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THE STEVEN L. NEWMAN REAL ESTATE INSTITUTE

The Evolving Landscape

Energy Efficiency Retrofitting For NYC Commercial Buildings

A research report prepared for the Steven L. Newman Real Estate Institute, Baruch College, CUNY by contributing authors Ellen Sinreich of Green Edge, LLC and Daniella Leifer, Ryan North and Michael Bobker of the City College, CUNY and its CIUS Building Performance Lab.

I. Introduction

The New York City Building Performance Stakeholders Consortium, which is co-sponsored by the CIUS Building Performance Lab of City College and Newman Real Estate Institute, requested that the research described in this paper be pursued. Members of the Consortium, comprised of over 200 commercial building owners and operators, recognize the need to better understand how they can move their properties to high performance and low energy use/carbon emission. Work was commissioned under funding from the New York State Energy Research and Development Authority (NYSERDA), originally to understand how stimulus funding might affect opportunities for energy retrofits. A working group of the Consortium concluded that it would be best if federal stimulus funds were incorporated with incentive programs and public-private financing mechanisms to provide a clear pathway for projects at the scale required to transform NYC's commercial property. The purpose of this paper is to describe the elements of such a pathway so that property owners may more readily walk down it. After briefly discussing the strategic context, we examine three elements of this evolving landscape: technology, financial incentives and project finance.

The Strategic Context

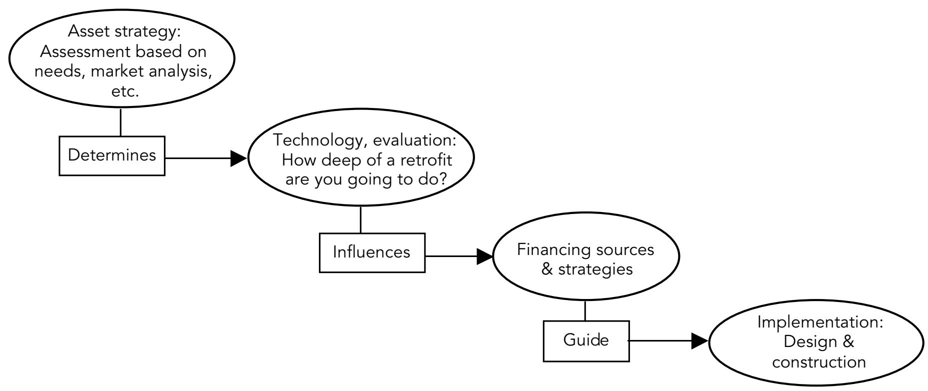
As a result of the recent economic downturn, there are limited opportunities to create value when it comes to existing commercial office buildings in New York City. Vacancy rates are up and rental rates are down as property owners face significant reductions in the value of their real estate assets.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

Regardless of expressed market desire and increasing regulatory imperatives for greater sustainability, owners of commercial office buildings are currently operating in a capital-constrained environment. In light of this, we explore financial programs and opportunities that are available or emerging to help commercial real estate owners pay for energy efficiency retrofits; these include public incentives, potential sources of funds from recent stimulus funding, and private financing mechanisms.

The energy efficiency retrofit strategy also depends on technology, itself rapidly evolving, and a plan for its introduction. We describe retrofit technologies and measures, currently available and emergent, which are appropriate for commercial buildings. Options for energy efficiency retrofits range from simpler measures with quick paybacks to more advanced measures with longer paybacks and deeper energy reductions. No single technology package will be right for every building. Some retrofits entail discrete equipment replacement while others include more extensive renovations; in some cases it may be best to directly pursue radical energy reduction at one time while in others a phased approach may be more appropriate.

Figure 1:

Planning an Energy Efficiency Retrofit Project



A strategic energy plan fits as a part of the strategic asset plan for the property, to guide project planning and decision-making. This is an important first step so that upper level management understands, buys-in, and supports the energy strategy. Figure 1 provides a schematized overview of the process involved.

With a comprehensive strategy and organizational mandate in place, the path is smoothed, compared with bringing each individual project for review-justification-approval.

II. Retrofit Tools & Technologies

Well-established energy efficiency practices and technologies are capable of achieving 15-25% savings with attractive cost-effectiveness. However, to achieve more ambitious goals, advanced technologies, which can reduce energy use by 50-60%, must be implemented. Among such technologies are better performing envelopes, heat recovery, alternative Heating, Ventilation, and Air Conditioning (HVAC) designs, on-site cogeneration, and enhanced building automation/management systems. These technologies and systems are detailed in this section.

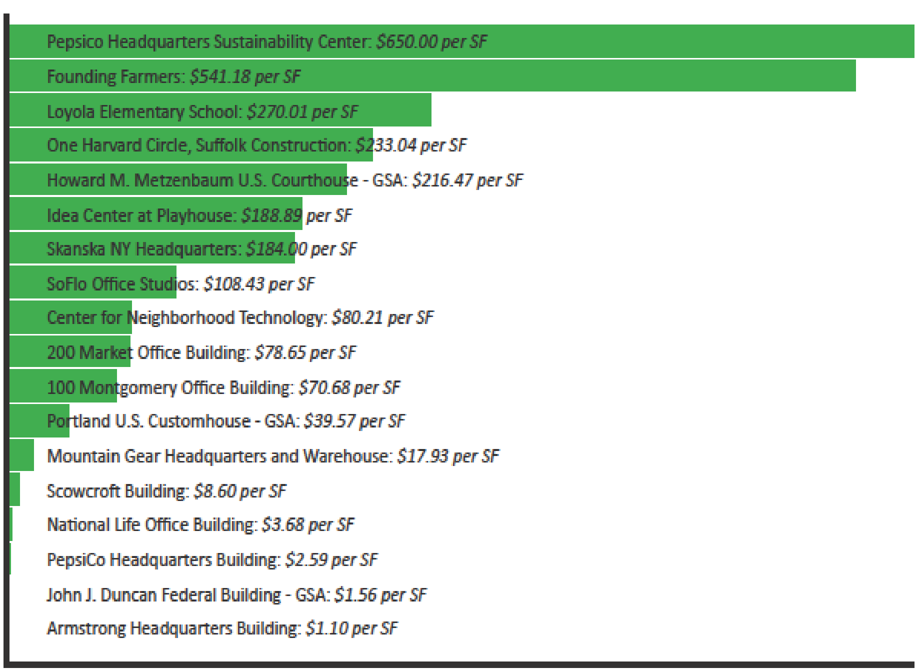
Determining an appropriate financing strategy for an energy efficiency retrofit depends, in part, on which building systems the owner intends to upgrade. Certainly any significant building investment or renovation project should consider incorporating energy-related measures even if the project itself is not specifically energy-focused. 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 potential costs and benefits of the various systems and technologies, as well as the general business strategy for the building. All of these factors will determine the extent of the retrofit, which building systems will be affected, and the appropriate financing strategy.

A recent report from McGraw Hill Construction surveyed a range of retrofit projects and their associated costs. Average cost per square foot across this sample was $58.51 (figure 2). However, this cost varied very widely depending on the scope of the retrofit project.[1] Most of the projects involved improving more than one building system, including full cost of extensive renovation at the high end of the surveyed projects.

Given NYC's commercial real estate market size of approximately 800 million square feet, based on this limited sample of project costs, the sector's capital requirement for energy retrofitting is on the order of $40 billion.

Figure 2:

Retrofit Costs per Square Foot



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

Table 1:

Energy Benchmarking Programs

Energy Star and **Portfolio Manager** Developed by the Department of Energy and the Environmental Protection Agency	• Portfolio Manager is a free web-based tool to analyze a building's energy use. • Rates buildings on a score of 1-100, based on their energy consumption relative to the energy consumption of similar buildings in the U.S. • Only buildings that achieve a score of 75 or higher can earn the ENERGY STAR label, indicating that the building is performing better than 75% of other buildings of the same type in the Energy Star database, based on its energy consumption.[2] • This system is almost exclusively focused on energy efficiency.
NYSERDA Focus on Commercial Real Estate (CRE) Toolkit Developed by NYSERDA, based on Energy Star Portfolio Manager	• A free, customized, web-based tool; enables commercial building owners and managers to rate their buildings' energy efficiency and carbon footprint relative to peer office buildings in NYC, the State, and across the nation. • Similar to Portfolio Manager, but tailored to commercial properties in New York. • Provides regional-based comparison of source energy consumption and carbon emissions for buildings located in New York City.
LEED (Leadership in Energy and Environmental Design) Developed by the US Green Building Council[3]	• Evaluates the sustainability of a building based on the number of points it achieves in six different categories - Site Selection, Water Efficiency, Energy and Atmosphere, Materials and Resources, and Indoor Environmental Quality. • There are certain prerequisites for every certified building. Examples: designated area for recycling; basic energy efficiency measures. • In addition to prerequisites, points in different categories can be mixed and matched according to 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.
Green Globes Developed by a public/private group including the Canadian Government[4]	• Also based on a points system; in this case the number of points available depends on the strategies involved in the project. Instead of earning a specific number of points, a building earns certification based on percentage of available points met. • Seven categories include Project Management, Site, Energy, Water, Materials and Resources, Emissions Effluents and Pollution Reduction, and Indoor Air Quality. • Minimum certification requires earning 35% of applicable points. • As with LEED there are different levels of certification that can serve as a basis of comparison between buildings.

Getting Started: Benchmarking and Energy Audits

Benchmarking establishes a building's energy use baseline and its performance relative to other, similar properties. It is a mandatory annual filing under NYC's new "Greener, Greater Buildings" legislation. The US Environmental Protection Agency's (EPA) EnergyStar Portfolio Manager is the primary tool presently used in the industry for benchmarking; NYSERDA provides a more customized state-wide database. These tools, as shown in Table 1, are used to establish energy performance under third-party rating and labeling systems, such as LEED and GreenGlobes.

While benchmarking shows the energy performance of a building, it does not show how the building uses that energy or ***why*** the building performs that way. This further level of understanding requires an ***energy audit*** to identify the end-uses of energy and assess what improvement opportunities may be available. The energy audit is often a required first step in retrofit incentive and financing programs.

The audit and benchmarking process enables building owners to determine the costs and benefits of achieving energy saving goals and may enable owners to pursue one of the building certifications outlined above. Goals need to be analyzed with the building technologies in mind to determine an appropriate financing strategy. Upgrades that focus on less technically complex measures may be accessible through budgeted operating funds, while advanced strategies will require capital investments and other financing vehicles may be necessary to implement them.

The First 25%: The Low-Hanging Fruit

Three strategies that can reduce energy usage significantly relative to cost are replacing inefficient lighting, upgrading certain HVAC components, and retro-commissioning (RCx). The payback periods for these "low-hanging fruit" strategies are under five years versus seven years and higher for more extensive retrofits and system replacements. The average commercial building's energy use is about 93,000 BTU/SF.[5] These basic measures, outlined in Table 2, may reduce this to 60-70,000 BTU/SF.

Going Deeper: Advanced Technology Strategies

The strategies outlined in Table 2 can be implemented relatively easily but are just the beginning. More advanced strategies, outlined in Table 3, have higher up-front costs and, usually, longer paybacks, but can achieve greater reductions in usage, targeting commercial building performance in the range of 35,000 BTU/SF. Some may be considered as stand-alone system replacements or additions but others may be best considered in the context of major building renovation or when existing systems are reaching their end-of-useful-life. In this context, it may be more appropriate to consider the incremental cost of the advanced technology, compared to a baseline technology.

Building Technologies and Smart Grid

Smart meters that enable two-way communications between buildings and power plants via a smart grid will become increasingly common in the future as part of public infrastructure investments. This two-way information exchange could allow buildings to reduce energy costs if a Building Automation System (BAS) is employed to control building systems

Table 2:

Basic Retrofit Strategies & Technologies

Lighting retrofits Involve switching to higher-efficiency components (light bulbs, ballasts, etc.)	• Large savings and fast payback from lighting retrofits has been well documented. Note that certain fluorescents are more efficient than others: T5 lamps are the latest technology and are more efficient than T8 or T12 lamps • Occupancy sensors are used to automatically turn lights on or off depending on whether people are present – appropriate for restrooms, conference rooms, and other areas with variable occupancy. Bi-level fixtures can be valuable in corridors and stairwells. Problems can arise if occupancy 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 is discussed below in Advanced Strategies. • LEDs are the next generation of lighting technology but given their high costs, they are several years away from being commercially viable.
Retrocommissioning ("RCx") Essentially a facility "tune-up" that restores and optimizes the building's energy-using equipment	• Restores the building's energy-using equipment (ie. HVAC, mechanical equipment, lighting) back to peak performance and to meet existing operating needs.[6] • RCx involves diagnostic monitoring and functional tests of building systems, with re-testing to fine-tune improvements. • This process helps find and repair operational problems (system performance generally declines after two to five years).[7] Can reduce energy consumption by 10% to 15% and payback periods are typically six months to two years.[8] • Includes adjustment to equipment but major focus on tuning controls.
Ventilation Control Control of outside air intake and uncontrolled air infiltration	• Testing and adjustment of outdoor air quantities can be part of RCx and can yield large savings. • **Demand Controlled Ventilation (DCV)** uses sensors to measure CO2 to automatically control ventilation based on occupancy. DCV is more practical for areas with variable occupancy, such as meeting rooms. Energy use savings are variable depending on the size of the spaces and how often they are occupied. • Uncontrolled air infiltration can be cost-effectively reduced by air-sealing of envelope components and/or by restoring building pressurization. Comfort is improved. • **Economizer** operation should be using maximum amounts of outdoor air when outdoor conditions are favorable. This can be a relatively low-cost retrofit. Requires on-going monitoring to assure proper function.
Variable Speed/Frequency Drives (VSD/VFD) Controls speed of pumps and fans	• By controlling the speed of pumps and fans, VSDs save energy by only moving the required volume of air or water based on actual demand, rather than on peak capacity. Because of the properties of motor performance, savings can be dramatic. • Alterations to valves and dampers throughout the distribution system may be required. • VFD's already in place should be monitored on an on-going basis to verify that they are reducing motor speed in response to load as intended.

in response to grid activity (see BAS description in Table 3) – for instance, a BAS may automatically cut back on energy use during peak hours as part of a Demand Response program, reducing energy use during periods of higher energy costs (known as "real-time" pricing, in which the utility charges higher rates for electricity during peak hours) and operating certain systems during off-peak hours when energy rates are lower.

III. Existing Incentive Programs

Public sector incentive programs that offset part of the costs of energy efficiency retrofits include federal tax benefits as well as cash rebates and incentives through NYSERDA. Individual utility companies also offer rebates and incentives for efficiency upgrades. In some cases overlapping incentives may be available from NYSERDA and utility companies, but can be claimed only from one entity.

Federal Tax Credits

A federal tax deduction of up to $1.80 per square foot is available for envelope, lighting, and mechanical system upgrades, placed in service between Jan. 1, 2006 through Dec. 31, 2013, that reduce energy use to 50% below that of a building that meets ASHRAE Standard 90.1-2001.[a,13] This ambitious energy reduction requirement often makes it difficult to qualify for the tax credit (although partial deductions are available). The partial deduction for lighting retrofits is most likely to be cost effective.

ARRA Federal Stimulus Funding

The American Recovery and Reinvestment Act (ARRA) has allocated federal stimulus funds targeting a wide range of energy-related programs, administered through the Department of Energy (DOE). Two categories most relevant to the private commercial building sector are the ***Energy Efficiency & Conservation Block Grants (EECBG)*** that support individual county- and municipal-level programs approved by the DOE,[14] and the ***Smart Grid Investment Grant Program*** that will fund smart grid technology deployment, mainly by utilities, which may include deployment at the individual building level.

Energy Efficiency & Conservation Block Grant Programs $81 million in EECBG formula funds (based on population/size) has been awarded to New York City and will fund nine programs, although only one – the Greener Greater Buildings Revolving Loan Fund – is applicable to the commercial office building sector.[b,15] The loan fund is intended to finance energy efficiency upgrades in buildings 50,000

[a] 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. To qualify, the building must be inspected by an approved third party engineer. For more information see: http://www.taxalmanac.org/index.php/Sec._179D.

[b] The remaining programs target city-owned buildings and/or schools only. Detailed information on each of the 9 programs is available on the NYC stimulus tracker website.

square feet or larger that have completed an energy audit, but are either financially distressed or unable to finance energy efficiency projects in traditional ways.[16] Lending under this program is expected to start in 2010 and will provide up to 100% of the required audit and retrofit costs. Loans will be structured so that payments are less than

Table 3:

Advanced Retrofit Strategies & Technologies

Daylighting Uses sunlight to meet lighting needs in order to rely less on artificial lighting	• Benefits including reduced energy costs, reduced HVAC load, and extended lifecycle of artificial lighting, improved lighting quality. • Requires use of special components including dimmable ballasts and photo-sensors that monitor current light conditions and determine proper amount of dimming and/or shut-off for artificial lights if natural light levels are adequate. • Use "light shelves" to extend the reach of daylight deeper into office space. • Sensitive to office and lighting fixture layout.
Heat Recovery Uses available heat before it is rejected from the building	• Recover heat from exhaust-air, steam condensate, boilers, refrigeration condenser, data-centers. • Various types of heat recovery systems (enthalpy wheels, heat pipes, run-around systems, cross-flow heat exchangers). • Heat pumps can be used to boost temperature of recoverable heat. • When combined with a heat recovery system, the replacement HVAC systems may be smaller in size than the system it is replacing.
Combined Heat & Power (CHP) or Co-generation	• Uses waste heat from on-site production of electricity. Generates power and heat from a single fuel source,[9] significantly cutting energy required.[10] • Use recovered waste heat for building heating, hot water, absorption air-conditioning. • Represents a major capital expenditure but work limited to central plant. Size to baseloads for most economic operation.
Major HVAC Replacement Full system replacement can employ new low-energy technologies. These measures more suited to major building renovation.	• Underfloor Air Distribution Distributes heated air through multiple outlets from raised-floor plenum. Reduces distribution pressure and fan work and enables more localized control by occupants. Benefits include improved thermal comfort, improved indoor air quality, and reduced energy use.[11] Potential issues with mold development from condensation, increased noise, and air leakage. • Radiant floor or ceiling slabs, chilled beams. Low temperature systems take advantage of better thermal transport by water than air. Can improve comfort. Separate ventilation-only air system.
Building Envelope Advanced envelope designs include passive and active elements, especially glazed elements (windows, curtain walls). High expense – generally relevant when windows or curtain wall are reaching end-of-life.	• Façade affects all the building systems in some way - impacting lighting levels, HVAC sizing, and occupant comfort. • High-Performance Windows. Northeast combination of cold winter and hot summer suggests windows with low U-values and low-Emissivity ("E") coating or film to reduce radiant heat flow. The Empire State Building energy efficiency upgrades will retrofit windows by incorporating a low-E film between re-fitted double glazing.[12] • Solar Shade Systems. Block direct summer sun from entering building. Can be fixed (such as a simple overhang), glazing tints or films, or mechanical system, with the latter more expensive to install and operate. • Strategic Insulation may sometimes be appropriate for commercial buildings. For example, atert infra-red scanning, the Empire State Building project incorporated reflective insulation placed behind perimeter convectors. In masonry buildings, exterior insulation may be attractive for certain facades. • Re-skinning is the full replacement of curtain wall facades. Thermal bridging should be eliminated by careful detailing. Re-skinning materials are a critical decision with emerging options. o Electrochromic glazing which changes tint in response to environmental signals (sunlight) via an electric current; used to control glare, solar heat gain, and fading. Although promising, the technology is still in its infancy. o Double-skin construction. Popular in advanced designs in Europe. Allows for various operating modes, using wall as plenum, controlled opening of exterior skin, occupant opening of interior skin, etc.
Building Automation Systems (BAS) Automated control system that manages building systems through a computerized network	• Use extensive sensor network to measure building conditions and gather real-time feedback; information is used to control various building systems (lighting, heating, ventilation). • These systems save energy by operating energy-using equipment and systems only when necessary and shutting them down when not required, varying equipment operation to match loads, etc. • Provides measurement, monitoring, fault detection and diagnostics (FDD), reporting to assist in supervisory control of performance. • Advanced functionalities - optimization via anticipatory control, machine-learning, auto-calibration of sensors, etc.

the projected energy savings as a financial incentive, and property owners continue to reap energy savings after repayment of the loan. Legislation authorizing the revolving loan fund was enacted by the New York City Council as part of New York City's Greener Greater Buildings Plan on December 9, 2009.[17]

In addition, a consortium of municipalities including New York City has applied for additional funding under the EECBG's competitive awards category; if awarded, part of this money would be used to initiate a large-scale financing program using the PACE model to make more money available for revolving loans. It is unknown at this time if commercial buildings would be eligible for loans.[18]

Smart Grid Investment Grant Program $4.5 billion is earmarked nationally for the modernization of the U.S. electric grid to enhance security and ensure reliable electricity delivery to meet growing demand. The Smart Grid Investment Grant Program, which comprises $3.5 billion of the total, has or will directly fund deployment and implementation of smart grid technology, mainly through utilities.[c] Con Edison has won a $136 million grant[19] which will be used to deploy a wide-range of grid-related technologies that the company expects will help customers use energy more efficiently.[20]

Table 4:

Existing Incentives

Federal	
Tax Credits	Up to $1.80 per sf for exceeding ASHRAE Std. 90.1 by 50% in three areas: envelope, HVAC, lighting. Credit can be obtained for any individual area of improvement.
ARRA Stimulus Funds	An energy focus has followed the first tranche of stimulus funding for public works and transportation projects. Two early allocations are identified as significant for NYC commercial property but they are relatively small in size.
State – System Benefit Fund and other sources	
NYSERDA incentives	Project-specific support, usually up to 50% of costs and including initial energy audits.
Utility incentives and programs	As of 2009, utilities are able to offer energy efficiency incentives and programs. Con Edison and National Grid will impact NYC.

Table 5:

Financing Models

Traditional Lending, Modified for Energy Efficiency	
Special-Purpose Windows - Energy Efficient Mortgages	NYSERDA write-down of interest on home-improvement loans. Community Preservation Corporation Green Financing Initiative for multi-family properties.
Municipal Bonds	
Bonding authority used for Energy Performance Projects	Used to finance ESCO-developed performance contracts for public facilities such as for school districts.
Property-Assessed Clean Energy (PACE) Bonds	New mechanism for securing energy project finance based on securing loan with municipal property tax roll.
Third-Party Finance	
ESCO shared-savings performance contract	May take various forms, such as lease with guaranteed-savings, energy services agreement.
Securitization and Private Equity Funds	Aggregation of retrofit performance contracts to reach scale of interest to capital markets. Success here would open a large source of capital.
Utility Financed	Charges for installed measures appear on utility bills with net savings to end-user. Helps by-pass split- incentive barrier.

There may be opportunities for commercial office buildings through this work, although its major focus is on technologies within the grid itself. In addition, Con Ed has also been awarded $46 million in Smart Grid Demonstration Funds for a project involving the New York City Economic Development Corporation, Viridity Energy, Boeing Company, Rudin Management Company, and Columbia University, designed to test new technologies and show how these can increase energy efficiency in commercial office buildings in the city.[d]

NYSERDA Incentive Programs

NYSERDA's ***Existing Facilities Program*** provides incentives and cost-sharing programs for energy efficiency upgrades. Incentives are available either on a prescriptive, per-unit-installed ("pre-qualified") basis – which partially cover the cost of replacing inefficient appliances, lighting, and HVAC equipment for smaller projects – or are based on the actual energy savings ("performance-based") of larger, more complex energy efficiency upgrades. Performance-based incentives are typically higher in total dollar amount than pre-qualified incentives and have a minimum project size requirement. An initial energy audit/engineering analysis is required and post completion measurement and verification procedures may also be required. Performance-based incentives include cost-sharing and financial assistance for initial engineering analysis and feasibility studies, and target a wide range of energy efficiency measures including:

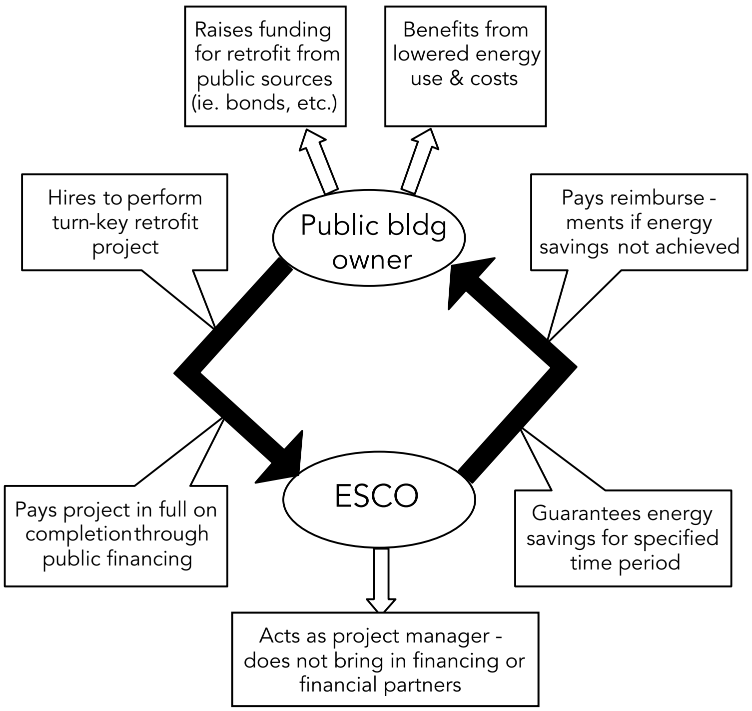
- Retrocommissioning
- Gas Efficiency: equipment (i.e., furnaces, boilers, etc.), procedures (i.e., heat pipe insulation), and systems (i.e., control systems, heat recovery)
- Electric Efficiency: lighting and electric HVAC components (i.e., motors, chillers, pumps)

[c] An unsuccessful but interesting application for Smart Grid Demonstration Funds is worth noting in this respect. BOMA Chicago's Virtual Generator Project, in partnership with the owners of over 260 Chicago office buildings, proposed installation of smart meters in all participating buildings along with targeted retrofit upgrades. The smart meters would feed information to a Network Operating Center, which would analyze demand in order to reduce energy usage in individual buildings and optimizing the population demand as a whole.

[d] Detailed information about this demonstration project is currently not publicly available. However, according to the company the funding will be mainly used for research projects to determine the viability of different smart grid technologies.

Figure 3:

Typical Public Sector ESCO Process



- Industrial/Process Efficiency: measures that reduce per-unit energy consumption in data centers and manufacturing plants
- Installation of technologies or equipment required for Peak Demand programs
- Installation of Combined Heat & Power (CHP) Systems

NYSERDA's ***Focus on Commercial Real Estate*** (Focus CRE) is a new initiative aimed at commercial building owners/managers and consultants, developed in partnership with the real estate industry in order to streamline the process for participating in NYSERDA's technical expertise and financial incentive programs. Focus CRE features a free, online Benchmarking Toolkit that enables commercial building owners to rate their buildings' energy efficiency and carbon footprint relative to peer buildings, and Energy Project Managers are available to help guide the retrofit process and ensure a maximum return on investment.[21]

Utility Incentive Programs – Con Ed & National Grid

Utility incentive programs target both electricity and gas efficiency measures. Electric efficiency incentives for Con Ed customers consist of a prescriptive (per-unit) rebate of up to 70% of the cost for installation of efficient lighting and HVAC equipment. Other electricity incentives target peak load management (i.e., demand management and demand response programs) and eligibility depends on the geographic location of the facilities. For smaller commercial customers (less than 100 kW/month), Con Edison's Direct Install program provides free energy audits and small energy efficiency measures (such as compact fluorescent bulbs and faucet aerators), along with the rebate program for more extensive upgrades.

Both utilities offer natural gas efficiency incentive programs for commercial and industrial users to encourage the purchase and installation of high-efficiency space heating and water heating equipment, as well as other measures such as weatherization. Con Ed's prescriptive incentives would be available for up to 70% of the cost per unit installed, with a per-unit cap of $25,000. National Grid offers technical assistance and financial incentives for both prescriptive and custom efficiency measures. Incentives cover up to 50% of the project cost with a cap of $250,000.

Office building owners and managers might consider providing information about these programs to commercial tenants in New York City office buildings as part of a strategy to reduce overall energy consumption in these buildings.

IV. Financing Models & Programs

Public sector incentives may enable some property owners to self-finance the balance of the costs of energy efficiency upgrades, although it is more likely that a private sector owner will need access to both public sector incentives as well as private sector financing at a cost that can be supported by the benefits generated by the upgrade. Private sector financing vehicles are emerging and evolving as the financial community evaluates the profitability of investing in cost-saving energy efficiency retrofits of commercial buildings. In this section we will discuss the basic energy performance contracting model and variations on that theme that are being developed by private sector players, as well as municipal and utility-based financing models that are being employed with increasing frequency in jurisdictions across the county.

Traditional Lending

Traditional lending can, of course, be applied to energy retrofit projects, especially when they are combined with more extensive building renovations. Traditional lending has perhaps been somewhat slow to recognize the benefits of energy efficiency projects as an economically productive part of the property asset. However some specialized products have been created, known as "energy efficiency mortgages." NYSERDA has a long-standing program that will write-down the interest rate of a conventional home improvement loan for a project that incorporates energy efficiency. There is continuing evolution of products in this area, primarily relevant to multi-family housing within the commercial property sector.

Green Mortgages/Energy Efficiency Mortgage Green Mortgages are usually residential mortgages that feature reduced rates, or a bigger loan than would otherwise be granted, as a "reward" for making energy-efficient improvements or for buying a home meeting high-efficiency standards. The model hinges on the principle that a more energy-efficient home lowers utility bills, which makes more funds available for debt service. These mortgages have also been called Energy Efficient Mortgages (EEMs) or Energy Improvement Mortgages (EIMs).[22] The Community Preservation Corporation (CPC) recently launched a program called the Green Financing Initiative, aimed at the affordable housing market, which will provide construction and mortgage loans for energy efficiency upgrades and renovations based on the Green Mortgage concept.[23] Green Mortgages may be another avenue for commercial owners seeking financing for energy efficiency projects, although they are less common in the commercial sector.

Municipal Bonds

Since Municipal Bonds offer an attractive source of long-term finance, they have been the vehicle-of-choice for energy retrofit projects developed for public buildings, often by Energy Service Companies (ESCO's) under turnkey or performance contracts, further discussed below.

Property Assessed Clean Energy (PACE) Bonds The most recent financing development has been the PACE Bond, which uses the property tax roll to secure bonding for energy improvements. Municipalities provide up-front funding for energy efficiency retrofit projects via bonds issued to create a loan pool which is then used to finance individual projects.[24] Loans are repaid through a surcharge added to the property tax bill and repayment is secured by a special tax lien. The surcharge is usually calibrated to the projected energy savings such that the property owner enjoys some of the savings while using the balance to repay the municipal loan. An attractive feature of this model is that debt payments are tied to the property, not the property owner, which makes deeper and more extensive retrofits more viable since the loan stays with the property even if the current owner moves.

There is a great deal of legislative activity underway based on the relatively new PACE model. New York State recently passed legislation enabling municipalities to establish loan pools[e] for PACE programs that the individual municipalities then must structure and administer on their own.[25] There are no legally mandated restrictions on eligible property types; however, PACE financing is currently directed to the single-family residential sector since it has not addressed other structural issues such as the "split incentive" problem that deter retrofits in many commercial properties. Additionally, PACE financing is on-balance sheet debt, which may violate mortgage covenants for commercial property owners.

Energy Performance Contracting

Energy Performance Contracting (EPC), or what is often referred to as the "ESCO model," is a general method for financing energy efficiency retrofits through projected future energy savings. Performance contracting usually involves an ESCO or an 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 in full upon completion of the project and will guarantee energy savings for a limited period of time after the work is completed; contracts often include reimbursements to the building owner at a predetermined rate if the projected savings are not realized.[26] The ESCO model does not necessarily address the issue of obtaining capital for the up-front costs of the energy efficiency, although in some cases the ESCO is aligned with a third party capital provider.

The ESCO model has been used for more than two decades but with limited application in the large-scale commercial sector, which currently accounts for less than 10% of the ESCO market. It has been most widely used in the public sector - Federal and Municipal/University/School/Hospital (MUSH) buildings - for a number of reasons[27]:

- Public buildings are generally held long-term, which facilitates repayment of project costs through energy savings and lends

[e] Either from federal funds or via a similar approach as the LIGH program.

a greater tolerance for the EPC process.

- Public buildings are often owner occupied, and do not have the burdens of a mortgage.
- Public buildings do not typically face the "split incentive" problem common in commercial tenant-occupied spaces.
- Funding is typically obtained through municipal funds or bond issues; allows higher tolerance for loan payment periods that can range from 10 to 20 years.

Despite its limitations, in recent years a number of private sector actors have brought new products or processes to market that seek to address or circumvent some of the impediments to employing EPC for private sector commercial buildings. Three of these models/processes are presented below.

BOMA and the Clinton Climate Initiative: A Partnership for Energy Efficiency Retrofits BOMA International and the Clinton Climate Initiative (CCI) have partnered to create the ***BOMA Energy Performance Contracting (BEPC) model***,[28] a refinement of the EPC model described above that is intended to facilitate and streamline the process for the private sector.[f] The partnership worked with major ESCOs to develop a unique set of contracting terms, documents, and conditions aimed at reducing project cost, development time, and business risk. The BEPC model features streamlined procurement, transparency in pricing, and a "Tool Kit" of standardized documents vetted by building owners and vendors which are available free of charge through the BOMA website. Additionally, CCI's ***Energy Efficiency Building Retrofit Program*** (EEBRP) provides pro-bono advisory support for building owners that are interested in BEPC. Building owners that take advantage of CCI's EEBRP can get assistance with formulating and communicating their financing needs to a broad financial audience and can get help in procuring financing. The program also makes pre-negotiated discounts available for a range of energy efficient products.[29]

The EEBRP has helped initiate more than 250 retrofit projects encompassing over 500 million square feet of building space in more than twenty cities around the world. While most have been in the MUSH sector, commercial sector projects are underway in Chicago, Johannesburg, Bangkok, and Mumbai, and also include the high-profile Empire State Building retrofit project in New York.[g]

"Third-Party Utility Management" Model This model provides energy efficiency services and financing in one "package." It is based on a transaction structure that replaces current utility expenses with a line-item operating expense that is set equal to historical (i.e., pre-retrofit) energy costs, adjusted for occupancy, weather, type of use, and rates. An intermediary enters into an agreement with a commercial property owner to manage a building's utility expenses for a period of time, assuming responsibility for paying the actual energy bill while performing energy upgrades (and effectively assuming the risk of achieving projected energy savings).[30] In this model the cost savings generated by the energy efficiency upgrade covers the cost of the upgrade, in essence providing off-balance sheet financing for the building owner. Since the intermediary does not take title to any equipment and the approach does not involve liens or debt, it does not violate prohibitions on secondary financing typical in most mortgage agreements. The line item charge that the building owner has agreed to pay in lieu of utility expenses is structured as an operating expense, thus addressing the "split incentive" issue common in tenant occupied commercial properties.

Efficiency Services Agreement (ESA) Model The ESA is another model for third-party financing of retrofit projects that is repaid through energy savings, and is 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 what would have been paid to the utility had those kilowatt hours been consumed.[31] This approach is likely to work best in industrial real estate and other property where energy-consuming equipment may not be part of the real property, so that third-party ownership would not run afoul of the mortgage.

Aggregation, Securitization and Emerging Private Equity Funds Private equity funds are already being used to a limited extent in funding energy efficiency projects on an aggregated basis

[f] The National Association of Energy Services Companies is another organization worth noting that provides resources to help streamline the EPC process including a searchable database for locating quality contracting and engineering service providers - see http://www.naesco.org/default.aspx; "Finding A Provider" link.

[g] Detailed information on the project planning process is available at http://www.esbsustainability.com.

across buildings. For example, one firm created a $25 million investment opportunity by aggregating the chiller replacements in over thirty buildings. Bundling the same kind of upgrade (e.g. chiller replacements) across multiple buildings is based on the similarity in risk and projected energy savings that can be predicted. A private equity structure allows the use of different investor sources for different risk-reward appetites.[32]

The risk of savings predictability should be reduced across a large portfolio of similar measures. However, constructing an investment risk profile across many buildings, many different technologies, with varying conditions such as weather can be challenging for a financial instrument whose repayment is dependent on the realization of savings. Nevertheless, the possibility of bringing energy performance contracts to a level of aggregation that would make them of interest to securitized capital markets is enormously attractive. It could radically change the terms of energy performance contracting.

Utility On-Bill Financing Programs

On-Bill Financing (OBF) Programs (sometimes referred to as "on-bill collection programs" and "Pay-As-You-Save", "PAYS") can be considered similar to PACE programs but funding is provided and administered by utility companies with surcharges added to the monthly utility bill. In another sense, the utility is acting as the ESCO and project financier. Program details vary, including duration of the repayment period, the portion of the capital costs that are financed, and the interest rate.[33] One important difference between OBF and PACE programs is that OBF programs don't necessarily tie loans to the property (referred to as "tariff" or "meter obligation"); some are structured as personal or business loans.[34] A meter obligated program can address some common obstacles including the split incentive problem[35]. The structure and terms of these programs are subject to the regulatory authority, in NYS the Public Service Commission.

OBF is a relatively new financing mechanism and has only been implemented by utilities in a handful of states (not including New York), although interest is growing. These programs have mostly been offered to small businesses for more minor upgrade measures and in some cases for residential appliance replacement. The Green Jobs/Green New York Act signed into law in October 2009 commits $112 million for retrofits of single-family homes, which will be administered through NYSERDA and may utilize an on-bill collection mechanism.[36] However, establishment of OBF programs is not the overarching goal of the legislation.

V. Conclusion

We have attempted to provide a comprehensive overview of funding opportunities for energy efficiency retrofits of commercial office buildings in New York City, as well as the different elements that must be considered in planning a high-quality project that meets the goals of the property owner. These include existing financial opportunities and incentive programs, new and evolving financial opportunities, tools and strategies for measuring a building's energy use and performance, and the range of technologies and systems for reducing and managing energy use.

In today's capital constrained environment, additional financing sources are needed in order for energy efficiency upgrades to be undertaken on a widespread basis. The finance and investment community is testing alternative financing vehicles in both the public and private building sectors. As these models evolve, we expect to see new ones crop up in response to the escalating demand for cost- and energy-savings. Growing interest from financial stakeholders may bode well for better financing opportunities for large commercial owners.

As the real estate community becomes more comfortable with the retrofitting process and technologies, 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 NYC real estate assets for the eventual upturn in the market. ■

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