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Revision 4

The Evolving Picture of Energy Efficiency Financing For New York City Commercial Buildings

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November 10, 2009

I. Executive Summary

The purpose of this paper is to describe the evolving landscape of energy efficiency retrofit financing for the commercial building sector in New York City. The economic downturn has resulted in reduced real estate values as well as the disappearance of traditional financing sources. The loss of value coupled with the lack of financing has pushed energy efficiency retrofits down on the list of priorities. However, now may be the time to pursue energy efficiency retrofits as a strategy to reposition real estate assets for the next upswing in the market.

We have targeted the following four areas that have implications for energy efficiency retrofits: ARRA Stimulus funding, Existing Incentive Programs, Financing Models and Programs, and Building Technologies. These four areas are described separately, but all work together in making an energy efficiency retrofit possible.

<u>American Recovery and Reinvestment Act of 2009 (ARRA): Stimulus Funding</u>
Stimulus funding pursuant to ARRA includes billions of dollars for green buildings and energy efficiency. This paper addresses how that funding may "trickle down" to the privately owned New York City commercial building sector.

<u>Existing Incentive Programs</u>
Independent of stimulus funding there is a range of financial incentives at the federal and state levels (through the New York State Research & Development Authority), as well as through individual utility providers, that are available to offset part of the cost of energy efficiency upgrades in privately owned New York City office buildings. These incentives include cash rebates, technical assistance and tax credits, in some cases based on actual energy savings. Incentives are available for both large and smaller commercial properties and vary depending on the size and type of the retrofit project.

<u>Financing Models and Programs</u>
Energy Performance Contracting (EPC), which uses guaranteed projected energy savings as the basis for project funding, is discussed as a basic framework for energy efficiency financing. A variety of different models of EPC are evolving as both market factors and regulatory imperatives increasingly motivate building owners to consider energy efficiency upgrades to their existing properties. The inability of the real estate industry to access traditional sources of financing, coupled with increased interest from the financial community in productizing the cost savings resulting from energy efficiency upgrades may result in new private sector financial products that will enable the real estate community to pursue energy efficiency upgrades on a wide spread basis.

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<u>Energy Efficiency Technologies and Strategies</u>
In the Building Technologies section, we describe some of the current technologies that can be implemented to reduce energy use in commercial office buildings and the available metrics to measure building performance.

Energy efficiency measures range from the easier “low-hanging fruit” to more advanced retrofit measures. Some retrofits can be added as discrete equipment replacement, others must be integrated with more extensive renovations. We identify a well known and established set of practices and technologies that is generally capable of achieving 20-30% savings with attractive cost-effectiveness. However, to achieve the goals being discussed in public policy for climate protection, more advanced technologies must be implemented that can reduce energy use much more dramatically, by 50-60%, to levels approaching 30,000 btu per square foot. Among such advanced technologies are better performing envelopes, heat recovery, alternative HVAC designs, on-site combined heat-and-power (cogeneration), and greatly enhanced building automation/management systems.

No single technology package is right for every building. Choice of energy efficiency technology is dependent upon many factors such as age of various systems, asset strategy, and level of financing that can be supported. It may be attractive to directly pursue a radical energy reduction in some cases, while in others a phased approach may be more appropriate. In some cases, taking easy energy savings may be necessary to convince management, while in other cases it may be preferable to delay harvesting the low-hanging fruit so that savings can be packaged with more expensive measures. In order to make such decisions and develop energy efficiency plans, asset managers must have better knowledge and training about energy technologies, finance and strategies.

II. Introduction

As a result of the recent economic downturn, there are limited opportunities to create value when it comes to existing commercial office buildings in New York City. Vacancy rates are up and rental rates are down as property owners face significant reductions in the value of their real estate assets. In spite of this recessionary economic climate, repositioning real estate assets as "green" or sustainable assets continues to be a potentially viable strategy for creating value. Especially for those owners with a long term perspective, greening their real estate assets is a strategy for reducing operating expenses, the cost of future regulatory compliance and vacancy rates, as well as increasing rental rates and occupancy rates.

Despite these market forces and increasing regulatory imperatives that together constitute a strong incentive for greater sustainability and a lower carbon footprint, owners of commercial office buildings in New York City are currently (and for the foreseeable future) operating in a capital constrained environment that is a formidable barrier to pursuing green strategies. The purpose of this paper is to explore public and private sources of financing for owners who are considering "greening" their existing commercial office buildings in New York City, as well as the current range of market-ready retrofit technologies and measures that can be incorporated into the retrofit plan.

The greening of an existing building or a "green" retrofit is the process of updating or replacing existing building systems in order to achieve improved environmental performance. Although retrofits can include a wide variety of improvements, we have limited the focus of this paper to energy efficiency upgrades, which are widely recognized as the lowest cost and lowest risk approach to reducing energy consumption and the carbon footprint of buildings. There are a great variety options when it comes implementing an energy efficiency retrofit project, from those that target "low hanging fruit" to more advanced measures with longer paybacks that result in greater reductions in energy use.

Given the current economic climate, energy efficiency upgrades in commercial office buildings will require both public and private sector financial support. In light of this, we present a range of financing opportunities that commercial owners can mix and match to defray the upfront costs of green retrofits, beginning with an analysis of funds that are available from the public sector for energy efficiency upgrades of commercial office buildings in New York City and then covering private sector financing models. Given that the public sector funds typically defray only a small percentage of the upfront costs of energy efficiency upgrades, innovative private sector financing strategies are critical. Finally we discuss various third party green building rating systems which are useful guides when considering what a particular green retrofit should include, and conclude with an analysis of the broad range of energy reduction technologies, systems, and process improvements available to the private sector commercial real estate owner.

III. ARRA Stimulus Funding

Pursuant to the American Recovery and Reinvestment Act of 2009 (ARRA), approximately $11 billion in federal recovery funds has been allocated for green buildings and energy efficiency. Much of this money is initially flowing to state and local governments, and it remains to be seen how much of will then flow to the private sector.

Of this $11 billion, there are two distinct "pockets" of funds that could provide financing for energy efficiency upgrades of existing commercial office buildings in New York City. They are:

> $6.3 billion for Energy Efficiency Grant Programs. These funds are being administered by the Department of Energy (DOE) and will initially flow to thousands of state and local governments for individual programs designed by the recipient municipalities and approved by the DOE.[i]
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> $4.5 billion for Electricity Delivery and Energy Reliability to modernize and improve the electricity grid, so-call Smart Grid funds. These funds are also being administered by the DOE and competitive applications for these funds have been submitted by a myriad of public sector and private sector applicants.

Energy Efficiency & Conservation Block Grant Programs

Of the $6.3 billion that the DOE is in the process of distributing to state and local governments for energy efficiency improvements, $81 million has been directly allocated to New York City. According to the NYC Stimulus Tracker website, this $81 million will fund nine proposed programs, three of which are applicable to the commercial building sector.[ii] These three proposed programs include: a Revolving Loan Fund ($16 Million), an Energy Audit Program ($5 million) and a program for Retrocommissioning Buildings ($2 million).[iii]

The Revolving Loan Fund[iv] is intended to finance energy efficiency upgrades in buildings 50,000 square feet or larger that are either "financially distressed" or are unable to finance energy efficiency projects in traditional ways[v]. Lending under this program is expected to start in early 2010 and will provide up to 100% of the required audit and retrofit costs for increased energy efficiency, assuming New York City's application to DOE is approved[vi]. The loans will be structured so that loan payments will be less than the projected energy savings, to ensure that building owners see the economic benefits of this investment. After the loan is paid back, the building owner continues to reap the benefits of energy savings for years to come.

The Energy Audit Program will use stimulus funds to perform energy audits for 300 buildings building throughout the city. The audits will be designed to identify the most-cost effective energy efficiency measures for these buildings. Thus far, 100 buildings have been identified for the program.[vii]

The proposed Retrocommissioning Buildings program will be used to fund the retrocommissioning of eight of New York City's largest buildings. Each retrocommissioning project is projected to cost between $100,000 and $350,000 and will restore the subject buildings' operations to original performance levels, correcting inefficiencies that developed over time.

In addition to the energy efficiency grant funds that have been earmarked for New York City as described above, there is a possibility that New York City will win additional funding out of $454 million that the DOE will be awarding for energy efficiency programs on a competitive basis. A Funding Opportunity Announcement (FOA) was released by the DOE on October 19, 2009 that clarified the basis on which the competitive grants will be awarded. According to the FOA, $390 million will be awarded for innovative programs that are structured to provide whole-neighborhood energy efficiency retrofits, including residential, commercial and industrial buildings. Possible approaches include public-private partnerships, utility retrofit and audit programs and alternative financing opportunities. DOE expects to make 8 to 20 awards under this topic area, with award size ranging from $5-75 million[viii].

Smart Grid Funds

Pursuant to ARRA, $4.5 billion is available for the modernization of the United States' electric grid, enhancement of the security of U.S. energy infrastructure, and to ensure reliable electricity delivery to meet growing demand[ix]. These funds will be allocated for the development and implementation of "smart grids", including demonstration projects, worker training programs, regional transmission planning, development of electronic system communication standards, and to enhance existing state regulations and administration[x].

Although the deadline for applications to the DOE for direct project funding has passed, we believe that there will be opportunities to fund energy efficiency upgrades of individual buildings and portfolios in New York City through awards made to Con Ed and the National Grid. Con Ed has been awarded $136 million in Smart Grid Investment Grant funds. According to DOE, the funds will be used for "a wide-range of grid-related technologies, including automation, monitoring and two-way communications, to make the electric grid function more efficiently and enable the integration of renewable resources and energy efficient technologies."[xi] Con Ed has also applied for $46 million for Smart Grid Demonstration funding for a project that will involve the New York City Economic Development Corporation, Viridity Energy, Boeing Company, Rudin Management Company, and Columbia University. The main goal of this project is to show how integration of smart grid information, communication and other innovative technology can result in increased energy efficiency in commercial office buildings in New York City[xii].

In addition, it is worth noting one other application for Smart Grid funds for a project that combines commercial office building energy efficiency retrofits with smart grid technology. BOMA Chicago, in partnership with the owners of over 260 office buildings in Chicago has applied for $92.7 million to fund half of the projected up front costs of the BOMA Chicago Virtual Generator Project. This project involves installation of smart meters into all of the participating buildings and upgrades to certain building systems in order to effectively work with a to-be-created Network Operating Center (NOC). The NOC will analyze electricity demand through the smart meters to determine an appropriate response for the individual buildings. According to publicly available information, the program will use energy performance contracts (see Section IV below for a discussion of energy performance contracts) to finance the balance through revenues generated by energy savings[xiii]. Although

DOE did not award BOMA Chicago any stimulus funding for its Virtual Generator Project, the sponsors will be looking at other ways to implement the program and we believe that similar strategies might be worth considering in New York City.[xiv]

IV. Existing Incentive Programs

Existing public sector incentive programs that offset part of the upfront costs of energy efficiency retrofits include federal tax benefits, cash rebates and other incentives offered by New York State Energy Research and Development Authority ("NYSERDA") and utility companies such as Con Ed. Often the retrofit contractor receives the incentives as part of the pay package for the project, unless the property owners themselves perform the work. It is important to note that although there are some areas in which overlapping incentives may be available from NYSERDA and from utility company programs, a retrofit project can receive incentives from only one entity, not both.

Tax Deductions for Commercial Buildings

A federal tax deduction of up to $1.80 per sq. ft. is available to owners or designers of new or existing commercial buildings that save at least 50% of the energy usage of a building that meets ASHRAE Standard 90.1-2001. Partial deductions can also be taken for improvements in any one of three building systems: the building envelope, lighting, or heating & cooling systems. Specifications vary, but the building or system must meet certification requirements according to guidance issued by the IRS in consultation with the DOE. The person or organization that makes the expenditures for construction is generally the recipient of the allowed tax deductions. This is usually the building owner, but for some HVAC or lighting efficiency projects, it could be the tenant. These tax deductions are available for systems placed in service from Jan. 1, 2006 through Dec. 31, 2013.[xv]

NYSERDA Programs

NYSERDA's incentive programs cover a wide spectrum of energy-related projects, including but not limited to energy efficiency upgrades. The Existing Facilities Program specifically targets energy efficiency retrofits/upgrades in commercial buildings through incentives and cost-sharing programs. Incentives are paid either on a per-unit-installed basis ("Pre-qualified") – which partially cover the cost of replacing inefficient appliances, lighting and HVAC equipment and are typically targeted to a smaller commercial audience – or are based on the actual energy savings ("Performance-based"). The Performance-based incentives are higher than pre-qualified incentives and the projects are also bigger and more complex, with a minimum project size requirement. An initial energy audit/engineering analysis is required and post completion measurement and verification procedures may also be required.

The Performance-based incentives include cost-sharing and financial assistance for initial engineering analysis and feasibility studies, and incentives target a wide range of energy efficiency measures including:

- Retrocommissioning

- Gas Efficiency: equipment (e.g. furnaces, boilers, etc.), procedures (e.g. heat pipe insulation) and systems (e.g. control systems, heat recovery).
- Electric Efficiency (lighting, electric HVAC equipment such as motors, chillers, pumps)
- Industrial/Process Efficiency: measures that reduce per-unit energy consumption in data centers & manufacturing plants
- Installation of technologies or equipment required for Peak Demand programs
- Installation of Combined Heat & Power (CHP) Systems

Utility Incentive Programs – Con Ed & National Grid

Utility incentive programs target energy efficiency measures in three main areas - electric efficiency, natural gas conversion, and peak load management (i.e.: demand management and demand response programs). Current incentives for large commercial customers are limited to peak load management programs and eligibility depends on the geographic location of the facilities, although a prescriptive rebate program for larger users (>100 kW/month) is being considered by the Public Service Commission.

For smaller commercial users (<100 kW/month usage), there are prescriptive electric efficiency programs currently available that provide cash rebates for installing efficient lighting, appliances and equipment. These "direct- install" programs are available through both Con Ed and National Grid and provide rebates of up to 70% for installation of approved lighting, HVAC, and other smaller-scale measures. Providing information about these programs to commercial tenants that occupy space in New York City office buildings could be a valuable service that both building owners and building managers could provide and a strategy to reduce overall energy consumption in these buildings.

V. Financing Models & Programs

As noted above, public sector incentives typically offset a small percentage of the upfront costs of energy efficiency upgrades, and thus need to be considered in conjunction with private financing vehicles to support the up front capital costs of energy efficiency upgrades, especially those that involve more than "low hanging fruit" and short, i.e., one to two year paybacks.

The financial community is beginning to consider the cost savings potential of energy efficiency upgrades as an investment opportunity. Combined with the public sector incentives that are available for energy efficiency upgrades, attractive financial models and programs are evolving for energy efficiency upgrades. In this section we will discuss the basic energy performance contracting model and evolutions of this model that are developing among private sector players, as well as municipal and utility based financing models that are being employed with increasing frequency in different jurisdictions throughout the county.

Performance Contracting

Energy Performance Contracting (EPC, or PC), or what is often referred to as the "ESCO" model, is a general method for financing retrofits through projected future energy savings. These terms loosely refer to transactions in which the future energy savings can be used to "pay" for the up-front costs of energy efficiency upgrades. Performance contracting usually involves an energy service company ("ESCO") or engineering firm that provides turnkey engineering, installation and maintenance services for energy efficiency upgrades and guarantees reduced energy consumption as a result of their work. Typically the ESCO is paid for its work when the work is completed and will guarantee the projected energy savings for a limited period of time after the work is completed, and reimburse the building owner at a predetermined rate if the projected savings are not realized.[xvi]

This model has been offered by ESCOs for more than two decades, with some success and some limitations seen in its application in the large commercial sector. It has been most widely used in the public building sector (Federal and MUSH – Municipal/University/ School/Hospital), for a number of reasons. Public sector building owners are generally longer-term holders of real estate, occupy the facilities they own without the burdens of a mortgage, and are able to go through lengthy contracting processes. These factors (complexity of contracts, long timelines, and the fact that lenders have historically required a lien or a personal guarantee from the owner) have impeded widespread use of performance contracting in private commercial buildings, which currently account for less than 10% of the ESCO market.[xvii]

Financing the up-front costs of these projects has also traditionally been an impediment to widespread adoption of this model in the private commercial sector. For public sector projects up-front financing has often been provided through municipal funds or bond issues. In some cases (both public and private sector) the ESCO is aligned with a third party provider of capital. In both cases, repayment of the up-front costs is aligned with the projected savings on energy costs, and can take as long as ten to twenty years for comprehensive, whole building projects.

Because this general model serves as a good template for structuring the kinds of large retrofit projects with long-term paybacks that are gaining the interest of financial stakeholders, the last few years have seen efforts to address or circumvent some of these impediments. Several private actors are pursuing variations on the general performance contracting "theme" that aim to address some of these barriers and make it more suited to the unique needs/characteristics of the large commercial sector, and that also aim to provide more comprehensive energy efficiency services rather than smaller piecemeal projects. Three models currently being employed in the market are presented below.

BOMA Energy Performance Contracting (BEPC) model/Clinton Climate Initiative Energy Efficiency Building Retrofit Program (EEBRP)

BOMA International and the Clinton Climate Initiative (CCI) have partnered to create the BOMA Energy Performance Contracting (BEPC) model,[xviii] a refinement of the general performance contracting model that is intended to help overcome some of the historical barriers to energy efficiency investment in the commercial sector. The partnership has worked with major ESCOs to develop a unique set of contracting terms and conditions, including streamlined procurement, transparency in pricing, and other processes that reduce project cost, development time, and business risk. A "Tool Kit" of boiler-plate documents aimed at standardizing and streamlining the contracting process is available to the public through the BOMA website.

Furthermore, CCI's Energy Efficiency Building Retrofit Program (EEBRP) works with a variety of financial institutions around the world to help owners procure financing for these projects on competitive terms, either through the use of existing financial products or through the development of entirely new funding mechanisms, and can help building owners formulate and then communicate their financing needs to the financial community. It has also created a way for building owners working with EEBRP to access information and discounted pricing on a number of energy-efficient products and technologies through CCI's Purchasing Alliance, which lowers investment barriers for products and technologies with significant energy efficiency improvement or fuel switching potential, focusing on both emerging and mature products and technologies that may otherwise be prohibitively expensive. Building owners can access the Purchasing Alliance products directly using their own procurement methods or as part of a larger retrofit project through an ESCO or other provider.[xix]

NAESCO (the National Association of Energy Services Companies) is another organization worth mentioning here as a source of information on the performance contracting process, and also provides a searchable database on its website for locating quality contracting and engineering service providers.[xx]

"Third-party utility supplier" model

Another model on the market provides energy efficiency services and financing in one "package". An intermediary enters into an agreement with a commercial property owner to essentially manage its utility expenses for a period of time that will enable it to upgrade the energy efficiency and possibly add renewable energy to the property and recoup its investment from the energy cost savings after the improvements are completed. This model is based on a transaction structure that replaces current utility expenses with a line-item operating expense that is set equal to historical (ie. pre-retrofit) energy costs. The intermediary company effectively becomes the energy supplier for the duration of the repayment period, manages the energy retrofit and effectively assumes the risk of achieving the projected energy savings for the duration of the contract[xxi].

Efficiency Services Agreement (ESA) model

The Efficiency Services Agreement (ESA) is another model for up-front third-party financing of energy efficiency retrofits that is repaid over time through energy savings and aimed at comprehensive, large-scale retrofits. Under this model, an ESA provider serves as financier and *owner* of energy efficiency assets (taking title to those assets with a repurchase option to the building owner) and partners with service providers to carry out required project installation and maintenance activities. Building owners continue to pay for their own energy (albeit less energy than before the retrofit) and make regular payments to the ESA provider for each kilowatt hour of energy that is *not* consumed as compared to pre-retrofit consumption, at a rate slightly lower than the rate that would have been paid to the utility had those kilowatt hours been consumed.[xxii]

Emerging Private Equity Funds

On a limited basis, private equity funds are being used to fund energy efficiency projects on an aggregated large scale basis – for example, a $25 million investment opportunity was created by aggregating together the chiller replacements in over 30 buildings. There are limitations with regard to the types of upgrades that can be achieved in a given building since these financing vehicles currently do not bundle different types of upgrades together. However, financing mechanisms like this can be useful for portfolio-wide upgrades that may fit similar criteria.[xxiii]

Other Programs of Interest

The three programs detailed below are mostly geared to the residential and the small-business segment, but some elements of these models may be valuable to the commercial sector; commercial stakeholders should be aware of these programs and how they are structured.

Municipal retrofit financing

Through municipal energy efficiency financing, the city/town provides loans for the up-front costs of the retrofit, which are then repaid through a line-item surcharge, usually on the property tax bill. The payments are typically slightly less than the energy savings, providing a benefit to the homeowner. The city pays the retrofit contractor directly, and one feature that makes it a particularly attractive model is that the debt payments are tied to the property, not to the property owner – the loan therefore stays with the property even if the current owner moves, and there are no personal loan guarantees or credit checks involved. As of mid July 2009, six cities and counties have established these programs.[xxiv] While mostly targeted to the residential sector, some also are available to the small business sector. The Long Island Green Homes (LIGH) Program is a good example of how this mechanism works.[xxv]

On-bill financing (OBF)

On-bill financing is structured somewhat similarly to Municipal financing. In this case the utility company itself provides the up-front funding for retrofits, with monthly repayments added as a surcharge on the monthly utility bill. On-bill financing has mostly been used in the small business sector for smaller upgrade measures, especially lighting retrofits, and is not yet widespread, but growing. Program details vary from utility to utility, including lengths and amounts of the loan; interest rates; etc. One important difference to note is that not all OBF programs tie loans to the property (one of the more attractive features of Municipal financing); some are structured as personal or business loans.[xxvi]

Community Preservation Corporation Green Financing Initiative

The Community Preservation Corporation (CPC) Green Financing Initiative, a new public-private partnership, will provide $1 billion in construction and mortgage loans for energy efficiency upgrades and renovations targeted to multifamily affordable housing facilities. This program will provide short-term construction financing for buildings needing larger, more extensive renovations which include energy efficiency upgrades as part of the larger renovation and permanent mortgages will be offered through Freddie Mac for properties that do not require extensive renovation.[xxvii] This program is based on the "Green Mortgage" concept and will feature reduced rates to support the energy retrofits. "Green Mortgages" refer to residential mortgages that provide a money-saving discount or a bigger loan than would otherwise be granted as a "reward" for making energy-efficient improvements or for buying a home that meets particular energy-efficiency standards. Green mortgages hinge on the principle that a more energy-efficient home means lower utility bills and, as a result, more funds available for debt service. These mortgages have also been called Energy Efficient Mortgages (EEMs) or Energy Improvement Mortgages (EIMs).[xxviii]

VI. Building Technologies

Energy efficiency measures range from the easier "low-hanging fruit" to more advanced retrofit measures. Some retrofits can be added as discrete equipment replacement, others must be integrated with more extensive renovations. Well-established practices and technologies are capable of achieving 20-30% savings with attractive cost-effectiveness. However, to achieve more ambitious goals being discussed in public policy for climate protection, more advanced technologies must be implemented that can reduce energy use much more dramatically, by 50-60%. These different technologies and systems are detailed in this section.

Determining which financial model will work for an energy efficiency retrofit depends, in part, on which building systems the owner intends to upgrade. Each building system and the various technologies for improving it need to be analyzed for potential energy savings. The building owner needs to establish energy efficiency goals in light of the potential costs and benefits of the various systems and technologies and general business strategy for the overall building. All of these factors will determine how extensive the retrofit will/should be and which building systems will be affected.

A recent report from McGraw Hill Construction showcased several retrofit projects and the costs associated. Analysis of the report revealed that the average cost per square foot per retrofit project was $58.51 per SF (See Table A for McGraw Hill Case Studies).[xxix] Most of the projects involved improving more that one building system, with a variety of strategies that ranged from upgrading lighting systems, to the more complex and expensive improvement of window replacements. Before any of these projects were implemented, existing conditions were benchmarked and overall efficiency goals were established.

Benchmarking Tools & Energy Analysis

In determining what a green building retrofit should encompass, there are several third party rating systems that a building owner can use a guide. The most prominent are the ENERGY STAR program developed by the DOE and the EPA, the Leadership in Energy and Environmental Design (LEED®) rating system developed by the US Green Building Council, and the Green Globes rating system developed by a public/private group including the Canadian Government. Energy efficiency is the sole focus of the Energy Star program, but only one component (albeit an important one) of the LEED and Green Globes rating systems.

The EnergyStar program rates buildings on a score of 1-100, based on their energy consumption relative to the energy consumption of similar buildings in the United States. Only buildings that achieve a score of 75 or higher can earn the ENERGY STAR label. A score of 75 indicates that the building is performing better than 75% of other buildings of the same type, in other words the building is in the top 25% of similar buildings in the Energy Star database, based on its energy consumption.[xxx]

The LEED rating system evaluates how sustainable a building is based on the number of points it achieves in six different categories including Site Selection, Water Efficiency, Energy and Atmosphere, Materials and Resources, and Indoor Environmental Quality. There are certain prerequisites that every certified building must achieve, for example there must be an area set aside for a recycling program and a minimum amount of energy efficiency achieved. In addition to satisfying the prerequisites for certification, points in the different categories can be mixed and matched according to the specific characteristics of the particular building. The more points earned, the higher the level of certification. The level of certification achieved is an environmental benchmark that can be compared to other buildings of the same type.[xxxi]

The Green Globes rating system is also based on a "points" system. The point system is different than LEED because the amount of points available to earn are dependent on the strategies involved in the project. Instead of earning a specific number of points, a building earns certification based on a percentage of available points. The minimum certification requires a building to earn 35% of the applicable points. Buildings earn points through seven sections that include Project Management, Site, Energy, Water, Materials and Resources, Emissions Effluents and Pollution Reduction, and Indoor Air Quality. As with LEED there are different levels of certification that other buildings of similar type can be compared.[xxxii]

It has been noted that if you can't measure it, you can't fix it. This applies to improving energy efficiency: in order to effectively improve the energy efficiency of a building, you must be able to measure or benchmark the existing energy consumption. Some of the tools described above can give building owners metrics to differentiate and compare their buildings to others. In addition to gaining a relative understanding of how one building compares to another in terms of energy consumption, it is also important to understand the actual energy consumption of a building whose owner is considering energy efficiency measures. In order to understand a building's energy consumption it must undergo an energy audit. An energy audit will reveal which building systems are performing to capacity and which are in decline.

The audit will also benchmark current energy usage. The benchmark is vital in determining the amount of energy savings that can be obtained through various retrofit strategies.

The benchmarking process will enable building ownership to determine the costs and benefits of achieving various energy saving goals for the retrofit project. The goals need to be analyzed with the building technologies in mind to determine which financial model is most appropriate. Building technologies that facilitate the "low hanging fruit" may be accessible through yearly operating funds and the investment required can be minimal. Advanced strategies require capital investments and a variety of financing vehicles may be necessary to implement these strategies.

The First 25%: The Low Hanging Fruit

Two strategies that can reduce energy usage significantly relative to cost of the project are replacing inefficient lighting and upgrading HVAC system components. These strategies are more easily implemented in commercial office buildings via energy performance contracts than via extensive whole building renovations, because they generally produce savings equal to or greater than the costs involved over a relatively short period of time, e.g. under five years, vs. ten to twenty years for extensive retrofits. Low hanging fruit retrofit strategies may reduce energy use to about 60,000 BTU/SF. According to the 2003 Commercial Building Energy Consumption Survey, the average commercial building uses about 93,000 BTU/SF.[xxxiii]

Lighting retrofits involve switching to higher-efficiency components (light bulbs, ballasts, etc.). Replacing incandescent lighting with compact fluorescents has been well documented, but certain fluorescents are more efficient than others. T5 fluorescent lamps are the latest technology in fluorescent lighting and are more efficient than T8 and T12 lamps. LEDs are the next generation lighting technology, but given the upfront costs of implementing LED lights, this technology is several years away from becoming a commercially viable option.

The use of Occupancy Sensors is another lighting strategy, used to automatically turn lights on or off depending on whether people are present. Occupancy sensors are appropriate for restrooms, conference rooms and other areas that have variable occupancy. Potential issues can arise if sensors are not properly located or delay times are not adjusted adequately. Occupancy sensors can be used in combination with daylighting strategies for increased energy efficiency. Daylighting can be an easy strategy, but due to the complexity of some daylighting systems the strategy will be discussed below in Advanced Strategies.

Retrocommissioning (RCx), is essentially a facility "tune-up" that restores and optimizes the building's energy-using equipment (such as mechanical equipment, lighting and related controls) back to its peak performance and to meet existing operating needs, rather than relying on major equipment replacement.[xxxiv] This process helps find and repair operational problems – building performance generally declines after two to five years[xxxv], and RCx can reduce energy consumption by 10% to 15% and realize a return on investment in as little as six months to two years[xxxvi]. RCx involves diagnostic monitoring and functional tests of building systems, with retesting and re-monitoring to fine-tune improvements.

Demand Controlled Ventilation (DCV) is an operational strategy that uses sensors installed in occupancy spaces to measure CO_2 and temperature levels, which then control ventilation levels for the number of people present in a room. DCV systems are more practical for areas that have variable occupancy such as meeting rooms that do not have constant occupancy. Energy use savings are variable depending on the size of the spaces and how often the spaces are occupied. Variable Speed Drives or Variable Frequency Drives (VSD/VFD) are another method for saving energy in the building's ventilation system. The VSD controls the speed of pumps and fans for the ventilation system. By controlling the speed, the VSD saves energy by only moving the volume of air based on demand as opposed to peak capacity.

Advanced Strategies

The strategies mentioned in "The First 25%" are available now and can be implemented relatively easily. While these strategies should result in reduced energy consumption, they are just the beginning. There are more advanced strategies that can be used to achieve even greater increases in energy efficiency. These advanced strategies have higher up-front costs and possibly longer paybacks, but can achieve great reductions in energy usage. These advanced strategies aim to reduce energy use in buildings to about 30,000 BTU/SF.

Daylighting is based on the simple concept of using available sunlight to meet lighting needs in order to rely less on artificial lighting. Daylighting offers several benefits including reduced energy costs, reduced HVAC load, and extended lifecycle of artificial lighting. However, upfront design costs with coordination of architecture, structure, and lighting design can be significant. In order for daylighting to function properly and reduce energy use certain components are a must, including dimmable ballasts and photo sensors that monitor current light conditions in order to determine the proper amount of dimming for the artificial lights (or turning off altogether if natural light levels are adequate).

Heat Recovery Systems are used to improve the efficiency of the HVAC system overall, there are several different types of heat recovery systems; these include Heat Exchange Enthalpy Wheels, Plate Exchangers, Heat Pipe Systems, and Run-Around Systems. The basic principle of these systems is to use available heat to reduce the energy needed for heating fresh incoming air. In general it is best to implement these systems when upgrades are required for other HVAC equipment. When combined with a heat recovery system, the replacement HVAC systems may be smaller in size than the system it is replacing.

Combined Heat and Power Systems (CHP) (also known as cogeneration) is another way to improve the overall HVAC system, by generating power *and* heat from a single fuel source[xxxvii]. CHP systems improve energy efficiency by using the waste heat byproduct of the power generation process for either space heating or hot water heating, significantly cutting the amount of additional energy required for these.[xxxviii]

Underfloor Air Distribution is a ventilation strategy that uses a cavity in the floor where heated air is distributed and then delivered through several outlets at the floor level. Some of the benefits of include improved thermal comfort, improved indoor air quality, and reduced energy use[xxxix]. This system is the subject of some controversy given potential issues with mold development from condensation, increased noise, and air leakage. It may also not be possible to incorporate underfloor distribution due to the existing layout of the floors.

Building Envelope - The building envelope is the building's primary protection against rain, wind, and temperature. The design of the façade affects all the building systems in some form, dictating lighting levels, HVAC sizing, and Indoor Air Quality (IAQ). These systems are impacted by the type of windows, insulation, and structure of the envelope.

Windows are often the source of air and moisture leaks that result in increased energy consumption and poor indoor air quality. Air and moisture leaks can usually be solved by specifying the correct window sizing and appropriate sealing. Due to the climate in the northeast U.S. it is best to use windows with low U values and incorporate a Low-e coating or film to reduce radiant heat flow. The Empire State Building energy efficiency upgrades will incorporate a low-e film between double glazed windows. This, combined with other building system upgrades, will save an estimated $4.4 million annually.[xl]

Solar Shade systems block direct sunlight from entering the windows of a building, and are designed to block the heat gain from summer sun and allow winter sun in to warm the building. The system can be fixed or mechanical with the latter the more expensive to install and operate. These systems can be quite complex (e.g. the New York Times tower) or can be as simple as an overhang. The use of solar shades may present an issue in existing structures due to the added weight of the systems. A structural engineering analysis is required in order to determine if this strategy is possible.

Another type of solar shading is Electrochromic windows. These advanced window systems change the tint in response to environmental signals via an electric current. These windows are used to control glare, solar heat gain, and fading. Although the technology for these window systems is promising, the technology is in its infancy.

Building Automation Systems (BAS) are control systems that monitor and control building systems, such as lighting, heating, and ventilation, through a computerized network which operates the systems only when required, based on real-time feedback. The BAS relies on sensors to measure the conditions of the building and uses this information to control the various building systems. These systems save energy by controlling building systems only when it is necessary and shutting them down when not required.

Building Technologies and Smart Grid

In the near future, buildings will be equipped with smart meters that enable two-way communication from the building to the power plant. This significant component of smart grid technology will allow buildings to use energy wisely by communicating current energy needs to the power plant. Simultaneously, the power plant will relay information to the building about energy peaks. This two way exchange of information will be useful, but will not help buildings use energy wisely. A Building Automation System (BAS) that can "use" this two-way exchange of information is necessary in order for energy efficiency to be maximized.

The BAS will be able to control building systems in response to grid activity. The power plant will communicate to the building about on going conditions. The BAS can follow certain routines based on the conditions of the grid. This allows the building to be resilient to various grid conditions and operate more effectively. BAS integration with the smart grid may reduce the risk of higher energy costs associated with "real-time" pricing. Real-time pricing works by the utility charging different rates based on energy demand. Prices during peak hours are higher than off-peak hours. BAS can take advantage of this by operating certain systems during off peak hours.

VII. Conclusion

We have attempted to provide a comprehensive overview of the public and private financing mechanisms available for energy efficiency upgrades of commercial office buildings in New York City, as well as other models applicable to the non-commercial sector that could have potential application to the commercial sector. As we note above, public stimulus funds will be available for energy efficiency upgrades of commercial New York City office buildings to an extent, and when added to existing public sector incentives such as NYSERDA's Existing Buildings Program, help to defray the upfront costs of these building improvements.

Additional alternative financing sources are needed in today's capital constrained environment in order for energy efficiency upgrades to be employed on a widespread basis. The finance/investment community is responding to this need and alternative financing vehicles are being tested in both the public and private sectors. These alternatives will continue to evolve and we expect to see additional models in the future as demand on the part of the real estate industry escalates for cost effective capital for energy efficiency upgrades.

As the real estate community becomes more comfortable with the myriad of existing technologies that can be employed to increase energy efficiency, and as financial alternatives for financing those technologies become more available, we look forward to much broader adoption of comprehensive energy efficiency retrofits as a strategy for value creation and the repositioning of real estate assets for the eventual upturn in the market.

Finally, it is important to note that no single technology package is right for every building - choice of energy efficiency technology is dependent upon many factors such as age of various systems, asset strategy, and level of financing that can be supported. In some cases it may be attractive to pursue a radical energy reduction, while in others a phased approach may be more appropriate. Easier retrofits can be accomplished at relatively low cost; although for commercial building owners in the current economic climate, larger and more comprehensive retrofit projects may be a better option especially if the goal is to reposition as a "green" real estate asset. Incorporating the low hanging fruit into a more comprehensive retrofit may be a good way to secure financing by making the return on the retrofit project more attractive. Growing interest from financial stakeholders may bode well for better financing opportunities for large commercial owners, especially in aggregating large numbers of these projects together on a portfolio-wide basis and/or in pursuing more comprehensive retrofits. In order to make such decisions and develop energy efficiency plans, asset managers must have better knowledge and training about energy technologies, finance and strategies.

TABLE A: McGraw Hill Case Studies

Case	Location	Size (SF)	Project Cost	Cost per SF
Center for Neighborhood Technology	Chicago. IL	14,961	$1,200,000.00	$80.21
Howard M. Metzenbaum U.S. Courthouse - GSA	Cleveland, OH	235,600	$51,000,000.00	$216.47
Portland U.S. Customhouse - GSA	Portland, ME	25,269	$1,000,000.00	$39.57
John J. Duncan Federal Building - GSA	Knoxville, TN	172,684	$269,000.00	$1.56
100 Montgomery Office Building	San Francisco, CA	424,454	$30,000,000.00	$70.68
Idea Center at Playhouse	Cleveland, OH	90,000	$17,000,000.00	$188.89
Scowcroft Building	Ogden, UT	133,000	$1,144,200.00	$8.60
Skanska NY Headquarters	New York, NY	25,000	$4,600,000.00	$184.00
SoFlo Office Studios	San Antonio, TX	16,600	$1,800,000.00	$108.43
Founding Farmers	Washington D.C.	8,500	$4,600,000.00	$541.18
Armstrong Headquarters Building	Lancaster, PA	126,000	$138,000.00	$1.10
One Harvard Circle, Suffolk Construction	West Palm Beach, FL	23,000	$5,360,000.00	$233.04
National Life Office Building	Montpelier, VT	543,992	$2,000,000.00	$3.68
Mountain Gear Headquarters and Warehouse	Spokane, WA	111,526	$2,000,000.00	$17.93
Loyola Elementary School	Los Altos, CA	29,629	$8,000,000.00	$270.01
200 Market Office Building	Portland, OR	384,000	$30,200,000.00	$78.65
PepsiCo Headquarters Building	Chicago. IL	425,000	$1,100,000.00	$2.59
PepsiCo Headquarters Sustainability Center	Chicago. IL	3,000	$1,950,000.00	$650.00

Compiled from McGraw-Hill Construction *SmartMarket Report: Green Building Retrofit & Renovation Rapidly Expanding Market Opportunities Through Existing Buildings.*

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