Pulling the Trigger: Increasing Home Energy Savings

Using ordinary home life-cycle events to achieve cost-effective upgrades of existing residential buildings

CalCEF

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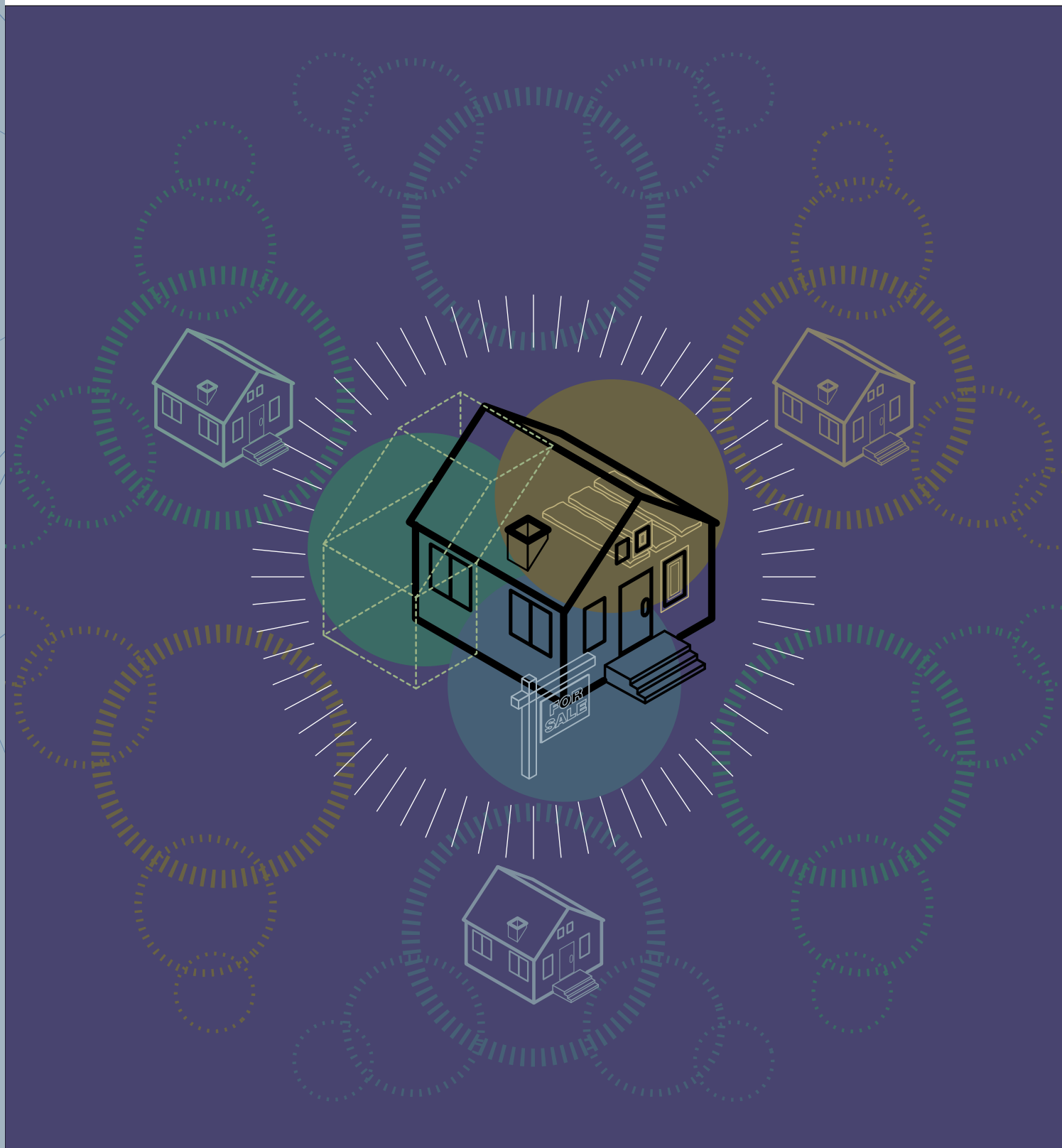
Lori Bamberger, CalCEF
Principal Author and EIR

Ellen Avis, UC Berkeley Labor Center
Chris Busch, BlueGreen Alliance
Bernard Lam, CalCEF



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Glossary

AB 32: California Global Warming Solutions Act

ARRA: American Recovery and Reinvestment Act

BPI: Building Performance Institute

CARB: California Air Resources Board

CARE: California Alternate Rates for Energy

CEC: California Energy Commission

CFPB: Consumer Financial Protection Bureau

CHFA: California Housing Finance Authority

CPUC: California Public Utilities Commission

CRA: Community Reinvestment Act

DIY: do-it-yourself

DOE: U.S. Department of Energy

ECOA: Equal Credit Opportunity Act

EE: energy efficiency

EECBG: Energy Efficiency Conservation Block Grant

EEM: energy-efficient mortgage

EERS: Energy Efficiency Resource Standard

ESA: efficiency service agreements

FHA: Federal Housing Administration

GHGs: greenhouse gases

GSE: Government Sponsored Enterprise

HCD: California Department of Housing and Community Development

HERS: Home Energy Rating System

HMDA: Home Mortgage Disclosure Act of 1975

HUD: U.S. Department of Housing and Urban Development

HVAC: heating, ventilation, and air conditioning

IDA: individual development accounts

IOU: investor-owned utility

LEED: Leadership in Energy & Environmental Design

LiUNA: Laborers International Union of North America

MLS: Multiple Listing Service

MSA: Metropolitan Statistical Areas

NAR: National Association of Realtors

PACE: Property Assessed Clean Energy

PG&E: Pacific Gas & Electric

POU: publicly owned utility

PPA: power purchase agreement

PV: photovoltaic

RECO: residential energy conservation ordinances

REO: real estate owned (property owned by a lender after an unsuccessful foreclosure auction)

RESPA: Real Estate Settlement Procedures Act

RPS: Renewable Portfolio Standard

SCE: Southern California Edison

SDG&E: San Diego Gas & Electric

SEC: Securities and Exchange Commission

SEP: State Energy Program

TILA: Truth in Lending Act

Executive Summary

Building energy use is responsible for about 40 percent of U.S. greenhouse emissions. Residential buildings account for nearly half of those emissions, and more than 85 percent of residential emissions are attributable to the 79 million single-family homes nationwide. California is home to more than 10 percent of such properties—approximately 8.4 million. If we are truly going to achieve meaningful energy efficiency (EE) and carbon savings nationwide, we must transform the residential marketplace.

Many studies, such as those from McKinsey and Co., indicate that there is a significant pool of economically beneficial EE upgrade opportunities ripe for investment. Existing homes represent one such opportunity, and many regions are looking for ways to seize it. In California, the Long Term Energy Efficiency Strategic Plan calls for 100 percent of existing homes to reduce energy use by either 30 percent or 70 percent over 2008 levels. However, progress toward the goals outlined in the strategic plan is not moving ahead quickly enough; at the current rate, it will take 290 years to reach the targets set out in the plan to be achieved within the next eight years.[1]

This paper presents the case for deploying statewide policies, alongside private financing innovations, that are capable of moving the entire residential market forward along an accelerated EE pathway.

California today is ground zero of the housing crisis. Home sales prices are depressed, one out of every three homes is still underwater, and there's a large volume of unsold and vacant housing inventory. The state is also experiencing a jobs crisis, with one of the highest unemployment rates in the nation. By coupling the worlds of borrower protection and energy efficiency, by helping protect home purchasers from the unforeseen surprise of high energy bills and consumption, California can simultaneously strengthen loan portfolios, support neighborhoods, and create quality jobs.

However, making this vision a reality will require crafting policies that consider our state's energy, housing, and economic recovery agendas in unison. We posit that transformation can occur by more deeply uniting the language, context, financing, and market segments of the single-family housing arena with the needs of California's energy and climate agenda.

This integration should begin by injecting EE actions into key moments in time during which homeowners already act and invest resources. We think it means generating consumer demand by piggybacking an EE action on a salient moment when homeowners are already engaged in a large transaction, a large renovation, or already interested in averting an unnecessarily high energy charge. Namely, we urge the state to help homeowners "pull the trigger" on EE by encouraging action at three key moments in homeownership tenure:

1. time of sale;
2. time of renovation; and
3. time of energy rate tier increase.

Because each of these events already requires homeowners and homebuyers to exert an effort or pay for a home-related function, an additional EE action becomes merely a small piece of a larger context. Embedding an energy survey, disclosure, financial incentives, or system upgrades into these ordinary life-cycle events can over time reach a large market and motivate positive consumer behaviors.

Most stakeholders see opportunities to further their own interests through residential EE efforts. Environmental organizations and state energy officials aim to achieve statewide energy reductions, while the EE industry and labor advocates point out that efficiency gains can create high-quality jobs and a well-trained workforce of contractors and construction workers. Catalyzing massive numbers of EE upgrades would satisfy the missions of both consumer protection and loan stabilization banking authorities, while also driving greater demand for more efficient homes. Consumer and banking advocates see energy savings and the attendant energy bill reductions as opportunities to reduce household indebtedness at a time when many families are underwater on their mortgages or struggling to stay on top of payments. Indeed, an executive at one of the largest mortgage banks in the nation remarks that understanding a prospective home's utility costs "gives borrowers a more educated decision about home affordability, and results in a marginally lower risk for financial institutions." Real estate agents see new opportunities to market their services and capture more value for buyers and sellers.

While these priorities may seem disparate, they suggest that the best first step toward achieving large-scale energy efficiency upgrades in the existing stock of single-family homes is to leverage the financial savings from energy use reduction to ease household budget pressures. By promoting actions that are easy, cost-effective, and value-additive, we can address stakeholders' diverse needs while further encouraging private capital to participate in this lucrative market transformation.

Our recommendations are designed to promote meaningful progress toward scaling residential EE improvements and jumpstarting the state's economic recovery, even in the face of challenges provided by the current housing market. We recommend implementing measures from each of four categories of actions: disclose, enforce, incentivize, and finance. They include, but are not limited to, the following:

- The energy efficiency of a home, including cost and consumption information, should be disclosed at the time of sale. California should also require a uniform, standardized list of energy features to be disclosed in each and every home advertisement on Multiple Listing Services.
- Existing EE incentive programs and funding in the state should be re-targeted so that they are specifically relevant at each trigger point.
- Strong standards to ensure work quality should be attached to any incentives for energy upgrades. At a minimum, incentives should be conditioned on proof of required permits and the use of licensed, bonded contractors for all EE retrofit work. For successful implementation, better enforcement of permitting requirements is also needed.
- California utilities should expand their existing tier-alert notifications to all ratepayers—not just those that have opted in to receive them—and make them even more meaningful by including cautionary information to the consumer about the long-term costs of paying high-tier rates. Consumers who remain in upper energy rate tiers for a significant period of time (such as three consecutive months) should be offered an EE upgrade to reduce consumption.
- California should signal for an alignment of housing and energy in financial products by extending the spirit of the Community Reinvestment Act (CRA). This could be accomplished by asking federal regulators to provide additional positive consideration in CRA evaluations to financial institutions that lend to low- and moderate-income homeowners or homebuyers who undertake EE improvements.

Our analysis suggests that implementing these recommendations (and others outlined in this paper) will significantly increase the pace of residential energy efficiency efforts, yielding 5–10 times more upgrades than are expected at the current rate. At the upper end, that means reaching nearly 1.8 million homes within 10 years.

1 Background: The Problem Expounded

Single-family homes sit at the intersection of two major challenges: stimulating housing market recovery and addressing global climate change.

Single-family homes are responsible for a sizable share of U.S. greenhouse gas emissions (GHGs). More than 40 percent of the nation's GHG emissions arise from building energy use, and residential buildings are responsible for nearly half of those emissions, with the vast majority (85 percent) coming from single-family homes.[2] California is home to approximately 8.4 million single-family homes—more than 10 percent of the nation's total.[3]

The past several years have seen positive changes in new home construction, with more energy-efficient materials and appliances, as well as updated energy and green-building codes. However, approximately two out of three single-family homes in California were built before the state's progressive energy codes were adopted in 1978.[4] The bulk of these homes will still be standing in 2050,[5] and if their current energy consumption is left unchecked, they are expected to contribute more than 60 million metric tons[6] of harmful carbon emissions, or the equivalent annual emissions of a dozen coal-fired power plants. Therefore, to make a dent in California's residential carbon emissions, we must reduce the energy consumption of the state's existing housing stock.

A statewide imperative to address this problem already exists: the California Long Term Energy Efficiency Strategic Plan.[7] Established by the California Public Utilities Commission (CPUC) in 2008 and updated in 2011, the strategic plan calls for a 40 percent reduction in energy use across all 13.3 million existing single- and multi-family homes by the year 2020.[8] While bold and ambitious, it is unlikely that this imperative is sufficient to drive market transformation. The current statistics on whole-house retrofits indicate that progress toward the goals outlined in the strategic plan is not moving ahead quickly; only about 10,000 to 20,000 home energy upgrades take place annually. At this rate, it will take 290 years to reach the targets set for our eight-year plan.[9]

However, there is reason for optimism. A 2009 McKinsey study identified retrofitting existing residential buildings as one of the most economically beneficial approaches to reducing GHGs.[10] The low-cost nature of upgrading existing homes arises from the fact that the upfront energy improvement investment can be repaid over time through energy savings. Many building scientists and economists believe that these investments, targeted correctly, can be more than repaid, generating additional wealth for homeowners over time. Therefore, reducing energy costs can also be a critical part of the affordability calculation for home-buyers and a component of neighborhood stabilization for communities in crisis—important benefits in today's ailing housing market.

The current statistics on whole-house retrofits indicate that progress toward the goals outlined in the strategic plan is not moving ahead quickly. At the current rate, it will take 290 years to reach the targets set for our eight-year plan.

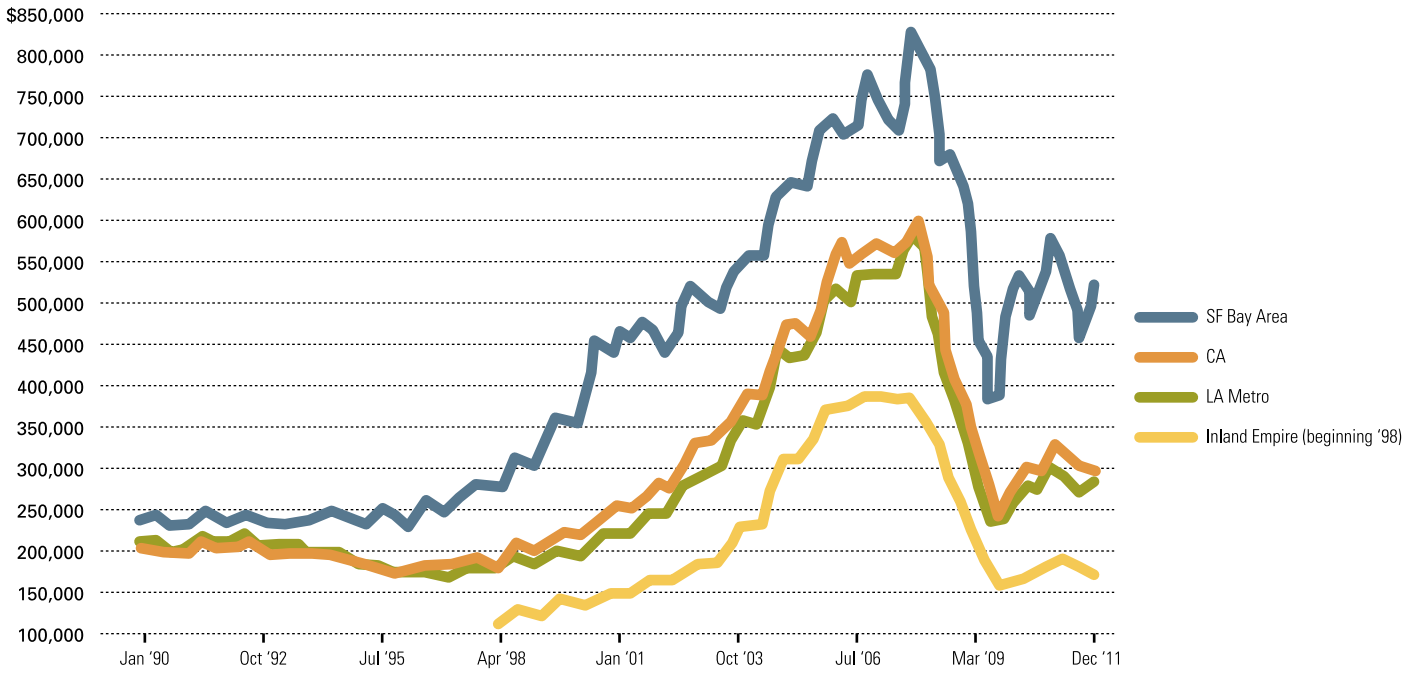
The Housing Crisis: A Critical Context

California exhibits the most housing distress of any state in the nation.[11] Since the beginning of the crisis, more than 1.2 million foreclosures have occurred in California, and another 800,000 to 1.2 million are predicted in the next year. As of July 2011, the majority of all homes sold in California were distressed, with more than 34 percent of homes sold via foreclosure and another 17 percent of homes sold as short sales.[12] In addition, the number of California homes in foreclosure or held by banks (known as the shadow inventory) ranks second in the nation.[13] Fully 31 percent of all homes in California are "underwater," meaning their sale value is less than outstanding mortgages.[14] In neighborhoods of crisis, such as in the City of Stockton, more than 60 percent of all homes are vacant.

The housing market's boom and bust means that prices for single-family detached homes in California averaged a 50 percent drop from peak value across all geographies. Home values are still a fraction of their peak five years ago, and values continue to trend lower. Between July 2010 and July 2011, home values dropped an average of 6 percent, even in the state's wealthy coastal communities, which are traditionally among the highest cost markets in the nation.

Projections from November 2011 suggest the real estate market will stabilize by the end of 2012, but home values will remain flat for several years following.[15]

Figure 1 Median Home Values in California 1/1990-6/2011



Source: California Association of Realtors®

The Energy Savings Opportunity for California's Distressed Home Market

Today, experts believe that the housing recovery will only come when we stem the tide of foreclosures and achieve real foreclosure prevention. Nationwide, efforts have increased to try to prevent foreclosure, keep homes and neighborhoods occupied and maintained, attract private investment in distressed neighborhoods, and reduce financial pressure on households with inferior mortgages. One recent strategy banks are adopting is to examine a defaulted borrower's total indebtedness, not just their outstanding mortgage debt. This means looking for relief levers that could offer borrowers at least $50–$100 per month in savings to supplement loan modifications. Reducing energy consumption represents one such opportunity. Greater efficiency can help reduce and stabilize home energy expenses and curtail the effect of spikes in home energy costs on household budgets.[16] Both of these impacts can protect a household's ability to make mortgage payments. Ultimately, this adds stability to bank loan portfolios.

Making homeownership more broadly available depends not only on home sales prices but also on maintaining manageable carrying costs over time. Therefore, addressing EE in existing homes can help ensure that homeownership remains an affordable and stable opportunity for middle and working-class families in California. About 83 percent of households in the middle third of incomes—those earning between 135 percent and 325 percent of the poverty level[17,18]—live in single-family homes, with the vast majority also owners. Within the state, these same households disproportionately live in houses built before California's progressive building energy codes were adopted in 1978.[19] These households stand to benefit substantially from EE investments. We estimate that homeowners who pursue a 25 percent EE upgrade could save $15,000 to $22,000 in energy costs over the course of a 30-year mortgage.[20]

In general, a whole-house retrofit is estimated to cost around $14,000. The typical components of this type of energy upgrade include HVAC and duct sealing (78 percent of total costs), insulation (9 percent of total costs), and air sealing (13 percent of total costs).[21] At the high end, retrofits can cost $25,000 to $50,000, and may include a renewable energy system like solar.[22] According to a CPUC financing study published in July 2011, for an average home size of 1,800 square feet, average installation costs for measures that yield 25 percent energy use savings are $7,200. Generally, payback—the amount of time that an investment accumulates sufficient energy savings to repay the upfront investment—ranges from an average of 5–15 years for efficiency, and greater than 20 years for solar.[23] With these figures in mind, to reach California's energy savings goals would require a more than $60 billion investment in home energy upgrades.

Current Barriers to Market Transformation

Despite the compelling reasons to grow EE efforts, there are myriad barriers to market transformation today. These include:

- **Low levels of consumer demand.** Today, demand for EE is low, arising from many factors, including a lack of awareness and the current economic malaise. In addition, the relatively low cost of energy discourages actions to offset inefficiency. Inadequate information about energy costs and efficiency opportunities, as well as poor marketing of existing efficiency programs, exacerbate these issues. Low levels of enforcement around the state's existing energy code (Title 24) and its application to building-related improvements also weaken potential demand.[24]

- **First-cost obstacles.** In California, homes require an average investment of $7,200 to achieve a 25 percent energy reduction, according to the CPUC financing study.[25] While energy savings can often repay these investments over time,[26] most households either do not have this capital available or do not currently prioritize future energy savings over other, more immediate household needs.

We estimate that homeowners who pursue a 25 percent energy efficiency upgrade could save $15,000 to $22,000 in energy costs over the course of a 30-year mortgage.

- **Nascent capital markets.** To date, the capital markets have failed to offer low-cost financing for standalone residential energy retrofits. Existing products are expensive, cumbersome, and not well suited to this market. Worse, the more affordable options that do exist are not typically accessible to the moderate and middle-income households that occupy the vast majority of California's single-family homes. While innovations are beginning in the commercial building finance arena, residential efforts have suffered from federal regulatory push-back (which effectively halted the innovative Property Assessed Clean Energy financing vehicle).

- **Uncertainty regarding EE impact on home valuation.** Efforts to quantify the impact of EE on home valuations are still nascent.[27] Only a few studies have begun in this arena, and mostly to show the connection between homes with energy labels and home valuation. There is still a dearth of evidence as to the value of efficient home energy systems in home sales pricing. The absence of robust data about the impact of EE efforts on home values exacerbates the inability of the capital markets to serve this space and discourages homeowners and homebuyers from valuing EE upgrades.

- **Moderate coastal climate.** California's moderate coastal climate confounds residential efficiency efforts, as it means that most homes have relatively low energy consumption; this lowers the total averted costs from which to draw investments in energy upgrades. The two most populated metropolitan areas in the state are located in moderate coastal climate zones (see Appendix A).

- **Housing market and crisis.** Home values have declined, foreclosures are continuing to wreak havoc in California, and credit has tightened significantly for both homeowners and purchasers. Unemployment levels in the state remain well above national averages.[28] This context significantly impacts many homeowners' ability o accomplish the upgrade of existing homes (and/or their interest in doing so), and in turn, limits the scaling up of robust capital market solutions.[29]

- **An enormously fragmented marketplace.** To upgrade all 8.4 million homes will require 8.4 million different investments and transactions, in addition to marketing messages capable of spurring 8.4 million households to action. The size and fragmentation of this market is a significant challenge to rapid deployment of EE upgrades and market transformation.

- **Principal/agent misalignment.** Approximately 30 percent of California's single-family homes are occupied by renters, who experience the costs of inefficient building energy systems without the opportunity (or in many cases, the means) to invest in efficiency.[30] This disconnect is referred to as the principal/agent or the split incentive problem. While this paper focuses on owner-occupied single-family homes, the energy financing problems afflicting renter-occupied single-family homes contribute to the problems of transforming the residential marketplace.

- **Lack of assurance that EE investments will achieve real savings.** Homeowners are unlikely to invest in expensive EE improvements without a solid guarantee that they will actually save money on their energy bills. Today, ratepayer-funded EE programs do not always achieve promised savings.[31] In part, this is due to improper installation of equipment by workers and contractors who are not educated in EE technologies and techniques or cut corners to lower costs. It is exacerbated by a lack of ongoing measurement and verification of savings.

This paper discusses how important moments in the life cycle of a single-family residence can be used to catalyze EE actions. In this complex environment, our recommendations must reflect energy reduction policies that can work in the context of today's challenged housing market, in addition to a more healthy housing market in the future.

2 Regulatory and Policy Context

A complex overlay of federal, state, local, and utility policies interact at the intersection of housing and energy issues. This section provides a brief summary of the laws and policies surrounding real estate transactions, building rehabilitation, state climate protection, and energy reduction.

An array of programs at all levels establish and administer EE goals and climate protection programs within California. Diverse laws and policies also govern a single-family home at different moments in its life cycle, from home sale transactions rules and mandatory loan attributes to consumer protection statutes and building codes. The recent housing crisis and resultant federal legislation have futher complicated this marketplace, adding new protections in the areas of mortgage finance, disclosure, and home appraisal, while also establishing new rules that govern distressed home sales.

Residential Transaction: The Federal Context

The home purchase loan is typically the single largest debt obligation for families in California. With this in mind, a series of federal consumer protection statutes[32] exist to protect homebuyers in taking on this enormous financial burden. These statutes govern what must be disclosed about the terms and other features of the loan, and they prevent abuse among industries involved in the settlement and advertisement of real estate transactions.

RESPA and TILA

Both the Real Estate Settlement Procedures Act (RESPA), first enacted in 1974, and the Truth in Lending Act (TILA), enacted in 1968, provide consumers with transparent information about their home purchase transactions and settlements. They aim to provide buyers with a better understanding of long-term carrying cost affordability, and provide a framework for comparison among financial institutions and title companies. RESPA also regulates the ability of insurance companies, real estate firms, mortgage brokers, and banks to interact and to compensate each other for referrals. By limiting such behaviors, the law protects homebuyers from overpaying for services and from abusive kickbacks. TILA, which covers a broader range of consumer credit products, establishes rules for disclosure of loan terms and conditions and consequences of default.

Neither RESPA nor TILA prohibits states from adopting more stringent protections. In this vein, California already requires other time of sale disclosures, including for example, natural hazard disclosures,[33] lead-based paint disclosures,[34] plumbing fixture disclosures,[35] and safety upgrades;[36] and requires information distribution on seismic safety. Most recently, the state has encouraged real estate agents to provide homebuyers and sellers with literature on EE basics and how to hire a Home Energy Rating System (HERS)–certified energy rater.[37]

Dodd-Frank Wall Street Reform and Consumer Protection Act

The Dodd-Frank Wall Street Reform and Consumer Protection Act, enacted in 2010, is intended to curb abuses in the financial industry in the wake of the housing and financial crises. The statute makes several significant changes to the real estate transaction regulatory arena, three of which are of interest here. First, because many believe that the crisis arose in part from loans whose terms were not fully understood by borrowers (and, therefore, from ineffective consumer disclosure requirements), Title XIV of the Act sets forth new mortgage origination and disclosure rules. Most of these rules are incorporated into TILA. Second, the Act places new rules on appraisers aimed at ensuring their independence from banks and real estate firms, to avoid future inflated home valuations. Finally, the Act establishes the new Consumer Financial Protection Bureau (CFPB) that retains transferred jurisdiction (from other financial agencies) over most of the financial institutions and transactions undertaken by consumers.

The CFPB now oversees the consumer component of many laws, including RESPA, TILA, the Home Mortgage Disclosure Act of 1975 (HMDA), the Equal Credit Opportunity Act (ECOA), and more.[38] The agency is tasked with streamlining RESPA and TILA disclosures for consumers. It also retains bank examination powers, and possesses enforcement and compliance powers, as well as the ability to assess damages on financial institutions that are deemed out of compliance with the laws. Experts predict that the mortgage lending industry will change more in the next few years than it has since the Federal Housing Administration (FHA) and the Government Sponsored Enterprises (GSEs) were created more than 75 years ago.[39]

DOE and Appraisal Foundation Memorandum of Understanding

Homes with more efficient energy systems are typically more affordable to operate than comparable, less efficient homes. There is nascent but mounting evidence that, in a healthy real estate market, they also command a premium value from homebuyers. However, appraisers face constraints on how home-price valuations are assigned, making it atypical that they factor in the impact of any EE improvements.[40] In an effort to address this issue, the U.S. Department of Energy in June 2011 launched a partnership with the nonprofit Appraisal Foundation aimed at developing evidence, metrics, and a consistent rubric for appraising homes with EE improvements. More recently, the Appraisal Institute in September 2011 introduced a "Residential Green and Energy Efficient Addendum" to home valuations, helping appraisers evaluate specific green and EE features for home sales.[41]

California Climate, Energy, and Utility Regulatory Context

California leads the nation in residential EE. This achievement is, in part, a result of the state's stringent building energy codes and standards, as well as decades of utility efficiency programs that have captured substantial energy savings. The CPUC has also set enormous efficiency goals for the three investor-owned utilities (IOUs). In addition, California is the first state to pass economy-wide legislation capping carbon emissions; the California Global Warming Solutions Act, or AB 32, requires a statewide reduction to 1990 emissions levels by the year 2020.

A variety of state laws and utility regulatory issuances established goals and a programmatic agenda by which to achieve the ambitious carbon reduction agenda laid out in AB 32. Among these is AB 2021, passed by the state legislature in 2006, which requires both the IOUs and the publicly owned utilities (POUs) to achieve a 10 percent reduction in energy consumption by the year 2020.[42] In addition, SB 1037 requires all utilities, both IOUs and POUs, to first acquire all available EE and demand reduction resources that are cost-effective, reliable, and feasible before building additional power generating facilities.

At least three different state agencies, described below, share responsibility for moving forward the goals of AB 32 and AB 2021, in addition to other EE-related mandates.

California Air Resources Board

The California Air Resources Board (CARB) is charged with developing plans to implement the portions of AB 32 emissions goals attributable to all buildings. The Climate Change Scoping Plan, adopted in 2008, establishes a statewide energy use reduction target of 32,000 gigawatt hours and 800 million therms by 2020.[43] To reach this goal, it calls for critical market transformation actions for existing buildings, including mandatory disclosure of building energy use ratings, efficiency improvement requirements for underperforming buildings, and the introduction of creative financing options. In particular, the Scoping Plan identifies improving the efficiency of existing buildings as the single most important action the state must undertake in order to accomplish the targeted reduction of GHG emissions.

California Public Utilities Commission

The CPUC regulates IOUs in California. Together, the three IOUs in the state, including Pacific Gas & Electric, Southern California Edison, and Sempra Energy (which operates Southern California Gas and San Diego Gas & Electric), provide electricity to 65 percent of all California residences and gas to most residential households. The CPUC oversees minimum threshold requirements for these utilities in terms of profitability, and mandates the share of EE and renewable sources in their portfolios.[44]

In 2008, as part of achieving AB 32 goals and planning for the three-year period beginning in 2010, the CPUC established a strategic plan for EE in buildings. The plan states that, by the year 2020, all existing residences must reduce energy consumption by an average of 40 percent. Specifically, 75 percent of existing residences must reduce consumption by 30 percent, and 25 percent of existing residences must undertake deep retrofits resulting in a 70 percent consumption reduction.[45] To achieve these and other goals, the CPUC approved a $3.1 billion EE program budget for IOUs over the 2010–2012 period, with more than $722 million dedicated to the residential sector.[46] In addition, the strategic plan endorses California's HERS standards for existing homes, disclosure of HERS ratings at the point-of-sale, and inclusion of HERS ratings in real estate listing information.

In June 2011, the CPUC published a financing report to document the level of investment needed to accomplish the strategic plan goals, as well as the financing alternatives that exist or must be created.[47] Based on that document, we estimate the state will need to invest more than $60 billion in order to retrofit the single family housing stock to achieve an average 25 percent energy consumption reduction (see Appendix D for more detail). The CPUC study also infers that California would need to invest $2.5 billion per year—more than 10 times the $309 million current annual investment of ratepayer funds—to achieve market transformation by 2020.

California Energy Commission

CEC Energy Efficiency Programs

The California Energy Commission (CEC) administers state and federal funding for EE, including an annual contribution of State Energy Program (SEP) funding from the U.S. Department of Energy. In 2009, the CEC was authorized to receive a one-time allocation of $226 million of SEP and Energy Efficiency Conservation Block Grant (EECBG) funding through the American Recovery and Reinvestment Act (ARRA), of which over $100 million has been targeted to improve the efficiency of existing residential buildings in California.

The CEC is also charged with implementation of AB 758, which establishes a framework for the Commission to achieve energy savings in existing buildings statewide and authorizes it to use a variety of strategies to do so. The legislation mandates that the CEC develop an EE infrastructure, including training the necessary workforce, providing public education and outreach, expanding home energy rating tools, developing building energy use labeling and disclosure requirements, developing financing options, and other necessary components of market transformation. The CEC has signaled its intention to adopt building energy use disclosure and whole house retrofit regulations by the year 2015.

The CEC also administers the Energy Upgrade California umbrella of programs, which include federal ARRA-funded efficiency programs and the IOUs' residential rebate programs. Under the regional programs administered by the nonprofit Ecology Action, approximately 2,000 homes underwent a whole-house retrofit between January and June of 2011, accomplishing approximately 28–31 percent energy consumption reduction per home.

CEC: Building Energy Efficiency Standards (Title 24 Part 6)

The formidable backdrop to these critical state energy goals and requirements is Title 24 Part 6, California's primary building energy standards for newly constructed buildings, additions, and alterations. Enacted in 1978, these standards are generally credited with developing one of the most efficient state building energy regimes in the nation, in part because it includes an automatic modernization component through which the standards are updated periodically. The state's building energy standards, coupled with stringent appliance standards (Title 20, sections 1601–1608), have saved consumers more than $56 billion since 1978 (averting 15 large power plants) and are en route to saving another $23 billion by 2013.[48]

Title 24 Part 6 is triggered for all new construction and for most building improvements, although its requirements remain proportionate to the building item being improved. Counties (typically their departments of building inspection) are granted the jurisdictional enforcement authority for Title 24 Part 6, and they engage in a delicate balancing act to ensure that buildings are safe and energy efficient without overburdening reduced staff loads.

3 Detailed Summary of Triggers and Actions

Moving from today's level of energy upgrade activity to market transformation will require significant effort and financial wherewithal on the part of a large number of California homeowners. Catalyzing market transformation will depend on attaching an EE action—a disclosure, a required upgrade action, financing, or a pairing of an incentive with a highly targeted and qualified market segment—to key moments in the homeownership life cycle when Californians are already making an investment in their homes. We refer to these events as triggers.

The remainder of this paper examines how combining triggers and actions can grow and strengthen the EE marketplace. In our opinion, the best options will be those capable of widespread adoption that balance cost effectiveness, energy potential, and government administrability. Equally critical is identifying solutions that adequately address and appeal to the needs of this market's broad range of stakeholders. As California and its cities and counties grapple with regulatory proposals and implementation challenges, we think it's time to evaluate a set of creative, new alternatives.

In this section, we describe the three triggers we believe provide the most salient moments for stimulating EE activity. We then discuss the four types of actions to consider at each trigger. While the opportunities and challenges of each action and trigger are assessed in isolation from one another, our recommendations at the end of this paper identify specific actions as mostly likely to be effective when coupled with specific triggers.

Triggers

Performing an EE upgrade of an existing home requires a capital investment and an energy retrofit action. Therefore, attaching the upgrade to another action, already underway, that requires investment and/or effort can help increase the likelihood of success.[49] In one UK-based study, researchers refer to these as "salient moments" when homeowners "are more amenable to fitting energy-efficient products in our homes and adopting new environmentally friendly habits."[50] Closer to home, the Lawrence Berkeley National Laboratory reports that EE actions will not occur unless they are relatively easy to perform.[51] We have identified three triggers where homeowners are already taking action:

- Time of Sale
- Time of Renovation
- Time of Energy Rate Tier Increase

At each of these moments in time, the homeowner undertakes one or more of the following actions:

- secures new financing;
- invests personal capital;
- performs repairs, replaces broken systems, or installs new equipment;
- remodels a home or room within;
- experiences an increase in utility fees.

Because buying a home, taking out new mortgage financing, and undertaking home renovations are already complicated, time-consuming, and relatively costly events, we strongly believe that incorporating a retrofit activity into any of them can be both effective and relatively effortless for an owner—at least when compared to the effort required for a household not already undertaking these activities. Likewise, the desire to avoid unnecessary costs makes the moment at which a homeowners are charged a higher energy rate a key opportunity for encouraging an EE action.

Time of Sale (TOS)

When a home is sold, new owners are making an investment by purchasing a tangible piece of property, usually containing fixtures and systems. The prevalence of long-term, lowest-cost financing (i.e. mortgage) makes home improvements possible and relatively inexpensive at this moment in time. More remodels and upgrades are performed at the time of sale than at any other time during a homeowner's tenure,[52] and homeowners—both buyers and sellers—invest 2.5 times more capital in renovations within two years of sale than at any other time in a home's life cycle.[53] Most new owners undertake repairs noted in inspections, remodel to suit their needs, and bring things up to code, while sellers are motivated to undertake improvements that add value. Buyers of distressed homes invest 14 percent more during the first year of homeownership than buyers of all other homes.[54] Upgrading energy systems for purchasers and sellers, therefore, could be a relatively small addition to the larger investments already being made.

Scalability

Approximately 4–7 percent of all homes are sold each year. However, some homes change hands more frequently than others; approximately 50 percent of homeowners stay in their homes for at least 10 years, and more than 27 percent stay in their homes for at least 20 years.[55] The housing market also impacts turnover rates. In a bull market, half of all single-family homes turn over every 10 years; in a bear market, it takes 15 years.[56] Assuming a mid-point of 12.5 years, that means that if every home was upgraded at the time of sale, this trigger has the potential to reach 50 percent of market by the year 2025.

Today's constrained credit environment, coupled with the plethora of unsold homes, the large and growing foreclosure pipeline, a surge in bank-owned properties, and plummeting home values, presents significant challenges to leveraging the time of sale for energy upgrade purposes.

Cost and Financing Considerations

The cost of performing an energy upgrade is likely to be lowest at time of sale than at any other trigger. In part, this is because mortgage financing generally offers the longest amortization periods and the lowest rates of financing for any loan.[57] The relatively low cost of the energy upgrade compared to the home purchase costs makes it possible to roll the energy piece into the longer-term financing. There are a few loan products today that incorporate an energy upgrade into the mortgage,[58] but there are opportunities to more easily incorporate the incremental cost of an energy upgrade into a traditional 30-year mortgage.

At the time of sale, buyers and sellers are also already required to pay for various inspections, transfer taxes, and closing costs. Because buyers therefore expect a host of transaction-related charges and fees, energy-related inspections and upgrade costs could fit into this trigger relatively easily. In addition, the ability to integrate an upgrade price into the home price negotiation enables both buyers and sellers to capture EE value, reducing upgrade costs.

Administrability

Federal, state, and local governments already play key roles in overseeing home purchases by regulating advertisements; loan terms and disclosures; title, settlement, and appraisal processes and disclosures; inspections; and required building, energy, and environmental code updates.[59] Depending upon the action required at the time of sale, an energy requirement might be easily integrated into existing administrative burdens and processes.

Trigger Timing Options

The time of sale comprises at least three different moments that could become a focus of energy intervention initiatives:

- **Closing date:** The date at which the property transaction and acquisition are recorded on title is when the majority of federal and state sales transaction laws come into play, particularly the RESPA transaction transparency requirements. The "closing" is a moment in time that is both legally identifiable and oriented toward home purchaser (borrower) protection. As described on page 21, the Montgomery County, Maryland, energy disclosure and many other truth-in-heating disclosure ordinances are tied to the closing date.

- **Executed contract:** After a prospective buyer makes an offer that is accepted by the seller, the home enters what is referred to as the contract period. During this time, buyers typically perform home inspections, including general, pest, and any other specialized inspections. At the end of the contract period—typically 14–28 days in California—buyers may try to renegotiate sales prices based on discoveries made during this time. The expiration of the contract period signifies the last point in time at which buyers may exit the transaction without significant financial penalty. In Texas, the City of Austin's energy disclosure ordinance has recently been moved from the closing date to a time prior to expiration of the contract period, in order to help buyers obtain data early enough in the home purchase process to inform their purchasing decisions.

- **Advertisement (listing):** Many advertising requirements for homes are self-policed by local real estate associations that own their regional Multiple Listing Services (MLS). However, voluntary and mandatory disclosure ordinances, as well as voluntary green MLS efforts, are all pegged to this moment. Most of the existing EE efforts around advertising are collaborations with associations of real estate agents seeking to provide better information to buyers at listing, including: (1) third party–verified information about the rating of a home (primarily new homes); and (2) check-boxes for specific EE features, such as dual-pane windows, attic insulation, and more.

Time Of Renovation

Most homeowners, at one time or another, undertake home maintenance, including a home remodel, repair, improvement, or replacement of broken systems. This event requires a combination of an investment and choice of contractor and/or new installations. In California, Title 24, Part 6 governs nearly all renovation (see page 13).

The complexity, cost, and scope of work, as well as the type of expertise needed in home repairs or remodels usually determines whether or not a building permit is required. Not all repairs require permits and, from a consumer perspective, permits can add cost and time to a project. Most individual energy upgrade measures undertaken by Californians are not properly permitted. For example, the CEC reports that no permits are obtained for more than 90 percent of residential air conditioners in the state.[60] Unpermitted work is never inspected to ensure it complies with even minimum EE requirements, so there is no guarantee of energy savings for these installations. Conversely, work completed not to standards often does not achieve the energy savings intended by the upgrade measure. Counties, responsible for policing building quality, navigate the fine line between ensuring quality of workmanship through permitting, and allowing owners to make their own choices on contractors and systems. Adding additional costs and requirements to the permitting process risks pushing more work into the unpermitted segment, unless enforcement is concurrently stepped up.

Scalability

Piggybacking an EE upgrade on renovation plans would provide a relatively fast mechanism for achieving transformation based on system replacement. Nationally, 60 percent of all middle-income households performed some sort of home improvement during 2009 and 2010,[61] and do-it-yourself (DIY) projects account for 20 percent of the dollar value of all home renovations. In California, nearly 5 percent of all homes undergo a significant renovation exceeding $50,000 each year.

If the trigger is defined as a DIY renovation or replacement of a failed system, uptake could be even greater than attaching the requirement to a building permit. For example, 8 percent of California homes replace or upgrade HVAC systems every year; that would allow us to reach nearly all homes over a 20-year period.[62]

Cost and Financing Considerations

Addressing energy in the scope of a DIY improvement or failed-system replacement (e.g. the HVAC system breakdown) would either add an incremental cost (the cost of an energy-efficient version of something already being replaced) or an entirely new cost (in the case of expanding project scope to include EE upgrades).

If an improvement is already being financed, adding in the energy retrofit could be relatively seamless and low-cost. There are several longstanding resources for energy financing at this trigger, include home equity loans, home renovation loans, and credit cards. Adding EE requirements to projects that are being paid for out of pocket could be burdensome for homeowners or require new, standalone energy financing tools.

Administrability

Governments typically play a role in renovations only when permits are required. Tying energy upgrade actions to the permitting process will require building officials to review yet another item, potentially adding to the cost and timing of issuing a permit. It is also important to note that county inspectors are already overworked with their existing caseload. At a minimum, adding more checkboxes to a permit and increasing the volume of permits will require new training and education of inspectors.[63] Separately, reducing the dollar threshold currently serving as the trigger for a permit, or increasing the number of items that are included in existing building permit thresholds, could drive more energy and renovation work underground. For DIY or failed-system replacement projects where permits are not currently required, adding a process through which to involve public agencies would be complicated.

Trigger Timing Options

- **Time of Building Permit Acquisition:** Improving compliance with existing permitting requirements has the potential to greatly increase EE uptake. Though adding a required EE action to smaller-scope projects would impose additional costs, an energy trigger could be tied to permits for work exceeding a certain dollar amount that would not be disproportionate to the underlying renovation.

- **Time of Failed System Replacement:** An energy upgrade action could be triggered when failed systems (such as HVAC, lighting, water, or plumbing) are replaced. System failure offers an opportunity to incrementally upgrade the purchase to a more efficient version. The success of this trigger depends, in part, on how the homeowner decides to fulfill this system need, whether through a contractor or a DIY improvement. Policy interventions would need to focus on contractor education, so that they could help upgrade homeowners at this moment in time, and on rebates targeted to consumers.

Time of Energy Rate Tier Increase

In California, the IOUs bill residential energy customers at a per kilowatt-hour (kWh) rate. Each household starts out paying the same base rate each month, but as energy consumption increases, the per kilowatt-hour rate goes up. Depending which utility services the home, rates increase in four or five tier increments.[64] These tiers are defined relative to "baseline" energy use, which varies by geographic region, season, and customers' heating fuel type, but is generally set at 50–70 percent of average energy use (see figure 2).[65]

FIGURE 2 ILLUSTRATION OF INCREASING BLOCK ELECTRICITY RATES

Tier Level	Description	Southern California Edison rates ($/kWh)	Cumulative Monthly Costs (for households using 350% of baseline)
Tier 1	Baseline	$0.17317	52.99
Tier 2	101-130% of Baseline	0.19618	71.00
Tier 3	131-200% of Baseline	0.27785	130.51
Tier 4	201-300% of Baseline	0.31285	226.25
Tier 5	Over 300% of Baseline	0.34785	279.47

Customers are given a blank slate each month due to the monthly nature of meter reading and billing, and higher rates are charged only for consumption that exceeds the baseline amount. As an example, a household in Pacific Gas & Electric's (PG&E) territory in the Bay Area pays $0.12/kWh for Tier 1 usage, then 14 cents for Tier 2, $0.30/kWh for Tier 3, and $0.33/kWh for Tier 4.[66,67] Because homeowners are subjected to an increased charge per kilowatt-hour at the moment the rate tier increases, this moment in time constitutes an opportune trigger for action.

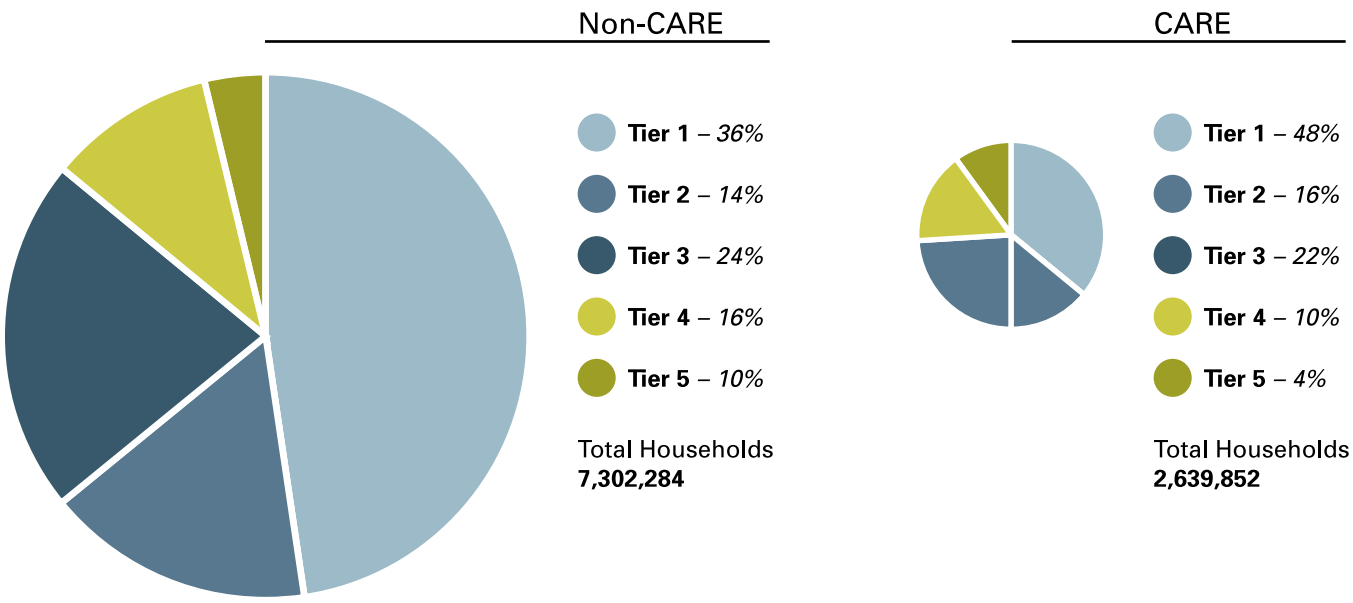
Approximately 25 percent of homeowners qualify for California Alternate Rates for Energy (CARE). These households receive a 20 percent discount on electricity and gas bills. To qualify for the program, utility customers' income must fall below 200 percent of the poverty line.

Scalability

Approximately 50 percent of all single-family residences served by the IOUs pay rates in Tiers 3–5 each month, with 23 percent of all households in the upper two tiers.[68] This translates to about 1.8 million non-CARE households.[69] Using this moment in time as a significant energy action trigger is premised upon the idea that homeowners will prefer to act in some way to avoid a higher charge. Many homeowners today likely are not aware of the tiered utility rate structure, and even fewer are likely to know that energy prices increase more quickly with each upward tier movement. Reaching a large percentage of rate-paying homeowners will require addressing this information gap.[70]

Figure 3 shows tiers, charges, and utility bill differences for households at all tiers in PG&E territory, given baseline assumptions.

Figure 3 Tier distribution of IOU-serviced California households



Cost and Financing Considerations

Households in the upper two tiers can pay monthly bills that are two to three times larger than households in the lowest two tiers, adding $2,000 to $3,000 to annual energy costs.[71] Twenty-six percent of all CARE customers are in the top three tiers, even while their rates are lower than non-subsidized ratepayers.[72] Because rates increase as energy use goes up, the ability to benefit financially from saving energy is correlated directly (or, rather, exponentially) with energy consumption.

To the extent that any energy action reduces energy costs incurred at the higher rate, there would be effectively no new cost to the consumer. For homeowners who consistently pay higher rates, the averted costs of even a substantial energy upgrade investment could be cost-neutral over a relatively short time period. Note that success in averting higher tiers could mean less revenue for utilities, adversely affecting their ability to operate if (1) energy consumption patterns change faster than rate designs and (2) utility regulators do not decouple earnings from commodity energy sales.[73] While the latter concern does not apply to California IOUs, there are many states within the U.S. where this could limit utility cooperation at this triggering moment.

Administrability

Smart meters make it possible to know exactly when a household's energy consumption kicks its per-kWh rates into higher tiers. Utilities are now required to provide notice of impending tier movement if requested by the customer.[74] Therefore, there is an existing point of contact with customers that could be leveraged for a variety of EE actions.

Additional Triggers

In addition to the above triggers, there may be a number of additional moments at which undertaking an EE action makes sense:

- **Loan Refinancing:** As at time of sale, loan refinancing constitutes a moment during which a homeowner is about to undertake a very large financial transaction. In some cases, the homeowner may also take out equity to undertake improvements. Refinancing has a few additional advantages, as well: every time a household refinances, the loan (if secured) is recorded, inserting a government process into the transaction. Additionally, most refinancing ends up reducing mortgage payments, in turn providing extra cash to borrowers. If EE improvement costs could be wrapped into a refinance without using up the differential, this could be a highly effective trigger.[75]

- **Electric Vehicle Purchase:** Households that purchase electric vehicles are typically "early adopters" of green technologies and energy-reduction strategies. Purchasing a hybrid or fully electric vehicle may be another moment in time at which to attach a building-related EE incentive. Experts note that households that choose energy efficient vehicles are also looking to reduce unnecessary household expenses, notwithstanding an upfront investment.[76] Using this moment to co-market another upfront investment with a savings opportunity could be effective.

- **Change of Rental Occupancy:** Thirty percent of single-family homes are occupied by renters.[77] Change of occupancy represents a key moment during which property owners upgrade homes and enter into new contractual agreements with renters; therefore, the time at which occupancy changes represent a particularly salient moment for an EE action.

- **Date Certain:** Some jurisdictions have introduced market transformation programs that require EE intervention by a particular date. As an example, New York City required all commercial buildings over 50,000 square feet to publish their asset rating by May 1, 2011; updated ratings must be published annually. In Truckee, California, the city defined quadrants, within which homeowners were required to undertake property retrofit actions during specified timeframes.[78]

Summary of Proposed Triggers

Trigger	Summary
Time of Sale	• ***Potential reach:*** 4–7% of the market each year. • ***Embedded investment opportunity:*** more investments are made in home improvements during the first two years of purchase than at any other time; financing for the home sale transaction (and related improvements) makes an energy upgrade easier to embed. • ***Financing opportunity:*** longest-term amortization for energy loan possible given 30-year mortgage finance. • ***Harmonize buyer protections:*** existing regulations for transparency in loan costs and advertising could easily incorporate disclosure of EE metrics. • ***Helps communities in crisis:*** reducing operating costs of distressed homes can prevent foreclosure or make homes more affordable & attractive to new purchasers.
Time of Renovation	• ***Potential reach:*** nearly 1% of Californians each year for large renovations exceeding $50,000 and much higher percent for smaller project sizes. • ***Embedded investment opportunity:*** upgrades already occurring make this trigger relatively easy for incorporating energy. • ***Protect owners:*** transparency would help owners and contractors understand energy implications and energy opportunities from an added upgrade. • ***Help contractors:*** the ability to upsell owners on prudent decisions that can save energy could help contractors win larger work scopes. • ***Marketing opportunity:*** at large retail outlets and via existing contractors, including those who replace failed systems.
Time of Energy Rate Tier Increase	• ***Potential reach:*** 26% of all Californians are in the top two energy rate tiers, a large and high-impact population. • ***Protect owners:*** helping owners learn how to reduce rates will add affordability at a moment when energy costs could increase by more than 200 percent. • ***Financing opportunity:*** Homeowners could use averted energy costs to invest in actions with long-term savings potential. • ***Leverages existing IOU information processes:*** since IOUs already provide tier alerts, improving and expanding should be simple.

Energy Upgrade Actions

There are many different ways to incentivize or mandate EE improvements. This section looks at four categories of actions, including improving market information, requiring home energy upgrades, strategically targeting existing and new types of financial incentives for energy upgrades, and seeding and scaling financing. Following are brief descriptions of each.

Disclose: Improve Market Information

Information and transparency can help democratize marketplaces, and they have been used to do so in the banking arena by eliminating redlining practices,[79] protecting borrowers in transactions,[80] and even helping shareholders understand climate change risks.[81] Disclosing home energy use provides better information to homeowners and homebuyers about the homes they occupy or seek to purchase or, in the course of renovation, about the equipment or materials being purchased. This, in turn, enables homebuyers to make better decisions about their financial transactions and energy use. Ultimately, improving market information could catalyze energy upgrades, in turn improving the industry, growing jobs, and increasing home values for sellers of more efficient homes.

Today, some cities, counties, and states mandate the disclosure of a home's EE to prospective buyers or home renovators through long-standing truth in housing laws. FHA or GSE (Fannie Mae or Freddie Mac) mortgage loans require clear and conspicuous disclosures about various costs related to home purchase and ownership; these requirements could be expanded to include home energy costs. In particular, the state could enact changes that add requirements to FHA, the Community Reinvestment Act (CRA), GSE housing goals, or RESPA disclosure requirements, by ensuring disclosures or other energy actions occur as conditions of closing a home sale.

Types of Disclosure

The ideal content of energy disclosures is a contentious topic, even among its supporters. An effective disclosure must (1) provide sufficient notice for the recipient to change behavior or take action and (2) spur the recipient to undertake an energy upgrade action. In this section, we examine four approaches in more detail.

Mandatory Operational (Utility Bill) Disclosure

Montgomery County, Maryland

When: Legislation enacted in 2008

Trigger: Time of sale. The disclosure must be made at least by the closing, but the practice of many real estate agents, as reported by county staff, is to include the disclosure in the packet given to prospective purchasers upon execution of the contract.

Responsible Party: Sellers, largely with the support of real estate agents. The bulk of the County's work in administering the ordinance has been collaborating with the Greater Capital Area Association of Realtors to understand how to collect and disclose this information. In addition, the association developed a website that provides a list of EE resources available to help new homebuyers.

Action: Sellers of all individually metered single-family homes (both attached and detached), as long as they are not in foreclosure or sold to banks, must disclose the prior 12 months of utility bills. If the home is not fully occupied during that period, the owner is responsible only for reporting usage during the time it was occupied. There are approximately 200,000 single-family homes in Montgomery County.

Cost: None

Enforcement: No enforcement separate and apart from the purchaser's rights under the real estate contract.

Results: No data has been collected on energy savings resutling from the mandate. According to staff, the two most important byproducts of this law are: 1) beginning to educate consumers about the energy bills of homes they purchase; and 2) a strong partnership with local real estate agents, who were trained on this disclosure and, as a result, became supporters of it.

Operational Rating (Utility Bill Disclosure)

Supporters of utility bill disclosure[82] point out that utility bills are immediately meaningful to owners and borrowers, as they indicate both consumption and cost.[83] Operational ratings can be provided directly through utilities or through a third party at virtually zero incremental cost. They can be provided as averages, either annually or seasonally, to help consumers understand overall trends and to permit a degree of anonymity, and they can be normalized for square footage or other subjective behavioral factors. However, historical utility bills are based on behavior and therefore are not perfectly reflective of a home's baseline level of efficiency. Advocates contend that this information is sufficient for educating consumers, represents a real improvement over buyer knowledge today,[84] and is the most accurate energy information for a specific home.[85]

Some cities and states require disclosure of utility bills as a condition of sale or rental. Truth in housing and heating laws, generally 20–30 years old, were typically enacted in cities with extreme weather climates so that purchasers could understand both the full liability of their monthly carrying costs as well as have the ability to incorporate upgrades (primarily to heating). Experts remark that these are rarely enforced and disclosures are often provided too late (e.g., at loan closing) to effectively impact buyers' decisions about purchase or pricing.

Truth in heating laws are in place in Chicago, Minnesota, and New York City (for multifamily residences). Recent energy bill disclosure laws are in place in place for single-family residences in Montgomery County, Maryland (see page 21); Alaska, and the city of New York.

Asset Rating

A number of different rating systems, labels, and modeling tools for asset ratings are appearing nationwide, such as Energy Star, Earth Advantage, and LEED[86] to name a few. Most but not all labels apply to newly constructed homes. Rating systems are used to indicate whether a home is energy efficient and may also have a labeling or scoring system. These include HERS, HERS II, Building Performance Institute (BPI), Energy Pro, Home Energy Score, and others.[87] Asset ratings, which offer an independent assessment of a home's EE, range in cost from $200 to more than $1,000, and can take anywhere from a few hours to a few days to complete. The strength of the asset rating—its objectivity—is also its weakness: depending on the occupants' behavior, square footage of the home, or other factors, a home with a low energy bill could have an inefficient rating, and a high energy bill could accompany even the most efficient home.

Mandatory Asset Rating Disclosure

United Kingdom

In 2007, the UK implemented the Energy Performance of Buildings Directive (EPBD), a European Union law requiring all homes sold or rented to obtain an asset rating.

Trigger: Time of sale or rental

Responsible Party: Seller or landlord

Action: In the UK, the EPBD takes the form of an Energy Performance Certificate (EPC), which includes energy efficiency asset rating information and recommendations for improvements that can be made to the property.

Cost: The cost of the EPC is determined by the market and is priced at £50–60 (approximately $79–95). According to UK officials, the pricing cannot be much higher or they risk complete noncompliance.

Results: Based on preliminary estimates, nearly 17 percent of the homes that received an asset rating also underwent an energy improvement.

Other Issues: The UK is in the midst of work to improve the EPC, by including predicted energy savings from the implementation of recommended measures, improving the format of the disclosure to be easy to review and understand, and enacting legislation to enforce disclosure with the real estate agents. The changes are intended to support the delivery of the UK's landmark "Green Deal," which will make on-bill residential financing available to more than 2 million homeowners by the autumn of 2012.* The UK is also experimenting with innovative approaches to counter behavioral inertia, including rewards and discounts for group purchases of EE products. For example, a group of five households might receive a 25 percent discount on the purchase of highly efficient appliances.

* Andrew Reeves, "UK Green Deal Set for launch next Autumn," Digital Journal.com, October 18, 2011.

Energy Conservation Audit and Disclosure

Austin, Texas

Trigger: Time of sale. Specifically, a date that is at least three days prior to contract execution. When the rule was enacted in 2008, the date of closing was used. It was changed in 2011.

Responsible Party: Home seller. There are numerous exemptions for types and conditions of homes. Noncompliance is considered a Class C Misdemeanor.

Action: Home seller must hire a qualified auditor to perform the rating, an Austin-specific checklist based on BPI standards. Auditors must be RESNET or BPI certified.

Cost: Approximately $200-$300.

Results: While the program was designed to achieve a 25 percent consumer uptake penetration, results from the first year (prior to changes that were made) show about a 12 percent penetration, and approximately 7 percent the second program year.* Note also that these percentages have occurred despite the down housing market.

Other Issues: Austin acknowledged that tracking is challenging. Right now, they will consider any improvement made within one year of the sale date (either before or after) resulting from the disclosure. We understand that the change of effective date (to prior to contract expiration) might have a better impact. The real percentage of improvements made to homes sold is much lower, since approximately 42 percent of all home sales were exempted from the ordinance's application. However, of those 4,862 homes that were audited as a requirement of sale in the first program year, approximately 712 implemented energy improvements (12 percent).

* See Case Study prepared by the ACEEE, September 2011, "Austin Energy Conservation Audit and Disclosure Ordinance".

Asset ratings must be performed by an expert—either a trained independent rater or an EE contractor.[88] This has two effects. On the positive side, requiring homeowners to obtain asset ratings at various trigger points would create jobs for home raters, and when homeowners act upon the new information, it would also create jobs in the home performance or residential remodeling industries. However, who performs the inspection raises some concerns. Requiring an independent asset rater could add unnecessary cost and time; instead, critics say contractors should do the rating, in part because they must do their own estimates to develop a scope of work in any case.[89] Typically, policymakers have preferred third-party assessments as a means of protecting owners' conflicts of interest between contractors who implement EE measures and asset raters that scope them.

Real estate professionals interviewed for this paper preferred the HERS II rating system to a utility bill disclosure, since they believe that consumption behavior is unique. Operational (utility bill) disclosures could affect pricing for reasons that have nothing to do with the home's efficiency. For example, they caution that operational ratings could adversely affect sales prices for homes occupied by senior households or families with young children, both high energy consumers, regardless of the home's efficiency. Yet, some real estate agents also perceive mandatory energy surveys, which add a cost at the time of sale, to be a tax on a home.

Green Multiple Listing Services

The National Home Performance Council[90] identifies a number of regional MLS systems that are beginning to include energy- and environmental-related features. In general, Green MLS initiatives are focused on two items:

- Ensuring that homes post verified information about their certifications or labels on the home listing. This strategy primarily affects homes built in the past decade.
- Adding check boxes for certain green features, and ensuring that real estate agents are trained on them so that boxes are listed and checked appropriately. This check box component is an important strategy for providing information about homes built more than 10 years ago.

Green MLSes have begun in many locations, including Chicago; Portland, Oregon; Southern California; Santa Monica, California; and Nevada.[91] Recently, San Francisco announced its intent to publish green labels on the recorded deed of trust.[92]

Green MLS initiatives aim to provide buyers with information they can use to search for more efficient homes or to evaluate tradeoffs around efficiency, comfort, and sales price. Publishing this information can also incentivize sellers to upgrade homes before listing, to capture greater value, or at least to encourage parity with other upgraded properties.

MLS systems are privately owned by associations of real estate agents. Nationally, there are over 800 different systems; in California there are approximately 45.[93] The most successful efforts to include green elements in MLS systems have occurred through working groups of stakeholders from a variety of sectors, all of whom are motivated to help sellers and buyers, and to promote consistency in advertisements of homes. In some instances, the plummeting housing market has inspired real estate agents to develop new lines of business, such as serving as a homeownership counselor, who can assist new owners with information and services they need early on in their ownership tenure, including EE renovation tactics.[94] National groups of brokers are beginning to be certified in green homes, either through the independent EcoBrokers association, or through the National Association of Realtors® Green Designation. In just a few years of the programs' existence, there are already over 4,000 Green Designated NAR real estate agents, in addition to a large number of EcoBrokers.

MyHomeEQ

Riverside, Illinois

The Center for Neighborhood Technology (CNT), a nonprofit organization chartered to help households at all income levels reduce energy use, launched MyHomeEQ, a pilot with the City of Chicago, that gives homeowners a utility bill disclosure normalized for square footage, using easily obtainable data from utility bills and the county assessor's office.

In this pilot, marketed via online social media, any homeowner can enter an address (currently limited to homes in Riverside, Illinois) and get a rating equal to the utility bill divided by square feet (obtained through a partnership with the assessor's office). The City hopes to add this rating to all MLS systems in the area.

Because CNT wants all ratings to occur at no charge to homeowners (to ease compliance and maximize the potential for market transformation), CNT is also developing an asset rating that modifies the above operational rating with systems and efficiency information already possessed by the assessor.

Tier Alerts

California utilities charge customers differential rates based on their level of energy consumption (see page 17). Smart meters are making real-time residential energy consumption increasingly accessible, and utilities are now required to offer alerts for customers at, or just prior to, the moment when they are moving from one energy rate tier to the next. Rate paper advocacy groups, such as TURN, have helped push legislation through requiring notification of tier movement. Customers can opt in to an electronic notification via email or mobile phone (text message) that lets them know their energy consumption is likely to move them into a higher tier (for an example, see Appendix C). The opt-in requires electronic delivery because the alert arrives mid-month, between utility bills. Therefore, there are existing points of contact with customers at the time of tier movement that could be leveraged to encourage an EE upgrade action. Households that do not know about the opt-in or do not have access to an electronic notification will not learn about tier movement until they receive their monthly bill. The ability to provide additional information via the alert, expand the reach and timing of those alerts, or develop new strategies for high-tier occupants, should be relatively easy for utilities' EE programs to manage.

Encouraging Uptake of Energy Upgrades

Unlike mandated upgrades (see next section), the energy savings and job creation outcomes of a disclosure policy are particularly affected by levels of consumer uptake. Existing examples in the market today demonstrate a wide range of effectiveness, ranging from 7 percent to 17 percent (see page 22 and page 23). Therefore, the method of information delivery and the associated programs of incentives and financing are as critical to disclosures as providing information about EE opportunities. This is particularly important for encouraging investment in the residential sector, where owner decisions have been found to depart significantly from idealized, rational, profit-maximizing behavior.

The Committee on America's Energy Future, an expert panel assembled by the National Academy of Sciences, offers a number of explanations for this "behavioral gap."[95] One factor is consumers' tendency to focus on purchase price and to ignore operating costs. In such instances, creative, visual presentation of the tradeoffs can help consumers make better decisions. In others, homeowners may simply lack the available capital for large investments, in which case low-cost financing plays an important role in closing the gap.

Another issue is what might be called behavioral inertia, where consumers are stuck in habitual behavioral patterns. In these cases, innovative program that focus on incentivizing peer groups could help change behavior. Comparing energy consumption within a neighborhood, or using other comparison proxies, has been shown to influence consumption by between 1 and 3 percent. Opower, a customer engagement software platform for utilities, provides information about residential energy use coupled with illustrations or qualitative comparisons with neighbors' energy use. The firm also provides information about how to reduce consumption through behavioral changes and EE upgrades. Opower tracks results and reports that this information can reduce consumption by nearly 2 percent.

Finally, consumers may be unwilling to invest in EE even when they recognize the benefits because the positive impact on household budgets is so small as to seem negligible.[96] This can be addressed with simple and convenient program design, which reduces effort and cost, and by encouraging whole building EE approaches, which bundle together multiple energy saving benefits.[97]

Enforce Upgrades

This action would require that homebuyers or homeowners upgrade their homes' energy systems in a prescribed manner. Existing types of upgrade mandates include residential energy conservation ordinances (RECOs), building code requirements, and other regulations that ensure homes contain safe and functioning systems to protect resident and community health (see examples on page 26 and page 27).

RECOs are city laws that aim to reduce energy through requirements placed upon residences, typically triggered at the time of sale or renovation (usually upon the acquisition of a building permit). The theory behind RECOs is that all homes contribute to environmental degradation and that intervening during a change in ownership is a way to ensure that all homes share responsibility for mitigating this impact. Most RECOs apply to multifamily or commercial buildings, rather than single-family homes. San Francisco and Berkeley, California, are two exceptions. Both cities have prescriptive RECOs for single-family homes that apply once in the life of a home.

Automatic Gas Shutoff Valve

Alameda, California

The City of Alameda requires an automatic gas shutoff valve installed prior to sale.*

Trigger: Time of sale or any renovation where gas pipes are installed or modified.

Responsible Party: Home seller or homeowner. Applies to all homes that do not already have this device.

Action: Requires installation of an energy-related safety device.

Process/Enforcement: Unspecified by the law. However, real estate agents know about this requirement and help enforce it with sellers; home inspectors also know to inspect for this device.

Costs: Depending on which type of device and which type of installation is selected, costs are for hardware ($5 to $500+) and for installation ($0 to $500+).**

Results: Reports full compliance.

* Alameda Municipal Code Section 13-5.2 (c.a) and (c.b.).

** Prices are from August 2011, as reported by the Association of Bay Area Governments. http://quake.abag.ca.gov/residents/natural-gas/

Types of Upgrade Mandates: Prescriptive vs. Performance

A mandatory home energy upgrade requirement would be either prescriptive (a pre-determined checklist of items) or performance-based (with actual efficiency results measured and verified). A checklist approach is easier to administer, yet checklists become outdated over time, reducing their effectiveness. Performance-based requirements can be targeted to have a greater effect; however, they also require an asset rating to measure baseline efficiency and benchmark improvements.

Cost

Cost of RECO compliance will depend on the choice between a prescriptive or performance structure. In Berkeley, California, RECO-mandated upgrades (see profile, page 27) average $2,000 per household. (That amounts to approximately 0.71 percent of the average California home sales price, and 0.29 percent of the average sales price in Berkeley). As discussed earlier, the CPUC estimates that to achieve 25 percent efficiency gains, the average whole-house retrofit will cost $7,200 (or approximately 2.5 percent of the average home sales price in California, or 1.04 percent of the average Berkeley price).[98] These investments would constitute a significant portion of the average homeowner's renovation budget, unless more efficient options could be added incrementally to an already planned project.

Without financing options to offset these upfront costs, requiring upgrades at any selected trigger could result in financial hardship, especially for homes with negative equity or that are otherwise distressed. Some worry that imposing an additional cost on homeowners, particularly at the time of sale, could slow the housing market even further.[99] However, such negative impacts could be offset by the energy savings benefits of EE work. A 1998 study found a $10–25 home value increase for every $1 reduction in annual fuel bills.[100] With more complete information about energy use and more social value placed on conservation, this "green premium" could prove to be even higher in the future.

Residential Energy Conservation Ordinance (RECO)

Berkeley, California

Trigger: Upon sale or at time of renovation where the total dollar amount exceeds $50,000.

Responsible Party: Home seller or buyer, although the responsibility can only be transferred to a buyer once. The buyer must comply with requirement within one year of home purchase. Applies to all homes sold, regardless of date built, as long as the home has not already met the most recent RECO requirements.

Action: Required to upgrade all elements on a prescribed checklist of 10 items, including duct sealing and insulation, water heater insulation, low-flow water device installation, weather stripping, lighting upgrades, and water pipe insulation.

Costs: Expenditures on reqired upgrades are capped at no more than 0.75 percent of the sales price or 1 percent of renovation costs. In addition, the audit fee is typically $100. The R-30 insulation upgrade requirement is generally the most costly.

Results: Berkeley does not track energy reductions achieved, though the ordinance was designed to achieve a 10 percent energy savings. The City does track compliance, which it reports as 100 percent, through collaboration with title companies, real estate agents, and a third-party energy auditor.

Other Issues: Berkeley's last prescriptive list update was made in 1992, and it is now outdated. The City expects to change to a performance-based system, in keeping with the state's AB 758 proceedings, which may end up increasing the cost of compliance.

Administrability and Political Challenges

Requiring EE upgrades would be the most aggressive way to scale up the home performance industry and the quickest way to create large numbers of residential construction jobs. However, there is a tension between how such a mandate is viewed—either as required expenditures to protect community and environmental interests or as charges that are considered taxes on individuals or households. As a result, mandatory upgrades are often hotly debated by members of the community they affect. Berkeley and San Francisco enacted their RECOs few decades ago, without much opposition. But a weak economy, and a weak housing market in particular, are likely to make a mandatory upgrade policy less palatable today.

While a mandatory upgrade requirement could apply to all eligible homes at the triggering moment, a politically feasible program would need to include exemptions (e.g., homes that are in foreclosure or that were built in the last 10 years).

Enforcement of Existing Laws

Today, there are already a range of existing laws that could be delivering greater energy savings in the residential marketplace. As described earlier in the paper, many different agencies oversee building codes, financial regulations, consumer protection requirements, energy efficiency standards, and more that all have a bearing on residential energy use. Many of these existing mandates are not achieving their full potential today, and expanding enforcement of existing laws could yield sizable energy savings.

For example, a recent UC Berkeley study shows that the majority of residential EE work today is un-permitted and performed by inadequately trained, low-paid workers.[101] To address this issue, California could prioritize Title 24 enforcement. This would require effort, as well as additional appropriations, at the county level for inspectors to more aggressively seek out contractors who failed to obtain permits for improvements. At a time when most counties' coffers are limited, funding increased enforcement could prove challenging, but permit fees and fines for unpermitted work could be a source of revenue to fund this.

Sewer Lateral Upgrade

San Francisco Bay Area

The U.S. EPA reached agreement with several East Bay cities and Sanitary Districts to require homeowners to upgrade sewer laterals upon sale, as part of a settlement of a long-standing litigation. This requirement became effective January 16, 2012. During wet weather, homes with leaky sewer laterals allow excessive storm water into sanitary sewers, resulting in overflows into neighborhoods and, ultimately, the San Francisco Bay. The cities of Berkeley and Albany and the Stege Sanitary District were the first jurisdictions to institute a mandatory upgrade requirement at time of sale as a mechanism to address this problem. Currently, about 15 jurisdictions are subject to this requirement, which now applies at two different timing triggers.

Trigger: Time of sale or renovation exceeding $100,000 (or $50,000 in Berkeley).

Responsible Party: Seller, if the sewer lateral is greater than 20 years old and an audit has shown the need for replacement. There are no exceptions, even in the case of foreclosure, but the EPA may allow a one-time transfer of responsibility to a buyer.

Action: Seller must get a sewer audit and must upgrade lateral if audit shows need.

Cost: The audit is low to no cost, depending on who performs the work, and the upgrade costs approximately $4,000.

Results: No results from the full program are available yet, but Berkeley and Albany piloted this measure voluntarily, beginning October 1, 2006.

Other Issues: Tracking compliance and results, and establishing an easy approval process, are issues to be addressed as the law becomes formalized. For tracking, the EPA is requiring that all participating cities and counties develop or share software to track participation as well as results in water flow.

The state could also expand credentialing requirements for technicians who perform major energy-related work, such as HVAC replacement or insulation. Currently, state law requires that electricians be licensed and meet certain training requirements, while there are no such licensing requirements for HVAC installers. Stronger credentialing requirements and training standards would make it more difficult for contractors to compete exclusively on low cost, but these actions might also drive more work underground.

Finance

Convincing homeowners to invest $7,200 to save 25 percent on their energy bills depends, in large part, on the availability of cash or adequate financing.

Today, credit cards and home equity loans are the primary available tools for home energy upgrades. Credit cards have relatively high interest rates and short amortization periods, while access to home equity loans depends on relatively high credit scores in addition to positive home equity. Over the past few years, new standalone innovations have emerged that underwrite energy savings, lengthen the amortization period, and attach loans to the property rather than the borrower. These include: Property Assessed Clean Energy (PACE) financing (municipal bond financing where repayment is attached to the property tax bill over up to 20 years),[102] on-bill financing (loans provided by banks or utilities where repayment attaches to the utility bill), efficiency service agreements (ESAs, where efficiency savings are shared among the owner and the contractor),[103] and low interest debt repaid out of energy savings.

Energy improvements can also be financed by embedding their costs within existing loan products that feature longer amortization periods or lower rates. Examples of these are energy efficient mortgages (EEM) and acquisition-plus-rehabilitation loans. Current mortgage financing that includes energy—such as the FHA EEM—is cumbersome and not competitive, notwithstanding the recent introduction of the FHA PowerSaver loans.[104] FHA 203(k) acquisition-plus-rehabilitation financing is quite popular today for investors of foreclosed properties to make improvements, even though rates are higher than typical mortgage financing for the same property.

Incentivize

Re-targeting existing incentives or creating new incentives tied to trigger moments could be another effective technique for driving energy upgrades. In general, incentives would be paired with other options discussed previously in this paper.

Incentives could better target homes with unnecessarily high energy costs, older energy systems, homes located in high-consumption climate zones, or homes where energy costs could destabilize mortgage underwriting. New incentives could relieve homeowners of an expense related to a trigger—such as a closing cost (at the time of sale) or a permit fee (at the time of renovation), when an energy upgrade is performed.

Tying incentives to pooled purchases—which typically helps individuals (or individual organizations) reduce costs because of aggregated demand, volume discounts, and reduced marketing costs—could be another effective strategy. As an example, there are several group-purchasing efforts around solar.[105] Other associations, such as affordable housing-focused Housing Partnership Network, offer group purchasing discounts to members for green construction and development materials and equipment.

Incentives need not only apply to homeowners; stakeholders in the financial and construction industries could also be incented to take EE into account. For example, banks making mortgage loans to EE homes could receive CRA credit (or extra credit) for this activity, since EE can contribute to home affordability.

Summary of Considered Actions

Action	Summary
Disclosure	Disclosure of present energy use, energy costs, and/or EE features of a home can help homeowners and homebuyers assess the value of performing EE upgrades at all triggers. • ***Types of disclosure:*** operational rating, asset rating, Green MLS, tier alerts • ***Costs of disclsoure:*** vary from no additional cost for operational and Green MLS disclosures to approximately $600 for an asset rating. • ***Uptake:*** Providing information is only the first step; the ability of a disclosure to encourage consumers to take action depends heavily on its content, format, and timing. Examples in the market today range from 4% to 17%.
Upgrade and Enforce	Mandatory upgrades and enforcement of new and existing upgrade requirements can have an immediate and direct impact on the market, but face challenges in today's housing and credit markets. • ***Types of upgrades:*** stronger enforcement of existing upgrade requirements (such as Title 24), prescriptive mandates, and performance-based mandates. • ***Costs of upgrades:*** Upgrade costs may be incremental if mandate is applied at the time of other investments in household energy systems, but whole-house upgrades are expected to cost an average of $7,200. • ***Uptake:*** As a mandatory measure, upgrade and enforcement actions could reach a wide range of the market very quickly, depending on the triggering events and exceptions made for low-income or otherwise distressed households.
Finance	Financing can help increase the effectiveness and reach of EE programs by eliminating upfront cost barriers facing consumers. • ***Types of financing:*** EEMs, on-bill financing, EE-specific loans, shared savings.
Incentivize	Incentives can help increase uptake of EE programs by reducing financial or administrative barriers for homeowners, as well as other players in the value chain, such as banks and the construction industry. • ***Types of incentives:*** Existing incentives can be re-deployed for relevance to a trigger, in an as-is form. New incentives could be attached to a trigger; for example, by relieving costs associated with the trigger if the energy upgrade also takes place.

4 Stakeholder Perspectives

Our goal is to scale up EE upgrades in the residential market. As discussed in the previous sections, we seek to achieve this by tapping into consumer momentum at a few ordinary home life-cycle events. We believe that these are effective targets for action because they are moments in which many of the key players in performing energy upgrades are already engaged, be they homeowners, real estate agents, bankers, contractors, community and environmental advocates, federal and state government leaders, local government staff, or others.

This section identifies a variety of different stakeholder contexts, needs, benefits, and concerns in order to guide our own set of actionable recommendations, which, in turn, can hopefully lever an alignment of political, industry, homeowner, labor, environmental, and community-based interests. The broad support of multiple constituencies will help to promote the implementation and longevity of the policy changes we recommend.

The good news is that most stakeholders see opportunities to further their own interests through residential EE efforts. Environmental organizations and state energy officials hope to achieve statewide energy reductions, while the EE industry and labor advocates point out that EE gains will result in new work (and new workers). Further, the best energy reduction outcomes will achieved by working with contractors who do things "by the book" with appropriate permits, fairly paid labor, and high-quality materials. Consumer and banking advocates see energy savings and the attendant energy bill reductions as opportunities to also reduce household indebtedness at a time when many families are underwater on their mortgages or struggling to stay on top of payments. Real estate agents see new opportunities to market their services and capture more value for buyers and sellers.

However, in addition to these points of alignment, stakeholders raise serious concerns about the effect of potential policy actions on their industries, particularly in the context of today's weak housing market and economy. Among these concerns: preserving affordability for lower- and middle-income homebuyers, protecting sellers of homes from additional time and cost burdens, ensuring that construction projects aren't driven underground, and identifying the most cost-effective strategies that return actual energy savings and profits.

Help revitalize the housing market by protecting buyers and sellers from additional cost burdens

Thirty percent of California homeowners are underwater today, and 50 percent of California home sales transactions are distressed.[106] Therefore, housing advocates, government and banking leaders, and real estate agents and advocacy organizations all caution against placing any unnecessary financial or other burdens on home sellers. Slowing transactions, they contend, will reduce prices for sellers or reduce credit availability (and increase prices) for buyers. In contrast, anything to speed the transaction is welcome. They strongly disapprove of anything that could slow the transaction, hurt the market, and disadvantage California's home sellers and homebuyers.[107] All contend that mandatory upgrades or even mandatory energy surveys could impose unfair, adverse, and unnecessary costs on California home sellers.

Given the tightening of credit and the continued depth of the crisis, banks seek to limit transaction costs and keep home sale transactions moving. Even a $600 asset rating is "too much today."[108] To the extent that any EE disclosure or upgrade requirement could slow the transaction and, in turn, slow the housing market's recovery—by adding costs, requiring new inspections, or leading to uncertainty among real estate agents or buyers about what to do with energy information—banks and consumer advocates have serious concerns.

Conversely, these same communities welcome opportunities to decrease cost and time of transactions. They suggest that one strategy could be to incentivize EE via averted fees at time of sale or other life-cycle events, such as an energy rate tier increase. At time of sale, they caution that buyers' sensitivity to extra costs is real but idiosyncratic. For example, buyers are extremely careful about the sale price but not total costs of sale.[109] Buyers eschew the costs required for inspections and closing costs though they are generally impervious to transaction (transfer) taxes or loan fees or points. Feature-wise, buyers perceive upgraded kitchens differently from appliance upgrades or inspection reports.

Strengthen loan and portfolio performance through improved energy transparency and efficiency

Executives at financial institutions, along with consumer and banking advocates, support transparency around energy costs as an added means of helping buyers best calculate personal affordability of mortgage loans. But the content and form of that disclosure are critical. Any notice must be provided in clear, conspicuous, and meaningful terms. Ideally, notice should offer an understandable description of current energy costs and future energy savings, in terms that borrowers are typically familiar with (i.e., dollars), rather than more technical energy consumption metrics.

Disclosing the utility costs associated with a home at the time of sale (an operational rating) would give borrowers a real energy input into the affordability calculation, and would likely result in a lower risk for financial institutions. Improving the affordability calculations of hundreds of thousands of California homebuyers each year could mean that California mortgage loans become a safer investment for lenders.

While an energy consumption reduction through EE measures is unlikely to prevent foreclosure, it may hold value in the loan modification arena. Banks today are vigorously seeking new ways to stabilize loan portfolios to prevent foreclosure, in part by looking at other household debt where savings can be achieved. To the extent that energy bill savings (via an upgrade) could amount to at least $50/month, banks would indeed be interested in thinking through the connection between loan stabilization and energy efficiency.

Help sellers capture value of energy-efficient homes

In some parts of the country, where the housing market has been especially hard hit, agents help advise homebuyers and homeowners on how they might learn about and upgrade home efficiency. To the extent that green attributes help sell homes, real estate agents express an interest in helping sellers promote EE. This could generate interest in or support for a certification through the National Association of Realtors® or EcoBrokers, or for helping develop locally organized green MLSes. Indeed, many of the most progressive green MLS listings have been accomplished with local real estate organizations leading the effort.

However, in capturing as much value as possible for sellers, real estate agents are required to disclose only those issues legally construed as "material" to the transaction, not doing anything for the buyer that would be perceived of as a conflict. In the case of homes that are not already energy efficient, actions to address this opportunity could have a downward pricing impact for sellers. This points to the likelihood that new legislation would need to mandate any disclosure of EE ratings to ensure broad compliance. This is not necessarily an insurmountable concern, however. One real estate agent noted that, a decade ago, the real-estate industry opposed the introduction of home photos online because of a similar concern that doing so could reduce the value of some homes. Today, online listings nearly always include photos.[110]

Ensure that EE does not price out of the market lower- and middle-income homebuyers

If the long-term impact of disclosure or upgrade is to make inefficient homes valued less, but more costly through underwriting, banks express a concern that an action at time of sale would inevitably make unaffordable the very homes most easily purchased by households with the least access to credit. More unaffordable homes in distressed markets would also mean more vacant REO inventory, another challenging issue for banks today.

Real estate agents also express a desire to make sure that old, inefficient homes are neither priced so high as to lose viable buyers nor sit vacant and unsold. Currently, low-income households can purchase inefficient homes and choose not to consume much energy. Making these homes more difficult for such borrowers to purchase could negatively impact this sector of the market.

The barriers to homeownership and credit qualification are high; therefore, stakeholders in Congress and in federal government agencies that administer energy and housing programs want to ensure that low- and moderate-income purchasers continue to have the option to buy a lower cost, inefficient home. Consumer banking advocates and governments representing homeowner interests seek to make energy part of the credit solution—freeing up funding for home carrying costs, as an example—rather than adding to formulas that might confound underwriting and credit access.

Support the EE industry and spur job growth

For the labor and government communities, job creation is a critical part of new policies supporting EE. Organizations across the political spectrum have identified EE as a key economic development strategy for the United States.[111] However, those in the EE industry—an amalgam of long-standing manufacturers, suppliers, and contractors in elements of home systems and home repair, whole-house retrofit firms, solar installers, home surveyors and inspectors, and clean energy financing firms—note that it's not easy to generate demand for such projects. The two main barriers they identified are:

- Cost of home energy surveys is disproportionate to the scope of work. Currently, the average cost of a survey is $600 before any upgrade work is done. Those in the industry argue that the cost of a survey must be proportionate to investment and benefit. If the average investment is $7,200 today, the $600 survey may be acceptable. If a household is interested in making only a $1,000 to $3,000 investment, then the cost of a survey is too high a percentage of the overall project cost. That discourages both surveys and implementation work. Industry stakeholders suggest that allowing contractors to perform both the survey and upgrades—rather than requiring a separate, third-party evaluation—could help reduce duplicate work and overall cost of upgrade projects.

- EE assessment models inadequately project savings, making it difficult to market EE and even harder to achieve projected savings. Contractors and EE industry professionals say that much of the work done in the market today has not generated sufficient energy savings for work to be cost effective, discouraging homeowners from undertaking recommended upgrades. Sometimes, EE just does not pay back in the requisite time frame. Sometimes, there is a mismatch between the survey's projected savings and the actual savings accomplished. In all of these instances, until models accurately project the measured and verified savings, generating demand will be challenging.

Industry representatives also remark that EE contractors are typically paid hourly for their work rather than receiving payment based on performance. The industry would prefer payment for performance to level the playing field for qualified and trained EE contractors. The efficiency service agreement is one innovative financing mechanism that attempts to better align the parties' interests.[112]

Create more opportunities for organized labor to participate in residential sector projects

Labor unions primarily represent construction workers in the commercial and public sectors, because very few union contractors do small private remodeling projects. Therefore, most labor unions are not strongly engaged in the residential sector and, while they would probably not oppose a residential upgrade or disclosure policy, they would be unlikely to provide strong support for such a program unless it was designed to level the playing field for signatory contractors in at least one of the following ways:

- Enforcing legal requirements on contractors: Labor union representatives emphasize the importance of enforcing existing laws and codes in the residential construction industry.[113] So more work is not pushed further underground, enforcement would ideally be incorporated into associated incentive or financing programs, or through a list of pre-approved contractors.

- Bundling individual homes into larger-scale projects: Labor representatives express concern that if a residential EE program is designed so that projects are done on an individual basis, without coordination, and commissioned by individual homeowners, the work is more likely to go to independent contractors—including some who may not be trained on efficiency measures. If individual homes can be bundled into larger projects, however, larger contractors, including those who employ union labor, could benefit from economies of scale. Aggregation of projects may be most possible in planned communities or in cases of shared title, such as bank-owned portfolios.

- Linking to high quality workforce training programs, like apprenticeship: Some unions are interested in EE policy because they already train for and perform commercial EE work. State-certified apprenticeship training programs provide comprehensive training and certification but are not commonly recognized and utilized by state and IOU EE programs. For example, the Laborers International Union of North America (LiUNA) has developed a home performance apprenticeship certification, which is recognized in several states but not yet in California. Recognizing a program such as this would give union employers a competitive advantage.

5 Recommendations

Our solution set proposes a menu approach; at each trigger event, we recommend implementing measures from each of four categories of actions. By taking this menu approach, California can piggyback on actions that are already occurring, transforming an EE upgrade from a standalone burden to an embedded component.

Our proposed solutions incorporate key themes expressed at a roundtable convened in October 2011. At the event, representatives from the EE and home construction industries expressed fatigue with tactics that promise energy savings results but are not scaling today. Meanwhile, representatives of homeowners, real estate agents, and banks voiced concerns about homes that have lost value, jobs that are disappearing, and credit that is hard to access, all of which weigh heavily on homeowners. This paper argues that these two facts are interdependent. We can only succeed in transforming the EE of the 8.4 million homes in which Californians live when we succeed in making the value proposition of efficiency readily apparent, through actions that are easy, cost-effective, value-additive, and helpful.

This section identifies our recommendations for immediate implementation.[114] These recommendations are based on our evaluation of their potential to generate homeowner action, recognition of the near-term challenges to homeowners' energy and energy-cost savings potential, successes from similar promising exemplary profiles, stakeholder feedback, and administrability. They are also designed to promote meaningful progress toward scaling residential EE improvements—even in the face of challenges provided by the current housing market.

Our proposed solutions are grouped into four categories: disclose, enforce, incentivize, and finance.

	Disclose	Enforce	Incentivize	Finance
Time of Sale	1. Mandate asset and operational disclosure at the time of advertisement (listing). 2. Standardize and include an energy feature list in all MLS listings.	Train home inspectors to perform energy assessments.	1. Target existing and new incentives to sellers and to buyers within two years of purchase. 2. Develop new incentives to reduce transaction costs, e.g. real estate agent fees or transfer taxes.	1. Offer innovative standalone financing to buyers within two years of purchase. 2. Provide additional positive CRA consideration to financial institutions that loan to low- and moderate-income purchasers and renovators of EE homes. 3. Reduce the FHA insurance premium for mortgages on EE homes. 4. Increase the number of mortgage-plus-rehab financing products usable for EE.
Time of Renovation	Mandate asset ratings for all renovations exceeding $25,000.	1. Improve enforcement of Title 24 requirements. 2. Mandate whole house upgrades for renovations over $100,000; capped at the lesser cost of the investment needed to achieve a 25% improvement or 5% of the renovation budget.	1. Redeploy existing incentives to time of renovation in order to encourage increasing project scopes to include EE. 2. Relieve permit fees for EE upgrades. 3. Extend system failure replacement incentives. 4. Offer discounts on EE products and services to group purchasers.	1. Market and scale the availability of standalone financing products, such as on-bill financing, energy service agreements, and FHA PowerSaver loans. 2. Develop new mortgage refinancing and home equity products that incorporate EE.
Time of Energy rate tier Rate Increase	1. Mandate communications to: all households that cross tiers, regardless of opt-in status; and to all households with consistent occupancy in the upper two energy rate tiers. 2. Tier alert should include projections, in dollars, of long-term energy costs and EE savings.		Use averted rate increase as an upfront investment for EE improvement.	

Trigger: Time Of Sale

Action: Disclose

Our strongest recommendations within this timing trigger are for the mandatory disclosure of a home's energy efficiency, costs, and consumption at the time of sale, and for the mandatory greening of all the Multiple Listing Services operating within California. Both actions would make enormous inroads into creating statewide awareness of efficiency, equalizing the knowledge basis of all buyers who purchase all sizes and types of homes, and protecting consumers. As best-in-class solutions, these tools can also help improve loan performance, allow sellers of efficient homes to capture greater value, provide real estate agents with additional tools to help sell homes, and safeguard borrowers from an unforeseen mismatch between monthly loan costs and true monthly operating costs of their homes.

Mandate disclosure of asset and operational ratings at time of advertisement (listing).

At the time of listing, California homebuyers should be able to learn the energy efficiency, energy cost and prior consumption attributable to the home they seek to purchase. Additionally, the state should require each of: (1) the form of the disclosure; (2) collaboration with county assessor offices for accuracy of square footage inputs; (3) automatic inputs of utility cost averages from utilities; and (4) information gathering systems to assess the effect of the disclosure.

- Operational Rating: To maximize the usefulness of this information, the state should normalize cost and consumption figures into an operational rating that uses the home's actual square footage, so that homebuyers can compare home energy costs across properties in a standardized manner. This rating should be calculated as an annual figure, based on at least the prior two years of occupancy, and as seasonal averages (winter and summer) over the two years, to best illustrate a range of home energy performance. Actual utility bills would not be shared, safeguarding home seller privacy to a great extent.

- Asset Rating: The state should standardize an acceptable asset rating methodology for deployment statewide to accommodate an objective understanding of existing homes' EE and can accurately reflect upgrades made prior to a home sale. The state should develop a system and labeling format capable of being understood easily by most Californians.[115, 116]

Green and standardize the California MLS.

California should standardize the information provided with each and every home listing in order to maximize market receptivity and understanding, and to ensure that homeowners are not penalized merely because they may reside in a county whose regional MLS is one that does not have helpful energy information. Publication on MLS systems also enables the effective search and comparison by prospective buyers for specific ratings or features. In particular, asset ratings, operational ratings, green labels, and a green feature list should be included with each and every home listing on the MLS systems. California should require a uniform, standardized list of home features to be disclosed in each and every home advertisement. This list should be updated periodically, ideally every three to five years. This is essential, especially for those older, existing homes that have invested in upgraded energy features but do not have an energy label.

Action: Finance

California should strategically deploy new and existing financing solutions to help California families cover the upfront costs of EE. These solutions are relevant at every trigger point. However, the following two federal financing policy solutions are particularly relevant at the time of sale, and their adoption would go a long way toward ensuring that all banks that offer mortgage financing are incentivized to accumulate loan portfolios of EE homes.

Amend the Community Reinvestment Act to provide extra credit to financial institutions for covered loans that also improve residential EE uptake.

The Community Reinvestment Act (CRA), enacted in 1977, requires depository institutions to help meet the credit needs of all communities in which they operate. In particular, financial institutions subject to CRA are evaluated periodically by regulators as to the adequacy of their community investments, such as mortgages lent to borrowers in low- and moderate-income neighborhoods. Their performance on these metrics is taken into account in determining whether or not to approve certain bank actions, such as mergers and acquisitions. CRA has been one of the most important and successful policy levers in catalyzing private bank investment across income levels and neighborhoods. California can support the spirit of CRA by asking the federal government to align housing and energy in financial products.

Neither the CRA nor its implementing regulation gives specific criteria for rating the performance of depository institutions. Rather, the law indicates that the evaluation process should accommodate a financial institution's individual circumstances and market conditions. At the end of the CRA examination process, depository institutions receive one of the following ratings of performance: Outstanding, Satisfactory, Needs to improve, or Substantial non-compliance. Financial intuitions making loans to low- and moderate-income purchasers and renovators of EE homes should receive additional positive consideration in their evaluation by CRA regulators.[117]

Reduce Federal Housing Administration premiums for energy-efficient homes.

In the first quarter of 2011, California had the second highest share of FHA-insured loans of any state in the nation.[118] FHA should safeguard its own portfolio by reducing the price of FHA premiums for those loans made to purchasers of efficient homes.[119] This would help ensure that FHA mortgages value EE.

Action: Incentivize

One of the primary mechanisms that California and the CPUC have used to encourage home energy upgrades is the offering of financial rebates and other incentives to consumers who purchase an EE appliance or improvement. Currently, more than 1,000 different incentive programs are offered in California by myriad government entities, investor-owned and municipal utilities, and water districts.[120] The most substantial incentives for homeowners, up to $4,000, are offered as part of Energy Upgrade California, an ARRA-funded alliance intended to catalyze whole-house retrofits.[121] Many counties have offered to partially match the state incentive for county residents who achieve the requisite level of performance.

State agencies and utilities should both retarget existing incentives and create new ones so that they are specifically relevant at each trigger point. This varied approach could help the state reach a broader range of homeowner populations.

Retarget existing EE incentives to focus on homebuyers and sellers.

Moving existing incentives to the trigger points identified in this paper will capitalize on the established pathways for buyer or seller action. In particular, redirecting existing incentives to sellers and buyers who upgrade homes within two years of listing or of purchase would take advantage of the existing motivations and behavioral inclinations.

Craft incentives that defray some transaction costs at the time of sale.

Borrowing behavioral approaches from the UK, these incentives are premised on the idea that relieving transaction costs may be more meaningful to homebuyers than subsidizing EE costs.

- **Offer a closing cost or real estate agent fee rebate for energy upgrades:** California has the fourth-highest average closing costs in the nation, at approximately $4,800, and home sellers typically pay up to 6 percent of the sales price to the real estate agent. For a median-priced California home, that amounts to over $16,000. Rebate eligibility could be determined by either prescriptive or performance-based measures (i.e. demonstrated by an asset test, savings identified on a utility bill over a period of time, or by stipulated EE installations).[122]

- **Rebate for integrated energy surveys/ home inspections.** To encourage homebuyers to learn more about the EE of prospective homes, and to encourage the up-skilling of home inspectors, California should make incentives available to homebuyers who choose a home inspector qualified in performing an energy assessment.[123]

- **Targeted education and training of home sales professionals.** To help sellers capture greater value and to help buyers better learn about their home carrying costs, the state and utilities should target specialized training to home inspectors that teaches them about energy assessment and should require them to conduct one for every home sold. One way to initiate this would be to partner with the national and state associations of home inspectors. Similarly, the state should offer education and training to real estate agents to learn about EE, energy rebates available to home buyers and home sellers, and energy surveys (including lists of contractors who perform energy assessments in their area).[124] Partnering with county and state associations of real estate professionals, such as the California Association of Realtors and the California members of EcoBrokers would be an important strategy in reaching and educating parties who are vital to the home sale transaction, and therefore influencing consumers' purchasing decisions.

- **Tax benefits:** California should offer to pay a portion of a home purchase–related tax (such as either a seller's county transfer tax or a buyer's new property tax) as an incentive for EE action, coupled with existing EE upgrade incentives targeted at various trigger points.[125] Eligibility could be determined by either prescriptive or performance-based measures.

Target energy incentives to distressed sales and foreclosure prevention.

Given today's housing market distress, California should target incentives to communities where EE can generate additional cash savings for homeowners and prospective home purchasers.

- **Help prevent foreclosure.** According to HUD, lenders may legally conduct any review they deem necessary "to verify that the property has no physical conditions which adversely impact the borrower's continued ability to support the modified mortgage payment."[126] California should target existing or new EE incentives to those homeowners in loan modification processes where homes are capable of achieving energy savings amounting to more than $75/month, as determined by a home inspection. Alternatively, banks could offer some of the loan modification funds to cover the cost of the upgrade if sufficient savings were possible.

- **Pair EE incentives with neighborhood stabilization efforts.**[127] Help low- and moderate-income purchasers of foreclosed homes by targeting EE incentives to bank-owned REO, or homes that have been conveyed to nonprofit organizations. These incentives could be predicated on leveraging other local, state, or federal funds for neighborhood stabilization. HUD and California's housing finance agencies (HCD and CHFA) should prioritize allocation of neighborhood stabilization funds to homes and communities undertaking EE.

Trigger: Time Of Renovation

Action: Disclose

California's Title 24 already regulates home improvements. This section offers recommendations to ensure that owners who renovate their homes evaluate and address the efficiency of the entire house, not just the renovated portion.

Require homeowners to obtain an asset rating for significant renovations.

An asset rating at the time of renovation would allow homeowners to learn the energy savings potential from incorporating appropriate efficiency measures not only into the remodel but into other aspects of the home that interact with the renovation.[128] We suggest the rating requirement be triggered by project values at a low enough dollar threshold to generate a meaningful number of EE upgrades, but not so high as to interfere with decisions to obtain a permit. We estimate this dollar threshold to be $25,000.

Action: Enforce

Mandate energy upgrades for large-scale renovations.

For those homeowners already undertaking remodels or home improvements exceeding $100,000, California should require them to include an energy upgrade. In particular, we recommend requiring each renovation that exceeds this threshold to incorporate a whole-house energy improvement of 25 percent, at a cost not to exceed 5 percent of the renovation budget. In effect, this requirement would extend the application of Title 24 to the whole house, rather than just the portion under renovation. This would add only incrementally to the preexisting cost and scope of project work.

Action: Incentivize

Tie existing and new incentives to the permitting and other home renovation processes.

- **Deep retrofit incentives offered upon obtaining permit.** California should reduce or waive the permit fee for renovations that include specified energy measures. For example, the state could refund some portion of the county permit fee for kitchen or bathroom renovations where whole-house energy is also improved.

- **Permit amnesty.** The state and counties could eliminate permit fees for illegal units if they comply with relevant codes and include EE improvements, within a specified time frame.

- **Increased renovation scope.** This incentive should motivate owners who are already renovating to do more energy work than they originally intended, perhaps through a graduated rebate that increases in dollar value as more EE equipment and services are purchased and properly installed. These incentives could be offered via retail outlets, manufacturers, and contractors.
- **Extended system failure replacement incentives.** Ideally, contractors performing system replacements would market these opportunities to customers as part of the normal sales consultation.
- **Group purchase discounts.** Aggregating demand through, for example, homeowner and neighborhood associations can reduce costs to individual purchasers of EE equipment and installations. The Housing Partnership Network include a bulk-purchasing program, through which member nonprofit housing development organizations can receive discounts on appliances and building materials. Similarly, Joint Venture Silicon Valley offers an aggregated approach for purchasers of solar panels.[129] The UK is one of the first entities to incentivize homeowners to join forces and purchase energy upgrades in bulk. Similarly, California should offer incentives for groups of homeowners who purchase in a pool.

Trigger: Time Of Energy Rate Increase

Action: Disclose

Extend tier alert disclosures to all ratepayers who consistently occupy high-rate tiers.

California utilities should expand the existing tier alert notifications to all ratepayers—not just those that have opted in to receive them. Notification should not depend on whether the homeowner has the ability to receive email or text messaging. The form and content of this notice should be improved, as well, to provide consumers with a better understanding of the consequences and costs of their consumption, along with the options and incentives for efficiency investments. Additional notices should be provided to all residential consumers assessed at the upper two tiers in each utility region for a significant period of time (for example, for three consecutive months). This would be an important way to reach the 26 percent of California households assessed at Tier 4 and 5 rates.

Enhance the tier alert with long-term cost implications.

California utilities should make their tier alerts even more meaningful by including cautionary information to the consumer about the long-term costs of paying high energy rates. Similar to the banking disclosure on credit card statements that illustrates how much interest a borrower will pay over the term of a loan, this alert should compare the cost of high-rate tier energy use with the cost of remaining at a lower rate over the same time period.

The alert might demonstrate, for example, that at current consumption and energy rates, the consumer's cost would be $3,350 over a single year in Tier 5, while reducing consumption to baseline at Tier 3 would cost only $1,650 per year.[130] Furthermore, the alert should show that over 30 years (the life of a mortgage), Tier 5 usage would cost the ratepayer just over $100,000, whereas remaining in Tier 3 would cost only $46,800, for an avoided cost of $53,700. Even showing a five-year savings projection of nearly $9,000 by moving to Tier 3 would be compelling. Providing a series of long-term projections—over 5, 15, and 30 years, for example—would mirror federal consumer credit and mortgage disclosures that illustrate the consequences of minimum payment amortization and negative equity.[131]

Action: Finance

Repurpose marginal increases in utility rates for energy upgrades.

Consumers who remain in upper energy rate tiers for a set period of time should be offered a financial incentive to reduce consumption. As an example, this incentive could be equal to the differential between the lower tier and the tier in which the consumer resides for a period of time (e.g., two years). In other words, if the consumer is paying $500/month for a year in Tier 3 or 4, and reducing energy consumption to Tier 2 levels would have brought that bill down to $250, then the utility would offer to pay $3,000 upfront for an EE upgrade (equivalent to $250 in savings multiplied by 12 months). Alternatively, utilities and consumers could share the actual or stipulated savings in much the same way as an ESA works with industrial properties, or utilities could offer to rebate customers after verifying consistent energy savings resulting from an upgrade.

Actions that apply at every trigger

Require data collection and reporting for all EE programs

Policymakers and regulators (and, of course, the marketplace) are in need of better information. We therefore recommend that EE programs should collect data about the pace of upgrades supported by newly targeted incentives to enable policymakers to gauge the effect of these recommendations and to improve the policy framework going forward.

Finance solutions that lower upfront cost barriers for ordinary Californians

One of the greatest barriers to home energy upgrades is the upfront cost, coupled with a payback timeline that can often extend beyond the threshold tolerance of many California households. Driving energy upgrades therefore requires adequate financing solutions. Unfortunately, current offerings are often expensive (such as credit cards), and lower-cost financial products (such as 30-year fixed rate mortgages) do not typically include energy renovations as part of their scope. California needs to take action to seed the marketplace for financing to cover upfront investments of ordinary families living in inefficient homes. State agencies should encourage the development of private financing for home energy upgrades at every single trigger point. Mechanisms to catalyze private financing are manifold, and include legislation or regulation to accommodate the following:

- Encourage private financial institutions to scale and market innovative financing mechanisms such on-bill financing, ESAs, FHA PowerSaver loans, EE mortgages, FHA 203(k) renovation loans, home equity loans, and typical renovation loans.[132]
- Encourage underwriting practices, such as those specified in the SAVE Act, that value EE improvements in the pricing of home loans.[133]
- Advocate at the federal level to ensure that financial products regulated or insured by the federal government prioritize EE.[134]
- Utilities, state agencies, and philanthropies should encourage exceptional EE behavior by creating and funding special matched energy savings accounts, similar to 401(K)s or Individual Development Accounts (IDA).[135]
- Develop and deploy an energy savings guarantee to accompany measures that meet minimum savings and quality thresholds and are performed by certified contractors, so that performance risks associated with EE projects are reduced, and such projects are therefore more attractive to prospective financiers.
- Establish a loan loss reserve or loan guarantee program to share EE financing risks with private financial institutions or to subsidize borrower loan costs.

Additional Considerations

Strong standards and enforcement are needed to ensure quality work

Ensuring quality work that delivers the promised benefits is an important objective of any EE program and is especially critical for creating high quality jobs. While there are some exemplary contractors, low quality work and widespread non-compliance with building codes results in a failure to achieve the engineering potential promised by technological improvements and, accordingly, lower than expected energy savings. Therefore, strong standards should be attached to any incentives for energy upgrades. Recent legislation (SB 454) now requires proof of permit in order to receive an incentive for EE work, but there are still questions of enforcement. However, additional steps are also needed to ensure quality work and quality jobs, such as requiring worker training standards and certifications.

Incentives could additionally be conditioned upon performance measurement and verification using internationally accepted protocols. The EE industry points out that today, contractors are paid the same whether their installations deliver savings or not. Performance-based pay or incentives to the homeowner would improve quality and customer expectations.

For successful implementation, better enforcement of permitting requirements is also needed. Current enforcement is limited, largely due to insufficient financial and personnel resources at county governments tasked with oversight.

Conditional recommendation for mandatory upgrades

In a healthy housing market where homes appreciate over time, the most effective strategy for achieving EE in the residential marketplace would be to require cost-effective energy upgrades of inefficient homes as a condition of sale. Any concerns about the financial implications of a mandatory upgrade could be offset through exemptions, such as for homes that are underwater or for low-income occupants. However, given the challenges of today's housing market, a mandatory upgrade would be infeasible; therefore, we choose to focus instead on improving information for homeowners and potential buyers, and on catalyzing demand through innovative incentive targets, financing, and enforcement of existing energy and building codes. In the future, we believe there could be strong support for a mandatory upgrade strategy.

Sensitivity Analysis

What is the combined effects of these actions at triggering moments in the homeownership life cycle?

To determine both the number of homes likely to be impacted by these solutions and the number of jobs created due to our recommendations, we developed two 25-year forecasts of market reach, in five-year increments: (1) an optimistic scenario, in which the housing market improves, disclosure mandates generate a robust number of energy upgrades, and homeowners have access to low-cost financing to cover the initial investment needed for EE upgrades; and (2) a pessimistic scenario, in which the housing market remains weak, there are fewer large-dollar renovations, disclosure mandates generate only moderate interest in energy upgrades, and there is no additional financing available to cover upfront EE upgrade costs.

Market Impact Analysis

Our market impact analysis measures the sum of (1) the percentage of homes upgraded due to sale and renovation triggers, multiplied by the number of single-family detached homes built before the introduction of Title 24 energy standards in 1978 (approximately two out of three existing homes) and (2) the percentage of homes upgraded due to the energy rate tier trigger, multiplied by the whole stock of single-family detached homes.

There are, admittedly, significant data limitations in our analysis. First, we do not know the extent to which there is overlap among households that would be covered by these three triggers. Second, we were unable to forecast the long-term effects of the energy rate tier–related trigger over time because of a lack of data. As a result, we have only included one year of upgrades due to energy rate tier disclosure; after the first five-year period, no additional upgrades are included in our total. However, these two simplifications have opposite effects. One is likely to bias the results upward and the other to bias the results downward. The full details of our analyses are available in Appendices C and D.

Figures 9 and 10 provide a summary of how many upgrades we expect to be completed over 25 years, under both scenarios, as a result of our recommendations.

Even the pessimistic scenario yields a rate of upgrades that is much greater than the current rate, which we have roughly estimated to be in the range of 10,000 to 20,000 homes annually. The results also point to the importance of the extent to which homeowners voluntarily act on additional information about energy saving investment options. The primary difference between the optimistic and pessimistic scenarios is the percentage of homeowners that choose to upgrade following disclosure. Many of our recommendations are designed to encourage higher consumer uptake resulting from disclosure practices.

Figure 9 Optimistic scenario: *Cumulative percentage of market upgrades over time due to recommended policies*

Trigger	5 years	10 years	15 years	20 years	25 years
Time of sale	6.1	12	17	22	27
Renovation (mandated upgrade)	0.75	1.5	2.3	3.0	3.8
Renovation (mandated disclosure)	1.4	2.8	4.2	5.6	7.0
Energy tier	5.2	5.2	5.2	5.2	5.2
Total	**13**	**22**	**29**	**36**	**42**

Figure 10 Pessimistic scenario: *Cumulative percentage of market upgrades over time due to recommended policies*

Trigger	5 years	10 years	15 years	20 years	25 years
Time of sale	2.3	5.3	8.2	11	13
Renovation (mandated upgrade)	0.75	1.5	2.3	3.0	3.8
Renovation (mandated disclosure)	0.70	1.4	2.1	2.8	3.5
Energy tier	2.6	2.6	2.6	2.6	2.6
Total	**6.4**	**11**	**15**	**19**	**23**

Jobs Impact Analysis

With unemployment in California still close to 12 percent,[136] and with even higher joblessness rates within the construction sector, it is important to look at the job market and economic impacts of proposed policy initiatives. Here we provide an overview of the jobs that could be directly and indirectly created in a single year as a result of the residential EE policies proposed in this paper, as well as some of the workforce issues that should be considered.

Figure 11 provides a summary of estimated jobs that would be created during the first year by the investment stemming from our recommendations. Our results indicate that all the policies we recommend would have a positive overall impact on employment, if implemented.

The numbers in Figure 11, represent the number of full-time positions for one year. If the levels of investment remain consistent over time, the same number of jobs would be available in the following year, but these would not be considered to be new jobs in each subsequent year. In other words, new jobs would be created in the first year of investment, but no additional jobs would be created in following years, unless investment levels changed due to policy actions, increased consumer uptake, housing market recovery, or some other factor.

Figure 11 Projected total jobs created in one year due to residential EE policies

Trigger	Policy Action	Jobs per Year High	Jobs per Year Low
Time of sale	• Mandatory disclosure of asset and operational ratings	12,744	3,655
	• Mandatory upgrade	52,255	14,047
Renovation	• Asset rating for renovations >$25K, upgrades for renovations >$100K	3,536	1,826
Energy tier increase	• Improved notification and disclosure for customers in high tiers	N/A	4,376
Total		**68,535**	**23,904**

Job Quality

When analyzing the overall economic impact of these proposed policies and their ability to contribute to economic recovery, it is important to take into consideration not only the number of jobs that could be created, but what type of jobs—in terms of wages, conditions, opportunities for advancement, and access for low-income or marginalized workers. Although the jobs projections above include both jobs that are directly created through investment in the residential retrofit industry and job growth that is stimulated throughout supply chains and the wider economy due to recirculation of those investment dollars, only the quality of jobs created in the residential retrofit sector can be directly influenced through policy design. Therefore, this section looks more closely at what types of jobs are currently available in the residential construction sector and what policy designers might do to improve the quality of jobs created by the actions proposed in this paper.

Although there are a small number of contractors doing residential EE work who try to distinguish themselves on the basis of quality, the majority of the industry is competing within the wider residential remodeling industry, which is highly unregulated and operates largely underground. The scale of projects tends to be small, as do the firms, and the pressure to reduce costs in order to compete is overwhelming.[137] Approximately 76 percent of residential contractors claim to have no permanent employees, but the majority of these contractors regularly hire independent subcontractors or day laborers, enabling them to avoid paying benefits, workers compensation insurance, unemployment insurance, and payroll taxes.[138] In fact, according to a nationwide survey, day laborers provide nearly half the workforce for residential contractors.[139] This informal workforce is widely acknowledged to experience wage and hour violations and other abuses. Another recent survey of over 1,800 low-wage workers in Los Angeles, including nearly 200 workers in the residential construction industry, showed that these types of labor law violations are rampant. The study found that 17.4 percent of workers in residential construction were subject to minimum wage violations, 63.7 percent were forced to work off the clock with no pay, and 78.7 percent were denied a standard meal break.[140]

It is particularly important to attend to job quality considerations in these policies for two reasons: first, the widespread under-investment in workers means that, without specific public policy interventions, creating more work in the industry is likely to result in new poverty-level jobs. Secondly, because of the underground nature of the industry, residential construction contractors often cut corners in other areas, including hiring low-skill workers, skimping on work quality, and avoiding permitting and inspections. As mentioned earlier, this often results in improper installation of EE equipment and unrealized energy savings.[141] Policymakers' efforts can help level the playing field for higher quality contractors in the residential EE industry—ensuring that those who invest in worker training, compensate workers for their skills, and take pride in high-quality work have the opportunity to compete. The tools for enabling competition based on quality include:

- Requiring training standards and worker certification: To date most EE programs do not have standards, or like the CEC's Energy Upgrade California program, only require certifications for contractors or home raters, but not for installation technicians.

- Setting minimum labor standards: While prevailing wages are reflective of the higher-quality, non-residential construction sector, raising the bar for wages in residential EE work would enable workers and employers to invest in training, and would likely reduce turnover in the industry, contributing to the development of a more stable, professionalized workforce.

- Enforcing existing legal requirements: Enforcement of existing requirements—such as contractor bonding and licensing, the permitting of building projects, and compliance with Title 24—would likely boost both job quality and energy savings from the recommended triggers and actions.

6 Next Steps

We strongly support expedited state and federal deployment of actions recommended in the previous section. In addition, the sponsors of this paper intend to take the important next steps identified below; these are the areas where we believe we can quickly achieve meaningful impact.

California

The work of this paper arises from a rich set of interviews and convenings of a unique cross-section of stakeholders whose opinions and contributions are necessary to develop and deploy successful catalyzing actions in the energy retrofit of single-family homes in California. CalCEF intends to continue to play a leadership role in working with these stakeholders via both the AB 758 and ongoing CPUC EE financing proceedings.

1) Help California develop, legislate, and deploy mandatory disclosures immediately. We expect to work closely with the state and stakeholders in developing a trigger-oriented approach to disclosures generally, and in crafting the content of disclosures in the most effective yet sensitive manner. We are inclined to pursue a phased approach beginning with requiring an operational disclosure at the time of listing that can be implemented immediately, with no costs to homeowners, followed by requiring an asset disclosure, also at the time of listing.

2) Develop a plan to launch and deploy new trigger-relevant incentives, starting with the averted marginal rate increases paid by homeowners in high tiers. We are quite intrigued by the concept of reorganizing existing incentives to maximize their effectiveness at each of the trigger points, and intend to assist state agencies in exploring how to actualize this. In particular, at least one of the new incentives we describe offers a unique potential way for utilities to repurpose the proceeds from avoided electricity and natural gas rate increases on affected ratepayer households (an "inefficiency premium") as a novel incentive for EE upgrades. We aim to help the state craft a mechanism that would allow households with sufficient cumulative occupancy in high tiers to access these funds for an upfront efficiency incentive payment, predicated on subsequent reduced consumption.

3) Apply the efficiency services agreement (ESA) model to the residential arena. What is particularly missing in the residential arena is a non-debt product that removes the first-cost barrier to EE improvement for homeowners. The concept of an ESA, which is used already in the market for large industrial and commercial customers, would allow homeowners to upgrade the efficiency of their property and pay for it over time out of their resulting energy savings. Similar in principle to PPA agreements for solar PV, CalCEF intends to develop a version of this innovative financing mechanism for owners of single-family homes.

Federal

While this paper is focused on the EE improvement of California's single family home market, we believe that two key federal regulatory changes could result in enormous transformations in our state as well as in the rest of the county. Moving forward, we intend to lead advocacy and stakeholder engagement to accomplish the following regulatory changes:

1) Require EE transparency (disclosures) in every single home purchase transaction, preferably at the time a home is advertised for sale. In particular, we would work to ensure that RESPA, TILA and any other relevant transaction transparency law includes at least a no-cost operational efficiency disclosure. This is a particularly opportune moment to lead in this arena, as a new federal official was recently appointed to lead the new federal CFPB, and as the GSEs will be reformulated over the next year or so.

2) Extend CRA credit to loans made to borrowers for EE homes. There is no question that a home with EE improvements reduces monthly payment obligations for homeowners, enhancing affordability. Neither the CRA nor its implementing regulation gives specific criteria for rating the performance of depository institutions. Rather, the law indicates that the evaluation process should accommodate a financial institution's individual circumstances and market conditions. At the end of the CRA examination process, depository institutions receive one of the following ratings of performance: Outstanding, Satisfactory, Needs to Improve, or Substantial Non-Compliance. We intend to work with banking regulators to ensure that, at least, financial institutions making loans to low- and moderate-income purchasers and renovators of EE homes receive additional positive consideration in their evaluations by CRA regulators.

In this appendix, we provide some quantitative context for our analyses.

Energy Consumption

Homes account for 32 percent of the 275,000 gigawatt-hours (GWh) of building-related electricity consumed in California and 40 percent of the total 12.8 billion therms of natural gas used across all sectors of California's economy.[142] California's single-family residents spend an average of $1,838 per home per year, or $151.17 per home per month on energy, divided roughly 70 percent/30 percent between electricity and gas.[143]

Housing Stock

Approximately 8.4 million homes in California are single-family residential buildings.[144] The average size of California homes is approximately 1,800 square feet for the average single-family home.[145] Approximately two out every three California homes were built before Title 24 energy codes were enacted in 1978. About 10 percent of all homes in the state were built since 2000. Figure 12 shows the age of California's single-family housing stock.

Moreover, the residential building stock performs differently based on age, with just a 6 percent increase in energy use, despite a roughly 25 percent increase in square footage for newer homes. Figure 13 illustrates differences in energy use between newer dwellings (homes built since 2001) and all other homes.[146]

In addition, the emissions reduction potential of homes increases in accordance with the age of the home, as Figure 14 illustrates.[147]

Figure 12 Age of Single Family Housing Stock

Single Family (1-4 units excluding mobile homes and trailers)

Year Built	Number	Percent
2000 or later	939,734	9.65%
1990-1999	1,061,124	10.89%
1980-1989	1,416,270	14.54%
1970-1979	1,567,965	16.09%
1960-1969	1,324,803	13.60%
1950-1959	1,617,527	16.60%
1940-1949	771,351	7.92%
1939 or earlier	1,043,645	10.71%
Total	**9,742,419**	**100.0%**
		~66% before Title 24

Source: American Community Survey, 2005-2009, Public Use Microdata Sample

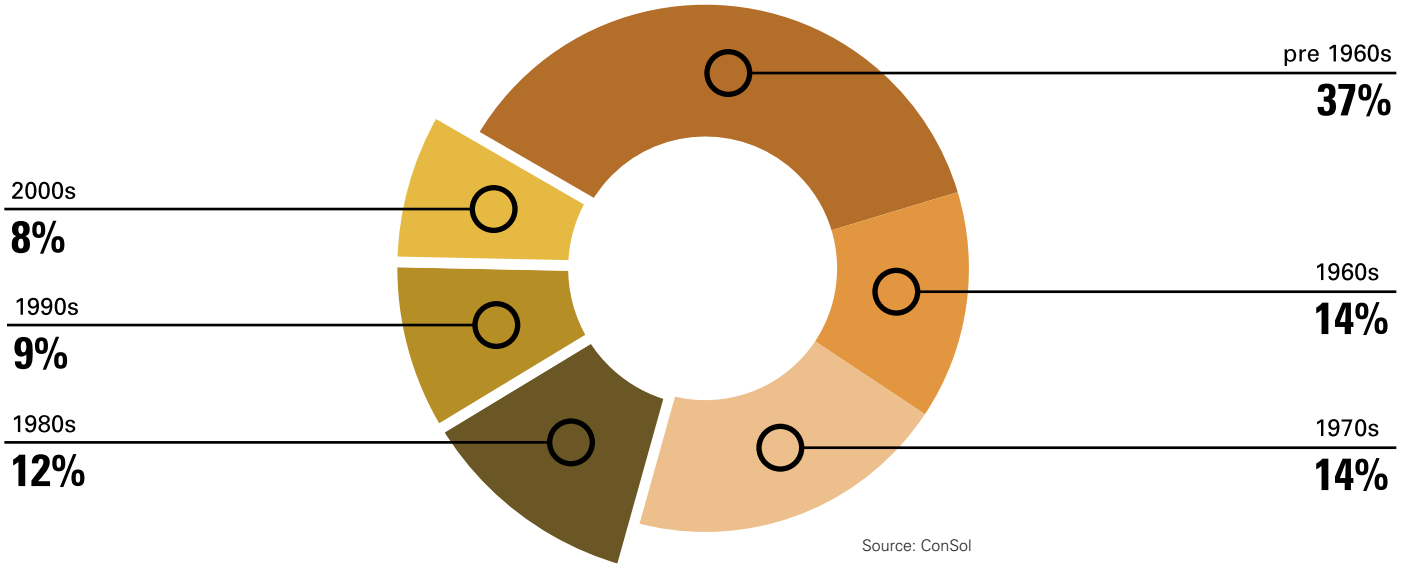
Figure 13: Comparison of Energy Use Factors and Overall Consumption, Pre-2001 vs. Post-2001

	Newer Dwellings	Older Dwellings	Percent Difference
Annual Electric Household Consumption	6,645	6,262	**6%**
Annual Gas Household Consumption	358	347	**3%**
Dwelling Size	2,020	1,521	**28%**
Number of Residents	4.16	5.12	**-21%**
Average Income	84,837	68,051	**22%**
Percent Single Family	68%	60%	**12%**
Owners	78%	67%	**15%**
Saturation of Central AC	84%	51%	**50%**
Cooling Degree Days	1,029	757	**30%**
Cooling Degree Days (those with CAC)	1,157	1,013	**13%**
Programmable Cooling Thermostat	87%	66%	**28%**
Pool Saturation	18%	24%	**-25%**
Average Number of Computers per Home	1.81	1.57	**14%**
Gas Primary Heating	78%	78%	**0%**
Heating Degree Days	2,292	2,159	**6%**
Exterior Wall Insulation Throughout	88%	48%	**58%**
Attic Insulation	90%	70%	**25%**
Double Pane Windows Throughout	80%	42%	**62%**
Low Flow Shower heads Throughout	69%	59%	**14%**
Average Number of CFLs per Home	12.25	8.79	**33%**
Horizontal Access Washers	132%	22%	**38%**

Source: 2010 California Residential Appliance Saturation Survey

Climate Zones and Energy Use

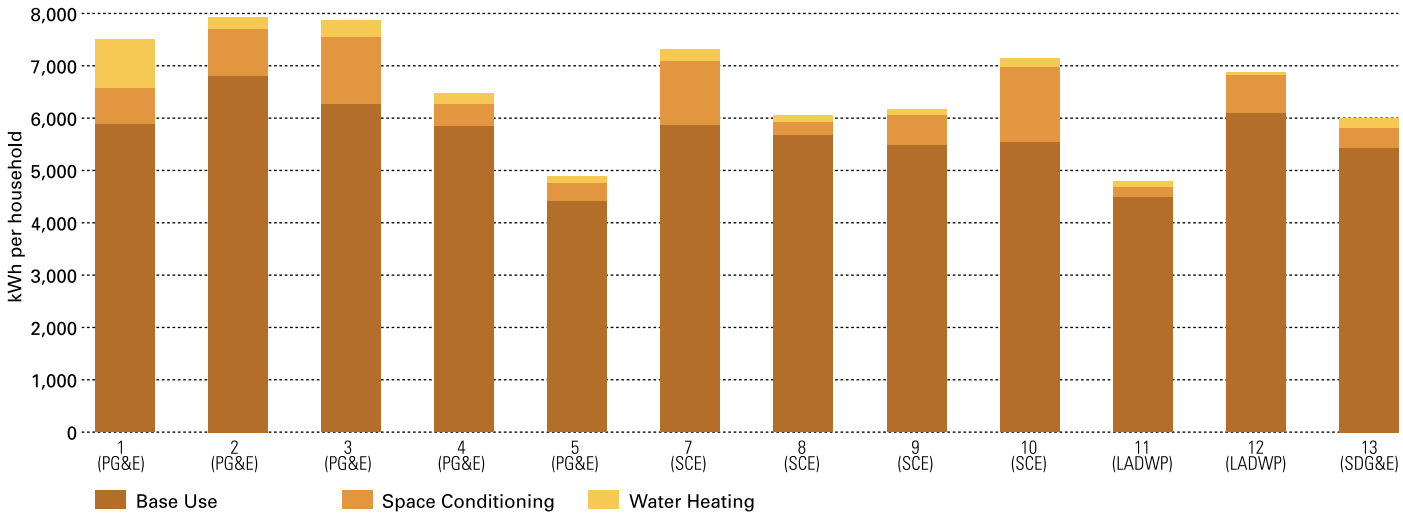
Figure 14 Greenhouse Gas Emissions from Residential Properties, by Construction Year



Source: ConSol

California's mix of climate zones and urban environments create myriad energy use profiles across the state. Each utility's baseline for residential energy use takes into account climate zone, among other factors, to ensure that rates do not penalize households in certain climate extremes. The San Francisco Bay Area (Zone 5) and the Los Angeles greater metropolitan area (Zone 11) occupy the mildest climate zones in California, using the lowest overall total electricity per household, and therefore with the lowest energy baselines in the state (see Figure 15). Consumption rises in climate zones that are further inland. For example, in the Los Angeles region, moving from the basin into the valley increases electricity use to 2,000 kWh from 500 kilowatt-hours (kWh) per year (see climate zone 12, Figure 15).[148] Electricity use reaches the highest zones within the state, with a significant share used for space conditioning, in climate zones 3 and 10, which are also the furthest inland.

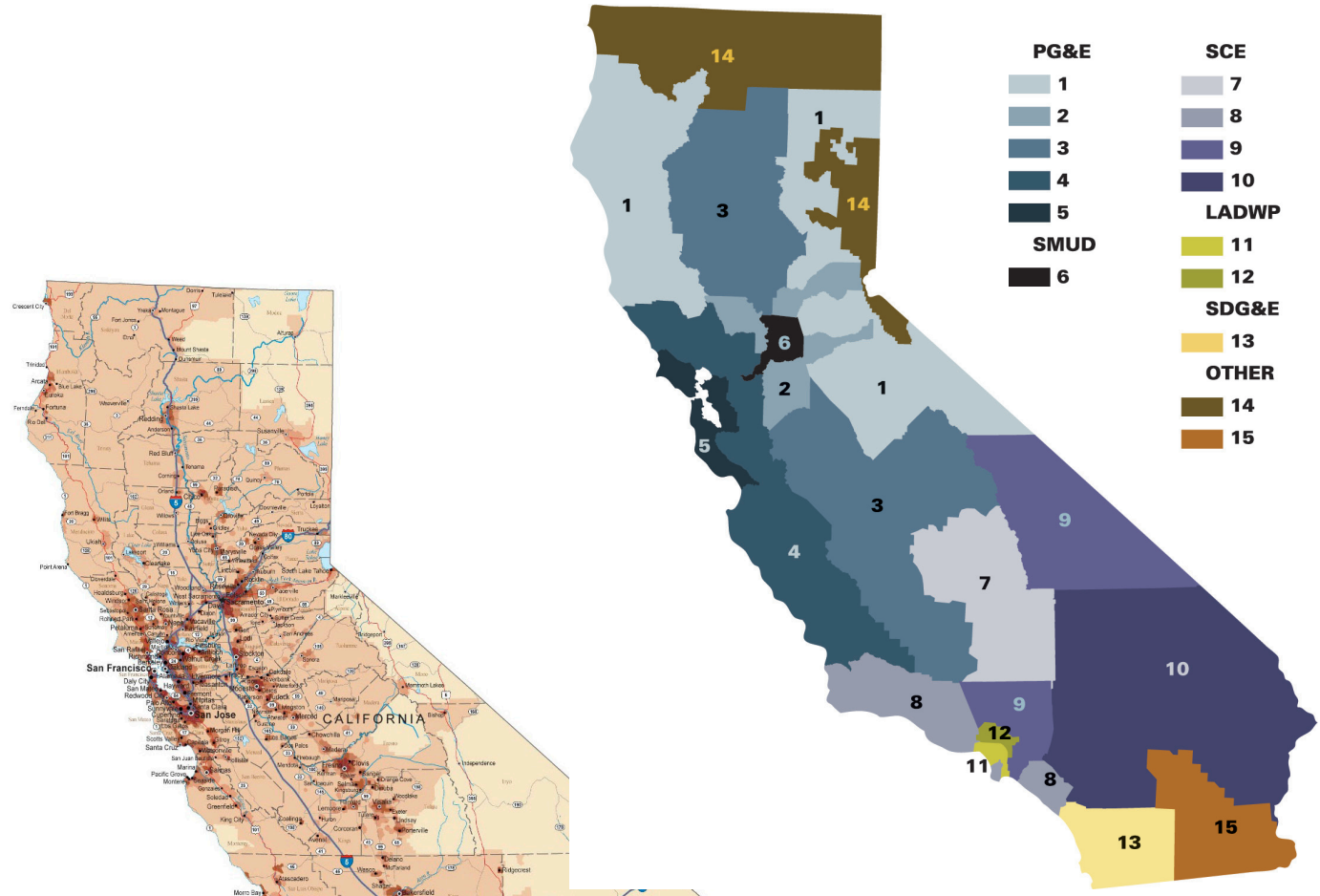
Figure 15 Greenhouse Gas Emissions from Residential Properties, by Climate Zone



Source: 2010 California Residential Appliance Saturation Survey

Although electricity use increases in inland zones, population density decreases, as approximately one-third of California's population reside in its 10 largest cities, according to the California Department of Finance. The largest cities are mainly in the San Francisco Bay Area and Los Angeles area. However, two of California's biggest cities, Fresno and Bakersfield, are much further inland and therefore in high energy-use climate zones.

FIGURE 16 CALIFORNIA CLIMATE ZONES AND POPULATION DENSITY



Source: U.S. Geological Survey and KEMA

Appendix B – CalCEF Estimate of Residential Energy Efficiency Costs Using Harcourt Brown & Carey Methodology

The Harcourt Brown & Carey (HB&C) July 2011 report to the California Public Utilities Commission estimates $60.5 billion total investment is needed to achieve 25 percent energy savings in residential single family homes. CalCEF independently researched inputs and used the same methodology to arrive at an overall $76.9 billion investment needed to achieve 25 percent energy savings in residential single family homes.

The methodology underlying the report builds to this total investment number by starting with granular per-square-foot metrics, then applying those to typical per property metrics, and finally extrapolating that into aggregate numbers for the target market.

Using the publicly available Residential Energy Consumption (REC) Survey 2005 Pivot Table, CalCEF determined that the average cost for electricity per square foot is $0.48 and the average cost for natural gas per square foot is $0.25. This results in a total average cost for energy of $0.73 per square foot. Corroborating the energy costs against the American Community Survey 2005-2009 Public Use Microdata Sample, the average yearly spend on energy of $1,838.00 is roughly approximate to the annual energy spend derived from the REC Survey of $1,534.80 (see Figure 17).

According to industry professionals, an average installation cost of $4.00 per square foot is a reasonable approximation of the capital costs of an EE retrofit.

Overall, CalCEF believes HB&C's methodology is sound in determining the market size for residential single family EE upgrades. Although critiques can be made regarding the linearity of the model when modifying the energy savings target (e.g., one would imagine energy savings of 75 percent would cause costs to escalate in a non-linear manner due to diseconomies of scale), the methodology is valuable as a first-pass estimation. The HB&C report is an important addition to the dialogue because there is a general lack of detailed, publicly available market information for the residential segment. Although the numbers differ between HB&C and CalCEF's inputs and final results, the magnitude of the investment needed is consistent, and both analyses demonstrate how immense the capital demand is, especially in light of current investment levels (see Figure 17).

Figure 17 Summary and Comparison of Harcourt, Brown & Carey and CalCEF Analyses

Typical per square foot metrics	HB&C	CalCEF	Methodology
Average energy cost (electric+gas)	$1.10	$0.73	
Average energy cost (electricity)	n/a	$0.48	
Average energy cost (natural gas)	n/a	$0.25	
Average installation cost	$4.00	$4.00	
Average energy savings $	$0.28	$0.18	Average energy savings % x Average energy cost
Average energy savings %	25%	25%	
Typical per property metrics			
Average square feet	1,800	2,093	
Average annual energy cost	$1,980	$1,528	Average energy cost x Average square feet
Average installation cost	$7,200	$8,373	Average installation cost x Average square feet
Average annual energy savings	$495	$384	Average energy savings $ x Average square feet
Simple pay-back period (years)	14.5	21.8	Average installation cost / Average annual energy savings
Per market sector metrics			
Number of properties	8,400,000	9,181,688	
Total square feet	15,120,000,000	19,220,608,008	Average square feet x Number of properties
Total annual energy cost	$16,632,000,000	$14,092,029,110	Average energy cost x Total square feet
Installation cost	$60,480,000,000	$76,882,432,033	Average installation cost x Number of properties
Annual energy savings	$4,158,000,000	$3,523,007,277	Average energy savings $ x Total square feet

Source: Harcourt, Brown & Carey; Residential Energy Consumption Survey 2005 Pivot Table; CalCEF

Pacific Gas & Electric Company Tier Alert

Dear Valued PG&E Customer,

This message is an Energy Alert about your electric use from Pacific Gas & Electric Company. You signed up to receive alerts from PG&E when you are moving from a lower-priced tier to a higher-priced tier of electric use.

The State of California has adopted a policy to encourage energy conservation where utilities like PG&E charge residential customers on a tiered rate structure. Each month, all customers start at Tier 1 where energy costs the least. But as you use more electricity, you go from Tier 1 to Tier 2, and can go all the way up to Tier 5. The higher the tier, the more you are paying for a kilowatt hour of electricity.

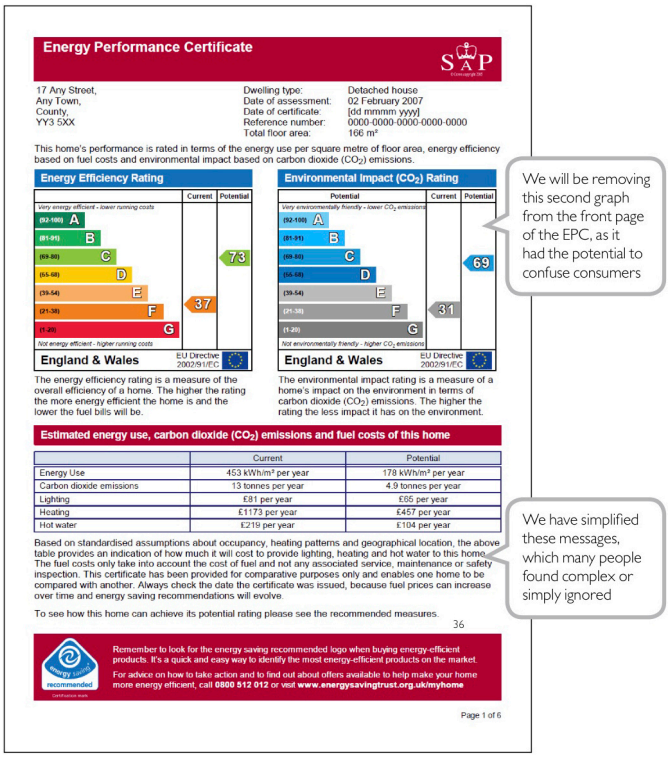
Based on your actual electric use to date, you have crossed into Tier 3 pricing for this billing period, and you are projected to cross into Tier 4 pricing by the end of the billing period.

Log on to My Account at www.pge.com/myaccount to see an estimate of your electric use and costs to date during this billing period. Visit www.pge.com/energyalerts to learn more about tiered rates and how you can conserve energy in your home and keep your costs in the lowest tier possible.

You can change your alert preferences or stop receiving Energy Alerts at any time at www.pge.com/myaccount. We value you as our customer and appreciate the opportunity to serve you.

Energy Performance Certificate (UK)

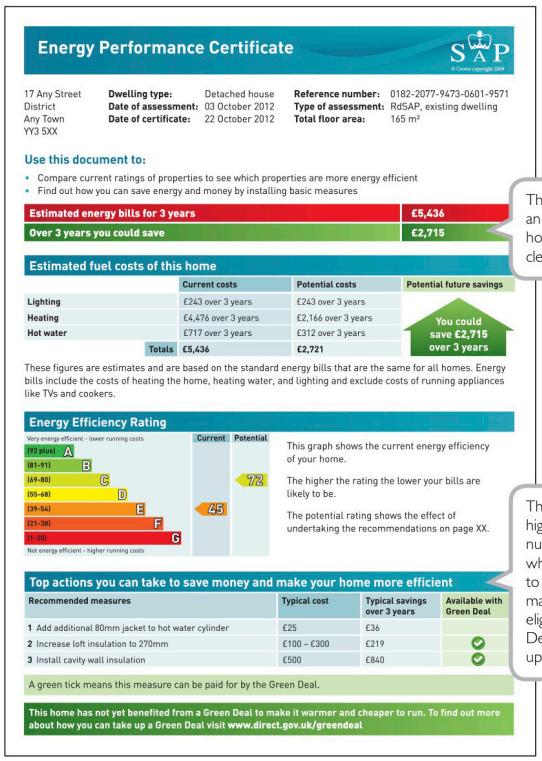
Current UK Disclosure



We will be removing this second graph from the front page of the EPC, as it had the potential to confuse consumers

We have simplified these messages, which many people found complex or simply ignored

New UK Disclosure



The savings of having an energy-efficient home will be made clearer

The new EPCs will highlight a small number of things which can be done to achieve savings – many of which will be eligible for the Green Deal and will incur no upfront cost

SoCal MLS Green Listing Features

Water Heater Description *(3)*
☐ 60+ Gallon Tank ☐ 72+ Gallon Tank ☐ Additional Water Heater(s) ☐ Coal ☐ Electric ☐ Gas ☐ Instant Hot Water ☐ Multi-Tank ☐ Natural Gas ☐ None ☐ Oil ☐ Other ☐ Propane ☐ Recirculating Hot Water ☐ S/W Changeover ☐ Solar Water Heating Panels ☐ Strapped ☐ Tankless ☐ Wood

Security Description *(9)*
☐ Automatic Fire Sprinkler System Throughout ☐ Automatic Gate ☐ Carbon Monoxide Detector(s) ☐ Card/Code Access ☐ Closed Circuit TV ☐ Exterior Cameras ☐ Exterior Security Lights ☐ Fire and Smoke Detection System ☐ Fire Rated Drywall ☐ Fire Sprinklers ☐ Firewall(s) ☐ Gated Community ☐ Gated Community w/Attendant ☐ Gated Community w/Guard ☐ Intercom ☐ Motion Detectors ☐ Non-Monitored ☐ Prewired for Alarm System ☐ Resident Manager ☐ Security System – Leased ☐ Security System – Owned ☐ Window Bars

High or Mid-Rise Amenities *(47)*
☐ 24-Hour Closed Circuit Building Surveillance ☐ 24-Hour Concierge ☐ Answering Service ☐ Aviary ☐ Banquet Facilities ☐ Barbecue Area ☐ Beach ☐ Biking Trails ☐ Billiards Room ☐ Bocce Ball Court ☐ Bowling Alley ☐ Business Center ☐ Club Room ☐ Clubhouse – Catering Sized Kitchen ☐ Clubhouse – Plasma Screen TV ☐ Comfortable Lounging Areas ☐ Community Recreation Clubhouse ☐ Concierge ☐ Conference Facilities ☐ Controlled Access ☐ Convenience Store ☐ Darkroom ☐ Day Care Facilities ☐ Desk in Lobby ☐ Dog Run ☐ Door Person ☐ Entrance Lobby ☐ Executive Business Center ☐ Fire Pit ☐ Fitness Center ☐ Golf – Full ☐ Golf – Par 3 ☐ Golf – Pitch and Putt ☐ Hiking Trails ☐ Horse Trails ☐ Indoor Half Basketball Court ☐ Jogging Track ☐ Kennel ☐ Lounge ☐ Maid Service ☐ Marina ☐ Meeting Room ☐ Mens and Womens Changing Rooms ☐ Mens and Womens Locker Rooms ☐ Mid-Rise Building ☐ On-Site Retail ☐ On-Site Guard ☐ Onsite Property Management ☐ Outdoor Cooking Area ☐ Passenger Elevator ☐ Picnic Area ☐ Pier/Dock ☐ Playground ☐ Pool and Spa ☐ Private Cabana ☐ Private Storage Lockers for Residents ☐ Racquetball Court ☐ Reception Desk ☐ Recreational Multipurpose Room ☐ Rooftop Sky Deck ☐ Rooftop Spa ☐ Rooftop Swimming Pool ☐ Satellite/Cable TV ☐ Sauna ☐ Service Elevator ☐ Steam Room ☐ Tennis Courts ☐ Trash Chute ☐ Yoga and Pilates Studio

Amenities, Other *(16)*
☐ Airplane Hangar ☐ Barbecue Private ☐ Boat Lift ☐ Boat Lock ☐ Boat Slip ☐ Brick Sidewalks ☐ Community Boat Ramp ☐ Community Dock ☐ Decorator Allowance – See Remarks ☐ Dock – Deeded ☐ Dock Private ☐ Dog Run ☐ Dry Bar ☐ Dumbwaiter ☐ Electric Air Cleaner ☐ Equestrian Center ☐ Furnished ☐ Gazebo ☐ Greenhouse ☐ Home Automatic System ☐ Home Theater ☐ Home Warranty Plan ☐ Kennel ☐ Koi Pond ☐ Laundry Chute ☐ Misting System ☐ Paved Sidewalk ☐ Putting Green ☐ Sauna Private ☐ Sidewalk – Pavers ☐ Sport Court Private ☐ Stair Climber ☐ Steam Room ☐ Tennis – E/W ☐ Tennis – N/S ☐ Tennis – SE/NW ☐ Tennis – SW/NE ☐ Tennis Court Private ☐ Turnkey ☐ Vacuum Central ☐ Wet Bar

Interior

Heat* *(16)*
☐ Baseboard ☐ Central ☐ Coal ☐ Combination ☐ Electric ☐ Electric Air Filter ☐ Energy Star Rated Heat ☐ Fireplace ☐ Floor Furnace ☐ Forced Air ☐ Geo-Thermal ☐ Gravity Heating ☐ Heat Exchanger ☐ Heat Pump ☐ High Efficiency HVAC ☐ Hot Water ☐ Hot Water Circulator ☐ Humidifier ☐ Kerosene ☐ Natural Gas ☐ No Heating ☐ Oil ☐ Other Heating ☐ Pellet Stove ☐ Programmable Thermostat ☐ Propane ☐ Radiant ☐ Radiator ☐ S/W Changeover ☐ Solar Heat ☐ Solar Heat Active ☐ Solar Heat Other ☐ Solar Heat Passive ☐ Solar Heat Water ☐ Solar Hybrid Heat ☐ Space Heater(s) ☐ Steam ☐ Variable Speed HVAC ☐ Wall Electric ☐ Wall Gas ☐ Wood Burning Stove ☐ Zoned HVAC

Cooling* *(9)*
☐ Attic Fan ☐ Attic Ventilator ☐ Bottled Gas ☐ Ceiling Fan(s) ☐ Central ☐ Dehumidifier ☐ Dual AC ☐ Electric ☐ Energy Star Rated A/C ☐ Evaporative ☐ Geo-Thermal ☐ Heat Pump(s) ☐ High Efficiency HVAC ☐ Natural Gas ☐ No Air Conditioning ☐ Other ☐ Programmable Thermostat ☐ Room Evap Air ☐ Room Refrig Air ☐ SEER Rated 13-15 ☐ SEER Rated 16+ ☐ Solar Attic Fan ☐ Swamp Cooler(s) ☐ Variable Speed HVAC ☐ Wall/Window ☐ Whole House Fan ☐ Zoned HVAC

Floors* *(11)*
☐ Adobe ☐ Bamboo Flooring ☐ Brick ☐ Carpet – Partial ☐ Ceramic Tile ☐ Clay ☐ Concrete Slab ☐ Cork Flooring ☐ Eucalyptus Flooring ☐ Granite ☐ Green/Recycled Carpet Material ☐ Hardwood ☐ Hardwood – Partial ☐ Laminate ☐ Linoleum ☐ Marble ☐ Mainsleum ☐ Flooring ☐ Other ☐ Parquet ☐ Pavers ☐ Raised Foundation ☐ Reclaimed Foundation ☐ Sheet Vinyl ☐ Slate ☐ Stained Concrete ☐ Stone ☐ Strandwoven Flooring ☐ Sustainable Flooring ☐ Terrazzo ☐ Travertine ☐ Vinyl Tile ☐ Wall-to-Wall Carpet ☐ Wood ☐ Wood Under Carpet

SoCal MLS Green Labels

Structural Condition *(7)*
☐ Additions/Alter ☐ As Is ☐ Fixer ☐ New Construction ☐ No Additions/Alter ☐ Rehab Potential ☐ Repairs Cosmetic ☐ Repairs Major Needed ☐ Restored ☐ Shell ☐ To Be Built ☐ Under Construction ☐ Update/Remodeled

Sprinkler ☐ Drip System ☐ Front ☐ Manual ☐ Rear ☐ Side ☐ Smart Irrigation System ☐ Sprinkler Timer ☐ Water Saving Nozzles ☐ Weather Station

Structural Other *(21)*
☐ 220V In Garage ☐ 220V In Kitchen ☐ 220V In Laundry ☐ 220V In Workshop ☐ 220V Other – See Remarks ☐ 220V Throughout ☐ Accessory Bldgs ☐ Awning(s) ☐ Close to Clubhouse ☐ Custom Built ☐ End Unit ☐ Faces East ☐ Faces North ☐ Faces Northeast ☐ Faces Northwest ☐ Faces South ☐ Faces Southeast ☐ Faces Southwest ☐ Faces West ☐ Foundation – Brick & Mortar Perimeter ☐ Foundation – Capped Brick ☐ Foundation – Combination ☐ Foundation – Concrete Block ☐ Foundation – Concrete Perimeter ☐ Foundation – Concrete Slab ☐ Foundation – Pier and Beam ☐ Foundation – Pillar/Post/Pier ☐ Freestanding ☐ Guest Quarters – Separate Entrance ☐ Gutters ☐ Natural Gas ☐ Pre-wired for high speed data lines ☐ Pre-wired for surround sound ☐ Propane ☐ Rain Gutters ☐ Service Entrance ☐ Solar Panels ☐ Solar Screens ☐ Subfloor – Slab on Grade ☐ Subfloor – Slab Other Story ☐ Subfloor – Slab Over Crawl Space ☐ Subfloor – Wood Other Story ☐ Subfloor – Wood Over Crawl Space ☐ Termite Clearance ☐ Two on a Lot ☐ Value Mainly in Land ☐ Verizon FIOS(r)

Entry Location* *(2)*
☐ Elevator to Entry ☐ Ground Level – no steps ☐ Ground Level – w/steps ☐ Mid Level ☐ Other ☐ Penthouse ☐ Top Level

Enclosed Yard *(10)*
☐ Automatic Gate ☐ Back ☐ Barbed Wire Fence ☐ Block Wall ☐ Brick Wall ☐ Cedar Fence ☐ Chain Link ☐ Cross Fenced ☐ Electric Fence ☐ Fenced-Rear ☐ Front ☐ Fully Fenced ☐ Glass ☐ Goat Type Fence ☐ Grapestake ☐ Invisible Fence ☐ Livestock Fence ☐ Masonry Fence ☐ No Yard ☐ Other Fencing ☐ Partially Fenced ☐ Pipe Fence ☐ Privacy Fence ☐ Redwood ☐ Slumpstone ☐ Split Rail Fence ☐ Stucco Wall ☐ Vinyl Fence ☐ Wire Fence ☐ Wood ☐ Wrought Iron ☐ Yard

Structures, Other
☐ Accessory Buildings ☐ Barn ☐ Barn w/Electricity ☐ Barn w/Water ☐ Barn/Stable ☐ Boat House ☐ Building Winterized ☐ Carriage House ☐ Chutes ☐ Corral(s) ☐ Greenhouse ☐ Indoor Arena ☐ Pool House ☐ Shed ☐ Stall(s) ☐ Tractor Shed

Green Features
☐ Earthcraft House ☐ Energy Audit Available ☐ Energy Recovery Ventilator ☐ Environments for Living Rated ☐ FSC Certified Wood Products ☐ IAQ Tested ☐ ICF Compatible Fixtures ☐ Locally Sourced Building Materials ☐ Low Flow Faucets ☐ Other, See Remarks ☐ Photovoltaics ☐ Rain/Freeze Sensors ☐ Recycled Building Materials ☐ Smart Electric Meter ☐ Solar Electricity ☐ Turbines ☐ Wind Generator ☐ Windmill

Green Building Certification _____ **Green Certifying Body** _____

Green Year Certified _____ **Green Certification Rating** _____

Lot Description

AP #* *System Generated* **Zoning** _____ **Lot #*** _____ **Block #** _____ **Tract #*** _____

Lot Description *(20)*
☐ Airpark ☐ Alley Access ☐ Artificial Glass ☐ Backs to Parkland ☐ Backs to Trees ☐ Bay Front ☐ Beach Access ☐ Beach Front ☐ BLM/National Forest ☐ Bluff/Cliff Front ☐ Canyon Rim ☐ Cleared ☐ Community Mailbox ☐ Compost Area/Bin ☐ Corner Lot ☐ Creek/Stream on Lot ☐ Cul-De-Sac ☐ Cultivated ☐ Curbs-Walks ☐ Decorative Pond ☐ Desert Back ☐ Desert Front ☐ Drought Resistant Landscape ☐ Estuary Front ☐ Fruit Trees ☐ Greenbelt ☐ Heavily Treed Lot ☐ Horse Property ☐ Horse Property – See Remarks ☐ Horse Property Improved ☐ Horse Property Unimproved ☐ In Golf Course Community ☐ Lagoon Front ☐ Lake Front ☐ Lake on Lot ☐ Large Tree(s) – over 40 Feet ☐ Lot Level-Flat ☐ Lot Shape-Flag ☐ Lot Shape-Irregular ☐ Lot shape-Rectangular ☐ Medium Tree(s) – 20-40 Feet ☐ Military Land ☐ Moderately Treed Lot ☐ Mountainous ☐ Native Plant/Reduced Irrigation/ Limited Turf ☐ Near Public Transit ☐ No Landscaping ☐ No Trees ☐ Non-Tidal Wetlands ☐ Not on Thru Street ☐ Ocean Access ☐ Ocean Front ☐ Ocean Side of Freeway ☐ Ocean Side of Highway 1 ☐ Off The Grid ☐ On Golf Course ☐ On Lake Front ☐ On Navigable Water ☐ Playscape ☐ Pond on Lot ☐ Possible Pool Site ☐ Premium Lot ☐ Preserve/Public Land ☐ Private Beach ☐ Private Road ☐ Rain Water Collection ☐ Ravine ☐ Reservoir ☐ Rip-Rapped ☐ River Front ☐ Rolling ☐ Room for a Pool ☐ Room for Tennis Court ☐ Seasonal Creek ☐ Seawall ☐ Secluded ☐ Shade Trees ☐ Single Loaded Street ☐ Slope – Gentle ☐ Slope – Steep ☐ Small Tree(s) – Under 20 Feet ☐ Some Landscaping ☐ Sparsely Treed Lot ☐ Stone Retaining Walls ☐ Street Dirt ☐ Street Paved ☐ Street Private ☐ Street Public ☐ Streetlights ☐ Subdivision Lot ☐ Tidal Wetlands ☐ Utilities – Overhead ☐ Utilities – Underground ☐ Valley ☐ Water Access ☐ Water Front ☐ Wooded ☐ Zero Lot Line

Operational Plus: My Home EQ

My Home EQ Improving the Value, Comfort and Energy Savings of Your Home

Through its innovative use of real energy and home characteristics data MyHomeEQ generates EQ scores and recommendations. It makes saving energy easy, actionable and valuable for homeowners.

Make it Real
MyHomeEQ has a unique competitive advantage: it assembles real energy usage and home characteristics data (from utilities and assessor's offices) and applies sophisticated, proprietary models to instantly suggest retrofit recommendations tailored to each home.

Make It Easy
Its web-based platform allows the user to learn their Home EQ score, which acts like an MPG rating for homes, simply by entering a valid address. This ease of access, combined with real data, quickly leads the user to highly accurate retrofit recommendations and suggestions of certified contractors to perform the recommended actions.

Make it Actionable
MyHomeEQ compares each home's operational EQ score with an asset-based score that does not take actual energy usage into account. An asset-based score like the USDOE Home Energy Score allows homeowners using MyHomeEQ to compare their actual usage with expected usage. This allows users to get an accurate impression of how their behavior influences their total energy usage.

Make It Valuable
MyHomeEQ's innovative use of real energy and home characteristics data translates energy efficiency into the real estate market value. The MyHomeEQ score serves as an independent operating cost comparison for homeowners to promote and home buyers to demand. Seemingly comparable homes now have a point of differentiation that the market can assign a value to.

Potential Energy Savings/Year
BASED UPON ZIP CODE 60617
$ 511

Estimated Annual Energy Costs
$ 2765

Your Home EQ Score
EQ 197

Rebates and Tax Credits
It's simple. A more energy efficient home means a lower MyHomeEQ and bill. That also means a cozier home with better efficiency.

Learn Your HomeEQ Now
How much energy does my home *really* use?
START HERE | Enter Your Address | Search

www.MyHomeEQ.com

Berkeley RECO Checklist

FORM B

Residential Energy Conservation Ordinance (RECO)
Buyer-Seller Warranty Acknowledgement //Agent Notification Form

This form is an acknowledgement of the implied warranty between seller and buyer and a notification by the real estate agent that conditions specified on Form A remain in effect. It applies only to this property sale. **In order to gain compliance with RECO (Resolution No. 62, 181-N.S.), a Certificate of Compliance (FORM A) requiring an inspection must have previously been submitted to the City of Berkeley.**

This form (FORM B) and a $20 filing fee is required for each structure and must be filed with:
City Of Berkeley Planning Department, Building & Safety Division 2120 Milvia Street, Berkeley CA 94704

Address of Property: _____ Unit: _____ Zip: _____ Date: _____ / _____ / _____

RECO MEASURES:		Yes	No	N/A
1.	Ceiling insulation of minimum thermal resistance value R-30 installed **EXEMPT:** Dwelling does not have an attic or an accessible attic space as defined in the Ordinance	☐	☐	☐
2.	Furnace system ducts sealed at plenum and all joints, and entire duct system sealed with mastic or UL-181-approved tape, and insulated to a minimum of R-3 **EXEMPT:** Ducts inaccessible between stories, inside walls, or otherwise inaccessible without alteration.	☐	☐	☐
3.	All domestic storage water heaters insulated with external insulation blanket rated at a minimum thermal resistance of R-6 **EXEMPT:** Minimum clearance of 2 inches from wall or other permanent fixture does not exist. Total internal and external water heater insulation is already in excess of R-12	☐	☐	☐
4.	Low-flow faucet devices or fixtures with maximum flow rate of 3 gallons/minute in all showers; 2.75 gallons per minute in all sinks and lavatories; and 4 gallons/minute in all other faucets	☐	☐	☐
5.	Hot water pipes in pumped, recirculating domestic water heating systems insulated to a minimum thermal resistance of R-3 **EXEMPT:** Water pipes are inside walls, in floors between stories, or otherwise inaccessible without alteration	☐	☐	☐
6.	All exposed hot water pipes, and cold water pipes connected to, and with 24-inches of water heater, must be insulated to a minimum thermal resistance of R-3	☐	☐	☐
7.	Incandescent light bulbs, located in multiunit structure common areas, must be replaced with lamps of at least 25 lumens per watt (Fluorescent, LED or other technology that meets lumen requirement)	☐	☐	☐
8.	Approved weather-stripping must be installed on all exterior doors; must be screwed in place; adhesive not acceptable.	☐	☐	☐
9.	Approved dampers, doors, or other devices to block air flow and reduce heat loss through chimneys	☐	☐	☐
10.	Replace existing tank or flushometer-type toilets with fixtures designed to use no more than 1.6 gallons per flush, or modify existing fixtures to reduce the amount of water used while ensuring correct operation. Any toilet installed in a renovation must be *designed* to use no more than 1.6 gallons per flush	☐	☐	☐

Seller: **Buyer:**

Seller/Owner: _____ Buyer: _____
PRINT PRINT

Seller/Owner: _____ Buyer: _____
SIGNATURE SIGNATURE

Address: _____ Address: _____

Zip: _____ Phone: (_____) _____ Zip: _____ Phone: (_____) _____

☐ I have notified both Buyer and Seller of the requirements of RECO (Berkeley Municipal Code 19.16) but do not know of my own knowledge that the property is in compliance.

☐ I have notified both Buyer and Seller of the requirements of RECO (Berkeley Municipal Code 19.16) and I know of my own knowledge that the property is in the compliance.

Agent: _____ Company: _____

Address: _____ Zip: _____ Phone: (_____) _____

RECO Chapter 19.16 Ordinance 6099 –N.S.
City of Berkeley Planning Department, Building & Safety Division: 2120 Milvia St. 94704
Contact: reco@cityofberkeley.info or 510-981-7440

Here we offer some further discussion of our household upgrade forecast and jobs impact analysis.

Projected Consumer Uptake

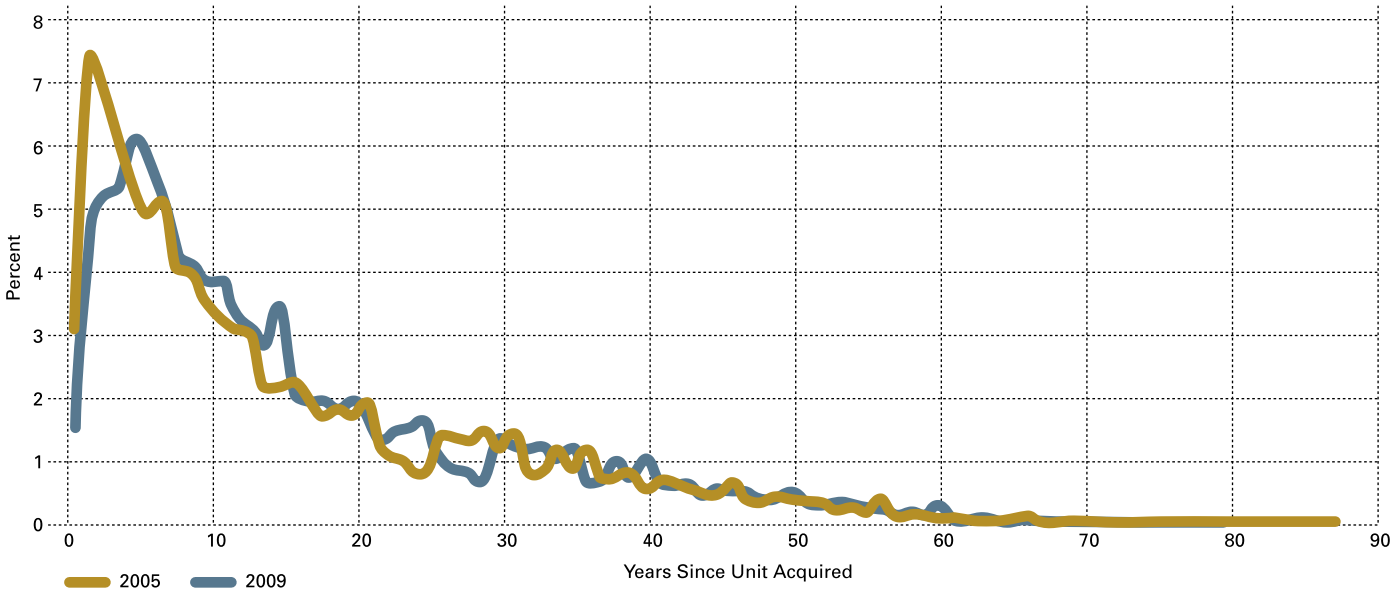
In the absence of a mandate, the number of upgrades undertaken each year depends entirely on the individual decisions of consumers. If market information improves, more homeowners will likely choose to upgrade their home, but it is difficult to predict how many. We expect that as consumers become more familiar with operational and asset ratings this important information will affect home values and homebuyer decisions, gradually increasing uptake of EE measures over time. Based on real-world precedents in Austin, Texas, and the UK, we tested a pessimistic scenario in which 10 percent of homeowners upgrade following disclosure and an optimistic scenario in which 20 percent of homeowners upgrade (see page 25). We use these percentages in all cases where our recommendation takes the form of a voluntary action following disclosure.

Methodology for Time of Sale Calculations

While some assessments of time of sale-related policies have evaluated annual turnover to gauge impact, we wanted to better reflect the reality that there are a range of different selling behaviors. We relied on national data from the American Housing Survey, conducted by the U.S. Census Bureau, as we were unable to obtain California-specific data.

The Census Bureau's 2009 report provides data for the year housing units were acquired.[149] We accessed the raw data to obtain year of acquisition for detached, one-unit buildings and calculated the number of years since each home's last sale.[150] The distribution of time since last sale allows us to see the effect of the housing market on short- and long-term reach of energy upgrades at this trigger. For our pessimistic scenario, we use the 2009 distribution of time since last sale, which reflects a slower turnover of homes in the short run. For the optimistic scenario, we use the 2005 distribution, which saw a greater number of homes sold within the past five years).

Figure 18 | Recency of Home Sale Transactions 2005 vs. 2009



While the two data sets are markedly different during the first five-year period, the distribution of years since last sale becomes increasingly similar over time (see Figure 20). In other words, the percentage of homeowners who have owned their property for more than 10 years has remained relatively constant over time. Between 2005 and 2009, the percentages of homes owned for at least 10 years (between 49.9 percent and 51.5 percent) and 20 years (27.6 percent to 28.6 percent) have remained relatively constant.[151] This provides us with a potential pool of homes that could be triggered to take an energy upgrade action at time of sale during each of our 25-year scenarios.

Our analysis considers only one-time upgrades. We do not address whether homes should become subject to upgrade requirements repeatedly. Therefore, our analysis also must take into account homes sold multiple times during the 25-year scenario period. In the pessimistic scenario, we project that 10 percent of homes sold will perform an upgrade; the remaining 90 percent of homes go back into the pool of unsold homes (which are, therefore, eligible for time of sale upgrades). In the optimistic scenario, we assume a 20 percent uptake rate; the remaining 80 percent are returned back to the pool.

Methodology for Renovation Calculations

For this analysis we use 2009 renovation rates from the American Housing Survey. Based on our recommended thresholds, we modeled the impact if asset ratings and disclosure were required for projects above $25,000 but below $100,000, affecting 1.39 percent of homes annually, and full EE upgrades were required for projects exceeding $100,000, affecting 0.15 percent of homes. Raising or lowering these thresholds would change the number of homes impacted by the policy each year.

Methodology for Energy Rate Tier–Related Upgrade Calculations

Our analysis indicates that approximately 26 percent of households are currently in the top two electricity tiers (i.e., would be affected by the energy rate tier–related trigger). While we believe that it is reasonable to forecast future developments for the time of sale and time of renovation triggers, under an assumption that there would be stability in these patterns over time, the same is not true for the energy rate tier data. It seems too speculative to guess how people may cycle in and out of tiers over time. Therefore, we do not forecast the impact of the energy rate tier trigger over time; rather, we only calculated the impact of the measures on the 26 percent of households in the top two energy rate tiers.

Impact of Simplifying Assumptions

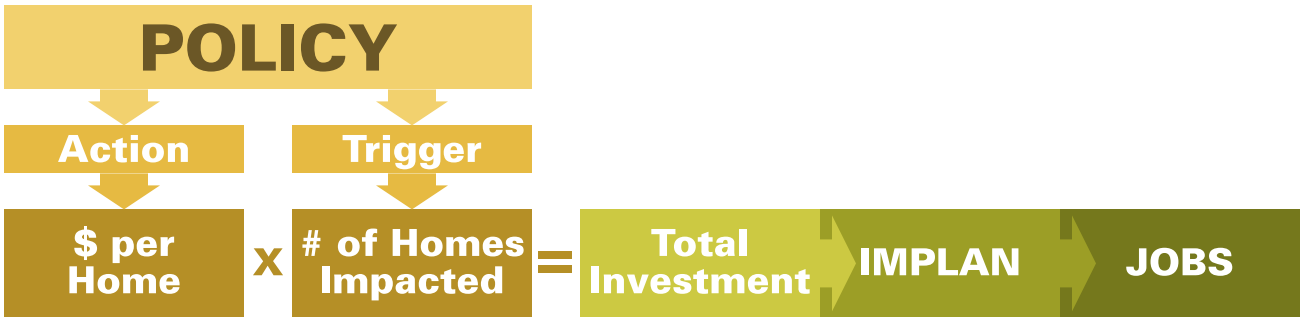
Our lack of long-term data about homeowner occupancy in high energy rate tiers has the effect of biasing results downwards. Additionally, we have not found any ways to take into account overlap between categories. So we ignore overlaps, which has the effect of biasing results upwards. We do not know the relative magnitude of the biases introduced by these simplifications.

Additional Assumptions Applied to Jobs Analysis

To assess the jobs impacts of the policies proposed in this paper, we first estimate the total amount of investment generated by each trigger and action, by multiplying the total number of homes impacted at each trigger by the dollar amount per home needed to complete the action. We then used the macroeconomic IMPLAN model to project job growth, both economy-wide and within the residential retrofit industry.

IMPLAN is a software tool and database developed by MIG for conducting economy-wide impact assessments of policies by creating regional input-output models that trace commodity flows from producers to consumers.[152] Within the model, total impact on employment and value added are driven by final demand and multiplied throughout the economy through purchases of goods and services, which continue until leakages from the region stop the cycle. Figure 20 provides a visual representation of our analysis methodology

Figure 20 | Jobs Impact Methodology



The IMPLAN model inputs used for our analysis were:

- **Consumer uptake of recommended measures, housing market turnover, renovation rates and thresholds, and energy rate tier activity:** These assumptions are the same as those detailed in the uptake analysis presented above.
- **Availability of financing: One of the biggest barriers to residential EE work is the high upfront cost to homeowners, who, as a group, generally lack capital.** Imposing the costs of EE work on homeowners, in one year, also decreases household discretionary spending in that year, leading to widespread negative economic impacts. Financing distributes costs over time, allowing homeowners to make the investment without sacrificing other goods. In our model, providing financing can increase economy-wide job creation rates by as much as 50 percent. We include full financing to mitigate upfront costs in our optimistic scenarios and assume that there is no financing available in our pessimistic scenarios. Additional, more fine-grained analysis could test the effects of different types of financing or financing available to different customer sub-segments.
- **Total cost of an upgrade, the cost of an asset rating, and the availability and amount of consumer rebates for efficiency work:** For the purposes of this analysis, we have held these values constant, assuming that an asset rating costs $600 per home,[153] that an average home would require $7,200 of investment to achieve 25 percent energy savings,[154] and that the average project would receive an incentive of $2,000 to do this work.[155]

1 Assuming 20,000 upgrades per year and 5.8 million single-family homes built before 1978. See Appendix B for further details.

2 Energy Efficiency and Renewable Energy (EERE), 2010 Buildings Energy Data Book (Washington, DC: U.S. Department of Energy, 2011), Table 2.4.1, Carbon Dioxide Emissions from U.S. Residential Emissions, by Year (million metric tons) and Table 3.4.1, Carbon Dioxide Emissions from U.S. Commercial Emissions, by Year (million metric tons). 2011 estimates accessed October 9, 2011, http://buildingsdatabook.eren.doe.gov/.

3 U.S. Census Bureau, 2005-2009 American Community Survey 5-Year Estimates: United States (Washington, DC: U.S. Government Printing Office, 2010), Table B25024, Units in Structure; Table GCT-T9-R, Housing Units; and Table S2504, Physical Housing Characteristics for Occupied Housing Units. The U.S. Census reports approximately 79 million single-family homes (attached and detached one-unit structures), comprising approximately 70% of all occupied housing units. CalCEF analysis indicates that approximately 70% of them are owner-occupied. There are more homeowners in buildings with two or more units.

4 U.S. Census Bureau, 2005-2009 American Community Survey 5-Year Estimates: California (Washington, D.C: U.S. Government Printing Office, 2010), Table S2504, Physical Housing Characteristics for Occupied Housing Units.

5 John Pitkin and Dowell Myers, U.S. Housing Trends: Generational Changes and the Outlook to 2050, Special Report 298: Driving and the Built Environment: The Effects of Compact Development on Motorized Travel, Energy Use, and CO2 Emissions. Report prepared for the Committee on the Relationships Among Development Patterns, Vehicle Miles Traveled, and Energy Consumption; the Transportation Research Board; and the Division on Engineering and Physical Sciences, 2008. Pitkin and Myers' report shows that well over 50% of the existing building stock will remain in 2050. This is the result of the economic downturn, as well as a growing interest in smaller homes and adaptive reuse.

6 ConSol, Carbon Footprint of Single-Family Residential New Construction. Report prepared for the California Building Industry Association, May 2008.

7 Engage 360SM, CA Energy Efficiency Strategic Plan: January 2011 Update, 2011. Available at http://www.cpuc.ca.gov/NR/rdonlyres/A54B59C2-D571-440D-9477-3363726F573A/0/CAEnergyEfficiencyStrategicPlan_Jan2011.pdf .

8 Harcourt Brown & Carey, Inc., Energy Efficiency Financing in California – Needs and Gaps – Preliminary Assessment and Recommendations. Report prepared for the California Public Utilities Commission (CPUC), Energy Division, July 2011. This report is our primary source for data on single-family homes and energy efficiency costs and potential. See Appendix B.

9 This estimate assumes there are 5.8 million single-family homes built before 1978 and that 20,000 upgrades are performed per year.

10 McKinsey & Company, Reducing U.S. Greenhouse Gas Emissions: How Much at What Cost? U.S. Greenhouse Gas Abatement Mapping Initiative Executive Report, December 2007, 11 and McKinsey & Company, Unlocking Energy Efficiency in the U.S. Economy, July 2009, Exhibit H, xiii.

11 Ngoc Nguyen, "California: Ground Zero for America's Foreclosure Crisis," New America Media, July 21, 2011.

12 Roger Vincent, "California Home Prices and Sales Fall in July," Los Angeles Times Blogs, August 16, 2011. Accessed at http://latimesblogs.latimes.com/money_co/2011/08/home-prices-and-sales-fall-statewide.html

13 As of March 2011.

14 According to the San Francisco Chronicle, California fared even worse in the third quarter of 2011 than in the second, as nearly 32% of all homes slid into the negative equity characterization as of September 2011. In the Bay area, nearly 25% of all homes were underwater. Carolyn Said, "More Homes Underwater Locally and Nationwide," San Francisco Chronicle, November 9, 2011.

15 Said, 2011.

16 Note that homeowners in Maine in 2008 experienced $2,000 annual increases in the cost of energy. That amount was nearly 50% of the average subprime mortgage spike. It is equal to a 100% increase in the average cost of energy in California. Susan Sharon, "Winter A Worry As Home Heating Oil Spikes in Maine," National Public Radio, Morning Edition, June 11, 2008.

17 U.S. Census Bureau, "State and County QuickFacts: California." Last revised December 23, 2011, http://quickfacts.census.gov/qfd/states/06000.html.

18 Approximately 66.9% of all households nationwide are homeowners. California's 56.1% homeownership rate is far lower than the national average (it is the third lowest rate in the nation, after Washington, DC and New York City). Zimring et al., 2011.

19 Mark Zimring, Merrian Goggio Borgeson, Ian Hoffman, Charles Goldman, Elizabeth Stuart, Annika Todd, and Megan Billingsley, Delivering Energy Efficiency to Middle Income Single-family Households. Environmental Energy Technologies Division, Lawrence Berkeley National Laboratory, December 2011, 7.

20 These savings are calculated without interest, assuming a $500 to $735/year savings, as set forth in Harcourt Brown & Carey, 2011.

21 Harcourt Brown & Carey, 2011.

22 Interview with Harcourt Brown & Carey, August 15, 2011.

23 CalCEF has independently verified these assumptions using a methodology produced by Harcourt Brown & Carey, 2011 (see Appendix B).

24 As described in Section 2, Title 24 has made enormous inroads to efficiency for the state's buildings by dramatically increasing the efficiency of newly constructed buildings since 1978, when Title 24 went into effect. However, enforcement of the code with respect to existing buildings and improvements remains much more challenging.

25 Harcourt Brown & Carey, 2011, 11

26 Note that some measures, and some whole-house upgrades, do not pay back within the useful life of the measure or the amortization schedule of financing. This exacerbates the upfront cost and financing problem. See also Zimring, et al., 2011, 10.

27 Ann Griffin, Ben Kaufman, and Sterling Hamilton, Assessing the Market Impacts of Third Party Certification on Residential Properties. Earth Advantage Institute, 2009.

28 Marc Lifsher, "California Adds 12,000 jobs in September; Unemployment Rate Slips," Los Angeles Times, October 22, 2011. The jobless rate in California was 11.9% in August 2011; the national unemployment rate was 9.1%.

29 According to Todd Conkey, Energy Finance Director, Wisconsin Energy Conservation Corporation: "many people would rather pay more per month on their utility bills than have a $6,000 loan hanging over their heads" today. Cited in Zimring et al., 2011, 29.

30 The owner-renter split for 2010 is based on CalCEF original analysis using data from the 2000 U.S. Census, the American Community Survey 2005-2009, and the 2010 U.S. Census.

31 E.g., see Noah Kaufman and Karen Palmer, "Energy-Efficiency Program Evaluations – Opportunities for Learning and Inputs to Incentive Mechanisms." Resources for the Future, April 2010, 3. According to the authors, "we find that the energy-efficiency programs in the 2004–2005 California program cycle did not meet ex-ante expectations in terms of electricity savings, gas savings, or peak-demand savings."

32 While state laws also protect consumers, this section primarily enumerates federal banking and transaction laws alongside state energy and climate protection laws.

33 Required disclosure of presence in a flood, fire hazard, earthquake hazard, or seismic fault zone.

34 Disclosure of the presence of lead-based paint is required for all homes built before 1978. This is a federal requirement.

35 For homes built before 1994. However, this law will not be in full effect until 2017).

36 Installed smoke and carbon monoxide alarms; water heater braces.

37 Our understanding is that this dispersal was never required; however, a subsequent legal determination by lawyers for California real estate agents advised the consistent distribution of the pamphlet to insulate them from any possible liability. Pamphlet distribution began in the spring of 2011. The pamphlet explains that homeowners can obtain Home Energy Rating System (HERS) ratings if they wish. It also describes the basics of EE tactics.

38 In addition, Dodd-Frank transfers to the Consumer Financial Protection Bureau (CFPB) the following legal structures: the S.A.F.E. Mortgage Licensing Act of 2008, the Home Ownership Equity and Protection Act of 1994 (HOEPA), The Fair Debt Collection Practices Act, and the Homeowners Protection Act of 1998.

39 In part, this dramatic change has to do with the required reformation of the government-sponsored enterprises (GSEs), which was called for in Dodd-Frank.

40 Griffin et al., 2009. The study shows that, on average, EE homes capture greater value in transactions than other homes.

41 Appraisal Institute, "Appraisal Institute Issues Form to Help Real Estate Appraisers Analyze Green Features," Press Release, September 29, 2011. This form is an optional addendum to the Fannie Mae Form 1004.

42 Retail electricity consumption in California is divided amongst public and investor-owned utilities as follows: 65% (IOU) and 25% (POU). Kae Lewis, Che McFarlin, Cynthia Rogers, Nick Fugate, Doug Kemmer, 2009 AB 2021 Progress Report: Achieving Cost-Effective Energy Efficiency for California. CEC Staff Report. CEC?200?2010?006, December 2010.

43 California Air Resources Board (CARB), Climate Change Scoping Plan: A Framework for Change. Prepared for the State of California, December 2008, 41. Available at http://www.arb.ca.gov/cc/scopingplan/document/adopted_scoping_plan.pdf.

44 California is a "decoupled" state, meaning that the state separates the requirements for energy generation from distribution. Because utilities generally earn revenue from energy consumption (via energy generation), decoupling was enacted in order to incentivize IOUs to be indifferent to earning revenues from energy generation or energy efficiency activities. In addition, the CPUC each year requires these IOUs to achieve a certain percentage of efficiency, and a certain percentage of its portfolio to come from renewable sources. These two requirements are referred to as the Energy Efficiency Resource Standard (EERS) and the Renewable Portfolio Standard (RPS). By 2020, California's RPS must be at 33%.

45 The strategic plan also establishes landmark energy consumption goals for new construction, which is outside the scope of this paper.

46 However, this budget includes expenditures for the efficiency of all buildings, including existing and new residential, commercial, industrial, and government.

47 Harcourt, Brown & Carey, 2011.

48 Engage 360, 2011, 2.

49 In the multifamily arena, this theory is moving forward as a strategy to embed a retrofit into a financing, refinancing, rehabilitation, or recapitalization already occurring. See Lori Bamberger, "Scaling the Nationwide Retrofit of Affordable Multifamily Buildings," Brookings and Urban Institute, January 2011. And in that arena, policymakers are seeking to develop the analytic tools, such as a Green Capital Needs Assessment, to support such a layering of events at the moment that rehabilitation and refinancing are supposed to occur.

50 Cabinet Office Behavioral Insights Team, "Behavior Change and Energy Use," July 2011, 14. Available at http://www.cabinetoffice.gov.uk/resource-library/behaviour-change and energy use. The UK team is evaluating pilots to pair incentives at key trigger points. One trigger point they discuss in detail is the time at which households move from house to house.

51 Zimring et al., 2011, 12; 32-33, and Merrian C. Fuller, Cathy Kunkel, Mark Zimring, Ian Hoffman, Katie Lindgren Soroye, and Charles Goldman, Driving Demand for Home Energy Improvements: Motivating Residential Customers to Invest in Comprehensive Upgrades That Eliminate Energy Waste, Avoid High Bills, and Spur the Economy. Environmental Energy Technologies Division, Lawrence Berkeley National Laboratory, September 2010, 3. These reports recommend a program design that can "make it easy, make it fast."

52 Interview with Kermit Baker, Senior Harvard Economist, Joint Center on Housing, July 28, 2011.

53 Joint Center for Housing Studies of Harvard University, "State of the Nation's Housing 2011," 2011, 10. The average annual maintenance expenditure is $2500 per home. During the first two years after home purchase, this amount increases by 250 percent. After the initial two years, "spending drops precipitously."

54 Joint Center for Housing, 2011.

55 Paul Emrath, "How Long Buyers Remain in Their Home," Housing Economics.com and National Association of Home Builders (NAHB), February 11, 2009. The average turnover rate is shorter than 10 years in part because many households move multiple times during 10 years, changing the average.

56 Emrath, 2009.

57 Today's 30-year mortgage rates are generally well under 6 percent, compared with 5-year home equity loans exceeding 9 percent and credit card loans that are even higher (typically reaching 20%).

58 The Federal Housing Administration's (FHA) Energy Efficiency Mortgage, Fannie Mae's Energy Efficiency Mortgage, and Department of Energy's (DOE) Energy Star Mortgage offer three possibilities for integrating energy into mortgage financing. However, these instruments are considered by most experts to be cumbersome; they are not widely marketed or available.

59 As described on page 27, Berkeley's Residential Energy Conservation Ordinance (RECO) requires all homes to have energy upgrades at the time of sale, and the U.S. Environmental Protection Agency (EPA) requires homes in certain counties in the East Bay to update sewer laterals at the time of sale.

60 Michael Messenger, Strategic Plan to Reduce the Energy Impact of Air-Conditioners. CEC Staff Report. CEC-400-2008-010, 2008.

61 Zimring, 2011. Also, this figure is down 40% from the height of the market.

62 Approximately 5% of HVAC systems are typically replaced each year. See Greg Kats and David Carey, Upgrading America's Homes: Comprehensive Residential Energy Upgrade Financing, May 2009. Available at http://www.cap-e.com/Capital-E/Resources_&_Publications_files/Upgrading%20Americas%20Homesv3.pdf.

63 In a recent litigation settlement, the U.S. EPA used acquiring a permit as the trigger for determining whether sewer laterals need to be replaced at sale (as discussed in the exemplary profile section of this paper). The EPA underscored the importance of education and training of inspectors and sensitivity to quantity of work already undertaken by too few inspectors, especially given county budgets today.

64 Pacific Gas and Electric (PG&E) and San Diego Gas & Electric (SDG&E) recently began using a four-tier system, and Southern California Edison (SCE) employs a five-tier system.

65 SCE, "Billing & Payment - Understanding Tiered Rates." Available at http://www.sce.com/CustomerService/billing/tiered-rates/tier-1.htm#faq. Accessed January 17, 2012.

66 PG&E, "Understanding Baseline Quantities." Available at http://www.pge.com/myhome/customerservice/financialassistance/medicalbaseline/understand/. Accessed January 17, 2012.

67 PG&E, "Electric Schedule E-1," 2009-2012. Available at http://www.pge.com/tariffs/tm2/pdf/ELEC_SCHEDS_E-1.pdf. Accessed January 17, 2012. Note that a household in Tier IV would be paying all four rates added together.

68 See Ahmad Faruqui, "Equity and Efficiency Aspects of PG&E's Residential Rate Design." Prepared testimony for Pacific Gas and Electric Company 2011 General Rate Case Phase 2, March 22, 2010. Available at https://www.pge.com/regulation/GRC2011-Ph-III/Testimony/PGE/2010/GRC2011-Ph-III_Test_PGE_20100322-Exh01.pdf.

69 Calculated using distribution data found from Borenstein, 2011 and various IOU regulatory proceedings expressing accounts by rate schedule.

70 While CPUC staff indicate that the tiered rate system may be abandoned once demand response pricing launches, California still possesses the ability to better educate consumers about ways to reduce charges and to think through consistent high consumption for investment opportunities.

71 As illustrated in Section 1, households at Tier I (up to 100% of baseline) in PG&E territory can pay approximately $636/year, while households in Tier IV would pay $2,715/year, and those in Tier V (assuming over 350% of baseline) would pay over $3,354/year.

72 CalCEF original analysis based on data from Severin Borenstein, "The Redistributional Impact of Non-Linear Electricity Pricing," Energy Institute at Haas (EI @ Haas) Working Paper Series, April 2011. Available at http://ei.haas.berkeley.edu/pdf/working_papers/WP204.pdf. The CalCEF analysis combined these data with information from rate cases filed by PG&E, SDG&E, and SCE.

73 In theory, per kilowatt-hour tier charges could be increased, defeating the very savings that lower tiers should accomplish. However, we welcome the opportunity to address this challenge, which can be summarized as too many households achieving efficient systems and reducing consumption.

74 The Utility Reform Network (TURN) utility ratepayer advocates helped create this tier alert system through advocacy efforts.

75 The Energy Star Mortgage financing innovation was predicated on financing energy improvements from a reduced rate refinance, which could end up resulting in a loan payment no different than a refinance without energy. See description by the Energy Programs Consortium (EPC), which initially administered the mortgage program: EPC, "Programs/ Energy Star® Mortgage." Available at http://www.energyprograms.org/programs/energy-star-mortgage/. Accessed January 17, 2012.

76 Lisa Wood, "Weighing the Costs and Benefits of Smart Meters," NEMA Electroindustry, November 2011, 22-23. Available at http://www.edisonfoundation.net/iee/issuebriefs/Wood_NEMA_11-2011.pdf. Households that have electric vehicles (EVs), which represented only about 1% of the hypothetical 1 million customers in a service territory, created a disproportionately high share of the overall consumer-driven savings, indicating that even modest increases in EV adoption will have a large impact on benefits.

77 CalCEF original analysis.

78 National Association of Realtors®. Public comments at the Thought Leader Roundtable, October 27, 2011.

79 E.g., Home Mortgage Disclosure Act.

80 E.g., RESPA and TILA.

81 The U.S. Securities and Exchange Commission (SEC) recently ruled that companies must disclose climate change risks, including disclosing the energy efficiency of real estate portfolios constructed by publicly traded real estate development companies. 17 CFR PARTS 211, 231 and 241 [Release Nos. 33-9106; 34-61469; FR-82], February 8, 2010.

82 This paper presumes that all utility bill disclosures will be somewhat anonymized or aggregated.

83 However, there may be confidentiality barriers to surmount. See e.g. CPUC's 15/15 Rule adopted in D.97-10-031. Any aggregated information must be made up of at least 15 customers, and a single customer's load must be less than 15% of an assigned category.

84 We assume that buyer knowledge varies, but by and large, buyers know very little about energy systems. On the other hand, general inspectors do inspect for functionality of energy systems. Additionally, some buyers have expertise in systems, and some sellers may voluntarily disclose. On average, we expect that buyer awareness and expertise in predicting cost and consumption are likely to be low today.

85 The efficiency industry contends that this operational (utility bill) information may be even more accurate than an asset test, since the asset test is based on hypothetical conditions and usage. See Section 4 for more detailed stakeholder feedback. In contrast, this information represents real conditions and usage. As suggested in this section, the state should require both an asset and an operational rating.

86 Leadership in Energy and Environmental Design (LEED) is a label administered by the U.S. Green Building Council (USGBC) and is intended to apply as a leadership indicator to the top-most percentage of green buildings.

87 HERS II is the more recent version of the Home Energy Rating System (HERS), both of which are used in California as part of the Energy Upgrade California whole-house retrofit program. Generally, HERS ratings are priced at $600. The Building Performance Institute also has a rating system. The U.S. Department of Energy (DOE) produced the Home Energy Score and Home Energy Yardstick.

88 Note that critics contend that there are not enough raters to enable a market transformation. We think this is a red herring and that greater demand will bring more raters.

89 One expert interviewed questioned the need for an independent rater by comparing the scenario to a car repair transaction, asking how consumers would respond if their auto repair shop said they would charge $600 simply to diagnose the problem but not fix it.

90 John Beldock, John Stovall, Robin Lebaron, and Kara Saul Rinaldi, Unlocking the Full Value of Green Homes: Why Green Multiple Listing Services are Key to Residential Energy Efficiency. National Home Performance Council and Association of Energy and Environmental Real Estate Professionals, March 2011. Available at http://www.naima.org/publications/NHPC_Unlocking_Full_Value_20110328.pdf.

91 See Appendix C for the variety of items that are included in the Southern California Multiple Listing Service (MLS). In Nevada, the Green MLS effort was begun after efforts failed to promulgate regulations around a mandatory audit or disclosure requirement.

92 Dan Schreiber, "Phil Ting Wants to List Green Building Certifications in San Francisco Property Records," SF Examiner Under the Dome Blog, October 13, 2011. Available at http://www.sfexaminer.com/blogs/under-dome/2011/10/phil-ting-wants-list-green-building-certifications-san-francisco-property-r. Accessed January 17, 2012.

93 The California Association of Realtors® emphasizes that there are nearly 100 different real estate agent associations in California and the MLSs represent regional collaborative efforts among them.

94 Interview with an independent real estate agent in Chicago, July 2011.

95 Committee on America's Energy Future, America's Energy Future: Technology and Transformation: Summary Edition (Washington, DC: The National Academies Press, 2010).

96 Committee on America's Energy Future, 2010, 50, Box 2.2.

97 Harcourt Brown & Carey, 2011.

98 The average home sales price as of July 2011 is $283,000. See Vincent, 2011. Note that the energy upgrade percentage of an improvement could be lower if the improvement is already touching upon energy.

99 Economic literature supports this concern. A recent study found that a 1.1% transfer tax imposed on home sales in Toronto reduced transactions by 15% and decreased housing prices by an amount equivalent to the tax. Ben Dachis, Gilles Duranton, and Matthew A. Turner, "The Effects of Land Transfer Taxes on Real Estate Markets: Evidence from a Natural Experiment in Toronto," Working Paper 423, February 2011. Available at http://repec.economics.utoronto.ca/files/tecipa-423.pdf.

100 Rick Nevin and Gregory Watson, "Evidence of Rational Market Valuations for Home Energy Efficiency," The Appraisal Journal (October 1998): 401-409.

101 Zabin et al., 2008.

102 Because the Federal Housing Finance Agency (FHFA) that oversees the GSEs (Fannie Mae and Freddie Mac) rules that Property Assessed Clean Energy (PACE) loans could not be senior to GSE-backed mortgages, most PACE residential loan programs have been halted. Some jurisdictions, such as San Francisco and Los Angeles, are continuing to make PACE commercial loans.

103 See Hinkle and Kenny, 2010, for detailed descriptions of CalCEF's work on innovations in energy financing and the Energy Services Agreement model.

104 PowerSaver loans are new EE loans insured by the U.S. Department of Housing and Urban Development (HUD). They loans offer up to $25,000 per borrower to make energy improvements in a home, regardless of whether the underlying mortgage is FHA or not. Twenty-five lenders nationwide were selected in April 2011 to participate in a two-year pilot test of this form of financing. See HUD, "HUD Selects Lenders to Participate in New Pilot Program to Help Homeowners Pay for Energy Improvements to Their Homes," Press Release, April 21, 2011. Available at http://portal.hud.gov/hudportal/HUD?src=/press/press_releases_media_advisories/2011/HUDNo.11-062.

105 National Renewable Energy Laboratory (NREL) Renewable Energy Project Finance, "Delivering Solar: Group Purchasing is Driving Down Costs for Customers," September 12, 2011. Available at http://financere.nrel.gov/finance/content/delivering-solar-group-purchasing-driving-down-costs-customers. The UK is also testing group purchasing as an incentive for efficiency.

106 Said, 2011.

107 Note also that real estate agent fees are tied to sales prices, so reduced prices would adversely impact real estate agent business bottom lines.

108 Interview with a senior executive at a national mortgage bank, August 2011.

109 Interviews with individual real estate agents, July-November, 2011.

110 Interview with an independent real estate agent, August 2011.

111 Referring to the Breakthrough Institute's controversial paper Energy Emergence: Rebound and Backfire as Emergent Phenomena (Jesse Jenkins, Ted Nordhaus, and Michael Shellenberger, February 2011) and debates about the size of the rebound effect that follow energy savings due to policy. The point is that both camps recognize that below-cost energy efficiency is critical for economic growth and should thus be aggressively pursued by governments and firms. The economic value of energy efficiency to California's economy has also been demonstrated by the work of David Roland-Holst, who has shown that shifting spending from energy, which has among the lowest job creation results, to other sectors results in macroeconomic gains in both jobs and economic growth. Roland-Holst estimates that California energy performance standards introduced in the 1970s led to the creation of approximately 1.5 million additional full-time jobs. Our own analysis of the job creation potential of our recommendation is detailed in Appendix C. See Jesse Jenkins, Ted Nordhaus, and Michael Shellenberger, Energy Emergence: Rebound and Backfire as Emergent Phenomena, Breakthrough Institute, February 2011. See also David Roland-Holst, Climate Action for Sustained Growth: Analysis of ARB's Scoping Plan. Report prepared for CARB and the California Environmental Protection Agency (CalEPA), April 2010, Slide 8. Available at http://www.arb.ca.gov/cc/scopingplan/economics-sp/meetings/042110/rolandholst.pdf. Finally David Roland-Holst, Energy Efficiency, Innovation, and Job Creation in California. Report produced by Next 10, October 2008. Available at http://next10.org/next10/pdf/report_eijc/75_01-3_ClimateAction_Report_Mod_PDF_FINAL.pdf.

112 Hinkle and Kenny, 2010.

113 For example, in 2008 the CEC estimated that over 90% of heating and air conditioning replacements were done without the required building permits and that at least 85% were not realizing potential energy savings because of improper installation. See Messenger, 2008. In addition, a survey of workers in Los Angeles shows that 60 to 70% of residential construction workers experience wage and hour violations. See Ruth Milkman, Ana Luz Gonzalez, and Victor Narro, Wage Theft and Workplace violations in Los Angeles: The Failure of Employment and Labor Law for Low-Wage Workers, Institute for Research on Labor and Employment, UCLA, 2010. Available at http://www.irle.ucla.edu/events/2010/pdf/LAwagetheft.pdf.

114 One of the issues we do not address in this paper is the optimal periodicity of revisions for mandated disclosure or upgrade requirements. Because of new energy saving opportunities as technology advances, there will be a case for updating and reapplication of further requirements after a defined period of time, even if disclosure or an upgrade has occurred previously,

115 We offer an idea recommended by Elton Sherwin. See Elton Sherwin, Addicted to Energy: A Venture Capitalist's Perspective on How to Save Our Economy and Our Climate (Palo Alto, CA: Energy House Publishing Group), 65-66. Sherwin recommends using an "A to F" grading system for homes and, among other ideas, proposes requiring that all 7th graders bring a copy of their home rating to school, as a way to catalyze action. We mention this as an example of a rating system that can be immediately understandable by most Californians, and that shows creativity in its approach to encouraging upgrades.

117A broader suggestion would be to require all homes made efficient to get CRA credit, since EE directly affects affordability. The "extra credit" suggestion is offered as a mechanism to ensure no competition between worthy affordable housing and EE goals. This could be implemented before GSE reform required by the Dodd-Frank act.

118 Ken Fears, "FHA Market Share," NAR Economists' Outlook Blog, September 14, 2011. Available at http://economistsoutlook.blogs.realtor.org/2011/09/14/fha-market-share/. Accessed January 17, 2012. California's share was approximately 20%. The state with the highest share in that quarter was Utah, at 35%. Experts expect the California share to decrease as the conforming limit maximum FHA mortgage amount for high-cost areas (prevalent in California) was reduced effective October 1, 2011 from approximately $729,750 to approximately $625,500.

119 HUD could undertake some research to evaluate the proposition that EE homes are better preserved, maintain greater value, and have higher repayment rates than other homes that are not EE.

120 According to the Flex Your Power energy website, there are 1045 different incentives offered in the state, though many of them are county- and improvement-specific. Flex Your Power, "Home." Available at http://www.fypower.org/. Accessed February 20, 2012. See also Engage 360SM, "Do: Rebates and Incentives." Available at http://www.engage360.com/index.php?option=com_rebate&view=rebate&Itemid=314. Accessed February 20, 2012.

121 Energy Upgrade California is an unprecedented alliance among all the IOUs and POUs, cities, counties, and nonprofit organizations in California. These actors have joined to help achieve EE in California homes and businesses. Energy Upgrade is supported by ARRA funding.

122 A rebate like this could be tied to improvements specified by an asset test, or improvements that generate a certain percentage of savings identified on a utility bill over a period of time (performance based), or for specific (prescriptive) measures. California has the fourth highest closing costs in the nation, at approximately $4800. Bankrate.com, "Closing Costs by State," 2011 Closing Cost Survey, Modified July 18, 2011. Available at http://www.bankrate.com/finance/mortgages/2011-closing-costs/closing-costs-by-state.aspx. These totals are based on a $200,000 loan and 20 percent down. These costs mean that the home price is approximately $250,000. And home sellers typically pay up to 6% of the sales price to the real estate agent. On the median-priced California home that amounts to over $16,000.

123 The cost of an inspection varies by geography and square footage, at least. Typically, California inspections range from $250 to $500. Adding an energy survey at that time could significantly increase the price, unless it is defrayed. It is not clear whether a separate energy survey would be less expensive than an integrated energy survey.

124 For example, the Energy Trust of Oregon has helped train Oregon real estate agents in energy issues. They have used grant funds to conduct free seminars for real estate agents and provided financial incentives to help agents become certified in green homes. See Energy Trust of Oregon, "Real Estate Professional Trade Ally." Available at http://energytrust.org/trade-ally/programs/new-homes/new-manufactured-homes-repta/. Accessed February 20, 2012.

125 A similar tax incentive is also being tested in the UK. Cabinet Office Behavioural Insights Team, 2011.

126 HUD, "Loan Modification Frequently Asked Questions." Available at http://portal.hud.gov/hudportal/HUD?src=/program_offices/housing/sfh/nsc/faqlm. Accessed February 20, 2012.

127 Federal and state funds have been allocated to communities hardest hit by foreclosure. As an example, Congress enacted the Neighborhood Stablization Program as part of the Housing and Economic Recovery Act of 2008 (PL 110-289). HUD administers this program, which has to date provided over $6.8 billion to help communities nationwide acquire and dispose of foreclosed properties. Some of this funding allocation goes to low-income new purchasers or renters or to nonprofit organizations working on their behalf.

128 Additionally, the state could develop a customized rating tool enabling an owner to incorporate renovation plans into a model, so that recommendations are sized and scoped appropriately. Our uptake and jobs analysis figures are premised on $50,000, but a lower threshold makes sense for an asset rating, as the measure is more likely to be oriented to an individual house component, not the whole-house.

129 Jenna Goodward, Rachel Massaro, Benjamin Foster, Caroline Judy, "Purchasing Power: Best Practices Guide to Collaborative Solar Procurement," World Resources Institute, Joint Venture: Silicon Valley Network & Optony, 2011.

130 CalCEF original analysis; Borenstein, 2011.

131 Regulation Z and Regulation E of the Bankruptcy Act of 2005, and the Credit Card Accountability, Responsibility, and Disclosure (CARD) Act of 2009 (amending the Truth in Lending Act (TILA) of 1968); require consumers to be informed of whether loans can be repaid at minimum payment amounts within the loan amortization. More recent additions to this law, depending on the institution, require projecting what would be paid within 3 years.

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151 Our conclusion is not unlike that of Paul Emrath, who—working with the same data—found that the percentage of homeowners who have been in their residences for longer periods [0]has remained relatively constant over time. See Emrath, 2009.

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155 This is a conservative estimate considering that Energy Upgrade California programs currently provide $3,000 in incentives for projects that achieve 25% energy savings.

About CalCEF

Our mission is to create institutions and investment vehicles that grow markets for and accelerate the adoption of clean energy technologies. CalCEF is an independent umbrella organization that pursues its goals at the state and national levels via two affiliated entities, each governed by separate boards of directors comprised of leading policy makers, scientists, entrepreneurs, and financial professionals. CalCEF Innovations, a 501(c)(3), is our analysis and product development shop. We design solutions — market strategies, business models, and public policies — that rapidly advance clean energy adoption, and focus on implementation to cure gaps and barriers in specific market segments. The California Clean Energy Fund executes and scales our investment strategy via an evergreen fund-of-funds model. It operates as a 501(c)(4) but makes for-profit investments in the public interest, partnering with established and emerging investment managers.

About the BlueGreen Alliance

The BlueGreen Alliance is a national, strategic partnership between labor unions and environmental organizations dedicated to expanding the number and quality of jobs in the green economy. Launched in 2006 by the United Steelworkers and the Sierra Club, this unique labor-environmental collaboration has grown to include the Communications Workers of America (CWA), Natural Resources Defense Council (NRDC), Service Employees International Union (SEIU), National Wildlife Federation (NWF), Utility Workers Union of America (UWUA), Union of Concerned Scientists (UCS), American Federation of Teachers (AFT), Amalgamated Transit Union (ATU), United Auto Workers (UAW), and the United Food and Commercial Workers (UFCW). The Blue Green Alliance unites 14 million members and supporters in pursuit of good jobs, a clean environment and a green economy.

About the UC Berkeley Labor Center

The Center for Labor Research and Education (Labor Center) is a public service and outreach program of the UC Berkeley Institute for Research on Labor and Employment (formerly the Institute of Industrial Relations). Founded in 1964, the Labor Center conducts research and education on issues related to labor and employment. The Labor Center's curricula and leadership trainings serve to educate a diverse new generation of labor leaders. The Labor Center carries out research on topics such as job quality and workforce development issues, and we work with unions, government, and employers to develop innovative policy perspectives and programs. We also provide an important source of research and information on unions and the changing workforce for students, scholars, policymakers and the public.

CalCEF Innovations
5 Third Street, Suite 1125
San Francisco, CA 94103

tel 415.957.0167
fax 415.957.0177

www.calcef.org