Office of
Jenine Windeshausen
Treasurer-Tax Collector
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September 12, 2012

Mr. Alfred Pollard
General Counsel
Attention: Comments/RIN 2590-AA53
Federal Housing Finance Agency
Eighth Floor
400 7th St., S.W.
Washington, DC 20024

RE: RIN 2590-AA53 Mortgage Assets Affected by PACE Programs ("Notice of Proposed Rulemaking")

Dear Mr. Pollard:

On behalf of the County of Placer (the "County"), I write to submit comments in Response to the Notice of Proposed Rulemaking ("NPR") of the Federal Housing Finance Agency ("FHFA") entitled "Enterprise Underwriting Standards," published June 15, 2012 in the *Federal Reg*ister, regarding Property Assessed Clean Energy Programs (PACE). This letter contains comments and responses to some of the specific issues posed in the NPR, and to some of the more general issues raised by the NPR.

The Proposed Rule Improperly Interferes with the Authority of Local Government to Impose Taxes and Assessments for Public Purposes

For over 120 years, the United States Supreme Court has recognized the power of local government to use police powers to require local improvements within their borders. See *Hagar v. Reclamation District No. 108*, 111 U.S. 701, 704 (1884). Local police powers clearly include the power to assess, tax, and spend for matters of health and welfare. Placer County has levied taxes and assessments to achieve important public purposes, such as the construction of schools, the installation of water and sanitary sewer systems and the undergrounding of public utilities, for more than a century.

Placer County's (PACE) program (mPOWER) is a lawful exercise of taxing power intended to benefit the health and safety of Placer County residents generally, through reduced energy consumption, improved air quality, decreased green house gas emissions, increased employment pertaining to the construction of PACE improvements, and to benefit property owners directly through reduced utility costs and increased property values. The program provided public funds to complete projects salutary to the

environment, and therefore clearly beneficial to the public health and safety. The establishment and implementation of PACE programs is a clever, routine, and lawful use of local police powers to act in the public interest. Nothing about PACE justifies the interference with Placer County's police powers, and those of other local entities, wrought by the FHFA's restrictions and conditions imposed first by their July 10, 2010 letter, and now by the NPR.

When Placer County designed its PACE program, the County considered a variety of public policy issues, including public purposes cited by the California Legislature when it amended Chapter 29 to authorize the financing of PACE improvements; the creation of jobs for County residents and businesses during challenging economic times; the reduction of congestion on the California power grid; the reduction of green house gas emissions; the improvement of national energy independence; the potential economic benefits to property owners; and the protection of existing lenders.

Unfortunately, the NPR is little changed from FHFA's overreaching July 6, 2010 Statement. The Proposed Rule directs the Enterprises to hold any property owner with a priority PACE lien in default on his or her mortgage absent Enterprise consent to the lien, directs that the Enterprises not purchase any mortgage subject to a priority PACE lien, and directs the Enterprises not to consent to the priority of PACE liens. Moreover, two of the three Risk-Mitigation Alternatives are obviously not viable solutions, though the third alternative could be modified in a way that might be reasonable. The Proposed Rule and Risk-Mitigation Alternatives remain surprisingly hostile to the exercise of police powers by local public entities to form and operate PACE programs.

FHFA is required to consider the public interests promoted by PACE programs in formulating regulations governing how the Enterprises address properties with PACE liens. See 12 U.S.C Section 4513(a)(1)(B)(v). Instead, FHFA's response to the County's exercise of its taxing power, as evidenced by the Statements and the Advance Notice of Proposed Rulemaking, and the NPR, is an unprecedented interference with the County's exercise of its taxing power to achieve valid and important public purposes.

The Proposed Rule Disregards the Evidence in the Record, and, as a result, Misses an Opportunity to Improve the Current Economic Conditions of the Country

In the Executive Summary and Background, and throughout other sections of the NPR, FHFA asserts as fact propositions that lack evidentiary support. However, FHFA must consider the voluminous and well researched evidence in the Federal Record demonstrating that PACE does not pose material financial risks to the Enterprises. It may not simply rely on assumptions and assertions. FHFA must "explain the evidence which is available, and . . . offer a 'rational connection between the facts found and the choice made.'" *Motor Vehicle Mfrs. Ass'n of U.S., Inc., v. State Farm Mut. Auto. Ins. Co.* 463

U.S. 29, 43 (1983). Because they are contrary to the evidence in the record, FHFA's conclusions regarding the need for the Proposed Rule, or any of the alternatives, fail to comply with the applicable legal standard. FHFA's approach to the NPR is unfortunate since Placer County and FHFA share a commitment to a strong and secure housing market and mortgage industry.

The evidence in the record shows that PACE is a bi-partisan initiative based on proven municipal financing that has been in use for over a century. Properly implemented, PACE is a safe and sound financing mechanism for energy retrofitting the country's existing building stock. It is the most promising economic tool for non-exportable job creation, while effectively moving the United States toward energy independence. PACE programs are smart, efficient, and cost effective financing options that can provide unique financing advantages for property owners to make energy retrofit improvements.

The Proposed Rule ignores the measures built into the County's PACE program to protect private lien-holders

The underwriting requirements of the County's PACE program, which are summarized in Exhibit 1, reflect the County's focus on achieving a broad range of public policy goals while protecting the County's many constituents. Significantly, the County's PACE program is consistent with the White House's policy framework for PACE programs (see "Policy Framework for PACE Financing Programs," October 18 2009) and the program design best practice guidelines promulgated by the Department of Energy (see "Guidelines for Pilot PACE Financing Programs," May 2010). Consistent with the County's focus on the interests of its many constituents, the County's PACE program is designed to comply with all applicable consumer protection laws.

The Proposed Rule unreasonably disregards the safeguards built into the County's PACE program. The County's underwriting criteria are designed to protect the entire range of County constituents. Moreover, California law does not permit acceleration of the unpaid principal amount of a contractual assessment; in the event of delinquencies in the payment of contractual assessment installments, the County is only authorized to initiate judicial foreclosure of delinquent installments (plus penalties and interest). This safeguard minimizes the risk for private lien holders to protect their liens in the event the County forecloses delinquent contractual assessment installments.

Analysis of Proposed Rule and Risk-Mitigation Alternatives

A. The Proposed Rule

The Proposed Rule would provide for the following:

1. The Enterprises shall immediately take such actions as are necessary to secure and/or preserve their right to make immediately due the full amount of any obligation

secured by a mortgage that becomes, without the consent of the mortgage holder, subject to a first-lien PACE obligation. Such actions may include, to the extent necessary, interpreting or amending the Enterprises' Uniform Security Instruments.

2. The Enterprises shall not purchase any mortgage that is subject to a first lien PACE obligation.

3. The Enterprises shall not consent to the imposition of a first-lien PACE obligation on any mortgage. In light of the comments received in response to the ANPR and FHFA's responses to those comments, FHFA believes that the Proposed Rule is reasonable and necessary to limit, in the interest of safety and soundness, the financial risks that first-lien PACE programs would otherwise cause the Enterprises to bear.

Response: The Proposed Rule is unreasonable and renders PACE program implementation and ongoing operation infeasible for the following reasons.

1) Properties that are not backed by FNMA or FHLMC would not be prohibited or encumbered by this rule. This would include "free and clear" properties, jumbo loan or other non-conforming mortgage. This may be enough to demonstrate level of risk. However, given the percentage of residential loans owned or guaranteed by the Enterprises, programs would not be feasible if they are limited to properties that are not owned or guaranteed by the Enterprises. The volume of assessments would produce not the number of energy efficiency and energy generation improvements to achieve any meaningful impact. Additionally, such a low volume would make any PACE program financially infeasible.

2) Currently, the standard mortgage application and related credit review and background investigation of mortgage applicants does not include any data collection or review of property tax assessments or utility expenses in debt to income and debt to equity ratios. The Proposed Rule unfairly differentiates and targets PACE liens. The Enterprises have never before considered assessment liens separate and apart from other assessments or special taxes that are currently included in most property taxes. Assessments and utility expenses, have not been considered a part of the mortgage credit review either prior to, or after, recent mortgage reforms. The attached Uniform Residential Loan Application (Freddie Mac Form 65, Exhibit 2) shows that assessment loans and utility expenses are not broken out for consideration in ordinary loan applications.

The Proposed Rule unfairly distinguishes PACE liens from other property tax liens that have been historically utilized by California municipalities. See attached detail of an actual property tax bill (Exhibit 3) which reflects many other city and school district assessments and special taxes beyond the base property tax. California has utilized assessments over the past 100 years, yet to date, there is no evidence supporting FHFA's claim that PACE liens cause a financial risk to the Enterprises.

The historical use of assessments to finance infrastructure provides a clear, but often indirect benefit to subject properties, (i.e. school bonds where the resident does not have a student at the school). FHFA's targeting of PACE liens is unjustified given the direct benefit to the property conferred by improvements funded by PACE liens

3) The evidence does not support FHFA's speculation that PACE related improvements may potentially reduce property value. To the contrary, the evidence shows that PACE related improvements increase property value. See Exhibit 4, compendium of recent research and documentation reflecting increases in property value due to PACE related improvements. Specifically, the **"KEY FINDING: Green Home Labels Add 9 Percent Price Premium"** is documented in The Value of Green Labels in the California Housing Market, research and "economic analysis of 1.6 million homes sold in California between 2007 and 2012, controlling for other variables known to influence home prices in order to isolate the added value of green home labels." published July 2012 (Nils Kok, Maastrict University Netherlands and University of California, Berkeley, and Matthew E. Kahn, University of California, Los Angeles) As reflected in that analysis, and in the other research and analysis included in Exhibit 4, the benefit of energy efficiency and renewable generation improvements to both residential and commercial properties confers clear economic value to properties enhanced thereby.

B. Risk-Mitigation Alternatives

FHFA is considering three alternative means of mitigating the financial risks that first-lien PACE programs would otherwise pose to the Enterprises. FHFA solicits comments supported by reliable data and rigorous analysis showing that any of these alternatives, or any other alternative to the Proposed Rule, would provide mortgage holders with equivalent protection from financial risk to that of the Proposed Rule, and could be implemented as readily and enforced as reliably as the Proposed Rule.

1. First Risk-Mitigation Alternative—Guarantee/Insurance

The first such Risk-Mitigation Alternative is as follows:

a. The Enterprises shall immediately take such actions as are necessary to secure and/or preserve their right to make immediately due the full amount of any obligation secured by a mortgage that becomes, without the consent of the mortgage holder, subject to a first-lien PACE obligation. Such actions may include, to the extent necessary, interpreting or amending the Enterprises' Uniform Security Instruments.

b. The Enterprises shall not purchase any mortgage that is subject to a first lien PACE obligation, except to the extent that the Enterprise, if it already owned the mortgage, would consent to the PACE obligation pursuant to paragraph (c) below.

c. The Enterprises shall not consent to first-lien PACE obligations except those that (a) are (or promptly upon their creation will be) recorded in the relevant jurisdiction's public land-title records, and (b) meet any of the following three conditions:

i. Repayment of the PACE obligation is irrevocably guaranteed by a qualified insurer, with the guarantee obligation triggered by any foreclosure or other similar default resolution involving transfer of the collateral property; or

ii. A qualified insurer insures the Enterprises against 100% of any net loss attributable to the PACE obligation in the event of a foreclosure or other similar default resolution involving transfer of the collateral property; or,

iii. The PACE program itself provides, via a sufficient reserve fund maintained for the benefit of holders of mortgage interests on properties subject to senior obligation under the program. In providing such consent, the Enterprises shall reserve the rights to revoke the consent in the event the subject PACE obligation ceases to meet any of the conditions, and to accelerate the full amount of the corresponding mortgage obligation so as to be immediately due in that event.

FHFA has reservations about the First Risk-Mitigation Alternative, including whether the referenced guarantees and/or insurance would be available in the marketplace. Moreover, even to the extent the referenced guarantees and/or insurance were available in the marketplace, the First Risk-Mitigation Alternative might not effectively insulate the Enterprises from the range of material financial risks that first-lien PACE programs otherwise would force them to bear. For example, the Enterprises would be exposed to the risk that the insurance provider may fail, potentially leaving the Enterprises to bear the very risks they were to be insured against. While an appropriate definition of "qualified insurer" can reduce this risk, it cannot eliminate it. Notwithstanding these reservations, and pursuant to the Preliminary Injunction, FHFA is considering the First Risk-Mitigation Alternative, and solicits comments regarding its potential benefits, detriments, and effects, as well as modifications that could make it more beneficial and effective or otherwise address FHFA's reservations.

Response: The proposed First Risk Mitigation Alternative is unreasonable and renders PACE program implementation and ongoing operation impossible for the following reasons.

1) The First Risk-Mitigation Alternative is based on an insurance product that does not exist. FHFA recognizes the infeasibility of this alternative and questions the availability of the referenced guarantees or insurance in the market place, "FHFA has reservations about the First Risk-Mitigation Alternative, including whether the referenced guarantees and/or insurance would be available in the marketplace...." Certainly, if such a "Guarantee/Insurance" product existed, PACE programs would have already embraced the use of such guarantee/insurance.

FHFA goes on to state, *"...the First Risk Mitigation Alternative might not effectively insulate the Enterprises from the range of material financial risks that first-lien PACE programs otherwise would force them to bear. For example, the Enterprises would be exposed to the risk that the insurance provider may fail, potentially leaving the Enterprises*

to bear the very risks they were to be insured against." Nothing is fully risk free. This remark betrays a reasonable projection of remotely possible risks onto the concept of PACE programs. FHFA's offering of a First-Risk-Mitigation Alternative that does not presently exist, and for which FHFA unreasonably projects hypothetical risks in the unlikely event that the proposed insurance should ever come to pass, suggests that the first alternative is arbitrary and capricious.

2) Indeed, the risk identified by FHFA is unlikely to be an insurable risk. It is highly unlikely that an insurance product providing coverage guarantees for a discrete foreclosure risk would be developed when losses from the risk are under the control of the beneficiary. It would be impossible to enforce the insurance where the lender is in control of "real estate owned" (REO) property and has the sole discretion of when, and how, to foreclose and subsequently re-market the property. Since the mortgage melt-down began in 2006, lenders frequently delay foreclosure action for months, or even years before enforcing foreclosure provisions under conditions of default. Once a property is in default, lenders have the sole discretion regarding disposition of the property. Properties have been held in lender portfolios for extended lengths of time prior to being placed on the market. During this time, the property taxes and related assessment liens including delinquent amounts are the responsibility of the REO lender. The beneficiary's control of the timing and circumstances of foreclosure render it unlikely that insurance to cover their alleged risk of financial losses resulting from PACE liens on foreclosed properties will ever be created.[1]

2. Second Risk-Mitigation Alternative— Protective Standards

The Second Risk-Mitigation Alternative is as follows:

a. The Enterprises shall take such actions as are necessary to secure and/or preserve their right to accelerate so as to be immediately due the full amount of any obligation secured by a mortgage that becomes, without the consent of the mortgage holder, subject to a first-lien PACE obligation. Such actions may include, to the extent necessary, interpreting or amending the Enterprises' Uniform Security Instruments;

b. The Enterprises shall not purchase any mortgage that is subject to a first lien PACE obligation, except to the extent that the Enterprise, if it already owned the mortgage, would consent to the PACE obligation pursuant to paragraph (c) below;

c. The Enterprises shall not consent to first-lien PACE obligations except in instances where, based on the Enterprise's underwriting definitions, the following five conditions are met;

i. The PACE obligation is no greater than $25,000 or 10% of the fair market value of the underlying property, whichever is lower;

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[1] Placer County believes it is prudent practice to require PACE or any other assessment or special tax lien to be recorded in the public land-title record. This is currently required by State statute in California and has been the practice in Placer County's mPOWER program since program inception.

ii. Current combined loan-to-value ratio (reflecting all obligations secured by the underlying property, including the putative PACE obligation, and based on a current qualified appraisal) would be no greater than 65%; and

iii. The borrower's adequately documented back-end debt-to-income ratio (including service of the putative PACE obligation) would be no greater than 35% using the calculation methodology provided in the Enterprises' guides;

iv. The borrower's FICO credit score is not lower than 720; and

v. The PACE obligation is (or promptly upon its creation will be) recorded in the relevant jurisdiction's public land-title records.

d. The Enterprises are to treat a home purchaser's prepayment of an existing first-lien PACE obligation as an element of the purchase price in determining loan amounts and applying underwriting criteria.

*FHFA has reservations about the Second Risk-Mitigation Alternative, including whether it would reduce but not eliminate the material financial risks that first-lien PACE programs would otherwise pose to the Enterprises. In particular, because the mechanism by which the Second Risk-Mitigation Alternative would protect the Enterprises is the imposition of a substantial equity cushion as a prerequisite to consent to creation of a senior PACE lien, market conditions in which equity is substantially eroded (*i.e., *severe declines in home prices) would cause the risks associated with such liens and borne by the Enterprises to become even more material. Notwithstanding these reservations, and pursuant to the Preliminary Injunction, FHFA is considering the Second Risk-Mitigation Alternative, and solicits comments regarding its potential benefits, detriments, and effects, as well as modifications that could make it more beneficial and effective or otherwise address FHFA's reservations.*

Response: The proposed Second Risk-Mitigation Alternative is unreasonable and renders PACE program implementation and ongoing operation infeasible for the following reasons.

1) The Second Risk-Mitigation Alternative of a $25,000 cap on PACE obligations fails to consider relative costs for dwellings of larger size. It also fails to account for the increased energy cost savings and property value benefit of multiple retrofit improvements such as window and HVAC replacement which when combined may often exceed the $25,000 maximum dollar amount.

2) Moreover, due to the equity requirements, the second Risk-Mitigation Alternative would rule out the financing of most cost saving energy efficiency and renewable installations. The second Risk-Mitigation Alternative effectively requires that a property must have 55% or more equity to qualify when adding a maximum PACE lien of 10% of value to not exceed the 65% total. Long-term mortgage market analysis has established that most homeowners maintain a mortgage for seven (7) years on average, due to sale

or refinance, therefore the pool of properties meeting this level of equity is likely to be extremely limited since most mortgages are not held long enough to achieve 65% equity.

3) The inflexibility of the requirement that prepayment of the existing PACE lien be factored into the purchase price would result in disparate treatment of individual properties without a reasonable basis for so doing. Treating a home purchaser's prepayment of an existing first-lien PACE obligation as an element of the purchase price in determining loan amounts and applying underwriting criteria ignores the market. There may be a great variety of scenarios under which a buyer prepays an existing PACE lien. Rather than a one size fits all approach, factoring the prepayment of a PACE lien into the purchase price should remain a function of the market and subject to negotiation. There is no basis to treat the pre-payment of other property tax liens, such as school bonds or other city or county assessments and special taxes more favorably than PACE liens. How would the purchase price and underwriting criteria be handled if a property's other tax liens such as school bonds or other assessment liens were paid off at time of sale? In certain markets, the payoff of existing property tax liens as a condition of sale is negotiated between the purchaser and seller. As is the case with other property tax liens, prepayment of a PACE lien should also be negotiated between the purchaser and seller.

4) The consent requirement is cumbersome and expensive. The expense of obtaining Enterprise consent would further reduce the limited pool of owners of "qualified" properties who could afford PACE improvements under the second alternative.

3. Third Risk-Mitigation Alternative—H.R. 2599 Underwriting Standards

The Third Risk-Mitigation Alternative would adopt the key underwriting standards set forth in H.R. 2599, which many commenters proffered as a reasonable source of standards FHFA could adopt, and is as follows:

a. The Enterprises shall take such actions as are necessary to secure and/or preserve their right to make immediately due the full amount of any obligation secured by a mortgage that becomes, without the consent of the mortgage holder, subject to a first-lien PACE obligation. Such actions may include, to the extent necessary, interpreting or amending the Enterprises' Uniform Security Instruments;

b. The Enterprises shall not purchase any mortgage that is subject to a first lien PACE obligation, except to the extent that the Enterprise, if it already owned the mortgage, would consent to the PACE obligation pursuant to paragraph (c) below;

c. The Enterprises shall not consent to first-lien PACE obligations except those that (a) are (or promptly upon their creation will be) recorded in the relevant jurisdiction's public land-title records, and (b) meet all of the following conditions;

i. The PACE obligation is embodied in a written agreement expressing all material terms;

ii. The agreement requires that, upon payment in full of the PACE obligation, the PACE program promptly provide written notice of satisfaction to the owner of the

underlying property and the holder of any mortgage on such property as reflected in the relevant jurisdiction's land-title records and take all necessary steps to extinguish the PACE lien;

iii. All property taxes and any other public assessments on the property are current and have been current for three years or the property owner's period of ownership, whichever period is shorter;

iv. There are no involuntary liens, such as mechanics liens, on the property in excess of $1,000;

v. No notices of default and not more than one instance of property-based debt delinquency have been recorded during the past three years or the property owner's period of ownership, whichever period is shorter;

vi. The property owner has not filed for or declared bankruptcy in the previous seven years;

vii. The property owner is current on all mortgage debt on the property;

viii. The property owner or owners are the holders of record of the property;

ix. The property title is not subject to power of attorney, easements, or subordination agreements restricting the authority of the property owner to subject the property to a PACE lien;

x. The property meets any geographic eligibility requirements established by the PACE program;

xi. The improvement funded by the PACE transaction has been the subject of an audit or feasibility study that:

a. Has been commissioned by the local government, the PACE program, or the property-owner and completed no more than 90 days prior to presentation of the proposed PACE transaction to the mortgage holder for its consent; and

b. Has been performed by a person who has been certified as a building analyst by the Building Performance Institute or as a Home Energy Rating System Rater by a Rating Provider accredited by the Residential Energy Service network; or who has obtained other similar independent certification; and

c. Includes each of the following:

1. Identification of recommended energy conservation, efficiency, and/or clean energy improvements;

2. Identification of the proposed PACE-funded project as one of the recommended improvements identified pursuant to paragraph 1.

3. An estimate of the potential cost savings, useful life, benefit-cost ratio, and simple payback or return on investment for each recommended improvement; and,

4. An estimate of the estimated overall difference in annual energy costs with and without the recommended improvements;

xii. The improvement funded by the PACE transaction has been determined by the local government as one expected to be affixed to the property for the entire useful life of the improvement based on the expected useful lives of energy conservation, efficiency, and clean energy measures approved by the Department of Energy;

xiii. The improvement funded by the PACE transaction will be made or installed by a contractor or contractors determined by the local government to be qualified to make the PACE improvements;

xiv. Disbursal of funds for the PACE transaction shall not be permitted unless:

a. The property owner executes and submits to the PACE program a written document requesting such disbursement;

b. The property owner submits to the PACE program a certificate of completion, certifying that improvements have been installed satisfactorily; and

c. The property owner executes and submits to the PACE program adequate documentation of all costs to be financed and copies of any required permits;

xv. The total energy and water cost savings realized by the property owner and the property owner's successors during the useful lives of the improvements, as determined by the audit or feasibility study performed pursuant to paragraph xi. supra *are expected to exceed the total cost to the property owner and the property owner's successors of the PACE assessment;*

xvi. The total amount of PACE assessments for a property shall not exceed 10 percent of the estimated value of the property as determined by a current, qualified appraisal;

xvii. As of the effective date of the PACE agreement, the property owner shall have equity in the property of not less than 15 percent of the estimated value of the property as determined by a current, qualified appraisal and calculated without consideration of the amount of the PACE assessment or the value of the PACE improvements;

xviii. The maximum term of the PACE assessment shall be no longer than the shorter of

a) 20 years from inception, or

b) the weighted average expected useful life of the PACE improvement or improvements, with the expected useful lives in such calculations consistent with the expected useful lives of energy conservation and efficiency and clean energy measures approved by the Department of Energy.

In providing such consent, the Enterprises are to reserve the rights to revoke the consent in the event the subject PACE obligation ceases to meet any of the conditions, and to accelerate so as to be immediately due the full amount of the corresponding mortgage obligation in that event.

FHFA has reservations about the Third Risk-Mitigation Alternative, including whether it could practically be implemented by FHFA and the Enterprises given that certain elements of the alternative appear to be inherently vague and/or dependent upon assumptions that FHFA lacks a sound basis (and the requisite staff and resources) to provide or evaluate.

*For example, while the alternative would require that "The total energy and water cost savings realized by the property owner and the property owner's successors during the useful lives of the improvements, as determined by [a mandatory] audit or feasibility study * * * are expected to exceed the total cost to the property owner and the property*

owner's successors of the PACE assessment," no methodology for computing the costs and savings is provided. Assumptions as to applicable discounts rates are significant and indeed can be determinative—especially since PACE funded projects may be cash-flow negative for the first several years. Given the uncertainty associated with important elements of calculating the costs and benefits of PACE-funded projects (such as uncertainty as to the course of future energy prices, the costs of maintaining and repairing equipment, and the pace of advances in energy efficiency technology), determining an appropriate discount rate is a non-trivial undertaking, and FHFA lacks a sound basis to provide one. Without a reasonable, reliable, and consistent methodology for making the calculations that purport to determine whether proposed projects are financially sound (including a reasonable and reliable method for determining the applicable discount rate or rates), the alternative would not adequately protect the Enterprises from financial risk. Similarly, while the maximum term of the PACE obligation is determined with reference to a "weighted average expected useful life of the PACE improvement or improvements," neither H.R. 2599 nor any of the commenters explained how the weights are to be determined, and most appear to assume that "expected useful lives of energy conservation and efficiency and clean energy measures approved by the Department of Energy" will be available and reliable for all PACE-funded projects, which FHFA believes is uncertain. Indeed, in many respects, the deployment of pilot programs tied to determining energy efficiency, providing metrics of such efficiency, training appraisers and inspectors, establishing standards based on such pilot programs in the area of energy efficiency and consumer protections and then providing a source of reliable information to consumers would appear more productive than selecting among financing mechanisms at this time. Additionally, a clear method for enforcing standards set forth in such a program would be beneficial.

Notwithstanding these reservations, and pursuant to the Preliminary Injunction, FHFA is considering the Third Risk-Mitigation Alternative, and solicits comments regarding its potential benefits, detriments, and effects, as well as modifications that could make it more beneficial and effective or otherwise address FHFA's reservations.

Response: The proposed Third Risk-Mitigation Alternative might permit PACE program implementation and operation, and contains elements that Placer County strongly supports or believes should be strengthened, as well as elements that are unreasonable, as discussed below.

1) The Third Risk-Mitigation Alternative contains elements that Placer County supports. Placer County completely agrees with the provisions included in subparts i – iii, and would prefer that subparts iv and v be strengthened to require that for the previous three years there be no involuntary liens, regardless of amount, and no notices of default or property-based delinquency or debt. An involuntary lien or a notice of default or

delinquency is a potential indicator of fiscal distress, weakness or other lack of responsible property ownership.

Placer County would prefer to strengthen subpart vi by not only requiring no filing or declaration of bankruptcy for the past seven years, but also by requiring that any prior bankruptcy be discharged for at least five years. Placer County further strongly agrees with the provisions included in subparts vii and viii. Subpart ix should include a provision that the property is not subject to any easements, rules, regulations, laws or covenants restricting the improvements that are to be made on the property through the PACE financing. From Placer County's perspective, subparts x – xviii are also workable terms for a successful PACE program.

2) However, the Third Risk-Mitigation Alternative is unreasonable where it states that the Enterprises reserve the right to revoke the consent in the event the subject PACE obligation ceases to meet any of the conditions, and further to accelerate so as to be immediately due the full amount of the corresponding mortgage obligation. This requirement does not provide for any notice of deficiency, time allotment for correction or compliance, or other due process allowing the property owner to return to compliance. It is unreasonable in that it does not provide for any waiver due to circumstances beyond the control of the property owner.

3) As to FHFA's stated concerns about the Third Risk-Mitigation Alternative, its assertion that PACE funded projects may be cash-flow negative for the first several years is erroneous and has not been the experience in existing programs. To the contrary all programs in California require positive cash flow as a condition of financing. FHFA concerns about methodologies and calculations for computing costs and benefits of PACE improvements are also unfounded. Most of the methodologies and calculations are established and recognized industry standards. Prudent use of industry standards informed the requirement in HR2599 of a Building Performance Institute or Home Energy Rating System audit or analysis. These institutions have developed and maintain standardized methodologies and calculations which could be included in the final regulation.

Regarding weighted useful life, the Internal Revenue Service maintains schedules of useful life for allowable depreciation. mPOWER Placer uses these schedules and incorporates the useful life into the total amortization of the financing by combining the amounts for each useful life and determining the annual debt service for each term of useful life. These amounts are then totaled for each year they are due. Therefore, if a 10 year useful life and a 20 year useful life are calculated separately and then combined, the debt service is combined for the first 10 years until the 10 year amortization is paid off at which time the annual debt service amount will be reduced to reflect the pay-off of the 10 year useful life improvement.

4) Given the evidence in the record showing the economic benefits conferred on properties subject to PACE improvements, and Sonoma County's experience with PACE program prior to FHFA action, preliminary resort to pilot programs should not be necessary. Pilot programs are not offered as an alternative and FHFA gives the notion of pilot programs to gather additional information about how PACE programs actually work tepid support in its discussions of concerns about the third alternative. While contrary to the record, FHFA complains that there is insufficient data to assess the safety and soundness of the Enterprises when lending in jurisdictions with PACE programs, yet it took drastic steps to shut down all PACE programs from which additional data might have been obtained. Nevertheless, should FHFA decide to pursue a pilot program, Placer County stands ready with its mPOWER Placer Program to provide thoughtful discourse, data collection and analysis with the flexibility to modify the program to improve service delivery and to protect all stakeholders.

Conclusion

FHFA initially overreached by directing that the Enterprises immediately take the actions necessary to secure and preserve their right to make due immediately the full amount of any obligation secured by a mortgage that becomes, without the consent of the mortgage holder, subject to a first-lien PACE obligation, to not purchase any mortgage subject to a first-lien PACE obligation, and to withhold consent to the imposition of a first-lien PACE obligation. FHFA further required that all properties in the jurisdiction become subject to increased debt-to-equity and debt-to-income ratios. The result is that a jurisdiction cannot effectively implement a PACE program even on properties without an Agency owned or guaranteed mortgage because of the negative impact on all properties in the jurisdiction even though less than 50% of residential properties have mortgages that are guaranteed or purchased by FNMA or FHLMC. The NPR does not sufficiently remedy these problems.

For the reasons explained above, Placer County believes that the NPR is arbitrary and capricious. FHFA should not have attempted to use its power to regulate the Enterprises to prohibit senior lien PACE programs altogether; instead, FHFA should have been part of the broader dialogue to define responsible PACE programs that resulted in the White House's policy framework and the Department of Energy's best practice guidelines.

The County urges the FHFA to adopt a rule to the effect that if a PACE program complies with the White House's policy framework and the Department of Energy's best practice guidelines, then the Enterprises (i) may purchase or insure a mortgage loan secured by a property that is encumbered by a PACE lien and (ii) may not take remedial action under a mortgage in response to the imposition of a PACE lien meeting the above-referenced criteria.

Thank you for the opportunity to respond to the NPR. Placer County stands ready to work with FHFA to resolve the PACE issues in a mutually agreeable manner.

Sincerely,

Jenine Windeshausen

Jenine Windeshausen
Treasurer-Tax Collector
mPOWER Placer Program Administrator

Enclosures:

Exhibit 1 – mPOWER Placer Summary of Underwriting Criteria
Exhibit 2 – Uniform Residential Loan Application (Freddie Mac Form 65)
Exhibit 3 – Typical Property Tax Bill, Placer County, Detail of Assessments, Special Taxes and other Charges

Exhibit 1

mPOWER Placer

Summary of Underwriting Criteria

Summary of mPOWER Placer Underwriting Requirements

Financing may be approved if the following criteria are met, among others:

- Property title is vested in the applicant(s).
- Property owner is current on property taxes on the subject property and has not been in default for three years (or since he/she took ownership if less than three years).
- Property owner is not in bankruptcy and, if the property owner was subject to bankruptcy, it has been at least seven years since discharge of bankruptcy, and the property is not an asset in a bankruptcy proceeding.
- Property owner is current on mortgage(s). A notice of default must not have been filed against the property during the last five years (or since the property owner took ownership if less than five years).
- The property must not be subject to a mechanics', Internal Revenue Service, Franchise Tax Board or other involuntary liens.
- There must not be a civil court record within the last five years that demonstrates failure by the property owner to make payments with respect to the subject property.
- The contractual assessments levied to finance Energy and Water Conservation Improvements will constitute a lien on the subject property. Depending upon the underlying loan documentation, creation of the assessment lien could result in a default under existing loan documents or give lenders the right to take certain remedial action. For non-residential property,[1] lender has signed an acknowledgement letter which states that the assessment contract will not constitute a default under its Deed of Trust.
- Without lender consent, except in limited circumstances, the principal amount of the contractual assessment may not exceed 10% of property value plus the value of the Energy and Water Conservation Improvements being financed. Value may be calculated in a number of ways, as appropriate, including (i) the assessed value as shown on the then current County real property tax roll (if the property owner is then contesting the value of the property, the assessed value will be deemed to be the lower amount claimed by the property owner), (ii) the appraised value, as determined in an appraisal performed by a qualified

[1] For mPOWER, "residential property" is defined as single-family properties with 1-to-4 residential units; "non-residential property" is all other property.

- The installation of Energy and Water Conservation Improvements can be completed by a qualified contractor of the property owner's choice. Eligible costs do not include labor costs for property owners that elect to do the work themselves. For purposes of mPOWER Placer, "qualified contractors" are those contractors who are appropriately licensed for the Improvement proposed to be installed.

- Property owners who elect to engage in broader projects such as home or business remodeling may only receive mPOWER Placer Financing for that portion of the cost of retrofitting existing structures with Energy and Water Conservation Improvements. Repairs and/or new construction do not qualify for mPOWER Placer Financing except to the extent that the construction is required for the specific approved Improvement. Repairs to existing infrastructure, such as water and sewer laterals, are considered repairs and are not eligible.

- The term of contractual assessments established by a mPOWER Placer Assessment Contract will be equal to the shorter of (i) 20 years, (ii) the useful life of the financed Energy and Water Conservation Improvements or (iii) such other shorter period requested by the property owner.

Exhibit 2

Uniform Residential Loan Application

(Freddie Mac Form 65)

Uniform Residential Loan Application

This application is designed to be completed by the applicant(s) with the Lender's assistance. Applicants should complete this form as "Borrower" or "Co-Borrower," as applicable. Co-Borrower information must also be provided (and the appropriate box checked) when ☐ the income or assets of a person other than the Borrower (including the Borrower's spouse) will be used as a basis for loan qualification or ☐ the income or assets of the Borrower's spouse or other person who has community property rights pursuant to state law will not be used as a basis for loan qualification, but his or her liabilities must be considered because the spouse or other person has community property rights pursuant to applicable law and Borrower resides in a community property state, the security property is located in a community property state, or the Borrower is relying on other property located in a community property state as a basis for repayment of the loan.

If this is an application for joint credit, Borrower and Co-Borrower each agree that we intend to apply for joint credit (sign below):

Borrower _____ Co-Borrower _____

I. TYPE OF MORTGAGE AND TERMS OF LOAN

Mortgage Applied for:				Agency Case Number	Lender Case Number
	☐ VA	☐ Conventional	☐ Other (explain):		
	☐ FHA	☐ USDA/Rural Housing Service			

Amount	Interest Rate	No. of Months	Amortization Type:		
$	%		☐ Fixed Rate	☐ Other (explain):	
			☐ GPM	☐ ARM (type):	

II. PROPERTY INFORMATION AND PURPOSE OF LOAN

Subject Property Address (street, city, state & ZIP)	No. of Units
Legal Description of Subject Property (attach description if necessary)	Year Built

Purpose of Loan				Property will be:		
	☐ Purchase	☐ Construction	☐ Other (explain):	☐ Primary Residence	☐ Secondary Residence	☐ Investment
	☐ Refinance	☐ Construction-Permanent				

Complete this line if construction or construction-permanent loan.

Year Lot Acquired	Original Cost	Amount Existing Liens	(a) Present Value of Lot	(b) Cost of Improvements	Total (a + b)
	$	$	$	$	$

Complete this line if this is a refinance loan.

Year Acquired	Original Cost	Amount Existing Liens	Purpose of Refinance	Describe Improvements ☐ made ☐ to be made	
	$	$		Cost: $	

Title will be held in what Name(s)	Manner in which Title will be held	Estate will be held in:
		☐ Fee Simple
		☐ Leasehold (show expiration date)
Source of Down Payment, Settlement Charges, and/or Subordinate Financing (explain)		

III. BORROWER INFORMATION

Borrower

Borrower's Name (include Jr. or Sr. if applicable)			
Social Security Number	Home Phone (incl. area code)	DOB (mm/dd/yyyy)	Yrs. School

☐ Married ☐ Separated	☐ Unmarried (include single, divorced, widowed)	Dependents (not listed by Co-Borrower) no.	ages

Present Address (street, city, state, ZIP)	☐ Own	☐ Rent ____No. Yrs.
Mailing Address, if different from Present Address		

If residing at present address for less than two years, complete the following:

Former Address (street, city, state, ZIP)	☐ Own	☐ Rent ____No. Yrs.

Co-Borrower

Co-Borrower's Name (include Jr. or Sr. if applicable)			
Social Security Number	Home Phone (incl. area code)	DOB (mm/dd/yyyy)	Yrs. School

☐ Married ☐ Separated	☐ Unmarried (include single, divorced, widowed)	Dependents (not listed by Borrower) no.	ages

Present Address (street, city, state, ZIP)	☐ Own	☐ Rent ____No. Yrs.
Mailing Address, if different from Present Address		

Former Address (street, city, state, ZIP)	☐ Own	☐ Rent ____No. Yrs.

IV. EMPLOYMENT INFORMATION

Borrower

Name & Address of Employer	☐ Self Employed	Yrs. on this job	Yrs. employed in this line of work/profession

Position/Title/Type of Business	Business Phone (incl. area code)

Co-Borrower

Name & Address of Employer	☐ Self Employed	Yrs. on this job	Yrs. employed in this line of work/profession

Position/Title/Type of Business	Business Phone (incl. area code)

If employed in current position for less than two years or if currently employed in more than one position, complete the following:

IV. EMPLOYMENT INFORMATION (cont'd)

Borrower			Co-Borrower		
Name & Address of Employer	☐ Self Employed	Dates (from – to)	Name & Address of Employer	☐ Self Employed	Dates (from – to)
		Monthly Income $			Monthly Income $
Position/Title/Type of Business		Business Phone (incl. area code)	Position/Title/Type of Business		Business Phone (incl. area code)
Name & Address of Employer	☐ Self Employed	Dates (from – to)	Name & Address of Employer	☐ Self Employed	Dates (from – to)
		Monthly Income $			Monthly Income $
Position/Title/Type of Business		Business Phone (incl. area code)	Position/Title/Type of Business		Business Phone (incl. area code)

V. MONTHLY INCOME AND COMBINED HOUSING EXPENSE INFORMATION

Gross Monthly Income	Borrower	Co-Borrower	Total	Combined Monthly Housing Expense	Present	Proposed
Base Empl. Income*	$	$		Rent	$	
Overtime				First Mortgage (P&I)		$
Bonuses				Other Financing (P&I)		
Commissions				Hazard Insurance		
Dividends/Interest				Real Estate Taxes		
Net Rental Income				Mortgage Insurance		
Other (before completing, see the notice in "describe other income," below)				Homeowner Assn. Dues		
				Other:		
Total	$	$	$	**Total**	$	$

* **Self Employed Borrower(s) may be required to provide additional documentation such as tax returns and financial statements.**

Describe Other Income *Notice:* **Alimony, child support, or separate maintenance income need not be revealed if the Borrower (B) or Co-Borrower (C) does not choose to have it considered for repaying this loan.**

B/C		Monthly Amount
		$

VI. ASSETS AND LIABILITIES

This Statement and any applicable supporting schedules may be completed jointly by both married and unmarried Co-Borrowers if their assets and liabilities are sufficiently joined so that the Statement can be meaningfully and fairly presented on a combined basis; otherwise, separate Statements and Schedules are required. If the Co-Borrower section was completed about a non-applicant spouse or other person, this Statement and supporting schedules must be completed about that spouse or other person also.

Completed ☐ Jointly ☐ Not Jointly

ASSETS Description	**Cash or Market Value**	**Liabilities and Pledged Assets.** List the creditor's name, address, and account number for all outstanding debts, including automobile loans, revolving charge accounts, real estate loans, alimony, child support, stock pledges, etc. Use continuation sheet, if necessary. Indicate by (*) those liabilities, which will be satisfied upon sale of real estate owned or upon refinancing of the subject property.
Cash deposit toward purchase held by:	$	

List checking and savings accounts below		**LIABILITIES**	**Monthly Payment & Months Left to Pay**	**Unpaid Balance**
Name and address of Bank, S&L, or Credit Union		Name and address of Company	$ Payment/Months	$
Acct. no.	$	Acct. no.		
Name and address of Bank, S&L, or Credit Union		Name and address of Company	$ Payment/Months	$
Acct. no.	$	Acct. no.		
Name and address of Bank, S&L, or Credit Union		Name and address of Company	$ Payment/Months	$
Acct. no.	$	Acct. no.		

VI. ASSETS AND LIABILITIES (cont'd)

Name and address of Bank, S&L, or Credit Union		Name and address of Company	$ Payment/Months	$
Acct. no.	$	Acct. no.		
Stocks & Bonds (Company name/ number & description)	$	Name and address of Company	$ Payment/Months	$
		Acct. no.		
Life insurance net cash value Face amount: $	$	Name and address of Company	$ Payment/Months	$
Subtotal Liquid Assets	$			
Real estate owned (enter market value from schedule of real estate owned)	$			
Vested interest in retirement fund	$			
Net worth of business(es) owned (attach financial statement)	$	Acct. no.		
Automobiles owned (make and year)	$	Alimony/Child Support/Separate Maintenance Payments Owed to:	$	
Other Assets (itemize)	$	Job-Related Expense (child care, union dues, etc.)	$	
		Total Monthly Payments	$	
Total Assets a.	$	Net Worth (a minus b) ▶ $	**Total Liabilities b.**	$

Schedule of Real Estate Owned (If additional properties are owned, use continuation sheet.)

Property Address (enter S if sold, PS if pending sale or R if rental being held for income) ▼		Type of Property	Present Market Value	Amount of Mortgages & Liens	Gross Rental Income	Mortgage Payments	Insurance, Maintenance, Taxes & Misc.	Net Rental Income
			$	$	$	$	$	$
		Totals	$	$	$	$	$	$

List any additional names under which credit has previously been received and indicate appropriate creditor name(s) and account number(s):

Alternate Name	Creditor Name	Account Number

VII. DETAILS OF TRANSACTION

a.	Purchase price	$
b.	Alterations, improvements, repairs	
c.	Land (if acquired separately)	
d.	Refinance (incl. debts to be paid off)	
e.	Estimated prepaid items	
f.	Estimated closing costs	
g.	PMI, MIP, Funding Fee	
h.	Discount (if Borrower will pay)	
i.	Total costs (add items a through h)	

VIII. DECLARATIONS

If you answer "Yes" to any questions a through i, please use continuation sheet for explanation.

	Borrower		Co-Borrower	
	Yes	No	Yes	No
a. Are there any outstanding judgments against you?	☐	☐	☐	☐
b. Have you been declared bankrupt within the past 7 years?	☐	☐	☐	☐
c. Have you had property foreclosed upon or given title or deed in lieu thereof in the last 7 years?	☐	☐	☐	☐
d. Are you a party to a lawsuit?	☐	☐	☐	☐
e. Have you directly or indirectly been obligated on any loan which resulted in foreclosure, transfer of title in lieu of foreclosure, or judgment?	☐	☐	☐	☐

(This would include such loans as home mortgage loans, SBA loans, home improvement loans, educational loans, manufactured (mobile) home loans, any mortgage, financial obligation, bond, or loan guarantee. If "Yes," provide details, including date, name, and address of Lender, FHA or VA case number, if any, and reasons for the action.)

VII. DETAILS OF TRANSACTION

j.	Subordinate financing	
k.	Borrower's closing costs paid by Seller	
l.	Other Credits (explain)	
m.	Loan amount (exclude PMI, MIP, Funding Fee financed)	
n.	PMI, MIP, Funding Fee financed	
o.	**Loan amount (add m & n)**	
p.	Cash from/to Borrower (subtract j, k, l & o from i)	

VIII. DECLARATIONS

If you answer "Yes" to any questions a through i, please use continuation sheet for explanation.	Borrower Yes	Borrower No	Co-Borrower Yes	Co-Borrower No
f. Are you presently delinquent or in default on any Federal debt or any other loan, mortgage, financial obligation, bond, or loan guarantee?	☐	☐	☐	☐
g. Are you obligated to pay alimony, child support, or separate maintenance?	☐	☐	☐	☐
h. Is any part of the down payment borrowed?	☐	☐	☐	☐
i. Are you a co-maker or endorser on a note?	☐	☐	☐	☐
j. Are you a U.S. citizen?	☐	☐	☐	☐
k. Are you a permanent resident alien?	☐	☐	☐	☐
l. Do you intend to occupy the property as your primary residence?	☐	☐	☐	☐
If Yes," complete question m below.				
m. Have you had an ownership interest in a property in the last three years?	☐	☐	☐	☐
(1) What type of property did you own—principal residence (PR), second home (SH), or investment property (IP)?	_____		_____	
(2) How did you hold title to the home— by yourself (S), jointly with your spouse (SP), or jointly with another person (O)?	_____		_____	

IX. ACKNOWLEDGEMENT AND AGREEMENT

Each of the undersigned specifically represents to Lender and to Lender's actual or potential agents, brokers, processors, attorneys, insurers, servicers, successors and assigns and agrees and acknowledges that: (1) the information provided in this application is true and correct as of the date set forth opposite my signature and that any intentional or negligent misrepresentation of this information contained in this application may result in civil liability, including monetary damages, to any person who may suffer any loss due to reliance upon any misrepresentation that I have made on this application, and/or in criminal penalties including, but not limited to, fine or imprisonment or both under the provisions of Title 18, United States Code, Sec. 1001, et seq.; (2) the loan requested pursuant to this application (the "Loan") will be secured by a mortgage or deed of trust on the property described in this application; (3) the property will not be used for any illegal or prohibited purpose or use; (4) all statements made in this application are made for the purpose of obtaining a residential mortgage loan; (5) the property will be occupied as indicated in this application; (6) the Lender, its servicers, successors or assigns may retain the original and/or an electronic record of this application, whether or not the Loan is approved; (7) the Lender and its agents, brokers, insurers, servicers, successors, and assigns may continuously rely on the information contained in the application, and I am obligated to amend and/or supplement the information provided in this application if any of the material facts that I have represented herein should change prior to closing of the Loan; (8) in the event that my payments on the Loan become delinquent, the Lender, its servicers, successors or assigns may, in addition to any other rights and remedies that it may have relating to such delinquency, report my name and account information to one or more consumer reporting agencies; (9) ownership of the Loan and/or administration of the Loan account may be transferred with such notice as may be required by law; (10) neither Lender nor its agents, brokers, insurers, servicers, successors or assigns has made any representation or warranty, express or implied, to me regarding the property or the condition or value of the property; and (11) my transmission of this application as an "electronic record" containing my "electronic signature," as those terms are defined in applicable federal and/or state laws (excluding audio and video recordings), or my facsimile transmission of this application containing a facsimile of my signature, shall be as effective, enforceable and valid as if a paper version of this application were delivered containing my original written signature.

Acknowledgement. Each of the undersigned hereby acknowledges that any owner of the Loan, its servicers, successors and assigns, may verify or reverify any information contained in this application or obtain any information or data relating to the Loan, for any legitimate business purpose through any source, including a source named in this application or a consumer reporting agency.

Borrower's Signature	Date	Co-Borrower's Signature	Date
X		X	

X. INFORMATION FOR GOVERNMENT MONITORING PURPOSES

The following information is requested by the Federal Government for certain types of loans related to a dwelling in order to monitor the lender's compliance with equal credit opportunity, fair housing and home mortgage disclosure laws. You are not required to furnish this information, but are encouraged to do so. The law provides that a lender may not discriminate either on the basis of this information, or on whether you choose to furnish it. If you furnish the information, please provide both ethnicity and race. For race, you may check more than one designation. If you do not furnish ethnicity, race, or sex, under Federal regulations, this lender is required to note the information on the basis of visual observation and surname if you have made this application in person. If you do not wish to furnish the information, please check the box below. (Lender must review the above material to assure that the disclosures satisfy all requirements to which the lender is subject under applicable state law for the particular type of loan applied for.)

BORROWER ☐ I do not wish to furnish this information	**CO-BORROWER** ☐ I do not wish to furnish this information
Ethnicity: ☐ Hispanic or Latino ☐ Not Hispanic or Latino	**Ethnicity:** ☐ Hispanic or Latino ☐ Not Hispanic or Latino
Race: ☐ American Indian or Alaska Native ☐ Asian ☐ Black or African American ☐ Native Hawaiian or Other Pacific Islander ☐ White	**Race:** ☐ American Indian or Alaska Native ☐ Asian ☐ Black or African American ☐ Native Hawaiian or Other Pacific Islander ☐ White
Sex: ☐ Female ☐ Male	**Sex:** ☐ Female ☐ Male

To be Completed by Loan Originator:
This information was provided:
- ☐ In a face-to-face interview
- ☐ In a telephone interview
- ☐ By the applicant and submitted by fax or mail
- ☐ By the applicant and submitted via e-mail or the Internet

Loan Originator's Signature X		Date
Loan Originator's Name (print or type)	Loan Originator Identifier	Loan Originator's Phone Number (including area code)
Loan Origination Company's Name	Loan Origination Company Identifier	Loan Origination Company's Address

CONTINUATION SHEET/RESIDENTIAL LOAN APPLICATION

Use this continuation sheet if you need more space to complete the Residential Loan Application. Mark **B** for Borrower or **C** for Co-Borrower.	Borrower:	Agency Case Number:
	Co-Borrower:	Lender Case Number:

I/We fully understand that it is a Federal crime punishable by fine or imprisonment, or both, to knowingly make any false statements concerning any of the above facts as applicable under the provisions of Title 18, United States Code, Section 1001, et seq.

Borrower's Signature	Date	Co-Borrower's Signature	Date
X		X	

Exhibit 3

Typical Property Tax Bill

Placer County

Detail of Assessments, Special Taxes and other Charges

TC0100INQv095: Main — **Current Secured [A,B,S]** — Sep 07, 2012 12:51 pm

Assessment	Year	As of Date	Owner
	2012	Fri 09/07/2012	

Code	Descr	Base	Rate	TaxAmt1	PenAmt1	TaxAmt2	PenAmt2
63200	City of Rocklin Park Dev & Maint	1	0	$5.00	$0.50	$5.00	$0.50
59700	Placer Mosquito & Vector Control	1	0	$12.38	$1.23	$12.38	$1.23
36700	Rocklin Unif B&I 1998	7	0.021847	$45.99	$4.59	$45.99	$4.59
63100	City of Rocklin LLD #2	1	0	$78.46	$7.84	$78.46	$7.84
68450	City of Rocklin CFD#1 Fire Stn #3 MR	1	0	$133.01	$13.30	$133.01	$13.30
68500	City of Rocklin CFD#5 MR	1	0	$218.48	$21.84	$218.48	$21.84
36100	Rocklin Unif B&I 1991	7	0.114384	$240.78	$24.07	$240.78	$24.07
64800	Rocklin Unif Sch CFD#3 MR	1	0	$372.44	$37.24	$372.44	$37.24
63700	City of Rocklin CFD #10 MR	1	0	$752.38	$75.23	$752.38	$75.23
92811	Placer County AB811 mPOWER Contractual Asmt	1	0	$883.67	$88.36	$883.67	$88.36
00001	Property Tax-1% Rate	7	1	$2,105.00	$210.55	$2,105.00	$210.55

TRA 004-089

Total Taxes	$2,391.77	$239.21	$2,391.77	$239.21
Total Direct Charges	$2,455.82	$245.54	$2,455.82	$245.54
Total Taxes + Direct Charges	$4,847.59	$484.75	$4,847.59	$484.75

Asmt | Owners | Values | Tax Codes | Taxes | Part Pays | Coll. Refunds | R/C Refunds | Supl Index

Summary — Find

Exhibit 4

Compendium of Research and Documentation

Exhibit 4

Compendium of Research and Documentation

Kok, Nils and Kahn, Matthew E., July 2012. "The Value of Green Labels in the California Housing Market, An Economic Analysis of the Impact of Green labeling on the Sales Price of a Home"

Griffin, Ann and Kaufman, Ben and Hamilton, Sterling, May 29, 2009. "Certified Home Performance: Assessing the Market Impacts of Third Party Certification on Residential Properties", Earth Advantage Institute

Earth Advantage Institute, June 8, 2011, "Certified Homes Outperform Non-certified Homes for Fourth Year, Existing Homes with a Certification Earn 30% More"

Dastrup, Samuel, Graff Zivin, Joshua S., Costa, Dora L., Kahn, Matthew E., July 2011, "Understandng the Solar Home Price Premium: Electricity Generation and "Green" Social Status", National Bureau of Economic Research

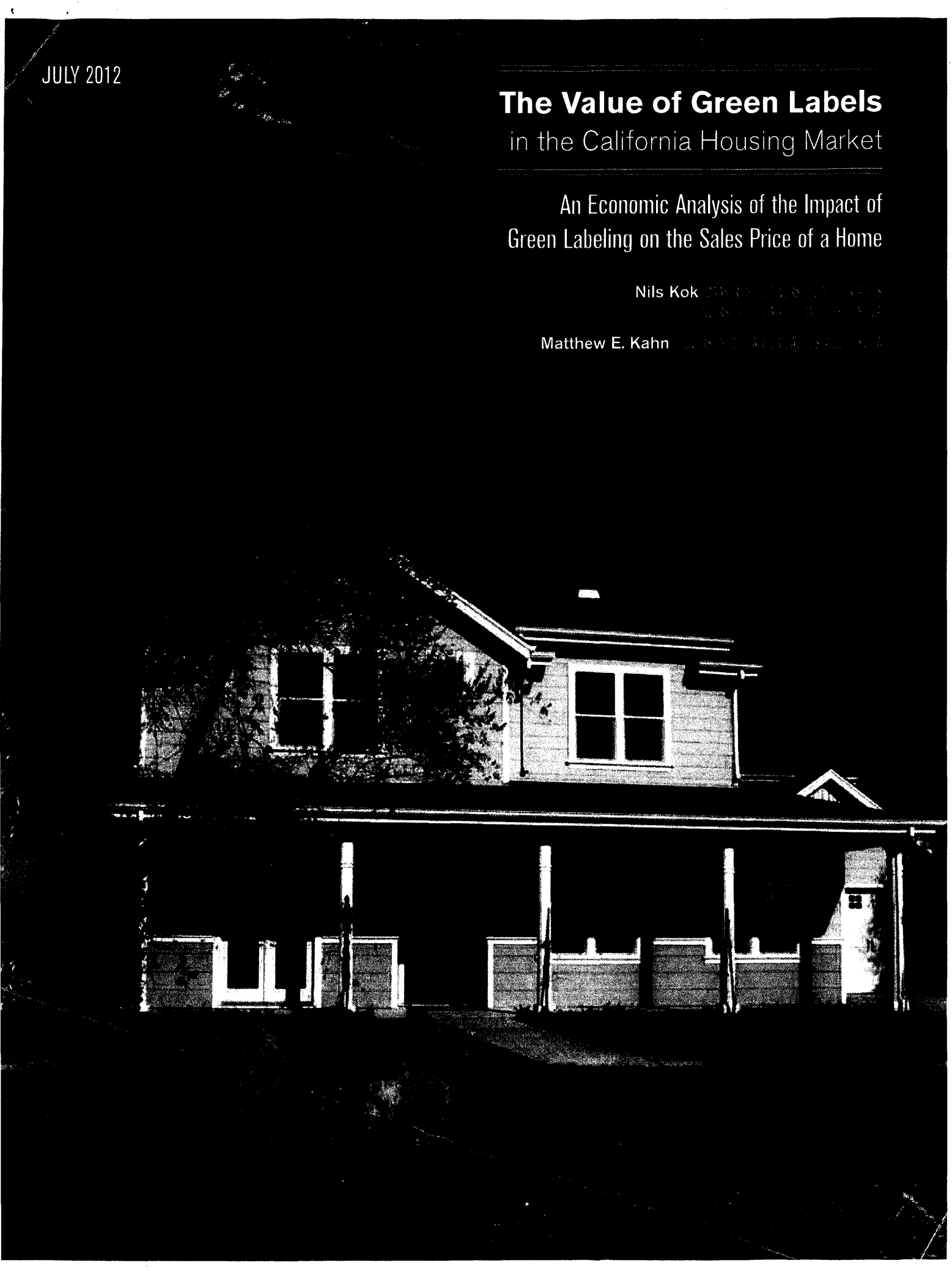
JULY 2012

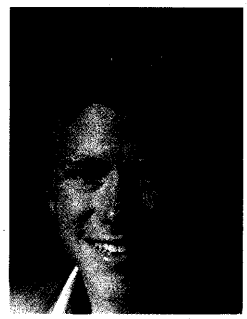
The Value of Green Labels
in the California Housing Market

An Economic Analysis of the Impact of Green Labeling on the Sales Price of a Home

Nils Kok

Matthew E. Kahn





Nils Kok

Nils Kok currently holds positions as a visiting scholar at the Goldman School of Public Policy at the University of California at Berkeley, and as associate professor in Finance and Real Estate at Maastricht University, the Netherlands. His research on the intersection of sustainability and finance in the real estate sector has been rewarded with several international grants and prizes, and has appeared in leading academic journals. He communicates his ideas and findings in the global arena as a frequent speaker at academic and industry conferences and actively shares his expertise through workshops with investment practitioners and policy-makers. Nils is also the co-founder of the Global Real Estate Sustainability Benchmark (GRESB), a premier investor-led initiative to assess the environmental and social performance of the global real estate investment industry. More information and blog at www.nilskok.com.

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Matthew E. Kahn

Matthew E. Kahn is a professor at the UCLA Institute of the Environment, the Department of Economics, the Department of Public Policy, the UCLA Anderson School of Management and the UCLA School of Law. He is a research associate at the National Bureau of Economic Research. He holds a Ph.D. in economics from the University of Chicago. Before joining the UCLA faculty in January 2007, he taught at Columbia University and the Fletcher School at Tufts University. He has served as a visiting professor at Harvard and Stanford Universities. He is the author of Green Cities: Urban Growth and the Environment (Brookings Institution Press 2006) and the co-author of Heroes and Cowards: The Social Face of War (Princeton University Press 2008). He is the author of Climatopolis: How Our Cities Will Thrive in the Hotter World (Basic Books 2010). His research areas include environmental, urban, energy and real estate economics.

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EXECUTIVE SUMMARY

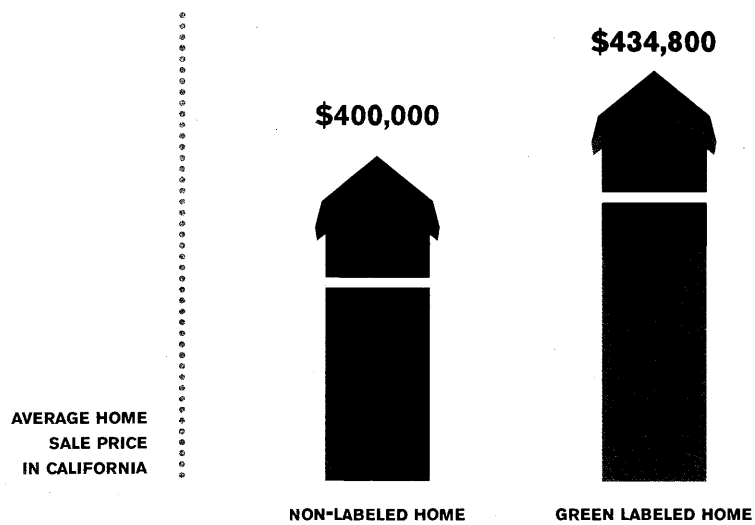
"The Value of Green Labels in the California Housing Market" is the first study to provide statistical evidence that, holding other factors constant, a green label on a single-family home in California provides a market premium compared to a comparable home without the label. The research also indicates that the price premium is influenced by local climate and environmental ideology. To reach these conclusions, researchers conducted an economic analysis of 1.6 million homes sold in California between 2007 and 2012, controlling for other variables known to influence home prices in order to isolate the added value of green home labels.

KEY FINDING: Green Home Labels Add 9 Percent Price Premium

This study, conducted by economists at the University of California, Berkeley and University of California, Los Angeles, finds that California homes labeled by Energy Star, LEED for Homes and GreenPoint Rated sell for 9 percent more (±4%) than comparable, non-labeled homes. Because real estate prices depend on a variety of factors, the study controlled for key variables that influence home prices including location, size, vintage, and the presence of major amenities such as swimming pools, views and air conditioning. Considering that the average sales price of a non-labeled home in California is $400,000, the price premium for a certified green home translates into some $34,800 more than the value of a comparable home nearby.

Green labeled homes sell at higher prices

A green label adds an average **9%** price premium to sale price versus other comparable homes.



GREEN LABELS FOR HOMES

Green home labels such as Energy Star, LEED for Homes, and GreenPoint Rated have been established to verify and communicate to consumers that a home is designed and built to use energy efficiently. Green homes also provide benefits beyond energy savings, such as more comfortable and stable indoor temperatures and more healthful indoor air quality. LEED and GreenPoint Rated homes also feature efficient water use; sustainable, non-toxic building materials; and other features that reduce their impact on the environment, such as proximity to parks, shops and transit.

EXPLAINING THE GREEN PREMIUM

This study yields two key insights into the effect of green labels on property values, and why these effects can be so significant. This is especially important in light of the fact that the added value of a green-labeled home far exceeds both the estimated cost of adding energy efficiency features to a home and the utility-bill savings generated by those improvements. Clearly, other factors are in play in producing this premium:

- The results show that the resale premium associated with a green label varies considerably from region to region in California, and is highest in the areas with hotter climates. It is plausible that residents in these areas value green labels more due to the increased cost of keeping a home cool.
- The premium is also positively correlated to the environmental ideology of the area, as measured by the rate of registration of hybrid vehicles. In line with previous evidence on the private value of green product attributes, this correlation suggests that some homeowners may attribute value to intangible qualities associated with owning a green home, such as pride or perceived status.

RESEARCH METHODOLOGY

The study, conducted by Matthew E. Kahn of UCLA and Nils Kok, visiting scholar at UC Berkeley and affiliated with Maastricht University in the Netherlands, examined all of the 1.6 million single-family homes sold between 2007 and 2012 in California. Of those homes, 4,321 were certified under Energy Star Version 2, GreenPoint Rated, or LEED for Homes. Seventy percent of the homes with a green label that were sold during this time period were new construction. The economic approach used, called "hedonic pricing analysis," controlled for a large number of variables that affect real estate pricing, such as vintage, size, location (by zip code) and the presence of major amenities (e.g., pools, views, and air conditioning). The findings of this study echo the results of previous research in the commercial real estate sector, which has found that green labels positively affect rents, vacancy rates and transaction prices for commercial space in office buildings.

1. INTRODUCTION

Increased awareness of energy efficiency and its importance in the built environment have turned public attention to more efficient, "green" building. Indeed, previous research has documented that the inventory of certified green *commercial* space in the U.S. has increased dramatically since the introduction of rating schemes that attest to the energy efficiency or sustainability of commercial buildings (based on criteria published by the public and private institutions administering the rating schemes). Importantly, tenants and investors value the "green" features in such buildings. There is empirical evidence that "green" labels affect the financial performance of commercial office space: Piet Eichholtz *et al.* (2010) study commercial office buildings certified under the LEED program of the US Green Building Council (USGBC) and the Energy Star program of the EPA, documenting that these labels positively affect rents, vacancy rates and transaction prices.

Of course, private homeowners may be different from tenants and investors in commercial buildings, especially in the absence of standardized, publicly available information on the energy efficiency of homes. But in recent years, there has been an increase in the number of homes certified as energy efficient or sustainable based on national standards such as Energy Star and LEED and local standards such as GreenPoint Rated in California. By obtaining verification from a third party that these homes are designed and built to use energy and other resources more efficiently than prescribed by building codes, homes with "green" labels are claimed to offer lower operational costs than conventional homes. In addition, it is claimed that owners of such homes enjoy ancillary benefits beyond energy savings, such as greater comfort levels and better indoor environmental quality. If consumers observe and capitalize these amenities, hedonic methods can be used to measure the price premium for such attributes, representing the valuation of the marginal buyer (Patrick L. Bajari and Lanier C. Benkard, 2005, Sherwin Rosen, 1974).

In the European Union, the introduction of energy labels, following the 2003 European Performance of Buildings Directive (EPBD), has provided single-family homebuyers with information about how observationally identical homes differ with respect to thermal efficiency. Presumably, heterogeneity in thermal efficiency affects electricity and gas consumption. The EU energy label seems to be quite effective in resolving the information asymmetry in understanding the energy efficiency of dwellings: Dirk Brounen and Nils Kok (2011) estimate hedonic pricing gradients for recently sold homes in the Netherlands and document that homes receiving an "A" grade in terms of energy efficiency sell for a 10 percent price premium. Conversely, dwellings that are labeled as inefficient transact for substantial discounts relative to otherwise comparable, standard homes.

We are not aware of any large sample studies the United States that have investigated the financial performance of "green" homes. There is some information on the capitalization of solar panels in home prices; one study based in California documents that homes with solar panels sell for roughly 3.5 percent more than comparable homes without solar panels (Samuel R. Dastrup *et al.*, 2012). But unlike findings in previous research on the commercial real estate sector, there is a dearth of systematic evidence on the capitalization of energy efficiency and other sustainability-related amenities in asset prices of the residential building stock, leading to uncertainty among private investors and developers about whether and how much to invest in the construction and redevelopment of more efficient homes.[1]

[1] There are some industry-initiated case studies on the financial performance of "green" homes. An example is a study by the Earth Advantage Institute, which documents for a sample of existing homes in Oregon that those with a sustainable certification sell for 30 percent more than homes without such a designation, based on sales data provided by the Portland Regional Multiple Listing Service. However, the sources of the economic premiums are diverse, not quantified, and not based on rigorous econometric estimations.

This paper is the first to systematically address the impact of labels attesting to energy efficiency and other "green" features of single-family dwellings on the value of these homes as observed in the marketplace, providing evidence on the private returns to the investments in energy-efficient single-family dwellings, an increasingly important topic for the residential market in the U.S.

Using a sample of transactions in California, consisting of some 4,231 buildings certified by the USGBC, EPA, and a statewide rating agency, Build It Green, and a control sample of some 1.6 million non-certified homes, we relate transaction prices of these dwellings to their hedonic characteristics, controlling for geographic location and the time of the sale.

The results indicate the importance of a label attesting to the sustainability of a property in affecting the transaction price of recently constructed homes as observed in the marketplace, suggesting that an otherwise comparable dwelling with a "green" certification will transact for about 9 percent more. The results are robust to the inclusion of a large set of control variables, such as dwelling vintage, size and the presence of amenities, although we cannot control for "unobservables," such as the prestige of the developer and the relative quality of durables installed in the home.

In addition to estimating the average effect, we test whether the price premium is higher for homes located in hotter climates and in electric utility districts featuring higher average residential electricity prices. Presumably, more efficient homes are more valuable in regions where climatic conditions demand more cooling, and where energy prices are higher. In line with evidence on the capitalization of energy efficiency in commercial buildings (Piet Eichholtz *et al.*, in press), our results suggest that a label appears to add more value in hotter climates, where cooling expenses are likely to be a larger part of total housing expenses. This provides some evidence on the rationality of consumers in appropriately capitalizing the benefits of more efficient homes.

We also test whether the price of certified homes is affected by consumer ideology, as measured by the percentage of hybrid registrations in the neighborhood. A desire to be environmentally conscious may increase the value of "green" homes because it is a tangible signal of environmental virtue (Steven E. Sexton and Alison L. Sexton, 2011), and an action a person can take in support of their environmental commitment. The results show that the green premium is positively related to the environmental ideology of the neighborhood; green homes located in areas with a higher fraction of hybrid registrations sell for higher prices. Some homeowners seem to attribute non-financial utility to a green label (and its underlying features), which is in line with previous evidence on the private value of green product attributes (Matthew E. Kahn, 2007).

The remainder of this paper is organized as follows: Section 2 describes the empirical framework and the econometric models. Section 3 discusses the data, which represent a unique combination of dwelling-level transaction data with detailed information on "green" labels that have been assigned to a subsample of the data. In Section 4, we provide the main results of the analysis. Section 5 provides a discussion and policy implications of the findings.

2. METHOD AND EMPIRICAL FRAMEWORK

Consider the determinants of the value of a single-family dwelling at a point in time as a bundle of residential services consumed by the household (John F. Kain and John M. Quigley, 1970). It is well-documented in the urban economics literature that the services available in the neighborhood, such as schools, public transport and other amenities, will explain a large fraction of the variation in price (see, for example, Joseph Gyourko *et al.*, 1999). But of course, the dwelling's square footage, architecture and other structural attributes will also influence its value.

In addition to attributes included in standard asset pricing models explaining home prices, the thermal characteristics and other "sustainability" features of the dwelling may have an impact on the transaction price. These characteristics provide input, which combined with energy inputs, provide comfort (John M. Quigley and Daniel L. Rubinfield, 1989). However, the energy efficiency of homes (and their equipment) is often hard to observe, leading to information asymmetry between the seller and the buyer. In fact, homeowners typically have limited information on the efficiency of their own home; it has been documented that the "energy literacy" of resident households is quite low (Dirk Brounen *et al.*, 2011). Indeed, recent evidence shows that providing feedback to private consumers with respect to their energy consumption is a simple, but effective "nudge" to improve their energy efficiency (Hunt Allcott, 2011).

To resolve the information asymmetry in energy efficiency, and also in related "green" attributes, energy labels and green certificates have been introduced in commercial and residential real estate markets. The labels can be viewed as an additional step to enhance the transparency of resource consumption in the real estate sector. Such information provision may enable private investors to take sustainability into account when making housing decisions, reducing ostly economic research (Robert W. Gilmer, 1989). From an economic perspective, the labels should have financial utility for prospective homeowners, as the savings resulting from purchasing a more efficient home may result in lower operating costs during the economic life, or less exposure to utility cost escalation over time.[2] In addition, similar to a high quality "view," various attributes of homes, such as durability or thermal comfort, may not provide a direct cash flow benefit, but may still be monetized in sales transactions.

To empirically test this hypothesis, we relate the logarithm of the transaction price to the hedonic characteristics of single-family homes, controlling precisely for the variations in the measured and unmeasured characteristics of rated buildings and the nearby control dwellings, by estimating:

$$(1)\ \log(R_{ijt}) = \alpha green_{it} + \beta X_i + \gamma_{jt} + \varepsilon_{ijt}$$

In this formulation, R_{ijt} is the home's sales price commanded by dwelling i in cluster j in quarter t; X_i is the set of hedonic characteristics of building i, and ε_{ijt} is an error term. To control more precisely for locational effects, we include a set of dummy variables, one for each of the j zip codes. These zip-code-fixed effects account for cross-area differences in local public goods such as weather, crime, neighborhood demographics and school quality. To capture the time-variance in local price dynamics, we interact zip-code-fixed effects with year/month indicators; the transaction prices of homes are thus allowed to vary by each month during the time period, in each specific location. This rich set of fixed effects allows for local housing market trends and captures the value of time-varying local public goods, such

[2] For the commercial real estate market, a series of papers that study investor and tenant demand for "green" office space in the U.S. show that buildings with an Energy Star label–indicating that a building belongs to the top 25 percent of the most energy-efficient buildings–or a LEED label have rents that are two to three percent higher as compared to regular office buildings. Transaction prices for energy-efficient office buildings are higher by 13 to 16 percent. Further analyses show that the cross-sectional variation in these premiums has a strong relation to real energy consumption, indicating that tenants and investors in the commercial property sector capitalize energy savings in their investment decisions (Piet Eichholtz *et al.*, 2010; in press).

as crime dynamics or the growth or decline of a nearby employment district. $green_i$ is a dummy variable with a value of one if dwelling i is rated by the EPA, USGBC or Build It Green, and zero otherwise. $\alpha, \beta, \gamma_{jt}$ are estimated coefficients. α is thus the average premium, in percent, estimated for a labeled building relative to those observationally similar buildings in its geographic cluster–the zip code. Standard errors are clustered at the zip code level to control for spatial autocorrelation in prices within zip codes.

In a second set of estimates, we include in equation (1) additional interaction terms where we interact "green" with a vector of locational attributes:

$$(2)\ \log(R_{ijt}) = \alpha_0 green_{it} + \alpha_1 N green_{it} + \beta X_i + \gamma_{jt} + \varepsilon_{ijt}$$

We estimate equation (2) to study whether the "green label" premium varies with key observables such as climatic conditions and local electricity prices.[3] We posit that green homes will be more valuable in areas that experience more hot days and areas where electricity prices are high. Presumably, the present value of future energy savings is highest in those regions, which should be reflected in the value attributed to the "green" indicator.

A second interaction effect addressed in this study is whether the capitalization effect of green labels is larger in communities that reveal a preference for "green products." A desire to appear environmentally conscious or to act on one's environmental values may increase the financial value of "green" homes because it is a signal of environmental virtue.[4] Our proxy for environmental idealism is the Toyota Prius share of registered vehicles in the zip code (these data are from the year 2007).[5] Last, we test for whether the green home premium differs over the business cycle. The recent sharp recession offers significant variation in demand for real assets, which may affect the willingness to pay for energy efficiency and other green attributes.

Anecdotally, we know that the green homes in our sample are mostly "production homes" and not high-end custom homes–many large residential developers, such as KB Homes, are now constructing Energy Star and GreenPoint Rated homes. But, it is important to note that we do not have further information on the characteristics of the developers of "green" homes and conventional homes. Therefore, we cannot control for the possibility that some developers choose to systematically bundle green attributes with other amenities, such more valuable appliances in green homes or a higher-quality finishing. We assume that such unobservables are not systematically correlated with green labels. Otherwise, we would overestimate the effects of "green" on housing prices.

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[3] In model (2), we replace the zip-code-fixed effects for county fixed effects, as data on Prius registrations, electricity prices and the clustering of green homes is measured at the zip code level. To further control for the quality of the neighborhood and the availability of local public goods, we include a set of demographic variables from the Census bureau, plus distance to the central business district (CBD) and distance to the closest public transportation hub.

[4] This is comparable to private investors' preference for socially responsible investments (Jeroen Derwall *et al.*, 2011).

[5] See Matthew E. Kahn (2007) for a discussion of Prius registrations as proxy for environmentalism.

3. DATA

A. Green Homes: Measurements and Data Sources

In the U.S., there are multiple programs that encourage the development of energy efficient and sustainable dwellings through systems of ratings to designate and publicize exemplary buildings. These labels are asset ratings: snapshots in time that quantify the thermal and other sustainability characteristics of the building and predict its energy performance through energy modeling. They neither measure actual performance, nor take occupant behavior into account. The Energy Star program, jointly sponsored by the U.S. Environmental Protection Agency and the U.S. Department of Energy, is intended to identify and promote energy-efficient products, appliances, and buildings. The Energy Star label was first offered for residential buildings in 1995.[6]

The Energy Star label is an asset rating touted as a vehicle for reducing operational costs in heating, cooling, and water-delivering in homes, with conservation claims in the range of 20 to 30 percent, or $200 to $400 in annual savings. In addition, it is claimed that the label improves comfort by sealing leaks, reducing indoor humidity and creating a quieter environment. But the Energy Star label is also marketed as a commitment to conservation and environmental stewardship, reducing air pollution.

In a parallel effort, the US Green Building Council, a private non-profit organization, has developed the LEED (Leadership in Energy and Environmental Design) green building rating system to encourage the "adoption of sustainable green building and development practices." Since adoption in 1999, separate standards have been applied to new buildings and to existing structures.

The LEED label requires sustainability performance in areas beyond energy use, and the requirements for certification of LEED buildings are substantially more complex than those for the award of an Energy Star rating. The certification process for homes measures six distinct components of sustainability: sustainable sites, water efficiency, materials and resources, indoor environmental quality, innovation, as well as energy performance. Additional points can be obtained for location and linkages, and awareness and education.[7]

Whereas LEED ratings for commercial (office) space have diffused quite rapidly over the past 10 years (see Nils Kok *et al.*, 2011, for a discussion), the LEED for Homes rating began in pilot form only in 2005, and it was fully balloted as a rating system in January 2008.

It is claimed that LEED-certified dwellings reduce expenses on energy and water, have increased asset values, and that they provide healthier and safer environments for occupants. It is also noted that the award of a LEED designation "demonstrate[s] an owner's commitment to environmental stewardship and social responsibility."

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[6] Under the initial rating system, which lasted until 2006, buildings could receive an Energy Star certification if improvements were made in several key areas of the home, including high-performance windows, tight constructions and ducts, and efficient heating and cooling equipment. An independent third-party verification by a certified Home Energy Rater was required. Homes qualified under Energy Star Version 1 had to meet a predefined energy efficiency score ("HERS") of 86, equating more than 30 percent energy savings as compared to a home built to the 1992 building code. From January 2006 until the end of 2011, homes were qualified under Energy Star Version 2. This version was developed in response to increased mandatory requirements in the national building codes and local regulations, as well as technological progress in construction practices. The updated guidelines included a visual inspection of the insulation installation, a requirement for appropriately sized HVAC systems, and a stronger promotion of incorporating efficient lighting and appliances into qualified homes. An additional "thermal bypass checklist" (TBC) became mandatory in 2007. As of 2012, Energy Star Version 3 has been in place, including further requirements for energy efficiency measures and strict enforcement of checklist completion.

[7] For more information on the rating procedures and measurements for LEED for Homes, see: http://www.usgbc.org/DisplayPage.aspx?CMSPageID=147.

In addition to these national programs intended for designating exemplary performance in the energy efficiency and sustainability of (single-family) homes, some labeling initiatives have emerged at the city or state level. In California, the most widely adopted of these is GreenPoint Rated, developed by Build It Green, a non-profit organization whose mission is to promote healthy, energy- and resource-efficient homes in California.

The GreenPoint Rated scheme is comparable to LEED for Homes, including multiple components of "sustainability" in the rating process, with minimum rating requirements for energy, water, indoor air quality, and resource conservation. Importantly, the GreenPoint Rated scheme is available not just for newly constructed homes, but it is applicable to homes of all vintages. The label is marketed as "a recognizable, independent seal of approval that verifies a home has been built or remodeled according to proven green standards." Comparable to other green rating schemes, proponents claim that a GreenPoint rating can improve property values at the time of sale.

B. Data on Homes Prices and Their Determinants

We obtain information on LEED-rated homes and GreenPoint Rated homes using internal documentation provided by the USGBC and Build It Green, respectively. Energy-Star-rated homes are identified by street address in files available from local Energy Star rating agencies. We focus our analysis on the economically most important state of California, covering the 2007–2012 time period.

The number of homes rated by the "green" schemes is still rather limited – 4,921 single-family homes rated with GreenPoint Rated and 489 homes rated with LEED for Homes (as of January 2012). The number of homes that obtained an Energy Star label is claimed to be substantially larger, but we note that data on Energy Star Version 1 has not been documented, and information on homes certified under Energy Star Version 2 is not stored in a central database at the federal level. Therefore, we have to rely on information provided by consultants who conduct Energy Star inspections. We obtained details on 4,938 single-family dwellings that have been labeled under the Energy Star Version 2 program.

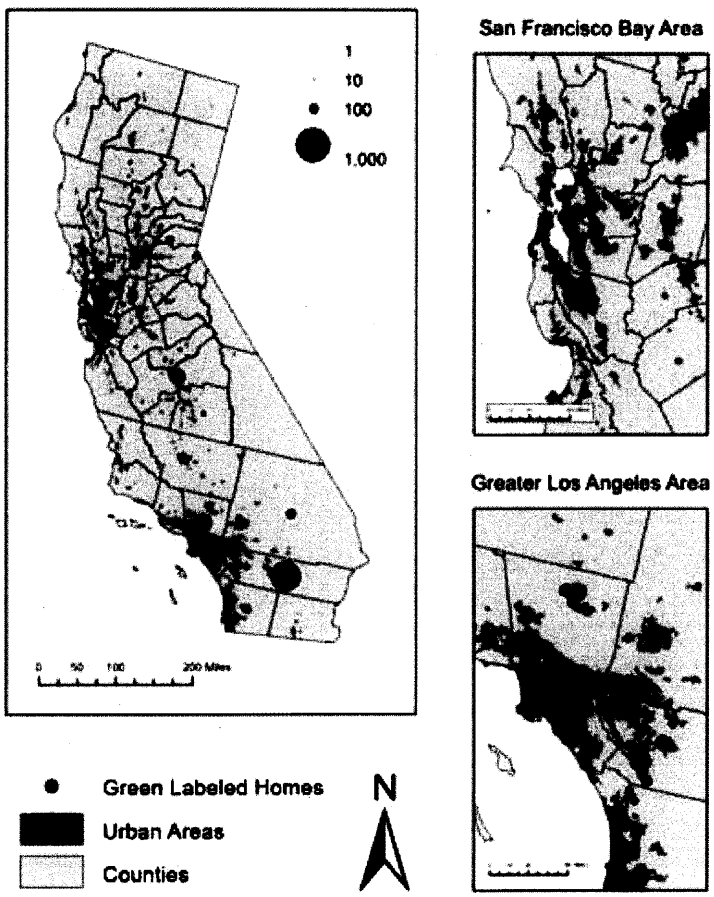
We matched the addresses of the buildings rated in these three programs as of January 2012 to the single-family residential dwellings identified in the archives maintained by DataQuick. The DataQuick service and the data files maintained by DataQuick are advertised as a "robust national property database and analytic expertise to deliver innovative solutions for any company participating in the real estate market."[8] Our initial match yielded 8,243 certified single-family dwellings for which an assessed value or transaction price, and dwelling characteristics could be identified in the DataQuick files; of those homes, 4,231 transacted during the sample period.[9]

[8] DataQuick maintains an extensive micro database of approximately 120 million properties and 250 million property transactions. The data has been extensively used in previous academic studies. See, for example, Raphael W. Bostic and Kwan Ok Lee (2008) and Fernando Ferreira *et al.* (2010).

[9] We were not able to match the remaining 2,105 certified properties to the DataQuick files. Reasons for the missing observations include, for example, properties that were still under construction, and incomplete information on certified properties.

Figure 1 shows the geographic distribution of the certified homes in our sample. There is a clustering of "green" rated homes in certain areas, such as the Los Angeles region and the San Francisco region. The geographic distribution is correlated with higher incomes (e.g., in the San Francisco Bay Area), but also with higher levels of construction activity in recent years (e.g., in the Central Valley). As shown by the maps, in the case of Los Angeles, many of the "green label" homes are built in the hotter eastern part of the metropolitan area. It is important to note that there is little new construction in older, richer cities such as Berkeley and Santa Monica (Matthew E. Kahn, 2011). This means that it is likely to be the case that there will be few single-family "green homes" built in such areas.

FIGURE 1. Certified Homes in California (2007-2012)



Sources: Build It Green, EPA, and USGBC

To investigate the effect of energy efficiency and sustainability on values of dwellings as observed in the market, we also collect information on all non-certified single-family dwellings that transacted during the same time period, in the same geography. In total, there are nearly 1.6 million dwellings in our sample of green buildings and control buildings with hedonic and financial data.

Besides basic hedonic characteristics, such as vintage, size and presence of amenities, we also have information on the time of sale. Clearly, during the time period that we study, many homes in our geography were sold due to financial distress (i.e., foreclosure or mortgage delinquency). This, of course, has implications for the transaction value of homes (John Y. Campbell *et al.*, 2011). We therefore create an indicator for a "distressed" sale, based on information provided by DataQuick.

We also collect data on environmental ideology, proxied by the registration share of Prius vehicles in each zip code.[10] Local climatic conditions are assessed by the total annual cooling degree days at the nearest weather station (measured by the longitude and latitude of each dwelling and each weather station) during the year of sale.[11] Information on electricity prices is collected at the zip code level.[12]

C. Descriptive Statistics

Table 1 summarizes the information available on the samples of certified and non-certified dwellings. The table reports the means and standard deviations for a number of hedonic characteristics of green buildings and control buildings, including their size, quality, and number of bedrooms, as well as indexes for building renovation, the presence of on-site amenities (such as a garage or carport, swimming pool, or presence of cooling equipment), and the presence of a "good" view.[13]

Simple, non-parametric comparisons between the samples of certified and non-certified homes show that transaction prices of "green" homes are higher by about $45,000, but of course, this ignores any observable differences between the two samples. Indeed, green homes are much younger—70 percent of the dwellings in the green sample have been constructed during the last five years.

More than two-thirds of the stock of "green" homes are those certified by Energy Star, but there is substantial overlap among the green certifications—about 20 percent of the green homes have multiple labels.

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[10] We calculate the Toyota Prius share of registered vehicles from zip code totals of year 2007 automobile registration data (purchased from R.L. Polk).

[11] Data retrieved from http://www.ncdc.noaa.gov/cdo-web/.

[12] Data retrieved from http://www.energy.ca.gov/maps/serviceareas/electric_service_areas.html. We thank the California Energy Commission for providing a list containing each zip code in California and the corresponding local electric utility provider.

[13] DataQuick classifies the presence and type of view from the property. A "good" view includes the presence of a canyon, water, park, bluff, river, lake or creek.

4. RESULTS

Table 2 presents the results of a basic regression model relating transaction prices of single-family dwellings to their observable characteristics and a "green" rating. Zip-code-fixed effects account for cross-area differences in local public goods, such as weather, crime, neighborhood demographics and school quality. The analysis is based upon more than 1.6 million observations on rated and unrated dwellings. Results are presented for ordinary least squares regression models, with errors clustered at the zip code level. Coefficients for the individual location clusters and the time-fixed effects are not presented.

Column 1 reports a basic model, including some hedonic features: dwelling size in thousands of square feet, the number of bed and bathrooms, and the presence of a garage or carport. We also include zip-year/month fixed effects. The model explains about 85 percent of the variation in the natural logarithm of home prices.

Larger homes command higher prices; 1,000 square feet increase in total dwelling size (corresponding to an increase of about 50 percent in the size of typical home) leads to a 31 percent higher transaction price. Controlling for dwelling size, an additional bathroom adds about 10 percent to the value of a home, and a garage yields about 6 percent, on average.

In column 2, we add a vector of vintage indicators to the model. Relative to homes constructed more than 50 years ago (the omitted variable), recently developed homes fetch significantly higher prices. The relation between vintage and price is negative, but homes constructed during the 1960-1980 period seem to transact at prices similar to very old ("historic") homes. Renovation of dwellings is capitalized in the selling prices, although the effect is small; prices of renovated homes are just one percent higher.[14]

Column 3 includes a selection of dwelling amenities in the model. The results show that homes that were sold as "distressed," for example following mortgage default, transact at a discount of 16 percent, on average. The presence of a swimming pool, cooling system or a "view" contributes significantly to home prices.

Importantly, holding all hedonic characteristics of the dwellings constant, column 4 shows that a single-family dwelling with a LEED, GreenPoint Rated or Energy Star certificate transacts at a premium of 12 percent, on average. This result holds while controlling specifically for all the observable characteristics of dwellings in our sample. The "green" premium is quite close to what has been documented for properties certified as efficient under the European energy labeling scheme. A sample of 32,000 homes classified with an energy label "A" transacted for about 10 percent more as compared to standard homes (Dirk Brounen and Nils Kok, 2011). In the commercial property market, "green" premiums have been documented to be slightly higher – about 16 percent (Piet Eichholtz, *et al.*, 2010).

[14] We replace the original "birth year" of a home with the renovation date in the analysis, so that vintage better reflects the "true" state of the home. This may explain the low economic significance of the renovation indicator.

A. Robustness Checks

In Table 3, the green rating is disaggregated into three components: an Energy Star label, a LEED certification, and a GreenPoint Rated label. The (unreported) coefficients of the other variables are unaffected when the green rating is disaggregated into these component categories. The estimated coefficient for the Energy Star rating indicates a premium of 14.5 percent. The GreenPoint Rated and LEED rating are associated with insignificantly higher transaction prices. Energy efficiency is an important underlying determinant of the increased values for "green" certified dwellings.[15] But of course, sample sizes for homes certified under the alternative rating schemes are quite limited, and just a small fraction of those homes transacted over the past years. An alternative explanation for the lack of significant results for the GreenPoint Rated and LEED schemes is the still limited recognition of those "brands" in the marketplace.[16]

The downturn in housing markets and the subsequent decrease in transaction prices may also have an impact on the willingness to pay for more efficient, green homes. It has been documented that prices are more procyclical for durables and luxuries as compared to prices of necessities and nondurables (see Mark Bils and Peter J. Klenow, 1998). To control for the time-variation in the value attributed to "green," we include interaction terms of year-fixed effects and the green indicator in column 4. When interaction terms of year-fixed effects are included in the model (the years 2007 and 2012 are omitted due to the lack of a sufficient number of observations in those years), we document substantial variation in the premium for green dwellings over the sample period. In the first years of the sample, labeled homes sold for a discount, albeit insignificantly (which may be related to the lack of demand for newly constructed homes during that time period), whereas the premium is large and significant in later years. The parallel with the business cycle suggests that, among private homeowners, demand for "green" is lower in recessions, but increases as the economy accelerates. This is contrasting evidence for the commercial market: It has been documented that green-certified office buildings experienced rental decreases similar to conventional office buildings during the most recent downturn in the economy (Eichholtz *et al.*, in press).

As noted in Table 1, most homes certified by one of three rating schemes have been constructed quite recently – some 70 percent of the green homes were constructed less than six years ago. Recognizing this point, we seek a similar control sample of non-certified single-family transactions, restricting the analysis to dwellings that are five years old or younger.[17]

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[15] The fundamental energy efficiency requirement is identical across the three different labeling schemes, and the mechanisms for verification are almost entirely similar. The three labels require design for 15 percent energy savings beyond building code requirements and all schemes require various on-site verifications to confirm the delivered home was built to that standard. GreenPoint Rated and LEED offer the highest number of credits for exceeding that minimum requirement. Energy Star rated homes are thus not necessarily better energy performers as compared to the other rating schemes.

[16] The Energy Star label is recognized by more than 80 percent of U.S. households, and 44 percent of households report they knowingly purchased an Energy Star labeled product in the past 12 months (see http://www.cee1.org/eval/00-new-eval-es.php3). Energy Star is one of the most widely recognized brands in the U.S. While similar data is not available for GreenPoint Rated or LEED, both were introduced as building labels much more recently, and do not benefit from near ubiquitous cobranding in consumer products.

[17] Quite clearly, this paper mostly deals with labeled developer homes rather than existing homes that went through the labeling process. As noted in Section 2, this raises the possibility of a "developer effect" in explaining the price variation between "green" and conventional homes. More information on the identity of developers of labeled and non-labeled homes would allow us to further disentangle this effect, but we have information on the developers of green homes only. About one third of the homes in the labeled sample have been constructed by KB Homes. Regressions that exclude homes constructed by KB Homes lead to similar results, with the green premium decreasing to about 6 percent.

Table 4 presents the results of this simple robustness check. Control variables, location-fixed effects and time-fixed effects are again omitted. The results presented in Table 4 are not consistently different from the results in Table 3, but the green premium is slightly lower: On average, green-rated homes that were constructed during the last five years transact at a premium of some 9 percent. The Energy Star label is significantly different from zero. We note that the estimated coefficient for the LEED rating indicates a premium of some 10 percent in transaction prices, but this is not statistically significant at conventional levels.

B. Testing for Heterogeneity in "Green Label" Capitalization

As demonstrated in the statistical models reported in Tables 2–4, there is a statistically significant and rather large premium in the market value for green-certified homes. The statistical analysis does not identify the source of this premium, or the extent to which the signal about energy efficiency is important relative to the other potential signals provided by a building of sufficient quality to earn a label. Of course, the estimates provide a common percentage premium in value for all rated dwellings. But the value of green certification may be influenced by factors related to the location of homes: Figure 1 suggests that the distribution of green-rated dwellings is not random within urban areas in California, and this may affect the geographic variation in the value increment estimated for green-certified homes. For example, non-financial utility attributed to "green" certification may be higher for environmentally conscious households (comparable to the choice for solar panels, see Samuel R. Dastrup *et al.*, 2012, for a discussion) or in areas where such homes are clustered (This peer effect is referred to as "conspicuous conservation" in a recent paper by Steven E. Sexton and Alison L. Sexton, 2011).

But, the financial utility of more efficient homes may also be affected by other factors related to the location of a dwelling. The financial benefits of a more efficient home should increase with the temperature of a given location, keeping all other things constant. (Presumably, more energy is needed for the heating of dwellings in areas with more heating degree days, and more energy is needed for the cooling of buildings in areas with more cooling degree days.) To test this hypothesis, we interact the green indicator with information on cooling degree days for each dwelling in the transaction year, based on the nearest weather station in the database of the National Oceanic and Atmospheric Administration (NOAA). Similarly, in areas with higher electricity costs, the return on energy efficiency should be higher. We therefore interact the climate variable with information on the retail price of electricity in the electric utility service area.

Table 5 presents a set of models that include a proxy for ideology, green home density, climatic conditions and local electricity prices. In this part of the analysis, we seek to (at least partially) distinguish the effects of the energy-saving aspect of the rating from other, intangible effects of the label itself. The results in column 1 show that more efficient homes located in hotter climates (e.g., the Central Valley) are more valuable as compared to labeled homes constructed in more moderate climates (e.g., the coastal region). At the mean temperature level (6,680 cooling degree days), the green premium equals about 10 percent. But for every 1000 cooling degree day increase, the premium for certified homes increases by 1.3 percent, keeping all other things constant. **This result suggests that private homeowners living in areas where cooling loads are higher are willing to pay more for the energy efficiency of their dwellings.**[18]

[18] While we do not have household level data on electricity consumption, the "rebound effect" would predict that such homeowners might respond to the relatively lower price of achieving "cooling" by lowering their thermostat. In such a case, the actual energy performance of the buildings would not necessarily be lower, because of this behavioral response.

In column 2, we add an interaction of climatic conditions with local electricity prices. (In models 2-4, we control for location using county-fixed effects.) Presumably, energy savings are more valuable if the price of electricity per kWh is higher. **However, our results do not show a difference in the capitalization of energy savings between consumers paying high rates** (the maximum rate in our sample equals 0.27 cent/kWh) **and those paying lower rates** (the minimum rate in our sample equals 0.07 cent/kWh). This may be because the true driver of consumer behavior is their overall energy outlay rather than the unit cost per kWh.

In Column 3, we include the share of Prius registrations for each zip code in the sample, interacted with the indicator for green certification. Quite clearly, the capitalization of "green" varies substantially by heterogeneity in environmental idealism: **In areas with higher concentrations of hybrid vehicle registrations, the value attributed to the green certification is higher.** These results on the larger capitalization effect of green homes in more environmentally conscious communities are consistent with empirical work on solar panels (Samuel R. Dastrup, *et al.*, 2012) and theoretical work on the higher likelihood for the private provision of public goods by environmentalists (Matthew J. Kotchen, 2006).

In column 4, we include a variable for the "density" of green homes in a given street and zip code, and built by the same developer. One could argue that in areas with a larger fraction of green homes, there is a higher value attributed to such amenity by the local residents. Households who purchase a home on this street know that their neighbors also will be living in a "green" home and this will create a type of Tiebout sorting as those who want to live near other environmentalists will be willing to pay more to live there. In this sense, the "green label" density acts as a co-ordination device. However, competition in the share of green homes in a given neighborhood may also negatively affect the willingness to pay for "green," as such feature is becoming a commodity (see Andrea Chegut *et al.*, 2011, for a discussion).

When including the density indicator, the point estimate for green certification does not change significantly, but the coefficient on green home density is pointing to a negative relation between the intensity of local green development and the transaction increment paid for green homes. This finding is not significant, but the sign of the coefficient is in line with evidence on green building competition in the UK. As more labeled homes are constructed, the *marginal* effect relative to other green homes becomes smaller, even though the *average* effect, relative to non-green homes, remains positive.

5. DISCUSSION AND CONCLUSIONS

A. Costs and Benefits of Green Homes

The economic significance of the "green" premium documented for labeled homes is quite substantial. **Considering that the average transaction price of a non-labeled home equals $400,000 (see Table 1), the incremental value of 9 percent for a certified dwelling translates into some $34,800 more than the value of a comparable dwelling nearby.**

Of course, this raises the issue of relative input costs. The increment in construction costs of more efficient, "green" homes is open to popular debate, and there is a lack of consistent and systematic evidence. Anecdotally, a recent industry report shows that estimated cost to reach a *modeled* energy efficiency level of 15 percent above California's 2008 energy code is between $1,600 and $2,400 for a typical 2,000 sq. ft. dwelling, depending on the climate zone. To reach a *modeled* energy efficiency level of some 35 percent above the 2008 code, estimated costs range from $4,100 to $10,000 for a typical 2,000 sq. ft. dwelling, again depending on the climate zone.[19] (Some of these costs are offset by incentives, and it is estimated that about one-third of the costs could be compensated for by rebates.) These admittedly rough estimates suggest that the capitalization of energy efficiency features in the transaction price (about $35,000) far exceeds the input cost for the developer (about $10,000, at most).

From the perspective of a homeowner, the benefits of purchasing a labeled home, or of "greening" an existing dwelling, include direct cost savings during tenure in the home. Indeed, we document some consumer rationality in pricing the benefits of more efficient homes, as reflected in the positive relation between cooling degree days in a given geography and the premium rewarded to a certified home. Presumably, the capitalization of the label should at least reflect the present value of future energy savings. Considering that the typical utility bill for single-family homes in California equals approximately $200 per month, and savings in a more efficient home are expected to yield a 30 percent reduction in energy costs, the annual dollar value of savings for a typical consumer is some $720. Compared to the increment for green-labeled homes documented in this paper, that implies a simple payback period of some 48 years.

Quite clearly, there are other (unobservable) features of green homes that add value for consumers. This may include savings on resources other than energy, such as water, but the financial materiality of these savings is relatively small. However, **there are also other, intangible benefits of more efficient homes, such as better insulation, reducing draft, and more advanced ventilation systems, which enhance indoor air quality. These ancillary benefits may be appealing to consumers through the comfort and health benefits they provide.**

The results documented in this paper also show that the premium in transaction price associated with a green label varies considerably across geographies. **The premium is positively related to the environmental ideology of the neighborhood.** In line with previous evidence on the private value of green product attributes, some homeowners seem to attribute non-financial utility to a green label (and its underlying features), explaining part of the premium paid for green homes.

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[19] Source: Gabel Associates, LLC. (2008). "Codes and Standards: Title 24 Energy-Efficient Local Ordinances."

B. Conclusion

Buildings are among the largest consumers of natural resources, and increasing their energy efficiency can thus play a significant role towards achieving cost savings for private consumers and corporate organizations, and can be an important step in realizing global carbon reduction goals. With these objectives in mind, an ongoing effort has sought to certify buildings that have been constructed more efficiently. Considering the lack of "energy literacy" among private consumers, if homebuyers are unaware of a building's steady state (modeled) energy consumption, then they will most likely not appropriately capitalize energy savings in more efficient dwellings.

Comparable to evidence documented for the commercial sector in the U.S., and for the residential sector in Europe, the results in this paper provide the first evidence on the importance of publicly providing information about the energy efficiency and "sustainability" of structures in affecting consumer choice. Green homes transact for significantly higher prices as compared to other recently constructed homes that lack sustainability attributes. This is important information for residential developers and for private homeowners: Energy efficiency and other green features are capitalized in the selling price of homes.

We note that the green homes in our sample are not high-end, custom homes, but rather "production homes" built by large developers. From the developer's perspective, there are likely to be economies of scale from producing green homes in the same geographic area. If green communities command a price premium and developers enjoy cost savings from producing multiple homes featuring similar attributes, then for-profit developers will be increasingly likely to build such complexes. This has implications for the green premium, as the marginal effect relative to other green homes becomes smaller.

The findings in this paper also have some implications for policy makers. Information on the energy efficiency of homes in the U.S. residential market is currently provided just for exemplary dwellings.[20] **The mandatory disclosure of such information for all homes could further consumers' understanding of the energy efficiency of their (prospective) residence, thereby reducing the information asymmetry that is presumably an important explanation for the energy-efficiency gap.** An effective and cheap market signal may trigger investments in the efficiency of the building stock, with positive externality effects as a result.

Of course, we cannot disentangle the energy savings required to obtain a label from the unobserved effects of the label itself, which could serve as a signaling measure of environmental ideology and other non-financial benefits from occupying a green home. Future research should incorporate the *realized* energy consumption in green homes and conventional homes to further disentangle these effects. Reselling of green-labeled homes will also offer an opportunity to further study the value persistence of certified homes, unraveling the effect of developer quality on the green premium documented in this paper.

It also important to note that this paper focuses just on the market for owner-occupied single-family dwellings. While this represents an important fraction of the housing market, the market for rental housing has been growing considerably over the course of the housing crisis, and represents the majority of the housing stock in large U.S. metropolitan areas such as New York and San Francisco. Addressing the signaling effect of "green" labels for tenants in multi-family buildings should thus be part of a future research agenda.

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[20] At the time of writing, the City and County of San Francisco's Office of the Assessor-Recorder is beginning to record and publish the presence or absence of green labels in the county property database. Their stated objective is to increase the incentive to make green upgrades in new and existing properties by using transparency to increase market actors' ability to act upon label information.

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TABLE 1. Comparison of Green-Labeled Buildings and Nearby Control Buildings
(standard deviations in parentheses)

	RATED BUILDINGS	CONTROL BUILDINGS
Sample Size	4,321	1,600,558
Sales Price	445.29	400.51
(thousands of dollars)	(416.58)	(380.47)
Assessed Value	425.95	355.21
(thousands of dollars)	(376.86)	(347.34)
Dwelling Size	2.06	1.80
(thousands of sq. ft.)	(0.69)	(0.86)
Lot Size	8.40	16.94
(thousands of sq. ft.)	(14.01)	(41.23)
Age	1.68	32.23
(years)	(9.49)	(24.39)
VINTAGE:		
Vintage < 6 years	0.70	0.18
(percent)	(0.46)	(0.38)
Vintage > 5 years < 11	0.00	0.08
(percent)	(0.02)	(0.28)
Vintage >10 years < 21	0.00	0.11
(percent)	(0.00)	(0.31)
Vintage > 20 years < 31	0.00	0.14
(percent)	(0.02)	(0.35)
Vintage > 30 years < 41	0.00	0.12
(percent)	(0.02)	(0.33)
Vintage > 40 years < 51	0.00	0.09
(percent)	(0.02)	(0.29)
Vintage > 50 years	0.01	0.20
(percent)	(0.08)	(0.40)
Renovated Building	0.04	0.12
(percent)	(0.19)	(0.33)
Garage	0.15	0.61
(number)	(0.55)	(0.94)
Number of Bedrooms	2.64	2.96
(percent)	(1.63)	(1.18)
Number of Bathrooms	2.03	2.11
(percent)	(1.26)	(0.94)
GREEN LABEL		
Energy Star	0.68	-
(percent)	(0.47)	-
GreenPoint Rated	0.47	-
(percent)	(0.50)	-
LEED for Homes	0.03	0.49
(percent)	(0.16)	(0.50)
Multiple Certifications	0.17	0.39
(percent)	(0.38)	(0.49)
Distressed Sale	0.08	0.11
(1 = yes)	(0.26)	(0.31)
Cooling Equipment	0.45	0.02
(1 = yes)	(0.50)	(0.15)
Swimming Pool	0.01	0.42
(1 = yes)	(0.09)	(0.41)
View	0.00	6.37
(1 = yes)	(0.02)	(4.34)
Prius Registration Share	0.45	14.94
(percent x100)	(0.38)	(1.37)
Cooling Degree Days Per Year	6.86	
(thousands)	(3.86)	
Electricity Price	15.06	
(cents/kWh)	(0.84)	

	RATED BUILDINGS	CONTROL BUILDINGS
TRANSACTION YEAR		
2007	0.01	0.13
(percent)	(0.09)	(0.34)
2008	0.04	0.19
(percent)	(0.20)	(0.39)
2009	0.15	0.23
(percent)	(0.36)	(0.42)
2010	0.55	0.21
(percent)	(0.50)	(0.41)
2011	0.23	0.21
(percent)	(0.42)	(0.41)
2012	0.01	0.02
(percent)	(0.08)	(0.14)

TABLE 2. Regression Results
Dwelling Characteristics, Amenities, and Sales Prices
(California, 2007 - 2012)

	(1)	(2)	(3)	(4)
Green Rating				0.118***
(1 = yes)				[0.023]
Dwelling Size	0.309***	0.289***	0.273***	0.273***
(thousands of sq. ft.)	[0.008]	[0.008]	[0.007]	[0.007]
Number of Bathrooms	0.095***	0.070***	0.066***	0.066***
	[0.005]	[0.005]	[0.005]	[0.005]
Number of Bedrooms	0.015***	0.019***	0.022***	0.022***
	[0.003]	[0.003]	[0.003]	[0.003]
Number of Garages	0.059***	0.062***	0.058***	0.058***
	[0.005]	[0.005]	[0.005]	[0.005]
AGE*				
New Construction		0.248***	0.190***	0.186***
(1 = yes)		[0.017]	[0.016]	[0.016]
1 - 2 years		0.259***	0.209***	0.206***
(1 = yes)		[0.015]	[0.015]	[0.015]
2 - 3 years		0.239***	0.223***	0.221***
(1 = yes)		[0.015]	[0.015]	[0.015]
3 - 4 years		0.207***	0.219***	0.219***
(1 = yes)		[0.014]	[0.014]	[0.014]
4 - 5 years		0.195***	0.213***	0.213***
(1 = yes)		[0.014]	[0.014]	[0.014]
5 - 6 years		0.186***	0.203***	0.203***
(1 = yes)		[0.014]	[0.014]	[0.014]
6 - 10 years		0.191***	0.193***	0.193***
(1 = yes)		[0.014]	[0.014]	[0.014]
10 - 20 years		0.158***	0.149***	0.149***
(1 = yes)		[0.012]	[0.012]	[0.012]
20 - 30 years		0.072***	0.064***	0.064***
(1 = yes)		[0.011]	[0.011]	[0.011]
30 - 40 years		0.009	0.001	0.001
(1 = yes)		[0.010]	[0.010]	[0.010]
40 - 50 years		0.007	-0.002	-0.002
(1 = yes)		[0.008]	[0.007]	[0.007]
Renovated		0.012**	0.011**	0.011**
(1 = yes)		[0.005]	[0.005]	[0.005]
Distressed Sale			-0.161***	-0.161***
(1 = yes)			[0.003]	[0.003]
View			0.063***	0.063***
(1 = yes)			[0.011]	[0.011]
Swimming Pool			0.086***	0.086***
(1 = yes)			[0.005]	[0.005]
Cooling Systems			0.060***	0.060***
(1 = yes)			[0.008]	[0.008]
TIME-ZIP-FIXED EFFECTS				
Constant	11.743***	11.651***	11.795***	11.681***
	[0.203]	[0.177]	[0.161]	[0.163]
N	1,609,879	1,609,879	1,609,879	1,609,879
R^2	0.849	0.854	0.864	0.864
Adj R^2	0.856	0.861	0.871	0.871

Notes:

* Omitted variable: vintage > 50 years

Regressions include: fixed effects by quarter year, 2007I–2012I, interacted with fixed effects by zip code. (Coefficients are not reported.)

Standard errors, clustered at the zip code level, are in brackets. Significance at the 0.10, 0.05, and 0.01 levels are indicated by *, **, and ***, respectively.

TABLE 3. Regression Results
Green Labeling Schemes and Sales Prices
(Energy Star, GreenPoint Rated and LEED for Homes)

	(1)	(2)	(3)	(4)
Energy Star	0.145***			
(1 = yes)	[0.027]			
GreenPoint Rated		0.024		
(1 = yes)		[0.024]		
LEED for Homes			0.077	
(1 = yes)			[0.082]	
Green*Year 2008				-0.011
(1 = yes)				[0.057]
Green*Year 2009				0.052
(1 = yes)				[0.033]
Green*Year 2010				0.144***
(1 = yes)				[0.024]
Green*Year 2011				0.131***
(1 = yes)				[0.029]
Time-ZIP-Fixed Effects	Y	Y	Y	Y
Control Variables	Y	Y	Y	Y
Constant	11.759***	11.778***	11.795***	11.668***
	[0.162]	[0.162]	[0.161]	[0.165]
N	1,609,879	1,609,879	1,609,879	1,609,879
R^2	0.871	0.871	0.871	0.871
Adj R^2	0.864	0.864	0.864	0.864

Notes:

Regressions include: fixed effects by quarter year, 2007I–2012I, interacted with fixed effects by zip code; as well as vintage, amenities and other measures reported in Table 2 (column 4). (Coefficients are not reported.)

Standard errors, clustered at the zip code level, are in brackets. Significance at the 0.10, 0.05, and 0.01 levels are indicated by *, **, and ***, respectively.

TABLE 4. Regression Results
Robustness Check: Recently Constructed Homes#

	(1)	(2)	(3)	(4)
Green Rating	0.087***			
(1 = yes)	[0.018]			
Energy Star		0.112***		
(1 = yes)		[0.017]		
GreenPoint Rated			-0.016	
(1 = yes)			[0.026]	
LEED for Homes				0.097
(1 = yes)				[0.074]
Time-ZIP-Fixed Effects	Y	Y	Y	Y
Control Variables	Y	Y	Y	Y
Constant	12.044***	12.059***	12.119***	12.114***
	[0.245]	[0.240]	[0.222]	[0.223]
N	314,759	314,759	314,759	314,759
R^2	0.884	0.884	0.883	0.883
Adj R^2	0.899	0.899	0.899	0.899

Notes:

Sample restricted to dwellings constructed during the 2007-2012 period.

Regressions include: fixed effects by quarter year, 2007I–2012I, interacted with fixed effects by zip code; as well as vintage (ranging from 1–5 years), amenities and other measures reported in Table 2 (column 4). (Coefficients are not reported.)

Standard errors, clustered at the zip code level, are in brackets. Significance at the 0.10, 0.05, and 0.01 levels are indicated by *, **, and ***, respectively.

TABLE 5. Regression Results
Green Labels, Climatic Conditions, Electricity Costs, and Sales Prices#

	(1)##	(2)###	(2)###	(3)###
Green Rating	-0.013	0.098*	-0.057	0.082**
(1 = yes)	[0.026]	[0.054]	[0.039]	[0.033]
Green Rating*Cooling Degree Days	0.014***	0.006		
	[0.003]	[0.075]		
Green Rating*Cooling Degree Days*Electricity Price		-0.001		
		[0.005]		
Green Rating*Prius Registration			21.957***	
			[5.355]	
Green Rating*Green Density				-0.002
				[0.001]
Distance to Closest Rail Station		-0.004***	-0.004***	-0.004***
(in kilometers)		[0.001]	[0.001]	[0.001]
Distance to CBD		-0.001	-0.001	-0.001
(in kilometers)		[0.001]	[0.001]	[0.001]
Time-ZIP-fixed Effects	Y	N	N	N
Time-FIPS-Fixed Effects	N	Y	Y	Y
Control Variables	Y	Y	Y	Y
Constant	12.055***	12.494***	12.378***	12.759***
	[0.023]	[0.067]	[0.161]	[0.240]
N	323,840	238,939	242,678	286,325
R^2	0.877	0.758	0.758	0.747
Adj R^2	0.893	0.760	0.761	0.749

Notes:

* Sample restricted to dwellings constructed during the 2007-2012 period.

** Regression in column 1 includes fixed effects by quarter year, 2007I–2012I, interacted with fixed effects by zip code; as well as vintage, amenities and other measures reported in Table 2 (column 4). (Coefficients are not reported.)

*** Regressions in columns 2 - 4 include fixed effects by quarter year, 2007I–2012I interacted with fixed effects by Census tract; the following Census variables at the zip code level: percentage of the population with at least some college education, percentage blacks, and percentage Hispanics, percentage in age categories 18-64, > 64; as well as vintage, amenities and other measures reported in Table 2 (column 4). (Coefficients are not reported.)

Standard errors, clustered at the zip code level, are in brackets. Significance at the 0.10, 0.05, and 0.01 levels are indicated by *, **, and ***, respectively.

Certified Home Performance:

Assessing the Market Impacts of Third Party Certification on Residential Properties

Ann Griffin, Earth Advantage Institute

with
Ben Kaufman, GreenWorks Realty and
Sterling Hamilton, Hamilton Investments, LLC

May 29, 2009

Contents

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Ann Griffin, Earth Advantage Institute

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Built Green Washington
Cascadia Region Green Building Council
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MBA of King Snohomish Counties
MBA of Pierce County
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II. Abstract

The report presents an analysis of the market performance of third-party certified sustainable residential properties in the Portland and Seattle metropolitan areas. In each location, a sample of third-party certified homes was selected and comparable homes were found. The author documents that certified homes in the Seattle metro area sold at a price premium of 9.6% when compared to noncertified counterparts, based on a sample of 68 certified homes. In the Portland metro area, certified homes sold at a price premium ranging between 3% and 5%. In addition, the certified homes stayed on the market for 18 days less than noncertified homes. These results are based on a sample of 92 certified homes and comparable properties approved by a project appraiser.

This investigative research effort also includes surveys and interviews with the builders of third-party certified homes and their residents. The author discusses the inherent limitations of current valuation practices for homes with sustainable features. Finally, the report includes a synopsis of related research on the relationship between marketing initiatives and the sale price of third-party certified properties.

III. Executive Summary

Certified homes are worth more. This report explains the basis for this statement, using an analysis of third-party certified sustainable homes in the Seattle and Portland metropolitan areas. Moreover, the report shows that there are several important issues inherent in this seemingly simple statement. The report concludes with recommendations to further expand the study of the market performance of third-party certified sustainable homes. It supports heightened collaboration among residential appraisers, real estate brokers, homebuilders, and sustainable building advocates to improve a common understanding of the multiple issues involved in home valuation and communicating the results to a larger audience.

How one defines a building's value may vary. Market sales information is based on standard approaches to building appraisal that do not account for performance-based cost savings. Further, standard approaches do not consider resident health or broader environmental benefits that result from the measures required to achieve third-party sustainable certification. Public understanding of general sustainability concepts has certainly improved in the past 5 years. At the same time, more homebuilders recognize the potential market advantages of building certified homes. However, for many consumers and some homebuilders, the connection between quality home construction and sustainability is not always understood.

<u>Comparable Property Study Results</u>
Earth Advantage Institute selected Taylor Watkins of Watkins & Associates in Portland to serve as the project appraiser for the comparable property analysis. Watkins recommended the parameters for defining a comparable home and reviewed suggested comparables for their suitability. The parameters used to identify a comparable home are listed in the study. The goal was to test the hypothesis that certified homes would demonstrate improved market performance in terms of sales price and time on market than comparable, noncertified homes.

In Portland, a sample of 92 certified homes and 340 comparable homes was compiled. The certified homes were built between 2000 and 2008, with a majority sold in 2006 and 2007. Most certified homes were matched with 3 or 4 comparables. Certified homes were geographically distributed throughout the metro area. The Portland study found that:

- Certified homes sold 18 days faster than noncertified homes.
- Certified homes sold for 3% to 5% more than noncertified homes. In a statistical analysis with a 95% level of confidence, the overall price difference was found to be 4.2%.

In Seattle, a sample of 68 certified homes and 207 comparable residences was determined. Like the Portland sample, most certified homes were matched with 3 or 4 comparable homes. The Seattle analysis also documented superior market performance in terms of the sales price achieved.

- The expected percentage change for sales price was found to be 9.6% more for the third-party sustainable certified homes.
- The certified homes did not sell faster, and stayed on the market an average of 5 days longer (or 40% more time on the market).

These findings are positive factors that will work to the benefit of sustainable home builders and consumers, providing welcome news during a time of reduced home market activity.

Consumer Input

The same issues that determine how much someone is willing to pay for a house - location, amenities, and size – are involved whether one is shopping for a certified sustainable home or not. However, residents living in third-party certified homes should also understand the sustainable features and the positive impact of those features on the longevity of their homes. The study recommends public education so that current and future residents of certified homes will have a greater understanding of those benefits.

Earth Advantage Institute, Master Builders Association of Pierce County, and Olympia Master Builders conducted surveys of residents living in either Earth Advantage® or Built Green® certified homes. Residents value the sustainable attributes of their homes, particularly energy efficiency and improved indoor air quality. Of those surveyed, 90% reported that they would choose a certified versus a noncertified home for their next residence if all other factors were equal. Collectively, the residents also agreed that they would pay more in order to continue to live in a sustainable home. Eighty percent of the survey respondents living in a third-party certified home reported that they would pay up to 5% more in order to move into a home that had been certified as sustainable versus one that had not.

Self-certified and third-party certification. Consumer surveys were taken from residents living in both self-certified and third-party certified homes. In many respects, their answers were similar. Both groups agreed that energy efficiency and indoor air quality were extremely important. In one area of difference, residents of self-certified homes reported that sustainable certification

was less of an influencing factor in their decisions to buy a particular home than did residents of third-party certified homes. (Thirty-one percent of residents in self-certified versus 61% of residents in third-party certified homes reported that the certification was an influence in their decisions to buy their homes). Additionally, 56% of third-party certified home residents reported that their utility bills had been lowered by moving into a certified home versus 46% of noncertified home residents.

Homebuilder Input

Thirty-five builders responded to an online survey and an additional 10 Earth Advantage homebuilders provided in-person interviews. The home builders answered questions regarding any costs associated with building a third-party sustainable certified home and trends in those costs over the past five years. They were also asked to assess current appraisal methodologies.

Home builders responded that awareness for sustainable features in a home had grown sigificantly over the past five years. Despite this, however, demand for third-party certified sustainable homes had not directly increased as a result.

The survey asked if there were added costs associated with building a sustainable residence. The majority of the responsents – 74% - indicated that building a home to certification standards was more expensive than building a home to code. However, they also noted that the change in cost is coming down. (See Table 5.4.) The increase in construction costs was observed to be between 5 and 10%. As builders become more experienced with the specifications of a given program, and as their networks of sub-contractors and other knowledgeable professionals become more extensive, they have seen some of these cost increases go down. Home builders join the call for increased public awareness related to sustainable building practices and increased collaboration among sustainable building advocages

Recommendations for Action

The interviews and surveys conducted for this research clearly point to a number of recommended actions. The following list is further detailed in the body of the report:

1) Increase tracking of third-party certified sustainable homes
2) Conduct property comparable work in other areas of Oregon and Washington
3) Develop and support professional training opportunities
4) Work with homebuilder and professional realtor associations to increase consumer knowledge about sustainable homes
5) Develop additional educational tools (e.g., a glossary of terms related to green building, an online resource guide)

IV. Project History and Summary of Key Findings

The Pacific Northwest is a stronghold for sustainable building and design. The region has earned a national and international reputation for public policy and public sentiment that supports sustainable living. Several green building and energy efficiency certification programs are available to prospective property owners in the region, including Built Green, Earth Advantage®, ENERGY STAR®, and LEED for Homes®. As of September 2008, there were close to 10,000 third-party Earth Advantage certified homes in Oregon and Washington. An additional 10,000 homes in Washington have achieved Built Green Home certification, including self-certified and third-party certified homes.

However, while demand for green buildings has increased appreciably over the past 10 years, many financial, appraisal, and real estate professionals do not have an adequate understanding of sustainable building practices (Jamison, 2007). This has resulted in a lack of consistent measurement and the potential undervaluing of sustainably built projects.

The Green Building Value Initiative (GBVI) started in the summer of 2007 when a number of leading green building and local government organizations in the Pacific Northwest met to discuss a growing need: demonstrating the practical value of sustainable certification for residential and commercial properties. According to Rachel Jamison of the Washington State Department of Ecology,

> GBVI was created to determine whether green building certification truly adds value to residential and commercial real estate projects. If so, the GBVI will determine the most effective method of communicating this to the real estate finance, appraisal, lending, and investment communities.

In 2009, a coalition of private industry, nonprofit and government organizations will release a series of papers examining certified residential and commercial properties through case studies, property comparisons, interviews, and surveys. This report is part of that effort.

Investigative research into the value of property certification and the valuation of sustainable building practices can be traced back to the efforts of the Vancouver Valuation Accord in 2007. In March of that year, leaders of valuation groups from throughout North and Latin America, Europe, and various Pacific countries met in 2007 in Vancouver, BC, to discuss the valuation implications of sustainability and how they should be approached on a global basis. The result of that meeting was the Vancouver Valuation Accord, a document that was signed by representatives from 20 countries and that adopted the definition of sustainable development created for the United Nations by the Brundtland Commission in 1987:

> ...development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

Research related to market performance of high performance buildings has followed two tracts: residential and commercial. This report presents the findings related to the residential sector in Oregon and Washington. Specific research activities included:

- residential property comparables (specific comparison between certified and comparable non-certified homes as determined by a certified appraiser)
- home builder surveys and interviews
- residential appraiser interviews
- surveys of residents living in certified homes
- study on the impact of marketing and consumer education to home sales performance
- residential property case studies (published separately)
- commercial property case studies (published separately)

The property comparison work focuses on Portland and Seattle. In each metro area, comparable homes were identified for a large number of certified homes. The sample sizes of certified homes were 92 and 68 in the Portland and Seattle metropolitan areas, respectively. Additional property comparison work on smaller samples of homes was completed in central Oregon and in the Willamette Valley.[1]

Sustainable Building Valuation

The Green Building Value Initiative recognizes the importance of value in discussions related to sustainable property development and certification. The value that is assigned to a single- or multi-family home may vary depending on the context of the assessment. Residential appraisers are responsible for determining the worth of a home in a given real estate market. Appraisal reference guides commonly offer three different approaches to defining value (sales comparison, cost approach, and income approach, although these are more frequently associated with commercial appraisals). The term *market value* is generally defined as the price that could be obtained for the sale of a given item in current market conditions. This study does not choose one specific definition of value over another. Rather, it points to the lack of a common, comprehensive definition of *value* as a primary obstacle in recognizing the contributions of sustainable home features. Measuring the added value to a home resulting from sustainable features, or from third-party sustainable certification as a whole, remains a challenge.

Sustainable building advocates face a challenge when trying to document the market value or performance of sustainable buildings. This is partially due to the lack of existing certified projects. This challenge has been less evasive as the number of certified properties in the United States has increased. However, the tools that property appraisers customarily use have not been modified to reflect the more complex valuation required for a sustainable or *triple-bottom line* approach. Valuation professionals "need to rely more heavily upon thorough analysis of sustainability attributes at the property level to ensure accurate identification of costs, benefits and risk" (Chappell, 2007).

Another consideration stems from the fact that a building cannot simply be labeled *sustainable.* Green building certifications vary in terms of the building elements that are evaluated under and the performance metrics associated with them. Many builders may not pursue certification at all but will incorporate one or more sustainable or high performance building features into their

[1] The budget for this residential property analysis did not make it possible to retain residential appraisers in either of these two areas. The sample size of homes in these areas was very small (less than 12 homes per area) and therefore not statistically significant.

projects. In some respects, the residential sector has lagged behind the commercial sector in terms of understanding property value implications related to sustainable certification (Pitts & Jackson, 2008). The Pacific Northwest may be at an advantage in this regard, as the region has more sustainable certified homes than any other U.S. region. As in the commercial sector, residential appraisers will become better able to evaluate properties as the number of completed projects grows.

Studies on the relationship between energy efficiency and resulting home values have shown that home values do increase as efficiency improvements are made (Nevin, 1998). Nevin suggests that home values increase by $11 to $21 for every dollar reduction in annual fuel expenditures. Homeowners obviously review a number of factors before buying a new home. Anticipated home energy savings is one factor that may be considered, particularly as domestic energy prices increase or become more uncertain. Similar to other sustainable characteristics in certified homes, energy efficient components can only be valued according to current industry norms and understanding.

> A key challenge in assessing the value implications of energy management strategies is gauging the market's acceptance of those strategies. This factor, coupled with the knowledge that the appraisal community relies heavily upon empirical data, means new or unorthodox approaches to building construction and operations will require a greater burden of proof to support performance projections. (Better Bricks, 2007)

Appraisers in the commercial sector are concerned with the value of real estate assets as investment opportunities. Residential properties (particularly single-family homes) are traditionally viewed as long-term assets for homeowners rather than as investments. This may contribute to the lack of professional literature on the appraisal of sustainable residential properties.

A growing number of builders and real estate brokers are aware of the limitations of the existing home valuation process. EAI staff interviewed three residential appraisers regarding the process of conducting an appraisal on a certified home. While three interviews obviously do not represent a cross-cross section of appraisers, they support trends observed in the wider market. Each appraiser agreed with Linehard, suggesting that there is a need to change regular residential appraisal practices in order to allow individual brokers more flexibility with documentation. The interviewees observed that more training for brokers and financial lenders regarding the specific attributes of energy efficient equipment and sustainable design features will benefit the evaluation of sustainable homes. These last two points were reiterated in additional interviews and surveys with home builders and consumers.

Residential Property Analysis: Summary of Key Findings

- *Sustainable third-party certified homes sell faster.* Certified homes stay on the market for a shorter period of time, selling 18 days faster in the Portland metro area in 2007-08. In the Portland metro area, the certified homes were primarily Earth Advantage® or Earth Advantage and ENERGY STAR® homes. In Seattle, the homes were primarily Built Green certified.

- *Certified homes sell for more than noncertified homes.* In the Seattle metro area, third-party certified sustainable homes were found to sell for 9.6% more than noncertified homes. In the Portland metro area, certified homes sold for 4.2% more than noncertified homes. This and the previous finding are based on appraiser qualified property comparable results described in section V.

- *Market aggregate data, Portland.* Price premiums for certified homes were observed in market-wide sales data for the first year that certified homes were tracked by the Portland Multiple Listing Service. Certified homes sold for 11% more than noncertified homes between May 1, 2007 and April 30, 2008 in the Portland metropolitan market (not including Clark County).

- *Market aggregate data, King County, WA.* A 4% price premium for newly constructed, green-certified homes was found in King County, WA for the 9-month period ending May 31, 2008. On a per square foot basis, certified homes sold for 37% more than noncertified homes.

- *Home builders believe that third-party verification adds value.* Almost all of the builders who contributed to this study (98%), stated that third-party sustainable certification adds to the value of the product. However, they were also concerned that current residential appraisal practices do not sufficient recognize the positive benefits of such certification.

- *Home buying public needs to better understand the value and significance of certified sustainable homes.* Increased public awareness regarding sustainability in the general media has not necessarily translated into a greater understanding of green home certification. Home builders who build Earth Advantage and Built Green homes asserted that homebuyers need to learn more in order to appreciate the full quality and value of their products. Long-term durability, high quality materials, improved indoor air quality, and increased energy efficiency are part of a certified home.

- *Home values should incorporate performance measures.* Residential performance measures should be incorporated into standard home valuation. For example, long-term reductions in home utility and repair costs should be a considered when a newly built or remodeled home is appraised for sustainable and energy efficiency features.

- *More dynamic appraisal models are needed.* Dialog among sustainable building advocates, home builder associations, residential appraisers, realtors, and financial institutions regarding more accurate and dynamic residential appraisal should continue. Such dialog is needed in order to develop the mechanisms for recording sustainable improvements in a home and monitoring those improvements' ongoing performances.

- *Certified homes perform better if the home buyer understands the quality and systems differentiation of that home.* A certified home is more likely to earn a price premium if the quality and performance savings of that home is clearly communicated to the future home resident.

V. Residential Property Analysis – Portland and Seattle Metropolitan Areas

This study was undertaken to test the hypothesis that sustainable third-party certified homes have a market advantage over comparable noncertified homes based on sales prices and time on the market. The homes in this study were all certified to Earth Advantage®, ENERGY STAR® or Built Green® (Four- or Five-Star) standards.

How have certified homes performed in the marketplace? The report explores this question in two ways. First, market-wide aggregate data regarding certified and noncertified homes are reviewed. Second, a specific sample of certified homes and the accompanying property comparables as determined by a qualified residential appraiser are analyzed. This was done in both the Portland and Seattle metro areas.

RMLS and NWMLS Data – The First Year of Tracking Certification

The section begins with an examination of sales data from the Regional Multiple Listing Service (RMLS) in Portland and the Northwest Multiple Listing Service (NWMLS) in Seattle. In 2006, EAI was instrumental in successfully lobbying RMLS to modify its database to include the new certification field. Seattle followed suit due to similar efforts. Both RMLS and NWMLS started to track the sales of sustainably certified homes in 2007. They were among the first MLS organizations in the nation to do so. NWMLS provides information on the sale of homes that have received a Built Green, ENERGY STAR, or LEED for Homes certification. RMLS allows real estate brokers to list new homes as Earth Advantage, co-branded Earth Advantage/ ENERGY STAR, ENERGY STAR, or LEED for Homes.[2]

Between May 1, 2007, and April 30, 2008, 833 newly constructed housing units in Multnomah, Clackamas, Columbia, Washington, Yamhill, and Clark counties were listed as Earth Advantage homes, Earth Advantage/ENERGY STAR co-labeled homes, ENERGY STAR, or LEED for Homes. This number is equal to 13.6% of all newly constructed units in the metro region, according to RMLS.

Certified homes performed better than noncertified homes, in terms of two key metrics: sales price and time on the market. The average sales price among all noncertified homes in the Portland, Oregon metropolitan area (new and existing) was $346,400. Noncertified new homes in the same market sold for an average of $390,400. Sustainable third-party certified new homes sold for an average of $431,900.

On a square foot aggregate basis, the certified homes in Portland sold for $223 per square foot. The noncertified homes sold for $196 per square foot. Newly constructed certified homes sold for 13.8% more than noncertified homes when compared in this way.

In the Portland metro market, not including Clark County, WA, new and existing homes stayed on the market for an average of 73 days. New homes in the same area stayed on the market for

[2] In 2007 and 2008, RMLS also provided the option of classifying a certified home as *other*. In 2008, RMLS discontinued this option, recognizing that the open-ended nature of such a response would make year-to-year comparisons impossible.

an average of 99 days. Sustainable new homes in the same market sold one-third faster, staying on the market for an average of 66 days.

The Northwest MLS reported similarly positive results for the first year of tracking certified home sales data. Sustainably certified homes (or *E-Cert homes*) built in 2007 accounted for 16.7% of the single-family homes and 18.7% of the condominium sales in King County in the 9-month period ending May 31, 2008 (Green Works, 2008).

NWMLS data shows that new construction E-Cert single-family homes sold in 18% less time, sold for 4% more, and were 25% smaller than noncertified homes. Priced per square foot, E-Cert homes were 37% more valuable. New construction E-Cert condominiums sold for 3% more and were 20% smaller than noncertified new construction condos. Priced per square foot, E-Cert condos were 28% more valuable than noncertified condos.

	Portland metro area	Seattle metro area
New homes, noncertified	$390,400	$470,000
New homes, certified	$431,900	$487,000
Percentage increase	10.6%	3.6%
New homes, noncertified per square foot	$196	$202
New homes, certified per square foot	$223	$278
Percentage increase, per square foot	13.8%	37.4%

Portland data provided by RMLS and analyzed by Earth Advantage Institute
Information for Portland metro area, less Clark Co.
Seattle data provided by NWMLS, analyzed by Green Work Realty.

The reports of improved sales performance in two major metropolitan areas were certainly encouraging for many professionals in the green building industry. In order to demonstrate that the primary component of comparison (the main difference between third-party certified homes and comparable traditionally built homes) was the evidence of sustainable certification, property comparables were required. Earth Advantage Institute and Built Green undertook the comparison analysis.

Property Comparison Work - Methodology

Ann Griffin of Earth Advantage Institute led the property comparison work for the Portland metropolitan area and Ben Kaufman of Green Works Realty completed the work for the Seattle metropolitan area. Watkins and Associates were retained as the project appraiser for the Portland analysis. The methodology described in this section was endorsed by Taylor Watkins, the project appraiser, and used in each of the comparable property analyses. The information gathered provides positive results regarding the performance of certified homes in the residential marketplace.

The Portland Regional MLS (RMLS) office provided Earth Advantage Institute with access to its home sales information. Using RMLS, researchers working with Earth Advantage Institute drew between 3 and 7 comparables for each certified property in the sample, with the majority having 3 or 4 comparables. The selected sample contains 92 certified properties in the Portland metropolitan statistical area (including Washington, Yamhill, Multnomah, and Clackamas Counties in Oregon, and Clark County in Washington). The project appraiser developed the guidelines to define comparable properties and confirmed the suitability of each comparable property selected. In Seattle, Ben Kaufman of Green Works Realty conducted a similar study using the same methodology.

Comparable properties were defined as residences that were

- sold with a closing date no more than 6 months prior to the closing date of the subject property
- located within the same neighborhood or sub-neighborhood
- constructed in a similar style based on photographs and staff determination
- constructed to the same degree of quality (e.g., design and materials)
- in the same age range (built within 10 years prior and 5 years after the subject home)
- approximately the same size (within a range from 15% smaller to 5% larger in square feet)
- approximately the same value (with a final sales price from 20% below to 10% above the sales price of the subject home)
- built with no distinguishing green features

The project appraiser reviewed an initial sample of property comparables to verify that EAI was gathering properties that were suitable for analysis (i.e., properties that may be deemed comparable according to professional standards in the residential appraisal field). The project appraiser approved between 2 and 7 comparables for 92 certified properties. Several dozen suggested comparables were rejected by the project appraiser for not satisfactorily meeting the needed criteria for a comparable home.

For each set of subject and comparable properties, the average price difference and average percentage change in price was determined. Rather than just the average price difference, the average percentage change in price was used in an effort to normalize the distribution of home prices. In order to account for the different number of comparable homes found for each subject home, a weighted average was calculated to determine differences in sales price. The number of days on the housing market for each subject and comparable home were also compared.

The study determined that newly constructed residential properties that obtained a sustainable certification sold on the market at a value that ranged between 3.3% and 5.1% higher than comparable properties that had not been certified. This finding was based on a sample of 92 homes at a statistical confidence level of 95%. The difference in home price between a certified home and a noncertified comparable home was found to be 4.2%.

Portland metro area property comparison

1. Certified homes sell faster than noncertified homes. Within the Portland market, homes that had a sustainable certification were purchased 18 days faster than noncertified homes.

2. Certified homes sell for more than noncertified homes, by a difference ranging from 3% to 5%. The margin of price difference was found to be a 4.2%.

Days on Market

As previously noted, the certified homes sold 18 days faster than noncertified homes. Stated as a percentage rate, the certified homes sold 30% faster. For most consumers, a two-week plus period translates into a month's mortgage payment. As a result, consumers selling certified homes are able to potentially realize important cost savings. Builders also realize the benefits of a property that sells faster. Builders may be able to close on outstanding construction loans more quickly and have shorter inventory turnover times, contributing to positive cash flow.

Reference has been made to the relationship between overall home value and the number of days on the market, with some observers finding that more expensive homes require longer time periods to sell. To determine if this was the case in the selected sample of Portland homes, EAI staff sorted the homes by sales price and examined the resulting pattern in days on the market. A positive linear relationship was not observed; the selling price of the home did not appear to have an impact on days on the market. Certified homes sold faster than noncertified homes. However, more expensive properties did not necessarily take longer to sell.

Seattle metro area property comparison

3. Certified homes in the Seattle metropolitan area sell for more than noncertified homes. The price premium based upon a sample of 68 subject homes was found to 9.6%.

4. In the Seattle study, certified homes remained on the market for an average of 5 days longer, or required 40% more time to be sold than non-certified comparables.

Home Performance and Home Value

The property comparison sections of this study focus on market performance in terms of sales price and time on market. These are standard economic performance metrics. Value may also be defined as the overall benefits of a home divided by its costs. Based on this definition, operational issues become more important. Occupants living in certified homes enjoy a number of benefits, such as reduced utility expenses, improved indoor air quality and accompanying health benefits, and reduced maintenance costs associated with high quality materials and durable construction methods. If these benefits were capitalized, then the value of a home would certainly increase. Larger exogenous economic factors resulting from reduced green house gas emissions could also be calculated and added to the overall performance measurements of a home.

Green commercial buildings are sometimes referred to as *Super Class A*, or more commonly as *high performance* buildings. Reduced utility costs and waste removal costs have been documented in a growing number of building case studies. According to USGBC, "(commercial) green buildings save an average 30 percent of energy costs, 35 percent of carbon costs, 30-50 percent of water use costs and 50-90 percent of waste costs" (Nicolay, 2007).

Reduced costs in the same categories are also observed in residential buildings. The following section of this report describes the survey results of homeowners living in Earth Advantage certified homes. More than half (56%) stated that their utility bills were lower in their current home than in their previous (noncertified) home. National surveys have produced similar results, indicating that the prospect of reduced utility costs also attracts prospective homebuyers. McGraw Hill Construction and the National Association of Home Builders conducted a survey of homeowners in early 2007. Sixty-three percent of the respondents reported lower operating and maintenance costs as the key motivation behind buying a green home (Environmental Leader, 2007). Nearly 50% reported environmental concerns and family health as motivators (Environmental Leader, 2007).

A number of articles in professional appraisal journals have cited the need for increased understanding and more detailed reporting with respect to appraisal reports related to sustainably constructed and appraised buildings, both residential and commercial.[3] For example, Claire Nicolay of Loyola University of Chicago, a frequent contributor to articles related to real estate appraisal, observed that

> (A)lthough the appraisal framework for a green building will not fundamentally change, appraisers will have to enhance their knowledge of key sustainable features and potential value impacts, similar to the type of information they have had to learn in recent years to better understand building-related telecommunication changes, American Disabilities Act legislation, and the effect of the securities markets on capital flows. (Nicolay, 2007)

The basic job that appraisers undertake will not change in terms of needed research, but research on a wider variety of topics will be necessary. These topics can include the performance specifications of energy efficient heating and cooling systems, home infiltration, home material sourcing, and construction site impacts on the local area.

> The current lack of a significant body of empirical data (comparable sales, surveys of property performance, and return expectations)...valuation professionals (will need to) rely more heavily upon thorough analysis of sustainability attributes at the property level to ensure accurate identification of costs, benefits and risk. (Lowe & Chappell, 2007)

In 1999, the National Association of Home Builders president, Charlie Ruma, stated that "lenders, appraisers and investors need to recognize the enhanced value in housing that comes from environmentally-efficient building practices so that buyers are given the credit" (McCuen, 2007). McCuen referred to the creation of home mortgage programs that credit sustainable home improvements as a step in the right direction.

[3] See Reference section and articles by Chappell, Corps, Muldavin, and Nicolay.

VI. Consumer Surveys – Input from Residents of Certified Homes

Consumer understanding and attitudes regarding sustainable home features play an important role in residential markets. The GBVI Steering Committee conducted surveys to identify consumer attitudes toward the sustainable attributes of their homes. Survey responses also provided some social demographic information for home residents.

Residents living in certified homes value the sustainable attributes of their houses, particularly their energy efficiency and improved indoor air quality. Of the respondents, 90% reported that they would choose a certified versus a noncertified home for their next place of residence, if other factors (e.g., location, price, quality) were equal. If cost were an issue, survey respondents continued to favor living in a certified home: 80% of the respondents from third-party certified homes reported that they would pay up to 5% more for their homes. In the case of a $400,000 home, a 5% premium is the equivalent of $20,000.

Ninety-eight percent of the survey respondents said that they would elect to purchase a green branded home over a home that was not green branded. Thirty-six percent of those surveyed indicated that they would pay up to 10% more on a $300,000 home that incorporated Earth Advantage measures.

In another regional consumer survey conducted at the Greener Homes and Gardens Expo in May 2005, 35% of the respondents indicated that Earth Advantage certification had had a direct influence on their home purchases. This finding in a more recent survey of home residents conducted in 2008, and described below.

Consumer Survey Description

Three organizations conducted consumer surveys among residents living in either Built Green or Earth Advantage certified homes: Earth Advantage Institute, the Master Builders Association of Pierce County, and Olympia Master Builders. Each organization used the same basic questionnaire. Among the three organizations, 248 people completed the survey either electronically or via mail. The surveys were conducted in May and June 2008.

Organization	**Number of Responses**
Olympia Master Builders	32
MBA of Pierce County	33
Earth Advantage Institute	183
TOTAL	248

Earth Advantage homes are third-party certified homes. Built Green Washington recognizes 5 levels of certification. Homes that receive Four- or Five-Star certification are third-party certified homes. Survey responses were analyzed separately by organization to determine if there were differences in attitude among residents of self-certified and residents of third-party certified homes. More importantly, the property comparison work was conducted on third-party certified homes. Survey responses were sorted accordingly to be consistent.

Residents of Third-party Certified Homes

In June 2008, Earth Advantage Institute mailed 3,000 surveys to residents living in Earth Advantage certified homes. EAI received a 6% return rate or 183 responses. A copy of the consumer survey and a summary of responses are included in the appendices. Importantly, the majority of survey respondents indicated that the sustainable certification positively influenced their decisions to purchase their particular homes.

Question: Did sustainable certification have any influence on your decision to buy your home?	**Response**
Yes	61%
No	39%

The survey asked about specific home attributes, including energy efficiency and indoor air quality. Respondents were asked to rank the importance of these attributes, on a scale from 1 (not important) to 5 (extremely important). Energy efficiency was considered an important or extremely important characteristic by 77% of the survey respondents, while only 3% answered that energy efficiency was not important. Residents living in certified homes also reported lower utility costs. More than half of the Portland respondents (56%) believed that their average utility costs (gas and electric) were lower in their new certified homes than their previous traditionally built homes.

Table 4.2. Important issues among residents 3rd party certified homes

Attribute	**Ranking**	
Energy Efficiency	(5) Extremely important	44.2%
	(4)	32.6%
	(3)	13.8%
	(2)	6.6%
	(1) Not important	2.8%
Indoor Air Quality	(5) Extremely important	43.4%
	(4)	28.0%
	(3)	19.2%
	(2)	7.1%
	(1) Not important	2.2%
Lower Utility Costs	Lower	55.6%
	Higher	13.5%
	The Same	19.1%
	Don't Know	11.8%

The survey asked consumers whether, when presented with two homes that were otherwise similar except for certification, they would choose the sustainably certified home. The majority (90%) responded that they would select the certified home. The survey also asked residents to specify how much more they might be willing to pay and the specific features that they valued

the most. Eighty percent indicated that they would be willing to pay up to 5% more to live in a certified home.

The consumer survey indicates that residents living in certified homes will choose a certified home for their next purchase and that they are willing to pay more for a certified home. The green home features that residents would be the most willing to pay for include energy efficient hot water systems, an energy efficient furnace, and improved indoor air quality. The responses are summarized in Table 4.3.

Table 4.3 Please check/describe the particular sustainable feature or features in which you would be most likely to invest.

energy efficient hot water heater/tankless water heater	89%
energy efficient furnace	87%
indoor air quality	69%
construction practices that utilize reclaimed/recycled materials and recycling	49%
on-site renewable energy source	42%
grey-water capture and re-use	27%
other feature(s)	10%

Note: Percentages may not add up to 100 due to rounding.

Table 4.4. What would be the maximum amount ***more*** you would be willing to pay for these added benefits and features on a $400,000 home? (1% 3% 5% 7% 10% 15%+)

$4,000 (1% more)	23%
$12,000 (3% more)	31%
$20,000 (5% more)	26%
$28,000 (7% more)	4%
$40,000 (10% more)	10%
$60,000 (15% more)	2%
$0 (I wouldn't be willing to pay more)	4%
Didn't answer question	11%

Other studies regarding owner preferences with respect to investments in sustainable homes have reached similar conclusions. According to the Concrete Network, a 2002 report found that 85% of homeowners would spend 1% more for an integrated concrete form (ICF) home, while 23% would spend 5% more for the same improvement (Balogh, 2008). While consumers have indicated that they would be willing to pay more for a sustainable home (perhaps up to 10% more or greater), the builders surveyed for this report did not generally have the same impression of consumer willingness to pay such an added cost.

Social Demographics of Earth Advantage Survey Respondents

Survey respondents provided basic demographic information about themselves. These questions were added to help determine how residents of certified homes might compare with the general population. Any observed trends could be used to better understand consumer behavior and target potential homebuyers.

In terms of gender, Earth Advantage consumer survey respondents were fairly evenly split between female (51%) and male (48%). Typical household size was reported as 2 (40%), 3 (21%) or 4 people (21%). People completing the survey reported their age as 39 or younger (51%), 40 to 64 (42%) or 65 or older (7%). Their education and income levels are reported in Tables 4.5 and 4.6.

Table 4.5. Education Level of Earth Advantage home residents

Answer Options	Percent	Number
Did not complete high school	0.0%	0
High School Grad/GED	13.2%	24
2-Year College Degree	10.4%	19
4-Year College Degree	38.5%	70
Masters Degree	26.4%	48
Doctoral Degree	4.4%	8
Professional Degree (MD, JD, DDS, etc.)	7.1%	13
No answer	0.5%	1

Table 4.6. Reported Household Income

Answer Options	Percent	Number
$40,000 – $59,000	18.6%	31
$60,000 – $79,000	19.2%	32
$80,000 – $99,000	12.6%	21
$100,000 -$199,000	39.5%	66
$200,000 - $499,000	10.2%	17
$500,0000 or more	0.0%	0
No answer	8.7%	16

Compared to the general Oregon and Portland metro county populations, residents living in Earth Advantage certified homes have completed more years of education. As education levels commonly correlate with income, the survey respondents also reported a higher level of income.

For example, in Multnomah County, approximately 31% of the population had a bachelor's degree or higher degree in the year 2000 (U.S. Census Bureau State and County Quick Facts). By contrast, 70% of the Earth Advantage survey respondents reported a bachelor's, master's, doctoral degree, or other professional degree. The median family income for a 4-person household in Portland in 2008 was $67,500 (Portland Development Commission). Sixty-two percent of the survey respondents reported household income of $80,000 or more.

Table 4.7 Certified Home Residents Compared to General Population

	Portland General Population	Earth Advantage Survey Respondents
Education – Bachelor degree or higher	31%	70%
Income	$67,500	$80,000

Portland general income based on median family income for a four person household. Earth Advantage survey respondents reported their household income.

While a demographic overview alone does not determine future market trends, it is useful to review how certified homes are distributed across the metro area and the typical profile of residents living in a sustainably certified home. From a policy perspective, this information may be useful to as a way to identify effective strategies for promoting public outreach messages regarding energy efficiency and sustainable home choices. This demographic information is also of interest to builders, developers, and realtors.

Residents of Self-Certified Homes

Olympia Master Builders received 32 survey responses. Of these, 28 responses were from residents with self-certified homes. All of the surveys received by the Master Builders Association of Pierce County were from self-certified homes. This section provides an overview of their responses. Their answers largely mirrored those given by residents of third-party certified homes, with some exceptions. For example, 68% of these respondents ranked energy efficiency as either a 4 or 5 on a five-point scale, suggesting that it is very or extremely important.

While residents in third-party certified and self-certified homes responded to the survey in a similar manner, a few differences were found. A greater number of residents in the third-party certified homes reported that their utility costs were lower in their current than in their previous home (46% versus 56%). Also, more residents in self-certified homes reported that sustainable certification was less of an influencing factor in their decisions to buy homes. This may be rationalized by the fact that they had not decided to pursue certification until after they have moved into their homes or, in the case of an existing certification, it may not have been highlighted as a selling point.

Finally, residents were asked if they thought that sustainable certification would have a positive impact on the future sales prices of their homes (Table 4.9). A number of respondents commented that the future value of their properties would depend on the market.

Table 4.8. Important issues among residents of self-certified homes

Attribute	**Ranking**	
Energy Efficiency	(5) Extremely important	42.6%
	(4)	26.2%
	(3)	18.0%
	(2)	1.6%
	(1) Not important	9.8%
Indoor Air Quality	(5) Extremely important	32.8%
	(4)	24.6%
	(3)	31.1%
	(2)	8.2%
	(1) Not important	1.1%
Lower Utility Costs	Lower	45.9%
	Higher	14.8%
	The Same	18.0%
	Don't Know	23.0%

Table 4.9 Consumer Purchase Decision

Question: Did sustainable certification have any influence on your decision to buy your home?	**Response**
Yes	31%
No	61%
no answer	7%

Note: Percentages may not add up to 100 due to rounding.

A few thoughtful residents went on to comment on the need for increased education for consumers and residential appraisers.

> "The impact will grow as the Real Estate agents and consumers are educated."
> "We built our home so if we ever decide to sell, we believe that the market for green homes, especially ones with certification, would be strong."
> "It's all in the market, what are people willing to pay at the time."
> "Not immediately, perhaps in five years. Some realtors, don't even know or care yet."
> "Our home will sell due to its appeal, location, and affordability, less the 'green clause'."

These comments reflect opinions stated in valuation and real estate literature on the topic. Green certification programs and the adoption of sustainable building practices will continue to grow, but within the field of real estate valuation, assessing the impact of sustainable certification remains an undeveloped science.

VII. Builder Interviews and Surveys

Home builders are clearly an important part of the valuation puzzle. The viability of their green business models depends on public knowledge regarding sustainable homes and public demand for those homes. Lenders and residential appraisers need to understand their products in order to provide financing and accurate value estimates. Builder input is included in this study as a means to identify trends in both industry and public perceptions regarding residential green building. Builders were asked about their motivations for building certified homes, the cost implications of certification, and general market demand.

The GBVI Steering Committee authorized one-on-one interviews and online surveys with residential builders who have constructed certified homes. Ten in-person builder interviews were conducted with senior staff of companies enrolled as Earth Advantage builders in April and May 2008. An additional 35 builders answered the same questions using an online survey conducted by the Master Builders of Pierce County and Earth Advantage Institute

The companies where the individual builders work are listed in Table 5.1.

Table 5.1 Earth Advantage Builder Interviews

Arbor Homes
Ben Walsh
CoHo Construction
Craftsman Homes
Legend Homes
New Traditions
Palmer Homes
Solaire Homes
Sun Forest Homes
Woodhill Homes

Company motivation: Builders reported a number of different reasons for offering certified homes. Primary answers involved extending or demonstrating a commitment to quality and the means to differentiate their companies from the competition. Other builders voiced their personal beliefs in the need for increased societal efforts to reduce climate change.

As a group, the builders stated that in order to remain a leader in a competitive environment, they needed to be abreast of green building technologies and techniques. One manager remarked,

> "All builders now need to be in the running (and need to offer sustainable products). The cost of energy is one the largest things on the mind of customers. Sustainable features are also of a growing interest in this market."

Consumer awareness and demand: Builders uniformly agreed that there is an appreciably higher level of awareness among their customers on issues related to sustainability. According to one builder, awareness has increased over the past 5 years. However, this increased awareness does not necessarily translate into greater demand for sustainably certified new homes. The builders generally commented that consumer demand was not the primary reason for offering an Earth Advantage certified home at this time.

Table 5.2 Role of Consumer Demand

Did direct consumer demand influence your decision to introduce green products into your homes?	
yes (9)	26%
No (25)	71%
No answer (1)	3%

n=35

Interviewees mentioned that they receive more questions about energy efficiency and sustainability in general and that consumers may ask about sustainable certification. Certification has become more important but remains one factor among several considered, most notably location and price.

Consumer demand for green homes increased nationally according to a survey released by Green Builder Media. Green Builder Media surveyed 250 residential builders across the U.S. and reported that more than half had stated that they saw not only an increase in demand for green homes but a willingness to pay more. According to this source, builders have reported a willingness of homebuyers to pay between 11% and 25% more for green-built homes (US Newswire, 2007). According to this source, the "average green homebuyer is between the ages of 35 to50 with a college degree and fair understanding of green products."

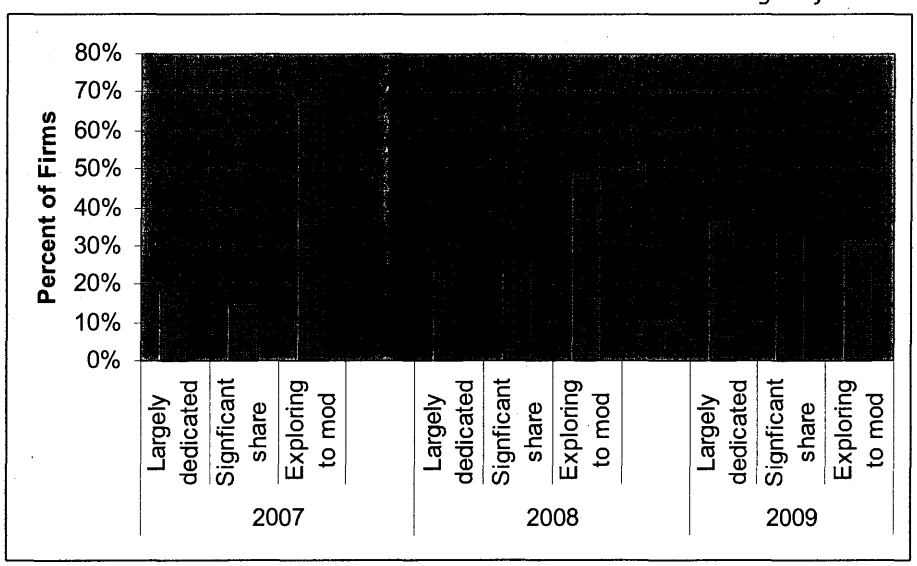
Some reduction in new residential construction began to take place in the later part of 2007. It should be noted that the significant slowdown in new housing and other challenges to the national economy occurred between spring 2008, when the builder interviews were conducted, and the time when this draft was written. Changes in consumer credit availability and a national decline in new residential construction experienced during the latter half of 2008 are not directly reflected in the responses given by the individual homebuilders. However, several home builders working with Earth Advantage Institute have credited their decisions to provide sustainably certified, high-quality products as a response to the down economy. According to McGraw Hill Construction's "The Green Builder SmartMarket Report" (2008), 40% of builders report a marketing advantage from green homes in today's housing slump.

Despite the recession in the U.S. economy, builders anticipate increased participation in sustainable residential projects in 2009. Table 5.3 shows the degree to which builders have and will be involved in sustainable building on a national level. The percent reporting that they would be "largely to fully dedicated" to green building (i.e., more than 60% of their projects) will grow from 18% in 2007 to an anticipated 36% in 2009.

Building professionals are positively responding to the market growth surrounding energy efficiency and green building. According to a survey conducted by the National Association of Home Builders (NAHB), "there has been a 20% increase since last year [2005] in builders dedicated to green building issues. The number was expected to rise by another 30 percent in 2007 to 64% of builders either heavily or moderately involved in green building projects." The survey also found that "nine out of ten builders say they are incorporating energy-saving products into new homes at all price levels" and "the leading factors triggering building firms to expand their green home building activities were: consumer demand, 88%; superior performance, 87%; competitive advantage, 83%."

Building professionals recognize the value of energy efficient and green building construction, features, and benefits. More builders are offering sustainable product as a way to differentiate themselves in the market. The Home Builders Association of Metro Portland joined a dozen other HBAs in adopting Earth Advantage as their preferred green building provider of choice. As market conditions shifted in the 2nd half of 2008, market differentiation become more important. The number of firms that provide green building projects grew from 2007 to 2009, according to McGraw Hill (see Table 5.3). describe themselves as providing sustainable building projects to their clients has grown dedicating projects

Table 5.3 Construction Firms Dedicated to Sustainable Building Projects



Source: McGraw Hill Construction Green Outlook 2009

Need for more consumer education: In their comments, home builders pointed to a separation between growing consumer awareness of general sustainability issues and market demand for certified residential properties. The home buying public may not understand the many elements that are needed to construct a home that will meet third-party certification requirements. According to one builder,

> If you know what we know about the quality and the added work that goes into a home to make it Earth Advantage certified, then absolutely, you understand the value. However,

most buyers don't know about the certification process or what goes in to building a home. There is a need to educate the buyer.

Another builder added that there was definitely an increase in the overall value of his company's homes, but that that value did not automatically translate into a higher price. "It doesn't follow that if we spend an extra $2,000 for a given item that we will automatically mark up the price by $2,000." The market may not know how to account for this increase in value. Additionally, a builder may choose not to directly change a price in order to maintain market competitiveness.

Cost implications: Popular perceptions linking sustainable construction with higher construction costs have been common (McCuen, 2007). Builders were asked to comment on the cost implications for building homes to meet sustainable certifications. Among those responding to the survey, 74% answered positively to the question, *Do you believe that building sustainably certified homes adds significant initial cost to you as a builder?* The survey then included a follow-up question to determine what the home builders had experienced in any additional costs. The greatest single answer was provided by twenty-nine percent of the respondents; they estimated that the added cost to the construction budget was between 5% and 10%. (See Table 5.4.)

Table 5.4 Cost of sustainable certification

Do you believe that building sustainably certified homes adds significant initial costs to you as a builder? (n=35)			
	Yes	26	74%
	No	8	23%
	No answer	1	3%
If yes, what is the additional cost that is added to the construction budget?			
	a. up to 5%	7	20%
	b. between 5 and 10%	10	29%
	c. between 10 and 20%	5	14%
	d. other	0	0%
	e. depends on home	8	23%
	f. not sure	1	3%
	No answer given	4	11%

Note: Above does not include the 10 in-person interviews

Importantly, builders who participated in one-on-one interviews stated the added cost has gone down over the past 5 years because more applicable products have become available, the economies of scale yielded benefits, and market demand for their homes has grown. Eight out of 10 individual builders who were interviewed reported that their costs had decreased over the last several years. Two builders attributed this cost decrease to their own increased level of experience and said that the growing experience of their contractors had helped to decrease their costs.

In the 2007 summary report by the World Business Council for Sustainable Development, 1,423 professionals were interviewed between November 2006 and February 2007. The results indicate that nationally, people perceive green buildings to be more expensive than they are.

While the majority of builders acknowledged additional costs, they also agreed that the costs associated with sustainable residential construction have decreased over the past several years. Twenty nine percent responded that costs had become much more competitive and an equal number stated that the costs had decreased by a small amount.

Table 5.5 Costs decreases

Has the additional cost of building a sustainably certified home decreased over time? (n=35)	
Yes, now cost neutral	0
yes, it has become much more price competitive	29%
yes, the costs have decreased by a small amount	29%
no, the costs have not changed	31%
no answer given	11%

Market value: Of the builders who contributed to this study, 98% agreed that sustainable certification adds to the market value of residential properties. The builders equate certification efforts with a high-quality end product, superior construction, increased energy efficiency, and positive health impacts for home residents. Additional discussion followed regarding how market value is determined. Several builders commented that the increased value of their homes is not adequately rewarded by the market.

One builder replied, "Yes, there is added value to a home (in achieving certification), but we don't just adjust the price. So it can be difficult to measure the value exactly. We are selling at cost right now in order to be competitive." Most residential appraisers simply may not know how to assign a dollar value to specific sustainable features in a home, such as high efficiency furnaces or improved duct sealing. Additionally, standard residential appraisal documents do not include an area where this information may be recorded.

Builders responded to the question, *Do your sustainably certified homes command a higher market value? If yes, by what percentage?* Builders were almost evenly split in their responses. They believed that the certified homes that they had built were more valuable. But they also stated that the market would not fully recognize that value.

> "In my opinion the answer... is yes, but if you're asking whether or not the home will sell for a higher price to prospective buyers, no, not in this market."

"(Our homes are) More likely to be purchased over similarly priced competition. As to being able to price them higher, the answer would be no additional value."

"We may be able to sell our homes for perhaps as much as 10 - 15% more. However, location is still the primary driver for home buyers...and green certification cannot offset a less desirable location."

Valuation challenges: A primary issue involved in the valuation of certified homes is the difficulty involved in finding suitable comparable homes. This was clearly demonstrated by the research conducted on property comparisons. This difficulty stems in large part from the lack of objective data and a common language for the description of sustainable features. Builders answering the online survey from Earth Advantage unanimously agreed that this is a primary issue. The majority of builders responded that current appraisal practices do not recognize the value of green features incorporated into a certified home (Table 5.6).

Table 5.6 Current Appraisal Practices

"Current appraisal practices do not recognize the value of green features incorporated into a certified home." Do you agree with this statement? (n=20)	
Yes	80%
No	5%
not sure	15%

NOTE: This question was not included on the electronic survey conducted by Pierce Co.

Public Incentives: The builder survey included questions regarding public incentives and utility rebates to support higher energy efficiency in new residential construction projects. Builders were asked if they were aware of these programs and if they had taken advantage of them. Most of the builders had taken advantage of utility rebates. A smaller number had utilized state or federal tax incentives.

Table 5.7 Builder Awareness of Public Incentives

Are you aware of rebates offered by some utility companies for higher efficiency furnaces/heat pumps/appliances? N=35	
Yes	91%
No	9%

Have you take advantage of any utility rebate programs to install higher efficiency equipment in a home that you have built? N=35	
Yes	57%
No	34%
no answer	9%

Have you taken advantage of state or federal tax incentives to support the construction of any of your residential projects? N=10	
Yes	30%
No	70%

Did tax incentives influence your decision to increase the energy efficiency of your homes? N=25	
Yes	72%
No	24%
no answer	4%

Builders generally acknowledged the important role that these kinds of programs can play in raising public awareness and providing support to individual homeowners. This was particularly true of programs offered by Energy Trust of Oregon. Seventy two percent (72%) of the builders surveyed reported that tax incentives had influenced their decision to increase the energy efficiency levels of their home products.

The downturn in new home construction that began in 2007 and that has continued into 2009, has certainly had an impact on all home builders, including those who construct certified homes. The housing market contracted further in 2008 in the months that followed the interviews and surveys described above. Sustainable or green homes have been reported to provide some amount of market protection for home builders. McGraw Hill Construction reports that green homes have not been as adversely impacted as standard construction homes. "In the context of today's down economy, green homes offer an opportunity for market differentiation for builders as well as cost savings and health benefits for consumers" (McGraw Hill, 2008). According to McGraw Hill's research on U.S. construction trends, "the green home market is expanding despite the downward trends of the market as a whole" (McGraw Hill, 2008).

VIII. Western Washington Marketing Analysis

In March 2009, the Master Builders Association of King and Snohomish Counties selected Hamilton Investments, LLC to study the relationship between the marketing comments included by real estate brokers on the Northwest Multiple Listing Service when selling a certified home and the sales price achieved for the home. The study includes Built Green, LEED for Homes and ENERGY STAR homes as certified homes. The study makes an important contribution to this report as it reinforces the important role that real estate brokers play in educating their buyers and the added value that results from this consumer understanding.

The following excerpt is from the report abstract:

(Hamilton's report) quantifies the effects of marketing and the acknowledgement in marketing materials of environmental certifications and sustainable features on sales prices of homes in a five-county western Washington region. The counties included in this study are: King (excluding Seattle), Pierce, Kitsap, Snohomish and Thurston. Homes are broken down into two major categories: marketed and unmarketed homes. These two categories are then analyzed by geography, certification type, and listing offices. The certifications used are Built Green®[4], LEED for Homes and ENERGY STAR. The listing offices included in this study are Windermere and John L. Scott. Major findings of this study include:

- Throughout the five-county region, certified homes that were marketed as green achieved an average sales price of $534,000 and homes that were not marketed achieved an average sales price of $458,000. In all of the homes analyzed, a roughly 14 percent premium is associated with the marketing of green features. This study includes 1,470 certified homes sold between 2007 and April, 2009, and built between the years 2005 and 2009.

- All counties show some sort of premium for marketed homes, presenting strong evidence that marketing green features and certifications has a positive effect on home prices.

- Thurston County received the highest premium, with marketed certified homes achieving an average price that was 25% higher than homes that were not marketed through the Northwest Multiple Listing Service.

- The county with the highest percentage of homes to receive marketing attention was Kitsap County, with 45 of 117 certified homes marketed. King County followed with 29% or 165 of all certified homes marketed as green. Thurston and Snohomish counties recorded the fewest percentage of homes marketed, at 16%.

- The Built Green® certification is the most referenced certification among marketing comments in the Northwest Multiple Listing Service, with 145 total listings referencing Built Green within their marketing remarks.

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[4] Built Green® is a registered trademark of the Home Builders Association of Metro Denver, Colorado, used by the Washington State Built Green programs with permission.

- Both Windermere and John L. Scott are Northwest residential real estate brokerages. Together they make up the majority market share of environmentally certified home sales in the five-county region. Of this study's 1,470 certified homes sold between 2007 and April, 2009, fifty two percent of those homes were listed by either Windermere or John L. Scott.

- Of the 766 certified homes listed by both Windermere and John L. Scott, 207 of these homes were marketed as green. John L. Scott marketed 75 homes and Windermere marketed 132 homes.

- The average price for all certified homes listed by Windermere was $541,783, whereas certified homes listed by John L. Scott sold for an average of $495,746. This discrepancy reinforces findings throughout the study that certified homes marketed as green will achieve higher premiums than certified homes which are not marketed as green.

Conclusions drawn from this study point to the positive effects on pricing of environmentally certified homes when marketing includes descriptions of sustainable features and of the specific program used to certify the home. While this study presents a very strong case for the relevance of the findings, it in no way questions the decisions of individual real estate agents in marketing their clients' product. The premiums shown amongst marketed product are only statistically significant in that they show a positive trend amongst many data sets. While some statistical tests were conducted, such as scatter diagrams and simple t-tests, specific metrics associated with marketing cannot be measured with high levels of specificity due to the many variables affecting real estate prices.

One conclusion that can be drawn from this study is that evidence points to consumers paying more for cost-saving and environmentally friendly home systems. Marketing these homes is a good way for a real estate brokerage firm to raise overall revenues as well as to educate consumers and other agents about the sustainable features of a certified home.

For more information regarding this report, please contact Aaron Adelstein, executive director of the Master Builders Association of King and Snohomish Counties, or Sterling Hamilton of Hamilton Investments, LLC.

IX. Conclusions and Recommended Next Steps

Residential appraisers, real estate brokers, and financial institutions will benefit from a greater understanding of sustainable home construction and home value by improving their ability to work with third-party certified buildings. Increased professional training and understanding of sustainable home practices will lead to more accurate value assessments of sustainable homes.

Home builders who participated in this study also emphasized the need for greater consumer understanding of what is involved in sustainable home construction and its benefits. As reported by Hamilton in section VIII, consumer familiarity with sustainable home features has a direct positive relationship with the sales price of third-party certified homes. Public outreach of this kind aligns with the marketing goals of the builders, but the promotion of their construction methodologies has a larger goal as well. Sustainable construction has a societal benefit in terms of reduced resource consumption and greenhouse gas reduction. Consumers will benefit from a greater understanding of the impacts that their homes collectively have on the environment and the economy.

Home valuations need to report on aspects of home construction that are tangible but potentially harder to quantify, such as the quality of durable materials and health benefits associated with improved indoor air quality. These long-term performance benefits can be measured, although they typically are not factored in to a home valuation.

Residential builders and sustainable building advocates must continue their dialog with appraisers, real estate professionals, and relevant financial institutions in order to facilitate this improved knowledge transfer. The importance of this dialog was underscored in a publication by Better Bricks, a program of the Northwest Energy Efficiency Alliance.

> Thus, investors, developers, and owners will be better served by engaging more directly with lenders and appraisers, detailing how your approaches to energy management present a more compelling investment opportunity. A clear explanation of key strategies, innovative or non-traditional techniques - and the reason for their incorporation - will facilitate a better assessment, increasing the potential for increased assessed value. (Better Bricks, 2007)

Conversations among builders and the professional groups mentioned earlier are ongoing. Additional training opportunities by organizations such as the American Appraisal Institute on the value and requirements for accurate assessments of sustainable residential properties, are clearly helpful and are beginning to occur. The Vancouver Valuation Accord resulted in a number of goals, including the support of valuation organizations in developing education courses and providing training to appraisal organizations (Bergsman, 2007). Green building organizations in the Pacific Northwest will continue their efforts to meet some of the same education and outreach goals, including real estate and appraiser professional training.

Recommended Actions

This study points to a number of specific recommendations to improve understanding related to the valuation of sustainable homes, including professional development and general public outreach. The proper venue for these actions will vary as will the source of needed resources.

1) Increase Tracking of Third-Party Sustainable Certified Properties

The property comparable work completed in this study only became possible in 2007 when the Portland RMLS and the NWMLS began to track the sale of sustainable homes. Other multiple listing services in the region also provide real estate brokers with the opportunity to track the certification of sustainable homes and/or significant sustainable features. The number of multiple listing services that provide this option should be expanded.

- Meet with other multiple listing service providers to determine if they would be able to provide a forum for information about third-party certified sustainable homes on their Web-based portals.

- Discuss with multiple listing service providers if they would be able to provide training to real estate brokers regarding the different sustainable certification listings. This training would also provide hands-on instruction in the input of information onto the Web-based tool.

2) Conduct Property Comparable Work in Other Areas

As other multiple listing service agencies begin to provide the platform for tracking the sales of homes that have received third-party sustainable certifications, additional property comparison work should be undertaken. Central Oregon MLS and Willamette Valley MLS, for example, have information about certified homes. If sales information can not be tracked by a multiple listing service, realtor associations may be able to to contribute sales data results.

3) Develop and Support Professional Training Opportunities

Following the Vancouver Valuation Accord, the American Appraisal Institute established a training seminar for real estate appraisers and other professionals. Earth Advantage Institute also plans to offer a training course for appraisers in 2009.

4) Work with Homebuilder and Professional Realtor Associations to Increase Consumer Knowledge about Sustainable Homes

Built Green Washington, Cascadia USGBC, Earth Advantage Institute, different Master Builder Associations, Home Builder groups and others, regularly work with professional home builder and real estate associations. These partnerships should be continued and used as an opportunity for increased and coordinated public outreach regarding the connection between sustainable certification and home value. Articles in on-line and printed newsletters, conference presentations and continuing education opportunities each play a role. A concentrated, short-term

outreach campaign would also result in increased general pubic understanding of these complex issues.

5) Develop Additional Educational Tools

Expand Green Building Valuation on-line resources available through GBVI member organizations. When GBVI first began, an on-line library was established through Cascadia USGBC for member organizations. Existing GBVI member websites and other resources include:

American Appraisal Institute:
http://www.appraisalinstitute.org/

Cascadia Regional Green Building Council:
http://www.cascadiagbc.org

Built Green Washington:
http://www.builtgreenwashington.org/page.php?id=3

Earth Advantage Institute:
http://www.earthadvantage.org

Green Works Realty:
http://greenworksrealty.com/e-cert_report/e-cert_report.php?t=e-cert_report

Lighthouse Sustainability Centre:
http://www.sustainablebuildingcentre.com/

Master Builders Association of Pierce County: http://www.mbapierce.com/page.php?id=1

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Certified Homes Outperform Non-Certified Homes for Fourth Year

Existing Homes with a Certification Earn 30% More

PORTLAND, Ore., June 8, 2011 - **Earth Advantage Institute**, a nonprofit green building resource, announced the results of its annual certified home analysis in the Portland metropolitan region for the 2010 to 2011 year. The study is part of the organization's research efforts that include gathering data on green building valuation.

Existing homes with a sustainable certification sold for 30 percent more than homes without such a designation, according to sales data provided by the Portland **Regional Multiple Listing Service** (RMLS) to Earth Advantage Institute. This finding is based on the sale of existing homes between May 1, 2010 and April 30, 2011 in Multnomah, Clackamas, Columbia, and Washington Counties in Oregon, and Clark County in Washington.

Better sales prices were also seen for newly constructed homes with a sustainability certification. As a group, new homes with a sustainability certification in the six-county Portland metropolitan area sold for 8 percent more than new non-certified homes.

This result continues a four-year trend in which new homes with a third-party certification for sustainable construction and energy performance have consistently sold for more than newly constructed homes that had not been certified. The term "certified home" includes homes that received an Earth Advantage New Homes, **ENERGY STAR**, or a **LEED® for Homes** designation, or a combined Earth Advantage/ENERGY STAR certification. Sales information is reported by participating real estate brokers to RMLS. The Portland metropolitan area region includes Multnomah, Clackamas, Columbia, Washington and Yamhill Counties in Oregon and Clark County in Washington. There were no certified new home sales in Columbia and Yamhill Counties that enable comparisons in those areas.

Differences clearly exist among the counties within the metropolitan area. The county exhibiting the greatest difference between new certified and new non-certified homes was Clackamas, where homes with a certification sold for 23.3 percent more than non-certified new homes. Clark County was the one area in the metropolitan region where newly constructed certified homes did not sell for more. However, certified existing homes in Clark County did perform better than their non-certified counterparts. As a group, existing homes with a sustainability certification in Clark County sold for an average of $288,400 versus $222,900 for homes without such a certification, or 29 percent more. Table One summarizes the information received, for both new and existing homes, across the metro region.

Table One: Average Sales Price 2010 - 2011

New Homes	Clackamas	Columbia	Multnomah	Washington	Yamhill	Clark County WA
Non certified	$305,647	$200,732	$292,837	$313,040	$239,147	$296,567

Certified home	$376,763	N/A	$348,240	$329,810	N/A	$254,172
Price premium	23.27%	N/A	18.92%	5.36%	N/A	-14.30%
Existing Homes						
Non certified	$299,696	$174,144	$277,449	$259,835	$209,264	$222,918
Certified home	$372,591	$138,000	$448,886	$354,245	$315,000	$288,363
Price premium	24.32%	-20.76%	61.79%	36.33%	50.53%	29.36%

Source: RMLS Portland May 2011

Portland RMLS was the first regional multiple listing service in the country to provide sales information for homes with green certification, at the request of Earth Advantage Institute. RMLS began tracking information in 2007.

Two important trends are shown by the four years of sales data. First, the market share of certified homes among all newly constructed homes stayed consistent, with 18 percent of the new homes in the Portland market receiving a sustainability certification. Second, a notable price premium for certified homes as a group was observed in each year.

Table Two: Market Summary May 2007 - April 2011 Portland Metro Region

	Number of certified new homes sold	Total New homes sold	Market share among all new homes	Price premium
May 1, 2007 to April 30, 2008	833	6125	13.6%	20.5%
May 1, 2008 to April 30, 2009	674	4135	16.3%	12%
May 1, 2009 to April 30, 2010	118	597	19.8%	14%
May 1, 2010 to April 30, 2011	408	2237	18.2%	18.9%

"This is important news for builders and home buyers alike," said Dakota Gale, the sustainable finance program manager at the Earth Advantage Institute. "While it must be noted that the data are supplied by real estate agents themselves through standard RMLS forms, and are based on averages, not comparables, we can still see a consistent trend that third-party certification continues to result in a higher sales price, even during the past year when home sales were down."

About Earth Advantage Institute
Earth Advantage Institute works with the building and design industry to help implement sustainable building practices. Its nonprofit mission is to create an immediate, practical and cost-effective path to sustainability and carbon reduction in the built environment. The organization achieves its objectives through a range of innovative certification, education and technical services programs.

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UNDERSTANDING THE SOLAR HOME PRICE PREMIUM: ELECTRICITY GENERATION AND "GREEN" SOCIAL STATUS

Samuel Dastrup
Joshua S. Graff Zivin
Dora L. Costa
Matthew E. Kahn

Working Paper 17200
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Understanding the Solar Home Price Premium: Electricity Generation and "Green" Social Status

Samuel Dastrup, Joshua S. Graff Zivin, Dora L. Costa, and Matthew E. Kahn

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ABSTRACT

This study uses a large sample of homes in the San Diego area and Sacramento, California area to provide some of the first capitalization estimates of the sales value of homes with solar panels relative to comparable homes without solar panels. Although the residential solar home market continues to grow, there is little direct evidence on the market capitalization effect. Using both hedonics and a repeat sales index approach we find that solar panels are capitalized at roughly a 3.5% premium. This premium is larger in communities with a greater share of college graduates and of registered Prius hybrid vehicles.

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I. Introduction

On a per-capita basis, California has the most installed residential solar capacity in the United States. Solar homes are expensive. It can cost $30,000 to install such a system. Several state and federal programs actively subsidize this investment. Judged on strictly efficiency criteria (foregone electricity expenditure per dollar of investment), solar panels may be a bad investment. Borenstein (2008) finds that the cost of a solar photovoltaic system is about 80 percent greater than the value of the electricity it will produce.

Solar panels bundle both investment opportunities (the net present value of the flow of electricity they generate) and conspicuous consumption opportunities (that it is common knowledge that your home is "green"). Kotchen (2006) provides a theoretical analysis of the case in which individuals have the option of consuming "impure" public goods that generate private and public goods as a joint product. Outside of the Toyota Prius, solar homes are perhaps the best known "green products" sold on the market.

The owner of a solar home faces low electricity bills and, if an environmentalist, enjoys the "warm glow" for "doing his duty" and producing minimal greenhouse gases (Andreoni 1990). Because the presence of solar panels on most roofs is readily apparent, the solar home owner knows that others in the same community know that the home owner has solar panels. This community level re-enforcement may further increase the demand for this green product. This "observability" is likely to be even more valued in an environmentalist community (i.e a Berkeley) than in a community that dismisses climate change concerns. The recent political divide between Democrats and Republicans over climate change mitigation efforts (see Cragg, Zhou, Gurney and Kahn 2011) highlights that in conservative communities solar panels may offer less "warm glow" utility to its owners.

We examine two facets of solar purchases in this paper. Our primary empirical contribution is to provide new hedonic marginal valuation estimates for a large sample of solar homes based on recent real estate transactions in San Diego County. We test the robustness of our results using data from Sacramento County. We document evidence of a solar price premium and find that this premium is larger in environmentalist communities. In most mature housing markets, we expect that the econometrician knows less about the market than the decision makers. In the case of solar panels, our interactions with professionals in the field suggests that these professionals have little basis for estimating the pecuniary benefits of solar installation.

Our second empirical contribution is to document what types of people, in terms of education, political ideology and demographic attributes do and do not live in solar homes. Most hedonic studies which use sales data (rather than Census data) have little information about the household living in the home, but we can observe household characteristics for a single year.

Our hedonic study contributes to two literatures. The real estate hedonics literature explores how different housing attributes are capitalized into home prices. Solar installation can be thought of as a quality improvement in the home. Recent studies have used longitudinal data sets such as the American Housing Survey (which tracks the same homes over time) to study how home upgrades such as new bathrooms and other home improvements are capitalized into resale values (Harding, Rosenthal and Sirmans 2007, Wilhelmsson 2008). A distinctive feature of solar panels is that on a day to day basis they have no "use value" as compared to a new bathroom or kitchen. Solar panels reduce your household's need to purchase electricity but from an investment standpoint they represent an intermediate good that indirectly provides utility to households. For those households who derive pleasure from knowing that they are generating their own electricity, the solar panels will yield "existence value". Such households will recognize that they have reduced their greenhouse gas emissions and thus are providing world public goods. In their local communities, such households may be recognized by neighbors for their civic virtue. Households who take pride in engaging in "voluntary restraint" will especially value this investment (Kotchen and Moore 2008).

A recent literature in environmental economics has examined the demand for green products. Most of these studies have focused on hybrid vehicle demand such as Kahn (2007), Kahn and Vaughn (2009) and Heutel and Muehlegger (2010) or the diffusion of solar panels across communities (Dastrup 2010 and Bollinger and Gillingham 2010). By using hedonic methods to estimate the price premium for green attributes our study shares a common research design with several recent studies that have used hedonic methods to infer the "green product" price premium such as Delmas and Grant's (2010) study the demand for organic wine, Eichholtz, Kok, and Quigley's (2010) work on the capitalization of Energy Star and LEED status for commercial buildings, and Brounen and Kok's (2010) investigation of the capitalization of residential energy efficiency when Dutch homes are certified with regards to this criterion.

II. The Hedonic Pricing Equilibrium and the Make versus Buy Decision over Solar Installation

A household who wants to live in a solar home can either buy such a home or buy another home that does not have solar panels and pay a contractor to install these solar panels. This option to "make" versus "buy" should impose cross-restrictions on the size of the capitalization effect. Consider an extreme case in which all homes are identical and there is a constant cost of $c to install solar panels. By a no arbitrage argument, in the hedonic equilibrium, we would recover a price premium of "c" for the solar homes. Over time, any supply innovations that lead to a lower installation cost or higher quality of the new solar panels would be immediately reflected in the hedonic price premium.

In reality, homes are differentiated products that differ along many dimensions. No home has a "twin". The non-linear hedonic pricing gradient is such that different homes are close substitutes at the margin (Rosen 2002). Since at any point in time the same home is not available with and without solar panels, there is no reason why the hedonic solar capitalization must equal the installation cost.

We recognize that the investment decision in solar has an option value component. Households may be uncertain about how much electricity the solar panels will generate, the future price of electricity and future price declines in quality adjusted solar systems. In a standard investment under uncertainty problem, it can be rational to delay and not exercise the option. Households may also be uncertain about what the resale value of their house would be if they install solar. All of these factors, as well as the household's power needs and its ideology, will influence demand for solar panels.

On the supply side, there are two sources of solar homes. There are existing homes whose owners have installed solar panels in the past and are now selling their home. In contrast, the second set of solar homes is produced by developers of new homes who will compare their profit for building a home with and without solar panels. Such developers are likely to have invested more effort in the basic marketing research of determining the market for this custom feature.

III. Empirical Specification

We employ both a hedonic and a repeat sales approach to assess the extent to which solar panels are capitalized into home prices. The hedonic specification decomposes home prices by

observable characteristics for all transactions while flexibly controlling for spatial and temporal trends. Solar panels are included as a home characteristic and average capitalization is measured as the coefficient on the solar panel variable. The repeat sales model controls for average appreciation of properties from one sale to the next within each census tract, with an indicator for installation of panels between sales.

Hedonic approach

Our first approach to measuring the capitalization of solar panels in home sales is to decompose home prices by home characteristics and neighborhood level time trends. We interpret the average difference between the log price of homes with solar panels and those without after controlling for observable home characteristics and average neighborhood prices in each quarter as the average percent contribution to home sales price of solar panels. The baseline equation we estimate in our hedonic specification is

$$\log(\text{Price}_{ijt}) = \alpha \text{Solar}_{it} + \beta \text{X}_i + \gamma_{jt} + \varepsilon_{ijt} \qquad (1)$$

where Price_{ijt} is the observed sales price of home i in census tract j in quarter t. The variable Solar_{it} is an indicator for the existence of a solar panel on the property and α is the implicit price of the panels as a percentage of the sales price -- our measure of the extent of capitalization. Home, lot, and sale characteristics are included as X_i.

We allow for the differential capitalization across geographic areas of home and lot size by interacting the logs of these observable characteristics with zip code level indicator variables.[2] Additional characteristics contained in X_i are the number of bathrooms, the number of times the property has sold in our sales data, the number of mortgage defaults associated with the property since 1999, indicators for the building year, if the property has a pool, a view, and is owner occupied, and month of the year indicators to control for seasonality in home prices. In equation (1), we are imposing a constant solar capitalization rate across time and space.[3]

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[2] There is substantial variation in climate and other local amenities across the three counties in our data sets. Our specification allows a home or lot of a given size on the temperate coast near the beach to be valued by the market differently than the same size home or lot in the inland desert region.

[3] Recent changes in the federal tax incentives for solar may affect the solar price capitalization. On October 3, 2008 the President signed the Emergency Economic Stabilization Act of 2008 into law. The bill extends the 30% ITC for residential solar property for eight years through December 31, 2016. It also removes the cap on qualified solar electric property expenditures (formerly $2,000), effective for property

We control for housing market price trends and unobserved neighborhood and location amenities with census tract-quarter fixed effects, γ_{jt}. Allowing different appreciation patterns for different geographies is critical because these different geographical appreciation patterns are correlated with the incidence of solar panel installation.

Any hedonic study is subject to the criticism that key explanatory variables are endogenous. While we have access to a detailed residential data set providing numerous controls, we acknowledge that there are plausible reasons why the solar panel dummy could be correlated with unobserved attributes of the home.

Our OLS capitalization estimate of α measures the average differential in sales price of homes with solar panels and homes without panels in the same census tract selling in the same quarter after controlling for differences in observable home characteristics. Interpreting the hedonic coefficient estimate as the effect on home price of solar panels requires assuming that the residual idiosyncratic variation in sales prices (ε_{ijt} in our framework), solar panel installation and unobservable house attributes are uncorrelated. This assumption is invalid if homeowners who install solar panels are more likely to make other home improvements that increase sales prices of their homes than their neighbors who do not install. We investigate how this might influence our capitalization estimate by estimating (1) with a control for whether a home improvement is observed in building permit data available for a large subset of San Diego County. Alternatively, homes with solar panels may be homes of higher unobserved quality. We explore whether these homes command a time-invariant premium by including an indicator for whether a home will have panels installed at some point in the future relative to a particular sale.

We allow the capitalization of panels to vary over system size and neighborhood characteristics by interacting our solar indicator variable in equation (1) with a linear term including the characteristic. Our estimating equation becomes:

$$\log(\text{Price}_{ijt}) = \alpha_0 \text{Solar}_{it} + \alpha_1 \text{N} * \text{Solar}_{it} + \beta \text{X}_i + \gamma_{jt} + \varepsilon_{ijt}. \qquad (2)$$

The value of installed solar panels may be influenced by factors beside the financial implications of installation, and we estimate equation (2) using a number of proxies for other

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placed in service after December 31, 2008 http://www.clarysolar.com/residential-solar.html. We do not have enough observations to determine whether the law has affected the size of the solar capitalization effect.

factors. Households may have preferences for the production technology used to generate the electricity they use if they are concerned about their individual environmental impact or value their own energy independence. A desire to appear environmentally conscious may increase the value of solar, because it is a visible signal of environmental virtue. Our proxies for environmental idealism and the social return to demonstrating environmental awareness are the percent of voters registered as Green party members in the census tract and the Toyota Prius share of registered vehicles in the zip code. For comparison, we estimate capitalization variation by Democratic party registered voter share and the pickup truck share of registered vehicles in the zip code. We also examine solar panel capitalization by census tract log median income and percent of college graduates.

Repeat sales approach

A second approach to measuring the average additional value to a home sale of solar panels is to average the additional appreciation of a single home from one sale to the next (repeat sales) when solar panels are installed between sales. We interpret the average differential in the appreciation in consecutive sales of properties where solar was installed between sales and other properties in the same census tract with no installation between consecutive sales as the average capitalization of solar panels in home sales. The baseline equation we estimate for our repeat sales specification is

$$\log\left(\frac{\text{Price}_{ij(t+\tau)}}{\text{Price}_{ijt}}\right) = \tilde{\alpha}\Delta\text{Solar}_{i(t+\tau)} + T_{j(t+\tau)} + \tilde{\varepsilon}_{ij(t+\tau)} \qquad (3)$$

where $\text{Price}_{ij(t+\tau)}$ and Price_{ijt} are consecutive sales of the same property i in neighborhood j occurring τ quarters apart where the first sale is in period t. The variable $\Delta\text{Solar}_{i(t+\tau)}$ is an indicator for the installation of solar panels at a property between sales (after t but before $t+\tau$). Census tract specific time effects are included as the vector $T_{j(t+\tau)}$, with remaining idiosyncratic property appreciation measured as $\tilde{\varepsilon}_{ij(t+\tau)}$.

Our repeat sales GLS capitalization estimate, $\tilde{\alpha}$, of the capitalization of solar panels in housing prices measures the average additional appreciation of homes with solar installed between sales beyond that measured by the housing price indexes of their respective census tracts. Interpreting $\tilde{\alpha}$ as the effect of panel installation on subsequent sales price requires the

assumption that idiosyncratic price appreciation of homes is not correlated with solar panel installation. Again, this will not be the case if unobserved changes in properties are correlated with solar panel installation.[4]

IV. San Diego County Data

Our hedonic analysis utilizes single family home sales records occurring between January 1997 and early December 2010 in San Diego County. For our sample of repeat sales of single family homes in which solar was installed between sales we use first sales beginning as early as January of 1990. When we restrict our analysis to homes for which we know the home square footage, the number of bedrooms and bathrooms, the year the house was built or most recently underwent a major remodeling, whether the property has a pool, whether the property has a view, and if the property is subject to a lower tax because it is owner occupied, we obtain 364,992 sales records for the hedonic analysis and 80,182 records for the repeat sales analysis.[5] The Data Appendix provides details on the variables.

We control for the home observable characteristics mentioned above as well as lot size, the number of times the property has transacted in our dataset and the number of public mortgage default notices associated with the property. We view the latter as proxies for idiosyncratic home quality. We also control for neighborhood characteristics. We use the percent of voters in each census tract who are Green Party registrants as a measure of the level of environmentalism in the neighborhood. We use the Toyota Prius share of registered automobiles from zip code totals of year 2007 automobile registration data as a proxy of the neighborhood prevalence of both the level of environmentalism and of displayed environmentalism.[6] We use the percent

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[4] Our hedonic and repeat sales approaches are related. Since differencing consecutive observations on the same property i in equation (1) results in equation (3), both methods estimate the same parameter for the average capitalization of solar panels, $\alpha = \tilde{\alpha}$. An advantage of the repeat sales approach is that this differencing controls for unobservable time-invariant housing characteristics, in addition to the observable X_i, that may be correlated with solar installations. The census tract-quarter time effects, $T_{j(t+\tau)} = \gamma_{i(t+\tau)} - \gamma_{it}$, are jointly estimated as quarterly repeat sales price indexes for each census tract using standard GLS procedures to account for the dependence of the idiosyncratic error $\tilde{\varepsilon}_{ij(t+\tau)}$ on τ, the number of quarters between sales.

[5] The building year is not recorded for 1,681 properties, 46 of which are matched to solar panel installations.

[6] See Kahn (2007) for a discussion on the Green Party and party membership as an identifier of environmentalists.

registered Democrats and vehicles classified as trucks from the respective summary datasets as comparison measures. We control for year 2000 census tract median income and average census tract education levels as percent of the over age 25 population who are college graduates. We also control for census tract specific time effects.

We know which homes have solar panels from administrative records from four incentive programs which have subsidized residential solar panel systems in San Diego County (details about these programs are given in the Data Appendix). These programs cover virtually all solar installations in San Diego County, as we have confirmed with conversations from industry experts.

The solar systems consist of solar panels installed on the property, typically on the roof, which are connected to the electricity grid, meaning the home draws electricity both from the panels and from standard utility lines and the panels supply electricity to the local infrastructure when production exceeds consumption at a given home. We use a dataset of the administrative records from these programs to determine the presence of solar panels on a property being sold as well as the installation of panels between sales.[7]

We know, for each installation, the address of the property, size of the system in terms of kilowatt production potential, and date completed. Most installations also include information on the cost of the system and the amount subsidized by the respective program. We successfully match installation records to 6,249 single family homes by address to public San Diego County Assessor property records for installations through early December 2010.[8]

We assign each home in our sample to one of four mutually exclusive and exhaustive categories. At the time the home was sold, the home can 1) already have solar panels installed (329 observations); 2) concurrently have installed solar panels (73 observations); 3) have solar panels installed in the future but be sold without solar panels at the time of the specific sale (3,433 observations); and, 4) not have solar panels as of Winter 2010. In the regressions, this

[7] Federal tax credits allow homeowners to recover 30% of the costs of a system, but we do not have access to tax return data as an additional source of installation detail.

[8] We match nearly 90% of installation records, and have verified that many unmatched records are business or multifamily addresses. Match quality was verified by inspecting publicly available aerial photographs (www.bing.com/maps) of the installation addresses for the existence of solar panels for a subset of the records.

fourth category will be the omitted category.[9] We use the date of installation of each system to determine how many homes in the same census block had solar panels installed for each month of our sample.

We use building permit data to examine whether homeowners who install solar panels also make other improvements to their homes more often than their neighborhoods, thus potentially biasing our estimate of the home price premium for solar panels. Our building permit reports begin in 2003 for San Diego City, the largest permit issuing jurisdiction in San Diego County, and for Escondido, a smaller municipality in our sample area. We define a "major renovation" as one referencing a kitchen, bath, HVAC, or roof with an associated value greater than $1,000 and a "high value" renovations as one with an associated value greater than $10,000.

Summary statistics for San Diego

Table 1 shows that compared to homes sold without solar, those sold with solar are bigger, have more bedrooms and bathrooms, and are more likely to have a view and a pool, among various other characteristics. We thus need to control for observable home characteristics as well as census tract location in our empirical specification so that our regressions are comparing sales prices of homes with solar panels to sales of similar homes in the same census tract.

Neighborhoods where solar panels have been installed are richer, whiter, more educated, have more registered Democrats, and have larger homes than the 103 of 478 census tracts where no solar was installed during period covered by our data (see Table 2). Our empirical analysis exploits the gradation in these differences across neighborhoods to examine how capitalization in home price varies with ideological and demographic characteristics.

V. Who Lives in Solar Homes?

Most hedonic real estate studies have detailed information about the home, its sales price, location and physical attributes but they know little about the marginal buyer who chose to pay the sales price to live there. For the city of San Diego in 2009, we have information for

[9] An additional 50 transactions with an existing solar systems occurred within the year following a public mortgage default notice or sometimes attendant notice of trustee's sale. These are excluded from the analysis here. Including them, along with an indicator for a sale following default for all observations does substantively alter our results.

registered voters on their age, education, political party of registration, and contributions to environmental, political, and religious organizations.[10] These data enable us to investigate what types of people self select into solar homes.

We estimate linear probability models using the full stock of City of San Diego homes in the year 2009. We regress a dummy variable indicating whether the home has solar panels on various household characteristics, including the number of voters in conservative (Republican, American, and Libertarian) and liberal parties (Democrat, Peace and Freedom, and Green), whether the two oldest registered voters in the household contribute to environmental, political, and religious organizations, the highest education level of the two oldest registered voters, the age of the oldest registered voter in the household, whether a child is present, the highest imputed income (based on census block data and the age of the household) of the two oldest registered voters in the household, and census tract fixed effects.

We find that households in which everyone is a registered liberal and in which the household contributes to environmental organizations are much more likely to be in solar homes controlling for education, imputed income, the age of the oldest registered household member, and whether any children are present in the household (see Table 3). When everyone in the household is a registered liberal (and also controlling for contributions to organizations) the probability of being in a solar home increases by 0.002, an 18 percent increase from the base of 0.011. When the household contributes to environmental organizations (and controlling for party registration) the probability of being in a solar home increases by 0.006, a 55 percent increase.

Education, age, and income were also predictors of living in a solar home. Those with a college education have a 0.003 greater probability of living in a solar home than those with less than a high school education and those with a graduate degree have a 0.006 greater probability of living in a solar home. This represents roughly a 27-55% increase in the probability of living in a solar home. Households living in a solar home are also most likely to be those where the oldest voter was born after 1950 (relative to being born before 1950) and households with imputed income above the 70th percentile compared to households with imputed income between the 50th and 60th percentile (results not shown).

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[10] Our data are from www.aristotle.com. We merged by street address to each home. We were able to match 90% of the sample.

We have shown that environmentalists, the college-educated, baby-boomers and later generations, and richer households paid the hedonic premium to live in solar homes. We next estimate the size of these hedonic premia.

VI. Estimation results

Tables 1 and 2 showed that large nice homes in rich white neighborhoods are more likely to have solar than small homes in poor minority neighborhoods. Our estimated solar coefficient is the average premium for a large nice home with solar (in a rich white neighborhood) relative to the other homes *in the same neighborhood* after flexibly controlling for observable differences between the two homes. Because the hedonic regressions based on equation (2) contain census tract by quarter fixed effects, the coefficient picks up the price premium for a home with solar relative to homes in the same tract. Similarly, our repeat sales approach measures the average additional increase in price between sales for homes with solar installed between sales relative to other homes in the neighborhood because we are fitting census tract specific repeat sales indexes.

Hedonic estimates

All of our hedonic specifications estimate the capitalization of solar panels in observed property sales while controlling for housing characteristics, and census tract/quarter fixed effects. We find that solar panels add 3.6% to the sales price of a home after controlling for observable characteristics and flexible neighborhood price trends (see Table 4). This corresponds to a predicted $22,554 increase in price for the average sale with solar panels installed.[11] Homes which do not yet have solar installed but will at some subsequent time in our sample have no associated premium, indicating that our measured solar effect is not attributable to unobserved, time-invariant differences in these homes. Homes in which the solar installation was done "concurrently" receive a statistically insignificant capitalization rate of 2.8 percent, probably because they are a combination of two types of installations. If the installation was done before the sale (for example, for new developments or contract remodels) then the price will be capitalized in the sales price. If the installation was done after the sale, the home owner probably added the panels. Unfortunately, we cannot distinguish between these two cases because we do not have the precise date of installation.

[11] We convert the coefficient estimate to a dollar amount by differencing the predicted sales price from our estimated model with our solar indicator equal to one and zero and all other characteristics equal to the mean values of all other homes with solar.

We estimate the solar premium to be 1% higher if other homes in the same census block have previously installed panels, but the coefficient is not statistically different from zero. We observe a decreasing return to additional system size, a positive relationship between the capitalization rate and Prius penetration, Green party registration share, Democrat registration share, median income, and education, as well as a negative relationship between capitalization and truck ownership. Controlling for building permit activity in a subsample of our data suggests that the solar panel addition rather than unobserved home improvements are responsible for the measured price premium.

The Returns to Solar Investment Based on the San Diego Estimates

Table 5 compares this predicted increase in price of $22,554 to four different measures of costs of solar panels. The first potential comparison is the average total cost of the systems, which is $35,967.[12] However, this amount does not include subsidies which lowered the effective price to homeowners to about $20,892. Although we do not know the value to the homeowners of federal tax credits for each installation, this comparison suggests that, on average, homeowners fully recover their costs of installing solar panels upon sale of the property. Another measure of the value of panels is the average cost of adding panels during the quarter in which the home was sold. We calculate this value for each quarter in our data, and for our sales the average of this replacement cost measure is $30,858 before and $21,047 after subsidies. Buyers purchasing homes with pre-installed solar panels are paying less than the cost of a new system. However, the 30% tax credit lowers this replacement cost measure net measure to $14,733, below our estimated capitalization value.

We use our hedonic estimates of equation (3) to test for heterogeneous impacts of solar installation across communities and structure attributes. First we include the log of the size in watts (maximum production capacity) of the solar system, $N = \log(Watts_{it})$ as a measure of the expected energy production from the system. Although a larger system by definition produces more electricity, because of the structure of electricity rates and the valuation of electricity produced under California's "net metering" system, we do not expect capitalization to increase proportionately with system size. For excess generation, households may opt in to the net

[12] All dollar amounts are adjusted to 2010 dollars using the "All items less shelter" consumer price index from the Bureau of Labor Statistics.

metering system that compensates them for electricity returned to the grid at (currently) between $0.171 and $0.275/kWh depending on the time of day, but the compensation is capped at the total of their annual electric bill and households face typically higher time of use prices for any electricity purchased from the utility.[13] The combined effect of the rate structure and net metering is that electricity produced by residential solar panels in excess of their annual electricity consumption is essentially donated to the utility. While households may value larger systems for other reasons, additional financial incentives to installing capacity decrease with system size.[14]

Allowing capitalization to vary by neighborhood characteristics demonstrates that the addition to a home's market value from solar panels varies across neighborhoods by environmental ideology, income, and education levels. The estimated coefficients on the linear solar term are jointly statistically significant in each neighborhood variable specification, as listed in Table 6. In each case, the capitalization of solar panels follows a pattern that would be predicted by the measure of environmental ideology, income, or education. Neighborhoods with relatively high Prius concentrations, Green party and Democrat registrant share, and median income capitalize solar panels at a higher value, while in neighborhoods with a large share of trucks, panels provide less of a premium to home sales.

Our final hedonic specification suggests that our estimates are not driven by unobserved home upgrades besides solar panel installation (see Table 8). Our capitalization estimate of 6.2% in the smaller subsample of San Diego City and Escondido is robust to the inclusion of our building permit measures. Our estimates suggest that remodeling a kitchen or bath or replacing a roof or HVAC system has a small impact on price, while high value renovations with costs similar to solar panels are estimated to have a similar value on home prices.

Repeat sales estimates

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[13] Consumer electricity prices in San Diego County are tiered by monthly consumption, with each household allocated a geography specific baseline amount of electricity (from 9.6 kWh along the coast to 16.4 kWh per month in the inland desert during the summer) at a relatively low price (currently $0.039/kWh during the summer months) with an up to five fold increases for above baseline consumption (the top of four tiers is $0.197/kWh during the summer for all consumption over 200% of the baseline). Households pay for electricity use in excess of what is produced by the panels at any given point in time.

[14] Because of these institutional factors, estimated or actual household specific expected electricity demand is necessary for a complete accounting of the financial benefit of installing a system as a function of system size, and is beyond the scope of this paper.

The results of our hedonic specification are largely replicated in our repeat sales approach. All of the presented results are based on three stage GLS estimates, with observations in the final stage weighted based on time between sales, and controlling for jointly estimated census tract level repeat sales indexes.[15] Our average capitalization estimate of 3.6% (see Table 8) implies that installing solar panels leads to an increase of $20,194 from the first to the second sale when the average price of the first sale is $558,100. Households who install panels thus recuperate more than their costs in subsequent sales even though our estimated value remains below our "replacement cost" measure of solar value. Our estimate of the contribution of system size to the capitalization rate suggests an anomalous large negative relationship. Neighborhood characteristics estimates in the repeat sales framework also indicate that the capitalization of solar panels depends on local preferences and incomes (results not shown).

VII. Capitalization of Solar Homes: Evidence from Sacramento County

We examine the robustness of our capitalization estimates using data on 90,686 single family home transactions in Sacramento County between January 2003 and November 2010. We believe that this is a 100% sample of all homes transacted in this period in the county. For each of these homes, we observe its sales date and sales price and its physical attributes. We are also able to identify every single family home in Sacramento County that has solar panels as of November 2010 and that was sold at least once between January 2003 and November 2010. For each of these 620 homes, we know the solar system's installation date. Using the information on the installation date and the sales date, we are able to partition these homes into four mutually exclusive and exhaustive categories. A home can either not have solar panels, or it can have solar panels already installed at the time of the sale (true for 256 observations), concurrently have installed solar panels (52 observations), or in the future this same home will have solar panels installed but it does not have solar panels at the time of the specific sale (312 observations).[16] We also define a "solar" street as a street where at least two homes adjacent to each other have solar panels. These streets are more likely to be new developments and solar installation is cheaper when done on all homes in a new development.

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[15] OLS estimates of solar capitalization that do not correct for time between sales do not vary greatly from our GLS estimates.

[16] For the "concurrent" set of homes, we do not know if the home had solar panels when it was sold. Either the new home buyer installed solar panels after purchase or the developer installed solar panels.

We find that the premium for solar homes in Sacramento is 4 percent (see Table 9), similar to the premium for solar homes in San Diego (see Table 4). We find an even larger capitalization of 7 percent for a solar home in Sacramento that is not on a solar street and a smaller one of 3 percent when it is on a solar street.

VIII. Conclusion

This study used a large sample of homes in the San Diego area to provide some of the first capitalization estimates of the resale value of homes with solar panels relative to comparable homes without solar panels. Although the residential solar home market continues to grow, there is little direct evidence on the market capitalization effect. Using both hedonics and a repeat sales index approach we find that solar panels are capitalized at roughly a 3% to 4% premium. This premium is larger in communities with more registered Prius hybrid vehicles and in communities featuring a larger share of college graduates.

Our new marginal valuation estimates inform the debate led by Borenstein (2008) on whether expenditure on residential solar is a "good investment." His analysis, consistent with those taken by others in the literature, treats residential solar installations as a 'pure' investment good judged in terms of upfront cost and power generation. Our evidence suggests that similar to other home investments such as a new kitchen, solar installation bundles both investment value and consumption value. Some households may take pride in knowing that they are producers of "green" electricity and "warm glow" may triumph over present discounted value calculations in determining a household's install choice.

Data Appendix

Solar panel installations

California's Emerging Renewables Program subsidized solar panel installations as early as 1999 and supported almost all installations through 2007, when it was replaced as the primary State subsidy regime by the California Solar Initiative, which continues today.[17] Over 95% of the systems in our data are installed under these two programs. The New Solar Homes Partnership aims to encourage developers to include solar on new properties, and accounts for less than 1% of installations in our data. These programs are administered in areas of California serviced by

[17] http://www.gosolarcalifornia.org/about/gosolar/california.php

public utilities, including San Diego County. A final program supported solar panel installations on rebuilding projects during 2005 to 2007 following wildfires in San Diego County.

Property records

The San Diego County Assessor maintains public records of characteristics and transactions of all property in the county for tax assessment purposes. We use a corresponding publicly available map file (GIS shapefile) of the boundaries of all county properties to determine the acreage of the lot on which each home is built. We also obtain information on the number of times the property has transacted in our dataset and the number of public mortgage default notices associated with the property.[18] Homes are grouped spatially using the county property map and census tract and zip code boundary maps to assign each parcel number to the respective geography in which its property lies.[19] We use these groupings to construct spatial and temporal controls as well as for matching a home to the characteristics of its census tract and zip code. The assessor also maintains a record of each property transaction in the county. The date, sales price, and parcel number identifier of all single family home sales since 1983 is publicly available from these records, which form the dataset which is our source for sales prices and dates.

Our building permit data begin in 2003 for San Diego City and for Escondido. In San Diego City, building permits are required for "all new construction" including for "repair or replacement of existing fixtures, such as replacing windows." Permits are also required for changes to a home's "existing systems"; for example, moving or adding an electrical outlet requires a permit."[20] A permit is not required "wallpapering, painting or similar finish work" and for small fences, decks, and walks.[21]

Neighborhood characteristics

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[18] Default data is matched by parcel number from public records published online by the San Diego Daily Transcript.

[19] Maps were retrieved from www.sangis.org.

[20] Although not all improvements may be completed with a permit, as long as homeowners who install solar panels are not less likely than others to obtain permits for other improvements, including permitting activity in our capitalization regressions should provide evidence of the extent of bias due to unobserved home improvements and maintenance in our capitalization estimates.

[21] http://www.sandiego.gov/development-services/homeownr/hometips.shtml#whendo

We use voter registration summary statistics for each San Diego County Census tract in the year 2000 from the Berkeley IGS (see http://swdb.berkeley.edu/), zip code level automobile registration summary statistics from 2007, and 2000 Census tract level demographic as sources of descriptors of San Diego neighborhoods over which solar panel capitalization may vary. The voter registration summary files report the total number of registrants by political party affiliation for each census tract in California. From these reports we calculate the percent of voters in each tract who are Green Party registrants. Similarly, we calculate the Toyota Prius share of registered autos from zip code totals of year 2007 automobile registration data (purchased from R.L Polk). We likewise calculate the percent registered Democrats and vehicles classified as trucks from the respective summary datasets. We obtain reported census tract median income and the percent of the over age 25 population who are college graduates from the 2000 Census.

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Table 1: San Diego Summary statistics and mean comparisons for solar and no solar home sales

	Sales with no solar	Sales with solar	No solar - solar
Variable	Mean *Std Dev*	Mean *Std Dev*	Difference in means *Pr(|T|>|t|)*
Sale price (2000 $s)	427,047 *380,536*	667,645 *426,980*	-240,599 *0.000*
Square feet	1,984 *961*	2,512 *1,124*	-528 *0.000*
Bedrooms	3.39 *0.89*	3.76 *0.86*	-0.37 *0.000*
Baths	2.37 *0.88*	2.86 *1.00*	-0.48 *0.000*
View	0.30 *0.46*	0.36 *0.48*	-0.06 *0.020*
Pool	0.18 *0.38*	0.33 *0.47*	-0.15 *0.000*
Acres	0.40 *1.51*	0.88 *2.56*	-0.49 *0.001*
Owner occupied	0.70 *0.46*	0.69 *0.46*	0.02 *0.531*
Building year*	1978 *19.5*	1983 *20.9*	-5.56 *0.000*
Sales since 1983	2.76 *1.39*	2.60 *1.19*	0.17 *0.012*
Defaults since 1999	0.29 *0.62*	0.22 *0.51*	0.07 *0.018*
System cost (2000 $s)[+]		27,790 *17,245*	
System size (kW)		3.37 *2.23*	
Incentive amount[+]		11,930 *8,301*	
Observations	364,663 (*363,504)	329 ([+]307)	

Table 2: San Diego neighborhood summary stats and comparison by solar penetration

	Neighborhoods with no solar	Neighborhoods with at least one solar	No Solar - Solar
Variable	Mean *Std Dev*	Mean *Std Dev*	Difference in Means *Pr(|T|>|t|)*
Average square footage	1,278 *326*	1,822 *535*	-544 *0.000*
Average acreage	0.22 *0.44*	0.44 *0.88*	-0.22 *0.000*
Percent with pools	3.01 *3.73*	15.01 *11081*	-12.00 *0.000*
Percent Green Party	0.50 *0.50*	0.52 *0.45*	-0.02 *0.709*
Percent Democrat	47.38 *9.42*	35.63 *8.95*	11.75 *0.000*
Median income ($1000s)	30.35 *11.97*	55.86 *22.85*	-25.51 *0.000*
Percent White	26.73 *22.70*	60.85 *23.67*	-34.13 *0.000*
Percent Owner Occupied	53.89 *18.21*	72.87 *8.95*	-18.99 *0.000*
Percent College Grads	13.54 *13.33*	31.19 *17.95*	-17.66 *0.000*
Percent Prius*	0.39 *0.03*	0.39 *0.03*	0.002 *0.993*
Percent Truck*	51.83 *8.23*	45.61 *6.92*	6.21 *0.126*
Observations	89 (*6)	496 (*89)	

*Auto data variables reported at the zip code level, all others are census tract averages

Table 3: Correlates of Living in a Solar Home in the City of San Diego in 2009

		Full Sample		Aristotle Sample	
Dependent Variable:		Coefficient	Coefficient		Coefficient
Dummy=1 if lives in a solar home	Mean	(Std Error)	(Std Error)	Mean	(Std Error)
Home has solar panels (count)	2,282			1,272	
Conservative (all HH voters)	0.703			0.405	
Liberal (all HH voters)	0.199	0.002***	0.002**	0.399	0.002**
		(0.001)	(0.001)		(0.001)
Mixed Conservative and Liberal	0.0111	0.005	0.005*	0.022	0.005
		(0.003)	(0.003)		(0.003)
Other Party	0.0866	0.000	0.000	0.174	0.000
		(0.001)	(0.001)		(0.001)
Less than high school	0.0337			0.067	
High school grad	0.103		0.001	0.205	0.001
			(0.001)		(0.001)
Some College	0.125		0.000	0.249	0.000
			(0.001)		(0.001)
College Grad	0.127		0.003**	0.253	0.003**
			(0.001)		(0.001)
Post graduate	0.0859		0.006***	0.171	0.006***
			(0.001)		(0.001)
Household has contributed to					
environmental organizations	0.0404		0.005***	0.080	0.005***
			(0.002)		(0.002)
political organizations	0.246		-0.001	0.490	-0.001
			(0.001)		(0.001)
religious organizations	0.0289		0.001	0.058	0.001
			(0.002)		(0.002)
Census Tract Fixed Effects		Y	Y		Y
Observations		202,864	202,864		100,943
R-squared		0.012	0.013		0.010

Estimated from a linear probability model. Additional controls include the age of the oldest registered voter in the household, whether a child is present in the household, the highest imputed income of the two oldest registered voters in the household, and an indicator for the being in the Aristotle data base. A conservative is registered as Republican, American, or Libertarian Party. A liberal is a registered as Democrat, Peace and Freedom, or Green Party. Robust standard errors in parentheses. The symbols *, **, and *** indicate significance at the 10, 5, and 1 percent level, respectively.

Table 4: San Diego Hedonic OLS regression estimates of log sales price on solar panels

Dependent variable: Log(SalePrice)	Baseline	Neighborhood	System Size
	Coefficient *(Std Error)*	Coefficient *(Std Error)*	Coefficient *(Std Error)*
Solar	0.036*** *(0.010)*	0.031** *(0.014)*	0.043 *(0.137)*
Solar will be installed	0.004 *(0.003)*	0.004 *(0.003)*	
Solar concurrently installed	0.028 *(0.021)*	0.028 *(0.021)*	
Solar home in solar block		0.010 *(0.020)*	
Log Size (watts) * Solar			-0.001 *(0.017)*
Joint significance of solar terms			F Stat = 6.60, Prob > F = 0.001
Log(Acres)†	0.074*** *(0.003)*	0.074*** *(0.003)*	0.074*** *(0.003)*
Swimming Pool	0.050*** *(0.001)*	0.050*** *(0.001)*	0.050*** *(0.001)*
View	0.049*** *(0.001)*	0.049*** *(0.001)*	0.049*** *(0.001)*
Log(SquareFoot)†	0.432*** *(0.003)*	0.432*** *(0.003)*	0.432*** *(0.003)*
Bathrooms	0.024*** *(0.001)*	0.024*** *(0.001)*	0.024*** *(0.001)*
Constant	9.385*** *(0.012)*	9.385*** *(0.012)*	9.385*** *(0.012)*
Census tract quarter fixed effects (578 tracts, 56 quarters)	30,426	30,426	30,426
Observations	364,992	364,992	364,992
Sales with solar	329	329	329
R^2 within; overall	0.64; 0.34	0.64; 0.34	0.64; 0.34

Significant at *** 1% and ** 5% levels; † Zip code specific variation in these coefficients is also estimated; Building vintage, mortgage default frequency, sales frequency, owner occupancy tax status, and month in year of sale are included in all regressions, with coefficient estimates available from the authors by request.

Table 5: Predicted value of solar from hedonic estimates and comparison sample values (Adjusted to 2010 dollars)

Predicted added value of solar at mean characteristics of sales with solar	$22,554; ($5.65/watt)
Average total (before subsidy) system cost of solar for solar sales	$35,967; ($9.02/watt)
Average net (after subsidy) system cost of solar for solar sales	$20,892; ($5.24/watt)
Average mean total (before subsidy) system cost of all systems installed during quarter of home sale (replacement cost)	$30,858; ($7.74/watt)
Average mean net (after subsidy) system cost of all systems installed during quarter of home sale	$21,047; ($5.28/watt)

Table 6: Hedonic OLS regression estimates of log price on solar panels with neighborhood characteristic interaction

Variable	Prius Share Coeff. *(S.E.)*	Truck Share Coeff. *(S.E.)*	Green Share Coeff. *(S.E.)*	Dems Share Coeff. *(S.E.)*	Log Med Income Coeff. *(S.E.)*	College Grads Coeff. *(S.E.)*
$Solar_{ijt}$	-0.002 *(0.022)*	0.198*** *(0.078)*	0.031** *(0.014)*	-0.027 *(0.047)*	-0.156 *(0.277)*	-0.022 *(0.026)*
$NbhdVar_j$ * $Solar_{ijt}$	0.076** *(0.038)*	-0.004** *(0.002)*	0.009 *(0.022)*	0.002 *(0.002)*	0.017 *(0.025)*	0.001* *(0.0005)*
Joint significance of solar terms - F Stat; (Prob > F)	8.77; (0.000)	8.90; (0.000)	6.69; (0.001)	7.55; (0.001)	6.84; (0.001)	8.09; (0.000)
Home characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Census tract quarter fixed effects (578 tracts, 56 quarters)	29,697	29,697	30,420	30,420	30,420	30,420
Observations	349,108	349,108	364,985	364,985	364,985	364,985
Sales with solar	319	319	329	329	329	329
R^2 within; overall	0.64; 0.33	0.64; 0.33	0.64; 0.34	0.64; 0.34	0.64; 0.34	0.64; 0.34

***,**,* Significant at 1%, 5%, 10% levels, respectively

Table 7: Hedonic OLS regression estimates of solar on log price with building permits

Variable	Baseline Coefficient *(Std Error)*	Major renovation Coefficient *(Std Error)*	High value renovation Coefficient *(Std Error)*	Any Permit Coefficient *(Std Error)*
$Solar_{ijt}$	0.062*** *(0.016)*	0.062*** *(0.016)*	0.060*** *(0.016)*	0.062*** *(0.016)*
$Building\ Permit_{ijt}$		0.025*** *(0.007)*	0.056*** *(0.005)*	-0.036*** *(0.001)*
Home characteristics	Yes	Yes	Yes	Yes
Census tract quarter fixed effects (578 tracts, 51 quarters)	13,416	13,416	13,416	13,416
Observations	136,389	136,389	136,389	136,389
Sales with solar	122	122	122	122
Sales with permit		725	1,411	20,324
Sales with solar and permit		4	12	25
R^2 within; overall	0.57; 0.31	0.57; 0.31	0.57; 0.31	0.57; 0.32

***Significant at the 1% level

Table 8: Repeat sales GLS regression estimates of log of sales price ratio on added solar

	Baseline	System Size
Variable	Coefficient *(Std Error)*	Coefficient *(Std Error)*
$\Delta Solar_{ijt}$	0.036** *(0.018)*	0.611** *(0.277)*
Log Size (watts) * $\Delta Solar_{ijt}$		-0.073** *(0.035)*
Joint significance of solar terms		F Stat = 4.36, Prob > F = 0.013
Census tract specific HPIs	110	110
Observations	80,182	80,164
Sales with solar	160	160
R^2	0.76	0.76

**Significant at the 5% level

Table 9: Sacramento Hedonic OLS regression estimates of log sales price on solar panels

Dependent Variable: Log(Sale Price)		Baseline	Street
	Mean	Coefficient (Std Error)	Coefficient (Std Error)
Solar	0.003	0.04	0.073
		(0.014)***	(0.026)***
Solar will be installed	0.003	0.009	0.009
		(0.013)	(0.013)
Solar concurrently installed	0.001	0.024	0.065
		(0.030)	(0.041)
Solar home on solar street			-0.046
			(0.030)
Log(acres)	-1.803	0.156	0.156
		(0.002)***	(0.002)***
Swimming Pool	0.116	0.076	0.076
		(0.002)***	(0.002)***
Log(Square Foot)	7.365	0.559	0.559
		(0.004)***	(0.004)***
Bathrooms	2.201	0.018	0.018
		(0.002)***	(0.002)***
Constant		8.523	8.523
		(0.028)***	(0.028)***
Year Built Dummies		Y	Y
Zip Code/Year/Month Dummies		Y	Y
Observations		90686	90686
Sales with solar		265	265
R^2		0.852	0.852

*** indicates significantly different from 0 at ***1% level. Regressions include year built dummies. Average sales price is $305,178.