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The Benefits of Energy Efficiency in Multifamily Affordable Housing

supporting the health & vitality of affordable housing, building residents & the greater economy




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In conjunction with:

LIVING CITIES
INNOVATE ▸ INVEST ▸ LEAD

Prepared by:

HR&A Analyze. Advise. Act.

Overview

New resources are required to take advantage of the energy savings potential in our nation's multifamily housing stock.

Billions of dollars of energy savings potential are sitting in our nation's multifamily buildings. A 2009 study by McKinsey and Company estimated that the capital required to unlock energy efficiency opportunities in our nation's low-income residential buildings between 2009 and 2020 is approximately $46 billion, and would provide a present value of $80 billion in savings. Almost a quarter of this energy efficiency potential is in multifamily buildings, accounting for approximately $16 billion in savings.[1]

Energy efficiency retrofits provide a reliable and achievable means to reduce greenhouse gas emissions, generate economic activity, and improve the long-term viability of affordable housing. Amidst efforts to curb climate degradation – and capitalize on sound opportunities for operational savings in our building stock - affordable housing regulators have begun to tighten energy efficiency requirements. For instance, New York City's Department of Housing Preservation and Development now require compliance with Enterprise's Green Communities criteria for new construction and gut rehab projects it helps finance. Furthermore, New York City has recently mandated tracking and assessing energy efficiency opportunities in local building stock.

The capital to unlock these improvements, however, is not always readily available. In response to this challenge, Deutsche Bank Americas Foundation and Living Cities engaged Steven Winter Associates and HR&A Advisors to aggregate and analyze a dataset of multifamily housing projects – totaling over 21,000 units – that had undergone energy efficiency retrofits in New York City. The dataset allows for insights into three key areas:

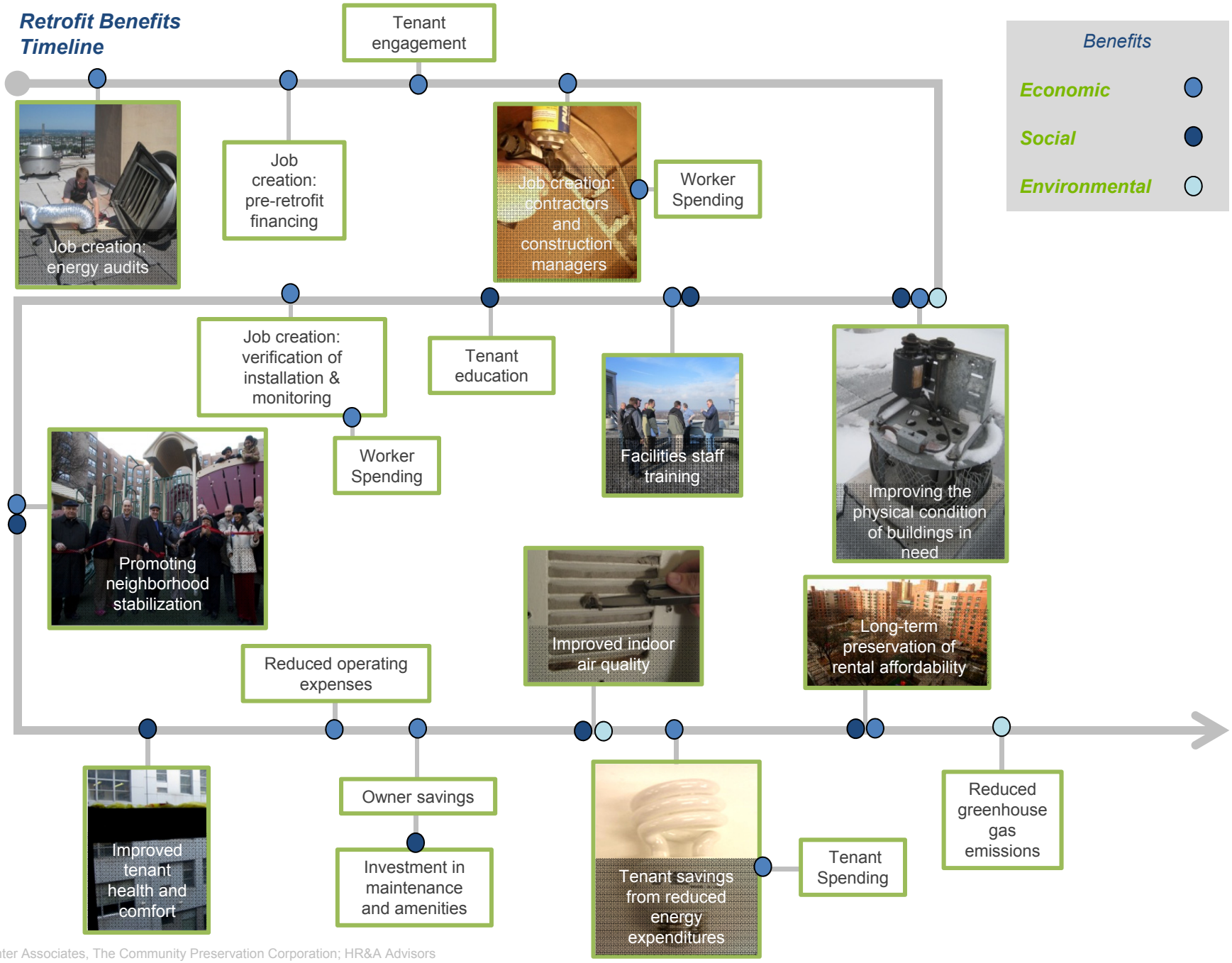
- Assessing trends in pre- and post-retrofit building performance;
- Analyzing the reliability of savings projections; and
- Utilizing findings to frame an approach for incorporating energy savings projections into underwriting.

As part of this effort, HR&A Advisors conducted a study of the wide ranging benefits of energy efficiency retrofits that accrue to building owners, tenants, and their communities. This document summarizes those benefits.

Image courtesy of The Community Preservation Corporation

1. McKinsey & Company, *Unlocking Energy Efficiency in the U.S. Economy*, 2009.

Retrofit Benefits Timeline



Images: Steven Winter Associates, The Community Preservation Corporation; HR&A Advisors

Policymakers, investors and other stakeholders who care about preserving affordable housing, creating jobs, combatting climate change, and supporting the health and financial well-being of low income population should care about energy efficiency.

1. Energy retrofits ensure the long-term viability of existing affordable housing.

- Retrofits help improve the physical conditions of existing housing stock, which helps to address the issue of the widening gap between supply of and demand for multifamily affordable housing across the United States.
- Retrofits generate significant operating savings that can be reinvested into the building, supporting future operations and/or capital work.
- Beyond repair of individual buildings, rehabilitation of affordable housing is a visible investment in economically disadvantaged communities.

2. Energy retrofits create jobs and have broad economic impacts.

A number of studies document the broad, industry-wide economic impacts of energy efficiency, including the additional spending, savings, and job creation. Two studies employing the most rigorous methodology estimate around 10 jobs created per million dollars of comprehensive energy efficiency retrofits in residential buildings.

3. Energy retrofits unlock a range of benefits for building residents.

- Retrofits bring direct energy savings to those most in need, help avert future rent increases, and improve conditions in affordable properties. These savings generate additional economic activity by providing an opportunity for increased spending by residents due to reduced energy expenditures.
- Retrofits also help improve the health, safety and comfort of building residents, including improved indoor environmental quality and better tenant mental and physical health outcomes.

4. Energy retrofits reduce greenhouse gas emissions.

In cities across the country, multifamily residential buildings account for a significant portion of greenhouse gas emissions (GHG); for example, in New York City, these buildings are responsible for 35% of total GHG emissions. By installing more energy efficient systems and reducing the energy consumption of these buildings, cities can reduce greenhouse gas emissions, improve the outdoor environment locally and globally, and ensure a better future for generations to come.

approximately **10 jobs per $1 million invested**
in comprehensive residential energy retrofits

nearly **$40 billion invested annually** in residential retrofits nation-wide

an average of **$300 per unit of tenant benefits,**
including direct benefits from utility savings and indirect benefits

19% fuel savings and 7% of electric savings
across a 231-building sample of multifamily affordable buildings

1. Energy retrofits ensure the long-term viability of existing affordable housing.

The preservation of existing affordable housing is critical to meet the needs of low- and moderate-income Americans.

The Joint Center for Housing Studies reports an increasing gap between the demand for and supply of affordable units. As a result of the recent economic downturn and increased unemployment, the number of renters with very low incomes (below 50% of area median income) increased by 9% between 2003 and 2009, from 16.3 million to 18.0 million.

Over the same time period, the number of housing units that were affordable to very low-income households, in adequate physical condition, and not occupied by renters of higher income levels decreased by about 3%, from 12.0 million to 11.6 million. The result is an affordable housing gap that grew by 33%, from 4.3 million to 6.4 million units.

All figures in millions	2003	2009	Percentage Change
Very low-income renter households	16.3	18.0	+ 9%
Units affordable to very low-income households	12.0	11.6	- 3%
Shortage of affordable units	4.3	6.4	+ 33%

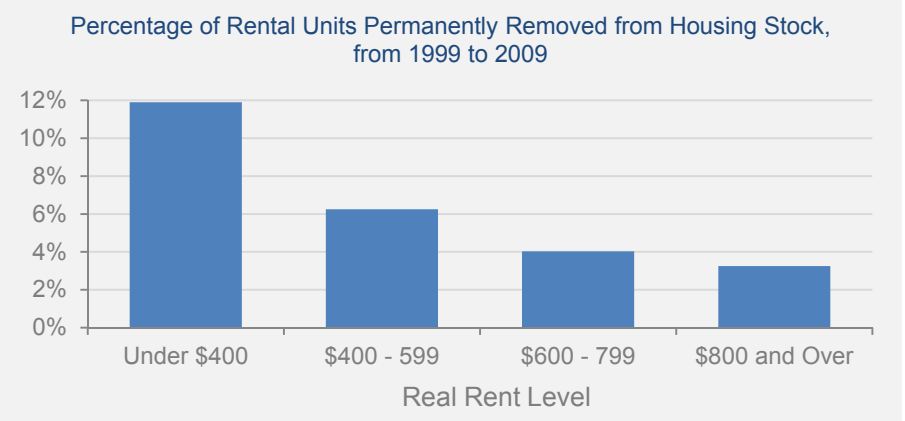
New construction helps to maintain the supply of rental housing by meeting new housing needs and replacing aged housing stock, but new housing is increasingly unaffordable. As land and construction costs for new multifamily buildings increase, median asking rents increase. Median asking rents for new low- to moderate-income housing across the nation in 2009 were nearly 40% higher than affordability levels, defined as 30% of household income:

$1,070
2009 median asking rent, new construction

vs.

≤ $775
2009 median affordable rent (≤ 30% of HHI)

Much of the lowest-cost rental housing stock has been demolished because building owners cannot afford the cost of maintenance. From 1999 to 2009, 12% of the lowest cost rentals were removed from the market. Those that are not demolished are generally found in aging, deteriorating buildings.



Source: Joint Center for Housing Studies, *State of the Nation's Housing*, 2011.

Ongoing capital investment in and maintenance of existing affordable multifamily buildings is critical to the long-term vitality of existing affordable housing stock.

Energy efficiency retrofits play a central role in this capital process:

- **Energy efficiency retrofits help improve the physical conditions of existing housing stock.** The *State of the Nation's Housing* states that while supply of quality multifamily affordable housing continues to dwindle, the remaining buildings constitute a large share of at-risk structures in cities and towns throughout the country. Energy efficiency retrofits can help promote a safe and healthy environment for residents in those buildings.

- **Not only do retrofits improve the quality of the housing stock, but they generate significant operating savings that can be reinvested into the building.** Energy efficiency savings can play a critical role in improving a building's financial stability, freeing up capital to offset potential rent increases and/or cover additional capital work. Energy savings essentially create an ongoing annuity that provides a return on investment to the owner.

  Affordable housing owners often face considerable financial hurdles to repairs and retrofits, as they are limited in raising rents or passing along costs to tenants to recapture the cost of improvements. Furthermore, most do not have the upfront capital available to invest in these projects. Operating savings resulting from retrofits can be used to build up capital reserves, service additional debt to carry new capital work, make repairs, or improve building operations.

  The 2011 Deutsche Bank Americas Foundation / Living Cities study reports that New York City affordable multifamily buildings undertaking comprehensive retrofits recorded $240 per unit in annual fuel savings, and $50 per unit in annual common area electric savings across the study portfolio.

  Assuming total building expenses of $5,000 to $6,000 per unit per year, and annual energy savings of $290 per unit from a comprehensive retrofit project, savings would equate to a 5% to 6% reduction in expenses. More importantly, this extra income could be used to support almost $3,000 in debt per unit.

  Examining fuel savings across the Deutsche Bank / Living Cities portfolio, $240 in annual savings could support approximately $2,480 in new debt per unit, which covers the median per unit cost of fuel retrofits of $2,200 across the portfolio.

- **Beyond repair of individual buildings, rehabilitation of affordable housing demonstrates visible investments in economically disadvantaged communities.** State and local investment in extensive "green rehabilitation" projects - for which energy efficiency is the cornerstone of improvements - support broader efforts to stabilize low- and moderate-income neighborhoods. HUD's *Neighborhood Stabilization Program* recognizes efforts to improve the sustainability of properties targeting households of less than 50% of area median income as eligible to receive grants supporting property redevelopment.

Retrofit Spotlight: Riverdale Osborne Towers

Riverdale Osborne Towers is a 532-unit multifamily affordable housing project located in the Brownsville neighborhood of Brooklyn, NY. Between its construction in 1972 and 2006, in which time the property changed ownership, no significant capital improvements had been made to the building.

By 2006, living conditions at Riverdale Osborne had deteriorated significantly; the housing complex suffered from high levels of crime in additional to substandard physical quality. Tenants often reported the presence of rodents, trash pile-ups, rotting walls, and poorly-functioning toilets and elevators. The City issued hundreds of violations and received negative press for poor living standards in the building.

Recognizing a need for change, in 2005 Catholic Charities Progress of Peoples Development Corporation devised a strategy to redevelop the site and preserve long-term affordability. The organization received support from the East Brooklyn Congregations and The Community Preservation Corporation Resources, as well as funding from the New York City Department of Housing Preservation and Development, and the Housing Development Corporation, to undertake $40 million worth of capital improvements, 10% of which was dedicated to energy efficiency improvements. The energy efficiency retrofit was integral to an extensive scope of work that facilitated the comprehensive rehabilitation of the buildings, thereby preserving the long-term affordability of the units and financially repositioning the property.

Images: Bing; The Community Preservation Corporation

The rehabilitation of Riverdale Osborne created significant numbers of jobs for local contractors. Construction took place over 24 months starting in 2007, with 91% of work completed within the first year. At the peak of construction, the project employed an average of 90 workmen per day. The owner required that 15% of these workers be either building residents or from the local community.

Within one year of construction, at approximately 90% of project completion, the building had already achieved 90% of its targeted energy savings, i.e. 15,500 MMBTU or $210,200 savings of a projected $235,7000 in savings.

The energy savings accrued as a result of the significant capital improvements and energy efficiency retrofits helped the owners to build up their capital reserves for future investments in the building and strengthened the financial state of the building.

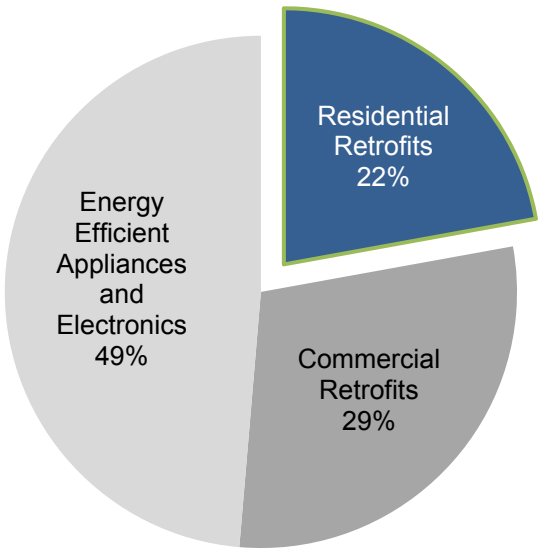
As part of the energy efficiency retrofit and broader capital improvements, Riverdale Osborne improved its building security, which helped to reduce crime and create a safer environment for residents. The owners were also able to invest in amenities for tenants, further improving the quality of life and helping to stabilize the surrounding community.

2. Energy retrofits create jobs and have broad economic impacts.

Nationwide investment in residential energy efficiency approaches $40 billion per year.

$179 billion was invested in building-related energy efficiency in 2004, out of approximately $300 billion invested in energy efficiency infrastructure and technologies. Residential retrofits represented 22% of the total investment in improving the energy efficiency of buildings, or $39.2 billion.[2]

Nationwide Investment in Building-Related Energy Efficiency, 2004



$179 billion total

A number of studies have assessed the economic impacts of the energy efficiency / retrofit industry relative to job creation, spending and savings.

HR&A reviewed nearly twenty studies conducted by private consultants, governmental organizations, and nonprofits to identify different quantifications for economic impacts of efficiency retrofits and studies' associated methodologies. The studies estimated a wide range job creation metrics related to energy efficiency retrofits. A list of these studies is available in the appendix.

HR&A selected two studies to highlight, both of which served the primary purpose of quantifying direct, indirect and induced job creation per dollar invested in residential energy efficiency retrofits. The studies also employed the most rigorous methodologies of the set, examining market sectors impacted by retrofit activity, and using economic impact assessment software to model how impacts flow through the economy.

Types of Economic Impacts

Direct:	Direct effects are those related to the initial spending in the economy. The initial purchase of goods and services is making a *direct* expenditure to a second business.
Indirect:	The second business needs to purchase goods and services to produce the product of the first business purchases. These purchases, and successive rounds of purchases, are known as the *indirect* effect.
Induced:	The spending that employees and their households make from income earned is the *induced* effect.

2. Ehrhardt-Martinez, Karen and John "Skip" Laitner, *The Size of the U.S. Energy Efficiency Market: Generating a More Complete Picture,* American Council for an Energy Efficient Economy (ACEEE), 2008.

Author	Booz Allen Hamilton (BAH)
Study	U.S. Green Building Council Jobs Study
Year	2009
Economic Impact of Energy Efficiency	Per $1 million dollars invested in residential energy efficiency retrofits, retrofits helped to generate Gross Domestic Product (GDP): • **$477,849 in direct GDP**. This is greater than the direct GDP generated from new construction of single-family and multifamily buildings, which generated $360,376 in GDP. • An additional **$785,157 in indirect and induced GDP**, versus $945,568 in residential new construction.
Number of Jobs Created	Per $1 million dollars invested in residential energy efficiency retrofits: **11.6 jobs total jobs created** • 1.8 direct jobs • 9.8 indirect and induced jobs
Methodology	BAH used IMPLAN software and identified retrofits as part of the "maintenance and repair construction of residential structures" economic sector. IMPLAN (Impact Analysis for Planning) is an input-output model developed at the University of Minnesota with the U.S. Forest Service's Land Management Planning Unit. This widely-recognized modeling tool generates estimates of direct economic output as well as indirect employment and output based on a series of inputs. BAH simulated economic impact by assuming an input of $1 million dollar in expenditure per green building category for new and repaired residential and commercial construction.

Author	ECONorthwest and Bonnie Gee Yosick LLC
Study	Economic Multipliers and Metrics for Green Sector Strategies and Green Industries in Oregon
Year	2010

Economic Impact of Energy Efficiency	With a focus on Oregon, this study found that the average economic impact per million dollars spent on residential energy efficiency retrofits:
	Output: $779,876
	• Gross State Product: $432,833
	  ○ Personal Income: $270,871
	  ○ Other Income: $140,829
	  ○ Indirect Business Taxes: $21,132
	• State and Local Taxes and Fees: $36,099
	Household energy savings, total output: **$1,308,413**
	Energy audits (all sectors), total output: **$1,875,878**

Number of Jobs Created	Per $1 million dollars invested, the direct, indirect, and induced jobs created in Oregon was: • In comprehensive residential retrofits, including weatherization: **9.5 jobs** • In residential efficiency improvements targeting select less labor intensive energy efficiency measures, such as installation of efficient appliances: **6.4 jobs** Per $1 million spent on **energy audits** (all sectors): **14.4 jobs** Jobs created from **household savings** per $1 million spent on energy efficiency retrofits (over a 5 year period following the retrofit): **11.0 jobs**
Methodology	The research team used IMPLAN software to quantify impacts of different "green sectors," as well as identify multipliers per sector. By comparing "green sectors" to existing IMPLAN business sectors that were representative of the broader industry (e.g., "green manufacturing" as a subsector of general manufacturing, "green construction" as part of general construction), the team determined economic impacts, outputs, and jobs created that generally reflected the trends in the underlying industry within each green sector.

Assuming $40 billion dollar are invested annually in residential retrofits nationwide, and an average of 10 jobs are created per million dollars invested, a total of 4 million jobs are created on an annual basis as a result of energy efficiency improvements.

The impact of job creation is most meaningful at the local level, particularly in low-income communities. Job creation is critical for generating economic activity, as retrofit workers earn money and in turn spend that money in the surrounding community. This economic activity supports broader neighborhood stabilization efforts, particularly as energy savings translate to additional capital for both building owners and tenants.

In cities such as New York City, construction contracting typically occurs locally, employing workers from the nearby region. Furthermore, building owners and managers may require local contracting. For example, as was mentioned on page 8, Riverdale Osborne employed 90 contractors per day at the peak of construction, 15% of which the building owners required were either building or neighborhood residents. The neighborhood surrounding the project has seen significant improvements in neighborhood safety and increased economic stability as a result of the jobs created and the resulting spending in the community.

Furthermore, in Williamsburg Court, described on page 18, the owners were able to reinvest savings accrued as a result of energy consumption reduction in job creation, adding new facilities staff to assist with building operations and management.

3. Energy retrofits unlock a range of benefits for building residents.

Retrofits bring direct energy savings to those most in need, helping avert future rent increases and improve conditions in affordable properties.

Residents of multifamily housing, particularly affordable housing, are extremely vulnerable to energy cost increases, and stand to benefit the most from energy retrofits. According to the U.S. Department of Housing and Urban Development (HUD), 88% of households in multifamily buildings are renters and have a nationwide median household income that is approximately half that of homeowners. Energy costs in low-efficiency multifamily housing puts a large financial strain on these households. HUD found that while average rents in multifamily housing increased by 7.5% from 2001 to 2009, energy costs for these renters increased by nearly 23%.[3] Implementing energy retrofits in multifamily housing will help to counteract the high cost of energy and the significant financial burden it places on low- and middle-income families.

Image courtesy of Michael Kason, owner of 1154 Ward Ave, Bronx NY

Tenants in direct-metered buildings can benefit from substantially lower utility bills following comprehensive energy retrofits. In direct-metered buildings (where tenants pay for the in-unit share of utilities and building owners pay for base-building energy consumption) residents can benefit directly from retrofits to apartments, such as appliance replacement, lighting upgrades and, in some cases, improvements that impact heating and cooling.

The New York State Research & Development Authority's (NYSERDA) affordable multifamily energy efficiency program, the Energy $mart^{SM} Assisted Multifamily Program, served more than 100,000 units of housing throughout New York State between 2002 and 2007. NYSERDA projected an average of $97 in direct annual reductions to tenant utility bills as a result of comprehensive building energy retrofits over-seen by it.[4]

Furthermore, a study published in the Journal of Epidemiology and Community Health found that the total tenant savings resulting from implementing energy efficiency measures were roughly twice the cost of implementation.[5]

Tenants also benefit indirectly from master-metered or house-metered savings reinvested in the building. The reinvestment of these funds results in improved health, comfort, and safety for tenants, increased reserve funds, and/or higher cash flow, which reduce the need for a rent increase. NYSERDA's Assisted Multifamily Program projected more than $200 in "indirect tenant benefits" per unit per annum. Taken together with direct utility savings, total projected annual benefits were $298 per unit.

3. US Department of Housing and Urban Development. *Quantifying Energy Efficiency in Multifamily Rental Housing. Evidence Matters.* Summer 2011. http://www.huduser.org/portal/periodicals/em/EM_Newsletter_Summer_2011_FNL.pdf
4. New York Energy Research and Development Authority, 2007, *The New York Energy $mart^{SM} Assisted Multifamily Program Final Report.*
5. Chapman, R., Howden-Chapman, P. e al., *Retrofitting housing with insulation: a cost-benefit analysis of a randomized community trial,* 2009. http://www.ncbi.nlm.nih.gov/pubmed/19299400

Retrofits can help improve tenant health and comfort.

Beyond these financial benefits, tenants in buildings that undergo energy retrofits also benefit from improvements to health, comfort, and safety in their homes. In apartments with good ventilation and climate control, residents are less likely to suffer from cardiac and pulmonary ailments caused or exacerbated by poor indoor air quality. A study conducted by the American Medical Association found that poor indoor air quality results in approximately 150 million missed workdays and $15 billion in productivity losses each year. Improved indoor air quality, as well as effective climate control and lighting, also has a measurable impact on mental health.[6]

A study completed by Sheffield Hallam University, in partnership with the London School of Hygiene and Tropical Medicine, found that after implementing energy efficiency measures in a residential building, tenants reporting anxiety or depression fell by half.[7] In addition, tenants are also less likely to suffer from accidents resulting from unsafe efforts to control indoor climate. Open windows in the winter, for instance, present a safety hazard to young children who may fall out, and the use of ovens or other informal sources of heat create a significantly higher risk of fires in the home.

During an energy audit, auditors from Steven Winter Associates found inadequate ventilation systems that have negative impacts on tenant health and comfort. These conditions particularly exacerbate respiratory illnesses such as asthma.

6. Lorna Rosenberg, Alyssa Neir, US EPA. *Health Benefits of Green Buildings*. http://www.gallinausa.com/pdfs/health_benefits-daylight_in_school.pdf
7. Green, G. and Gilbertson, J. Warm Front. *Better Health: Health impact evaluation*. Centre for Regional, Economic and Social Research, Sheffield Hallam University, 2008. http://www.apho.org.uk/resource/view.aspx?RID=53281

4. Energy retrofits reduce greenhouse gas emissions.

By pursuing energy improvements in multifamily residential buildings in urban areas around the country, we can ensure that cities remain clean, healthy, and sustainable places for generations to come.

Multifamily buildings are one of the biggest contributors to greenhouse gas (GHG) production in cities throughout the United States. In New York City, for example, multifamily residential buildings account for approximately 35% of all GHG emissions. As a matter of perspective, that is equal to the GHG emissions from all New York City office, retail, and industrial buildings combined, and more than 50% higher than GHG emissions from all vehicles in New York City.[8]

Older residential buildings are disproportionately responsible for GHG emissions. One study found that buildings built before 1980 are responsible for approximately 70% of building GHG emissions, and buildings built before 1960 are responsible for almost 40%. Housing units built before 1980 represent approximately half of the United States' total housing stock, presenting a tremendous opportunity to capture energy savings through the implementation of retrofits.[9]

Even if only a fraction of buildings were to implement energy retrofits, there would still be a substantial impact on total GHG emissions nationwide. If just one in ten households nationwide installed ENERGY STAR-rated heating and cooling equipment, it would prevent the release of more than 17 billion pounds of greenhouse gases. Likewise, if every household in the United State replaced just one incandescent light bulb with a compact fluorescent bulb, it would prevent GHG emissions equivalent to taking more than 800,000 cars off the streets.[10]

8. City of New York, *PlaNYC Inventory of New York City Greenhouse Gas Emissions*, 2011. http://www.nyc.gov/html/om/pdf/2011/pr331-11_report.pdf
9. Con Sol, *Cost-Effective Green House Gas Reductions in the Residential Sector,* 2008. http://www.cbia.org/go/cbia/?LinkServID=D3BFD657-F8E2-4F63-97B404B55FD856B5&showMeta=0
10. ENERGY STAR, *Residential Home Improvement: An Overview of Energy Use and Energy Efficiency Opportunities*. http://www.energystar.gov/ia/business/challenge/learn_more/ResidentialHomeImprovement.pdf

Retrofit Spotlight: Williamsburg Court

Williamsburg Court is a 59-unit affordable multifamily housing property located in the Williamsburg neighborhood of Brooklyn, NY. The property currently houses 190 residents, the majority of whom earn less than 60% of area median income.

St. Nicks Alliance (St. Nicks) financed the construction of the building in 1993, using Low Income Housing Tax Credits (LIHTC) as equity. As the building approached its Year 15 LIHTC refinancing in 2008, St. Nicks sought to implement energy efficiency measures as a means to physically improve the relatively new building, and better position the building for refinancing.

St. Nicks would test the waters for energy efficiency retrofits with Williamsburg Court, with the intention of employing these strategies across their portfolio if it proved successful. Even though Williamsburg Court was a modern building with relatively newer systems, energy efficiency improvements implemented throughout the building enabled the building to achieve nearly 60% of energy savings, which totaled a reduction of nearly 150 tons of CO_2 from fuel and common area electric use reduction.

Furthermore, St. Nicks found that this improved the indoor environment for tenants as well, noting that tenants found that the improved air quality (as a result of increased air sealing and ventilation system upgrades) also improved health conditions for those suffering from asthma and other respiratory problems.

Williamsburg Court not only served as a successful test case for St. Nicks, but also showed the owners that the opportunity for energy improvements exists in old and modern buildings alike.

Market transformation as a priority for investment

As the affordable multifamily sector seeks to stimulate greater energy efficiency retrofit activity, coordinated support and increase resources are required from government regulators, policymakers, philanthropic organizations, and the real estate industry.

Energy efficiency retrofits result in a broad range of economic, social and environmental goods that align with the missions of these varying stakeholders. Retrofits provide a reliable and achievable opportunity to improve the long-term viability of affordable housing, generate economic activity, provide health and financial benefits to building residents, and reduce greenhouse gas emissions. Policymakers, investors and other stakeholders who care about these objectives should care about investing in energy efficiency.

The most effective way to engender this change is to focus on activities that can spread beyond a single retrofit project to help systematically change existing business practices, including project financing, technology, or public policy.

One of the greatest impediments to implementing energy efficiency improvements, however, is the lack of upfront capital to invest in retrofits. The Deutsche Bank / Living Cities initiative recognizes that new, innovative approaches to financing retrofits can have extraordinary impacts and engender lasting change in the market.

The ability to underwrite against energy savings potential is central to unlocking new financing. Conventional lenders, however, treat energy savings projections skeptically and virtually never incorporate them in the underwriting models that determine the sizing of loans. Many point to the fact that, despite decades of investment in energy efficiency in multifamily buildings, there are no commonly accepted datasets, data standards, or third party verification practices to measure and confirm energy savings. This means that lenders cannot reliably assess the risk associated with lending against energy savings projections.

While the Deutsche Bank / Living Cities study marks considerable process on this front, a variety of additional efforts are critical to supporting transformation of underwriting practices. The industry needs to continue to document the reliability of energy savings through the development and/or expansion of building energy databases. Furthermore, increasing accountability in audit projections can serve as a means to improve the accuracy of projections and support lenders' use of audit projections. Additional efforts are also required to build upon the study's methodology for underwriting against energy savings and prove out the concept. Finally, support from government and philanthropic sources are required to support these activities and serve as a source of credit enhancement in the early stages. And while some housing agencies and industry stakeholders have begun to make important shifts, energy efficiency retrofits need to become part of typical business practice on a broader scale.

Other efforts are helpful to engender greater support from government, foundations and others. These include the need to continue to measure the positive economic impacts of energy efficiency retrofits, document the health and safety benefits to tenants, and systematically quantify savings and associated economic benefits for building residents.

More information on these policy considerations can be found in the 2011 Deutsche Bank / Living Cities study at: http://www.db.com/usa/content/en/ee_in_multifamily_underwriting.html

Appendix

Additional Sources and Studies Reviewed

HR&A reviewed nearly twenty studies conducted by private consultants, governmental organizations, and nonprofits to identify different quantifications for economic impacts of efficiency retrofits and studies' associated methodologies. These studies are listed below. Among a plethora of interesting research on the subject, HR&A chose two studies to highlight in this document, focusing on research that fit the following criteria:

1. Quantified job creation per dollar invested in multifamily energy efficiency retrofit projects, including direct, indirect and induced job creation;
2. Provided a clear description of the methodology employed, including the sources of data inputs;
3. Utilized data from actual market activity as inputs to the project model;
4. Utilized industry-accepted economic impact assessment software such as IMPLAN to model how impacts flow through the economy; and
5. Conducted within the last five years.

Benningfield Group, Inc. U.S. Multifamily Energy Efficiency Potential by 2020. The Energy Foundation. October 2009.

Booz Allen Hamilton. U.S. Green Building Council Green Jobs Study. US Green Building Council, 2008.

Chapman, R., Howden-Chapman, P. e al., Retrofitting housing with insulation: a cost-benefit analysis of a randomized community trial, 2009. http://www.ncbi.nlm.nih.gov/pubmed/19299400

City of New York, PlaNYC Inventory of New York City Greenhouse Gas Emissions, 2011. http://www.nyc.gov/html/om/pdf/2011/pr331-11_report.pdf

Con Sol, Cost-Effective Green House Gas Reductions in the Residential Sector, 2008. http://www.cbia.org/go/cbia/?LinkServID=D3BFD657-F8E2-4F63-97B404B55FD856B5&showMeta=0

DeCicco, John, Howard Geller, and Skip Laitner. Energy Efficiency and Job Creation: The Employment and Income Benefits from Investing in Energy Conserving Technologies. ACEE, October 1992.

ECONorthwest and Yosick, Bonnie Gee. Economic Multipliers and Metrics for Green Sector Strategies and Green Industries in Oregon. August 2010.

Economic Opportunity Studies. How Many Workers Does the Weatherization Assistance Program Employ Now? What Jobs Will the Recovery Act Offer? 2009.

Ehrhardt-Martinez, Karen and John "Skip" Laitner, The Size of the U.S. Energy Efficiency Market: Generating a More Complete Picture, American Council for an Energy Efficient Economy (ACEEE), 2008.

ENERGY STAR, Residential Home Improvement: An Overview of Energy Use and Energy Efficiency Opportunities. http://www.energystar.gov/ia/business/challenge/learn_more/ResidentialHomeImprovement.pdf

Global Insight. U.S. Metro Economies: Current and Potential Green Jobs in the U.S. Economy. United States Conference of Mayors and the Mayors Climate Protection Center. October 2008.

Gold, Rachel and Steven Nadel. Appliance and Equipment Standards Jobs: A Money Maker and Job Creator in all 50 States. ACEEE. May 25, 2011.

Goldenberg, Noam, Dan Kawai, and Ian Saxon. An Economic Feasibility Study of Green Buildings in Vancouver. January 2006.

Heintz, James, Robert Pollin, Heidi Garrett-Peltier, and Helen Scharber. Green Recovery: A Program to Create Good Jobs and Start Building a Low-Carbon Economy. Center for American Progress and Political Economy Research Institute at University of Massachusetts Amherst. September 2008.

Kats, Greg. The Costs and Financial Benefits of Green Buildings. 2003.

Majersik, Cliff. The Impact of Energy Costs on Multi-Family Residential Building Value. New York State Energy Research and Development Authority. August 2005.

Mast, Bruce, Jennifer Somers, and Jennifer Roberts. Green Rehabilitation of Multifamily Rental Properties. Bay Area LISC and Build It Green. 2007.

McKinsey Global Energy and Materials, Unlocking Energy Efficiency in the U.S. Economy. McKinsey & Company, July 2009.

New York City Labor Market Information Service. "Green Collar Training and Workforce Development." July 2009.

New York Energy Research and Development Authority.The New York Energy $martSM Assisted Multifamily Program Final Report. 2007.

North Carolina State University and National Center for O*NET Development. Greening of the World of Work: Implications for O*Net-SOC and New and Emerging Occupations. US Department of Labor Employment and Training Administration. February 2009.

Roland-Host, David. Energy Efficiency, Innovation, and Job Creation in California. Center for Energy, Resources, and Economic Sustainability (CERES) at UC Berkley. October 2008.

State Environmental Resource Center. "Environmental and Economic Impacts of Traditional Building vs. Green Building." Sep 14, 2004. http://www.serconline.org/grBldg/fact.html

Urban Green Council. Cost of Green in NYC.Fall 2009

US Department of Housing and Urban Development. "Quantifying Energy Efficiency in Multifamily Rental Housing". Evidence Matters. Summer 2011. http://www.huduser.org/portal/periodicals/em/EM_Newsletter_Summer_2011_FNL.pdf

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