U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

BUILDING TECHNOLOGIES PROGRAM

Expert Meeting Report: Energy Savings You Can Bank On

Mark Berman, Jeremy Springer, Pepper Smith, and Erik Porse
Alliance for Residential Building Innovation

February 2013

Building AMERICA SM
U.S. Department of Energy

NOTICE

This report was prepared as an account of work sponsored by an agency of the United States government. Neither the United States government nor any agency thereof, nor any of their employees, subcontractors, or affiliated partners makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States government or any agency thereof.

Available electronically at http://www.osti.gov/bridge

Available for a processing fee to U.S. Department of Energy
and its contractors, in paper, from:
U.S. Department of Energy
Office of Scientific and Technical Information
P.O. Box 62
Oak Ridge, TN 37831-0062
phone: 865.576.8401
fax: 865.576.5728
email: mailto:reports@adonis.osti.gov

Available for sale to the public, in paper, from:
U.S. Department of Commerce
National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
phone: 800.553.6847
fax: 703.605.6900
email: orders@ntis.fedworld.gov
online ordering: http://www.ntis.gov/ordering.htm

Printed on paper containing at least 50% wastepaper, including 20% postconsumer waste

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Expert Meeting Report: Energy Savings You Can Bank On

Prepared for:

The National Renewable Energy Laboratory

On behalf of the U.S. Department of Energy's Building America Program

Office of Energy Efficiency and Renewable Energy

15013 Denver West Parkway

Golden, CO 80401

NREL Contract No. DE-AC36-08GO28308

Prepared by:

Mark Berman, Jeremy Springer, Pepper Smith, and Erik Porse

Alliance for Residential Building Innovation (ARBI)

Davis Energy Group, Team Lead

123 C Street

Davis, CA 95616

NREL Technical Monitor: Cheryn Metzger

Prepared under Subcontract No. KNDJ-0-40340-00

February 2013

[This page left blank]

Contents

List of Tables v
Definitions vi
Executive Summary vii
1 Introduction 1
2 Meeting Logistics 2
2.1 Topic 2
2.2 Location and Time 2
2.3 Attendees 2
3 Meeting Objectives and Agenda 4
3.1 Research Questions 4
3.2 Specific Objectives of Meeting 4
3.3 Agenda 5
4 Presentations 6
4.1 Survey of Energy Efficiency Financing Products 6
4.2 Solar Leasing Models 6
4.3 Applying Lessons From Solar Leases to Home Energy Upgrades 7
4.4 Residential Energy Efficiency Performance Guarantees 7
4.5 Monitoring Devices and Performance Guarantees 8
4.6 Driving Demand for Energy Efficiency 8
5 Discussion 10
5.1 Solar and Residential Energy Upgrades: Understanding the Differences 10
5.1.1 Risk, Uncertainty, and Market Response 10
5.1.2 Reducing Risk Through Public Participation and Robust Data 10
5.1.3 Consumer Behavior 11
5.2 Research Questions 11
6 Conclusions and Next Steps 13
6.1.1 Future Steps 14
References 15
Appendix 1: Meeting Slides 16

List of Tables

Table 1. Meeting Participants 2
Table 2. Meeting Agenda. 5

Definitions

ARBI	Alliance for Residential Building Innovation (program team)
HEU	Home energy upgrade
LBNL	Lawrence Berkeley National Laboratory
PPA	Purchase power agreement
PV	Photovoltaic

Executive Summary

In October 2011, the Alliance for Residential Building Innovation organized and conducted an Experts' Meeting on the topic of performance guarantees and financing vehicles for energy efficiency upgrades. The meeting brought together technical, policy, and financial experts, including researchers, experienced installation contractors, and innovative energy business leaders, to discuss the opportunities and challenges for the energy efficiency upgrade industry to increase market uptake of home energy upgrades (HEUs) through innovative offerings such as performance guarantees.

The meeting had several primary goals:

1. To understand how other industries have developed successful models for financing renewable energy installations while providing performance guarantees. This has been most recently demonstrated by the solar leasing industry.
2. To explore the applicability of such business models to the energy efficiency upgrade industry.
3. To identify technical impediments to performance guarantees for energy efficiency retrofits.
4. To provide a common framework for these goals within the context of current financing mechanisms for energy efficiency upgrades.

Presentations and discussions focused on addressing the research questions through participant expertise. The discussions revealed the need to develop technical and programmatic solutions to facilitate performance guarantees through improved monitoring of energy consumption. The need to develop market-ready, affordable technologies that provide greater resolution for residential energy use in upgraded homes, most notably thermostats that measure potential "takeback," is clear. There is also a clear need to develop procedures that effectively incorporate performance guarantees into current successful business models for HEUs. This would include ensuring that industry professionals can offer valid performance guarantees.

The discussions revealed that, for the solar leasing industry, the ability to offer performance guarantees has been a significant asset for increasing finance acquisition and consumer sales. Solar leasing experts provided insights and key barriers, noting that understanding consumer psychology is vital to increasing sales of energy efficiency through private market capital mechanisms. Other presentations highlighted current industry professionals who have offered performance guarantees to customers for residential efficiency upgrades. Discussions indicated that, despite common views that current energy models are not accurate, discrepancies between model and actual performance can also be due to substandard installation work by contractors or inaccurate modeling inputs. Nonetheless, it was agreed that the EnergyPro Model required by the Energy Upgrade California program may be a good tool for assigning rebates, but is not a good tool for projecting energy use.

The meeting showed that further technological and programmatic innovations are necessary to ensure greater financing potential for residential energy efficiency upgrades. In particular, developing new procedures to track energy use, improving quality assurance and training

programs for industry professionals, and further refining energy models can allow industry professionals to offer strong performance guarantees. As proven in other energy-related sectors, the ability to offer performance guarantees is a key component to increased market uptake. The meeting provided a clear agenda for identifying the technological and programmatic innovations that would be necessary to offer performance guarantees for HEUs.

1 Introduction

On October 12, 2011, the Alliance for Residential Building Innovation (ARBI) conducted an Experts' Meeting on the topic of financing and performance monitoring needs for the home energy upgrade (HEU) industry. This meeting sought to advance understanding of innovative financial and technological methods that address significant impediments to uptake of residential energy efficiency upgrades. The meeting also sought to explore the technological and programmatic requirements of performance guarantees for energy efficiency upgrades. The need for such understanding has become clear to ARBI team members through its work providing program design and technical support for several California-based programs that seek to increase energy efficiency in the residential sector. These programs promote increased uptake of whole-house HEUs by capitalizing on economies of scale to make HEUs more affordable for homeowners.[1]

Although many advances have taken place in technology and policy mechanisms to promote energy efficiency, consumer uptake has been slow. Many sources have documented common financial impediments faced by consumers seeking to upgrade residential energy performance.[2–4] These include:

- High interest rates for energy efficiency loans
- Insufficient consumer knowledge
- High upfront costs
- Unreasonable consumer expectations for energy savings
- Inaccurate savings predictions from current energy models
- Variability of HEU results caused by consumer behavior
- Lack of emphasis in market valuation.

In robust economic times, gaining access to capital is easier, as homeowners possess equity and greater economic security. As such, the housing market since 2008 has proven challenging for energy efficiency upgrades. Uncertainty around utility bill savings is another impediment to homeowner action. The residential solar industry provides a contrast in this regard, as solar leases typically include performance guarantees. This deserves examination, as the residential solar industry has enjoyed strong growth in the last five years. If residential retrofits for energy efficiency are good investments that generate verified savings, they may provide justification for public and private capital to invest in such retrofit programs.[5] Moreover, other sectors may already have such investment models in place, which the energy efficiency industry can adopt or adapt as appropriate.

2 Meeting Logistics

As part of the Large-Scale Residential Retrofit Pilot research agenda, the team sought input and expertise from a variety of industry and government sources, working to incorporate best practices from related sectors to promote uptake of residential energy efficiency upgrades. The Experts' Meeting, titled "Energy Savings You Can Bank On," was hosted by ARBI to explore cross-cutting issues related to financing and performance monitoring of HEUs.

2.1 Topic

The Experts' Meeting focused on terms for offering residential retrofits, emphasizing the relationship between performance monitoring, consumer perception, and sector financing. More specifically, the meeting brought in experts on solar leases, current energy efficiency financing options, performance guarantees in the solar and residential energy upgrade markets, and marketing professionals. The schedule was intended to generate healthy discussion and collaboration. The attendees could learn how to apply and adapt performance monitoring and leasing lessons from one industry—residential solar installations—to the residential retrofit market for energy efficiency.

2.2 Location and Time

The meeting took place on October 12, 2011, from 10:00 a.m. to 3:00 p.m. at the offices of Renewable Funding, which are located at 155 Grand Ave., Third Floor, Oakland, California. To provide greater accessibility, the entire event was also presented through a webinar, allowing those who could not travel to hear the presentations and discussions.

2.3 Attendees

Table 1 provides a list of in-person and webinar attendees.

Table 1. Meeting Participants

Name	Position and Organization	Attendance
Aatisha Singh	Local Government Commission	Webinar
Amber Wood	NAHM Research Center	Webinar
Avery Kintner	Empowered Energy	In Person
Betsy Pettit	Building Science Corp.	Webinar
Bob Knight	President, BKI	In Person
Bradley Oberg	Integrated Bldg. & Construction Solutions	Webinar
Brian Gitt	Principal, BKI	In Person
Brian Toll	Ecobeco	Webinar
Cathy Fogel	CPUC	In Person
Cheryn Engebrecht	National Renewable Energy Laboratory	In Person
Cisco Devries	Renewable Funding	In Person
Cliff Staton	Renewable Funding	In Person
Conrad Asper		In Person
Dan Cautley	Energy Center of Wisconsin	Webinar
Danny Kennedy	Sungevity	In Person
Darren Harris	Building Media, Inc.	Webinar

Name	Position and Organization	Attendance
Dave Carey	Harcourt Brown & Carey, Inc.	Webinar
Dave King	Center for Energy & Environment	Webinar
David Riley	PA State University	In Person
Debra Little	Debra Little Sustainable Design	Webinar
Dianne Griffiths	Steven Winter Assoc.	Webinar
Elizabeth Weitzel	Sr. Engineer, Davis Energy Group	In Person
Emanuel Levy	Levy Partnership	Webinar
Eric Martin	Florida Solar Energy Center	Webinar
Jack Frost	SMI Eco-Fund	In Person
Jennifer Finnigan	CA. Public Utilities Commission	In Person
Jeremy Springer	Controller, Davis Energy Group	In Person
Jonathan Shi	University of NE-Lincoln & University of FL	In Person
Judi Schweitzer	Schweitzer + Associates, Inc.	Webinar
Kari Heinrich	WECC	Webinar
Katy Finseth	WECC	Webinar
Kelley McKanna	Renewable Funding	In Person
Kurt Roth	Fraunhofer Center for Sustainable Energy	Webinar
Larry Brand	Gas Technology Inst.	Webinar
Lisa Zuffi	SVP, OneCaliforniaBank	Webinar
Lori Bamberger		In Person
Mark Berman	Principal, Davis Energy Group	In Person
Mark Fischer	Senior VP, Grupe Company	In Person
Mark Tsimanis	VP Lending, Matador Credit Union	Webinar
Mark Zimring	Lawrence Berkeley National Laboratory	In Person
Mary Kathryn Lynch	Renewable Funding	In Person
Matt Golden	Founder, Recurve	In Person
Merrian Fuller	Lawrence Berkeley National Laboratory	Webinar
Michael Mazor	Dow Chemical Co.	Webinar
Pat Huelman	University of MN	Webinar
Pepper Smith	Davis Energy Group	In Person
Richard Chien	City of San Francisco	Webinar
Rick Chitwood	Owner, Chitwood Energy Management	In Person
Rick Williams	EcoEnergyLoan	In Person
Robert Hammon	ConSol	Webinar
Ross Rieda	Gridpath Capital	Webinar
Victoria Doyle	Consol	In Person
Wendy Sommer	Principal Program Manager, StopWaste.org	In Person

3 Meeting Objectives and Agenda

The primary purposes of the meeting were to stimulate discussion about the opportunity for new business and financial models for energy efficiency retrofits, and to explore the role of performance guarantees for increased uptake. Three main topics were included:

- **Untapped instruments for offering energy efficiency upgrades**, as guided by models from the solar leasing industry
- **The role of performance guarantees in residential energy efficiency upgrades,** noting lessons from the solar leasing industry and consequences for access to capital
- **Methods to drive demand for energy efficiency upgrades**.

By compiling these three topics, the attendees sought to understand the success of the solar industry, compare it to the energy efficiency upgrade marketplace, and understand how to apply lessons learned from solar leasing to HEUs.

3.1 Research Questions

Several key research questions were the focus of the meetings.

- What business and technical models have been employed by the solar leasing industry, which has successfully moved private capital toward residential photovoltaic (PV) installation?
- To what extent are such models applicable to the energy efficiency retrofit market for residential homes?
- How did the solar leasing industry design performance guarantees that are acceptable to consumers and investors, and what challenges were faced in creating these structures?
- Can similar performance guarantees be designed for the energy efficiency upgrade market for residential homes through technical and market innovations?

3.2 Specific Objectives of Meeting

The meeting covered a selection of topics in depth, drawing on the expertise of presenters and the knowledge of other participants. Specific objectives included:

1. Understand how the solar leasing industry develops products and markets to consumers.
2. Understand the mechanisms that drive consumer uptake for the leasing model related to residential PV installations.
3. Discuss technical impediments and solutions for energy savings performance guarantees in the residential sector, including the integration of technology innovations with program structures that draw on knowledge of consumer and financial markets.
4. Explore similarities and differences between the PV installation industry and the residential retrofit industry to determine if leasing models can be used for energy efficiency upgrades.

5. Bring together expertise from the government, industry (installation contractors and program managers), research (academic and government laboratories), and financial sectors to develop consensus about the applicability of leasing models for residential energy efficiency.
6. Chart a path for continued progress in developing a leasing model for energy efficiency retrofits.

3.3 Agenda

The agenda for the meeting is provided in Table 2.

Table 2. Meeting Agenda

Time	Topic	Speaker
10:00 a.m.–10:05 a.m.	Welcome and Introduction	Mark Berman, Davis Energy Group
10:05 a.m.–10:25 a.m.	Survey of Energy Efficiency Financing Products	Cisco DeVries, Renewable Funding
10:25 a.m.–10:55 a.m.	How do solar leases work and why are they attractive to the consumer?	Danny Kennedy, Sungevity
10:55 a.m.–11:30 a.m.	Applying lessons from solar leases to home energy upgrades	Matt Golden, Efficiency.org
11:30 a.m.–11:45 a.m.	Residential energy efficiency performance guarantees	Rick Chitwood, Chitwood Energy Management
11:45 a.m.–12:15 p.m.	Monitoring devices and performance guarantees	Beth Weitzel, Davis Energy Group
1:15 p.m.–1:45 p.m.	Driving demand for energy efficiency	Mark Zimring, LBL
1:45 p.m.–2:30 p.m.	Lessons from solar leases, performance guarantees, and marketing	Discussion moderated by Mark Berman and Cisco DeVries
2:30 p.m.–3:00 p.m.	Summary and Next Steps	Discussion moderated by Mark Berman and Cisco DeVries

4 Presentations

The presentations of the meeting covered five main topics, which are discussed in Sections 4.1 through 4.5.

4.1 Survey of Energy Efficiency Financing Products

Cisco DeVries of Oakland-based Renewable Funding gave the opening presentation, titled "Survey of Energy Efficiency Financing Products." The presentation provided background on the variety of common financing mechanisms for residential energy efficiency upgrades and proposed the question, "How do we reframe the energy efficiency value proposition for consumers?" The main themes of the presentation included: 1) the general goals for any HEU financing program, 2) a discussion of the current market, and 3) a survey of current options. The current financing market for home energy retrofits is highly-fragmented, with high interest rates and poor market penetration. While mortgage refinancing and home equity lines of credit are viable options in healthy housing markets, the current market has diminished such opportunities for homeowners. Some programs offer interest rates of 5%–9% for energy efficiency loans, notably those backed by federal, state, and local funding. Many homeowners, however, do not qualify for such loans and instead have to rely on higher interest, unsecured loans.

4.2 Solar Leasing Models

Danny Kennedy, president of the solar leasing firm Sungevity, gave a presentation on solar leasing and markets titled, "Road Map to a Sustainable Future: Aligning Public and Private Market Interests." The presentation focused on the need to ramp up home energy performance, including meeting the California policy goal of 40% reductions in residential energy use by 2020. Mr. Kennedy noted that the role of the public sector in this effort is to define risk, spur nascent market forces, and eventually regulate as market forces take over. He further discussed the relationships between contractors, homeowners, utilities, and markets, citing that all the stakeholders in the process are not accurately incentivized to pursue HEUs. To pursue residential energy efficiency, the market must be aligned with policy goals and social factors, including contractor profits and homeowner savings.

Mr. Kennedy also discussed the solar leasing market specifically, describing the forces that currently drive the solar market. He noted that more than $800 million are flowing into solar leases this year, and strong future sales are predicted. Furthermore, solar purchase power agreements (PPAs) are attractive for homeowners, who are guaranteed quality installations and energy savings at no additional risk or upfront cost. There is strong consumer preference for PPAs (50% of all solar installations in California are performed through this model). As a key point, although savings through a PPA may be less than if the homeowner funded the installation personally, strong consumer sentiments against large capital outlays without guaranteed benefits routinely inhibit action. The solar leasing industry has tried to address these points through program design and marketing.

Mr. Kennedy provided statistics about the progress and work of Sungevity.[6] The company was launched in 2010 and has seen dramatic market growth, with approximately 100 contractors in eight states and 1100 homes in its pipeline. Sungevity receives 200–500 inquiries per day, approximately 5% of which are converted to sales. The company typically bundles about 100, 5-kW residential projects into one 500-kW project, which is then funded through a tax equity

investment fund. Customers are engaged through an easy, over-the-phone assessment process, and a two-week sales cycle helps to maintain that engagement. Guaranteeing immediate savings with no upfront costs and engagement with the consumers over the life of the equipment are critical for consumer action. Sungevity gives each customer an IPad to monitor energy use, a perk that has been widely successful. The customer base has also been shifting, from relatively affluent customers to less-affluent neighborhoods where customers are very concerned about energy costs. For all customers, the company works with partners to run background and credit checks; a minimum credit score of 700 is required. This results in a very low default rate and drives the profitability of the investment model.

4.3 Applying Lessons From Solar Leases to Home Energy Upgrades

Mr. Matt Golden next discussed how to apply lessons from the solar leasing industry to the HEU process. Mr. Golden raised the most pressing questions facing the residential energy efficiency market in attempting to adopt a similar leasing model, including:

- **Mitigation of risk** is critical to increasing consumer demand. At present, the industry cannot accurately describe the risk profiles, and there is need for a continued large public sector role in this early adoption phase to better understand results before instituting performance guarantees.
- **Alignment of incentives is poor** for many involved parties. For instance, unlike the solar industry, contractors do not make more income based on increased energy savings.
- **Quality assurance** in the solar industry is much more stringent than in the HEU industry, which makes performance guarantees viable.
- **Energy models** are not accurate enough at present to ensure that predicted savings match actual savings.
- **Monitoring technologies** are critical for acquiring data to understand performance, maintain quality control, and fully understand the risk profile of the industry.
- **Occupant behavior** is an issue for the home energy retrofit industry. Unlike solar panels, which produce power subject to environmental conditions, energy upgrade performance is dictated by occupant behavior, which may or may not change after energy efficiency measures are installed.
- **Access to data** is critical to proving the business model. Energy Upgrade California is one potential repository for such data, as the program currently has several thousand homes.

In summary, Mr. Golden noted a series of issues, notably risk management and guaranteeing performance, that are the main challenges in applying the solar leasing model to home energy retrofits.

4.4 Residential Energy Efficiency Performance Guarantees

Mr. Rick Chitwood next discussed the topic of performance guarantees for the residential energy upgrade industry. As an industry leader, Mr. Chitwood discussed how he is able to provide performance guarantees and laid out needs and requirements the industry must meet to ensure that other contractors operate at the same level.

A major challenge is that this is currently a "low-bid" market, whereby contractors are not rewarded for spending more time, effort, and money in doing upgrades, because they reap no financial returns. Consumers are more likely to choose less expensive options, which often results in substandard work. Current energy models are inaccurate as predictors of energy savings for the industry, but not necessarily because of poor modeling. Further data are needed to use such models more accurately; however, in many cases, poor installation work degrades home upgrade performance. Thus, although models must be recalibrated after a period of use, doing installations to a high quality standard is perhaps more important to ensure performance. Once major variables are controlled, model performance can be accurate.

Mr. Chitwood proposed that the most effective interventions to increase market penetration are changes in mindset. Reeducating the public, design professionals, building professionals, and the finance industry about the proper ways to seek energy retrofit savings must be emphasized to the same degree as developing new energy models or collaboration tools.

Mr. Chitwood described how he has offered performance guarantees on the heating and cooling parts of the utility bill, which was very effective. He would guarantee performance for three years, offering to pay any overages during this time as long as the customer agreed to operate the home efficiently based on a desired thermostat setting. He then discussed a series of specific examples of poor installation work that he has found through inspections. Problems with the installation of ducts, insulation, HVAC systems, and electrical wiring all detract from overall performance, subsequently skewing results from predicted values.

4.5 Monitoring Devices and Performance Guarantees

Ms. Beth Weitzel, senior engineer at Davis Energy Group, discussed issues surrounding energy use monitoring in homes. Modeling tools project energy savings and impacts of individual retrofit measures on savings, serving as the basis for consumer sales, performance guarantees, and potential industry investments. Currently, models can use pre-installation and post-installation data to project cost savings, assuming consistent consumer behavior compared to actual savings. Currently utility data, however, do not have sufficient resolution to fully reveal consumer behavior. For instance, key metrics such as pre-installation thermostat settings, heating and cooling system disaggregation (identifying the energy used to run only home heating and cooling), and the relationship between indoor and outdoor environmental conditions are not accurately captured.

In terms of market-ready consumer devices, monitoring devices that can track heating and cooling set points and system use are reasonably priced, easy to install, and allow for remote access to data. Thus, technical solutions are already available that can address some of the major challenges involved in monitoring energy use and providing performance guarantees.

4.6 Driving Demand for Energy Efficiency

Mr. Mark Zimring discussed themes from a Lawrence Berkeley National Laboratory study titled, "Driving Demand for Home Energy Improvement: Motivating residential customer to invest in comprehensive upgrades that eliminate energy waste, avoid high bills, and spur the economy."[7] Based on case studies, market research, expert interviews, and home performance contractor interviews, the research identified some successful components of strong energy upgrade

programs, and questioned the assumption that educated, affluent consumers will proactively spend $10,000–$20,000 on energy retrofits.

Instead, the energy retrofit industry must use its knowledge of consumer and contractor behavior to effectively design programs that are both acceptable and approachable. Building trust among the participants is important and is most effectively done through personal interactions and word-of-mouth marketing. Messaging is also very important and should reflect current findings; for instance, that people are more sensitive to losses than to gains, and are easily overwhelmed. Effective marketing to initial groups is important for early adoption, which can then build new social norms that spread acceptance and broader uptake. Industry must respond to these realities to design programs that function effectively. At the same time, contractors must be properly trained and able to market a program that they believe in. The programs should focus on comprehensive upgrade models rather than piecemeal approaches.

Mr. Zimring also noted that although building effective programs is important, in many cases, current program structures impede progress. Regulatory inflexibility can prevent the industry from offering products that people want. Thus, programs that institutionalize a set of upgrades may not provide enough flexibility to respond to consumer preferences.

5 Discussion

Understanding the differences between the solar and residential energy retrofit industries can illuminate discussions for cross-sector model adaptation. Meeting participants engaged this issue during the last sessions as a way to identify and summarize relevant points.

5.1 Solar and Residential Energy Upgrades: Understanding the Differences

Despite an array of subsidy programs for energy efficiency retrofits, the market in the current economic climate is nascent. The solar industry, which has also benefitted from an intermittent collection of government subsidies, has seen more rapid uptake only when subsidies are combined with business models that capitalize on market conditions and opportunities. Thus, though the solar leasing industry has found a successful formula, the extent to which market conditions and opportunities are applicable is not absolute. Solar installations are more visible than energy efficiency upgrades. Transaction costs for a PV installation are lower than with an energy efficiency upgrade. Solar arrays are also viewed as technologically advanced; energy efficiency is not.

5.1.1 Risk, Uncertainty, and Market Response

Solar panels, if installed and maintained, will produce power based on the PV array characteristics and site constraints, regardless of how a customer uses produced electricity. Established models can account for climatic variability and predict with reasonable accuracy the performance of a PV array, notwithstanding annual climatic perturbations. Similarly, models can predict with reasonable accuracy the risks associated with a portfolio of PV customers based on standard metrics such as credit scores. In the home energy retrofit industry, however, performance of installations is perceived to be much more variable, in in part because customers have the potential to affect the performance of the technology. Presenters noted, however, that this impediment is closely related to training and quality control as well as technology gaps. Increasing market penetration may mean addressing all these factors, but no one factor presents an unattainable challenge.

5.1.2 Reducing Risk Through Public Participation and Robust Data

Spurring further private investment for home energy retrofits is more closely related to a consumer's ability to maintain monthly payments than to equipment performance. Thus, if viable markets emerge by convincing consumers to complete HEUs, the vehicles to attract private investments are available. The public sector can play a key role in supporting the nascent industry by providing credit enhancements that will spur private investment. In sponsoring pilot programs, developing best practices, and providing capital guarantees, the public sector can help current industry participants show profitability and the extent of potential markets. It can also emphasize the importance of such efforts through critical regulatory support.

Data can also reduce uncertainty and alleviate the risk that predicted savings will not be realized. Market-ready technologies can provide the residential retrofit industry with better data repositories, which are useful in developing more accurate models. For example, thermostats that differentiate home heating and cooling from other residential activities such as pool heating or appliances can greatly help develop accurate savings projections. Not all data solutions, however, are technological. Program designs that emphasize pre- and post-installation monitoring can help consumers realize savings and contribute to energy models. Data are an

important contributing factor for offering performance guarantees on a broader scale, but alone are not sufficient.

5.1.3 Consumer Behavior

Consumer behavior is also a critical consideration for successful residential energy efficiency programs. Consumer limitations of knowledge, key price points, and importance of relationships must influence program design and industry approaches. Many in the industry might believe consumers seek the best deal, but in reality, successful programs from the solar leasing industry show that consumer behavior is not solely influenced by final cost. Instead, **successful programs minimize upfront costs, provide savings guarantees, and offer extended maintenance contracts to entice consumers.** Even more, small perks such as free IPads can effectively "push consumers over the edge" toward an installation. Sales and marketing must rely on a keen understanding of consumer behavior rather than on numbers alone.

Some related industries, especially residential security monitoring, are becoming engaged with the energy retrofit industry. Security companies regularly maintain information architectures that can monitor for open doors and windows or changes in energy use that might indicate a security issue. The opportunity to couple energy monitoring with other industries should be explored to the extent that it can generate savings or bundled packages for consumers. Opportunities to package energy retrofits with solar leasing installations or routine HVAC upgrades were also discussed. Although exploiting such channels may be viable, the complexity of these additional packaged services would have to be carefully managed to maintain consumer-friendly market approaches.

5.2 Research Questions

Discussion covered many points related to the primary research questions.

What business and technical models have been employed by the solar leasing industry, which has shown success to date in moving private capital toward residential PV installation?

The solar leasing industry, as represented by Sungevity, has successfully used a leasing model that bundles about 100 small-scale residential PV projects into a larger investment package. The model increases investment attractiveness by pooling risk, providing portfolio management services, and ensuring performance guarantees. The industry has built a robust risk management strategy by understanding performance guarantees and revenue generation potential. At the same time, solar leasing companies also have effective market knowledge, using insight into consumer preferences to provide desirable products. Minimizing information requirements, meeting key baseline savings estimates, and minimizing consumers' initial capital investments are critical for market growth.

To what extent are such models applicable to the energy efficiency retrofit market for residential homes?

Models from the PV industry are applicable for the home energy retrofit industry, but some gaps in programs and technologies remain. The home retrofit industry and associated contractors must work to ensure quality control at a level equivalent to the solar industry to achieve the

performance guarantees sought by potential investors. HEUs must also tailor marketing approaches to the retrofit industry specifically.

How did the solar leasing industry design performance guarantees that are acceptable to consumers and investors, and what challenges did it face in creating these structures?

The solar leasing industry used its strong knowledge of consumer preferences to design performance guarantees based on a developed "magic number" of 15% savings, which serves as a key marker to predict consumer adoption. Moreover, consumers seek minimal responsibility for maintenance and upkeep, so business models that alleviate customers from effort and worry spent maintaining the PV array are more successful. From the standpoint of investors, by bundling risk, managing a portfolio of PV projects, and showing verified risk models based on data, the solar leasing industry can show investors clear returns with low risk.

Can similar performance guarantees be adapted to the energy efficiency upgrade market for residential buildings?

Discussion of this topic ranged from monitoring devices to quality control for installations. To develop performance guarantees for home energy retrofits, more data need to be collected, including pre- and post-installation envelope and HVAC system performance, which can feed more accurate modeling. Moreover, current market technologies can gain greater resolution into residential energy use for installation projects, notably advanced thermostats. Finally, despite current thought, performance guarantees for energy efficiency are possible and are currently being done by a few contractors to an acceptable level of predictability. The critical components to making this work are ensuring quality installation work, making post-installation model adjustments, and accurately assessing upgrade options.

6 Conclusions and Next Steps

Capturing energy efficiency opportunities is a monumental but necessary task that must be embraced to maintain global competitiveness. Rather than a single solution set, this macroeconomic shift requires cross-sector learning that identifies business models that successfully promote renewable energy and energy efficiency, and adapts these models appropriately across industries. With this goal in mind, the meeting facilitated robust discussions between financial, technical and policy experts across two important energy fields: solar and energy efficiency.

Performance guarantees are seen as critical to leasing programs. The discussions revealed, though, that performance guarantees are most important for consumers. At the same time, other factors influence consumer uptake of home energy retrofits. Minimizing upfront costs, information barriers, and maintenance responsibilities can be key selling points for customers. Thus, even when performance guarantees are commonly available, they alone will not result in automatic market growth of HEUs.

For the residential energy efficiency industry to use successful leasing models, several requirements are necessary:

- Energy models must more accurately reflect energy savings, allowing consumers to understand potential benefits of upgrades. This is both a technical and programmatic challenge. Market-ready technologies can provide increased data resolution on consumer energy use, which could help residential energy upgrade professionals quantify savings.
- More and better data from a growing set of residential retrofit programs are necessary to feed more accurate modeling efforts.
- Experienced energy efficiency professionals can accurately provide performance guarantees based on current models.
- With the development of enhanced energy modeling use procedures, as well as proper installations and quality control, upgraded homes could perform very close to proper estimates.
- Programs must be developed that provide incentives for contractors to do quality work, essentially giving them “buy-in” to the upgrade process.
- The leasing arrangements employed by the solar industry are essentially unsecured loans sold as monthly payments. Energy efficiency retrofits can achieve the same effect by selling home performance as a periodic service with a performance guarantee. The methodology for structuring this service may vary; however, a service arrangement represents less uncertainty to the homeowner and a more effective sales mechanism to the contractor.

Only through a combination of these advances can performance guarantees be realized.

6.1.1 Future Steps

Key next steps include:

1. **Survey available technologies,** such as SmartMeters, that can increase data resolution for home energy use. Needed capabilities include differentiating home heating and cooling costs from other uses such as pools or appliances. Procedures need to be developed for gathering data from SmartMeters and disaggregating the data by use.
2. **Update energy models** based on more data and actual home performance. This should include consideration of very different types of tools, notably bill disaggregation coupled with inspection data, to avoid inherent modeling simulation problems.
3. **Develop energy bill correlation and model use guidelines for current energy models** that lead to more accurate savings projections that can form the basis for widely offered and accepted energy savings performance guarantees.
4. **Explore the potential for continued service agreements** as part of energy efficiency upgrade packages. This continued engagement of customers and contractors would increase the potential for continued performance, and give contractors significant incentive to perform quality installations.
5. **Pilot performance guarantees and test their impact** for consumer uptake of HEUs.

References

1. Davis Energy Group Draft Technical Report: Coordinate Pilot Neighborhood Programs. A report to the Building America, Building Technologies Program. (Davis, CA, 2011).
2. Harcourt Brown & Carey, Inc. Energy Efficiency Financing in California: Needs and Gaps. Preliniary Assessment and Recommendations. A Report to the California Public Utilities Commission. (2011).
3. Lockhart, J.B. Federal Housing Finance Agency: Background on Energy Loan Tax Assessment Programs (ELTAP). (2009).at <http://pacenow.org/documents/FHFA%20Letter.pdf>
4. Karolides, A. Mainstreaming Energy Efficiency in U.S. Homes: Market Barriers and Potential Solutions. (Rocky Mountain Institute: 2011).
5. Middle Class Task Force, Council on Environmental Quality Recovery Through Retrofit. (2009).
6. Sungevity Web Page. (2007).at <http://www.sungevity.com/how-does-it-work>
7. Fuller, M.C. et al. Driving Demand for Home Energy Improvement: Motivating residential customer to invest in comprehensive upgrades that eliminate energy waste, avoid high bills, and spur the economy. (Lawrence Berkeley National Laboratory: 2010).

Appendix 1: Meeting Slides

Alliance for
Residential
Building
Innovation

ENERGY SAVINGS YOU CAN BANK ON

Residential Energy Efficiency Financing Mechanism

October 12, 2011

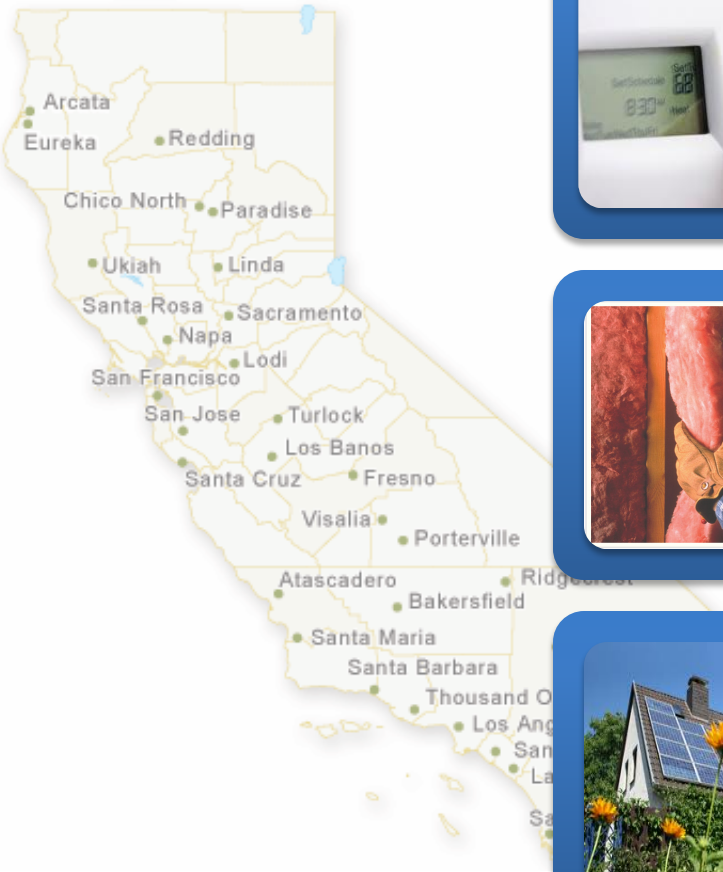
Home Energy Retrofit Financing

October 12, 2011

RENEWABLE FUNDING

Alliance for Residential Building Innovation

California Energy Efficiency Market



Reactive: HVAC Replacement Alone is $1 billion per year

- 2% of homes replace HVAC on average
- Over 150,000 units per year

Proactive: Energy 'Upgrade' Market Nascent, Lacks Financing

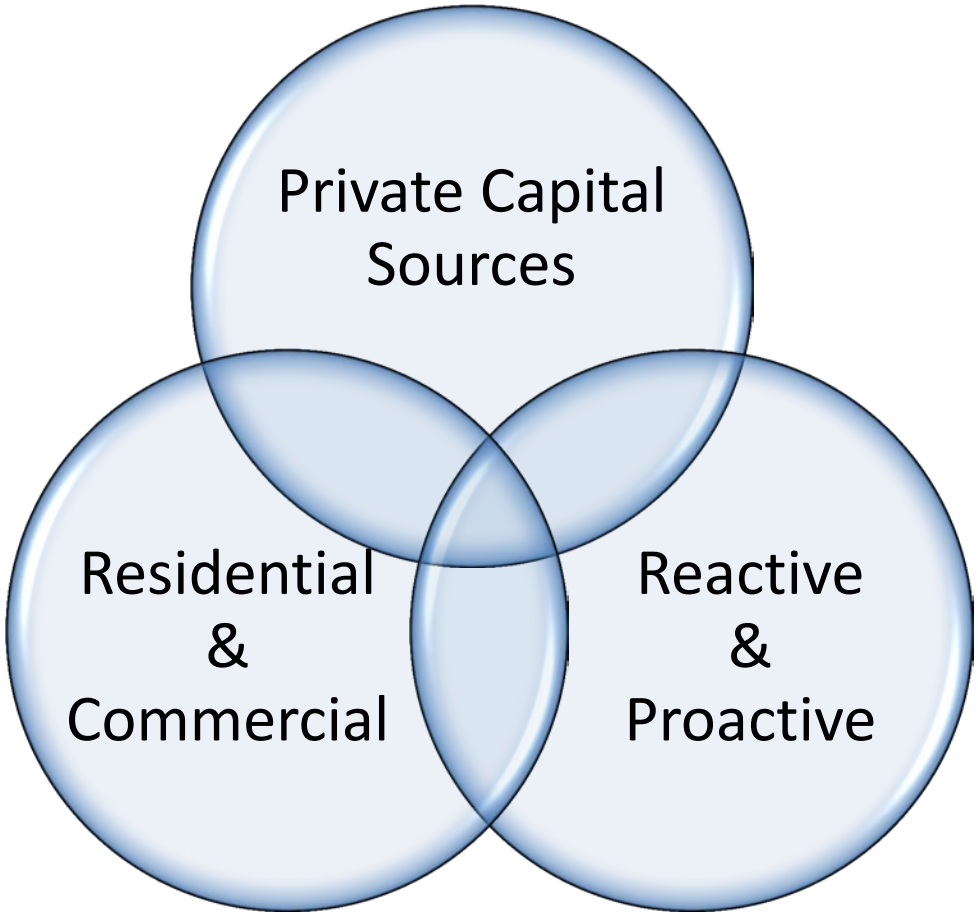
- Goal of Energy Upgrade California
- New State Rebates and Local Programs

Solar Market Now $1.3B/ year

- CSI program nearly complete
- Lease and PPA financing is accelerating

Goals for Financing Program

- Supports highly leveraged private capital
- Serves residential and commercial markets
- Supports reactive and proactive projects



Home Energy Retrofit Market Today

- Current home energy retrofit market:
  - Highly fragmented
  - Unsubsidized rates in mid-to-high teens
  - Idiosyncratic, small financings held in private portfolios (banks, credit unions, state agencies)
  - Poor market penetration
  - Illiquid
- The lack of an attractive, scalable financing solution has limited the market's growth

Financing Option Overview

Unsecured

- Application of standard consumer credit and underwriting practices coupled with contractor, project and program requirements
- Generally requires credit enhancement
- Supports residential not commercial

PACE

- AB 811 allows cost of energy improvements to be repaid through an assessment on the property tax bill
- Residential mostly on hold, commercial moving forward

"On-Bill"

- A collection mechanism, not a financing mechanism
- Security of repayment depends on a number of policy and design factors

General Financing Options

Product	Average Rate as of 10/11/11
Mortgage Refinance	4.15% fixed
Home Equity Line of Credit (HELOC)	4.72% variable
Home Equity Loan	6.01% fixed
Credit Card	16.05% variable

Alliance for Residential Building Innovation

Examples of California Energy Retrofit Financing Options

	Rate	Terms	Loan Amount	Notes
EUC Los Angeles	4.99%-6.99% secured 6.99%-8.99% unsecured	10-15 years secured 5-10 years unsecured	$2,500-$50,000	ARRA funded LLR
Sonoma County Energy Independence Program	7%	Based on the expected life of the measure, up to 20 years	$2,500-10% of the value of the home	-PACE program -Debt secured by a senior lien
Energy Efficiency Mortgages	Varies by lender and product – average 4.48%	30 years	Varies by lender	Many homeowners may not be eligible for an EEM
FHA PowerSaver Loans	Varies by lender; may be between 5-7% secured 6-8% unsecured	Up to 20 years	$7,501-$25,000 for secured (loans under $7,500 are unsecured)	-FHA backs a percentage of portfolio -Not yet available in California

Examples of California Energy Retrofit Financing Options

	Rate	Terms	Loan Amount	Notes
CHF Residential Energy Retrofit Program	3% fixed	15 years	N/A	-Restricted to low to mid-income homeowners -Unsecured
GeoSmart	Rates start in the mid 20's	10 year fixed or variable	Up to $25,000	-Rates are bought down by the contractor -Unsecured
Enerbank Express Loan	0% for initial period, then converts to 18%	Same as cash for a period up to 18 months	Up to $45,000	-The contractor pays a premium for this financing -Unsecured
Fannie Mae Energy Loan Program	14.99%-15.99%	10 years for regular upgrades and 12 years for EnergyStar products	Up to $20,000	Unsecured

25

Summary of Consumer Loan Proxies

	Non-Subprime 2nd Lien/ HELOC's	Credit Cards	Prime Auto Loans	HUD Title I	Keystone HELP Program
Maximum Historic Losses Per Annum	~20%	~10%	~2.1%	~16% (peak in 1996)	~2.99%

Alliance for Residential Building Innovation

Danny Kennedy

SUNGEVITY™

Alliance for Residential Building Innovation

Building America finance experts meeting October 12, 2011

Road-Map to a Sustainable Future:
Aligning Public and Private Market Interests

Alliance for Residential Building Innovation

We are Building a Foundation

- But what does the house look like?
- How much will it cost?
- What does home retrofitting look like in 15 years, at scale, and delivering on the promise?
- What does the model look like that is:
  - Economically Sustainable at Scale
  - Drive Consumer Demand
  - Attract Billions in Private Investment
  - Bring Energy Efficiency to Market as a Resource

Ramping up Home Performance

- 5 Million Home's per Year
  - $1,911 per house total program costs (NYSERDA cost 2010)
    - admin / marketing / incentives / financing
  - **$9+ Billion** in subsidies required per year
- California Goal of 40% reductions by 2020:
  - **$150 Billion** in Consumer Spending (40% reduction in Res Energy)
  - Total Rate Payer EE Investment (all sectors) $1B per year
- HERSII will cost over $4B just to add labels to CA homes

* Source: U.S. Census, 2010

State	Units of Housing	10,000 Years	1000 Years	100 Years	10 Years
U.S. Total	130,000,000	13,000	130,000	1,300,000	13,000,000
California	13,433,718	1,343	13,434	134,337	1,343,372

Role of the Public Sector

- Define Risk in the face of Uncertainty
- Act as a proxy for market forces that don't yet exist
  - Incentives based on predicted performance
  - Ensure risk to reduce financing costs
  - Set standards to ensure quality work
  - Be a market accelerator (marketing / workforce / etc.)
- As markets stand up, the public sectors role must transition from market maker to regulator

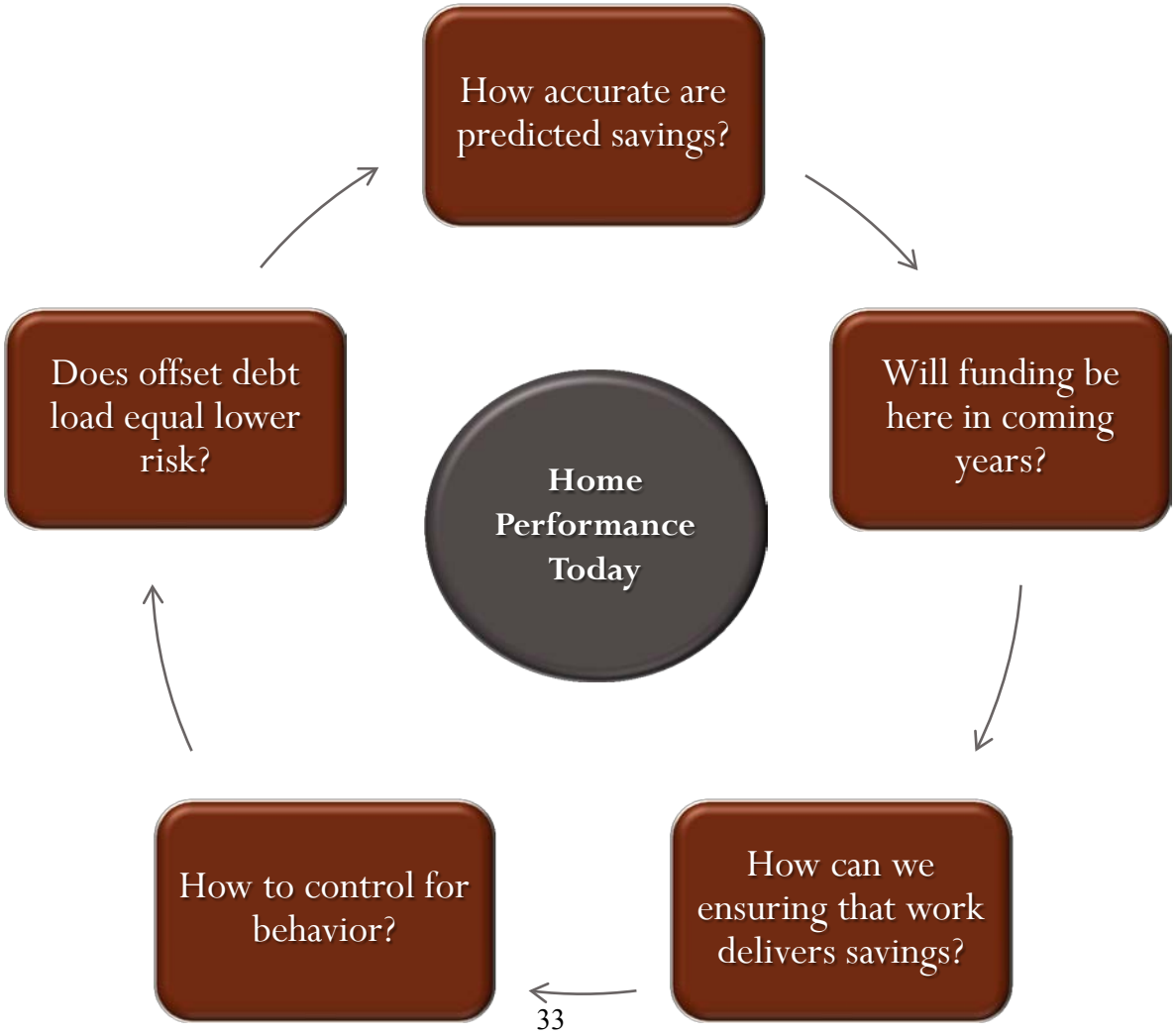
Uncertainty vs. Risk

UNCERTAINTY is present when the likelihood of future events is indefinite or incalculable

RISK is present when future events occur with measurable probability

- House odds if you bet on black: **5.26%**
- House always takes the bet!

Is it Risk or Uncertainty?



Market or Regulatory System?

Stakeholders are not incented correctly:

- **Contractors** make more money doing poor work, and don't share in the long term financial benefit of a job well done.
- **Homeowners** lack price transparency and pay too little for energy to motivate change. Not to mention tiered rate structures are not aligned with policy goals.
- **Utilities** make money by selling energy.
- **Capital Markets** like to invest in managed risk based on actual performance data.

Aligning Market Interests with Policy Goals

- **Contractors** predict energy savings with known certainty.
  - On the hook for the results of their work
- **Homeowners** buy comfort and guaranteed savings
  - Cold beer, warm showers
- **Market** to turning negawatts into a resource
  - Reduced risk of energy efficiency projects drives access to capital
  - Utilities buy DRM and Negawatts as a resource

An Example of Market Transformation

- California Solar Initiative in Northern California from $4.50 a watt to $.25 in 2011
- Over 1000 active solar contractors and growing

What's Driving the solar Market?

- Private Capital Enter The Market
  - $800M++ into solar PPAs and Leases this year
  - Many additional deals on the horizon
- Solar Power Purchase Agreements (PPA)
  - Homeowner assumes no risk or upfront expense
  - Installation is done to extremely high standards
  - Homeowner gets guaranteed savings
- Market Holds Industry to High Standards

Can it Work for Energy Efficiency?

- Savings may be less certain, but are cheaper
  - Federal Energy Regulatory Commission:
    - Demand response negawatts get full market price
  - Serious Energy / Metrus Energy
    - Commercial Efficiency PPA
  - New England ISO Markets

Performance Guarantees

… or Getting Paid to do Good Work & Delivering Real Performance

Rick Chitwood

Alliance for Residential Building Innovation

How is an HVAC or Insulation contractor going to get paid to do good work – in a "low-bid" market?

- Marketing high-quality and high-efficiency
- HERS ratings
- Energy Star certified homes
- **Bill Guarantees**
- **Energy features that really perform**

Redding, California - Showcase Home

Case Study – The Benefits of a Home Performance Approach

Redding, California Showcase Home

Bill guaranteed at $76.00 per year for air conditioning, $241.00 per year for heating, 3,500 square foot home

$317.00/year total for heating & cooling

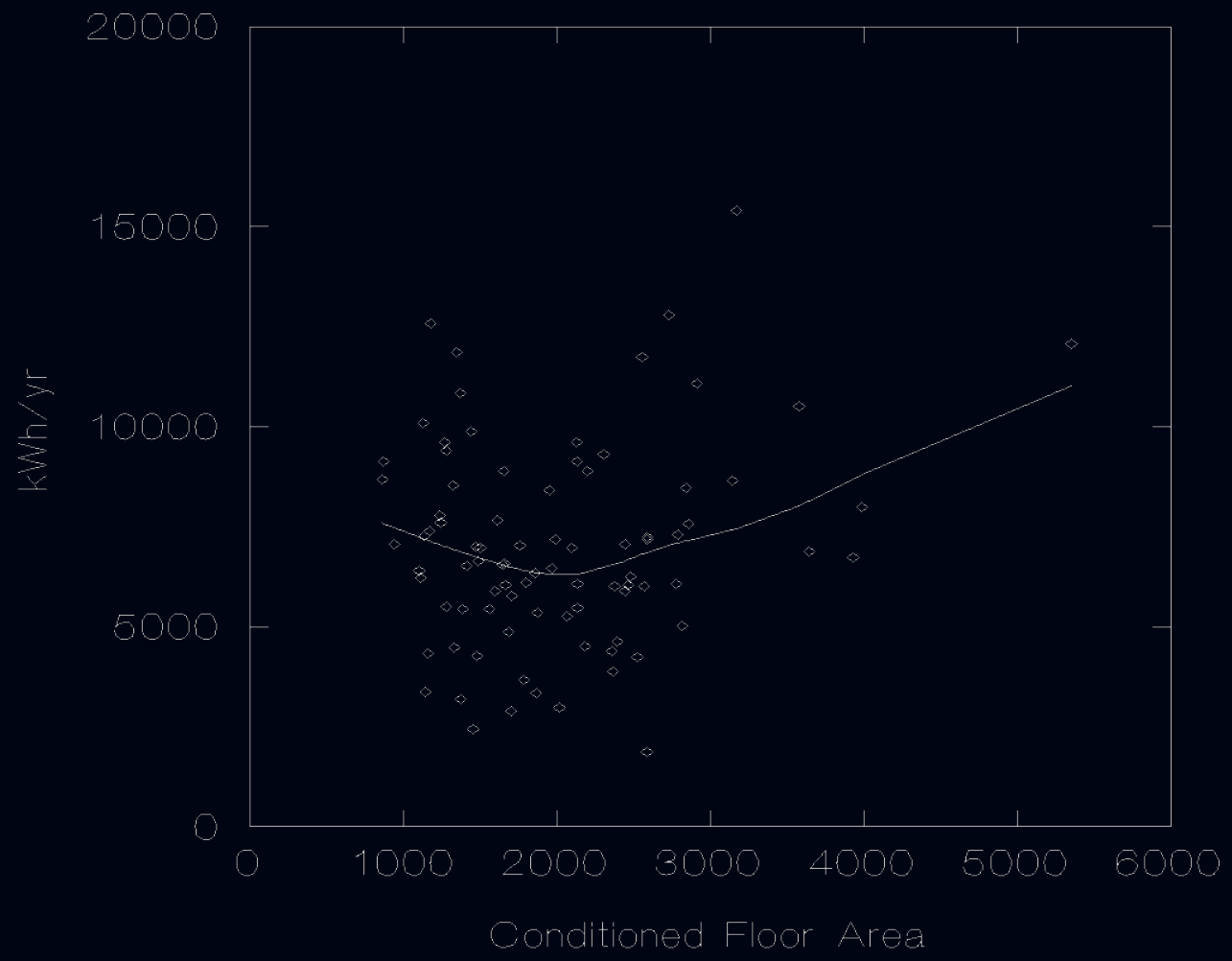
Redding, California Showcase Home Performance Monitored By DOE Building America Program

- High-end custom home (Realtor's Showcase of Homes)
- Conventional architecture
- Conventional framing
- Conventional insulation (batts in walls, loosefill in attic – to standard R-values)
- Conventional HVAC system (ducts in the attic)

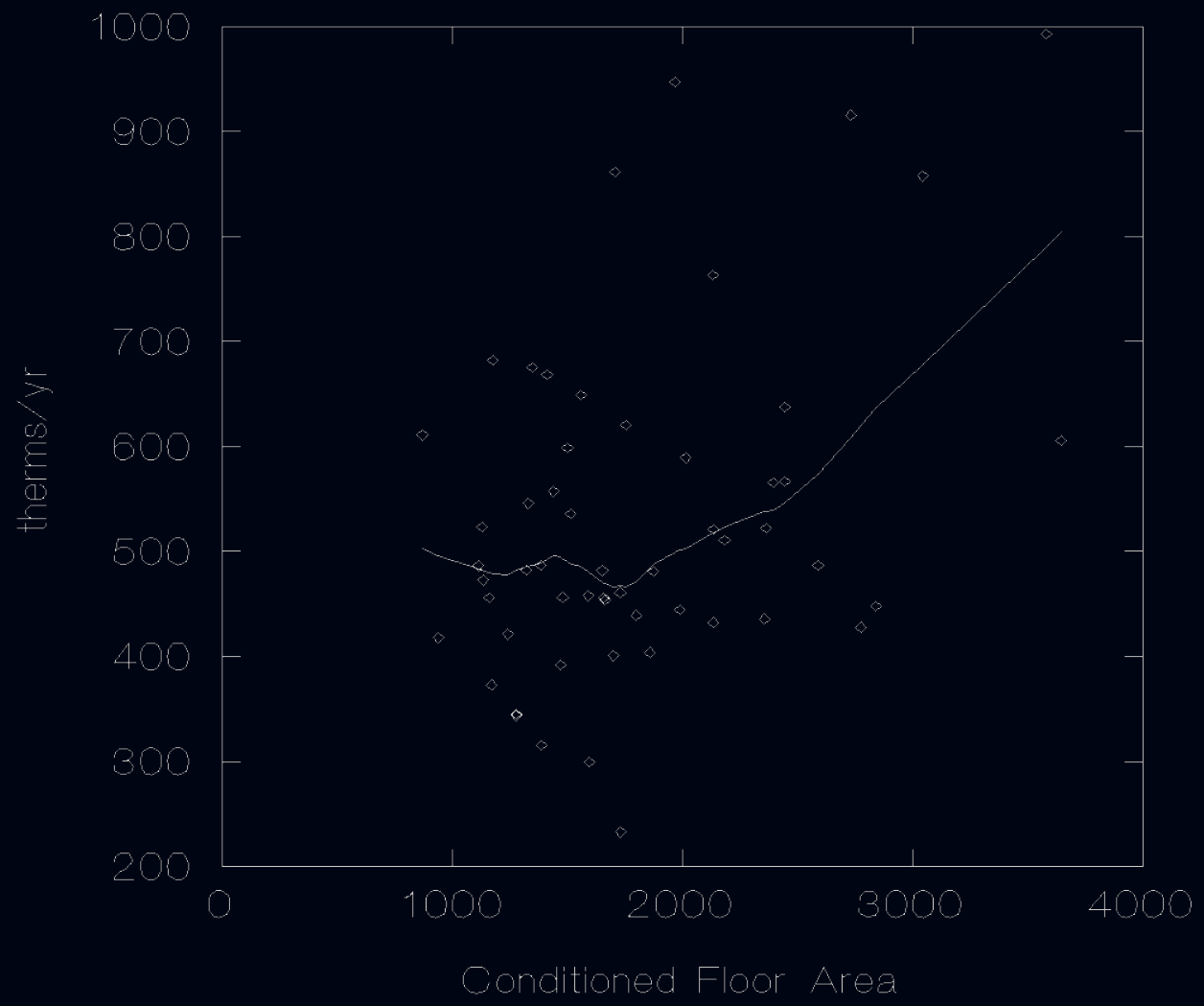
Redding, California Showcase Home Performance Monitored By DOE Building America Program

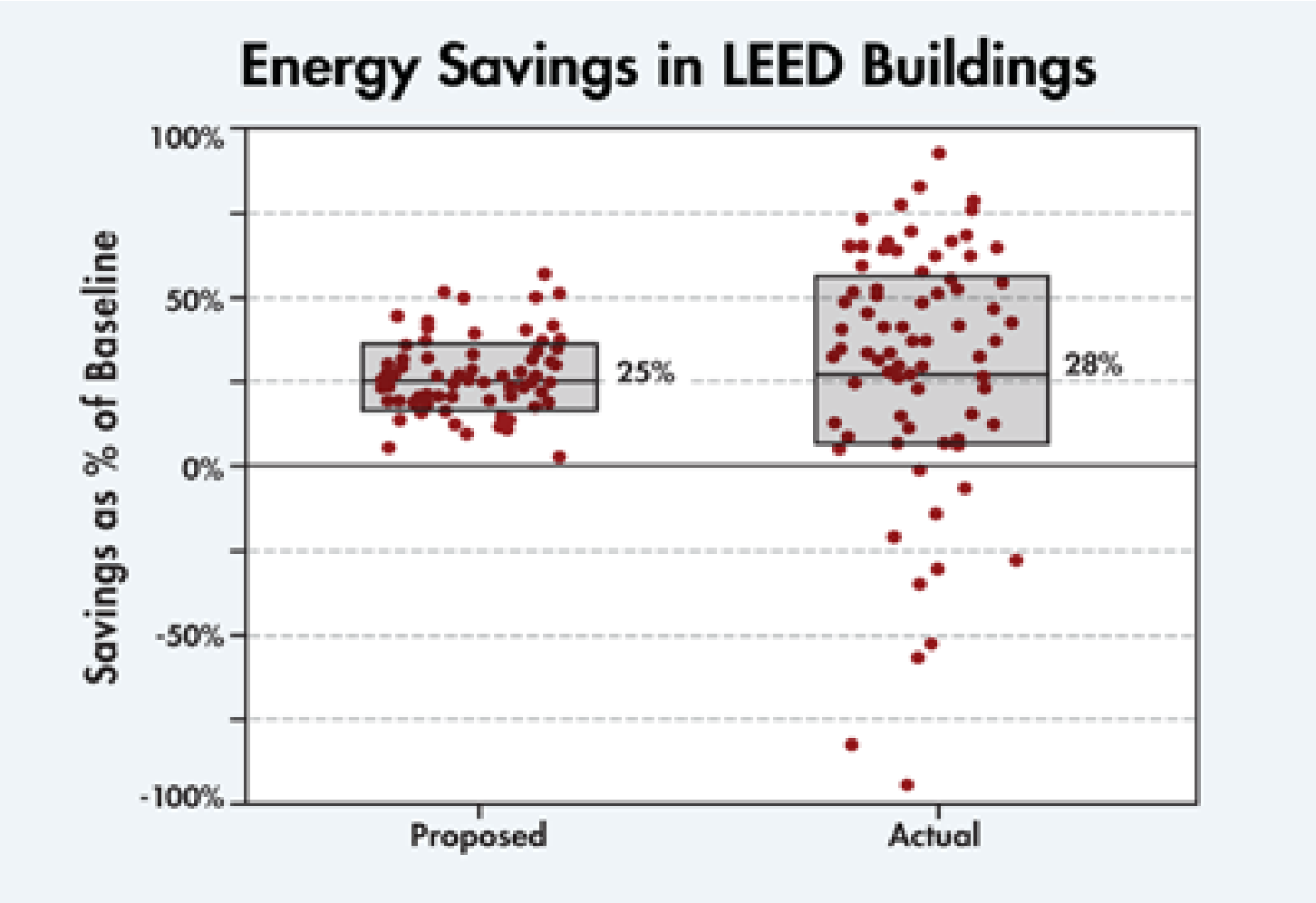
- Actual cooling costs reduced **81%** (83% compressor, 68% fan, report page 10)
- Actual heating costs **49%** reduction in gas usage, 65% fan energy reduction (report page 10)
- Cost of energy improvements were **0.4%** of home cost, or $5,139.00 (see report page 11)
- Air conditioner size **2 tons** (1,760 square feet per ton, one quarter of typical)
- **60% better** than the Geothermal Heat Pump next door

How Much Electricity Does A New California Home Use?



How Much Natural Gas Does A New California Home Use?

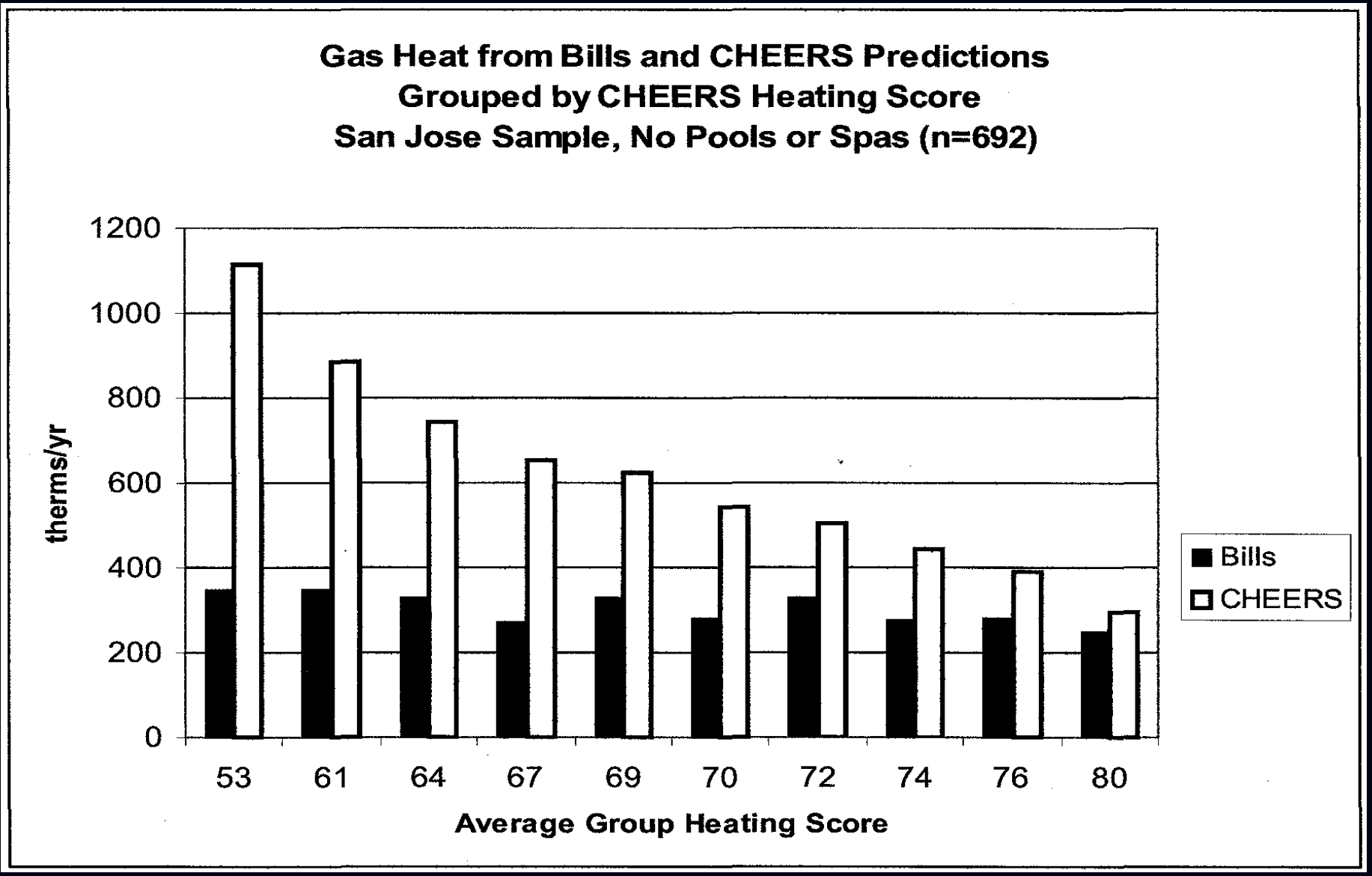


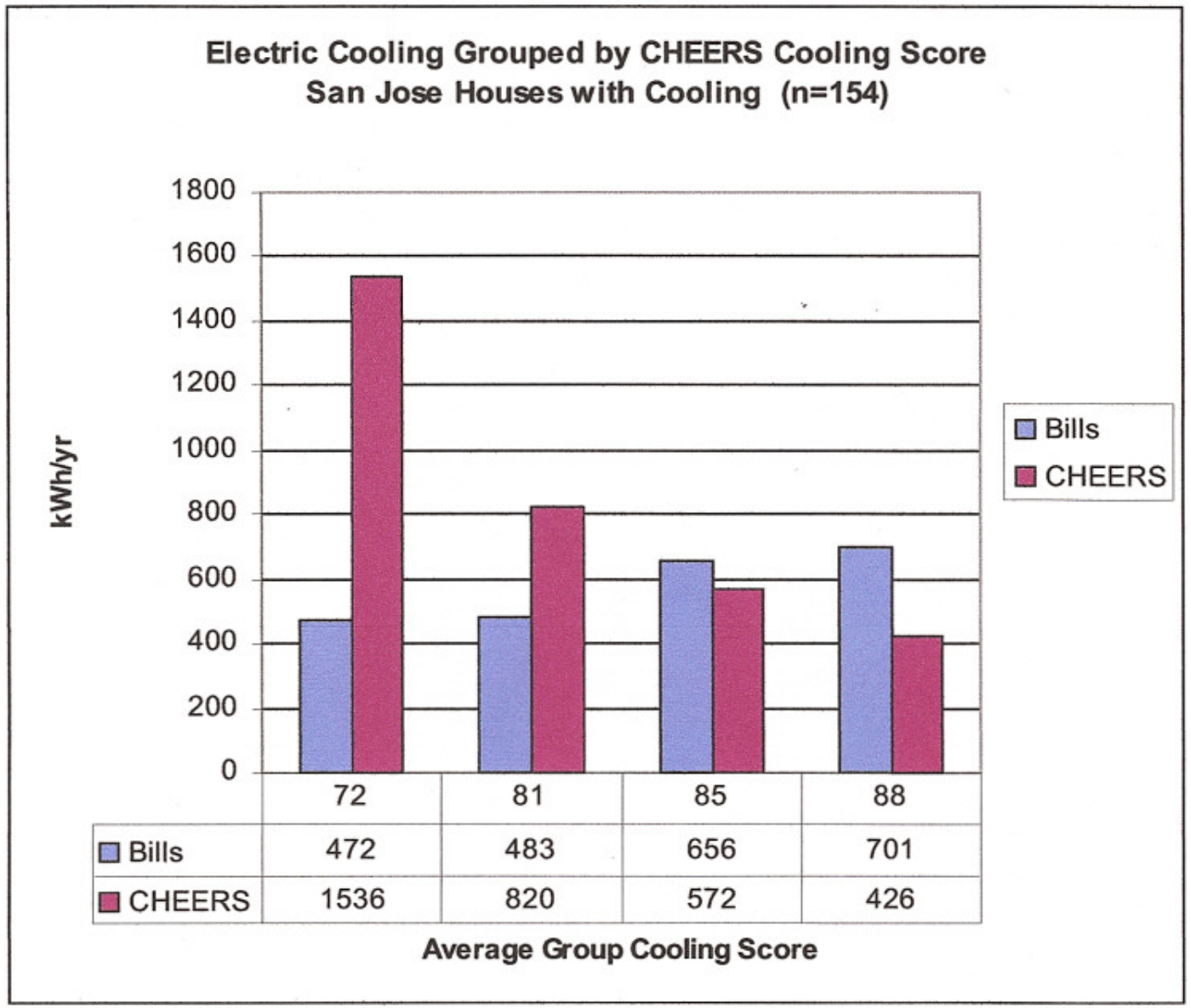

Energy Savings in LEED Buildings
Savings as % of Baseline
100%
50%
0%
-50%
-100%
25%
28%
Proposed
Actual

Modeling vs. Reality
(using our best engineering judgment and our best modeling tools)

- **LEED buildings use 40% <u>more</u> than predicted** (University of Massachusetts at Lowell research)

- **The Redding Showcase Home used 45% <u>less</u> than predicted** (Building America research)


Gas Heat from Bills and CHEERS Predictions
Grouped by CHEERS Heating Score
San Jose Sample, No Pools or Spas (n=692)
therms/yr
1200
1000
800
600
400
200
0
53
61
64
67
69
70
72
74
76
80
Average Group Heating Score
Bills
CHEERS



	72	81	85	88
Bills	472	483	656	701
CHEERS	1536	820	572	426

Current Residential HVAC Design and Installation

	Low	High	% difference
Fan: watts/square foot	**0.13 W/SF**	**0.92 W/SF**	**708%**
Heating: Btu/square foot	**9 Btu/SF**	**110 Btu/SF**	**1,222%**
Cooling: square feet/ton	**1,739 SF/ton**	**200 SF/ton**	**869%**
Air Infiltration: ACH	**0.12 ACH**	**1.92 ACH**	**1,600%**

Note: Average air infiltration is 0.25 ACH in new homes (2010 research, Wilcox, Proctor, Chitwood)

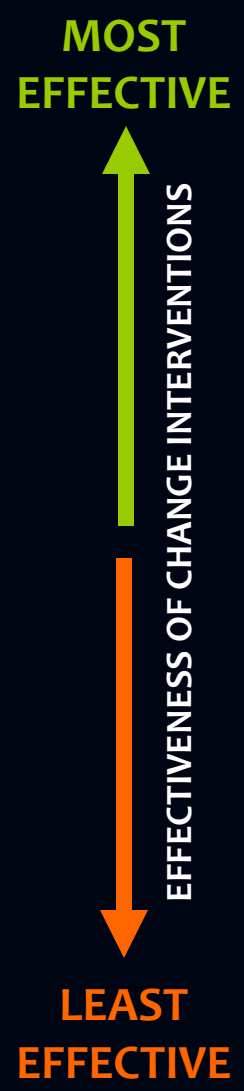
Why aren't our HVAC Professionals and our Ability to Model Energy Efficiency; Delivering Consistent Results?

- No QA and little QC
- The installed performance of the energy features varies greatly – but no one is looking
- The HVAC industry gets all its training from "marketing"

How do we deliver bill guarantees and real performance?

- Our new "intermediate testing" effort is a good start (BlowerDoor, DuctBlaster, charge, airflow, etc.
- Real "whole system" performance testing and "whole building" energy consumption monitoring is where we need to be - soon
- We need to stop believing the modeling
- Performance testing (intermediate and whole system) will help us train our workforce

Effecting change … EFFECTIVELY



- **New MINDSET – reeducate**
  - Public
  - Design professionals & students
  - Building professionals & trades
  - Finance and real estate professionals
  - Educators (yes, even them)
- **New PROCESSES – revamp**
  - Goal-setting
  - Design collaboration
  - Energy modeling
  - Construction
- **New TOOLS – reevaluate and redesign**
  - Energy models
  - Collaboration tools
- **New TECHNOLOGIES … *maybe?***

16” uninsulated bypass duct with no weight on the barometric damper

Pressure boundary and insulation performance problems

High static pressure with a clean filter – 463 Pa

Natural gas tankless & electric storage water heater

No plenum attachment

No TXV bulb attachment

Outdoor air duct damper with no wires attached

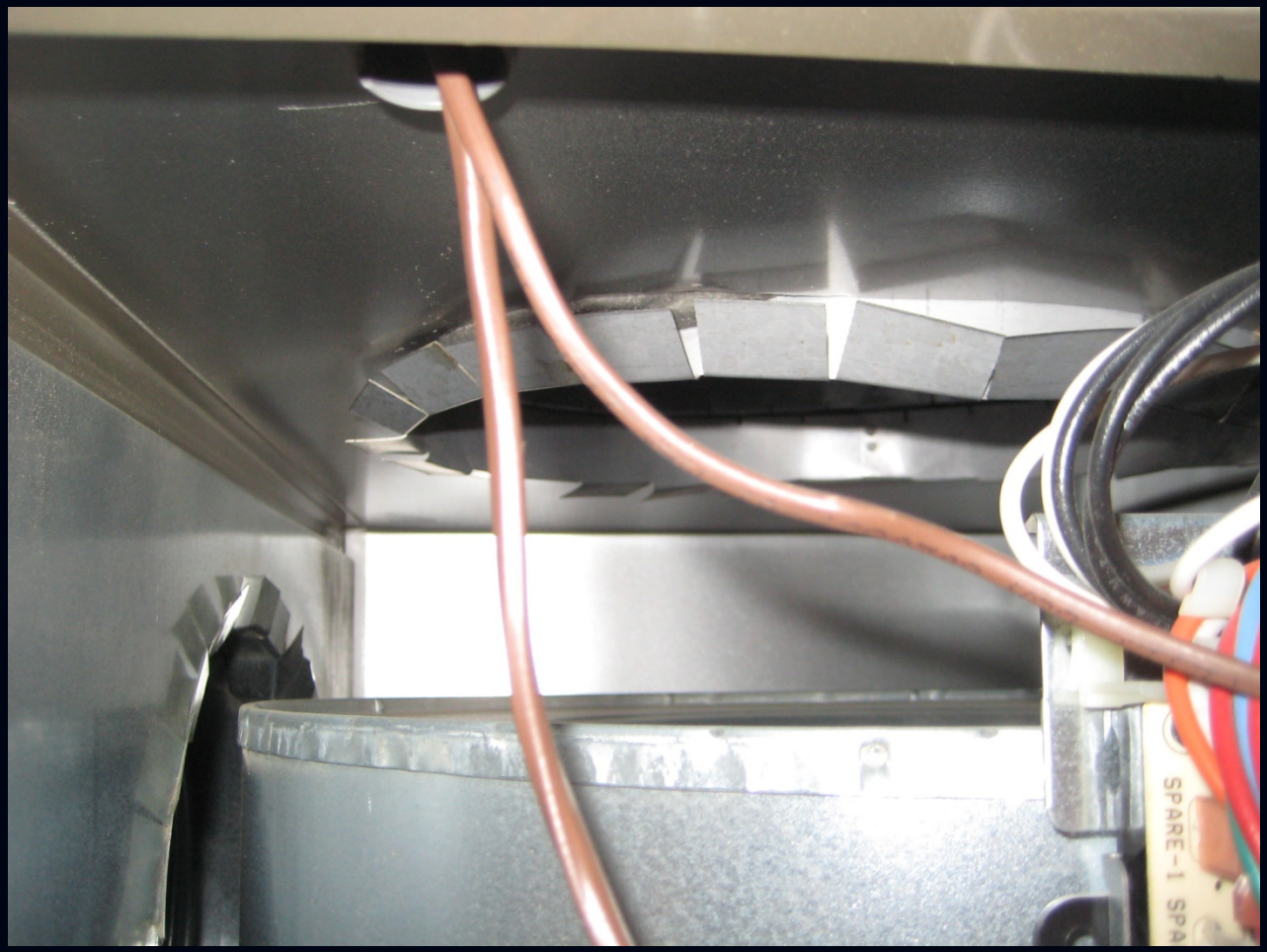
Outdoor air damper closed to pass duct leakage test – two years ago

Outdoor air duct covered for leakage test – two years ago

183 square feet per ton for one system

Mastic on top of tape!

How do you do a “dove tail” connection?



Gas Leak

Most new systems have no fan cabinet insulation

Worst case -16 Pa in the WH CAZ

No filter bracket wire

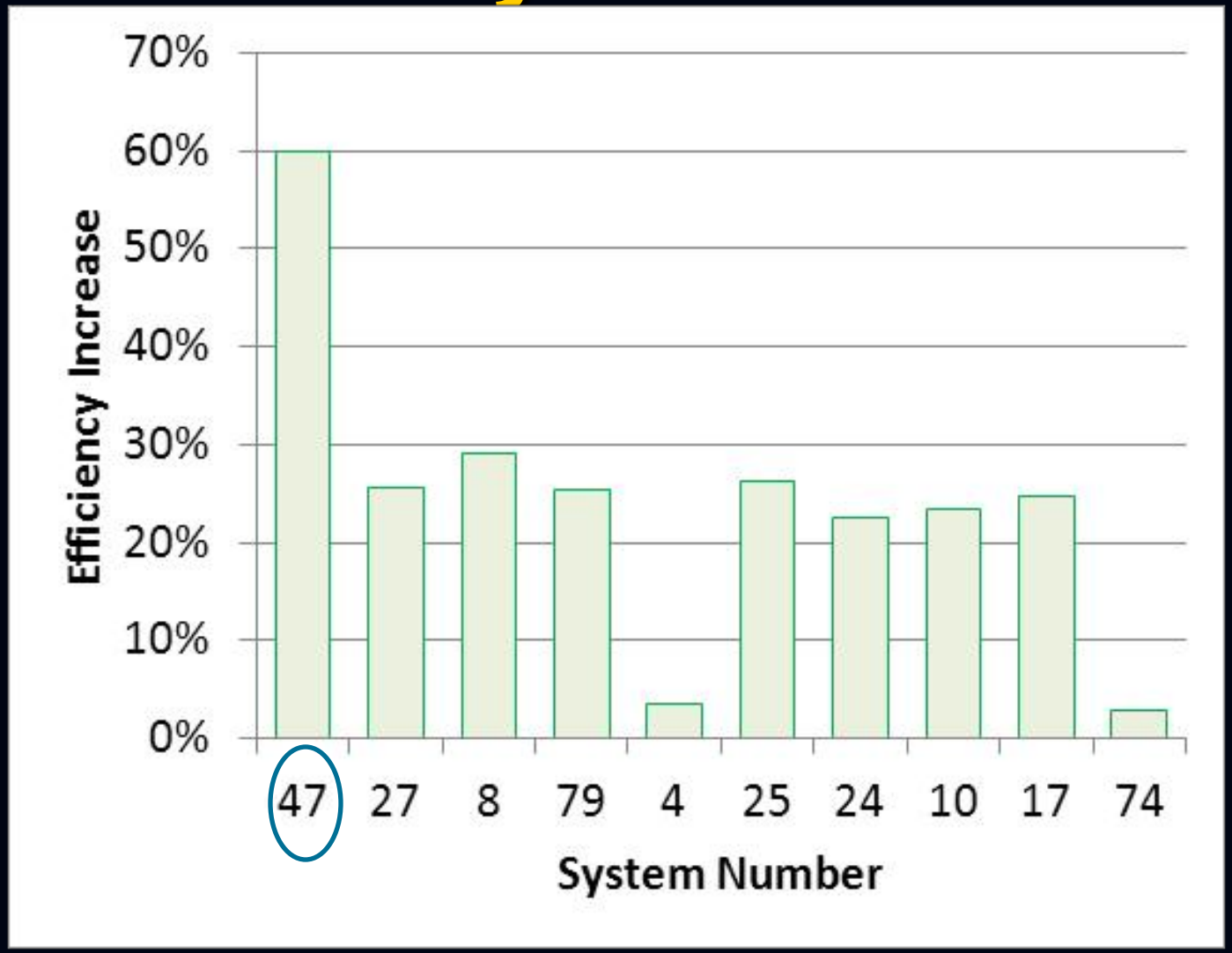
100 CFM per ton

Clean (minimum efficiency) filter with 155 Pa

Installation instructions left in fan cabinet

High SEER & AFUE – but still needs electric heaters

Efficiency increase



High SEER & AFUE – but very small return air grille (14 x 24) with 14" duct – improved from 252 to 371 CFM/ton with 2nd return

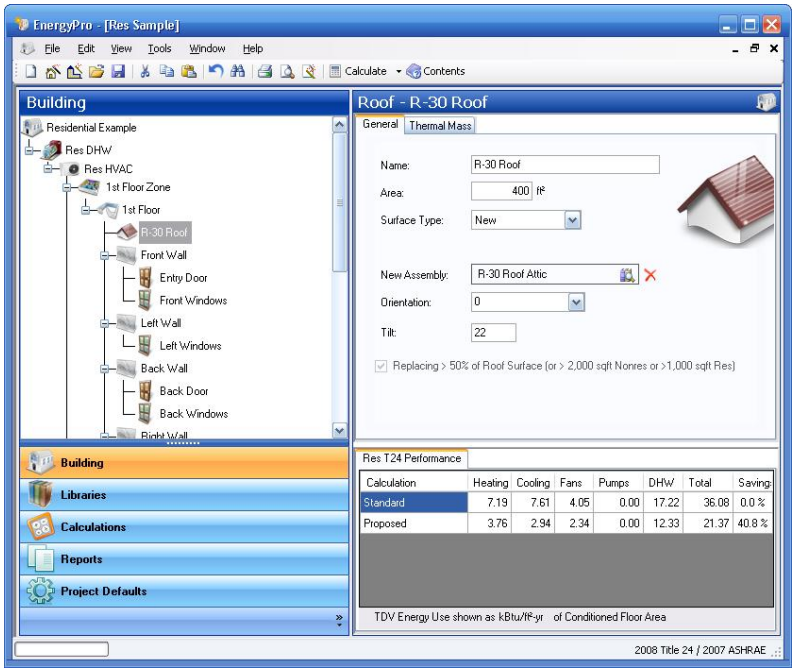
Alliance for
Residential
Building
Innovation

MONITORING DEVICES AND PERFORMANCE GUARANTEES

If financial products are contingent on performance guarantees, what data and monitoring devices are needed to evaluate performance?

October 12, 2011

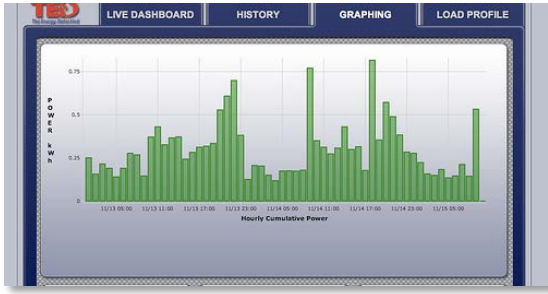
Retrofit Measure impact analysis



- Modeling tools project energy savings and impacts of individual retrofit measures on savings
- Pre& post utility bill data show actual cost savings
- Modeling tools assume consistent behavior pre & post retrofit
- However….

Alliance for Residential Building Innovation

Higher resolution with Monitoring



Monitoring data could capture behavioral affects not visible in utility data.

Examples:

- **Thermostat Set point –** Can monitor post-retrofit but need to know pre-retrofit set points
- **Cooling Calls** - to disaggregate AC usage from appliances/pools in utility bill data
- **Heating Calls** - to disaggregate furnace from other gas appliances
- **Indoor & Outdoor temperature** - differential is a possible measure of comfort to correlate with energy use

Alliance for Residential Building Innovation

Measurable Retrofits

Retrofit Measures	**Heating & Cooling Energy Use**	Whole House Gas Usage	Whole House Electrical	Whole House Water Use
Attic Insulation	**X**			
Envelope Sealing	**X**			
Duct Replacement / Sealing	**X**			
Water Heating Blanket		X		
DHW Pipe Insulation		X	X	
Bathroom Fan Replacement			X	
Power Strips			X	
Smoke/CO Detector			X	
CFLs/Lighting Bulb Replacement			X	
Caulk/Seal	**X**			
Toilet				X
W/H Replacement (EF > 0.65)		X	X	X
Gas Furnace HX Replacement	**X**			
AC Coil Replacement	**X**			
Window Film	**X**			
Window Replacement	**X**			
Dish Washer				X
Refrigerator			X	
Garage Refrigerator			X	
Clothes Washer		X	X	
Clothes Dryer		X	X	
Variable Pool Pump			X	
TED Energy Monitoring			X	
Sink Aerator				X
PV			X	
High Efficacy Light Cans			X	
Monitoring Abilities	**Communicating Thermostat**	Utility Bills	Energy Monitors or Utility Bills	Utility Bills

Standard Package
Upgrade 1
Upgrade 2
Additional

Alliance for Residential Building Innovation

Monitoring Device Criteria

- Reasonably priced
- Easy to install
- Remote access to data
- Minimum set of data?

Current market available devices:

Smart Thermostats	WiFi	Setpoint	Indoor Temp	Outdoor Temp	Price
Ecobee	*	*	*	*	$350
EnergyHub	*	*	*		$300
Enphase Environ	*	*	*		$375
Upcoming					
Honeywell/Opower	*	*	*	?	n/a
Custom Home Energy Management Devices					
Control4	*	*	*	*	$400+
HAI Omnistat	*	*	*	*	$430+
Schnieder	*	*	*	*	

Alliance for Residential Building Innovation

Sample Guarantee

Performance Data Sources:

- Minimum: Energy Model + Utility Data
- Better: Energy Model + Utility Data + Thermostat Data
- Best: Energy Model + Utility Data + Home Energy Management Data

With the data available, how could we provide a performance guarantee?

One example:

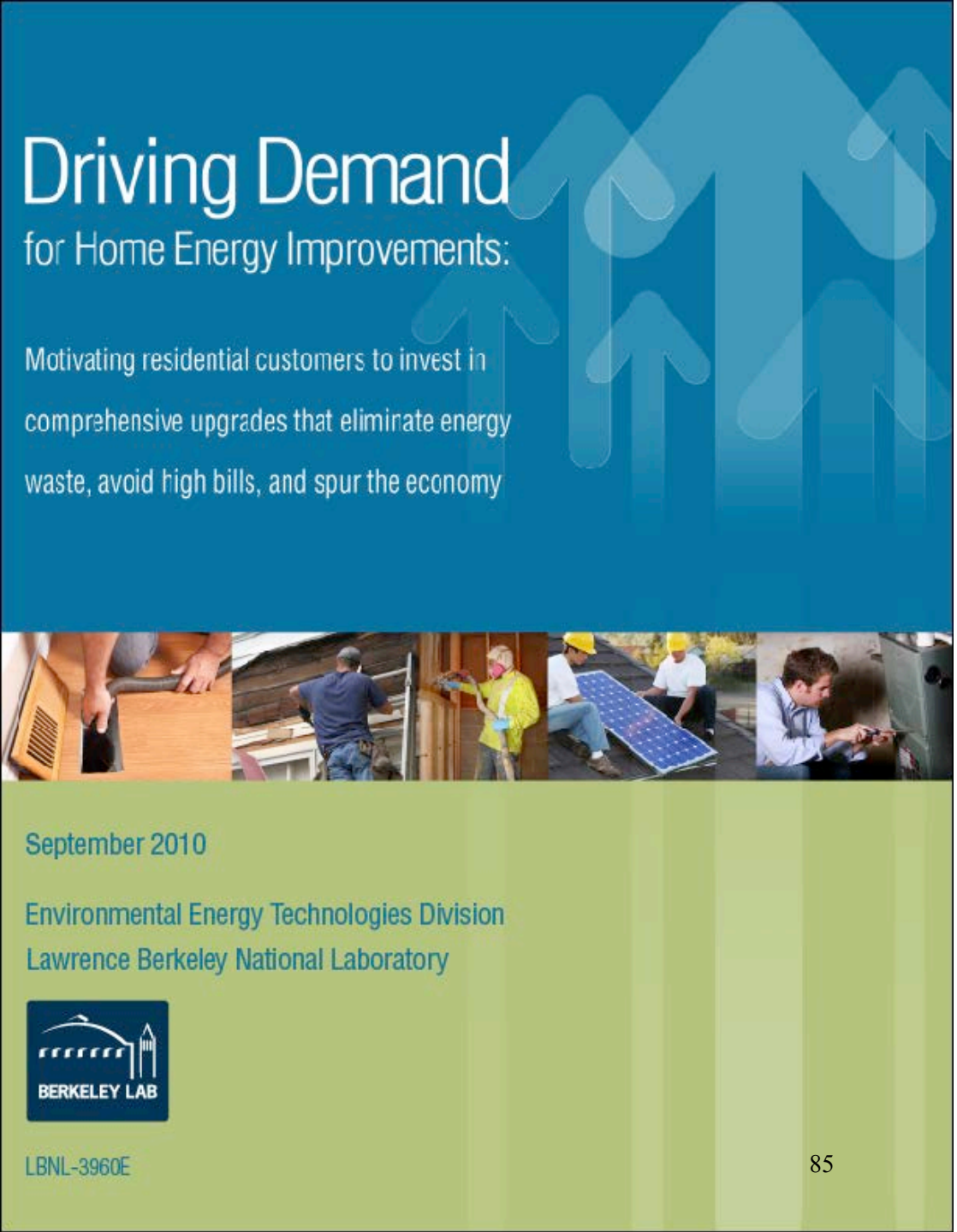
$$\%\text{Savings}_{\text{projected from model}} \quad \text{VS} \quad \frac{\text{Energy use}_{\text{from utility bills post-retrofit}}}{\text{Energy use}_{\text{from utility bills pre-retrofit}}}$$

Guarantee savings will be at least 85% of projected savings.

Alliance for Residential Building Innovation

Driving Demand for Home Energy Improvements

Mark Zimring
Lawrence Berkeley National Laboratory
ARBI Experts Meeting
October 12, 2011



Question: How can millions of Americans be persuaded to divert valued time and resources into upgrading their homes?

What We Did:

- ✓ Case studies of 14 residential energy efficiency programs
- ✓ Review of relevant marketing and behavioral research reports and presentations
- ✓ Interviews with 30 home performance contractors
- ✓ Interviews with key experts

Report, listserves, upcoming & past webinars, and other resources:

http://drivingdemand.lbl.gov/

Two MYTHS

1. If people are "informed" they will make different choices

2. If people have access to capital they will make energy efficiency improvements

+ INFO ≠ ACTION

86

We Are Charting New Territory

Limited success to date motivating large numbers of Americans to invest in ***comprehensive*** home energy improvements, especially if they are being asked to pay for a majority of the costs.

But we can learn from past programs, current experiments, and behavioral research…

Consider Multiple Pathways

- **Reactive.** Incentives for more efficient equipment replacement at key transaction points.
- **Just the Basics.** Lower-cost measures that won't be addressed with ongoing equipment replacements.
- **Prescriptive Packages.** Streamlined delivery of packages widely expected to deliver savings
- **Comprehensive.** Attractive in certain regions and for certain customers.

Relevant Behavioral Insights

- **Social norms are often a significant decision driver**, though often people will not admit it (or they are unaware of the influence)
- People are **more sensitive to losses than to gains**
- People tend to be **biased towards maintaining the status quo**
- People often **feel overloaded by having too many choices**
- People often **assume they are performing better than the average person** or that they are **already doing all that they can**

Engage Trusted Messengers

- Start with local opinion leaders
- Model success
- Encouraging contact with peers
- Local control
- Get buy-in from local organizations

Case Study Examples

- **Hood River, OR** – Word of mouth marketing & engage "early adopters" before full launch
- **Minnesota** – Neighborhood-based, "one stop shop" program
- **Kansas** – Competition between 6 towns
- **Vermont** – Local volunteers spread the word and start with simple direct installs
- **Babylon, NY** – Engage past participants to speak about the program at community meetings

Partner with contractors

- Design a program that contractors want to sell
- Consider sales training & marketing incentives for contractors
- Not all contractors have the same business model – structure incentives to move contractors toward more comprehensive upgrades
- QA is VITAL, but should not increase burden on customer

Sell Something People Want

Comfort: Increase your family's comfort and wellbeing.

Practical Investment: Make an investment to protect and maintain your most valuable asset.

Self-Reliance: Become a self-reliant American – reduce your energy dependence.

Social Norm: All of your neighbors are making home energy improvements.

Health: Protect your family from mold allergies and asthma.

Community: Join your neighbors in supporting local prosperity, reducing energy waste, and protecting the environment for future generations.

Identify the Target Audience

You will not be able to reach everyone in the initial launch, in fact, it may be prohibitively expensive to do so effectively.

- Focus on the early adopters in the beginning stages of a program.
- Use focus groups and market segmentation research to identify the target audience; understand the specific barriers and effective messages to reach this audience.
- **Consider targeting by:**
  - Demographics
  - Values
  - Hot issues
  - Potential for savings
  - Entry point

Give People Something to Talk About

- Word of mouth is POWERFUL
- Use incentives wisely
- Make it easy for people to participate

"Success is when participants become proselytizers"

Sammy Chu, Long Island Green Homes

Language Matters

- Words have power – try to fit within existing mental frames. The terms "audit" and "retrofit" are not effective.

- Communication style matters, and this can require training to get right.
  - Vivid examples
  - Personalized information
  - Use statements of loss rather than gain
  - Inducing a commitment from the homeowners

Pilot, Experiment, Measure…

Know success and failure by *measuring* it, and *experiment* to figure out what works

- Design for data collection and evaluation start to allow
  - ✓ Mid-stream adjustments
  - ✓ Better selection among strategies
  - ✓ Knowing success when it arrives

- **Pilot pilot pilot** - It is important to pilot strategies before launching full-scale programs and to test a variety of strategies to learn what works.

- **Look at the *all in* costs of the program** – including all direct and indirect staff time, incentives, marketing materials, etc – and come up with a cost per home upgraded. How does this return on investment compare to other strategies available?

Results take TIME

"Many programs don't last long enough for the public to understand what is offered, or for the contractors to take advantage. Without a sufficient time horizon, most contractors will simply be unwilling or unable to make the infrastructure investments needed"

- Mike Rogers, GreenHomes America

Resources

Join the Driving Demand email listserve

(announcements only or the discussion group)

Driving Demand Webinars online

- Results from the Driving Demand report, plus Minnesota's "One Stop Shop" case study
- Door-to-door outreach and tracking metrics
- Working with and learning from contractors

Merrian Fuller
mcfuller@lbl.gov
510-486-4482

http://drivingdemand.lbl.gov

Discussion

Lessons from Solar Leases, performance guarantees, and marketing

Alliance for Residential Building Innovation

Discussion

What's next?

Alliance for Residential Building Innovation

buildingamerica.gov

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

DOE/GO-102013-3832 ▪ February 2013

Printed with a renewable-source ink on paper containing at least 50% wastepaper, including 10% post-consumer waste.