Incremental Cost, Measurable Savings:

Enterprise Green Communities Criteria

By
Dana L. Bourland

Abridged.
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Enterprise green communities
The Next Generation. For Every Generation.℠

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SECTION 1

Executive Summary

Dinkins Gardens, Harlem, N.Y.

Applying comprehensive green methods and materials to affordable housing developments invariably raises two hotly debated questions: 1) How much do these measures cost? and 2) Are these measures cost-effective? In-depth answers to both questions are now available from Enterprise Community Partners. This report shares findings from our evaluation of 27 affordable housing developments across the United States that meet the Enterprise Green Communities Criteria.

From a strictly financial standpoint, the projected "lifetime" utility cost savings—averaging $4,851 per dwelling unit discounted to today's dollars—are sufficient to repay the average $4,524 per-unit cost of complying with the Enterprise Green Communities Criteria.

In summary, estimated lifetime savings exceed the initial costs of incorporating the Enterprise Green Communities Criteria into affordable housing. The Criteria offer health, economic and environmental benefits by addressing integrated design, location, site improvements, water conservation, energy efficiency, materials that benefit the environment, healthy living environments, and operations and maintenance of affordable housing.

Integrating the required Criteria can also produce substantial increases in residents' quality of life. Developers of the 27 projects discussed in this report found it financially feasible to meet the Criteria, which go beyond energy- and water-conservation measures to include requirements that advance quality of life, such as:

- Promoting smart growth by choosing sites near public transit and community amenities, while avoiding sprawl, disturbance of wetlands and "leapfrog" development into greenfields.
- Using healthier materials such as the Carpet and Rug Institute's Green Label carpets, as well as paints and adhesives with no or low percentages of volatile organic compounds (VOCs).
- Ensuring better indoor air quality by directly venting kitchen stoves and bath areas to the outdoors, and using other methods to re-supply fresh air and reduce the potential for moisture infiltration, which could lead to possible mold growth and negative effects on residents' health.

While this report focuses on the cost-effectiveness of meeting the Enterprise Green Communities Criteria, forthcoming reports will examine the Criteria's impact on carbon reductions and improved health of residents. For example, through our experience with the Enterprise Green Communities Offset Fund, we calculated that, on average, the housing units studied will cut 2 tons of CO_2 emissions annually, compared to homes that only meet local building code standards.

Enterprise Green Communities

A national leader in investment capital and development solutions for affordable housing and community revitalization, Enterprise has invested more than $10 billion since 1982 to help finance more than 250,000 affordable homes in communities across the nation. Enterprise launched the Green Communities initiative in 2004, building on more than two decades of creating decent, quality, affordable homes and communities for low-income families.

To measure the impact of the Green Communities Criteria, Enterprise developed a survey and obtained data points on costs and utility cost savings from 27 housing development projects with a total of 1,640 single- and multifamily homes. This represents a quantifiable sample of the nearly 16,000 estimated units in 360 housing development projects that have complied with the Criteria. Enterprise will continue to actively collect data from all Green Communities projects, and plans to regularly release similar evaluation reports as projects are constructed and placed in service for at least one year.

Achieving full compliance with the Enterprise Green Communities Criteria requires housing developers to implement mandatory and a required number of optional criteria. Our evaluation calculated the additional costs and utility cost savings that resulted from applying 38 mandatory criteria and 13 optional criteria in the 2005 version of the Green Communities Criteria (available in the Appendix).

Meeting the Enterprise Green Communities Criteria yields striking savings in utility costs, especially when compared to the cost of implementing the Criteria's energy- and water-conservation measures. These savings make the cost of implementing the Criteria ($4,524) financially attractive. When considering the benefits revealed in our study, the average cost per dwelling unit to incorporate the energy and water criteria was $1,917, returning $4,851 in predicted lifetime utility cost savings (discounted to 2009 dollars).

In other words, the energy and water conservation measures not only paid for themselves but also produced another **$2,900 in projected lifetime savings per unit**. Moreover, water cost savings shared in this report are almost certainly underreported, given that we were unable to obtain complete data on sewer fee savings, which are a direct result of water-conservation measures.

Measures in the Criteria that do not have easily identifiable financial savings, but undoubted indirect financial benefit, include (though are not limited to) the integrated design process, ensuring a healthy living environment, reducing construction waste and providing operations and maintenance manuals. In fact, tradeoffs between cost expenditures and financial savings underscore the importance of executing an integrated design approach. Focusing on the design elements, such as orientation of the housing, location of the windows and optimization of daylight into the housing, can lead to less expensive mechanical and electrical system purchases, allowing room in the budget for other measures such as healthier building materials.

Our calculation of lifetime savings took into account the useful life of various improvements, anticipated increases in energy and water/sewer costs of nearly 5 percent, and a present value discount factor of 6 percent to express utility cost savings in 2009 dollars. The predicted savings from actual usage were based on a subset of 10 projects for which Enterprise had access to utility usage data for a one-year period.

How Utility Cost Savings Were Achieved

Implementing the following conservation measures produced dramatic utility cost savings:

- Building to Energy Star standards or better
- Installing all energy improvements with a 10-year or better payback for moderate rehabilitation projects
- Installing Energy Star appliances
- Installing Energy Star lighting
- Individually metering electricity for rental dwelling units (except supportive housing) to encourage conservation
- Installing water-conserving appliances and fixtures

The return on the subsidized investment of installing photovoltaic (PV) panels was a most impressive 194 percent per year. It should be noted, however, that the cost of installing photovoltaic (PV) panels to provide at least 10 percent of a project's estimated electricity demand—an optional Green Communities criterion—was not found to be cost-effective, unless subsidies made this measure feasible. For the particular project that both installed PV panels and reported actual energy usage data, the average return on the cash investment was only 3 percent when subsidies were not taken into account. Until the production and installation costs of renewable energy technologies decline, it is widely recognized that subsidies are needed to make PV panels a cost-effective proposition for developers and building owners.

The costs of adhering to the Green Communities Criteria were self-reported by project developers. The "premium" was defined as the cost increment of implementing a Green Communities criterion versus following local codes and previous development practices that may have exceeded code requirements. On the next page, Tables 1.1 and 1.2 illustrate the study's findings on these costs and financial cost savings.

Table 1.1: Costs of Meeting Green Communities Criteria

	Average Cost of Meeting Green Communities Criteria (27 projects)	Average Cost of Meeting Optional Renewable Energy Criteria Only (9 projects)
Green premium per ownership/ rental unit	$4,524	$3,074
Green premium per square foot	$4.52	$3.22
Percent added to total development cost	2.1%	0.5%

Table 1.2: Actual Cost Savings from Meeting Green Communities Criteria

	Actual Average Lifetime Savings from Energy and Water Conservation Measures (10 projects)[1]	Actual Average Lifetime Savings from Optional Renewable Energy Criteria Only (1 project)
Utility savings per home/ rental unit	$4,851	$5,034
Utility savings per square foot	$5.43	$5.17
Internal rate of return	17%	3%
Simple payback period (years)	8	40

[1] Ten of the 27 projects provided energy utility data; of those, eight provided actual water billing data. An additional two projects of the 27 also provided water billing data but not energy utility data.

Benefits of Tracking Utility Usage and Costs

Many affordable housing developers do not routinely track the costs and benefits associated with going green and therefore found it difficult to provide the data we requested. This was particularly true for tracking electricity, gas and water usage, whether paid for by residents, owners or property managers of rental housing. It appears that many homeowners and rental property managers pay these bills without knowing if their usage is above average, normal or below average when compared to local norms.

Accordingly, it is logical to assume that green building and property management practices would be more widely adopted and valued if property owners and residents paid greater attention to their energy usage. This would require tracking utility costs periodically and increased awareness of building features and habitual practices that influence utility costs. If rental property managers periodically tracked utility use by dwelling units, they would be more likely to identify underperforming HVAC and other building systems. Depending on the reason(s) for the low performance, property managers could make improvements and/or encourage residents to adopt conservation measures.

Additional Key Findings

- Project developers reported many instances of implementing individual Green Communities Criteria with no cost premium over their normal construction practices. These reports of zero additional costs were included to determine the weighted average costs for the mandatory criteria. We believe this non-reporting of cost premiums is explained by the large proportion of sampled projects located in cities and states with previously established green building standards. For example, six of the projects located in Oregon and Washington state reported no cost premiums for meeting the Enterprise Green Communities Criteria.
- Larger and more prevalent cost premiums were associated with providing adequate ventilation and improving energy efficiency, as well as installing Carpet and Rug Institute Green Label carpeting.
- On average, negligible cost premiums were reported for selecting "smart sites" for affordable housing that were located near public services and transportation, and minimized sprawling development of greenfields on the outskirts of developed areas. However, this finding may partly reflect the difficulty of quantifying land cost premiums.
- With respect to water-conserving irrigation methods, low-tech roof-water harvesting systems yielded modest costs, on average, while potentially offering significant future savings as described in this report.
- Integrating the Enterprise Green Communities Criteria has far-reaching environmental benefits—namely, the annual reduction of carbon emissions. In developing the Enterprise Green Communities Offset Fund, we calculated that, on average, the Green Communities homeownership and rental units studied would cut 2 tons of CO_2 emissions annually, compared to homes meeting local building code standards below the Green Communities Criteria.
- In all categories of occupancy, the per-unit costs of compliance were remarkably similar, while predicted utility cost savings varied considerably. The 15 supportive housing projects in our survey had the highest predicted lifetime savings, while the three projects with for-sale homes had the lowest. Based on our extensive experience with supportive housing developers, we presume that these developers paid careful attention to compliance to improve residents' health and reduce energy costs, most of which are paid by the supportive housing property owners.
- By far, the study's three for-sale homes had the lowest predicted lifetime utility cost savings. This is likely the result of energy and water conservation measures already in place by builders, who reported an average incremental cost of only $1,137 for those features. This amount was then projected to yield $2,878 in lifetime utility cost savings—more than two and a half times the investment.
- The incremental cost of incorporating the Enterprise Green Communities Criteria was lowest among moderate rehabilitation projects—a fact that we attribute to the Criteria's ability to adapt to the realities of partially rehabilitated single- and multifamily homes. The predicted lifetime savings for these projects are now two times the reported incremental costs of complying with the Criteria, giving moderate-rehab projects the highest return on investment of any subset of the 27 projects we surveyed.
- Substantial rehabilitation projects had the highest cost premium for compliance. At the same time, these developments are projected to have remarkably high lifetime utility cost savings.
- One of the study's surprise findings involves the predicted lifetime savings for new construction projects, which were 23 percent lower than the average of all projects combined. Since our analysis does not reveal any specific reasons for this finding, we conjecture that new home developers had previously used relatively high standards for energy and water conservation measures and/or had to meet higher construction standards. In other words, there is strong evidence that starting from a higher baseline reduces the expected incremental lifetime savings.

Overview of the Report

This study is presented in two parts. The first part includes background on the study, an analysis of the Green Communities Criteria's financial benefits, and implications for future policy and practice. The second part, the Technical Report, describes how and why specific Green Communities Criteria are incorporated into development projects and provides detailed findings on the average costs to implement each criterion.

We hope that the study's information and analysis will help affordable housing professionals better understand the cost-effectiveness of meeting the holistic measures included in the Green Communities Criteria. Ultimately, Enterprise seeks to encourage more widespread adoption of the Criteria toward inspiring a national commitment to delivering the health, economic and environmental benefits that can be realized by greening all affordable homes.

BACKGROUND ON STUDY

SECTION 2

Background on Study

The Essex, San Francisco

Despite recent declines in home prices, the nation faces a huge shortfall of decent, affordable housing. Currently, there is not a single county in the United States where an individual earning minimum wage can afford to rent a market-rate apartment, according to the National Low Income Housing Coalition. Nationwide, an estimated 55 million Americans live in unaffordable, overcrowded or substandard housing. Moreover, much of our existing subsidized housing stock—not to mention market-rate housing—has hidden costs for residents, rental property owners and the planet. The typical affordable single- or multifamily home wastes energy and water, unnecessarily adding to household costs. The location of many housing developments—situated far from public transportation options and existing city, town or village centers—contributes to greenhouse gas emissions.

Mounting evidence also links building conditions to public health issues, underscoring how the location of housing and site amenities can encourage more active, healthy lifestyles. The U.S. Centers for Disease Control and Prevention reports that low-income people endure the highest rates of asthma, with many known and suspected triggers linked to home conditions, including mold and dampness, which account for 21 percent of all asthma cases.

To encourage housing solutions that promote health, economic and environmental benefits, Enterprise Community Partners launched the Green Communities initiative in 2004 in partnership with the Natural Resources Defense Council (NRDC). We brought together community development and environmental professionals to create green building guidelines for affordable housing. All of the participants agreed that the guidelines must accomplish the following:

- Result in high-quality, healthy living environments
- Reduce utility and maintenance costs associated with single- and multifamily housing
- Enhance residents' connection to nature and promote more active lifestyles
- Protect the environment by conserving energy, water, materials and other resources
- Advance the health of local and regional ecosystems by reducing negative impacts on air quality, wetlands, waterways and undeveloped land
- Reduce global warming impact and depletion of natural resources

Guided by these principles, the Enterprise Green Communities Criteria were drafted by environmental and green building experts, and introduced in January 2005. Partner organizations assisting Enterprise in the development and promotion of the Criteria included NRDC, the American Institute of Architects, the American Planning Association, the National Center for Healthy Housing, Southface, Global Green, the Center for Maximum Potential Building Systems and the U.S. Green Building Council.

The Enterprise Green Communities Criteria are organized into eight categories:

1. Integrated Design
2. Location and Neighborhood Fabric
3. Site Improvements
4. Water Conservation
5. Energy Efficiency
6. Building Materials Beneficial to the Environment
7. Healthy Living Environment
8. Operations and Maintenance

The Enterprise Green Communities Criteria are the nation's most widely adopted comprehensive green affordable housing framework. The Criteria were developed with the goal of creating a holistic approach to delivering significant health, economic and environmental benefits to residents, owners and low-income communities. Enterprise and its partners sought to offer proven, cost-effective green building methods and materials for developers that could be integrated during the design and construction process. At the time, many affordable housing developers were philosophically inclined to adopt green building standards but viewed additional costs as an unknown quantity that could jeopardize the financial feasibility of new or rehabilitated affordable housing. This concern persists among some affordable housing developers today.

Based on earlier research by Tellus and New Ecology, along with Greg Kats's 2003 report, *Green Building Costs and Financial Benefits*, Enterprise estimated that the cost of complying with the Green Communities Criteria would add 2 to 4 percent to the total costs of developing typical affordable housing. Enterprise also believed that those additional first costs would have an associated payback because of reduced operating expenses related to energy and water conservation measures. Therefore, the initiative's guiding principles sought to ensure that Green Communities housing developments should be cost-effective to build, durable, and practical to maintain, while offering long-term financial savings.

The Criteria were also intended to provide a holistic threshold, within reach of all developers, from those with very little or no green building experience to the most seasoned green builders. This led to a prescriptive approach of predominantly mandatory measures based on national reference standards and proven methods and materials. But because the Criteria were developed to be flexible enough for use in all markets across the country, some measures with significant regional variances, such as those involving the availability and cost of certain materials, were made optional.

To comply with the Criteria, a project must meet each mandatory measure and acquire at least 25 optional points (see Green Communities Criteria Checklist in the Appendix). The Criteria include 38 mandatory measures and 13 optional ones. Optional measures offer an opportunity to acquire a total of 125 points. Each optional criterion includes a range of points based on the extent to which the criterion is pursued. For example, one optional measure relates to renewable energy. Developers can acquire a range of points, depending on the percent of the building's overall electricity demand that is met with energy from the renewable source.

When devising the Criteria, Enterprise and its partners made a deep commitment to ensuring that their guidelines delivered housing with significant health benefits. A 2007 survey by Robert Charles Lesser & Co. asked buyers about their attitudes toward green building, and their motivation and willingness to pay for green homes. Forty-one percent of respondents reported that they cared about and were willing to pay for the health and wellness measures in a green building, *even if the costs were not recoverable*. That result compares with 18 percent of respondents willing to pay for energy savings and 24 percent willing to cover costs relating to protecting the environment.

Another study emphasizing the importance of health measures in green affordable housing was completed by the National Center for Healthy Housing (NCHH) in 2008. The study compared four national green building programs: Enterprise Green Communities, the National Association of Home Builders' Green Home Building Guidelines, the U.S. Environmental Protection Agency's Energy Star with Indoor Air Package, and the U.S. Green Building Council's LEED for Homes. NCHH compared each program to a detailed list of healthy home measures based on its own seven healthy homes principles. Those principles involve keeping homes dry, clean, ventilated, safe, contaminant-free, pest-free and maintained. Enterprise Green Communities ranked highest among the programs in the analysis, largely due to the fact that the Green Communities Criteria include many mandatory measures for indoor environments.

Evolution of the Green Communities Criteria

Since their introduction in 2005, the Criteria have been revised twice, in 2006 and 2008. For the purposes of this evaluation, Enterprise used the 2005 version of the Criteria, since most of the verified data obtained to date came from the early set of projects designed to conform to the 2005 version. The housing developments that enrolled in Enterprise's evaluation committed to apply all 38 mandatory measures and enough of the 13 optional measures of the Criteria's 2005 version to reach a required score. Enterprise required new construction projects to earn 25 points from the optional criteria; moderate-rehabilitation projects were required to earn 15 points from the optional criteria.

The Enterprise Green Communities Criteria are applicable to new construction projects, substantial-to-moderate rehabilitation projects and all housing types. Substantial rehabilitation projects are expected to meet all of the Criteria for new construction, but the Criteria are modified for moderate-rehabilitation projects, as described in the Technical Report.

One of the major differences for moderate-rehabilitation projects involves the energy conservation criteria. New construction and substantial rehabilitation projects must either meet Energy Star requirements, achieve a HERS design score of 86 or lower, or exceed ASHRAE 90.1 energy standards by 30 percent. In comparison, the 2005 version of the Green Communities Criteria required moderate-rehabilitation projects to conduct an energy analysis of the existing building and incorporate all energy conservation measures with a simple payback of 10 years or less. (In the 2006 and 2008 versions of the Criteria, rehabilitation projects must identify cost-effective energy improvements by preparing an energy improvement report and implementing measures that improve the building's energy performance by 15 percent.)

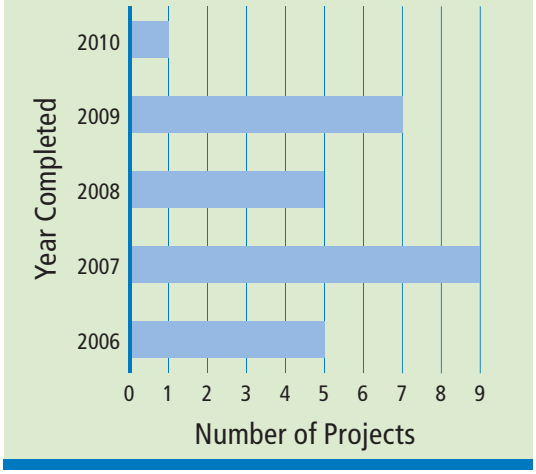
The current (2008) version of the Criteria gives developers more options for achieving the required minimum score, aligns more closely with the LEED for Homes rating system, includes clarifying language related to intended methods of meeting the Criteria, and references the newest Energy Star for Homes standard. It includes 40 mandatory criteria and 23 optional criteria.

The Enterprise Green Communities Criteria have been fully adopted by the following government entities: the U.S. Department of Housing and Urban Development (HUD), with regard to certain funding for public housing authorities; the states of Minnesota, Washington and Iowa; the cities of San Francisco, Cleveland, Miami and Denver; and the District of Columbia. In addition, 40 housing finance agencies have adopted portions of the Green Communities Criteria as part of their scoring systems for allocating Low-Income Housing Tax Credits.

Characteristics of Projects that Provided Data

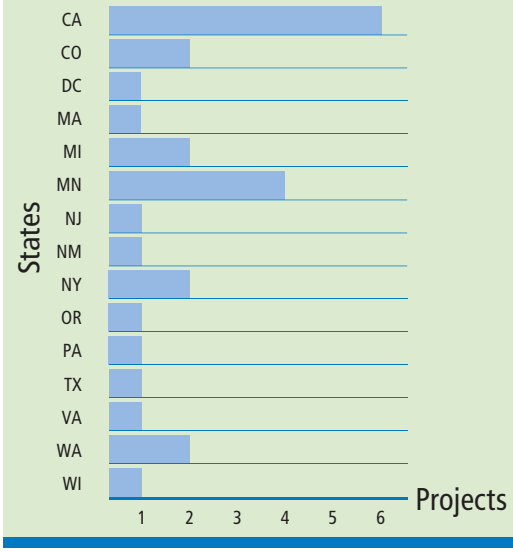
1. Project Information

Of the 27 projects within our sample:
Average Unit Number per Project = 58 units
Average Unit Size = 1,001 sq. ft.

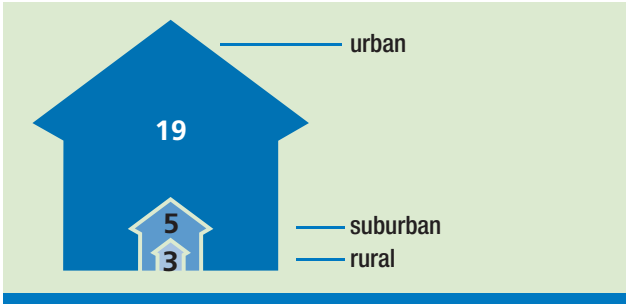


2. Geographic distribution

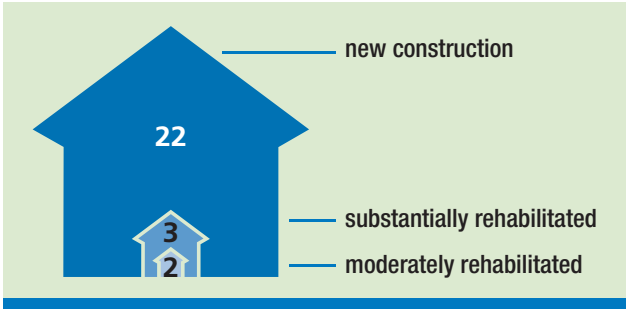
Projects are located in 14 states plus the District of Columbia



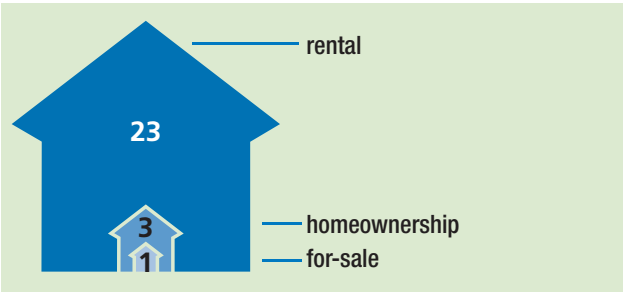
3. Location



4. Construction Type

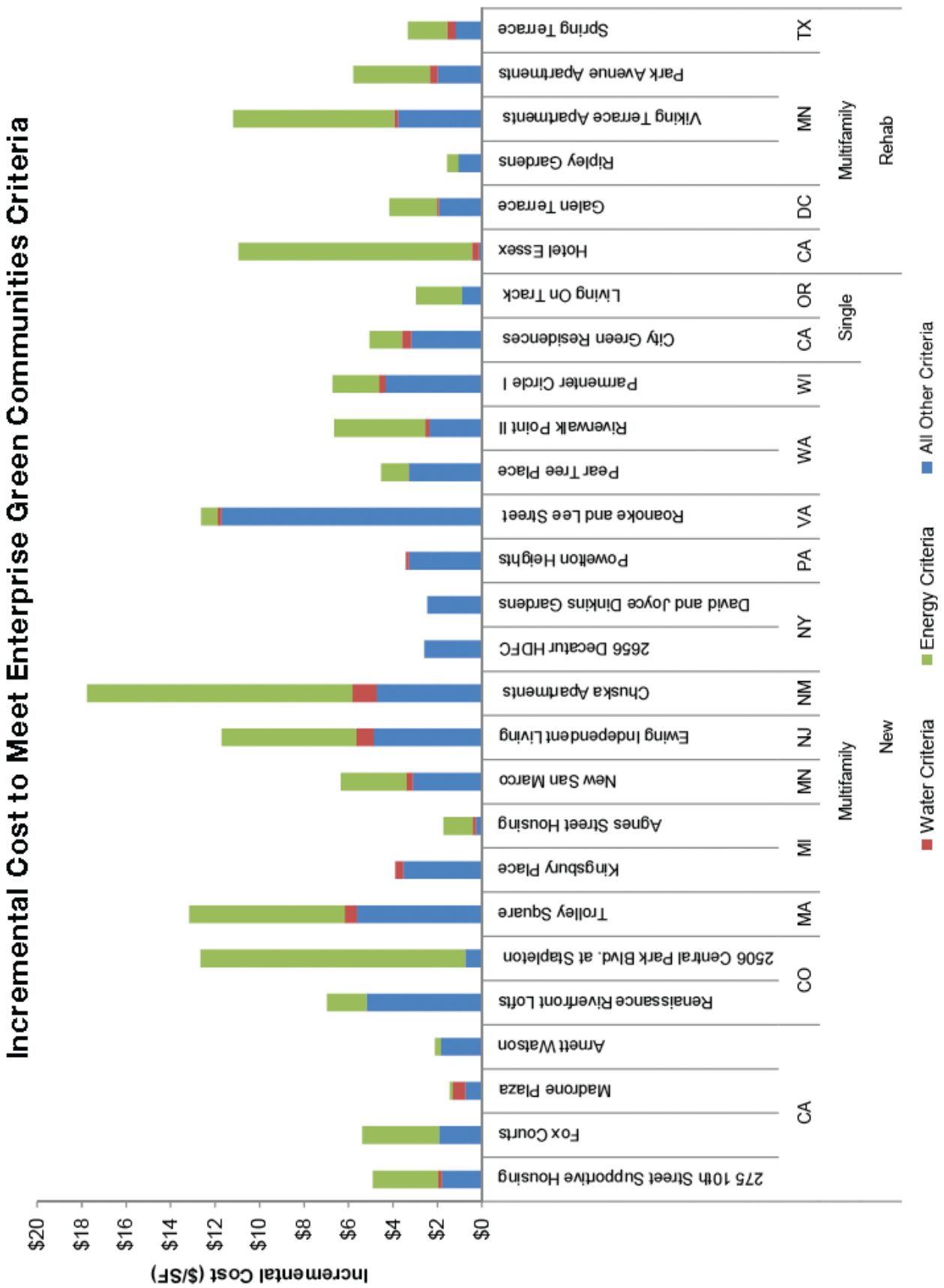


5. Property Type



Building Type:

- Clustered single-family = 2 projects
- Clustered townhomes = 6 projects
- High-rise (4-10 stories) = 12 projects
- Mid-rise (<4 stories) = 6 projects
- Scattered-site single-family = 1 project


Incremental Cost to Meet Enterprise Green Communities Criteria
Incremental Cost ($/SF)
$0
$2
$4
$6
$8
$10
$12
$14
$16
$18
$20
Water Criteria
Energy Criteria
All Other Criteria
New
Rehab
Multifamily
Single
275 10th Street Supportive Housing
Fox Courts
Madrone Plaza
Arnett Watson
Renaissance Riverfront Lofts
2506 Central Park Blvd. at Stapleton
Trolley Square
Kingsbury Place
Agnes Street Housing
New San Marco
Ewing Independent Living
Chuska Apartments
2656 Decatur HDFC
David and Joyce Dinkins Gardens
Powelton Heights
Roanoke and Lee Street
Pear Tree Place
Riverwalk Point II
Parmenter Circle I
City Green Residences
Living On Track
Hotel Essex
Galen Terrace
Ripley Gardens
Viking Terrace Apartments
Park Avenue Apartments
Spring Terrace
CA
CO
MA
MI
MN
NJ
NM
NY
PA
VA
WA
WI
CA
OR
CA
DC
MN
TX
Multifamily
Single
Multifamily

Methodology

Our survey universe is composed of certain projects that have received Enterprise Green Communities grants, and agreed to report the costs and benefits of complying with the Green Communities Criteria. All grants were conditioned upon compliance with the Green Communities Criteria; submission of documentation outlining compliance measures; and agreement to report incremental design and construction costs, and utility usage and cost savings.

Many grantees reported extensive project data on our cost-benefit survey form and signed a release permitting the Enterprise survey team to obtain actual utility usage and cost data directly from utility companies for a project's first year of full operations. For each participating developer, a total of $3,000 in grant funds—out of grant amounts up to $50,000—were earmarked to offset the costs of reporting. Enterprise offered an additional $500 bonus to encourage developers to provide data by a specified time.

Once construction documents were completed, Enterprise used a two-step process to verify that projects incorporated all of the required Criteria. First, the developer was required to submit a certification of compliance signed by the project's green design specialist, architect and project sponsor. These certification forms described the methods (and in some cases materials) that would be used to achieve compliance with particular Green Communities Criteria. Second, Enterprise staff and consultants reviewed these certifications to confirm compliance.

For the purposes of both Green Communities and this survey, Enterprise determined compliance with the Green Communities Criteria for each project at the construction documents stage and did not require construction inspections or testing. Green Communities was designed to reduce the internal and third-party costs of compliance for developers—an approach that Enterprise presumed would lead to wider Criteria adoption. On a sampling basis, Enterprise incurs the cost to contract with a third party to visit completed projects and verify compliance.

Performance Systems Development (PSD), a third-party consultant, compiled and analyzed the data from the surveys. While a total of 53 grantees provided data, only 42 submissions were completed. Certain anomalies in data reporting—e.g., failure to provide cost data—forced Enterprise to eliminate several projects from the survey universe, leaving a total of 27 projects.

PSD calculated the predicted long-term energy and water usage, utility costs and utility cost savings resulting from applying the Criteria for 27 projects that provided complete submissions. The baseline for calculating utility usage, costs and savings for each model was a theoretical model—namely, a development built to the minimum construction code requirements of that locality. When this analysis was completed, PSD was able to predict utility usage and cost savings for each of the 27 projects.

In addition, Enterprise and PSD were able to obtain actual energy usage data from 10 projects that had been in service for at least one year. This data was normalized to project future yearly usage, costs and savings by adjusting for heating and cooling during the 12 months for which data was collected. From this smaller survey universe, PSD was able to more accurately predict future energy usage. Actual water usage data was obtained from seven projects that provided complete cost-benefit survey forms. Projections from these smaller survey samples appear in this report, in addition to the predicted usage and savings for the primary survey universe of 27 projects.

Enterprise staff and consultants then analyzed the data to produce the conclusions and tables in this report. Assumptions used to calculate "lifetime" utility cost savings, simple payback and internal rate of return are described in the Financial Benefits section of this report.

Lessons Learned

This evaluation effort has revealed a few very important yet simple conclusions.

- Tracking the costs of green measures is not standard practice.
- Tracking the cost-effectiveness of green measures is not standard practice.
- The Enterprise Green Communities Criteria are cost-effective.

TRACKING COSTS

Enterprise has always sought to ensure that our commitment to Green Communities would deliver significant health, economic and environmental benefits without compromising affordability. This report exposes some of the challenges that lie ahead as we continue our effort to benchmark performance, and measure and monitor improvements based on integrated design, construction, rehabilitation, operations and maintenance of green methods and materials. Now that we have a tool for uniformly collecting data upfront, we can work with our housing development partners to find better ways to capture this data as a matter of course.

Enterprise is currently including relevant parts of the survey tool in our green development plan template. Understanding the costs and associated lifetime savings will inform our decisions and help transfer knowledge across the affordable housing sector as data on the cost-effectiveness of green methods and materials becomes more widely shared. Even with a mandatory requirement for establishing both a green development plan and an integrated design process, the developers participating in our survey did not routinely track the costs of green measures. Determining the average cost of meeting the Criteria ($4,524) is significant, given the difficulty in acquiring this level of data from survey participants.

TRACKING COST-EFFECTIVENESS

Putting costs aside, we found that our development partners in this effort did not have established systems for measuring and monitoring the results of their investments in energy and water conservation. It was difficult to obtain the energy modeling work reportedly completed during the design phase. This was due in part to staff turnover and to a reliance on engineering consultants who may have only shared outputs from energy models in terms of recommending systems or requirements for windows and insulation values. If circumstances changed after modeling was completed, such as the number of residents actually living in the building, then the building's expected energy performance would no longer be known.

In most cases, we found that it was not common practice to complete post-construction assessments (for example, testing proper functioning of mechanical systems or adequately sealed ducts), regardless of who was paying for utilities. Enterprise hired a third party to complete post-construction audits of 20 projects; this consultant found higher-than-expected duct leakage in 10 projects. The leakage can be both more difficult and more costly to correct after construction is complete. In two projects, the residents had been the first to notify the property manager about the leakage because they experienced drafts and discomfort in their apartments and were turning up the thermostats to compensate. We recommend that a local building performance specialist be hired on a routine basis to perform air sealing. Another strategy for eliminating discrepancies like this is to both complete the preliminary energy modeling report and to inform design and post-construction assessments.

An important component of this evaluation effort is verifying that expected energy and water savings are actually realized. As such, Enterprise reached out to numerous utility companies across the country to collect energy and water consumption data in order to conduct a comparative analysis of predicted versus actual usage. We quickly learned that this is not an easy process. Energy usage data tracked by utility companies is not as readily available to building owners and third-party entities. This information is useful for improving energy efficiency and water conservation programs. We found that many utilities require additional permissions beyond what was originally secured by project sponsors who had completed our Utility Release Form. This release form enabled Enterprise to collect common area water and energy usage only, and would not authorize the release of tenant usage.

As a result, Enterprise worked closely with project managers to collect resident consent from a sample of units within select properties to access usage data from local utilities. We have since revised our form to address privacy concerns (see Appendix E for Utility Release Form); the new version includes a request for release forms from 15 percent of all units within a property. Owners have informed us that the best time to collect tenant release forms is during tenant lease-up. Moving forward, Enterprise will focus on creating easier access to utility data that can be understood and used to measure energy and water consumption against expected performance.

OTHER LESSONS

This evaluation effort has led Enterprise to fully understand the importance of integrating green measures into the design process early. This ensures that all agreed-upon measures are appropriately documented in the plans and specifications, and follow an intentional, rigorous commissioning process to guarantee, for example, that insulation is installed properly, ducts are tightly sealed and water fixtures have the right flow rates. A well-established and ongoing integrated design process appears to deliver significant benefits. During the integrated design process, informed and innovative decision-making can help determine how to meet the green goals of the project, and who should champion which measures to ensure that they are integrated into the completed building. We found that when measures required in the Criteria are included in the plans and specifications of a project, 95 percent of the time those measures would be installed in the building.

In the early years of Green Communities, Enterprise placed a heavy emphasis on integrated design. While we continue to value the importance of an integrated design approach, we are now equally, if not more, focused on the commissioning, performance measurement, and testing necessary to realize the expected benefits. To earn back the initial upfront investment of $4,524 in green measures, we must know which financial cost savings we expect to achieve, and monitor the utility bills to make sure they are being realized.

Throughout the entire lifetime of the housing, we must also pay careful attention to routine performance testing. This entails engaging residents and homeowners in the green goals of the housing project. Residents can play a critical role by exercising proper maintenance and conservation practices, as well as by maintaining a healthy living environment through the use of non-toxic cleaning supplies and other best practices (see information resource for a Resident Healthy Living Guide template in Appendix F).

Extending the integrated design process into the asset management of the building is essential. This entails engaging the professionals responsible for operating and maintaining the building as well as those working in the building. It is critical that everyone understands the green goals that were designed into the building and their respective roles in achieving expected performance levels as well as finding new opportunities for introducing additional green elements into the building.

FINANCIAL BENEFITS

SECTION 3

Financial Benefits

Ripley Gardens, Minneapolis

We measured the financial benefits of incorporating the Enterprise Green Communities Criteria—in terms of utility cost reductions—using three different methods:

- Simple payback—the estimated number of years of utility cost savings required to pay back the initial incremental costs of the green improvements
- Lifetime utility cost reductions—an estimate of the present value of future savings
- Internal rate of return (IRR)—the percentage return on investment in energy- and water-saving improvements, represented by the estimated future utility cost savings

Estimating Incremental Costs of Conservation Measures

All of the above methods require an accurate estimate or accounting of the incremental cost of each energy- or water-conservation measure. For the findings in this report, we relied on project developers to provide estimates of incremental costs, defining these as the additional costs incurred in adopting a particular criterion above the cost of what the developer otherwise would have installed. For example, we asked developers to estimate the incremental cost of installing water-conserving appliances and plumbing fixtures, as compared to appliances and fixtures that would otherwise have been specified. Sixteen of the study's 27 developers reported additional costs because incorporating these Green Communities measures led to an upgrade of the features they normally would have installed. Eleven developers reported no additional costs, presumably because they were already installing fixtures that met Green Communities measures or were able to obtain these upgraded fixtures at no extra cost.

To determine average costs of the mandatory criteria, such as the one above, the estimated incremental cost per unit is the weighted average cost of the 27 projects reporting predicted results, including those for which the reported incremental cost was zero. For each of the optional criteria, we calculated the weighted average cost incurred only by those projects that opted to incorporate that criterion.

Estimated and Actual Utility Cost Savings

To estimate future utility cost savings, we used building plans and specifications to calculate average annual energy and water usage resulting from complying with particular criteria, compared to a benchmark for each project. The benchmark usage assumed that the previous standards of the developer or federal or local codes were applied. For example, two water usage calculations were made for the 27 projects, one assuming the same development designed to include water fixtures and appliances in compliance with EPA federal requirements, the second assuming specifications for water-conserving appliance fixtures required by the Green Communities Criteria. Then, using current or recent energy, water and sewer rates for each project, we calculated annual expenses in both scenarios—the difference, of course, being the predicted savings resulting from incorporating a particular criterion.

From a smaller universe of the 27 projects, we were able to obtain actual energy and water usage and costs for one full year of operations. It was not within this report's scope to ascribe the gross savings resulting from energy conservation measures to individual Green Communities Criteria. The predicted savings from actual usage data resulting from water conservation measures were all due to the installation of water-conserving appliances and fixtures (criterion 4.1), since we collected water usage data only for interior water usage.

Simple Payback

The simple payback method of estimating financial benefits is useful for individuals who are not accustomed to "present value" financial analysis. It provides an easily understood estimate of financial benefits, but it is not well-suited for forecasting benefits precisely and making investment decisions. Unlike the lifetime savings and internal rate of return methods, it does not account for the useful life span of the improvements or the cost of capital used to finance the improvements. In addition, this method uses only the first year's estimated utility savings, without accounting for inflation of energy and water costs. (Because of the differences in methodology, the simple payback numbers in this report cannot be determined by dividing lifetime savings by the upfront costs.)

Simple payback calculations are useful, up to a point. Conservation measures with short payback periods—for example, five years or less—are typically good investments, because the useful life spans of almost all building components are at least 10 years, and the simple payback is 20 percent or more annually, which is far greater than the usual cost of capital to finance affordable housing projects. On the other hand, a more detailed analysis is required to decide whether measures with long payback periods are sound investments.

Using data from the 27 projects that reported predicted results, the simple payback associated with both criteria 5.1 and 5.5 (efficient energy use investments) was seven years. The simple paybacks of the 5.2 Energy Star appliance and 5.3 energy-efficient lighting investments occurred over an even shorter time frame—four years and three years, respectively.

On average, for these criteria combined, a six-year payback of the incremental costs was predicted for all 27 projects in our survey universe. However, the 10 projects that provide actual energy use data show an average payback period of nine years. We predicted that optional criterion 5.6 (renewable energy) would achieve payback within 40 years without subsidy, or two years with subsidy. Currently, projects that reported actual results had on average a 40-year payback without a subsidy, and just a one-year payback with subsidy. We believe the latter result is atypical because of the major subsidies provided to these particular projects for installing renewable energy features.

We anticipate that this figure will change as more projects report data.

The investment in interior water efficiency (criterion 4.1) was predicted to be paid back within three years, based on the 27 projects that reported predicted results. To date, the actual results show a two-year payback period, based on reporting from the seven projects that met or exceeded the water-efficiency criteria.

Lifetime Savings

For this report, the first step in analyzing lifetime savings was to calculate both predicted and actual annual energy and water savings. We then projected a 5 percent annual increase in energy expenses and a 4.7 percent annual increase in water and sewer fees. The predicted inflation of energy costs was based on the average annual increase in the consumer price index for all urban consumers (CPI-U) for natural gas and electricity costs over the past 10 years, as reported by the U.S. Bureau of Labor Statistics. The predicted increase in water and sewer maintenance fees was also based on the average annual increase in the CPI-U over the past 10 years.

The expected useful life of energy conservation measures was assumed to be as follows:

Criterion Number	Criterion Description	Assumed Useful Life
5.1	Efficient Energy Use[1]	25 Years
5.2	Energy Star Appliances	15 Years
5.3	Efficient Lighting	12 Years
5.4	Individual Electricity Meters	N/A
5.5	Additional Reductions in Energy Use	Case-by-case basis
Total 5.1-5.5	Mandatory Criteria plus Optional 5.5	Weighted average of amounts above
5.6	Photovoltaic (PV) Panels	20 Years
4.1	Water-Conserving Appliances and Fixtures	15 Years

[1] Efficient Energy Use as defined in the Green Communities Criteria includes meeting Energy Star standards, achieving a Home Energy Rating System design score of 86, exceeding ASHRAE 90.1 by 30 percent or meeting the local energy code, whichever is most stringent. If the project is a moderate rehab, developers must demonstrate equivalent energy efficiency by implementing all cost-effective energy improvements with a 10-year or earlier payback, as identified by a qualified engineer or energy auditor.

For criterion 5.1, efficient energy use, the assumed useful life is a blend of industry standards for the life spans of components such as boilers and furnaces (15 years), high-performance windows and doors (20 years) and insulation (50 years).

All of these assumptions were used to estimate future utility costs and savings over the life spans described above. To express these in current (2009) dollars, we used a 6 percent discount rate. We chose that rate as an approximation of the highest cost of capital—i.e., loans—typically used to finance affordable housing projects or purchases by homeowners. In other words, our lifetime cost estimates assume that the incremental cost of incorporating each Green Communities criterion is being funded with loans at 6 percent interest, so we used that percentage as the discount rate.

Using data from the 27 projects that reported predicted results, the average lifetime savings per unit for the 5.1 and 5.5 criteria for efficient energy use was $3,056 over an average of 22 years. The average lifetime savings per unit for the 5.2 criterion, for Energy Star appliances, and the 5.3 criterion, for energy-efficient lighting investments, was $406 over 15 years and $799 over 12 years, respectively. On average for these criteria combined, we predicted $4,260 per unit lifetime savings over an average of 20 years; however, to date, our actual results show an average of $3,916 per unit savings over an average lifetime of 22 years, or 92 percent of the predicted amount. The optional criterion 5.6, for renewable energy measures, was predicted to achieve $1,731 per-unit savings over 30 years, and in our data collection so far, the project that reported actual results shows $5,034 per-unit average savings over 30 years, or almost three times the predicted amount.

The investment in interior water efficiency (criterion 4.1) was predicted to generate lifetime savings per unit of $352, based on the predicted water usage data from the 27 projects analyzed. To date, using the first-year results supplied by the seven projects that met or exceeded the water efficiency criteria, the projects are achieving a $935 per-unit lifetime savings over a 15-year period, almost three times the predicted savings.

Internal Rate of Return

The estimated internal rate of return (IRR) of individual criteria is calculated with a method similar to the one used for lifetime cost savings, except that the resulting return on investment is expressed as a percentage. This is the method typically used by investors to determine the benefits of making a particular investment or alternative investments. In this report, the IRRs are indicators of the relative benefits of making decisions to adopt—i.e., invest in—individual Green Communities Criteria, based on the average IRRs of the projects surveyed.

The data in sections 4 and 5 of the Technical Report indicate that nearly all energy and water conservation measures called for in the Enterprise Green Communities Criteria have exceptionally high IRRs, ranging from 17 to 42 percent. The exception was photovoltaic panels in the project, which had a 3 percent IRR with the incremental costs measured against the savings. The results were mixed when subsidies of the PV systems were taken into account. The average predicted IRR of nine projects incorporating PV panels was only 6 percent when subsidies were taken into account. One project also reported actual savings; the IRR was 194 percent. That project had nearly 100 percent subsidies for the PV panel installations, reducing the effective cost to near zero.

When using data from the 27 projects reporting predicted results, the internal rate of return for the 5.1 and 5.5 criteria, both for efficient energy use, was 17 percent over an average useful life of 22 years. The internal rate of return for the 5.2 criterion for Energy Star appliances and the 5.3 criterion for energy efficient lighting investments was 28 percent over 15 years, and 42 percent over 12 years, respectively. On average for these criteria combined, a 21-percent internal rate of return was expected; however, our actual results to date, based on 10 projects, showed a return of 15 percent over an average lifetime of 22 years—still an impressive outcome.

The investment in interior water efficiency (criterion 4.1) was predicted to deliver a return of 38 percent over a 15-year useful life, based on the predicted water usage data from the 27 projects analyzed. To date, using the first-year results supplied by the seven projects that met or exceeded the water efficiency criteria, those green building measures are achieving a phenomenal 61 percent return.

Cost Premiums and Lifetime Savings by Occupancy Type

In the three categories of occupancy that we analyzed separately—supportive housing, rental housing for general populations and for-sale homes—the per-unit costs of compliance were remarkably similar, but the costs per square foot and predicted utility cost savings varied considerably, as illustrated in the following table.

Costs and Benefits by Project Occupancy Type

	Entire Survey Universe (27 Projects)	Supportive Housing (15 Projects)	Rental Housing (9 Projects)	For-Sale Housing (3 Projects)
Average cost of compliance, per dwelling unit[2]	$4,524	$4,617	$4,408	$4,275
Lifetime savings (based on predicted usage, not actual)	$4,612	$5,441	$3,608	$2,878
Average cost per square foot	$4.52	$4.71	$4.93	$2.63
Average square footage of dwelling units	1,001	981	893	1,624
Percentage added to development cost	2.1%	2.1%	2.6%	1.1%

[2] Includes cost premiums of compliance with all but the energy conservation criterion for installing renewable energy sources (criterion 5.6). We found that costs of renewables distorted the numbers, because, in many cases, costs were exceptionally high and substantially funded by special subsidies. Renewables were among the optional criteria selected to allow developers to achieve a minimum point score. We believe developers would have chosen other options in many cases had the renewables not received special subsidies.

The 15 supportive housing projects in our survey universe had the highest predicted lifetime savings, while the three projects with homes for sale had the lowest. Analysis of the data showed no conclusive reasons for the higher predicted savings from supportive housing projects. However, discussions with supportive housing developers indicated that they generally paid extra attention to compliance with the Criteria to ensure better health among residents and reduce utility costs, which are generally paid by the property owner in these types of projects.

The three for-sale home projects had by far the lowest predicted lifetime utility cost savings. This was apparently the result of the builders already embracing energy and water conservation features, since these developers reported an average incremental cost for those features that was only $1,137 per unit, projected to yield $2,878 in lifetime utility cost savings—more than two and a half times the investment. However, the single-family homebuilders spent more than most other developers in our survey universe—about $3,500 per home on average—in order to meet the other requirements of the Green Communities Criteria. We believe that this was largely a result of the homes being 60 percent larger than the average dwelling unit we surveyed, given that the incremental construction cost of green features is largely associated with square footage and economies of scale.

Cost Savings Accruing to Property Owners versus Tenants

Our study clearly shows that adopting specific Enterprise Green Communities energy and water conservation criteria leads to cumulative "lifetime" savings that, on average, exceed the initial costs of meeting these measures—including smart siting, healthy materials and other tactics that do not generate quantifiable savings. Less clear, however, is how these savings can help developers afford to pay the marginally higher costs of green building.

Naturally, in building and selling homes to owner-occupants, developers do not benefit directly from long-term utility cost savings. They can only recoup the extra costs of complying with the Enterprise Green Communities Criteria through modest price increases, development subsidies or a combination of the two. Homebuyers are increasingly asking for—and seeing value in—green building features. Government agencies able to subsidize affordable homes also see this added value due to recent increases in federal subsidies for energy conservation.

With rental housing developments, both property owners and tenants experience the long-term benefits of utility cost savings. But the relative shares of these long-term savings vary considerably. In many supportive housing projects for residents with special needs, the property owners pay all the utility bills; this is mainly due to the fact that these residents typically have very low incomes and thus would have difficulty establishing accounts and paying utility bills. Accordingly, these property owners tend to receive the most utility cost savings because of conservation measures.

In high- and mid-rise apartments for general occupancy, tenants typically pay bills for electricity service, but the property owner pays for heating and air conditioning because of the cost-effectiveness of large, centralized HVAC systems. In low-rise and town home-style rentals, tenants typically pay for the majority of utility costs.

This raises a key question: What are the incentives for rental housing developers to embrace green building measures? Clearly, providers of special needs rental housing who pay all the utility bills have the most immediate and measurable incentives. Similarly, having landlords pay all the utility bills is not a sound policy for operators of rental housing for general populations, since this reduces or eliminates incentives for residents to conserve energy and water.

According to the prevailing federal rules governing rents and utility payments for subsidized housing, most of the benefits of utility cost savings should—in theory—eventually accrue to the property owners. This broaches the complex and controversial topic of adjusting the so-called "utility allowances" so that federally assisted housing can generate slightly higher rents.

Understanding the impact of these utility allowances requires some additional explanation. Almost all assisted rental housing in the United States is subject to rent caps based on the size of the dwelling unit, the tenant's household income, or both. But the allowed rental amounts must be further reduced based on an estimate of the utility costs paid by tenants. These adjustments are made based on utility allowance schedules, usually provided by the local public housing authority and based on a survey of average utility costs paid by rental units of different sizes, in different building types, and using different energy sources (natural gas, oil, propane and electricity) for heating and cooking.

Every federally assisted rental housing project answers to some monitoring agency, and one of the responsibilities of these agencies is to make sure that the proper rents are charged and utility allowances deducted. But developers of green rental housing projects find that exceptional conservation measures are almost never taken into account when properties are first occupied. Developers are required to deduct utility allowances from those rents derived from rental housing communities that, by definition, have average rather than low efficiency in terms of energy and water usage. Monitoring agencies give rental property owners the option of tracking utility costs over a period of several years and making the case for a customized set of utility allowances.

In practice, very few rental property owners go to the trouble of trying to reduce utility allowances and thus marginally raise rents, even for very high-performance buildings. The presumption is that residents may resist the resulting increases.

One solution to this problem is for federal and state housing agencies to establish special utility allowance schedules for buildings that agree to meet certain design criteria, such as the Enterprise Green Communities Criteria, at a project's outset, before buildings are built and financed. In this scenario, the financial underwriters will see slightly higher costs but also slightly higher rents that can support a mortgage that is a few thousand dollars higher per dwelling unit. Another solution is to phase in lower utility allowances and share some of the cost savings between the owner and the residents.

Until policies along those lines are established, developers of rental housing for general populations get direct benefits for only a part of the "lifetime savings" and internal rates of return described in this report. In the near term—since most affordable rental housing developers struggle to reach breakeven on their development-cost budgets—they must rely on additional grants and low-cost financing from public agencies to pay for the modest additional costs of adopting green building standards.

It is our hope that the societal and financial values of green rental housing demonstrated in this report will encourage government housing agencies to provide these necessary subsidies in the short term and eventually adjust their rent-setting policies to favor energy and water conservation.

Other Financial Considerations for Rental Housing

Rental housing communities, where most utility cost savings accrue to residents, offer indirect benefits for property owners. Energy and water conservation features help lower-income tenants reduce their overall housing costs and should also increase residents' ability to pay rent timely. This, of course, increases the property's financial stability.

For these reasons, the asset management team of an affordable housing owner in Denver has provided group training, handouts and individual counseling to raise residents' awareness of ways to maximize energy-efficiency benefits. According to the team, this has been an extremely valuable experience for all involved and has helped to ensure efficient building performance.

Costs and Benefits in Projects of Different Construction Types

In the three categories of occupancy that we analyzed separately—substantial rehabilitation, moderate rehabilitation and new construction—the per-unit costs of compliance and predicted lifetime utility cost savings varied considerably, as shown in the following table.

Costs and Benefits by Project Construction Type

	Entire Survey Universe (27 Projects)	Substantial Rehab (3 Projects)	Moderate Rehab (2 Projects)	New Construction (22 Projects)
Average cost of compliance, per dwelling unit[3]	$4,525	$6,620	$2,447	$4,583
Lifetime Savings (predicted)	$4,612	$10,561	$5,890	$3,565
Average cost per square foot	$4.52	$7.40	$3.57	$4.26
Average square footage of dwelling units	1,001	894	685	1,077
Percentage added to development cost	2.1%	3.1%	3.2%	1.9%

[3] Includes cost premiums of compliance with all but the energy conservation criterion for installing renewable energy sources (criterion 5.6). We found that costs of renewables distorted the numbers, because the costs in many cases were exceptionally high and substantially funded by special subsidies. Renewables were among the optional criteria selected, allowing developers to achieve a minimum point score. We believe developers would have chosen other options in many cases had the renewables not received special subsidies.

The incremental cost of incorporating the Enterprise Green Communities Criteria was lowest with moderate rehabilitation projects—which we believe is due to the Criteria's adaptation to the realities of partially rehabilitating homes and apartments. Developers were not required to meet the Energy Star for Homes standard. Instead, the criterion requires identifying and installing conservation measures with a simple payback of 10 years or less. Furthermore, with regard to many other criteria, moderate rehab projects were required only to upgrade any materials and equipment being replaced. This approach—based on Enterprise's decades-long experience with housing rehabilitation—is apparently very effective in financial terms because the predicted lifetime savings identified in these projects is two times the reported incremental costs of complying with the Criteria. This savings amount would yield the highest return on investment of any subset of the 27 projects.

Substantial rehabilitation projects had the highest cost premium for compliance, but they are also projected to have remarkably high lifetime utility cost savings. These findings indicate the large potential for cost-effectively upgrading older housing to reduce energy and water costs. One of the most surprising findings of our study was that the predicted lifetime savings among new construction projects was 23 percent lower than the average of all developments. Since our analysis of the data does not reveal any specific reasons for this, we can only conjecture that the developers of new homes had previously used relatively high standards for energy and water conservation measures. In other words, according to our methodology, starting from a higher baseline reduces the incremental lifetime savings when all other factors are equal.

IMPLICATIONS FOR POLICY AND PRACTICE

SECTION 4

Implications for Policy and Practice

Central Park at Stapleton, Denver

This report only begins to examine the cost-effectiveness of integrating the holistic measures included in the Green Communities Criteria into affordable housing. However, the findings suggest several important implications for developers, policymakers, and private and public funders.

Expect Green

The findings from this study strongly suggest that certain green methods and materials as defined within the Green Communities Criteria are cost-effective. Instead of value-engineering out criterion, development teams should constantly seek ways to value-engineer in green measures that can further increase energy efficiency, reduce water consumption and contribute to a healthy living environment. Affordable housing by definition should be green.

Affordable housing developers should start from the premise that building green is non-negotiable during the initial planning and pre-development phase. It is important to set the bar increasingly higher with each development project, and seek innovative ways to achieve the maximum level of cost-effective energy and water savings, indoor air quality improvements and other green benefits. If developers encounter cost concerns from project team members they should consider alternative paths for meeting the intent of certain measures. It is our experience that early integrated design work can deliver significant cost savings. For example, design alternatives should be fully explored and exhausted before money is spent on high-efficiency equipment, appliances and lighting.

Policymakers and capital providers should expect affordable green development as well. A number of cities and states have added significant incentives and requirements for publicly funded affordable housing developments to include green measures. The federal government has taken initial, positive steps in this direction as well. We encourage the acceleration and expansion of these efforts. Although not fully discussed in this report, housing that meets the Enterprise Green Communities Criteria may also contribute to a healthier locality by not exacerbating pre-existing infrastructure deficiencies such as failing stormwater management systems, overcrowded roads, and increasing demands on the electricity grid. Combined, these factors make a compelling case for ensuring that taxpayer funds for affordable housing of any kind come with an expectation of cost-effective green performance.

To be sure, additional public and private subsidies for green affordable housing remain necessary and appropriate. As demonstrated in the report, subsidies play a critical role today in advancing the use of clean and renewable technologies and supporting innovation. Grant funds have an important place in promoting an integrated planning process, ensuring commissioning and performance testing, and engaging residents in ongoing maintenance of the building and individual dwelling units. In addition, below-market and other favorable forms of public and private financing will remain vital to providing construction and permanent funding for affordable green development projects, while paving the way for more mainstream financial products.

Extend Integrated Design into Performance Monitoring

Enterprise's data collection tool was designed by leading experts, beta tested in the market, substantially revised after developer feedback and accompanied by financial incentives for developers. Yet many developers still struggled to provide basic data on energy and water usage. As noted, we received complete survey data from 27 of the 53 developers initially surveyed.

There were several primary reasons for these data-completion challenges. Affordable housing developers and owners—like developers and owners of all property types—are simply not accustomed to tracking building performance, and often lack an understanding of and access to the tools and resources needed to track performance. Additionally, unit-level data on energy and water consumption is not easily available from utilities and often not available in an easily understood format. Owners of green affordable housing must ensure that the benefits designed into the housing are realized over its lifetime. Integrating the work of professionals who operate and maintain the building with the efforts of residents can help turn the performance monitoring process into an active and ongoing effort to further enhance the building's health, economic and environmental benefits.

Without greater building science and performance literacy among affordable housing developers and owners as well as their funder and investor partners, efforts to deepen the energy savings in affordable housing will not reach their potential. The challenge requires a concerted effort by policymakers at all levels of government to mandate and create incentives for taking advantage of existing resources and investing in expanded methods for benchmarking, modeling and monitoring building performance in the affordable housing sector.

Expand Financing Approaches to Leverage Energy and Water Savings

The substantial and recent growth in the number of green affordable housing projects and the results from this evaluation strongly suggest that current, conventional capital for newly constructed and substantially rehabilitated affordable housing may be sufficient from a funding perspective to create green housing opportunities. Yet there remains a huge shortfall of capital available for the development, rehabilitation and preservation of affordable housing. Moreover, new financial products may be needed as energy efficiency targets are tied to lowering greenhouse gas emissions below current levels.

With respect to existing affordable home and developments, however, there is both the need and opportunity to finance green retrofits by leveraging cash savings from future reductions in utility bills. Our evaluation used several approaches to illustrate the cost-effectiveness and potential cost savings from green measures in affordable housing. We found that, in most cases, developers could meet the Enterprise Green Communities Criteria through approaches that paid back their costs relatively quickly.

We also found that the present value of projected financial savings from certain Criteria exceeded the cost of implementing them. The average per-unit cost of $1,917 to incorporate only the energy and water criteria would return $4,851 in predicted lifetime utility cost savings, discounted to 2009 dollars. This represents approximately a $2,900 net gain to cover the cost for other measures in the Criteria that contribute to health and environmental improvements.

Importantly, the extent to which future savings can be tapped as a source of upfront capital to make green retrofits of existing affordable housing will depend on a host of factors. These include the manner in which energy bills are paid and by whom, existing financing and current financial condition of the property, and the capacity of the owners and their partners to execute and maintain a green retrofit.

Our findings suggest that financing structures based solely on projected energy and water savings will require significant loan loss reserves, credit enhancements and/or subsidy. These requirements could be relaxed to the extent that retrofit pilot programs demonstrate the viability of add-on financing structures over time.

Full report available at
www.enterprisenextgen.org

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