	1/1/07	23,063	\$3,459	5,766	\$865	17,297	\$2,595	\$45	\$994	0.4	17,297	\$2,595
	B-8 Men's room	KWH & KW	1/1/07	9,435	\$1,415	4,717	\$708	4,717	\$708	\$10	\$87	0.1	4,717	\$708
	B-8 Ladies room	KWH & KW	1/1/07	9,435	\$1,415	3,145	\$472	6,290	\$943	\$10	\$87	0.1	6,290	\$943
	B-8 Dist Ctr	KWH & KW	1/1/07	30,576	\$4,586	5,242	\$786	25,334	\$3,800	\$50	\$500	0.1	25,334	\$3,800
	B-8 Janitor closet	KWH & KW	1/1/07	2,097	\$314	349	\$52	1,747	\$262	\$138	\$138	0.5	1,747	\$262
	B-8 Mech Room	KWH & KW	1/1/07	4,193	\$629	87	\$13	4,106	\$616	\$107	\$213	0.3	4,106	\$616
	Fac Eng office area	KWH	1/1/07	17,472	\$1,922	10,920	\$1,201	6,552	\$721	\$45	\$1,135	1.6	6,552	\$721
	Fac Eng storage	KWH & KW	1/1/07	2,097	\$314	31	\$5	2,066	\$310	\$44	\$88	0.3	2,066	\$310
	Facilities maint. Shop	KWH	1/1/07	50,319	\$5,535	1,048	\$115	49,271	\$5,420	\$102	\$2,448	0.5	49,271	\$5,420
	Evaporator room	KWH & KW	1/1/07	8,387	\$1,258	262	\$39	8,124	\$1,219	\$22	\$88	0.1	8,124	\$1,219
	Compactor room	KWH & KW	1/1/07	10,483	\$1,572	328	\$49	10,156	\$1,523	\$59	\$295	0.2	10,156	\$1,523
	Tool Room	KWH & KW	1/1/07	1,922	\$288	120	\$18	1,802	\$270	\$8	\$88	0.3	1,802	\$270
	Compressor room	KWH	1/1/07	8,387	\$923	44	\$5	8,343	\$918	\$189	\$755	0.8	8,343	\$918
	Bldg Vestibule	KWH & KW	1/1/07	6,290	\$943	33	\$5	6,257	\$939	\$185	\$555	0.6	6,257	\$939
	Model Shop	KWH & KW	1/1/07	246,443	\$36,966	48,702	\$7,305	197,741	\$29,661	\$597	\$37,000	1.2	197,741	\$29,661
	Paint shop	KWH & KW	1/1/07	19,656	\$2,948	1,456	\$218	18,200	\$2,730	\$510	\$2,550	0.9	18,200	\$2,730
	Model Shop office	KWH	1/1/07	13,366	\$1,470	7,426	\$817	5,940	\$653	\$59	\$995	1.5	5,940	\$653
	MS Conf Room	KWH & KW	1/1/07	1,310	\$197	131	\$20	1,179	\$177	\$29	\$88	0.5	1,179	\$177
	EH&S storage room	KWH & KW	1/1/07	655	\$98	66	\$10	590	\$88	\$29	\$88	1.0	590	\$88

BAE Systems estimates that they have been able to capture about 50 percent more utility savings by including production equipment in the room-by-room audit approach, than they would if they had included the building infrastructure alone.

The room-by-room approach captures far more than utilities. The room-by-room approach follows the criteria for the building rating system created by the U.S. Green Building Council's LEED® system,

Figure 12: Utility Reduction Comparison: Room by Room vs. Traditional Approach

UTILITY REDUCTION PERCENTAGE				
100% Room-by-Room Approach		Traditional Approach		
Utility Cost Takeout	VFD's	Lighting Controls	HVAC Controls	Power Factor Correction
Room-by-Room Combat				
50% Savings	50% Savings			
High efficiency motor upgrades	Variable frequency drives			
Waste heat usage	Building Management System			
Roll-up door sensors	Lighting controls			
Time clocks on production equipment	HVAC controls			
Room-by-Room lighting power reduction	Power Factor correction			
Air compressor upgrades	Sustainable design			
Use of solvents and process fluids	Site lighting			
Fleet fuel conservation	Recycling and waste management			

and includes elements of each of the following:

- Energy consumption
- Water use and consumption
- Materials and resources
- Environmental quality
- Site use

The results of the UCT program and room-by-room approach at Greenlawn could only be achieved by internal cooperation and education. Developing buy-in for the program was achieved by paying attention to detail and demonstrating to the organization the power of integration of green and sustainability throughout the organization.

The education program developed at Greenlawn included a marketing campaign that called on each employee to contribute to the greening efforts through posters, signage and group meetings. A typical appeal includes becoming part of the energy campaign by submitting ideas that:

- Decrease the usage of energy: Electrical and natural gas
- Conserve resources / Recycle and stop waste
- Use products made from recycled materials
- Avoid use of large power consumption between 10am and 6pm
- Identify non-critical devices that can be turned off
- Consolidate the need for personal devices, such as coffee pots
- Identify the infiltration of air gaps and leaks
- Turn off the lights and equipment (during break time and lunch, and other times it is not in use)
- Use non-biodegradable materials wisely
- Use environmentally friendly products
- Let us know your ideas

Armed with a successful evaluation approach, proven results and hard cost savings data, BAE was able to turn the Greenlawn experience into an enterprise-wide training and implementation program for the hundreds of nationwide facilities under the Electronics Solutions Group. From manufacturing to food service, this program includes a methodology for a room-by-room assessment and implementation of green operations initiatives.

5.1.3 Results

Each potential initiative identified in the room-by-room approach included an estimate of cost for implementation and potential payback. The benefits of a room-by-room approach were substantial for BAE, and were made possible by integrating the facility manager's actions with production, testing, and office management leaders within the organization.

Examples of savings and environmental benefits at the Greenlawn facility included the following:

- Management of Peak Demand to Mitigate Electrical Cost
- Electrical savings of 3,416,000 kilowatts/year
- Fuel oil savings of 20,000 gallons/year (75,700 liters/year)
- Water savings of 1.3 million gallons of water/year (4.9 million liters of water/year)
- Reduction of Solid Waste of over 225 tons/year (204,000 kg/year)

Many organizations institute sustainability programs, but few achieve significant results without top-to-bottom organizational commitment. In developing a UCT and room-by-room combat approach and promoting education, awareness and the importance of conservation and sustainability, BAE was able to align the program with BAE's culture and achieve significant cost savings. Even the name, room-by-room combat is a reflection of BAE's organizational mission and approach to their business. The next step for BAE is to take the UCT and room-by-room combat approach to each of their other facilities and create an organization-wide program that has the potential to save millions of dollars in operational costs. By aligning a sustainability program with organizational mission, facility managers can be the driver of their sustainability programs; saving energy, water, resources, and making significant improvements in workplace quality.

5.1.4 Lessons Learned at BAE

In developing this case study for this Guide, the facility management group at the BAE Greenlawn facility relayed a number of lessons learned and approaches that they found helpful in developing and implementing a SFM program. The following are a few of the highlights of their lessons learned:

Develop the test case and thoroughly document the results before instituting programs across the enterprise

- Include all available evaluation tools, such as the U.S. Green Building Council's LEED® system
- Involve operations personnel and all facility areas in implementing the room-by-room approach
- Transfer your best practices across all lines of business in your organization
- Seek and encourage buy-in from senior management
- Develop your methodology to be able to easily and quickly determine value and payback for your actions
- Don't over-analyze; if the payback is short, execute
- Harness the enthusiasm and power of your employees
- Don't underestimate the employee educational component of the program
- Advertise the results of your program and seek internal and external recognition for your efforts



Great Public Schools for Every Student

5.2 National Education Association

5.2.1 Introduction

The National Education Association (NEA) is a non-profit organization that serves a variety of distinct groups of education professionals. NEA headquarters is located in downtown Washington DC, in a 470,000 square feet (42,000 square meter) facility, originally built in 1957. The building was renovated in 1991 and consists of several ageing building systems that pose a challenge to sustainability efforts.

The effort toward making this existing building more efficient started many years ago, before sustainability became commonplace. In the late 1990's, NEA started focusing on energy savings and upgrading building controls and systems to reduce consumption. The primary motivation for this was to reduce operational cost. Since 2006, environmental awareness among NEA's constituents increased, and the motivation changed from being primarily cost driven, to being "the right thing to do". The facility managers at NEA have taken on the task of driving the sustainability initiatives within their organization. Starting small, budgeting incremental improvements and raising building awareness has been the primary strategy of the facility management group at NEA.

Along with the growing awareness of sustainable facility management, NEA observed the growing popularity and value of building certification as a milestone in demonstrating their commitment to sustainability in their facility. As a result, the goal of NEA's sustainability facility management plan, which started with energy savings, has developed into building certification.



Primary Goal: LEED® Certification

5.2.2 Methodology

Armed with a new objective beyond just energy and utility savings, NEA embarked on a program to make their existing facility more sustainable in all five of the key areas required by the LEED® program: site sustainability, energy, water, materials and resources, and indoor environment. Along the way, they met some significant challenges, particularly the age of the facility and efficiency of their ageing building systems.

NEA registered for certification under the LEED® for Existing Buildings program and performed a sustainability assessment utilizing the USGBC's LEED-EB® checklist as a guide. The initial phase of the assessment was aimed at the LEED-EB prerequisites. Despite NEA's energy savings efforts, energy consumption proved to be one of the major hurdles. A LEED-EB® program prerequisite is a minimum ENERGY STAR rating, measured using ENERGY STAR's Portfolio Program. The minimum rating requirement depends on when and under which LEED-EB® system the building was registered. The Portfolio Program evaluates your buildings' energy use and benchmarks against similar buildings in a similar climate with similar characteristics. On a relative rating of 0 to 100, your building's energy performance is given a numerical rating. In NEA's case, their initial rating did not qualify them for certification under the LEED-EB® system. However, over a period of about two years, using a combination of operational improvements and minor adjustments to planned capital purchases, NEA has been successful in reducing energy consumption, paving the way for LEED® certification.

5.2.3 Results

At the time of the development of this Guide, NEA was in the process of implementing a number of sustainability improvements and upgrades in their quest for building certification. The goal of LEED-EB® certification remains in sight and is expected to be achieved within a year.

However, in the meantime, NEA has reached a number of goals that contribute to their ultimate goal of building certification. Over the first several years of their sustainability program, NEA established an energy savings goal of a 10 percent reduction in utility cost annually. In their first year after establishing the goal, a 19 percent reduction in utility cost was achieved. Since the energy audit performed in October 2007, their ENERGY

STAR rating has increased incrementally, reaching a rating of 76 in June of 2009, enabling them to apply for the ENERGY STAR label.

NEA was able to achieve these results with minimal capital expenditure outside of planned upgrades. Aside from replacement of the building management system and the installation of variable frequency drives, most of their efforts have been in the low to no cost category, coupled with a strong employee education program, revision of policies and practices, and frequent updates to, involvement of, and encouragement from senior management. They have switched faucet aerators and toilet flush valves, developed a lamp replacement strategy, instituted policies of turning off window air units and lights when spaces are not occupied, broadened their no smoking and sustainable purchasing policies, broadened their recycling program, installed bicycle racks and implemented a parking rate reduction program for carpoolers and fuel efficient vehicles (FEVs), implemented green cleaning practices and policies, and annually celebrate Earth Day with their building occupants.

5.2.4 Lessons Learned from NEA

In developing this case study for this guide, the Conference and Facility Management group at NEA relayed a number of lessons learned, motivational guidelines and approaches that they found helpful in developing and implementing a SFM program. The following are a few of the highlights of their lessons learned.

- Start small, plan your upgrades, budget accordingly
- Recognize that your organization's motivations may change over time – lead and adapt!
- Make sustainability a public conversation
- Seek and encourage buy-in from senior management, they often provide much more support than you may think
- Leverage your vendors, suppliers and business partners to make sustainability happen
- Support your sustainability champion, sustainability can be infectious and your champion can motivate many participants
- Be patient, use outside help when needed, as time is the facility manager's most valuable asset

- Don't be afraid to use outside help. Find the right role for your outside help that maximizes the skills of your team. NEA found it useful to utilize their outside consultant to keep them motivated and on schedule.
- Develop, participate, and communicate with your internal advisory group
- Take a balanced approach, it's not all about capital expenditure. You can seek the low hanging fruit, and look to change behavior, not processes and systems.
- Complement the operational, "firefighting" mentality of facility management with the strategic and systematic approach, having these skills served NEA well in their program.
- Remember, it's a journey, not a race; sustainability does not happen overnight

Finally, one of the major obstacles to SFM that NEA pointed out was the job of the facility manager itself. As most facility managers are aware, there are other jobs the facility manager has to do on a day to day basis, and making the facility more sustainable is not necessarily one of them. Overcoming the "fire fighting" mentality and day-to-day operational issues is not an easy task. Often the intention to be more efficient and sustainable is there, but the time, energy, and resources are not.

Overcoming old habits in facility management can also provide a challenge to a SFM program. Stay vigilant for new ways to accomplish tasks and engage your staff and constituents in achieving sustainability goals. We would hope that upon the next update to this Guide, or even sooner, we can congratulate NEA on achieving LEED-EB® certification.

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5.3 ASCD

5.3.1 Introduction

Founded in 1943, ASCD (formerly the Association for Supervision and Curriculum Development) is an educational leadership organization dedicated to advancing best practices and policies for the success of each learner. ASCD has 175,000 members in 119 countries that are professional educators from all levels and subject areas. Headquarters for ASCD is in Alexandria, Virginia and is housed in an 88,000 square feet (8,000 square meter) facility built in 1998.

ASCD owns their facility and has a relatively small in-house FM staff of just two individuals. The engineering support function is outsourced to a property management company. Over the last several years, the security and cleaning functions at ASCD were transitioned from an outsourced to an in-house function.

The need for a sustainability program for ASCD was realized in 2007 when sustainability became prominent in the built environment. Awareness of the impact of sustainability in the management and operation of their building built over the past several years. The commitment and drivers for the social and environmental elements of the triple bottom line from senior management have always been, and remain high at ASCD. That commitment also translated to Board of Directors level commitment.

Primary Goal: Building Certification

5.3.2 Methodology

For several years, the facility management staff at ASCD implemented a number of sustainability initiatives: lighting upgrades and retrofits, low-flow aerators on showers and lavatories, temperature setbacks, recycling, landscaping practices, and policies and incentives that encourage sustainable transportation practices. They were benefited from the construction and efficiency features of a relatively new building: economizers, variable frequency drives, high efficiency glass, and the absence of asbestos, PCB's and other hazardous

construction materials. Over a period of 2 to 3 years, ASCD was able to invest a relatively small amount of capital dollars to these efficiency efforts (lighting retrofits representing the largest portion).

In 2008, ASCD sought a methodology for recognition of their sustainability efforts and adopted building certification as their primary goal. Originally that goal was LEED-EB® certification. In 2008, ASCD conducted a sustainability audit to determine their standing relative to the LEED-EB® prerequisites. Despite a number of energy efficiency upgrades, the ENERGY STAR rating did not meet the LEED-EB® prerequisite requirements. ASCD also evaluated the LEED® certification process and amount of FM staff and outside help required to validate and document sustainable practices. With a small FM staff and limited funding for outside resources, the LEED® certification process posed a significant hurdle in time and budget.

In the process of evaluating their available resources and matching those resources with their stated goal, ASCD focused on the Green Globes system of building certification through the Green Buildings Initiative (GBI). The Green Globes process differs from the LEED® process in that the point structure is significantly different, there are no prerequisites, the documentation process is significantly less, and an on-site inspection of the facility is conducted by the Green Building Initiative (GBI) to audit and validate the sustainability practices. The Green Globes certification process relies heavily on the user to review and complete an on-line checklist to document existing practices.



The Green Globes certification evaluates sustainability in existing buildings with its Green Globes continuous Improvement of Existing Buildings (CIEB) program. There are 1000 possible CIEB points in the categories of energy, indoor environment, resources, water, emissions and effluents, and environmental management.

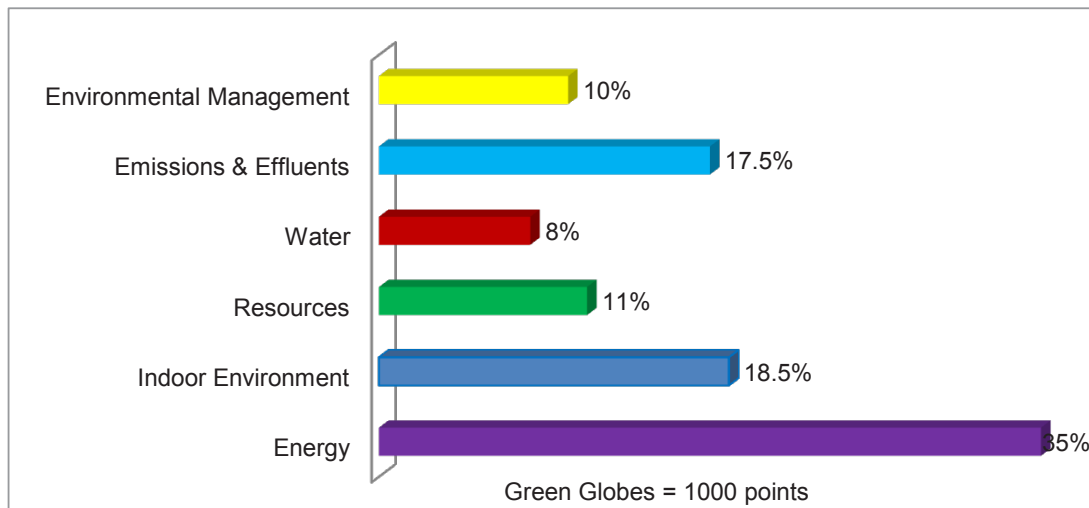


Figure 13: Green Globes Point Categories and Percentage of Points for Each Category

The rating that the building achieves is expressed as a percentage of the available 1000 points achieved and the certification is expressed as a number of globes. ASCD went through the process of entering their practices and documenting them in Green Globes on-line system. The following are some of the highlights of their sustainable practices.

- Lighting upgrades: installation of occupancy sensors, variable frequency drives
- Existing building features: energy efficient windows, no hazardous materials, economizers
- Reduction in water use: low-flow fixtures, and economizing flush valves
- Temperature and hot water control setbacks
- Establishment of daytime and limited weekend heating and cooling hours
- Better use of building controls and energy management
- Transportation: Bike racks, public transportation subsidies, carpooling, showers and locker facilities, use of a zip car, nearby access to public transportation, shuttle service
- Introduction of green cleaning practices
- Landscaping and irrigation improvements

The total labor effort invested in the Green Globes system was several hundred hours, between the in house facility management staff at ASCD and their engineering support contractor. The total capital expenditure for building improvements was less than \$40,000 US dollars, and the cost of certification was less than \$10,000 US dollars.

5.3.3 Results

In a period of about eight months, ASCD was able to register with Green Globes, utilize the on-line assessment and documentation system, conduct the on-site inspection, and achieve the certification of two Green Globes. For ASCD, this process matched their available resources much more closely than the LEED® rating system.

Many may argue the merits of one building rating system over another, but this example illustrates that there are alternatives available to owners and managers of existing buildings. At ASCD, the certification proved valuable in quantifying their efforts and gaining a level of recognition. The advantages cited by ASCD included the ease of use of the rating system, lower cost than the alternative, the benefit of an on-site inspection, and shorter timeframe required for the certification.

A stated disadvantage was the perceived value of the certification when compared with the LEED® for Existing Buildings rating system.



Figure 14: ASCD Building and Green Globes Plaque

5.3.4 Lessons Learned from ASCD

In developing this case study for this Guide, the facility management staff at ASCD relayed a number of lessons learned, and approaches that they found helpful in developing and implementing a SFM program. The following are a few of the highlights of their lessons learned:

- Use your in-house expertise to start your sustainability initiatives, as many initiatives do not require significant budgets or outside help
- Do as many sustainability initiatives in house as your time and resources allow
- Start with the easily achievable initiatives and build from there
- Seek and encourage buy-in from senior management
- Seek opportunities to initiate processes such as green cleaning through in house efforts
- Utilize the sustainable expertise that resides in and around your location and in your network, including IFMA Chapters, USGBC, Green Globes, others
- Be prepared to adapt to new programs and goals as you make your facility more sustainable

At ASCD their accomplishments are valued and recognized by their senior management. The facility manager was able to align with the sustainability goals and overall strategy of the organization without capital or operational expenditures that were outside of the normal operating budgets for the facility.

5.4 Common Themes of the Case Studies

An effective SFM program will help the facility manager to link facilities with the asset management philosophy of the organization. This will also help improve the visibility of the facility manager's work. It may also help to elevate the position of the facility manager in the organization, linking the physical assets, workplace, and workforce productivity, and demonstrating the value of effective facility management to any organization.

As this Guide illustrates, not all SFM programs start in an organized fashion with well defined goals and objectives. Sustainability in existing buildings is constantly changing as we learn better techniques, operating procedures, and methods for measuring, monitoring, and quantifying our successes. As you can see from the examples

in this Guide, motivations, leadership styles, and even mandates change and evolve over time. The processes we use to improve our operational practices need to change along with these external drivers.

5.5 A Summary of Lessons Learned

- Start with your organizational commitment and align with your mission, vision, and strategy
- Match your goals with available resources
- Consider that the time and effort to achieve your sustainable goals are often exceeded, maybe it's our natural tendency to underestimate!
- Start small, look for incremental changes, be patient
- Seek and obtain senior management buy-in
- Do not underestimate the importance or power of workforce education and buy-in
- No matter how efficient and effective your facility is, there are always improvements to be made. This is NOT a reflection of poor management skills.
- Look for a sustainability champion and support them
- Leverage the support of your consultants, service providers and vendors to achieve success
- Measure, measure, measure!
- Benchmark
- Celebrate your successes

We appreciate the help and contributions of each of the contributors to this Guide. We did not attempt to address the merits of one SFM system over another, evaluate the value or effectiveness of building rating systems, or provide details on how each and every facility manager should develop a SFM program. Those details are better left for other forums and future how-to guides from IFMA and the dozens of other dedicated organizations that deal with sustainability.

Our goal in publishing this Getting Started guide was to outline the process and document how a few of our fellow FMs have accomplished this task. There are many more success stories out there, and perhaps we can share more of them in the future.



6 APPENDICES

6.1 Appendix A: References

APPA (2004). 2003-04 Facilities RS Means (2009). Square Foot Data, RS Means Company, Kingston, MA.

IFMA (2009). Operations & Maintenance Benchmarks, Research Report #32, p48. International Facility Management Association.

6.2 Appendix B: Additional Resources

ENERGY STAR www.energystar.gov. ENERGY STAR is a joint program of the United States of America Environmental Protection Agency and the United States of America Department of Energy helping to save money and protect the environment through energy efficient products and practices.

Green Globes www.greenglobes.com Green Globes is a building environmental design and management tool that includes an online assessment protocol, rating system and guidance for green building design, operation and management. Green Globes is owned and operated by the Green Building Initiative (GBI).

Leadership in Energy and Environmental Design (LEED®) www.usgbc.org LEED® is a green building rating system of the United States of America Green Building Council. It is a third party certification system and benchmarks design, construction, and operation of high performance green buildings.

6.3 Appendix C: Glossary

ASCD: Formerly the Association for Supervision and Curriculum Development is an educational leadership organization dedicated to advancing best practices and policies for the success of each learner.

Association of Higher Education Facilities Officers (APPA): Formerly the Association of Physical Plant Administrators, promotes excellence in all phases of educational facilities management, including administration, planning, design, construction, energy/utilities, maintenance, and operations, and is open to all educational facilities professionals.

Balanced Score Card (BSC): A strategic performance measurement tool for measuring whether the smaller-scale operational activities of a company are aligned with its larger-scale objectives in terms of vision and strategy.

Building Owners and Managers Association International (BOMA International): BOMA International represents 92 local building management associations throughout the United States and 13 affiliates in Australia, Brazil, Canada, Finland, Indonesia, Japan, Korea, Mexico, New Zealand, the Philippines, Russia and South Africa. BOMA's 16,500-plus members own or manage more than nine billion square feet (8.4 billion square meters) of commercial properties in North America.

British Thermal Unit (BTU): A traditional unit of energy. It is approximately the amount of energy needed to heat one pound of water one degree Fahrenheit.

Corporate Social Responsibility (CSR): Self-regulating mechanism whereby business would monitor and ensure their adherence to law, ethical standards, and international norms by embracing responsibility for the impact of their activities on the environment, consumers, employees, communities, stakeholders and all other members of the public.

Current Replacement Value (CRV): The cost of replacing an existing building or structure at today's standards.

Energy Intensity: The measure of energy use in buildings in kBtu per square foot per year (kilowatts per square meter per year)

International Facility Management Association (IFMA): IFMA is the world's largest and most widely recognized international association for professional facility managers, supporting more than 19,500 members in 60 countries. The association's members, represented in 125 chapters and 16 councils worldwide, manage more than 37 billion square feet (3.4 billion square meters) of property and annually purchase more than US\$100 billion in products and services.

Key Performance Indicator (KPI): A measure of performance commonly used to help an organization define and evaluate how successful it is, typically in terms of making progress towards its long-term organizational goals.

Leadership in Engineering and Environmental Design (LEED®): A building certification program of the U.S. Green Building Council that measures building design, construction, and performance against a specific set of environmental performance standards.

LEED® for Existing Buildings (LEED-EB®): LEED for Existing Buildings: Operations & Maintenance provides a benchmark for building owners and operators to measure operations, improvements and maintenance.

National Education Association (NEA): A non-profit organization that is dedicated to preserving the rights of all educators and children, and serves a variety of distinct groups of education professionals.

Net Present Value (NPV): An economic standard method for evaluating competing long-term projects in capital budgeting

Payback Period: The period of time required for the return on an investment to "repay" the sum of the original investment.

Return on Investment (ROI): Used to evaluate the efficiency of an investment in finance and economics, also known as rate of return.

Sustainable Facility Management (SFM): A life-cycle approach to facility stewardship that integrates the people, place, and business of an organization with the economic, environmental, and social benefits of sustainability.

Triple Bottom Line (TBL): An expanded spectrum of values and criteria for measuring organizational (and societal) success: economic, ecological and social. (Also known as the balance of social, economic and environmental effects of what we do, or "people, planet, profit." TBL is also abbreviated as 3BL

Utility Cost Takeout (UCT): A technique developed and used by BAE Systems to significantly decrease utility costs and lower operating expenses.

United States Green Building Council (USGBC): A non-profit community of leaders with the mission to make green buildings available to everyone within a generation.

Zipcar: A for-profit, membership-based car-sharing company providing automobile rental to its members, billable by the hour or day.

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