



# Multifamily Energy Efficiency

*Insights on Program Best Practices to  
Align Stakeholder Interests*

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Prepared by:



Principal Authors:

Mark Brown

Greenway Insights LLC, under contract with Franklin Energy Services, LLC

Tom Syring

Franklin Energy Services, LLC

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Please send inquiries to: [mark.brown@greenwayinsights.com](mailto:mark.brown@greenwayinsights.com) or [tsyring@franklinenergy.com](mailto:tsyring@franklinenergy.com)



# Introduction

## Background

This study aims to highlight themes and strategies for achieving improved energy efficiency in the existing multifamily housing stock that comprises nearly one quarter of all housing units in the U.S. While it offers a number of recommendations for program sponsors and policy makers, in some ways it raises more questions than it answers – and that is a good thing. Discussions with leading industry experts and practitioners and a review of published literature revealed a defining characteristic of the multifamily sector: This is a very diverse and challenging sector to address. It is only by laying out clear goals, engaging with multiple stakeholders, and thoughtfully considering the tradeoffs inherent in program design that sponsors can best ensure the success of their multifamily programs.

It is important to recognize that this study was a precursor to a more ambitious market characterization and energy savings potential analysis for existing multifamily housing (defined as structures with 5 or more housing units) in Minnesota. As such it focuses on offering a framework for understanding the best practices for program success – as identified by industry experts – rather than quantifying the size and sources of the energy savings opportunities.

## Contents – A Guide to Navigating the Report

This report is divided into five sections each with a different focus to serve the needs of the reader.

Section	Pages	Provides...
1 Introduction	3-6	An outline of the content of this report, an executive summary of the findings, and context on the energy savings opportunities and challenges facing sponsors of multifamily energy efficiency programs
2 Best Practice Themes	7-16	A framework for considering the dimensions of program success and a synthesis of feedback from study interviews and a review of published literature
3 Literature that Illuminates	17-33	A synopsis of relevant key takeaways from 15 of the most useful publications reviewed as part of the study
4 Program Profiles	34-40	A comparison of offerings from current ratepayer-funded energy efficiency programs targeting the multifamily sector
5 References and Resources	41-44	A broader listing of publications and references reviewed for the study that may provide readers with additional insights

## Executive Summary

This study combines findings from interviews with experts (listed in the Acknowledgements on Page 2) involved in multifamily energy efficiency programs with a review of literature on the subject and details on existing program offerings.

While this study offers value by bringing together a wide variety of resources and perspectives, its most significant contribution is to offer a framework for program sponsors and other stakeholders to use in designing and implementing cost effective energy efficiency programs. This framework provides dozens of questions to prompt program sponsor decision makers to evaluate their efforts to achieve significant energy savings in the multifamily housing sector.

Among the most salient findings for readers to take away:

1. The achievable energy savings for multifamily housing in the U.S. is on the order of 30% of current energy consumption. Comprehensive retrofits commonly achieve energy savings of 15% to 20% or more based on the experience of program sponsors. Energy improvements, particularly for cooler Northern climates, tend to achieve significantly higher savings for natural gas and other heating fuels compared to electricity savings. These results are largely a function of central plant improvements for domestic hot water and space heating systems and the majority share of energy use attributable to these uses.
2. Decision makers can view program best practices with respect to challenges and opportunities at three levels:
  - a. A market-level perspective that recognizes the diverse market segment characteristics of the multifamily housing sector. Sponsors must ask themselves how they are prioritizing actions to streamline engagement efforts and to provide appropriate incentive structures that maximize impacts in targeted segments.
  - b. A program-level perspective that engages stakeholders as collaborative partners to ensure program engagement is timed and targeted to coincide with trigger events and project needs. Sponsors must ask themselves if their program processes and offerings are geared toward continuous improvement.
  - c. A policy-level perspective through which decision makers can anticipate barriers to program success and adopt proven strategies and standards to align interests and provide program stability.
3. Initiatives at the federal agency level and among national collaborative organizations are helping to leverage existing protocols and programs to bring standardization to data collection that can benefit local program initiatives.
4. A review of existing program offerings shows that only a small proportion of program sponsors are addressing the multifamily sector with programs that promote comprehensive energy improvements. The variability in measure offerings and incentive structures suggests that program sponsors have the opportunity to increase program impact by broadening measure portfolios and adding flexibility to incentive structures to promote broader uptake (e.g., direct install programs) and deeper energy retrofits (e.g., performance-based incentives).

## The Multifamily Energy Efficiency Opportunity

Data from the U.S. Census Bureau's American Housing Survey shows that 23% (25.9 million) of the more than 110 million households in the U.S. reside in buildings with more than one housing unit. 16% of all households (17.5 million) live in multifamily buildings with 5 or more units, in which over 86% of housing units are occupied by renters.<sup>1</sup>

In a recent synthesis of findings from over two dozen state and regional efficiency potential studies, the Benningfield Group concluded that the U.S. multifamily housing sector has achievable energy savings potential on the order of 28% of current energy consumption. Much of this opportunity is a function of the age and construction of the existing multifamily housing stock, which is rapidly aging. As of 1989, the median rental housing unit was 26 years old. By 2009 the median age had increased to 38 years.<sup>2</sup> Over 70% of existing multifamily housing was built prior to the existence of building energy codes, the first of which was enacted in 1978. Achieving 28% energy savings would yield \$9 billion annually for tenants and landlords, which currently spend more than \$31 billion each year on energy bills.<sup>3</sup>

The sizable opportunity for energy savings in the multifamily sector is even more compelling when considering the standing of the end-use customers that have the most to gain.

While households in multifamily buildings of five or more units use on average only 40% as much energy as those in single-family detached housing, these expenditures are felt much more acutely. Nearly three-quarters of renters have incomes below the median household income, including 41% in the bottom income quartile and 30% in the lower-middle quartile. Low income households spend nearly 20% of their monthly income on energy, compared to around 4% for the average household.<sup>4</sup>

Utility costs as a share of income have been growing substantially as well. According to the Joint Center for Housing Studies of Harvard University, from 1975 to 2007, real utility costs for multifamily housing tenants increased by more than 20%, real rents increased by nearly 10%, while real household income for renters *decreased* by nearly 3%. In short, the impacts of rising energy costs on renters are both large and disproportionate.

## Moving Past Barriers

While the case for pursuing energy efficiency opportunities in the multifamily sector is clearly compelling, the challenges faced by programs aiming to generate impacts are substantial. Several publications profiled in Section 3 enumerate barriers to program success across multiple dimensions including: market characteristics, communications, financing, and workforce development.

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<sup>1</sup> U.S. Census Bureau, American Housing Survey, 2009. <http://www.census.gov/housing/ahs/data/ahs2009.html>

<sup>2</sup> Joint Center for Housing Studies of Harvard University, *America's Rental Housing: Meeting Challenges, Building Opportunities*, April 2011. <http://www.jchs.harvard.edu/sites/jchs.harvard.edu/files/americasrentalhousing-2011.pdf>

<sup>3</sup> Stone, N., *U.S. Multifamily Energy Efficiency Potential by 2020*. Prepared for The Energy Foundation by the Benningfield Group, Inc., October, 2009. [http://www.benningfieldgroup.com/docs/Final\\_MF\\_EE\\_Potential\\_Report\\_Oct\\_2009\\_v2.pdf](http://www.benningfieldgroup.com/docs/Final_MF_EE_Potential_Report_Oct_2009_v2.pdf)

<sup>4</sup> Ibid

*Split incentives* are the barrier identified most often by multifamily energy efficiency experts and publications. Split incentives exist in a number of situations in multifamily housing energy efficiency. First and most commonly, property owners usually pay the upfront cost of energy improvements, while tenants often pay utility bills – and benefit from the owners investments. Less commonly, tenants may invest or take actions to reduce energy use, but if the property owner pays the utilities – the owner benefits from the tenants investments or actions. Both cases are cited as reducing energy saving investments or actions due to a split between who pays for the investment and who benefits from it.

While split incentives are often cited as a barrier to investments in multifamily energy efficiency, some practitioners are beginning to see evidence challenging this prevailing view. In a paper included in the 2010 ACEEE Summer Study on Energy Efficiency in Buildings, researchers from KEMA Inc. and Southern California Edison highlight program evaluation evidence that few multifamily property owners identify split incentives as an impediment to investing in energy improvements. Furthermore, they suggest that owners do perceive direct economic incentives from efficiency improvements in the form of greater tenant cash flow available for rent payment.<sup>5</sup>

This example speaks to a broader theme found in interviews with program managers, industry experts and a review of the literature on the opportunities for energy efficiency in the multifamily sector – that many of the perceived barriers in the multifamily sector can be turned into significant opportunities:

- An older less efficient housing stock with less efficient appliances translates to a baseline for achieving greater energy savings by applying available efficiency measures
- Low Income Housing Tax Credit (LIHTC) financed projects, while highly restrictive to new financing arrangements due to the complexity of partnerships<sup>6</sup>, typically have a recapitalization event 15 years after construction. This event can be used to support investments in energy improvements
- Utility allowances<sup>7</sup> on low income housing normally diminish dollar-for-dollar as tenant utility costs are reduced, eliminating owner incentives for reducing those costs. The same allowances are now sometimes utilized by owners to recover retrofit investment costs
- Historically, a lack of data on the benefits of energy improvements has hampered investments; currently, benchmarking tools and proprietary databases are being leveraged to increase owner motivation and provide guidance for underwriters
- Hierarchical tiers of decision makers, often found among larger buildings and owner portfolios, can pose challenges to program outreach efforts, but may also be linked to well-established association networks that can open doors and provide platforms for energy education

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<sup>5</sup> Dyson, C., Chen, C. and Samiullah, S., *The Split Incentive Barrier: Theory or Practice in Multifamily Sector?*, 2010 ACEEE Summer Study on Energy Efficiency in Buildings, 2010. <http://eec.ucdavis.edu/ACEEE/2010/data/papers/2150.pdf>

<sup>6</sup> Stone, N., *Addendum Report: U.S. Multifamily Housing Stock Energy Efficiency Potential: HUD-Assisted, Low Income Housing Tax Credit, and Large Real Estate Investment Trust Properties*, Prepared for The Energy Foundation by the Benningfield Group, Inc., April 2010. [www.livingcities.org/related/downloads/?id=8](http://www.livingcities.org/related/downloads/?id=8) (see pages 4-5)

<sup>7</sup> HUD's definition of utility allowance: Per-apartment-unit allowance for resident-paid or check-metered utility expenses that are set annually by the housing authority using a variety of means. The utility should be set to cover the utility costs of a reasonably conserving resident. Source: [http://portal.hud.gov/hudportal/HUD?src=/program\\_offices/public\\_indian\\_housing/programs/ph/phecc/definitions](http://portal.hud.gov/hudportal/HUD?src=/program_offices/public_indian_housing/programs/ph/phecc/definitions)



2

# Best Practice Themes

## A Framework for Organizing Best Practices

Interviews with leading industry experts and practitioners and a review of relevant literature resulted in a framework for organizing the best practices in multifamily energy efficiency programs.

**FIGURE 1 – Framework for Organizing Multifamily Program Best Practices Concepts**

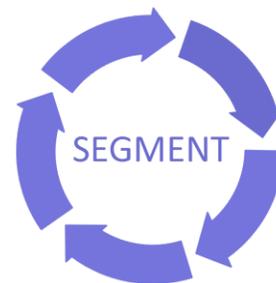


This framework addresses areas of focus across three levels of decision making and implementation:

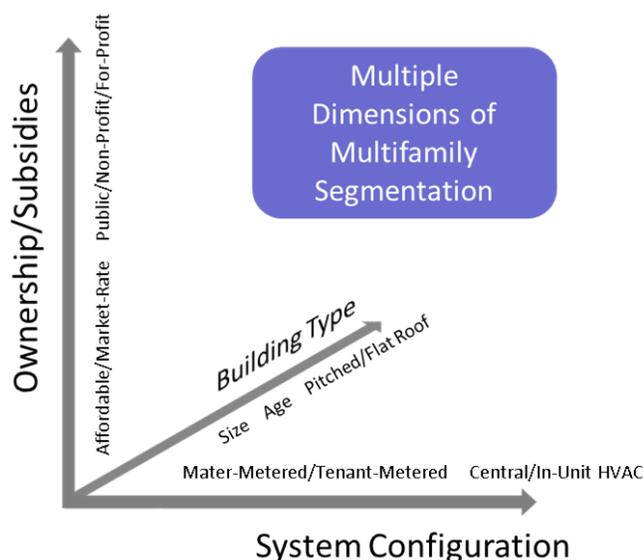
- Market:** Prioritizing actions by recognizing diverse market segment characteristics and needs is essential to delivering cost-effective energy savings.
- Program:** The most successful programs unite multiple stakeholders in a well-considered approach to engage participants, assess opportunities, provide incentives, and incorporate feedback to drive continuous improvement.
- Policy:** Decision makers involved in formulating the processes and metrics by which program resources and outcomes are governed and evaluated may best enable program success by 1) anticipating barriers to program success and 2) enacting policies to align stakeholder interests in order to overcome those barriers.

## Market Level: Segment

The multifamily property sector is a commercial enterprise providing residential living spaces. The challenges faced by ratepayer-funded programs are complex, and include: the mix of master-metered and tenant-metered accounts, the diversity of building types, sizes, and vintages, and the myriad ownership and management structures. All of these challenges need to be addressed by program sponsors aiming to successfully target decision makers, and offer technical assistance and financial incentives that will motivate project activity and yield cost-effective energy savings.



## Best Practice Themes and Observations



- Multifamily housing breaks into segments along multiple dimensions defined by differences in system/meter configuration, building characteristics, and ownership type
  - A property's ownership structure and sophistication often dictates the number and influence of decision makers, as well as access to capital and financing
  - The opportunity for energy savings from building shell and HVAC measures is largely dependent on building size, age, construction characteristics and mechanical systems
  - By narrowing the scope of targeted multifamily properties, programs can focus processes and protocols for participant recruitment, audits/assessments, and quality assurance – ultimately improving project conversion rates and program cost effectiveness

- The affordable housing market presents unique opportunities to partner with financing and development stakeholders to leverage financing events, subsidy structures, and taxpayer-funded resources as catalysts for energy improvements benefitting both tenants and owners.

## Key Questions for Program Stakeholders to Address

1. To what degree is the program limiting its focus in order to best serve the needs of specific ownership categories or building types?
2. Are engagement strategies, assessment protocols, and measure opportunities well-tailored to the decision makers and building stock for the targeted population(s)?
3. Is the potential overlap between the targeted program and other existing residential or commercial portfolio programs understood and addressed with respect to eligibility requirements, incentive structures and levels, and accounting of budgets and impacts by customer class category?
4. What market segments are likely to be underserved as a result of program attributes?

## Market Level: Prioritize

Given the high level of resources required to support engagement, technical assistance, and project management activities for multifamily sector programs, it is essential to identify strategies that target the most productive opportunities, while avoiding situations where capital constraints and split incentive barriers are likely to doom project uptake. Sponsors can maximize program impacts by using benchmarking tools to cost effectively screen for the most attractive projects and by proactively seeking out projects approaching refinancing and equipment replacement events.



## Best Practice Themes and Observations

### Benchmarking Energy-Use Intensity

### Owner-Paid Central Heating Plants

### Trigger Events

### Piggybacking on Refinancing

- High per-unit energy consumption intensity, often highly correlated with building age, has been empirically demonstrated to be the most significant predictor of achievable energy savings, confirming its value as a screening tool to maximize retrofit program cost effectiveness<sup>8</sup>
- Benchmarking tools can serve as a low-cost means of engaging owners by offering the opportunity to compare and rank energy use intensities
- Where central heating plants exist, owner-paid utility bills make up the majority of energy use and are not burdened by split incentive barriers
- Trigger events present the greatest opportunity to access capital and tenant living spaces. Common trigger events include unit turnover, building-wide rehabilitation projects, and refinancing events
- Stand-alone retrofit financing can pose significant affordability and convenience barriers. Energy improvements that take advantage of recapitalization events can spread transaction and underwriting costs over much larger principal loan amounts, reducing these barriers
- Each year through 2020, over 100,000 Low-Income Housing Tax Credit (LIHTC) funded projects will be refinanced in the U.S., creating opportunities to fund energy improvements<sup>9</sup>. (The 15-year mark is the typical time for required refinancing to restructure ownership and debt).

## Key Questions for Program Stakeholders to Address

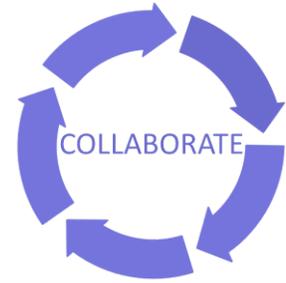
1. Does the program incorporate benchmarking tools to compare and rank energy use intensities?
2. Are there mechanisms to prioritize and cater to the retrofit opportunities of older buildings and those with central HVAC systems?
3. Is the program designed to engage property owners in concurrence with trigger events that often present the greatest opportunity to access funding and tenant living spaces?
4. How does the program proactively identify, track and engage affordable housing projects slated for refinancing events in the next two to three years?

<sup>8</sup> Steven Winter Associates and HR&A Advisors, *Recognizing the Benefits of Energy Efficiency in Multifamily Underwriting*, January 2012. [http://www.db.com/usa/img/DBLC\\_Recognizing\\_the\\_Benefits\\_of\\_Energy\\_Efficiency\\_01\\_12.pdf](http://www.db.com/usa/img/DBLC_Recognizing_the_Benefits_of_Energy_Efficiency_01_12.pdf)

<sup>9</sup> Stone, N., *U.S. Multifamily Housing Stock Energy Efficiency Potential*, April 2010. <http://www.livingcities.org/related/downloads/?id=8>

## Program Level: Collaborate

Perhaps more so than in any other market segment, multifamily energy efficiency programs benefit from partnerships and collaborative program design efforts. In order to seamlessly address both the technical and financial needs of building owners without exceeding their bandwidth for program engagement, stakeholders must work together to deliver a one-stop experience that provides both a roadmap and a personal champion for participants.



## Best Practice Themes and Observations

### One-Stop, Not One-Size

- A “one-stop shop” experience gives property owners and managers a single point of contact (both an information portal and an assigned Project Manager) to help navigate the entire process from assessment to financial analysis to implementation - including access to project financing resources
- Given the diversity of multifamily housing and decision maker needs, “one-stop” should in no way translate to “one-size-fits-all,” but instead provide a roadmap for participants to navigate to best-fit assistance and resources

### Electric and Gas Joint Delivery

- Pursuing joint delivery across gas and electric utilities can achieve economies of scale and simplify the process for program participants
- Collaboration with parallel programs (e.g., WAP) and owner/manager associations can add valuable perspectives and increase program visibility

### Financing Partners

- As projects often require or have implications for financing arrangements, close coordination with state housing finance authorities (HFAs) ensures program alignment and provides access to valuable resources
- Public housing authorities (PHAs) have structured requirements with respect to captive capital funds and 5-year energy audit cycles that make them ideal program partners (with additional benefits of large scale)

### Federal Initiatives

- Ongoing federal initiatives including the HUD Green Mark-to-Market program and the Fannie Mae/FHA Green Refinance Plus program provide favorable refinancing terms
- Mechanisms exist for PHA and LIHTC funded projects to utilize energy-efficient utility allowances, helping to address split incentives by providing owners with higher rental incomes as a proportion of housing cost caps<sup>10</sup>

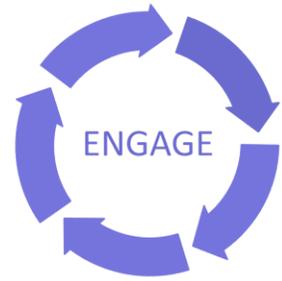
## Key Questions for Program Stakeholders to Address

1. Have HFAs, WAP administrators, building owner/manager associations, utilities, and the state energy office been engaged early in the program design process? How is their role defined?
2. Does the program address savings for both electric and gas efficiency improvements through joint program delivery or other coordination mechanism(s)?
3. Have relationships been cultivated with Public Housing Authority representatives?
4. Are there ways for the program to leverage ongoing and emerging federal and collaborative initiatives to provide opportunities for financing, standardization, or lead generation?

<sup>10</sup> Trehubenko, T. and D. Schmidt, *Multifamily Utility Usage Data: Issues and Opportunities*, June 2011. <http://greenbootcamp.livingcities.org/download.php?id=21>

## Program Level: Engage

Model programs are characterized by a high-touch, person-to-person sales process that cultivates strong relationships with individual property owners and managers, often leveraging member associations to deepen relationships and provide education on program resources. Program capabilities must be assessed both with respect to the skill sets of the program and project managers as well as the information management systems they rely upon.



## Best Practice Themes and Observations

### Captive vs. Open Trade Ally Models

- Tradeoffs exist in captive versus open models for engagement of assessment consultants and installation contractors – both vital partners to program success. A captive model – in which program sponsors contract directly with select providers – excludes trade allies that would otherwise have the opportunity to participate under an open model, but may offer important quality assurances (e.g., consistency in training, execution of combustion safety testing by assessment consultants)

### Relationships Based on Trust

- In order to be seen as a valuable resource, program personnel must attend gatherings of decision makers and put in the time over multiple meetings to cultivate trust; among other events such as multifamily property owner association functions and affordable housing conferences provide venues to educate prospective participants about program resources and demonstrate knowledge of and commitment to the multifamily business and market

### Sales Skills, CRM Systems

- A key customer account model is well suited to develop the person-to-person relationships that are vital to navigating among decision makers and guiding participants through the program process
- Selling skills are at least as important as technical skills early in the engagement process; personnel need to be well-practiced in making the economic/business case for energy improvements

### Reliable Lead Generation Sources

- Multiple program managers report that sourcing leads for multifamily program outreach can be a major pain point often overlooked during program design; sponsors and implementers should proactively identify accurate and extensive list services, both public and proprietary

## Key Questions for Program Stakeholders to Address

1. Do the program's contractor participation protocols support a well-qualified trade ally community and leverage local workforce development initiatives?
2. Has the program identified comprehensive and reliable lead generation sources?
3. Does the program have a long-term plan to maintain visibility at key property owner/manager affiliated events? Are program personnel regularly assigned to attend and present?
4. Are customer relationship management (CRM) processes facilitated by a robust system for tracking customer interactions and project management functions through to measure installation and inspection?
5. Are project managers given the opportunity to develop sales skills?

## Program Level: Assess

A program's energy assessment activities and deliverables create "make-or-break" opportunities to motivate building owners to take action and invest in energy improvements that are shown to have a solid return on investment. In order to strike an appropriate balance in expending resources, program sponsors should work to ensure rigorous quality assurance processes are in place and that assessment activities and reports are engaging and compelling



## Best Practice Themes and Observations

### Assessments as Catalysts for Action

### Owner Skin in the Game

### Whole-Systems Approach

### Bottom Line ROI, Including H2O and IAQ

- The most effective assessment reports clearly communicate problem areas (using pictures to compliment technical details), give buildings a grade or grades (A to F) for performance, tie directly to an action plan (both technical and financial), and can easily be turned into a bid document
- Overly complex audit reports go over owners' heads and eat up scarce budget dollars that could otherwise fund customer incentives
- Industry experts recommend initially giving assessments away during well-monitored start-up periods. However, once assessment consultants and processes are under steady-state quality assurance, it is reasonable to require building owners to put some skin in the game for intermediate level (e.g., ASHRAE Level 2) audits that can run \$10k+ for larger buildings
- Taking a "building-as-a-system" approach helps to draw connections between physical systems and behavioral systems; assessments should engage building owners, superintendents, operators and tenants to incorporate input on operations and maintenance in addition to physical data collection, diagnostic tests, and energy use analysis and modeling
- Industry experts stress that framing energy improvement opportunities in terms of return on investment (ROI) and cash flow impacts, not simple payback, is essential to making the business case that will resonate with building owners and other decision makers
- Assessment studies should go beyond energy efficiency to address opportunities for water efficiency (often a larger expense to owners than common area electric<sup>11</sup>), improved tenant comfort, and indoor air quality improvements that have real and tangible – if not readily quantifiable – benefits.

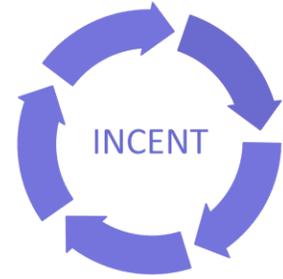
## Key Questions for Program Stakeholders to Address

1. Do assessment reports serve as action plans that can readily translate to bid documents?
2. How are we ensuring that owners are vested in the program prior to expending assessment resources?
3. Does our assessment process take into consideration operations and maintenance practices?
4. How do our reports incorporate non-energy benefits in making a case for project ROI?

<sup>11</sup> Padian, A. *Management Techniques to Reduce Energy Use*, The Community Preservation Corporation, November 2009. [http://prattcenter.net/sites/default/files/users/pdf/MLG\\_Management%20Techniques\\_APadian\\_Nov09.pdf](http://prattcenter.net/sites/default/files/users/pdf/MLG_Management%20Techniques_APadian_Nov09.pdf)

## Program Level: Incent

In designing program incentive structures, sponsors balance tradeoffs between increased motivation for investments in comprehensive energy improvements and an imperative to maintain cost effective resource acquisition. In many cases a blended approach, combining direct install, prescriptive incentives, and performance-based design can strike a balance between meeting the needs of diverse projects and laying a foundation for future success.



## Best Practice Themes and Observations

Direct Install as  
a Relationship  
Builder

Prescriptive  
Rebates to  
Streamline

Performance-  
Based Custom  
Incentives

Complimentary  
to Financing,  
QA

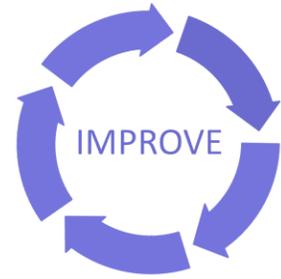
- Direct install models covering 100% of measure costs eliminate upfront cost barriers and can be an effective means to cultivate relationships instrumental to deeper retrofits down the road
- Prescriptive incentives coupled with deemed savings can streamline the evaluation and processing of standard measures such as common area lighting retrofits, LED exit signs, and direct install measures such as CFLs, faucet aerators, and low-flow showerheads
- Gas savings projects related to boiler and domestic hot water (DHW) upgrades and controls, ventilation enhancements, and building envelope measures are better suited to custom/performance-based incentives using estimated or achieved savings to determine financial incentives
- Per-unit incentives (e.g., \$1,500 or \$2,500 per unit) have provided a useful means to capping project incentives. They also offer owners greater predictability and easily-understood scale that can increase participation.
- Custom approaches also accommodate ESCO/performance contracting delivery models that minimize project risk, solve financing challenges, and encourage deep energy retrofits
- Incentive structures based on savings tiers (e.g., NYSERDA's MPP 15% minimum) promote pursuit of more substantial energy improvements
- Delayed performance-based incremental payments dependent on post-install performance testing and verification serve as a means for quality assurance and an opportunity to gather more data
- Segment-specific needs can necessitate different incentive structures (e.g., deed-restricted qualified affordable housing may require 100% cost coverage to motivate participation due to economic barriers)

## Key Questions for Program Stakeholders to Address

1. How do program incentives serve to motivate building owners to take action?
2. Are incentives designed to encourage pursuit of deep, comprehensive energy retrofits, or only the most cost effective measures?
3. Are incentive structures flexible enough to accommodate projects where costs and savings are highly dependent on a building's unique circumstances?
4. Are program incentives supportive of an ESCO/performance contracting solution?
5. How do incentive designs help promote quality assurance and increase access to performance data?

## Program Level: Improve

Well-designed and executed program evaluation processes are essential to ensure the cost effectiveness of program impacts and identify opportunities for continuous improvement. Additionally, in order to transform and scale the market for multifamily improvements, program sponsors should aim to leverage program project data to move private capital markets to place a value on energy efficiency, and to increase knowledge of the health and economic impacts of improving indoor air quality.



## Best Practice Themes and Observations

Need for More  
Data on Actual  
Project ROI

Key to Asset  
Appreciation  
and Financing

IAQ Impacts  
Poorly  
Understood

Need to  
Address Data  
Blind Spots

- Only 2% to 3% of existing multifamily buildings are likely to be represented in existing benchmarking databases, many of which began less than five years ago; this lack of empirical data on the ROI of energy improvements is a major barrier to realizing improved asset valuations and access to financing underwriting<sup>12</sup>
- Program sponsors must incorporate sustainable processes for capturing and leveraging data from program participants and the broader multifamily housing stock in order to overcome the current data deficit impeding greater private capital investments
- Multiple industry experts interviewed for this study stressed the need for programs to pay greater attention to indoor air quality (IAQ). Some identified IAQ as the “elephant in the room” with respect to multifamily housing and the potential upside (and possible downside) outcomes of modification to building air sealing and ventilation; while there are no easy ways to quantify poor indoor air quality, the value of potential health benefits could provide tremendous support for increased investments in retrofits
  - Multifamily energy efficiency programs represent one of the greatest opportunities to shed light on the economics, benefits and risks related to IAQ, but this opportunity will only be realized if program sponsors take the lead in developing robust datasets
- Multiple study respondents voiced concern about the validity and accuracy of assumptions underlying multifamily program deemed savings (e.g., hours of use for tenant in-unit lighting fixtures); program sponsors should take action to address blind spots to ensure program cost effectiveness

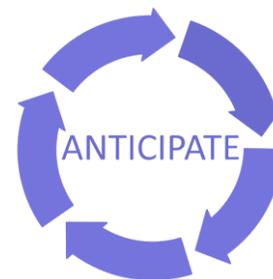
## Key Questions for Program Stakeholders to Address

1. What measures do you track to gauge improvement in program effectiveness?
2. What program protocols ensure that data from participating projects can be leveraged to demonstrate the value of energy improvements to improved net operating income and tenant cash flows?
3. Does your program have a plan to evaluate the indoor air quality impacts of retrofit projects?

<sup>12</sup> Trehubenko, T. and D. Schmidt, *Multifamily Utility Usage Data: Issues and Opportunities*, June 2011.  
<http://greenbootcamp.livingcities.org/download.php?id=21>

## Policy Level: Anticipate

Program policy makers face the challenge of balancing local market dynamics and needs with the pressure coming from national consensus, federal initiatives, and adoption of standards with implications for local program results. By staying engaged with collaborative initiatives and monitoring early adopters of new program innovations, decision makers can ensure these trends are more likely to add value, and not confusion, for local program stakeholders.



## Best Practice Themes and Observations

- In the case of major building rehabilitation, projects can span multiple years from initial design charrette to final measure implementation; policy makers should allow program sponsors the runway to invest resources over a sufficiently long period of time to realize dividends
- Both the National Association of Regulated Utility Commissioners (NARUC) and the National Association of State Utility Consumer Advocates (NASUCA) recently adopted resolutions supporting proportional expenditure of energy efficiency funds in all customer sectors, naming the multifamily segment and specifically affordable multifamily housing.
- Green building standards (e.g., ENERGY STAR, Enterprise Green Communities Criteria) are gaining traction, albeit only with a very small fraction of properties to date. It is worth considering how ratepayer-funded programs can complement standards adoption, and important for regulators to clarify whether/how standards would impact baselines for cost-effectiveness calculations.
- Model programs offer opportunities to observe the impact of bold policy actions; New York City's recent moves to require buildings over 50,000 square feet to complete an annual benchmark analysis of energy consumption, conduct an energy audit every ten years, and require owners to make any improvements with a five year payback is one example to watch<sup>13</sup>
- Collaboration at the federal level is helping to address the private capital market's desire for better empirical data on the impacts of multifamily retrofits on operating income
  - The Green Refinance Plus program aims to deploy \$100 million in its first year toward FHA-insured loans underwritten by Fannie Mae. The loans provide 4-5% additional proceeds for energy and water efficiency measures implemented to improve and preserve affordable housing; participants must complete a Green Physical Needs Assessment (GPNA) in cooperation with a qualified contractor<sup>14</sup>

## Key Questions for Program Stakeholders to Address

1. How can policy makers increase synergy between ratepayer-funded program resources and green building standards? How should incremental savings be determined (e.g., relative to standard baselines vs. code)? Can ratepayer incentives and technical assistance be credited for driving increased participation?
2. How are decision makers aligning policies to leverage federal initiatives to expand access to financing and assessment tools? Are the results of early adopter communities being tracked?

<sup>13</sup> Living Cities and the Institute for Sustainable Communities, *Scaling Up Building Energy Retrofitting in U.S. Cities: A Resource Guide for Local Leaders, Version 1.0*, May 2009. [http://www.iscvt.org/who\\_we\\_are/publications/Green\\_Boot\\_Camp\\_Resource\\_Guide.pdf](http://www.iscvt.org/who_we_are/publications/Green_Boot_Camp_Resource_Guide.pdf)

<sup>14</sup> HansonBridgett, "What is Green Refinance Plus and can you qualify?," 2011. <http://www.hansonbridgett.com/Publications/pdf/~media/Files/Publications/What%20is%20Green%20Refinance%20Plus%20and%20can%20you%20qualify.ashx>

## Policy Level: Align

The primary objective of program policy makers should be to align incentives to ensure resources can be as applied as cost effectively as possible in generating energy savings impacts and transforming markets to yield even greater future benefits. To the extent that parallel programs end up working at cross purposes or requirements lead to wasteful duplication of effort, policy makers have an obligation to act to remove disincentives and apply common standards.



## Best Practice Themes and Observations

- As more financing initiatives are operating alongside ratepayer-funded initiatives (e.g., 1 in 5 BetterBuildings grant recipients is addressing financing for the multifamily sector<sup>15</sup>), issues such as the attribution of savings may give program sponsors pause before embracing a coordinated synergistic approach (i.e., during program evaluation, participants may cite financing over utility rebates as a motivating decision factor). Similar issues exist with green building standards.
  - Policy makers have the opportunity to get out in front of these potential disincentives by providing appropriate assurances for claimed savings or other incentive alignment mechanisms
- By including identifiable societal and non-energy benefits in cost effectiveness calculations, program administrators and regulators can better reflect the true impact of energy improvements
- Multifamily projects often have to undergo energy analysis in multiple software programs to meet the requirements of: 1) code compliance (e.g., EnergyPro in California), 2) utility incentive programs, and 3) the Weatherization Assistance Programs (e.g., U.S. DOE-approved programs such as TREAT); by seeking flexible standards, policy makers can help to eliminate duplicative efforts
- Living Cities, the MacArthur Foundation, the White House Council on Environmental Quality and the Urban Land Institute have agreed to standardize their energy consumption data and develop a common “data taxonomy”
- The Residential Energy and Water Data Collaborative (REWDC), a collaborative formed in 2010 with participation from Enterprise Community Partners, the Local Initiatives Support Corporation (LISC), NeighborWorks, Stewards of Affordable Housing for the Future (SAHF), and the Housing Partnership Network (HPN), achieved consensus on data points that will be collected by members for the multifamily properties in their portfolio – hopefully to serve as a basis for standardization across the industry. Further coordination with a New York City collaborative, Fannie Mae, and the EPA is creating additional movement toward consistent data collection.
- Since inception, DOE’s WAP program has helped weatherize more than 82,000 multifamily units, though only limited evidence is available on successful coordination with utility programs

## Key Questions for Program Stakeholders to Address

1. How are policies being shaped to align incentives for program sponsors operating in parallel to engage in greater coordination that can be beneficial to achieving their goals?
2. What is being done to align program policies and guidelines with ongoing collaborative efforts to standardize data taxonomies and evaluation of energy improvement opportunities?

<sup>15</sup> Brown, M. *Financing Energy Improvements: Insights on Best Practices to Engage Stakeholders and Marry Dollars with Demand*. January 2011. <http://mn.gov/commerce/energy/images/CARD-Financing-Improvements.pdf>



## Diving Deeper – Literature that Illuminates

In preparing this report, a significant effort was made to identify and review the published research and literature most relevant to achieving increased energy efficiency in the multifamily housing sector. Among the literature reviewed, several reports stood out as highly useful to stakeholders and decision makers in providing thoughtful coverage on a range of key issues and program best practices.

In order to leverage the contributions of these reports for readers and to encourage further investigation, key findings and takeaways are highlighted on the following pages along with links to the online documents. In addition to these selected reports, readers are encouraged to review the full listing of references and resources listed with hyperlinks to source documents in Section 5.

Selected reports fall under several major areas of focus, including:

<b>Potential Savings:</b>	These studies provide a quantification of the magnitude of energy savings potential within the multifamily housing sector as well as insights on market characterization and levers to realize savings
<b>Best Practices:</b>	Based on research, case studies, and the hard-won experience of authoring teams, these studies seek to articulate lessons learned regarding barriers to successful programs in multifamily energy efficiency as well as the prescriptions to ensure success
<b>Financing:</b>	Given the complexity and necessity of financing as a key consideration to successful multifamily program efforts, particularly with respect to affordable housing, these studies highlight promising innovations for policy makers, program practitioners, and financing providers
<b>Data Usage:</b>	They studies highlight strategies and recommendations for policies and tools to manage access and use of utility billing data, a key challenge identified by study respondents and reviewed literature

**U.S. MULTIFAMILY  
ENERGY EFFICIENCY POTENTIAL  
BY 2020**

Prepared for The Energy Foundation  
October 19, 2009

Prepared by the Benningfield Group, Inc.  
400 Plaza Drive, Suite 120  
Folsom, CA 95630

Click image or [here](#) to launch

Title: **U.S. Multifamily Energy Efficiency Potential by 2020**

Author(s): Nehemiah Stone

Prepared by: The Benningfield Group, Inc.

Prepared for: The Energy Foundation

Published date: October, 2009

Stated Purpose/Focus:

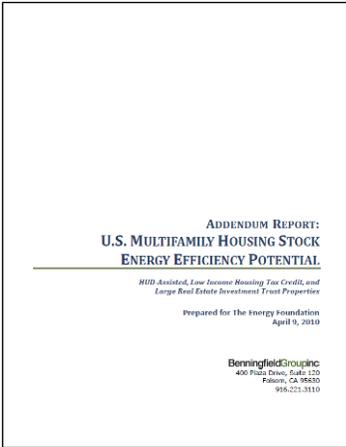
*"This report is meant to help national and regional policy-makers understand the economic and achievable energy efficiency potential in the country's existing multifamily sector."*

Methodology:

Synthesizes findings from 27 state and regional energy efficiency potential studies that had estimated the energy savings potential for the multifamily sector on a national and regional basis.

**Key Findings and Takeaways of Relevance**

1. The U.S. multifamily housing sector is found to have achievable energy savings potential by the year 2020 of over 51,000 annual gigawatt-hours of electricity and over 2,800 million annual therms of natural gas (or equivalent heating fuels), representing on the order of 28% to 29% of current energy consumption.
2. This savings potential, which could be obtained with an estimated investment of \$8 billion over the next 11 years, would yield a \$9 billion annual energy "dividend" to tenants and landlords, compared to current annual energy costs of over \$31 billion.
3. The majority of energy savings potential studies evaluated did not provide a separate estimate for multifamily savings from the larger estimate of savings in the residential sector. Only 13 of the 27 state studies reported multifamily savings directly.
4. Multipliers derived from comparing the ratio of multifamily as a share of housing stock to multifamily as a share of energy savings potential ranged from 0.7014 for California (i.e., MF is 27.8% of housing units, 19.5% of energy savings potential) to 1.087, 1.256, and 1.008 for the Midwest, South and Northeast respectively.
5. Households in multifamily buildings with five or more units use about 40% as much energy per household as those in single-family detached housing according to EIA data, though the proportion of multifamily tenant income spent on energy bills is significantly higher than the average residential customer. Low income households spend nearly 20% of their monthly income on energy, compared to about 4% for the average household.
6. Renter household incomes are approximately half those of owner households (\$31k vs. \$61k)
7. Based on data from Harvard's *State of the Nation's Housing 2008*, from 1975 to 2007, rent for multifamily household tenants increased 8.9% in real dollars on average across the U.S. while utility costs increased 20.4% and real household monthly income for renters actually fell by 2.8%.
8. Because of split incentive issues (e.g., tenants pay for the energy use of landlord-owned in-unit appliances) and the lower average income of tenants, a larger unmet need for upgrades to more efficient appliances exists among multifamily households as compared to the single-family market.
9. Over 70% of the nation's existing multifamily units were built before there were any building energy codes (1978).
10. As compared to other residential housing, a greater proportion of savings potential is attributable to water heating efficiency gains and appliances as compared to building envelope or HVAC measures.
11. Controls such as those that manage the re-circulation pump for central domestic hot water (CDHW) and boiler temperature modification controls are examples of high-potential energy savings measures.
12. Solutions to overcome the split incentive barrier include 1) program incentives covering the full cost of efficiency upgrades, 2) owner recoupment of energy investments through increased rents, and 3) more complex contractual relationships such as on-bill repayment or shared savings contracts.
13. Projects financed with investments receiving federal Low Income Housing Tax Credit (LIHTC) incentives create a future effective opportunity to finance energy efficiency upgrades. 15 years after construction, when the equity partner is no longer obligated to remain in the partnership, the managing partner typically obtains new financing to cash out the equity partner.
14. Due do the long waiting lists (e.g., no/low vacancy) and low turnover rate (e.g. under 10%% in California), public housing authorities have little marketing advantage to being more energy efficient.
15. U.S. Census survey data show that 30% of multifamily units receive an inspection or property needs assessment every two years, and owners of nearly 60% of multifamily units report renovations in the previous five years, a third of which involve plumbing or HVAC systems.



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Title: **Addendum Report: U.S. Multifamily Housing Stock Energy Efficiency Potential: HUD-Assisted, Low Income Housing Tax Credit, and Large Real Estate Investment Trust Properties**

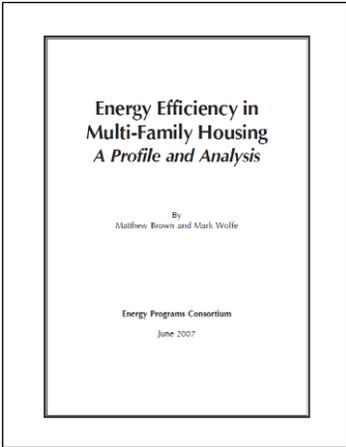
Author(s): Nehemiah Stone  
 Prepared by: The Benningfield Group, Inc.  
 Prepared for: The Energy Foundation  
 Published date: April 2010

Stated Purpose/Focus:  
*"This report lays out the potential in a few segments of the multifamily housing stock: those owned by large real estate investment trusts (REITs), those that are HUD-assisted, and those that were financed partly by Low Income Housing Tax Credits (LIHTCs)."*

Methodology:  
 Relies on the energy efficiency potential per unit of multifamily housing from the earlier study – *U.S. Multifamily Energy Efficiency Potential by 2020* – and applies source data to refine the analysis, providing insight on the three subject segments

**Key Findings and Takeaways of Relevance**

1. The three segments highlighted in the study, comprising more than 25% of U.S. multifamily housing units (around 7.2 million apartments), have achievable energy efficiency potential of about 29% of energy use, equating to around 12,000 gigwatt-hours of electricity and around 650 million therms of natural gas, segmented as follows:
  - a. HUD-Assisted: 4.8MM units, 7,847 GWh, 432MM therms
  - b. LIHTC: 1.8MM units, 3,037 GWh, 167MM therms
  - c. (Top 15) REITs: 0.6MM units, 1,037 GWh, 57MM therms
2. To achieve the above efficiency gains, which translate to an annual energy cost savings of over \$2 billion per year for tenants and property owners, requires estimated investments of less than \$5 billion.
3. HUD research shows the median income for renter households was \$26,983 in 2009 vs. \$10,475 for HUD-assisted renters.
4. While utility costs make up less than 1/8<sup>th</sup> of the total housing cost for the median household, they make up more than 1/3<sup>rd</sup> (\$118/month) of housing costs for the average HUD-assisted renter household.
5. As of 2009, the average vintage of HUD-assisted rental units was the mid-1970s (pre-energy efficiency codes). 30% were built before 1950, 81% were built between 1950 and 1989, and 9% were built in the last 20 years from 1989 to 2009.
6. There are around 1 million LIHTC apartments in the U.S. yet to reach the 15-year mark at which refinancing is typically required to restructure the ownership and debt. Through 2020, there will be between 103,000 and 128,000 LIHTC housing units refinancing each year nationwide.
7. Minnesota is identified to have 26,732 LIHTC apartments across 669 projects, averaging around 40 units per project.
8. The top 15 largest multifamily REITs account for around 629,000 dwelling units in over 3,600 apartment complexes across the U.S., presenting program sponsors with an opportunity to target a meaningful share of the multifamily housing market while streamlining administration and transaction costs.
9. Thirty-three percent of low-income households now use electricity as their primary heat source, compared with 10% in 1979.
10. U.S. Census data shows that while low-income household heating energy use dropped nearly in half from 1979 to 2009, because of rising energy prices, heating costs actually rose from around \$300/year on average to around \$500/year. At the same time, cooling costs rose from about \$15/year to \$200/year with greater adoption of air conditioning equipment, and costs for lights and appliances rose from just over \$300/year to more than \$950/year. Overall energy costs in 2007 were 274% of 1979 levels.
11. "An investment without a return is not an investment – it's a gift. Without a mechanism for property owners to share in the utility bill savings from energy efficiency (e.g., by resetting rents after upgrades), there is no way for the property owner to realize a return on the investment until they sell the property."
12. The correlation between energy efficiency and property market value has not been adequately studied.
13. Adjusting restricted rents through property-specific recognition of tenant utility cost savings from energy efficiency and solar upgrades (i.e., utility allowance adjustment) presents a mechanism to encourage economically rational investments.
14. Systems to credibly help renters evaluate the true costs (e.g., rent + utilities) of renting when evaluating apartment options could change demand dynamics and force apartment owners to view energy efficiency as directly impacting their cash flow.



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Title: **Energy Efficiency in Multi-Family Housing: A Profile and Analysis**  
 Author(s): Matthew Brown and Mark Wolfe  
 Prepared by: Energy Programs Consortium  
 Prepared for: stakeholder meeting sponsored by Surdna Foundation  
 Published date: June 2007

**Stated Purpose/Focus:**

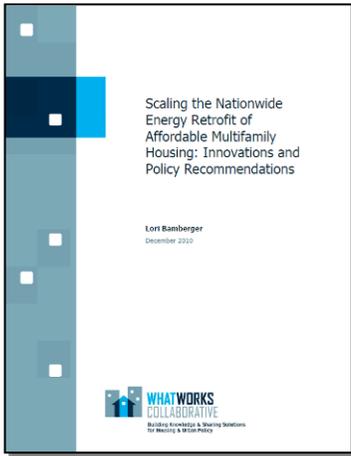
*“This paper describes the number and types of multifamily housing units in the country as a percentage of the total U.S. housing stock, the income level of those who inhabit multi-family buildings and whether they rent or own their units. It then describes energy use and the potential for energy efficiency in multi-family buildings. It ends with a summary of major policy issues.”*

**Methodology:**

Uses data from U.S. Census, HUD and other sources to characterize the multifamily sector, articulate the magnitude of energy savings potential, and review policies and program models that can successfully overcome barriers

**Key Findings and Takeaways of Relevance**

1. 19 million (18%) of the nation’s 106 million housing units (at the time of publication) are in multi-family buildings.
2. Multi-family housing is highly concentrated with 10 states accounting for 64% of units and the top five states (CA, FL, IL, NY, TX) accounting for 49%.
3. Housing built in the 1990s is 8.5% more energy efficient than housing built in the 1980s, 17% more efficient than housing built in the 1960s and 1970s, and 23% more efficient than housing built before 1960 according to the Joint Center on Housing Studies at Harvard University.
4. 83% of multifamily buildings are rental buildings, while only 17% are owner-occupied.
5. Housing subsidized by HUD programs represented 5.7 million units – one third of the total – in 2000.
6. The Low Income Housing Tax Credit (LIHTC) program leverages around \$6 billion of private investment each year, helping to produce between 75,000 and 100,000 units of affordable housing.
7. Allocation of LIHTCs is highly competitive, with reports suggesting that it may be common to receive four applications for every available tax credit allocation. State systems of awarding credits (qualified allocation plans, or QAPs) provide an opportunity to provide incentives for energy efficient designs, with over a dozen states mandating energy efficiency standards or providing financial incentives in LIHTC projects and the large majority (39) providing extra points in scoring projects that invest in energy efficiency. 17 of these states reference EPA Energy Star standards while at least 5 (LA, MD, NM, ND, OH) reference Enterprise Community Partners’ Green Communities program.
8. State tax-exempt bond financing programs issued around \$5.8 billion of bond funds in 2005 to finance construction and rehabilitation of 58,000 low income multifamily units. These “private activity bonds” receive a 4% tax credit vs. 9% for LIHTC.
9. An achievable 20% improvement in multifamily energy efficiency would translate to a 6% savings in residential energy consumption and a 1.3% reduction in total U.S. energy use.
10. Audit reports from different sources suggest that the variability of multifamily energy use intensity max range from 36 kBtu/sq.ft. to as much as 123 kBtu/sq.ft., a fourfold difference.
11. Evidence from programs on the energy efficiency potential in rehabilitation of existing buildings range from an average of 30% (Southface) to between 50% to 70% in many cases (Illinois Department of Commerce).
12. Recommended best practices to drive energy efficiency in multifamily housing include:
  - a. Compile a database of information on building characteristics, energy use and savings potential in MF housing
  - b. Develop financing models that incorporate ratepayer-funded program resources, and focus on performance-based incentives
13. Three means by which states can increase energy efficiency investments in affordable housing include:
  - a. Leveraging ratepayer-provided efficiency program funds with funding from housing financing agencies
  - b. Adjusting allocation award mechanisms for LIHTCs to account for energy efficiency
  - c. Working with HUD (and the IRS) to modify utility allowance calculations for LIHTC and other subsidized projects



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Title: ***Scaling the Nationwide Energy Retrofit of Affordable Multifamily Housing: Innovations and Policy Recommendations***

Author(s): Lori Bamberger

Prepared by: Lori Bamberger Consulting

Prepared for: What Works Collaborative

Published date: December 2010

Stated Purpose/Focus:

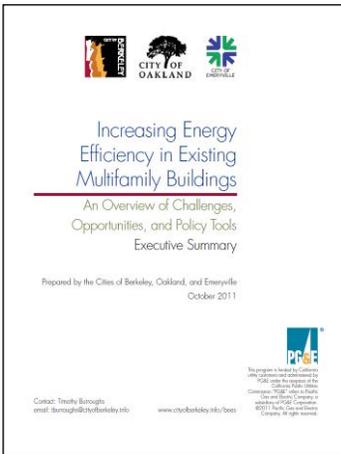
*“This paper, drafted for the What Works Collaborative, presents in detail the opportunity that might arise from energy retrofits of federally subsidized multifamily residential buildings occupied by low-income households. The goal: to identify those innovations (and the policy changes enabling them) capable of scaling and transforming the affordable residential energy efficiency marketplace in a post-ARRA world.”*

Methodology:

Synthesizes findings from literature and in-depth conversations with dozens of multifamily housing experts sharing, vetting, and prioritizing the ideas and policy recommendations made in the paper.

#### Key Findings and Takeaways of Relevance

1. The opportunity to scale a national affordable multifamily retrofit represents a free “magic pill” to realize over \$1 billion in annual savings, create new jobs, and improve building health, longevity and affordability, if not for the market and regulatory barriers that stand in the way.
2. Fifteen percent (15%) of HUD’s annual budget goes to pay \$6.8 billion in utility bills for subsidized housing units, money that could be redirected by greater energy efficiency to improve and expand available affordable housing.
3. Unlike the ability given to public housing authorities to freeze utility allowances for up to 20 years to recover retrofit investment costs, HUD-provided utility subsidies to assisted housing owners disappears dollar-for-dollar anytime resident utility costs are reduced, creating an enormous regulatory and capital barrier to private owners of HUD-assisted housing.
4. Pre-existing financing and associated limitations on prepayment, lockouts, and requirements for senior debt holder approval create enormous transactions costs and make refinancing or additional debt legally or practically impossible.
5. The unwillingness of housing financial institutions to value energy savings as part of the underwriting of energy improvements arises largely out of a lack of data and predictability of savings.
6. HUD’s ad hoc case-by-case approach in granting permission for project reserves and residual receipts to fund energy improvements creates significant administrative burdens and barriers to tapping existing project capital for energy efficiency.
7. Coordination between the Community Preservation Corporation (CPC) and the New York State’s mortgage insurer (SONYMA) has produced an innovative “co-first loan” retrofit financing that is showing promise in “re-opening” existing insured loans through the approval of secondary market holders.
8. HUD’s Green Mark-to-Market program allows owners to use an existing market and capital mechanism to fund energy improvements by allowing rents to remain higher than otherwise would be the case, also providing the incentive of reducing required owner contribution to rehabilitation costs from 20% down to 3%.
9. The proposed Preservation, Enhancement, and Transition of Rental Assistance (PETRA) policy to transition public housing to market-based rents if enacted would dramatically alter the potential for incentive mechanisms that could unlock energy efficiency improvements; though a greater shift toward market rents could help to unlock private capital market investment.
10. Off-balance sheet financing structures utilizing Power Purchase Agreement (PPA) and Managed Energy Services Agreement (MESA) models as well as property-tax (e.g., PACE), meter-secured (e.g., on-bill financing), and ESCO-oriented approaches are all being shown to offer means to overcome project and credit risk barriers.
11. As is being demonstrated by a number of organizations and localities leveraging their portfolio to gather data and gain insight on the value of energy improvements, the federal housing portfolio represents a tremendous opportunity to establish protocols to piggyback energy audits on capital needs assessments and standardize systems to responsibly collect, analyze, and leverage energy use data.
12. By establishing clear goals and providing leadership in the development of public/private partnerships, federal agencies and authorities including HUD, DOE, FHA, Treasury and others have the opportunity to catalyze large-scale multifamily energy improvements that overcome barriers and drive innovation in realizing substantial benefits.



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Title: ***Increasing Energy Efficiency in Existing Multifamily Buildings: An Overview of Challenges, Opportunities, and Policy Tools***

Prepared by: Cities of Berkeley, Oakland, and Emeryville

Prepared for: What Works Collaborative

Published date: October 2011

Stated Purpose/Focus:

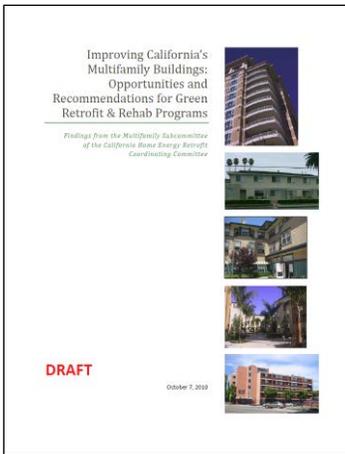
*“This report is designed primarily for local government policy makers. It is one component of a joint project between the cities of Berkeley, Oakland, and Emeryville aimed at developing effective strategies to increase energy efficiency in our communities’ multifamily properties, including apartment buildings, cooperatives, and condos.”*

Methodology:

A review of literature and interviews with policy makers and multifamily property owners and managers as well as an online survey of 100 local government decision makers (Multifamily Energy Efficiency Survey) provided insights on best practices and lessons learned.

### Key Findings and Takeaways of Relevance

1. Multifamily buildings account for 25% of U.S. households, one-third of California households, and over 50% of households in the cities of Berkeley, Oakland, and Emeryville.
2. Misaligned incentives between property owners and tenants, high initial capital costs, overwhelming processes to identify upgrades and obtain incentives, an uncertain return on investment, and limited knowledge to identify and make improvements are all barriers to realizing greater energy efficiency in multifamily buildings.
3. Achieving market transformation requires policy mechanisms that enable property owners to realize an economic return on investments in energy efficiency via increased revenues or increased property value and equity.
4. In Berkeley and Emeryville, close to 90% of multifamily units are individually metered for electricity while around 62% of Oakland’s multifamily units are individually metered. The percentage of units individually metered for natural gas is around 65% in Berkeley, 20% in Emeryville and 36% in Oakland.
5. A growing number of local governments are employing minimum requirements including mandatory energy and water savings upgrades and mandatory energy data disclosures to coincide with trigger events including property sale, renovation, or unit lease turnover.
  - a. Seattle, Washington DC, and New York have all enacted ordinances that mandate the measurement and disclosure of energy use data and operational ratings for applicable multifamily buildings.
6. Performance-based rebate programs offer flexibility in serving the wide diversity of multifamily buildings (e.g., size, vintage, construction type, metering configuration, etc.) that are difficult to reach with prescriptive measure rebate incentives.
7. The Efficiency Kansas on-bill financing program, which provides energy loans tied to the meter not the tenant, provides an example of a program that can help to remove split incentive barriers and concerns about the repayment horizon relative to tenant turnover.
8. Multifamily high-rise buildings with four or more habitable stories are a type of commercial building eligible for tax deductions ranging from \$.30 to \$1.80 per square foot for the installation of energy efficiency improvements including lighting, HVAC, hot water, and building envelope measures under the Energy Efficient Commercial Buildings Deduction passed as part of the Energy Policy Act of 2005.
9. The California Utility Allowance Calculator (CUAC), which currently only applies to new affordable housing construction using Low Income Housing Tax Credit (LIHTC) financing, represents an opportunity to provide project-specific adjustments to utility allowances for existing multifamily housing, providing increased rents that would allow property owners to recoup the cost of investments in energy improvements.
10. Similar to the CUAC, the Energy Efficiency-Based Utility Allowance (EEBUA) is a mechanism to reflect higher efficiency in a utility allowance, freeing up space under the 30% adjusted gross income (AGI) cap for owners to receive additional rent to recoup investments made to achieve a minimum level of energy efficiency. Unlike the CUAC which models energy use at the project level, the EEBUA sets a separate allowance level across all properties based on a public housing authority’s portfolio jurisdiction.
11. Initiatives such as Energy Upgrade California and the East Bay’s Smart Lights program provide examples and lessons in delivering streamlined one-stop-shop technical assistance to multifamily property owners.



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Title: ***Improving California's Multifamily Buildings: Opportunities and Recommendations for Green Retrofit & Rehab Programs***  
 Author(s): Heather Larson, StopWaste.Org (lead technical author)  
 Prepared by: California Home Energy Retrofit Coordinating Committee, Multifamily Subcommittee  
 Published date: October 2010

Stated Purpose/Focus:

*"The California Home Energy Retrofit Coordinating Committee was convened by U.S. EPA Region 9 to develop consistent recommendations and standards for statewide home energy retrofit programs. This report summarizes the MF HERCC's recommendations and analysis in five specific areas: 1. Program delivery, 2. Professional qualification and training, 3. Prescriptive vs. performance whole-building approaches, 4. Energy analysis software, 5. Low-income and energy efficiency program access and coordination"*

Key Findings and Takeaways of Relevance

1. Programs should tailor their services to take advantage of trigger events (e.g., unit turnover, major rehab, refinancing, etc.) that create entry points for assessment, execution and financing of energy improvements.
2. The single largest opportunity in multifamily housing is reducing the energy consumed to heat domestic water, particularly in the case of central systems. Measures such as water heater upgrades, solar pre-heat systems, pipe insulation, recirculation controls, and high-efficiency recirculation pumps present significant energy savings opportunities.
3. By adopting a model where well-qualified energy consultants/raters/verifiers are the focus of program delivery, as opposed to a limited set of approved contractors, multifamily owners have greater flexibility to hire the contractors they trust while the program benefits from objective providers of compliance documentation and project verification.
4. Rather than require a single contractor training certification, programs can be more effective by targeting specialized training at the sub-trade level, notably for water heating system contractors due to the size of the savings potential.
5. A comprehensive statewide prescriptive approach to multifamily whole-building upgrades would require 16 or more distinct packages of measures to accommodate the diversity of building types, system configurations, and other factors. As such a performance-based approach to whole-building improvements (i.e., incentives based on achieving significant energy savings on the order of 10%, 20% or more) is well-suited to the multifamily sector.
6. To accommodate trigger events such as unit spruce-up and turnover occurring outside of major retrofit/rehab efforts, individual measure-based prescriptive incentives should be available to compliment whole-building incentive offerings.
7. Tiered minimum performance improvements targets based on building vintage can be used to avoid excluding participation of newer buildings where less achievable energy savings can be realized. The committee recommended a 20% target for pre-1980 buildings, a 15% target for 1980-2000 vintage buildings and a 10% targeted for 21<sup>st</sup> century vintages.
8. Factors that influenced the committee's recommendations for the use code compliance software programs (e.g., Alternative Calculation Method – ACM – software such as EnergyPro) include:
  - a. Baselines, assumptions, and time dependent valuation (TDV) consistency with energy codes for new construction
  - b. Large workforce of professionals proficient with the programs
  - c. Use of the same software for building permit purposes
9. Other software programs (e.g. TREAT and EA-QUIP) that are specifically designed to handle energy auditing are also worth considering because they can be made more accurate by using billing data and may also be more accurate in analyzing operational improvements such as commissioning, maintenance, and added controls.
10. Multifamily projects often have to undergo energy analysis in multiple software programs to meet the requirements of code compliance (e.g., EnergyPro), utility incentive programs, and the Weatherization Assistance Programs (e.g., DOE-approved programs such as TREAT).
11. Because of a multitude of factors, less than 1% of the more than 90,000 low income apartments in California have benefitted from energy retrofit programs.
12. Allowing property owners to apply for and authorize energy improvements on behalf of low-income households would reduce barriers to reaching the low-income market and enable whole-property energy retrofit approaches.

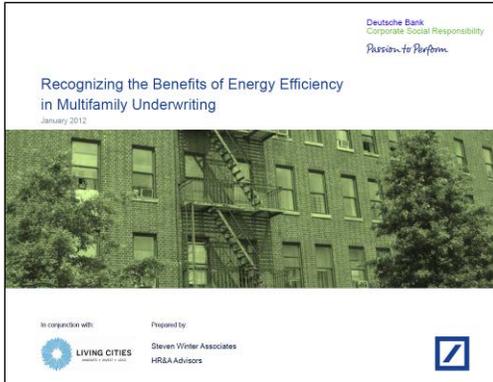
Title: **Recognizing the Benefits of Energy Efficiency in Multifamily Underwriting**

Author(s): Jason Block et. Al.

Prepared by: Steven Winter Associates, HR&A Advisors, Inc.

Prepared for: Deutsche Bank Americas Foundation, in conjunction with Living Cities

Published date: January 2012



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**Stated Purpose/Focus:**

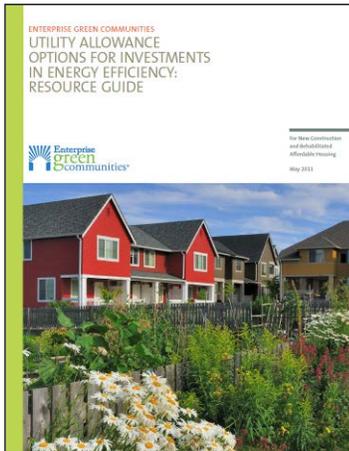
*“Deutsche Bank Americas Foundation instigated this project to encourage the financial industry to scale up financing of building energy efficiency retrofits. ...This study has tried to address a key bottleneck for private capital: the lack of confidence in energy savings for lenders to underwrite loans against. New York City proved an exceptional laboratory for commencing the study.”*

**Methodology:**

*“The team amassed a database of 231 projects – more than 21,000 units – that had undergone energy efficiency retrofits in New York City. A dataset of this size and scope has never been built before for multifamily housing. Its development allows for insights into three key areas: 1) assessing trends in pre- and post-retrofit building performance, 2) Analyzing the reliability of savings projections, and 3) utilizing findings to frame an approach for incorporating energy savings projections into underwriting”*

**Key Findings and Takeaways of Relevance**

1. Across the 231 buildings surveyed, retrofit projects were found on average to reduce heating fuel consumption by 19% and common area electric consumption by 7%. This translates to \$240 in annual per unit savings for fuel and \$50 in per unit savings for common area electricity. This 5 to 1 savings ratio is not surprising when considering that heating fuel expenditures make up 75% to 90% of owner-paid energy costs in direct-metered buildings.
  - a. The split between savings from heating and from domestic hot water (DHW) was found to be fairly even, with projects resulting in 18% average savings for heating cost savings and 21% average savings for DHW.
2. While a number of weaker correlations were found in analyzing the relationships between building characteristics and retrofit scope measures as compared to realized energy savings, only one factor – pre-retrofit fuel use intensity – was found to have a strong correlation with the magnitude of energy savings as a % of consumption. In other words, the most energy inefficient buildings were found to realize the greatest reductions in energy use.
  - a. The best-fit linear relationship between pre-retrofit fuel use intensity (EUI) to fuel savings on a kBTU/sq.ft. basis is given as:  $Savings = .51 * EUI - 30.66$
  - b. For example, a building with a EUI of 140 kBTU/sq.ft. tends to save approximately 40 kBTU/sq.ft. (28%) while a building with a EUI of 100 kBTU/sq.ft. will tend to save 20 kBTU/sq.ft. (20%)
  - c. Building age and heating system type are found to be good proxies for determining pre-retrofit fuel use intensity
3. Electric savings varied widely and unpredictably across the portfolio while fuel savings was more consistent.
4. While retrofits projects nearly always resulted in energy savings, actual savings fell short of projections in the large majority of projects. Across the portfolio, the realization rate (i.e., actual savings/projected savings) was 61% with a 90% confidence interval of +/-14%.
  - a. The study proposes a methodology by which lenders can mitigate the risk of “over-projected” savings by capping an auditor’s projected savings to a reasonable threshold of expected savings based on the building’s pre-retrofit fuel use intensity
  - b. Applying the proposed “capping” method, the overall fuel realization rate for the portfolio increases from 61% to 117% (with a 90% confidence interval of +/- 21%)
5. Among the factors identified to contribute to the low savings realization rate are:
  - a. Over-projections of energy savings in audits from misusing tools and energy modeling software or relying on overly optimistic assumptions (e.g., assuming ideal case scenarios for measure implementation and maintenance)
  - b. Poor or incomplete retrofit measure implementation



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Title: **Utility Allowance Options for Investments in Energy Efficiency: Resource Guide**

Author(s): Julieann Summerford and Yianice Hernandez

Prepared by: Heschong Mahone Group and Enterprise Green Communities

Prepared for: Enterprise Green Communities

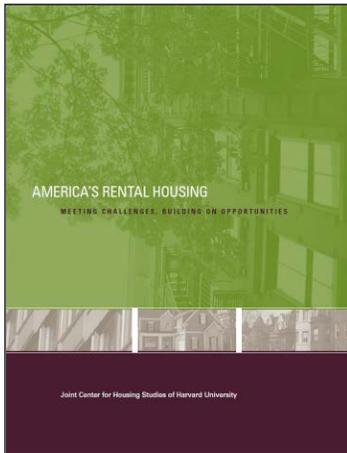
Published date: May 2011

Stated Purpose/Focus:

*“The purpose of this resource is to increase awareness of affordable housing developers, building owners, housing authorities (PHA), and housing finance authorities (HFA) about adopting, establishing, and offering utility allowance options supportive of energy-efficiency investments in new construction and rehabilitation.”*

Key Findings and Takeaways of Relevance

1. Utility allowances apply to tenant-paid utilities in subsidized affordable housing in order to maintain tenant housing burden (“gross rent” combining rent and utilities) below a targeted income amount (generally 30% of adjusted monthly income). Utility allowances are set differently depending on various ownership and subsidy structures:
  - a. In housing owned by a local Public Housing Authority (PHA), known as “public housing,” the PHA sets the utility allowance
  - b. In housing developed under the Low-Income Housing Tax Credit (LIHTC) program, the state Housing Finance Authority (HFA) determines the applicable utility allowance
  - c. For Section 8 and other HUD-assisted properties, HUD allows either the use of an allowance developed by the PHA, one estimated by the local utility company, or one developed in accordance with other HUD regulations
2. PHA established standard utility allowances, whether determined by engineering-based or billing data-based methodology, disincentivize owners of affordable housing to make investments of energy efficiency and provide lower than targeted rental income to owners of more efficient buildings.
3. Conversely, a lower utility allowance designed to reflect investments in energy efficiency acts as an incentive for upgrades and deeper energy savings, helping to overcome split incentives by providing building owners with higher rental incomes as a proportion of housing cost caps.
4. Energy-efficient utility allowance options fall into two categories:
  - a. A 2008 IRS ruling (impacting Section 1.42-10 Utility Allowance) now allows LIHTC-funded projects to use an Energy Consumption (engineering) Model (ECM) to calculate a project-specific utility allowance. The ruling grants state HFAs with the option of adopting the IRS ruling and allowing projects to employ an ECM to establish project-specific utility allowances.
  - b. Under Energy Efficiency-Based Utility Allowance (EEBUA) models PHAs can elect to allow properties with proven energy efficiency investments to adopt lower utility allowances based on the average energy savings of projects that achieve a minimum verifiable level of efficiency (e.g. >15% improvement over code). Similar to standard utility allowances, the EEBUA schedule is the same for any qualifying building in the PHAs jurisdiction.
5. Beyond financial benefits that accrue to both tenants and owners, energy-efficient utility allowances enable improvements that yield more comfortable and healthy homes for tenants and can foster green job creation.
6. In California, projects must use the California Utility Allowance Calculator tool to calculate an ECM. Furthermore, the IRS requires that the ECM must be calculated by a licensed engineer or other HFA-qualified professional that is not related to the building owner or developer.
7. A best practice of incorporating a “safety factor” by applying less than the full energy savings estimates to the adjustment factors (e.g., counting only 75% of savings) serves to ensure tenants will receive some of the economic benefit from reduced energy costs.
8. California’s experience with both the ECM and EEBUA models provides valuable precedence for other HFAs and PHAs looking to adopt energy-efficient utility allowances:
  - a. Included in the report are documents including sample HFA guidance, sample HFA submission requirements, sample EEBUA policies and forms, and a sample request for HUD waiver from regulations



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Title: **America's Rental Housing: Meeting Challenges, Building Opportunities**

Prepared by: Joint Center for Housing Studies of Harvard University

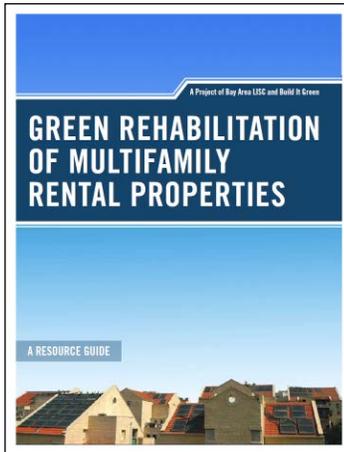
Published date: April 2011

Stated Purpose/Focus:

*"The troubled homeowner market, along with demographic shifts, has highlighted the vital role that the rental sector plays in providing affordable homes on flexible terms. But while rental housing is the home of choice for a diverse cross-section of Americans, it is also the home of necessity for millions of low-income households. And the share of US households unable to find affordable rentals has been on the rise for a half-century, with an especially large jump in the last decade as renter income fell even further behind housing and utility cost increases. Even as the need for affordable housing grows—both assisted by the government and supplied in the private market—long-run pressures continue to threaten this essential resource."*

#### Key Findings and Takeaways of Relevance

1. Factors including falling vacancy rates and little new supply of multifamily units in the pipeline are putting upward pressure on rents at the same time that persistently high unemployment limits renter income gains and federal budget cuts threaten available subsidies – a recipe for greater economic pressure on U.S. renters in the current environment.
2. While younger age groups are much more likely to rent, more heads of renter households are 35-64 years old (46%) than under 34 (41%), with elderly households making up the remainder (13%).
3. Nearly three-quarters of renters have incomes below the median household income, including 41% in the bottom income quartile and 30% in the lower-middle quartile. Only 10% of renters are in the top quartile of income earners.
4. While renters are more likely to live in the center cities of metro areas than homeowners, more than half of renters (~54%) live in suburban (2 of 5, ~40%) or non-metro areas (1 of 7, ~14%). While city renters are more likely to live in larger buildings, nearly half of rental households are in structures with just one to four units, even in urban areas.
5. Fully 63% of extremely low-income renters (defined as less than 30% of area median income) had severe housing cost burdens with rent and utilities totaling more than 50% on income, while an additional 15% had burdens between 30% and 50% of income.
6. As a result of household utility costs rising close to 23% in real terms from 2000 to 2010, energy costs as a share of gross rents rose from 10.8% to 15.0% percent over the same period, with the lowest-income renters seeing their utility share of housing burden jump from 12.7% to 17.4%.
7. Combining landlord- and tenant-paid utilities, utility costs in 2005 accounted for nearly 30% of total housing costs among bottom-income quintile renters.
8. Three-quarters of extremely low-income renters in 2009 lived in units build before 1980, compared with two-thirds of higher-income renters.
9. Four out of five renters pay at least some of their own utility costs.
10. The U.S. rental housing stock is found to be rapidly aging. As of 1989, the median rental housing unit was 26 years old. By 2009, the median age stood at 38 years.
11. The stock of available subsidized housing units has dropped significantly. As of 2009, there were just 1.1 million public housing units and 2.0 million privately-owned subsidized units, an overall loss of 700,000 units from peak levels in 1995. While growth in tenant-based assistance (i.e., vouchers) has helped to make up for this decline, the growth in vouchers has stalled in the last five years. As of 2009, 2.1 million housing vouchers were in use, supporting nearly 3 in 10 assisted renter households.
12. From its inception in 1986 through 2007, the Low Income Housing Tax Credit (LIHTC) helped to develop 1.7 million affordable units, with roughly two-thirds newly constructed and one-third substantially renovated. LIHTC peaked in the 2003-2005 timeframe during which more than 125,000 units were developed each year under the program.
13. Among the inventory of units renting for less than \$400 per month (a proxy for a family of two living near the federal poverty line, or what one full-time, minimum-wage worker could afford), 2.1 million units were assisted and 3.0 million units were unassisted in 2009. This stock of housing is rapidly disappearing, having declined by more than 28% from 1999 to 2009 as a result of demolished units (12%) or upward filtering to higher rent ranges or conversion to non-residential use.
14. Moody's Commercial Property Price Index for apartment buildings was down 31% from 2007 to 2009 before rebounding by 12% in the following year. Overall prices are 28% below the peak in real terms.



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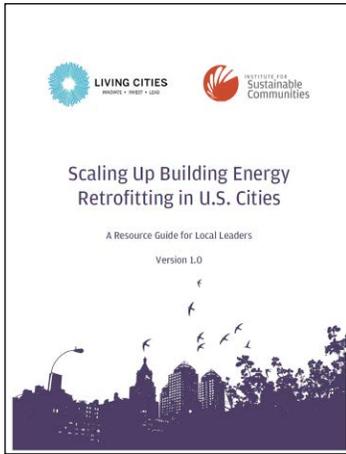
Title: **Green Rehabilitation of Multifamily Rental Properties: A Resource Guide**  
Prepared by: Bay Area Local Initiatives Support Corporation (LISC) and Build It Green  
Published date: August 2008

Stated Purpose/Focus:

*“Affordable housing developments that integrate green building into their rehabilitation projects benefit from lower energy bills, products that are more durable and require less maintenance, and an overall healthier building environment for the occupants. The objective of this document is to provide a comprehensive tool for nonprofit developers of affordable housing and their consultants to assist them in greening their rehabilitation projects.”*

Key Findings and Takeaways of Relevance

1. To achieve a true high-performing building from your green rehabilitation efforts, do not consider green building and energy efficiency measures in isolation. Use an integrated design approach to maximize your energy efficiency opportunities, including the interaction between elements such as lighting, windows, and mechanical systems.
2. Making green building and energy efficiency practices a goal at the project outset of a major rehabilitation project and gaining buy-in from the project team will help to ensure that strategies planned in the design phase are ultimately incorporated during rehabilitation and operations.
3. The most common “low-hanging fruit” energy efficiency measures include energy-efficient lighting (e.g. replacing standard T12 with T8s or HPT8s, using an electronic ballast instead of a magnetic ballast) and appliances (e.g., ENERGY STAR). Boiler controls including an outdoor reset/cutout control are another category of low-cost energy efficiency improvements, as are hot water system insulation, weatherization measures such as insulation and air sealing, and replacement of incandescent lighting with CFLs or LEDs.
4. Longer-term payback measures include replacement of HVAC equipment such as water heaters, air conditioners, and boilers. Where capital constraints exist, leasing arrangements can provide a means to upgrade to high-efficiency equipment.
5. Unfortunately replacing single-pane windows with newer, more efficient ones is generally not cost effective as a stand-alone retrofit. Replacement is generally more cost effective when pursued in conjunction with general wall rehabilitation to address rot, water damage, and other issues.
6. The simple payback for CFLs can be as little as 3 months depending on what type of lamp is purchased, how often the lamp is used, the current cost of electricity, and available rebates.
7. LED exit signs have a typical payback of less than one year to four years depending on cost of the fixture, rebates, and maintenance costs.
8. A typical multifamily solar hot water system will cost between \$1,000 to \$3,000 per unit, depending on system size, with payback periods ranging from three to eight years.
9. On demand water recirculation pumps that work on request from the user (usually by pushing a button located close to the fixture) can save significant amounts of water wasted at the drain and can reduce the large losses of heat that occur in continuous recirculation systems.
10. Most high-efficiency boilers and storage tank water heaters also have the benefit of direct venting with sealed combustion, which reduces the risk of backdrafting combustion gases into the home and can eliminate the need for draft hoods or dampers.
11. ACCA’s Manual J Residential Load Calculation Procedure is the accepted industry standard, approved by ANSI and the California Energy Commission, for the proper sizing and selection of HVAC equipment. Many systems are oversized to allow for expected high levels of duct leakage – field research shows that ducts in existing homes on average allow about 30% of heated or cooled air to leak out. Thus, when replacing a system that may have been oversized, it is important to fully seal ducts and recalculate system size, as in many cases the old system can be replaced with a smaller system.
12. The payback for building retro-commissioning is often less than five years.



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Title: **Scaling Up Building Energy Retrofitting in U.S. Cities: A Resource Guide for Local Leaders, Version 1.0**  
 Prepared by: Living Cities and the Institute for Sustainable Communities  
 Published date: May 2009

Stated Purpose/Focus:  
*“The purpose of the Guide is to help cities and states improve, accelerate and scale up their building energy retrofit efforts by compiling and synthesizing much of the best available information on these challenge areas, and the most promising approaches to meeting them.”*

### Key Findings and Takeaways of Relevance

1. Even the boldest initiatives in the country fall well short of the pace and scale of building energy retrofitting activity in U.S. cities that is achievable. In order better reach this potential, cities and states must work even more closely with each other, and with the other key stakeholders, to develop and implement robust and integrated energy retrofit strategies.
2. Based on a survey of officials from local and state governments, utilities, workforce development agencies, financial institutions, and nonprofit organizations, four key “challenge areas” emerged as contributing barriers to scaling up building energy retrofit initiatives:
  - a. Securing participation by large numbers of building owners and operators requires coordinated programs to provide education, outreach, and marketing campaigns that articulate program benefits and the economic value proposition to engaging in energy improvements.
  - b. While most practitioners recognize that financing is not the barrier to success, most recognize that upfront capital costs and the split incentive problem stand in the way of financing large numbers of building energy retrofits.
  - c. Developing and implementing coherent green workforce development systems requires synchronizing the supply and demand for labor by improving the coordination of development infrastructure with the energy efficiency industry sectors driving demand.
  - d. Finally, in order to pull together key elements including policy initiatives, marketing campaigns, funding sources financing schemes, and workforce development efforts, a new system or enterprise – embedded in an existing institution or in a newly created institution – is needed to administer a coherent and well-functioning delivery system.
3. By setting high goals, committing substantial long-term funding, and recognizing there is no “magic bullet,” program sponsors can put themselves in a position to develop tailored engagement and incentive strategies for specific market segments, fully inform building owners while making investment in energy improvements as simple as possible, and cultivate a culture of energy awareness that leverages the power of social motivators.
  - a. Model programs exist across the country that highlight specific dimensions of this vision for integrated approach to drive participation
4. New York City serves as a powerful example of policy changes that will engage building owners in energy improvements:
  - a. All city buildings will have a benchmarking standard for tracking their energy consumption and for enabling prospective buyers to better assess the value of the building as it relates to energy efficiency
  - b. Buildings over 50,000 square feet must conduct an energy audit every ten years, and make any improvements that pay for themselves within five years
  - c. Buildings over 50,000 square feet must have an annual benchmark analysis of energy consumption to identify new energy efficiency opportunities, and commercial buildings over 50,000 square feet must have upgraded lighting
5. There is no one organizational pathway to a building retrofit system or enterprise as confirmed by a snapshot of the work underway in small and large cities to develop cross-sector partnerships. Depending on the city, different kinds of organizations are stepping into the role of convener, system architect and manager. Examples as varied as Portland, OR, Babylon, NY; and Flagstaff, AZ offer insights on key to successful coordination and integration.



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Title: **National Energy Efficiency Best Practices Study: Volume R5 – Residential Multi-family Comprehensive Best Practices Report**

Author(s): Kenneth James, Michael W. Rufo, Jane S. Peters, Ph.D. and Dulane Moran

Prepared by: Quantum Consulting Inc.

Prepared for: California Best Practices Project Advisory Committee

Published date: December 2004

**Stated Purpose/Focus:**

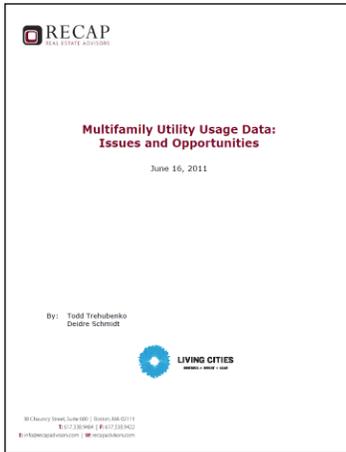
*“This volume presents results of a comparative analysis of residential multi-family comprehensive programs included in the National Energy Efficiency Best Practices Study.”*

**Methodology:**

*“The Best Practices Study team (“Best Practices Team”) reviewed six residential multi-family comprehensive programs for this program area study (“R5 Programs” and “R5 Study,” respectively), each of which had the goal of improving the overall efficiency of multi-family buildings, typically defined as having more than four units of housing.”*

**Key Findings and Takeaways of Relevance**

1. The following outline relates the high level best practice findings demonstrated by model programs in the report:
  - a. Theory and Design
    - i. Have a sound program plan and clearly articulated program theory which describe the program logic, niche, resources and ultimate goal
    - ii. Understand the financial and ownership structure of the local multifamily market and the relationships among the various market actors
    - iii. Include societal and non-energy benefits in cost-effectiveness calculations
    - iv. Tailor multifamily programs to the unique needs of the sector
  - b. Project management
    - i. Develop and retain institutional knowledge of the multifamily building sector and lessons learned as implementation structures shift over time
    - ii. Set reasonable, accurate expectations for energy savings and measure performance
    - iii. Tailor project roles to the unique strengths of each implementation organization
  - c. Reporting and Tracking
    - i. Base reporting and tracking system design on how information will be used and data needs unique to multifamily programs
    - ii. Assure that tracking systems are intuitive, straightforward, integrated and comprehensive
    - iii. Develop systems for long-term strategy and use
    - iv. Track the key components of multi-family buildings and program participation
  - d. Quality Control and Verification
    - i. Base quality control practices on a program’s vendor relationships, measure types, and project volume
    - ii. Conduct quality assurance and verification inspections to improve understanding of building function
    - iii. Govern post-inspection levels by cost-effectiveness as well as quality assurance considerations
    - iv. Conduct inspections in a timely manner
    - v. Use product specifications in program requirements and guidelines
  - e. Participation Process
    - i. Offer a single point of contact for customers
    - ii. Offer an attractive mix of eligible measures and integrated program services
    - iii. Use a whole-building approach to achieve maximum energy savings
    - iv. Provide support to building owners throughout the process



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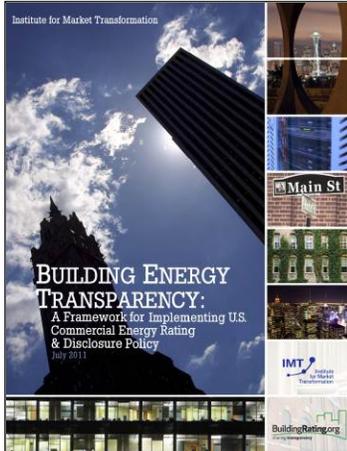
Title: **Multifamily Utility Usage Data: Issues and Opportunities**  
 Author(s): Todd Trehubenko and Deidre Schmidt  
 Prepared by: Recap Real Estate Advisors and the Affordable Housing Institute  
 Prepared for: Living Cities  
 Published date: June 2011

Stated Purpose/Focus:

*“The primary purpose of this paper is to identify the major utility usage databases currently in use or being developed for privately-owned multifamily rental housing, both market-rate and affordable. We have also explored how these databases and associated analytic tools interact (or do not interact) with the simulation models most commonly used to predict multifamily energy usage for retrofits, as well as the intersection of national green building standards and usage data. Finally, we have surveyed opinions on the desirability, feasibility, and key obstacles to creating a more conducive environment for the collection, use, and leveraging of multifamily utility usage data.”*

Key Findings and Takeaways of Relevance

1. Despite the age of the U.S. multifamily housing stock and the long operating histories of the assets, only 2% to 3% of multifamily buildings are likely to be represented in existing databases. Many of the most significant data collection efforts began less than five years ago.
2. The lack of industry standards and best practices for data collection hinders the development of large datasets. There is presently no industry consensus around which data variables should be collected for existing multifamily rental properties or the best methods for obtaining and aggregating this information. Without a common set of protocols and definitions, seemingly similar data may not be interoperable.
3. New programs emerging at the federal level have a focus on multifamily rental housing, including data collection by HUD for properties undergoing retrofits through its Mark to Market (M2M) program and Fannie Mae’s partnership with the EPA aimed at developing an ENERGY STAR label for multifamily properties.
4. The power of collected utility usage data is limited by the lack of direct relationship with the primary simulation models used to evaluate potential energy savings for existing properties.
5. Major barriers to the development of large utility usage databases for multifamily rental housing include privacy concerns, data integrity issues, and the cost and resources associated with the effort.
6. The Residential Energy and Water Data Collaborative (REWDC), a collaborative formed in 2010 with participation from Enterprise Community Partners, the Local Initiatives Support Corporation (LISC), NeighborWorks, Stewards of Affordable Housing for the Future (SAHF), and the Housing Partnership Network (HPN), achieved consensus on a set of data points that will be collected by its members for the multifamily properties in their portfolio – hopefully to serve as a basis for standardization of across the industry. Further coordination with a New York City collaborative, Fannie Mae, and the EPA is creating further movement toward consistent data collection.
7. At least seven simulation programs have gained prominence for use in evaluating multifamily retrofit opportunities, including DOE-2, EA-QUIP, EnergyPlus(e+), eQUEST, NEAT, TREAT, and Visual DOE. Some of these tools (e.g., TREAT, EA-QUIP) have been specifically approved by DOE for use in multifamily retrofits using Weatherization Assistance Program (WAP) funds. These simulation models differ in terms of the underlying algorithm-driven simulation engines, the sophistication of front-end graphical user interfaces (GUIs) and software license costs.
8. Similar to the case with utility usage databases and simulation models, a diversity of green building standards for multifamily exist including national standards such as the ENERGY STAR for Multifamily High Rise (MFHR), ASHRAE 189.1, and the Enterprise Green Communities Criteria. Most of these standards are rating systems that typically follow a prescriptive path (i.e., checklist) in providing a framework for practical and measurable energy and water efficiency improvements in the siting, design, construction, operations and maintenance of properties.
9. Until recently, all standards assumed that the property under consideration was either new construction or substantial rehabilitation. Not having a ‘blank slate’ from which to start makes the application of a standard much more difficult, requiring an understanding of the existing building condition and, ideally, baseline utility usage. Currently, Enterprise Green Communities Criteria is the only standard that addresses ‘moderate rehab’ as a distinct activity.



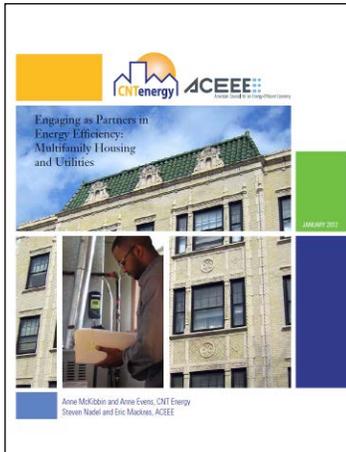
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Title: ***Building Energy Transparency: A Framework for Implementing U.S. Commercial Energy Rating & Disclosure Policy***  
 Author(s): Andrew C. Burr, Caroline Keicher, and David Leipziger  
 Prepared by: Institute for Market Transformation, BuildingRating.org  
 Published date: July 2011

Stated Purpose/Focus:  
*“In November 2010, the Institute for Market Transformation convened senior policymakers from 10 U.S. states and cities, national building energy efficiency experts, and leaders from the real estate industry to discuss challenges and best practices in implementing commercial rating and disclosure policies. The Roundtable on Implementing Benchmarking and Disclosure Policy was the first event of its kind in the United States and a bellwether for the swift and continuing evolution of rating and disclosure policies throughout the nation. This report draws from the Roundtable, both in structure and substance. In doing so, it presents the most comprehensive review to date of U.S. rating and disclosure policies, and creates the first framework policymakers can use to identify challenges and apply best practices piloted by leading jurisdictions in policy implementation.”*

**Key Findings and Takeaways of Relevance**

1. Within the past five years, two states and five major cities have passed energy performance rating and disclosure policies that will affect some of the nation’s largest metropolitan real estate markets including New York City, Los Angeles, Washington D.C., and Seattle.
2. Best practices are rapidly emerging that can help policy implementers overcome barriers and effectively implement rating and disclosure policies.
3. To prevent market confusion, policy implementers should reference and reinforce existing federal technical rules for benchmarking with EPA’s ENERGY STAR Portfolio Manager. Jurisdictions may need to modify existing ENERGY STAR benchmarking rules to meet localized implementation needs, but must balance this need against potentially negative effects from issuing conflicting benchmarking rule sets.
4. Many jurisdictions are providing information and benchmarking training sessions in partnership with the local chapters of the Building Owners and Managers Association (BOMA) International, the U.S. Green Building Council (USGBC) and the International Facility Managers Association (IFMA), groups that typically represent a significant share of affected stakeholders.
5. By aggregating consumption data for all energy meters in a building and sending a single consumption number to the building owner each month, utilities can help to overcome the need to seek permission to capture each tenant’s data while still satisfying the confidentiality regulations governing the utility’s release of customer data. This strategy is being employed by several utilities to support voluntary or mandatory benchmarking.
6. Electronic authorization options for tenants could help to remove barriers in instances where tenant authorization is required.
7. If jurisdictions can find ways to allow utilities to earn credit toward mandated energy efficiency goals by providing whole-building data access in support of benchmarking, utilities would have greater incentives and motivation to apply resources to add whole-building data access capabilities.
8. As a long-term strategy, jurisdictions should encourage building owners and real estate brokers to add language in lease contracts authorizing the owner to collect tenant consumption data at defined intervals.
9. Jurisdictions are utilizing local tax assessment databases to identify building owners that must comply with regulations, though this solution has drawbacks including the fact that data is typically based on parcel numbers and not building addresses and assessor data may not capture key building parameters used for screening including square footage.
10. By utilizing enforcement mechanisms early in the implementation process, jurisdictions can deter the market from perceiving that noncompliance is tolerated.
11. In determining how public disclosure of energy ratings and benchmarking information can maximize consumer awareness and market demand for energy-efficient buildings, jurisdictions must be sensitive to confidentiality issues and ensure information is easily accessible.



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Title: ***Engaging as Partners in Energy Efficiency: Multifamily Housing and Utilities***

Author(s): Anne McKibbin, Anne Evens, Steven Nadal, and Eric Mackres

Prepared by: CNT Energy and the American Consortium for an Energy Efficient Economy (ACEEE)

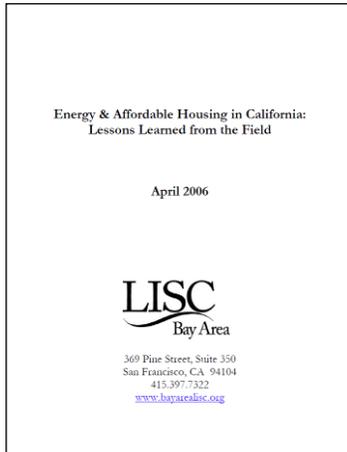
Published date: January 2012

Stated Purpose/Focus:

*“This paper outlines the opportunity and strategies for the multifamily housing sector to engage electric and natural gas utilities in order to expand resources available for energy efficiency retrofits and improve the use of these investments.”*

#### Key Findings and Takeaways of Relevance

1. With 2010 national average residential energy prices, energy efficiency improvements of 15% of electricity consumption and 30% of natural gas consumption in all multifamily buildings would create annual utility bill savings of \$3.4 billion, with \$2.0 in electricity savings and \$1.3 billion in natural gas savings.
2. In leading states such as California, Massachusetts, and New York targeted multifamily programs are found to be funded in proportion to their share of residential housing units (i.e., 20% or more) as a percentage of ratepayer funded residential program budgets. However in most states the multifamily sector is significantly underfunded or not targeted by ratepayer-funded program portfolios at all.
3. Both the National Association of Regulated Utility Commissioners (NARUC) and the National Association of State Utility Consumer Advocates (NASUCA) recently adopted resolutions supporting proportional expenditure of energy efficiency funds in all customer sectors, naming the multifamily segment and more specifically to affordable multifamily housing.
4. Multifamily buildings straddle both the residential and commercial market segment categories and therefore may not be adequately served by ratepayer-funded program geared for either sector. This point can serve as an important starting point for discussions with utility program sponsors and other stakeholders considering multifamily program approaches.
5. Because they may see non-utility efficiency programs as exhausting a finite efficiency resource, utilities may be less inclined to support regional or statewide coordination efforts that seek to link utility programs with other public sector resources in order to successfully implement comprehensive multifamily programs. To encourage utilities to collaborate in efficiency programs that are funded by non-utility sources and to support regional coordination, states should ensure that utility participation in these initiatives gains the utility credit toward its government-mandated savings targets. Examples of this full-attribution rule can be found in ARRA-funded projects that involve utilities in California, Florida, Massachusetts, Michigan, Minnesota, and North Carolina among others.
6. To encourage utilities to invest in comprehensive energy efficiency retrofit programs that leverage funds from multiple sources, program evaluation criteria should allow full or at least partial savings to be counted from leveraged funds.
7. While a well-designed comprehensive multifamily energy efficiency program will general pass the utility-cost test (UCT), programs may have difficulty passing the total resource cost (TRC) test unless non-energy benefits such as higher property resale value, reduced bad debt, and improved tenant comfort and safety are also factored into the analysis.
8. In addition to providing technical assistance and financial incentives, the most effective programs also integrate electric and natural gas efficiency measures, even when those fuels are provided by different utilities.
9. State actions can help to balance both the need to assure data privacy and security while also allowing access to data that is critical to the design and implementation of the most cost-effective energy efficiency programs, particularly for the multifamily sector where aggregating individually-metered tenant unit energy use can provide insight on energy improvement opportunities and impacts. At a minimum, states should create consistent data-sharing agreements for use by utilities, efficiency program designers and implementers, and research institutions. States can also look to develop comprehensive systems, such as a neutral data aggregator who can combine utility data with tax records and other useful information.



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Title: ***Energy & Affordable Housing in California: Lessons Learned from the Field***  
 Prepared by: Bay Area Local Initiatives Support Corporation (LISC)  
 Published date: April 2006

Stated Purpose/Focus:  
*"This paper was created to share the lessons learned from Bay Area Local Initiative Support Corporation's (LISC) work to bring energy efficiency and renewable energy technology to multifamily affordable housing properties in Northern California. From 2002 – 2006, LISC participated in a partnership which created the Energy Action program, funded by California ratepayers under the auspices of the California Public Utilities Commission (CPUC)."*

#### Key Findings and Takeaways of Relevance

1. Programs can gain legitimacy and gain access to a variety of properties and staff by involving partners with roots in the affordable housing sector in the program design and services.
2. In order to maintain the long-term success of energy efficiency improvements, in addition to targeting the property owners and managers that make investment decisions, programs must also provide services and education to the operations and maintenance staff who maintain the functionality of buildings and the tenants who are the end-use consumers.
3. By taking an intensive account management approach, programs are able to successfully assist affordable housing staffs that tend to be stretched thin and have limited capacity to navigate program processes and complete program requirements.
4. Competing incentive programs can translate to resources being wasted cultivating program participants only to lose them to higher incentives available to alternative programs.
5. Direct install program designs are found to be the most successful for implementing energy efficiency measures in the affordable housing sector.
6. Already financed with investment of public funds, the affordable housing sector deserves special consideration with respect to free ridership concerns. The author argues that fee rider issues should be considered irrelevant.
7. In addition to the often-cited barriers of scare capital and split incentives, long project timelines, distrust of utility and third-party programs, and issues with unreliable contractors are among the barriers identified for implementing energy efficiency in the affordable housing sector.
8. When program sponsors prioritize energy savings cost effectiveness, programs addressing hard-to-reach markets such as the affordable housing sector are often not able to compete given the greater need to provide support services such as project management and training in order to motivate project uptake. Setting aside funds in ratepayer-funded programs to specifically address affordable housing can help to ensure that the sector has the needed resources to support energy improvements on an ongoing basis.
9. Piecemeal marketing of competing energy efficiency programs can create confusion among decision makers.
10. Energy efficient utility allowances are the only way to overcome the split incentive barrier for tenant-metered facilities. Higher collectable rents made possible by varying utility allowances can allow property owners to recoup investments in energy improvements while also providing direct savings to tenants through lower utility bills.



# Program Profiles

## Program Profiles

This section compares current ratepayer-funded energy efficiency programs across the U.S. addressing existing multifamily buildings. It facilitates examination of differences in eligibility criteria, incentive strategies, covered measures, and approaches for energy assessment and quality assurance. This program listing is not exhaustive, but the selected programs represent a cross section among major program sponsors.

## Program Profile Dimensions

The following pages provide tabular information on key program characteristics in order to observe differences across existing ratepayer funded programs in four major dimensions:

Eligibility:	Specification of property eligibility requirements including minimum units per structure, rental/owner-occupied status, and tenant income qualifications
Assessment Services:	Program requirements or provisions for technical assistance to identify energy savings opportunities, either through program personnel or affiliated trade allies providing walk-through audit assessments and/or energy reduction plan development
Incentive Strategies:	The mix of direct installation, prescriptive rebate incentives, and custom rebate incentives (calculated based on energy savings or project cost) providing financial resources to offset the upfront cost of energy improvements
Measure Specifications:	The availability of rebate incentives based on the specific materials, components and equipment upgraded or replaced and the required efficiency or other performance properties, standards, or qualifications

## Key Takeaways from Existing Program Offerings

A review of existing program requirements, services, incentive strategies and measure specifications suggests significant opportunity for programs to gain insight from the experiences of their counterparts:

- Differences in sponsors defining eligibility cutoffs between 2 and 5 units per structure suggests that sponsors are particularly challenged to serve the needs of buildings with 2 to 4 units. Focusing on this challenge could produce significant impacts given that this segment makes up 32% of multifamily housing.<sup>16</sup>
- Roughly half of program sponsors are found to incorporate a direct installation component to their program that removes financial barriers for building owners and tenants to benefit from cost effective energy savings measures. Several interview respondents also indicate that these programs can serve as a valuable means to establish the trust and working relationships with the building owner community that are essential to gain traction for more comprehensive programs or those targeting major upgrades and retrofits.
- Long-running ratepayer-funded statewide programs including those in New York, Oregon, and Wisconsin demonstrate a much broader commitment to technical assessment services as well as a broader range of measure offerings and custom incentive structures. In contrast, programs sponsored by investor-owned utilities (IOUs) tend to have a lighter footprint and are more transactional in providing prescriptive rebate incentives. This difference is likely attributable to the challenges IOUs face to ensure program cost effectiveness, and to shorter program planning horizons that limit willingness to commit resources for workforce development and cultivating a performance-based approach that could yield increased project activity and deeper retrofits.
- The greatest orders of magnitude differences in incentive amounts are observed for replacement windows, a measure that is often identified as popular among building owners (due to its aesthetic nature) but is absent from most program offerings, particularly among Eastern and Midwestern state sponsors. Incentives among West Coast states range from as little as \$.75 per square foot to as much as \$6 or \$8 per square foot.
- LED lamps and fixtures beyond exit signs (e.g., downlight replacements) are beginning to be incorporated into program offerings.
- Interviews with study respondents suggest that air sealing could be a major energy savings opportunity, which is currently ignored by existing program efforts due to challenges with measurement and verification. Field studies in Wisconsin have demonstrated infiltration reductions for wood-frame multifamily properties on par with single-family homes, on the order of 18%.<sup>17</sup>

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<sup>16</sup> U.S. Census Bureau, American Housing Survey, 2009. <http://www.census.gov/housing/ahs/data/ahs2009.html>

<sup>17</sup> Hynek, D., "Blower Door Testing in Multifamily Buildings," Home Energy Magazine, September 2011. <http://www.homeenergy.org/show/article/nav/blowerdoor/page/2/id/1711>

Table 1 – Eligibility Requirements and Assessment Offerings – Select Ratepayer-Funded Energy Efficiency Programs

ID	Program/Sponsor	Eligibility	Assessment Offerings (specific to MF sector)
AZ-APS	APS (AZ) Multifamily Energy Efficiency Program	5+ units	No-cost walk-through common area assessment Energy Design Incentive – up to 50% of modeling costs (max \$5,000)
CA-PGE	Pacific Gas & Electric (CA) Multifamily Properties Program	2+ units	No assessment services associated with this program
CA-SCE	Southern California Edison Multifamily Energy Efficiency Rebate Program	2+ units	No assessment services associated with this program
CA-SCG	SoCalGas Multifamily Energy Efficiency Rebates	2+ units	No assessment services associated with this program
CA-SDGE	San Diego Gas & Electric (CA) Multifamily Energy Efficiency Rebate Program	2+ units	No assessment services associated with this program
IL-A	Ameren (IL) Multi-Family Properties Energy Efficiency Rebate Program	3+ units	No assessment services associated with this program
MA-MSLI	MassSave Low-Income Multi-Family Retrofit Program	5+ units	Two types of assessments: Appliance Audits evaluate refrigerators, lighting; Comprehensive Level I and Level II assessments evaluate building shell, HVAC equipment and ventilation systems Enrollment in WegoWise benchmarking system
NY-CE	ConEd (NY) Multifamily Energy Efficiency Incentives Program	5 to 75 units	Free surveys to evaluate common areas and individual units for lighting, heating and cooling upgrades
NY-MPP	NYSERDA (NY) Energy \$mart Multifamily Performance Program	5+ units	Requires initial whole-building assessment, benchmarking, and creation of an approved Energy Reduction Plan, with specific executable steps to boost energy efficiency by 15 percent or more
OR-ETO	Energy Trust of Oregon Existing Multifamily Program , Five or More Units	5+ units	Participants can request to receive a no-cost on-site walkthrough survey, which can be combined with measure direct install
TX-AE	Austin Energy Multi-Family Energy Efficiency Rebate Program	2+ units, A/C	A no-cost walk-through rebate survey is required before a rebate application will be accepted
VT-VE	Vermont Efficiency Multifamily Apartment Rebate Program	Residential Rental Property	No assessment services are offered, but costs of assessments for comprehensive renovations may be offset by incentives
WA-PSE	Puget Sound Energy (WA) Multi-Family Efficiency Programs	3+ units	Program facilitates required Energy Efficiency Evaluation to assess energy- saving opportunities and develop an incentive proposal
WA-SCL	Seattle City Light (WA) Multifamily Weatherization and Lighting Rebates	5+ units	No assessment services associated with this program
WI-FOE	Wisconsin – Focus on Energy Incentives for Existing Multifamily Buildings	4+ units	Participants work with a Focus Energy Advisor to perform a free energy assessment and identify suitable building improvements

Table 2 – Incentive Strategies – Select Ratepayer-Funded Energy Efficiency Programs

ID	Incentive Strategies	Details
AZ-APS	No-cost direct installation of energy and water conservation measures (includes walk-through audit) Major renovations can earn \$650/unit incentive by meeting minimum qualifying requirements	<a href="#">Link</a>
CA-PGE	Offers prescriptive rebates across a range of energy improvements	<a href="#">Link</a>
CA-SCE	Offers prescriptive rebates across a range of energy improvements	<a href="#">Link</a>
CA-SCG	Offers prescriptive rebates across a range of energy improvements	<a href="#">Link</a>
CA-SDGE	Offers prescriptive rebates across a range of energy improvements	<a href="#">Link</a>
IL-A	In-Unit Energy Efficiency Program provides direct installation of energy and water conservation measures; Common Area Lighting Program provides rebate incentives for efficient lighting, controls and signage; Major Measures Program provides incentives for building shell, heating equipment, and programmable thermostats	<a href="#">Link</a>
MA-MSLI	Combines both prescriptive and custom measures with bid-negotiated pricing; often program covers the full cost of measure installation, though some cases require an owner co-pay	<a href="#">Link</a>
NY-CE	Offers prescriptive rebate incentives for common area and in-unit gas and electric measures	<a href="#">Link</a>
NY-MPP	Performance incentives include three possible payments: Payment 1: initial base incentive at plan approval: market-rate buildings can earn \$2,500/project (for buildings up to 30 units), \$5,000/project (30 to 100 units) or more (\$10/unit over 100 units); amounts are double (\$5,000/project, \$10,000/project, \$20/unit over 100) for affordable housing projects Payment 2: up to \$300/unit payable at 50% construction complete based upon a successful program inspection Payment 3: up to \$300/unit payable at substantial completion subject to inspection and performance testing (as applicable)	<a href="#">Link</a>
OR-ETO	Instant Savings Measures (direct install) available at no cost during walkthrough survey; additional prescriptive rebates for common area and in-unit gas and electric measures, subject to pre-approval requirements; custom incentives of up to 35 %of project costs for lighting measures not included on prescriptive incentives list	<a href="#">Link</a>
TX-AE	Requires application pre-approval prior to installation for a range of prescriptive rebates	<a href="#">Link</a>
VT-VE	Offers a combination of no-cost measures for customers to install, prescriptive rebates on a range of electric and gas efficiency measures, and custom incentives of up to \$7,500 per property for comprehensive retrofits	<a href="#">Link</a>
WA-PSE	Provides no-cost direct installation of several energy savings measures in addition to other prescriptive rebate incentives	<a href="#">Link</a>
WA-SCL	Offers prescriptive and custom (insulation, common-area lighting) rebates for windows, insulation, and lighting retrofits	<a href="#">Link</a>
WI-FOE	Offers a combination of prescriptive equipment rebates and custom incentives based on the amount of energy that a project saves	<a href="#">Link</a>

Table 3 – Measure Incentives and Specifications – Select Ratepayer-Funded Energy Efficiency Programs

Program ID	CFL A/B Lamp	Faucet Aerator	Shower-head	HE Washer	HE Dish-washer	T8, T5	HP T8, T5	T12 Delamp to T8	Occup. Sensor	LED Exit	Day-light Cntrl.	CFL Fixture	CC CFL Lamp	Prog. T-Stat	Refrigerator	Ceiling Fan
AZ-APS	DI					\$5-\$10			\$0.12/W	\$25	\$0.30/W	\$15-\$20	\$1.75-\$3.50	\$40	Up to \$200	
AZ-APS															Comm.	
CA-PGE	\$8/\$10		\$15	\$50-150	\$30-\$50		\$32-\$45	\$6	\$10	\$35		\$25				
CA-PGE	R30/ R40		1.6 gpm	CEE Tr. 3	Varies			T8	Interior	<5W		ES				
CA-SCE	DI						DI		DI	DI		DI				\$20
CA-SCE	ES Label						Elec. Ballast					ES Label				ES CFL
CA-SCG					\$30-\$50											
CA-SCG					EF .65+											
CA-SDGE	\$4-\$10	\$1.25	\$5	\$75/\$150			\$32-\$45	\$6	\$10	\$35		\$40				\$20
CA-SDGE			1.5 gpm	varies				T8		<5W		ES				ES CFL
IL-A	\$1.5, DI	DI	DI			\$7-\$12			\$25	\$22		\$23-\$26		\$25		
IL-A	15W								24-hr	3W						
MA-MSLI	Bid-negotiated pricing for comprehensive retrofits; typically no cost to owner (full measure cost), with co-pays required in some instances															
MA-MSLI			1.5 gpm													
NY-CE	\$3-\$4, DI	DI	DI				\$32- \$45		\$50	\$50		\$50				
NY-CE	In-unit DI	1.5 gpm	1.5 gpm							<5W		pin-based				
NY-MPP	Program pays performance-based incentives based on minimum achieved energy savings (15%), approved Energy Reduction Plan and inspection of project completion															
OR-ETO	\$2-\$4, DI	DI	DI		\$25		\$20-\$42	\$5	\$25-\$100	\$20		\$25-\$45			\$50	
OR-ETO					ES			T8	varies						ES	
TX-AE	\$3-\$4					\$9-\$12			\$5-\$32			\$30-\$35				
TX-AE	2700K											-50W				
VT-VE	DI	DI	DI												\$150	
VT-VE															CEE Tr.2	
WA-PSE	DI	DI	DI	\$50-\$100		Calculated common area lighting incentives				\$30		\$20			\$20	
WA-PSE				MEF 2.2		Varies based on fixture type(s), savings						ES			ES	
WA-SCL						85% discount on common area lighting										
WA-SCL						varies										
WI-FOE	\$2-\$5			\$15-\$25	\$15		\$2-\$5		\$7.5-\$10	\$5		\$15			\$15	
WI-FOE	varies			ES	ES		list		varies			ES			ES	

Source: Program Sponsor Materials (see links in Table 2)

Table 3 (continued) – Measure Incentives and Specifications – Select Ratepayer-Funded Energy Efficiency Programs

= Incentive type/level, DI = direct install at no cost

= Specification for measure eligibility, varies = see program for more details

Program ID	Central Plant Boiler	Central DHW	Boiler /DHW Controls	Wall Insul.	Attic/ Ceiling Insul	Windows	A/C	HE Furnace	Heat Pump	In-Unit Elec. HW Heater	Air/Duct Sealing	Duct Sealing	In-Unit Gas HW Heater	Evap. Cooling	Variable Speed Motor	PTAC	Room A/C	
AZ-APS				Below specifications reflect minimum requirements to earn \$650/unit incentive for major retrofits														
AZ-APS				R11	R19	.86 SHGC	14 SEER	80% AFUE	8.2 HSPF	.93 EF	0.70 ACH	5%						
CA-PGE	\$1,500	\$500		\$0.50/sf	\$.15/sf	\$.75/sf		\$150-\$300		\$15			\$30/\$50	\$300-\$600	\$50	\$100	\$50	
CA-PGE	84% TE 82% AFUE	82% TE		R13	<R19 to R38	.40 SHGC .40 UF		94% AFUE		.93 EF			.62/.65 EF	varies	varies	varies	ES	
CA-SCE				\$.15/sf	\$.15/sf	\$.75/sf				\$30						\$100	\$50	
CA-SCE				R13	R11 to R30	.32 SHGC .35 UF				.93 EF						varies	ES	
CA-SCG	\$1,500	\$500	\$700-\$1,400	\$.15/sf	\$.15/sf			\$200					\$30					
CA-SCG	84% TE 82% AFUE	82% TE	varies	R13	R11 to R30			92% AFUE					.62 EF					
CA-SDGE	\$1,500	\$500	\$700-\$1,400	\$.15/sf	\$.15/sf			\$200					\$30				\$50	
CA-SDGE	84% TE 82% AFUE	82% TE	varies	R13	R11 to R30			92% AFUE					.62 EF				ES	
IL-A	\$3/kBTUh			\$1.20/sf	\$.70/sf		\$100-\$300	\$4.50/1kBTU/h	\$150-\$600				\$.50/ CFM					
IL-A	88% AFUE			R11	R11 to R38		varies	95% AFUE	varies									
MA-MSLI	Bid-negotiated pricing for comprehensive retrofits; typically no cost to owner (full measure cost), with co-pays required in some instances																	
MA-MSLI				R13-19	R38-49													
NY-CE	\$1k to \$15k		\$200					\$500 to \$2,500							\$45-\$120	\$50/ton	\$30	
NY-CE	varies		Boiler reset					90% AFUE								13.1 EER	ES	
NY-MPP	Program pays performance-based incentives based on minimum achieved energy savings (15%), approved Energy Reduction Plan and inspection of project completion																	
OR-ETO	\$4/kBTUh	\$2.5/kBTUh			\$.30/sf	\$2-\$3/sf		\$150	\$200 to \$600	\$35/\$75			\$35/\$100					
OR-ETO		91% AFUE			R18 to R38	.30 UF		90% AFUE	varies	.93/.94 EF			.62/.67 EF					
TX-AE					\$.05-\$ .23/sf	\$2/sf	\$200-\$500		\$250-\$350				\$.20-\$ .38/sf					
TX-AE					varies	.35 SHGC	varies		varies				varies					
VT-VE	\$2/kBTUh	Comprehensive renovation incentives up to \$7,500/property																
VT-VE	87% TE								90% AFUE									
WA-PSE	Calculated			\$.75/sf	\$.75/sf	\$6-\$8/sf		\$250		\$50								
WA-PSE	varies			varies	varies	.30 UF		90% AFUE		.95 EF								
WA-SCL				50% discount			\$3-\$5/sf											
WA-SCL				varies, cost limits			.30 UF											
WI-FOE	Custom, two incentive tiers: \$.30 or \$.45/Therm							\$100-\$200	\$150	\$100-\$250	\$50		\$50-\$200		\$40/HP			
WI-FOE	varies							varies	90% AFUE	varies	.93 EF		varies		2k hrs			

Source: Program Sponsor Materials (see links in Table 2)

Table 4 – Additional Measure Incentives – Select Ratepayer-Funded Energy Efficiency Programs

ID	Additional Measure Incentives
AZ-APS	Major renovations required to achieve lighting power density of 0.292 W/sq.ft. or lower and misc. power density of 0.875 W/sq.ft. or lower
CA-PGE	Cool roofs are incentivized at three levels ranging from \$.10/sf to \$.20/sf; pool/spa heaters at \$2/kBTUh, variable-speed/flow pool pumps at \$100/unit, exterior photocells at \$10
CA-SCE	Exterior photocells at \$10, ENERGY STAR refrigerators at \$50
CA-SCG	Exterior hardwired fluorescent fixtures at \$30/fixture, exterior photocells at \$10
CA-SDGE	Central heat pumps at \$100
IL-A	In-unit direct install includes water pipe insulation (in addition to CFLs, aerators and showerheads)
MA-MSLI	Prescriptive measure list also includes pipe/duct insulation, floor insulation
NY-CE	Smart strips provided as a direct install measure, efficient refrigerator incentives from \$100-\$325/unit depending on occupant characteristics, heating system clean and tune at \$225, energy management system with in-unit temperature sensors covered up to 70% of project cost (\$6,000 to \$20,000), pipe insulation from \$3 to \$5 per linear foot, door weatherstripping and sweeps up to \$50, interior metal halide fixtures \$25 (>350W) or \$50 (<\$350)
NY-MPP	N/A – program provides performance-based measures
OR-ETO	Floor insulation at \$.30/sf, duct insulation at 50% of cost up to \$100, R5 exterior doors at \$25/door, heat pump hot water heater at \$500, tankless gas water heater at \$200 (in-unit) or \$2/kBTUh (central, commercial), clothes washers at \$300 (electric, common)/\$200 (gas, common)/\$150 (in-unit), package terminal heat pumps (PTHPs) at \$200/unit, boiler pipe insulation at \$4/linear ft., additional \$5/fixture for low ballast factor, LED downlights at \$30, LED Par lamps at \$15 to \$25, LED refrigeration case lighting at \$10/linear foot, motion sensor on LED cases at \$2/linear foot, dimmable/bi-level electronic ballasts \$10 to \$15
TX-AE	Solar screens or film of \$1.88/sf (single-pane) and \$1.50 (double-pane), roof insulation of \$.10/sf, reflective roof coating at \$.15/sf, duct system replacement of \$1.75/linear foot, high performance ballast upgrade at \$9-\$12 per fixture
VT-VE	Ventilation fans at \$110/fan
WA-PSE	Wall insulation at \$.75/sf, calculated incentives for solar pool heater and parking garage CO sensors, direct install measures include water heater pipe wrap, \$20 for ES qualified LED lamps, \$30 for ES qualified LED fixtures
WA-SCL	No additional measures specified though common area lighting and insulation retrofits are open-ended custom incentives
WI-FOE	ES dehumidifier at \$15/unit, ES freezer at \$15/unit, electric chiller reward based on size and load, custom measures including air conditioning, chillers, ground-source and water loop heat pump systems, building management systems, limiting thermostat control, temperature averaging systems, energy recovery ventilator, garage exhaust fan control, exhaust fan with VFD, building shell insulation, and HPT8 parking garage fixtures at two tiers: \$.030 or \$.045/kWh (\$100 or \$150/kW), energy recovery ventilator at \$.75/CFM, vending energy control systems at \$15 (snack machine) and \$60 (cold beverage), pool heaters and heat recovery systems at two tiers (\$.030 or \$.045/kWh, \$.30 or \$.45/therm, LED downlights at \$30/unit, low watt T8 lamp replacement at \$.25/lamp

Source: Program Sponsor Materials (see links in Table 2)



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