



Testimony of Tony Crasi

**On Behalf of the
National Association of Home Builders**

Before the

Senate Committee on Energy and Natural Resources

“Hearing on Energy Efficiency Legislation”

April 30, 2015

Introduction

Chairman Murkowski, Ranking Member Cantwell and members of the Committee, I am pleased to appear before you today on behalf of the 140,000 members of the National Association of Home Builders (NAHB) and to share our views on the *Energy Savings and Industrial Competitiveness Act of 2015* (S. 720). My name is Tony Crasi. I am the founder and owner of The Crasi Company, and I have been designing and building custom homes in the Akron, Ohio area for the past 31 years. I also serve on the board of the Urban Neighborhood Development Corporation, a non-profit organization which seeks to improve the availability of new homes for moderate and middle-income families in urban areas.

Thank you for welcoming NAHB to this important policy discussion. As a longtime leader in the drive to make new and existing homes more energy efficient while prioritizing housing affordability, NAHB is uniquely positioned to analyze the impact of the legislation on the home building, remodeling and rental housing industries. NAHB supports many of the goals of *The Energy Savings and Industrial Competitiveness Act of 2015* and seeks to ensure that it encourages meaningful energy savings for residential construction that are achievable and cost-effective. To that end, NAHB has four specific recommendations for S.720, or any comprehensive energy bill.

First, the Department of Energy (DOE) can be an effective participant in the development of model energy codes by providing technical assistance to analyze energy savings. Section 101 improves this process by increasing transparency within DOE, but additional safeguards are necessary to prevent DOE from advocating for specific products or technologies and seeking requirements that are not proven to be cost-effective.

Next, consumers deserve a reasonable return on their investment when it comes to required energy efficiency improvements. Failure to consider the true economic costs of energy-use reductions and establish a reasonable payback period for these investments will result in fewer families being able to achieve the American Dream.

Incentive programs such as the *SAVE Act* (Section 433) encourage home owners to invest in energy efficiency by ensuring that mortgage underwriting and appraisals accurately account for savings in operating costs, and this should be included in any final energy package.

Finally, NAHB would like to see S. 1029, which addresses a flawed DOE rule on non-weatherized gas furnaces, included in any final legislation.

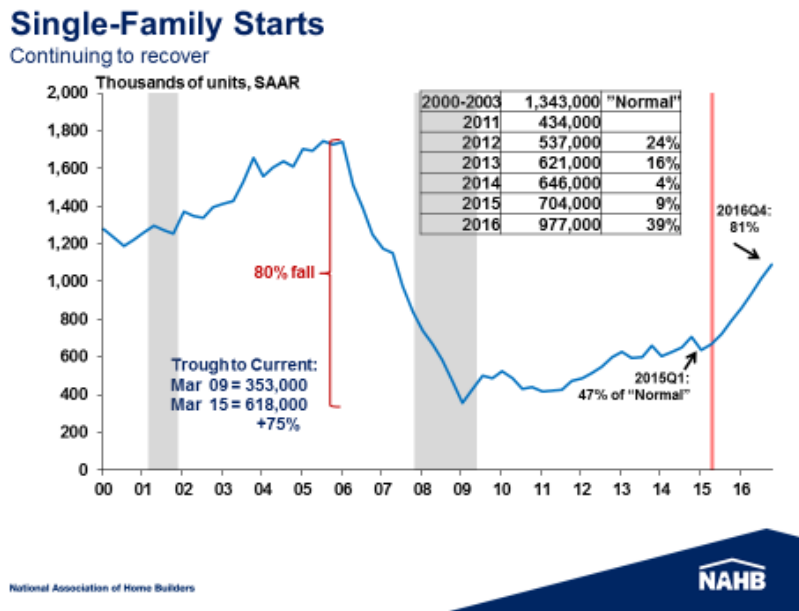
NAHB would like to thank Chairman Murkowski, Ranking Member Cantwell, Senator Portman and Senator Shaheen for being welcomed as a key stakeholder in energy efficiency policy discussions and for the opportunity to continue to work on this important legislation.

Housing Industry Background

NAHB's members build approximately 80 percent of all new housing in America each year. Collectively, we employ millions of people and generate 17% of our nation's gross domestic product.

The housing industry is just starting to come out of the worst economic downturn since the Great Depression. In order to meet the housing needs of a growing population and replacement requirements

of older housing stock, the industry should be building 1.4 million new single-family homes each year. But in 2014, home builders constructed only 648,000 single family homes. That said, the industry is improving and builder confidence is on the rise.



Energy in the Residential Sector

One of the bright spots in the housing sector is the growing demand for energy-efficient homes. New homes are considerably more efficient than older homes, and consumers want energy-efficient windows, doors and mechanical equipment.

According to the Energy Information Administration, homes built after 1999 consume only 2% more energy on average than homes built prior to 2000, even though these homes are, on average, 30% larger. In fact, heating and cooling no longer account for the majority of energy use in a home.¹

These gains are due to energy efficiency improvements in new construction. Homes built from 2000-2009 account for only 3.2% of the total energy consumption in the country, while older homes account for 19%. Because new homes are already so efficient, any significant reduction in overall energy use can only be achieved by addressing the existing building stock and occupant behavior.

¹ U.S. Energy Information Administration, Residential Energy Consumption Survey

The existing building stock comprises over 95 million rental and owner-occupied homes that were built before 1991, when modern energy codes were first established. And 80% of the buildings that exist today will still be in use in 2050.

But building retrofits can be very expensive. NAHB believes that incentive programs are an important tool to reduce the barriers of high initial costs and encourage more home owners to invest in energy efficiency. Tax incentives see the fastest results and are the most effective at advancing energy efficiency improvements. Sections 25C for qualified improvements in existing homes (building components), 45L for new homes and 179D for commercial buildings have permeated the market and assisted many families and building owners invest in efficiency. NAHB estimates that for every \$100,000 spent on remodeling, 1.11 full-time equivalent jobs are created. The remodeling activity generated by the 25C tax credit in 2009 was associated with over 278,000 full-time jobs. Unfortunately because these tax incentives keep expiring and being retroactively renewed, the positive impact of these incentives have decreased since 2011.

Occupant behavior is also a growing factor in energy consumption. Electricity use (not including space heating and cooling) accounts for over 70% of energy use, irrespective of when a home was built. The energy-use impact of items purchased by occupants after a home is built can be twice as large as the impact of items typically installed by a builder like windows and insulation. Leaving the television on, doing laundry, running the dishwasher, and even working from home can all drastically increase energy use in a home. Congress should examine education programs and other policies aimed at encouraging consumers to use energy more wisely. One example is the budget-neutral Tenant Star program, which Congress just sent to the President's desk and recognizes tenants who decrease their energy use.

NAHB Green

NAHB is leading the way to improve energy efficiency in the residential sector for new and existing homes. NAHB launched the development of a green building standard for residential buildings now known as the ICC 700 National Green Building Standard (NGBS). The NGBS is an affordable yet rigorous standard that applies to all types of residential buildings, from single-family homes to multifamily buildings of all sizes, retrofits and land development. It focuses on energy efficiency, water conservation, resource conservation, indoor environmental quality, site design and home owner education and is the basis of a national certification program administered by the Home Innovation Research Labs. This rigorous certification requires buildings to improve in every category to achieve a higher certification level. The NGBS is also the first and only residential green building standard approved by the American National Standards Institute (ANSI), which guarantees that the NGBS was developed using a true consensus process.

NAHB is also working to educate builders on new green design and construction practices through webinars, in-person courses offered during the International Builders' Show and at our state and local home builder associations and two professional designations. Earning the Certified Green Professional (CGP) and the Master Certified Green Professional (Master CGP) credentials requires continuing education green building science and methods and a commitment to incorporate green building principles into homes.

The Energy Savings and Industrial Competitiveness Act of 2015 (S. 720)

These sections detail the provisions in S. 720 that directly impact the housing industry.

Section 101 – Greater Energy Efficiency in Building Codes

Model building energy codes such as the International Energy Conservation Code (IECC) are used across the country to establish minimum standards for building energy efficiency. The codes are developed by private entities, updated every three years, and are adopted by state and local governments. Once adopted by a state or locality, the code becomes a baseline requirement for all buildings in that jurisdiction.

Department of Energy Technical Assistance

While it does not write or publish the codes, the Department of Energy (DOE) participates in the development of model building energy codes by providing technical assistance—needed building science research, energy modeling and analysis that only DOE can provide. But NAHB has concerns that “technical assistance” has been broadly interpreted to allow representatives from DOE to advocate for or against certain technologies, picking winners and losers and seeking aggressive and costly requirements.

Some businesses have realized that by inserting specific products into the code, they can require the use of their products and increase their profits. Instead of allowing the builder to make decisions in the interest of the buyer, the energy codes dictate specific construction methods and which products to use. In addition, DOE has attempted to hire individuals or a firm to provide advocacy assistance. While this has since halted, it is an example of inappropriate advocacy on the part of DOE.

For example, in the 2012 IECC, DOE proposed to prescriptively require foam sheathing, a specific type of insulation. This proposal eliminated the ability to use more cost-effective construction materials and methods. Conversely, DOE did not support an NAHB proposal that would have increased flexibility by allowing builders to trade off efficiency measures—wall insulation, for example—provided they install more efficient mechanical equipment.

Section 101 of S. 720 makes some key improvements in the development of model building energy codes by requiring DOE to publish energy savings targets and supporting analysis in the Federal Register and setting some of the guidelines by which DOE operates in this context. This will go a long way towards increasing transparency and ensuring that the public is heard. NAHB would like to see this legislation include additional safeguards to prevent DOE from crossing the line into “advocacy” and ensure a more cost-effective residential building code.

Cost-effectiveness

Another unfortunate trend in energy codes is the failure to consider true economic costs when seeking further energy use reductions. I am a licensed energy rating professional; I know how to build green homes. I know how valuable the energy savings are to the consumer, but even with these savings, there is a significant, upfront investment.

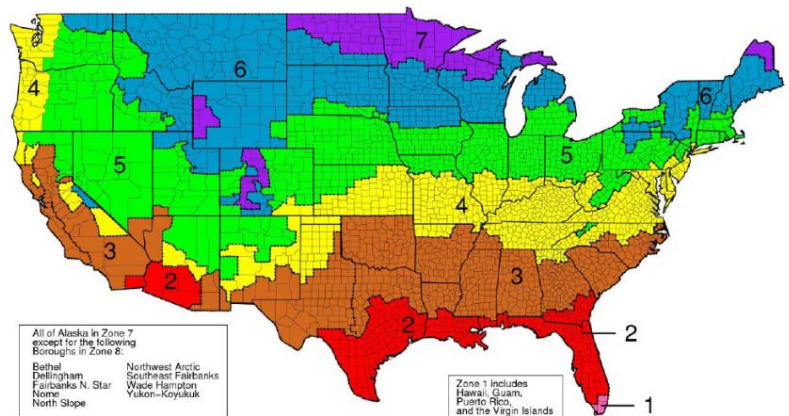
Meeting an energy code is a requirement for every single home, including low-income housing and homes for first-time home buyers. Increasing housing costs for all home buyers will have the unintended consequence of reducing housing affordability. For every \$1,000 increase in the price of a

home, 246,000 households will be priced out of mortgage eligibility for a 30-year, fixed-rate mortgage with a 5% interest rate.

According to an NAHB market report, *What Home Buyers Really Want*, buyers are willing to pay for lower utility costs, but need a 14 percent return, which corresponds to a 7-year payback. Budget-conscience first time home buyers require a 5-year payback period (attached). The 2012 version of the IECC had such significant cost increases that it would take the average family 13.3 years just to break even. Some climate zones saw payback periods in excess of 16 or 17 years (see graphic below). The average home owner does not stay in their home for this long and will never realize a return on their investment. DOE typically analyzes cost-effectiveness over the life of the building, which they define as 30 years. Some energy efficiency advocates argue that the code should reflect a 30-year payback period, but this is simply not realistic.

Table 8: 2012 IECC Cost Effectiveness Relative to 2009 IECC

Climate Zone	Annual Energy Savings	Incremental Construction Cost	Simple Payback (yrs)
1	\$206	\$3,224	15.7
2	\$294	\$3,330	11.3
3	\$470	\$7,203	15.3
4	\$410	\$7,091	17.3
5	\$505	\$4,653	9.2
6	\$397	\$6,399	16.1
7	\$609	\$6,465	10.6
8	\$725	\$6,465	8.9
National Weighted Average	\$427	\$5,668	13.3



2012 IECC Cost Effectiveness Analysis -

<http://www.homeinnovation.com/~media/Files/Reports/Percent%20Energy%20Savings%202012%20IECC%20Cost%20Effectiveness%20Analysis.PDF>

The commercial building sector requires an even shorter return on investment in order to bring the cost in line with commercial leasing structures (10 years or less). Many lenders require strict return on investment analyses. A Turner Construction Report, “2012 Green Building Market Barometer,” indicated that 65% of commercial developers expect a payback period of 5 years or less (attached).

A DOE report prepared by the Pacific Northwest National Laboratory, *Assessing U.S. ESCO Industry Performance and Market Trends: Results from the NAESCO Database Project*, found that, in the context of Energy Service Companies (ESCOs), while institutional buildings can withstand a 7-year payback period for energy efficiency improvements, private, commercial buildings can only withstand a 3-year payback (attached). DOE’s own report acknowledges that a return on investment is critical for any investments in energy efficiency.

With an aging infrastructure and building stock, more American families are going to be relegated to living and working in less-efficient homes and buildings.² As the housing market begins to recover, home buyers will be facing dramatically different mortgage qualification requirements and financing issues than before the downturn. The reality is that the oldest, least-efficient homes are the most affordable to families with low to moderate incomes. Unfortunately, these families also bear the largest burden in energy costs as a percentage of income.³ Home energy use comprises about 17% of total housing costs, and about 9% of the total income for families that earn less than the national median household income. NAHB believes that any mandated energy efficiency measure should have a simple payback period of 10 years or less.

Section 433 – Enhanced Energy Efficiency Underwriting (SAVE Act)

The availability of green homes, both new and remodeled, has resulted in meaningful utility bill savings for many families. Energy efficient homes are also safer investments. A study conducted by the University of North Carolina – Center for Community Capital, and funded by the Institute for Market Transformation, found that energy efficient homes have lower default risks - on average 32 percent lower, even when accounting for loan determinants.

One of the major barriers for builders choosing to invest in green construction is that appraisers unfamiliar with green construction often neglect to include the true value of this investment in their valuations. As a result, “green” homes, which can cost the consumer less money in utility bills and long-term operations/maintenance costs, do not always reflect the increase in construction costs or value of these future savings. Unfortunately this has turned some builders away from this market.

That is why NAHB supports inclusion of the *SAVE Act* in any final energy package. Originally introduced by Senators Johnny Isakson and Michael Bennet and included in S. 720, this legislation provides guidance to the Department of Housing and Urban Development (HUD) to update underwriting and appraisal guidelines to ensure they more accurately reflect the economic benefits of green features.

Further, home owners or home buyers would be able to voluntarily obtain an energy efficiency report and supply that to a lender for use in certain mortgage calculations. Utility savings could be factored into the debt-to-income qualifying ratio, which tests a borrower’s ability to make monthly payments, and the present value of expected energy savings could be included in the loan-to-value ratio. In some parts of the country, utility bills can be higher than the interest or taxes paid on the mortgage, yet they are not currently factored into these calculations.

The *SAVE Act* is a voluntary program that will not only ensure more accuracy in mortgage underwriting and appraisals, but will have a transformative effect in encouraging energy efficiency across the residential sector. NAHB strongly supports its inclusion in the final energy package.

DOE Proposed Rule on Furnace Efficiency

² The average age of an owner-occupied home in the U.S. is now 35 years and climbing. See the following NAHB analysis for more detail (“An Aging Housing Stock,” Eye on Housing blog, <http://eyeonhousing.org/2014/01/20/the-aging-housing-stock/>)

³ CES, 2010

While not included in S. 720, legislation has been introduced by Senators John Hoeven and Lamar Alexander (S. 1029) that addresses the recently proposed DOE rule for residential non-weatherized gas furnaces and mobile home furnaces. This legislation would require DOE to convene a representative advisory group of interested stakeholders to help analyze the impacts of the proposed rule and determine whether it is technically feasible and economically justified, and if not, participate in a negotiated rulemaking.

This is needed because the rule, as proposed, is not cost-effective in the southern U.S. Homes in the warmer southern climate use much less heat throughout the year. Unfortunately, DOE used a nationwide cost-benefit analysis to determine whether this rule is economically justified, and this neglects the low energy savings that would be achieved in the south.

Additionally, this rule would eliminate the availability of non-condensing furnaces, which can complicate the replacement of these furnaces in existing homes across the country. Replacing a non-condensing furnace with a condensing furnace will require remodeling to re-route the exhaust system, and this could potentially cost homeowners hundreds, if not thousands, of dollars. This type of retrofit may also be impossible or even illegal in some existing town homes and multifamily structures. Replacing a furnace after a break would also take significantly more time and money. For these reasons, NAHB believes that S. 1029 will help DOE better understand market realities and hopefully result in a more effective rule. NAHB urges the committee to consider this legislation and support its inclusion in the final energy package.

Conclusion

NAHB wants to work as a partner with all levels of government to encourage energy efficiency, however, we must also make sure that any mandates are cost-effective and do not jeopardize housing affordability. NAHB looks forward to working with the committee to improve and ultimately advance this important legislation. Thank you once again for this opportunity.

Chapter 10

Impact on the Environment, Utility Costs & Energy Efficiency

Builders, architects, and product manufacturers, among other housing industry professionals, often want to know if home buyers are concerned about the impact of building their home on the environment, and if so, what is the level of their concern. The answers have important, practical implications on how a home is built and what products and materials are used in its construction.

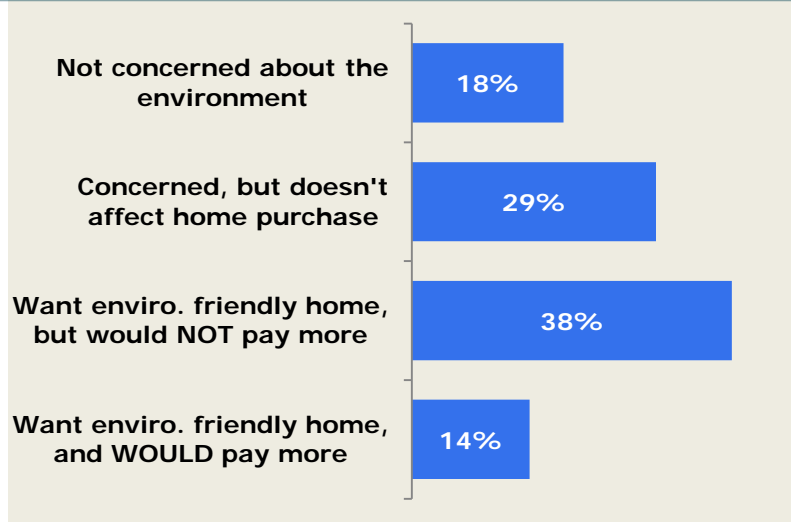
Questions about the environment can be asked in several forms. The 2012 NAHB survey asked buyers about their general attitude toward the environment and how it impacts their purchase decision, how important low utility costs are and have been to them, how much they would be willing to pay up-front for lower utility costs in the future; and, finally, how desirable they find particular environment-friendly amenities.

Concern About the Environment Doesn't Mean Home Can Cost More

As Exhibit 10-1 shows, although the majority of home buyers are concerned about the environment in general, most are not willing to pay more for a “greener” house. In fact, 38 percent of home buyers report wanting an environment friendly home, but would not pay more for it. Another 29 percent are concerned about the environment, but don't take this into consideration when buying a home. On either side are relatively small shares of buyers at the extremes: 18 percent who are not at all concerned about the impact of building their home on the environment and 14 percent who are not only concerned but would actually pay more for the house to reduce its impact on the environment. Home buyers have rather similar attitudes about the environment irrespective of their age,

Exhibit 10-1 Buyer Concern About Impact of Their Homes on the Environment

(Percent of Respondents)



geography or race.

However, more buyers—24 percent—expecting to pay at least \$500,000 would be willing to spend more for a home that is environmentally friendly. Appendix A shows a detailed demographic breakdown of the question on environmental concern, beginning on page A-34.

History shows that there has been a noticeable shift away from taking environmental impacts into account when buying a home. In 2004, 36 percent of buyers said either that they

Exhibit 10-2 Concern About Impact of Home on the Environment - History

(Percent of Respondents)

	2004	2007	2012
Not concerned about the environment	10	13	18
Concerned about the environment, but not a consideration in house purchase	26	24	29
Want environment friendly home, but would NOT pay more	48	45	38
WOULD pay more for environment friendly home	16	17	14

were not concerned at all about the environment, or that it was not a consideration in their choice of a home. By 2012, this share had increased from 36 to 47 percent (Exhibit 10-2).

Buyers Do Want to Know the Home’s Projected Utility Costs

Demand for energy saving features can be driven not only by general concern about the environment, but also by a desire to achieve lower ongoing utility costs. The “What Home Buyers Really Want” survey included a question that asked buyers the extent to which they agreed with three statements about utility costs on a

scale of 1 to 5, where 1 is “strongly disagree” and 5 is “strongly agree.”

A little over three-quarters of buyers agree to strongly agree (rating it 4 or 5) with the general statement that “knowing the projected utility costs of a home is very important (Exhibit 10-3). Only 5 percent rate this statement as low as a 1 or 2 (Appendix A-40).

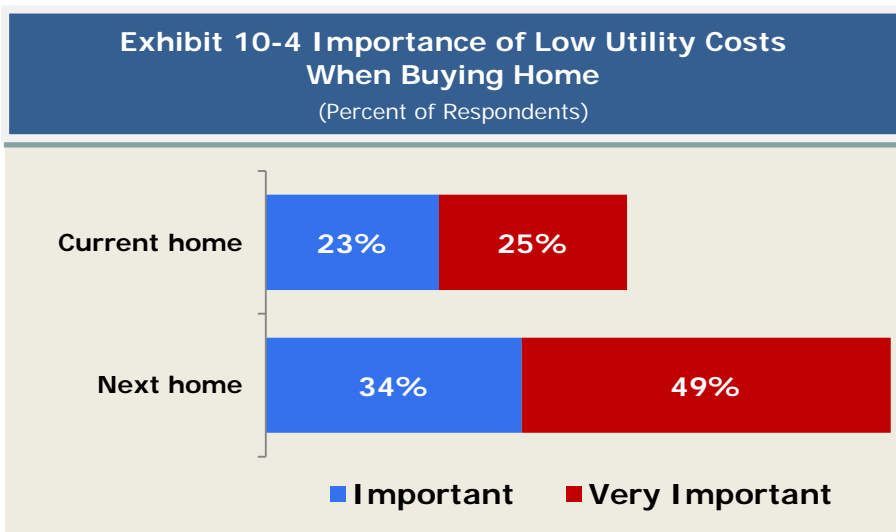
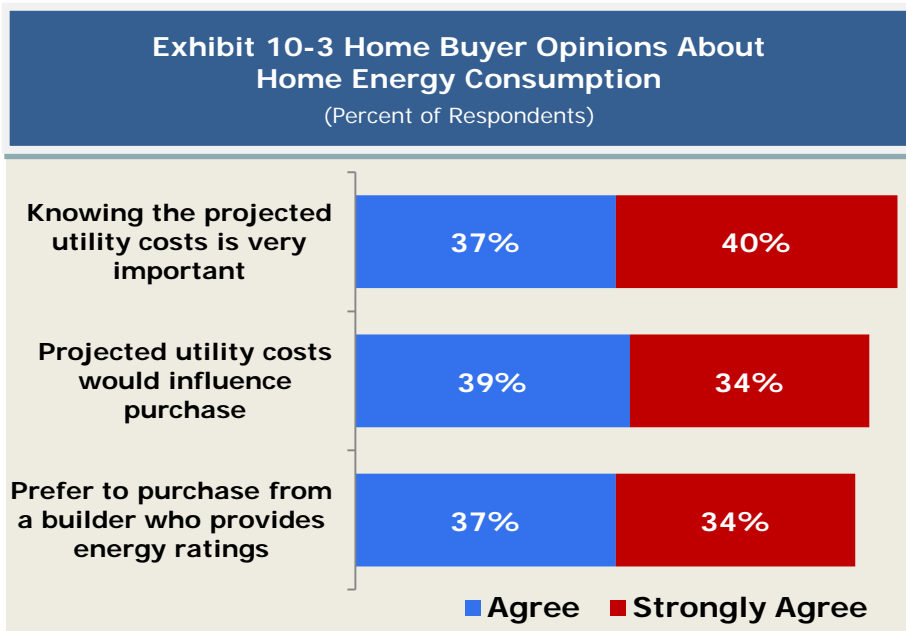
For nearly as many buyers, projected utility costs are important enough to influence their purchase decision (73 percent agreeing with the statement enough to rate it a 4 or 5). Just over 70 percent of buyers agree or strongly agree that they would prefer to purchase a home from a

builder who provides energy ratings. (The question explained that a home energy rating gauges the energy efficiency of a home much like a miles-per-gallon reading measures gas efficiency for a car.)

Buyers of different ages, geographic areas, income, and racial groups all provided rather similar responses to this multi-part question (Appendix A, pages A37-A42).

The survey also investigated if attitudes toward utility costs have changed since the last time owners bought a home, asking them to rate how important low utility costs *were* at the time they bought their current home, and *will be* when they buy their next one. Again, the rating was done on a scale of 1 to 5. In this question, 1 was defined as “not at all important” and 5 as “very important.”

The results show that home buyers attach much more importance to having low utility costs in their next home than



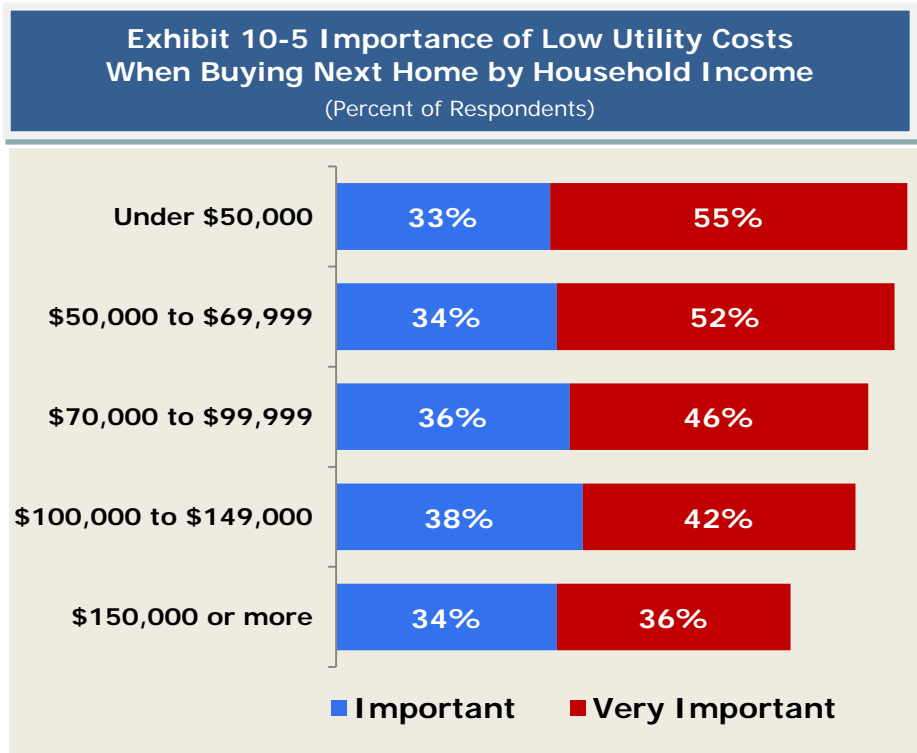
they did when choosing their current one. More than 8 out of 10 buyers (83 percent) rate having low utility costs in their next home important to very important (i.e., a rating of 4 or 5), compared to only 48 percent who consider low utility costs this important when buying their current home (Exhibit 10-4). On average, home buyers rate the importance of low utility costs when choosing their current home a 3.4, while for their next home the average rating is 4.3.

There are significant differences in how much importance buyers attach to low utility bills, depending on their income level. Among buyers who earn less than \$50,000 a year, 88 percent rate low utility costs a 4 or 5 on the importance scale when buying their next home, with 55 percent giving it the maximum rating of 5. The very important share declines steadily as income rises, however, to 36 percent among those earning \$150,000 or more (Exhibit 10-5).

More breakdowns on the importance of low utility costs to various types of buyers are shown in Appendix A, starting on page A-37.

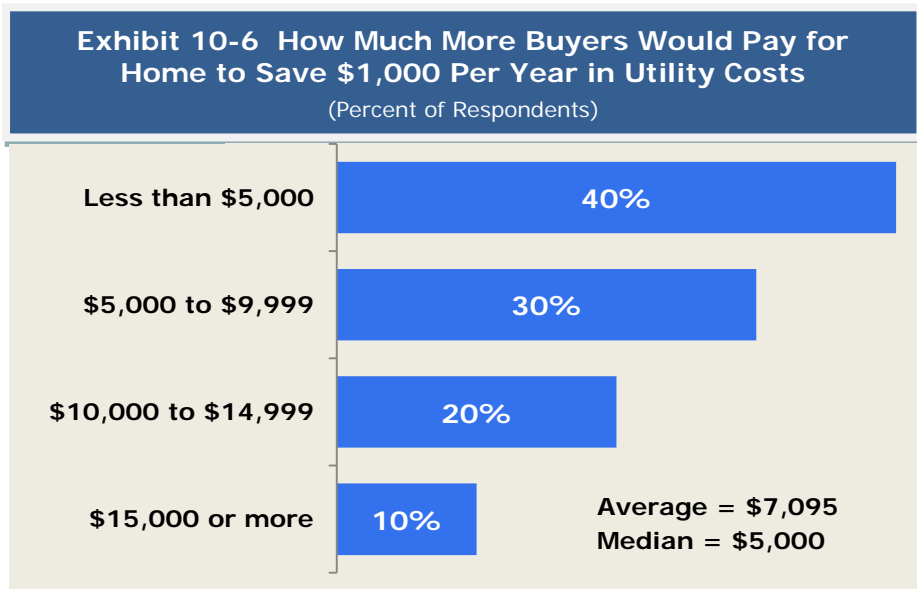
Buyers Will Pay More for Lower Utility Costs, but Want a 14 Percent Return

So far in this chapter, we've seen that most buyers are quite concerned about the cost of utilities in the homes they intend to purchase—often to the point of agreeing that they prefer to buy from a builder providing home energy ratings. In the previous chapter, we've seen that a large majority of buyers



are, in fact, willing to pay more for a home to achieve an unspecified reduction in utility bills over the life of the home (Exhibit 9-6).

This still leaves the question of how much more buyers will pay up front in the cost of the home to achieve a specific dollar reduction in annual utility bills. For many years, a standard feature of NAHB consumer surveys has been a question on how much extra buyers would pay up



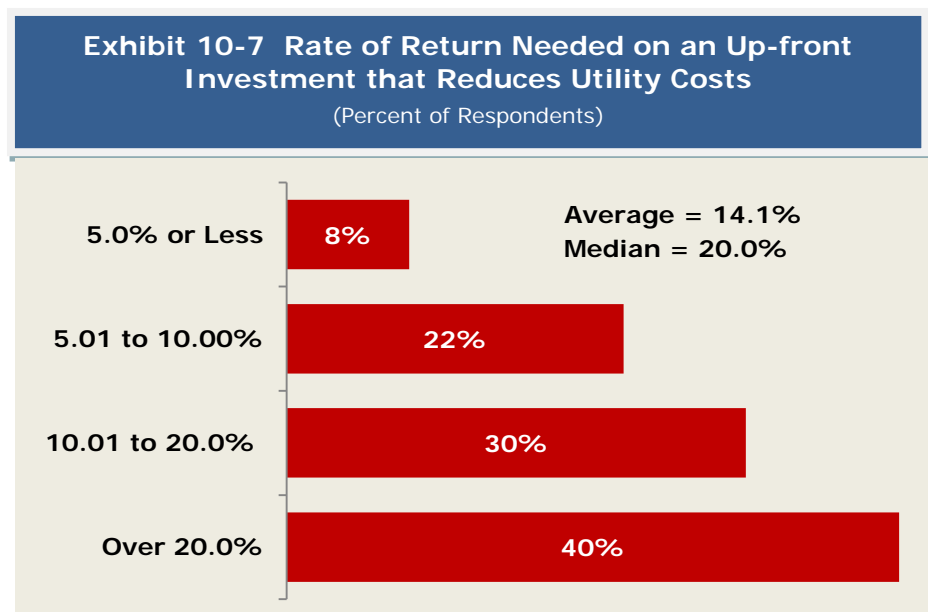
front, in the purchase price of their next home, if it would save \$1,000 every year in utility costs. That question was included again in the 2012 survey.

Answers show that, in 2012, 40 percent of buyers would pay less than \$5,000 extra for a home to save \$1,000 per year in utility bills, 30 percent would pay between \$5,000 and \$9,999, and another 30 percent would pay \$10,000 or more (Exhibit 10-6).

On average, home buyers would pay an average of \$7,095, and a median of \$5,000, to save \$1,000 annually in utility costs. On the survey, this is phrased as an open ended question that allows buyers to write in any dollar amount they want. Although some write in specific numbers with a perhaps odd looking combination of digits (e.g., \$4,762), there is a tendency to answer in round numbers. Over a quarter of respondents wrote in \$5,000 and nearly 20 percent wrote in \$10,000. The relatively high share writing in \$5,000 tends to make the median stable (unlikely to vary much across subgroups in the population) at that level.

Some buyers said they were willing to pay a lot to achieve a \$1,000 reduction in utility bills, all the way up to \$100,000 more for the home (a few cases where buyers said they were willing to pay more than that were deleted as unrealistic, possibly signaling respondent error in counting the number of zeros in their answers). Buyers like these pull the average of \$7,095 above the median of \$5,000.

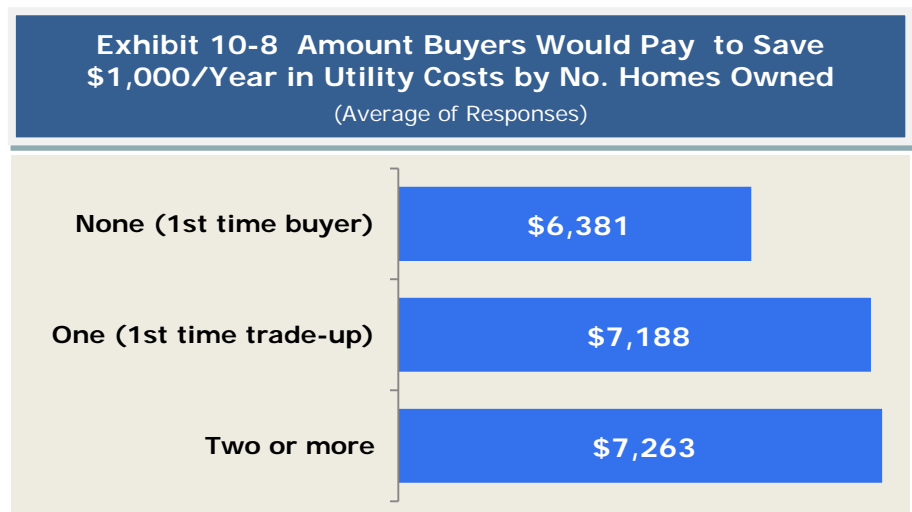
Some may find it more convenient to flip the question and answer around and evaluate the information in terms of a rate of return on the



upfront investment. If a buyer is willing to pay less than \$5,000 up front to save \$1,000 per year, it means the buyer needs a return of over 20 percent on the investment. The average rate of return buyers need on an investment in energy efficiency (or something else that reduces utility bills) is 14.1 percent, and the median is 20 percent (Exhibit 10-7).

First-time, Lower-income Buyers Will Pay Less to Reduce Utility Costs

The survey results also show that first-time home buyers are willing to spend less up front for lower utility bills. Buyers who have never owned a home before are willing to pay



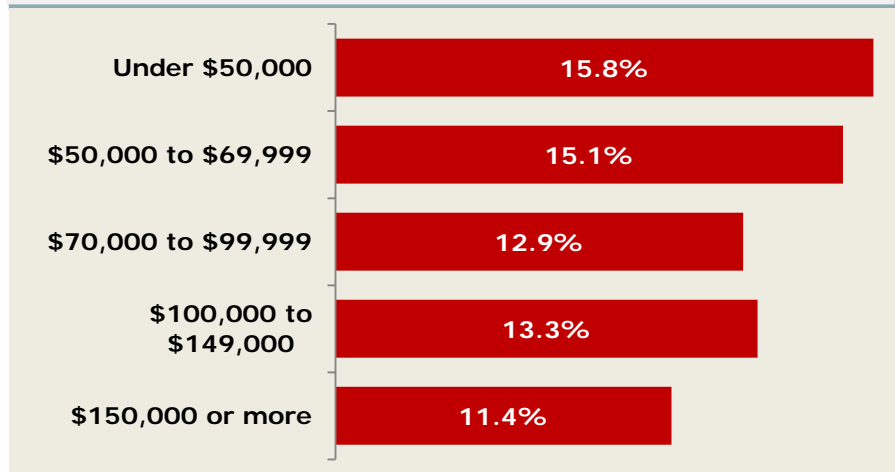
\$6,381 on average for a \$1,000 per year reduction in utility bills, compared to over \$7,000 for those who have owned a home before (Exhibit 10-8). This result is not surprising, given that first-time buyers lack equity in a previously owned home that they can use for a down payment, and tend to have a more difficult time qualifying for a mortgage, making the up-front increase in cost difficult to withstand.

Homes buyers with lower incomes are also likely to have a more difficult time qualifying for a mortgage, and consequently a lower tolerance for higher up-front costs. This shows up in a higher rate of return needed on an investment that will save \$1,000 a year in future utility costs. Buyers earning less than \$70,000 a year need over 15 percent on average; buyers with incomes in the range of \$70,000 to \$149,999 range need about 13 percent; and buyers with incomes of at least \$150,000 need 11.4 percent (Exhibit 10-9).

The Appendix contains additional breakdowns on pages A-34 to A-36. The average amount buyers are willing to pay up front to save \$1,000 in annual utility costs is under \$10,000 for every Division, age or income bracket, household type, house price, generation, or racial/ethnic category considered in the appendix—with the single exception of buyers expecting to pay half a million dollars or more for the home, who are willing to pay an average of \$10,343. The median is exactly \$5,000 for every one of these groups, except for the West South Central Census Division, where it is \$4,000.

Between 2004 and 2007, the average amount buyers were willing to pay up front for energy efficiency (or

Exhibit 10-9 Rate of Return Buyers Need on a Utility Cost Saving Investment by Household Income
(Average of Responses)



other utility cost reducing measures) increased from just over \$7,000 to almost \$9,000, but this trend reversed itself in 2012 (Exhibit 10-10). Generally, the only group willing to accept less than a 10 percent return on an energy efficiency

Exhibit 10-10 How Much Buyers Are Willing to Pay for Reduced Utility Costs – History
(Average of Responses)

	2004	2007	2012
A. Price they'd pay up front to save \$1,000 per year (\$)			
All buyers	7,073	8,964	7,095
First-time buyers	6,588	10,081	6,381
First-time move-up buyers	6,935	9,506	7,188
2nd-time+ move-up buyers	7,304	8,308	7,263
By price buyers expect to pay for the home:			
Less than \$150,000	5,925	8,274	6,423
\$150,000 to \$249,999	7,234	7,234	6,171
\$250,000 to \$499,999	7,877	9,964	8,036
\$500,000 or more	7,742	11,477	10,343
B. Annual return needed on the up-front investment (%)			
All buyers	14.1	11.2	14.1
First-time buyers	15.2	9.9	15.7
First-time move-up buyers	14.4	10.5	13.9
2nd-time+ move-up buyers	13.7	12.0	13.8
By price buyers expect to pay for the home:			
Less than \$150,000	16.9	12.1	15.6
\$150,000 to \$249,999	13.8	13.8	16.2
\$250,000 to \$499,999	12.7	10.0	12.4
\$500,000 or more	12.9	8.7	9.7

investment is the one expecting to pay \$500,000 or more for a home. In 2007, first-time buyers were willing to invest in energy efficiency for a return of just under 10 percent, but this appears to be an anomaly and was not confirmed by more recent data.

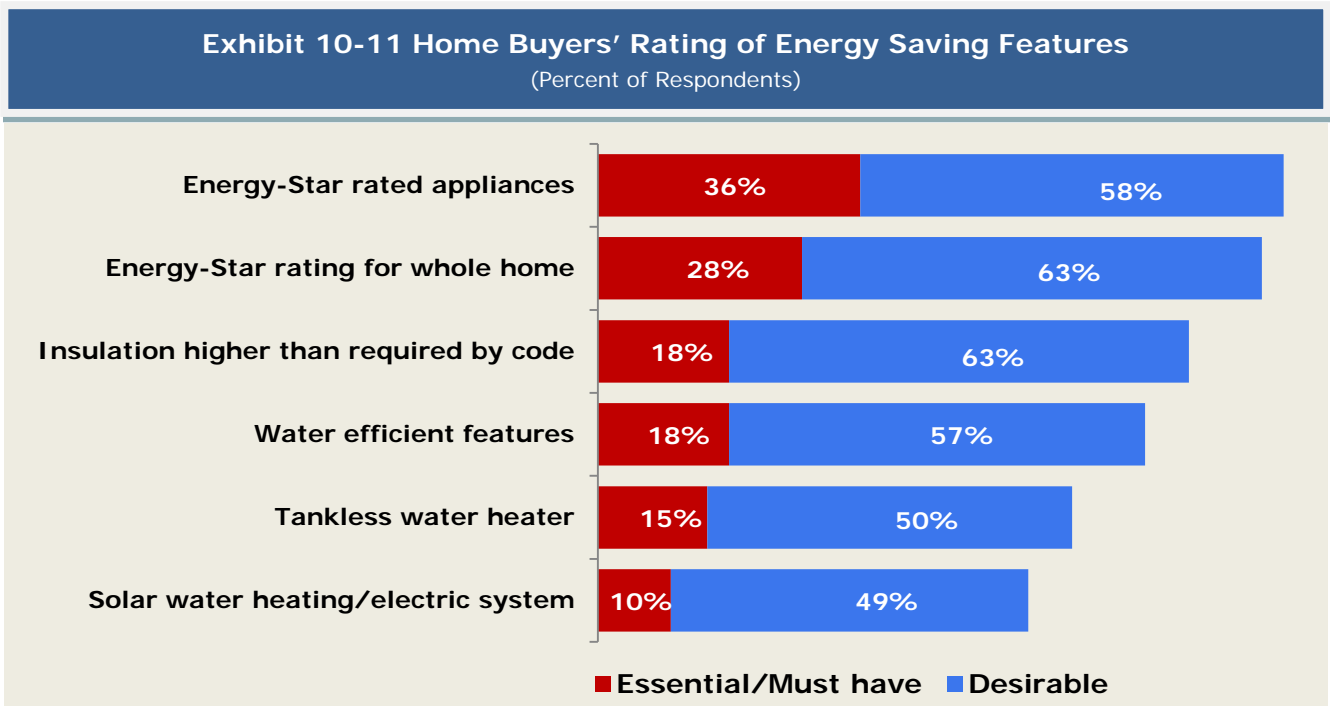
Home Buyers Give Energy-Star High Marks, Especially for Appliances

So far, we’ve seen that most buyers want an energy efficient home, and on average would pay an additional \$7,100 up front if it would save them \$1,000 a year in utility costs. In other words, buyers want energy efficiency, but apply a fairly stringent cost-effectiveness requirement when deciding on specific energy efficiency investments. A related question is what specific characteristics home buyers believe will tend to deliver energy efficiency in this cost-effective fashion.

To investigate this, the survey asked home buyers to rate six energy-saving or green features on a scale of essential, desirable, indifferent, or “do not want.” As first described back in Chapter 3, essential means the buyer is

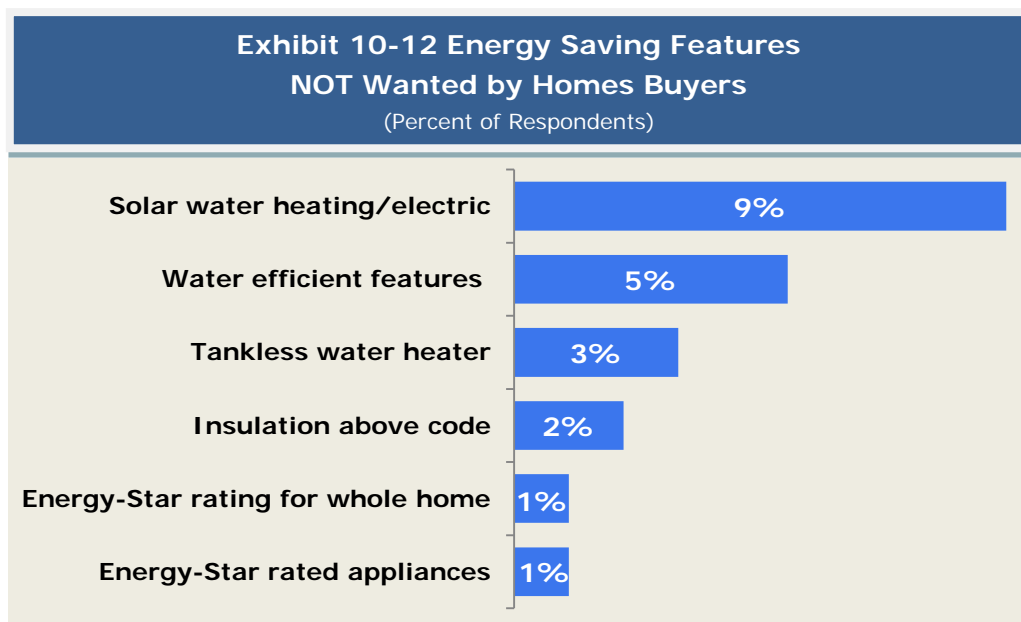
unlikely to buy a home without feature; desirable implies buyer would be seriously influenced to buy because feature is included; indifferent means feature would not influence purchase decision; and “do not want” means the buyer is not likely to buy a home if it has this particular feature.

Energy-Star rated appliances came in at the top of the list (Exhibit 10-11). A full 94 percent of home buyers said that Energy-star appliances are at least desirable, and of these 36 percent consider them essential. Next on buyers’ wish list is an energy-star rating for the whole home, with 91 percent rating it as desirable or essential. All energy-saving features on the list are rated as desirable or better by well over half of buyers. Insulation higher than required by code is rated this highly by 81 percent of buyers, followed by water-efficient features (75 percent), a tankless water heater (65 percent), and a solar water heating/electric system (59 percent). There are no significant preference differences for these features among buyers of different ages, incomes, or any of the other variables shown in Appendix A (pages A-88 to A-90).



As noted in earlier chapters, it is important for builders to know about features that buyers say will prevent them from purchasing a home. When it comes to energy saving features, however, few buyers show this level of antipathy. Fewer than 10 percent of buyers are willing to say they will expressly reject a

home simply because it has one of the green or energy-saving features in the survey. At the extreme, 9 percent say they do not want a home with a solar water heating/electric system. For the other five energy saving features, the “do not want” percentages are even smaller than this (Exhibit 10-12).



In conclusion, to summarize a few of the more important points in this chapter:

- In 2012, only 14 percent of home buyers are willing to pay more for a home out of pure concern for the environment
- However, a large majority of buyers think low utility costs are important and are willing to pay more up front to achieve lower utility costs in the future.
- To persuade them to make these utility cost saving investments, most buyers require a substantial rate of return—an average of 14 percent and a median of 20 percent across all buyers, the same in 2012 as it was in 2004.
- Home buyers with lower incomes are more likely to say low utility costs are important, but are willing to pay less up front to achieve the ongoing, annual savings.
- Among specific energy saving features, buyers see Energy-star ratings as highly desirable, especially for appliances.

Assessing U.S. ESCO Industry Performance and Market Trends: Results from the NAESCO Database Project

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ABSTRACT

The U.S. Energy Services Company (ESCO) industry is often cited as the most successful model for the private sector delivery of energy-efficiency services. This study documents actual performance of the ESCO industry in order to provide policymakers and investors with objective information and customers with a resource for benchmarking proposed projects relative to industry performance. We have assembled a database of nearly 1500 case studies of energy-efficiency projects – the most comprehensive data set of the U.S. ESCO industry available. These projects include \$2.55B of work completed by 51 ESCOs and span much of the history of this industry.

We estimate that the ESCO industry completed \$1.8-2.1B of projects in 2000. The industry has grown rapidly over the last decade with revenues increasing at a 24% annualized rate. We compare typical project characteristics, energy savings, and economics in institutional and private sector market segments. ESCOs typically invested about \$2.30/ft² per project in various energy efficiency improvements, although there is large variation in project costs across market segments. We find that lighting-only projects report median electricity savings of 47% of targeted equipment consumption; the median for lighting-&-non-lighting projects is 23% of the total electric bill baseline. Median simple payback time is seven years for institutional sector projects and three years in the private sector. We estimate direct economic benefits of \$1.62 billion for the 1080 projects in our database with both cost and savings data. The median benefit/cost ratio is 2.1 for 309 private sector projects and 1.6 for 771 institutional sector projects. Finally, we discuss the role of enabling legislation and policies, including ratepayer-funded energy-efficiency programs, in encouraging ESCO industry growth.

Introduction

A large private sector energy-efficiency services industry has developed in North America over the last 20 years whose primary business is performance contracting. Today, over sixty national and regional Energy Services Companies (ESCOs) are actively operating in the U.S. Utilizing savings from investments in high-efficiency equipment, these companies work to provide solutions to customer needs, including facility and equipment modernization, reduced utility expenses, reliable power and improved control over facility operation and comfort.

The U.S. ESCO industry has attracted the interest of federal, state, and international policymakers interested in promoting successful models for energy efficiency. Although much has been written about the U.S. ESCO industry, few studies have relied on key

underlying empirical data – the track record of ESCOs in developing projects – in order to assess trends in ESCO market activity over time as well as actual project performance and economics from the customer’s perspective. This project, a collaborative effort of the National Association of Energy Service Companies (NAESCO), an industry trade association, and Lawrence Berkeley National Laboratory (LBNL) attempts to fill that gap by developing a large database of projects completed by ESCOs.

This database of ~1500 projects represents an investment of \$2.55B by 51 companies. Preliminary results from the LBNL/NAESCO database were first reported in Goldman et al (2000). The database has nearly doubled in size since that initial study. We have analyzed this more extensive project data and conducted a survey of active ESCOs in order to develop a comprehensive, historical “snapshot” of the ESCO industry (Goldman et al 2002). This report includes more detailed information than the initial publication on project characteristics, costs, and energy savings, as well as an analysis of project economics from the customer’s perspective and estimates of historic and current ESCO industry market activity. Overall goals of the project are to provide objective information on ESCO market and industry trends and to analyze the impact of enabling policies that facilitate broad customer access to energy-efficiency services from private sector providers.

Approach

Most project information was provided by ESCOs as part of NAESCO’s voluntary accreditation process. State agencies that administer performance-contracting programs in the institutional market also submitted ~275 projects for our database. Our sample includes projects completed in 45 states between 1982 and 2001 by ESCOs for whom performance contracting is a core part of their business, although the database is not limited to performance-contracting projects. We reviewed project data and worked with individual ESCOs and state agencies to ensure data quality and accuracy. Project information provided by ESCOs has been verified through a peer review process and customer reference checks of a subset of projects. We also estimated aggregate industry size by interviewing ESCOs and industry experts to determine the portion of the industry represented by our sample.

Our database is not necessarily representative of the entire energy-efficiency services industry because of our data collection process and because ESCOs self-select projects to submit. ESCOs that want to be accredited by NAESCO submit an application every 2-3 years, which includes information on up to 50 energy-efficiency projects completed in the preceding 42-month period. The extent to which these projects represent the ESCO’s total business varies with the size of the company. For smaller ESCOs, the database typically includes all of their performance-based projects, while for larger ESCOs, the database includes a self-selected sample. Note that not all of the 1500 projects in the database have complete information in all data fields, so where appropriate we indicate sample sizes when reporting analysis results.

Aggregate ESCO Industry Activity

Several previous studies have characterized the market for energy efficiency or energy services and estimated industry activity or market potential. Different sampling methods and definitions of industry scope have been used, with dramatically different results

(Cudahy and Dreessen 1996; Easton Management Consultants and Feldman 1999; Frost & Sullivan 1997). In estimating aggregate ESCO industry activity, we decided to focus on energy-efficiency and other value-added services and have excluded revenues from electric or gas commodity procurement. We collected information on market activity of 63 companies that have national or regional operations in the energy-efficiency services industry. Companies that do not offer performance contracting were excluded from our survey, although ESCOs did not have to offer performance-contracting services exclusively. We used various methods to collect this information, including interviews with NAESCO member companies (N=20) and financial information on individual ESCOs from state agency program RFQs (N=17). We also surveyed several industry experts through a modified delphi approach in order to develop high and low estimates of historic and current market activity of 26 other companies that were identified as ESCOs.

Industry Revenues Reached ~\$2Billion/year in 2000

Figure 1 shows our low and high estimates of ESCO industry activity between 1990 and 2000. We estimate that ESCO market activity for various energy-efficiency related services ranges between \$1.8B and \$2.1B in 2000. The industry has experienced rapid growth during the last decade with aggregate revenues increasing at a 24% annualized rate. Growth has slowed since 1996, with 9% annualized revenue growth over the period 1996-2000. Factors that may explain slower growth rates include the relative maturity and saturation of performance contracting in the institutional market, the upheaval and uncertainties created by electricity restructuring and retail competition in various states, reduced spending on ratepayer-funded energy-efficiency programs, and competition from new entrants such as retail energy service companies. We estimate that 13 companies with annual revenues over \$30 million (M) account for ~75% of total industry activity.

In our high estimate, performance contracting as a fraction of these 63 companies' total activity has dropped from 74% (1995 and earlier) to 57% (1996-2000). The size of the performance-contracting market ranges between \$0.9B and \$1.2B in 2000. These results suggest that performance contracting may not be the primary source of future growth for the ESCO industry, but rather that revenue growth may hinge on successful development of energy-efficiency related value-added services that build on ESCO core competencies.

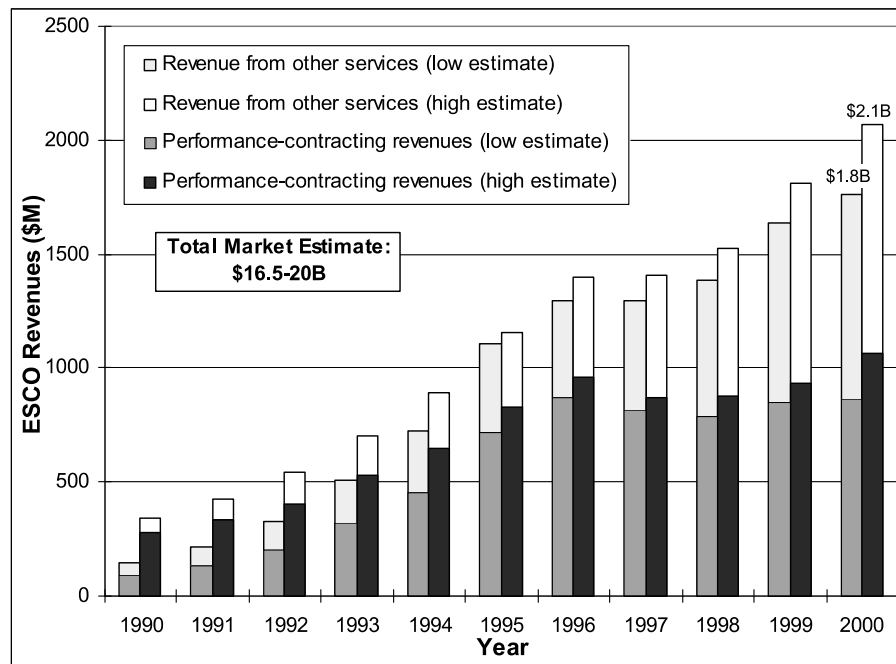
We believe that the \$2.55B in investment represented by the ~1500 projects in our database represents about 15% of total ESCO industry activity during the 1990-2000 period. From 1990 to 1995, our database projects represent about \$400M (11%) of the \$3.0-4.1B total cumulative ESCO industry investment during this time period. From 1996-2000, the \$1.6B of project investment in the database represents about 19% of the \$7.9-8.7B invested in ESCO projects during that period.

Typical Project Characteristics

ESCOs are active in almost all states, although this activity is concentrated in areas with high population and economic activity, and states with attractive performance-contracting legislation, supporting policies or public benefits funding for energy efficiency (Kushler & Witte 2001). In our sample, four states (New York, New Jersey, California and Texas) account for 44% of market activity. **Figure 2** shows the range of project costs for

1420 projects representing an aggregate investment of ~\$2.55B. Projects completed since 1996 account for about two-thirds of reported costs. This skew reflects both our intensified data collection efforts and the growth of the ESCO industry in recent years. Median and average project costs are \$0.7M and \$1.8M respectively over the entire sample, although projects vary tremendously in size. The range in project investment is quite large, even among projects in the same market segment.

Figure 1. Estimated Market Activity of U.S. ESCO Industry



ESCOs Focus on Institutional Sector Customers

ESCOs classified their projects using market segment categories that we created (see **Table 1**). In much of our analysis, we examine trends between institutional and private sectors, rather than individual market segments. We find that this distinction impacts project performance and economics because of differences in customer motivation, access to capital, and planning time horizons.

Approximately 73% of the projects in our database are from the institutional sector. The total share of private sector projects represented in the database dropped from 33% before 1996 to 25% from 1996 on. We believe that the institutional market share in our database represents an upper bound on ESCO activity in this market for two reasons. First, ESCOs are more reluctant to divulge information on private sector projects. Second, our sample also includes ~275 projects that were provided voluntarily by eight state agencies that administer performance-contracting programs.

Figure 2. Range in ESCO Project Costs

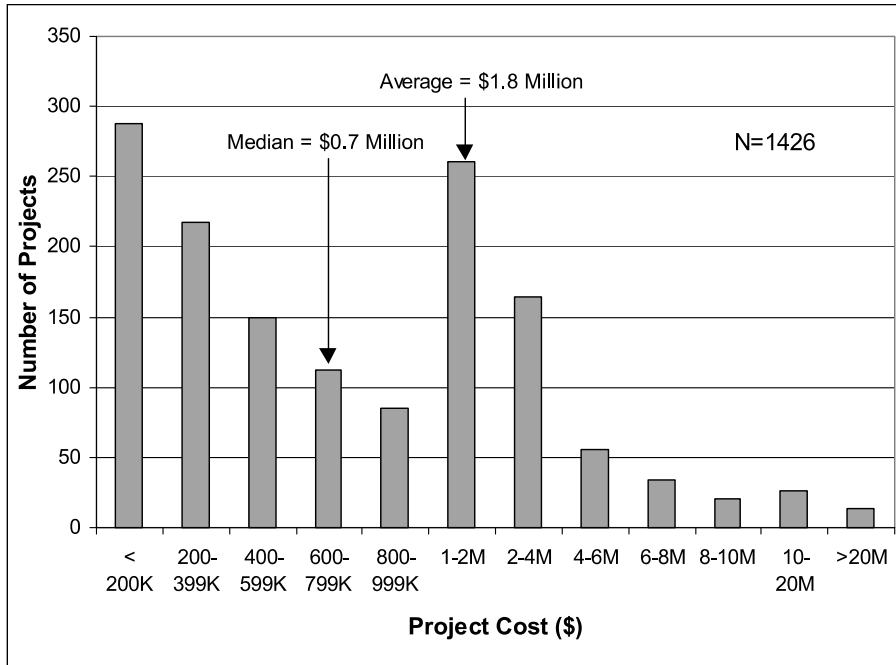


Table 1. Market Segments in Institutional and Private Sectors

Institutional Sector	Private Sector
K-12 schools	Hotels/hospitality
State/local government	Office, commercial
University/colleges	Retail
Federal government	Industrial
Health/hospitals	Residential
Public housing	Other

Multiple Measures, Multiple End Uses

Projects typically install multiple measures or retrofits that target several end uses. Individual energy conservation measures were aggregated into 11 broader “measure categories” for analysis purposes. Penetration rates of measure categories for database projects are: lighting measures (82%), comfort conditioning (68%), motors/drives (23%), water heaters (8%), power supply (6%), refrigeration (2%), miscellaneous equipment/systems (3%), industrial process improvements (3%), other measures/strategies (21%), plumbing products & fittings (10%), and non-energy improvements (3%)¹. Comfort conditioning measures are more popular in institutional projects than in private sector

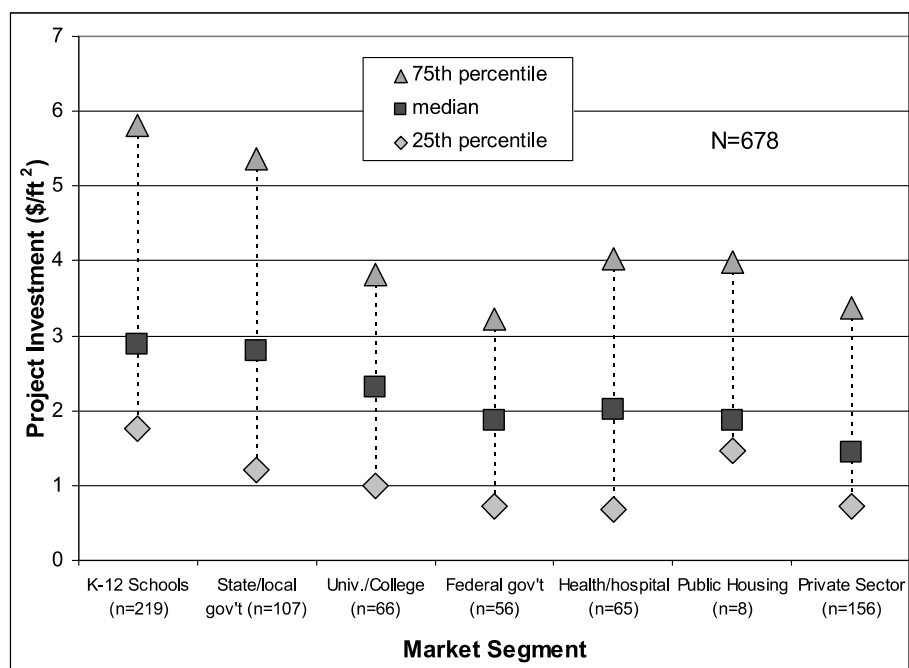
¹ ESCOs reported installing non-energy improvements almost exclusively in the institutional sector, often in K-12 Schools. Roof replacement/repair was the most common type of non-energy improvement, followed by asbestos abatement and new ceilings.

projects (76% vs. 45%). Our data suggest that institutional sector projects, on average, target a greater number of measure categories than projects for private sector customers.

Project Investment is Higher in Institutional Markets

In aggregate, median project investments in the institutional sector are three times higher than in private sector projects (\$0.9M vs. \$0.3M). This relationship holds true when normalized for floor area, as shown in **Figure 3**. Median project costs/ft² are 1.8 times greater in institutional than in private sector projects (\$2.50/ft² vs. \$1.40/ft²). The difference in the number of retrofit measure categories between market sectors may help to explain this trend. There is large variation in costs among projects in the same sector but for all projects, the median investment is \$2.3/ft².

Figure 3. Project Cost Normalized by Floor Area



Performance-Contracting Market Share Is Decreasing among ESCOs

Over the last decade, there has been an evolution in the types of contractual agreements utilized by ESCOs and their clients. ESCOs were asked to characterize the type of contract agreement for each project as guaranteed savings, shared savings, pay-from-savings, asset ownership/chauffage, design/build, fee-for-service or fixed price. The share of performance-contracting projects in our sample has decreased significantly since 1996 (from 92% before 1996 to 76% since). This trend likely understates the shift away from performance-contracting arrangements in the energy efficiency services market overall because of our data collection approach and focus. Guaranteed savings contracts and design/build or fee-for-service arrangements are the most common contracting approaches. The 621 projects that employed performance contracting had higher project investment than

the 160 projects that used non-performance contracts (\$1.0M vs. \$0.5M). Of the performance-based contracts in our database, 86% used the guaranteed savings contracting mechanism. Typical duration of contracts in our sample is 10 years, although shorter term contracts (i.e., <5 years) have become increasingly popular since 1995 (~20% of projects during this time period). Contracts lasting more than 15 years accounted for about 10% of projects in the database.

Delivered Energy Savings

We also analyzed typical project energy savings. ESCOs were requested to report baseline consumption as well as predicted and actual (verified) savings in energy and/or dollar terms for each project. Reductions in **electricity** consumption are critically important to project success, accounting on average for over 80% of total energy savings (on a site energy basis). Median energy savings (electricity and other fuels) are 15 kBTU/ft² for the 29% of projects that provided sufficient data to complete this analysis. Median energy savings (electricity and other fuels) are higher for state/local government and health/hospital projects (18-19 kBTU/ft²) compared to 13-15 kBTU/ft² for K-12 schools, university/college, federal government and private sector projects. Reported project energy savings vary widely. After normalizing for floor area, energy savings typically vary by a factor of 3-5 for the middle 50% of projects within each market segment (inter-quartile range).

Percent Electricity Savings

We grouped projects into three retrofit strategies in analyzing percent savings: lighting-only (LO), lighting-&-non-lighting (LNL), and non-lighting-only (NLO) measures. The baseline metric used to gauge pre-retrofit electricity consumption differs by retrofit strategy. Baseline electricity consumption for LO projects is usually measured for the targeted equipment only; LNL project electricity consumption tends to be measured on a total facility (utility bill) basis.

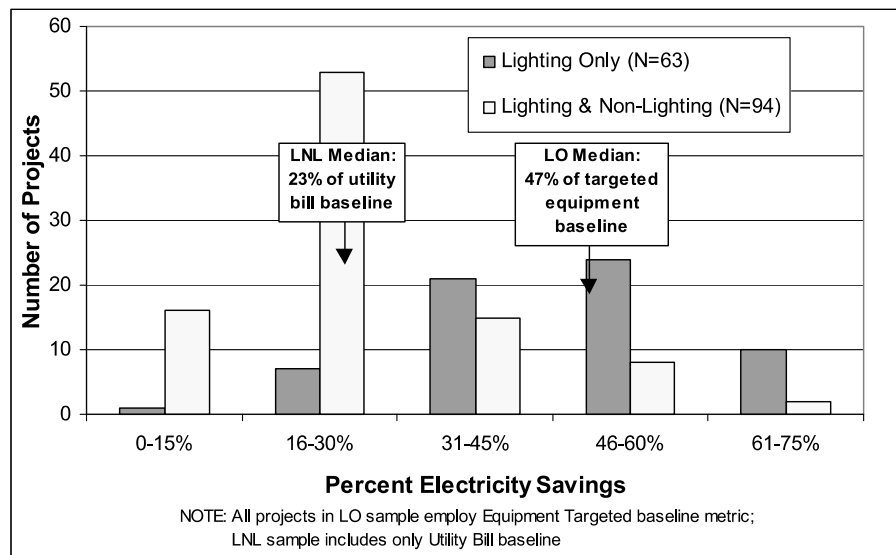
Figure 4 shows the distribution in percent electricity savings for projects using these two retrofit strategies. LO projects report median electricity savings of 47% of the targeted equipment (with inter-quartile range of 37% to 56%). These results suggest that ESCOs are achieving significant reductions in lighting energy consumption. The median electricity savings for the 94 LNL projects is 23% of the total electric bill baseline with an inter-quartile range of 17% to 32%. These results give a sense of the extent to which ESCO projects are impacting total facility electricity usage.

Project Economics from the Customer's Perspective

For each project in the database, we calculated three economic indicators: net benefits, benefit/cost (B/C) ratio, and simple payback time (SPT). We chose to define economic benefits conservatively and included only the direct value of reduced expenditures on energy and other financial savings, such as operations and maintenance (O&M). ESCO projects may also yield a number of indirect or less tangible benefits such as increased productivity, replacement of aging equipment, improved amenity and comfort levels, and environmental improvements. For many customers, these benefits are as important and

valuable as cost savings from direct energy-related expenditures. Because it is difficult to assign a dollar value to indirect benefits, our analysis focused only on the dollar value of the direct economic benefits of ESCO projects. Thus our approach is likely to underestimate the actual value of these projects to customers.

Figure 4. Electricity Savings by Retrofit Strategy



Based on customer market research and discussions with ESCOs, institutional sector customers typically have longer planning horizons, can access third party financing at attractive interest rates, and issue solicitations for performance contracts that allow for relatively long economic payback times (e.g., 10-25 years). In contrast, in evaluating energy-efficiency project proposals, private sector customers often have high investment hurdle rates (which translate into shorter payback periods), shorter planning horizons (e.g., due to leased space), and often face higher interest rates for third party financing (e.g., due to risk of plant shutdown, business risks). To reflect these differences, we used lower nominal discount rates in our economic analysis of institutional sector projects (7% with 10% sensitivity analysis) than for private sector projects (10% and 15%).

Project Net Benefits

For the 1080 projects with both cost and savings data (73% of the database), net direct economic benefits are ~\$1.62B, using 7% and 10% nominal discount rates respectively for institutional and private sector projects (see **Tables 2** and **3**). Net benefits for the entire sample decrease to \$874M at the higher discount rates of 10% and 15% respectively. About 90% of the gross benefits come from energy savings, with the remaining 10% attributed to non-energy (e.g., O&M) savings.

Cost-Effectiveness of ESCO Projects

We found that 87% of the 309 private sector projects and 70% of the 771 institutional sector projects have B/C ratios greater than one. The B/C ratio is 1.6 for institutional sector projects using a 7% discount rate and 1.3 using a 10% discount rate (see Table 1). For private sector projects, the median B/C ratio ranges between 2.1 and 1.6, depending on the choice of discount rates (see Table 2). We believe that these results may understate the value of projects to customers, because we have not accounted for indirect benefits and have used conservative assumptions (i.e., discount rates).

Table 2. Institutional Sector Project Economics: Benefit/Cost Analysis

Market Segment	N	Total Project Costs (\$M)	7% Discount Rate					10% Discount Rate				
			Direct Economic Benefits (\$M)		Benefit/Cost Ratio			Direct Economic Benefits (\$M)		Benefit/Cost Ratio		
			Gross	Net	25 val	median	75 val	Gross	Net	25 val	median	75 val
K-12 schools	289	714	803	88	0.7	1.0	1.7	633	-81	0.5	0.8	1.3
State/ local gov't	159	276	581	305	1.0	1.7	3.0	471	195	0.9	1.4	2.4
Univ./ colleges	100	301	809	508	1.2	1.7	3.1	637	336	0.9	1.4	2.4
Federal gov't	58	153	280	126	0.9	1.7	3.2	225	72	0.8	1.4	2.6
Health/ hospital	134	136	365	229	1.6	2.3	3.8	295	159	1.3	1.9	3.3
Public Housing	31	96	140	45	0.7	1.5	1.8	114	18	0.6	1.2	1.4
Institutional Sector	771	1677	2978	1301	0.9	1.6	2.5	2375	698	0.7	1.3	2.0

Table 3. Private Sector Project Economics: Benefit/Cost Analysis

Market Segment	N	Total Project Costs (\$M)	10% Discount Rate					15% Discount Rate				
			Direct Economic Benefits (\$M)		Benefit/Cost Ratio			Direct Economic Benefits (\$M)		Benefit/Cost Ratio		
			Gross	Net	25 val	median	75 val	Gross	Net	25 val	median	75 val
Commercial*	192	137	349	212	1.7	2.2	3.7	265	128	1.3	1.7	2.8
Industrial	76	95	181	86	1.3	1.8	2.7	136	41	1.0	1.4	2.2
Other**	41	28	47	18	0.8	1.8	2.7	34	6	0.7	1.3	2.0
Private sector	309	260	576	317	1.4	2.1	3.2	435	176	1.1	1.6	2.6

*includes hotels/hospitality, retail space, and commercial offices.

**includes residential and projects that were classified as "other" by the ESCO.

Simple Payback Time (SPT)

We calculated SPT for each project by dividing project costs by savings². Savings were determined by multiplying average annual energy savings by the appropriate price for that energy source (e.g., electricity, gas) in the year the project was completed. If actual energy savings were not available, we used the dollar value of savings as reported by the ESCO. The median SPT is about seven years for the 788 projects in the institutional sector (see **Figure 5**). Approximately 44% of institutional sector projects have a SPT of six years or less. Within the institutional market, median payback times are shorter (4 years) in the 139 health/hospital and 159 state/local government projects compared to the 296 K-12 schools projects with a median payback time of 10 years. In contrast, median SPT is about three years for the 319 private sector projects; about 83% of these projects have a SPT of six years or less.

² For projects that received a rebate, we subtracted 100% of the incentive from project cost; for other REEP programs, we subtracted 50% of the reported incentives from project cost; other projects were unaffected.

Our analysis suggests that project economics are also influenced by choice of retrofit strategy and state or federal performance-contracting guidelines (e.g., maximum contract terms). We compared SPT in institutional and private sectors for projects grouped by retrofit strategy (see **Table 4**). First, note the higher share of LO projects in the private sector than the institutional market (43% vs. 20%). Second, median payback times for LO projects are relatively short in both institutional and private sector projects (2 years). Third, median payback times are significantly longer for LNL and NLO projects in the institutional sector than the private sector projects (8 vs. 4 and 2 years). As these retrofit strategy categories are quite broad, it appears that private sector projects selectively focus on individual measures with shorter payback times. This result is not surprising given the typical time horizon for decision-making in the private sector.

Figure 5. Simple Payback Time of Institutional Sector Projects

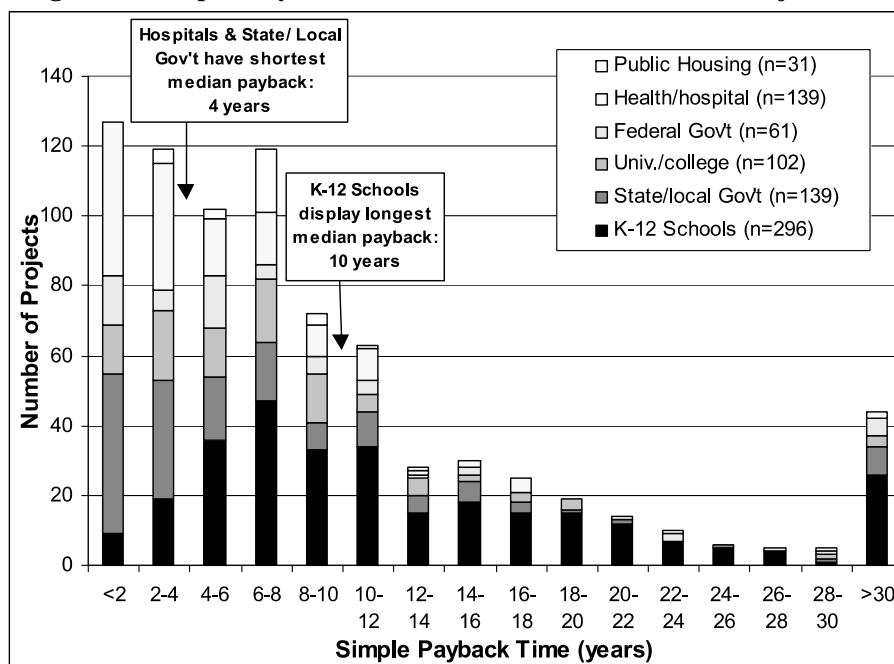


Table 4. Impact of Retrofit Strategy on Simple Payback Time

Retrofit Strategy	Simple Payback Time (years)							
	Institutional Sector				Private Sector			
	N	25 val	median	75 val	N	25 val	median	75 val
Lighting Only	146	1	2	4	128	1	2	4
Lighting & Non-Lighting	498	5	8	13	97	3	4	6
Non-Lighting Only	98	2	8	14	73	1	2	5

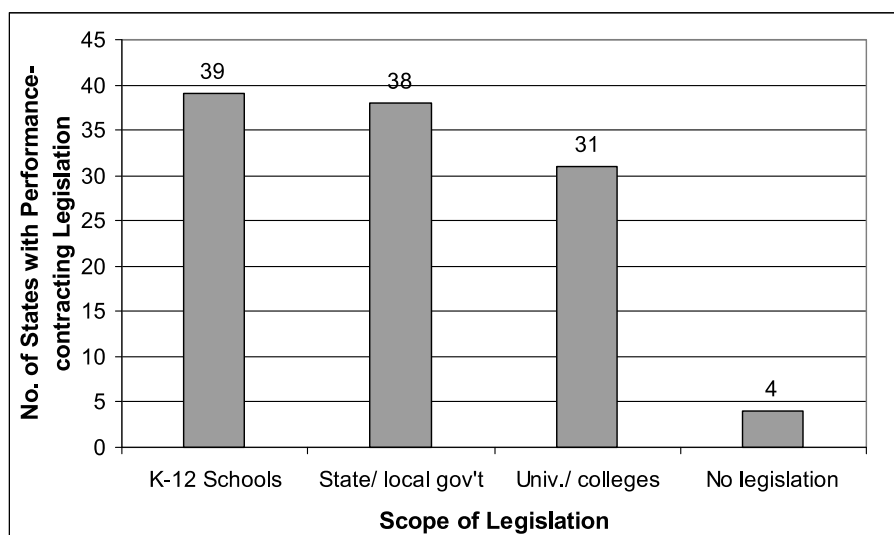
In the institutional market, enabling legislation and program guidelines influence project economics and the types of measures installed in projects. For example, many states specify the maximum contract term for performance contracts in their enabling legislation. The underlying intent of these provisions is to articulate the state’s willingness to undertake comprehensive projects that install and finance high-efficiency equipment and other

measures up to a cost-effectiveness threshold. More than two-thirds of U.S. states (34) allow maximum contract terms of 10 or more years. Thus it is not surprising that energy-efficiency equipment and measures that are installed in institutional sector projects have long expected economic lifetimes and SPTs.

The Role of Enabling Policies and Programs

Policies and programs supported by state or federal legislatures and public utility commissions (e.g., energy efficiency programs) have played an important role in stimulating ESCO activity in various markets. In a survey of state legislation, we found that most states allow or encourage performance-contracting projects in various public institutional markets: K-12 schools, state/local governments, and university/colleges (**Figure 6**). Only four states have no such legislation in any of these market segments.

Figure 6. Most States Promote Performance Contracting with Legislation



Drivers of Performance Contracting in Institutional Markets

Our sample of institutional sector projects suggests that the amount of performance-contracting activity in K-12 school, university/colleges, and state/local government market segments is affected by a state's overall potential market size, favorable enabling legislation and procurement rules for performance contracting, and active support from state energy program offices. **Table 5** shows the 10 states with the highest levels of ESCO institutional project investment in our database. We ranked each state in terms of their economic activity (gross state product), state energy office activity,³ number of institutional sectors targeted by

³ We surveyed several industry experts and asked them to categorize the activity level of state energy offices or the office responsible for administering performance-contracting programs in the institutional market. Activity level was ranked on a scale of 1 to 3 (3 = high activity and 1 = low activity).

enabling legislation, and overall performance contracting promotional rating based on a simple metric developed by LBNL.⁴

Eight of the top 10 states in terms of ESCO institutional project investment also ranked in the top 10 for economic activity. This result underscores the reality that ESCOs tend to be most active in states with large markets. Favorable performance-contracting legislation may have the most impact in states with medium to smaller size institutional markets that might not otherwise attract ESCO interest (e.g., Indiana). For example, Kentucky, Missouri and Washington have enabling legislation that covers all three institutional markets and these states report high numbers of projects in our database, with total project costs that place them in the second activity tier (rank 11-20). Ohio is the only state in the top 10 with enabling legislation in only one market segment (K-12 schools). Other enabling policies such as REEPs may also play a role. For example, four of the top five states in terms of ESCO institutional project investment had REEPs that were particularly attractive to ESCOs (e.g., SPC programs in New York, New Jersey, California and Texas).

Table 5. State ESCO Promotion and Activity Ranking

State	ESCO Project Costs (SC, UC & GO) [†]			Economic Activity (1999 GSP)*		State Energy Office Activity	Number of Sectors with Legislation	LBNL Overall Rating*** of State Support for Perf. Contracting
	Rank [†]	(\$M)	N	Rank [†]	(\$B)	1=low, 2=medium, 3=high**		
New York	1	287	76	2	755	2.3	3	7
California	2	147	81	1	1229	1.0	3	3
Texas	3	131	40	3	687	2.0	3	6
Indiana	4	112	23	15	182	1.0	3	3
New Jersey	5	84	95	8	332	2.0	3	6
Illinois	6	75	38	4	446	2.0	3	6
Ohio	7	68	45	7	362	2.0	1	2
Massachusetts	8	66	27	11	263	1.7	3	5
Florida	9	65	23	5	443	1.0	3	3
Pennsylvania	10	54	37	6	383	2.0	3	6

[†]SC = K-12 schools, UC = university/colleges, GO = state/local gov't

[†]Ranking among the 50 U.S. states; 1=highest, 50=lowest.

Sources:

* Bureau of Economic Analysis 2001

** Values are averages of responses in a blind survey of several industry experts

*** Calculated as "State Energy Office Activity" level multiplied by the "Number of Sectors with Legislation"

Conclusion

This report summarizes industry and market trends in the energy-efficiency services industry based on a bottom-up analysis of ~1500 projects. We have tried to demonstrate the value of compiling and analyzing project-specific information on the ESCO industry using standardized methods in order to provide useful information to policymakers and market actors alike. In undertaking such an effort, we are cognizant of limitations imposed by our

⁴ We combined the activity of state energy offices and the number of institutional sectors covered by enabling legislation into a single metric (calculated as "State Energy Office Activity" level multiplied by the "Number of Sectors with Legislation").

data collection methods (e.g., project selection bias), inconsistent ESCO tracking and reporting practices of ESCOs, and uneven quality of project data. We have adopted various quality assurance measures and controls to improve data quality and consistency and reached out to other data sources (e.g., state energy offices) to minimize self-selection bias.

The NAESCO/LBNL database project is an ongoing initiative, which provides a unique information source on industry trends, market activity and business practices of companies involved in energy-efficiency related services. We intend to continue to expand and refine the project database and industry/market analysis reports in order to continue to address evolving information needs of policymakers, market actors, and customers.

Acknowledgements

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Executive Summary

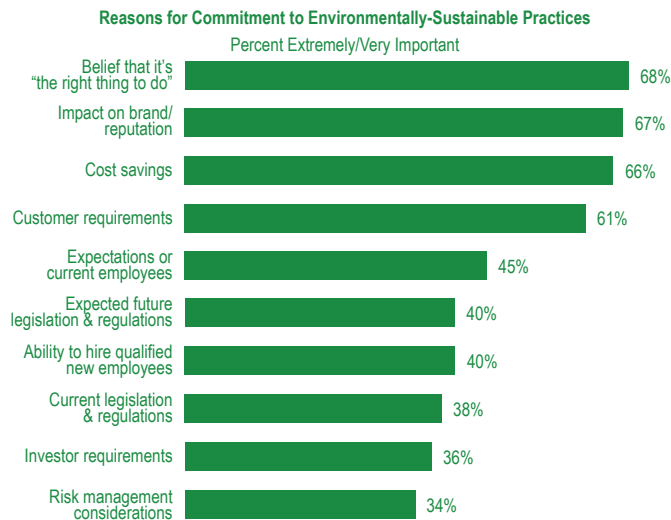
Turner Construction Company's latest Green Building Market Barometer, which surveyed more than 700 executives, found that companies remain committed to constructing environmentally-sustainable buildings. Almost all the executives participating in the 2012 survey said their companies would incorporate at least some Green features in their next construction project, citing the potential to reduce energy costs and ongoing operations and maintenance costs as the most important reasons for constructing Green buildings. While the commitment to constructing Green buildings remains high, fewer executives said their companies were likely to seek LEED certification when constructing a Green building.

Brightening Outlook for Construction Projects

Among real estate owners, developers, and corporate owner-occupants, 64% said they expect to launch construction projects over the next 12 months (up from 46% in the 2010 survey), and 71% said they expect to undertake renovation projects over the same period (up from 58% in the 2010 survey).

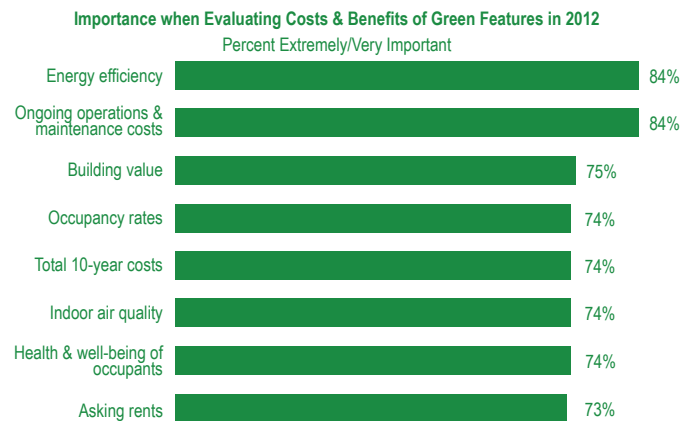
Widespread Commitment to Sustainable Practices

Fifty-six percent of executives said their companies were extremely or very committed to following environmentally-sustainable practices in their operations, while an additional 34% said they were somewhat committed. In addition to citing financial reasons for this commitment, executives were most likely to cite broader considerations as extremely or very important including belief that it's the "right thing to do," (68%), impact on brand/reputation (67%), and customer requirements (61%), along with cost savings (66%).



Reducing Energy Costs and Operating Expenses are the Key Drivers to Green Construction

Executives were most likely to cite financial factors as being extremely or very important to their companies' decisions on whether to incorporate Green features in a construction project: energy efficiency (84%) and ongoing operations and maintenance costs (84%).



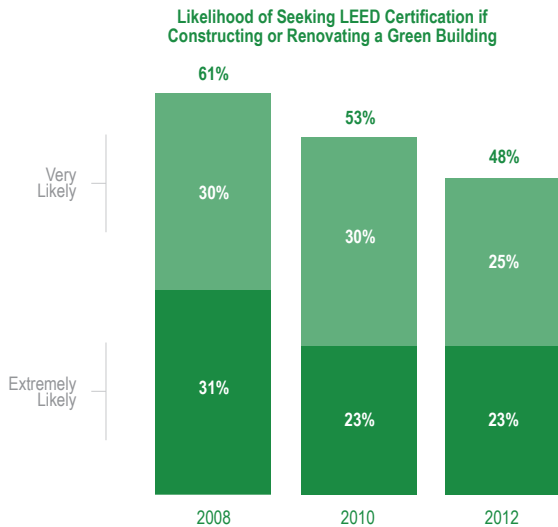
In addition, executives cited that building value (75%) and occupancy rates (74%) were important considerations when evaluating the benefits of incorporating Green features into their building. However, two-thirds or more of executives also said that non-financial factors were extremely or very important such as indoor air quality (74%), health and well-being of occupants (74%), satisfaction of employees/occupants (69%), impact on brand/reputation (67%), and employee productivity (67%). However, only 37% of executives said it was extremely or very important to their companies to minimize the carbon footprint of their buildings. This suggests that the decision to incorporate Green features is driven by a desire to reduce cost followed by an interest to improve the indoor environment for building occupants, rather than broader concerns about the impact of buildings on the global environment.



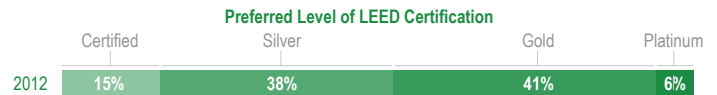
A large majority of executives said their companies would be extremely or very likely to incorporate Green features if they were undertaking a construction project. Consistent with their focus on reducing costs, 81% of executives said their companies would be extremely or very likely to invest in energy efficiency improvements. Fewer executives, but still more than half, said their companies were extremely or very likely to invest in improved indoor environmental quality (63%), improved water efficiency (57%), or Green materials (53%).

Fewer Companies Plan to Seek LEED Certification

Although the vast majority of companies remain committed to Green buildings, the percentage of executives who thought it was extremely or very likely that their company would seek LEED (Leadership in Energy and Environmental Design) certification if they constructed a Green building was 48%, down from 53% in the 2010 survey and 61% in the 2008 survey. Among executives who said their companies were not likely to seek LEED certification, the most important reasons cited were the cost of the certification process (82%), staff time required (79%), time required for the process (75%), and the overall perceived difficulty of the process (74%).



In addition, many companies seem to have become more knowledgeable about the means and methods of designing and constructing Green buildings and are less reliant on LEED as a checklist or a scorecard. This is indicated by the fact that 52% of executives who are not likely to seek LEED certification would prefer to use their own company's green building standards. However, of those who would seek LEED certification, 47% would seek Gold or Platinum.



Forty-one percent of all the executives surveyed thought it was at least somewhat likely that their companies would consider seeking certification under a rating system other than LEED if they constructed a Green building. Among these executives, 63% said they would be extremely or very likely to consider seeking certification under ENERGY STAR, which addresses energy efficiency. Roughly 20% of these executives said they were extremely or very likely to consider seeking certification under Green Globes, Living Building Challenge, or BREEAM (Building Research Establishment Environmental Assessment Method).

Concerns Persist about Construction Costs and the Length of the Payback Period

When asked what length of payback period would be acceptable when considering Green features, 44% of executives said they would accept five years and almost 80% of executives said they would accept a payback period of five years or longer. Despite the acceptance by most executives of an extended payback period, 61% of executives still felt that the length of the payback period was an extremely or very significant obstacle to the construction of Green buildings while 62% cited higher construction costs.





Introduction

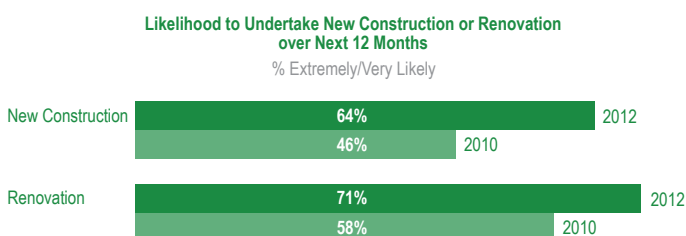
Over the past several years, the Green building market has exploded. In 2005, Green building construction projects had a total value of \$10 billion.¹ A September 2012 McGraw-Hill analysis predicted the total market would reach \$85 billion in 2012.² Turner Construction Company, the top Green contractor in the U.S. according to Engineering News Record, generated 53% of its sales revenue from Green projects in 2012, up from just 24% in 2006

The vast majority of the executives surveyed said they would incorporate Green features if they were undertaking a construction or renovation project. This growth in the Green building market reflects a broader commitment to environmentally-sustainable practices by corporate America. Customers, investors, employees, and the general public increasingly expect companies to following sustainable practices.

The 2012 Market Barometer assesses these continuing trends and examines the factors driving the decision to build Green buildings, the acceptable payback period for investing in Green features, the remaining obstacles to Green construction, and the role of LEED and other Green building rating systems.

Brightening Outlook for Construction Projects

The 2012 Market Barometer found increasing optimism among real estate executives since the prior survey in 2010. Sixty-four percent of the real estate owners, developers, and corporate owner-occupants surveyed said they expect to undertake new construction projects over the next 12 months (up from 46% in the 2010 survey), and 71% expect to undertake renovation projects over the same period (up from 58% in 2010).



This outlook reflects the improving financial position for both corporations and institutions, allowing many to move ahead with projects they had postponed. These results are also consistent with economic data released during the fall of 2012. In September 2012, the U.S. unemployment rate dipped below 8% for the first time in four years, and the economy grew at an annual rate of 2% in the third quarter, beating expectations. Stock values more than doubled from March 2009 to November 2012.³ And the U.S. Census Bureau reported that in October total nonresidential construction spending was up more than 5% compared to one year earlier.

Widespread Commitment to Sustainable Practices

Companies continue to report their commitment to environmentally-sustainable practices, not only in real estate, but across their operations. Ninety percent of executives said their companies are committed to following environmentally-sustainable practices in their operations, with 56% percent extremely or very committed, and 33% somewhat committed.

The reasons driving this commitment go far beyond a simple question of cost savings. Although many executives did cite cost savings (66%), the other top reasons were belief that it's the 'right thing to do,' (68%), impact on brand/reputation (67%), and customer requirements (61%). These are broader considerations involving social responsibility and the growing realization that sustainability can provide an important competitive advantage. This is also reflected in the biggest changes from the 2010 survey: a growing number of executives said their companies are committed to environmentally-sustainable practices because of the expectations of current employees (45%, up from 36% in 2010) and the ability to hire qualified new employees (40%, up from 33% in 2010).

The move toward sustainability is becoming central to the way a company views itself and wants to be seen by its employees, customers, investors, and the general public. One recent study by Harvard Business School researchers found companies that are leaders in sustainability "significantly outperform their counterparts over the long-term, both in terms of stock market and accounting performance."⁴



Increasingly, the importance of sustainability extends beyond a company's operations to include the vendors and service providers it chooses to engage. Seventy-five percent of executives said their companies consider the level of sustainable practices when choosing a supplier of goods or materials, with 48% calling it an extremely or very important consideration. The level of sustainable practices is nearly as important when selecting service providers. Seventy-four percent of executives said their companies take it into account, with 42% saying it is an extremely or very important consideration in the selection process.

Among executives at companies where sustainable practices are at least somewhat important when selecting vendors and service providers, the use of Green materials was the factor cited most often as a consideration (87%), followed by amount of waste in operations (78%). Roughly 70% of executives said their companies also consider energy efficiency of operations, Green packaging, water efficiency of operations, and carbon footprint.



Reducing Energy Costs and Operating Expenses are the Key Drivers to Green Construction

While executives cited broad considerations in their companies' commitment to sustainable practices, they focused more on the bottom line when asked about their decisions to incorporate Green features in a construction or renovation project. Executives said the top two considerations when deciding whether to incorporate Green features are energy efficiency and ongoing operations and maintenance costs. Eighty-four percent of executives said both are extremely or very important factors in evaluating the costs and benefits of Green features. Other financial factors that rank high are: building value (75%), total 10-year costs (74%), and asking rents (73%).

The impact of Green features on a building's occupants also heavily influences decision-making. More than two-thirds of executives said the following factors are extremely or very important: indoor air quality (74%), health and well-being of occupants (74%), satisfaction of employees/occupants (69%), and employee productivity (67%). Researchers are now calculating the bottom line impact of Green buildings on productivity. A study of PNC bank branches by University of Notre Dame management professors Edward Conlon and Ante Glavas found that the LEED-certified branches outperformed their non-certified counterparts by \$461,300 per employee.⁵ Employee hiring and retention was an extremely or very important consideration in building Green for almost half of the companies. Another key driver for Green construction is impact on brand/reputation, rated as extremely or very important by 67% of executives. It may be assumed that companies recognize that these factors—health, productivity, and satisfaction of workers, as well as brand identity—have economic benefits as well, although they may be harder to quantify.

Sixty-seven percent of respondents cited water efficiency as a key factor in their decisions. The large gap in the percentage of executives who consider energy efficiency highly important (84%) compared to water efficiency (67%) may be due to the fact that water usage accounts for a smaller percentage of building operating expenses than energy usage. Yet, water efficiency is likely to become a larger consideration as costs rise. Single-family residential water prices in 30 major U.S. cities went up an average of nearly 18% from 2010 to 2012⁶ and monthly costs doubled in 29 communities from 2000 to 2012.⁷ By 2035, the country's water systems are expected to require as much as



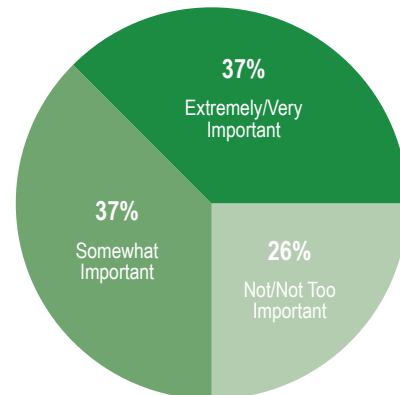
\$1 trillion in infrastructure improvements, which will likely lead to higher rates.⁸ There is also growing awareness that water is a finite resource. One study predicts that by 2030 the world's water requirements will exceed current sustainable supplies by 40 percent.⁹

The vast majority of executives said their companies would be extremely or very likely to incorporate Green features if they were constructing a new building or undertaking a renovation. Executives were most likely to say their companies would invest in energy efficiency (81%), consistent with its large economic impact and the importance placed on reducing ongoing costs. Buildings account for 41% of total energy consumption and 73% of electric consumption in the United States.¹⁰ The opportunity to reduce costs through energy efficiency can be significant. For instance, LEED Gold buildings in the General Services Administration's (GSA) portfolio typically consume 25% less energy than the average commercial building.¹¹ Those GSA LEED Gold buildings also consume 11% less water than the average commercial building.¹² However, once again, saving water was seen as less important than saving energy, with 57% of executives saying that improved water efficiency would be an extremely or very likely investment. Indoor environmental quality (63%) ranked slightly higher, and 53% of executives said they were extremely or very likely to invest in Green materials. Among the executives who said their companies would be extremely or very likely to use Green materials, the top choices were materials with low or no volatile organic compounds (VOCs) (90%) and those that contain recycled content (89%).



Although the majority of executives said they plan to incorporate a number of Green features in their projects, just 37% of executives said minimizing the carbon footprint of their buildings is extremely or very important to their companies. This suggests that the decision to incorporate Green features is more about reducing costs and pleasing occupants through better indoor environmental quality, rather than broader concerns about the impact of buildings on the environment. Evaluating the performance of Green buildings in operation is becoming the norm, with 81% saying they conduct post-occupancy evaluations. More than half of executives said their companies review performance at least once a year, including 26% who said they do so on an ongoing basis.

Importance of Minimizing Carbon Footprint of Buildings



Companies use building evaluations as a way to reduce operating costs and improve performance. The most important reasons reported for conducting evaluations are to monitor operating costs and financial performance (80%) and to improve building performance (75%). Fifty-three percent said evaluations are important to assess the impacts on tenants or employees. Just 40% said the evaluations are important to provide information for company sustainability reports.

Some early critics of LEED cited the fact that it focused on the design and construction of Green buildings but did not address their ongoing operation and maintenance. More recent versions of LEED have addressed this concern by including requirements for post-occupancy evaluation. The next version of LEED will require sub-metering of building systems as a prerequisite for certification.



Fewer Companies Plan to Seek LEED Certification

LEED has become the leading global standard for measuring building sustainability since its launch in 2000. The U.S. Green Building Council (USGBC) developed the voluntary certification program. LEED-registered building projects are independently verified by the Green Building Certification Institute (GBCI). As of October 2012, more than 13,000 commercial buildings in the U.S. had been certified under LEED, and another 30,000 were pursuing certification.¹³ Government agencies have been strong proponents of LEED—from 2000 to 2010, 400 cities, counties, states, and federal agencies across 45 states approved policies requiring LEED standards for their new or renovated buildings.¹⁴ LEED certification is the most widely used third-party verification of Green construction standards. LEED has been widely adopted in all sectors of the real estate market, in every region of the U.S. and increasingly around the world. Today, 50% of the total LEED square footage is outside the U.S.¹⁵

However, while the commitment to incorporating Green features in building projects is widespread, the 2012 Barometer found a continuing decline in the assumption that companies would seek LEED certification for their Green buildings. Only 48% of executives said it is extremely or very likely that their company would seek LEED certification for a Green construction or renovation project. That's down from 54% in the 2010 survey and 61% in the 2008 survey. Cost, time, and the difficulty of the certification process are the leading reasons cited for the declining commitment to LEED. Among executives who said their companies are not likely to seek LEED certification, 82% said the cost of the certification process is an extremely or very important reason. Other highly important reasons are: staff time required (79%), time required for the process (75%), and the perceived difficulty of the process (74%).

“Cost, time, and the difficulty of the certification process are the leading reasons cited for declining commitment to LEED.”

LEED certification also appears to be less of a priority for companies that have developed their own building standards. Fifty-two percent of executives at companies not likely to certify under LEED said they would prefer to rely on their company's standards. This indicates that, in the decade since LEED was first introduced, companies have become more knowledgeable about the means and methods of designing and constructing Green buildings. This makes them less reliant on seeking formal LEED certification, although many are still using LEED as a standard to assess the design and performance of their buildings. Today, many projects that forgo formal certification are still requested to be built “to the LEED standard” or that they be “LEED equivalent.”

In addition, building codes today are more likely to include more rigorous environmental standards. For example, California adopted the first mandatory Green building code in the country.¹⁶ Taking effect in January 2011, CalGreen requires all new buildings in the state to conserve water, use interior materials that are less prone to emitting pollutants, and recycle construction waste. It also steps up enforcement of energy efficiency for large non-residential buildings. Other states, including Massachusetts, Florida, and Oregon, have adopted the International Energy Conservation Code (IECC) as part of their state-wide building codes, and Boston has incorporated LEED standards into its building code.





More Companies Consider Other Ratings Systems

Forty-one percent of the executives surveyed said it is at least somewhat likely that their companies would consider seeking certification under a rating system other than LEED if they constructed a Green building. Among the executives who said they would consider another type of certification, ENERGY STAR was mentioned most often, with 63% saying they would be extremely or very likely to consider seeking certification. ENERGY STAR, a joint program of the U.S. Environmental Protection Agency and the Department of Energy, addresses only energy efficiency and is consistent with LEED. In fact, a minimum ENERGY STAR score of 69 is a prerequisite for any existing building seeking LEED 2009 certification. More than 16,000 U.S. buildings have been certified as ENERGY STAR as of April 2012.¹⁷

Other types of certifications executives said they would be extremely or very likely to consider include Green Globes (25%), which advertises itself as a “business-friendly and affordable alternative to LEED,” and Living Building Challenge (21%), a highly rigorous system that is not intended to compete with LEED certification. Nineteen percent of executives said they would be likely to consider BREEAM (Building Research Establishment Environmental Assessment Method), which has certified 200,000 buildings globally, most of them in the UK.¹⁸

If companies were to pursue LEED certification, 41% of executives said their preferred designation is Gold, while 38% chose Silver. Only 15% chose the lowest ranking of Certified and just 6% chose the highest ranking of Platinum. One indicator of the generally higher aspirations for Green building projects is that of those who would seek LEED certification almost half (47%) would seek Gold or Platinum, the highest levels.

The USGBC plans to revise LEED substantially in 2013, which will make LEED certification even more challenging. The new standards aim to ensure certified buildings use more environmentally-friendly materials and achieve greater energy and water use efficiency. This means builders will have to do more to obtain certification.¹⁹ Revisions were originally scheduled for release in 2012, but many in the industry objected that there were too many significant changes since the standards were last issued in 2009.

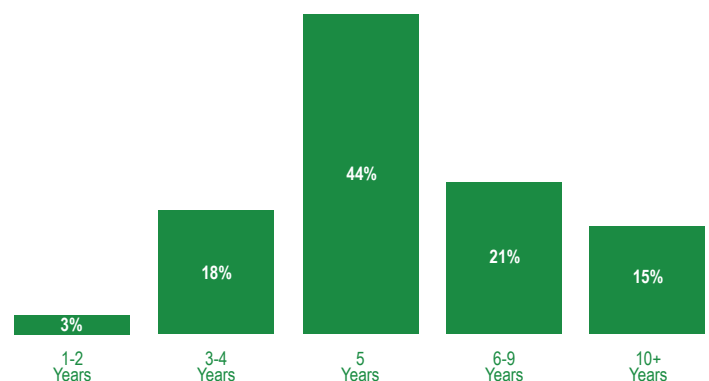
Of the executives who said their companies would be at least somewhat likely to seek LEED certification, 65% said strengthens our brand is an extremely or very important reason. More than half (57%) said provides an objective standard of performance is as important factor. This is another indication that LEED is increasingly viewed as a tool to burnish a company’s reputation rather than simply a “how to” guide for Green construction.

Concerns Persist about Construction Costs and the Length of the Payback Period

A major theme of the 2012 Green Building Market Barometer is the importance executives place on reducing costs. So it’s understandable that financial concerns top the list of obstacles to Green construction.

When asked the maximum length of payback period that would be acceptable when considering Green features, 44% of executives said they would accept five years, and 36% said they would accept six years or longer. While this reflects a shift from what executives expressed in the 2010 Barometer, where 33% said they would accept five years and 45% chose a longer time frame, it still indicates more executives are willing to look beyond the traditional period of one to three years to recover their investment, with fully 80% of executives willing to accept a payback period of five years or longer.

Maximum Acceptable Payback Period when Incorporating Green Features





Even though 80% of executives said they would accept a payback period of five years or longer, 61% of executives still said that the length of the payback period was an extremely or very significant obstacle to the construction of Green buildings. This ranked just behind the obstacle cited most, higher construction costs (62%). However, a 2007 study found there was no significant difference, on average, in the cost of constructing Green buildings compared to non-Green buildings.²⁰

Difficulty in quantifying benefits is seen as an extremely or very significant obstacle by 49% of executives. While the immediate cost savings from more efficient operations are easy to quantify, it is more difficult to measure the positive impacts on such items as building value, employee productivity, and satisfaction of occupants and employees.

Two obstacles showing the largest decline from the 2010 Barometer are higher operating and maintenance costs (41%, down from 50%) and more complex operations and maintenance requirements (36%, down from 40%). This appears to reflect the fact that companies are becoming more experienced and knowledgeable about operating Green buildings.

It is remarkable that after ten years of data showing the cost premium for Green buildings averages between zero to 2%, that so many decision makers still see the costs of construction to be an obstacle. It may be that the obstacle is the high cost of construction in general, whether the project is a Green building or not. That these misperceptions persist emphasizes the continuing need for education and information about the true costs and benefits of Green buildings.

Profile of Survey Respondents

Turner's 2012 Green Building Market Barometer surveyed 718 executives in October 2012. The executives participating in the survey were from the following principal types of companies: architecture (49%), construction (19%), real estate consulting (11%), corporate owner-occupants (9%), developers (9%), engineering (9%), real estate owners (7%), corporate tenants (3%), and broker/real estate service providers (2%).²¹

Respondents are active in a wide variety of different types of buildings including office (77%), retail (51%), healthcare (47%), higher education (46%), industrial (44%), multi-unit residential (43%), K-12 education (41%), data centers (32%), single-family homes (30%), hotel (29%), sports and entertainment (29%), R&D (27%), and aviation and transportation (22%).

As in the 2010 survey, email invitations were sent to subscribers of several real estate publications. The percentage of respondents who came from email invitations sent to subscribers of Environmental Design & Construction was significantly greater in the 2012 survey (83%) than in the 2010 survey (34%). In general, subscribers to this publication were more positive about Green buildings than other respondents. To gain a more representative picture of industry perceptions and to ensure comparability with the prior survey, the 2012 data were weighted so that the responses of subscribers to Environmental Design & Construction had the same weight as they did in the 2010 survey.



Previous versions of Turner's Green Building Market Barometer can be found at: <http://www.turnerconstruction.com/about-us/sustainability/green-market-barometer>

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 20 In this and the following paragraph, the percentages total to more than 100% since executives could provide multiple responses about industry and building type.