Multiple Benefits of Multifamily Energy Efficiency for Cost-Effectiveness Screening

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Executive Summary

This report offers guidance on incorporating multiple benefits of energy efficiency into cost-effectiveness testing for multifamily retrofit programs. Multiple benefits are the impacts of energy efficiency improvements beyond energy savings. Most tests used by regulators do not include the value of benefits beyond the cost of energy saved, even though the tests are designed to include them. Such benefits are particularly relevant to multifamily efficiency programs where reduced maintenance, health, and comfort have been identified as salient results of energy efficiency work. This report describes the range of multiple benefits in multifamily programs and discusses particular ways of establishing their value so administrators can include them in cost-effectiveness testing.

COST-EFFECTIVENESS TESTING

Administrators use cost-effectiveness tests to determine whether the benefits of utility investments of ratepayer funds in energy efficiency outweigh the costs. A majority of jurisdictions with ratepayer-funded programs rely primarily on the Total Resource Cost (TRC) test. It is designed to consider costs and benefits experienced by the utility system and all utility customers, as well as the costs and benefits to program participants.[1]

In practice, however, administrators do not consistently include multiple benefits. Less than one-third of the jurisdictions in ACEEE's 2012 survey included customer benefits other than energy savings when applying the TRC, whereas more than three-quarters of them included all participant costs.[2] Those that did consider nonenergy customer benefits used water and other fuel savings, reduced maintenance, and a general adder to capture the value of multiple benefits.

UNIQUE CHARACTERISTICS OF MULTIFAMILY HOUSING

When applying cost-effectiveness tests to multifamily programs, administrators should consider the fact that multifamily property owners have different costs and financial concerns than single-family homeowners. Tenants also experience multiple benefits, and these too affect the building owner's bottom line. Multifamily buildings vary with respect to who is responsible for utility bills for major energy loads, and who realizes the savings. Therefore administrators must pay particularly close attention to calculating costs and benefits in multifamily cost-effectiveness testing.

MULTIPLE BENEFITS OF MULTIFAMILY PROGRAMS

Participant Benefits

Participant benefits are the effects of energy efficiency improvements that accrue to program participants. Participant nonenergy benefits in the multifamily sector include reduced maintenance costs, improved appliance and equipment performance and lifespan, greater

[1] M. Kushler, S. Nowak, and P. Witte, *A National Survey of State Policies and Practices for the Evaluation of Ratepayer Funded Energy Efficiency Programs* (Washington, DC: ACEEE, 2012), http://aceee.org/research-report/u122.

[2] *Ibid.*

property value, increased building durability, and increased tenant comfort, health, and safety.

Utility Benefits

Utility benefits are program impacts that affect the utility and all its customers. Customers who have lower, more predictable monthly utility bills are less likely to get behind on payments. A single retrofit to a multifamily building can positively affect many tenants and their accounts, leading to fewer shutoffs, reconnects, customer calls, and debt collection actions. Some utility benefits, including carrying cost on arrearages and debt collection efforts, may be more prevalent in low-income programs, so administrators should focus on them when they evaluate programs targeting affordable multifamily buildings.

Societal Benefits

Societal benefits are the benefits of energy efficiency improvements that accrue to the public at large.[3] For example, reduced energy costs for multifamily households can have a positive impact on local economic activity. Money spent on utility bills is more likely to leave the local economy than money spent on local goods and services.[4] Research has established that some societal benefits are greater for programs targeting low-income customers. These include hardship and equity benefits such as reduced dependence on government aid resulting from more stable employment and income.[5]

Societal benefits are frequently measured by modeling, while utility benefits may be quantified by computing incidence and marginal valuation derived from utility data. Participant benefits are measured through surveys establishing monetary value to home dwellers.

INCLUDING BENEFITS OF MULTIFAMILY ENERGY EFFICIENCY IN COST-EFFECTIVENESS TESTING

Cost-effectiveness tests sometimes fail to include nonenergy benefits but at the same time include all costs. This implies that consumers undertake projects only to save energy and reduce utility bills. In reality, saving energy is not the only motivation for most property owners, managers, and cooperative boards who choose to undertake a retrofit.

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[3] J. Lazar and K. Coburn, *A Layer Cake of Benefits: Recognizing the Full Value of Energy Efficiency* (Montpelier, VT: The Regulatory Assistance Project, 2013), http://www.raponline.org/event/recognizing-the-full-value-of-efficiency-theres-more-layers-in-the-layer-cake-than-many-account.

[4] N. Stone, "Multifamily Housing Deserves More Attention" (Presentation to the UC Program on Housing and Urban Policy, September 2011).

[5] NMR Group, *Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non Energy Impacts (NEI) Evaluation,* prepared for Massachusetts Program Administrators (Madison, WI: NMR Group and Tetra Tech, 2011), http://www.rieermc.ri.gov/documents/evaluationstudies/2011/Tetra_Tech_and_NMR_2011_MA_Res_and_LI_NEI_Evaluation%2876%29.pdf.

The best way of applying multiple benefits to cost-effectiveness tests is to use monetized estimates of benefits expressed in consistent units (i.e., dollars per participant per year).[6] The National Efficiency Screening Project's Resource Value Framework can help guide cost-effectiveness testing that accurately represents the value of multifamily programs.[7]

FURTHER RECOMMENDATIONS

Collect data from programs. The impact of energy efficiency programs can be better understood by measuring pre- and post-retrofit results, and by comparing buildings that have undergone efficiency retrofits with those that have not. While the amount of energy saved through an upgrade can be a convincing sell by itself, the impacts of efficiency improvements on key elements of multifamily business models can also be key motivators. These elements include not only net operating income but also tenant satisfaction, turnover, and vacancy rates.

Apply data to influence cost-effectiveness testing. Administrators may set a lower cost-benefit screening threshold for programs for which there are many hard-to-quantify benefits, or they may use adders to account for the nonmonetized benefits.

Provide equal opportunities. Energy efficiency services should be available to tenants and owners of multifamily housing. If tenants are contributing to energy efficiency program funds through utility bill charges, they should have access to the programs they are helping to support.

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[6] L. Skumatz, *Non Energy Benefits/Non Energy Impacts (NEBs/NEIs) and Their Role and Values in Cost-Effectiveness Tests: State of Maryland,* prepared for NRDC (Superior, CO: Skumatz Economic Research Associates, Inc. 2014).

[7] National Efficiency Screening Project, *The Resource Value Framework: Reforming Energy Efficiency Cost-Effectiveness Screening* (Washington, DC: National Home Performance Council, 2014), http://www.synapse-energy.com/sites/default/files/The%20Resource%20Value%20Framework%20Reforming%20EE%20Cost-Effectiveness%2014-027.pdf.

Introduction

Investment in energy efficiency improvements provides multiple benefits to various stakeholders. Program administrators and customers may save large amounts of energy from retrofits to multifamily buildings. Building owners may benefit from lower energy bills, reduced maintenance costs, lower vacancy and turnover rates, and higher property value. Tenants may spend less on energy and enjoy greater comfort and financial stability.

As utilities scale up energy efficiency retrofits for multifamily buildings, they must meet cost-effectiveness thresholds and match the cost–benefit ratio of other energy efficiency programs. Most cost-effectiveness tests used by regulators to evaluate whole-building retrofits do not include the value of benefits beyond the cost of energy saved, even though the most widely used tests are designed to include them (Kushler, Nowak, and Witte 2012; Amann 2006). The result is that administrators balance all the costs of a program against only some of the benefits, and so they fail to capture the full value of energy efficiency improvements.

This report addresses the challenges in meeting cost-effectiveness testing requirements for multifamily retrofit programs. Drawing from a growing body of research that focuses on multifamily buildings, we describe the range of benefits and discuss particular ways of establishing their value so administrators can include them in cost-effectiveness testing.

Key Terms

Policy and program discussions use a number of terms to characterize the benefits provided by energy efficiency improvements beyond utility bill savings. These include *nonenergy benefits (NEBs), nonenergy impacts (NEIs),* and *co-benefits*.

We find the term *multiple benefits*, used by the International Energy Agency (IEA), to be most suitable for describing the broad range of benefits, both energy and otherwise, that may result from energy efficiency improvements. Benefits can be of different importance to different stakeholders, and this term does not prioritize one benefit over another (IEA 2014). Thus it may make energy efficiency improvements more attractive to building owners, who have other priorities besides saving energy.

Key Resources

The Resource Value Framework is the primary source of guidance on improving cost-effectiveness screening of electricity and natural gas efficiency programs (NESP 2014).

A Layer Cake of Benefits: Recognizing the Full Value of Energy Efficiency provides guidance on how the full value of energy efficiency benefits can be captured to do justice to energy efficiency as a low-cost, reliable resource (Lazar and Coburn 2013).

Elevate Energy's *Valuing the Financial Benefits of Energy Efficiency in the Multifamily Sector* quantifies the impact of recent energy efficiency upgrades on the financial performance of multifamily buildings (Elevate Energy 2014).

What Are Multiple Benefits and How Are They Measured?

Multiple benefits is a term used to describe the impacts of energy efficiency improvements beyond energy savings. Benefits fall into three primary categories: participant, utility, and societal benefits.[1]

[1] This structure has been well established by earlier research on nonenergy benefits (NEBs) for single-family and low-income weatherization programs and can apply to the multifamily program arena with some modifications (TecMarket Works 2001; Skumatz 2014).

Participant benefits are the impacts from energy efficiency improvements that accrue to the program participant. Utility benefits are the effects of programs that affect customers and utilities, including utility infrastructure. Societal benefits are the benefits of energy efficiency improvements that accrue to the public at large, beyond those that are attributed directly to participants of a program (Lazar and Coburn 2013).

Multiple benefits are measured in different ways depending on the benefit that is being measured (Skumatz 2014; Amann 2006). Societal benefits are frequently measured by modeling such factors as emissions and climate change, job creation, and net economic multipliers from spending on energy efficiency improvements and other goods and services with money from energy saved. Utility benefits (e.g., reduced-demand on-call centers, lower carrying costs from billing arrearages) may be measured by computing such things as incidence and marginal valuation derived from utility reports.

Participant benefits are generally measured through surveys that establish the monetary value of things that have value to home dwellers but are not easily quantified (e.g., comfort, noise reduction, light quality, increased reliability, fewer days off sick from school and work). For hard-to-value benefits, researchers formerly used willingness-to-pay methods similar to ones used in natural resources and environmental fields to determine how much participants are willing to offer for a benefit. They now use comparative and ranking and scaling methods, where respondents estimate the value of other benefits relative to the energy savings realized. While these latter methods elicit less variable and volatile responses than willingness-to-pay methods, they can entail other drawbacks and biases. Researchers have experimented with conjoint analysis as an alternative approach that can complement comparative methods (Wobus et al. 2007).

Including Multiple Benefits in Cost-Effectiveness Testing

Energy efficiency programs funded through customer contributions are subject to regulator-established cost-effectiveness tests to ensure funds are spent in the public interest.[9] Cost-effectiveness testing is used to determine whether the benefits of utility investments of ratepayer funds in energy efficiency outweigh the costs.

In practice, one or more of five standard cost-effectiveness tests is applied to assess energy efficiency programs. Each of the tests weighs certain efficiency program benefits against their costs. State legislatures or the state regulatory agencies overseeing utilities (e.g., the public service commission or public utility commission) typically mandate the specific test(s) that utilities must use to demonstrate program cost effectiveness. Common tests are defined in the California Standard Practice Manual (CPUC 2001):

- The Societal Cost Test (SCT) compares program cost and certain benefits as experienced by all members of society.
- The Total Resource Cost Test (TRC) compares program costs and certain benefits for the utility system and program participants.

[9] See Kushler, Nowak, and Witte (2012) for a review of state policies and practices for the evaluation of ratepayer-funded energy efficiency programs: http://aceee.org/research-report/u122.

- The Utility Cost Test or Program Administrator Cost Test (UCT/PACT) compares the costs and certain benefits of the programs for the utility system.
- The Participant Cost Test (PT) compares program costs and certain benefits for customers participating in the program.
- The Rate Impact Measure Test (RIM) compares only those costs and benefits that affect utility rates, including utility system benefits and costs (such as lost revenues from lower energy sales).

Table 1 summarizes the costs and benefits considered in each of the five major cost tests.

Table 1. Components of the standard cost-effectiveness tests

	Participant Cost Test	RIM Test	Utility Cost Test	TRC Test	Societal Cost Test
Energy efficiency program benefits					
Avoided energy costs	---	Yes	Yes	Yes	Yes
Avoided capacity costs	---	Yes	Yes	Yes	Yes
Avoided transmission and distribution costs	---	Yes	Yes	Yes	Yes
Wholesale market price suppression effects	---	Yes	Yes	Yes	Yes
Avoided cost of environmental compliance	---	Yes	Yes	Yes	Yes
Nonenergy benefits (participant)	Yes	---	---	Yes*	Yes*
Nonenergy benefits (utility)	---	Yes	Yes	Yes	Yes
Nonenergy benefits (societal)	---	---	---	---	Yes
Customer bill savings	Yes	---	---	---	---
Energy efficiency program costs					
Program administrator costs	---	Yes	Yes	Yes	Yes
EE measure cost: program financial incentive	---	Yes	Yes	Yes	Yes
EE measure cost: participant contribution	Yes	---	---	Yes	Yes
Lost revenues to the utility	---	Yes	---	---	---

*In theory, participant nonenergy benefits should be included in the TRC and societal tests. However in practice they are typically underestimated or wholly neglected. As a result, most TRC assessments understate efficiency benefits.
Source: NESP 2014.

A survey of state policies and practices for ratepayer-funded efficiency programs (Kushler, Nowak, and Witte 2012) found that all jurisdictions with ratepayer-funded programs—a total of 43 states and the District of Columbia—used one of the above tests to evaluate program cost effectiveness. In the majority of these jurisdictions, use of these tests was mandated by legislation or regulatory order.

While most states consider more than one test in some capacity, two-thirds of the jurisdictions with ratepayer-funded programs rely on the TRC as their primary cost-effectiveness test. The TRC considers costs and benefits experienced by the utility system

and all utility customers, plus costs and benefits to program participants, in theory including benefits that accrue to the utility and the participant (NESP 2014). Given the widespread use of the TRC and its prevalence as the primary test for making program cost-effectiveness determinations, we will focus our discussion on the TRC and, to a lesser extent, the SCT.

Cost-effectiveness tests should provide a comparison of the costs of an energy efficiency improvement with the benefits that result. In practice, multiple benefits are not consistently incorporated into cost-effectiveness tests, even in tests that are designed to include them. This results in an inaccurate assessment of the costs of investing in energy efficiency improvements and the benefits that come from them, beyond just energy saved.

Multiple benefits are likely excluded from most cost-effectiveness tests for two reasons: (1) lack of data on their value, and (2) lack of consensus on methodologies for establishing values and incorporating them into cost-effectiveness tests. In short, many benefits are harder to quantify than project energy savings and project costs.

To address the shortcomings in the current application of cost-effectiveness tests, the National Efficiency Screening Project (NESP), a group of organizations and individuals working to improve the cost-effectiveness screening of electricity and natural gas efficiency programs, developed the Resource Value Framework (RVF) to provide guidance on the development and implementation of cost-effectiveness tests (NESP 2014). One goal of the RVF is to improve consistency in the application of cost-effectiveness tests across states while maintaining flexibility for the states to develop tests that align with state energy policy goals.

The RVF outlines six principles for cost-effectiveness screening that can be applied to any of the widely used screening tests (discussed below) or in development of a new screening test. One of the six principles addresses the treatment of benefits in efficiency screening:

> Efficiency screening practices should not exclude relevant benefits on the grounds that they are difficult to quantify. Applying rough or qualitative approximations of hard-to-quantify benefits and costs is preferable to assuming that those benefits do not exist or have no value (NESP 2014, 6).

The RVF also offers recommendations for how to deal with relevant program benefits. First, the value of benefits should be monetized whenever possible; when not possible, estimates or proxies should be used. Studies often express the value of nonenergy benefits as a percentage of the project energy savings benefits. When monetary values and estimates are difficult to quantify, the RVF recommends the use of alternative screening benchmarks or regulatory judgment. For example, programs with particular public interest benefits may pass screening with a benefit–cost ratio less than one. In practice, many states allow this type of alternative benchmark for low-income programs. Regulators may also give program administrators the flexibility to account for benefits that defy quantification, such as market transformation effects. Maine has allowed special consideration for programs meeting the state's market transformation goals for its utility efficiency programs (PUC Maine 2009). Table 2 lists the recommended options for addressing multiple benefits as outlined in the RVF along with examples for application to benefits observed in the multifamily sector.

Table 2. Options for addressing multiple benefits in cost-effectiveness screening

RVF recommended treatment	Examples of multifamily benefits
Put benefits into monetary terms whenever possible	Water bill savings
Use estimates or proxies to approximate the value of non-monetized benefits	Operations and maintenance savings expressed as a percentage of energy cost savings
Use alternative screening benchmarks	Low-income programs required to meet lower benefit–cost ratios
Allow regulators and programs to use regulatory and policy judgment in lieu of options listed above	Comfort, health and safety, market transformation effects
Use other values to quantify benefits to inform the application of estimates or proxies, alternative benchmarks, and regulatory judgments	Reduced sick days, tenant financial security, equipment reliability

While the tests specified above are used in most jurisdictions, their implementation is quite varied, as states use their own rules and methods to interpret and apply the test. The treatment of benefits is an area where application of costs tests in practice strays substantially from the original intent of the tests as defined. Both the TRC and SCT, in theory, include the value of all participant benefits (energy and nonenergy). In practice, this is rarely done. ACEEE's 2012 survey of evaluation practices found that less than one-third of jurisdictions (a total of 12) included customer benefits other than energy savings when applying the TRC (or other primary test) compared with more than three-quarters of jurisdictions (a total of 36) that included all participant costs (Kushler, Nowak, and Witte 2012).

Among those including other customer benefits, seven included water and other fuel savings, two included reduced maintenance, and one included a general adder to capture the value of multiple benefits.[10] One survey respondent included a benefit listed as "other," and five respondents did not specify which benefits they included. No respondents selected health, comfort, or improved productivity as benefits included in the test.[11] These findings are relevant for multifamily efficiency programs where reduced maintenance, health, and comfort have been identified as salient benefits of energy efficiency work. More recent research indicates that there may be a small but burgeoning awareness of these benefits, with a handful of states now incorporating comfort, health, or safety benefits into tests for some programs (e.g., whole-home retrofits and low-income programs), and as many as nine jurisdictions including some type of adder for some programs (Itron 2014).

[10] An adder is an adjustment to the benefits included in a cost effectiveness test meant to approximate the value of multiple benefits that are not easily measured. In 2012, the Vermont Public Service Board adopted a 15% adder to account for some of the nonenergy benefits of energy efficiency investments. This was an increase over a stopgap 5% nonenergy benefit adder adopted in 2009 (Malmgren and Skumatz 2014).

[11] For the results of this evaluation, see Kushler, Nowak, and Witte 2012.

Unique Characteristics of Multifamily Housing

Much of the valuation of participant benefits so far has assessed the impact on the occupants of single-family homes, who are also usually the owners. Multifamily programs require unique consideration because multifamily property owners have different costs and financial concerns than single-family homeowners.

Fairly extensive work has been done to identify an array of benefits for single-family retrofit programs, particularly for weatherization programs. A 2006 ACEEE literature review summarized research to identify and quantify multiple benefits for whole-house single-family retrofits (Amann 2006). More recent work has also addressed the status of nonenergy benefit estimation and use in regulatory tests (Skumatz 2014; Woolf et al. 2012; NMR Group 2011).

Multiple benefits from multifamily retrofit programs have been identified to a lesser extent. This is partly because energy efficiency programs are less prevalent in multifamily buildings. While many of the benefits identified through research on single-family retrofits can be applied in the multifamily setting, considerations unique to the multifamily sector are important for cost-effectiveness testing. Multifamily homes differ from single-family homes in ownership structure, management scheme, occupancy, and responsibility for energy payment. These differences can affect the types and scale of benefits realized, as well as the way they are measured.

OWNERSHIP AND OCCUPANCY

Whether a building is occupied by renters or its owner(s) has important implications for energy efficiency programs, particularly for determining program benefits and to whom they accrue. A 2013 ACEEE report, *Scaling up Multifamily Energy Efficiency Programs* found that in the top 50 metropolitan areas (with a few exceptions), a large majority of multifamily units are occupied by renters (Johnson and Mackres 2013). In 44 of the 50 largest metropolitan areas, over 80% of multifamily units are renter occupied.[12] Therefore, in multifamily buildings, it is likely that the benefits that are realized by building occupants are felt by tenants, not the building owner. For a cost-effectiveness test comparing the participant (building owner) costs and benefits, this necessitates looking at benefits that accrue to tenants from the perspective of how improved tenant comfort and satisfaction impacts the building owner's bottom line. In addition, how the building is managed has implications for determining which party benefits accrue to. While some buildings are owned and managed by one party, other buildings are owned by one party and managed by another.

Assisted multifamily housing offers additional challenges for determining how energy savings and co-benefits accrue, because the financial structure of ownership is different than it is for market-rate properties. Assisted housing is multifamily housing that receives some

[12] Six metropolitan areas of the 50 surveyed had a higher prevalence of owner-occupied multifamily units, where owners organize to make decisions under the guidance of condo associations.

form of subsidy in order to maintain low rents (Johnson and Mackres 2013).[13] It is important to note, however, that the majority of affordable, low-rent apartments are privately owned and do not receive any federal or state rental assistance (Johnson and Mackres 2013).

METERING CONFIGURATION AND RESPONSIBILITY FOR ENERGY COST

Another important factor for multifamily buildings is how buildings are metered and who pays the utility bill. Metering configuration often dictates whether the owner or tenant pays the utility bills (Fannie Mae 2014). Some buildings are master metered, meaning there is one meter that accounts for all the gas or electricity used in the building. In this scenario, utility cost is typically built into a tenant's rent, while the building owner receives utility billing statements and manages payments to the utility. Buildings can also have separately metered units, where tenants pay for one or more of their utilities directly. Some buildings are metered separately for one utility (most commonly electricity) but are master metered for another (e.g., natural gas). Split incentives are created when the party paying for the energy efficiency improvement is not realizing the energy savings. ACEEE research indicates that a relatively small share of multifamily units—an average of 10% across the 50 largest metropolitan areas surveyed—are located in master-metered buildings where tenants do not pay directly for any utilities (Johnson and Mackres 2013). Therefore, 9 out of 10 multifamily unit tenants in the most populous metropolitan areas are responsible for directly paying for at least one metered utility (Johnson and Mackres 2013). The metering configuration in a building affects whether the tenant or owner is responsible for the costs associated with the largest energy loads in the home. A 2014 study on multifamily housing found that a high percentage of tenants—81%—pay directly for the energy used for plug load (Fannie Mae 2014). A slightly smaller proportion—75%—of tenants pay directly for cooling load. The heating load is covered by 56% of tenants, and the water heating energy is covered by 37% (Fannie Mae 2014).

Variation in who is responsible for utility bills for major energy loads, and in who realizes the savings, means that administrators must pay more attention to calculating costs and benefits for multifamily cost-effectiveness testing than they do for similar benefits in a single-family setting. For a utility with a program targeting whole-building retrofits such as air sealing and insulation, the way savings are calculated and applied to cost-effectiveness tests can differ from building to building, depending on how fuels are metered. Programs targeting whole-building improvements must consider that energy savings and associated benefits are not always confined to the building owner and must develop strategies to account for program impact. Efforts by program administrators to understand energy payment responsibility in the buildings they target can not only improve the accuracy of cost-effectiveness calculations, but can also help programs market energy efficiency improvements based on benefits to the business beyond owner energy savings. For instance,

[13] The three primary types of assisted housing are (1) privately owned rental properties that receive subsidies from the U.S. Department of Housing and Urban Development (HUD), USDA, or are insured by the Federal Housing Administration (FHA); (2) properties that are owned and subsidized by the federal government and operated by local public housing authorities; and (3) privately owned buildings financed with Low Income Housing Tax Credits (LIHTC) (Johnson and Mackres 2013).

lower tenant utility bills through energy efficiency improvements can positively impact tenant satisfaction and ability to pay bills on time, resulting in benefit to building owners.

Participant Benefits in the Multifamily Sector

Participant benefits are the impacts from energy efficiency improvements that accrue to program participants (tenants and owners). Benefits vary by user, program, and energy efficiency measures applied. Impacts may include higher property value, reduced maintenance costs, greater levels of comfort, improved appliance and equipment performance and lifespan, and improved health and safety.

Research and literature on multifamily benefits have focused on program participants (owners and occupants). Multifamily participant benefits are different from the benefits in single-family program evaluation because of the owner-occupant relationships discussed above. Appendix A describes representative studies.

MAINTENANCE

Reduced maintenance costs through energy efficiency improvements can be a significant benefit when considering the value of retrofit work for multifamily building owners. Maintenance and repair expenses for multifamily building owners come primarily from addressing equipment, lighting, and building durability issues. The average annual maintenance cost per apartment in the United States is $1,095 (HUD 2012). It is not uncommon for affordable housing to have higher than average operating expenses in part because of maintenance and repair costs (Elevate Energy 2014b). Reducing the frequency or intensity of work needed can cut down on the overall operating expenses for a building owner. Energy efficiency improvements that decrease maintenance costs, particularly with respect to HVAC equipment and lighting maintenance, have been demonstrated in a number of cases. Table 3 summarizes the results of the three studies described in Appendix A.

Table 3. Impact of energy efficiency improvements on maintenance costs

	Elevate Energy Boulevard Apartments case study	Massachusetts program evaluation	NYSERDA multifamily program case study
Efficiency measures installed	Air sealing, roof cavity insulation, and furnace replacement	A variety of energy efficiency measures, including refrigerator or freezer replacement, hot water system upgrade or water saving measures, lighting, thermostats, and air sealing	HVAC system replacement
Result	17% decrease in annual maintenance costs after retrofit (figure 1). Valued at 150% of the value of energy saved.	Equipment maintenance: four owners reported a post-retrofit benefit, valued at $500, 3% of the value of energy saved. Lighting maintenance: 12 owners reported a post-retrofit benefit, valued at $2,900, 28% of the value of energy saved.	$250–$475 per tenant decreases in maintenance costs in a cooperative building in New York
Data collection method	Data collected by building owner interviews	Data collected by building owner or manager survey and relative valuation	Data collected by building manager interview

Sources: Elevate Energy 2014a; NMR Group 2011; NYSERDA 2013a.

While the type and scope of the three energy efficiency retrofits in table 3 vary, they signal a need to more systematically quantify the impact on maintenance costs that a variety of multifamily building types can realize through energy efficiency improvements. The examples in table 3 range from approximately 3% to 150% of project energy savings, with a simple average of 60%.

In the Elevate Energy Boulevard Apartments case study, reduction of maintenance and repair costs supplement utility savings, contributing to a reduction in operating costs, as shown in figure 1. In this case study, the reduction in maintenance cost has a value of about 150% of the value of energy saved.

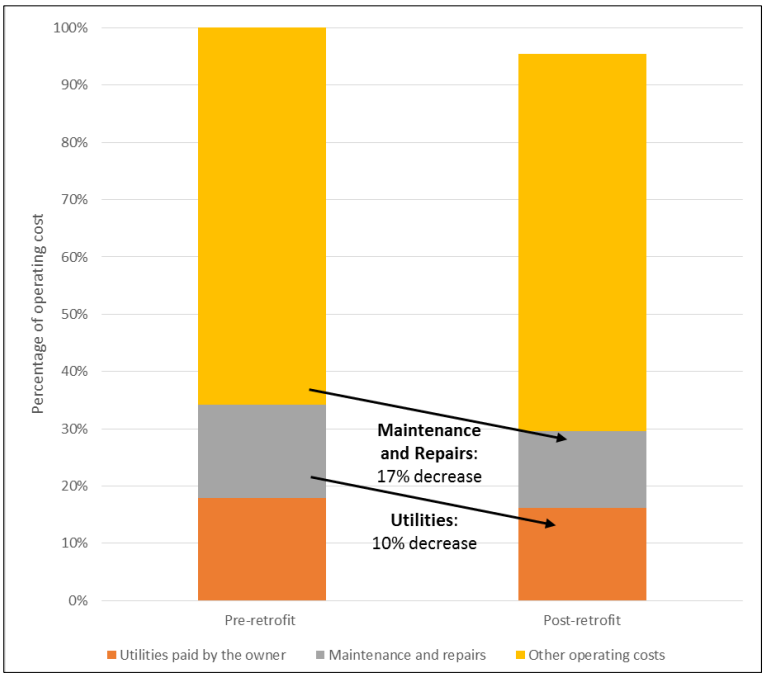

Figure 1. Pre- and post-retrofit building operating expenses. "Other operating costs" includes payroll costs for employees hired by owner, fringe benefits, real estate property taxes, management company, insurance, other professional services (legal, accounting), scavenger, extermination, and security. The 10% decrease in utilities represents an approximation of the decrease in utility expenses for the building owner. A 10% overall decrease in utility expenses was measured for owners and tenants. While owners and tenants are each responsible for 50% of the utilities, they are broken down as follows: water (owner) 22%, gas (owner) 23%, gas (tenant) 30%, electricity (owner) 5%, electricity (tenant) 20%. Depending on retrofit measures implemented, one party could save more than the other. *Source:* Adapted from Elevate Energy 2014a.

Avoiding Major Maintenance Costs and Last-Minute Replacements

Avoiding catastrophic failure of an outdated mechanical system is an additional benefit of energy efficiency that building managers recognized after a multifamily cooperative building had been upgraded through NYSERDA's Multifamily Performance Program (NYSERDA 2013a). Building managers did not estimate a dollar value of protecting against a significant or catastrophic failure in this case, but the example highlights an important benefit. When systems fail, last-minute repair calls and equipment replacements can result in costly temporary fixes. This can also result in hastily thought out replacements that may be less efficient or inadequately sized for the heating and cooling load of the building. These may stem from a lack of information or lack of access to the best solution on a rushed timeline.

Challenges in Determining Change in Maintenance Costs

A decrease in maintenance costs resulting from an energy efficiency improvement is not always easily detected, because of changes in occupancy. As buildings fill more units, some operational costs can increase as a result of greater occupancy. An Elevate Energy report evaluating the financial benefits of energy efficiency shows that considering maintenance

costs alone without considering changes in occupancy is misleading (Elevate Energy 2014b). In one case study, a $55,000 energy efficiency upgrade that resulted in a 6.5% reduction in natural gas consumption (annual value unknown) yielded a 7% increase in rental income valued at $17,500, likely due to increased occupancy, and a $6,300 increase in maintenance and repair costs. Thus, although overall maintenance and repair costs increased, rental income, likely due to an increase in the number of tenants, yielded an overall increase in net operating income of 3.3%, or $4,000.

While maintenance costs are concrete expenses for a building owner, they aren't always reported in the same way between owners, or even by managers and owners in the same building, making it difficult to understand the impact efficiency improvements have on these costs. For example, during the turnover of a rental unit to a new tenant, owners often perform regular maintenance on the unit, such as painting or minor repairs. Larger capital improvements might also be done at this time, including appliance replacement, replacing or refinishing flooring, and upgrades to kitchens or bathrooms. Sometimes the costs for deferred maintenance and larger capital improvements that occur at the time of turnover get lumped into the same pool.

IMPACT ON TENANTS

Benefits of energy efficiency improvements have been widely observed for single-family occupants through a number of nonenergy benefit assessments (NMR Group 2011; Skumatz 2014). These benefits include increased comfort, financial security, confidence paying bills, and health and safety impacts. For multifamily buildings, a number of case studies suggest these benefits have a significant impact on tenant satisfaction, which in turn can have a significant financial benefit for rental property owners. Increased tenant satisfaction can lead to lower vacancy and turnover rates, thereby generating greater and more stable rental income for owners. Our findings show that the value could be equivalent to or greater than the cost of energy saved. Monitoring these benefits is critical to better understanding the broader impacts of energy efficiency improvements.

More research is needed to fully understand the impact of increased tenant satisfaction on tenant turnover, vacancy rates, and thus the net operating income of building owners. However we can gain some valuable insights from the work that has been done so far to better understand (1) how tenants are impacted by efficiency improvements and (2) how tenant satisfaction impacts a building's operating income.

Tenant Comfort and Energy Burden

Energy efficiency improvements such as air sealing and insulation help multifamily building owners provide more comfortable and desirable spaces for tenants. A tenant survey administered by Elevate Energy to tenants living in a building retrofitted under their multifamily retrofit program revealed that tenants were comfortable in their units, more confident paying rent and utility bills on time than they were before the retrofit was completed, and likely or very likely to renew their lease (table 4). In another study, a survey administered to building owners on the owner observed benefits to tenants revealed that tenants were pleased with lower energy bills, increased building reliability, and unit temperature, among other benefits. Multiple case studies from NYSERDA indicate that

tenants benefited from improved comfort in living spaces that were previously heated insufficiently.

Table 4. Key findings on tenant impact

Elevate Energy tenant survey	Massachusetts evaluation	NYSERDA multifamily program case studies
Unit stays cool when hot outside (67% of tenants surveyed agree with statement) Unit stays warm when cold outside (80%) Tenants would ask about energy efficiency when moving to a new building (89%) Tenants feel more confident/have less stress paying rent and utility bills after upgrades (33%) Tenants are likely or very likely to renew lease (70%)	Lower energy bills Increased building reliability Satisfaction with new refrigerators More comfortable temperature Longer-lasting bulbs Improved lighting Less equipment noise	Pulaski, New York, apartment tenants experience more comfortable winter living conditions and lower utility bills. Buffalo, New York, apartment tenants experience improved comfort in living spaces that previously had insufficient heat.

Sources: Elevate Energy 2014a; NYSERDA 2013b; Majersik 2004; NMR Group 2011.

For tenants responsible for some portion of energy cost, energy efficiency improvements that have an impact on their utility bill can improve tenant satisfaction as well as tenant finances. Particularly for affordable multifamily properties, even modest savings can have a positive impact on personal finances because the average income for multifamily households is lower than single-family households. Improving tenants' ability to pay utility bills can also positively impact their ability to pay other bills, such as rent. While this has not been widely explored, energy efficiency improvements have the potential to reduce collection losses incurred by property owners for rent or other charges that an owner is unable to collect from tenants.

Vacancy and Turnover Rates

Evidence suggests that tenants who are satisfied with their living conditions and feel confident paying bills are more likely to renew their lease, resulting in decreased turnover and reduced vacancy rates. A multifamily building's net operating income relies on a steady influx of income from renting units. Building owners work to maximize rental income by minimizing the amount of time units go unoccupied, minimizing turnover costs, and keeping vacancy rates low.

The National Apartment Association's annual report estimates the average loss to vacancy as a percentage of gross potential rent (GPR) at 6%, greater than the average cost of utilities as a percent of GPR (4.7%) for a building owner in an individually metered property (Lee 2013). Lowering the vacancy rate can have a significant impact on a building's net operating

income. In the affordable housing market, keeping vacancy rates low is a priority because some building owners have lending agreements that require a minimum occupancy rate, while others have loans that are underwritten at a vacancy rate of less than 5% (the national average is 11%) and need to maintain that vacancy rate to balance expenses (Elevate Energy 2014b; HUD 2012).

In addition, turnover can be a large cost for building owners, particularly in the affordable housing market (Elevate Energy 2014b). According to the American Housing Survey (2013), 33% of renters have moved in the past year, and over one-third of the group that moved in the past year cited a housing-related reason for moving, like the desire for a better home or lower maintenance costs (HUD 2013). Turnover costs can vary widely based on length of tenure of the past tenant, the time it takes to fill the unit with a new tenant, and marketing costs to fill the unit (Isaacs and Mearns 2013). This is often a time that building owners make upgrades to units beyond the basic cleaning and painting it might take to turn over a unit, including floor refinishing, appliance replacement, and kitchen and bathroom remodels. Elevate Energy's interviews reported a range of $900–3,000, and other sources report broad ranges from about $1,500 to over $5,000 (Elevate Energy 2014a; Isaacs and Mearns 2013; Hammond 2014). At a minimum, industry rule of thumb estimates a cost of at least $1,000 for turning over a unit (Hammond 2014).

Table 5 illustrates how improved tenant satisfaction from energy efficiency upgrades can result in benefits to two important factors in the multifamily business model, tenant turnover and vacancy rate.

Table 5. Impact of energy efficiency improvements on tenants and multifamily building owners

Impact	Elevate Energy tenant survey	NYSERDA case studies	Massachusetts evaluation	NYSERDA Pine Harbor case study	Energy Trust of Oregon case study
Tenants	More comfortable More confident in ability to pay bills on time	More comfortable Less burdened by energy costs	Lower energy bills Pleased with new upgrades and equipment reliability	Feel warmer Have more control over temperature in their units	More comfortable Lower utility bills
Owner	More likely to renew lease, therefore less turnover Less vacancy, therefore higher rental income for owner	Higher demand for units = low vacancy rates Tenants more confident paying bills, less likely to move, therefore less turnover	Fewer tenants complaints Units are more marketable	Building vacancy rate decreases from 15.7% to 2% pre- and post-retrofit	Almost no turnover; no vacancies in 190-unit building

Sources: Elevate Energy 2014a; NYSERDA 2013a; NYSERDA 2013b; NMR Group 2011; Majersik 2004; Energy Trust of Oregon 2013

Energy efficiency improvements in a multifamily building in Buffalo resulted in units that were significantly more comfortable in the winter. The pre-retrofit vacancy rate of 15.7%

was reduced to 2% post-retrofit, a reduction that the property manager attributed almost entirely to an energy efficiency heating retrofit (owner specified 90% attribution) (Majersik 2004). In this case, the value from the vacancy reduction attributable to the energy efficiency improvements was equal to the value of the energy savings ($1,150,000), doubling the benefits accrued to the building owner (Majersik 2004).

The financial impact of energy efficiency improvements on rental income and overall net operating income was assessed in a study that compared the annual income and expenditures of similar buildings that underwent retrofits with those that had not (Elevate Energy 2014b). Buildings that underwent retrofits had 4.8% higher rental income, valued at $8,240 per unit annually, contributing to an overall average increase in net operating income of 1.6% for efficient buildings. While occupancy information wasn't available to researchers, the data suggest vacancy rates were lower in the buildings that had undergone retrofits. Another possible reason for the increase is that owners may be charging higher rental rates. This is unlikely in this scenario because many of the buildings are owned by mission-driven organizations.

OWNER FINANCIAL STABILITY AND PROPERTY VALUE

Financial stability and health of the business is an additional consideration when making investments in energy efficiency improvements that owners expressed as a benefit to energy efficiency work.

An Elevate Energy case study (Boulevard Apartments) illustrates greater financial stability as a benefit realized through energy efficiency improvements. The retrofitted property is owned by a member-based nonprofit corporation that redevelops communities in Chicago for low- and moderate-income people. The asset manager for the organization, who assumes responsibility for many of the functions of an owner, indicated that savings from reduced energy and maintenance costs help the organization maintain expenses closer to what the property was underwritten for. Reducing operating costs allows the building owner to set aside a larger reserve for repairs and capital replacements.

The impact of efficiency on property value and durability is also a consideration for building owners. The study of Massachusetts' programs evaluated benefits to property value and durability and found that almost a quarter of the property owners interviewed indicated that improvements had a positive effect on property value, with an average value of $245 (see table 6). Many respondents reported improved durability, valued at $1,065, or 10% the estimated energy savings cost. A small number of building owners and managers noted the value of other impacts that were not explicitly examined in the impact evaluation. These impacts included helping the bottom line due to lower energy bills, increasing tenants' awareness of energy efficiency, increased safety, and respect from the community. Negative impacts were also included, e.g., bulbs not lasting as long as they were supposed to. Other impacts had a value of 18% energy savings. The results are presented in table 6.

Table 6. Owner nonenergy impacts observed by building owners and managers

Impact	Positive	Negative	No difference	Sample size	Value
Property value	23%	0%	77%	26	$245
Durability of home	42%	4%	54%	26	$1,065 (10% of energy savings)
Other impacts	83%	17%	--	6	$3,439 (18% of energy savings)

Source: NMR Group 2011

Utility Benefits in the Multifamily Sector

Utility benefits are the effects of programs that affect ratepayers and utilities, including utility infrastructure. Energy efficiency programs provide various impacts on the utility's long- and short-term costs of providing service. Impacts include reduced credit and collection costs as customers are better able to pay bills on time, and reduced risks in utility resource planning (Lazar and Coburn 2013). Many of these impacts vary among utilities because of differences in cost structure and policies (NMR Group 2011).

Much of the literature to date that identifies and quantifies utility benefits comes from assessments of low-income programs (NMR Group 2011; Skumatz 2014). Multifamily programs may offer additional utility benefits that have been measured in low-income programs. Benefits that have been quantified in low-income programs include reductions in arrearage carrying costs, bad-debt write-offs, terminations and reconnections, customer calls, notices, and safety-related emergency calls (NMR Group 2011).

Depending on how the building is metered, a retrofit to a multifamily building can affect multiple tenants and multiple utility accounts. Impacting multiple utility customers in one project could have a positive impact on utility operations. If an improvement reaches tenants with utility accounts beyond just that of the building owner, utilities can realize improvements in operations such as fewer shutoffs, reconnects, notices, customer calls, and reduced debt collections burden for multiple accounts, helping to improve the relationship utilities have with their customers.

Utility benefits that are considered more important in the low-income case, including carrying cost on arrearages and debt collection efforts, should be considered for programs targeting affordable multifamily buildings. Customers who have lower, more predictable monthly utility bills are less likely to get behind on payments.

Societal Benefits in the Multifamily Sector

Societal benefits accrue to the public at large, not just to participants of a program (Lazar and Coburn 2013). These benefits balance the externalities of energy production that are not directly paid for by utilities or customers, including impact on air and water quality that affects the climate, human health, and the health of ecosystems. The impacts of reduced energy production through energy efficiency programs include (1) economic impacts such as job creation and higher levels of disposable income (leading to higher levels of local economic activity), (2) public health and welfare impacts such as reduced asthma and other

disease associated with particulate matter and other air emissions, (3) environmental impacts such as effects on ecosystems and on the climate associated with air emissions, and (4) water and wastewater impacts due to water use and pollution at various points in the energy production process as well as in end uses. Societal benefits generally vary by local economy, electricity generation mix, and peak and nonpeak program effects (Lazar and Coburn 2013; Skumatz 2014).

Programs that target affordable market-rate housing may experience similar benefits to those in low-income cases. Most low-rent apartments are privately owned; an estimated 60% of the 5.1 million affordable multifamily units receive no assistance (Johnson and Mackres 2013).[14] Research has established that some societal benefits are greater for programs targeting low-income customers (e.g., weatherization). Examples include hardship and equity benefits such as reduced dependence on government aid resulting from more stable employment or income (NMR Group 2011). In addition, reduction of energy costs for multifamily households can have a positive impact on local economic activity. A greater percentage of money spent on utilities leaves the local economy than does money spent on local goods and services (Stone 2011). The average multifamily household spends a higher percentage of their income on energy costs than single-family households (Stone 2011). Lower tenant energy bills can free up income that can be spent in the local economy instead on local goods and services such as food, childcare, haircuts, and so on.

Including Benefits of Multifamily Energy Efficiency in Cost-Effectiveness Testing

While cost-effectiveness tests regularly include all of the costs incurred by a building owner (and utility) for a project, the benefits to building owners beyond energy savings are rarely considered. The full value of their investment is included in the cost-benefit calculation, but their energy savings benefit is expected to carry the entire weight of justifying their costs.

Not including all benefits, but including all costs, some of which are not specifically for energy-saving measures, implies that consumers undertake projects only to save energy and reduce utility bills. In reality, property owners, managers, and cooperative boards choosing to undertake retrofits indicate that these decisions are often not solely rooted in the goal of saving energy. Research on single-family buildings indicates that homeowners decide to make energy improvements to their homes for reasons that may trump the motivation to reduce costs through energy savings (Lutzenhiser 2006). For multifamily property owners, reasons for undertaking energy improvements in buildings are also rarely limited to saving energy. Case studies and program evaluations show that multiple benefits are a significant factor in spurring investment in energy efficiency improvements. Savings associated with maintenance, tenant comfort and satisfaction, and owner financial stability and property value have a significant role to play in balancing the owner contribution project costs.

[14] The Joint Center for Housing defines an affordable unit as $400 a month maximum for a family of two living near the poverty line, or for one full-time minimum-wage worker (Johnson and Mackres 2013).

Adding nonenergy-related impacts to the cost-benefit balance sheet in a cost-effectiveness test can allow for fairer evaluation of costs and benefits. Multiple benefits that are valuable to building owners could more than double the savings from reductions in energy use.

QUANTIFYING MULTIFAMILY BENEFITS

Many benefits from the societal, utility, and participant perspective have valid and tested methods for valuation, enabling them to be considered in cost-effectiveness testing in some form. For the most streamlined application of multiple benefits to cost-effectiveness tests, best practice suggests providing monetized estimates of benefits and expressing values in consistent units (dollars per participant per year) (Skumatz 2014; NESP 2014). The Resource Value Framework can be used to guide the development and implementation of cost-effectiveness testing that more accurately represents the value of multifamily programs (NESP 2014).

Program administrators can administer surveys that rely on data provided by building owners (e.g., vacancy rates, occupancy, rental revenues) to assess in conjunction with surveys administered to tenants pre- and post-retrofit to demonstrate the impact of energy efficiency improvements. Existing survey data, such as the Housing and Urban Development's (HUD) Rental Housing Finance Survey, can provide a benchmark by which to compare retrofitted multifamily buildings. Over time, with a larger pool of post-retrofit multifamily building data, researchers can assess the impact that energy retrofits have on key metrics, such as vacancy and turnover rates.

Benefits that are difficult to quantify and value, or that take extensive amounts of time and effort to assess, should not be omitted from cost-effectiveness testing because of lack of data. For these benefits, there are options to include rough estimates or adders to indicate a value in relation to the cost of energy saved, and validate with pre- and post-retrofit data collected when the program is administered (Woolf et al. 2012). The Utility/Program Administrator Cost Test could be used for participant benefits that are particularly hard to quantify.

From the perspective of the building owner, there are a number of benefits from energy efficiency work that can translate to financial gain. In many cases, these benefits are already accounted for as part of standard accounting practices, including maintenance and repair costs, and costs of other utilities (particularly water and delivered fuels). For some participant benefits, such as improved resale value, opportunities exist to value energy efficiency through more in-depth market evaluations, but this has not often been done. Most existing valuation work relies on survey methods.

In a cost-effectiveness test where owner project costs are compared to owner benefits, the benefits that are felt by occupants can be considered according to the benefit they provide to the owner. Existing research shows that many of these benefits are significant factors in building owners deciding to undertake work. They include decreasing maintenance costs for aging equipment, increasing marketability of units (via greater comfort, lower bills, and so on), and addressing problems that cause routine tenant complaints such as comfort. Furthermore, many programs already market these benefits to potential program participants.

Societal and utility benefits are also quantifiable. Societal value is usually estimated based on calculations that rely on how much energy and money is saved. Established calculation methods based on energy savings can quantify the benefits associated with reduced emissions. The utility benefits of multifamily programs can be quantified in the same way as for single-family. Assessing benefits from the utility perspective relies on accurate accounting of energy saved from projects. Additional benefits that accrue in low-income programs are most commonly quantified via evaluation of utility operating cost data.

To properly account for utility and societal impacts for a multifamily program, the energy use from all accounts should be included, whether the owner or occupant is responsible for the cost. Considering all the energy savings that result from the retrofit, including those realized by tenants as well as the building owner, will lead to more appropriate accounting of utility and societal benefits, which are based on the amount of energy saved.

CASE STUDY

Using the work from Massachusetts as an example of the types and scale of benefits that can be realized, we illustrate how cost-effectiveness testing can be performed in a more balanced way for multifamily retrofit programs (table 7).

Table 7. Valuation of impacts from building owner and manager perspective

Impact	Additional value (per building)	Value as percentage of estimated bill savings
Marketability of rental units	$113	8%
Equipment maintenance	$500	3%
Lighting maintenance	$2,927	28%
Durability	$1,065	10%
Tenant satisfaction (both positive and negative results)	$221	4%
Other (both positive and negative results)	$3,439	18%
Total		71%

Values were adjusted to account for potential overlap when estimating the value of impacts individually. Equipment maintenance and lighting maintenance valuation questions were asked only in instances in which buildings had undergone equipment or lighting replacements. For the "tenant complaints" and "other" category, both positive and negative impacts are accounted for in the value presented. "Other" includes helping the bottom line due to lower energy bills, increasing tenants' awareness of energy efficiency, increased safety, respect from the community, and bulbs not lasting as long as they were supposed to.
Source: NMR Group 2011.

Including multiple benefits makes a measurable difference. If $10,000 in energy efficiency improvements are performed with expected energy cost savings of $2,000 per year, a project would pay for itself in five years. If the nonenergy financial benefits are included at a value of 71% of energy savings, the project would pay for itself in under three years.

Further Recommendations

COLLECT MORE DATA FROM PROGRAMS

The impact of energy efficiency programs can be better understood by measuring pre- and post-retrofit results, and by comparing buildings that have undergone efficiency retrofits to those that have not. While the amount of energy saved through an upgrade can be a convincing sell by itself, the way an efficiency improvement impacts the most critical business considerations in a multifamily business model is key to motivating improvements. The following pieces are important in understanding the relationship between tenants influenced by energy efficiency and a building owner's bottom line:

- *Impact of retrofits on tenants.* It is critical to understand the impact of retrofits on tenants in order to determine how changes in occupant comfort, ability to pay bills, and health impacts can affect vacancy and turnover rates. Tenant assessments via survey or interview should be administered before and after retrofit work. Questions regarding comfort and ability or confidence in paying bills can be used to gain valuable information from tenants.
- *Tenant turnover and vacancy rate.* Building owners and programs should track the amount of tenant turnover and the number of occupied units, or vacancy rate, for their retrofitted buildings before and after retrofit.
- *Net operating income.* Evaluating the financial impact that reduced turnover and vacancy have on a building owner can be a challenge because of the many interrelated expenses associated with these changes. More tenants occupying units will affect rental income, while the cost of maintenance may also increase. Assessing changes in rental income and maintenance and how they have changed pre- and post-retrofit, based on the number of occupied units, can help elucidate how a reduction in vacancy impacts the building owner.

Programs should develop ways of collecting data that can be built into programs, particularly for early pilot or proof-of-concept programs. This information can be used for marketing energy efficiency programs to customers in addition to incorporation in regulatory evaluation. While valuation for some benefits may be challenging, having better data on the incidence of benefits is useful for applying as a part of an adder or for making the case for a program in the regulatory process.

APPLY DATA TO INFLUENCE COST-EFFECTIVENESS TESTING

Other options exist for more accurately assessing cost effectiveness of programs with many benefits that cannot easily be monetized. This includes setting a lower cost-benefit screening threshold for programs for which there are many hard-to-quantify benefits, or using adders to include estimates of the non-monetized benefits. Values from more easily assessed benefits can also be combined with an adder that accounts for harder to value benefits.

PROVIDE EQUAL OPPORTUNITIES

Energy efficiency services should be available to tenants and owners of multifamily housing. In many states, homeowners paying utility bills are contributing to energy efficiency program funds. While tenants paying utility bills are also contributing to the same pool of money, they do not have the same access to programs. Public utility commissions

have an obligation to make sure all customers have access to energy efficiency programs that they pay into.

Conclusion

Failure to adequately address multiple benefits in cost-effectiveness testing leads to underinvestment in energy efficiency in the multifamily sector. When the full cost of retrofits is weighed only against the energy savings benefits and none (or only a portion) of the other benefits, projects and measures that represent cost-effective energy savings are left on the table.

Better understanding and quantification of the impact of energy efficiency improvements beyond energy savings for multifamily buildings can be important to programs for marketing the whole value of energy efficiency improvements to owners. Program implementers can use multiple benefits to market the programs and attract owner investment. Owners undertake energy efficiency retrofits for reasons that benefit their business other than saving energy. For example, in buildings where a retrofit reduces heating load, and tenants are responsible for the costs of heating, owners would not expect to experience significant energy cost savings. However they can experience financial returns in other aspects of their business, through reduced maintenance costs, reduced complaint calls, reduced tenant turnover, or reduced rental vacancy losses. Benefits that positively impact occupants can have a significant impact on a building owner's bottom line.

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Appendix A. Studies Assessing the Multiple Benefits of Multifamily Energy Efficiency

As shown in table A1, three key studies have assessed benefits in multifamily retrofits.

Table A1. Studies assessing multiple benefits of multifamily retrofits

Study	Overview
Elevate Energy 2014a	Assessment of nonenergy benefits (NEBs) of energy efficiency building improvements specific to the multifamily sector, with a multifamily retrofit case study that measures NEBs
Elevate Energy 2014b	Evaluation of how energy efficiency upgrades affect the financial performance of multifamily buildings
NMR Group 2011	Summary of values of participant nonenergy impacts (NEIs) reported in literature for single-family housing. Includes a summary of the various methods used to value NEIs and results of a survey of low-income multifamily building owners.

Nonenergy impacts (NEIs) are similar to NEBs but recognize that impacts of energy efficiency improvements can be both positive and negative.

In the January 2014 Elevate Energy case study on NEBs in affordable multifamily housing, the owner retrofitted three apartment buildings through the Elevate Energy multifamily program. Following retrofit, Elevate Energy assessed impacts of the work. Improvements included air sealing, roof cavity insulation, and furnace replacement. Following the improvements, Elevate Energy conducted in-person interviews with the building owner and surveyed tenants of the 70 affected units to assess tenant and owner benefits from the retrofit work.[15]

A later 2014 study by Elevate Energy evaluated how energy efficiency retrofits through its Energy Savers program affected the financial performance of multifamily by comparing the retrofitted building stock with similar buildings that had received an energy assessment but did not undergo improvements (Elevate Energy 2014b).

In Massachusetts, residential and low-income residential state efficiency programs were evaluated for nonenergy impacts for possible application to cost-effectiveness testing. The work included an assessment of participant nonenergy impacts from the perspective of owners of low-income rental housing (NMR Group 2011). In this study, 21 owners and managers of low-income rental housing facilities were surveyed, representing 27 housing facilities and more than 7,000 housing units that were treated with a variety of energy efficiency measures, including refrigerator and freezer replacement, hot water system upgrade or water saving measures, lighting, thermostats, and air sealing. In the survey,

[15] The retrofitted buildings are all owned by a member-based, nonprofit corporation that redevelops communities in Chicago for people with low to moderate incomes. Therefore, the owner interview was conducted with the asset manager for the organization, who is responsible for many of the functions that an owner would be responsible for in a different organizational setup.

owners and managers were asked to determine whether energy efficiency improvements impacted a number of categories closely related to their business finances.

In addition, individual case studies point to benefits that multifamily building owners have taken into consideration and realized as a result of comprehensive retrofits. NYSERDA's Multifamily Performance Program encourages whole building energy upgrades for multifamily buildings through low-cost financing and incentives. Attempts to value NEBs from the owner's perspective were not explicitly made during this process, but many building owners and managers note benefits of the improvements beyond energy savings.