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Community Development INVESTMENT REVIEW

FEDERAL RESERVE BANK OF SAN FRANCISCO

Commentary

Articles

CENTER FOR COMMUNITY DEVELOPMENT INVESTMENTS

Community Development INVESTMENT REVIEW

The Community Development Department of the Federal Reserve Bank of San Francisco created the Center for Community Development Investments to research and disseminate best practices in providing capital to low- and moderate-income communities. Part of this mission is accomplished by publishing the *Community Development Investment Review.* The *Review* brings together experts to write about various community development investment topics including:

Finance—new tools, techniques, or approaches that increase the volume, lower the cost, lower the risk, or in any way make investments in low-income communities more attractive;

Collaborations—ways in which different groups can pool resources and expertise to address the capital needs of low-income communities;

Public Policy—analysis of how government and public policy influence community development finance options;

Best Practices—showcase innovative projects, people, or institutions that are improving the investment opportunities in low-income areas.

The goal of the *Review* is to bridge the gap between theory and practice and to enlist as many viewpoints as possible—government, nonprofits, financial institutions, and beneficiaries. As a leading economist in the community development field describes it, the *Review* provides "ideas for people who get things done." For submission guidelines and themes of upcoming issues contact David Erickson, Federal Reserve Bank of San Francisco, 101 Market Street, Mailstop 215, San Francisco, California, 94105-1530, Esther.Fishman@sf.frb.org. The material herein may not represent the views of the Federal Reserve Bank of San Francisco or the Federal Reserve System.

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Foreword

Bruce Schlein, Director
Corporate Sustainability, Citi

March 2014

Communities, people, and the natural and built environments within which they live are, and always have been, inextricably linked. While this is stating the obvious, it is pointed out in the context of this issue of the CDIR because the disciplines and organizations that seek to improve communities and the environment have not always been as linked as the constituent parts they serve.

There are good reasons for this, perhaps the most notable being that disciplines require degrees of specialization that can create silos. Optimizing the balance between specialization and integration is a longstanding challenge. Too much specialization and we might miss out on critical connections and opportunities. Too much integration and we run the risk of tackling everything, and therefore nothing.

Community development and environment are illustrative of this dynamic. There have been strong interdisciplinary efforts, particularly community groups that have pursued environmental issues from the perspective of social justice. And there have been isolated efforts, ones that have delivered results in one but not both dimensions, and in the worst case actually come at the expense of the "other" dimension.

Several trends are driving more interdisciplinary efforts, including increasing environmental pressures, urbanization and digitization. Climate change, for example, and resulting intense weather events, as well as urbanization and growing populations, are both putting pressure on urban infrastructure and systems. Digitization is providing community and environmental groups with new tools for understanding and managing integrated issues and solutions. All of this taken together is driving new approaches to community and environmental issues with direct bearing on community assets, employment and enterprise opportunities, and public health.

This issue of the Community Development Investment Review highlights a number of deliberate, innovative interdisciplinary efforts that seek to concurrently and holistically address community development and environmental issues. Many of them focus on cities and their surroundings. They are diverse in the combination of issues they touch and address including air quality, climate change, water access on the environmental side, and education, health, and affordable housing on the community development side. And they are diverse in their range of approaches and partnerships.

Contributors and their organizations and partners are finding and leveraging direct and ancillary benefits. CFED's Andrea Levere, in her piece "Mixing Asset Building with Energy Efficiency: A Recipe for Financial and Environmental Sustainability" shows how cost savings associated with household energy improvements and behavior change builds assets and reduces environmental impact. Kim Dempsey and Jennifer Afdahl Rice of Capital

Impact Partners explore how green schools can have a direct impact on student health and performance in "Charter Schools Ripe for Green Investments." And ACEEE's Casey Bell, in "Understanding the True Benefits of both Energy Efficiency and Job Creation" helps illuminate issues related to green jobs. Connections within and between articles illustrate the complexities and potential of multidisciplinary efforts and co-benefits.

Interdisciplinary partnerships at Citi – both internally and externally – have been instrumental to our understanding of these issues and the related development of solutions. Citi has had the good fortune to collaborate with many of the groups that contributed articles as we have worked together to pursue finance solutions that help scale activity and impact. Many of the examples in this issue explore fragmented and decentralized activity; activity that needs to be aggregated and standardized to reach sufficient scale and for more efficient execution, including with respect to deploying capital. Through the Citi for Cities platform, Citi is leading the pursuit of solutions in this space.

This issue of the Review, with respect to Citi's role, was a partnership between Corporate Sustainability, and Citi Foundation and Citi Community Development; the latter represented by Kristen Scheyder and Laura Sparks (now with William Penn Foundation). About two years ago, Laura and I met, discussed our respective bodies of work and realized untapped ways in which they were complementary. That prompted a conversation with the Federal Reserve Bank of San Francisco's David Erickson, who gave Kristen and me a green light to develop an outline of articles and authors. I would like to thank all of the aforementioned individuals, the authors in this issue, and Citi's heads of Corporate Sustainability and Citi Foundation, Pam Flaherty and Brandee Mchale for their leadership and support.

Mixing Asset Building with Energy Efficiency: A Recipe for Financial and Environmental Sustainability

Andrea Levere, President
CFED (Corporation for Enterprise Development)

Homeownership has played an iconic role in the American dream ever since the 30-year mortgage opened homeownership to the middle class at an unprecedented scale during the New Deal in the 1930s. Not only does homeownership rival the allure of earning a college diploma or becoming a self-made entrepreneur in our culture, but it has long benefited from more public policy incentives than any other wealth creation strategy in the United States.

Housing has also been the focus of innovation by the private market and policymakers—for good and for ill—in the areas of design, finance, and more recently, energy efficiency. It has been the core business strategy of the majority of community development practitioners aiming to rebuild neighborhoods, increase access to affordable housing, and combat homelessness. But the financial crisis of the past five years, with its massive number of foreclosures and indictment of unfettered and unregulated private-sector financial practices, has raised big and largely unanswered questions on the future role of homeownership in the 21st century version of the American dream.

Yet, at the same time, Americans rarely fail to leverage a crisis into new opportunity. That is precisely what the marriage of energy efficiency strategies with asset-building products and policies has the potential to achieve. Such a marriage leverages the best advances in technology and design to meet increasingly stringent levels of environmental sustainability in new homes and to increase efficiency in existing homes. In addition to responding to climate change and its urgent demands to conserve energy in residential buildings, energy efficiency investments can also help households save money, which will have an outsized impact on low-income households who currently spend a disproportionate share of their income on utilities. The goal is to design products and services that enable these households to deploy these savings in ways that expand economic opportunity for both individuals and communities.

The growing connection between energy efficiency and savings is just one of many integrated approaches that are defining the future of social policy. We already know that it takes a village to raise a child; now we are learning that it takes multiple sectors working together to make enduring change in the lives of low-income households. In the 50 years since this country launched the War on Poverty, we have discovered that addressing poverty is as complex as the lives of the people who are striving for a better life. Many of the most successful initiatives today rely on interdisciplinary strategies that link various combinations of affordable housing, quality education, health care, financial services, or workforce

training–in an aligned way. It isn't easy, but this approach works precisely because it identifies and connects the primary drivers that create a financially stable and productive life.

This issue of *Community Development Investment Review* speaks directly to a new partnership between energy efficiency and asset-building that is producing concrete opportunities to increase our stock of affordable housing, build the financial resilience of low-income families, and promote environmental sustainability. It is particularly promising because unlike many other new approaches, we have the technical tools and programmatic knowledge to execute this approach successfully, a policy environment that is becoming more friendly, and growing interest from the private sector to help bring this strategy to scale. At the same time, the promise and potential of these two strategies are undervalued in the marketplace of social change, which makes the opportunities for impact even greater.

What is Asset-Building?

Less than two decades old, the asset-building field aims to broaden the ownership of assets by low-income Americans as a means to move them toward financial stability and ultimately to wealth creation. This approach complements the invaluable work of antipoverty advocates who have focused on increasing the income sources available to the poor through safety net programs and wage subsidies. The asset-building approach concentrates on strengthening the household balance sheet in the belief that people move out of poverty only if they have the opportunity to build both short- and long-term assets.

The need to address the asset side of the balance sheet responds to the latest data from CFED's 2013 Assets and Opportunity Scorecard, which finds that 44 percent of U.S. households are liquid asset poor, meaning they lack the financial resources to subsist at the poverty level for three months if their main source of income were disrupted.[1] Equally stunning is the finding that 26 percent of households earning between $55,000 and $90,000–solid members of the middle class–are also in liquid asset poverty.[2] While much of this financial insecurity is the result of Great Recession, not all of it is. The insecurity is also a direct result of federal and state policies and a lack of financial products that meet the needs of the lower-income families, which leaves 30 percent of the population without a savings account.

The journey to asset-building usually starts with financial inclusion, as low-income families open bank accounts, thereby saving up to $1,000 a year–the average amount that an individual spends in interest and fees charged by alternative financial service providers. Individuals build financial capability by learning and applying basic rules of positive financial behavior in their daily lives. As household's financial security increases, so does the opportunity to save, whether in an "emergency" savings account or for longer-term goals, such as homeownership, education and training, or entrepreneurship.

1 CFED, Living on the Edge: Financial Insecurity and Policies to Rebuild Prosperity in America; Findings from the 2013 Assets & Opportunity Scorecard (Washington, DC: January, 2013), p. 3

2 Ibid.

Tens of thousands of low-income people have defied the stereotypes that "poor people can't save" once they have the chance to access the same products and services and incentives that middle- and upper-class people regularly use to build wealth. When we offer middle- and upper-income people financial incentives, we call it policy, but when we offer those same incentives to low-income people, we call it subsidy.

Fundamentally and practically, saving is about managing risk and creating hope for the future. It changes the objective financial condition of families, increases economic resiliency, and builds aspirations–especially for college. Recent research has shown that children in households with savings dedicated for college education are four times more likely to attend college that those without savings, and when children have a savings account in their own name, they are six times more likely to attend college.[3] If there is anything that this financial crisis has taught us, it is that the road to financial security and wealth creation is not built on debt alone.

Energy Efficiency as the New Antipoverty Strategy

Numerous studies have documented the disproportionate financial burden created by energy costs in low-income households, with estimates that the percentage of household income devoted to these costs ranges from two to five times that of a median income household. To date, this situation has resulted in two primary outcomes: the need for a broad array of subsidies to fill the gap between utility costs and ability of low-income people to pay their bills given their income levels, and the multiple, largely negative consequences when they cannot. These consequences apply not just to families, but also to their neighborhoods and communities, when rising utility costs spiral in ways that jeopardize rent payments, lead to evictions, and produce other results with repercussions beyond the household. There is broad consensus among both community development and environmental activists that improved energy efficiency should no longer be viewed as a luxury for low-income households.

Although public investment in energy efficiency is more than 40 years old, launched with the birth of the Weatherization Assistance Program in 1972, it has been in the last five years, with the allocation of $5 billion through the American Recovery and Reinvestment Act (ARRA), and expanded funding through the departments of Energy and Housing and Urban Development, that these efforts have achieved significant scale at the community level. State and local governments and nonprofit organizations supplement federal programs while utilities provide incentives to manage demand, weatherize homes, and finance improvements. Yet despite this recent expansion in resources, the nation's current subsidy system is widely viewed as fragmented, uncoordinated, and inadequate to meet demand. The goal is to create an integrated system of efficiency programs that is comprehensive, innovative, and accessible to all income levels and housing types.

3 W. Elliott and S. Beverly, "The Role of Savings and Wealth in Reducing 'Wilt' between Expectations and College Attendance." Research brief, CSD publication 10-04. (St. Louis: Washington University, Center for Social Development, 2010) p. 2.

Two relatively recent studies underscore the significant benefits of and returns to energy efficiency on poverty and the economy. Jerrold Oppenheim and Theo MacGregor, in their 2007 article on the economics of poverty, estimated that the social and economic return on investment for energy efficiency improvements is seven-fold, measuring the impact on the household, surrounding community, and society.[4] They calculate that a universal program to weatherize and/or make all homes energy efficient would free up more than $6 billion in spending on programs that subsidize utility costs, address delinquency and evictions, and other outcomes from unaffordable energy bills. McKinsey & Co. released a report in 2009 that forecasts a similar impact while also quantifying what it would cost in energy efficiency investments to generate such a return. Undaunted by the price tag, the McKinsey report affirms that in fact we can do this.[5]

Existing programs–several of which we describe in the following section-- illustrate how the benefits of lower utility bills and improved energy efficiency go far beyond the individual household. The benefits reach into the broader community, ranging from the performance of children in school to the increase in property values to job creation. As the affordability of housing is increasingly defined by the cost of energy, and as energy costs become part of the underwriting formula to determine both the appraised value of the home and the terms of the mortgage, both the opportunity and challenges become more urgent.

Case Studies of Innovation

There are two examples of how connecting energy efficiency with asset-building can redefine affordable homeownership, mobilize savings, and build wealth. Next Step USA is a social enterprise headquartered in Kentucky with a mission of providing and financing Energy Star manufactured homes–in collaboration with the industry's leading manufacturers. The goal is to make homeownership affordable, energy efficient, and a means to wealth creation for their customers. They have turned the outmoded stereotype of manufactured homes on its head. Designs incorporate technological advances to produce energy savings that even exceed the Energy Star standards, resulting in cost savings for homeowners that range from $360 to $1,800 per year. Next Step's business strategy offers another powerful case for identifying undervalued assets–in this case factory-built housing, also recognized as the largest stock of unsubsidized affordable housing in the nation–and combining it with high-quality design, technology, and mortgage finance. This provides a product with the potential to transform the economic situation of a low-income household.

4 J. Oppenheim and T. MacGregor, "The Economics of Poverty: How Investments to Eliminate Poverty Benefit All Americans," Journal of Energy Assistance, vol. 1, no. 2 (2007): 1.

5 McKinsey & Company. (2009, July). Unlocking Energy Effiiency in the US Economy.

The second example of the power of aligning asset-building with energy efficiency is The Fuel Fund of Maryland, a nonprofit organization serving central Maryland. Its mission is to ensure that low-income residents have the resources to adequately fund their energy needs. Their "Watt Watchers" program blends lessons in energy conservation and efficiency with financial education with the explicit purpose of strengthening both. The primary goal is to teach families how to reduce their energy costs to achieve significant savings. The program also intentionally uses this "teachable" moment to encourage participants to open a savings and/or checking account (thereby increasing their savings if they were formerly using high-cost alternative financial services), create a financial plan, and achieve greater financial stability.

Another powerful example is the NeighborWorks of western Vermont, which has conducted retrofits on more than 1,000 homes during the past three years, documenting an average household energy savings of $1,500 per year. The stellar performance of the unsecured loans NeighborWorks has provided to assist their customers with the upfront investment, and the benefits generated in terms of improved comfort, safety, and home value, have attracted the attention of state and federal policymakers. Their experience highlights the need to pair flexible financial incentives to address the barrier of the upfront cost and underscores the potential role of state and federal agencies in filling this gap as a strategy to take these successful pilots to scale.

Priorities for Action

Given the impressive results when energy efficiency is mixed with asset-building, the next step is to expand the scale and sustainability of this emerging field. I suggest four priority areas for action.

1. Customer information and outreach

The first challenge in expanding the use of energy efficiency measures and encouraging household savings is in providing the necessary information in the appropriate way to spark interest and participation. Given the mixed reputation of many utilities, practitioners cite the need for "trusted messengers" to reach out to low-income communities and families. There are several existing delivery channels that combine both high-quality information and local credibility: the network of homeownership counselors that integrate financial education with homeownership topics; local and regional nonprofit social service agencies that provide subsidies for energy costs, among their other services; and financial counselors who understand the central role that energy costs play in the household budget. Leaders of each of these networks should work together to share curriculum, outreach mechanisms, and encourage the development of new training protocols that ensure that critical information on energy efficiency, savings, and asset-building is integrated into their programs as appropriate.

2. Legislative and regulatory policy at the federal, state, and local levels

The policy opportunities and needs are vast, as are the number of policymakers who have a role to play. Legislatively, current federal and state programs that fund energy efficiency programs meet only a fraction of the need. Much of the new funding through ARRA was a nonrefundable tax credit, which is of little value to low-income households. Efforts must be made to quantify and address the "home energy affordability gap" through expanded funding through federal and state agencies and regulated utilities. Regulatory actions are of equal importance in terms of setting standards for both industry and government, and aligning financial incentives in support of these measures. Advocating for rigorous efficiency standards in building codes for both site-built and manufactured housing will provide the foundation for achieving market change. Finally, changes in private-sector practices, such as appraisals, to quantify the value of energy efficiency in the valuation process, are essential to strengthening the case for these investments.

3. Technology development and dissemination to low-income communities

One of the most important contributions of Next Step USA is the commitment to leverage the best design and technology innovations on behalf of low-income homeowners, rather than those who can pay the most to benefit from these advances. Philanthropists, policymakers, and social entrepreneurs should partner with industry to ensure that effective and innovative technologies are applied in places where they will have the greatest impact–creating affordable, green housing at a scale that begins to meet the need in this country.

4. Access to financial products and incentives

There is a tremendous amount of innovation underway in financial products in private financial markets, among community development lenders, and through federal agencies, ranging from savings accounts targeted to those without bank accounts to green mortgages. Energy efficiency experts have identified the start-up costs in improvements as the greatest barrier to ensuring low-income households can afford energy improvements. This is a fertile area for community development financial institutions (CDFIs), state treasurers, and other sources of social investment capital to pursue given the relatively short-term payback period. In addition, programs should explore how to ensure that customers have bank accounts and are building their credit scores through their participation in these lending programs.

Conclusion

The lesson from each of the case studies, as well as from the many other articles in this issue, is the potentially transformative impact on low-income households that can happen when energy efficiency is aligned with asset-building initiatives. Program after program provides the evidence of the savings potential, especially when viewed as a percentage of household income. This creates a payback timeline that is relatively short given the financial

impact, which provides the foundation for asset-building. As we wrestle with the challenging question of how to define and achieve widely shared economic prosperity in the 21st century, it seems clear that part of the formula must include pairing energy conversation with savings mobilization and wealth creation.

Andrea Levere is the president of the Corporation for Enterprise Development (CFED). CFED designs and operates major national initiatives that aim to expand economic opportunity for low-income people and disadvantaged communities through matched savings, entrepreneurship, and affordable housing. CFED operates a comprehensive public policy program to build and protect assets at the local, state, and federal levels, and produces the nationally recognized Assets and Opportunity Scorecard. In 2012, CFED launched the Assets & Opportunity Network, composed of 75 state and local organizations representing thousands of members who advocate for asset development and protection policies at the municipal and state levels. Levere holds a bachelor's degree from Brown University and an MBA from Yale University.

The Future of the Clean (Green) Economy

Denise G. Fairchild,
Emerald Cities Collaborative

Nothing is more daunting or dubious for investors, economists, and businesses than gauging the health and direction of the U.S. clean ("green") economy. Is this a sector to "bank on"? Can it, will it, fuel the regional and national economy with substantial new investment, jobs, and business opportunities? The short answer is yes. But clarity on these questions is clouded by both the hype and unwarranted expectations of a substantial federal investment in the green economy in 2009, and a definitional challenge regarding the scope and nature of the green economy. This article describes the trends and job prospects in the clean economy, with an emphasis on the clean energy sector. Also highlighted are key issues and strategies for accelerating and meeting the growing demand and the opportunities to do this with the tools of community reinvestment community

Market Trends

In 2009, the federal government invested $800 billion in the economy as a partial answer to the Great Recession. This economic stimulus was neither large enough nor enduring enough to fix the spiraling U.S. economy, nor the numerous problems of going to scale with a relatively new industry. Since then there has been considerable political chatter and media hype about the fallacy and failure of green jobs, defying mounting evidence about the promise and reality of a U.S. clean economy. The fact is, despite its faltering start, a robust clean economy has been and continues to be an important pathway to restoring America's economic competitiveness and jobs. And if produced at scale, it comes with such ancillary benefits as energy security; climate change mitigation; critical infrastructure improvements; reduced government, business, and household waste and expenses; and improved family health and community development.

Part of the challenge in measuring the impact of the clean economy is the lack of a clear definition. The Brookings Institution's 2011 study, "Sizing the Green Economy," offers the broadest and most accepted definition: "The 'green' or 'clean' or low-carbon economy is defined as the sector of the economy that produces goods and services with an environmental benefit."

This definition suggests that the clean economy permeates all sectors of the economy. It also suggests that the thrust of business and job opportunities is not in an "emerging sector," but in the growth of new materials, technologies, processes, and services offered by businesses in traditional sectors. The cumulative effect is that we can expect to see growth in existing manufacturing, construction, retail, and professional services in addition to new business devel-

opment, because of a growing demand to reengineer all aspects of the economy to be greener.

The trends highlighted in the Brooking's study are informative. The report determined that although the sector is still modest in size relative to the overall U.S. employment base, it is larger than the fossil fuel and the bioscience industries. Moreover, although growth between 2002 and 2011 was slightly less than the national average, growth has been above average within the clean energy segments (renewables and energy efficiency). The study suggests that the sector holds considerable promise, particularly given that its wages are above national averages.

Market Drivers

Several factors propel the market opportunities in the clean economy. The continued growth prospects are fueled by policies, investments, economics, and to a growing extent, consumer demand. New energy efficiency performance standards are driving growth in auto, appliance, lighting, paint, metal parts (e.g., wind turbines) and a range of new product manufacturing. In addition to manufacturing, transportation services and jobs in public administration are emerging from related public policies and investments.

The bulk (57 percent) of the clean economy, however, centers around the real estate and construction industries. The two key drivers behind the green building industry are infrastructure development and clean energy (energy efficiency/renewables). There is a tremendous market to retrofit America's physical infrastructure to better withstand extreme weather and become greener.

There is greater awareness of and need to re-engineer and rebuild the nation's aging infrastructure, most of which relates to how we harness, distribute, and use natural resources. Specifically, in 2013, the American Society of Civil Engineers gave America's infrastructure a cumulative grade of D+ across 16 categories.[1] The infrastructure most in disrepair and at risk of failure (D grade and lower) included energy, drinking water/wastewater, levees/inland waterways, transit/roads, aviation, and schools.[2] A total of $2.75 trillion of infrastructure investment is needed between 2013 and 2020 to upgrade all infrastructure to a B grade. Only $1.66 trillion in funding is available, however, leaving a $1.1 trillion gap.[3] Super Storm Sandy racked up $65 billion in damage in the New York tri-state area, mostly instigated by the failure of the energy infrastructure. It is increasingly clear that the electric grid is inadequate to handle the effects of extreme weather.

The urgency to make the nation's infrastructure greener is evident in public sector investments. In 2013, for example, 32 state infrastructure banks were operating to finance crit-

1 American Society of Civil Engineers, "2013 Report Card: America's Infrastructure (Washington, DC: ASCE, 2013). Available at http://www.infrastructurereportcard.org/.

2 Ibid.

3 American Society of Civil Engineers, "Failure to Act. The Impact of Current Infrastructure Investment on America's Economic Future" (Washington, DC: ASCE, January 2013).

ical projects (albeit mainly transportation), up from six in 2007.[4] New York, Chicago, and Connecticut are among a growing number of cities and states developing green infrastructure banks. Since 2007, a series of bipartisan congressional proposals to create a national infrastructure bank has also been advanced, with varying levels of success, to create jobs and to keep the U.S. economy strong, including a current bill snaking through the 113th Congress for a green infrastructure bank.[5]

In addition to large-scale infrastructure projects, the efficiency/renewable energy subsector in particular has been viewed as the "sweet spot" for immediate job creation.[6] The demand in this emerging sector is huge. Energy efficient buildings, a modernized power grid, renewable power, and public transportation not only address multiple national problems (climate change, energy security, and infrastructure crises), but are also labor-intensive job generators.

U.S. capacity for cleaner and more energy efficient economy depends on retrofitting U.S. buildings and related energy infrastructure (e.g., wastewater treatment plants). Making existing properties more energy efficient is the most important and cost-effective way to achieve the required 50 percent reduction of greenhouse gas emissions by 2050. The fact is, the building sector is the largest generator of carbon as it consumes 71 percent of generated electricity. Energy conservation in this sector, therefore, will have the greatest short-term impact.

The scale of the work entails retrofitting nearly two-thirds of U.S. building stock built prior to new energy standards of the last decades. This includes $400 billion of potential commercial retrofits ($41 billion of annual energy savings for commercial properties), and 112 million residential properties ($2 billion annual savings for public housing alone). This does not include government facilities, schools, and hospitals, which also carry a big carbon footprint.

A plethora of studies stakes out the job prospects of a clean energy economy. Apollo Alliance identified 21.5 jobs in energy efficiency per $1 million of investments. A 2008 study by Global Insight projected an addition of 4.2 million U.S. jobs between 2008 and 2038 by increasing renewable use and implementing energy efficiency measures.[7] Another study projected an additional 2 million jobs from spending $100 billion in public funds in a "green recovery program."[8] In the 2008 "Blueprint for Change", then candidate Barack Obama anticipated 5 million jobs would be added from investing $150 billion in stimulus funds in clean energy.[9] The magnitude of the job creation is maximized when whole-building (comprehensive) retrofits are the goal as opposed to single measure installations (e.g., lighting), which, unfortunately, has been the trend to date.

4 The Council of State Governments, Capitol Research. "Increasing Public Awareness of Infrastructure Costs and Financing" (September, 2009).

5 Deutsche Bank Group, "Economic Stimulus: The Case for Green Infrastructure, Energy Security and Green Jobs" (New York: November 2008); Abbey Phillips "Infrastructure Banks Gains Steam," Politico (March 2011).

6 Ibid.

7 Global Insight, "Current and Potential Green Jobs in the US Economy" (US Metro Economies , 2008).

8 Polin, Robert, et.al. , "Green Recovery: A Program to Create Good Jobs & Start Building a Low Carbon Economy" (Political Economy Research Institute, University of Massachusetts: Sept., 2008).

9 "Energy and Economic Policies" The Blueprint for Change, Barack Obama's Plan for America (2008).

Clearly, the construction industry stands to gain substantially from the growth of the clean economy. Jobs of energy auditors, solar installers, weatherization technicians, plumbers, insulators, glazers, electricians, mechanical trades (e.g., HVAC), and laborers become "green jobs" when the skills, technology, processes, and materials used produce positive environmental outcomes. Similarly, most operations jobs in the utility sector stand to gain from "green" developments. Therefore, although the future of new construction has diminished, rebuilding and greening existing infrastructure and buildings is growing.

Table 1. Commercial Energy Retrofits: Jobs per $1 million by Type of Investment

Sector	Direct Jobs/$1m	Indirect Jobs/$1m	Induced Jobs/$1m	Total Jobs/$1m
Lighting	5.1	4.2	3.7	12.9
HVAC	5.3	4.2	3.8	13.3
Motors/drives	4.5	3.9	3.4	11.9
Water heating	5.0	4.1	3.6	12.6
Office equipment	3.8	3.7	3.0	10.5
Environmental ontrols	5.0	4.3	3.7	13.0
Building improvements (windows, insulation, roofing)	7.7	3.9	4.7	16.3
Average	5.1	4.0	3.7	12.8
Weighted average	5.7	4.1	3.9	13.6

Source: Garrett-Peltier, H. "Employment Estimates for Energy Efficiency Retrofits of Commercial Buildings", PERI, University of Massachusetts, Amherst, June, 2011

The Green Building Multiplier

The economic impact of green building and infrastructure development, however, goes beyond construction. The economic and job multipliers for this investment are deep and wide-ranging. A technology revolution is underway that is producing jobs in the research and development and manufacturing sectors. Professional services of architects, engineers, facilities and property managers are growing and changing at the same time.

A 2009 University of Massachusetts, Amherst, study examined the job creation potential for a $1 million dollar investment in clean energy over fossil fuel and found 16.7 jobs in the former vs. 5.3 new jobs in the latter.[10] Further analyses by Garrett-Peltier in 2011 found that for every $1 million of investment in the energy upgrade of commercial buildings resulted in an

10 Polin, Heintz & Garrett-Peltier, "The Economic Benefits of Investing in Clean Energy" (University of Massachusetts, Amherst, PERI, June 2009).

estimated 5.1 direct jobs, and 4.0 indirect jobs, and 3.7 induced jobs, or 13-14 jobs per $1 million investment. These averages differ by trade, with the highest multiplier (7.7) in building improvements (windows, insulation, roofing) and the lowest in lighting and water heating (5.1 and 5.0, respectively). The numbers portend the importance of whole building retrofits for achieving the greatest impact on both carbon reduction and job creation. See Tables 1 and 2 for the industry composition used to generate these jobs estimates.

The study suggests that in addition to manufacturing and installing new energy efficient technologies, employment will be generated in facilities services, as building owners employ personnel to operate and monitor their building's energy system. The majority of these costs (95 percent) will be directly attributable to personnel, with a smaller percentage used to purchase equipment to maintain the facilities' energy operations. In this scenario, $1 million will produce 8 direct jobs and 4.4 indirect, including scientific and technical consulting, real estate, telecommunications, architecture and engineering. Finally, energy efficiency upgrades are also projected to spur new investments allied with non-energy purchases.

Table 2. Commercial Building Retrofits Job Multiplier by Retrofit Type

Category	Direct Impacts	Indirect Impacts
Lighting	70% manufacturing; 30% installation	Wholesale trade; power equipment and transformer manufacturing; truck transportation; building services; machine shops
HVAC	24% air purification and ventilation equipment; 33% heating equipment; 23% air conditioning and refrigeration equipment; 30% installation	Wholesale trade; truck transportation; services to buildings; machine shops; ferrous metal foundries; iron and steel mills
Water heating	35% power boilers, 35% water heaters (excluding boilers); 30% installation	Wholesale trade, machine shops, truck transport; building services; business support services; architecture and engineering
Motors/drives	70% motor and generator manufacturing; 30% installation	Wholesale trade; truck transportation, building services, copper rolling and drawing, crown & closure manuf; iron and steel mills
Office equipment	28% photocopying equipment; 28% computer equipment; 30% installation	Wholesale trade; semiconductor manufacturing; software publishers; scientific R&D; advertising
Environmental controls	70% auto environmental control manufacturing; 30% installation	Wholesale trade; scientific R&D; software publishers; building services; custom computer programming; semiconductor manufacturing
Envelope improvements	8% window manufacturing; 8% insulation; 2% roofing materials; 2% painting and coating materials; 80% installation	Wholesale trade, truck transportation, services to buildings, accounting, maintenance and repair construction; architecture and engineering

Greening the Nation's Future: Building Market Demand

Different methods of defining the clean economy and estimating job creation continue to be sorted out. Enough forces are converging, however, to suggest that a clean economy is inevitable. At the same time, considerable work remains to convert this demand for clean energy into a reliable or substantial part of the U.S. regional and national economy. The requisite tools to stimulate the market are fragmented and underdeveloped. Unlike the affordable housing and community development industry, neither long-term financial incentives (e.g., the Low Income Tax Credit) nor mandates (e.g., Community Reinvestment Act) for clean energy exist at the national level to expand and accelerate the market.

Progress is being made rather randomly and state by state. The strength of the clean economy depends entirely on local politics and voter appetite and support for a clean economy. This creates an uneven playing field. The American Council for an Energy Efficient Economy (ACEEE) produces a clean energy scorecard that ranks how well states and cities are addressing their clean energy needs on a variety of criteria. California and the Northwest are among the top performers, the South and Southeast among the worst.

In general, however, substantial movement is taking place on the policy front. Local and state regulations, for example, are quickly changing the landscape for the utility sector, businesses, and the real estate industry. Twenty-five states have enacted long term (n=3years), binding energy savings targets known as energy efficiency resource standards (EERS). California is one of the most aggressive with a goal of 50 percent of existing commercial and state buildings achieving zero net efficiency (ZNE) standards by 2030. Seattle is moving to completely ban coal plants, requiring conversion to alternative, cleaner energy sources. Even industry is taking action. Southern California Edison is shutting down its nuclear plant, which supplies 20 percent of its energy, in favor of alternative forms of energy.

Local ordinances are also pushing energy conservation and increasing jobs in the process. This includes new building codes and disclosure ordinances. The latter includes energy reporting requirements for commercial and, to a lesser extent, residential property owners to provide energy consumption data on their buildings. This is influencing how buildings are appraised and valued.

The development and use of new financing mechanisms are both a huge challenge and opportunity. Innovative financing tools are complementing the investments made (voluntarily or not) by investment-owned utilities. State financing mechanisms have emerged. The State of California, for example, has allocated $2.5 billion to retrofit elementary, middle, and high schools as well as community colleges from voter approved funds. And other commercial financing tools are working their way into the marketplace, including on-bill financing and commercial property assessed clean energy PACE financing. These tools seek to ease the cost of energy upgrades by amortizing the costs into the property owner's utility bill and/or property assessments.

Finally, real estate buyers and tenants (commercial and residential) are becoming more sophisticated consumers. They want the lowest possible energy cost and they want "green and healthy" buildings.

These forces combined will inevitably make natural resource conservation in the United States ubiquitous as it is in Europe and as pervasive as technology is to the American way of life, driving a new economy in the process.

The Supply Side: Challenges and Opportunities

The economic development potential of the clean economy is not only influenced by market demand, but also supply-side challenges and opportunities. That is, transforming the energy/utility sector will require a skilled workforce and pool of contractors able to understand and meet the rigorous technical standards of the clean economy. A recent national survey (2012) of architects, engineers, and contractors (AEC), however, highlights a critical shortage of workers and contractors with the requisite skills.

Specifically, a McGraw-Hill Construction study identified the specific challenges of the AEC industry including an aging workforce, skilled workers leaving the industry due to economic downturn, an insufficient pipeline of younger workers, and a green skills shortage.[11]

The findings are disturbing. This national survey indicates that AEC professionals anticipate that 45 percent of all design and construction jobs will be "green" by 2014 and two-thirds saw "green" as the norm by 2016. Yet, 69 percent of those surveyed expect skilled workforce shortages in the next three years; 32 percent of the architects, engineers, and contractors surveyed were concerned about a shortage of specialty trade contractors by 2014; 49 percent of the general contractors are concerned about finding skilled craft workers by 2017, and 37 percent of architect and engineering firms were concerned about finding experienced workers.

Skilled "green" workers are in even more demand; 86 percent of architecture and engineering firms and 91 percent of contractors cannot find enough green-skilled employees. Senior (32 percent) and mid-level (41 percent) professionals are the most difficult to find.

This double-edged sword of green jobs but few workers creates a new sense of urgency for business and workforce development to respond. It is critical to increase the capacity of the contractor community to meet industry demand by attracting and training a qualified workforce. The good news is that the growth of green jobs may help draw more young people into the industry. The younger generation reports a strong commitment to sustainability, with 63 percent of architecture students saying they would engage in sustainable design out of a personal responsibility. This suggests that as "green" rises, so too may the interest of youth in the design and construction fields of practice.

11 McGraw-Hill Construction, "Construction Industry Workforce Shortages: Role of Certification, Training and Green Jobs in Filling the Gaps" (2012).

Construction and building operations are also ideal careers for disadvantaged youth and veterans through such programs a Helmet to Hardhats. Attracting and retaining youth, women, and veterans in the green sector, however, means a commitment to quality training, career opportunities, and middle-class wages. It will require investments in apprenticeship training programs and other workforce and business development support services. Without these efforts, the industry will have no qualified workforce.

The Role of Community Reinvestment

The scale, pace and overall direction of this emerging green building sector can be greatly enhanced by strategic community reinvestment activities. While there seems to be regulatory challenges to recognizing energy efficiency investments as a qualified reinvestment activity, there are both demand and supply side strategies that are needed and that do qualify.

Citi Community Development Group, for example, is investing in building the capacity of small, minority, women and veteran owned contractors (DBE/WBE) to create jobs in this growing building sector. DBE/WBEs are both job creators and hiring halls for minority, disadvantaged populations. A concerted effort and substantial investments are needed, however, to expand their knowledge about the changing "green building" regulatory environment, the new green building technologies, materials and applications, and what it takes to compete for lucrative public sector energy contracts. Without this support low and moderate-income communities will miss this emerging job and business development opportunity, creating an 'energy divide' not unlike the 'digital divide' of the 1990s.

Similarly, Union Bank of California is investing in local non-profit sustainable development intermediaries as a "demand-side strategy" to include the affordable housing sector in the efficiency revolution. This lowers the operating budgets of both low-income families who pay a disproportionate amount of their household budgets on the cost of utilities (12-13 percent vs. 8 percent of the average household), as well as the operating proformas of non-profit developers.

The importance of investing in workforce development – education and training - is mentioned above and is an important 'supply-side" strategy. Lucrative jobs are available for youth, veterans, challenged workers (e.g., ex-offenders) in the construction and related "green building" careers. These opportunities first start with STEM education in schools to prepare our youth for technical careers. Investments are also needed for community-based pre-apprenticeship programs to help match the skills of workers to the rigors of the job. YouthBuild, JobCorps, Conservation Corps, Helmets to Hardhats, are among the various construction career programs that need support to re-populate and re-skill the diminishing supply of workers in this emerging sector of the economy.

Conclusion

The clean, green economy is more fact than fiction. The trends are growing, albeit unevenly, across cities and states throughout the country. New policies, investments, and growing concern over climate change are among the drivers of this emerging sector. Within a broadly defined economic sector, substantial opportunities are developing in the real estate and construction industries as clean energy becomes the core strategy for mitigating the effects of global warming.

The full transformation into a stable and substantial sector of the national economy, however, is stymied by the lack of a national energy policy. This is critical to drive demand and to align the financial, utility, and capital markets as full participants. At the same time, even in its current nascent state the clean energy economy is challenged by supply-side issues, including a dearth of skilled workers and contractors. The conversion from the demand for clean energy into a viable economic development sector is not only possible, but necessary for U.S. energy security and overall global competitiveness. It does, however, require, substantial public, private, and community commitment and resources to make it happen. The nation marshaled the needed commitment to build a viable affordable housing and community development industry 40 years ago, and we can do it again today with a green economy.

The success of this effort can be substantially bolstered by the commitment of the community reinvestment community. At the heart of this commitment is positioning low and moderate income communities as full participants and beneficiaries of a clean-energy economy. This includes fostering jobs and business development opportunities, as well as improving greener and healthier homes and operating budgets.

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Cleaner Energy and Health: Household, Local and Global Benefits

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Energy is central to the very service systems that sustain human life and well-being such as transportation, buildings, materials, infrastructure, food, hygiene, thermal comfort, communications, and lighting. But how we choose to supply energy can also have negative consequences such as water scarcity, air pollution, and extreme weather related events. When we burn fossil fuels to produce energy, for example, greenhouse gas emissions trap heat in the lower atmosphere and affect the quality of environmental services, the global climate, and our health. This year in the United States alone, more than 10,000 people will die from complications connected to air pollution. And we must not forget that energy goes hand in glove with another life-sustaining resource – water. Water is essential to operating power plants. When power plants produce more energy, they use more water and compete for this finite resource with other industries in drought-prone areas. The result is higher costs of water and energy.

We experience these externalities of our energy choices every day in the quality of the air we breathe and altered weather patterns such as heavy rains, record-setting periods of drought, or hotter than average days. According to the American Lung Association's 2013 "State of the Air" analysis, more than 44 million Americans live in an area with unhealthful levels of air pollution all year.[1] Wind carries solid and liquid particles from power plant emissions through the air, and when inhaled, the particles can result in heart and lung damage. Climate changes also affect health. Extreme heat not only exacerbates upper respiratory illnesses like asthma and sinusitis but also extends the pollen season, which in turn triggers more, and more intense, cases of asthma. Asthma prevalence has risen 17 percent in the United States between 2001 and 2010 according to federal data.[2] The Centers for Disease Control and Prevention report that one in 12 people has asthma, which costs the United States about $56 billion a year in medical costs, lost school and work days, and early deaths. If greenhouse gas

1 American Lung Association, State of the Air 2013 Rankings, available at http://www.stateoftheair.org/2013/city-rankings/most-polluted-cities.html.

2 Lara J. Akinbami, M.D.; Jeanne E. Moorman, M.S.; Cathy Bailey, M.S.; Hatice S. Zahran, M.D.; Michael King, Ph.D.; Carol A. Johnson, M.P.H.; and Xiang Liu, Trends in Asthma Prevalence, Health Care Use, and Mortality in the United States, 2001–2010. NCHS Data Brief. Number 94, May 2012. Available at http://www.cdc.gov/nchs/data/databriefs/db94.htm.

emissions continue to increase, doctors expect allergic conditions to worsen.[3] In addition to the pollution from fossil fuels, thousands of families burn charcoal or wood on small stoves in their homes because they cannot afford to pay utility costs. The pollution from these energy sources also results in compromised upper respiratory health, which also leads to missed school and work days and more admissions to the emergency room.

According to the U.S. Energy Information Administration, fossil fuels supply 76 percent of the energy consumed in the United States to operate the buildings we live and work in every day. The total energy consumed is expected to grow by nearly 10 percent between 2010 and 2030, with about one-third of this growth from the building sector. Homes with little or no insulation or with windows that leak can expose families to the noises from the street, outdoor air pollutants, and extreme weather conditions. These homes also require more energy to heat or cool the living space, which results in higher utility bills and ultimately an increase in harmful emissions and water usage at the power plant. People with lower incomes are more likely to be living in older, deteriorated buildings. It should come as no surprise, then, that they also experience much higher rates of asthma-related hospitalizations.[4] Specifically, building dampness is associated with a 30 to 50 percent increase in a number of respiratory and asthma-related health problems, including upper respiratory tract ailments, coughing and wheezing, and asthma.[5] Children who do not feel safe or comfortable in their own homes coupled with routine visits to the emergency room and the financial hardship that ensues can be sources of toxic stress for children, which we are learning can disrupt brain development and threaten their learning, health, and life prospects.[6]

The Opportunity

Addressing the connections between energy service provision, consumption, and externalities can uncover structural barriers. This in turn may lead to innovations to change the enabling environment, develop new financial and business models, change behavior patterns, and transcend limitations of man-made environments, infrastructures, and technologies. Interventions in the energy system can then influence human and community health by positively contributing to critical community resources. For example, if the United States were to successfully reduce greenhouse gas emissions by 17 percent by 2020, more

3 W. Koch, Climate Change Linked to More Pollen, Allergies, Asthma. Natural Resources Council of Maine. (May 2013) available at http://www.nrcm.org/news/environmental-issues-in-the-news/climate-change-linked-to-more-pollen-allergies-asthma/.

4 FJ. Malveaux and SA Fletcher-Vincent. Environmental risk factors of childhood asthma in urban centers. Environmental Health Perspectives. 103 (Suppl 6): 59-62 (September 1995).

5 D. Mudarri and W. J. Fisk, "Public Health and Economic Impact of Dampness and Mold. Indoor Air (June 2007), 226-35.

6 J. Radner and J. Shonkoff, Mobilizing Science to Reduce Intergenerational Poverty. Investing in What Works for America's Communities (San Francisco: Federal Reserve Bank of San Francisco, 2012), 338.

than 24,000 lives could be saved.[7] We can reach that target through new business development, local investments, and civic engagement and participation, which could simultaneously strengthen the fabric of communities and improve human health and well-being.

To leverage the energy system to enhance human health, we must intervene at the level of energy *supply*, energy *demand*, and energy *efficiency* while also addressing structural barriers and innovation opportunities.

Energy supply interventions involve developing new, clean sources of energy or reducing the social, economic, and environmental costs related to existing practices. Continued public investment in the supply of renewable technologies provides an opportunity to create lasting healthy and stable environments for low-income residents. Last year, supported with Community Development Block Grant (CDBG) funding from Los Angeles County Supervisor Gloria Molina, Enterprise Community Partners, Inc. orchestrated energy retrofits on nearly 90 homes in East Los Angeles has helped homeowners and their families save substantially on utility bills. One resident, Hermila Garcia, noted that when she received her first utility bill after her home was retrofitted with solar photovoltaic panels, attic insulation and a tankless water heater, she couldn't believe how much it had declined. For homeowners like Garcia, the retrofits have drastically reduced their utility bills, estimated to be about 30 percent annually. Savings from the last installation cycle are estimated to eliminate 1,165 tons of greenhouse gas emissions over the 30-year lifetime of the solar panels.

Interventions at the level of energy demand include reducing the consumption of energy at the individual, community, and national scales. Here there is a tremendous opportunity to build on the effectiveness of community health workers interventions to both advance health and energy conservation. Community health workers could help identify tactics and resources for improving energy efficiency, which have the added benefit of improving human health. Models such as "Health Leads" in Boston, and the Washington-Heights "Inwood Network for Asthma" (WIN) initiated by New York Presbyterian Hospital anchor community health workers in the community while maintaining a strong presence in the hospital where they connect with families who need immediate support. The WIN program includes a home environmental assessment but could be augmented with a home energy audit that would combine improvements to lower or eliminate asthma triggers with improvements that could reduce the household utility bills. Much could be done to better streamline and combine federal resources for energy efficiency through weatherization and other programs with resources for public health initiatives.

Intervening at the level of energy efficiency includes increasing the efficiency with which energy is converted, supplied, and used. The U.S. Department of Housing and Urban Development targeted more than $6 billion of the $14 billion allocated under the American

7 Seth Godin, "Deaths per TWH by Energy Source," Next Big Future, March 13, 2011, available at http://nextbigfuture.com/2011/03/deaths-per-twh-by-energy-source.html.

Reinvestment and Recovery Act (ARRA) for addressing energy, including $2 billion in Neighborhood Stabilization Program funds to address green improvements in the foreclosed housing stock across the country. In addition, of the $840 billion funds allocated through ARRA, more than $60 billion went to states and localities specifically for energy-related tax incentives, contracts, grants, loans, and entitlements. These investments have sparked new ways of thinking about energy as a pathway to job creation and a healthier planet through cleaner energy sources and greater energy efficiency as well as opportunities to reduce the costs associated with operating buildings and homes. Investments in energy efficiency at the household level are resulting in lower utility bills and improvements in occupant health and could result in millions of children and adults experiencing healthier indoor environments through energy retrofits.[8] But this nexus between health and energy must be intentional.

Conclusion

Converging trends in the electric power market have utilities, state, and federal agencies reassessing how best to provide low-cost electricity while meeting requirements for reducing a range of pollutants, particularly from aging coal plants that harm public health and worsen climate change. We can reduce power plant pollution through a combination of using electricity more efficiently and switching to cleaner sources of power. As we pursue strategies to deliver energy from cleaner sources to improve overall air quality we must also increase the efficiency with which we use energy in our homes where we stand to gain health benefits directly from the improved indoor air quality.

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8 E. Tohn, J. Wilson. Creating Healthy and Efficient Housing. Home Energy Magazine. (September 2012) Available at http://www.homeenergy.org/show/article/id/1805 .

Financing Energy Efficiency Retrofits of Affordable Multifamily Buildings

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Apartment buildings are home to more than 17 million households nationwide, yet they remain a significant and mostly untapped opportunity for energy efficiency gains. Energy efficiency upgrades in multifamily buildings could save building owners and residents up to $3.4 billion annually.[1] Many cities and states that have embraced energy retrofitting as a job creator and boon to both the environment and economy have yet to address potential savings in multifamily properties, primarily because of obstacles not faced by single-family and commercial properties. The need for multifamily energy retrofits is clear, but two barriers–a lack of information and financing–stand in the way.

Before a retrofit program can be effectively marketed, financed, and implemented, there is an information gap to close. First, it is necessary to determine how much retrofit measures cost, how much they save, and whether they are cost-effective. Accurate estimates on the payback period also inform loan underwriting. To ensure that the retrofits result in predicted savings, programs must identify qualified contractors, monitor construction quality and costs, and confirm savings.

Even if a program addresses the information gap, financing energy efficiency improvements in the multifamily market remains a challenge. Stakeholders, including both subsidized and unsubsidized building owners, lack access to capital for retrofits. When financing programs are available, most lenders will not consider future energy savings in loan underwriting, thereby limiting the size and sometimes the availability of a loan. Challenges are exacerbated in the subsidized multifamily housing market, as properties face very long refinance and rehabilitation cycles and complicated, multilayered financing structures.

Improving the energy efficiency financing options for a wide range of affordable multifamily buildings will require a multipronged approach to address information and financing barriers. One tool that can help, especially in the subsidized multifamily market, is on-bill

1 Anne McKibben et al., "Engaging as Partners in Energy Efficiency: Multifamily Housing and Utilities" ACEEE report no. 122. (Chicago: CNT Energy and American Council for an Energy Efficient Economy, January 2012). Available at http://www.elevateenergy.org/wp-content/uploads/2014/01/Engaging_as_Partners_in_Energy_Efficiency_Multifamily_Housing_and_Utilities.pdf

repayment, in which building owners repay loans for eligible energy efficiency improvements through monthly utility bills. Partnering with local utilities to implement on-bill repayment allows stakeholders to capitalize on existing billing systems as a repayment mechanism. Although working with utility companies is not the only path to efficiency in the multifamily market, on-bill repayment can complement existing private programs by capturing savings not otherwise available and providing alternative financing options.

This paper reviews the challenges facing the multifamily housing energy efficiency market and the opportunity that tools such as on-bill repayment provide to finance energy efficiency retrofits for the subsidized affordable multifamily market.

The Multifamily Market is Difficult to Serve

The first challenge to overcome in financing energy efficiency improvements in the multifamily market is an information gap. Before financing a retrofit, it is vital to have accurate information about what retrofit measures the building needs, the cost of a retrofit, and the savings that will result. A qualified contractor must properly install the retrofit measures, and someone should verify savings are achieved after the retrofit is complete.

Complete and accurate data about retrofits also help to overcome resistance from building owners. Some owners, especially owners of small to mid-sized buildings, may not have a strong grasp of their retrofit needs and may not believe a retrofit will result in significant savings. Even for owners who complete a retrofit, building engineers may not always operate the new equipment at optimal levels, and buildings do not maximize their energy savings.

Even when multifamily owners do understand the importance of retrofits–especially owners of subsidized properties where rents, cash flow, and reserves are restricted–many lack the capital to cover the cost of a whole building retrofit. Although the per-unit cost of a retrofit can be small (typically between $2,500 and $5,000), the total cost can quickly add up to several hundred thousand dollars. Whether the building is subsidized or part of the private market, the cost of a comprehensive retrofit often exceeds the amount of cash an owner has on hand.

Lacking their own capital, multifamily building owners need access to financing. Many owners plan building improvements to coincide with a larger refinance, so that the cost of rehab can be incorporated into the new loan. Yet, a vast majority of lenders do not underwrite the post-retrofit energy savings into projections of operating costs, which may prevent an owner from investing in a retrofit. Without underwriting to the post-retrofit savings, some buildings cannot support the additional debt from the retrofit. Moreover, although many private building owners refinance every 7 to 10 years, the period between major property renovations is generally longer for government-assisted housing, and can be as long as 20 to 30 years. To avoid waiting decades to make energy efficiency improvements, owners need access to loans between refinancing cycles.

Although financing for multifamily energy improvements may be available between refinancing cycles, some properties may not be able to access it. Programs that provide financing for multifamily retrofits typically secure a retrofit loan by recording a lien against the property. If other liens are already in place, the retrofit lien will take a subordinate position. This poses a challenge for some market-rate buildings and most subsidized buildings. For buildings that already have liens, owners must seek permission from senior lenders to add a subordinate lien against the property. Buildings with loans backed by Fannie Mae, Freddie Mac, and FHA generally prohibit subordinate liens as a matter of policy. Many subsidized buildings fall into this category. Even subsidized buildings that do not have loans backed by these institutions face the daunting challenge of seeking approval from multiple lienholders, as assisted buildings typically have many layers of financing.

Looking to a subordinate lien for security also presents a problem for would-be lenders in retrofit loan programs. By definition, a subordinate lien means it will get paid after the more senior liens. As a result, most private lenders do not consider a subordinate lien a secure investment, and typically do not finance smaller retrofit loans outside larger transactions. Similarly, most lenders will not invest in a pool or program for smaller retrofit loans, absent significant loan loss reserves and "soft" investments from government or philanthropy. Although multifamily retrofit programs have proved successful in some markets in achieving significant energy savings and low default rates on loans, the track record on multifamily retrofit financing is too short to assure most lenders of the security of this type of loan. This constrains the availability of private capital for smaller retrofit loans.

Another reason the multifamily market is difficult to serve is because of the split incentive barrier. When utility payments are divided between the building owner and the tenants, the benefits of energy savings are also split. When gas and/or electricity are individually metered, residents benefit from the savings that result from energy efficiency investments that the owner paid for with capital improvements. Thus, the owner's incentive to invest is reduced.

Overcoming Barriers to Retrofit Multifamily Buildings

Despite the challenges facing the multifamily retrofit sector, some energy efficiency programs find success. A case in point is Energy Savers, a Chicago based energy efficiency program for owners of multifamily buildings, run in partnership by Elevate Energy (formerly CNT Energy) and Community Investment Corporation.

Energy Savers features an innovative one-stop shop. Program staff guide a building owner through every step of the retrofit process, starting with a building assessment. Elevate Energy identifies cost-effective improvements, which can include air sealing and insulation, and HVAC systems replacement and optimization. The building owner receives a report indicating the cost and payback schedule of each measure. As part of the turnkey program, Elevate Energy connects building owners with available utility rebates and incentives, and even completes the rebate applications on behalf of the owner. The Community Invest-

ment Corporation offers financing and incorporates projected energy savings into the underwriting. Elevate Energy connects owners with prequalified contractors, oversees construction, and verifies the savings after the retrofit is complete.

Since the program launched in 2008, owners have retrofitted more than 17,500 apartments. Building owners who implement all or most of the recommended energy efficiency measures through Energy Savers commonly see a 30 percent savings on natural gas use. The retrofits help preserve affordable housing, create local jobs, and reduce greenhouse gas emissions.

As part of the program, Community Investment Corporation provides low-cost financing to building owners, underwriting the projected energy savings and structuring the loan to allow for quick payback from the savings generated by the retrofit. Although nearly two-thirds of property owners have financed retrofits using their own resources, based on information provided in the energy assessment, the Energy Savers Loan Fund has provided loans and grants to buildings with nearly 7,000 units totaling more than $14 million. None of the Community Investment Corporation loans are in default. Energy Savers loans are secured by a second mortgage, and most are small, with a low interest rate of 3 percent, which is attractive to property owners.

The interest rates are low because of strong loan loss reserves and strong investments from both government and philanthropic sources. The Energy Savers Loan Fund was originally funded with a $1 million program-related investment from the John D. and Catherine T. MacArthur Foundation, a $1 million grant from the Grand Victoria Foundation, and $1.25 million from Community Investment Corporation. Building on the program's success, the Community Investment Corporation expanded program resources with an additional $5 million program-related investment from the MacArthur Foundation, $8 million from Bank of America, and $3.5 million in loan loss reserves from local and federal government sources.

Of the identified challenges facing multifamily retrofits, Energy Savers helps bridge the information gap, addresses access to capital, and incorporates energy savings into loan underwriting. However, the program could reach an even broader, untapped market if it were to address additional barriers.

The primary challenges facing the Energy Savers program are:

1. Inability to finance retrofits for buildings whose senior lenders or investors will not grant permission for subordinate liens. This includes loans backed by Fannie Mae, Freddie Mac, or FHA, and also includes subsidized properties with multiple layers of financing. Owners of these types of buildings are generally unwilling to accept personal recourse for loans made to their buildings.
2. Identifying future sources of capital for the Energy Savers Loan Fund. To date, socially motivated investors have provided the capital for the loan fund. To truly reach scale, market rate capital is needed.

On-Bill Repayment: A Promising Tool to Unlock Private Capital

A relatively new tool, on-bill repayment, has the potential to overcome many of the barriers to unlocking private capital. On-bill repayment provides convenient access to capital, reduces the cost of financing, and uses an existing billing relationship between consumers and utilities.

The major structural advantage of on-bill repayment is that it eliminates the need to secure a loan on the property, which in the case of multifamily buildings has generally already been claimed as security by lenders and sometimes other parties. Because payments on the utility bill can be limited to the estimated amount of savings, properties can use the energy savings to finance retrofit work without increasing monthly payments, thus leaving intact covenants and other promises made by the owner regarding cash flow. Since on-bill repayment is technically a utility charge, it does not require a lien on the property, thus saving owners the significant time and hassle of seeking approval of senior lienholders before proceeding with the energy retrofit. A structural advantage of on-bill repayment over its close cousin, on-bill financing, is that it deploys private capital, thus stretching rate-payer and state funding to help scale up retrofit programs. On-bill financing, in contrast, requires utility companies to use their own closely regulated capital.

The simplicity of securing repayment on a utility bill has the potential to attract both new interest among multifamily owners and new sources of capital. When loan payments are attached to the utility bill and sized to be no greater than the projected cost savings, they can be assumed to reflect the track record of the owner's utility bill payments. Given the extremely low rates of default on utility payments among multifamily owners, these loans have the potential to attain a greater level of security than a retrofit loan secured only by a subordinate mortgage. When utility companies also provide a guarantee or loan-loss reserve for a retrofit financing program, the security is even greater, potentially allowing a lender to leverage even more, and less expensive, private capital.

The biggest potential advantage of on-bill repayment is that it can tap the savings from both owner and tenants' meters in the large number of multifamily buildings where tenants pay a share of the utility costs. In this way, on-bill repayment has the potential to solve the split incentive barrier. It is a best practice of on-bill repayment programs for repayments to be bill neutral, so that the payments are less than the savings from the retrofit, ensuring that tenants still save money on their utility bills. However, in most states, legislation is needed to authorize the use of on-bill repayment on tenant meters along with strong consumer protections to avoid tariffs exceeding annual savings. Without the protection of bill neutrality, tenant advocates would correctly raise the concern that owners claiming savings from tenant-paid utilities for on-bill repayment could be increasing net utility costs to tenants.

Piloting an On-Bill Repayment Solution in California

In developing new energy efficiency financing programs to meet the needs of the underserved low-income housing sector, the California Housing Partnership Corporation and national partner Stewards of Affordable Housing for the Future designed the Ratepayer Integrated On-Bill Payment Program (RIOPP). This innovative pilot offers a complete package of integrated energy efficiency financing tools tailored to the specific needs of low-income, multifamily rental properties for performance-based, whole-building energy retrofits.

Inspired in part by the success of the Energy Savers program, the RIOPP model depends on the implementation and integration of two key elements:

1. A single point of contact to access utility energy efficiency programs, and
2. An on-bill repayment mechanism.

Although utility incentive programs are vital to expanding energy efficiency retrofits into the affordable multifamily housing sector, they are generally administered independently of each other within each utility company, which greatly complicates the process of efficiently combining their benefits. RIOPP acts as a one-stop shop that helps building owners cut through the confusion of multiple utility programs and arranges for third-party on-bill repayment financing.

A Prototype for a One-Stop Shop Approach

The demonstration project at LINC Housing's City Gardens Apartments is a compelling example of how on-bill repayment can serve California's affordable multifamily market, which faces many of the barriers discussed above. To demonstrate the effectiveness of RIOPP's one-stop shop approach in California, the California Housing Partnership and Stewards of Affordable Housing for the Future worked with nonprofit building owner LINC Housing to facilitate a whole-building retrofit of the 274-unit City Gardens Apartments with the cooperation of key program managers from Southern California Gas and Southern California Edison.

Constructed in 1969, City Gardens is composed of 27 two-story buildings spread across nearly 12 acres in Santa Ana, California. The units are a mix of studio, one-, and two-bedroom apartments, master metered for gas and water. The last major renovation of this former Low Income Housing Tax Credit property was performed in 1996, although LINC replaced seven of the eight hot water boilers in the early 2000s, significantly reducing the potential for energy savings from the RIOPP demonstration retrofit in 2013.

Nonetheless, calculations using the energy audit report generated from the Fannie Mae Green Refinance Plus Green Physical Needs Assessment Protocols [2] show that using only

2 The Fannie Mae Green Refinance Plus: Green Physical Needs Assessment Statement of Work and Contractor Qualifications. https://www.fanniemae.com/multifamily/green-initiative-financing.

savings generated from improvements to the owner-paid utilities, the whole-building retrofit is projected to reduce annual energy and water cost by 23 percent. The retrofits range from weather stripping to a solar domestic hot water system to irrigation improvements.[3] Table 1 is a summary of the type and cost of each retrofit measure, as well as projected savings.

Table 1. Costs and Type of Retrofits in City Gardens Apartments

Energy Conservation Measures Installed at City Gardens	Value of Rebate and/ or Direct Install Measures	Measure Costs After Rebates	Projected Annual Owner Savings Post-Retrofit	Projected Annual Tenant Savings Post-Retrofit
Electricity (lighting measures)	$64,378	$18,736	$9,360	$17,026
Gas and water (solar domestic hot water and ESAP measures in non-income-eligible units, low flow plumbing fixtures, irrigation, etc.)	$332,597	$199,283	$47,911	$0
Totals	**$396,975**	**$218,019**	**$57,271**	**$17,026**

Table 1 shows that after accessing all available utility incentives, LINC was left with a gap of $218,019 to complete the retrofit. RIOPP staff was able to demonstrate to the California Public Utilities Commission that LINC could afford to finance the remaining retrofit cost through on-bill repayment.

The total amount to be financed was $253,821, which included the $218,019 total cost after rebates, a $14,000 loan servicing fee, and a 10 percent overhead fee to LINC.

Table 2: Maximum Possible Loan Amount

Term	10 years
Interest rate	4.1%
Annual energy savings	$57,271
Debt service coverage ratio	1.10
Amount available for annual debt service	$52,065
Maximum loan amount	$426,530
Per unit	$1,557

3 A full picture of post-retrofit performance at City Gardens will not be available until May 2014. However, usage data to date suggests that City Gardens is on track to achieve higher-than-projected cost savings.

Table 2 shows that using only the savings from owner-paid utilities, there is more than enough savings to finance the measures not covered by utility incentives.

In September 2013, the Public Utilities Commission authorized the California Housing Partnership Corporation to proceed with a pilot offering on-bill repayment to up to 5,000 units of low-income multifamily rental housing, based in large part on the RIOPP demonstration at City Gardens.

On-Bill Repayment Is Not a One-Size-Fits-All Mechanism

There are several other examples of on-bill repayment programs that show promise for the future of financing energy efficiency improvements in the affordable multifamily housing market. But it is important to keep in mind that these mechanisms will vary significantly by state because of variations among utility systems, state regulations, utility products, and consumer lending.

Conclusion

Millions of people living in multifamily buildings nationwide could benefit from energy efficiency improvements. The need is clear, but two key barriers stand in the way: lack of information and financing. Some energy efficiency programs, like Energy Savers, have managed to overcome these retrofit barriers with impressive results. Yet even this successful program faces challenges related to security and capital. Not only can on-bill repayment help overcome these challenges, but it creates an opening for financial institutions and investors to potentially enter the underserved multifamily retrofit market. Leveraging on-bill repayment makes energy efficiency financing a more attractive investment, and it is a valuable tool that can be integrated into both new and existing retrofit programs that need financing options to reach scale.

Jack Markowski is the president of Community Investment Corporation, a nonprofit mortgage lender that provides financing to buy and rehab multifamily apartment buildings with five units or more in the six-county metropolitan Chicago area. As president, Markowski oversees the most important source of loans for the rehabilitation of multifamily residential buildings in the Chicago region.

Anne Evens is the CEO of Elevate Energy, a nonprofit organization whose mission is to provide smarter energy use for all. As CEO, Evens provides oversight for programs related to energy efficiency retrofits in multifamily buildings, energy performance of commercial and residential buildings, regional energy and climate planning, as well as smart grid and dynamic electricity pricing initiatives.

Matt Schwartz is president and CEO of the California Housing Partnership Corporation, a private nonprofit organization that assists nonprofit and government housing agencies to create and preserve housing affordable to lower-income households, while providing leadership on housing preservation policy and funding. As president, Schwartz assists local government and nonprofit organizations with the preservation and creation of affordable housing through policy advocacy, technical assistance and training.

Manufactured Homes Help Both Save the Planet and Save Money for Low-Income Owners

Stacey Epperson
Next Step

Doug Ryan
CFED (Corporation for Enterprise Development)

Addressing affordable housing while simultaneously reducing pollution seems like an impossible task. Yet manufactured housing can do just that.

The American housing market has long benefited from design and finance innovations to meet the changing demands of home buyers. It is also a sector of the economy that has been greatly affected by government interventions in the market. From local zoning and planning decisions to preferential treatment in the federal tax code, housing's progression is a many-chaptered story.

Changes in housing design have been driven by public policy, consumer demand, and producer marketing (the evolution of kitchen appliances from avocado green to stainless steel is one curious example). Often these influences converge, which can, eventually, provide the homeowner with a better home at lower costs. The story of manufactured housing and the development of quality standards is a case study on this.

In one stroke in 1974, Congress changed mobile homes into manufactured housing by passing the National Manufactured Housing Construction and Safety Standards Act. Before the law, there was no incentive to standardize construction quality and cost-effective building practices. Without the act, it is unlikely that industry would have developed innovative and cost-effective construction techniques.[1] And largely that is what happened.

Industry stepped up, revising manufacturing practices to meet or exceed the U.S. Department of Housing and Urban Development (HUD) code, as the 1976 regulations are known. The government trigger and the market's response led to a growth in manufactured housing and a revised view among many Americans, though not all, of this part of the housing market. (The industry suffered a dramatic decline in the early 2000s for many of the same reasons the broader housing market declined a few years later, including, for example, the way manufactured home loans were underwritten and securitized. Recent trends suggest home manufacturers are rebounding albeit at a slower pace than their site builder peers.)

1 42 USC Chapter 70: Manufactured Home Construction and Safety Standards (Ithaca, NY: Cornell University Law School, 2013), available at www.law.cornell.edu/uscode/text/42/chapter-70.

The Evolution of Manufactured Homes

Like all housing types, the role of manufactured housing in any particular market varies widely. It ranges from about 20 percent of all housing in South Carolina (this share includes pre-1976 homes, of which there are about 2 million still occupied nationwide) to an inconsequential share in a state such as Hawaii, given the prohibitively high shipping costs. In every market, manufactured housing makes up an outsized share of affordable housing. In the Denver area, 60 percent of manufactured housing is affordable compared with 27 percent of all housing. The proportions are 60 percent and 18 percent in San Diego, and 68 percent and 24 percent in the Bay Area.[2] But unlike affordable housing that many are familiar with, such as public housing or tenant-based vouchers, manufactured housing is largely unsubsidized, as its affordability is inherent in its construction, which reduces waste, standardizes production, and nearly eliminates weather damage during manufacture.

American policy heavily promotes homeownership, and it is seen, more so than renting, as means for a family to build wealth and enhance its financial stability. This, of course, happens as a family makes its mortgage payments and more goes to principal rather than interest, acting as a type of forced savings account, and as a home appreciates in value, or at least, retains its value. One of the concerns with manufactured housing is that in some scenarios, a home cannot build wealth, as the home may depreciate and the family financed its purchase with a high-cost loan. However, if built, sited, and financed with the long-term interest of the homeowner in mind, manufactured homes can and do appreciate.

The guiding philosophy of the Corporation for Enterprise Development's (CFED) I'M HOME initiative is to ensure that manufactured homeownership is treated fairly by lenders and policy makers and is developed in a way that provides its owners real value, high-quality housing, and the chance to build wealth. The Next Step is a social enterprise supported by CFED that is building a value chain to connect manufactured housing companies to nonprofit affordable housing developers, called "Network Members." In Next Step's scalable model, manufacturers serve a new market while Network Members find market-based solutions to affordable housing. Following the Next Step system, Network Members site high-quality, highly efficient manufactured homes throughout the country in a way that families can afford and thrive in and that helps dispel the notion that manufactured housing strips wealth from a family's balance sheet.

Benefits of Better Quality, More Energy-Efficient Manufactured Housing

Factors that enhance the asset-building value of manufactured housing include ensuring access to mortgages or other fairly priced financing, control of the land under the home (about 40 percent of units are sited in communities), and delivery of quality housing. By

2 CFED, "Manufacture Housing Metropolitan Opportunity" (Washington, DC, 2013). Available at http://cfed.org/programs/innovations_manufactured_homes/manufactured_housing_metropolitan_opportunity/index.html.

focusing on quality and performance through upgrades such as ENERGY STAR construction, permanent foundations, and elements of universal design, the likelihood of appreciation increases, thus building wealth in addition to substantial savings in energy costs. The homeowner is also eligible for preferred real estate mortgages that save money over the life of the loan. When the homebuyer decides to sell, the next buyer qualifies for the same government-backed financing.

So as improvements to home design and construction challenge one major concern about manufactured homes, a growing trend in manufactured home community ownership confronts another barrier to the sector becoming a true an asset-building tool: The homeowner's lack of control of the land beneath the home.

ROC USA (Resident Owned Communities), a social enterprise that CFED supports and a part of the I'M HOME initiative, works to create cooperatives when investors in a manufactured home community offer the property for sale. Researchers with the University of New Hampshire concluded in a 2010 report that owners in these cooperatives enjoy significant advantages over their counterparts in investor-owned communities, including lower lot fees, higher average home sales prices, faster home sales, and, in New Hampshire, access to mortgage financing.[3] Site control also encourages homeowners to maintain and update their properties or even upgrade to newer, more efficient homes.

The stereotypes that hinder manufactured housing are rooted in its pre-1976 past. The HUD code today helps ensure good construction. There's an opportunity now to expand beyond the current HUD rules on what good design and good financing should be. Good quality housing must include energy-efficiency features, which for low- and moderate-income homeowners mean more disposable income, increased savings potential, and an increased likelihood of making the monthly mortgage payments.[4]

For both site-built and manufactured homes, energy consumption is a significant portion of a homeowner's monthly costs. For all homes, energy composes about 17 percent of ownership costs. For owners of manufactured homes, this proportion is 23 percent. This reflects, in part, the lower initial costs of owning a manufactured home. In contrast, manufactured home owners use about 35 percent less fuel than do site-built homes, which directly relates to the typical size of the units. However, measured per square foot, energy use in manufactured housing is much higher than it is in site-built homes. In addition, in older manufactured homes, families spend twice as much per square foot ($1.75 versus $0.87) as owners of site-built homes do.[5] There are numerous reasons for this, and these reasons hold great potential for improving of the housing stock and enhancing asset-building capabilities of manufactured housing residents.

3 Sally K. Ward, Charlie French, and Kelly Giraud, "Resident Ownership in New Hampshire's 'Mobile Home Parks:' A Report on Economic Outcomes" (Durham, NH: Carsey Institute, March 2010).

4 University of North Carolina Center for Community Capital and the Institute for Market Transformation, "Home Energy Efficiency and Mortgage Risks, March 2013" (Chapel Hill, NC: 2013).

5 Jacob Talbot, Mobilizing Energy Efficiency in the Manufactured Housing Sector, American Council for an Energy-Efficient Economy, July 2012.

As noted above, about 2 million of the approximately 7 million manufactured homes were built before 1976, when they were not subject to the HUD code. Many of these units have little or no insulation, thin roofs and walls, poor windows, inefficient heating and cooling equipment, and they are leaky.[6] The U.S. Department of Energy's Residential Energy Consumption Survey found that manufactured homes built before 1980 consume an average of 84,316 BTUs per square foot, 53 percent more than all other types of homes.[7] In addition, the lack of quality building standards means these units deteriorate in a way that further compromises their durability and performance. Replacing one pre-1976 manufactured home with a Next Step one will not only improve the owner's bottom line, but the environment, too: Based on industry and Department of Energy sources, Next Step found that such a replacement would reduce 2.25 tons of carbon emissions in one year.[8]

While pre-1976 homes are less efficient than their newer counterparts, as well as many site-built homes, families in manufactured housing of all vintages are less likely to upgrade their units. For example, according to 2009 data from the U.S. Energy Information Administration, manufactured homes are 72 percent more likely than site-built detached units to have inefficient single-pane windows and their owners are 28 percent less likely to have replaced windows as owners of site-built homes. This difference is not necessarily because manufactured housing residents, who are on average much poorer than other residents, do not want to reduce utility expenses. Rather, some upgrades are too costly. Manufactured housing residents are about one-third more likely than owners of detached single-family units to use energy-efficient light bulbs, a relatively inexpensive way to reduce electricity use.[9]

Many residents in manufactured housing may not see the value in upgrading or improving their units. Tenure security, and for a manufactured homeowner this means control over the land beneath the home though ownership, cooperative control, or long-term lease, also would provide the family with the incentive to improve the unit. After all, if the chance of being forced to move is high, why invest in energy-saving new windows or doors? On the other hand, if a family knows it can stay for 20 years, and it has the resources, why not?

What these data suggest is that significant rehabilitation or replacement of certain units would save owners on energy bills, if the upgrades were affordable or affordably financed. Many very low-income families would be reluctant to take on housing debt, even if it significantly improved housing quality and reduced overall housing costs. But if done fairly and transparently to the buyer, the impact can be huge.

In one case, an elderly Kentucky woman, who had spent over half her income on utilities at her pre-1976 home, replaced her unit with an ENERGY STAR home. The cost of the mortgage and the reduced utility bills together equaled less than the utilities in her old

6 Government Accounting Office, "Manufactured Homes: State-Based Replacement Programs May Provide Benefits, but Energy Savings Do Not Fully Offset Costs" (Washington, DC, March 2013).
7 Environmental and Energy Study Institute, "Energy Use in Mobile Homes" (Washington, DC, June 2009).
8 Next Step, "Next Step's Impact," (Louisville, KY:2012).
9 U.S. Energy Information Administration, "Resident Energy Consumption Survey: 2009 RECS Survey Data" (Washington, DC: 2011)

unit.[10] Clearly, this result is a net benefit. And while each case is not quite as dramatic, the difference between energy costs in an older manufactured home and a new, highly efficient one, is meaningful.

A University of North Carolina study, for example, reviewed over 71,000 homes and uncovered the value of energy efficiency. Loans on ENERGY STAR homes were 32 percent less likely to default than others. And the more efficient the home, the lower the likelihood of default. This could serve as a huge motivator to policymakers and practitioners, who want to promote affordable, responsible homeownership and conservation of resources.

Barriers to Selling More Energy Efficient Homes

Accurate mortgage underwriting should ensure that total housing costs, including utilities, are manageable. No doubt homebuyers at all income levels would purchase an energy efficient home if the cost and benefits were detailed simply and clearly. A recent review of appraisal practices found that many appraisers undervalue the energy efficient qualities of a manufactured home, undermining the ability of the appraisal to serve as an effective asset-building tool.[11]

One of the barriers to consumers embracing "green" products is entry cost, and without a means to evaluate savings over time, a potential buyer will often choose a less costly, less efficient, and less valuable home. As part of its climate change efforts, the Obama administration is considering including efficiency in the appraisal and underwriting processes of the Federal Housing Administration.[12] This is a step in the right direction, as life-cycle pricing that takes into account value built into the home through energy upgrades can provide transparency to buyers and allow them to more accurately gauge long-term affordability.

As an illustration, researchers at Washington State University determined that the purchase of a manufactured home with the most efficient features, based on the International Energy Conservation Code (IECC), the standard for most state and local site-built codes, would be paid for in less than five years through reduced utility bills.[13] If the unit were financed fairly through a mortgage that takes into account the efficient design, the monthly homeownership costs would be lower (compared to a home financed by a chattel or personal property loan, which is the dominant financial product in the market) and the home's appreciation greater.

10 Anne B. Gass, Frontier Housing: Replacement Housing with Manufactured Housing Done Right, NeighborWorks America, November 2009.

11 Robin LeBaron, Real Homes, "Real Value: Challenges, Issues and Recommendations Concerning Real Property Appraisals of Manufactured Homes", CFED December 2012.

12 Brian Collins, "Obama Wants Underwriting to Reflect Energy Savings," National Mortgage News, June 28, 2013, p. 1.

13 Emily Salzberg, Michael Lubliner, Luke Howard, Andrew Gordon, Ken Eklund, and Kelly Morgan, "Cost Implications of Retrofit vs. Replacement of Manufactured Housing" (Olympia, WA: Washington State University Extension Energy Program and Habitat for Humanity, 2012), pp. 2-32.

Changing Policy, Construction, and Finance to Overcome Barriers

Government interventions have long nudged or cajoled innovation in energy improvements. Congress uses the tax code to encourage behaviors it deemed worthy of support. In the so-called fiscal-cliff bill enacted at the end of 2012, Congress renewed, though just for a year, the Energy Efficient Home Credit, which provides builders of ENERGY STAR manufactured homes with a tax credit of $1,000 per home. Although a temporary tax credit for a small segment of the housing market is not going to turn the economy around, its revival restated Congress' intent that manufactured housing should have better energy efficiency.

Although manufacturers are often reluctant to lead the market with costly upgrades that may turn away potential customers, they may not, in the near future, have a choice. The Energy Independence and Security Act of 2007 requires the Department of Energy (DOE) to develop energy efficiency standards for manufactured housing. Although promulgation of the rules is delayed (they were to be implemented in 2011), DOE appears to be moving forward. The department recently released a request for information to help guide their rulemaking. With some exceptions, Congress instructed DOE to base the new manufactured housing standards on the most recent version of the IECC. Although this will add to unit costs, the adoption of the rules will result in much more stringent energy standards, as it did with every innovation since the HUD code was first adopted in 1976. These shifts will broaden the money-saving, asset-building value of manufactured homes for the families who move into them.

The potential for savings is immense. According to a 2007 report from the American Society of Heating, Refrigeration, and Air Conditioning Engineers, manufactured homes built to the ENERGY STAR guidelines save as much as $246 in annual energy costs over the current standards.[14] Couple this with the potential savings that could be realized in replacing a much older home, which, as noted above could be twice this, the value of new technology is significant.

Like most industries, manufactured housing producers do not always support the regulations that govern it. Yet the industry is supportive of tougher energy standards and innovation in general. The Systems Building Research Alliance (SBRA), the industry's nonprofit research and development arm, aims to develop technology, practices, and designs to improve home quality, performance, and value. As a research organization, SBRA brings together a broad spectrum of stakeholders to spur the development of new technologies. Ultimately, these advances drive down costs as they improve overall energy performance, placing greater efficiency and lower energy bills within the reach of manufactured home buyers. SBRA operates the ENERGY STAR for manufactured homes program for the U.S. Environmental Protection Agency.

14 American Society of Heating, Refrigeration, and Air Conditioning Engineers, Inc., "National Energy Savings Potential in HUD-Code Housing from Thermal Envelope and HVAC Equipment Improvements" (Atlanta, 2007).

Next Step is using ENERGY STAR and higher standards in its programs, which will translate into meaningful savings for owners and create an appreciating asset. Based on average energy savings for ENERGY STAR homes calculated by DOE, one Next Step Home is projected to save $360 per year on energy costs for new development, and according to SBRA calculations, one Next Step Home can save up to $1,800 per year for pre-1976 mobile home replacement. Yet ENERGY STAR is a voluntary program, and its reach is limited. ENERGY STAR is a fair proxy for IECC, to which the new DOE rules will have to conform. The combination of new standards, mandatory adoption by industry, and the rebounding sales of manufactured homes will translate into a meaningful shift in the affordable homeownership space.

Marlette Homes, a manufacturer, already offers units that exceed the IECC standards. Palm Harbor Homes, another manufacturer, touts the savings that buyers can expect over the life of a 30-year mortgage. With a purchase of one of its highly efficient models, the firm claims that a buyer will save between 26 percent and 43 percent on heating and cooling costs, which can mean $21 per month in Tampa and as much as $69 per month in Amarillo, Texas.

Palm Harbor and Marlette promote these products because they believe they're good business, and they realize that the regulations will be adopted. As consumers embrace these homes, and realize the savings, the manufactured housing segment will become a bigger and better asset-building tool for American families.

Conclusion

There are several reasons why manufactured housing can emerge as a viable homeownership alternative for low- and moderate-income Americans who want to build wealth. First, the economy and the housing markets continue to rebound. Second, policymakers are likely to reshape the government-sponsored enterprises, the Federal Housing Administration, and consumer protections. Third, the industry, with the right mix of tools and oversight, is developing high-quality housing at reasonable prices. Finally, the lack of real wage growth for many Americans will require new thinking on housing options across the country.

The first three reasons can be seen as positive, depending on how any legislation plays out. The fourth, however, is decidedly negative. Wages for most have Americans have been stagnant for decades, and it seems fairly certain that this trend will continue for at least the near future. Combine this trend with the fact that new site-built homes are larger than ever,[15] traditional homes are now farther out of reach for many Americans. Lenders, policymakers, and advocates are looking not only for new housing options for their communities, but safe and scalable models to get there.

There is a solution: when done right, manufactured housing is affordable, energy-efficient, and appreciating, a recipe for sustainable growth, good policy, and smart lending.

15 U.S. Census, "Annual Characteristics of New Housing" (Washington, DC, June 2013).

Stacey Epperson, president and CEO of the Next Step, is a native of rural Kentucky and has worked in affordable housing throughout her entire career. In 2010, she assumed leadership of Next Step, a social venture that mobilizes a national network of nonprofits to provide energy-efficient, affordable housing solutions tailored to the needs of their communities. In 2012, Stacey was elected as an Ashoka Fellow for her innovative approach to creating an independent distribution channel for affordable manufactured housing. She received a Masters of Public Administration at Western Kentucky University and attended the University of Kentucky Patterson School of Diplomacy and International Commerce. Stacey serves on the boards of the Kentucky Housing Corporation, the National Rural Housing Coalition and the Fair Mortgage Collaborative, in addition to the Advisory Council for the Federal Home Loan Bank of Cincinnati.

Doug Ryan is director of Affordable Homeownership at CFED, the Corporation for Enterprise Development, a national nonprofit organization working at the local, state and federal levels to create economic opportunity that alleviates poverty. In this role, he is also the director of CFED's Innovations in Manufactured Homes (I'M HOME) initiative, a national effort to transform the manufactured housing market into a fair, sustainable and asset-building homeownership option for American families. He holds a Masters of Public Administration from New York University's Robert F. Wagner Graduate School of Public Service.

Utilities and Community Developers Partner to Improve the Energy Efficiency of Affordable Rental Housing Nationwide

Michael Bodaken and Todd Nedwick,
National Housing Trust

Improving the energy efficiency in homes is an important strategy for reducing poverty's impact on low-income families. Low-income individuals and families spend a disproportionate share of their income on utility bills, and energy costs are one of the highest operating expenses in residential housing.

Correspondingly, the benefits of efficiency investments in low-income housing include higher net discretionary income for poor households, a more stable affordable housing stock, and healthier living environments. These outcomes directly affect the quality of life of disadvantaged families as well as the physical and economic resilience of low-income communities.

The challenge before the community development field is how to finance efficiency improvements in affordable housing at a scale that maximizes the benefits for low-income families and communities. In this article, we analyze the role the nation's utilities can play in helping to finance efficiency improvements in multifamily affordable housing. Although public resources have been shrinking, the utility sector is playing a significant and increasing role in funding efficiency improvements in existing and new buildings. As utility energy efficiency resources grow, the community development field is faced with an important opportunity to ensure that funding is effectively targeted to multifamily affordable housing, where most low-income families reside. Seizing this opportunity requires developing new and creative cross-sector partnerships with utilities, their regulators, and influential energy efficiency allies. Bringing the affordable housing and energy efficiency sectors together can be a challenge, but, as the case studies in this article make clear, it can be achieved, with significant benefits for low-income communities.

Utilities' Role in Energy Efficiency

Utility customers in many areas of the United States have had access to financial incentives, such as rebates and loans, to improve energy efficiency for more than three decades. During the last 10 years, utility spending on energy efficiency nationwide has tripled (see Figure 1). It is estimated that utilities spent approximately $7 billion on energy efficiency in 2011. According to the Department of Energy, this number could reach as high as $16 billion annually by 2025.

Figure 1: Annual eEectric and Natural Gas Energy Efficiency Spending or Budgets

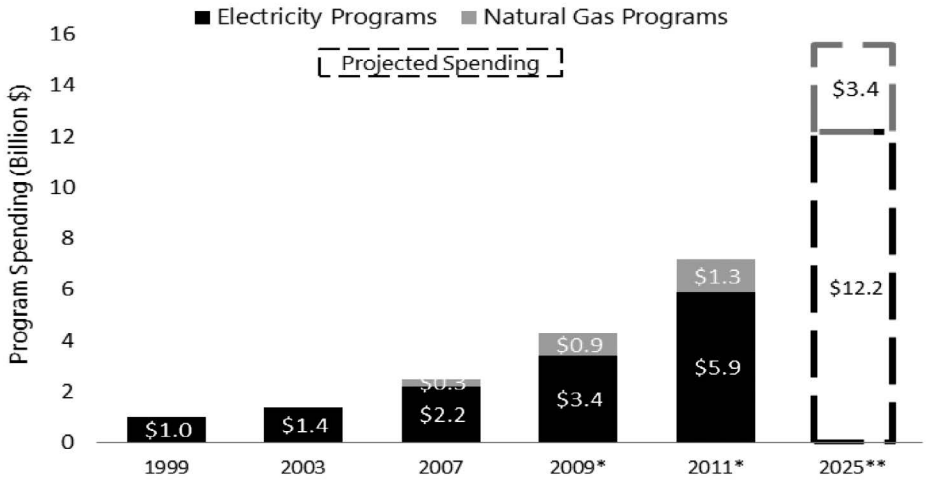


Figure 2: States with Energy Efficiency Resource Standards

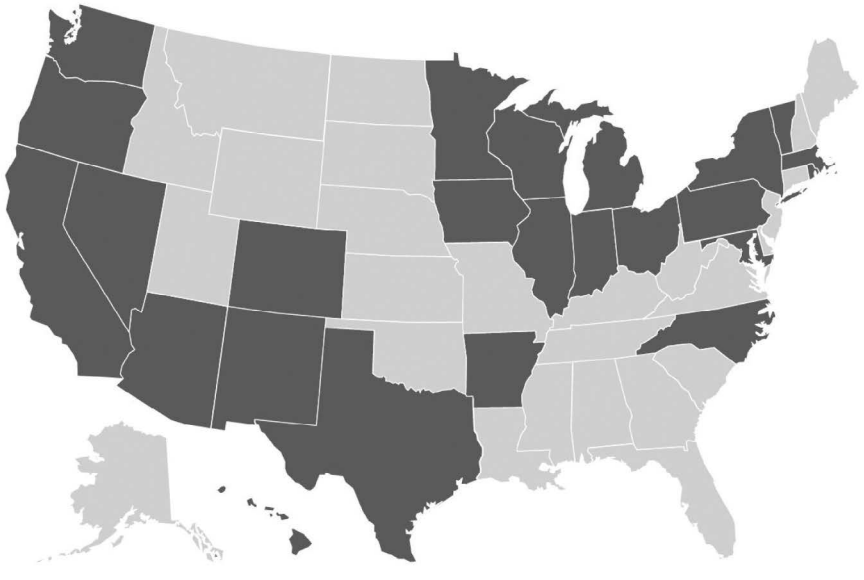
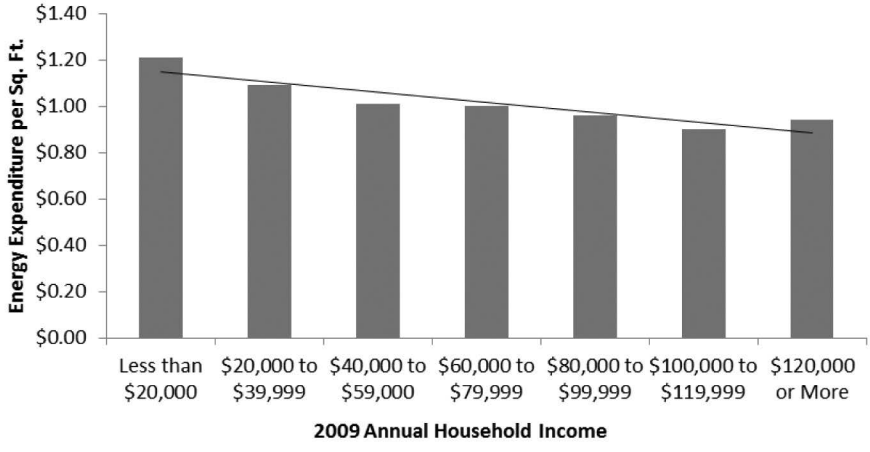


Figure 3: Household Energy Expenditures per Square Foot and Household Income Level



The common driver of this spending is the recognition among state legislators, regulators, and utilities that meeting the nation's energy demand by saving energy through efficiency improvements is more cost-effective than investing in new sources. State legislatures in 24 states have enacted policies called Energy Efficiency Resource Standards (EERS) that establish high, specific energy savings targets through improved building efficiency (see Figure 2).[1] Many other states without such specific policies have greatly increased their commitments to energy efficiency programs in order to achieve the environmental and economic benefits that result from these investments.

Why Focus on Multifamily Rental Housing?

Spending on energy efficiency has not been focused on multifamily rental housing. On average, multifamily rental homes have fewer energy savings measures than any other type of housing.[2] With nearly one-half of all very low income renters residing in multifamily housing, the failure to reduce energy consumption adversely affects the families least able to afford high energy bills.[3] As seen in Figure 3, energy expenditures per square foot of living space are correlated with household income level.[4] Households with annual income less than $20,000 spend proportionately more on energy per square foot than households with higher incomes.[5]

1 Foster, Ben, et al., The 2012 State Energy Efficiency Scorecard (Washington, DC: American Council for an Energy Efficient Economy, 2012).

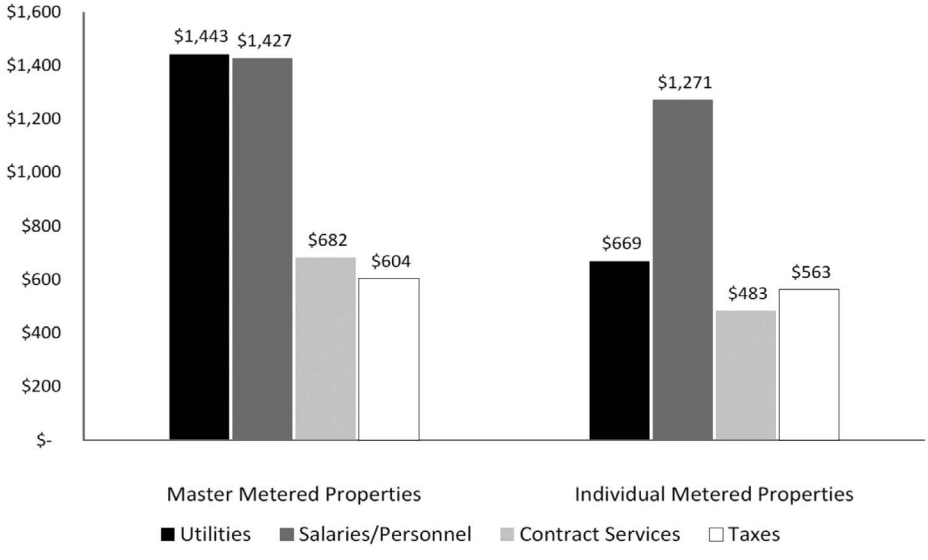
2 Gary Pivo, "Energy Efficiency and its Relationship to Household Income in Multifamily Rental Housing" (Washington, DC: Fannie Mae, 2011). Available at https://www.fanniemae.com/content/fact_sheet/energy-efficiency-rental-housing.pdf.

3 Ibid.

4 National Housing Trust analysis of the U.S. Energy Information Administration's Residential Energy Consumptions Survey "Table CE1.1 Summary Household Site Consumption and Expenditures in the U.S. - Totals and Intensities, 2009."

5 Ibid.

Figure 4. Top Four Categories of Operating Expenses per Unit in Master and Individually Metered, Subsidized, Multifamily Housing



The lack of energy efficiency measures in multifamily rental housing has real consequences for the families and communities that rely on affordable housing. As seen in Figure 4, Utility costs are the largest operating expense in subsidized rental buildings that are master-metered and the second largest expense in individually metered, subsidized, multifamily buildings.[6] Reducing operating expenses in low-income multifamily buildings frees up capital for the owner that can be used for maintenance repairs and other necessary improvements while keeping rents affordable.

Energy Retrofits Lead to Better Health for Residents, a Better Environment, and Jobs

When the National Housing Trust (NHT) began its engagement with utilities in various states, described in more detail below, it initially approached the work strictly from an affordable housing perspective. Over time, NHT came to realize that there were other, equally important benefits for residents and their communities that resulted from its work.

The benefits of energy efficient, affordable housing extend beyond lower utility costs. More efficient housing has been shown to improve health outcomes for residents. The retrofit of Viking Terrace in Worthington, Minnesota, for example, resulted in measurable

6 Lee, Christopher, 2012 Survey of Operating Income & Expenses in Rental Apartment Communities [Executive Summary] (Arlington, VA: National Apartment Association, 2012).

decreases in certain ailments for both young and old residents.[7] A study by the National Center for Healthy Housing found that the incidence of specific medical conditions decreased, including:[8]

- Ear infections in children from 15 percent to 4 percent
- Adult chronic bronchitis from 10 percent to 0
- Asthma in adults from 12 percent to 4 percent and
- Respiratory allergies in children from 15 percent to 4 percent.

Moreover, improving the energy efficiency of affordable housing results in a significant reduction in carbon emissions that would otherwise negatively affect the community. According to the U.S. Department of Energy, weatherizing a low-income home reduces residential and power plant emissions of carbon dioxide by 2.65 metric tons per year.[9] Accordingly, improving the efficiency of 100-unit apartment building reduces carbon emissions by 5,200 metric tons over a twenty year period, equivalent to annual greenhouse gas emissions from 1,100 passenger vehicles.[10]

Finally, energy efficiency is a job creator. According to the American Council for an Energy Efficient Economy (ACEEE), investing in energy efficiency creates more local jobs than a comparable investment in energy production and distribution.[11] Jobs created through efficiency investments include the installation or maintenance of equipment locally. In addition, consumer savings from lower energy bills is more often than not spent locally on products or services, which in turn affects local businesses and jobs.[12]

Breaking through Barriers by Engaging Key Stakeholders

During the last two years, NHT has been engaging with utilities and other stakeholders in eight targeted states (Colorado, Minnesota, Illinois, Michigan, Ohio, Pennsylvania, Rhode Island, and Maryland) to advance multifamily energy efficiency funding through utility efficiencies. The objectives are to:

- Explore barriers to cost-effective energy efficiency improvements;
- Demonstrate the potential for energy savings in the multifamily housing stock;

7 Enterprise Community Partners and the National Center for Healthy Housing (2010). "Case study: Creating green and healthy affordable Homes for families at Viking Terrace, Worthington, Minn," Available at: http://www.enterprisecommunity.com/resources/ResourceDetails?ID=67397.pdf.

8 Ibid.

9 U.S. Department of Energy, "Weatherization Assistance Program." Fact sheet. Available at www1.eere.energy.gov/library/pdfs/48098_weatherization_assisprog_fsr4.pdf.

10 Estimate of greenhouse gas emissions offsets were calculated using the Environmental Protection Agency's Greenhouse Gas Equivalencies Calculator which can be found online here: http://www.epa.gov/cleanenergy/energy-resources/calculator.html.

11 Eric Mackres, "Energy Efficiency and Economic Opportunity" (Washington, DC: American Council for an Energy Efficient Economy, 2012).

12 Ibid.

- Identify tools and approaches to finance energy efficiency improvements with utility-funded retrofits and simultaneously help utilities achieve their goals; and
- Demonstrate the value of new partnerships between utilities and housing stakeholders.

NHT's experience clearly demonstrates that obstacles preventing utility-sponsored investments in multifamily affordable housing can be overcome through collaboration between the housing and utility sectors. This engagement has contributed significantly to utilities committing nearly $40 million in funding for energy efficiency improvements to multifamily affordable housing.

By engaging with affordable housing providers, utilities, and regulators, NHT has identified some of the key barriers to investing utility funds in multifamily affordable housing. The barriers can be classified as:

- ***Programmatic/Policy.*** A common programmatic barrier is the lack of utility energy efficiency programs tailored to the multifamily housing stock. Utilities provide commercial or residential incentives for which multifamily may be eligible, but utilities often fail to specifically target affordable rental housing. Typically, utility residential retrofit programs do not address common area efficiency needs such as upgrading a central heating system. Utility-funded commercial programs often do not provide incentives for reducing energy in residential living spaces. Programs tailored to multifamily housing provide owners easy access to incentives that address the whole building's efficiency needs.

  A common policy barrier is that master-metered, low-income buildings are often ineligible for utility funding that is designated specifically for low-income populations. Most states do not allow funding designated for residential households to be used in buildings that pay commercial utility rates.

- ***Economic***. A well-known economic barrier to multifamily energy efficiency is the "split incentive." The owner who owns the property and is responsible for capital investments and upkeep is not necessarily the same party responsible for paying all of the building's energy costs. The owner therefore lacks the motivation to make efficiency improvements.

  Another barrier in low-income multifamily housing is the limited cash flow that the building generates. This makes it difficult for owners to take on new debt to pay for efficiency improvements.

  Finally, the terms of existing debt on the property may make it impossible for the owner to add a new loan on the property's debt stack, even though that new energy efficiency loan might make perfect sense when combined with a utility funded grant for a portion of the energy efficiency measures.

- ***Capacity***. Lack of capacity, both on the part of utility administrators and the building owner or manager, is another common barrier to multifamily energy efficiency. Prop-

erty owners may have limited staff resources and little experience or knowledge about pursuing energy efficiency improvements. Likewise, utility program administrators are often unfamiliar with the diversity of the multifamily housing stock, how properties are financed, and the most effective means for reaching multifamily decision makers and creating demand for utility programs.

Breaking through these barriers begins with active engagement and dialogue among a range of stakeholders from both sectors. Guidelines for successful engagement include the following:[13]

- ***Build the right relationships.*** Understanding who controls key decisions, both formally and informally, is a critical first step in advancing successful utility-funded retrofits.
- ***Define the value proposition for the utilities.*** Achieving cost-effective savings to fulfill mandated energy reduction goals is often required of utility energy efficiency programs. Therefore, it is important for affordable housing stakeholders to demonstrate significant, cost-effective energy savings potential in the multifamily housing stock.
- ***Convene stakeholders to discuss opportunities and challenges.*** Bringing stakeholders together for an open dialogue can catalyze change. NHT found that working with local energy efficiency organizations was an effective means to engage with utilities. Rather than overwhelm utilities with a large meeting attended by a significant number of housing organizations, a smaller meeting, facilitated by a local or state energy provider and an organization dedicated to consumer rights (e.g., the National Consumer Law Center), helps develop trust between parties.

  Once engagement with housing developers commences, it is crucial that the facilitator instill a mutual understanding of the utilities' and housing developers' goals and how they overlap. The initial meeting must also include educating the parties about respective constraints and obstacles. Agreement by all parties on the main obstacles preventing multifamily affordable housing from receiving utility-funded services helps pave the way for discussion about appropriate solutions.
- ***Take advantage of strategic "entry points."*** Utilities and affordable housing stakeholders should be aware of key strategic entry points or milestones that provide an opportunity to advance utility-funded energy efficiency services for multifamily affordable housing. Examples include utility plan filing deadlines, utility stakeholder collaboratives, and regulator rulemaking proceedings.
- ***Advance both program and policy changes.*** Engagement should address both the program and policy changes needed to successfully implement utility-sponsored energy efficiency services for multifamily housing. An example of a programmatic change might be a utility implementing a one-stop shop for multifamily housing

13 These guidelines are an excerpt from a recent report published by NHT called Partnering for Success: An Action Guide for Advancing Utility Energy Efficiency Funding for Multifamily Rental Housing. The report can be found here: http://www.nhtinc.org/downloads/partnering-for-success-action-guide.pdf.

so owners can avoid applying to multiple programs to fully address the energy efficiency needs of the whole building. An example of a policy change might be a state regulator determining that multifamily buildings can be classified as either commercial or residential.

The Value of Partnerships between Utilities and Housing Finance Agencies

In several states, engagement between utilities and housing finance agencies (HFAs) has proved effective in overcoming obstacles to multifamily efficiency. HFAs can play a critical role in helping utilities design effective programs and gain access to a pipeline of properties. Utility funding can be used to leverage housing resources to help owners of properties financed by HFAs make efficiency improvements that they otherwise would not have the capital to implement. Engagement among utilities and HFAs in Pennsylvania, Maryland, and New Jersey demonstrate the value of these partnerships.

Pennsylvania: Barriers overcome through collaboration among utility and housing stakeholders

In Pennsylvania, NHT joined the Pennsylvania Utility Law Project, the National Consumer Law Center, and the Pennsylvania Housing Finance Agency (PHFA) to engage with utilities and housing stakeholders in creating dedicated utility funding for multifamily housing.[14] In spring 2012, the Pennsylvania Public Utility Commission (PUC) began to develop rules that would govern a new phase of the utilities' energy efficiency program portfolios. Leading up to the PUC's consideration of that guidance, NHT, PHFA, the National Consumer Law Center, and the Pennsylvania Utility Law project convened utility staff and multifamily housing developers to identify the barriers to improving multifamily efficiency.

One of the key challenges was ensuring that utilities would receive the benefits of energy consumption savings if they implemented multifamily funding. Utilities needed to feel confident that such programs would help them satisfy their energy savings obligations as mandated by state law. Pennsylvania utilities are required to obtain a minimum of 10 percent of consumption reductions from government, education, and nonprofit sectors. NHT urged the commission to count energy savings achieved through investments in low-income multifamily properties in meeting mandates. The commission agreed and announced that any savings achieved from multifamily housing financed under federal or state housing programs could be applied to the utility obligation. Following the PUC's policy change, Pennsylvania's utilities announced that they would dedicate more than $12 million for efficiency improvements in multifamily housing.

14 PHFA has successfully administered $25 million in funding to make energy efficiency improvements to more than 8,300 affordable apartments and used this experience to demonstrate the significant energy savings potential from the multifamily housing stock.

Maryland utilities realize the value of collaboration

The Maryland Energy Administration (MEA) and Maryland Department of Housing and Community Development (DHCD) teamed up to create Multifamily Energy Efficiency and Housing Affordability (MEEHA). MEEHA provides funding for energy audits, energy efficiency retrofits, and renewable energy improvements. The average participating property receives approximately $1,700 per unit to cover the cost of efficiency improvements. The average property is projected to save $11,400 per apartment over the life of the measures as a result.[15]

In 2011 and 2012, the Maryland Public Service Commission directed utilities to set aside $21 million in funding for the MEEHA program. Part of MEEHA's success can be attributed to DHCD's experience administering several other high-quality affordable housing programs. Affordable multifamily projects already being considered for other DHCD rental financing were targeted for MEEHA funding. Property owners could submit one application for all their financing requests from DHCD. Existing affordable rental projects seeking funding only for energy efficiency improvements were also eligible to participate. DHCD's experienced staff leveraged their existing relationships with affordable housing providers to recruit participation.

The Maryland Energy Administration provided critical technical expertise in energy improvement, best practices, and audit reviews as well as evaluation, monitoring, and verification of results. DHCD acknowledged the advantage the partnership provided, "MEEHA's unique blending of energy efficiency with housing affordability creates a whole that is greater than the sum of its parts."[16]

In one example of the program, National Housing Trust/Enterprise Preservation Corporation redeveloped Mountain View Towers, a senior affordable housing in Cumberland, Maryland. The retrofit of the property, which was built in 1977, will help maintain affordability for low-income households by lowering operating expenses. The pro forma below demonstrates how the MEEHA funding fit into the project's overall financing.

Sources of Funds	
Federal LIHTC Equity (DHCD) Tax Credit Assistance Pgm. (DHCD)	$4,913,000
MEEHA (DHCD)	$3,000,000
Other Sources	$258,935
	$3,376,095
Total Sources	$11,548,000

Uses of Funds	
Acquisition	$3,300,000
Construction	$5,330,526
Total Soft Costs	$704,988
Other Costs	$2,248,516
Total Dev. Costs	$11,548,000

15 Maryland Department of Housing and Community Development, "2012-2014 EmPOWER Maryland Limited Income Energy Efficiency Program (LIEEP)" submitted to the Maryland Public Service Commission on August 31, 2011.

16 Ibid.

On-Bill program proves successful in New Jersey

New Jersey's largest utility, PSE&G, has overcome a number of the obstacles that prevented multifamily housing from being effectively served in previous utility energy efficiency programs. The Residential Multifamily Housing Program is an on-bill financing mechanism that aims to preserve affordable housing and reduce carbon emissions by providing upfront, interest-free financing and incentives to cover the cost of eligible energy efficiency improvements. It was designed collaboratively with the New Jersey Housing and Mortgage Finance Authority, the state's affordable housing mortgage lender. PSE&G committed $39 million of its own capital to the program since it began in 2010.

The program is fully subscribed and has a waiting list of customers interested in participating. The program's success can be attributed to the overall program structure, which allows the owners to pay the costs of the retrofit over time rather than all upfront. The program allows owners to realize cost savings immediately and before repayment begins.

PSE&G worked closely with the Housing and Mortgage Finance Authority in designing the financing terms of the program to ensure that affordable multifamily owners were able to participate. Owners of affordable housing are permitted to repay the project costs over a 10-year term rather than a 5-year term for market rate properties. The longer repayment period results in higher cost savings for affordable multifamily properties.

Conclusion

The community development field has a widening window of opportunity to achieve significant energy savings and in turn help to sustain much-needed affordable housing for the nation's low-income families. Utility spending on energy efficiency programs is expected to increase substantially over the next decade. Effectively targeting these resources to multifamily affordable rental housing, helps utilities and state governments achieve their energy savings goals, increase housing affordability, improve health for low-income households, spur local economic growth, and significantly improve the air quality in low-income communities.

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Michael Bodaken is the executive director of the National Housing Trust. Under his leadership, NHT has helped preserve more than 25,000 affordable multifamily homes, requiring combined acquisition and rehabilitation financing of over $1 billion.

Integrating Energy Efficiency into Mortgage Financing: Promising Efforts in the New York City Multifamily Building Sector

Sam Marks
Vice President, Deutsche Bank

When McKinsey & Company first released its global cost curve for greenhouse gas abatement in 2007, proponents of energy-efficient retrofits of buildings rejoiced. Here was a respected analytical framework that supported what they understood intuitively: that simple, tried-and-true measures associated with building retrofits could be implemented at net-present value "negative cost."[1] In other words, using relatively mundane technologies (such as insulation, air sealing, efficient boilers) would not only reduce carbon emissions but would pay for themselves in savings over time. At least one aspect of the massive greenhouse gas reduction challenge appeared to be easy low-hanging fruit.

Unfortunately, this fruit has not been as low-hanging as policy wonks once thought. Market demand has yet to propel energy efficiency into the mainstream, and the reasons for its limited uptake are as myriad as the types of buildings that make up the potential retrofit marketplace.

From the vantage point of Deutsche Bank's community development activities, we see some promising initiatives that treat energy efficiency upgrades not as a separate, stand-alone transaction, but as a component in existing transactional frameworks, namely the multifamily mortgage refinancing process.

Focusing on the New York City's Multifamily Submarket

If it could be aggregated, the investment potential for energy efficiency is huge. A study by Deutsche Bank Climate Change Advisors and The Rockefeller Foundation estimates a $279 billion investment opportunity in the United States across the residential, commercial, and institutional market segments, saving $1 trillion over 10 years.[2] However, in the same paper, the authors identified a taxonomy of 17 separate market segments within three broad

1 McKinsey & Co., "Reducing US Greenhouse Gas Emissions: How Much At What Cost?" (New York: 2007). Avvailable at http://www.mckinsey.com/client_service/sustainability/latest_thinking/reducing_us_greenhouse_gas_emissions; and McKinsey & Co., "The Impact of the Financial Crisis on Carbon Economies" (New York, 2010). Available at: http://www.mckinsey.com/~/media/McKinsey/dotcom/client_service/Sustainability/cost%20curve%20PDFs/ImpactFinancialCrisisCarbonEconomicsGHGcostcurveV21.ashx.

2 Rockefeller Foundation & Deutsch Bank Climate Change Advisors, "United States Building Energy Efficiency Retrofits: Market Sizing and Financing Models" (New York: March 2012), p.3. Available at http://www.rockefellerfoundation.org/news/publications/united-states-building-energy-efficiency.

categories of residential, commercial, and institutional. (As a further indication of the industry's complexity, this taxonomy does not include 21 different industrial sub-segments not covered in the paper.)

Each submarket demonstrates different energy use characteristics and varying ownership and leasing structures that drive decision-making. Each submarket thus may require a different technical and marketing approach to a retrofit solution. Tapping the aggregated opportunity involves many individual decisions at the building level to take on the cost and hassle of these transactions, for a payoff that is perceived to be limited and uncertain.

A number of factors make the New York City multifamily sector a promising submarket for scaling energy efficiency. Multifamily buildings compose a significant share of the city's housing stock, with 64 percent of its housing units in buildings with more than four units.[3] Because of the city's scale and density, there is a rich community development ecosystem, composed of highly sophisticated local government, nonprofit, and financial stakeholders who are fairly united in recognizing the alignment between carbon reduction and community development goals. After all, not only do the retrofit measures–such as air sealing, upgrading boilers and heating systems, adding insulation–reduce greenhouse gas emissions, but they are associated with outcomes that improve the lives and living conditions of low- and moderate-income New Yorkers. These include greater resident comfort and improved health and more financial stability for housing assets. In New York City, there is a critical mass of local actors who are willing to put shoulder to grindstone to deliver these outcomes.

Other factors make New York City a promising multifamily submarket to go to scale with energy efficiency. Tenants, for example, usually pay their in-unit electricity bills, while the owner typically pays heat, hot water, and common area electricity. This arrangement helps to mitigate the split incentive that has bedeviled retrofit efforts in multi-tenanted commercial office buildings where building owners bear the cost of much of the energy usage. Approximately one-half of a building's energy cost (heat, hot water, and common area electricity) is borne by the owner. As a result, significant potential savings are aggregated in a single decision-maker.

Furthermore, the City of New York has taken significant policy steps to integrate environmental standards into its housing policies. In 2011, NYC's Department of Housing Preservation and Development (HPD) adopted Enterprise's Green Communities Criteria for all HPD-financed housing. Local laws passed by the Bloomberg administration's Greater Greener Buildings Plan in 2011 require building owners whose properties are over 50,000 square feet to report their energy use annually and make the information publicly available, as well as undergo at ASHRAE Level II audit every 10 years. These disclosure rules and auditing requirements are making building owners more attentive to their energy use.

3 Statistic provided by Elizabeth Greenstein from New York City Department of Housing Preservation and Development (HPD), citing HPD's"New York City Housing and Vacancy Survey" (New York: HPD, 2011). Available: http://www.nyc.gov/html/hpd/html/pr/vacancy.shtml.

The Limitations of the Stand-Alone Retrofit Model

As stand-alone transactions, energy efficiency upgrades appear insufficiently compelling to most multifamily owners. The hassle and transaction costs (particularly auditing and engineering) are relatively high in relation to the potential savings. Multifamily incentive programs at the New York State Energy Research and Development Authority (NYSERDA) have penetrated approximately 6.7 percent of the multifamily marketplace in New York City since the program's launch in 2007.[4] Lindsay Robbins, Project Manager at NYSERDA, told me that it was rare that building owners initiated stand-alone energy efficiency improvements. Rather, they come to NYSERDA when their buildings require significant capital improvements (such as a new boiler), and it is sensible to access NYSERDA technical assistance and incentives to accomplish a broader building upgrade in the most effective and cost-efficient manner.

A number of key players in the city's multifamily sector have been attempting to integrate energy efficiency into typical financing that building owners are familiar with rather than as stand-alone transactions. Aligning energy efficiency with the mortgage refinancing process is one option that they see as integral to making energy efficiency a more mainstream practice. However, doing so brings its own challenges because organizations must manage multidisciplinary efforts and adapt their ways of doing business. As has been typical in community development in the past, nonprofits and quasi-public organizations are leading the way for the private sector, bringing in new interdisciplinary teams that can balance the idealistic goals of carbon reduction and community development benefits with practical knowledge of how the engineering and financing expertise can be brought to bear.

The case studies below share the belief that the best way to get building owners to retrofit their buildings is to retrofit the mortgage refinancing process to incorporate energy efficiency.

Community Preservation Corporation: An Organization Retrofits Itself

Community Preservation Corporation (CPC) is 39-year-old nonprofit specialized mortgage lender that provides financing and technical assistance to affordable and rent-stabilized buildings. CPC has achieved significant scale. Since its inception, the organization has deployed more than $8 billion in the New York tri-state area and financed the construction or preservation of more than 93,000 units of housing in New York City. In 2008, CPC management began to see a market niche in expanding its energy efficiency offerings. According to executive vice president Sadie McKeown, mission and self-interest drove this renewed focus at CPC. Since the buildings that composed the bulk of CPC's clients were rent stabilized and only marginally profitable, they were particularly vulnerable to spikes in utility costs. "Identifying ways our borrowers could manage costs, and by extension continue to make mortgage payments, was in our own interest," says McKeown. [5]

4 Author interview with Lindsay Robbins, June 17, 2013.
5 Author interview, June 27, 2013.

CPC management recognized that ramping up the use of third-party consultants would be insufficient for this new strategy. The organization had to retool its own way of doing business. They would need to educate their clients, and in order to take on that task, they had to educate their loan officers. The company hired F. L. Andrew Padian as its first vice president for energy initiatives. Previous to CPC, Mr. Padian had a 30-year career in building efficiency, managing the Multifamily Buildings Division for the building systems consulting firm Steven Winter Associates Inc. (SWA) and serving on the boards national, regional, and local industry associations and affinity groups such as Northeast Sustainable Energy Association and GreenHome NYC.

CPC's first step with their Green Initiative was launching the Neighborhood Energy Loan Program, a special $50 million loan fund capitalized by Deutsche Bank, HSBC, Morgan Stanley, and Goldman Sachs to make energy efficient construction loans for moderate rehabs that were undergoing refinancing anyway. The program was developed in consultation with CPC's permanent lender partners, New York City and state pension funds, and the State of New York Mortgage Agency (SONYMA), which provides mortgage insurance.

Loan officers were initially somewhat resistant. For many years, when loan officers calculated the amount of debt that could be supported by a property, they used standard industry averages of utility costs in their assumptions, along with standard annual cost escalations. Now they were being asked to dig deeper into each building and use more accurate estimates that were rooted in the experience of a particular building. Five years into CPC's green initiative, the company is building a track record of data on how retrofit financing activity has performed. Mr. Padian meets regularly with loan officers to discuss case studies of particular buildings so lenders have a better understanding of the technical aspects of how these buildings operate. As a result, loan officers and credit officers are now more comfortable making downward adjustments to utility costs to reflect anticipated savings, particularly for the buildings that start out as very wasteful. "Underwriting has always been more art than science," said McKeown, "and CPC's learning curve on energy efficiency is beginning to inform our lending practices."[6]

Under CPC's Green Initiative, 44 buildings containing 3,126 units of affordable multifamily apartments have been retrofitted. These units represent just under $31 million of private debt in conjunction with $18.7 million in public subsidy and incentives. The Green Initiative was bolstered when CPC was selected as a NYS Weatherization Assistance Program (WAP) agency to deploy American Recovery and Reinvestment Act (ARRA) stimulus funds.

The Deutsche Bank–Living Cities Study: An Interdisciplinary Learning Table

At the same time that CPC was demonstrating leadership in incorporating energy efficiency into underwriting, Deutsche Bank embarked on a field-building initiative to accelerate this adoption. Our hypothesis was that if we could address a key bottleneck–the lack of

6 Ibid.

confidence in dependable savings for lenders to underwrite against–more lenders would be willing to incorporate projected savings into their underwriting decisions. Over 18 months, Deutsche Bank funded a study of 230 retrofit projects representing 21,000+ units, with additional support from New York City's Department of Housing Preservation and Development (HPD), which repurposed a grant from Rockefeller Brothers Fund toward this project. Staff from Living Cities, the collaborative of 22 leading foundations and financial institutions, provided additional guidance and helped disseminate the study. The report, "Recognizing the Benefits of Energy Efficiency in Multifamily Underwriting," was released in 2012. [7]

Member organizations of the multi-sector, multi-disciplinary advisory committee that provided guidance to the DB-Living Cities study included:

Consolidated Edison
Deutsche Bank
Local Initiatives Support Corporation
National Grid
NYC Department of Housing Preservation & Development
NYC Energy Efficiency Corporation
New York City Investment Fund
New York State Energy Research and Development
NYS Homes & Community Renewal
Seedco Financial Services
Community Preservation Corporation
Enterprise Community Partners
Low Income Investment Fund
Natural Resources Defense Council
NYC Economic Development Corporation
NYC Housing Development Corporation
NYC Office of Long-Term Planning and Sustainability
Authority (NYSERDA)
Rockefeller Brothers Fund

The initiative benefitted from a stakeholder group composed of mission-oriented organizations that were also interested in cracking this problem for New York City multifamily housing: city and state housing agencies, key community development intermediaries, utilities, energy program incentive providers, and other mission-driven nonprofits. (See the box above for a full list of organizations.)

A key insight that this group provided was that the data to prove the reliability of savings probably already existed. An enormous amount of work had already been done retrofitting multifamily buildings in New York City, instigated by the New York State Weatherization Assistance Program (WAP) and programs of the New York State Energy Research and Development Authority (NYSERDA). However, the pre- and post-retrofit performance data were scattered in file cabinets and spreadsheets throughout the boroughs, and it would be no small task to aggregate, analyze, and learn from them.

The approach had to be interdisciplinary, bridging the worlds of building science and finance, which tended to speak past each other. To that end, the advisory group selected

7 Full report is available at https://www.db.com/usa/content/en/ee_in_multifamily_underwriting.html

through a competitive process a consultant team, Steven Winter Associates (SWA) and HR&A Advisors, which brought together these worlds. SWA brought decades of building science and engineering experience. HR&A combined expertise in running energy efficiency programs with a broader policy and finance expertise. According to Candace Damon of HR&A Advisors, the strength of this team combined not only experts on financing and building science, but "people who love getting their hands dirty with the data and see what you can learn from it. We put together a team that has the insights to know how to approach this work and what kinds of questions to ask."[8]

Ms. Damon also credits the ongoing engagement of the working group, which provided guidance and feedback throughout the process, reviewed early findings and asked detailed, provocative questions. Candace Damon said that the working group kept the team on their toes. "We really had to have our game on. Most of the hard work presenting to that group was done in the preparation, putting together slides, pushing each other to see what we could do with the data."

The study represented the most comprehensive study of multifamily buildings in New York City to date, and provided valuable information to the field. The report stated emphatically that "building retrofits save energy," reducing fuel consumption by 19 percent and common area electricity consumption by 7 percent. Also of relevance to practitioners was the finding that fuel measures saved more (and that savings were more predictable) compared with electricity. The study examined a number of variables to determine whether they were statistically significant predictors of post-retrofit performance. These variables included building characteristics (such as age, size, heating system, and fuel types) and retrofit measures (such as boilers, heating controls, windows, air sealing). The analysis concluded that only one variable reliably correlated with statistical significance to predicted savings: pre-retrofit fuel use intensity. In other words, the biggest "energy hogs" had the greatest (and most predictable) potential to save.

The study also suggested some implications and strategies for incorporating energy efficiency projections into underwriting, which the New York City Energy Efficiency Corporation is now advancing.

New York City Energy Efficiency Corporation: A New Intermediary Combining Technical with Financial Expertise

The release of the Deutsche Bank–Living Cities study got some attention from policy experts and energy efficiency specialists, but mainstream financial institutions are still in the early stage of adopting it. The New York City Energy Efficiency Corporation (NYCEEC) has acted as a catalyst, piloting several innovative financial transactions using the study's findings. In all of its work NYCEEC's mission goes beyond simply financing projects; it is also

8 Author interview with Candace Damon, June 24, 2013.

intentionally and proactively trying to determine which approaches are replicable and have the potential to scale.

NYCEEC was launched in 2011 at the instigation of the NYC Mayor's Office for Long Term Planning and Sustainability, with advice from Natural Resources Defense Council (NRDC), and Deutsche Bank, who jointly recognized a gap in the marketplace for energy efficiency finance. The city had received federal stimulus funds through ARRA, and with the guidance of Deutsche Bank and NRDC, the Bloomberg administration capitalized a new quasi-public intermediary that could facilitate retrofit financing transactions through credit enhancement and direct lending. With philanthropic support from Deutsche Bank Americas Foundation, Surdna Foundation, Rockefeller Foundation, Kresge Foundation, Doris Duke Charitable Foundation, Rockefeller Brothers Fund, and Living Cities, NYCEEC has achieved a capitalization of $40 million.

NYCEEC's governance and staff reflect the cross-sector, cross-disciplinary role that the entity was envisioned to play. The board consists of representatives from city government (including representatives from the Mayor's Office), the financial sector (including Deutsche Bank and Citigroup), real estate (including Related Companies and the nonprofit Enterprise Community Partners), and the energy sector. Under the leadership of CEO Susan Leeds, NYCEEC has assembled a 10-person cross-disciplinary staff, including engineers, credit underwriters, and business development professionals. Leeds states, "We knew that to address clean energy lending challenges and the specific needs of NYC buildings, NYCEEC would have to become a nexus where multiple stakeholders could effectively collaborate."[9]

To date, NYCEEC has committed $28 million of its $37.8 million ARRA funds along a range of energy efficiency transactions, including providing credit enhancement for Energy Service Agreements on commercial and multifamily properties and direct lending for hotel retrofits.

On the multifamily side, NYCEEC was funded by Living Cities to engage with the SWA/HR&A team from the Deutsche Bank–Living Cities study and Forsyth Street Advisors to begin to put the findings from the study into practice. NYCEEC has accomplished this goal by working with two public purpose institutions each with significant market share in multifamily mortgage lending: The New York City Housing Development Corporation (HDC) and the Federal National Mortgage Association (Fannie Mae).

HDC is a New York City's quasi-public sister agency to the city's Department of Housing Preservation and Development, with a highly sophisticated financial capacity to make direct loans and issue tax exempt bonds in support of housing development financed with Low Income Housing Tax Credits. In 2012 HDC began to develop their new Program for Energy Reduction Loans (PERL), which sought to retrofit buildings in the agency's portfolio that needed to increase their energy efficiency. HDC required the technical assistance of

9 Author interview, June 13, 2013

NYCEEC, which worked with HDC staff to incorporate ASHRAE Level II energy audits into their capital needs assessment. NYCEEC also developed a technical guidelines manual to articulate and provide best practice guidance from the perspective of a lending organization on every step of the energy efficiency retrofit process, including tracking and monitoring historic energy use information, audit and retrofit information (including vetting energy auditors), and post-retrofit energy use. In addition to the technical assistance, NYCEEC facilitated the roll out of this new program by providing credit enhancement on the mortgages HDC will originate under the program.

NYCEEC's unique blend of engineering expertise and financial incentives was a key factor in accelerating HDC's capacity to roll out this new program. The PERL product officially launched in October 2012, and about a dozen multifamily properties, mostly large Mitchell-Lama properties, are currently slated to be retrofitted as part of their refinance process. The first of these was the $33.7 million refinancing of Franklin Plaza, an affordable housing cooperative in Harlem with 14, 20-story buildings. "Before NYCEEC's involvement," says HDC Executive Vice President Joan Tally, "Franklin Plaza was slated to undergo a substantial rehabilitation. NYCEEC brought an engineering expertise that brought the energy efficiency aspects to the next level."[10] NYCEEC "catalyzed a much larger scope change" and HDC was able to provide the borrower with financing at a lower blended rate because of the PERL program. The project achieved financial closing in July, 2013, which has allowed the construction and energy efficiency work to proceed.

NYCEEC has played a similar role with Fannie Mae Multifamily Mortgage Business (MMB), which has developed an enhancement to its existing mortgage product. This product enhancement, the NYC Multifamily Property Improvements to Reduce Energy (M-PIRE) Loan, is notable because it allows for up to 50 percent of projected energy and water cost reduction from efficiency measures to be included in the pro forma net operating income. As a result of credit enhancement provided by NYCEEC, select Fannie Mae Multifamily Delegated Underwriting and Servicing (DUS) Lenders are able to incorporate energy savings into projections and can also increase the loan-to-value ratio as high as 85 percent, from the typical 80 percent on other Fannie-supported deals.[11] DUS lenders can market a product to building owners that offers them increased loan proceeds for energy efficiency and water upgrades, the implementation of which supports the owner's compliance with local laws. Buildings being considered for Fannie Mae financing typically undergo a physical needs assessment to identify a building's capital needs. For its M-PIRE loans, Fannie Mae MMB is integrating an ASHRAE level II audit into its requirements for physical needs assessment. More important, in cases where M-PIRE loans are underwritten to higher cash flows than an owner would see for a conventional loan, the M-PIRE program has the potential to radically alter the decision calculus for building owners, who would now view energy efficiency upgrades as a no-brainer rather than a hassle.

10 Author interview, December 9, 2013.

11 DUS lenders are private banks that are authorized by Fannie Mae to originate mortgage loans on Fannie's behalf according to agreed upon underwriting standards.

Conclusion

Planning and implementing energy efficiency upgrades are complex and time-consuming technical tasks, and past experience suggests that when considered as a stand-alone transaction, few building owners choose to prioritize them. The aforementioned efforts by Community Preservation Corporation and NYCEEC (in partnership with HDC and Fannie Mae) are promising because they piggyback energy efficiency retrofits onto routine transactions–mortgage refinancing, which provides building owners with an opportunity to think about their properties in a holistic way. The Community Preservation Corporation, HDC, and Fannie Mae have each undergone a rigorous learning process (the latter two in partnership with NYCEEC) to integrate energy reduction opportunities into the mortgage refinancing process. The benefits to building owners include making energy efficiency transactions more routine, more efficient transactions (including less time), and better operating buildings with better cash flow. The efforts hold promise for the broader energy efficiency field as a model for how strategies to achieve carbon reduction can be successfully integrated into practice.

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Home Energy Efficiency and Mortgage Risks: An Extended Abstract

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In recent years, home energy efficiency (EE) has progressed from the margins to the mainstream. However, many households are deterred by large upfront costs and longer payback periods, so are missing significant opportunities to implement cost effective energy savings measures in their homes. Financing would help overcome these obstacles. However, the use of loans for energy efficiency upgrades has been low. In particular, as de T'Sercales (2007) points out, lenders have not promoted loans for energy efficiency upgrades because of lack of information about the relationship between energy efficiency and risks. We provide initial evidence of the associative relationship between home energy efficiency and mortgage risks. Using a national sample, compared to non-ENERGY STAR houses, we find that the odds of default for households in ENERGY STAR houses are 32 precent lower and odds of prepayment are 28 precent lower. Furthermore, the greater the efficiency within the ENERGY STAR residences, the lower the risk of default. These results are reported in Cityscape by Kaza, Quercia and Tian (2014) and this paper summarizes them.

In 2012, the market share of the ENERGY STAR label in new single family construction had reached close to 40 precent in some states in the US (Environmental Protection Agency 2013). On a square foot basis, all types of houses have become more energy efficient in the last few decades. Yet, the United States is the fifth largest consumer of primary energy per capita among the OECD countries and its residential sector accounts for 20 percent of the total energy consumed in the United States. Households in the U.S. spend around 230 billion dollars annually on residential energy (Energy Information Administration 2012). According to the Consumer Expenditure Survey, an average household spends about a fifth of its housing costs in utility expenditures, with rural households spending up to a quarter of their housing costs (Bureau of Labor Statistics 2013).

1 The authors wish to thank Sarah Stellberg, Stephanie Burns, and Amanda Kolson Hurley of the Institute for Market Transformation for their assistance with this paper.

While there is little in the literature on the price premium for new energy efficient homes, there is evidence to suggest that green labels such as ENERGY STAR and Leadership in Energy and Environmental Design (LEED) command a 8 percent premium on resale (Kok and Kahn 2012). Nevin and Watson (1998) find that, *ceteris paribus*, a dollar decrease in utility costs is associated with about a $20 increase in home values. Preliminary analysis using the 2011 American Housing Survey data and the framework of Nevin and Watson replicates these results ($17, with 7.6 standard error).

Despite these trends, energy consumption in the residential sector continues to rise. This is partly due to countervailing trends such as reduction in household size, increase in house size and increasing number of appliances (Kaza 2010). While promoting conservation behavior is important to reduce energy consumption, energy efficiency still has a large role to play. Longer payback periods and higher upfront costs are likely to prevent many moderate and low-income households from purchasing energy efficient houses and making efficiency upgrades, and these households are precisely those that are most likely to benefit from them. While the households in the top income quintile pay more than three times as much as the bottom quintile in shelter costs, they only pay 75 percent more in utility costs, suggesting that the energy consumption is relatively income-inelastic and energy inefficiency places a greater burden on the low income households (Bureau of Labor Statistics 2013). A recent survey by the National Association of Home Builders finds that an overwhelming majority of homebuyers (over 80 percent) prefer energy efficient features, including appliances, windows and an ENERGY STAR rating for the house, and are willing to pay a 3 percent premium over an inefficient house (National Association of Home Builders 2013). An important way to improve access and to satisfy this potential demand is for mortgage pricing and underwriting to reflect the savings that come as a result of energy efficiency. Until now, lenders and investors have been reluctant to do so, in part because they lack reliable loan performance data on which to base underwriting decisions.

Financing Energy Efficiency

In many cases, financing residential energy efficiency is treated as financing energy retrofits in homes. Most energy improvements for existing homes can be financed through consumer loans, a home equity loan secured by property, or a traditional or specialized mortgage. Such financing usually requires that consumers have substantial equity in their existing homes, the financial reserves to pay any added costs out-of-pocket, or larger down payments for a home purchase. The U.S. housing stock is valued at about $18.5 trillion, according to the Federal Reserve System. Even if 2 percent were devoted per year to energy efficiency improvements, this would mean capital outlays of nearly $370 billion and $3.7 trillion over a decade. A variety of funding mechanisms exist today, such as state and local energy efficiency loan funds, on-bill repayment, and Property Assessed Clean Energy (PACE) bonds. But their scale is vastly lower than what is required and is estimated at less than $6 billion annually.

Contrast this to a recent estimate that an increase in residential energy efficiency has the potential to save up to $41 billion annually (Granade et al. 2009).

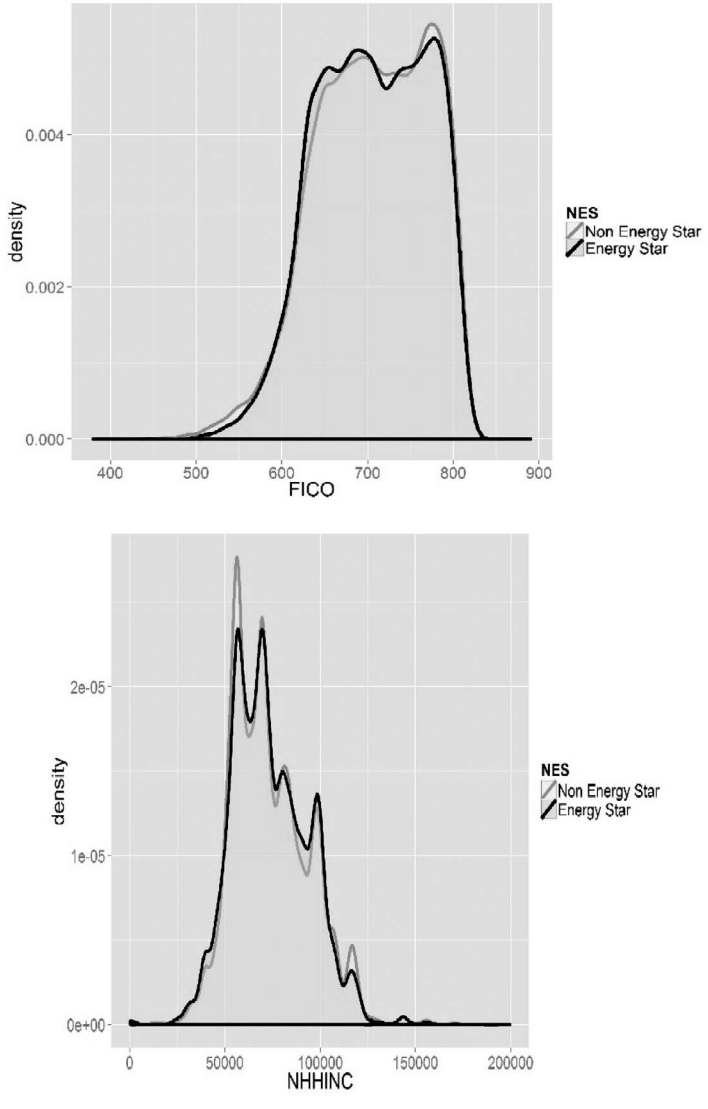
For many first-time homebuyers and moderate-income borrowers who do not have these financial resources, energy-efficient mortgages (EEM) could offer a solution. EEMs allow some flexibility in underwriting considerations so that borrowers can qualify for larger loans to implement energy-saving improvements and/or purchase homes that already meet certain performance criteria. However, EEMs that are backed by the Federal Housing Administration and the Department of Veterans Affairs have not caught on, because of the transactional complexity, poorly developed lender guidance, limited benefits for lenders, and lack of consumer information. Transaction costs and information asymmetries prevent rapid and widespread adoption of these products. In a wide ranging study, de T'Sercales (2007) showed that a more important barrier that prevents large scale adoption of energy efficiency is the financiers' belief of higher risk exposure than the availability of funding. Thus, it is useful to quantify the risks associated with energy efficiency investments.

Current underwriting standards do not recognize the potential lower risks associated with energy efficient housing. *Ceteris paribus*, lower and less volatile utility costs might provide a household with some cushion in case of crisis events to pay its mortgage. Furthermore, valuing energy efficiency might be a marker of financial savvy for the household. If, indeed, mortgages held by homeowners in energy-efficient homes have lower risks than those in less efficient homes, then good credit policy would merit more flexible underwriting standards or even consideration in loan-level price adjustments. Traditional residential mortgages offer the potential to create the scale necessary for energy efficiency investment because they rely on the mainstream financial system. In addition, with more accurate information on risks, lenders may be able to develop and tailor mortgage products that better meet the needs of both consumers and investors

Data & Methodology

This study examines actual loan performance data obtained from CoreLogic, the lending industry's leading source of such data. A carefully constructed sample was developed of both ENERGY STAR (obtained from RESNET and other Home Energy Rating providers) and non-ENERGY STAR-rated single-family homes (other non-rated homes in the same Zip code), so that the distributions of loan, household, house and neighborhood characteristics of the two groups were similar (see Figure 1). These databases are merged with data from the American Community Survey for neighborhood characteristics, climate data from the National Climatic Data Center, and electricity prices from Open Energy Info accounting for privacy restrictions. We restricted the analysis to 30 year fixed rate mortgages, the first five years after origination and Loan-to-Value ratios between 50 percent and 150 percent. This resulted in a national sample of 71,062 loans, of which 35 percent were for ENERGY STAR homes.

Figure 1. Examples of distributional similarities in the covariates (FICO scores & Neighborhood Income) for ENERGY STAR and non-ENERGY STAR homes



There are two frameworks in the literature that explain the twin (prepayment and default) mortgage termination risks; financial benefit of options and trigger event considerations. Our study, like many others, uses a combination of these frameworks that accounts for local unemployment rates, loan-to-value ratio, borrower credit and wealth. To account for the possibility that borrowers might still default after the study period, hazard analysis techniques are used. To operationalize this, the econometric model takes the form of a multinomial logit model with a set of dummy variables representing the age of loan in months. In our models, we also account for state fixed effects.

The savings resulting from energy efficiency can be viewed as a cushion to unanticipated crisis or adverse events that could make mortgage repayment more difficult. It is also likely that homeowners in the market for efficient homes weigh the long-term savings derived from energy efficiency against the short-term higher costs, thus reflecting a higher degree of financial savvy. On the basis of the mortgage termination literature, we hypothesize mortgages on energy-efficient homes to have a lower probability of default than those on less efficient ones.

Results

We find that the odds of default for households in ENERGY STAR houses decrease by 32 percent and odds of prepayment decrease by 28 percent compared to non-ENERGY STAR houses. Furthermore, the greater the efficiency, the lower the risk of default. Controlling for other factors within the ENERGY STAR subsample, more efficiency, measured by a point decrease in the Home Energy Rating System (HERS) score, is associated with a decrease in the risk of default by 4 percent and in that of prepayment by 2 percent. This suggests that mortgages on more efficient homes exhibit even lower mortgage risks than those on their less-efficient but still ENERGY STAR-rated counterparts. For more details and complete results refer to Kaza et.al (2014).

Table 1. Selected Results from the model estimations with the inclusion of County Type variable. For full set of results, refer to Kaza et. al (2014).

	Base model				HERS model			
	prepay		default		prepay		default	
	estimate	odds ratio	default	odds ratio	estimate	odds ratio	estimate	odds ratio
ENERGY STAR Certification	-0.311*** (0.00001)	0.73	-0.380*** (0.00)	0.68				
HERS Index					0.021*** (0.001)	1.02	0.038*** (0.0001)	1.04
Mixed Rural	-0.191*** (0.00)	0.83	0.094*** (0.00)	1.10	-0.263*** (0.00001)	0.77	0.355*** (0.00)	1.43
Mixed Urban	-0.276*** (0.000)	0.76	0.002*** (0.00)	1.00	-0.359*** (0.00001)	0.70	0.207*** (0.000)	1.23
Urban	-0.409*** (0.00)	0.67	0.163*** (0.00)	1.18	-0.529*** (0.000)	0.59	0.379*** (0.000)	1.46

Note: *p<0.1; **p<0.05; ***p<0.01

To test the robustness of the results and the differences in the implications for different markets, we included a county type variable (Isserman 2005) in the models specified by Kaza et.al (2014). The coefficients in both the base model (with ENERGY STAR certification dummy variable) and HERS model (with HERS Index variable within the ENERGY STAR subsample) remain as previously reported (see Table 1). However, urban households are less likely to prepay and more likely to default than their rural counterparts. In the base model, the default risks for the mixed urban and mixed rural households are only marginally greater than those of rural households though substantially higher within the HERS model (ENERGY STAR subsample). Although the results suggest that mortgage risks are geographically uneven and are correlated with the development trajectory of the place, the effect of energy efficiency on mortgage risks is remarkably consistent.

Caveats

Future work needs to address a number of issues associated with this research. It is important to recognize that the energy savings of energy efficient homes may not cause the reduction in risk. What we have demonstrated in this work is the association between reduction in risk and energy efficiency, which could very well be reflective of the underlying borrower characteristics. Panel data that tracks the borrower's income and market conditions and that will allow us to tease these effects is not available. Many borrower characteristics such as income and employment status are not available in the dataset. We included a number of Zip code level variables as proxy for individual variables. Cognizant of ecological fallacy risks, we do not derive implications from the inclusion of these variables.

Future research also needs to examine additional measures of energy efficiency. While HERS can predict average energy costs in general, individual ratings, especially for older houses, are largely uncorrelated with the energy costs (Stein and Meier 2000). Therefore, better measures of energy savings could be considered in future studies to capture more fully its impact on mortgage risks. Future research should use a broader sample to study the effect on risk. Furthermore, other rating systems such as LEED and the National Green Building Standard which promote more comprehensive green building strategies could also be examined for their effect on mortgage risk. However, overall, we believe the findings in this paper are robust and consistent enough across different model specifications to warrant further examination.

Policy Implications

Because the findings are consistent across different model specifications and types of subsamples, we can derive a number of implications for policy and lending practices.

First, lenders may want to require information about energy costs and encourage an energy audit or energy rating during the process of mortgage underwriting. In the same manner that appraisals calculate the value of the home, an energy-rating determination could inform other important characteristics of the loan, including the debt-to-income ratio. Utilizing energy audits as part of the mortgage underwriting process would help homeowners

make informed decisions about energy efficiency investments and likely promote long-term efficiency of the house.

Second, lenders and secondary market investors should take into account the energy efficiency of the home used as collateral for the loan in an underwriting decision. For instance, they may allow for a higher debt-to-income ratio and changes to appraisal guidelines to offset the modest increase in cost of energy improvements. This and similar approaches would allow borrowers to obtain the underwriting flexibility needed to cover the modest additional cost of the improvements. This step would increase affordability for many moderate- and middle-income borrowers. Moreover, when possible, lenders should consider an energy rating that accounts for degrees of energy efficiency.

In summary, the findings demonstrate that energy efficiency and the degree of energy efficiency matter. The lower risks associated with energy efficiency should be taken into consideration when underwriting mortgage risks. Major market stakeholders, such as FHA, Freddie Mac, and Fannie Mae, could encourage underwriting flexibility for mortgages on energy-efficient homes as well as promote energy efficiency to consumers in concert with their lending partners. Finally, Congress should consider the findings in its deliberations of the Sensible Accounting to Value Energy (SAVE) Act, the bill proposed to improve the accuracy of mortgage underwriting used by federal mortgage agencies, by ensuring that estimated energy cost savings are considered in the underwriting process.

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Charter Schools Ripe for Green Investments

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Every day, about 25 percent of America goes to "school" in schools, colleges, or universities.[1] According to the U.S. Green Building Council (USGBC), more than one-quarter of these students and teachers are in facilities considered substandard, even dangerous to occupant health. Nearly two-thirds of schools have building features such as air conditioning that are in need of extensive repair or replacement. To address this reality, a growing trend is to design sustainable or "green" schools that provide healthy and productive learning environments.[2]

Recent evidence points to the long-term financial benefits of sustainable schools. These benefits more than offset any initial cost premium.[3] An increasing number of green schools are being built and operated for less than traditional buildings. Green schools reduce both negative impacts on the environment and ongoing building maintenance and operating costs. Specifically, efficient lighting, heating, and cooling systems, greater use of natural light and light sensors, and better-insulated walls and roofs all contribute to reduced energy consumption and costs. Reduced use of electricity and gas in green buildings leads to fewer pollutants. Rainwater catchment, green roofs, and low-flow fixtures help conserve water and reduce wastewater.

Beyond the environmental and financial benefits of sustainable facilities, indoor air quality, temperature control, lighting and acoustics have direct effects on student and teacher productivity.[4] Green schools promote a healthy, productive learning environment, improved teacher retention, hands-on learning opportunities, and environmental stewardship. In addition, green schools can serve as examples in their communities, providing opportunities to share the lessons and rewards of sustainable development.

Financial investments in the development of sustainable schools, then, have far reaching potential effects, including:

- Increased health and productivity of students, faculty, and staff,[5]
- Reduced impact of school operations on the environment,
- Cost savings through reductions in energy and water consumption,[6]
- Opportunities for community collaboration and engagement, and
- Environmental awareness and stewardship through hands-on learning.

1 Center for Green Schools. "Initiatives" (website). Available at www.usgbc.org/initiatives/centers/green-schools.
2 According to USGBC, a green school is "a school building or facility that creates a healthy environment that is conducive to learning while saving energy, resources, and money." See http://www.greenschoolbuildings.org/why-green-schools.aspx.
3 Gregory Kats, "Greening America's Schools/Costs and Benefits: (Washington: Capital E, October 2006).
4 Ibid.
5 Ibid.
6 Green schools save, on average, $100,000 per year primarily through 30 percent to 50 percent reductions in energy usage and 30 percent to 40 percent reductions in water usage. Ibid.

Why Sustainable Charter Schools?

A sustainable approach is a particularly good fit for charter schools. Typically, charter school missions state the importance of innovative approaches to learning and aim to achieve this goal by developing a curriculum that involves new teaching methods, emphasizes civic responsibility, promotes student and community involvement, enables effective teaching, and demands accountability and discipline. Charter schools often focus their curriculum on a common subject, allowing students to get involved in specific interests or subject matters. Promoting environmental awareness can be a natural fit for charter schools. In fact, many schools have embraced sustainability as an overarching theme for their charter.

For those seeking opportunities for impact investing, a sustainable charter school is an excellent option. High-quality educational opportunities are a critical piece in any effort to alleviate poverty, and charter schools serve a noteworthy share of students from low-income families. That is one reason investments in charter schools have become a central part of so many mission investors' strategies. These students are already at higher risk for adverse health outcomes, including asthma and obesity. Investments in school facilities that will contribute to, and not hurt or hinder, good health for students, faculty, and administrators can have a profound and lasting impact, including teaching the value of environmental stewardship to our future leaders.

This article offers a brief overview of the various design considerations a charter school will face as it plans its sustainable facility. What follows are case studies highlighting specific, positive impacts of green charter school facilities and related educational programs.

What Is a Charter School?

Charter schools are independent public schools that were first created in Minnesota in 1991 to address the decline in public school performance. Charter schools are permitted by state law to operate outside the rules and regulations that govern traditional public schools. However, charter schools may not practice selective enrollment or charge tuition. In exchange for greater autonomy, schools agree to be held accountable for the academic achievement of their students. In addition, charter schools are expected to meet the terms of their charter or face closure by their authorizing bodies.

State law determines funding for charter schools. Typically schools receive funding on the basis of enrollment–commonly referred to as "per pupil" allocations–with additional funding for special education and for special-needs students. Just 15 states and the District of Columbia offer public charter schools some amount of state facilities aid; the majority struggle to cover capital expenses from their limited operational budgets.[7] Unlike school districts, charter schools cannot issue taxpayer-backed bonds; therefore, finding funds to support adequate facility development is a challenge.

7 National Alliance for Public Charter Schools, "Facilities" (Washington: NAPCS, 2013), Available at http://dashboard.publiccharters.org/issues.

Today, 40 states and the District of Columbia have charter laws.[8] In fall 2012, 379 new charter schools opened in the United States. With approximately 6,000 schools operating across the country, charter schools represent 6 percent of all public schools and enroll more than 1.6 million students.[9] In 2009, charter enrollment in Detroit and Washington, DC, alone climbed to more than 30 percent of total public school enrollment. Students at charter schools in New Orleans accounted for nearly 60 percent of total public school enrollment in the same year.[10]

Sustainable Facility Design

There are a number of primary design elements to consider when building a sustainable facility, including:

- Maximizing daylight,
- Indoor air quality,
- Environmentally safe materials,
- Energy efficiency/alternative energy sources,
- Acoustics,
- Water efficiency, and
- Waste management.

All design elements have both environmental and health impacts. What follows is a brief description of each along with evidence that supports the need to consider implementation in the nation's schools. A more in-depth discussion can be found in "The Sustainable Answer Key," a how-to manual for charter schools interested in building or renovating a sustainable facility.[11]

Maximize Daylight

Natural light has health benefits and reduces energy costs. A 1999 study found that student performance and concentration levels improve greatly when natural light enters the classroom.[12] More recent research validated this study, demonstrating that students exposed to more daylight show a 21 percent increase in performance when compared with students exposed to the least amount of natural light.[13] Methods to maximize daylight in classrooms

8 Ibid.

9 National Alliance for Public Charter Schools, "Growth" (Washington: NAPCS, 2013), Available at http://dashboard.publiccharters.org/dashboard/schools/year/2013.

10 National Alliance for Public Charter Schools, "Top 10 Charter Communities by Market Share" (Washington: NAPCS, October 2009), available at www.publiccharters.org/data/files/Publication_docs/MarketShare_P4.pdf_20110330T170229.pdf.

11 NBC Capital Impact, "The Sustainable Answer Key," (Arl: NBC Capital Impact, June 2010), available at www.ncbcapitalimpact.org/wp-content/uploads/2013/05/The-Sustainable-Answer-Key-FINAL-6_24_10.pdf.

12 Heschong-Mahone Group, "Daylighting and Productivity Study" (Fair Oaks: Heschong-Mahone Group, 1999), available at: www.h-m-g.com/projects/daylighting/projects-PIER.htm.

13 California Energy Commission, "Daylighting in Schools: Reanalysis Report" (Fair Oaks: California Energy Commission, October 2003).

include clerestory windows, skylights, light wells, and reflective surfaces; shading devices; lighting control devices; light shelves; and green interior finishes.

Improve Indoor Air Quality

A recent study by U.S. Government Accountability Office (GAO) found that the air is unfit to breathe in nearly 15,000 schools.[14] Schools with "sick building syndrome" (very poor indoor air quality) have greater rates of absenteeism for both teachers and students, resulting in lower productivity. In contrast, good indoor air quality is directly correlated with a better learning environment for students and working environment for teachers and staff. Good indoor air quality design minimizes the potential problems that outdoor and indoor pollutants, building materials, molds, and bacteria present. Methods of cross-ventilation and stack ventilation help ensure good air quality, for example. Proper moisture control measures can prevent bacteria and mold growth. In addition, the use of low volatile organic compound (VOC) products, including carpet, paint, surfaces, linoleum, and cleaning products, can also help ensure good indoor air quality.

Use of Environmentally Safe Materials

Beyond low VOC products, other building materials are also better for both the environment and the health and performance of students. For example, rapidly renewable materials are those that can be grown and harvested within a short amount of time. Materials such as bamboo, cork, plywood, linoleum, hemp, and wool are examples. In addition to being environmentally friendly, products like cork provide acoustic benefits and are considered a durable and resilient surface.

Schools may also consider where their materials are grown and harvested. Locally sourced materials are products made and shipped from a local area (usually within a 500 mile radius of the project site). Using locally available materials lessens the overall environmental impact of a facility project.

Finally, many products contain recycled materials or can be easily re-used or recycled after use. Items such as resilient flooring, carpet, and concrete, to name a few, can contain recycled content or even be recycled. Concrete floors are also durable and easy to clean, requiring less maintenance and cleaning products–another method of reducing waste and building green.

Energy Efficiency/Alternative Energy Sources

Energy efficiency is one of the easiest and most effective ways to lower everyday operating costs. In the average school, 10 to 20 percent of the total energy consumed is directly related to the inefficiency of the building "envelope," or building enclosure that separates the interior

14 American Federation of Teachers, "Building Minds, Minding Buildings" (Washington, DC: AFT, 2008).

space from the external environment.[15] Proper insulation of the building envelope, including exterior and interior partition insulation, double-paned glass, and control of existing building leaks, is important for both existing buildings and new construction. Frequently, seals between windows and walls need repair and are major sources of energy loss in existing structures. Efficient building envelopes can contribute to improved comfort, reduced heat loss, and reduced size and cost of HVAC (heating, ventilation, and air conditioning).

The use of alternative energy sources is another method of lowering energy use and cost in charter schools. Alternative energy sources are free, clean, and renewable sources of energy (think sun, wind, and earth) that do not negatively affect the environment. Use of alternative energy sources decreases carbon emissions and requires less dependence on finite and polluting resources like coal, gas, and oil. Although initial implementation costs may be high, lifecycle costs are low. Alternative sources of energy also provide great hands-on learning opportunities for students. Also, some schools have worked with their local energy and utility companies on lease programs (that is, power purchase agreements) to install alternative energy systems.

Acoustics

The National Academy of Sciences, which looked at the advantages of green schools in a 2006 report, noted that excessive background noise in many conventional schools impairs students' ability to learn and achieve.[16] The study noted that background noise levels in many classrooms were 10 times too loud. High background noise levels in schools can affect students' memory, attention, and speech recognition and cause voice strain for teachers that may result in higher absenteeism.

Green school design minimizes noise from heating and cooling systems as well as noise from outdoor and indoor spaces. Acoustical standards for green schools ensure that a teacher's voice is clearly understood by students against any remaining background noise.

Water Efficiency

Greywater refers to all untreated water produced by a building that is not used for waste management (toilets, kitchen sinks, or related functions). Rainwater and water from sinks other than in the kitchen can be collected daily and used without treatment for flushing toilets, or filtered and used for subsurface irrigation. All unused water can be diverted to sewage systems daily. Although greywater collection systems can have high initial costs, lifecycle savings often balance initial costs over time. Re-use of water from rainfall, commonly known as storm water re-use, is a great method of saving water and reducing water costs. Water can be collected for uses such as irrigation, landscaping, and flushing toilets.

15 U.S. Dept. of Energy, "Energy Design Guidelines for High Performance Schools: Cold and Humid Climates" (Golden, CO: U.S. Dept. of Energy, National Renewable Energy Lab, June 2002), available at: HYPERLINK "http://www.nrel.gov/docs/fy02osti/29107.pdf" www.nrel.gov/docs/fy02osti/29107.pdf.

16 National Academy of Sciences, "Green Schools: Attributes for Health and Learning." Report of the Committee to Review and Assess the Health and Productivity Benefits of Green Schools (Washington, DC: National Research Council, 2006).

Waste Management

Collecting building waste properly throughout the school can be an inexpensive way to reduce costs and protect the environment. Teaching students and staff to recycle, compost, and separate waste appropriately can save on waste management and hauling costs throughout the year.

Case Studies

"Greening" a school may be as simple as implementing a recycling program, installing energy-efficient appliances, or maximizing the natural light in each classroom. A school may also choose a more holistic approach to greening its facility by pursuing Leadership in Energy and Environmental Design (LEED) certification with the USGBC. LEED certification verifies that the school has been built to meet the highest level of performance in areas such as energy and water efficiency, materials selection, and indoor air quality. In addition to LEED, other rating systems and standards include the Collaborative for High Performance Schools (CHPS), the U.S. Environmental Protection Agency's ENERGY STAR program for rating building energy performance, and other regional programs.

The following case studies offer three examples of investing in sustainable charter schools. The case studies explore how each school incorporated nearly all of the elements listed above with health and environmental benefits in mind. Not only are their school facilities LEED certified, but the schools embody their environmental values in their curriculum, school wide waste-reduction programs and gardens. They have also engaged their students and communities by leveraging public, corporate, and nonprofit partnerships.

Thurgood Marshall Academy Public Charter High School (Washington, DC)

Thurgood Marshall Academy is a charter high school in the historic Anacostia neighborhood of Washington, DC. High crime rates, particularly associated with drug trade, have plagued the neighborhood for years as have failing schools and shuttered businesses.

Thurgood Marshall Academy was developed by a group of Georgetown University Law School students and faculty in the DC Street Law clinical program. During law school one of the school's founders taught a course at a D.C. public high school in Anacostia. Appalled at the dropout rate for students at the school (80 percent of incoming freshman students never graduated), he made a personal commitment to provide the children in this community the chance for a better education. Shortly thereafter, Thurgood Marshall Academy's eventual founders began searching Anacostia's neighborhoods for a future location to start a charter high school. Eventually Habitat for Humanity helped reconstruct a vacant church school building to become the Thurgood Marshall Academy's first, temporary home. In 2001, the Academy opened its doors to 80 incoming freshman students.

Journey to a Sustainable, Permanent Home

School leaders spent the first several years searching for a new home. Although several properties were available beyond the neighborhood, staff and faculty were dedi-

cated to serving the Anacostia community. School leaders identified a historic building, the Nichols Avenue School Building, which had been abandoned for more than 30 years. With its proximity to the Anacostia Metro station and its location at the historic gateway to the community, it was the ideal building to renovate and re-establish as a school Anacostia could be proud of.

After extensive negotiations with the City, and extensive outreach to the community, TMA purchased the building. The purchase and renovation of the facility required both financing and donations. By 2005, they had raised nearly $6.5 million from grants, low interest loans, and an $8 million conventional construction loan from Bank of America. In 2007, Thurgood Marshall Academy used New Markets Tax Credits, supported by a letter of credit shared by Capital Impact Partners and The Reinvestment Fund, to refinance the debt from Bank of America. Assisted by City First Bank of DC, the transaction made use of Charter Schools Development Corporation (CSDC) tax credits, with PNC Bank as both investor and leverage lender.

The decision to renovate the Nichols Building as sustainably as possible came naturally. First, for political and cultural reasons, the school's founders were committed to a more sustainable approach than ground-up construction, and therefore finding and rehabilitating an existing building in the Anacostia community was a goal. Second, it proved more cost-effective, and historically significant, to re-use as much of the existing materials as possible, leaving much of the building's original trim, floors, transoms, and skylights intact.

Finally, the schools' founders wanted the facility to be a teaching tool and students to be proud of their facility's energy-efficient systems, school-wide waste-reduction program, and organic garden. The school's Green Club has significantly reduced waste by creating and maintaining a campus-wide recycling and composting program. The Green Club maintains four raised vegetable beds for student meals when possible. The garden has also provided food for events, including the kick-off for National Farm to Schools Week and the 2013 Green Inaugural Ball. Finally, via an in-kind donation from Earth Day Network, the school installed a 2.8 kilowatt solar system on its roof in fall 2010.

A Historic Collaboration

Thurgood Marshall Academy worked with the leadership of its neighboring DC public school (DCPS), Savoy Elementary, local government, and 21st Century School Fund to modernize Savoy as a LEED certified facility. The project included the construction of a 26,000 square foot athletic center shared by both schools. In addition to LEED certification, the collaborative effort ensures that roughly 800 students annually will share one facility. This is a rare example of a charter school working directly with a conventional DCPS school on facility development from design to use. Achieving LEED certification was due, in large part, to Thurgood Marshall Academy's expertise and commitment to building sustainable facilities.

Growing Green, Teaching Green

In another collaborative effort, Thurgood Marshall Academy, teachers and leadership at Savoy Elementary, and local government worked with Earth Day Network to build an Organic Teaching Garden. The garden was constructed on Savoy's land by Thurgood Marshall Academy students through a partnership with the DC Department of the Environment and the Mayors' Summer Jobs Program. Earth Day Network donated all materials for the project. Thurgood Marshall Academy took the lead in maintaining the garden and coordinating its use by teachers and students from both schools. Although the space primarily functions as an "outdoor classroom" available to both schools, periodic joint sessions give older students from Thurgood Marshall Academy the opportunity to teach elementary school students from Savoy about ecology and gardening.

Award-Winning Success

Today, Thurgood Marshall Academy serves Grades 9-12 with 400 students, all minorities and most of whom qualify for the federal free and reduced-price meals program (a standard benchmark of economic need). The school has graduated nine classes with 100 percent acceptance rates to college, and boasts student test scores among the highest for open-enrollment DC high schools–and significantly higher than those of students in surrounding public high schools. The school has been ranked as a Tier 1 school by the DC Public Charter School Board since the inception of this rating system.

The school and its staff have received widespread recognition, including a U.S. Department of Education "Doing What Works" listing, a Coalition of Schools Educating Boys of Color COSEBOC School Award, and the 2011 Mayor's Environmental Excellence Award. The Middle States Association of Colleges and Schools granted Thurgood Marshall Academy full accreditation. Current Executive Director Alexandra Pardo received a 2013 Washington Post Distinguished Education Leadership Award, and physics teacher Kena Allison recently received a Milken Educator Award. Students have received scholarships, including Posse Foundation scholarships and the "full-ride" Stephen J. Trachtenberg Scholarship to George Washington University. Cumulative scholarship earnings among students–many of whom are the first in their families to attend college–rank in the millions of dollars.

Thurgood Marshall Academy's renovation and operation of a successful public charter school has stimulated a commercial renaissance in the adjacent neighborhood. Many formerly vacant buildings are now occupied by both public and private-sector organizations, including the Salvation Army and the DC Department of Housing and Community Development.

High Tech High (San Diego, California)

High Tech High (HTH) was originally conceived by a group of about 40 civic and high tech industry leaders in San Diego. In particular, members were concerned about the "digital divide" that resulted in low numbers of women and ethnic minority groups entering the fields of math, science, and engineering. HTH's mission is to prepare a diverse range of

students for postsecondary education, citizenship, and leadership in the high tech industry. Today, HTH operates 12 schools (five high schools, four middle schools, and two elementary schools), and serves approximately 4,700 students. Academic Performance Index (API) rankings place HTH schools among the highest achieving in the state. Virtually all of High Tech High graduates are accepted to and continue on with a college education. Of those, roughly 80 percent have received admissions offers from four-year institutions.

High Tech High North County

HTH North County opened in fall 2007 under HTH's recently awarded California Statewide Benefit Charter. Temporary facilities (modulars) were fixed on a vacant parcel to serve HTH North County students for its first two school years. Approximately $21.7 million was needed to construct a 48,000 square foot permanent facility that would accommodate approximately 530 students in Grades 9-12. Approximately 40 percent of HTH students qualify for the federal free- and reduced-price lunch program. The North County project is located in an area with a poverty rate of 24.9 percent and an estimated median family income of $37,943 in 2013. Using New Markets Tax Credits (NMTCs) from Revolution Community Ventures, three organizations –Capital Impact Partners, Local Initiatives Support Corporation (LISC) and RSF Social Finance–provided more than $13 million in leveraged debt. Capital Impact Partners underwrote the entire transaction and provided nearly $7 million in bridge financing to support the site acquisition and a short-term advance on a portion of HTH's equity contribution to the transaction. US Bank provided $6.8 million in equity in exchange for the tax credits.

The new school building contains classrooms, specialty labs, administration offices, a commons/dining area, and support/building core facilities. Outside areas include learning patios, plazas, walkways, dining terraces, play yards including half basketball courts, green space, areas for drop off and pick-up, and parking spaces for cars and bicycles. The school was certified "LEED for Schools" Silver. The new facility includes a variety of sustainable design elements including solar panels, low-water and low-energy use fixtures, and materials with high recycled content. Specifically, in all its facilities, HTH focuses on the three primary design elements shown to have the greatest effect on student health and achievement: indoor air quality, daylight, and acoustics.

Environmental and Financial Impact

All HTH facilities are built to LEED standards and all are used as part of the learning curriculum. In fact, HTH was honored by San Diego Gas & Electric as an "Energy Champion" because of its overall approach to energy management and sustainability. The following are the specific environmental and financial benefits attributed to the sustainable features of HTH North County's facility:

- Exceeds EPA water efficiency standards by 45.4 percent, resulting in a savings of 500,000 gallons and $10,000 in operating costs per year.
- Exceeds California Title 24 energy efficiency standards by 16.8 percent, resulting in savings of $22,000 per year.

- A rooftop-mounted photovoltaic (PV) system generates 77,000 kWh per year, which accounts for about 10 percent of the school's energy demand on a net annualized basis.
- All core learning spaces, including classrooms, offices, and conferences rooms, are tuned and verified to exceed ANSI S12.60, the gold standard for learning environment acoustics. This is to compensate for noise reverberation and ambient background noise.
- All paints, coatings, adhesives, sealants, flooring, ceilings, and wall coverings exceed the South Coast Air Quality Management District's (SCAQMD) standards for the off-gassing VOCs. Rather than simply performing a building "flush out," HTH tested the air prior to occupancy to ensure a healthy indoor environmental quality.
- The daylight factor is greater than 2 percent in all classrooms through careful space planning and window placement. This is enough for all classrooms to operate in "Audio-Visual Mode" without any electric light sources on.

Local utility incentives and rebates offset the cost of these sustainable features, including the LEED, CHPS, and Energy Star documentation.

HTH also designs spaces that adapt and accommodate multiple uses over time. For example, the Commons is used as a theater, afterschool program, testing center, lunchroom on rainy days, and for school gatherings. Elimination or integration of systems, use of waste (recycled materials), and reduced maintenance are all methods of saving money, demonstrating a more responsible use of scarce natural resources, and ensuring HTH students, faculty and staff work in healthy environments and can perform to their greatest potential.

Since opening the NMTC–funded high school facility, High Tech High has continued to expand its presence at the campus with a middle school that opened in 2009 (its permanent home opened in 2011 and has been certified LEED for School Platinum) and an elementary school that opened in 2013 with its permanent home slated for completion in July 2014. Together the three schools now serve nearly 1,000 students and employ more than 60 staff.

Prairie Crossing Charter School (Grayslake, Illinois)

Prairie Crossing Charter School (PCCS) serves 432 students in Grades K-8 and will begin its 16th year of operations in fall 2014. PCCS is located within the nationally recognized conservation community of Prairie Crossing, and the school exemplifies the goals of the surrounding community by using the preserved landscape, prairie fields, sustainable agriculture, and natural wetlands as integral tools in the academic curriculum. Test scores consistently place PCCS among the best in the state, but the school is especially proud of its educational emphasis on environmental conservation and civic responsibility. Outdoor learning is integrated into the core subjects of math, science, social studies, and language arts, and students are engaged throughout the year in self-designed environmental service learning projects.

After initially operating out of a one-room schoolhouse, PCCS's student population quickly outgrew even the temporary modular structures and additional facility space. In 2004, PCCS used tax-exempt bond financing, along with donations from individuals and community foundations, to construct a 14,000 square foot LEED Gold-certified building. The sustainable features of the facility include:

- Nontoxic, recycled, or recyclable building materials,
- Daylight in classrooms and interior corridors (classrooms boast large expanses of glass, negating the need for electrical lighting during daytime),
- Geothermal heat pumps,
- Natural ventilation,
- Photovoltaic electricity,
- Storm water re-use (storm water is collected in large cisterns and used throughout the campus grounds for a variety of uses).

Green Inspiration

Today, the PCCS campus includes five buildings. The school's K–4th grade students are housed in the LEED-certified building, and a grassy field containing the school's geothermal system separates the elementary students from those in Grades 5–8. The building for the middle school was also built sustainably but did not pursue LEED certification process owing to budget constraints. Motivated to ensure their building was also equipped with both rain gutters and rain catchment devices, fifth and sixth-grade students, who study water and water conservation in their curriculum, designed their service learning project to develop a quasi-business to raise the necessary funds. They purchased and painted rain barrels, which they sell to the community, educating others about the importance of water conservation and re-use in the process. The students were invited to discuss and display their efforts at the 2010 National Charter Schools Conference, where they sold several additional barrels.

Community Partnerships

The school's gardening program is another example of how the facility promotes environmental health and awareness. By maintaining gardens on campus, PCCS has developed a relationship with a local organic working farm. In the "Farm to Table" program, students produce lunches for the school community using ingredients grown in their garden projects. Not only does this program teach students how food is grown, harvested, and prepared, it also teaches about the functioning of a farm business while supporting and promoting local agricultural efforts.

Both PCCS's green facility and integrated educational programming ultimately support the school's mission of teaching students to protect and preserve the environment. In fact, all eighth graders are required to complete a culminating project of identifying a pressing environmental issue and developing potential solutions.

The school has been recognized throughout the country. The Center for Education Reform awarded PCCS a National Charter School of the Year Award in 2007. In 2012, the U.S. Department of Education recognized PCCS's environmental commitment with their inaugural Green Ribbon Award. PCCS has also been recognized for the outstanding academic achievements; in 2013 the U.S. Department of Education recognized PCCS as a Blue Ribbon School, one of only 286 in the country.

Conclusion

Investments in sustainable charter schools facilitate learning opportunities, create ongoing cost savings, lower the environmental impact, and improve health. These schools not only benefit the students, staff and faculty, but also the community and environment as well.

Existing research on environmentally sustainable schools usually does not extend to charter schools, and more research is needed to more fully recognize the benefits of environmentally sustainable schools. As an example, although researchers have conducted studies of the cost premium and ongoing costs of sustainable schools, they have not analyzed the building costs for charter schools, which often vary significantly from public district schools. The latter may be required to meet more stringent design standards or pay higher, prevailing wages for labor, for example. Of the three schools discussed here, only Prairie Crossing was able to comment on a cost premium. They noted cost premiums associated with heating and cooling (6-7 percent); general construction (about 4 percent) owing to waste separation, unfamiliarity and additional reporting requirements for LEED certification, and recycled content needed for concrete; and material procurement (less than 2 percent) for specialized construction materials. By 2006, green construction was more common and Prairie experienced a notable decrease in cost per square foot for a similar set of design criteria.

We do not yet know whether demonstrated ongoing cost, performance, and health improvements of sustainable schools hold true for charter schools. Further, the three schools were not yet able to estimate the ongoing cost savings, or the academic or health benefits of their facilities. Only Prairie Crossing had some limited information from an energy group suggesting 18-20 percent less energy use on average than comparable facilities in their vicinity.

There is still much work to be done to expand the number of environmentally sustainable charter schools. However, leaders such as Thurgood Marshall, High Tech High North County, and Prairie Crossing Charter School are providing a clearer path for others to develop sustainable facilities. With access to affordable capital, more charter schools can follow in their footsteps.

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Financing Energy Efficiency in Low-Income Multifamily Rental Housing: A Progress Update from the Low Income Investment Fund

By Nancy O. Andrews and Dan Rinzler[1]
Low Income Investment Fund

Bringing energy efficiency to our nation's building stock is an attractive triple bottom line proposition, and a critical one–for addressing global climate change, improving environmental quality and health, and delivering cost savings to owners and tenants. Although markets for retrofitting commercial properties and single-family homes are developing, many low-income people are still waiting on the sidelines to partake in benefits. This trend is particularly worrisome because the least fortunate are more likely to live, attend school, and work in older, less energy-efficient buildings; as a result, low-income households consume about one quarter more energy per square foot of living space than their higher-income counterparts, and a larger share of their paychecks are dedicated to utility costs.[2] Poorer communities' limited ability to pay for retrofits has caused energy efficiency markets designed for wealthier settings to bypass them.

In this context, we at the Low Income Investment Fund (LIIF) interpret the considerable challenge of delivering energy efficiency to low-income families and low-wealth communities as crucial not only for environmental sustainability, but also for addressing social inequality.

We have taken this challenge head-on. LIIF has made more than $170 million in front-end loan and grant capital investments for energy efficiency in multifamily housing, schools, child care centers, and other community facilities. Our work has delivered real benefits, but it has also revealed important lessons for how to finance retrofits for these underserved borrowers and their tenants. One example of a program that served this dual purpose was the California Preschool Energy Efficiency Program (CPEEP), which provided energy audits and retrofits to 2,065 child care centers serving more than 95,000 children in California. Although this program was grant-based, it demonstrated considerable savings and helped establish an evidence base for future energy efficiency financing.

LIIF is currently focused on solving the puzzle of financing energy retrofits for low-income multifamily rental housing. Most state and federal programs designed for single-family homes are inadequate for this purpose, but the solution is unclear and challenges to incorporating private capital are substantial. For example, loans for individual properties are

1 Special thanks to Kim Latimer-Nelligan and Hannah Blitzer for their invaluable help in developing content for this paper.

2 "Income, Energy Efficiency, and Emissions: The Critical Relationship," Energy Programs Consortium (February 26, 2008).

unattractive to most investors because they are typically small, complex, unsecured, and non-recourse. In addition, ideal moments for retrofits, such as recapitalization, are infrequent, calling for models that work outside these points in time in order to reach scale. Finally, ease of use is difficult to achieve but critical, given that economic incentives for owners are weak. LIIF's approach has been to test multiple promising strategies in the form of pilots, which address these challenges in different ways.

Our expertise and appetite for experimentation has not gone unnoticed. LIIF was the first community development financial institution (CDFI) to become a "Financial Ally" for the President's Better Buildings Challenge when the U.S. Department of Housing and Urban Development (HUD) and the U.S. Department of Energy (DOE) jointly announced in December 2013 that the program would expand from commercial buildings to include multifamily housing. In this role, LIIF has committed to providing innovative financial products to help owners and managers reach ambitious energy reduction goals, as well as to sharing lessons and data with other stakeholders. We are thrilled about this new partnership, and hope that other CDFIs join us in working with leaders in the federal government to advance such an important agenda.

Although LIIF is working hard, making the pieces fit is difficult. Every day, we learn more about what does and does not work–and move closer to identifying the best vehicles for scaling up multifamily energy efficiency. We are joined in this effort by numerous other CDFIs, including Boston Community Capital, Enterprise Community Partners, and Craft 3. This article is a chance to share some of LIIF's successes and challenges to date, and also to describe what we currently see as key lessons from our work and important next steps.

In brief, we believe the two models LIIF is currently helping design and implement could be viable platforms for at-scale multifamily energy retrofit finance–in one case by reducing transaction costs and increasing ease of use, and in the other by setting the stage for portfolio-level transactions. But to leverage the power of these models and others to create functioning markets, the field should prioritize the following areas:

1. ***Better data*** on energy and cost savings are needed to achieve the predictability necessary for underwriting at scale; and
2. ***Smart subsidies*** from government agencies and utility regulators are needed to allow for pooling and leverage, and to encourage flexible and effective use of funds.

BAM Fund

LIIF's first major effort to finance stand-alone energy efficiency retrofits for multifamily properties was the Energy Upgrade California: Bay Area Multifamily Fund (BAM), which launched in 2010 in partnership with the San Francisco Mayor's Office of Housing and Enterprise Community Partners. The $4 million fund provided affordable loans to property owners to finance energy upgrades, and then use savings resulting from new efficiencies to pay debt service.

Administering BAM was challenging on several fronts. Transactions were complex and costly, and relying on energy efficiency savings for repayment restricted loan sizes to such an extent that they could not cover the full scale of properties' retrofit needs. On the other hand, BAM loans were more successful when paired with other subsidies, such as federal weatherization funds and locally administered Community Development Block Grants.

Ease of use for all parties also left much to be desired. For example, energy audits were useful but at times not user-friendly or well integrated into properties' larger capital needs assessments and recommendations. In the end, this confluence of sometimes unforeseen challenges translated to only four properties participating in the fund.

Our experience with BAM revealed a key lesson that has continued to define our green financing efforts: Without the right model, financing multifamily energy efficiency retrofits is just plain difficult, and will remain unattractive to all but the heartiest and most mission-driven lenders. Not being in our nature to give up so easily, the lessons we learned from BAM pushed us to innovate and try new approaches designed to be more user-friendly for owners, less costly and risky for lenders, and more likely to achieve scale. We have fortunately had such an opportunity in two additional pilots that are currently underway.

Energy Performance Contracting Pilot

The Energy Performance Contracting (EPC) pilot is a partnership between LIIF and Stewards of Affordable Housing for the Future (SAHF), a membership organization of sophisticated nonprofit housing developers and owners. Under the pilot, LIIF provides stand-alone, fully amortizing loans to support retrofits in HUD-assisted multifamily properties owned and operated by SAHF members. LIIF originally committed up to $8 million for the effort, with support from Bank of America's national Energy Efficiency Finance Program in the form of low interest, long term capital and a grant. However, the program was recently scaled back to approximately $2 million.

The EPC pilot is innovative for two main reasons. First, it addresses the "split incentive" issue in HUD-assisted properties with rental assistance contracts, where the agency recoups extra cash flow instead of the owner–a rule that has discouraged owners from implementing cost-saving efficiencies and precluded lenders such as LIIF from making loans payable from cash flow generated by energy savings. HUD's cooperation in removing this regulatory obstacle was critical and demonstrated the agency's desire to creatively lower barriers to energy efficiency financing.

Another feature that distinguishes the EPC pilot from the BAM Fund is that an Energy Services Company (ESCO), in this case Johnson Controls, Inc., is providing an energy savings guarantee for each property, which will mitigate risk for LIIF's non-recourse loans. Although the ESCO model has been used for public housing, the EPC pilot is the first time it is being applied to HUD-assisted, privately owned affordable housing at scale.

We have encountered some of the same challenges in navigating complex, stand-alone transactions as we did with the BAM Fund, but the EPC pilot has begun to bear fruit. LIIF

closed its first two loans in first quarter 2014–retrofits of a 204-unit property and a 56-unit property in Rhode Island that are both owned by Preservation of Affordable Housing, Inc. SAHF has identified and screened several other properties for participation in the program later in the year.

Looking forward, the EPC pilot is promising because its structure and early successes have laid the groundwork for potentially scaling up via a Pay for Success financing model, which could allow for larger transactions that could cover multiple properties–avoiding the need to do individual security interests for each one, and making it possible for harder-to-serve smaller properties to be included. In its fiscal year 2014 budget, HUD has requested funding for a Pay for Success demonstration for energy efficiency retrofits of properties with rental assistance contracts. We believe this initiative holds much promise, and we are sure that CDFIs would be willing partners as investors in this model.

On-Bill Repayment Pilot

LIIF's third and earliest-stage experiment in multifamily energy efficiency finance is the Ratepayer Integrated On-bill Payment Program (RIOPP) Pre-development Pilot, a partnership with SAHF, the California Housing Partnership Corporation (CHPC), the MacArthur Foundation, and Capital One. RIOPP differs from BAM and the EPC pilot by incorporating an on-bill repayment (OBR) mechanism, which adds the owner's debt service to his or her monthly utility bill. Although the pilot maintains the basic principle of underwriting retrofits based on energy savings, OBR could be groundbreaking by lowering transaction costs and substantially improving ease of use for all parties–owners, lenders, and utilities. This process innovation could make it possible for smaller properties to undergo retrofits, as well as for owner participation to increase across the board.

As of January 2014, LIIF is planning to invest $1.5 million for a "pre-pilot" of five properties in early 2014 to provide fully amortizing loans to finance energy retrofit costs after borrowers take advantage of various utility company incentives and rebates. We are working closely with CHPC and SAHF to launch this pre-pilot in Southern California Gas Company's (SoCalGas) territory. SoCalGas is one of four investor-owned utilities in the state that the California Public Utilities Commission has mandated to offer OBR for affordable multifamily properties as part of a larger, two-year Energy Efficiency Financing Pilot (the full pilot). The full pilot will offer up to 10 percent ratepayer credit enhancement, subsidies for audits, and an automated billing system to track and collect OBR payments. The full pilot will also be available in all four investor-owned utility territories and will launch later in 2014, covering 5,000 units in properties of 20 units or more across the state. LIIF also hopes to be part of the full pilot.

RIOPP illustrates the important role that states and utility commissions can play in enabling better approaches to multifamily energy retrofit finance–especially with the help of strong advocacy, which CHPC and others have provided in California. Oregon and Illinois have also authorized OBR for multifamily housing, and several others are moving in this direction. Meanwhile, OBR has already proved successful as a tool for financing retrofits of

single-family homes in the Pacific Northwest. As such, the RIOPP model has the potential to scale up not only in California but around the country. If successful, it could become the preferred mechanism to finance large-scale retrofitting of the nation's privately held, multifamily housing portfolio.

Escape Velocity

LIIF and other CDFIs can play a significant role in helping markets for energy retrofits in affordable multifamily housing take off. To deliver on this potential, we must embrace our entrepreneurial roots and take on the work of innovation–first by collaborating with other skilled partners such as SAHF and CHPC to determine what works, and then by leveraging private capital, subsidy, and policy solutions to achieve scale.

The good news is that we are on the right track. Despite some early bumps, LIIF is helping to design and implement pilot strategies that have real market potential–and we are pleased that HUD and DOE want to support this work. Stepping into our new role as a Financial Ally to the President's Better Buildings Challenge couldn't have come at a better time, and we look forward to leveraging this role to not only advance such an important agenda, but to invite other CDFIs to join us as Financial Allies and increase our sector's capacity and engagement in this area.

As we look beyond our own programs and scan the broader multifamily energy efficiency landscape, we see two important priorities for the field. First, we need better data on energy and cost savings in order to build an evidence base and achieve the predictability needed to do any underwriting at scale. We are excited by the Better Building Challenges' focus on data sharing and are heartened by other examples, such as Bank of America's engagement of EnergyScoreCards–a subsidiary of the energy consultant Bright Power, Inc. EnergyScoreCards will collect pre- and post-retrofit data to measure program outcomes in conjunction with providing capital to CDFIs for multifamily energy retrofit lending via its Energy Efficiency Finance Program. As with other areas of community development, demonstrating success is sometimes the hardest thing to do, but it's incredibly important.

Second, we should continue to promote the "smart subsidy" concept with federal and state agencies, as well as with utility commissions. To date, most subsidies directed at energy efficiency have not allowed for pooling or leverage–characteristics that encourage the most flexible and effective use of funds, and which we believe will be central to any strategy with a chance to achieve scale. Government agencies and regulators have been willing partners in enacting crucial policy changes that have enabled the current wave of pilots, but the private sector needs to work with them on crafting the next set of tools and reforms.

LIIF and other CDFIs always return to the mission. If something is worthwhile for advancing opportunities for low-income people and places, how do we make it work? We think we are well on our way to answering that question for multifamily energy efficiency finance, and we hope that the experiences we shared in this article will provide fodder for discussions among those trying to do the same.

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Neighborhood Health: A New Framework for Investing in Sustainable Communities

Maggie Super Church
Consultant to the Conservation Law Foundation

The sustainability movement in the United States has increasingly embraced the environmental benefits of dense, mixed-use walkable communities. However, it has been slower to codify these benefits into formal project review and rating systems for investment. Sustainability advocates have historically focused on building-level performance, with a particular emphasis on energy, water, and waste management. This emphasis on the building as a stand-alone structure, separate from its neighborhood context, reflects both the challenges of neighborhood-scale data gathering and the fragmented nature of neighborhood development in the United States. As a result, individual projects may be high-performing in some respects without actually addressing the larger issues of site and neighborhood design that are so vital to sustainable communities. For example, one of the first Whole Foods stores to achieve Green Globe certification, located in Dedham, Massachusetts, is situated in a strip mall surrounded by parking and major roadways and is virtually unreachable on foot from nearby neighborhoods. Although projects like this certainly outperform their peers in terms of building energy performance and other important attributes, they fail to advance a larger vision for sustainable development that reduces auto dependency and fosters healthy, walkable, and connected communities.

Fortunately, public policymakers and private industry leaders have recently begun to develop a more robust set of tools for measuring sustainability at the neighborhood scale. In 2007, the U.S. Green Building Council launched the pilot version of LEED for Neighborhood Development (LEED-ND), and followed with an updated version in 2009. Created in collaboration with Congress for the New Urbanism and the Natural Resources Defense Council, LEED-ND integrates principles of smart growth, urbanism, and green building into the first national rating system for neighborhood design. The LEED-ND rating system captures a number of characteristics that contribute to sustainable communities at the neighborhood scale, including smart location, housing and jobs proximity, walkable streets, compact development, and transit facilities.

As the sustainability movement continues to evolve toward larger-scale interventions and measurement, it is vital to link sustainable development goals with research and best practices on the social determinants of health. Even modest changes to the built environment, which in turn shape behavior and social circumstance, can drive significant changes in health outcomes. A 2007 *New England Journal of Medicine* article identified behavior, environment and social circumstance as the largest determinants of premature death (together, these account for 60 percent of the effect). In contrast, genetics account for 30 percent, and

health care only 10 percent.[1] These findings are particularly relevant to poor and working-class Americans, who are far more likely to suffer from poor health and have significantly lower life expectancy.

A Framework for Healthy and Sustainable Development

Healthy development, like sustainable development, aims to address the very serious economic, environmental, and community consequences of what, where, and how we build. Record numbers of Americans are now suffering from chronic diseases such as diabetes and asthma that are strongly influenced by environmental conditions, while the cost of health care continues to grow. Between 1980 and 2004, health care costs grew faster than the economy as a whole. As a consequence, health spending now accounts for 16 percent of gross domestic product (GDP) compared with 9 percent in 1980. Direct health care costs for chronic disease, which account for 75 percent of health care spending,[2] are correlated to socio-economic factors, with diabetes and heart disease twice as prevalent among poor adults as among upper-middle-class Americans.[3]

The most significant driver of chronic disease in the United States is obesity. With more than one-third of its adult population obese, the United States faces an issue of epidemic proportions. Current health care costs associated with obesity are estimated at 21 percent of all medical spending in the United States, equivalent to $190 billion in 2005.[4] Researchers have estimated that if current trends continue, obesity-related medical costs could rise by $48 to $66 billion a year in the U.S. by 2030.[5] At the individual level, obesity generates an additional $1,152 in medical expenditures every year for an obese male and $3,613 for an obese female in the United States. The annual cost to workplaces from lost productivity is $3,792 for every obese male worker and $3,037 for every obese female worker.[6]

Fortunately, there is a growing body of research that shows the economic, environmental, and community health benefits of walkable, transit-oriented neighborhoods are closely linked. An April 2013 study in the *American Journal of Public Health* found that increasing median daily walking and bicycling from 4 to 22 minutes reduced the burden of cardiovascular disease and diabetes by 14 percent while also decreasing greenhouse gas emissions by 14 percent. The study further concluded that the increased physical activity associated with active transport could generate a large net improvement in population health.[7] Similarly, a

1 S. Schroeder. "We Can Do Better: Improving the Health of the American People," New England Journal of Medicine, 357 (2007):1221-28.
2 G. Anderson, "Chronic Conditions: Making the Case for Ongoing Care" (Baltimore: Johns Hopkins University, 2004).
3 L. Berkman and I. Kawachi, eds., Social Epidemiology, first ed. (New York: Oxford University Press; 2000).
4 J. Cawley and C. Meyerhoefer, "The Medical Care Costs of Obesity: An Instrumental Variables Approach," Journal of Health Economics. 2012; 31:219-30.
5 Wang CY, McPherson K, Marsh T, Gortmaker S, Brown M, "Health and Economic Burden of the Projected Obesity Trends in the USA and the UK," Lancet. 2011; 378:815-25.
6 "The Heavy Price of Obesity in America: By the Numbers," The Week, May 2, 2012.
7 N. Maizlish et al., American Journal of Public Health, 103 (2013):703–9. doi:10.2105/AJPH.2012.300939

2012 study in the *American Journal of Preventive Medicine* found that the odds of hypertension were 24 percent lower and 31 percent lower among individuals with low and high levels, respectively, of active transportation, compared with no active transportation, and high active transportation was associated with 31 percent lower odds of diabetes. The article concluded that, "active transportation was associated with more-favorable cardiovascular risk factor profiles, providing additional justification for infrastructure and policies that permit and encourage active transportation."[8] Increased daily walking and decreased daily driving can also produce a number of ancillary benefits, including reduced stress, greater neighborhood sociability and improved public safety. Research has demonstrated that transit-oriented neighborhoods have a significantly lower rate of traffic fatalities, and often have lower rates of violent crime because of the greater presence of pedestrians and cyclists whose "eyes on the street" increase overall security.[9]

Recognizing these important connections, the Centers for Disease Control (CDC) published a notice in the April 2013 Federal Register seeking public comment on a "Call to Action on Walking," noting that "Many factors can contribute to low levels of walking and physical inactivity, including lack of access to safe and convenient places to walk, lack of signage and directional information, long distances to destinations, lack of public transportation, and lack of the inclusion of persons with mobility limitations in walking campaigns and programs."[10]

Access to fresh food is another important dimension of healthy and sustainable development. Projects that create new outlets for production, processing, distribution, and sale of healthy food can help to reduce shipping and transport distances, place healthy food options closer to where people live and work, and create local jobs. This is particularly important in lower-income neighborhoods that often lack access to fresh food. A recent nationwide study of over 28,000 ZIP codes found that low-income ZIP codes have 25 percent fewer per capita supermarkets than middle-income ZIP codes.[11] Although there is still more work to be done in understanding the complex relationships between income, obesity, and food access, improved access to healthy food is an important part of addressing health disparities in poor neighborhoods.

Finally, healthy neighborhood development projects located near transit can bring substantial benefits to low- and moderate-income households most sensitive to the combined costs of housing and transportation. The Brookings Institution, for example, notes that, "The combined costs of commuting and housing make up a larger portion of the household

8 G. Furie and M. Desai, "Active Transportation and Cardiovascular Disease Risk Factors in U.S. Adults," American Journal of Preventive Medicine, 43 (2012): 621–28.

9 T. Litman, "Evaluating Public Health Transportation Benefits" (Victoria, BC: Victoria Transport Policy Institute, June 2010), 8-9.

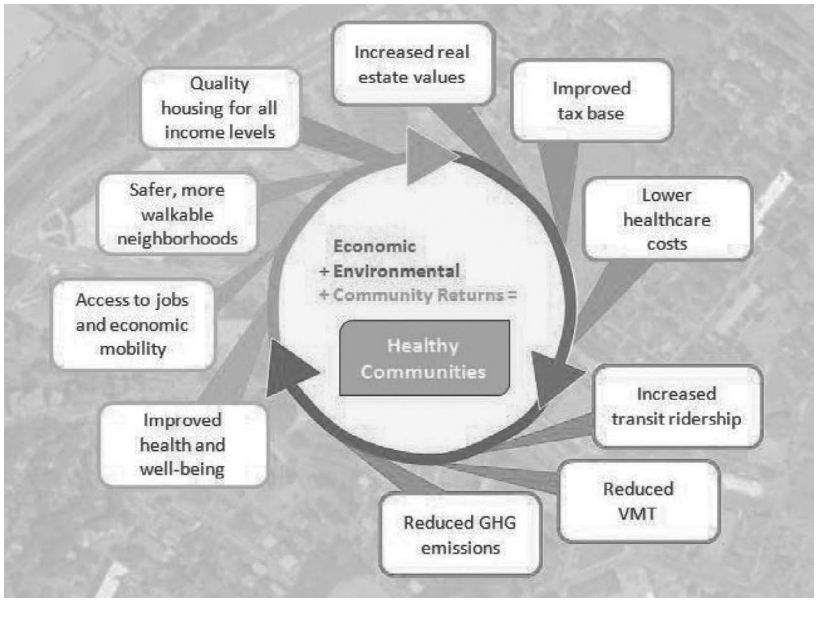
10 "Walking as a Way for Americans to Get the Recommended Amount of Physical Activity for Health," Federal Register, 78 (62) (April 1, 2013), 19491.

11 M. Manon and C. Harries, "Food for Every Child: The Need for more Supermarkets in Massachusetts" (Philadelphia: The Food Trust; December 2010), 3.

budgets of the working poor than other households.... For households in the lowest one-fifth of the income distribution, spending on housing, transportation, and food jumps to 71 cents of every dollar."[12] By locating more affordable housing in job centers and by improving access to transit and healthy food, healthy neighborhood development can be an effective strategy for fighting poverty and supporting economic mobility among low- and moderate-income households.

Financial Challenges and Opportunities for Healthy Neighborhood Development

Despite mounting evidence for the critical role that neighborhood conditions play in determining health outcomes, the resources needed to finance healthy and sustainable neighborhoods (including infrastructure, transportation, affordable housing, commercial and retail space, and community facilities) are becoming increasingly scarce. In fiscal year (FY) 2011 and FY 2012, the U.S. Department of Housing and Urban Development's (HUD) Community Development Block Grant (CDBG) program, one of the primary sources of funding for community capital improvement projects, was cut by 32 percent, and in FY12, HUD's HOME Investment Partnership budget was slashed by 38 percent.[13] This loss of long-standing public funding, alongside a surge in vacant and abandoned properties owing to foreclosure, has had a disproportionate impact on low- and moderate-income neighborhoods across the country. Existing systems and policies are not fully capable of addressing the current crisis.



12 A. Berube , E. Kneebone, R. Puentes, and A. Tomer, "Missed Opportunity: Transit and Jobs in Metropolitan America." (Washington, DC: Brookings Institution, May 2011), 3.

13 "CPD Appropriations Budget," U.S. Department of Housing and Urban Development, accessed February 25, 2014, http://portal.hud.gov/hudportal/HUD?src=/program_offices/comm_planning/communitydevelopment/budget.

Fortunately, the scale and severity of the challenge is generating new interest in innovative, cross-platform solutions that harness the strengths of the health and community development fields to create meaningful, cost-effective, and sustainable change. Linking investments in community development with investments in health has the potential to improve lives while creating new opportunities for socially responsible "triple bottom line" investments that generate financial, social, and environmental returns. For example, the growing interest in social impact bonds (SIBs), in which private entities contract with government agencies to deliver targeted social outcomes (such as a reduction in recidivism) that reduce public expenditures, demonstrates that the public sector is willing to engage the private and nonprofit sectors more deeply in solving complex social problems. In contrast to the health care system's traditional focus on clinical treatment of illness, the Centers for Disease Control and Prevention's Community Transformation Grants Program, authorized under the Affordable Care Act, is designed to prevent death and disability through policy, environmental, programmatic, and infrastructure changes. In the context of this rapidly evolving landscape, there is a tremendous opportunity to pioneer new approaches that create measurable improvements in public health and generate attractive returns for investors. Linking investments in community development with investments in health, especially in low- and moderate-income neighborhoods, has the potential to improve lives, reduce health care expenditures, and build sustainable communities while creating new opportunities for socially responsible investment.

Furthermore, the environmental, community, and health benefits generated by investments in transit-oriented development need not come at the expense of financial returns. In fact, just the opposite is true. A recent study by Chris Leinberger and Mariela Alfonso sponsored by the Brookings Institution found that more walkable neighborhoods, including those that are close to transit, have higher commercial and residential rents, retail revenues, and for-sale housing values than less walkable places.[14] Based on five levels of walkability, ranging from poor to very good, a one-level increase in walkability translates, on average, to 18.5 percent higher residential rents, 21 percent higher retail rents, 27 percent higher office rents, 28 percent higher for-sale home values per square foot, and 80 percent higher retail revenues. Between 2000 and 2007 (pre-recession), places with very good to good walkability had a 23 percent premium per square foot valuation on average. During the recession (2008-2010), that premium nearly doubled to 44.3 percent. The researchers found a consistent relationship between walkability and economic value regardless of median income in the neighborhood.

In addition, the current gap between supply and demand for walkable neighborhoods creates an attractive opportunity for investors to lock in the value of long-term price appreciation in these areas. Acknowledging this opportunity, real estate advisory firms are encouraging their clients to invest in transit-rich locations. For example, the Urban Land Institute's

14 C. Leinberger and M. Alfonso, "Walk This Way: The Economic Promise of Walkable Neighborhoods in Metropolitan Washington, D.C." (Washington, DC: Brookings Institution, Metropolitan Policy Program May 2012), 9-12.

2011 "Best Bets" recommends that investors "favor infill over fringe" and consider buying land, which "will not get any cheaper than it is now."[15] In a May 2012 study, the U.S. Conference Board notes that walkable neighborhoods will lead the recovery of the housing market. According to the study, "house prices in these locations fell by less than the national average between 2006 and 2011, in some cases by much less. The same is true of local employment…. These localities will be the first to recover. We expect house prices here to rise…by up to 5 percent a year between 2014 and 2017."[16]

Alongside increased real estate values, the financial benefits associated with even incremental improvements in public health are substantial. According to an analysis in the *American Journal of Public Health*, as little as a 5 percent reduction in the prevalence of diabetes and hypertension (conditions that are measurably improved by increased exercise and weight) would save almost $25 billion annually in medium-term health care costs.[17] In sum, transit-oriented development projects that create healthy and walkable neighborhoods hold great promise for delivering multiple benefits to investors and the community.

The Role of Private Equity in Building Healthy Communities

New financing tools are urgently required to support the development of transformative mixed-income, mixed-use development on existing sites close to transit, particularly in low and moderate income neighborhoods. In most of these locations, the financing gaps for moderate-income and market-rate housing as well as retail/commercial and industrial space have made these types of projects quite challenging. The markets are not strong enough (or have not yet proved themselves strong enough) to support these uses at scale without some combination of deep subsidies and long-term equity investments. The available subsidies are very limited and highly competitive, and most developers do not have sufficient equity to self-fund projects of this scale. Further compounding this issue, project underwriters have generally been unwilling to finance future unproven value. For example, in larger-scale housing projects, the market rate component of those projects in low- and moderate-income (LMI) neighborhoods is a financial drain on the pro-forma. This is because project costs are relatively high (comparable to any other dense residential project), but the rents that can be underwritten are limited by the rents in the surrounding neighborhood, and typically lenders have believed that equity should bear the risk of achieving rents or sales prices greater than current market. This is a particular challenge for commercial projects, where debt levels are based on the strength of pre-leasing. Over time, real estate values in the neighborhood will grow, but the developer has no way to monetize this long-term growth potential.

Therefore, triple bottom line private equity funds, which provide patient capital from philanthropic and high net worth impact investors, can enable larger-scale projects to move forward that would not otherwise be feasible in a transitional real estate market. These equity funds also leverage as much as 4:1 other sources of public and private financing, including

15 Urban Land Institute, "Emerging Trends in Real Estate" (Washington, DC: Urban Land Institute, 2011), 12.

16 Louise Keely et al., "The Shifting Nature of U.S. Housing Demand" (New York: U.S. Conference Board Demand Institute, May 2012).

17 R. A. Hammond, "Obesity, Prevention, and Health Care Costs." (Washington, DC: Brookings Institution, 2012).

both conventional debt and tax credit equity, and provide greater assurance to other private lenders and public agencies that the projects are worthy of investment.

Healthy Neighborhoods Equity Fund: A New Tool for Healthy Development

Recognizing the complex and interwoven challenges of building healthy, equitable, and sustainable communities, the Conservation Law Foundation and the Massachusetts Housing Investment Corporation have partnered to create an innovative new private equity fund designed to bring new sources of capital to promising transit-oriented development projects that have the potential to drive neighborhood transformation. The Healthy Neighborhoods Fund (HNEF) will invest in high-impact real estate projects in Massachusetts that strengthen community and environmental health, promote regional equity, and provide attractive risk-adjusted returns for investors. The Fund will provide patient capital for catalytic residential, commercial, and mixed-use projects and help leverage other sources of private and public financing. As part of the investment screening process, HNEF will prioritize projects that bring lasting benefits for local residents and help advance a community vision for the future. Recognizing that each community is unique, the Fund will offer unmatched flexibility to support a wide range of project types and uses that support healthy neighborhoods.

HNEF is designed to help address a myriad of health and environmental issues facing the Commonwealth of Massachusetts. Despite Greater Boston's status as a world leader in health services and research, the state has seen an alarming rise in obesity and chronic disease during the past decade. The Massachusetts Department of Public Health attributes an estimated $1.82 billion per year of medical expenses in the Bay State to adult obesity and its correlates. These costs are especially acute in low-income neighborhoods and communities of color. In addition, residents of lower-income neighborhoods often face greater challenges with respect to public safety, which can contribute to elevated stress and depression.

Massachusetts is also facing significant environmental challenges related to greenhouse gas emissions (GHGs). The transportation sector, as the largest single contributor to GHG emissions, represented 38 percent of total emissions in 2009. Of particular concern is the rapid growth in transportation-related emissions in Massachusetts over the past two decades; from 1990 to 2000, these emissions rose by 11 percent, and from 2000 to 2005 they rose an additional 6 percent. Although the growth rate has fallen slightly since 2008, transportation is still the biggest GHG culprit. For these reasons, the future environmental health of the region will be determined in part by the extent to which new development occurs in neighborhoods with access to transit and services that produce fewer vehicle miles traveled.

All of these trends point to the growing importance of walkable, mixed-use, transit-oriented neighborhoods as a centerpiece of any future growth strategy for the state. Fortunately, Massachusetts has a strong network of Community Development Corporations, for-profit developers, a progressive state government, and a well-used transit system that are part of the solution. A consensus is also emerging at the state level regarding the importance of transit-oriented development, as evidenced by significant public investments through Mass-

Works and other financing programs. New private-sector financing tools, alongside public policy and regulatory action, will be necessary to accelerate the development of healthy, walkable communities across the state.

HNEF Goals and Objectives

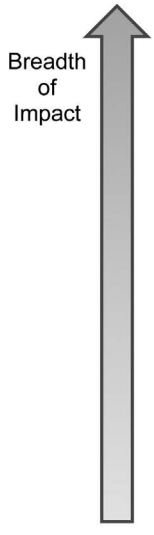
The Conservation Law Foundation and the Massachusetts Housing Investment Corporation are currently working in collaboration with a mix of public, private and philanthropic partners to accomplish the following goals through the HNEF:

> Attract ***new sources of private equity*** (including program-related investments) to support moderately priced and market-rate housing, local job creation, commercial development, and healthy, walkable, mixed-use neighborhoods in a variety of transit-oriented development settings.
>
> Align ***equity investments*** with other sources of funds, including state housing, economic development, and infrastructure dollars, to spur and accelerate the development of high-impact transit-oriented development projects along key transportation corridors.

HNEF will use a quadruple bottom line approach to evaluating projects. The approach includes a consideration of community, environmental, and health impacts in addition to financial returns. In that context, HNEF will seek to invest in neighborhoods that are in the early to mid-stages of transformational change, and where an investment from the HNEF can help spur and accelerate that change. HNEF will prioritize projects that create measurable benefits for residents and employees, the neighborhood, and the region. The fund sponsors will seek to partner with projects that implement a community vision, capitalize on the investments already made by other sources, and demonstrate clear potential to advanced regional equity and reduce health disparities.

Evaluating Impact

The Fund's approach to measuring HNEF's impacts has been shaped in part by our work with the Massachusetts Department of Public Health and the Metropolitan Area Planning Council, with whom we have jointly undertaken a Health Impact Assessment for three sample projects in Roxbury, Massachusetts. As part of the Health Impact Assessment, the Department of Public Health and the Planning Council identified 12 health determinants associated with transit-oriented development as well as health outcomes associated with each of these determinants. These determinants were ranked according to their breadth of impact, as shown in the chart on next page.



Health Determinant	Health Outcomes
Walkability/Active Transport	Physical activity, mental health, chronic disease
Safety from Crime	Injury, physical activity, mental health, real and perceived safety
Economic Opportunity	Economic stability
Food Access	Nutrition, chronic disease
Safety from Traffic	Injury, air quality, real and perceived safety
Affordable Housing	Economic stability
Green Housing	Exposure to environmental contaminants, chronic disease
Green Space	Physical activity, mental health, air quality
Social Cohesion	Mental health
Displacement/ Gentrification	Mental health, economic stability
Air Quality	Air quality
Environmental Contamination	Exposure to environmental contaminants

Using the Health Impact Assessment as a foundation, HNEF will use a standardized screening process for investment that focuses on key characteristics of the neighborhood and the proposed project. The initial screening will focus on the neighborhood in which the project is located to determine whether it meets the baseline criteria for investment. This process may be streamlined over time if multiple projects are located in the same neighborhood. Broadly speaking, HNEF is seeking to invest in neighborhoods that are in the early to middle stages of transformational change, and where an investment from the HNEF can help spark and accelerate that change. The neighborhood screening criteria will include the following:

- Community Support and Growth Potential: The Fund will invest in neighborhoods that are well-positioned for substantial long-term growth. To evaluate this, we will consider the level of community support for new development; the physical form of the existing neighborhood, including density, land use, transportation networks, and connections to adjacent residential and commercial areas; current zoning and permitting requirements; and other existing and planned investments nearby.
- Access to Multi-Modal Transportation: The Fund will make investments in transit-accessible neighborhoods that have the potential to become more walkable and less auto-dependent. In general, the Fund will prioritize projects that are located within a quarter-mile to a half-mile walk of an existing or planned transit station (including subway, commuter rail, and/or high-speed bus service). The Fund will also consider investing in projects outside existing transit corridors that offer substantial opportunities for improved walkability and health.
- Opportunity to Advance Regional Equity: The Fund will make investments in economically disadvantaged neighborhoods, as measured by household income, poverty and unemployment rates, educational attainment, and environmental justice

status. In addition, the Fund will consider investments in more prosperous neighborhoods if the proposed project will strengthen the supply of affordable and/or workforce housing and provide new access to jobs and services for disadvantaged populations.

- Opportunity to Reduce Health Disparities: The Fund will prioritize investments in neighborhoods with significant health disparities that are influenced by the built environment, including obesity, chronic disease, stress and depression. This evaluation will include Behavioral Risk Factor Surveillance Study (BRFSS) data generated by the Mass. Department of Public Health as well as the Boston Public Health Commission (for projects located in the City of Boston).

The project screening criteria reflect our interest in supporting transformative projects that will: i) create dense, mixed-use, walkable neighborhoods that promote active living, increase transit use, and reduce Vehicle Miles Traveled (VMTs); ii) provide new economic opportunities, especially for low and moderate-income residents; iii) contribute to quality housing for all income levels; iv) increase access to fresh and healthy food; v) create a healthy and safe environment. Based on these considerations, we have identified the following factors that will be considered as part of the project review and rating process:

1. Increase in overall walkability for the site and surrounding neighborhood;
2. Increase in the number of new people living and/or working within ½ mile of transit;
3. Increase in economic opportunity through new job creation and access to regional job centers;
4. Increase in the quality and diversity of the housing stock;
5. Increase in access to fresh and healthy food;
6. Increase in access to green space and recreational facilities;
7. Use of Crime Prevention Through Environmental Design (CPTED) strategies;
8. Use of design and construction techniques that promote indoor air quality;
9. Use of design and construction techniques that promote energy efficiency, minimize waste, and contribute to cleaner air, land and water;
10. Potential to catalyze additional private and public investment.

In addition to measuring the impact of specific projects, a long-term goal is to expand our understanding of the relationship between health and the built environment. Toward this end, we hope that knowledge and insights gained through Fund activities will have a broader influence on health and community development investment decisions. At the same time, we recognize that Fund sponsors alone cannot sustain the level of research and documentation needed to yield significant new findings. We are therefore exploring the opportunity to develop a longitudinal research program that will operate alongside the Fund. Although

there is more work to be done in developing the research proposal, we anticipate that the research effort will track neighborhood changes across multiple domains over 8–12 years, consistent with the timeframe for equity returns to investors in the Fund. These domains include economic, social and behavioral, environmental, and health outcome indicators. Taken together, these indicators can help to predict and track neighborhood change over time and may provide important new insights about the connections between the built environment and health.

HNEF Pipeline and Impact

HNEF is currently building a pipeline of potential projects for investment that will build on plans for expanded transit access in greater Boston during the next decade, including the Fairmount Line, Orange Line, and Green Line. The Fund will also invest in Gateway cities and suburban centers outside of Boston that are supported by regional commuter rail and bus service. In all of these locations, multiple sites are awaiting construction or renovation for a mix of uses that will provide new opportunities for healthy and sustainable development. A recent analysis by the Metropolitan Area Planning Council found that transit-oriented neighborhoods in greater Boston have the potential to accommodate 76,000 new housing units and 133,000 new jobs during the next 25 years.[18] Targeted investment in these locations can help to unlock the social and economic potential of these communities while improving health outcomes for thousands of people who live and work in Massachusetts. This leading-edge approach may also generate downstream benefits for similar projects and funds across the country.

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18 T. Reardon and M. A. Dutta, "Context-Based Station Area Typology and Transit Oriented Development Goals for Metro Boston" (Boston: Metropolitan Area Planning Council, March 2012).

Bringing Down Green Financing Costs: How a State-sponsored Bank Might be the Key

Richard L. Kauffman

Chairman of Energy and Finance for New York, Office of the Governor

The costs of clean energy solutions are falling. As one example, solar panel prices are down more than 50 percent in the last three years.[1] Costs of batteries, wind turbines, and fuel cells have also declined. As promising as that is, soft costs–installation, permitting, and financing–now account for nearly two-thirds of the cost of a residential solar system, and they have not declined. There is little hope of providing clean energy solutions at scale until the soft costs are brought under control. One promising innovation is a state-sponsored "green bank" to lower finance costs for the deployment of clean energy.

Despite nearly record low interest rates, financing costs for the clean energy sector remain high–not for the largest, utility scale projects–but for smaller projects, including small business and residential. Because the ongoing costs of clean energy are very low, given that wind and sunlight are free, the solution to reducing clean energy costs is reducing the upfront costs. And costs are costs–whether they are hardware costs or financing costs. The key reason of why financing costs are high for clean energy is that the industry is financed in an old-fashioned, anachronistic way. The energy technology deployed may be 21st century, but the financing structures used are out of date.

Three market gaps or failures in the clean energy financing market keep it from modernizing.

First, there is an overreliance on tax equity. Because many projects are financed on a nonrecourse project finance basis by entities that do not have large taxable incomes, the industry relies on a small number of tax equity partners that, despite the term "equity," offer debt-like financing in exchange for tax benefits. Today, there are fewer than 20 active providers of tax equity.[2] The limited number of providers means that tax equity is not only expensive, but also that it is primarily rationed to the largest projects and developers. The

1 Rocky Mountain Institute, "As Solar PV Efficiency Climbs, Costs Likely To Drop," May 14, 2013, available at http://blog.rmi.org/blog_2013_5_14_As_Solar_PV_Efficiency_Climbs_Costs_Likely_To_Drop.

2 There is a disconnect between the tax equity market for Low Income Tax Credits and renewable energy tax credits. Although part of the disconnect relates to the size and maturity of markets—and risks associated with project financing structures found in renewable energy—a major part of the difference stems from the benefits lenders obtain through Community Reinvestment Act (CRA) investments in housing credits. Except where renewable energy projects are located in low- and moderate-income areas and offer significant employment opportunities, renewable energy projects are not eligible for CRA benefits.

other problem is that the deals are typically structured so that the bulk of the cash flow from projects over the first few years goes to repay the tax equity provider. Although investors everywhere are looking for current yield investment opportunities of all kinds–after all, the choice is between low interest rates and a volatile stock market–the current tax equity structure makes it difficult to tap general investor demand for current yield opportunities because renewable energy projects offer little current yield.

Second, bank capital rules and insurance company regulations restrict lending. After the financial crisis, it is understandable that banks and insurance companies are more prudent. In practice, the amount of capital that banks must reserve against smaller loans, those that are barely investment grade or below, or long tenor loans means that smaller renewable energy projects simply cannot get loans from large financial institutions at any cost. This is one of the reasons there are few solar installations on the many flat warehouse and factory rooftops near airports. To be clear, these constraints are not loans to finance the manufacturing of renewable energy equipment; these are loans to renewable energy projects using proven technology.

Third, clean energy financing markets make little use of stock or bond markets. In most sectors of the U.S. economy, companies use stock and bond markets to raise billions of dollars of capital. Stock and bond markets typically offer cheaper and deeper pools of capital than private markets. Not so in the clean energy sector, with the exception of bonds for the largest of projects. Stock market investors can buy shares in Real Estate Investment Trusts (REITs) or Master Limited Partnerships (MLPs) that have yield characteristics of renewable energy projects; however, MLPs or REITs are not available for renewable energy assets. Further, to create renewable energy bonds for clean energy markets will require standardization of contracts that does not exist yet in order to aggregate small loans into larger bonds and sufficient data to allow bond ratings.

What Do These Market Failures Mean?

With continued reliance on tax equity, limitations on availability of bank debt, and little use of stock and bond markets, the United States clean energy industry relies too much on private capital compared to other countries that are able to take advantage of their competitive capital markets. Simply put, costs of financing remain too high here in the United States. In addition, customer choice is also limited. Consider getting a new car: you can buy it using cash or borrowed money or you can lease it. The same is true for most large capital expenditures. The solar lease has revolutionized the residential solar market; given that energy is an ongoing operating expense, it is not surprising that customers would want to substitute one operating expense–their electric bill–for another–the lease payment. Unfortunately, in the clean energy space, the solar lease is the exception rather than the rule. If a customer wants a solar hot water system, an energy efficiency upgrade or a ground source heat pump, more likely than not, he or she would need a home mortgage or pay cash.

State Governments Respond to the Challenge

These market gaps justify government involvement. Absent federal action, several states have established or announced the formation of state green banks. In his State of the State address in January 2013, Governor Andrew M. Cuomo announced that New York will create a $1 billion green bank to help address some of these failures in clean energy finance. The NY Green Bank strategy has several operating principles:

1. It will provide credit support to clean energy generation and energy efficiency projects. Until it can earn a meaningful surplus, it will not offer loans to manufacturers.
2. It will work where government activity can catalyze private market activity, which is what the Department of Energy's loan program did so successfully. Government loans to large solar projects led the way so that subsequently, private-sector banks could lend to other projects without government involvement.
3. It will find intermediaries in the market–project developers, service companies, or private-sector financial institutions–whose progress is constrained by the lack of availability in financing more than cost. It will not use artificially low-cost financing as the sole means of generating demand. Examples of activities the green bank–in conjunction with private-sector intermediaries–intends to support include loans to smaller clean energy projects such as commercial and industrial solar projects, which could be standardized, aggregated, and sold to the capital markets and credit enhancement for energy efficiency loans, where data on project energy performance and/or customer credit performance is immature. Through risk sharing, a green bank can help a private bank lend more than it would otherwise feel comfortable doing on its own. The same logic can be applied to partnerships with insurance companies that are considering insurance products to help in financing clean energy projects. Offering financing to equipment providers that want to provide new clean energy products to customers through a leasing structure or vendor financing and smaller scale combined heat and power units that use natural gas are other opportunities for green banks.
4. It will not be in the direct lending business itself. New York's green bank will work in partnership with private-sector finance institutions to offer financing both to leverage private sector capital, and to benefit from the origination and underwriting capabilities of the banks.
5. It will facilitate development of bond markets. In exchange for providing financing, the green bank intends to help standardize contracts and can provide warehouse facilities to act as an aggregator of smaller loans. In addition, the bank can help collect data to help rating agencies. Through credit enhancement, perhaps in conjunction with an insurance company, the green bank could also help clean energy bonds achieve investment grade ratings, thereby further lowering the cost of capital.

By focusing on gaps in the financing value chain rather than strictly on the costs of financing, the green bank will not be in the subsidy business per se. Instead, it will operate at the near frontier, where financial institutions are not active, and use its resources to reduce

risk for the private sector. Once the market sees that specific opportunities are attractive, the green bank can step out of the way, leaving the private-sector to take over and the green bank to move on to the next frontier.

Conclusion

State green banks can help solve clean energy financing gaps. After all, it makes sense for states to play a role in clean energy finance: projects are local, building codes are local, and a substantial part of utility regulation is done at the state level. However, although states can address some of the financing gaps, they cannot address them all. Federal leadership is needed.

An outline is emerging of how federal government policy might address the remaining market gaps. First, only the federal government can solve the industry's reliance on tax incentives. Permitting transferability of tax benefits would reduce the overreliance on tax equity and remove a barrier to tapping investor demand for current yield instruments. Because the current structure increases financing costs, it increases the industry's need for government support. Second, green banks can do little to help create stock-market instruments for clean energy projects: only federal policy can do so. Giving MLP or REIT status to renewable energy would level the playing field. And to be clear, the benefit in the cost of capital is less about the tax benefits of MLPs and REITs and more about the lowers costs of equity in the stock market than in private equity markets. Expanding eligibility to renewable projects on a revenue-neutral basis would barely change the cost of capital for those incumbent industries that currently enjoy MLP or REIT benefits. Third, although state green banks can help accelerate the creation of debt markets, it would be better for the federal government to help standardize contracts and collect data rather than have 50 states work on the problem independently. Fourth, the federal government could help capitalize state green banks. New York has identified likely funding sources for its bank, but other states may not have such resources. Given that state green banks can focus on market gaps and therefore earn a rate of return, the federal government could be repaid for its support. Eximbank and the Overseas Private Investment Corporation (OPIC) show that the federal government can offer guarantee programs that offer low cost financing and can earn a surplus from guarantee fees.[3]

None of these steps require a major new federal commitment to industry subsidies. Rather, they involve repurposing existing programs, expanding others on a revenue-neutral basis, or providing financial support on which the government can earn a rate of return. Together with state initiatives, these proposed federal actions would lower costs of clean energy financing by leveraging private-sector capital and accelerating the transition to using stock and bond markets. Leaders in the clean energy industry look forward to the end of

3 For more information on Eximbank's "Working Capital" program, please visit: http://www.exim.gov/products/workingcapital/index.cfm. For more information on OPIC's financial products, please visit: http://www.opic.gov/what-we-offer/financial-products.

subsidies and the arrival of cost parity because at that point the industry faces nearly unlimited demand for its products. The quickest way for the industry to achieve cost parity is through economies of scale, and lowering financing costs is one of the most cost-effective ways to accomplish this objective.

Richard Kauffman joined the administration of New York State Governor Andrew M. Cuomo in February 2013 as the chairman of energy and finance for New York. In June 2013 he was also confirmed as chairman of the New York State Energy Research and Development Authority (NYSERDA). His mission is to develop and implement a strategic plan to scale up clean energy, enhance New York's competitiveness for clean energy businesses, and make the state's energy systems more resilient and reliable. Prior to his current appointment, Mr. Kauffman served as senior advisor to Secretary Steven Chu at the U.S. Department of Energy. In his private sector career, he was CEO of Good Energies, Inc., a leading investor in renewable energy and energy efficiency technologies, a partner of Goldman Sachs where he chaired the Global Financing Group, and vice chairman of Morgan Stanley's Institutional Securities Business and co-head of its Banking Department.

Understanding the True Benefits of Both Energy Efficiency and Job Creation*

Casey J. Bell

The American Council for an Energy-Efficient Economy (ACEEE)

In recent years, the U.S. economy has struggled to create and sustain job growth. Despite the technical end of the "Great Recession" in 2009, recovery has been slow and unemployment remains high. In the face of continued high unemployment, policymakers continue to seek lasting solutions that will reenergize the American workforce and create permanent job opportunities.

Investments in energy efficiency spark opportunities for employment that draw on skill-sets that are prevalent in the United States. Moreover, evidence suggests that as companies' investments in energy efficiency improve their bottom line, their competitiveness increases, which can help bring jobs back to American soil.[1] Furthermore, cost savings from energy efficiency can eventually translate into additional productive spending, creating economic development opportunities and increasing job creation.

However, the means through which investment in energy efficiency stimulates net job creation are complex and often misunderstood. Discrepancies between approaches to modeling job creation and measuring it after implementation can lead to conflicting ideas about the effectiveness and value of energy efficiency programs. Thus, in order to increase and maintain support for energy efficiency policies and programs, it is important to flesh out the underlying economic argument and assumptions that drive preliminary analyses. Such efforts can also help us to set appropriate goals and realistic expectations for program implementation and job creation measures.

Net Jobs or Gross Jobs?

Models that explore the potential impact of policies and programs on job creation (e.g. input-output and computable general equilibrium models) are often based on shared accounting matrices that represent how industries within the economy trade goods and services with one another. These matrices are typically based on data from the Bureau of Labor Statistics, the Bureau of Economic Analysis, and other sources.[2]

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* Portions of this article are excerpted from Energy Efficiency Job Creation: Real World experiences, an ACEEE white paper, and related blogs and fact sheets. The article, as a whole is original and has not been previously published and is not in the public domain. For more information on this topic, visit the website at www.aceee.org.

1 H. Sirkin, M. Zinser, and D. Honer, Made in America, Again: Why Manufacturing Will Return to the U.S. (Chicago: Boston Consulting Group, 2011).

2 Minnesota Implan Group, Using IMPLAN V3. (Hudson, WI: MIG, 2011).

Analysts apply a series of manipulations to these matrices to derive multipliers that represent how many jobs (or how much economic activity) are created per $1 million invested in each sector of the economy. In other words, any investment in any industry in the economy will result in some level of job creation. However, one should be wary of those who choose to report on gross job creation (see Table 1) without assessing impacts relative to the "business as usual" case. This approach ultimately inflates the estimates by neglecting to provide context. For example, a coal-fired power plant may support 100 jobs. However, if those expenditures into energy production and distribution were redirected to more labor-intensive energy efficiency investments, the economy might be able to support 170 jobs. In this scenario, it is misleading to claim that the power plant creates 100 jobs.[3]

Table 1. Common Terms Used in Jobs Analysis

Job	A metric that is equivalent to the resources required to employ 1 person for 12 months (or 2 people for 6 months each, or 3 people for 4 months each. Can be full- or part-time.
Gross Jobs	The total number of jobs supported by an industry and its supply chain.
Net Jobs	The number of jobs supported by an industry and its supply chain beyond a "business as usual" reference case.
Direct Jobs	Jobs generated directly from a change in spending patterns resulting from an expenditure or effort.
Indirect Jobs	Jobs generated in the supply chain and supporting industries of an industry that is directly impacted by an expenditure or effort.
Induced Jobs	Jobs generated by the re-spending of received income resulting from direct and indirect job creation.
Labor Intensity	The proportion of labor capital required to produce goods and services.

Source: MIG 2011 and ACEEE 2011

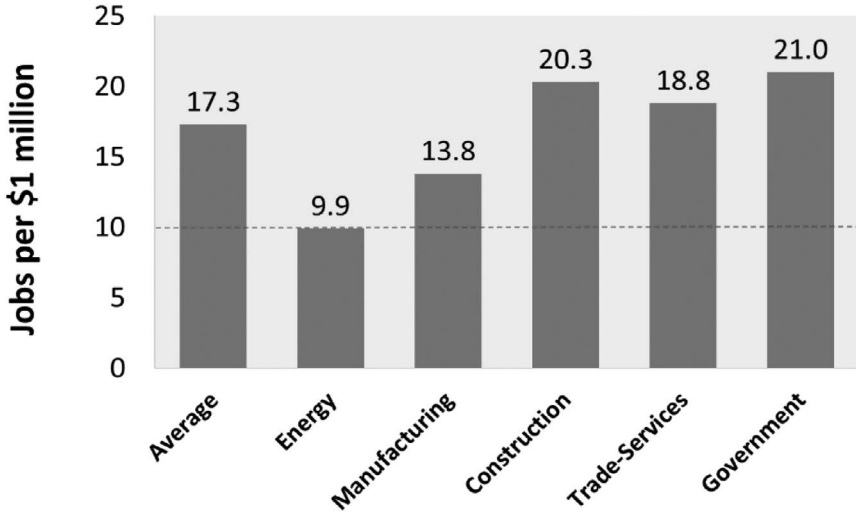
Instead, a more accurate analysis would report on net job creation (or loss). Net jobs (see Table 1) are created only when the employment created by an investment extends beyond the "business as usual" scenario–in other words, the number of jobs that would have been supported on average across all sectors of the economy by that same investment amount.[4]

Figure 1 extracts multipliers for labor intensities (see Table 1) across various industries from the IMPLAN shared accounting matrix. We can compare these labor intensities to form a compelling narrative about how investments in energy efficiency, and the energy savings resulting from these investments, create and sustain jobs.

3 ACEEE, "How Does Energy Efficiency Create Jobs?" (Washington, DC: American Council for an Energy-Efficient Economy, 2011).

4 Ibid.

Figure 1. Jobs per Million Dollars of Revenue by Key Sectors of the US Economy



Source: MIG 2011 and ACEEE 2011

Two Links between Energy Efficiency and Job Creation

Investments in energy efficiency shift spending patterns within an economy in two ways, both of which stimulate a net increase in employment. First, an expenditure or effort such as a building owner's investment in energy efficiency upgrades or an infrastructure investment stimulates the creation of jobs as the project is carried out, and, second, the dollars saved from lower energy bills are re-spent in the broader economy.[5]

> I described this phenomenon in an earlier ACEEE white paper:
>
> Both the initial investment and the re-spending of energy savings produce direct, indirect, and induced jobs. Direct jobs are jobs that are supported directly through a shift in spending patterns resulting from an expenditure or effort. Indirect jobs are generated in the supply chain and supporting industries of an industry that is directly affected by an expenditure or effort. Induced jobs are generated by the re-spending of income resulting from newly created direct and indirect jobs.
>
> Generally, an initial investment in energy efficiency drives direct, indirect, and induced jobs in labor-intensive industries such as construction, engineering, maintenance, and contracting. Direct jobs are created as workers are deployed to develop and install the efficiency measures. Indirect jobs are subsequently created in the supply chain in facilities such as lumber yards and with manufacturers such as plumbing suppliers.

5 C. Bell, Energy Efficiency Job Creation: Real World Experiences. (Washington, DC: American Council for an Energy-Efficient Economy, 2012).

Then, as newly employed workers spend their earnings, induced jobs are created in a wide variety of service and retail industries throughout the economy.

The second round of job creation occurs as individuals and businesses re-spend the money that they saved through lower energy bills, and this wave of job creation reverberates throughout the economy over the long-term. In fact, this is where the bulk of energy efficiency job creation resides. Dollars once spent on energy bills are put back into the general economy (which is, on average, more labor intensive than energy production and distribution), and ongoing job creation is stimulated. The recognition of energy savings, in the form of lower energy bills, causes consumers and businesses to redirect their prior spending into other activities to support higher levels of employment in the form of direct, indirect, and induced jobs.

For example, a factory that recognizes significant energy savings from a retrofit of its facilities may be able to support (or maintain) direct jobs as a result of increased competitiveness. Depending on the demand for goods and services from the beneficiary, factory suppliers may also see a small but net positive increase in employment. And, as with the first mechanism, induced jobs are generated as new workers spend their earnings in the surrounding economy.[6]

As a simplified numerical example of the two ways in which energy efficiency stimulates job creation, we will consider an energy efficiency upgrade where the initial expenditures for an energy efficiency project will rely heavily on the labor-intensive construction industry. According to Figure 1, "construction" supports approximately 20.3 jobs per $1 million dollar investment. This industry is more labor intensive than the economy on average, which is labeled "average" above. The economy on average supports 17.3 jobs per $1 million. So the initial investment shifts spending from the economy on average (17.3) into the construction industry (20.3) to create approximately 3 jobs per $1 million.[7]

In addition, energy savings will shift spending away from energy production and distribution, which is labeled "energy" in Figure 1. Energy production and distribution, in this example supports 9.9 jobs per $1 million. Energy savings shift spending back into the economy on average, or "average" (17.3) to create approximately 7 jobs. Let's say the initial investment produces energy savings for 20 years. These 7 jobs are supported each year for 20 years.[8]

Real World Examples of Energy Efficiency Job Creation

In an earlier article and ACEEE blog post, I profiled six examples of real world experiences in energy efficiency job creation.[9] These "vignettes" illustrate examples of job

6 Ibid.

7 ACEEE, "How Does Energy Efficiency Create Jobs?" (Washington, DC: American Council for an Energy-Efficient Economy, 2011).

8 Ibid.

9 C. Bell, Energy Efficiency Job Creation: Real World Experiences. (Washington, DC: American Council for an Energy-Efficient Economy, 2012).

creation resulting from energy efficiency by profiling programs, policies, investments, partnerships, and business models that have spurred regional increases in employment. These examples serve as valuable examples of the types of jobs created through energy efficiency, however it should be noted that all numbers are self-reported by the subjects. Highlights from the report include the following:

OPower: Opower is a software provider that partners with utilities to develop feedback reports on home energy performance. Opower today employs more than 400 software engineers, programmers, and sales and marketing experts.[10]

New York City Greener, Greater Buildings Plan: The New York Greener, Greater Buildings Plan was enacted in 2009. Four local laws require, among other actions, annual benchmarking of building energy performance and retro-commissioning. A number of firms have employed energy analysts to help meet compliance and the subsequent demand for interpreting benchmarking metrics and applying the information to investment decisions.[11] New York City estimates that the laws will generate $700 million in savings and support roughly 17,800 construction jobs over 10 years.[12] These reported numbers are likely gross effects, but the employment returns to efficiency should be sufficient to promote net job creation.

Nissan North America: In 2006, in the aftermath of Hurricane Katrina and amid rising natural gas prices, Nissan decided to prioritize investments in energy efficiency and establish a rigorous energy-management program to control manufacturing costs and become more competitive. By improving the cost-effectiveness of the production process, Nissan is now more competitive, creating and retaining jobs on U.S. soil.[13]

Ohio Low-Income Weatherization: With support from the American Recovery and Reinvestment Act (ARRA), the Corporation for Ohio Appalachian Development (COAD) weatherized 9,000 homes and expanded its workforce by 400 people and catalyzed a total of 188 indirect and induced jobs in Ohio. They are now working to sustain program funding without ARRA. COAD estimates that at full funding, given current demand, the program could support approximately 1,600 jobs during the next 20 years.[14]

Johnson Controls, Wisconsin Energy Initiative: In 1992, Johnson Controls worked with the State of Wisconsin to implement energy conservation lighting projects, and expanded their efforts in 1998 to include additional efficiency measures. The total

10 (Opower 2014), available at http://opower.com/company.

11 Personal communication with E. Brabon, Steven Winters & Associates, June 26, 2012.

12 A. Burr, Energy Disclosure and the New Frontier for American Jobs. (Washington, DC: Institute for Market Transformation, 2012).

13 U.S. Department of Energy, Nissan Showcases the Results of an Energy-wise Corporate Culture. (Washington, DC: DOE, 2012).

14 Personal communication with T. Calhoun, Corporation for Ohio Appalachian Development, Sept. 14, 2012.

effort created 1,500 annual jobs for more than 50 private-sector companies employing architects, engineers, electricians, and maintenance workers.[15]

General Electric, Appliance Park: Appliance Park in Louisville, Kentucky, is the headquarters for General Electric Appliances, which manufactures more than 750 ENERGY STAR-qualified lighting and appliance products. Appliance Park made headlines in October 2010 when it announced that it would invest $800 million to upgrade the facilities in order to begin manufacturing new products at the Louisville campus, including a dishwasher production line being moved to Louisville from Mexico. A 2010 Tripp Umbach study commissioned by GE shows that the Appliance Park directly and indirectly generates $1.6 billion in the state from local purchasing and other mechanisms, and supports over 12,000 jobs in the state. For every job at Appliance Park, which employs more than 5,000 full-time employees, an additional 1.5 jobs are indirectly supported through vendor purchases or are induced through the re-spending of a GE employee's wages.[16]

Discrepancies between Modeling Predictions and Verifying Real World Experiences

Fiscal responsibility is an important priority, and energy efficiency is a cost-effective policy intervention that can provide economic development benefits in addition to energy savings and environmental impacts. However, verification of job creation, can pose a challenge. While ACEEE is in the process of establishing a generally accepted method for verifying job creation from energy efficiency investments, to date there is no standard approach.

Programs typically use either a modelling tool such as input-output model to estimate the job impacts or a headcount to show evidence of job creation. Both approaches have shortcomings. Input-output models were not developed for ex-post analyses, but are appropriately used as predictive tools. They also do not provide concrete evidence of job creation, and given their reliance on assumptions, they are vulnerable to skepticism.

Headcounts do provide verification of jobs created, but it is challenging for them to convey the full range of direct, indirect and induced job creation. In addition, program managers may struggle to gather accurate employment information from contractors. It is also challenging to assess how many of the new jobs that they report are directly attributable to the energy efficiency program.

Additional challenges arise when programs try to compare predictive modeling results with results from headcounts. As Table 1 specifies, jobs in these models are measured in terms of job-years or, in some cases, full time equivalency. Therefore, a job is a metric that represents the amount of resources required to employ one person for forty hours per week for a full year (or two people for six months each, or three people for four months each). The

15 Johnson Controls, Inc., Case Study: Wisconsin Energy Initiative. (Madison, WI: Johnson Controls, 2008).

16 General Electric, "GE Unveils French Door Refrigerator Factory in Louisville's Appliance Park." Press Release. Louisville, KY: GE, 2012).

metric of a job can be composed of full- or part-time employment.[17] Programs often include additional parameters around the metric such as only counting full-time employees, positions that pay a living wage, or individuals that have been on the job for a full year. These additional parameters cause discrepancies. For example, if a program measures an individual with 2,080 hours at the time of analysis as one job and a particular position has been occupied by two different individuals over the course of the year because of turnover, the results of the model and the headcount will not match.

When verifying indirect and induced jobs there is even more gray area. Degrees of separation from initial program spending make it more difficult to account for the job creation activity that is directly attributable to the energy efficiency program or investment. Furthermore, it may be particularly challenging to provide concrete evidence of net job creation, as it could be challenging to measure and verify jobs that were not created and maintained in other industries.

These observations are not assertions that we should avoid evaluating the performance of these programs and investments as job creators, but merely that it is important to set realistic standards and expectations for verifying for the job creation impacts.

Clean Energy Works Oregon (CEWO) is an example of a potentially acceptable approach. Clean Energy Works Oregon (CEWO) is a nonprofit program that provides turnkey solutions for residential retrofits. They connect customers with contractors to provide energy audits and perform upgrades and also offer a utility on-bill financing product.[18] CEWO hired a workforce specialist to construct and maintain a detailed database of contractor employment data. Contractors associated with CEWO report information about their employees for every project, and the workforce specialist uses the information (including hours worked, project costs, and job classifications) to determine the job creation that is attributable to the program. The workforce development specialist can use this information to provide additional estimation of other job impacts in the local economy.[19]

Conclusion

The impact of investments in energy efficiency extends well beyond environmental benefits and energy bill savings. These investments create employment opportunities for American workers and are helping them to support their families and communities. The underlying argument that lays out the job creation potential of energy efficiency is structurally effective and sound, but it can be difficult to verify in the real world.

17 Minnesota Implan Group, Using IMPlAN.

18 A recent ACEEE report describes on-bill financing in these terms: Property Assessed Clean Energy (PACE) enables municipal governments to offer a bond to investors, and subsequently to loan the money to consumers and businesses for energy efficiency improvements. The loans are repaid through an annual assessment on the borrower's property tax bill. The concept originated in Berkeley, California in 2008 and has since been adopted by 31 states and the District of Columbia (PACENow 2014), PACE legislation overcomes several recognized barriers to the adoption of energy efficiency: high first costs, high transaction costs involved in identifying and financing projects, and payback times that often exceed expected occupancy. S. Vaidyanathan, et al. Overcoming Market Barriers and Using Market. Forces to Advance Energy Efficiency. Washington, DC: ACEEE, 2013)

19 Green for All, Job Projection and Tracking Guide. (Oakland, CA: Green for All, 2013).

In an effort to ensure that energy-saving, cost-saving, and job-creating energy efficiency programs are supported in the future, we are working to establish generally accepted practices for verifying program results. We hope that these efforts will further ensure that the costs of program administration yield net benefits to their respective communities and further justify energy efficiency investments that help reduce energy costs, environmental benefits, and build a more robust economy.

Casey J. Bell joined the American Council for an Energy-Efficient Economy in 2011. She performs macroeconomic modeling of the impacts of energy efficiency policy and programs, and has worked to document and articulate the underlying economic mechanics behind how energy efficiency supports job creation. She also leads the organization's finance policy research identifying best practice polices and market mechanisms that can be used to finance energy efficiency in the residential, commercial, manufacturing, and nonprofit sectors. Prior to joining ACEEE, Casey worked as a consumer behavior researcher in the Division of Consumer and Community Affairs at the Federal Reserve Board of Governors. She also previously worked as an analyst in the Division of Reserve Bank Operations providing project oversight for Reserve Bank Fiscal Agency activities.

Can Cities Lead the Way in Innovative Energy Retrofits for Single-Family Homes?

Dorian Dale
Suffolk County, NY
Will Schweiger
Long Island Green Homes

The American Recovery and Reinvestment Act of 2009 pointed to an era of expanded energy efficiency, one that, as the well-known McKinsey's carbon abatement curve posits, would in effect be self-financing.[1] The "Recovery through Retrofit Report" from the Vice President's office in late 2009 detailed a distinct financing mechanism, Property Assessed Clean Energy (PACE), which would "enable the costs for energy efficiency retrofits to be added to an owner's property tax bill… which takes the same priority as traditional property tax liens and assessments."[2] *The Harvard Business Review* would round out the year by identifying PACE as one of 10 "Breakthrough Ideas for 2010."[3] The future looked exceedingly energy efficient. However, behind the promise lurked several issues.

Is It Possible to Use Large Building Retrofit Approaches to Meet the Needs of Scattered Single-Family Homes?

In 2008, an "energy service company" (ESCO) was upgrading the town of Babylon, New York's, buildings.[4] The ESCO model secured financing and guaranteed that savings realized on energy use would cover the capital cost. Given that residential housing composed 38 percent of Babylon's carbon footprint, the town supervisor asked the company if the town could apply that model to its 65,000 homes. Because the business model for ESCOs was to retrofit a confined number of public sector buildings, the prospect of retrofitting so many scattered single-family homes was daunting. The company respectfully declined.

The challenge then was to devise a scaled-down version of the ESCO model with a delivery system tailored for homeowner demands. A promising source of funding was a waste district reserve that the town maintains for its energy-from-waste facility. The town expanded the definition of solid waste in July 2008 to include "the carbon component (or 'content

1 H.C. Granade et al., "Unlocking Energy Efficiency in the U.S. Economy" (McKinsey Global Energy and Materials, July 2009).

2 Joseph Biden, "Recovery through Retrofit Report." (Washington, DC: Middle Class Task Force, October19, 2009), available at http://www.whitehouse.gov/photos-and-video/video/vice-president-biden-releases-recovery-through-retrofit-report?page=14.

3 "Breakthrough Ideas for 2010," Harvard Business Review, vol. 88 (Jan/Feb, 2010): 50-51.

4 An ESCO, or energy services company, installs energy savings measures that pay for themselves. ESCOs have primarily served the so-called MUSH (municipal, university, school, hospital) sector for more than 30 years.

of') in energy waste"[5] (often cited in evaluations of a carbon tax).[6] Because Babylon had this source of funds, it did not need to levy a new tax or sell bonds. Complete upfront financing would be offered to homeowners through a revolving fund into which participants would repay the principal plus 3 percent interest, which compared favorably to what the town was earning with the same money in an investment account.[7] Babylon named this residential energy efficiency pilot Long Island Green Homes (LIGH), anticipating expansion to regional townships.

Given that the power authority declined to provide an on-bill financing mechanism (despite having signed on to the principle[8]), Babylon opted for a dedicated monthly charge via an existing solid-waste billing platform. This was linked to a benefit assessment, as is the case for waste collection and infrastructure enhancements such as sewer installation.[9] A benefit assessment can be assigned when a municipality provides a specific improvement on a parcel of property for a public purpose, assessing the cost of the benefit against the property. [10] Should the property owner fail to fulfill their obligation, it is assigned to the property tax. The property tax is first on the lien list, ahead of the mortgage and substantially senior to utility bills.

Soon after LIGH launched in late summer of 2008 as the first operational residential PACE program in the country, Boston-based investors focusing on the energy sector visited Babylon and were impressed with the municipal delivery model. Investor confidence was further enhanced by the affirmation of newly passed Babylon town law by New York State statute.[11] But it was the time-honored senior lien status of benefit assessments that appealed to them the most. When the program was ready to expand, they agreed to provide $40-$50 million in financing. Major financial institutions would later confirm this appetite for senior liens on tens of millions of residential retrofits nationwide at innumerable symposia. Key LIGH personnel were engaged in an advisory capacity, appeared on academic panels and on U.S. Department of Energy (DOE) webinars assessing PACE. [12]

5 Town of Babylon, NY Code, Solid Waste Management, Chapter 133.

6 Marilyn A. Brown et al., "Making Buildings Part of the Climate Solution by Pricing Carbon Efficiently," (Atlanta: Georgia Tech, July 2012), p. 5. Available at www.spp.gatech.edu/faculty/workingpapers/wp69.pdf

7 Carolyn Nardiello, "In Babylon, An Incentive for Energy Efficiency," New York Times, January 18, 2009, p. LI5.

8 Working Group VI, "On-Bill Financing, Case 07-M-0548 – Proceeding on Motion of the Commission Regarding an Energy Efficiency Portfolio Standard" (Albany: State of New York Public Service Commission, 2008). An on-bill financing mechanism incorporates the obligation for the energy upgrade to the monthly utility bill.

9 This organic resolution came about absent knowledge of Berkeley First, which was developing simultaneously.

10 The Constitution of the State of New York, Article VIII, §1, "Local Finances," 2010.

11 State statute: Laws of New York, 2009, § 409: "the prevention or reduction of waste matter consisting of carbon components of energy waste from residential properties." Augmented authorization via Laws of New York, §198, to §209-i, Town Law: "an improvement (or contractual assessment) district for addressing energy waste by means of a sustainable energy revolving loan program to enable property owners to surmount financial barriers in order to do deep energy efficiency retrofits and install site-generated renewable energy."

12 Yale University/REIL, "Best Practices: Sharing Local and State Successes in Energy Efficiency and Renewable Energy" (April 23, 2010), available at www.youtube.com/watch?v=strzyLo9UmI). U.S. Department of Energy, "Getting Started: Legal Authority & Administering PACE Financing Programs" (Washington, DC: DOE, Dec. 19, 2009), available at http://www1.eere.energy.gov/wip/solutioncenter/eecbg_webex_121109.html)

During its five years of operations, LIGH has upgraded nearly 1,250 houses, reducing their carbon emissions by 29.7 percent. Recent analysis of post-retrofit energy bills shows that the "average savings realization rate" for LIGH was 77 percent, or approximately 20 percent more fuel efficient, on average, than projections.[13]

Convenience Is Key

Long Island Green Homes delivers cost, comfort, and convenience with a one-stop retrofit that underscores the efficacy of its municipal delivery model. Trusted vendor status is key to overcoming reservations homeowners have historically harbored about having work done that is hard to verify given that the work is often invisible. LIGH requires participating contractors to be certified by the Building Performance Institute (BPI). Controlling the workflow, LIGH brings considerably more leverage should a job not be completed to satisfaction. BPI-certified LIGH staff has the ability to retest homes and advocate on behalf of homeowners to get the job done right. If the homeowner moves before the term of the obligation, the balance is assumed by the new owner. Convenience is the hallmark of the municipal delivery model, unmatched by any other type of program.

From the outset, LIGH's program discipline called for a loading order of the most cost-effective energy efficiency measures. (Solar installs would, necessarily, follow the sealing of the building envelope which, in turn, would decrease sizing of any PV array to be installed.) Financing was not to exceed $15,000 nor extend beyond 10 years. Projects would have to achieve a savings-to-investment ratio (SIR) of 1.3. Credit-worthiness was based on a record of timely property tax payments.

The average Green Home retrofit is a good investment. The average obligation is $10,765 paid over 10 years, providing nearly an 11 percent annualized return on investment. The total cost of any given job has almost never exceeded 5 percent of the so-called LTV (loan-to-value) or appraised value of the property, and delinquencies have been few. Green homeowners have lowered their operating cost by more than $1,340 per year and enhanced the value of their property. Overall, through mid-August 2013, Babylon has provided $13.5 million to retrofit 1,243 homes for an audit-to-completion rate of 65 percent, the number of homeowners who went ahead with an energy efficiency retrofit after having their house evaluated. LIGH, which was retrofitting at a pace of 1 percent of Babylon home annually, has now, owing to federal ruling, been obliged to constrict its output by four-fifths to remain within the limits of a revolving loan fund.

Setbacks for Single Family Energy Retrofits

In June 2009, despite less than a handful of nascent PACE programs, the Federal Housing Finance Agency (FHFA), conservator for mortgage giants Fannie Mae and Freddie Mac,

13 This is based upon a 25 percent response, despite the offer eliminating a one-month payment for those participating.

issued a stern warning: "An emerging trend in state and local financing for residential energy efficiency home improvements" would have "the effect to impair value of the first mortgages to creditors and any subsequent holder of first mortgages and, at the same time, to create risks for homeowners."[14] A year later, despite concerted efforts by the U.S. Department of Energy and members of Congress to address concerns, four other regulators were enlisted to join FHFA in stating that PACE programs "present significant safety and soundness concerns."[15] Punitive repercussion could be forthcoming, it was stated.[16] The town of Babylon, State of California, Sonoma County, the National Resources Defense Council and others filed complaints against FHFA's position.[17] The federal district court ruling that instructed FHFA to follow their rule-making process as a regulator was overturned in appellate court,[18] which accepted the FHFA contention that, in their capacity as conservator, they were not subject to such procedure.

Although the impact of these rulings has effectively curtailed the large-scale single-family retrofits that the US Department of Energy had actively promoted, a certain number of PACE outposts remain operational.[19] A $185 million initiative approved by municipalities in Riverside County, California, has attracted more than 6,000 subscribers in less than two years, an economic stimulus that has generated 2,500 local jobs.[20] The Sonoma County Energy Independence Program, launched six months after LIGH, reports a default rate of 0.085 percent compared with 2.19 percent countywide.[21] Going with a PACE-light junior lien position combined with FHA Power Saving loans, Efficiency Maine completed only 400 retrofits through April 2013.[22] Dispossessed of PACE, New York State Energy Research and Development Authority (NYSERDA) developed an on-bill recovery loan for its GreenJobs/GreenNewYork program.[23] Despite an attractive loan rate of 3.49 percent, the audit/completion rate, or number of houses being retrofitted after evaluation, on Long Island has been

14 James Lockhart III, "Energy Loan Tax Assessment Programs" (FHFA letter "brings to your attention…risks" to state bank regulators et al., June 18, 2009).

15 U.S. Department of Energy, "Guidelines for PACE Pilot Financing Programs" (Washington, DOE: May 7, 2010).

16 Federal Housing Finance Agency, "FHFA Statement on Certain Retrofit Loan Programs" (Washington, DC: FHFA, July 6, 2010).

17 For Babylon's complaint, see Jonathan Hiskes, "Long Island Town Threatens to Sue Fannie and Freddie Over Clean-Energy Program," Grist, July 13, 2010.

18 Original federal district court ruling: Chief District Judge Claudia Wilken, State of California v Federal Housing Finance Agency, U.S. District Court for the Northern District of California, August 26, 2011. This was the lengthiest in-depth judicial analysis produced in this process. For appellate court ruling, see U.S. Court of Appeals for the Ninth Circuit, County of Sonoma, People of the State of California, et al v Federal Housing Finance Agency (March 19, 2013).

19 For more on Florida PACE Funding Agency, see www.floridapace.gov/about (which is being funded by $2 billion state bond).

20 Needles Desert Star, "HERO [Home Energy Renovation Opportunity] Financing Program Approved," June 18, 2013.

21 Sonoma County comments in response to "Re: RIN 2590-AA53, Notice of Proposed Rulemaking on Enterprise Underwriting Standards Relating to Mortgage Assets Affected by PACE Programs"(Federal Register, Vol. 77, No. 17, September 12, 2012).

22 FHA wrote just 1,066 Energy Efficiency Mortgages (EEM) nationwide in 2007. Gerarden, Todd "Rebuilding Mortgages for Energy Efficiency" (Federation of American Scientists, 2008). Efficiency Maine, "Energy Efficient Heating Options: Pilot Projects and Relevant Studies" (April 8, 2013).

23 http://www.nyserda.ny.gov/Energy-Efficiency-and-Renewable-Programs/Green-Jobs-Green-New-York.aspx

22.6 percent, in no small measure because financing is more arduous and time-consuming than PACE, and the project sales cycle is much longer for NYSERDA (120-180 days) than it is for LIGH (25-40 days). The principle of PACE has just crossed the border to Canada where Toronto "will apply a surcharge, known as a local improvement charge (LIC), on the owner's property tax bill, to cover the cost of the retrofit."[24]

Sealing 80 million leaky homes nationwide will create close to 9 million jobs and save homeowners more than $100 billion per year. Long Island Green Homes stands as proof of concept to this potential. To pick all that low-hanging fruit, government agencies will conclude, at some point, that the nation must pick up the PACE.

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24 "Residential Energy Retrofit Program" (July 24, 2013) http://www.toronto.ca/teo/residential-energy-retrofit.htm.

Lenders' Property Standards and Energy Efficiency: The Vital Link for Affordable Housing

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Energy efficiency is an important attribute of affordable housing. Whether housing is, in fact, affordable for an individual or family depends not only on the nominal rent or mortgage payment but also on expenses such as utility payments, transportation costs, and home maintenance. Even if the nominal rent or mortgage payment appears to be affordable, low efficiency housing can be expensive after accounting for energy expenses. Improving energy efficiency can reduce the total cost of housing, making housing more affordable for the occupant.

Energy efficiency is viewed as challenging in affordable housing because achieving higher efficiency often requires additional investment.[1] Whether it is installing extra insulation at the time of construction or making repairs to existing buildings, such as replacing worn weather sealing, making a better building usually adds expense to a project, and capital can be scarce in affordable housing.

But many efficiency measures are cost-effective in the most direct way because the amount of savings from reduced utility bills in a short period is greater than the cost of the measures. A homeowner or building owner does not "save" money in any real sense by refraining from installing cost-effective efficiency measures or making efficiency repairs–it merely shifts the added expense from construction costs to higher monthly utility expenses. In fact, the expense of buying the energy that will be wasted is often much greater than the cost of building better in the first place. This concept is basic. The problem is figuring out how to enable building owners to make the needed investments in a manner that makes sense.

In this paper, I describe several property standards related to energy efficiency that neatly fit the mortgage lending transaction. By incorporating such property standards into the conventional loan transaction, lenders can help to assure their borrowers -- both in single family houses and multi-family buildings – have more affordable total housing expenses. Doing so will help to fulfill affordable housing goals. Most interesting, these measures also make sense from a lender's risk management perspective: sensible efficiency standards make for more valuable properties that secure their loans.

In section I of this paper, I describe and substantiate the basis for the Federal Housing Administration's (FHA's) smart policy to require new single-family houses comply with

1 For a description of the challenges facing energy efficiency installations and the varied strategies to surmount these challenges, see Namrita Kapur, Jake Hiller, Robin Langdon, Alan Abramson, "Show Me the Money: Energy Efficiency Financing Barriers and Opportunities," Environmental Defense Fund, (Washington, D.C., July 2011).

modern building energy codes in order to be eligible to secure a mortgage loan insured by FHA. I argue this policy makes sense both to fulfill FHA's important affordable housing mission and as sensible risk management. Other institutions with affordable housing goals, such as Fannie Mae and Freddie Mac, should follow this smart policy.

In section II, I describe the basis for the Fannie Mae Green Refinance Plus program, which enables multifamily property owners to borrow additional funds to make needed efficiency repairs as part of a refinance loan. This exemplary program allows Fannie Mae to further its affordable housing mission and improve the properties securing its loans. It should be followed and expanded by other lenders and investors. I also describe the need for industry standards for maintenance of certain efficiency attributes of multifamily buildings so that building owners could better plan for the costs of making cost-effective efficiency repairs and build the expense into the capital plan for the building.

And, in section III, I offer three simple and inexpensive ways lenders could collect useful information on the energy efficiency level of properties that secure their loans.

I. Mortgage lenders should require new homes comply with a modern building energy code

a. Background building energy codes and cost-effectiveness

Building codes in the United States exist at the city and state level for single-family houses and multifamily buildings to assure minimum acceptable standards for construction.[2] The energy code portion of a building code relates to the features of the building that affect energy use, including the integrity of the building envelope, insulation, mechanical systems, and air sealing. Most city and state energy codes are based on model energy codes, such as those maintained by the International Code Council (ICC) or the American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE). The residential energy codes maintained by the ICC have been revised in three year cycles to account for new technologies, new methods, changes in the market, and increasing efficiency standards, among other things. About 42 states have modern minimum energy codes in place today.[3]

Requiring private home builders to meet minimum standards of construction is based on long-standing theories of public safety, public health, correcting market failures, and preventing hidden defects. [4]

2 "Building Energy Codes 101: An Introduction," US Department of Energy (Washington, DC, February 2010).

3 See U.S. Department of Energy, Building Energy Codes Program website, located at http://www.energycodes.gov/adoption/states.

4 Wendy Collins, Lesley Stone, and Lawrence Gostin, "The Built Environment and Its Relationship to the Public's Health: The Legal Framework," American Journal of Public Health, 3(9) (2003). Also see Sara Bronin, "The Quiet Revolution Revived: Sustainable Design, Land Use Regulation, and the States," 93 Minnesota Law Review 231, (2008).

Two realities in particular show why good energy codes are important to a well-functioning housing market. First, it is often difficult for a home buyer, a prospective tenant, an inspector, or an appraiser to identify the hidden construction elements that affect energy use (such as insulation levels, or the quality of the air sealing around windows) after the building is completed, and even more difficult if the space is occupied by the seller or an existing tenant. Building codes give prospective buyers and tenants confidence in the home purchase transaction, reduce transaction costs, and protect buyers who cannot invest in expensive inspections of the level required to test such hidden elements. Second, builders have the opportunity to implement measures during construction at a much lower cost than if the same measures were installed later by a homeowner or tenant.

Cost-effectiveness is a guiding concept for energy codes. Cost-effectiveness compares the added cost to implement a measure– such as sealing gaps around windows, which can require the builder to pay for more time, training, and materials– to the value expected from the added efficiency in the form of lower utility expenses.[5] Cost-effectiveness tests typically use a hypothetical house of assumed attributes (e.g., square footage, construction type, specific component efficiencies) to then make determinations about cost and expected savings.[6]

For any particular homeowner or tenant, actual levels of energy use and actual utility expenses will vary depending on many factors, such as household size, type of appliances, usage patterns, and local rates. Estimates used in energy models are averages that are substantiated across a group of sufficient size, and are not intended to be estimates for individual occupants.[7] The cost to build the reference house used in the

5 The analysis does not subject each individual measure to cost-benefit analysis, but the package of measures is tested to determine expected savings and incremental cost over a baseline. In many cases, specific equipment may have interactive effects that are revealed when treated as a system. See Todd Taylor, Nick Fernandez, and Robert Lucas, "Methodology for Evaluating Cost-Effectiveness of Residential Energy Code Changes," prepared for the US Dept. of Energy (Richland, Washington: Pacific Northwest National Labs, April 2012). Some of the added construction cost is due to quality control and training rather than additional equipment or materials.

6 Energy codes may provide prescriptive paths to compliance, which allow a builder to comply with certain mandatory measures plus an overall energy performance target. The builder may choose to implement more efficient measures in one area to balance lower efficiencies of other features. Actual incremental costs and cost-effectiveness of a home built to the code will depend on the specific construction attribute and actual costs. The pending 2015 version of the IECC includes such a rating-based path to compliance. See Institute for Market Transformation, "Fact Sheet RE 188-13: Adding a Rating-Based Compliance Path to the IECC," Washington, DC, located online at www.imt.org/uploads/resources/files/Fact_Sheet_on_ERI_Proposal.pdf.

7 Blanchard et al., "Actual and Estimated Energy Savings Comparison for Deep Energy Retrofits in the Pacific Northwest." (Richland, Washington: Pacific Northwest National Laboratory, October, 2012). Note that the models predict the relative energy use for a specific occupant with very high certainty; that is, an occupant in a house with a low efficiency rating is almost certain to have higher utility expenses than if the same occupant were in a house with a higher efficiency rating.

energy models can also vary based on region, economic conditions, and other factors.[8] While values for any specific house may vary, cost-effectiveness determinations appear to provide a strong indicator of expected savings.

b. New Federal Housing Administration policy is a major step forward

FHA recently implemented a requirement that a house must meet or exceed the 2006 International Energy Conservation Code (IECC) in order to be eligible to secure a FHA-insured mortgage.[9] This requirement only applies to mortgage loans for the purchase of a new house and does not apply to loans to buy existing houses. Congress required FHA to implement the updated energy code requirement in the Energy Independence and Security Act of 2007 (EISA), citing energy security, reducing energy waste, and more.[10]

Applying the 2006 IECC is a big step forward. FHA's previous policy required builder certification that the house was built according to the 1992 Council of American Building Officials (CABO) code–a badly out-of-date code that was seldom used by home builders in the market.[11]

One reason it is a step forward is that some states have very weak or no energy codes in place. As of the date of this paper, about 40 states have energy codes in place that are as good as the 2006 code or better (i.e., 2009 or 2012), and 10 states have not yet adopted an energy code as stringent as the 2006 code.[12] Now, home builders in these 10 states will have an added incentive to comply with the 2006 code so that FHA borrowers are potential buyers.

Another reason it is a step forward is that many cities lack code enforcement. The fact is that a home buyer today in a state with a modern energy code could still obtain a house with defects, such as too little insulation or substandard appliances. FHA's requirement will add an additional level of assurance that a house purchased by an FHA borrower will meet the code.[13]

8 There is also variation across regions in the measurement of incremental costs of energy efficiency measures. See Zachary Paquette, John Miller, Mike DeWein, "Incremental Construction Cost Analysis for New Homes, Building to the 2009 IECC," Building Codes Assistance Project, 2010); **and, B.** Polly, N. Kruis, and D. Roberts, "Assessing and Improving the Accuracy of Energy Analysis for Residential Buildings," prepared for the US Department of Energy (Golden, Colorado: NREL, July 2011).

9 FHA requires a builder to sign a form certifying that the house meets property standards when a borrower applies for a loan to purchase a newly built house. HUD **Form 92541** "Builder certification of Plans, Specifications, and Site."

10 See the Energy Policy Act of 2005, Section 153: Energy Efficiency Standards, and the Energy Independence and Security Act of 2007, Section 481: Application of International Energy Conservation Code to Public and Assisted Housing. 42 US Code, Sec. 12709(a)(1). Increasing energy productivity is a vital national goal, as evidenced by President Obama's Climate Action Plan, announced in June, 2013.

11 See US Department of HUD, Notice PIH 97-16 (HA) (April 17, 1997).

12 See map from Building Codes Assistance Project (BCAP), available at www.energycodes.gov/adoption/states. Note that DOE issued on August 6, 2013, a request for information on methodology to assess code compliance in cities and states.

13 Federal statutes provide financial and criminal penalties for intentional misrepresentation on FHA loan documents. See 18 U.S.C. Section 1001, et seq.

FHA will now have a foundation in place to support adoption of more current versions of the code, such as the 2009 and 2012 versions, and soon to be approved 2015 version. The Department of Housing and Urban Development (HUD) is required to implement updated and approved versions of codes upon determining the updated version would not have an adverse effect on availability or affordability of housing.[14] It is also expected that FHA will upgrade the applicable code required on the builder certification form to the 2009 IECC code in the near term.[15] Making this determination is grounded on substantially better data with the 2006 code as a baseline.

c. Quantifying savings for homeowners with FHA-insured loans

Like all major mortgage lenders and investors, FHA has not tracked the energy code status of homes that secure the mortgages it insures. As a result, it is difficult to estimate how much of an advance compliance with the 2006 code would mean for new home buyers, as compared with business as usual or the "typical" new house securing loans insured by FHA today. The code status of the "typical" new FHA house is not known. There are, however, studies that provide directional guidance comparing a 2006 IECC house to the typical house in the market.

A 2007 study of housing in Gulf Coast states found a house built according to 2006 IECC would cost about $618 more to build compared with a newly house built to market standards at the time, which was estimated to be the 2003 version of the IECC. If financed in a conventional mortgage, $618 would mean an incremental annual cost of $70. On the other side of the ledger, the house built according to the 2006 IECC would save about $167 per year in reduced energy expenses. This means the owner or occupant would have annual savings of $97. The report also found savings of $360 per year when comparing a new house built according to 2006 code with an existing house built according to average market standards in 1995.[16]

Another 2007 study considered the cost-effectiveness of the 2006 IECC for homes built in Chicago, Illinois. It showed incremental costs of $2,123 relative to a new house built according to market standards, with estimated annual energy savings of $472. This produces annual savings for the owner or occupant of $340. This savings amount was derived assuming the incremental cost was financed with a mortgage of 7 percent

14 Energy Independence and Security Act of 2007, Section 481: Application of International Conservation Code to Public and Assisted Housing. 42 US Code, Sec. 12709 (a)(1).

15 According to the US Office of Management and Budget, though the website www.reginfo.gov, HUD has submitted a determination that adopting the 2009 code "[does] not negatively affect the availability or affordability" of covered housing, which is the threshold test required by EISA to adopt the updated code version. See www.reginfo.gov, at RIN 2501-AD64.

16 Robert Lucas, "New Residential Energy Codes for the Gulf Coast." Pacific Northwest National Labs, (Richland, Washington, January 2007).

annual percentage rate (APR).[17]

It is reasonable to expect that savings would be greatest for homebuyers in states without a modern energy code in place today and in states with low levels of compliance with energy code requirements. For homebuyers who otherwise would obtain a house built to lower standards, savings in the range of $100 to $400 per year appear reasonable, depending on the climate zone and house quality.

Savings for homeowners would be increased further if lenders required the 2012 versions of the IECC. Estimates of savings vary widely across climate zones for the 2012 code versions due in part to heating equipment upgrades that lead to substantial savings in colder climates. On average, occupants could expect to save about $300 per year as compared to a house that meets 2006 IECC, and even more as compared to a house built to less stringent standards.[18]

d. Requiring that houses meet a modern code supports FHA's affordable housing mission

Affordability is at the heart of FHA's mission. Implementing property standards that require energy code compliance means an FHA borrower will obtain a house that is more affordable, thereby furthering FHA's affordability mission.

Some organizations, including some home builders, have argued that energy codes can hurt the very people affordable housing goals are intended to help, because higher standards raises the cost to build a house, which will reduce availability of housing.[19] But as the cost-effectiveness analysis demonstrates, substandard housing is not "cheaper" in any real sense. Building a substandard house merely shifts the actual costs from the purchase price to the monthly utility expenses. A house built to lower energy code standards is more expensive when utility expenses are included.

If there is a negative effect on the availability of housing, it is the higher down payment required to purchase a house of higher value. For an FHA-insured loan, down payment amounts can be as low as 3.5 percent, and many borrowers will pay between 5 and 10 percent at origination. Assuming an incremental cost of $3,000 for a house built to a higher code, such as the 2012 IECC, this could mean a higher down payment of about

17 Robert Lucas, "Assessment of Impacts from Adopting the 2006 International Energy Conservation Code for Residential Buildings in Illinois." (Richland, Washington: PNNL, January 2007). Number selected from Table 4.5 for a house with an unheated basement.

18 See V. Mendon, R. Lucas, S. Goel, "Cost-Effectiveness Analysis of the 2009 and 2012 IECC Residential Provisions – Technical Support Document, Pacific Northwest National Labs (Richland, Washington, April 2013). Energy savings will vary greatly by climate zone, and are estimated to average $500 per year. Incremental costs also vary greatly by climate zone, and range from a low of about $2,000 to a high of $4,000, which produces increased loan payments of about $144 to $240 per year when financed in a 30 year mortgage at 6%. Note that the savings and incremental cost in this study results blend results from single and multifamily buildings into an average for the residential sector.

19 See report published by the National Association of Home Builders Research Center, "2012 IECC Cost Effectiveness Analysis" (Upper Marlboro, Maryland: 2012). NAHB estimated the incremental cost of meeting the 2012 code, over the 2006 baseline, to be about $7,000 on average – a substantially higher estimate than found in the the report of Mendon, et al. cited above.

$150. In comparison, an average homeowner would realize savings of $300 in the first year alone, after paying the higher mortgage cost of the incremental cost of construction to meet the code.[20]

The hurdle of a higher down payment could also potentially be addressed by targeted utility programs that contribute directly to offset a builder's costs to meet the code.[21]

e. Energy codes as prudent risk management for FHA and all mortgage investors

In addition to fulfilling FHA's important affordable housing mission, FHA's energy code policy makes sense purely on the grounds of prudential risk management. Assuring that loans are secured with houses built to modern energy codes will create better loans for FHA than if loans were secured by houses built to less stringent standards.

Houses built according to a modern energy code should be more valuable than houses built according to less stringent standards. The added value is derived from fundamental attributes–better materials, better workmanship, and lower utility expenses for the homeowner or occupant. The evidence for lower utility expenses is contained in the very cost-effectiveness research that informed the code adoption process and is cited in the previous section of this paper. There is evidence that the market recognizes these fundamental values, although this evidence has been slow to emerge and should increase with market trends toward better availability of information on energy usage.[22] A recent study found evidence to support the conclusion that houses with energy efficiency labels in California are about 9 percent more valuable.[23]

House value is known to be a key determinant of loan performance. At origination, the concept is reflected in loan-to-value metrics, but the actual or real loan to value (LTV) of a loan varies over time as market value of the property changes.[24] Some argue this is the dominant determinant because default should be rare if the house can be

20 See V. Mendon, et al. "Cost-Effectiveness Analysis of the 2009 and 2012 IECC Residential Provisions."

21 "Utility programs refers to incentive payments and rebates many utilities pay to market participants to implement measures that deliver increased energy efficiency to the electricity or gas systems.

22 Energy efficiency levels, including code compliance, have not traditionally been included in property appraisals or inspections but are receiving increasing attention. Appraisers often do not account for whether the house is built according to code, since it has been difficult for the appraiser (or automated valuation systems) to make adjustments between a subject house and comparables.

23 See Mathew Kahn and Nils Kok, "The Value of Green Labels in the California Housing Market." (Report published by US Green Building Council, July, 2012). A 2013 paper found evidence in homes sales data for "Energy Star" labeled homes built between 1995 and 2006 garnering a premium, but did not find a premium for homes built and sold after 2006, although the effects of the major housing downtown that began in 2007 (and arguably prior) suggest this question should be reexamined with data from a more stable market. Margaret Walls, Karen Palmer, and Todd Gerarden, "Is Energy Efficiency Capitalized into Home Prices? Evidence from Three US Cities," (Washington, DC: Resources for the Future, July 2013).

24 For an interesting analysis of how LTV intersects with other factors, including FICO score and DTI, see Ken Lam, Robert M. Dunsky, Austin Kelly, "Impacts of Down Payment Underwriting Standards on Loan Performance Evidence from the GSEs and FHA portfolios," Fed. Housing Finance Admn., Working Paper 13-3 (Washington, DC, Dec. 2013).

sold for more than the loan balance.[25] If a house built according to a modern code retains its value during the life of a loan better than houses that are otherwise comparable (but with hidden defects, such as too little insulation), this should deliver value to the lender or holder of credit risk in the form of higher resale value of the property, reduced risk of default, and higher resale value in the event of defaults.

A second reason why the FHA policy should be good risk management for FHA is because the house is more affordable for the homeowner. To determine eligibility for a mortgage loan, lenders typically examine several household expenses in the loan application process, including homeowners insurance, car loan payments, credit card payments, student loan payments, and property taxes to determine if the borrower has sufficient income to support these payments plus a new payment on the applied-for loan. If these household expenses are, to some extent, determinants of loan affordability, then utility expenses should operate similarly. Reducing household expenses should work to increase income available for a mortgage payment.[26]

The average amount of annual savings on utility bills appears fairly small relative to the average borrower's total income, and this has caused some observers to doubt that reduced energy expenses are a material factor in affordability. But for several reasons, the energy savings due to high energy efficiency could, in fact, be material to the household budget of a distinct subset of borrowers, though it is important to note that more research on this point is needed.

First, as noted above, homeowners can experience a wide range of actual utility expenses in a regular distribution, so a portion of total borrowers will have utility expenses considerably higher than the average. What is known about the distribution of expenses suggests a significant portion of homeowners and occupants could have expenses twice the average amount.[27] Second, even if the amount of utility expenses appears modest as a portion of any borrower's total income, the expenses may be material to the household budget as a portion of income after payment of other essential expenses and debts. For many families, money available for utility expenses could compete dollar for dollar with income available for rent or a mortgage loan payment.

More studies are needed to validate whether the lower energy expenses affect mortgage risk, but it seems reasonable to expect that reducing energy expenses will, for some subset of borrowers, make the mortgage more affordable.

25 See John Y. Campbell and Joao F. Cocco, "A Model of Mortgage Default." NBER Working Paper No. w17516 (NBER, October 2011).

26 This conclusion is described in and supported by Roberto Quercia and Janneke Ratcliffe, "Home Energy Efficiency and Mortgage Risks," (University of North Carolina at Chapel Hill and Institute for Market Transformation, March 2013). The authors found Energy Star homes had lower delinquencies and default rates, and within the group of ENERGY STAR homes, delinquencies and defaults declined with increasing efficiency levels.

27 See Philip Henderson, "New Data from EIA Shed Light on Residential Energy Expenses," Natural Resources Defense Council website (http://switchboard.nrdc.org/blogs/phenderson/new_recs_results_shed_light_on).

In Summary, for a lending institution with an affordable housing mission, including not only FHA, but also Fannie Mae and Freddie Mac,[28] a policy requiring that newly built houses comply with modern energy codes makes sense as a way to reduce the total cost of homeownership for borrowers. The policy also makes sense as a matter of risk management and offers public benefits that should be valued by these institutions.[29]

II. Property standards for multifamily affordable housing

Lenders making mortgage loans secured by multi-family buildings have a strong interest in assuring that buildings securing their loans are built in compliance with modern energy codes, for many of the same reasons set forth above – it helps further the lender's affordable housing mission by reducing expenses for occupants and it is sensible risk management.

It is also essential to assure buildings are kept in good repair during the term of the loan. Degradation of a property can cause higher utility expenses for occupants and reduce the value of the building.[30] Many efficiency repairs can be cost-effective, such as fixing air leaks, repairing worn pipe insulation, retuning a boiler, and tuning water pumps –these repairs deliver savings in the form of reduced utility bills in an amount greater than the cost of the work.

Multiple reports suggest the total cost of housing for many affordable-housing occupants is inflated by paying the cost of wasted energy used in the building.[31] Most of the country's vast stock of multifamily buildings was built before energy codes were even adopted.[32] Multifamily buildings, especially large ones, require regular upkeep as time, occupancy, and weather cause buildings to degrade.

The central concept in this section II is the same as in section I: When a building owner forgoes making cost-effective efficiency repairs, this does not lead to real savings, but simply

28 Freddie Mac describes its affordable housing mission on its website as follows: "As part of our public mission, Freddie Mac has a responsibility to provide financing that helps families buy or rent decent, affordable housing." See http://www.freddiemac.com/corporate/company_profile/affordable.html. Fannie Mae uses similar language: "Fannie Mae helps provide financing to enable Americans to buy or rent quality affordable housing." See "A Report on Fannie Mae's Mission Activities," April 2011, page 9, located at www.fanniemae.com/resources/file/aboutus/pdf/FM_Mission_Report.

29 Most houses have useful lives longer than 50 years. The annual benefits of better construction will be realized by subsequent owners or occupants, and their lenders, over a long period, and federally-related housing institutions have a high likelihood of holding the risk on the loan in subsequent transactions. Confidence in the condition of hidden elements of the construction will reduce uncertainty and transactions costs for subsequent purchasers, lenders, insurers, and utility companies with regard to expected energy use. It is also worth noting that the finance charges on the incremental cost as part of the purchase mortgage financing are likely to be cheaper financing home improvements to remedy the defects at a later date.

30 Multifamily lenders have long recognized the importance of assuring a building is maintained generally and many require annual inspections. See Fannie Mae Instructions for the PNA Property Evaluator, Form 4099 (located at www.fanniemae.com/multifamily/current-guide-forms).

31 See Anne McKibbin, Anne Evans, Steve Nadel, Eric Mackaras, "Engaging as Partners in Energy Efficiency: Multifamily Housing and Utilities." (Washington, D.C.: CNTenergy and ACEEE, January 2012); and, "Quantifying Energy Efficiency in Multifamily Rental Housing," published in HUD Newsletter Evidence Matters: Transforming Knowledge into Housing and Community Development Policy, Summer 2011, available at www.huduser.org/portal/publications/EM_Newsletter_Summer_2011_FNL.pdf; and "The Benefits of Energy Efficiency in Multifamily Housing." (New York: Deutsche Bank USA, January 10, 2012).

32 See Energy Foundation, "US Multifamily Energy Efficiency Potential by 2020." (Benningfield Group, Inc., October 19, 2009).

shifts the cost to the tenants in the form of higher monthly utility expenses. The challenge is assuring owners of affordable housing buildings that they will recover the cost of making cost-effective repairs.

a. Typical incentives for multifamily building owners

In most multifamily affordable housing buildings, tenants pay the cost of utilities either through separate utility meters on systems serving tenants spaces or indirectly through an allocation of the utility expense for the whole building–or a combination, such as a building with a central boiler and window-unit air conditioners. In some buildings, the owner receives an allowance from a housing agency to compensate for some or all of the utility expenses that tenants otherwise would pay.

These factors mean that many building owners do not realize direct savings in the form of reduced utility expenses after making efficiency repairs; the owner bears the cost of the repair, but lower utility expenses are paid by occupants (or the agency subsidizing the expenses). This outcome is often referenced as the "split incentive."

It is necessary to be more specific about why an owner might not invest in efficiency than to simply invoke the "split incentive," because even where the owner would not realize utility savings directly, the owner should have incentives to make certain efficiency repairs and improvements to keep the property in a condition to compete for tenants and maintain or potentially increase rents.

Theory suggests tenants with good information about rent and expenses should be willing to pay higher nominal rent to be in a building with lower utility costs. But there are many reasons why this outcome is interrupted and owners might not think about making certain efficiency repairs as a way to maintain property value and rents.

An important factor is that it is difficult for owners to raise rent in most multifamily buildings, even market-rate buildings, and doing so can take time. A plan to raise rent is attended by uncertainty about market acceptance of higher rent for any given building. Not all tenants will make decisions with expected utility bills in mind; some tenants will simply think about nominal rent. The lack of reliable information about expected future utility expenses appears to be an important factor in this dynamic.[33]

Another factor is that in some affordable housing buildings, commitments related to rental increases and assistance from HUD or state housing agencies in the form of rent subsidies tied to the amount of utility expenses.[34]

33 Reliable information about expected utility expenses is essential for tenants and owners be able to negotiate for nominal rents to reflect total rents. Policy changes appear to be moving to deliver better information tenants , as many cities are adopting benchmarking and disclosure policies. See e.g., NYC LL84 (2012) and "PlaNYC", located athttp://www.nyc.gov/html/planyc2030/html/about/ggbp.shtml.

34 See Lori Bamberger, "Scaling the Nationwide Energy Retrofit of Affordable Multifamily Housing: Innovations and Policy Recommendations," (A report by the What Works Collaborative: December, 2010). This report states that HUD provided $1.5 billion in annual operating subsidy costs for utilities and $471 million in annual utility allowances for residents of public housing.

For these reasons, some owners of multifamily properties might be hesitant to invest in making efficiency repairs and improvements. But these realities also suggest that some building owners do have incentives to make efficiency repairs and improvements – specifically, when doing so is likely to be valued by tenants as an input to total rent and accounted for by appraisers.

Especially in affordable housing buildings, owners will need assurances that investments in efficiency repairs will likely be recovered in increased rent or higher property value.

It is important to note the ongoing work of HUD and housing agencies to correct how rental subsidies in certain properties account for utility expenses so that owners do not have disincentives to make investments in efficiency repairs and improvements.[35]

b. Expand the exemplary Fannie Mae Green Refinance Plus program

Fannie Mae's Green Refinance Plus loan program is responsive to the realities of the market. It allows a building owner, at the time of a refinance transaction, to obtain additional funds than would otherwise be available under typical loan guidelines, if the funds are used to make certain efficiency repairs. It is offered in conjunction with FHA pursuant to a risk-sharing agreement and is limited to certain affordable housing buildings.[36]

The centerpiece of the program is a "Green Needs Assessment" (GNA) of the building. In addition to inspecting the building for typical conditions related to safety, integrity of systems, and more, the owner would obtain an inspection performed by a person with experience in energy audits. The GNA is designed to specifically identify repairs and improvements that will improve the building and reduce energy expenses – measures that are candidates to be funded by the loan -- and provides an estimate of energy savings associated with these measures.

Fannie Mae will allow the owner to borrow an additional 5 percent to make efficiency repairs identified in the GNA. Maximum loan-to-value (LTV) for eligibility is then adjusted from 80 percent to 85 percent and the debt service threshold is reduced from 1.20 to 1.15 to accommodate the extra loan funds.

The program is grounded in the understanding that efficiency repairs and improvements will work to enhance the value of the building–increasing the useful life and improving financial performance through higher occupancy and ultimately higher rents, even if these adjustments take time to materialize. For the holder of credit risk, higher rents, lower maintenance expenses, and higher occupancy have concrete value and are very real, even if near-term savings from reduced utility expenses accrue to tenant utility accounts.

35 See descriptions of several housing initiatives on the HUD Sustainable Communities website.

36 See Fannie Mae Fact Sheet, "Multifamily Green Initiative," Second Quarter, 2012 (located at: www.fanniemae.com/content/fact_sheet/wpgreen.pdf). The product is available for properties that are at least 10 years old that will remain subject to affordable income and rent restrictions for the loan term (at least 10 years).

Making "Green Refi" loans on properties that would otherwise be approved appears to make sense purely from a prudential perspective for the holder of credit risk to maintain and improve the property securing its loan, although more research is needed on the performance of these loans. Lenders should also be aware that in many places, electric and gas utilities will contribute to the cost the efficiency repairs and improvements. [37] Thus, by funding the project, the lender is effectively enabling outside funds to go to improve the property securing its loan.

The program also has a compelling value from an affordable housing perspective. For this reason, FHA's main multifamily programs (sections 221 (d) (4)) should incorporate the GNA into refinance transactions and offer owners a "Green Refi" option to make identified repairs. Fannie Mae and FHA should consider expanding the program to purchase transactions to improve properties. Freddie Mac, the other federally chartered enterprise with an affordable housing mission and a substantial multifamily line of business, should also follow suit.

It is important to emphasize the need for reliable results from these programs so that the assumptions can be confirmed or terms adjusted in light of results. After a sufficient number of loans have been made, Fannie Mae and FHA should study and report on the results to provide the market with substantiated conclusions.

c. Establish maintenance standards for multifamily buildings

Currently, there are few standards for multifamily building owners to use to gauge efficiency repairs. The Fannie Mae program uses a GNA performed by a qualified inspector to identify needed efficiency repairs, but only if the owner seeks to obtain loan funds to make identified repairs. What is missing in the market are standards for efficiency maintenance, such as a minimum standard for air sealing and periodic testing of central heating and cooling systems. Such a standard could then be used to identify basic repairs that keep a building in good working order, are likely to be cost-effective from a utility-expense perspective, and do not have unreasonable capital requirements.

A key benefit of such a standard is to allow the building owner to plan and budget in advance for the cost to keep the building in compliance. By accounting for an efficiency repair budget in the capital plan for a building, the owners can incorporate into the rent a premium needed to fund a reserve account, avoiding the need for owners to grapple with obtaining new financing or trying to increase rent to recover the cost of making needed repairs.

If a reasonable standard for efficiency maintenance were in place, programs that provide government contributions to affordable housing developers, such as the Low Income Housing Tax Credit program and programs operated by state housing finance agencies, could then require a commitment from developers or owners to maintain the building in conformity with the referenced standards.

37 See McKibbin, et al. "Engaging as Partners in Energy Efficiency: Multifamily Housing and Utilities."

One possibility is for HUD, an agency with multifamily expertise, to establish a set of standards for efficiency maintenance, possibly starting with standards used by the Weatherization Assistance Program.[38] Any such standard should be established with input of building owners, investors, and building engineers, and potentially the buildings experts at the U.S. Department of Energy.

As with code requirements for new construction, cost-effectiveness must be an essential concept for any such efficiency maintenance standard. Required repairs must be carefully screened to be cost-effective so that reductions in utility expenses are likely to exceed the rent premium that funds the repairs. One possible ingredient in any standard could be an owner's discretion to avoid a repair if the owner has a reasonable basis to believe it would not be cost-effective after accounting for the savings that would accrue to tenants.

III. Lenders should use property standards to obtain better information on energy expenses

An examination of how energy efficiency is treated, in both single-family and multifamily mortgage loans, reveals that lenders and investors have remarkably little information about the utility expenses and usage in properties that secure their loans.[39]

Lenders and financial institutions were leaders in "big data" long before the phrase became part of the lexicon.[40] They were early adopters of information technology and business intelligence to improve processes and make better decisions about customers and transactions. Credit reporting agencies are capable of delivering deep information about customers to consumer lenders in seconds at the point of sale, and automated valuation models use information from many disparate sources. The ability to gather information has increased at an astonishing rate in recent years, and the cost of doing so has steadily decreased. Yet, mortgage lenders and investors today appear to have only coarse information from surveys on the energy use in homes and buildings.

Below are three simple and inexpensive measures lenders could take to gather significantly better and meaningful information about property energy usage. With the better data that would accumulate over time, lenders should be in a position to make better decisions.

First, mortgage lenders could incorporate into conventional loan documents borrower permission to obtain utility usage information from applicable utilities, just as lenders today obtain borrower permission to obtain credit reporting information and tax information.

38 US Department of Energy, "National Weatherization Training and Technical Assistance Plan." (Washington, DC: Weatherization Assistance Program, December 2009), available at www1.eere.energy.gov/wip/pdfs/wap_tta_plan.pdf.

39 See Victoria Doyle and Abhay Bhargava, "The Role of Appraisals in Energy Efficiency Financing," US Dept. of Energy (Washington, DC: 2012). And, Todd Trehubenko and Deidre Schmidt, Multifamily Utility Usage Data: Issues and Opportunities (New York: Recap Real Estate Advisors and Living Cities, May 2011).

40 For a description of early uses of "big data" by lenders, see Ruediger Adolf, Stacey Grant-Thompson, Wendy Harrington, and Marc Singer, "What leading banks are learning about big databases and marketing," The McKinsey Quarterly, number 3 (1997); and, Kenneth Collier, et al. "A Perspective on Data Mining," Center for Data Insight, (Ariz. State Univ: July 1998).

Even if lenders do not have plans to obtain such information from any external sources, with permission in place, lenders could later assess opportunities to obtain the information.

Second, multifamily mortgage lenders could require property owners to report the energy use of the subject property to a benchmarking tool and make the results available to the lender. Benchmarking involves delivering utility data to a system that records the usage and delivers a score showing how a subject property compares to other similar properties in the system.[41] This process is routine for many building owners today and can be largely automated.

Third, mortgage lenders could automatically collect information on property efficiency level when such information is available in systems, such as Energy Star status and home energy ratings. Efficiency fields and ratings are increasingly included in MLS systems and could be obtained by lenders integrating to these systems or as part of the appraisal.[42]

As with other proposals in this paper, gathering better information about utility expenses in the properties that secure their loans should enable lenders, as well as major financial institutions to make more informed decisions, and thereby improve risk management as well further affordable housing goals.

Conclusion

Improving the efficiency levels of housing delivers multiple values–occupants' utility expenses are reduced, the owner obtains a more valuable building, the lender's loan is secured by more valuable property, the utility obtains valuable efficiency resources, and the public avoids toxic pollution from wasted energy in housing that does not meet minimum standards.

These values are compelling for lenders or financial institutions with affordable housing goals, due to the reduced expenses for occupants. The concepts also appear convincing for all mortgage lenders and investors due to the benefits of more valuable properties and reduced borrower utility expenses.

FHA, Fannie Mae, and Freddie Mac, in particular, should evaluate how energy efficiency could fit into property standards in all of their conventional loan products.

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41 The US Environmental Protection Agency maintains the industry-standard system, known as Portfolio Manager, which is the basis for the Energy Star for Buildings program. Moreover, lenders maintain systems that can interface with Portfolio Manager and obtain results that can be used to evaluate properties.

42 Fannie Mae and Freddie Mac have developed a Uniform set of appraisal data fields to obtain on loans. See Fannie Mae and Freddie Mac Uniform Appraisal Dataset Specification, located on the Fannie Mae website at www.fanniemae.com/singlefamily/uniform-appraisal-dataset.

Energy to Heal: Health Care, Climate Change, and Community Resilience

Robin Guenther and Gary Cohen

Today, the health care sector has a critical role to play in both reducing climate change effects and improving the resilience of the communities it serves. In the United States and beyond, the health care industry is increasingly among the major energy consumers in any given region, and the industry is among the largest local employers in many areas of the country. Collectively, hospitals have begun to commingle their identities as consumers, industries, and citizens. They are exerting both upstream leverage on their supply chains and downstream influence on their employees and patients. Leading health care organizations are navigating shifting economics, patient expectations, and regulatory challenges to transform their practices to become leaders on a low-carbon development path and anchors for climate resilience.

Three important ideas are reshaping 21st-century health care in the service of health and planetary survival:

- carbon mitigation through energy-efficiency measures and transition to renewable energy sources;
- anchoring community resilience through local economic investments and securing infrastructure for extreme weather events;
- providing leadership and policy engagement in promoting population health, climate change advocacy, and environmental programs.

Can the health care industry become a model for the world by developing an ecological approach to emerging environmental and health challenges? Central to these approaches to medicine is the axiom, "First, do no harm." This seminal principle forms the basis of a broad definition of health and recognizes prevention and restoration as preferable to treatment on a planet with a finite carrying capacity. How can health care positively contribute to the conditions that foster individual, community, and global health?

Background

The U.S. services sector–from real estate to retail and fast food to health care–accounts for more than 79 percent of the country's economic activity.[1] As of 2010, health care alone accounted for a little more than 18 percent of total U.S. gross domestic product (GDP)–

1 "U.S. Economic Profile," Economy Watch (June 2013). Available at: http://www.economywatch.com/world_economy/usa/?page=2.

more than 20 percent of the services sector's economic activity.[2] The buildings that support the delivery of health care services encompass a broad range of building types–from small community outpatient clinics to large acute care hospitals–and an equally broad range of owners: philanthropic nonprofits to corporate entities.

The tremendous effect of health care on the environment can be divided into three basic categories: (1) upstream leverage, where health care influences its suppliers and others up the value chain; (2) downstream influence, where health care influences its customers (patients); and (3) environmentally responsible production, which requires the health care organization to consider how the "production" of services can be done more efficiently. There is general agreement that the health care sector has the capacity to define markets by what they build and purchase–and how they operate.

More recently, the complex set of factors that underlie increasing chronic disease burdens has begun to influence health care's interest at the intersection of community, environment, and buildings: The asthma epidemic, for example (annual self-reported asthma prevalence increased 73 percent between 1980 and 1996)[3] may be attributable to increased exposure to indoor allergens and poor indoor air quality (the building environment), combined with more time spent indoors (90 percent on average), and decreased physical activity (behavior). Similarly, the obesity and diabetes crises are somewhat attributable to an industrial agriculture and food distribution system that subsidizes and promotes pesticide-intensive agriculture and the ubiquity of junk food. Hospitals are often distribution centers for the same poor quality foods that contribute to the ill health of the American people.

Recent US health care system reform, manifested in the 2010 Patient Protection and Affordable Care Act (ACA), has set in motion the transformation of health care with regard to community engagement, prevention, and population health. The ACA mandates that nonprofit hospitals become "accountable care organizations" and produce periodic Community Health Needs Assessments aimed at improving access to health care in lower-cost settings. Recent changes in the Internal Revenue Service definition of community benefit are increasing the ability for many health care organizations to invest in sustainable programs that benefit community health and healthy communities as part of maintaining their nonprofit status.

The sheer scale of health care, coupled with the emerging focus on chronic disease prevention and health promotion, are catapulting health care service delivery from self-contained, separated disease-care campuses to vital definers of urban fabric and place-making. Improving access to health care, an important factor in reducing system costs and improving public health, requires a new focus on locating health care facilities for convenient access that are

2 Natalie Jones, "Healthcare in America: Follow the Money." (Washington, DC: NPR, March 19, 2012), available at http://www.npr.org/blogs/health/2012/03/19/148932689/health-care-in-america-follow-the-money.

3 D. M. Mannino et al., "Surveillance for Asthma—U.S. 1980–1999." In: Surveillance Summaries, Morbidity and Mortality Weekly Report. (Atlanta: Centers for Disease Control and Prevention, 2002).

centered in communities. In addition, large numbers of staff, visitors, and patients aggregating on major health care campuses can, in and of themselves, generate necessary volumes for public transit investments. The varied health care workforce spans income and education levels, offering enormous local employment opportunities. As the purchasing agents for millions of health care consumers, health care organizations have tremendous leverage over their suppliers–and they can choose to invest in and support local economies. By virtue of the services it provides and the intrinsic public trust it holds, health care is held to higher moral and ethical standards than nearly any other business sector. Together, these factors support an expanded role for health care at the center of healthy communities.

Health Care and Climate Change

In 2009, the UK medical journal *The Lancet* proclaimed, "Climate change could be the biggest global health threat of the 21st century. Effects on health of climate change will be felt by most populations in the next decades and put the lives and wellbeing of billions of people at increased risk." The article goes on to state, "the health sector can play a key role in helping societies adapt to the effects of climate change and the risk it poses to human health."[4]

The building sector is by far the largest emitter of carbon, outpacing both transportation and industry. U.S. health care buildings are highly developed, and health care buildings constitute the second most energy-intensive U.S. building sector (consuming energy at an average of twice the intensity of commercial office buildings). Acute care hospitals drive this excessive consumption, although they represent only 25 percent of the total square footage of health care buildings. These buildings operate continuously, 365 days per year, with multiple back-up and redundant mechanical and electrical systems, and they only increase in energy intensity as medical diagnostic equipment with large heat loads continue to enter the marketplace. In 2013, the University of Washington's Targeting 100! Study[5] joined the U.S. Department of Energy in confirming that new U.S. hospital buildings could reduce their energy consumption by 50 to 70 percent and still maintain required air change rates and filtration by implementing mechanical system design approaches that are widely used in Europe. As existing hospitals implement aggressive energy efficiency programs, demand reductions of 25 to 30 percent are not uncommon.

Across the United States, states and municipalities are enacting legislation aimed at achieving rapid reduction of greenhouse gas (GHG) emissions through public transportation investments and green building programs. Because health care organizations are both large employers and massive consumers of energy, they are frequently prominent players in municipal GHG reduction efforts. At the same time, the health care industry increasingly

4 A. Costello et al., "Managing The Health Effects of Climate Change," The Lancet 373 (9676) (2009): 1693-1733. http://www.thelancet.com/climate-change.

5 H. Burpee. and J. Loveland. "Targeting 100! Envisioning the High Performance Hospital: Implications for a New, Low Energy, High Performance Prototype." University of Washington Integrated Design Lab (2012). Available at: http://www.betterbricks.com/graphics/assets/documents/Targeting100_ExecutiveSummary_063010.pdf.

views GHG reduction as a mission-related imperative, as the direct health effects of climate change–asthma, heat stress, spread of infectious diseases, water contamination, and environmental refugees–have been documented in public health literature.

On the other hand, the health care industry is only beginning to articulate the effects of climate change on the delivery of health care services. As average temperatures rise, heat island effects in dense urban areas will exacerbate chronic respiratory conditions in the elderly and children. More extreme weather events–hurricanes in eastern coastal areas, tornadoes and floods in the Midwest, or fires and drought on the West Coast–will require a more resilient emergency care infrastructure capable of delivering potable water and health care. Furthermore, grid reliability is likely to continue to be an issue in unstable energy markets.

Energy Strategies in Health Care

Health care organizations across the United States are implementing energy conservation strategies and shifting from fossil fuel to renewable energy sources. For most energy conservation strategies on hospital campuses, the business case is relatively straightforward: Utility savings can be redirected to fund investments in energy efficiency measures–paybacks range from relatively immediate to as long as 8 years. Health care organizations view the uncertainties associated with rising utility prices as a future "risk." Therefore, investments in energy reduction are often viewed as part of a risk-avoidance strategy. The case studies in this section, gathered from health care organizations in diverse climates and regions, demonstrate both boldness and creativity.

In a groundbreaking study funded by the Commonwealth Fund,[6] a package of energy reduction strategies that in aggregate reduced "average" hospital energy demand by 9.8 percent (27.2 kBtu/sf compared with an estimated average annual baseline of 276 kBtu/sf) yielded a combined net savings of $980 million in 5 years, when extrapolated to the entire U.S. acute care hospital portfolio. Energy reduction strategies include lighting upgrades, variable-frequency drives, high-efficiency electric motors and motor upgrades, occupancy sensors for public areas, boiler and central plant chiller replacements, hydronic heating controls, and solar film on windows. In 10 years, aggregate energy savings were close to $6 billion. These are persuasive numbers, and they lead hospitals to seek expanded and creative opportunities to partner in energy investments that reduce carbon, improve "energy-independence," and save operating dollars.

Gundersen Health System, La Crosse, Wisconsin

Gundersen Health Systems, Inc., is an integrated health care network and is one of the nation's largest multispecialty group medical practices, regional community clinics, hospitals, home care providers, behavioral health services, vision centers, pharmacies, and air

6 S. Kaplan et al. "Can Sustainable Hospitals Help Bend the Health Care Cost Curve?" Issue brief (New York City: The Commonwealth Fund, November 2012).

and ground ambulances. It operates in 19 counties in Wisconsin, southeastern Minnesota, and northeastern Iowa. In 2007, the health system's environmental stewardship program, Envision, was born. Gundersen has developed a multifaceted portfolio of innovative energy efficiency and renewable energy projects intended to lower costs, encourage community partnerships, and reduce the organization's environmental footprint. In a few short years, the health system has become a national model for other health care organizations looking to do the same.

Gundersen has an aggressive and challenging system-wide energy goal: to become 100 percent energy independent by 2014–a first for a U.S. health care system. Energy independent means the health system will produce as much renewable energy as it uses through a combination of energy conservation and grid-connected renewable energy projects. The first step toward energy independence began with conservation–by the end of 2010, Gundersen had reduced total energy consumption by 30 percent from a 2007 consumption baseline by using a wide-ranging set of energy efficiency measures.

Gundersen has developed their own renewable energy infrastructure rather than purchase renewable power at premium rates. Gundersen's creative renewable energy portfolio utilizes power generation opportunities available through partnerships with municipalities, utility companies, and private businesses.

Gundersen's gas-to-energy project with the La Crosse County landfill in Onalaska, Wisconsin, is a compelling example of what a public-private partnership can achieve. The health system is teamed with the La Crosse County Solid Waste Department to harvest biogas created from organic waste at the landfill, converting methane into electricity and heat–an excellent use of a previously unused energy resource. Two wind turbine projects, implemented in 2011–2012 in Lewiston, Minnesota, and Cashton, Wisconsin, have two commercial turbines at each site. The Cashton project, in partnership with Organic Valley–the nation's largest cooperative of organic farmers and a leading organic brand–reduces the amount of carbon dioxide in the atmosphere by 12 million pounds each year. Together, the combined wind projects are expected to offset an additional 13 percent of Gundersen's total energy use.

Dr. Jeff Thompson, CEO of Gundersen Health System, believes that "sustainable investments are one of only a few things health systems can do that improve health, save money, engage staff and inspire communities."[7] Gundersen's sustainability work is directly connected to its mission, core values, and commitment to the community. He says community excitement is something he's seen many times with Envision's sustainability projects. "The village of Cashton is very proud of its wind farm. It gives them green energy and distinguishes them from other rural communities."[8]

7 R. Guenther and G. Vittori. Sustainable Healthcare Architecture. (Hoboken: Wiley, 2013); p. 227.

8 From Janet Brown, "Branding Sustainability in Healthcare," Healthcare Design Magazine, Sept. 12, 2012. Available at: http://www.healthcaredesignmagazine.com/article/branding-sustainability-healthcare.

Partners HealthCare, Boston

Partners HealthCare, founded in 1994, is a nonprofit health care system that includes seven greater Boston area and three Cape Cod hospitals with their related ambulatory services; in aggregate, the system encompasses more than 17 million square feet of owned and leased space and employs 60,000 people. Partners HealthCare frames its sustainable initiatives around long-term cost control and risk mitigation, improved patient and employee health and safety, and improved public and environmental health. Energy efficiency provides the backbone of the business case; other sustainable features are incorporated based on the success of energy conservation.

John Messervy, vice president of real estate planning, notes, "Within our organization, up to the senior management level, there is a growing understanding of the relationship between fossil fuel combustion, health, and disease. We needed to address it through our energy choices."[9] In August 2008, Massachusetts passed the Global Warming Solutions Act, making it one of the first states in the nation to move forward with a comprehensive regulatory program to address climate change. It set aggressive GHG reduction targets as follows: (1) between 10 and 25 percent below 1990 GHG emission levels by 2020 and (2) 80 percent below statewide 1990 GHG emission levels by 2050.

At the same time, the rapid rise in the cost of energy in the energy-intensive health care sector demanded a strategic response to long-term energy management. The combination of escalating energy charges and increasing demand demonstrated that inactivity would result in an increase in system-wide energy costs from $70 million per year in 2010 to $140 million by 2022. A key question emerged: Could compliance with the Massachusetts legislation also provide a path to avoid the financial consequences of energy cost escalation?

This question led to the development of the 10-year Strategic Energy Master Plan (SEMP) that is guiding Partners HealthCare's investments and is creating their short- and long-term compliance pathway. In summary, the SEMP demonstrated that achieving the statewide 2020 GHG reduction targets required extensive efficiency retrofit measures and integration of cogeneration (also known as combined heat and power, or CHP), although the 2050 goals demand a wholesale integration of renewable energy sources. Overall energy utility expenditure is expected to remain relatively constant; by 2022, system-wide energy costs may be as much as 44 percent less than if Partners HealthCare did nothing.

The SEMP concluded with the following action plan for the first two phases (2008 to 2022):

Invest in energy conservation measures (ECMs)

- $61 million investment in 230 ECMs yields a 28 percent energy reduction;
- 3.7-year payback (27 percent annual return)

Implement cogeneration at major Boston hospital sites

- 33 megawatt total at four hospitals and one research lab;
- 7.8-year payback (13 percent annual return)

9 R. Guenther and G. Vittori. Sustainable Healthcare Architecture. (Hoboken: Wiley 2013); p. 204.

These measures were then phased in a 10-year period to achieve a relatively equal investment each year–approximately $20 million to $25 million per year. In the first two years of implementation, they have realized close to half of the 28 percent energy reduction goal related to implementing energy efficiency measures. They are installing 14 megawatts of CHP, with 48 megawatts of additional capacity in the planning stages. Collectively, by 2022 they will reduce carbon-based fuel use by 43 percent while increasing renewables from 32 percent to 37 percent; they will meet the most aggressive reduction target of the Massachusetts policy. They will also significantly reduce the financial risks associated with rising fossil fuel energy prices.

Implementing distributed cogeneration at the system hospital sites has presented opportunities for unique business partnerships and complex regulatory challenges. Working with Health Care Without Harm, Partners HealthCare has formed a network of Boston hospitals to accelerate energy successes and support local and state policy initiatives aimed at improving access to renewables and distributed generation.

At the same time, Partners HealthCare has continued to raise the bar for sustainable and resilient building practices across the system. Its recent major buildings (Massachusetts General Hospital's Lunder Building and Spaulding Rehabilitation Hospital) achieved the US Green Building Council's LEED Gold Certification, and Spaulding has demonstrated the system's proactive approach to climate change adaptation and resilience. Located on the Boston Harbor waterfront, the new facility is the first building in Boston to elevate its ground floor to account for rising sea level, place required electro-mechanical infrastructure (including its CHP plant) on the roof, and incorporate operable windows throughout. This building continues to influence policymakers along the East Coast, particularly post–Hurricane Sandy. In a poignant and prescient reminder of the importance of resilient health care infrastructure, its opening, approximately six months following Hurricane Sandy, coincided with the Boston Marathon bombings, and the victims of the disaster were among its first patients.

Kaiser Permanente, Oakland, California

Kaiser Permanente is one of the largest nonprofit health care plans in the United States with more than 9 million members, 37 hospitals, and 611 medical offices and other outpatient care facilities in California, nine other states, and the District of Columbia. Kaiser Permanente is uniquely positioned in the US health care marketplace as an integrated delivery model–a health plan, hospital system, and a medical group all working together to provide high-quality, coordinated, and affordable care to its members. It has a long-standing commitment to environmental stewardship and the relationship between the health of its members, communities, and the planet. Today, that commitment is reflected in the design, construction, and operation of greener hospitals and many specific goal-oriented health initiatives:

- Reduce carbon footprint: Reduce overall GHG emissions by 30 percent by 2020 compared with 2008 levels, including energy conservation and investments in clean and renewable energy sources and generating 13.5 percent of energy needs on-site with solar photovoltaic and fuel cells.

- LEED Gold Certification: For all new buildings and major retrofits.
- Support healthy food: More than 50 farmers' markets and farm stands are located at Kaiser Permanente hospitals and facilities to improve access to fresh, local, and organic foods for members and staff.
- Waste reduction: Reuse, recycle, or compost at least 40 percent of waste materials by the end of 2015.

Kaiser Permanente is considerably raising standards for aggressive energy use reduction targets. In 2011, Kaiser sponsored an international design competition, aimed at harvesting the best ideas for delivering a "net-zero" energy, resilient, and restorative hospital. The lessons learned are influencing their next generation of health care construction, including a net-zero medical office building at Kaiser Antelope Valley and a low-energy hospital at Kaiser San Diego Central Hospital.

Ascension Health

Ascension Health is improving energy efficiency in its hospitals and health care facilities as part of its Environmental Stewardship Program. Specifically, Ascension Health has set a goal to achieve a 20 percent reduction in energy usage from 2008 levels by 2020. With a portfolio of 71 acute care facilities and 35 million square feet across 23 states and the District of Columbia, Ascension Health developed individual energy reduction goals for each hospital and health ministry (regional health systems) in recognition of the varied existing conditions across its portfolio.

Because many of its facilities indicated a "first-cost hurdle" to capital investments in energy efficiency measures, Ascension created a facility investment pool of $50 million to fund individual projects, with a focus on projects with payback of less than four years. Ascension Health has recognized its first goal of achieving a system-wide 7.1 percent energy use reduction ($18.8 million in savings) from July 1, 2008 through June 30, 2012, owing in part to the ability to implement energy efficiency projects using dedicated capital funds.

Anchoring Community Resilience

As an important local employer and service provider, the health care industry is uniquely positioned to support the resurgence of support for local economies. Coined in 2002 by Harvard Business School professor Michael Porter, anchor institutions are defined as named industries anchored to a place–nonprofit centers for education or health, whose name and history tie them to a city. Increasingly, major U.S. cities and metro regions are focusing on tying development and economic revitalization efforts to anchor institutions–the "eds and meds." Anchor institutions are pivotal to community resilience–or the capacity of communities to withstand and recover from economic, social, or environmental disruptions.

In U.S. health care, strategies focus on leveraging the economic power of health care organizations to produce targeted community benefits. Most hospitals are affiliated within large health systems that cover multiple states or metros; the Gundersen example discussed earlier demonstrates the power of a health care organization in leveraging local economic activity.

The Henry Ford Hospital in Detroit provides incentives to managers to hire locally and has set in place a policy to pay local vendors in advance to provide working capital. The hospital expanded this initiative in 2010 by partnering with two other local anchor institutions, Detroit Medical Center and Wayne State University, and has already seen $400,000 in redirected annual purchasing to local businesses. The Cleveland Clinic has sponsored local urban farming businesses to supply year-round produce for its food service operations.[10] University Hospitals targeted more than 90 percent of its $1.2 billion campus renovation to supporting local businesses. These examples point to a future with creative partnerships between health care organizations and their communities for economic growth and investment.

At the same time, architect Thomas Fisher, in Designing to Avoid Disaster, notes that the acceleration of extreme weather events has challenged our current "fracture-critical" design reality, in which "centralized infrastructure, from power grids to hospitals, are larger, more complex, increasingly dependent upon massive amounts of increasing ongoing maintenance, and often vulnerable to failure of a single element."[11] With each weather disaster, health care features prominently in headlines chronicling disruption and evacuation with, in some cases, significant loss of life. The health care sector should embrace "passive survivability" of health care infrastructure as critical–the concept, coined after Hurricane Katrina, that buildings be designed to survive loss of essential services, such as electricity, water, and sewer as a consequence of a natural disaster, utility outage, or terrorist attack.[12] On-site renewable energy, daylighting, and passive ventilation are examples of strategies that contribute to extending the critical services of a health care facility in the event of major ongoing utility disruptions. For mission-critical systems, it is imperative to provide multiple independent and redundant ways of supplying necessary services and locate those services out of harm's way. Hospitals that incorporate renewable energy on-site, for example, have a second option when grid infrastructure is unavailable. Moreover, an active and resilient health care infrastructure can provide important community resilience in the wake of a devastating event, providing essential "safe haven" services.

The notion of resilience is beginning to transform the health care building environment. There are remarkable examples of social and climate-resilient health care buildings emerging in response to lessons learned from extreme weather events and natural disasters; these buildings are anchoring community health and restoration. Kiowa County Memorial Hospital, a critical-access hospital reconstructed after a devastating Category 5 tornado leveled Greensburg, Kansas, in 2008, is completely powered by on-site and off-site wind turbines with the goal of increased resilience. On the Boston waterfront, Spaulding Rehabilitation Hospital (profiled earlier) demonstrates a facility designed to withstand the effects of rising sea level.

10 http://evergreencooperatives.com/business/green-city-growers/.

11 T. Fisher, Designing to Avoid Disaster: The Nature of Fracture-Critical Design. (New York and London: Routledge, 2013).

12 A. Wilson. Passive Survivability: A New Design Priority for the 21st Century. GreenSource Opinion, June, 2006. Available at: http://greensource.construction.com/people/0606mag-opinions.asp.

Building Momentum through Leadership

The Healthier Hospitals Initiative[13] (HHI) is a three-year campaign dedicated to transforming the US health care industry–more than 700 hospitals and 13 founding health care systems are shifting to a more sustainable business model and accepting the challenge to address the health and environmental effects of their industry. This platform provides a mechanism to integrate innovative energy strategies within the sector (through their Leaner Energy Challenge) and measure the collective improvements that are achieved by member hospitals and systems. HHI is partnering with Health Care Without Harm's Global Green and Healthy Hospitals Network[14] to extend learning and best practices globally. These leading organizations are working on issues ranging from energy to healthy food and waste reduction to environmentally preferable purchasing. Practice Greenhealth, a membership organization dedicated to improving the environmental performance of U.S. health care, recently launched the Greenhealth Energy Alliance, "a collaboration between industry leaders in clean energy and Practice Greenhealth members focusing on best practices for energy efficiency and clean energy implementation in the health care sector," according to a statement on their website.[15] Collectively, they are transforming the footprint of global health care.

As hospitals make the connection between their fossil fuel energy use and individual, community, and global health, the momentum to reduce energy effects and shift to renewable sources is building. The health care organizations profiled here, in concert with a growing number of others, are acting as if their energy decisions are an extension of their mission–they are using renewable energy to heal. Increasingly, the health care sector is participating in policy debates about issues that affect individual and community health. Finally, they are reaching beyond their four walls and outside their organizational boundaries to develop and test innovative community partnerships with utilities and with for-profit and nonprofit businesses.

The health care sector should not need to argue that delivering high-quality patient care requires a passport for waste and energy intensity–or that saving patient lives is somehow outside of broader population health and ecological concerns. The health care industry is in a pivotal position to lead the 21st-century reintegration of environment, health, and economic prosperity. Through their increasing focus on community benefit, green construction, and operations initiatives, leading health care organizations are demonstrating more than a broad commitment to high-quality patient care–they are committed to saving lives and improving health without undermining ecosystems or diminishing the world.

Gary Cohen is president and cofounder of Health Care Without Harm and Practice Greenhealth. Robin Guenther is a health care architect, principal at Perkins+Will and is a senior advisor to Health Care Without Harm.

13 See www.healthierhospitals.org.
14 See www.greenhospitals.net.
15 Available at: https://practicegreenhealth.org/initiatives.

Community Development INVESTMENT REVIEW

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