Creating a Market for Energy-Efficient Commercial Buildings

How Governments Can Reduce Carbon Emissions by Implementing ENERGY STAR Buildings Program Elements

By Robert Sauchelli

Dedications

This guide is dedicated to all those governments, countries, and regional economic organizations that have committed to responding to climate change and are seeking practical solutions for addressing its causes and effects. There are many ways to mitigate the release of greenhouse gas emissions into Earth's atmosphere and countless adaptive strategies for coping with the effects of climate change. We hope that this guide, based on the United States Environmental Protection Agency's successful ENERGY STAR Buildings program, will serve as a useful template for governments and organizations interested in reducing carbon emissions from power plants by creating a market for energy-efficient commercial buildings.

This guide is also dedicated to the management and staff of the ENERGY STAR Buildings program. It was their groundbreaking imagination and tireless efforts over the course of 20 years that developed and implemented a suite of market-influencing program elements that were essential to creating a market for energy-efficient commercial buildings. The success of the ENERGY STAR Buildings program is a model for how voluntary government energy efficiency programs can reduce greenhouse gas emissions from power plants. Their work continues to this day.

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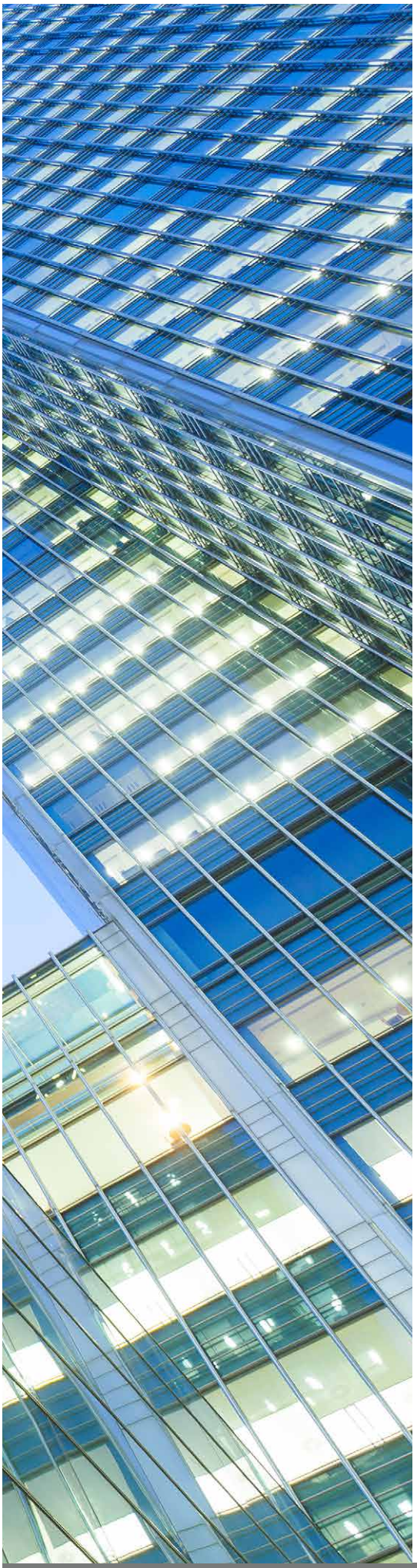

Introduction

Creating a Market for Energy-Efficient Commercial Buildings

Climate change is real. Greenhouse gas emissions must be reduced.

The evidence is clear. Our Earth is warming. Rising global temperatures have been accompanied by changes in weather and climate. Many places have seen changes in rainfall, resulting in more floods, droughts, or intense rain, as well as more frequent and severe heat waves. The planet's oceans and glaciers have also experienced some big changes: oceans are warming and becoming more acidic, ice caps are melting, and sea levels are rising.

As these and other changes become more pronounced in the coming decades, they will likely present challenges to our society and our environment.

Over the past century, human activities have released large amounts of carbon dioxide and other greenhouse gases into the atmosphere. The scientific consensus is that these man-made greenhouse gases are the main cause of global warming and climate change. Sixteen percent of these greenhouse gases come from burning fossil fuels to produce energy to light, heat, cool, and ventilate commercial buildings.

Creating a market for energy-efficient buildings reduces emissions and grows the economy.

It can be done. Emissions reductions can be accomplished through implementing energy efficiency in buildings. It can be done at a profit and while growing the economy. It's a strategy for reducing emissions that is good for the environment and good for the economy.

So often we hear that reducing emissions from power plants will create a drag on economic activity by reducing the pace of economic growth resulting from higher

In the United States, 16 percent of greenhouse gas emissions result from burning fossil fuels to produce the energy needed to light, heat, cool, and ventilate commercial buildings.

energy costs. The answer to this assertion depends on the perspective from which policy-makers see the challenge of reducing greenhouse gas emissions. Policy-makers seem to focus heavily on energy production, electric utilities, and the operation of power plants, regulating energy-related emissions at the production source. This perspective only considers the impact on energy utilities, which are heavily invested in old technologies and are only too anxious to pass along the costs of a renewable energy transition to energy consumers. The inevitable result of this approach is the self-fulfilling prophecy of rising energy costs and decreased economic activity.

However, if policy makers look at the emissions reduction challenge from the perspective of energy consumers, a completely different scenario arises. Energy users have for decades taken advantage of evolving energy efficiency technologies to reduce energy consumption and save money. Reducing energy consumption in buildings reduces operating costs, empowering businesses to reap higher profits or to lower prices for the purpose of being more competitive in the marketplace, resulting in the creation or retention of jobs. Additionally, the process of creating more energy-efficient buildings is a decentralized activity that takes place at the point of energy consumption and results in the employment of many thousands of technical and trade workers to implement the latest energy-saving technologies and management practices in buildings. Thus, stimulating energy efficiency in buildings has the potential result of **increasing economic activity** while repositioning an economy to be more cost effective and competitive in the future, **while also reducing emissions from power plants by simply using less energy**.

It is easy to understand why utilities have not embraced energy efficiency more robustly. After all, they are in the business of selling more and more energy. But given the scientific imperative to reduce emissions, the time has come to worry less about the old electric utility business model and encourage the new industries of energy efficiency and renewable energy that are now cost effective and can be implemented directly by energy users.

This Guide

Improving the energy efficiency of buildings—and reducing the associated greenhouse gas emissions—is a significant opportunity that saves money, creates jobs, strengthens the local economy, supports grid reliability, and helps pave the way for investments in renewable energy.

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This guide is intended for government policy-makers, trade associations, and non-profit organizations that wish to reduce greenhouse gas emissions from power plants to address global warming and climate change.

Typically, energy efficiency in commercial buildings is regulated by governments through codes and standards. This guide describes how to reduce carbon emissions resulting from energy consumption in buildings by implementing key elements of the successful United States' ENERGY STAR Buildings program as a template for creating a market for energy-efficient

commercial buildings. What makes the ENERGY STAR Buildings program unique is that it is a successful voluntary program that relies on using the power of information to influence markets. By establishing a voluntary program that identifies and recognizes energy-efficient buildings and their inherent value attributes, governments, trade associations, or nonprofits can stimulate demand for energy-efficient buildings and the services and technologies that are used to create them. Most importantly, building owners, managers, and occupants can be motivated to voluntarily improve the energy efficiency of their buildings and businesses simply by being made aware of the financial benefits, without having to resort to regulations or stricter building codes. While building codes and standards are important for setting a floor for energy performance, a more powerful and flexible market stimulus is the fact that **saving energy saves money for building owners, managers, and occupants. This financial motivation results in creating energy-efficient buildings that are more competitive, profitable, and valuable.**

What makes the ENERGY STAR Buildings program unique is that it is a successful voluntary program that relies on using the power of information to influence markets.

At the community level, the economic result of a market-driven voluntary program is a more **attractive, competitive, and constantly improving building infrastructure**, as well as the creation of an energy efficiency services industry that **stimulates economic activity and creates jobs**.

In 1999, the United States Environmental Protection Agency developed and implemented the ENERGY STAR Buildings program (www.energystar.gov/buildings). This voluntary program is focused on improving the energy efficiency of existing commercial buildings in the United States and reducing the associated carbon emissions from power plants and other energy sources.

In order to influence market behavior and create demand for energy-efficient buildings, ENERGY STAR Buildings created a set of market-influencing program elements that would drive the demand for energy-efficient buildings as well as the practices, technologies, and energy efficiency services that would improve and achieve a high level of energy performance

for commercial buildings. What were those dynamic market-influencing program elements? How were they promoted to building owners, managers, occupants, mortgage lenders, and investors? Why were they embraced by the real estate market and US corporations?

This guide contains the answers to these questions. It describes how emissions reductions can be achieved and documented on a voluntary basis in a world that is allergic to environmental regulation or doubtful of the effectiveness of carbon trading, carbon taxes, and international carbon reduction commitments. And finally, it will describe the environmental and economic benefits that accrue to communities, not only resulting from improved building infrastructure, but also from the development and manufacturing of new energy efficiency technologies and the establishment of a profitable energy efficiency services industry.

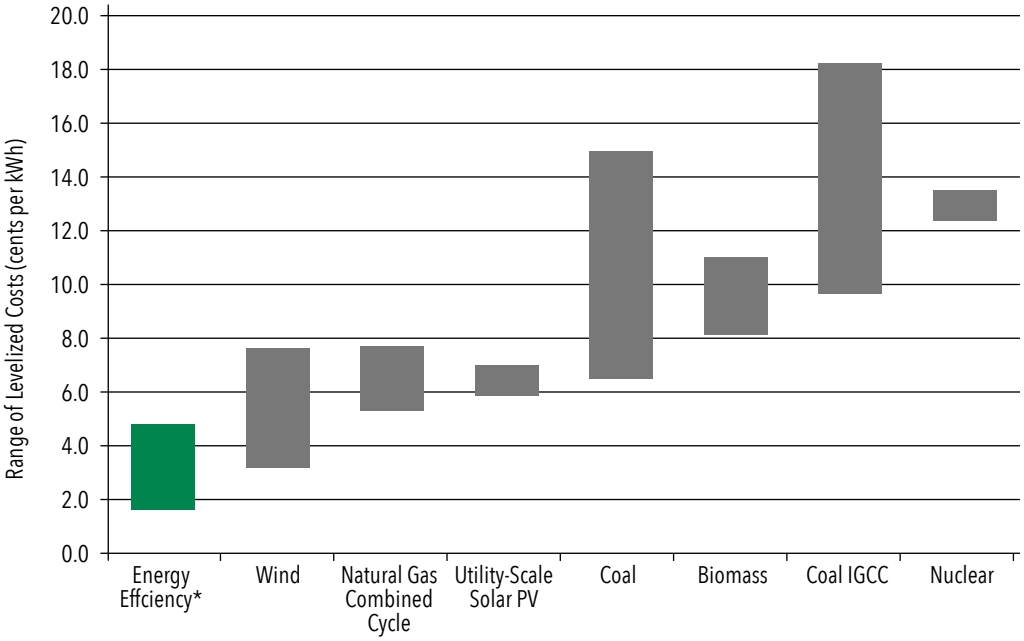
Greater building efficiency can meet 85 percent of future demand for energy in the United States.

Energy consumed by commercial buildings and industrial facilities is responsible for 40 percent of all carbon emissions from power plants in the United States. Commercial buildings account for 16 percent of greenhouse gas emissions.[1] In major cities such as New York City, buildings are responsible for 70 percent of greenhouse gas emissions.[2] The ENERGY STAR Buildings program demonstrated that existing buildings could, on average, be 30 percent more energy efficient while continuing to perform without compromise for their owners, managers, and occupants.[3]

The results of the ENERGY STAR Buildings program are impressive. By 2015, more than 400,000 buildings were using the program's tools to measure and track their energy performance and more than 25,000 had earned ENERGY STAR certification for superior energy efficiency. The resulting energy saved was the equivalent of 17 million metric tons of carbon dioxide equivalent (MtCO2e), or the electricity use of 2.3 million homes annually.[4]

By focusing on existing commercial buildings, the ENERGY STAR Buildings program was able to address all the energy consumption and emissions that resulted from their operation. Newly designed and constructed buildings were included on a "post

The Resource Cost Advantage of Energy Efficiency[5]



**Note: Energy efficiency program portfolio data from Molina 2014; All other data from Lazard 2015. High-end range of coal includes 90% carbon capture and compression.*

construction performance basis" since new buildings become existing buildings as soon as they are put into service. The ENERGY STAR Buildings program also encouraged new building designs that would result in the construction of high-performing energy-efficient buildings.

While the ENERGY STAR Buildings program did not limit the scope of buildings that were included in the program, it did provide a particular focus on building types that were the most energy intensive, represented the most square footage, and had the potential to result in the greatest carbon emissions reductions.

Critical to this process is the essential realization that the energy performance of buildings can be improved in a financially justifiable manner, creating energy-efficient buildings.

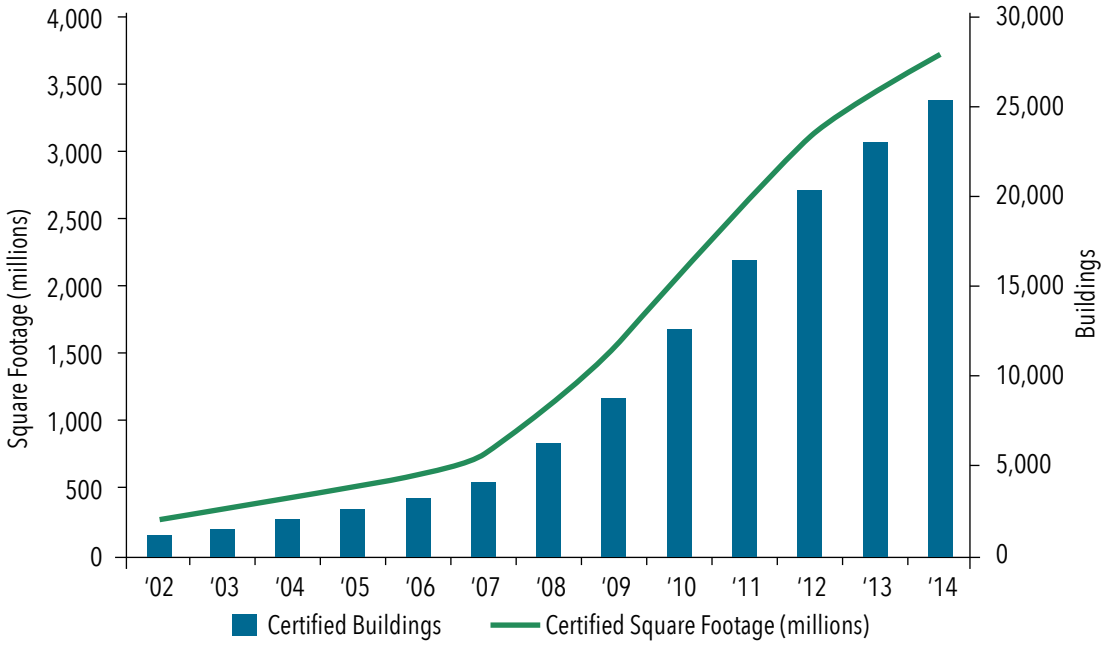
Energy Efficiency is an Energy Resource

Energy efficiency remains the cheapest and cleanest form of new energy supply. Greater building efficiency can meet 85 percent of future demand for energy in the United States.[5] (See chart from the American Council for an Energy Efficient Economy) Simply put, a watt not used does not have to be generated. When considering a shift from fossil fuels to renewables, it is important to reduce the demand and consumption of energy as much as possible in concert with deploying a renewable energy supply system. While both energy efficiency and renewable energy generation can be pursued together, it is important to remember that reducing the overall demand and consumption of energy will result in a reduction in the amount of renewable energy resources that will be required to achieve the overall goal of reducing carbon emissions. In this way the transition to a low carbon energy system based primarily on renewables can be accomplished more quickly.

Energy-Efficient Building Definition

The United States' ENERGY STAR Buildings program defined an energy-efficient building as a one that is more energy efficient that 75 percent of similar buildings in the nationwide building population. The ENERGY STAR Buildings program provides ENERGY STAR building certification to buildings that perform in the top quartile of similar building types. In this way, an energy-efficient building does not have to be an abstract idea, or a conceptual maximization of energy efficiency in a building. The placing of the ENERGY STAR building certification level at the top quartile

ENERGY STAR Certified Buildings and Square Footage (Cumulative)[16]



of buildings enables the vast population of buildings to have a realistic opportunity to embrace energy efficiency and achieve certification.

The strength of the ENERGY STAR Buildings program is the ability to:

- Measure ACTUAL energy use in buildings on a level playing field
- Identify and score the relative energy performance of buildings to each other
- Recognize those buildings in the top quartile with ENERGY STAR building certification

By comparing buildings based on ACTUAL energy performance, it is not necessary to prescribe the technological components or the management practices that are inherent to energy-efficient buildings but merely to assess the resulting energy performance. This "results orientation" frees the program to focus on overall energy management strategies and the benefits of improved energy performance without getting bogged down in the complex world of evolving energy efficiency technologies.

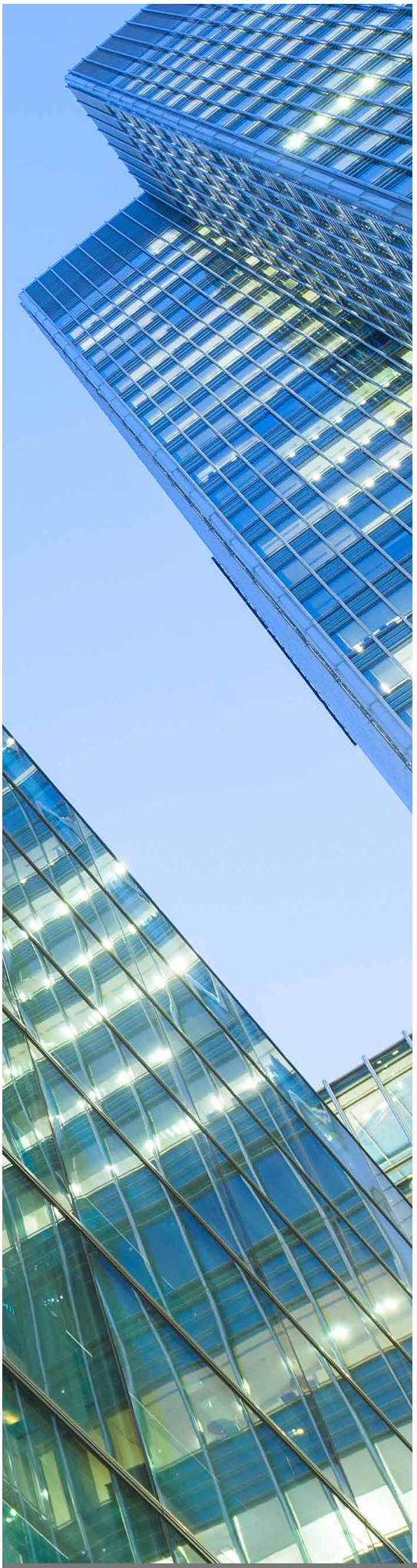
The Market for Energy-Efficient Buildings

Simply put, a market for energy-efficient buildings is a market that recognizes energy-efficient buildings and their value attributes. But a market must be able to:

- Understand the actual relative energy performance of buildings
- Understand the value attributes of energy-efficient buildings for their owners and the community
- Understand the process of improving the energy performance of buildings.

And, the market must be able to identify and recognize energy-efficient buildings through a generally accepted certification process.

The United States' ENERGY STAR Buildings program incorporated a suite of market-transforming program elements to successfully improve the energy performance of buildings, identify energy-efficient buildings, and create a market for them. This guide will show how.

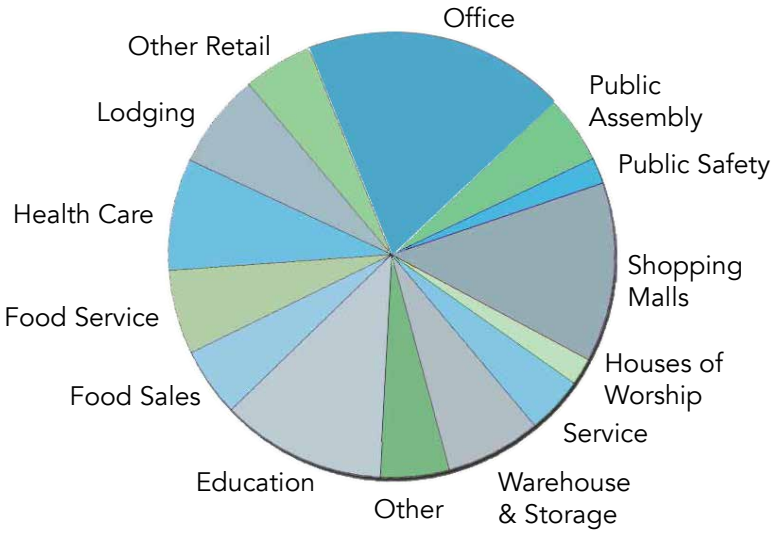


Chapter 1:
Why Focus on Energy Efficiency in Commercial Buildings

Energy efficiency in existing commercial buildings offers a significant opportunity to save energy, save money, reduce emissions, enhance building asset values, and stimulate the economy.

The financial and economic benefits of energy efficiency projects in buildings are strong enough to create a market-driven opportunity for building owners, managers, occupants, and entire communities to benefit from improved energy efficiency in buildings. For the benefits to be realized, it is only necessary for building owners, managers, energy service providers, and communities to fully understand the magnitude of the financial and economic benefits of measuring, tracking, and improving the energy performance of buildings. Moreover, improving the energy efficiency of buildings can be accomplished by utilizing existing low-risk proven technologies and energy management best practices.

Carbon Emissions by Building Type[25]



Creating energy-efficient buildings is a low-risk, high-return, financial and economic opportunity that is easily realizable.

The Environmental Benefits: Save Energy Reduce Emissions

Every building, from the smallest retail store to the largest office tower, uses energy. In the United States, this energy is mostly generated by burning fossil fuels, which releases greenhouse gas emissions. In fact, the buildings in our communities—offices, hospitals, schools, supermarkets, factories and multi-family housing—account for nearly 40 percent of all greenhouse gas emissions in the United States and the world. In major cities such as New York City, buildings are responsible for 70 percent of carbon emissions.[1,2]

A EPA study of more than 35,000 buildings working with the ENERGY STAR program revealed average annual energy savings every year of 2.4 percent, with a total savings of 7 percent over the three years.

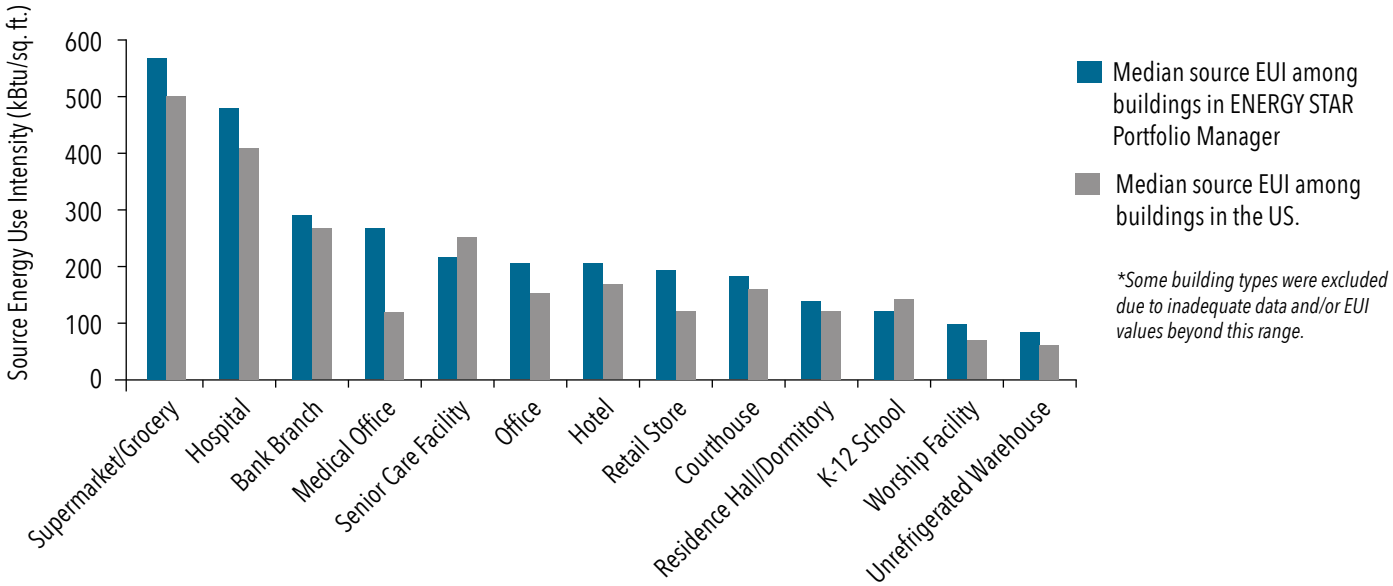
Here's the opportunity: Much of that energy—often 30 percent or more—is wasted.[6] Improving the energy efficiency of the technologies used in buildings is the single largest way to eliminate this waste. It's also the most cost-effective policy. Reducing energy consumption in existing commercial buildings is simply a matter of retrofitting the existing building systems with the latest energy-efficient lighting, HVAC, and energy management systems.

However, energy efficiency is not just an investment in equipment, but also in energy management best practices and changes in behavior that, when combined, can make a big improvement in the energy performance of buildings.

Through the ENERGY STAR Buildings program, thousands of organizations in the United States are transforming the way they use energy every day. And they're preventing millions of metric tons of greenhouse gas emissions from entering the atmosphere. Participants in the ENERGY STAR Buildings program have cut their energy use by 30, 40, and even 60 percent in a single year! School districts and retailers are improving their efficiency by up to 30 percent across their entire building portfolios. On average, ENERGY STAR certified buildings use 35 percent less energy and cause 35 percent fewer greenhouse gas emissions than similar buildings across the United States.

Typical Energy Use Intensity (EUI) values for various building types and is based on research the

Typical Energy Use Intensity (EUI) Values for Different Building Types*[23]



Some building types were excluded due to inadequate data and/or EUI values beyond this range.

The McKinsey Study

In 2009, the United States consulting firm McKinsey published a study entitled "Unlocking Energy Efficiency in the US Economy." Their research shows that the US economy has the potential to reduce annual non-transportation energy consumption by roughly 23 percent by 2020, eliminating more than $1.2 trillion in waste—well beyond the $520 billion upfront investment (not including program costs) that would be required. The reduction in energy use would also result in the abatement of 1.1 gigatons of greenhouse gas emissions annually—the equivalent of taking the entire US fleet of passenger vehicles and light trucks off the roads.[13]

ENERGY STAR Buildings program conducted on more than 100,000 buildings benchmarking in the ENERGY STAR Buildings program's energy performance rating tool, ENERGY STAR Portfolio Manager.[7]

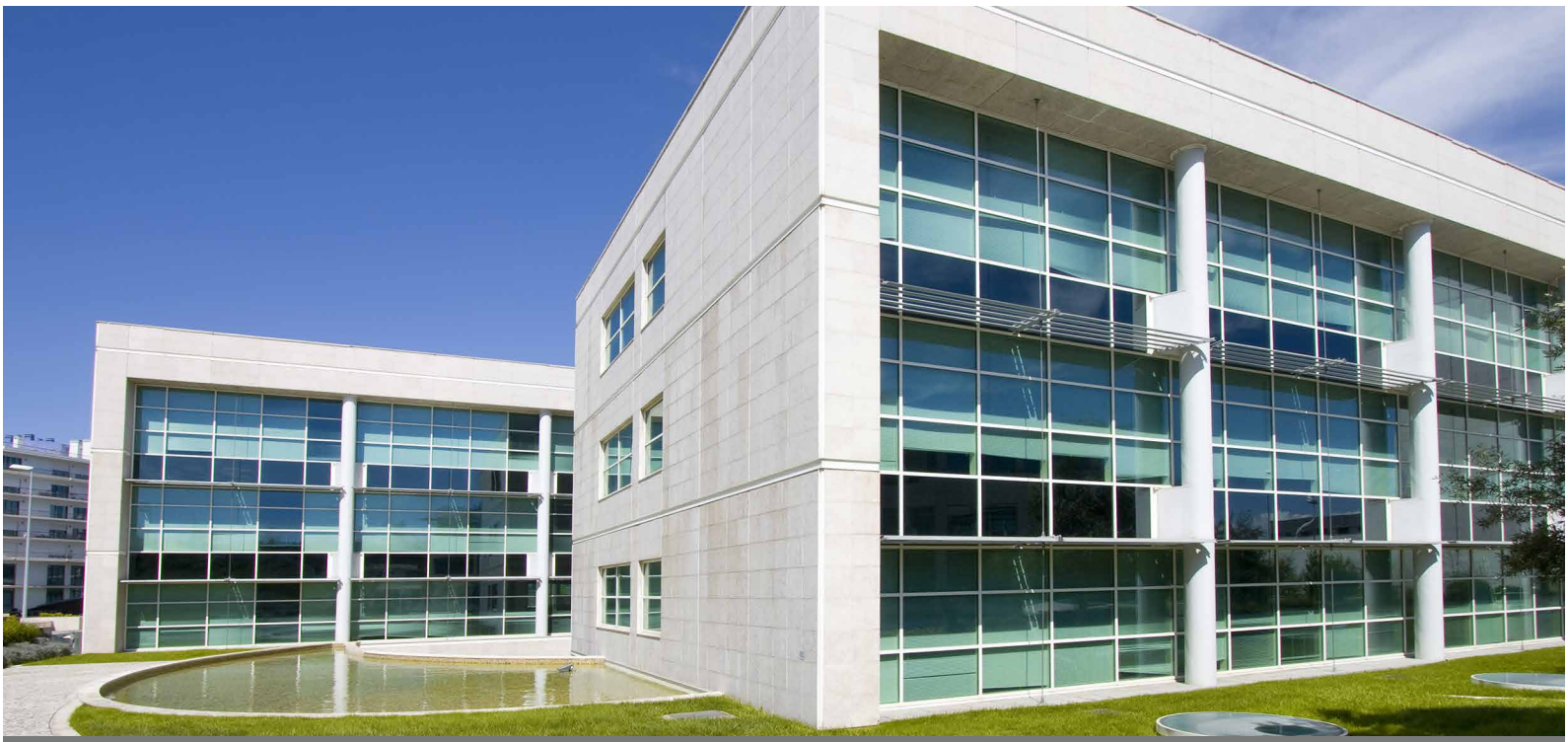
The Emissions Reduction Potential

Each year, the improved energy efficiency of buildings participating in the ENERGY STAR Buildings program has resulted in saving the equivalent of 118 million metric tons of carbon dioxide equivalent (MMTCO2e). That's equal to the emissions resulting from powering 18 million homes, or 25 million cars, or produced by 33 coal-fired power plants.[8]

More than 35,000 buildings actively participated in the ENERGY STAR Buildings program between 2008 through 2011, representing three years of change from a 2008 baseline. A study of these buildings revealed average annual energy savings every year of 2.4 percent, with a total savings of 7 percent over the three years. If all buildings in the U.S. followed a similar trend, more than 18 million metric tons of carbon dioxide equivalent could be prevented from entering the atmosphere each year. Through 2020, the total savings could be approximately 25 percent.[9]

Local Environmental Benefits

Emissions from power plants not only contribute to climate change but also detrimentally affect public



health depending on the type of energy sources used in power generation. Communities dependent on coal for power generation, for example, have a different environmental outlook that those relying on natural gas generation. One only needs to look at the current situation in China, where entire cities have been shut down because the air is too dangerous to breathe.

Improving the energy efficiency of buildings will also reduce the need for existing or new power plants. In the case of polluting energy sources, no community wants a polluting power plant near them. There remain many questions about the safety of nuclear power. Some communities don't even want large wind farms located locally. And, in the case of hydro power, why waste critical water and habitat resources on power generation that could be saved through energy efficiency?

The Financial and Economic Benefits of Creating Energy-Efficient Buildings

A broad range of economic benefits can be realized by implementing energy efficiency projects in buildings. These benefits include the **direct financial savings** to building owners, the **economic development benefits** of the process of making buildings more energy efficient, and the **future economic growth benefits** of a modernized building infrastructure that will be more attractive to investors and occupants.

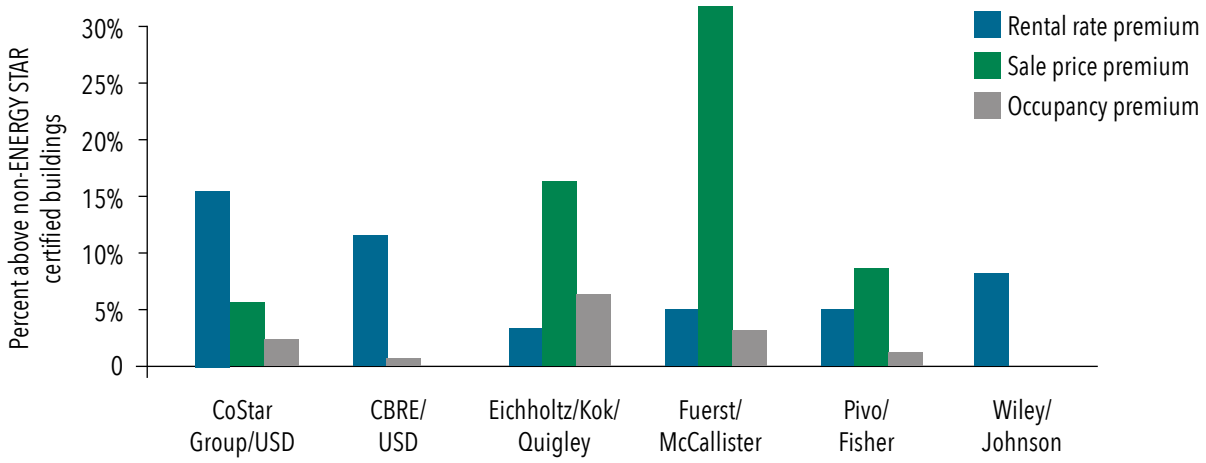
Direct Financial Benefits

The first of these is the direct financial savings from reducing the operating costs of buildings. **Investing in energy-saving technologies is profitable.** Saving energy saves money for building owners, managers, and occupants.

Since energy efficiency improvements save energy and money, the financial savings from implementing these energy-efficient technologies in commercial buildings can be used to quickly pay for the investments in energy-saving technologies within a period of 3 – 5 years. This represents a financial return on investment of 20 percent – 35 percent. The new energy-saving technologies are so effective—and the financial benefits so strong—that it makes economic sense to retrofit buildings that are just 10 years old and simply replace the buildings' older energy-consuming systems with new energy-efficient systems.

The financial value of measuring, tracking, and improving energy performance can be expressed in terms that are meaningful to each building type. studies have shown that energy-efficient commercial real estate buildings typically have lower vacancy rates, higher rents, and greater asset values. In the commercial real estate market sector, ENERGY STAR certified buildings rent for 6.5 percent more and sell for 12.9 percent more. Each $1-per-square-foot savings in office buildings increases cash flow by $0.95 and asset value by $13 per square foot. This improved valuation results from capitalizing the increased net operating income resulting from energy savings.[10]

The Value of ENERGY STAR Certified Buildings[27]



Keeping it Local

In some cases, it may be possible, depending on product demand, to establish the manufacturing of the new equipment within the community itself, furthering job creation. In one instance in New York City, the project to improve the energy efficiency of the Empire State Building by 38 percent included the replacement of 6,500 windows. To facilitate this process, the windows were refurbished on site. The entire energy efficiency project resulted in savings of more than $4 million per year and the creation of more than 250 jobs. Opportunities for creating local manufacturing jobs can be extended to other types of energy-efficient equipment such as lighting fixtures, heating, and ventilation equipment.[11]

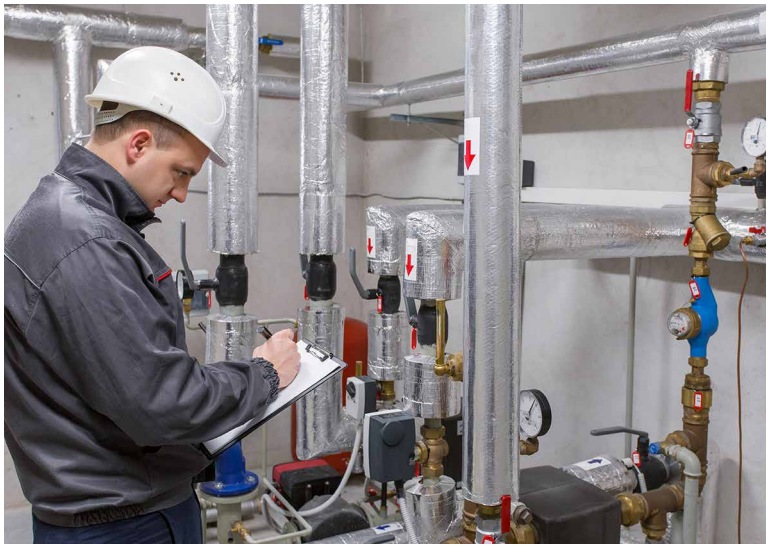
The financial benefits also extend to the profitability, competitiveness, and value of corporations that use buildings to house their operations. An energy savings of 2.4 percent for three consecutive years is equivalent to the following financial benefits in the United States[9]:

- **500,000-square-foot office building:** Cumulative energy cost savings of $120,000 result in an increase in asset value of more than $1 million.
- **Medium-size retailer with 500 stores:** Cumulative energy cost savings of $2.5 million is the equivalent of an increase in sales of 0.89 percent.
- **Full-service hotel chain with 100 properties:** Cumulative energy cost savings of $4.1 million is the equivalent of an increase in revenue per available room of $1.41.
- **800,000-square-foot school district:** Cumulative energy cost savings of $140,000 equals the salary of 1.2 full-time teachers each year.

Economic Benefits

Secondly, there is the increased economic activity resulting from manufacturing and installing more energy-efficient technologies in commercial buildings. There is both the potential to stimulate new technological product manufacturing and expand employment opportunities resulting from the installation of new technologies in buildings. These benefits result from the engineering activities of **Energy Efficiency Service Companies** that design and install energy efficiency projects in buildings. These companies can also provide or arrange for capital loans for building owners to pay for energy efficiency projects. The loans are repaid from the financial savings produced by the energy efficiency projects. The savings are usually large enough to produce a net positive cash flow to the building owner even while the loan payments are being made. Once the loan is paid off, usually in 5 – 7 years, the savings are free in perpetuity.

At the community level there are many indirect benefits that accrue to the community from both the activities that make buildings more energy efficient and the establishment of a modernized energy-efficient building infrastructure.



Communities accrue many indirect benefits—such as job creation—when they invest in energy efficiency programs.

One of these is **job creation**. Energy efficiency projects require the design, financing, and installation of energy efficiency projects within buildings. These projects include the work of engineers who measure building energy performance and identify energy saving opportunities. Once a project has been identified, the proper technological equipment must be identified, purchased from vendors, financed by banks, and installed in the building. The installation activities are labor-intensive and usually involve skilled electrical trades.

Energy reliability can also be enhanced by energy-efficient buildings which reduce energy demand on the local electrical grid. This is especially important when growing a 21st-century economy where more and more energy is required to power buildings and the latest technologies within them. Greater energy efficiency eventually plays out in terms of greater local electrical grid capacity and reliability. In fact, in some locations in the US, electric utilities provide financial incentives to energy users to save energy. In this way, the electric utilities recognize that it is more cost effective to encourage energy users to save energy than to build new generation capacity and distribution infrastructure. Moreover, restrictions on the location of energy generation facilities exacerbates the problem of expanding generation capacity.

Additionally, a unit of energy that is not consumed saves more than a unit of energy generated. This is the result of the inherent inefficiencies of the generation process itself and the losses incurred in the transmission and distribution of electrical energy through the electric grid system. The amount of energy that is wasted through the generation and the distribution process depends on the mix of energy sources in the region.

Finally, energy efficiency reduces the overall demand for generated energy, thus allowing for the introduction of **renewable energy** on a more cost-effective basis. Simply put, why develop new clean energy resources to satisfy wasteful energy demand? In this sense, energy efficiency is a critical first step in the transition to a renewable energy infrastructure.

Future Economic Growth

The most strategic benefit of all is the potential repositioning of an entire national building infrastructure to be more competitive in attracting business activity. The business world of the 21st century requires

The Rockefeller Study

In 2012, The Rockefeller Foundation and DB Climate Change Advisors (DBCCA) released a research study that examined the potential size and investment opportunity of upgrading and replacing energy-consuming equipment in US buildings. The paper is entitled, "United States Building Energy Efficiency Retrofits: Market Sizing and Financing Models."[12]

The Rockefeller Foundation noted that "buildings consume approximately 40 percent of the world's energy and are responsible for 40 percent of global carbon emissions."

In this report, the Rockefeller Foundation highlights that:

- Roughly $279 billion could be invested in retrofitting the residential, commercial, and institutional market segments in the US.
- This investment could yield more than $1 trillion in energy savings over 10 years, equivalent to savings of approximately 30 percent of annual electricity expenditures in the United States.
- If all of these retrofits were undertaken, more than 3.3 million job years could be created.
- These jobs would include a range of skill qualifications and would be geographically diverse.

Additionally, if all of these retrofits were successfully undertaken, it would reduce U.S. emissions by nearly 10 percent.

high-performing, efficient, state-of-the-art, modern buildings that can accommodate today's technology-intense business activities. By revitalizing the energy infrastructure of existing buildings, the entire economic base of a community can be improved to take advantage of future economic growth and investment opportunities.

Why Focus on Existing Buildings Versus New Buildings

It is important to note that the ENERGY STAR Buildings program focused primarily on existing buildings. In this way it was possible to address the full potential of emissions reductions from energy savings in all commercial buildings. Sometimes there is a tendency to focus only on new construction and the maximum potential of energy efficiency in new buildings. However, while optimizing energy use in new building construction is an important consideration and opportunity, a more modest 10 – 20 percent savings in the full population of existing buildings can produce dramatic results, as in the case of the ENERGY STAR Buildings program.

> Simply put, why develop new clean energy resources to satisfy wasteful energy demand? In this sense, energy efficiency is a critical first step in the transition to a renewable energy infrastructure.

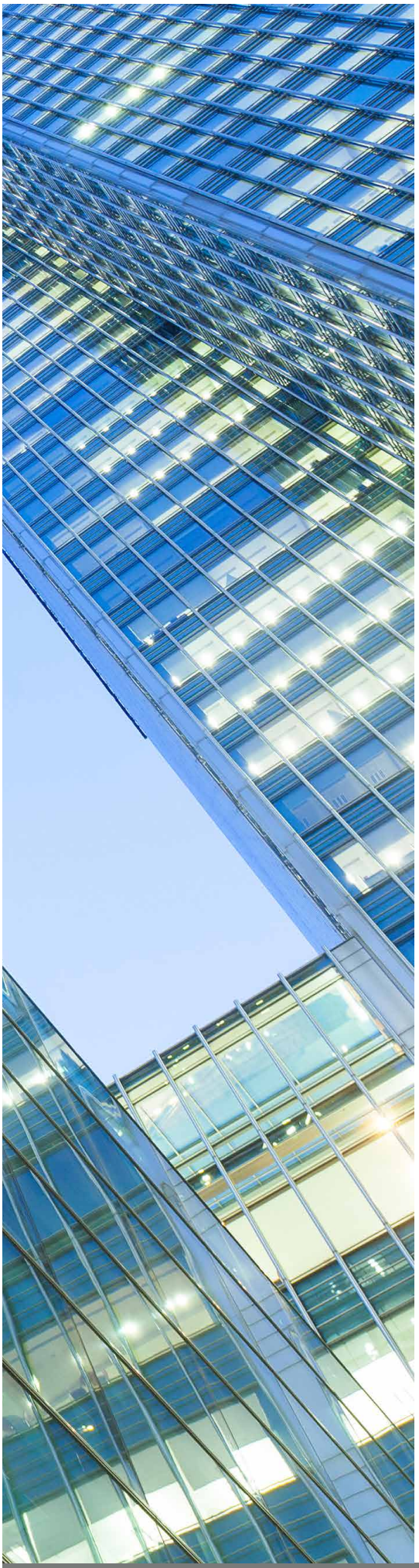
Energy Efficiency as an Energy Resource

As mentioned in the introduction, energy efficiency remains the cheapest and cleanest form of new energy supply. Greater building energy efficiency can meet 85 percent of future demand for energy in the United States.[3] Simply put, a watt not used does not have to be generated. When considering a shift from fossil fuels to renewables, it is important to reduce the demand and consumption of energy as much as possible in concert with developing a renewable energy supply system. While both energy efficiency and renewable energy generation can be pursued together, it is important to remember that reducing the overall demand and consumption of energy will result in a reduction in the amount of renewable energy resources

that will be required to achieve the overall goal of reducing carbon emissions. In this way the transition to a low carbon energy system based primarily on renewables can be accomplished more quickly.

CHAPTER SUMMARY

- Improving the energy efficiency of buildings—and reducing the associated greenhouse gas emissions—is a significant opportunity that saves money, creates jobs, strengthens the local economy, supports grid reliability, and helps pave the way for investments in renewable energy.
- Commercial buildings and industrial plants account for nearly 40 percent of greenhouse gas emissions. In many cities, buildings are responsible for roughly 70 percent of greenhouse gas emissions.
- On average, 30 percent of the energy that buildings use is wasted.
- A study of buildings that actively participated in the US EPA's ENERGY STAR Buildings program showed that they reduced their energy use by an average of 2.4 percent per year.
- The return on investment for implementing energy-saving technologies is 3 – 5 years, on average.



Chapter 2:
Who Can Create a Market for Energy-Efficient Buildings

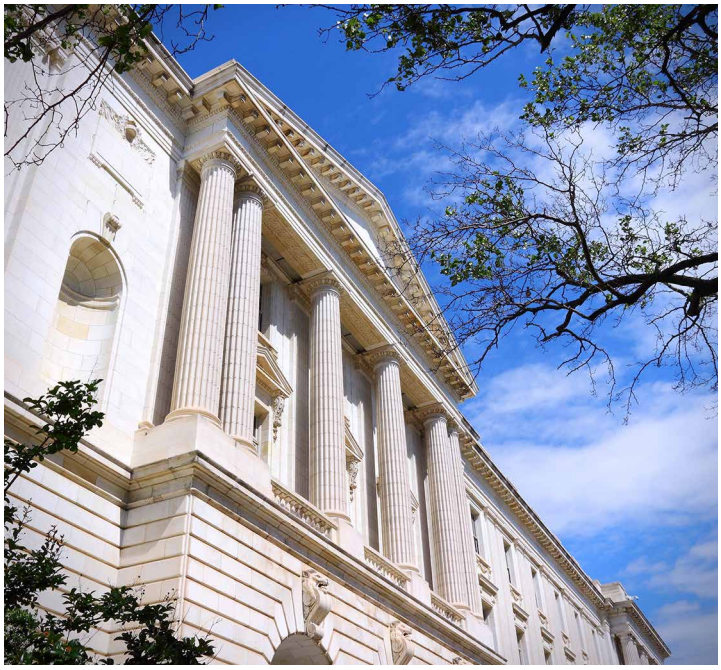
A market for energy-efficient buildings can be sponsored and created by several different types of organizations. However, whichever organization takes the lead in creating a market for energy-efficient buildings, it will need the cooperation of other organizations.

Governments

Governments are well positioned to sponsor and create a voluntary energy efficient commercial buildings program because governments are authoritative, independent, respected, and act in the public interest. Currently, many governments have committed to greenhouse gas emissions reduction goals and need a proven strategy to reduce emissions. Energy efficiency is one of those strategies. Governments also have financial resources that can be devoted to program development.

In the United States, the US Environmental Protection Agency (US EPA) created and manages the ENERGY STAR Buildings Program. This is a government agency with the responsibility of reducing all types of pollution in the environment, including greenhouse gases, which are now considered air pollution in the United States. Rather than institute a regulatory regime for reducing carbon emissions, in 1999 the US EPA created the voluntary ENERGY STAR Buildings program, which provides the ability for buildings owners, managers, and occupants to measure, track, and improve commercial building energy performance. The US EPA ENERGY STAR Buildings program developed a web-based **Energy Performance Rating System** which was made available to the pubic for free.

A key element of the Energy Performance Rating System is the identification and certification of energy-efficient buildings. Besides building owners and managers, the ENERGY STAR Buildings program also includes the participation



Many governments have committed to greenhouse gas emissions reduction goals and need a proven strategy to achieve them.

of Energy Efficiency Service Companies, which are an important market resource for improving the energy efficiency of commercial buildings.

To stimulate market demand for energy-efficient buildings and energy efficiency services, the ENERGY STAR Buildings program formed working partnerships with buildings owners and Energy Efficiency Service Companies. **These partnerships were centered on educating the market on the feasibility of new energy-efficient technologies and the financial benefits of implementing energy efficiency improvements in buildings.** The end result was bringing together energy users and energy services providers in mutually beneficial financial transactions to improve the energy performance of buildings through energy efficiency.

Non-Profit Organizations

Independent non-profit organizations similar to the US Green Building Council, which sponsored a successful Green Buildings Program, can very effectively create and manage a voluntary energy-efficient buildings program. This is especially true since the success of the program will be driven by market dynamics and not by government regulation. While a non-profit does not have the authority of a government agency, it can nevertheless stimulate voluntary market demand for energy-efficient buildings. However, the non-profit organization must engage the participation of buildings owners, managers, tenants, and especially the providers of the energy efficiency products and services that make buildings more energy efficient. ***All of these market participants stand to reap significant financial rewards from improving the energy efficiency of commercial buildings.*** The non-profit entity must still provide the tools and resources that the ENERGY STAR Buildings program provided. These can be supported financially through the membership dues of participating organizations, such as product manufacturers and Energy Efficiency Service Companies.

Trade Associations

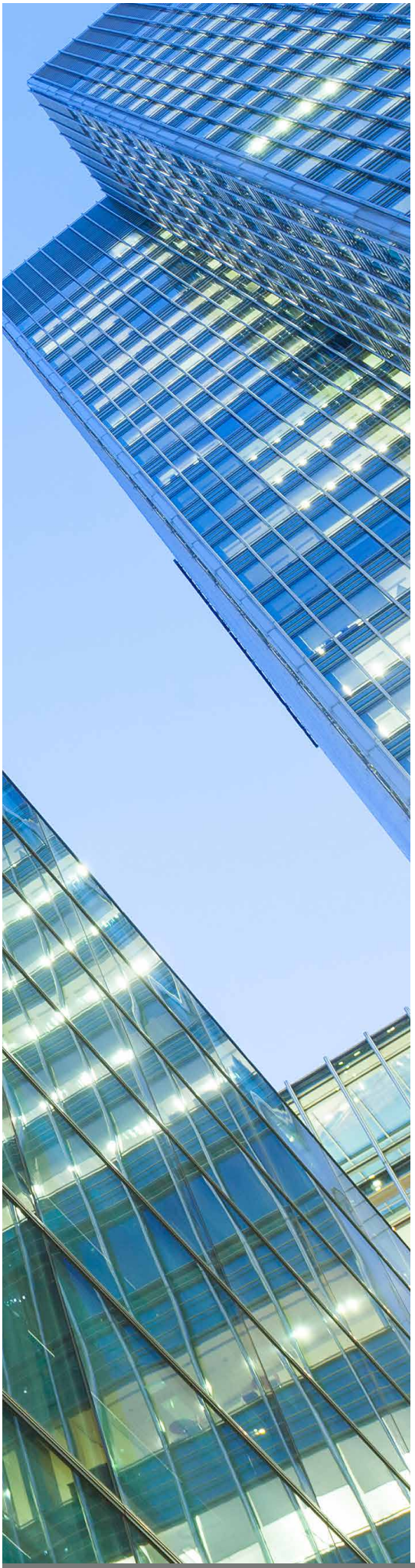
Trade associations, such as the International Association of Energy Engineers, are also well positioned to create and manage a voluntary energy-efficient buildings program, especially those focused on commercial building design, engineering, product manufacturing, and providing the energy efficiency services that improve commercial building energy performance. These established organizations are usually well financed and have the inherent goal of providing education and communications on market trends to their members and, most importantly, ***stimulating market demand for the services and products of their members.***

Building owners and managers associations may also constitute another important trade association that can sponsor an energy-efficient buildings market. Utilizing energy efficiency, the members of these organizations have a significant financial opportunity to make their organizations and buildings more **competitive, profitable, and valuable.**

CHAPTER SUMMARY

Several different types of organizations can take the lead in creating a market for energy efficient buildings:

1. Governments
2. Non-profit organizations
3. Trade associations



Chapter 3:
How to Create a Market for Energy Efficient Commercial Buildings

Creating a market for energy-efficient buildings requires taking several actions to influence market behavior through the power of information.

This chapter describes each of those actions, beginning in **Section 1** with the establishment of four informational program elements. These include providing an Energy Performance Rating System for rating and documenting commercial building energy performance. This section also includes providing credible technical and financial information to the market and establishing energy performance public disclosure policies.

Section 2 focuses on creating and implementing the components of the Energy Performance Rating System. This includes the development of a web-based Energy Performance Rating Tool that will deliver a building's Energy Performance Score and related documentation.

Section 3 describes how to identify and influence market participants based on free market dynamics. Creating a market for energy-efficient buildings relies on establishing both market demand for energy efficient buildings and a supply of energy efficient buildings. The motivations of the different market participants are revealed along with the critical role of Energy Efficiency Service Companies.

Section 4 encourages the establishment of energy performance public disclosure policies. These policies require the public availability of building energy performance information so that the market can make informed decisions. Current trends and the benefits of energy performance public disclosure policies are described.

Section 5 describes the importance of providing credible technical and financial educational resources and recommends strategies for the research, creation, and distribution of these resources to market participants.

CHAPTER 3

Section 1:
Influencing Market Behavior through the Power of Information

Establish Four Market Behavior Influencing Program Elements

The market power of information can drive an energy-efficient buildings program. Creating a market for energy-efficient buildings requires the establishment of four market-behavior-influencing informational program elements. These program elements will drive the financial considerations of building owners and managers as well as various community stakeholders, such as energy service providers, product manufacturers, and economic development organizations. The four informational program elements as defined by the US EPA's ENERGY STAR Buildings program are:

1. Energy Performance Rating System

Develop and provide a web-based Energy Performance Rating System, to measure, track, document, compare, and recognize high-performing energy-efficient buildings. This system will consist of:

- An online **Energy Performance Rating Tool** to measure the ***actual*** energy use in buildings, allowing for the measurement, tracking, documentation, and comparison of energy use in buildings. This tool will deliver a building's Energy Performance Score.
- A simple comparative **Energy Performance Scale** (i.e. 1-100) that will indicate a building's normalized **Energy Performance Score** as compared to other similar buildings.
- Standard energy performance documentation in the form of a **Statement of Energy Performance**.

Four Program Elements to Influence Market Behavior

Energy Performance Rating System | Technical Information | Financial Information | Public Recgonition and Disclosure

- Recognition of high-performing energy-efficient buildings. This can take the form of awarding a **high performing building certification**.

Establishing standard energy performance documentation and the certification of high performing buildings is extremely important.

Once the energy performance of the building has been measured, it can be documented by a Statement of Energy Performance. If the building performs at a high level, it can be recognized as an energy-efficient building through building certification. Just as businesses have financial statements, buildings should have a Statement of Energy Performance. This documentation and recognition provides three important functions.

- **Documenting Performance:** The Statement of Energy Performance documents the energy performance of a building and any energy performance improvement. It can be used to disclose and communicate the energy performance of a building to interested parties such as prospective buyers, tenants, investors, or the general public.

- **Declaring Success:** Documentation of energy performance improvements and recognition through certification can be used to declare that an energy improvement project was a success.

- **Establishing Value:** A high level of energy performance represented by certification establishes that the building is more competitive, profitable and valuable.

2. Technical Information

Provide energy management technical information for building owners and managers that describes how energy use is manageable and that it can be reduced through the implementation of proven new technologies and better management practices. Energy savings can be achieved at low risk without compromising the intended function of the building.

3. Financial Information

Provide energy management financial information about the positive financial benefits for building owners, managers, and occupants of implementing energy efficiency projects in buildings. The energy savings improvements not only pay for the implementation of the projects at high rates of return but also improve the cash flows in the building, increasing business profitability and making the building more competitive, profitable and valuable.

4. Public Recgonition and Disclosure

Publicly recognize and disclose the energy-efficient buildings that have been awarded the high performing building certification. Public disclosure may also be expanded to include the public disclosure of the Energy Performance Score on an annual basis for all buildings as documented by the Statement of Energy Performance.

These four program elements are based on the power of information to inform and stimulate market behavior. Once it is understood, based on a commonly accepted measure, that a building is not energy efficient, then the opportunity for producing energy savings can also be measured and realized. The magnitude of the potential energy savings produces a strong financial incentive that drives the implementation of energy efficiency projects in the building. After all, why would a building owner want to give an energy utility money that could otherwise be saved and used to enhance the profitability of their own business? Additionally, a poorly performing building that is wasting energy is no different than a building with a leaky roof. It must be repaired to protect or improve the building's productivity and value.

Research and Promote New Technologies and Energy Management Practices to Building Owners

Organizations that own, manage, and operate buildings are not always aware of the opportunities to save energy in buildings by investing in new building technologies and management practices. It is important to promote these opportunities to building owners and managers because these low-risk opportunities to save energy are real and their benefits only increase in magnitude over time. Information on new energy efficient technologies is readily available from vendors

and independent research organizations. However, it may be necessary to bring this information together in a convenient package for building owners and managers to reference. The ENERGY STAR Buildings program published a Building Upgrade Manual that focused on the optimal technological strategy for improving the energy performance of a whole building. The ENERGY STAR Buildings program also initially provided in-depth technological information on lighting technologies and other building systems. As the new technologies became more established and generally accepted, the ENERGY STAR Buildings program shifted its emphasis away from education about technologies to education about the best management practices for their application and the value of the benefits to be derived.

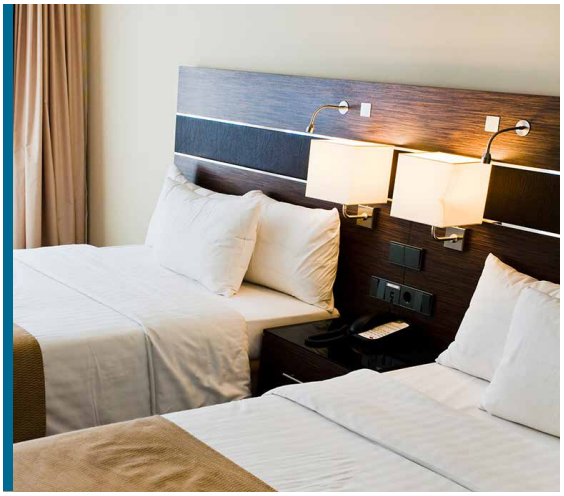
Once the Energy Performance Score of a building has been determined by the Energy Performance Rating Tool, its meaning needs to be fully understood by building owners and managers. A good score may qualify a building for certification. A poor score may indicate that there is a lucrative opportunity to save energy and money through a low-risk investment opportunity.

There are many new technologies and management practices available that can reduce the energy consumption of a building by 25 percent to 35 percent. They range from upgrading the lighting or the heating and ventilation equipment to installing computer-based Energy Management Systems (EMS). These technologies are low-risk and their performance is easily verified. The energy saved reduces utility bills and provides the financial savings that pay for the installation of the new equipment, usually within a 3 – 5 year timeframe.

Independent, third-party studies of the financial benefits can establish a credible, reasonable expectations for building owners, managers, and occupants.

In addition to new technologies, there are also management best practices that can save energy with little or no cost. These are practices such as cleaning buildings during the day instead of at night to save on lighting costs. They may also include modifying temperature settings or the timing of when a building's heating or cooling systems are turned on and off.

These equipment and management best practice opportunities are constantly evolving with the advent of new technologies and the availability of new information. There are many technological trade associations and research institutes—such as the National Electrical Manufacturers Association (NEMA), the American



Speak Their Language

Each type of business has a different motivation for becoming more energy efficient. Translate potential energy savings into metrics that they care about most:

Commercial real estate:
Net operating income

Hotels:
Revenue per room

Retail stores:
Sales growth and profit margins

Schools:
Cost minimization

Society of Mechanical Engineers (ASME), the Lighting Research Center at Rensselaer Polytechnic Institute (LRC), the National Renewable Energy Laboratory (NREL), E Source, and the Rocky Mountain Institute—that research and evaluate energy efficiency technologies.

Research and Promote the Financial Benefits of Energy-Efficient Buildings to Building Owners

The success of a market driven voluntary energy efficiency program will depend on educating the various building owners, managers, and occupants that the financial benefits of energy efficiency are genuine, low risk, and applicable to their businesses. Independent organizations or governments that research and disseminate the financial value of energy efficiency improvements for each major building type will add credibility to the financial benefits of energy efficiency. Independent, third-party-derived information is especially important since many Energy Efficiency Service Companies are often too optimistic, and overestimate the financial benefits of energy efficiency projects. The potential result of this aggressive selling is skepticism and a lack of confidence in the technologies or their benefits and often leads to inaction by building owners. However, independent, third-party studies of the financial benefits can dispel these concerns by establishing a credible, reasonable expectation of the benefits for building owners, managers, and occupants.

Clarifying and promoting the financial benefits of energy-efficient buildings is critical to establishing the credibility of creating a market for energy-efficient buildings. The implementation of an energy efficiency project in a building saves energy, money, and reduces emissions from power plants. The potential amount of energy savings depends on the building use and how energy-intensive the building is in the first place. For example, an office building, a hotel, a retail store, and a school all have different energy use intensities. These building types also have different use patterns and employ different technologies in their operation. Office buildings have more computers, hotels have more appliances, retail stores have intense display lighting, and schools have recreational facilities. Yet, each type of building has specific and valuable opportunities to benefit from energy efficiency.

It is important to emphasize the financial impact that energy efficiency savings will have on the business that is operating within the building. Each type of business will benefit in different ways from energy efficiency projects. Each type of business also has different motivations for becoming more energy efficient. For example, a 7 percent reduction in energy use could be expressed in the following ways:[9,10]

- **Commercial real estate office building** owners are interested in maximizing net operating income, which in turn impacts the asset value of their buildings. Energy savings in office buildings reduces operating costs, improves the occupancy rates, and increases rental rates. The net effect for a 500,000-square-foot office

building: Cumulative energy cost savings of $120,000 and an increase in asset value of more than $1 million. Each $1-per-square-foot savings in office buildings expenses increases cash flow by $0.95 and asset value by $13 per square foot.

- **Retail store** operators are very concerned with sales growth, market share, and expanding profit margins. For a medium-size retailer with 500 stores: Cumulative energy cost savings of $2.5 million is the equivalent of an increase in sales of 0.89 percent. That is the amount of sales increase that would be necessary to produce additional profits of $2.5 million.

- One way that **hotels** measure their financial strength is by how much money they are able to charge for a room per night. For a full-service hotel chain with 100 properties: Cumulative energy cost savings of $4.1 million is the equivalent of an increase in revenue per available room of $1.41. Thus, a hotel can be more competitive and profitable without actually raising room rates.

- **Schools** are a different case since they are not driven by the profit motive. However, operating costs are always a concern for schools. For an 800,000 square foot school district: Cumulative energy cost savings of $140,000 is equal to the salary of 1.2 full time teachers each year.

Disseminating the financial benefits of energy efficiency can be done through the various business associations whose members own or operate buildings. Associations are always looking to provide industry-specific information and opportunities that will benefit their members. In the US, these include major business associations such as the Building Owners and Managers Association, International Facilities Managers Association, National Association of State Energy Officials, the Institute for Real Estate Management, the National Association of Real Estate Investment Trusts, and the National Retail Federation.

Another important dissemination avenue is to make this information available to the Energy Efficiency Service Companies through their associations. Official third-party information related to the benefits of energy efficiency projects adds to the credibility of their project proposals and their industry in general. In the US, the ENERGY STAR program worked with the National Association of Energy Service Companies and the Association of Energy Engineers, among others,

to promote the financial benefits of energy efficiency in buildings.

Bringing together the building owners and Energy Efficiency Service Companies in a mutual understanding of the benefits of energy efficiency projects will go a long way to making a market for energy efficiency services and stimulating demand for the energy-efficient buildings that will be created.

Beyond the direct financial drivers for building owners for improving energy performance, there are also powerful **indirect financial drivers** for improving energy efficiency in buildings. These indirect financial drivers are represented by the interests of third parties such as:

- **Tenants,** who want to be in a low-cost building that is well managed. An energy-efficient building will command higher rents.
- **Mortgage lenders,** who will prefer to loan money to energy-efficient buildings since the owners will have greater cash flow available to repay the mortgage. The increased asset value of buildings will also make the loans more secure. In the future, mortgage lenders may require that the energy performance of a building be improved as part of a loan contract.
- **Prospective buyers,** who will be willing to pay more for efficient buildings or less for inefficient buildings. Energy performance will become part of building valuation assessments.

These indirect financial considerations create additional market pressures.

The Role of Public Disclosure Policies and Energy-Efficient Building Recognition

Public Disclosure

Public disclosure is the requirement that energy performance information be made available to the general public. There are many powerful market factors that can motivate building owners, Energy Efficiency Service Companies, product manufacturers, financiers, trade workers, energy utilities, economic development policy makers, environmentalists, and community citizens in the direction of making buildings more energy efficient. However, there may be no action taken by the market unless the energy performance of buildings is made **public information**, and the benefits of improved energy performance are understood by all market participants.

Public Disclosure and Greenhouse Gas Commitments

Many municipalities and governments have adopted goals to reduce GHG emissions within their jurisdictions. In many large cities, energy use in buildings is responsible for the majority of emissions from power plants. Having more efficient buildings, as part of the urban infrastructure, will reduce energy demand on power plants and the emissions associated with power generation. To encourage the improvement of building energy performance, many municipalities and governments have required the public disclosure of building energy performance. This public disclosure has taken the form of either requiring annual disclosure of the Energy Performance Score for buildings or

Many municipalities and governments have required the public disclosure of building energy performance, either on an annual basis or at the time of sale, leasing, or financing.

requiring disclosure when buildings are involved in a financial transaction such the sale, leasing, or financing of a building.

It is possible that in the future, municipalities may view poorly performing buildings as not contributing towards meeting municipal emissions reductions goals. Under these circumstances, underperforming buildings may be assessed an additional real estate tax penalty to discourage poor performance.

Public Disclosure of energy performance is an important part of making a market for energy-efficient buildings and will be fully discussed in a later chapter.

Recognition

Every energy efficiency project needs a way to declare and celebrate success. Awarding certification to high-performing buildings is a valid way of recognizing the achievement of creating an energy-efficient building. But awarding the certification alone is not enough to stimulate market interest. The United States ENERGY STAR Buildings program provided an online listing of ENERGY STAR certified buildings to create greater market awareness by enhancing their visibility.

SECTION SUMMARY

Creating a market for energy efficient buildings requires the establishment of four elements:

1. A system by which the energy efficiency of buildings gets measured and rated.
2. Technical information on how to manage energy use in buildings
3. Credible information about the financial benefits of energy efficient buildings. This information should be translated into statistics that are meaningful for each audience (i.e. For a retail store, converting bottom-line energy savings to the equivalent increase in revenue.)
4. Public disclosure of buildings' energy performance.

CHAPTER 3

Section 2:
Creating an Energy Performance Rating System

As described earlier, there are four **informational program elements** that must be established to successfully influence market demand for energy-efficient buildings. The most important of these is to develop and provide a web-based **Energy Performance Rating System** to measure, track, document, and recognize the energy performance of buildings. The critical component of this system is the **Energy Performance Rating Tool**, which delivers a building's **Energy Performance Score**. The Energy Performance Score indicates the building's energy performance on a simple normalized 1 – 100 **Energy Performance Scale**. The score is similar to other common metrics such as miles per gallon of fuel consumption for cars or a Body Mass Index for humans. Without such a generally accepted metric there can be no standard way to understand whether a building is energy efficient or not. And, in the end, you can't manage what you don't measure.

In the United States, the ENERGY STAR Buildings program created ENERGY STAR Portfolio Manager®, an online Energy Performance Rating Tool that is used to measure and track energy consumption as well as greenhouse gas emissions. It is also used to rate the energy performance of one building or a whole portfolio of buildings, in a secure online environment.

Components of the ENERGY STAR Buildings Energy Performance Rating System

The Energy Performance Rating Tool

The first of these is to develop and provide an online Energy Performance Rating Tool to measure, track, and document the **ACTUAL** energy consumption of a building and its related greenhouse gas emissions. The Energy Performance Rating Tool delivers the Energy Performance Score. The tool calculates the score from actual energy consumption data using information about the building type, its use, and operating characteristics. The Energy Performance Score indicates how the building is *currently* performing with regard to *actual* energy consumption.

Many building energy efficiency evaluation methodologies rely on energy audits that determine the presence of energy-efficient technologies in a building. These audits are then used to determine the modernization opportunities for upgrading the energy-consuming equipment in a building. Other methodologies model the technological characteristics of a building and **estimate** the energy performance of a building in

terms of an energy intensity index. However, none of these methodologies describe how a building is currently performing with regard to actual energy consumption.

The only way to determine if a building is actually energy efficient is to provide an Energy Performance Rating Tool that requires the input of current, *actual* energy consumption data and uses that data to evaluate how energy efficient a building is.

It cannot be assumed that a new building is energy efficient. Often buildings are designed, built, or renovated in a manner that incorporates new energy efficient technologies. However, these buildings do not always perform to the expectations of their design. Furthermore, their energy performance is affected by the many ways in which they are managed.

By creating a normalized Energy Performance Score based on actual energy use, energy performance can be determined at any point in the life of the building. Based on actual, measured data, the Energy Performance Score will incorporate how a building is currently performing as a whole, reflecting its technologies, its operations, and how people use it. Is the building open 24 hours? Does it have a high density of workers? What are the implications of weather and climate? An Energy Performance Score based on actual energy use will reflect how efficiently a building uses energy in the real world.

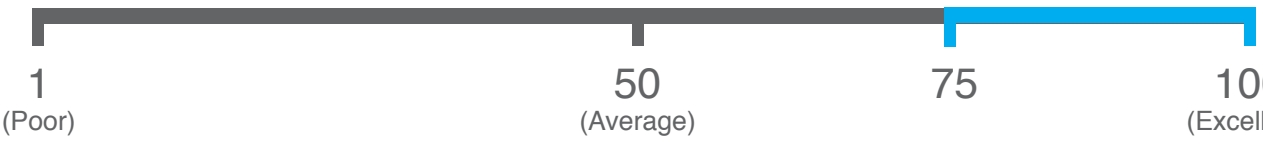
Also, by providing a rating based on actual energy consumption, the building can be rated every time new energy consumption data is available, which will allow for the tracking of energy performance over time. This is critical to the ongoing management of a building. It is important that energy performance improvements be managed on an ongoing basis. This capability also provides the building operators the opportunity to track the impact of energy efficiency improvements as they are implemented and to maintain a high level of energy performance going forward over time.

Actual energy consumption data is easily obtained from energy utility invoices. These invoices can then be used to populate the Energy Performance Rating Tool and update it monthly. In most cases this is done

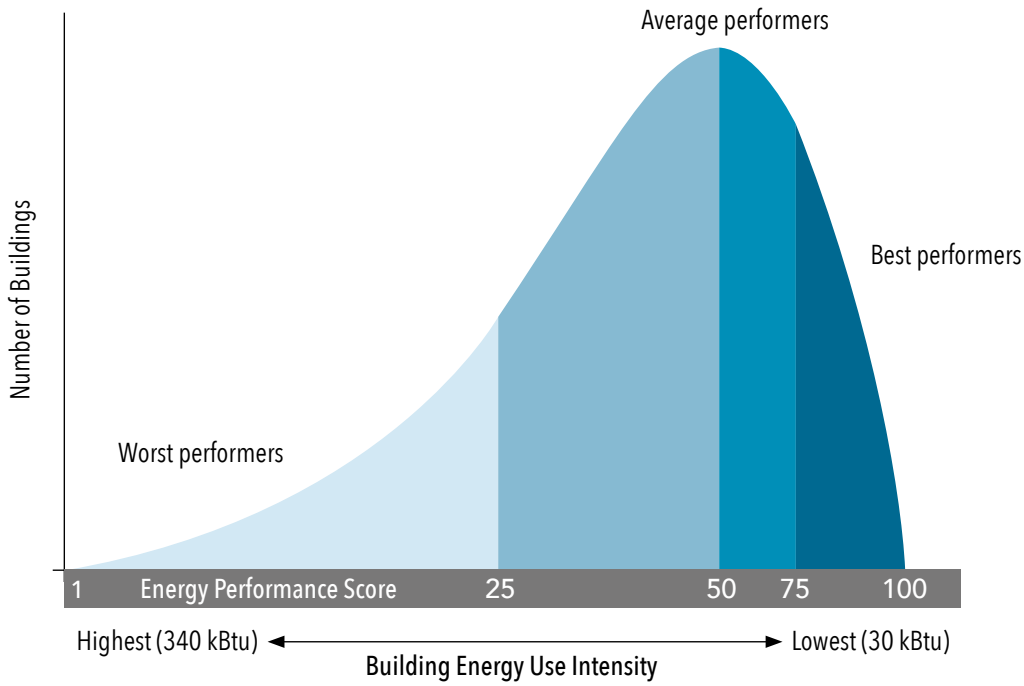
The ENERGY STAR Buildings Energy Performance Rating Scale

A higher score indicates a more energy-efficient building. Buildings with scores of 75 or higher are eligible for the ENERGY STAR Building certification.

Eligible for the ENERGY STAR



Distribution of ENERGY STAR Scores for US Buildings



The ENERGY STAR Energy Performance Rating Score indicates the percentile ranking of a building. A building with a score of 75 is more energy efficient than 75% of similar buildings. A building with a score of 50 is at the 50th percentile and is an average performing building.

manually via a simple online interface. In some cases building owners and managers authorize Energy Information Service Providers to obtain energy consumption data directly from the energy utility and upload it into the Energy Performance Rating Tool automatically.

The Energy Performance Scale

It is essential to provide a simple Energy Performance Scale that enables the objective comparison of buildings and that produces energy performance documentation in the form of a **Statement of Energy Performance**. There are many ways to view energy intensity in buildings. They include energy cost per square foot or energy consumed per square foot in terms of kBtus per year. However, these metrics are not usually normalized for building use or weather and climate impacts. They don't allow for the comparison of buildings across a national scope because energy sources and the costs of energy as well as weather and climate vary geographically. These metrics also do not reflect the impact of normalizing for building use based on factors such as building type, occupancy, worker density, or hours of operation.

It is important to establish a performance metric that can be universally and clearly understood by decision-makers, beyond engineering and architectural professionals. These decision-makers are typically Chief Executive Officers, Chief Financial Officers, Chief Operations Officers, and the whole management chain down to facility managers.

To achieve this clarity goal, the ENERGY STAR Buildings program created the Energy Performance Scale, which assigns a score between 1 and 100, to indicate how a building performs relative to similar buildings nationwide. The scores are automatically adjusted using standardized methods to take into account differences in building type, building attributes, operating characteristics, and weather and climate variables. The process of accounting for these differences in called normalization. Normalization would enable identical buildings with different operating hours to be compared fairly by allowing the building that is operating for more hours to have a larger energy budget for the purposes of comparison. This is similar to acknowledging that taller people can weigh more than shorter people, yet have the same Body Mass Index.

Within the ENERGY STAR Buildings program, an Energy Performance Score of 50 represents an average-performing building. A building with an Energy Performance Score of 75 or higher is performing in

Calculating Building Energy Performance Scores

The ENERGY STAR Buildings program does *not* compare buildings within its Energy Performance Rating Tool to other buildings using the tool to determine the ENERGY STAR Energy Performance Score. Instead, a building is compared to a static database of other buildings nationwide that have the same primary use. Where does this peer group come from?

Every four years, the U.S. Department of Energy's Energy Information Administration conducts a national survey to gather data on building characteristics and energy use from thousands of buildings across the United States. This Commercial Building Energy Consumption Survey (CBECS) is the only national-level source of data on the characteristics and energy use of commercial buildings. For most property types located in the United States, a building's peer group consists of those buildings in the CBECS survey that are similar to the one being scored.

For a few property types, such as hospitals and senior care communities, industry associations took the lead and conducted nationally representative surveys to gather the information necessary to create a robust data sample.

In this way, the ENERGY STAR Energy Performance Score is a relative score resulting from comparing a building to its peers. A score of 75 means that a building is more efficient than 75 percent of the buildings of that type in the country.

In countries where a national survey of building energy consumption is not available, it is possible to develop a "model" building and compare buildings to the "model". However, a model does not exist in the real world and such a comparison would not reveal where a building stands in the population of similar buildings. Yet, such a comparison could be useful in determining if a building meets or exceeds an energy efficiency standard that could be represented by the model.

While a "model" based Energy Performance Scale can be valuable in determining the energy efficiency of a building, the danger is to create a model that is arbitrarily too stringent. An overly stringent model could discourage participation by establishing a certification goal that is too difficult to achieve. Therefore, when creating an Energy Performance Scale using a model, it is important to keep the "average building" in mind.

Remember, the objective should be to improve the energy performance of all existing buildings somewhat, not to optimize the energy performance of a few buildings. Existing buildings have various constraints that will limit the degree to which energy performance can be improved. Some buildings that are very inefficient can save a lot of energy and related emissions by only improving 10 points on the Energy Performance Scale. This is important because a country might want to start by focusing on the bottom 25 percent of buildings. Other buildings that are already energy efficient can still reduce energy use marginally. Therefore, establishing a realistic standard either based on a real world building survey or a representative "model" is essential to program participation and success.

For complete details about how the ENERGY STAR Buildings program's Energy Performance Score is developed and calculated, refer to Portfolio Manager technical reference: ENERGY STAR Score (www.energystar.gov/buildings/tools-and-resources/portfolio-manager-technical-reference-energy-star-score)

Site Energy vs. Source Energy

The ENERGY STAR Buildings program has determined that **source energy** is the most equitable unit of evaluating building energy performance. Commercial buildings use all types of energy, from electricity to natural gas to steam. To compare a diverse set of commercial buildings equitably, the 1 – 100 ENERGY STAR score must express the consumption of each type of energy in a single common unit. Source energy represents the total amount of raw fuel that is required to operate the building, including on-site renewables.[26] It incorporates all transmission, delivery, and production energy losses. By taking *all* energy use into account, the Energy Performance Score provides a complete assessment of energy consumption in a building.

Site energy, on the other hand, is the amount of heat and electricity consumed by a building as reflected in utility bills. Looking at site energy can help to understand how the energy use for an individual building has changed over time. But site energy alone cannot be used to compare buildings effectively.

Site energy may be delivered to a building in one of two forms: primary or secondary energy. **Primary energy** is the raw fuel that is burned on-site to create heat and electricity, such as natural gas or fuel oil. **Secondary energy** is the energy product (heat or electricity) created from a raw fuel, such as electricity purchased from the grid or heat received from a district steam system. A unit of primary energy burned on-site and a unit of secondary energy consumed on-site are not directly comparable because one represents a raw fuel while the other represents a converted fuel.

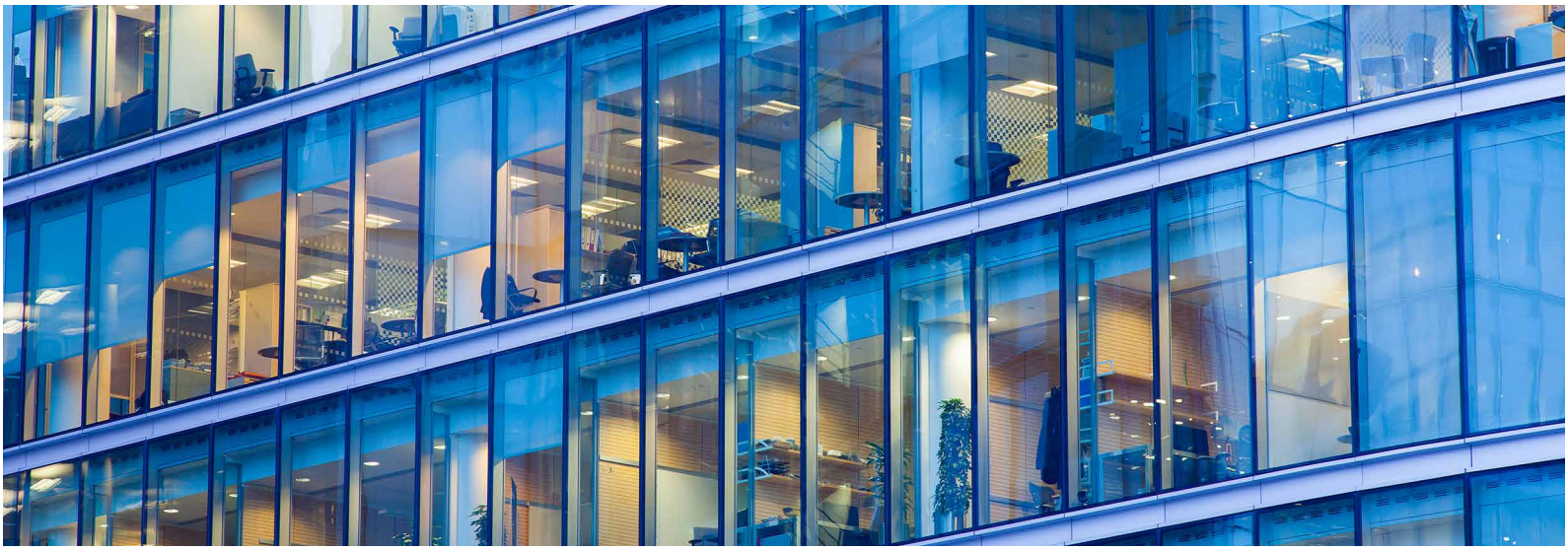
Therefore, to assess the relative efficiencies of buildings with varying proportions of primary and secondary energy consumption, it is necessary to convert these two types of energy into equivalent units of raw fuel consumed to generate that one unit of energy consumed on-site. To achieve this equivalency, the ENERGY STAR Buildings program uses source energy.

When primary energy is consumed on-site, the conversion to source energy accounts for losses that are incurred in the storage, transport, and delivery of fuel to the building. When secondary energy is consumed on site, the conversion accounts for losses incurred in the production, transmission, and delivery to the site. The factors used to restate primary and secondary energy in terms of the total equivalent source energy units are called the *source-site ratios*.

The efficiency of secondary energy (e.g., electricity, steam) production depends on the types of primary fuels that are being consumed and the specific equipment that is used. These characteristics are unique to specific power plants and differ across regions of the country. For example, some states have a higher percentage of hydroelectric power, while others consume greater quantities of coal.

Because ENERGY STAR Buildings is a national program for protecting the environment through energy efficiency, the ENERGY STAR Buildings program has determined that it is most equitable to employ source-site ratios at the national level. As such, there is only one source-site ratio for each of the primary and secondary fuels in Portfolio Manager, including electricity. The use of national source-site ratios ensures that no specific building will be credited (or penalized) for the relative efficiency of its utility provider.

However, to calculate emissions resulting from energy use, the ENERGY STAR Buildings program uses the energy mix composition of regional utility electric grids. This allows for a realistic assessment of potential emissions reductions.[14]



the top quartile of buildings and would qualify for the ENERGY STAR building certification. Buildings in the lower quartile are typically 2 – 4 times less energy efficient than buildings in the top quartile and represent prime opportunities for improvement.

The Statement of Energy Performance

The Energy Performance Rating Tool that measures and tracks energy performance should also provide documentation of the Energy Performance Score. This can take the form of a Statement of Energy Performance document. There should also be a provision for the Statement of Energy Performance to be verified and authenticated by a Professional Engineer who signs and stamps the document, indicating that the building information and energy consumption information are accurate and that the operational characteristics of the building meet current acceptable standards for indoor air quality, thermal comfort, and lighting levels—in other words, that the essential functions of the building have not been compromised.

In addition to the Energy Performance Score, the Statement of Energy Performance may also contain a range of relevant information related to building energy consumption such as:

- Property Name
- Owner
- Location
- Property Type
- Energy Performance Score
- Square Footage
- Site Energy Use Intensity (kBtu/sq. ft.)
- Source Energy Use Intensity (kBtu/sq. ft.)
- Annual fuel consumption by fuel type
- Greenhouse Gas Emissions (MTCO2e/year)

Once the Statement of Energy Performance has been authenticated by a professional engineer, it becomes a legal document that can be relied on and used by many organizations in a variety of transactions. These include disclosing energy performance to:

- The general public
- City and state governments
- Prospective building buyers and sellers
- Current and prospective building occupants

ENERGY STAR® Statement of Energy Performance

LEARN MORE AT energystar.gov

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ENERGY STAR® Score[1]

Sample Property

Primary Property Function: Office
Gross Floor Area (ft²): 50,419
Built: 1951

For Year Ending: July 31, 2014
Date Generated: October 01, 2014

1. The ENERGY STAR score is a 1-100 assessment of a building's energy efficiency as compared with similar buildings nationwide, adjusting for climate and business activity.

Property & Contact Information

Property Address	Property Owner	Primary Contact
Sample Property 123 Main St Boston, Massachusetts 02134	Property Inc. 123 Early Bird St. Washington, DC 20460 202-999-9876	Jane Doe 123 Early Bird St. Washington, DC 20460 555-123-4567 jane_doe@propertyinc.com

Property ID: 3681885

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
75.7 kBtu/ft²

Source EUI
181.2 kBtu/ft²

Annual Energy by Fuel

Electric - Grid (kBtu)	2,453,824 (64%)	
Natural Gas (kBtu)	1,273,766 (33%)	
Propane (kBtu)	91,000 (2%)	

National Median Comparison

National Median Site EUI (kBtu/ft²)	103.5
National Median Source EUI (kBtu/ft²)	247.6
% Diff from National Median Source EUI	-27%

Annual Emissions

Greenhouse Gas Emissions (Metric Tons CO2e/year)	311

Signature & Stamp of Verifying Professional

I _____ (Name) verify that the above information is true and correct to the best of my knowledge.

Signature: _____ Date: _____

Licensed Professional

John Smith
4 Privet Dr
Arlington, VA 22201
703-111-1234
john_smith@energyinspectors.com

Professional Engineer Stamp
(If applicable)

- Prospective investors and financiers
- Insurance companies
- Real estate appraisers
- Utilities
- Energy Efficiency Service Companies

All of the above organizations will assign a level of importance to the role that the Statement of Energy Performance plays in informing their activities. These activities may include reducing carbon emissions, assessing the value of buildings, identifying energy efficiency opportunities, granting mortgages, or stimulating economic growth in the community.

Certification of High-Performing Buildings

Recognition of achievement is an important part of a successful energy efficiency program. Building owners, managers, and occupants need to be able to set goals, celebrate achievements, and declare success publicly. The establishment of a certification for high performing energy-efficient buildings is an outward universal symbol to the community, customers, and investors that the building is energy efficient. From an environmental standpoint, certification indicates that the owners and managers are responsible members of the community by reducing energy consumption and related greenhouse gas emissions.

The establishment of a certification for high performing energy-efficient buildings is an outward universal symbol to the community, customers, and investors that the building is energy efficient.

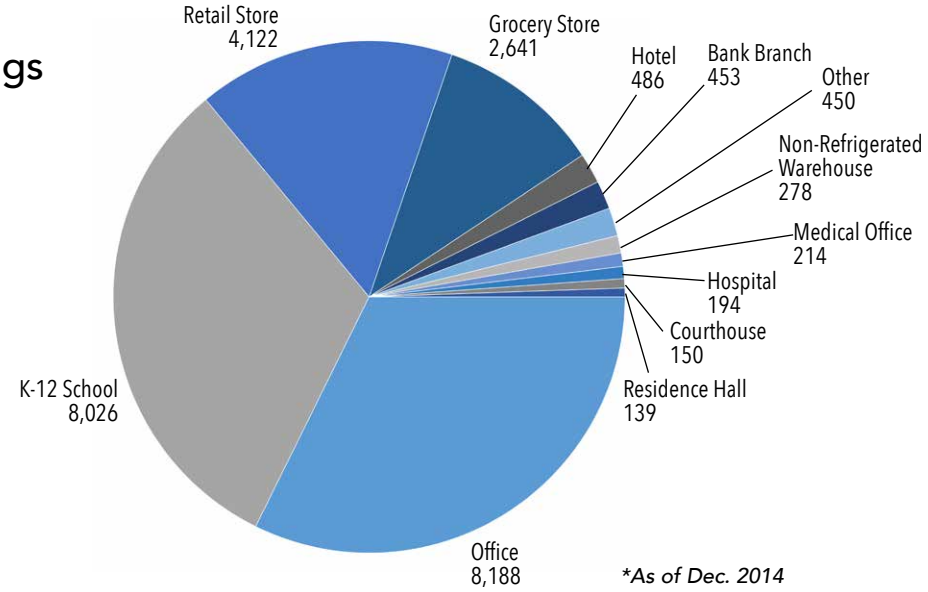
For buildings that are owner occupied by businesses, the certification is a symbol of profitability, cost effectiveness, and environmental responsibility. For investor owned commercial real estate buildings, the certification is a symbol of competitiveness, profitability and asset value. It has been demonstrated in the United States that ENERGY STAR certified buildings command higher rents, have higher occupancy rates, and are more valuable.[15]

For public sector buildings, such as schools, the certification is a symbol of social environmental responsibility and financial stewardship due to lowering operating costs and reducing the tax burden on citizens. The certification can also provide an educational component for students and parents that incorporates the achievement of financial and environmental goals in a learning experience.

Cumulative ENERGY STAR Certified Buildings by Type*[16]

As of the end of 2014, more than 25,000 buildings have earned ENERGY STAR certification. The vast majority of them have been offices, schools, and stores.

Since certification is only valid for the year in which it was awarded, buildings owners and managers are encouraged to re-certify each year as a way to demonstrate that they're maintaining their building's superior energy performance.



**As of Dec. 2014*

The ENERGY STAR Buildings program developed the **ENERGY STAR buildings certification** to provide recognition for those buildings that score a 75 or higher, meaning that they perform better than 75 percent of similar buildings nationwide. Verification and authorization of the Statement of Energy Performance by a Professional Engineer is required by the ENERGY STAR Buildings program prior to awarding the ENERGY STAR certification in order to document that the building's energy performance achievement of 75 is accurate and that the building adheres to indoor air quality, thermal comfort, and lighting standards.

ENERGY STAR certifications are awarded based on current energy performance using the most recent 12 months of energy consumption data. Since ENERGY STAR certification documents energy performance over a specific time period, all ENERGY STAR certifications are dated for the year in which they are awarded. Building owners are encouraged to re-certify their buildings each year because older certifications may no longer represent an accurate assessment of the building's current operations and the resulting energy performance.

As of December 31, 2014, the ENERGY STAR Buildings program has awarded more than 25,000 ENERGY STAR certifications. The building types that achieved the most certifications were:

- Office buildings (8,000)
- K-12 schools (8,000)
- Retail stores (4,000)
- Supermarket/grocery stores (2,500)

All ENERGY STAR Certifications are publicly listed on the ENERGY STAR Buildings website, which indicates the building owner, the building location, and the year that the certifications were awarded.[16]

For complete details of the United States' ENERGY STAR Buildings program's energy performance rating tool, Portfolio Manager, please see the ENERGY STAR Buildings website at www.energystar.gov/Portfolio-Manager.

SECTION SUMMARY

The most important part of creating a market for energy efficient buildings is to establish a system by which the energy efficiency of buildings gets measured and rated. This system comprises:

1. A software tool to measure actual energy use and calculate performance. Users input actual, measured energy use data (from utility bills) into the tool along with information about the building.
2. A 1 – 100 performance scale that translates a building's energy performance into an easy-to-understand score. To ensure that buildings can be fairly compared against one another, scores account for variables such as weather and building characteristics.
3. Standardized documentation of a building's rating that can be used for a variety of purposes, including during lease or sale transactions.
4. Recognition and certification of top-performing buildings

CHAPTER 3

Section 3:
Influencing Market Participants

The Supply of and Demand for Energy-Efficient Buildings

In order to create a market for energy-efficient buildings, there must be both a way to make buildings more energy efficient (providing a **supply** of energy-efficient buildings), and energy-efficient buildings must be highly valued by owners (providing a **demand** for energy-efficient buildings). Ultimately this means bringing together two types of market participants in an energy efficiency market transaction: owners and managers who will demand energy-efficient buildings and Energy Efficiency Service Companies who will create them. This transaction will be market-driven by the interests of the participants involved, i.e. owners who want to maximize the financial benefits of owning and operating energy-efficient buildings and Energy Efficiency Service Companies who want to seize the profitable business opportunity of providing products and services that will make buildings more energy efficient.

In order to create a market for energy-efficient buildings, there must be both a way to make buildings more energy efficient (providing a **supply** of energy-efficient buildings), and energy-efficient buildings must be highly valued by owners (providing a **demand** for energy-efficient buildings).

Educational outreach to the large community of market participants is essential to creating a marketplace that will value the creation of energy-efficient buildings. The educational outreach must focus on providing market participants with credible information about the benefits of energy efficiency to the core business that the market participant is involved in. To influence the market participants, it will be necessary to research the financial role that energy consumption plays in the operations of various types of buildings and establish the positive financial impact that energy efficiency in buildings will have on each type of building owner. Once the market participants have been identified, engaged, and educated as to the benefits of energy-efficient buildings, it will be possible to establish both a market demand for energy-efficient buildings and the energy efficiency services that will provide a supply of them.

Every marketplace consists of market participants who are serving their own interests. There are the provid-

ers of products and services and there are the buyers of products and services. Each of these participants engage in business transactions that serve their individual self interests. The market for energy-efficient buildings relies on the recognition by building owners and managers that there are powerful reasons to create, own, and operate energy-efficient buildings. These reasons provide the market motivations that will drive the demand for energy-efficient buildings and the technologies and management strategies that create then.

Creating Demand for Energy-Efficieny Among Building Owners

It is important to identify and educate the owners and managers of commercial buildings about the significant **direct financial benefits** available to them through pursuing energy efficiency in buildings. In most cases this can be done through the **trade associations** that the building owners and managers are members of. Trade associations often provide educational programs and useful market trend information to their members. The highest priority is to promote the value of measuring, tracking, and improving the energy performance of buildings and linking improved energy performance to financial performance.

The value of improved energy performance in buildings will vary depending on the building's purpose and the type of business that owns and operates the building. For this reason, it is necessary to work with the various types of building owners and managers to understand their individual business models, motivations, and opportunities. This process will require a significant amount of outreach to the following types of building owners and managers:

Commercial Real Estate: Investor-Owned for Leasing to Tenants

These buildings are owned as commercial real estate businesses by investors and are leased out to tenants. The prime motivation of these owners is to maximize the profitability of the building and its **asset value**, which is driven by profitability. As discussed earlier, studies have shown that energy-efficient commercial real estate buildings typically have lower vacancy rates, higher rents, and greater asset values. Many types of buildings can fall into this category. They include office buildings, warehouses, distribution centers, retail stores, and shopping centers. At current capitalization rates, each dollar increase in net operating income can be worth as much as 5 dollars in increased asset value.[17]

Corporate Real Estate: Owned to House Business Operations

These are buildings that are owned by business to house their own operations. As such, these buildings are an overhead cost to produce the product or service that the business provides. The role of energy efficiency in these businesses is to reduce operational costs and increase the profit margins of the products

or services produced. Reducing operational costs has a direct impact on **profits, earnings per share and ultimately the stock value of a corporation**. There are many types of buildings that are owned by businesses to house their own operations. They include office buildings, retail stores, hotels, warehouses, distribution centers, for-profit hospitals, for-profit schools, data centers, and bank branches.

Commercial Buildings: Owned by Governments

These are buildings that are owned by government organizations to provide services to the community. These buildings are supported by the taxes and user fees that citizens pay in order to receive services. Reducing the operational costs of providing these services will **lower the burden of taxes and user fees** on community citizens. Or, reduced costs will allow for the financial savings to support expanded services such as providing additional teachers, educational equipment, healthcare, or recreational facilities. Many types of public buildings fall into this category. They include administrative buildings, schools, hospitals, police stations, libraries, and public universities.

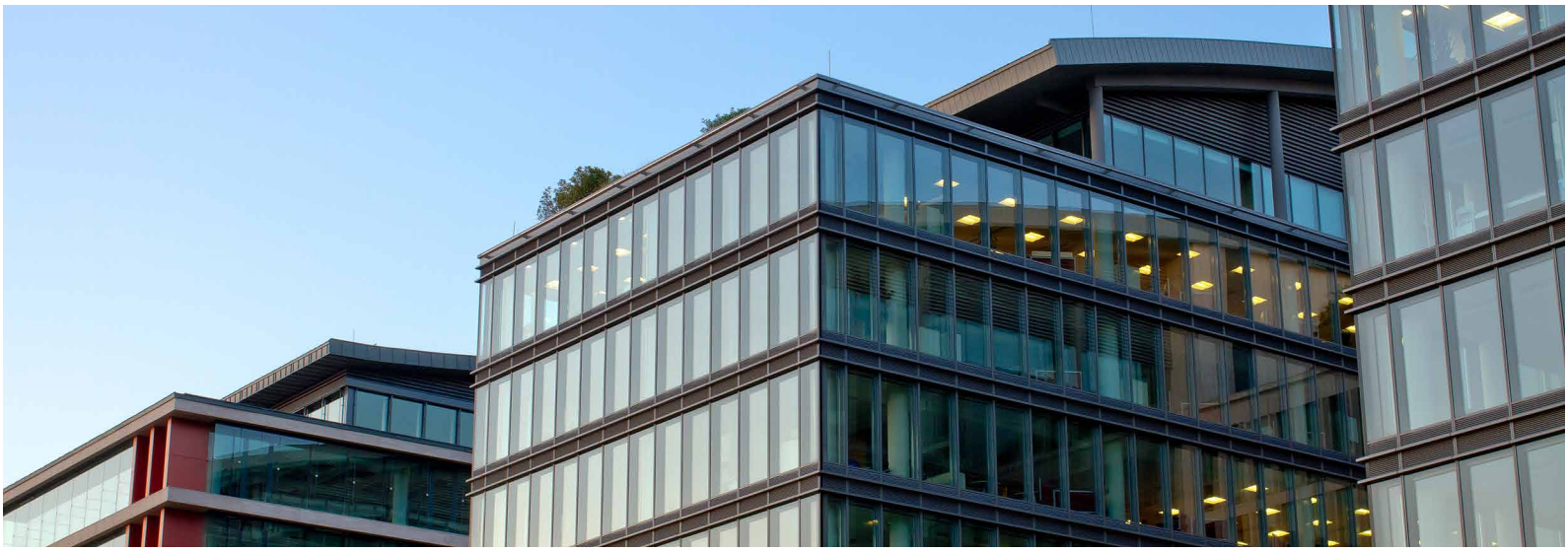
Commercial Buildings: Owned by Private Not-for-Profit Organizations

These are buildings that are owned by private not-for-profit organizations such as hospitals and universities. The activities housed in these buildings are primarily paid for by user fees. As with public sector buildings, using energy efficiency to reduce the operational costs of providing these services will lower the burden of **user fees** that community citizens must pay. Or, reduced costs will allow for the energy savings to support expanded services such as improved health care and educational facilities. There is a range of private not-for-profit buildings in every community. They include economic development organizations, religious institutions, hospitals, schools, and universities.

Multifamily Residential Buildings: Owned by Investors, Governments, or Residents

These are large residential buildings that are owned by investors, governments, or the residents that live in them in the form of cooperatives and condominiums. The energy efficiency incentives for these buildings depend on the type of ownership.

Investors see multifamily housing as commercial real estate and respond to the energy efficiency opportunities as they would for any investor-owned commercial real estate investment. Investors are looking to enhance profitability by reducing costs or by collecting higher rents because energy-efficient apartments have lower energy costs and are more attractive to residents when compared to other apartments. Low-cost, competitive apartments result in higher rents, higher



occupancy rates, and greater profitability. The higher profitability translates into **greater asset value**.

Government owners relate to these buildings as they would to the other public sector buildings that they own, except here user fees are collected from tenants in the form of rents. In the case of publicly owned housing, affordability is an ongoing social crisis. Reducing energy costs helps to reduce operating costs and keep the housing units affordable. Keeping public housing **affordable** for tenants and **reducing housing subsidies** from the community benefits both the residents and the taxpayers.

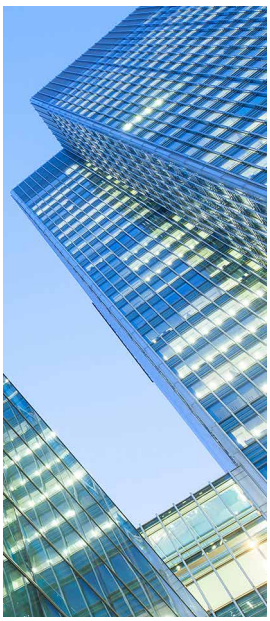
In the case of **resident-owned cooperatives and condominiums,** energy savings will be returned to the residents directly through their utility bills and through lowering common charges from energy use in the common areas. Individual apartment unit owners will benefit from **lower energy costs** and from the **higher resale value** that the energy efficient units will command when sold.

Creating a Supply of Energy-Efficient Buildings

There are strong social, environmental and financial drivers for building owners and managers to build and buy energy-efficient buildings, or to improve the energy performance of their existing buildings. However, **demand alone does not make a market**. There must also be a low-risk, financially justifiable supply of energy efficiency products and services that, when implemented either in new or existing buildings, will result in the creation of energy-efficient buildings.

Advances in Lighting

Lighting is a good example of a fast-evolving technology. After many decades of little change, there was a sudden evolution from magnetic fluorescent lighting ballasts and incandescent lighting to electronic ballasts and compact fluorescent lighting components from 1990 to 2000. This change included lighting controls such as occupancy sensors. Lighting-related energy consumption could suddenly be cost-effectively reduced by 30 – 50 percent by installing these technologies. By 2010, a new wave of electronics was making LED lighting the latest reliable, cost effective, technology available. Cost-effective LED lighting applications are now sweeping through residential and commercial buildings. Combined with the latest energy management software, these new technologies are reducing lighting energy consumption another 30 – 50 percent. In many cities, LED lighting is being used for street lighting as well as for traffic signals. Not only are LED lights reliable and cost effective but, due to their long life, LED lights greatly reduce maintenance costs.



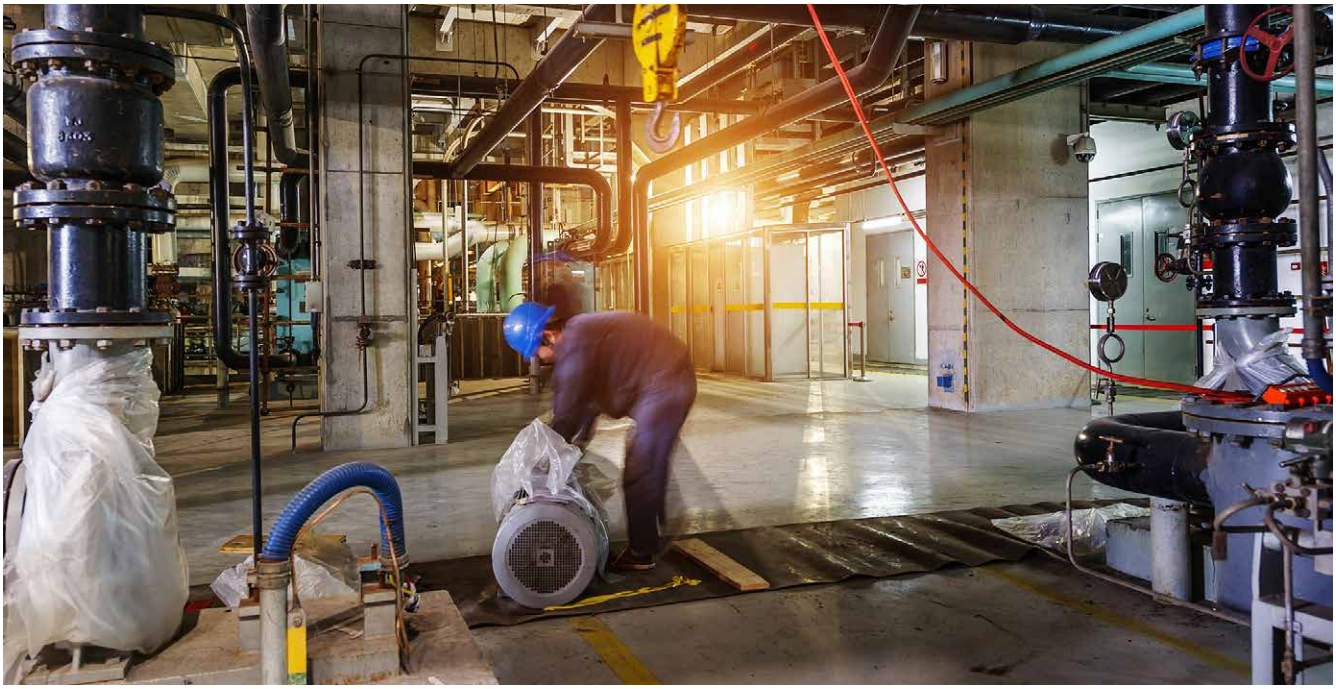
Fortunately, the current fast pace of technological development is making available a great variety of cost-effective, reliable, low-risk energy efficiency products and services that can be implemented in buildings. These technologies can greatly increase building energy efficiency and reduce energy consumption from 20 percent to 35 percent. These new energy efficiency technologies seem to take a great leap forward about every 10 – 15 years.

The Role of Energy Efficiency Service Companies

In the United States, the supply of energy efficiency products and services is provided through the expertise of Energy Efficiency Service Companies. These companies are a relatively new industry that has matured since 1990. They take both an engineering and a business approach to assessing the cost-effective opportunities to improve the energy performance of buildings. In doing so they are seizing a business opportunity to provide a profitable energy efficiency service that benefits building owners and managers.

Energy Efficiency Service Companies will typically:

- Assess the current overall energy performance of a building, using an Energy Performance Rating Tool to measure a building's current energy performance
- Audit the existing building infrastructure to identify components that are not energy efficient
- Specify the appropriate new energy-saving technologies and management practices to be implemented
- Conduct a financial analysis to determine the cost-effectiveness of the proposed energy efficiency project
- Identify and obtain any financial incentives available from utilities or governments
- Arrange financing for the energy efficiency project
- Provide project management services to obtain and correctly install the new technologies
- Measure, track, and verify the improved energy performance of the building



Energy Efficiency Service Companies need help building a credible reputation in the marketplace. Building owners and managers must have confidence that the opportunities for improving energy efficiency are real and low-risk.

Establishing a strong relationship with the Energy Efficiency Service Companies and their trade associations with the goal of stimulating a market for their services is essential to creating energy-efficient buildings. The most important part of this relationship is to help the energy services community build a credible reputation in the marketplace, because building owners and managers must have complete confidence that the opportunities for improving energy efficiency are genuine and that they can be implemented with low risk.

Energy efficiency project financers and lenders must also have complete confidence in the ability of the energy efficiency services industry to implement the new technologies in a manner that will **deliver the cost savings** to owners, which will, in turn, repay the lenders for financing the energy efficiency projects.

The ENERGY STAR Buildings program formed a partnership with Energy Efficiency Service Companies that helped to identify the credible providers of energy efficiency services. The ENERGY STAR Program also increased their visibility by listing these providers on the ENERGY STAR Buildings website along with successful case studies.

The ENERGY STAR Buildings program also provided educational programs to the community of Energy Efficiency Service Companies on how to use the program's Energy Performance Rating Tool and the Statement of Energy Performance, as well as the value of establishing recognition for high performing buildings through the ENERGY STAR building certification. Initially, the ENERGY STAR Buildings program also provided education to both building owners and Energy Efficiency Service Companies about the emerging energy efficiency technologies in order to increase market awareness of the low-risk, credible opportunities that these technologies represented. As market awareness developed and the Energy Efficiency Service Companies matured, it was no longer necessary to provide technical education.

Additional Market Participants

While influencing the Market Participants described above is of paramount importance, there are other important market participants that sit on the periphery of the market but play important supporting roles. These include tenants, mortgage lenders, insurance companies, energy efficiency project financiers, real estate appraisers, real estate brokers, institutional real estate investors, shareholders, utilities and government policy makers. The roles that these market participants play can affect how quickly energy-efficient buildings are adopted as a market standard. For example, mort-

gage lenders should ask for the current Statement of Energy Performance to be assured that a building is not leaking energy and money. Tenants should desire to be in a low-cost, state-of-the-art building. Institutional real estate investors want to see their portfolios gain in value. Appraisers want to give an accurate assessment of a buildings value. All of these market participants must be educated as to the benefits of energy-efficient buildings. Then, as they each pursue their responsibilities, they will enhance the demand for energy-efficient buildings by bringing additional pressure to bear on the market.

In the next chapter, we will discuss the critical role of government policymakers and their responsibility to require the public disclosure of energy performance scores.

The Resulting Market Dynamic

Making a market for energy-efficient buildings requires bringing together the owners of buildings with Energy Efficiency Service Companies in an opportunistic, low-risk, credible, and verifiable business transaction that results in the implementation of energy efficiency products and management practices to create energy-efficient buildings. This result is powered by information and will be accomplished by the market dynamics of all market participants seeking their own best interest.

SECTION SUMMARY

Two groups of people must come together to create a market for energy-efficient buildings:

1. Building owners, managers, and occupants who will demand energy-efficient buildings due to the financial benefits.
2. Energy Efficiency Service Companies who will create a supply of energy-efficient buildings as a business opportunity.

It's critical to reach out to building owners to educate them on the benefits of energy-efficient buildings. This will require a significant amount of communications, marketing, and outreach.

Energy Efficiency Service Companies will need help establishing a credible reputation to gain the trust of building owners and lenders. They may also need training on how to use the Energy Performance Rating System and its tools.

CHAPTER 3

Section 4:
Establishing Energy Performance Public Disclosure Polices

The Importance of Energy Performance Public Disclosure Policies

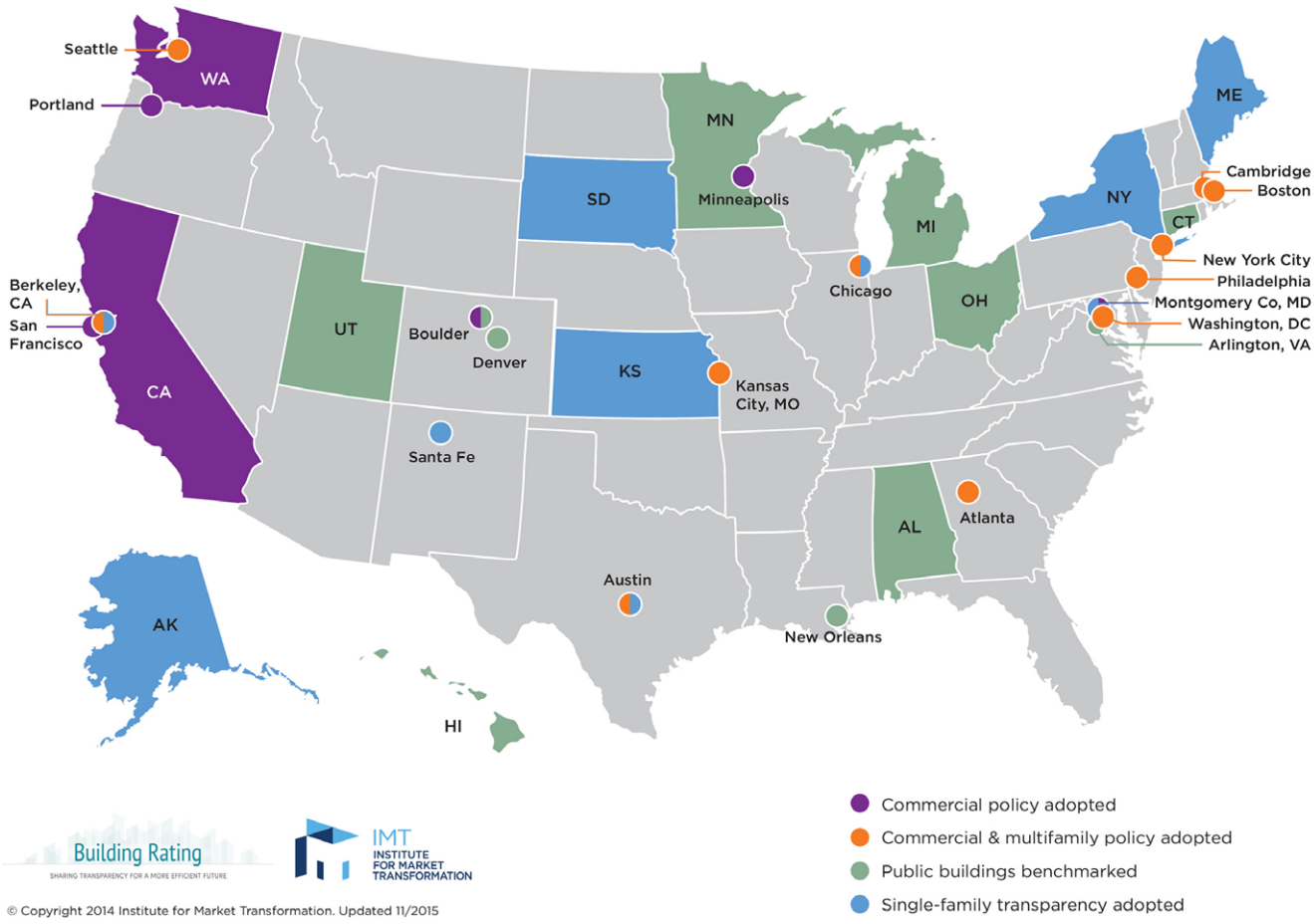
The creation of a market for energy-efficient buildings can be completely voluntary and driven by the financial and economic considerations of the market participants. **Yet the market can only act on information that is available to it**. Building owners and managers will only manage energy consumption if they are encouraged to measure it. Also, buildings that have a poor Energy Performance Score might hide that fact from tenants, customers, lenders, and investors. Finally, market participants who are not aware of the existence the Energy Performance Score might not ask for it when buying, leasing, or financing a building.

The availability, credibility, visibility, and transparency of the Energy Performance Score to the public is therefore the ultimate market stimulant. Once all the market realities have been established (i.e. energy efficiency can be measured; energy efficiency can be improved; investing in energy efficiency is low risk and profitable; an energy-efficient building is more competitive, profitable, and valuable), **THEN the next step in creating a market for energy-efficient buildings is to make the Energy Performance Score of buildings public information.**

Major municipalities and governments in the United States have been **requiring** the public disclosure of the Energy Performance Score since 2012, beginning with New York City. By 2015, 15 major US cities and two states, including California, had legislated Energy Performance Score disclosure policies. **These municipalities and governments are not requiring that buildings become energy efficient. They are not regulating the energy performance of buildings.**

Proportion of Greenhouse Gas Emissions Resulting from Building Energy Use

US Building Public Disclosure Policies



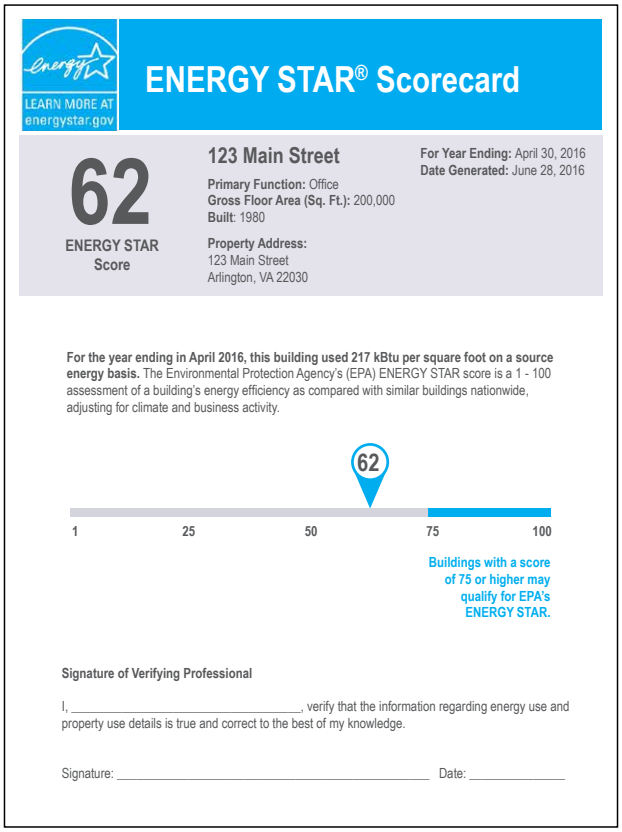
They are only requiring the annual public disclosure of the Energy Performance Score, as provided by the ENERGY STAR Buildings program's Energy Performance Rating Tool, so that the market can act on that information. In some cases, it is required that buildings with poor scores undergo energy audits and implement energy efficiency improvements where such improvements are financially justifiable and make good business sense. In some cases, ENERGY STAR certified buildings are exempted from the audit requirement.

In the future, municipalities and governments may assess inefficient buildings with a property tax surcharge penalty. This penalty would be justified on the grounds that the building owners are not acting in the public interest and are not assisting the government in achieving the goals that the improvement of energy performance in buildings offers, such as meeting emission reduction goals. Governments might at some time in the future also require that buildings be "brought up" to a certain level of energy performance in the public interest.

Major municipalities and governments in the United States have been requiring the public disclosure of the Energy Performance Score since 2012, beginning with New York City.

Public disclosure can be accomplished in several ways. The majority of legislation in the United States requires the annual disclosure of the Energy Performance Score to the local municipal government. This is accomplished through the Energy Performance Rating Tool described earlier. This information can be made public by the municipality or government on its website. Another way that the public could be made aware of the energy performance of a building is to require that the Energy Performance Score be posted in the form of an Energy Label in the lobby of

the building. In the United States, the ENERGY STAR Buildings program makes such a label available (see example below).



Some jurisdictions require that the Statement of Energy Performance be presented when there is a financial transaction happening that involves the building. These types of transactions include disclosing the building's energy performance to the prospective buyers or tenants of properties as well as to those who are providing financing on the property. The intent is to bring energy performance awareness into the transaction because the Energy Performance Score may impact the value of these transactions.

While the United States does not require public disclosure on a national basis, it is recommended here that it would be appropriate for a national government to require the public disclosure of a building's Energy Performance Score on a national basis. This would allow for reaping the rewards of public disclosure across the entire country and capture the opportunity to influence the owners and managers of the entire population of buildings.

The Community Impact of Energy Performance Disclosure Policies

Resources for the Future has studied the impact of energy performance disclosure policies and has stated that there is about a 3 percent reduction in energy use annually in the four cities studied.[18] The benefits to municipalities and governments of requiring the public disclosure of a building's Energy Performance Score are numerous. These include:

Clean Air

Emissions from power plants take many forms and emit many types of contaminants—both particulate and chemical—into the atmosphere. Some of these contaminants can travel many miles from generating facilities located hundreds of miles away from major population centers. Many health risks are associated with these contaminants. Decreased energy demand from energy-efficient buildings will reduce these air-polluting emissions, particularly during peak energy consumption hours when the dirtiest generation capacity is usually brought online.

Green Job Creation

Improving the technological infrastructure of buildings and providing the management information that will enable buildings to be more energy efficient requires the production of energy-efficient technology hardware and software components, as well as the education of building owners and managers on new energy management strategies. Locally manufacturing the energy-efficiency-related products will create a skilled workforce to produce these products and the energy management software that controls them.

The development of new products is accompanied by the creation of Energy Efficiency Service Companies who will access building energy performance, specify and install the new technologies, and train the building operators on the proper management of the buildings. The Energy Efficiency Service Companies in turn employ both engineering professionals as well as the skilled electrical trade workers who will install the energy efficiency projects. It has been documented in New York and other cities that there has been job growth as a result of an expanding Energy Efficiency Services Industry.[19]

Strengthening the Local Economy

While the process of making buildings more energy efficient adds employment opportunities in the community, the long-term effect will be to provide state-of-the-art, energy-efficient buildings that will **retain and attract** businesses that are growing. This adds to the employment of workers and to the tax base. Retaining and attracting businesses eventually supports the development of the local housing market.

Improving Electric Grid Capacity and Reliability

Twenty-first-century businesses are highly automated and web-connected. They rely on increasing amounts of energy. These energy requirements place increasing demands on the electrical grid and the energy sources that supply energy. Energy-efficient buildings reduce energy demand and help to increase grid capacity, especially during peak energy demand times. The result is that the overall electrical system becomes more reliable and economic growth can continue to expand.

Another aspect of improved electrical system capacity is to reduce the need to add power generation facilities. Even if the new generation is benign and renewable, it is not often convenient to locate.

Meeting Climate Change Greenhouse Gas Reduction Goals

More and more, communities see that it is in their best interest to reduce greenhouse gas emissions. Many have set goals for reducing emissions resulting from economic activity in their communities. New York City's Greener Greater Buildings Plan has set a goal to reduce emissions by 30 percent by 2030 and 80 percent by 2050.[20] This initiative is the combined result of policies focused on preserving the viability of the community by protecting the local infrastructure from climate change events and being responsible to the larger world community. In 2013, hurricane Sandy caused massive electric power blackouts and severe damage to the transportation infrastructure in the New York metropolitan area, resulting in more than **$70 billion** of damage and bringing the city to a standstill. Many businesses simply had to close. Hundreds of thousands of citizens suffered many hardships resulting from failure of the electric grid and the direct damage to residential buildings, including loss of heat, water, and elevator services as winter approached. The hurricane also resulted in the need to spend **billions** more dollars to "harden" the electrical grid and transportation facilities against future disruption. Unfortunately, the "hardening" of infrastructure is a sunk cost

After studying four cities with disclosure policies, Resources for the Future found a 3-percent annual reduction in energy use among the cities' buildings.

that will only be recovered through higher taxes and higher utility rates.

New York City is not alone in recognizing the dangers of climate change and the vulnerability of the city to climate change events. Responding to climate change is an unprecedented challenge. Many cities have now set emissions reductions goals and are actively pursuing a range of strategies to achieve those goals. Energy efficiency in buildings is one of the key strategies that can be utilized in helping to meet these goals and the public disclosure of energy performance in buildings will quickly stimulate the market for energy-efficient buildings.

The Institute for Market Transformation provides the latest trends in public disclosure in the United States and the world. (IMT.org) (BuildingRating.org)

SECTION SUMMARY

- Public information about the energy performance of individual buildings is the ultimate market stimulant.
- A recent study found a 3-percent reduction in building energy use within four cities that have disclosure policies.
- Currently, disclosure policies only exist at the state and local levels. Typically, they mandate that buildings report their 1 – 100 Energy Performance Score to a government agency, which then publishes the data on a public website. Other policies require that this information only be disclosed to relevant parties during a sale, lease, or financial transaction.

CHAPTER 3

Section 5:
Providing Educational Resources to the Market

Credible Educational Resources

In order for the energy-efficient buildings marketplace to function effectively, there needs to be credible information available to market participants. Building owners and managers must have complete confidence in the new technologies and their application. They must also have complete confidence in the financial viability of implementing energy efficiency projects, and lenders and investors must share in the belief that energy efficiency is achievable, low-risk, and profitable.

Developing and promoting educational resources falls into the following three major categories:

Energy management best practices that include the measurement and tracking of building energy performance, setting energy performance goals, implementing financially justifiable energy efficiency projects, documenting energy performance improvements and recognizing achievements. To this end, the ENERGY STAR Buildings program developed the ENERGY STAR Guidelines for Energy Management.[21]

The environmental and financial benefits of improved energy performance to all stakeholders, including buildings owners, managers, occupants, investors, Energy Efficiency Service Companies, lenders, and community citizens.

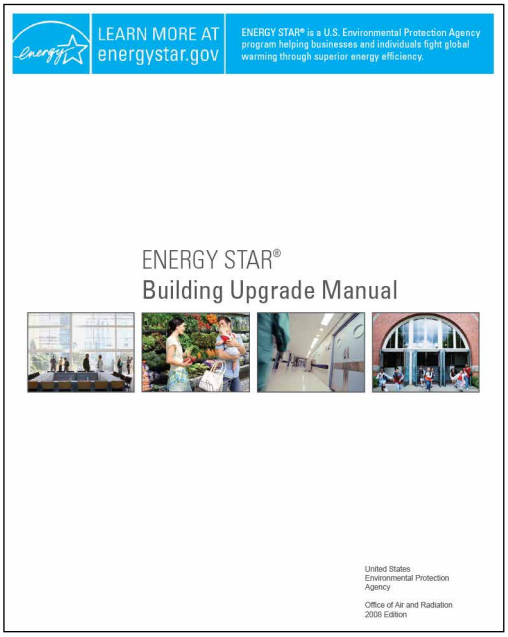
Energy efficient technologies and Energy Efficiency Service Companies who are qualified to implement energy efficiency projects.

The Importance of Independent Third-Party Educational Information

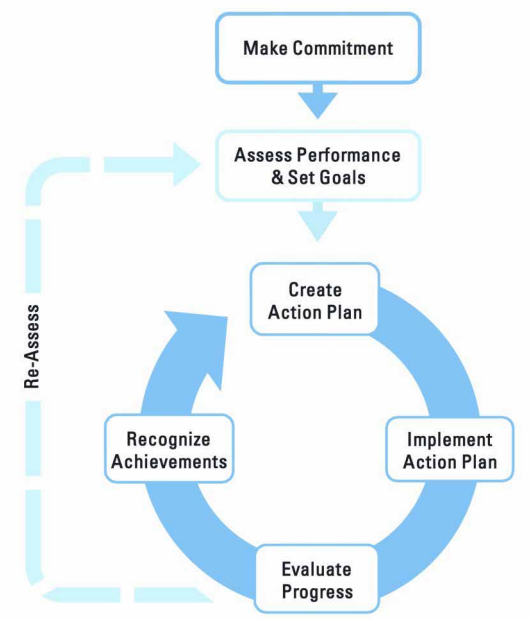
This information needs to come from independent sources that are acting in the public interest. While information from technology manufacturers and Energy Efficiency Service Companies is valuable to inform market participants about their products and services, it is not always a credible source of information for driving the market due to the self-interests of the manufacturers and service providers. The following types of organizations are good candidates for researching and disseminating information.

Governments

In 1993, the US EPA's ENERGY STAR Buildings program conducted a series of whole building case studies to determine the overall opportunity and potential impact of implementing energy efficiency technologies and energy management best practices in buildings. Through these case studies, the ENERGY STAR Buildings program determined that the real savings



In 1993, ENERGY STAR Buildings published the ENERGY STAR Building Upgrade Manual, a technical guide for improving the energy performance of whole buildings.



As the marketplace began to understand the opportunity to create energy-efficient buildings and the pace of technology development increased, the ENERGY STAR Buildings program focused less on endorsing specific technologies and more on promoting a set of best practices, named the Guidelines for Energy Management.

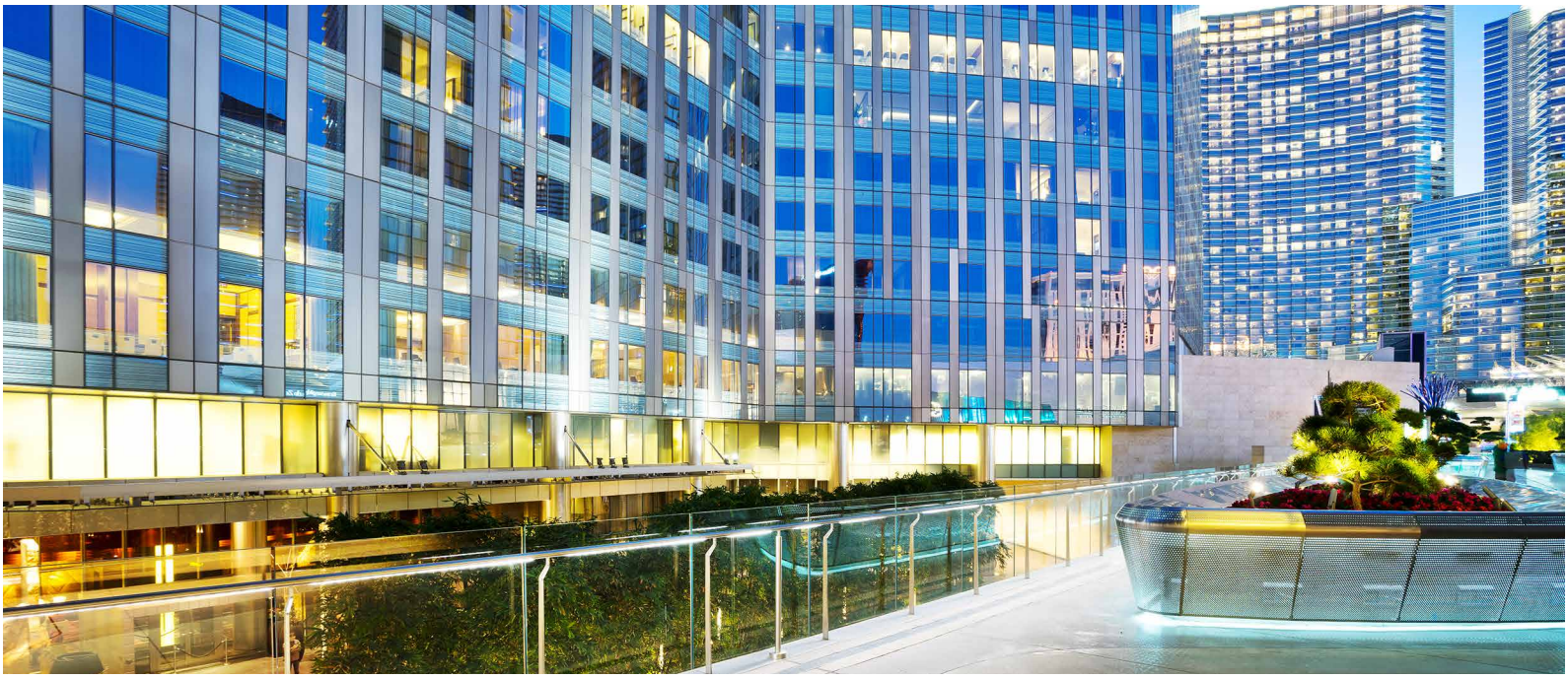
lay not just in the individual technologies themselves but in the interaction of the various building systems. Modeling software had shown that whole buildings could reduce their energy use by 30 percent through efficiency improvements.

Two dozen buildings were selected to test this hypothesis over the course of a year. Measurements were taken before and after the trial period, and participating organizations used a uniform strategy provided by the ENERGY STAR Buildings program as the basis for improvements. The study results showed that despite using the same whole building approach, some buildings logged 50 percent energy savings, while others only showed 12 percent savings. But what did that mean?

To interpret the results, the ENERGY STAR Buildings program needed an objective measure by which all buildings could be evaluated. It was obvious that saving energy was good, but there was no way to objectively compare, or benchmark, the performance of one building to another. ENERGY STAR turned to an existing inventory of commercial building energy use—available from the United States Department of Energy—to develop comparative metrics for evaluating performance.

Using these comparative metrics, program officials realized that the "very successful" building that cut its energy use in half still had above-average energy use. Even more surprising, the "less successful" building with the modest 12 percent savings was actually performing well above the average building. Moreover, the inventory revealed a wide distribution of energy performance between the best and worst performers—making a comparative metric even more important given such a large spectrum.

The results of the building study represented a major turning point that helped the ENERGY STAR Buildings program transform the view of energy use in commercial buildings. It was clear that organizations needed to measure energy use in order to manage it and to make sense of those measurements within an objective context. The results strengthened the program's position that the business-as-usual approach of estimating savings based on calculations—rather than actual energy consumption—needed to change. With the global climate at risk, damage to the environment caused by greenhouse gas emissions was not going to be prevented by theoretical



predictions of how a building was intended to operate, but rather by **real-world reductions in energy use.**[3]

This research and the publication of the results played a key role in the development of the Energy Performance Rating Tool, establishing the market for energy efficiency services, and the creation of energy-efficient buildings in the United States.

In 1991, the US EPA introduced the **Lighting Upgrade Manual** in conjunction with the development of the Green Lights Program, a partnership program designed to promote efficient lighting systems in commercial and industrial buildings. In 1993, with the momentum established by Green Lights, EPA moved beyond lighting to capture substantial additional savings by improving the energy efficiency of the whole building. Focusing on energy efficiency improvements for whole buildings led to the development of the **ENERGY STAR Building Upgrade Manual**, a technical guide for improving the energy performance of whole buildings.[22]

As the marketplace began to understand the opportunity to create energy-efficient buildings and the pace of technology development increased, the ENERGY STAR Buildings program focused less on endorsing specific technologies and more on promoting a set of **Guidelines for Energy Management**[21]—best practices such as properly assessing building energy performance, setting energy performance goals, implementing financially viable projects, documenting energy performance, and recognizing success through the ENERGY STAR building certification.

Trade Associations

Manufacturers and Energy Efficiency Service Companies are often members of trade associations, which can play an important role in providing independent energy efficiency information to the market. These trade associations are responsible for developing market opportunities for their industry and are concerned with the long-term viability of the market itself. Therefore, these associations are less concerned about the individual products that their members offer and more concerned about the viability of the general technology applications. Associations also understand that the worst thing that a manufacturer or Energy Efficiency Service Provider can do is to overstate the energy savings that the new technologies can deliver and the financial benefits of energy efficiency. So, involving trade associations in the research, creation, and dissemination of realistic energy efficiency information is critical to making a market for energy efficiency products and services.

Some trade associations—such as the Association of Energy Engineers (AEE)—have created valuable professional energy efficiency certifications (i.e. the **Certified Energy Manager** certification, or **CEM**). CEM participants are required to maintain their certification through continuing education provided by AEE. AEE is also engaged in publishing the energy-efficiency-related works of researchers and academics.

Colleges and Universities

Involving colleges and universities is anther good strategy for placing credible information in the marketplace. Both public and private higher education institutions are often involved in the research and development of new energy efficiency technologies and their applications. These institutions can aid in the development of new technologies and also in the field testing of real-world applications. Test results published by colleges and universities are extremely credible and useful.

Research Institutes and Laboratories

In the United States, there are many research institutes and laboratories that are deeply involved in the research and development of energy efficiency technologies. These institutions may be funded independently or by the government. Some examples in the United States are the Lighting Research Center, E Source, the National Renewable Energy Laboratory, and the Rocky Mountain Institute. The Rocky Mountain Institute, headed by Amory Lovins, was an early promoter of the viability and benefits of energy efficiency. The Rocky Mountain Institute also identified how utilities could make energy efficiency viable as a business opportunity by investing in energy efficiency rather than new energy generation capacity. This realization led to a wave of demand-side energy management initiatives on the part of electric utilities, which served to launch the energy efficiency marketplace in the United States.

In some cases, research laboratories are funded by national governments. These National Laboratories were critical to the development of the ENERGY STAR Buildings program in the United States. They were used to develop and test many of the new energy efficiency technologies in use today and to help the ENERGY STAR Buildings program develop the Energy Performance Rating Tool.

Energy Efficiency Program Sponsors

These are organizations acting in the public interest, which recognize the full range of benefits that creating energy-efficient buildings brings to the community. In some cases, **energy utilities**, especially publicly owned utilities, fulfill this role because they are looking at ways to meet increasing energy demand and improve reliability, while minimizing cost and environmental impact. Often energy utilities are required to offer financial incentives to energy users to reduce energy use. These financial incentives are designed to stimulate market demand for energy efficiency projects by lowering the cost of implementing energy efficient technologies in buildings.

In addition to energy utilities, some governments create **public benefits organizations**. These organizations act independently in the public interest. They are authorized to collect modest public benefits fees from energy users and use those fees to conduct energy-related research and stimulate the development of renewables and energy efficiency technologies. They also use the collected fees to provide incentives for improving the energy efficiency of buildings by lowering the cost of implementing energy efficiency projects.

All the above organizations are in an excellent position to stimulate the demand for energy efficiency in buildings by promoting the viability of energy efficiency projects and the full range of community benefits, or by directly incentivizing the implementation of energy efficiency projects. Their position as independent organizations increases the credibility of the new energy technologies and the benefits of their implementation. Their reach through their membership and their respected place in the community increases the general awareness of the substantial opportunities offered by creating a market for energy-efficient buildings.

SECTION SUMMARY

Credible information about energy efficiency must be made available for all market participants. There are three types of resources:

1. Energy management best practices
2. Information about financial and environmental benefits
3. Information on the latest technologies (and professionals who can install them)

Information should come from independent third parties, such as:

1. Governments
2. Trade associations
3. Colleges and universities
4. Research institutes and laboratories
5. Energy efficiency program sponsors

Chapter 4:
Evaluating Program Progress

Progress Evaluation Methodologies

Establishing a methodology to measure program progress over time should be part of any energy efficiency program that has a goal of reducing carbon emissions caused by energy use in buildings. Using an Energy Performance Rating Tool as the primary way to capture building energy consumption and measure efficiency will also capture greenhouse gas emissions information about the buildings.

There are several options and ways of understanding progress and some are more complicated than others. But in the end, it will be necessary to accurately calculate the real emissions reductions that result from creating a market for energy-efficient buildings in order to determine if the program is successfully reducing emissions.

Setting meaningful and achievable emissions reduction goals is also an important aspect of establishing a successful energy efficiency program. These goals can initially be set in terms of emissions reductions but then must be translated into criteria related to the improved energy performance in buildings. The following are several types of overall energy performance criteria by which a program's progress can be tracked and evaluated:

Documentation through the Energy Performance Rating Tool

The preferred way to ensure accurate tracking of improvement in the level of energy performance of buildings is to couple the availability of the Energy Performance Rating Tool with energy performance public disclosure policies. These policies should require that the target population of buildings enter their energy consumption information into the Energy Performance Rating Tool and that the Energy Performance Scores be disclosed annually.

Enacting energy performance public disclosure legislation requiring the use of the Energy Performance Rating Tool will ensure that the energy consumption and the

energy performance of all targeted buildings will be captured. In this way, when aggregated for the total population of buildings, both the total improvement in energy performance and the emissions associated with improved energy performance in buildings can be documented and tracked accurately over time on an actual basis in the Energy Performance Rating Tool.

The US EPA's ENERGY STAR Buildings program conducted a study of 35,000 buildings that used the Energy Performance Rating Tool consistently, on a voluntary basis, between 2008 and 2011. This study revealed that, on average, these buildings reduced energy use annually by 2.4 percent each year and in total by 7 percent over the 3 years. The study also revealed that buildings with scores starting below average saved twice as much energy as those starting above average. If all buildings in the United States followed a similar trend, more than 18 million metric tons of carbon dioxide equivalent would be saved each year. And, through 2020, the total savings could equal approximately 25 percent of the emissions emitted in 2008.[9]

It should be noted that the US EPA's ENERGY STAR Buildings program does not currently have the advantage of a national energy performance disclosure policy for buildings. These policies currently only exist at the state and local jurisdiction levels.

Market Participation Rate

Translating market participation rate into emissions reductions is challenging but is a good estimate of progress. Every market has a total population. The degree to which the total population uses the Energy Performance Rating Tool is a valuable initial calculation that will determine the potential impact of the program, especially since participation is voluntary. In the beginning, the program may face resistance because many potential participants may assert that the measurement is not accurate or that it is based on the wrong criteria. The real reason may be that building owners and mangers are afraid that the Energy Performance Scores for their buildings will be low because

they don't believe that they reflect the true nature of their buildings.

These barriers can be overcome through the education of the marketplace, as discussed in the previous chapter, and by not highlighting poor energy performance but instead focusing on the opportunity to improve energy performance, enjoy its significant benefits, and recognize achievement through the certification of high performing buildings. Nevertheless, there will be initial resistance to participate, but participation will grow as building owners and managers freely join the initiative to take advantage of the Energy Performance Rating Tool and the new technologies and management practices that the program will promote.

Market participation barriers can be overcome through the education of the marketplace.

Some organizations may decide to take advantage of the opportunities to improve energy performance by using other proprietary measurement and tracking tools. The degree that these organizations improve their buildings must therefore be estimated through a general participation survey, since they are adopting the philosophy of the program but will not be detected since they are not using the Energy Performance Rating Tool. This can be called "shadow" participation. Shadow participation will have to be measured based on a separate sample study of buildings.

In 2011, the voluntary participation rate in the United States was about 260,000 buildings, or about 40 percent of all commercial building floor space. By 2015 there were more than 450,000 buildings using the ENERGY STAR Energy Performance Rating Tool.[23]

Number of Certified Buildings

As explained earlier, an important component of the Energy Performance Rating System is the recognition and certification of high performing buildings. In the United States in 2015, there were more than 27,000 buildings that were ENERGY STAR certified. The number of buildings and the portion of the population that achieve certification is a good indication that the program is making progress. This is especially true if the number of certified buildings continues to grow over time. However, one problem with this measure alone is that many buildings may already qualify for certification and therefore do not represent any emissions savings. Or, some buildings that are close to a high level of performance may only have to improve a little to reach the certification level, saving few emissions. Yet, many buildings will struggle from the depths of inefficiency to reach certification. While still an indication of progress, tracking the number of certifications alone is not enough to measure the success of the program. Yet, emissions reductions from certified buildings can be estimated.[24]

In the United States, ENERGY STAR buildings certification is awarded to buildings that perform in the top quartile of all buildings of that type. A 2012 study of 20,000 ENERGY STAR certified buildings revealed that these buildings use an average of 35 percent less energy and emit 35 percent fewer GHG emissions than typical buildings. ENERGY STAR certified buildings have also reduced their emissions by an average of 10 percent since first using the ENERGY STAR Energy Performance Rating Tool. Collectively, they reduce 1.8 million metric tons of CO2e every year, equivalent to the emissions from the annual electricity use of more than 270,000 homes in the United States. Emissions reductions were greater for ENERGY STAR certified buildings starting in the lower quartile of their building type since these buildings had to improve the most in order to achieve ENERGY STAR certification.[10]

Documentation through Statistical Sampling Surveys

Another valid option is to commission an independent statistical survey of energy efficiency in buildings. This survey would have to be conducted annually by an independent third party. It would have to be statistically accurate and reflect the overall energy efficiency of the targeted building population. And, it would have to account for energy use in buildings and the reduction in emissions resulting from the implementation of energy efficiency measures.

The United States ENERGY STAR Buildings Program has used statistical sampling successfully to evaluate the progress of the ENERGY STAR Buildings Program and its associated emissions reductions.

CHAPTER SUMMARY

Programs should calculate real, actual energy and emissions reductions as a way to measure progress towards a goal. Methods include:

1. Annual reporting through the Energy Performance Rating Tool. This is most easily done in locations that have already passed disclosure policies that require buildings to report on their energy use on an annual basis.
2. Market participation rates
3. Number of certified, high-performing buildings
4. Independent statistical sampling surveys

End Note:
Voluntary Versus Regulatory Programs

This guide is focused on reducing greenhouse gas emissions by developing a voluntary program to improve the energy efficiency of commercial buildings driven by the market demand for energy efficient commercial buildings. The program is dependent on developing and implementing the appropriate market-influencing program elements described in this guide that will result in increasing the supply and demand for energy-efficient buildings. While the behavior of the market participants is totally voluntary, the dynamics of a market that understands the value of energy efficiency in buildings creates pressure on market participants to seize the opportunity to improve the energy performance of commercial buildings and reap its benefits. The simple idea is for energy efficiency in buildings to ultimately become a business standard and best management practice.

Utilizing energy performance public disclosure policies as a mechanism to encourage energy efficiency improvements is a valid market-influencing strategy. To disclose energy performance is NOT regulation. It is merely a requirement that a building's energy performance become public knowledge in the community interest so that prospective owners, investors, tenants, and lenders can make an informed decision when evaluating a building's attributes. This is no different than the current practice of requiring that a building undergo an engineering inspection prior to sale or financing. A building that has poor energy performance is leaking energy and should be fixed in the same way that a building that has a leaking roof should be repaired. Energy performance public disclosure policies enable the market to make informed decisions driven by energy performance information transparency.

Approaching the market by regulating the energy performance of buildings is fraught with problems. These regulations often focus on new construction and take the form of codes and standards. While building codes and standards are valuable in establishing a floor for the application of basic technologies, they do not reflect how a building will eventually perform. Nor do they ensure that the resulting building will be energy efficient. They merely set a design expectation of performance. They do not measure actual energy performance. Also, they are sometimes focused on the hardware and software components of buildings and the individual building systems. Codes and standards do not reflect how these components and systems will interact together. And finally, codes and standards cannot account for management practices, which are critical to overall energy performance. As a result, there is no way that codes and standards can be used to define a high performing building.

Most of all, the minute a regulatory standard is set, it is obsolete. The evaluation of appropriate technologies and practices should be left to market dynamics, which are fluid and can accommodate and implement new ideas as they develop.

Regulation also creates an atmosphere of forced compliance, penalties, and a costly enforcement infrastructure. Such an atmosphere is counterproductive when compared to an atmosphere of opportunity, positive recognition, and financial reward.

Creating a voluntary market for energy efficient commercial buildings is an appropriate and effective way to reduce carbon emissions resulting from energy use in existing commercial buildings.

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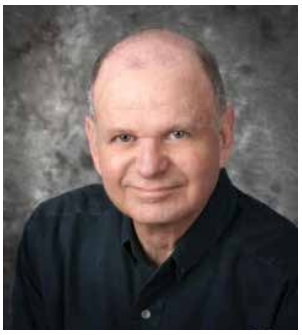
About the Author



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Bob Sauchelli is one of the originators of the U.S. Environmental Protection Agency's ENERGY STAR Buildings program where he was a Program Manager for 20 years. He has worked with a wide range of public and private sector organizations to create a market for energy efficient commercial buildings. He participated in the development and implementation of ENERGY STAR Buildings program elements such as, the ENERGY STAR Energy Performance Rating Tool: Portfolio Manager, energy management technical and financial information, and the ENERGY STAR Certification for buildings. Bob promoted ENERGY STAR Buildings by establishing partnerships with the Commercial Real Estate and Energy Efficiency Services industries. He also worked to incorporate ENERGY STAR Buildings program elements into state and local energy performance disclosure legislation.

Prior to joining ENERGY STAR Buildings, Bob was Executive Vice President of Environmental Energy Efficiency Services, Inc. a New York based energy efficiency services company.

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